Science Equipment Operations Manual

Project Name:	MBARI
Shipyard:	Freire S.A.
Vessel Name:	David Packard



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Prepared by: Michael van Epps
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Note: *Pentagon 7 Seas User's Manual to be added*

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Revision history

1	**12/10/2023**	**First Issue**	**EXTMV**	**HD**	**HD**
Rev.	**Date**	**Reason to issue**	**Prepared**	**Checked**	**Approved**

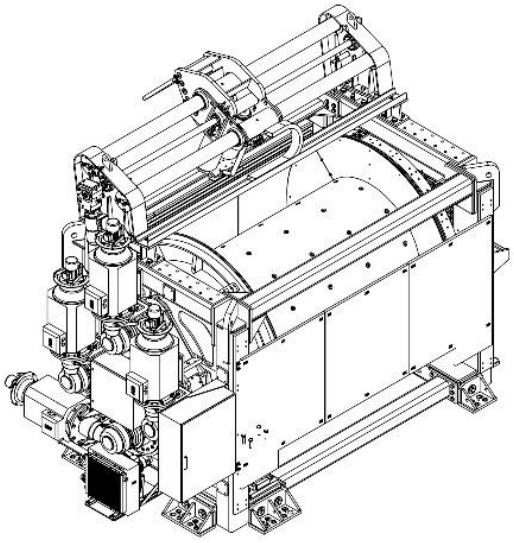
Section 1

Personnel Safety Precautions

DESCRIPTION	DOC/DRW #	REV #	PAG #
Personnel Safety Precautions	5558	11	2

Title:		Date:	Doc.Id:	Version:
Personell Safety Precautions		21.02.2022	5558	11
Author:	Approver:			
Stein Erik Arnsen	Stein Erik Arnsen			
Doc.Applies to:		Department:		
MacGregor FAR		Quality - HSE		

PERSONNEL SAFETY PRECAUTIONS



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WARNING

THIS PRODUCT MUST BE USED IN ACCORDANCE WITH MACGREGOR BODØ INSTRUCTIONS AND LIMITATIONS AND APPLICABLE INDUSTRY STANDARDS. FAILURE TO FOLLOW THESE INSTRUCTIONS AND LIMITATIONS COULD RESULT IN EQUIPMENT MALFUNCTION, PROPERTY DAMAGE, SERIOUS INJURY OR DEATH.

General

OPERATION AND MAINTENACE OF THE WINCH SYSTEM SHALL BE EXECUTED IN ACCORCANCE WITH REQUIREMENTS OF THIS INSTRUCTION AND WITH VESSEL SAFETY REGULATIONS.

THE DECK MACHINERY MUST BE OPERATED BY QUALIFIED PERSONNEL THAT HAVE STUDIED THE DOCUMENTATION, INSTRUCTIONS AND REQUIREMENTS.

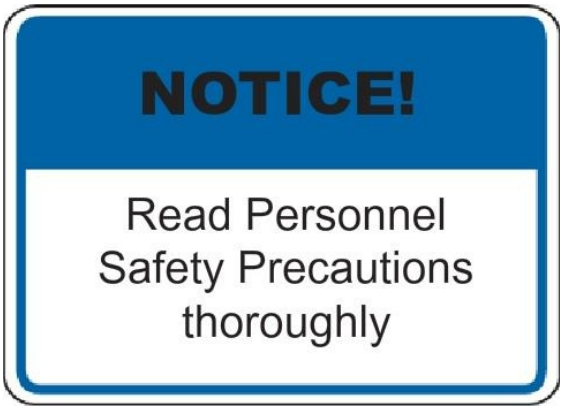
NEGLIGENCE OF OPERATIONS AND LIMITATIONS SPECIFIED IN THIS INSTRUCTION CAN CAUSE FAILURE OF EQUIPMENT, DAMAGE OF PROPERTY OR INJURY OF PERSONNEL.

Introduction

Typical sources of danger for personnel during operation and maintenance of winches are:

- Rotation of drums
- Level wind screws (where applicable)
- Warping heads and lifters of anchor winches
- Tension of ropes
- High voltage in electric equipment
- High pressure in hydraulic equipment
- Remote operated winches

When working with these topics is in general a high level of attention recommended. In addition, routine maintenance will decrease the possibility of malfunction and failure of the deck machinery, which can be a source of danger for personnel safety.



Working with winches and rotating machinery

Working with winches and rotating machinery such as warping heads and capstans involves health and safety risks and requires a high level of attention. For safety reasons please note the following:

- Never place any part of your body into running machinery.
- Never wear jewelry or loose-fitted clothing when working around winches and rotating machinery as it can attach to the rotating or moving components. Personnel with long hair are recommended to tie the hair back or use hair nets.
- Personnel wearing gloves around rotating or moving parts must be aware the risk of injuries if a glove gets trapped in rotating or moving components.
- Use of protective eyewear is recommended.
- MacGregor Bodø deck machinery will not normally require use of hearing protection. However, use of hearing protection must be considered together with use of other deck machinery.
- When using Portable Remote control panels, operators must make sure they are located in a secure place.
- Operators must know where the Emergency Stop buttons are located.
- Control and test of the equipment before operating is advised.

As a vessel deck may contain several types of deck machinery from various suppliers, MacGregor Bodø's deck machinery must be included in a complete safety analysis. A complete safety regulation and correct personal protective equipment should be detailed in the vessel's Safety Management System.

Working with wire ropes

Working with wires ropes connected to winches and rotating machinery involves health and safety risks. For safety reasons please note the following:

- It is highly recommended that during winch and equipment operations, only necessary personnel to be allowed on restricted area. Restricted area to be defined by ship management.
- Keep away from hanging loads and overhead equipment.
- Personnel must pay special attention when working with and around wire ropes as it may come under tension suddenly.
- Never stand across a wire rope.
- Always keep out of the line of force of any load.
- Personnel should not stand in the bight of a rope at any time.
- Avoid crossing wire ropes. If this is necessary, one must pay special attention when crossing.
- Wires ropes under tension can part. Personnel must therefore ensure that they stand in a position of safety away from where a line may snap back if it parts.
- Use of protective eyewear is recommended.
- Gloves should always be used when handling wire ropes due to the possibility of hand injuries arising from broken wires. However, personnel wearing gloves must be aware the risk of injuries if a glove gets trapped within ropes wires (particularly on drum ends).
- Use of jewelry or loose-fitted clothing when working with ropes/wires is not recommended.

A complete safety regulation and correct personal protective equipment should be detailed in the vessel's Safety Management System.
More information about this topic can be found in MacGregor Bodø's "Guidance for Wire Rope Spooling".

Working with hydraulic systems

Hydraulic systems often store hot and pressurized fluid. For safety reasons please note the following:

- All maintenance and repair of hydraulic systems can only be carried out by qualified personnel.
- Personnel are exposed to 3 kinds of hazards:
  - Burns from hot, high-pressure fluid.
  - Bruises, cuts or abrasions from failing hydraulic lines.
  - Injections of fluid into the skin.
- Before work: Review the Material Safety Data Sheets for all chemicals used. Know location of emergency shower, eyewash station and other first aid equipment.
- During work: Always use protection goggles, chemical-resistant gloves and solid workwear.
- After work: Cleanse and wash affected skin and apply moisturizing cream. Immediately change and wash affected workwear.
- Never use bare fingers or hands to find leaks in the hydraulic system. Pinhole leaks in the hydraulic system can cause a jet of hydraulic fluid that easily can penetrate the skin and cause severe internal damage to the body.
- Hydraulic systems can contain high pressure even when switched off. One must therefore always assure that pressure in the hydraulic system is released before disassembly of hydraulic components. Be aware that hydraulic supply can come from more than one hydraulic power unit.
- Use extreme caution when disconnecting hydraulic components and lines as hot hydraulic oil can cause severe burns to the body.
- It is forbidden to tighten connections when hydraulic pumps are running (mainly to prevent oil leakage).
- Pump room can be a zone with high level of noise, it is therefore recommended to use ear protection inside pump rooms.
- If hydraulic fluid is spilled it must be cleaned up immediately.
- Hydraulic systems under maintenance and repair should be locked and tagged according to a Lock-out/Tag-out procedure.

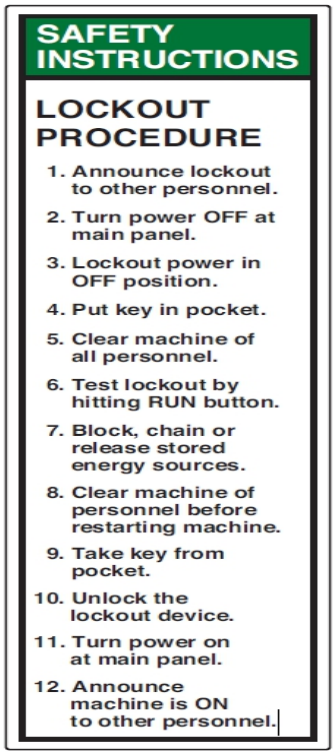
As a vessel may contain several types of hydraulic systems from various suppliers and with different pressure levels, Macgregor Bodø's deck machinery and its hydraulic components must be included in a complete safety analysis. A complete safety regulation and correct personal protective equipment should be detailed in the vessel's Safety Management System.



Working with electric systems

Electricity is a very potent energy form and if used carelessly it can cause severe injury to the human body. For safety reasons please note the following:

- All maintenance and repair of electric systems can only be carried out by qualified personnel.
- Qualification and personal protection needed for working on electric systems are dependent on which voltage level the system has.
- Electric systems can contain high voltage even when switched off.
- Make sure that the electric system is switched off and de-energized before disassembly of electric components.
- ***NOTICE,** Main boards usually have main power and heating which comes from separate circuits. The same applies to I / O circuit boxes and panels that can contain both 230VAC and 24VDC.Starter controls panels may have control power supply from separated starter cabinets.
- Do not wear conductive articles like jewelry, clothing, watches etc. when working with or near electric systems.
- Use of protective eyewear is recommended.
- Protective gloves made of rubber or leather is recommended although it can make work with electric components and equipment harder.
- Only use insulated tools when working with or near electric systems.
- Fuses or safety breakers must not be replaced or reset until it is determined that a circuit is safe to operate.
- Do not bypass any protective system or device designed to protect employees from contact with electrical energy.
- Water and other conductive fluids are electric components worst enemy and can damage or reduce service life to electric components and subsequently make a threat for personnel.
- Electric systems under maintenance and repair should be locked and tagged according to a Lock-out/Tag-out procedure.



As a vessel may contain several types of electric systems from various suppliers and with different voltage levels, MacGregor Bodø's deck machinery and its electric components must be included in a complete safety analysis. A complete safety regulation and correct personal protective equipment should be detailed in the vessel's Safety Management System.



← Example of Lockout procedure.

Maintenance and machinery control

A routine periodic maintenance is important in order to decrease the personnel safety risk. The periodic maintenance will reduce the possibility for malfunctions or breakage on the equipment which will secure operators and personnel working on deck or close to machinery.

The most basic maintenance is performed by operators on a daily basis and is normally a visual control of the system.

A daily visual check/inspection should include the following:

- Mechanical system
  - Check for cracks or other damage in load-carrying structures.
  - Check for loose bolt and screw connections and bolt locks for defects.
  - Check wire ropes, shackles and other lifting or pulling equipment for defects and make sure they are in good working conditions.
  - Check brake parts for damage or defect, and brake lining for excessive wear.
- Hydraulic system
  - Check oil level and oil color in oil tank(s) and oil level in level glass on winch drive units (where applicable).
  - Check for hydraulic oil leaks, especially around couplings, hose and pipe connections, oil tanks and hydraulic power units.
- Electric system
  - Check electric cables and components for damages.
  - Check fuses.

During operation of winches and deck machinery it is necessary to pay attention to the condition of the machinery and deck equipment.
If any of the following occurs, operations must be stopped immediately:

- Malfunctions in control.
- Unusual sounds.
- Unusual working movements.
- Unusual observations and occurrences.
- Leakages in the hydraulic system.
- Overheating of hydraulic oil and electric components.
- Blown fuses.

More information about maintenance can be found in Macgregor Bodø's "MAINTENANCE GUIDELINES FOR MACGREGOR BODØ HYDRAULIC DECK MACHINERY"



Section 2

Handling, Installation, Storage & Transit

Installation Drawings

DESCRIPTION	DOC/DRW #	REV #	PAG #
ROV Overhead Crane	25479	D	2
A-Frame	25480	B	4
CTD Davit	25482	A	6

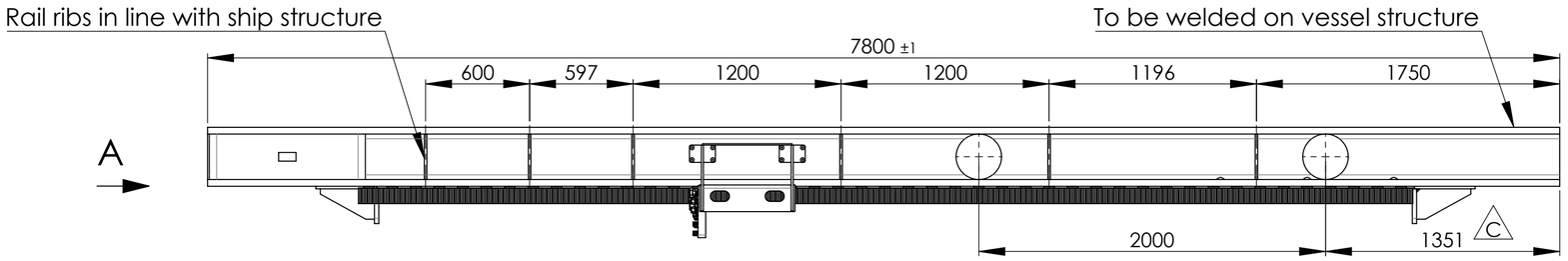
Lifting Arrangements

DESCRIPTION	DOC/DRW #	REV #	PAG #
ID:8513 CTD WINCH HW-515E-T90	2000005765	A	8
ID:8515 LEVELWIND W/SWC, ELSWC5000-L2000	2000004325	A	9
A-Frame	A-Frame Lifting	1	10
CTD Davit	CTD Davit Lifting	1	11

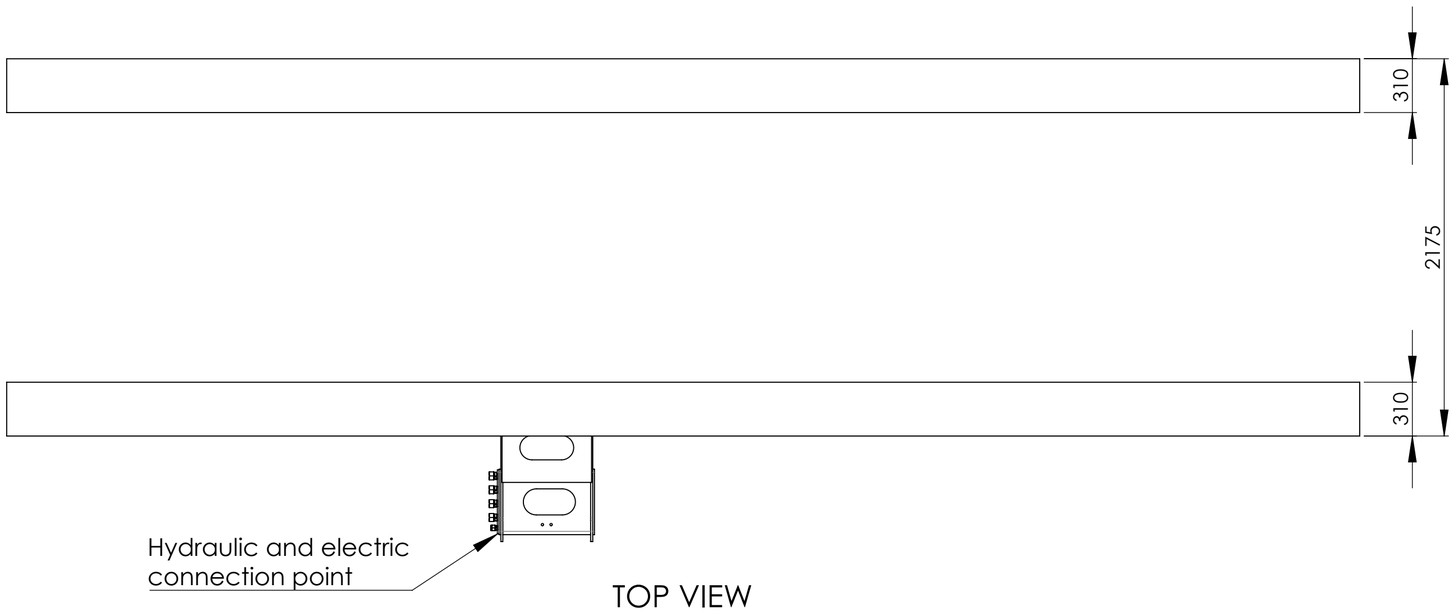
Hydraulic Connection Points

DESCRIPTION	DOC/DRW #	REV #	PAG #
Overhead Crane ROV LARS Valve Central	24859	D	12
Triplex Design Davit Valve Central	24820	C	14
A-Frame Stern Valve Central	24821	D	15
HPU Brake	2000004113	A	17
HPU Gear Cooling	2000004110	A	18

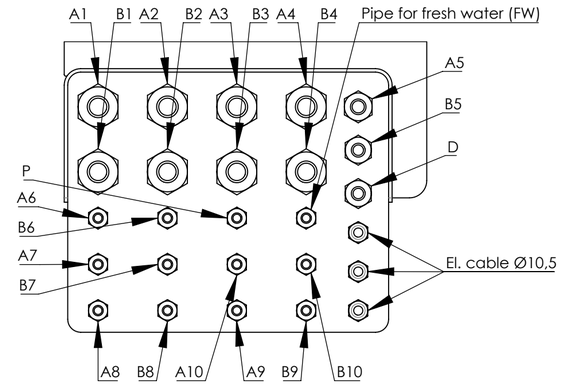
Hydraulic connection points		
Port	**Pipe dimensions**	**Thread dimensions in connection plate**
A1, B1, A2, B2, A3, B3, A4, B4	Ø25 x 2,5	G1"
A5, B5	Ø16 x 2	G1/2"
A6, B6, A7, B7, A8, B8, A9, B9, A10,B10, P, FW	Ø12 x 1,5	G3/8"
D	Ø18 x 2	M20X1,5



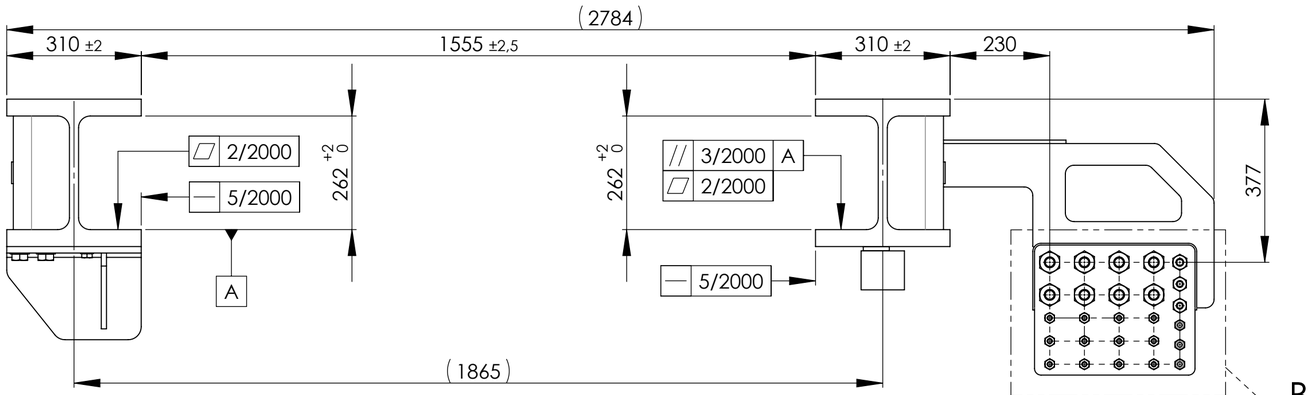
STARBOARD SIDE SEEN FROM FORE PORT SIDE



TOP VIEW



DETAIL B
SCALE 1 : 5



AFT SIDE FORE SIDE

VIEW A
SCALE 1 : 10

Reference dimension sketch: 20673

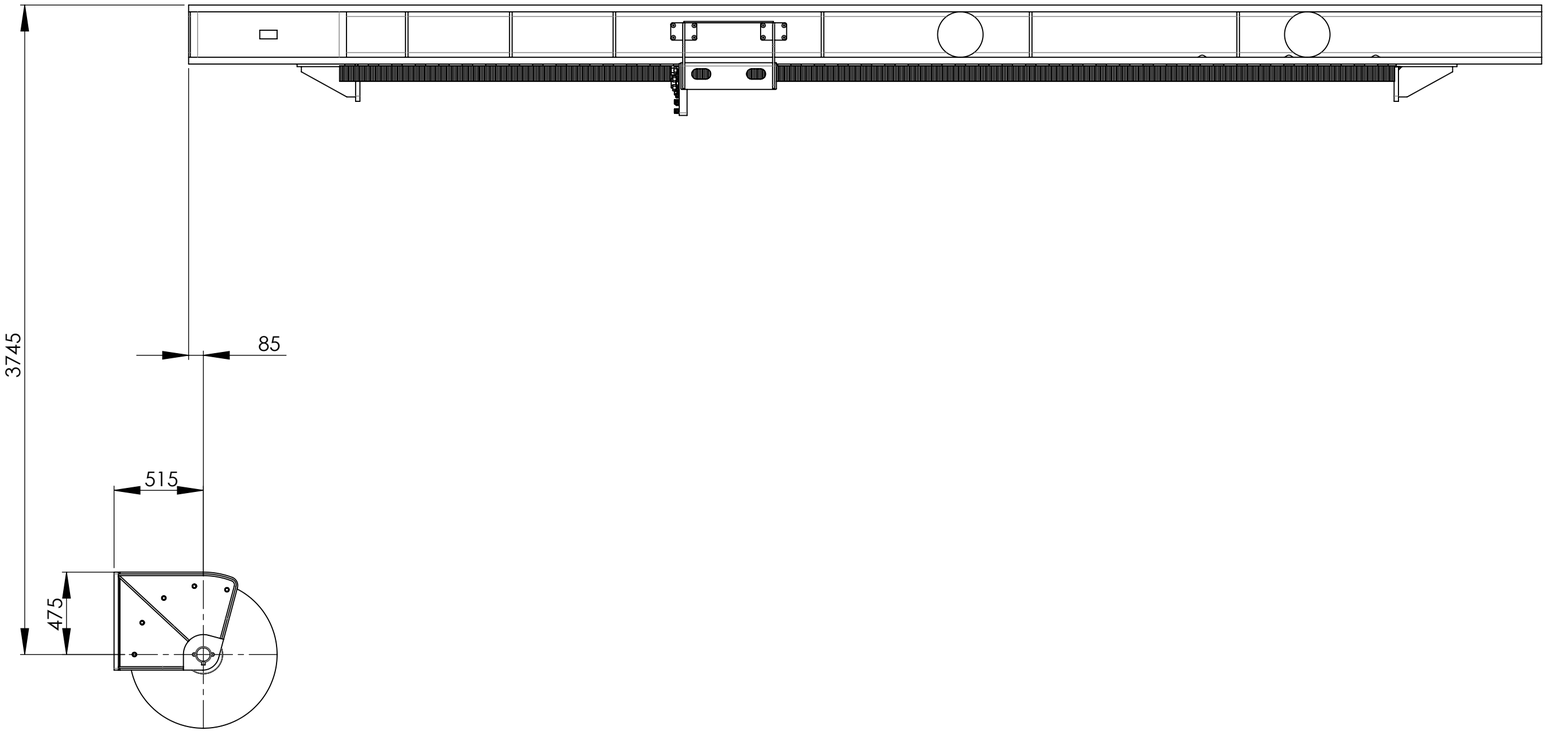
REV.	DESCRIPTION	DATE	APPROVED
REVISIONS			
D	Added new sheet for sheave installation	21/05/2023	SS
C	Changed distance of opening for service and assembling.	26.08.2022.	KJ
B	Updated Service holes position.	25.08.2022.	KJ
A	Released.	19.07.2022.	KJ

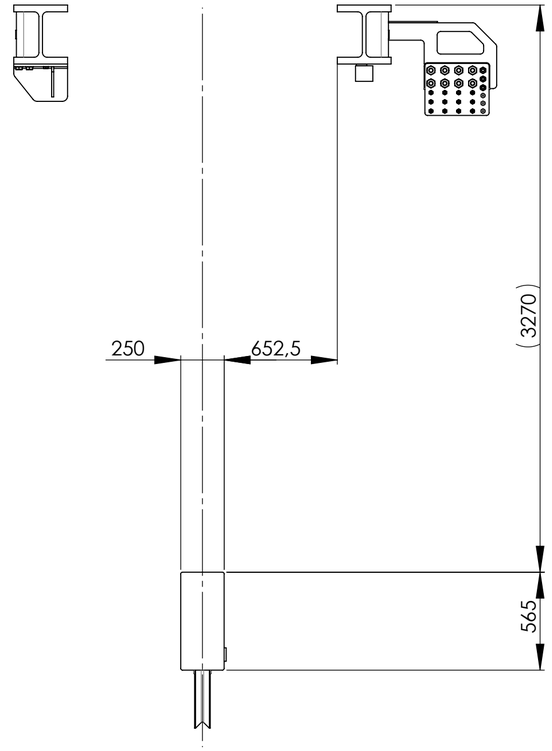
OVERHEAD CRANE
ROV LARS
INSTALLATION

MACGREGOR

Unspec. tolerances in compliance with	NS-ISO 2768 M
Scale	1:25
Projection	
Format	A2
MPS no.	
Drawing no.	25479
Revision	D
SHEET1 OF 2	
Weight (kg)	4268.2 Kg
Date	19.07.2022
Created by	KJ
Approved date	21/05/2023
Approved by	SS

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REV.	DESCRIPTION	DATE	APPROVED
D	Added new sheet for sheave installation	21/05/2023	SS
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REVISIONS

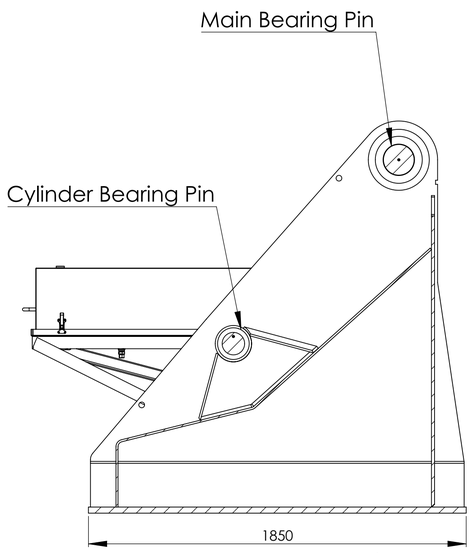
OVERHEAD CRANE
ROV LARS
INSTALLATION

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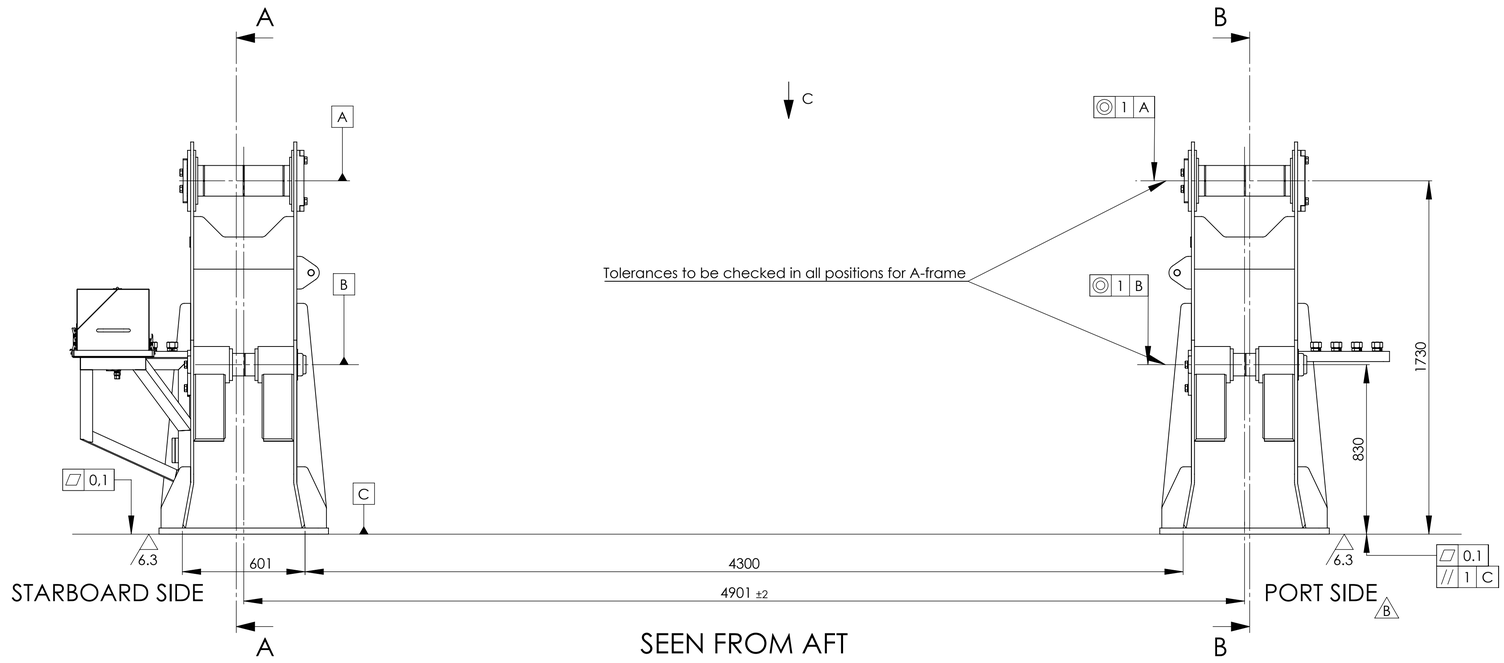
Unspec. tolerances in compliance with	NS-ISO 2768 M
Scale	1:25
Projection	
Format	A2
MPS no.	
Drawing no.	25479
Revision	D
SHEET2 OF 2	

Weight (kg)	4462.7 Kg
Date	19.07.2022
Created by	KJ
Approved date	21/05/2023
Approved by	SS

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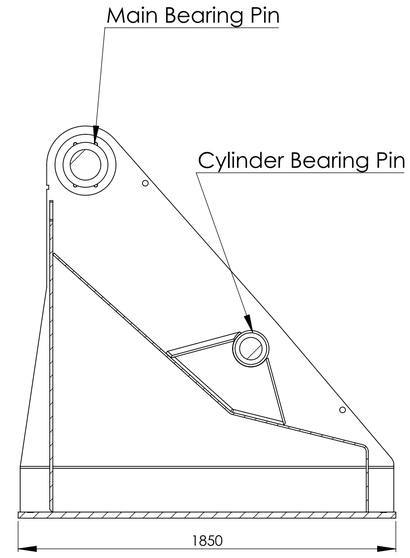
SECTION A-A B



STARBOARD SIDE

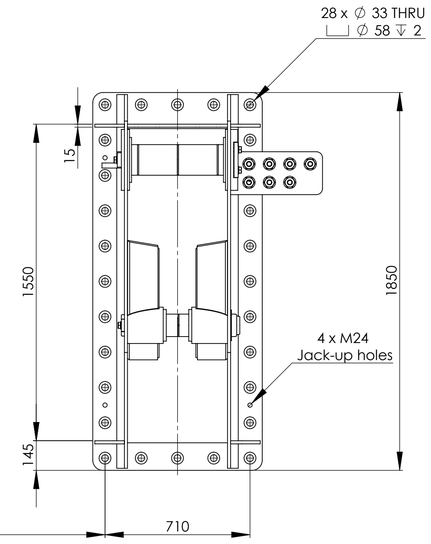
SEEN FROM AFT B

PORT SIDE B



SECTION B-B

VIEW C



TIGHTENING TORQUE			
SCREWS MARKED WITH: T. USE tightening torque. Torque Units [Nm]			
dim \ matr	**8.8**	**10.9**	**12.9**
M8	24	33	40
M10	47	65	79
M12	81	114	136
M16	197	277	333
M20	385	541	649
M24	665	935	1120
M27	961	1350	1620
M30	1310	1840	2210
M36	2280	3210	3850
Lubricate threads and flanges with MoSo2 or similar.			

REFERENCES	
Description	**Drawing no.**
Dimensional Sketch	20549
Valve Central	24821
Main hydraulic diagram	24854
Electrical diagram	E-4501

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
B	Changed the view perspective annotation	24. 10. 2022.	BH
A	Released	10. 10. 2022.	BH

FRAME
A-FRAME STERN
INSTALLATION

MACGREGOR

Unspec. tolerances in compliance with

Scale 1:15

Projection

Format A1

MPS no.

Drawing no. 25480

Revision B

SHEET1 OF 2

Weight (kg) Kg

Date

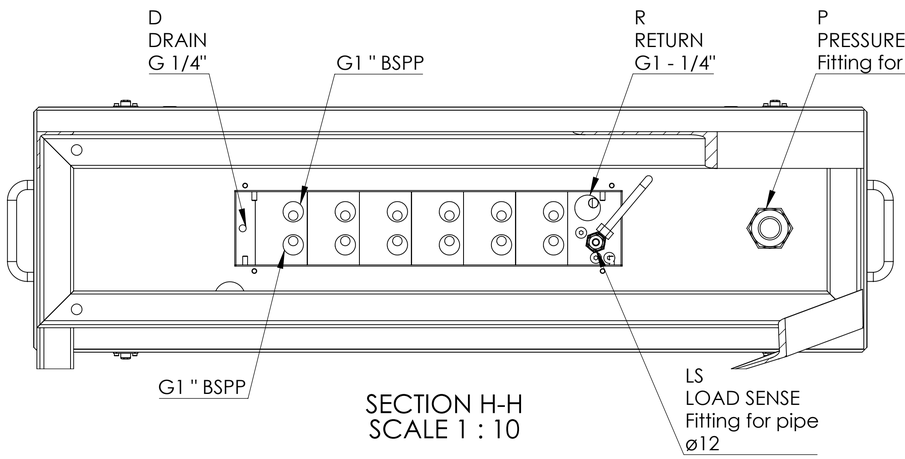
Created by

Approved date 12/01/2023

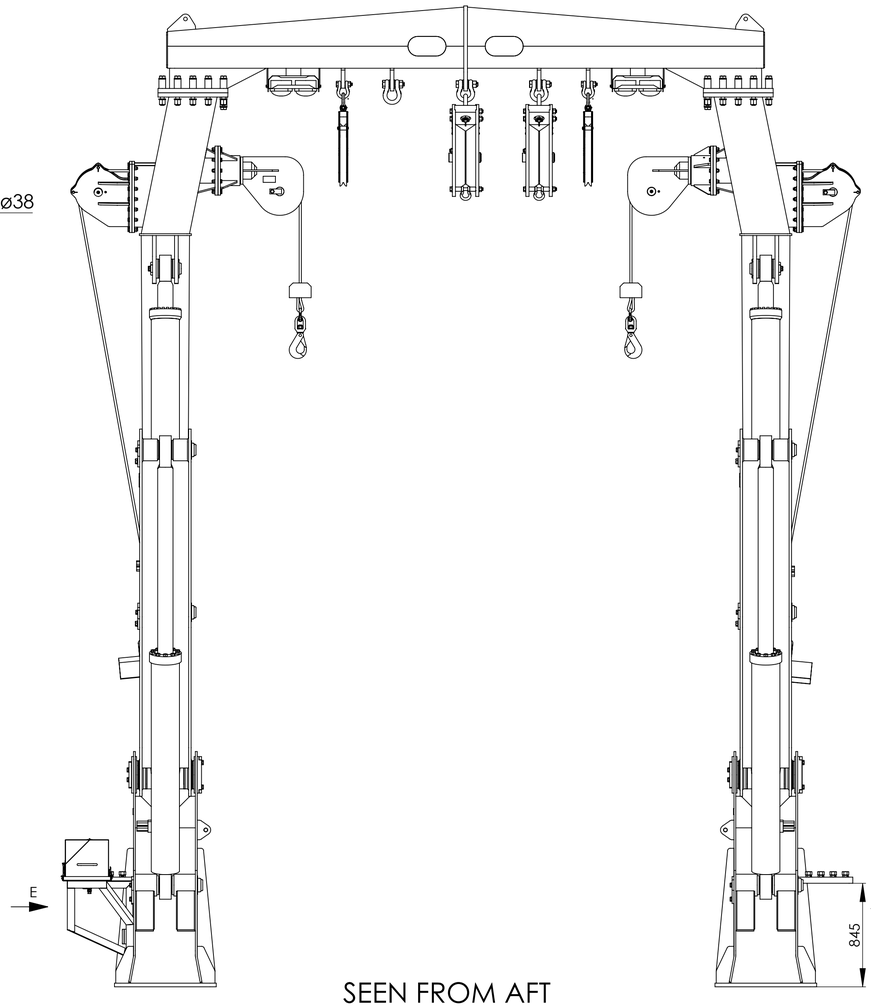
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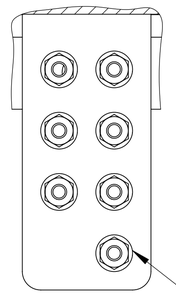
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Hydraulic connection points		
Port	Pipe dimensions	Thread dimensions in connection plate
A,B	∅25x2,5	G1"

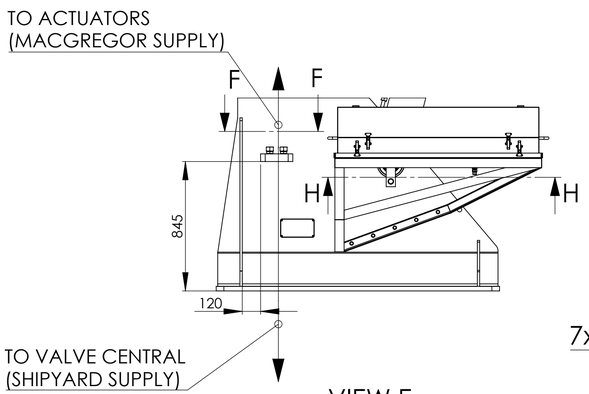


SECTION H-H
SCALE 1 : 10

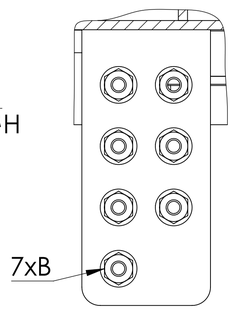




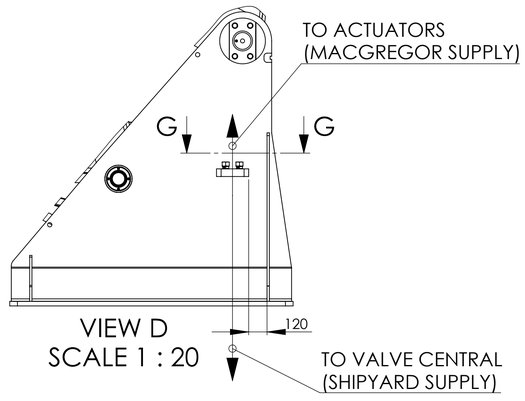
SECTION G-G
SCALE 1 : 5



VIEW E
SCALE 1 : 20



SECTION F-F
SCALE 1 : 5



VIEW D
SCALE 1 : 20

REV.	DESCRIPTION	DATE	APPROVED
B	Changed the view perspective annotation	24. 10. 2022.	BH
A	Released	10. 10. 2022.	BH

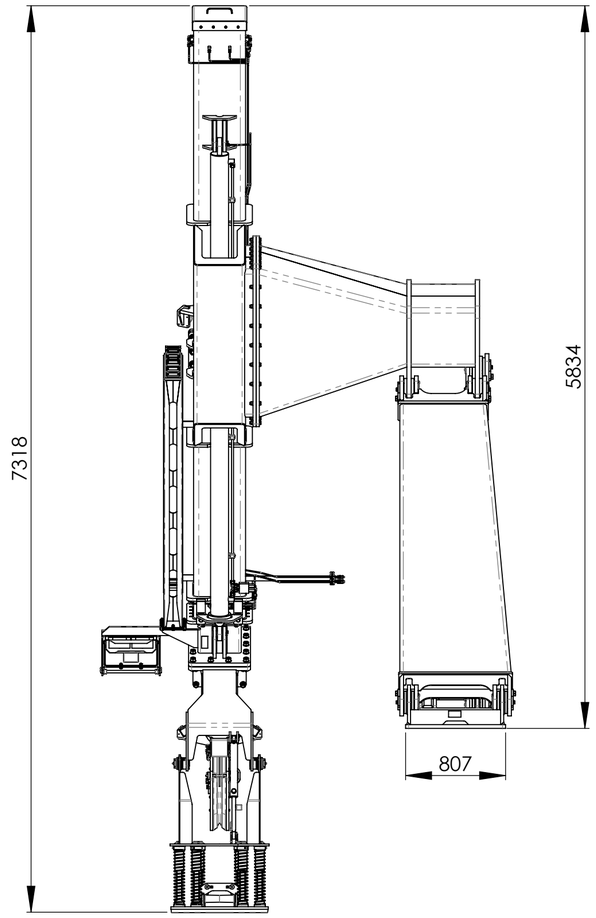
REVISIONS

FRAME
A-FRAME STERN
INSTALLATION

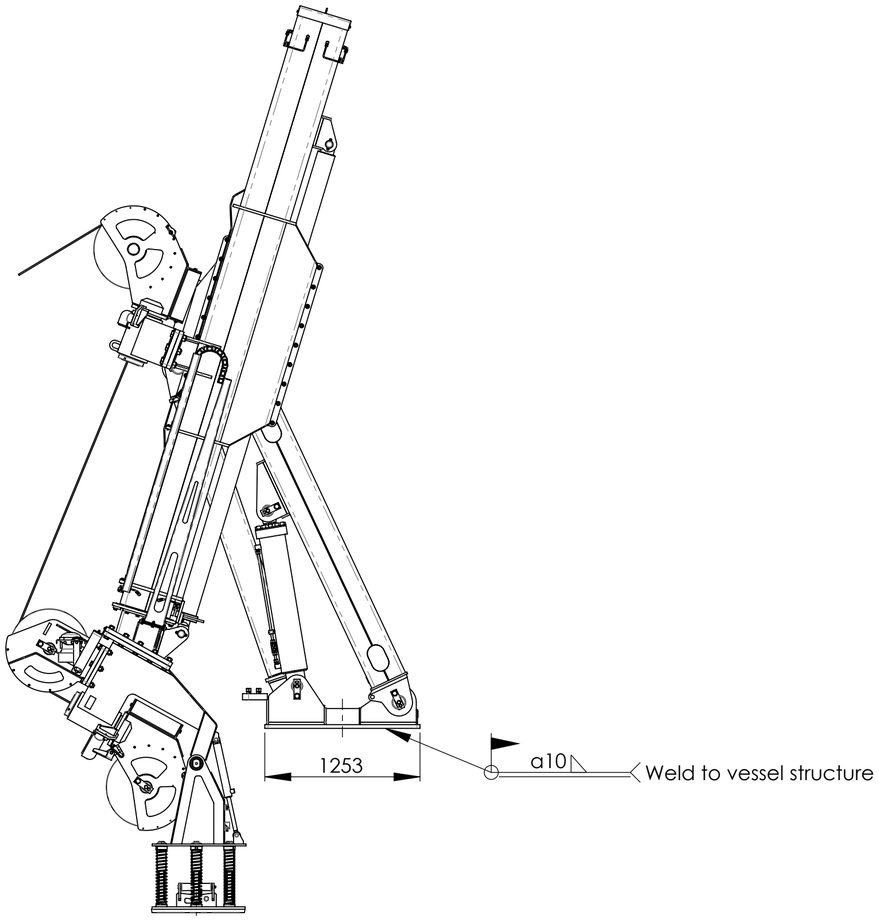
MACGREGOR

Unspec. tolerances in compliance with	Weight (kg) Kg
	Date
Scale 1:25 Projection	Created by
Format A1	Approved date 12/01/2023
MPS no.	Approved by SS
Drawing no. 25480 SHEET2 OF 2	Revision B

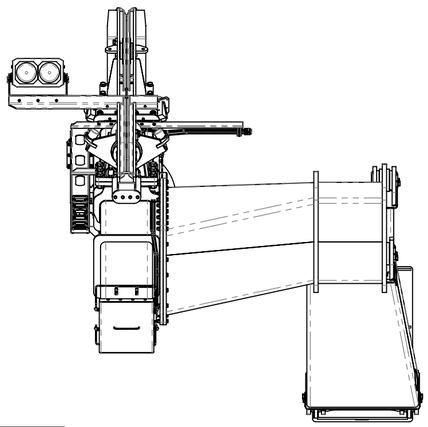
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Seen from Starboard



Seen from AFT



Seen from above

REFERENCES	
Description	**Drawing no.**
Dimensional Sketch	20547
Valve Central	25331
Main hydraulic diagram	24856
Electrical diagram	E-4503
Note: Valve central is delivered separately and installed on the port side of the CTD DAVIT.	

REV.	DESCRIPTION	DATE	APPROVED
A	Released	10. 10. 2022.	BH

REVISIONS

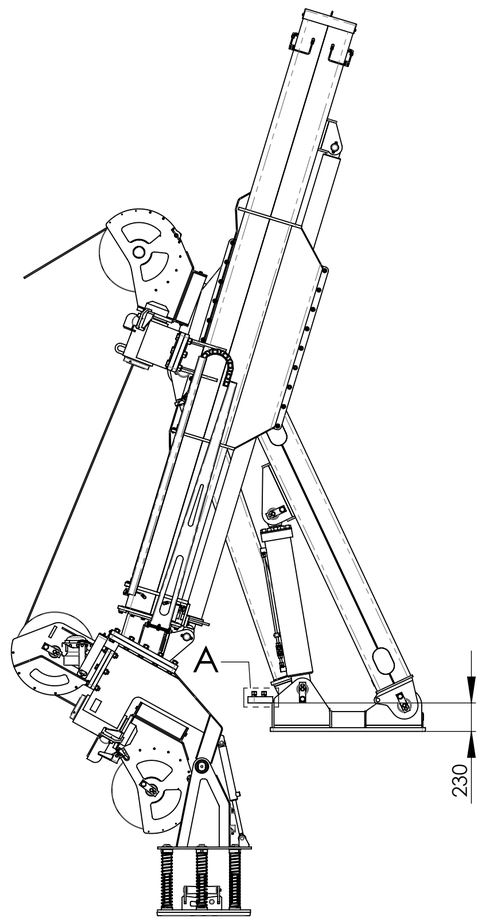
DAVIT
CDT DAVIT
INSTALLATION

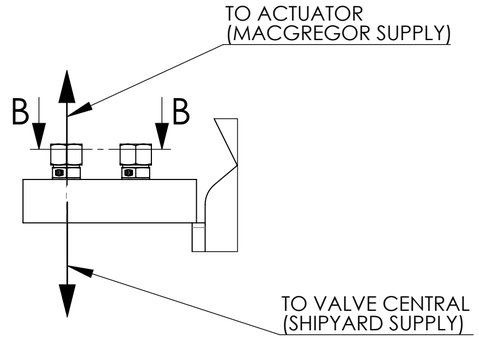
MACGREGOR

Unspec. tolerances in compliance with	
Weight (kg)	Kg
Date	10.10.2022
Scale 1:35	Projection
Created by	BH
Format A2	
Approved date	11/10/2022
MPS no.	
Approved by	HK
Drawing no. 25482	Revision A
SHEET1 OF 2	

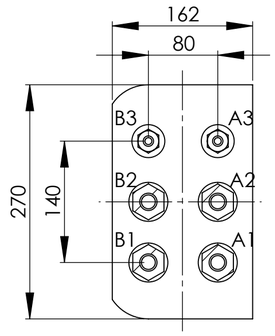
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Hydraulic connections part		
Port	Pipe dimension	Thread dimension
A1,A2,B1,B2	∅20x2	G 3/4"
A3,B3	∅12x1.5	G 3/8"





DETAIL A
SCALE 1 : 5



SECTION B-B
SCALE 1 : 5

REV.	DESCRIPTION	DATE	APPROVED
A	Released	10. 10. 2022.	BH
REVISIONS			

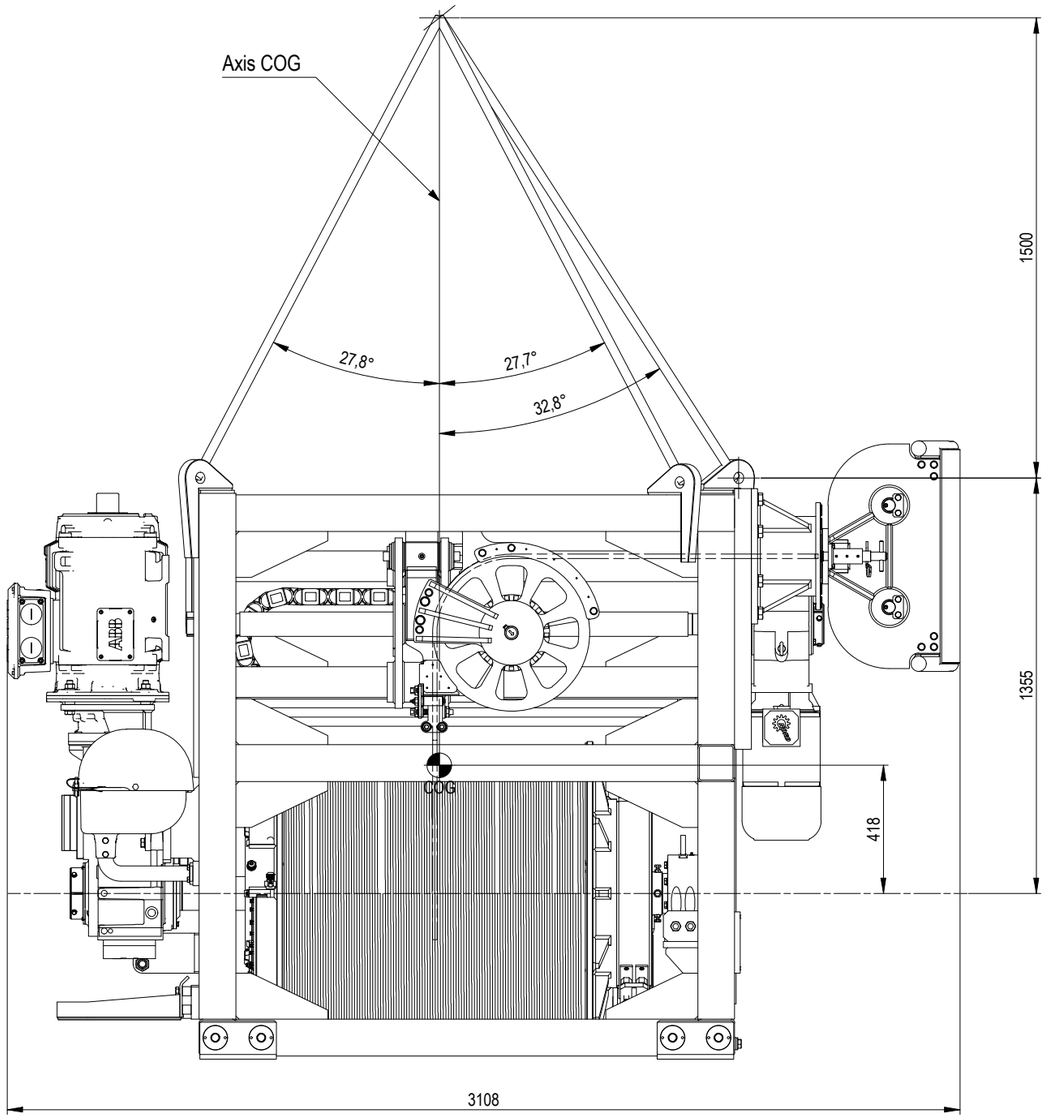
DAVIT
CDT DAVIT
INSTALLATION

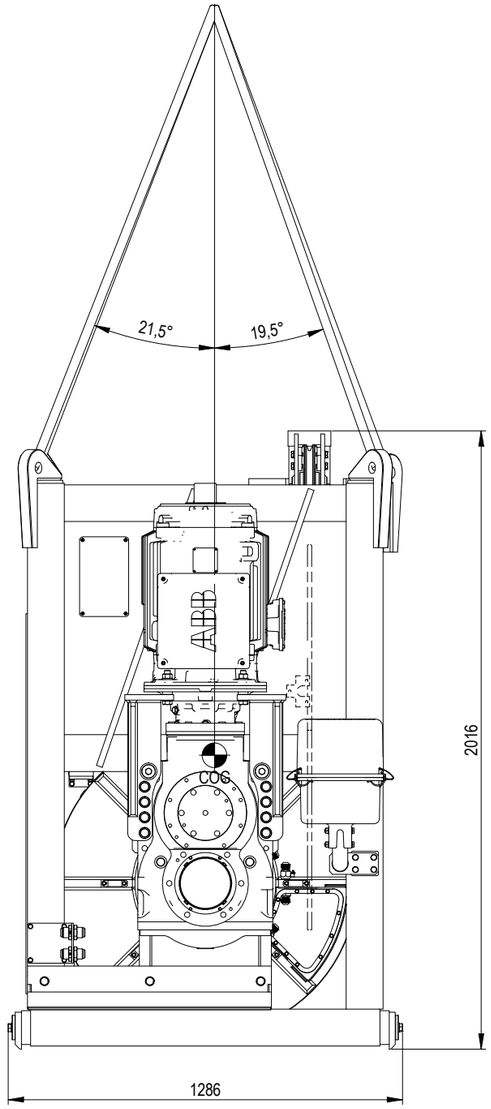
MACGREGOR

Unspec. tolerances in compliance with	
Weight (kg)	Kg
Date	10.10.2022
Scale 1:35 / Projection	Created by BH
Format A2	Approved date 11/10/2022
MPS no.	Approved by HK
Drawing no. 25482	Revision A

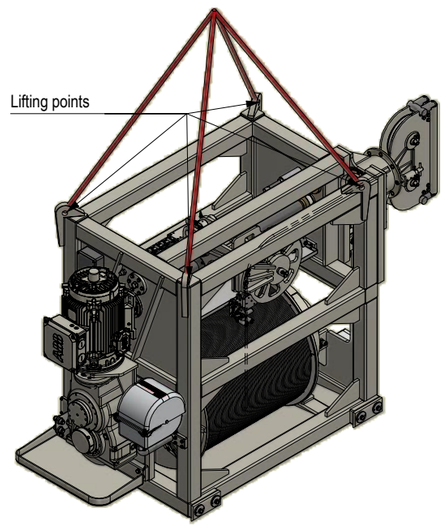
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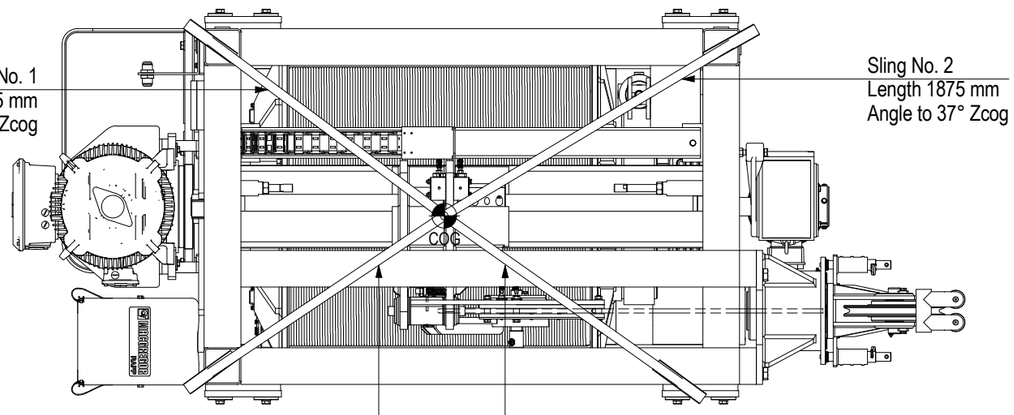
SHEET2 OF 2





ISO VIEW (1 : 40)



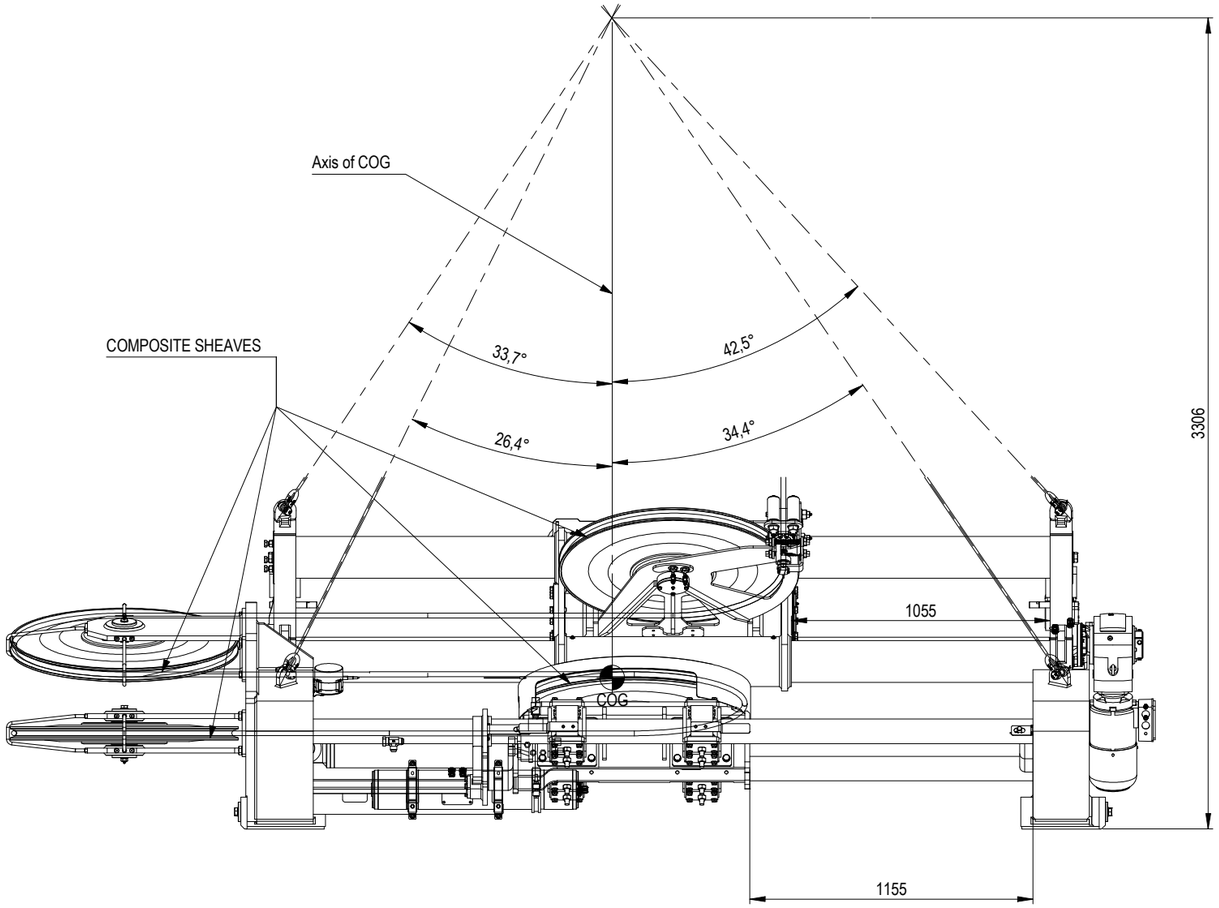


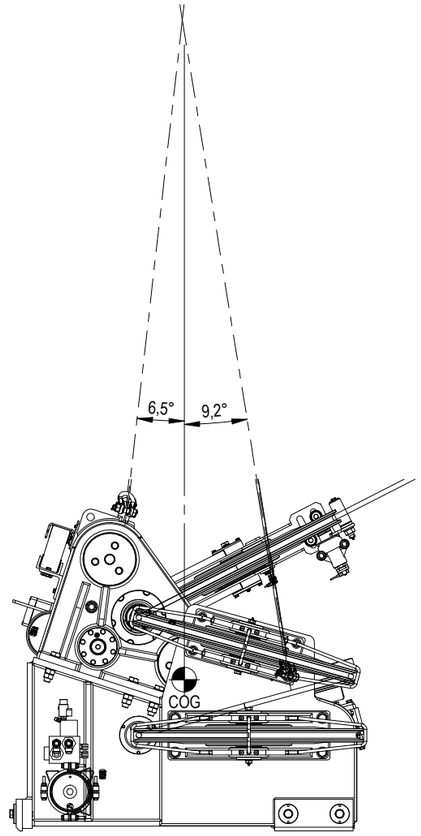
Designed by	Date	Modified by	ECO / CO			
P Pantovic	09.02.2022.	P Pantovic	ECO-2056698			

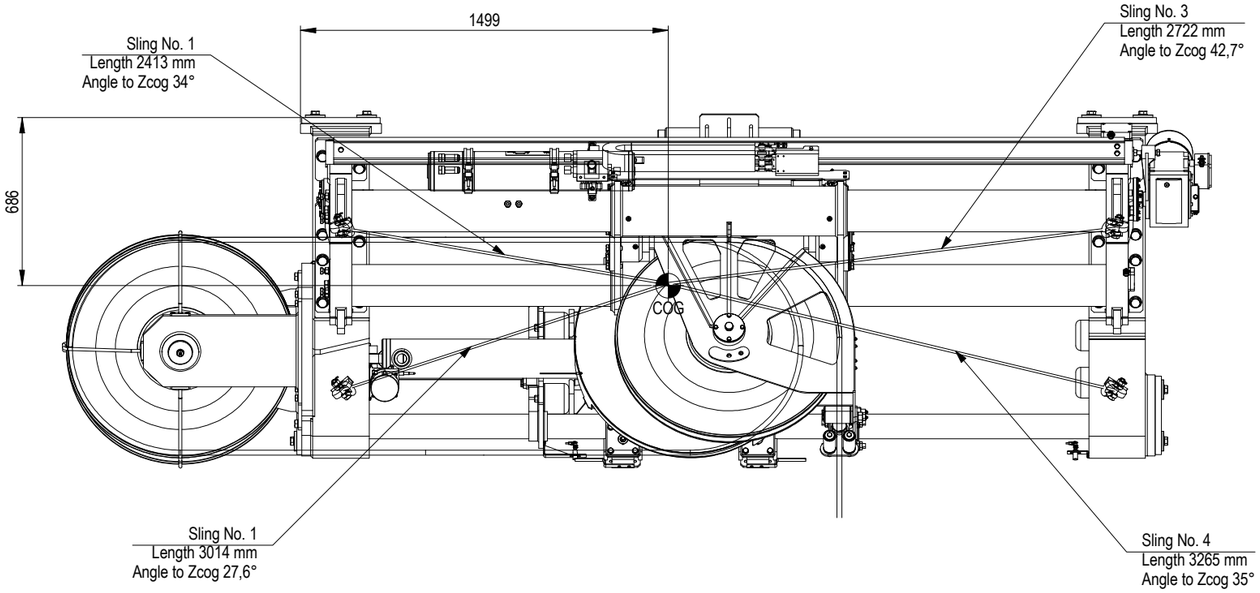
MACGREGOR

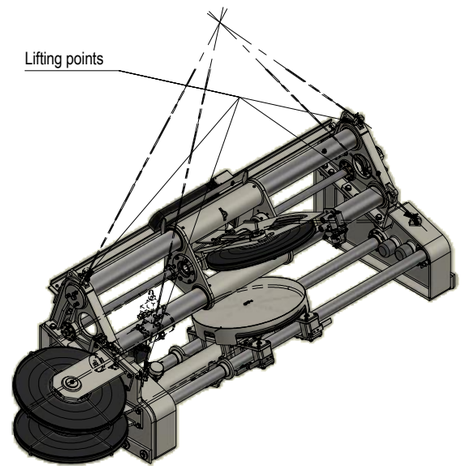
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Name	Weight (kg)
LIFTING ARRANGEMENT	5979
Description	Scale (A3)
A301592 (6.5km x 266kg/km=1729kg)	1 : 20
Document ID	Revision / Sheet
2000005765	A / 1 / 1





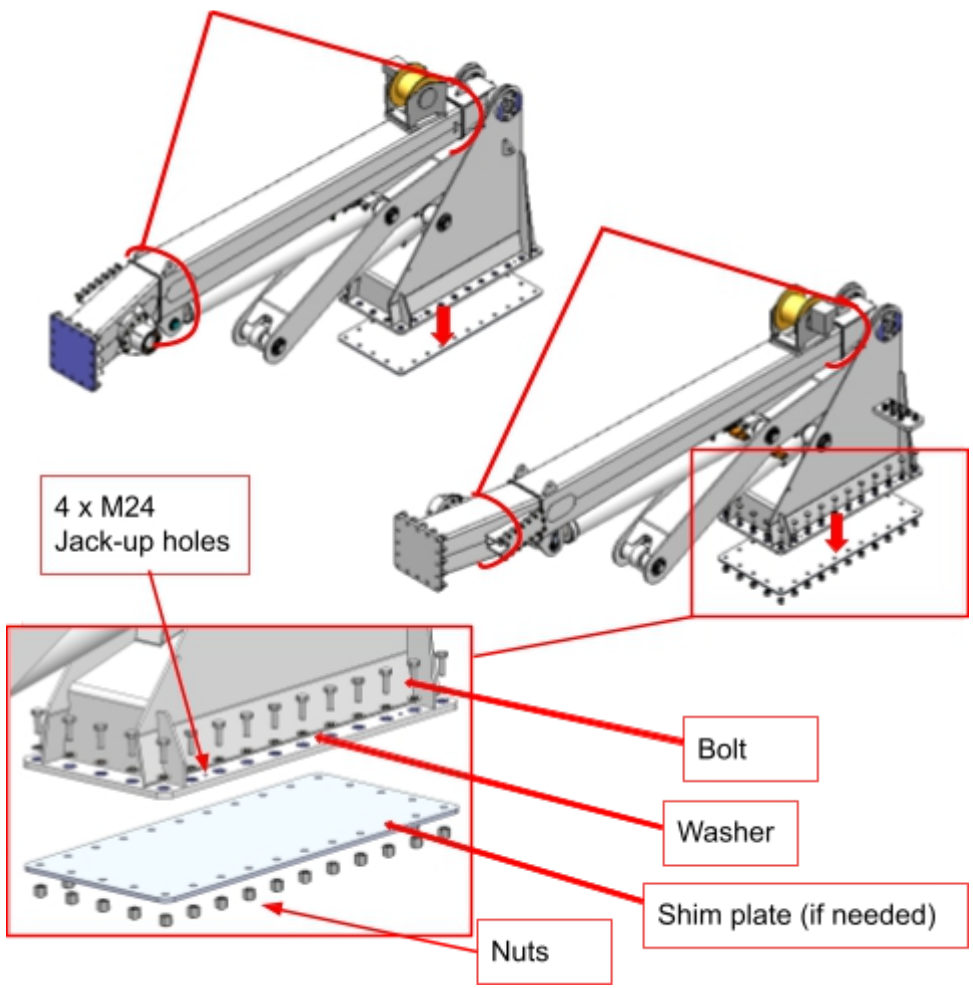


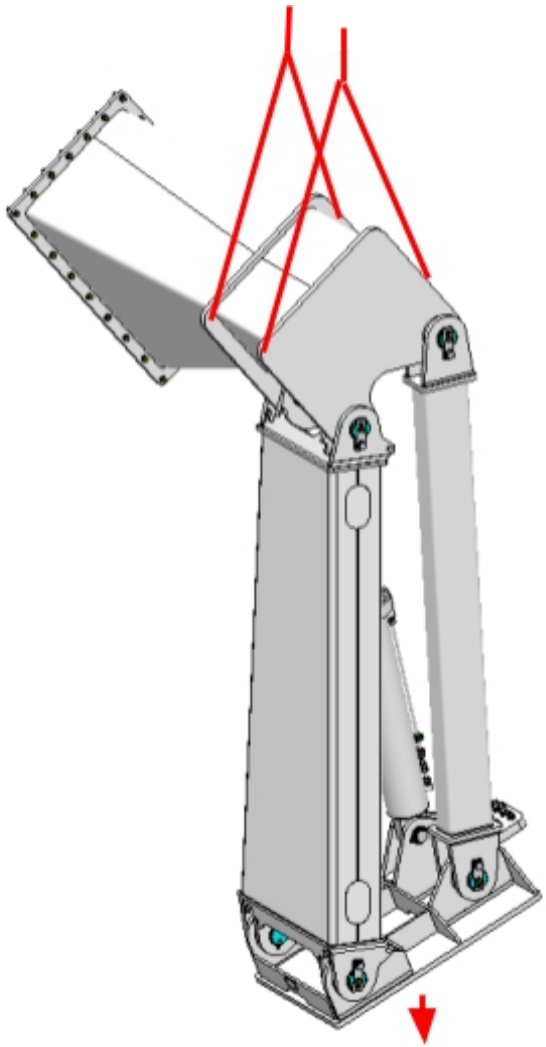


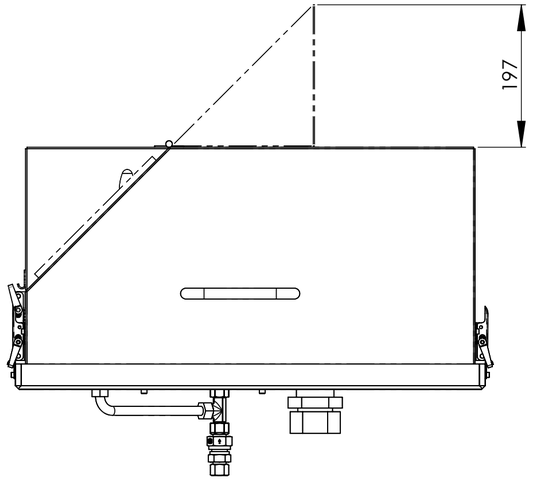
Designed by	Date	Modified by	ECO / CO			
P Pantovic	27.12.2021.	P Pantovic	ECO-2056483			

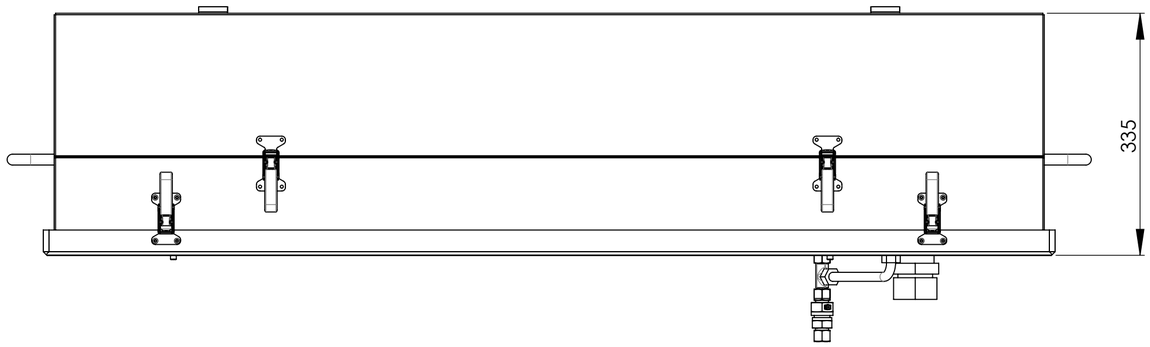
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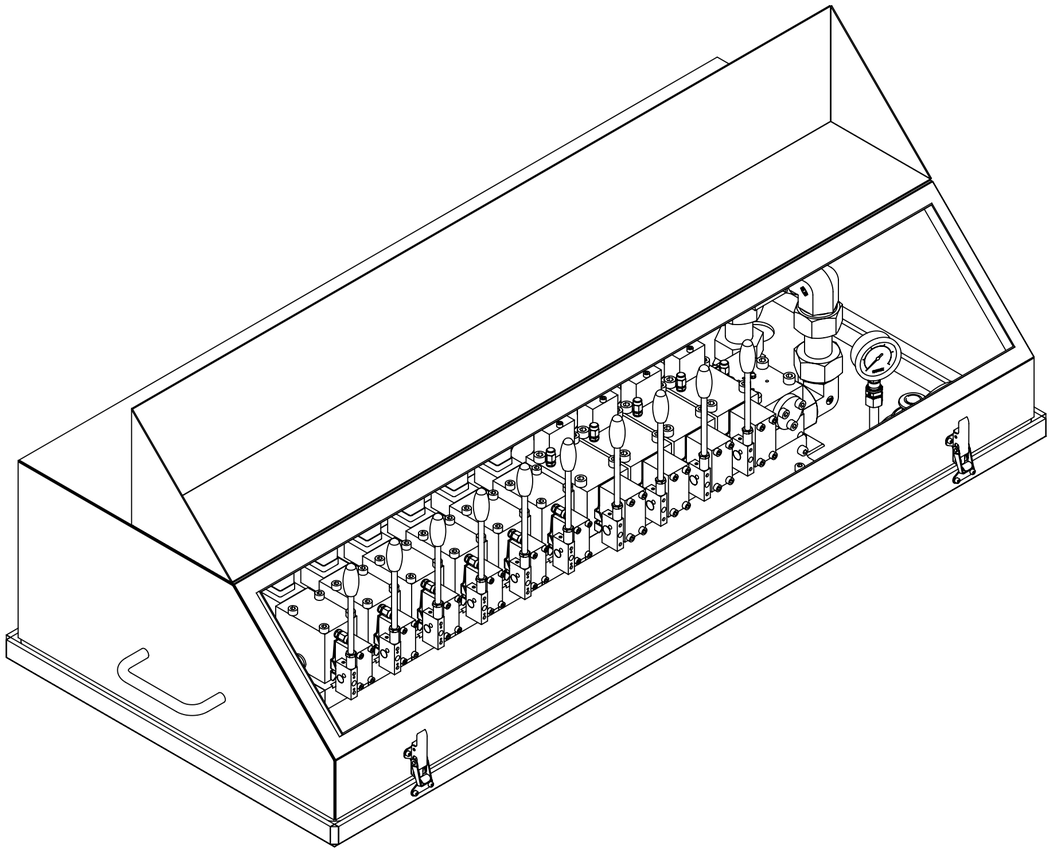
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LIFTING ARRANGEMENT	4540 kg
Description	Scale (A3)
LEV. WITH SLACK WIRE, LSWC5000/01L1	1 : 25
Document ID	Revision / Sheet
2000004325	A / 1 / 1

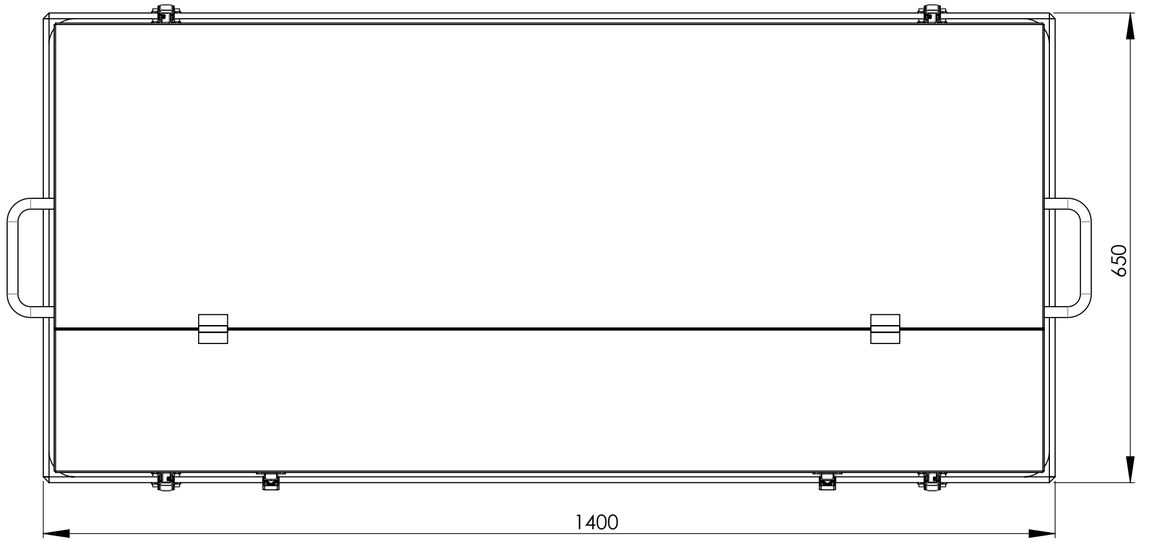
Item	Activity	Illustration/picture/drawing	Comments
1.	Lift assembled foundations with Gantry legs and cylinders. Position them in the centerlines using lifting lines. (see picture). Ref. drw. For foundation positioning: 25480 Installation drawing(Sheet 2). Mount to deck by using Bolts: ISO 4017 M30- 10.9 Apply torque of 1840 Nm. Weight of PORT and STARBOARD foundation assemblies is approx. **4600 kg** each.		

Item	Activity	Illustration/picture/drawing	Comments
1.	Lift assembly of foundation, arm, outer boom and cylinder. Weld the foundation to the deck of the vessel. Welding to be done according to drw. 25482 CTD DAVIT Installation.		









PROJECT: 4/60185 MBARI

REV.	DESCRIPTION	DATE	APPROVED
D	Added LED Beacon and Emergency stop button	11.01.2023	CI
C	Drawing updated	02/02/2022	SS
B	Added one more section.	14/12/2021	HK
A	Released	26/11/2021	SS

REVISIONS

OVERHEAD CRANE
ROV LARS
VALVE CENTRAL

MACGREGOR

Unspec. tolerances in compliance with

Scale 1:6

Projection

Format A2

MPS no.

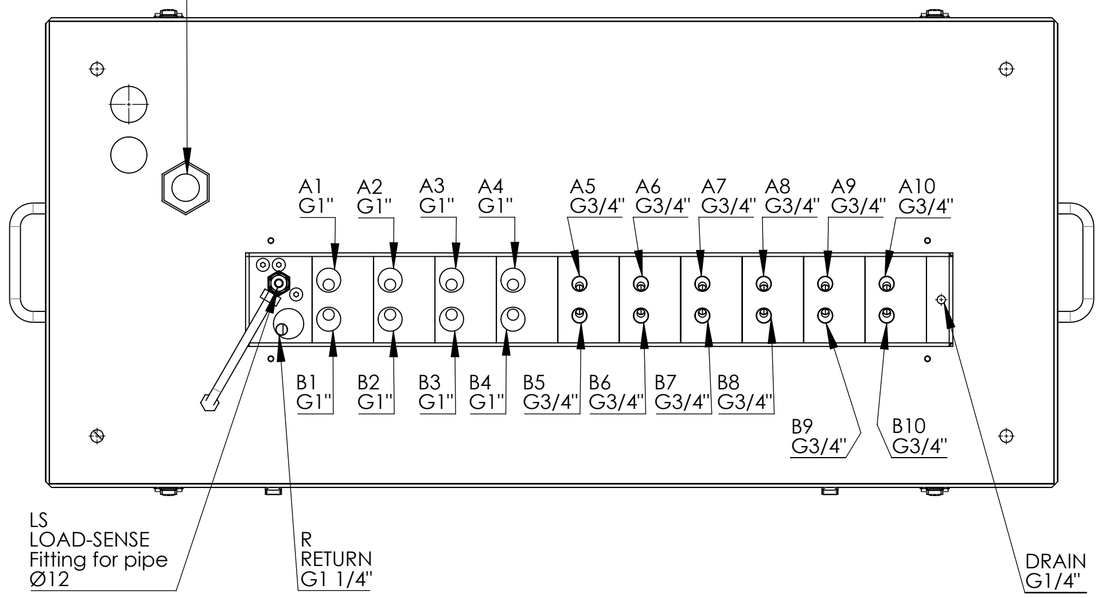
Drawing no. 24859

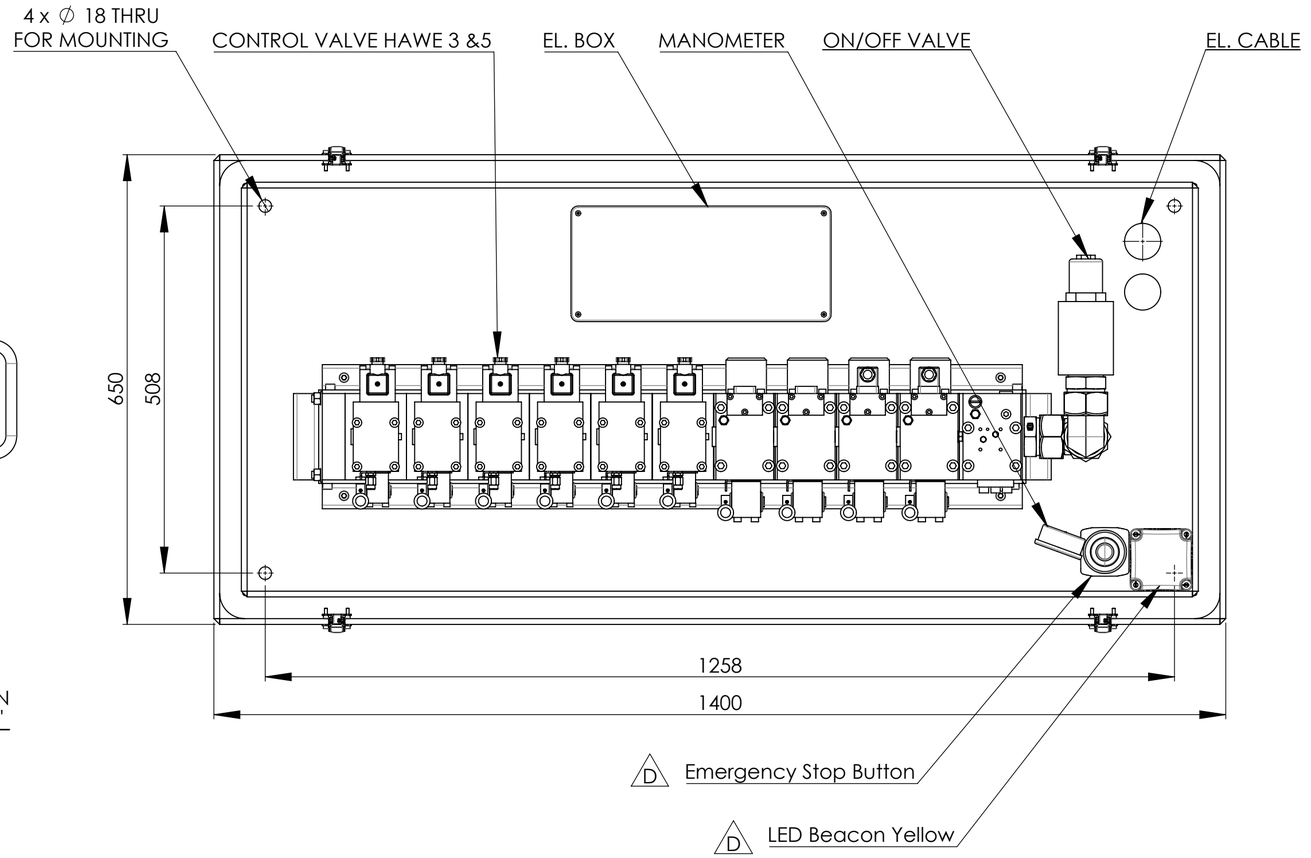
Revision D

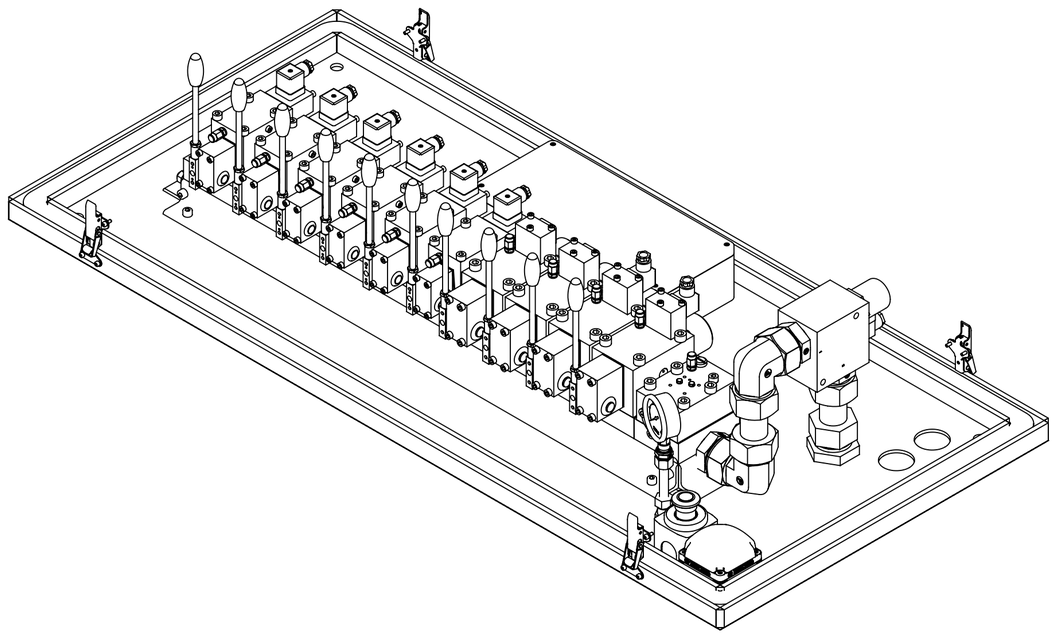
SHEET1 OF 2

Weight (kg)	226.2 Kg
Date	02.07.2014
Created by	HK
Approved date	11.01.2023
Approved by	LS

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PROJECT: 4/60185 MBARI

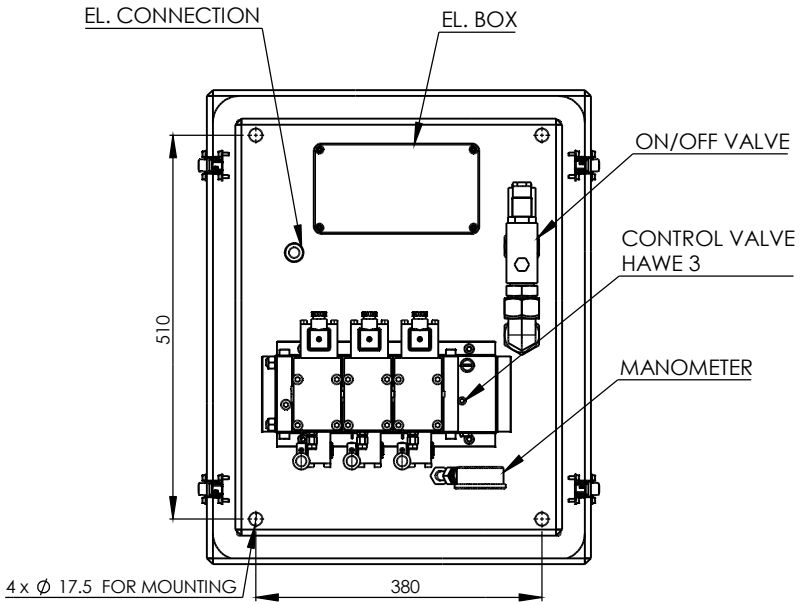
REV.	DESCRIPTION	DATE	APPROVED
REVISIONS			
D	Added LED Beacon and Emergency stop button	11.01.2023	CI
C	Drawing updated	02/02/2022	SS
B	Added one more section.	14/12/2021	HK
A	Released	26/11/2021	SS

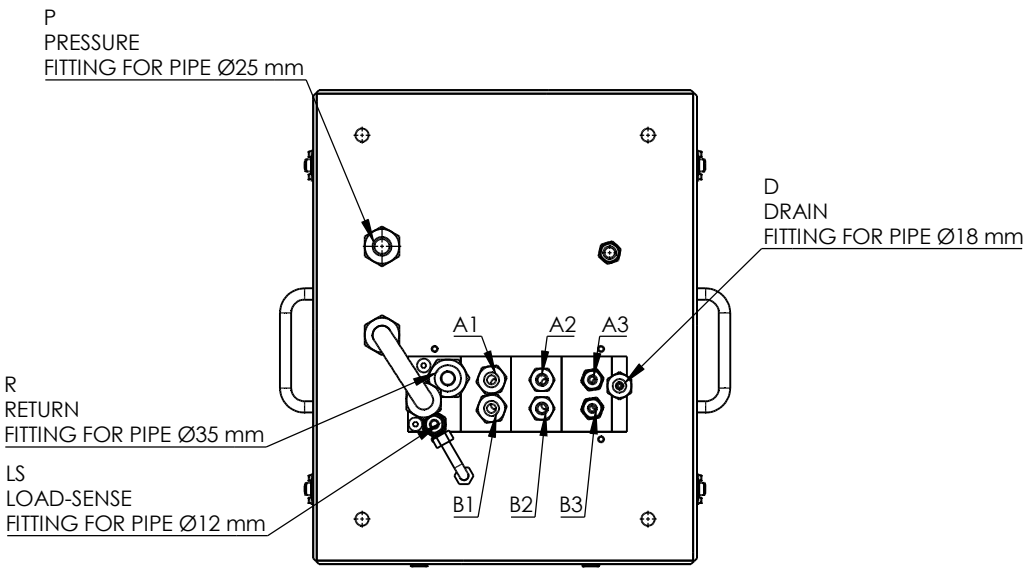
OVERHEAD CRANE
ROV LARS
VALVE CENTRAL

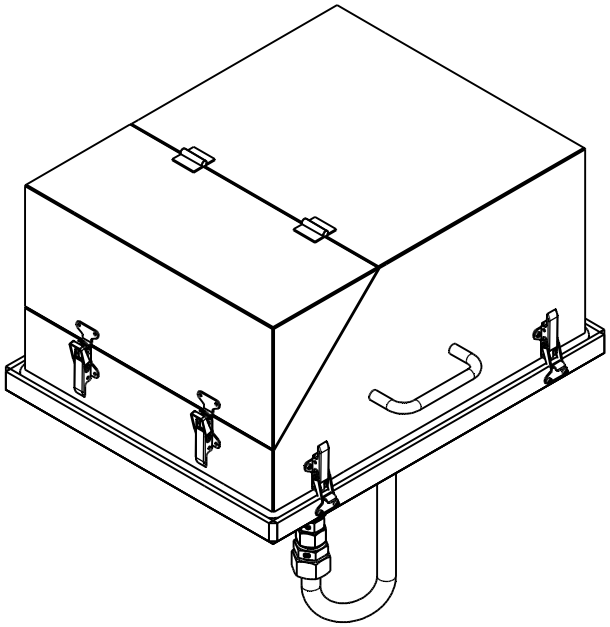
MACGREGOR

Unspec. tolerances in compliance with	
Weight (kg)	226.2 Kg
Date	02.07.2014
Scale	1:6
Projection	
Created by	HK
Format	A2
Approved date	11.01.2023
MPS no.	
Approved by	LS
Drawing no.	24859
Revision	D
SHEET2 OF 2	

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PROJECT: 4/60185 MBARI

TRIPLEX DESIGN
DAVIT
VALVE CENTRAL

REV.	DESCRIPTION	DATE	APPROVED
C	Updated after reorganizing dim sketch/main assembly	17/05/2022	SS
B	Diameter of return fitting changed to Ø35mm.	13/12/2021	AT
A	Released	04/11/2021	AT

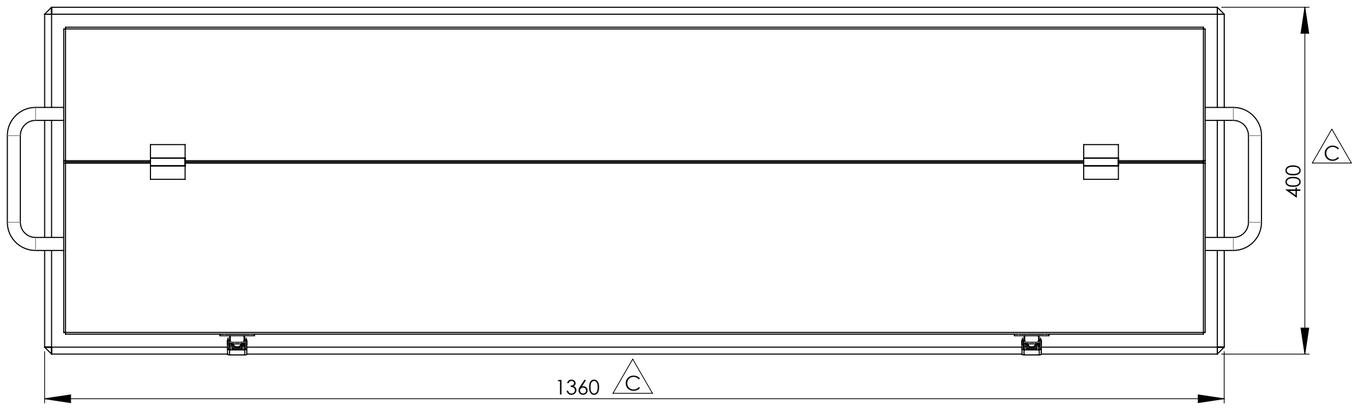
REVISIONS

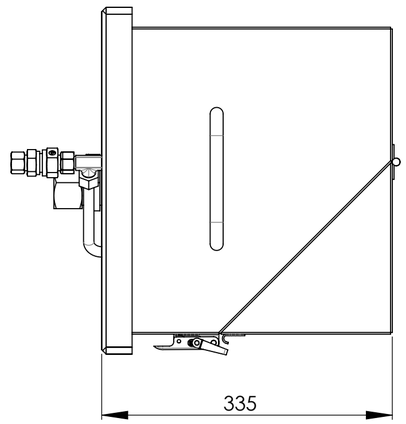
MACGREGOR

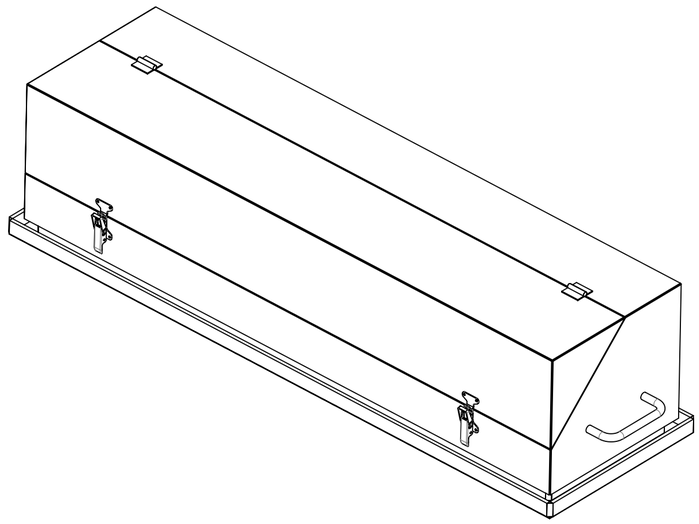
Unspec. tolerances in compliance with	NS-ISO 2768 M
Scale	1:5
Projection	
Format	A2
Weight (kg)	63.1 Kg
Date	04.11.2021
Created by	AT
Approved date	04.06.2022
MPS no.	400180306
Approved by	OPF
Drawing no.	24820
Revision	C

SHEET2 OF 2

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PROJECT: 4/60185 MBARI

NOTE !
Dimension of the hydraulic connections acc. to hydraulic diagram.

REV.	DESCRIPTION	DATE	APPROVED
D	Added MPS number	02.05.2022	OPF
C	Valve central dimensions changed	06/01/2022	SS
B	Connections for pressure and drain changed	13/12/2021	SS
A	Released	04.11.2021	CI

REVISIONS

FRAME
A-FRAME STERN
VALVE CENTRAL

MACGREGOR

Unspec. tolerances in compliance with

Scale 1:5

Projection

Format A2

MPS no. 400185989

Drawing no. 24821

Revision D

SHEET1 OF 2

Weight (kg) 153.0 Kg

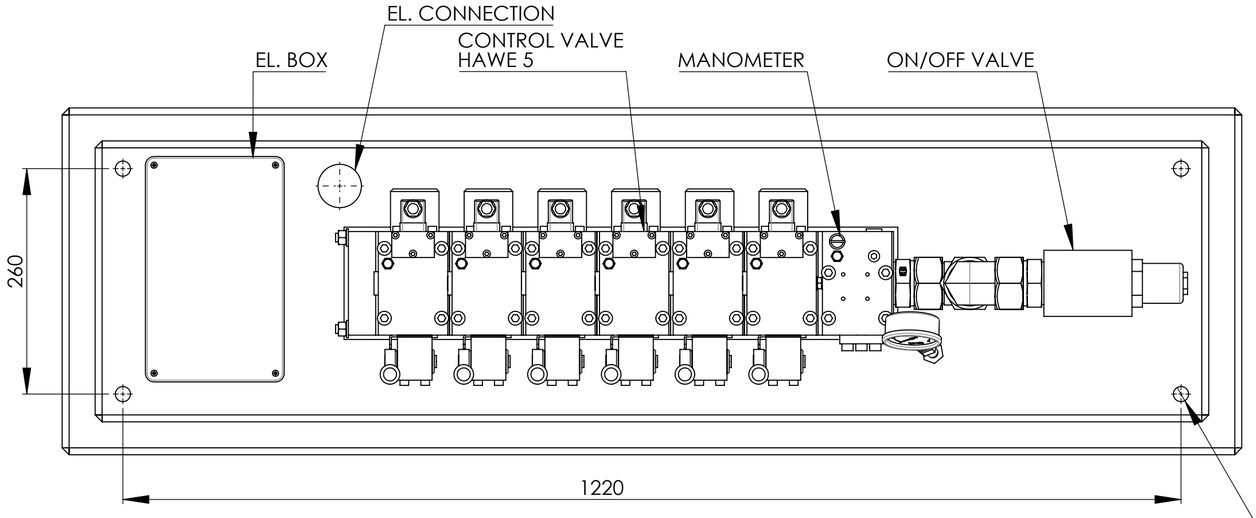
Date 04.11.2021

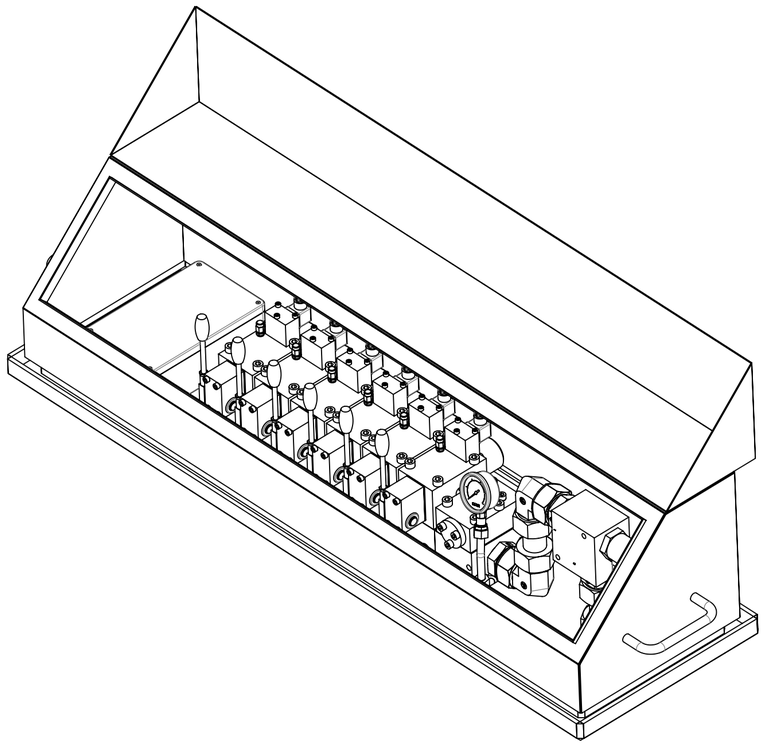
Created by CI

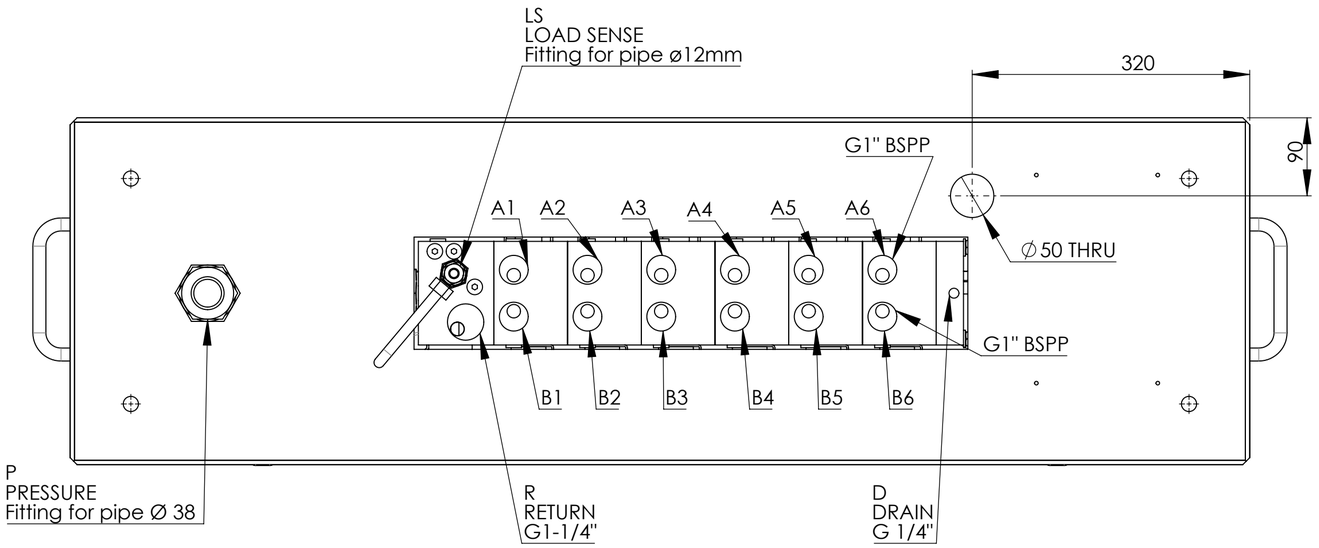
Approved date 02.05.2022

Approved by LS

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NOTE !
Dimension of the hydraulic connections acc. to hydraulic diagram.

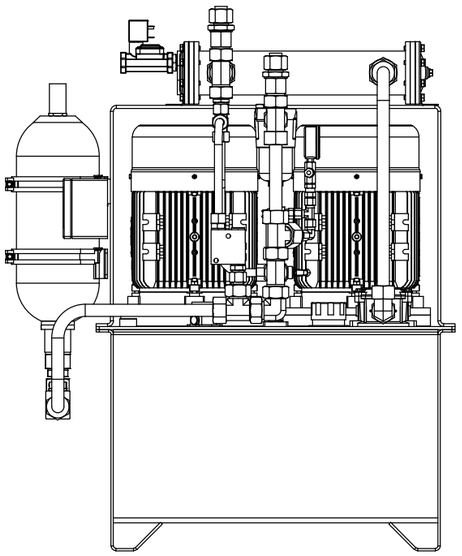
PROJECT: 4/60185 MBARI

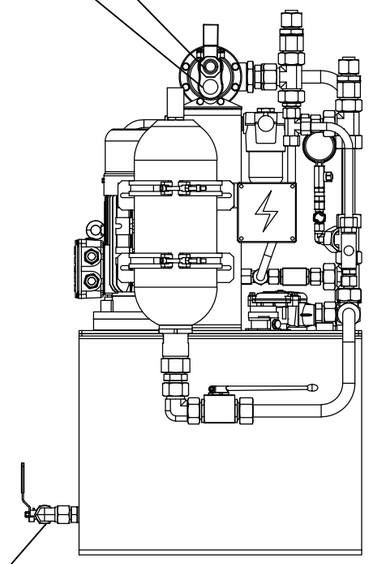
REV.	DESCRIPTION	DATE	APPROVED
REVISIONS			
D	Added MPS number	02.05.2022	OPF
C	Valve central dimensions changed	06/01/2022	SS
B	Connections for pressure and drain changed	13/12/2021	SS
A	Released	04.11.2021	CI

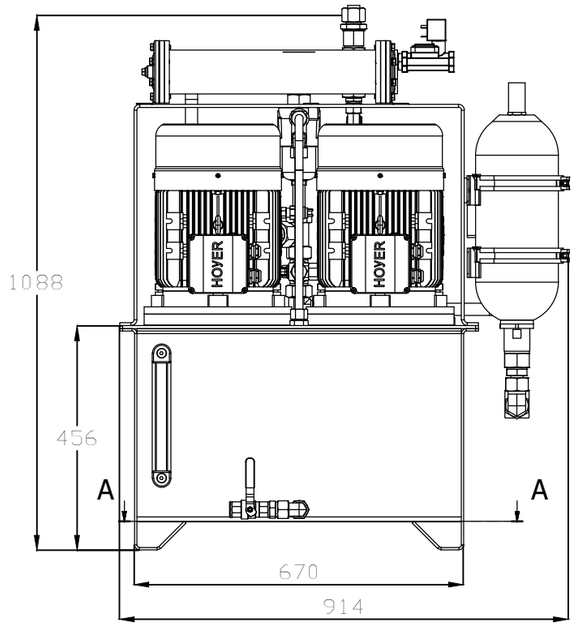
FRAME
A-FRAME STERN
VALVE CENTRAL

MACGREGOR

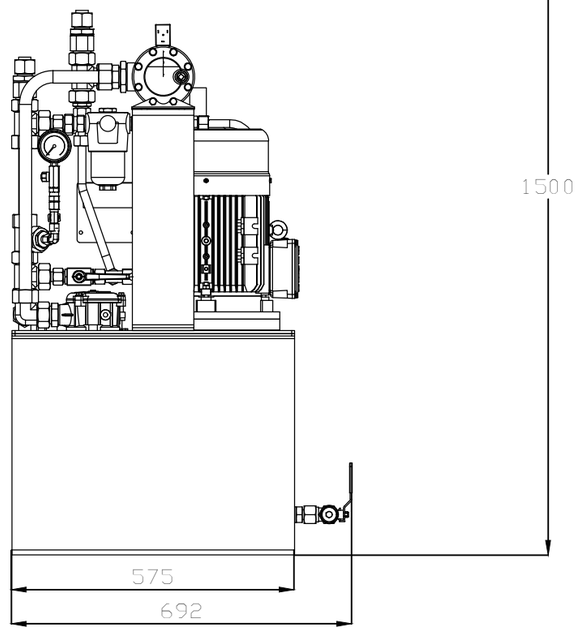
Unspec. tolerances in compliance with	
Weight (kg)	153.0 Kg
Date	04.11.2021
Scale 1:5 / Projection	Created by CI
Format A2	Approved date 02.05.2022
MPS no. 400185989	Approved by LS
Drawing no. 24821 SHEET2 OF 2 / Revision D	**According to international laws this drawing is the property of MacGregor. The drawing and contents can not be made public, copied or otherwise used without our approval.**

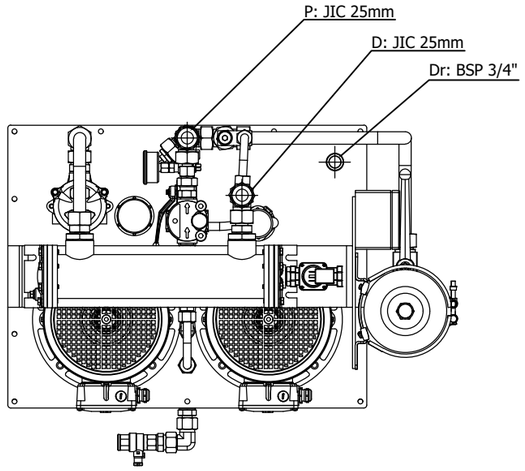




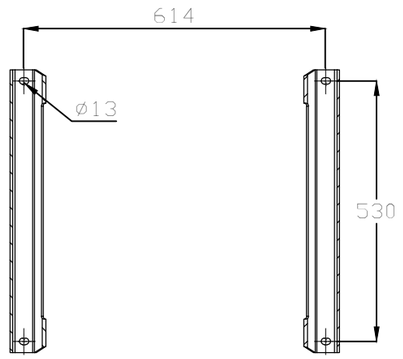


Approx. min. maintenance height

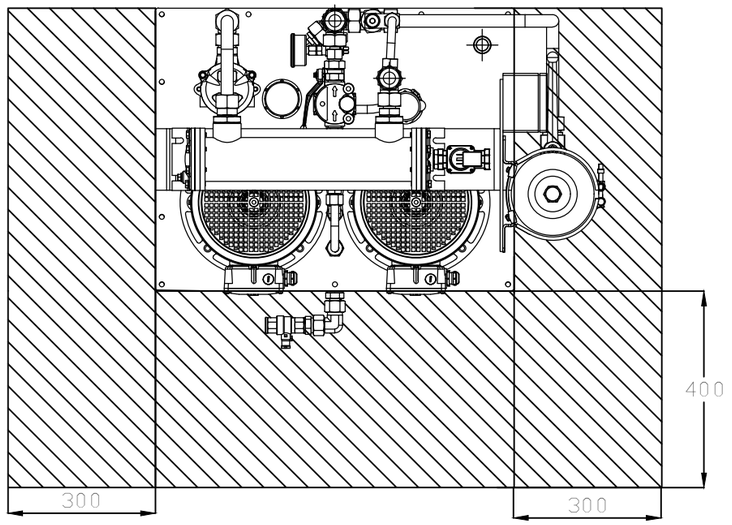


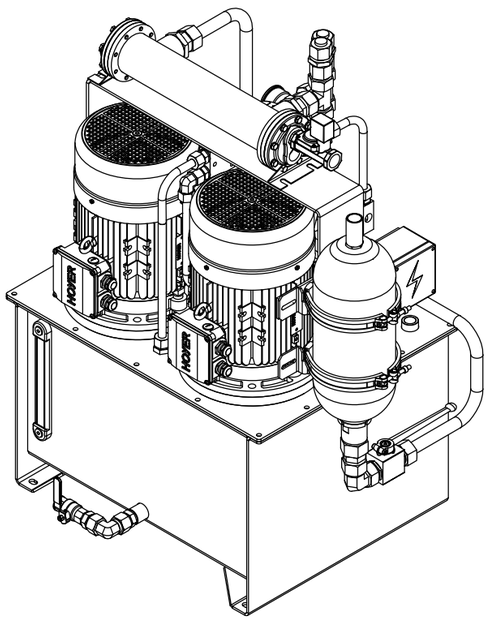


A-A (1:8)



Recommended maintenance area





Ref. Hyd. schematic drawing RH322323

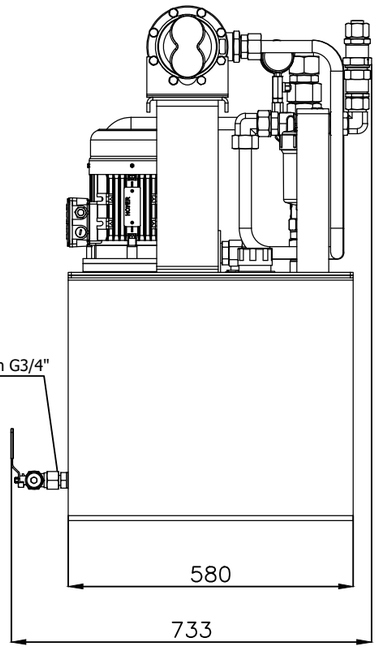
*Weight excluding oil

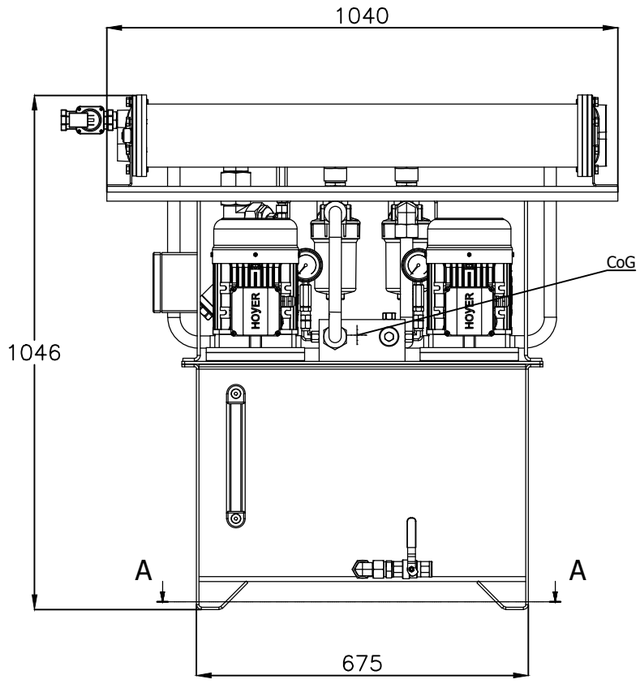
Designed by	Modified by	Date	ECO			
H Johansen		17-Dec-21				

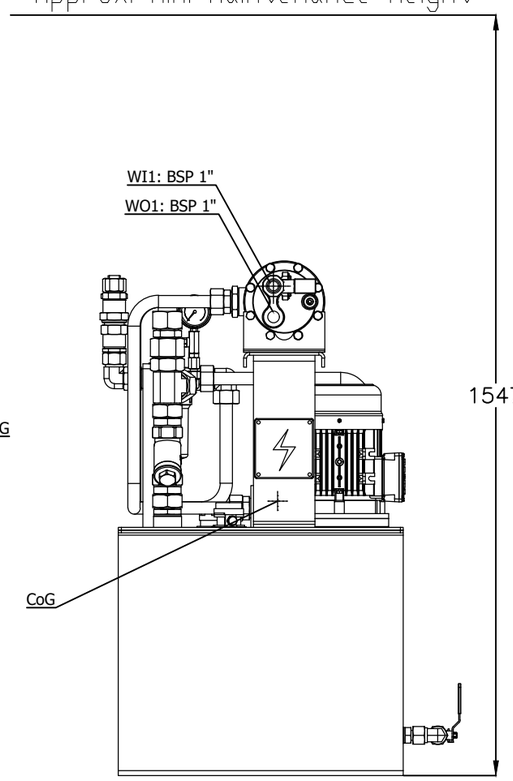
MACGREGOR

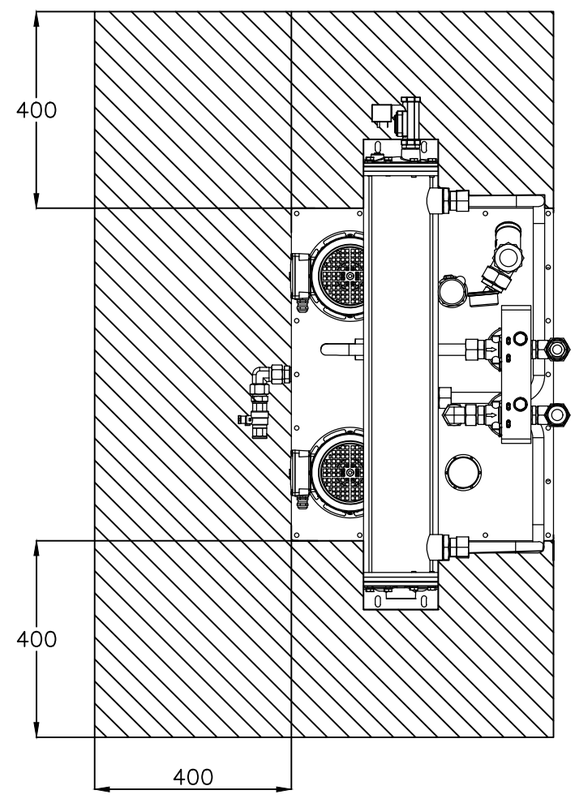
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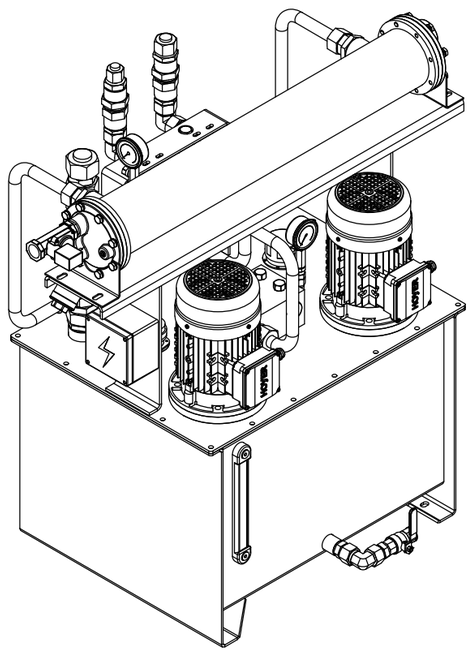
Name	Weight
Dimension Drawing / Connection Drawing	300 kg
Description	Scale (A3)
HPU Servo Sys., cooler & accum. 70L (109L)	1: 12, 5
Document ID 2000004113	Revision A

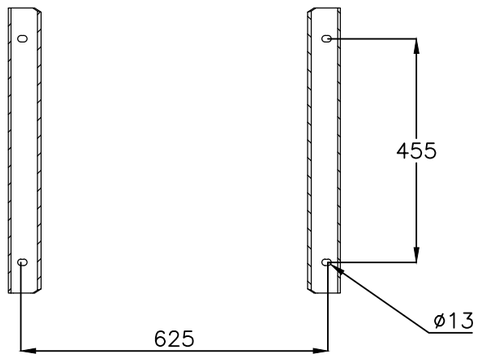


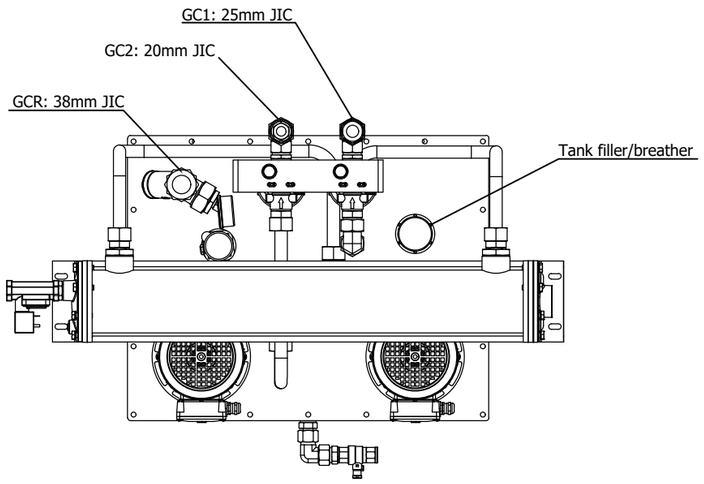












Ref. Hyd. schematic drawing RH325930

*Weight excluding oil

Designed by	Modified by	Date	ECO			
H Johansen		17-Dec-21				

MACGREGOR

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Name	Weight
Dimension Drawing / Connection Drawing	240 kg *
Description	Scale (A3)
HPU Gear Cooling 120L (155L)	1:12,5
Document ID 2000004110	Revision A

Section 2

Handling, Installation, Storage & Transit

Annex A – Installation & PHS&T

DESCRIPTION	DOC/DRW #	REV #	PAG #
A-Frame Installation			
Safety Precautions	Safety Installation A-Frame MBARI CNP Freire		2
A-Frame	02146 A-Frame		12
Cranes			
Safety Precautions	Safety Precautions Crane version 03		17
ROV LARS	02147		29
CTD Davit	02148 CTD Davit		42
KN-75 Main Crane	KN-75		48
Winches			
EN-IM Mechanical Installation	6837	3	52
EN-IM Installation of Electrical System	4251	6	59
Hydraulic Systems Installation	3035	12	88
Winch Alignment	6440	6	117
Guidance to Wire Spooling	1389	10	128
RM Standard for Packing	5867	3	150
RM Standard for packing material and products	5953	-	168
RM Packing of Electrical Cabinets	6267	4	169
RM Standard for Preservation	5866	4	181
RM Preservation Manual	6243	6	195
RM Preservation of Winches, Reels and Storage Drums	5952	-	198
RM Standard preservation material and products	5954	-	200

Installation

Dear Customer,

Thank you for choosing a product from MACGREGOR.

In order for the Crane to be reliable for a long time and to be a good investment read the installation instructions carefully.

Personnel Safety Precautions

OPERATION AND MAINTENACE OF THE CRANE SYSTEM SHALL BE EXECUTED IN ACCORCANCE WITH REQUIREMENTS OF THIS INSTRUCTION AND WITH VESSEL SAFETY REGULATIONS.

THE DECK MACHINERY MUST BE OPERATED BY QUALIFIED PERSONNEL THAT HAVE STUDIED THE DOCUMENTATION, INSTRUCTIONS AND REQUIREMENTS.

NEGLIGENCE OF OPERATIONS AND LIMITATIONS SPECIFIED IN THIS INSTRUCTION CAN CAUSE FAILURE OF EQUIPMENT, DAMAGE OF PROPERTY OR INJURY OF PERSONNEL.

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Typical sources of danger for personnel during operation and maintenance of cranes are:

- Hanging load
- Overload
- Tension of ropes
- High voltage in electric equipment
- High pressure in hydraulic equipment
- OIl leaks and oil spill
- Remote operated cranes
- Electric power lines
- High wind speed
- Heel + trim of crane above specified limit.
- Movements out of control
- Loose parts on crane
- Bearing structures, additional equipment, with cracks or any damage.

When working with these topics is in general a high level of attention recommended. In addition, routine maintenance will decrease the possibility of malfunction and failure of the deck machinery, which can be a source of danger for personnel safety.



GENERAL SAFETY INFORMATION

Operation only by trained/qualified personnel that have studied the documentation, instructions and requirements.
Safety devices not to be tampered with.
Prescribed safe distances to be maintained.
Safe distances from electric power lines to be maintained.
Be alert to faults during crane operation.
Do not operate the crane when the wessel's heel + trim is higher than maximum designed value. (Ref: dimension sketch)
Do not operate the crane when wind speed makes it indefensible.

SAFETY FOR USE OF CRANE.

Operating of the cranes requires skill, ability and experience.

Therefore only entrust persons with the operationof the cranes:

1. Who are physically and mentally suitable for this (not tired, and not under influence of alcohol, drugs or medication).
2. Who handle the crane responsibly and reliably.
3. Who have the right qualications(training, crane operator's license).
4. Who can prove that they have been instructed on how to operate the unit described here and who are familiar with the content of these operation instructions This also applies to the operating instructions for ancillary equipment used on the crane.



OPERATORS DUTIES AND RESPONSIBILITIES

1. Duties: The operator should carry out the following duties: crane (enabling the power circuits, operating the machine, etc.); assembling/disassembling the optional parts (grab, hook, etc.); servicing the machine, he should therefore perfectly know the safety rules and the relevant devices installed for this purpose, the usage of the commands of handling and the techniques of loads slinging.

2. Leaving control valve or radio control with hanging load in crane is prohibited .

3. Responsibilities: !e operator is directly responsible for every action he takes within the above mentioned duties.



ACTIONS AT ERROR

If you notice the following injuries or disorders of the CRANE / A-FRAME and accessories, Operation must be stopped immediately.

- Damage or cracks on the supporting components
- Defect bearings
- Defect on the hydraulic system or safety devices.
- Loose screw connections.
- Inadequate secured bolt connections.
- Leakages in the hydraulic components or the connection of these.
- Unusual sounds.
- Unusual fast or slow working movements.
- Malfunctions in control.
- Unusual high heating of the hydraulic components.

With these injuries, it may no longer be guaranteed a safe CRANE operation.
There is an acute accident and mortal danger.

DAILY VISUAL INSPECTION

Check:

- Coupling, hose connections and elements of the hydraulic system for damage or hydraulic oil leaks.
- Oil leakage can cause accident and pollute the environment
- Tension of the bolt and screw connections.
- Bolt locks for defects
- The radio/valve controls move easily and sets back by itself.
- Bearing structures, additional equipment, for cracks or any damage.
- When laser measurement are used, these must be checked for external damage before use. Functional tests must be performed without load before use.
- Check that the emergency stop works as expected.
- Check radio control for damage/defects.

When you discover such defects, CRANE shall not be used.



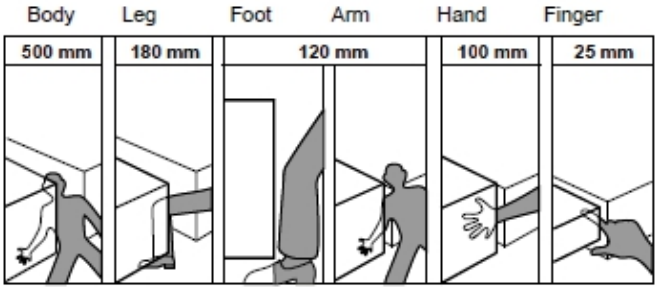
If your crane is equipped with safety devices such as an emergency CUT-OFF, an overload protection system or a rope winch limit stop, always carry out a function test on them before operation.

The winch must not be manipulated to drive at a speed higher than max. speed specified by winch supplier.

If the safety devices do not work or is manipulated, operation of the crane is strictly prohibited.

AVOID DANGER OF CRUSHING

Avoid operating situations in which there is a risk of you or bystanders being crushed by the crane, or load.
The crush point is not regarded as a danger point for the body parts stated if the safety distances highlighted below are complied with and it is ensured that the next-biggest body part cannot penetrate. Required minimum distances:



If the distances are not complied with there is danger of injury and even death.

LOADING

- Use the deck crane only to hoist the load and never break, hit, pull (towing) load, press and run against fixed obstacles or towing.
- Do not lift the load higher than necessary for moving in the work area.
- Transport of people are only allowed in the special personnel basket which is designed for this purpose.
- The specific regulations in each country shall be complied.
- Lift the load of center of gravity. Secure the load against slippage.
- Using the deck crane, grab the control stick and press it firmly until the deck crane responds.
- Then, through slow and steady pushing the control stick to speed up the deck crane function.
- Move the lifted load so that this does not violate the deck crane or other obstacles
- Loading should only be hung and removed by complete standstill of the deck crane.
- Make sure the person hanging on or taking off the load is no longer in the danger area before moving the load arm.
- Do not run the deck crane at full operating speed to estimates, this increases wear and shortens life of the deck crane.
- Do not run the deck crane at full working speed to the end, this increases wear and shortens the life of the deck crane.
- Use approved lifting straps / chains with a higher strength than the weight of the load.



Keep distance from power lines

Keep the required minimum distances away from power lines. If this is not possible because of the particular work being carried out the lines must be disconnected (switched off).
The appearance and height of electric power lines gives no indication of their voltage.
In the case of lines where the voltage is not known a distance of at least 5 metres between the crane and the line must be maintained. This also applies to all load lifting gear and ancillary equipment attached to the crane.
Take into account that in a wind a power line can sway out or the load arm of the crane can be caused to swing by sudden movements (also upwards). Even unintentional approaching can lead to flashover. Flashover can occur even on just approaching a power line.

This entails the risk of fatal injury for the crane operator and auxiliary personnel.

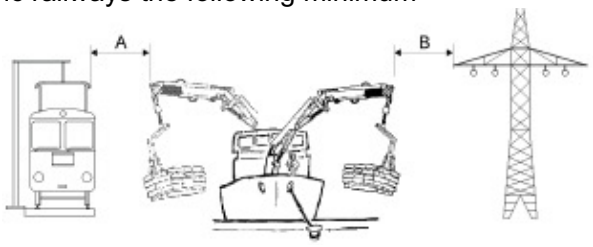
Safe distances from electric power lines

For overhead power lines and contact lines of electric railways the following minimum distances apply:

A

= DC
up to ..... à 1.500 V ..... 1,0 m
over ..... à 1.500 V ..... 1,5 m

~ AC
up to ..... à 1.000 V ..... 1,0 m
over ..... à 1.000 V ..... 1,5 m



B

up to ..... 1.000 V ..... 1,0 m
1.000 ..... 110.000 V ..... 3,0 m
110.000 ..... 220.000 V ..... 4,0 m
220.000 ..... 380.000 V ..... 5,0 m
unknown voltage ..... 5,0 m



Please observe the following in connection with load lifting gear:

The weights of the load lifting gear and accessory equipment count as part of the load.
The load lifting gear must be matched to the crane in terms of size and lifting capacity.
A type plate must be attached to the load lifting gear showing details such as manufacturer, type designation, manufacture number, weight, operating pressure, capacity, maximum permissible lifting capacity and year of manufacture.
The maximum lifting capacity of your crane is always determined by the weakest unit of load lifting gear used.
Please therefore always observe the lifting capacities stated on the load lifting gear.
Familiarize yourself with the content of the operating instructions of the respective load carrying equipments.

Hook:

On your crane only use certified load hooks which match your crane and the load to be lifted.
The lifting capacity of the load hook and the shackle must correspond to the maximum lifting capacity of the crane.
Fasten and secure the load hook properly.
Ensure that the safety catch closes again by spring pressure after the load has been hooked.

Safety Instructions radio controller

- The radio system serves to control machines and for data transfer. Observe the job safety and accident prevention.
- The intended use also includes reading the operating instructions and adhering to all safety information contained therein.
- The radio system must not be used in areas where there is a risk of explosion, nor for the control of machines used to convey persons, unless it is explicitly approved by the manufacturer for these uses.
- Modificationsto the radio system may only be carried out by specialist personnel who have been trained and authorized by HBC-radiomatic. All modifications must be documented at the factory in the radio control master file.
- The radio control system safety devices must not be modi€ed, removed or bypassed. In particular, modi€cations to any part of the radio system's complete E-STOP system are impermissible.



Working with hydraulic systems

Hydraulic systems often store hot and pressurized fluid. For safety reasons please note the following:

- All maintenance and repair of hydraulic systems can only be carried out by qualified personnel.
- Personnel are exposed to 3 kinds of hazards:

o Burns from hot, high-pressure fluid.
o Bruises, cuts or abrasions from failing hydraulic lines.
o Injections of fluid into the skin.

- Before work: Review the Material Safety Data Sheets for all chemicals used. Know location of emergency shower, eyewash station and other first aid equipment.
- During work: Always use protection goggles, chemical-resistant gloves and solid workwear.
- After work: Cleanse and wash affected skin and apply moisturizing cream. Immediately change and wash affected workwear.
- Never use bare fingers or hands to find leaks in the hydraulic system. Pinhole leaks in the hydraulic system can cause a jet of hydraulic fluid that easily can penetrate the skin and cause severe internal damage to the body.
- Hydraulic systems can contain high pressure even when switched off. One must therefore always assure that pressure in the hydraulic system is released before disassembly of hydraulic components. Be aware that hydraulic supply can come from more than one hydraulic power unit.
- Use extreme caution when disconnecting hydraulic components and lines as hot hydraulic oil can cause severe burns to the body.
- It is forbidden to tighten connections when hydraulic pumps are running (mainly to prevent oil leakage).
- Pump room can be a zone with high level of noise, it is therefore recommended to use ear protection inside pump rooms.
- If hydraulic fluid is spilled it must be cleaned up immediately.
- Hydraulic systems under maintenance and repair should be locked and tagged according to a Lock-out/Tag-out procedure.

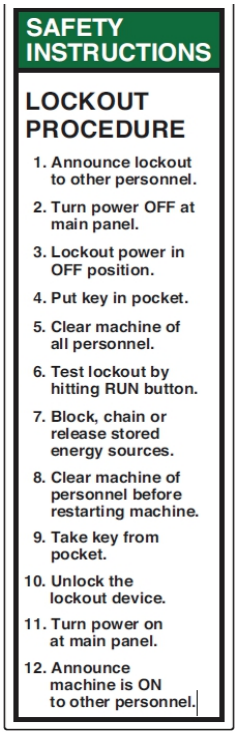
As a vessel may contain several types of hydraulic systems from various suppliers and with different pressure levels, Macgregor deck machinery and its hydraulic components must be included in a complete safety analysis. A complete safety regulation and correct personal protective equipment should be detailed in the vessel's Safety Management System.



Working with electric systems

Electricity is a very potent energy form and if used carelessly it can cause severe injury to the human body. For safety reasons please note the following:

- All maintenance and repair of electric systems can only be carried out by qualified personnel.
- Qualification and personal protection needed for working on electric systems are dependent on which voltage level the system has.
- Electric systems can contain high voltage even when switched of.
- Make sure that the electric system is switched of and de-energized before disassembly of
- electric components.
- NOTICE, Main boards usually have main power and heating which comes from separate circuit The same applies to I / O circuit boxes and panels that can contain both 230VAC and 24VDC. Starter controls panels may have control power supply from separated starter cabinets.
- Do not wear conductive articles like jewelry, clothing, watches etc. when working with or near electric systems.
- Use of protective eyewear is recommended.
- Protective gloves made of rubber or leather is recommended although it can make work with electric components and equipment harder.
- Only use insulated tools when working with or near electric systems.
- Fuses or safety breakers must not be replaced or reset until it is determined that a circuit is safe to operate.
- Do not bypass any protective system or device designed to protect employees from contact with electrical energy.
- Water and other conductive fluids are electric components worst enemy and can damage or reduce service life to electric components and subsequently make a threat for personnel.
- Electric systems under maintenance and repair should be locked and tagged according to a Lockout/ Tag-out procedure.



Example of Lockout procedure.

As a vessel may contain several types of electric systems from various suppliers and with diferent voltage levels, MacGregor Bodø's deck machinery and its electric components must be included in a complete safety analysis. A complete safety regulation and correct personal protective equipment should be detailed in the vessel's Safety Management System.

Safety Instructions for Installation and Operation HBC radiocontrol

- The radio system serves to control machines and for data transfer. Observe the job safety and accident prevention.
- The intended use also includes reading the operating instructions and adhering to all safety information contained therein.
- The radio system must not be used in areas where there is a risk of explosion, nor for the control of machines used to convey persons, unless it is explicitly approved by the manufacturer for these uses.
- Modifications to the radio system may only be carried out by specialist personnel who have been trained and authorized by HBC-radiomatic. All modifications must be documented at the factory in the radio control master file.
- The radio control system safety devices must not be modified, removed or bypassed. In particular, modificationsto any part of the radio system's complete E-STOP system are impermissible.

Electrical Connection



Warning – shock hazard!

- The electrical connection may only be carried out by skilled personnel.
- The electrical connection must comply with the enclosed wiring diagram.
- Switch of the supply voltage before opening the receiver. There is a risk of fatality from touching live parts inside the housing!

INSTALLATION

BASE INSTALLATION

The deck area where the Stern A-Frame is to be installed must be reinforced and supported from underneath in relation to the loads that the Stern A-Frame will carry.

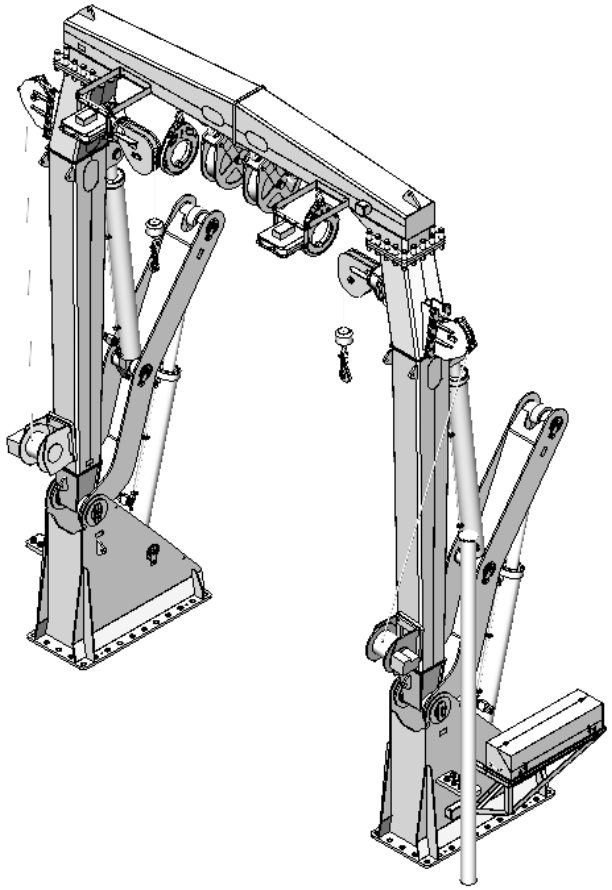
Table of tightening torques screw connections

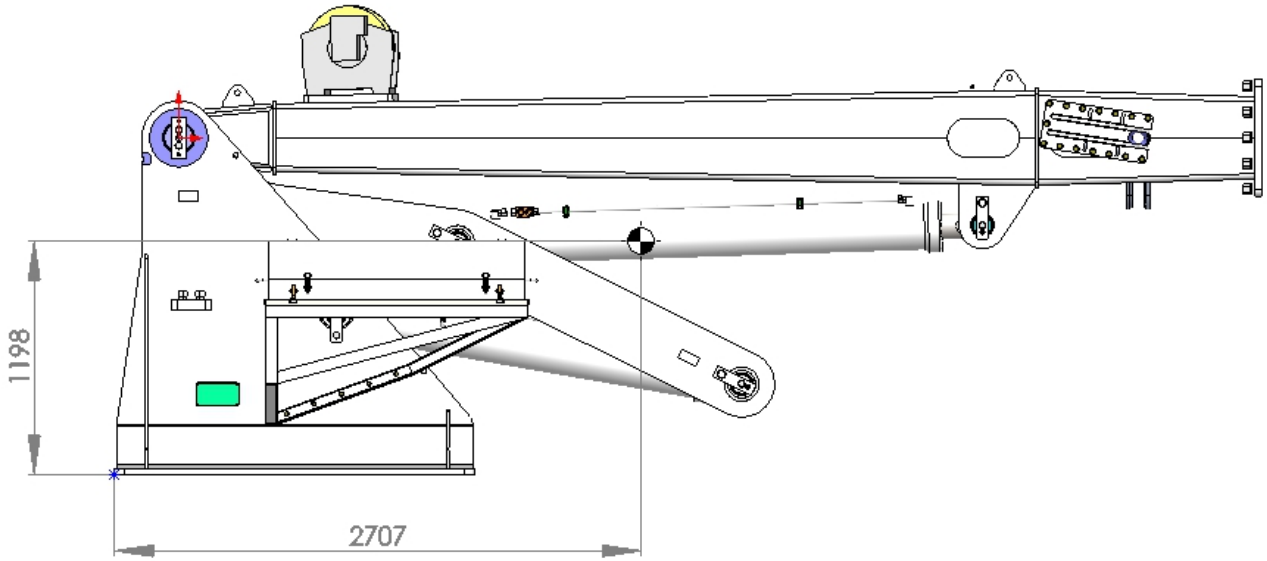
MAKE-UP TORQUE			
dim \ matr	**8.8**	**10.9**	**12.9**
M8	24	47	33
M10	47	65	79
M12	81	114	136
M16	197	277	333
M20	385	541	649
M24	665	935	1120
M27	961	1350	1620
M30	1310	1840	2210
M36	2280	3210	3850
Where hardened washer is not used, lubricate screw head with MoSo2 or similar.			

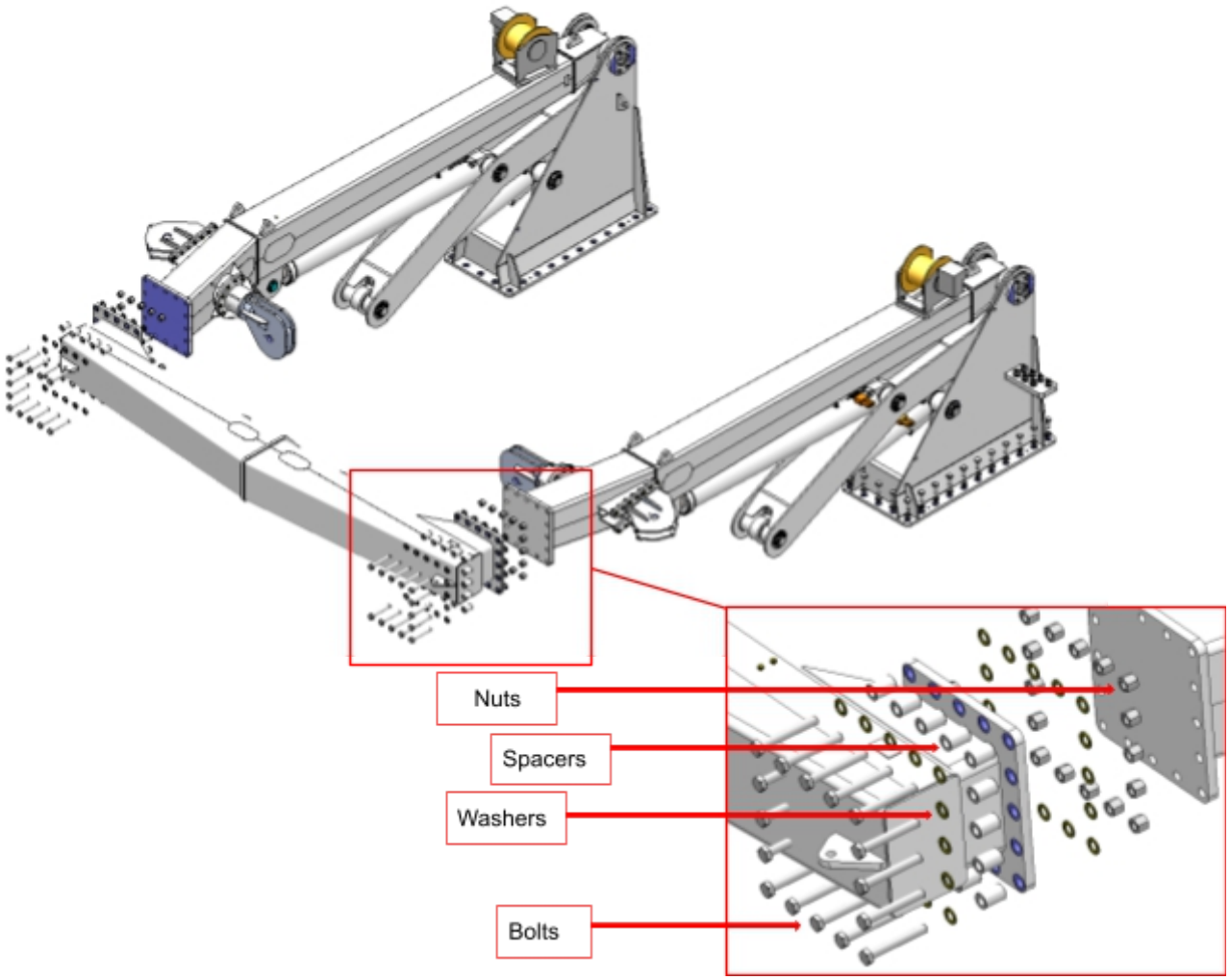
HYDRAULIC SYSTEM

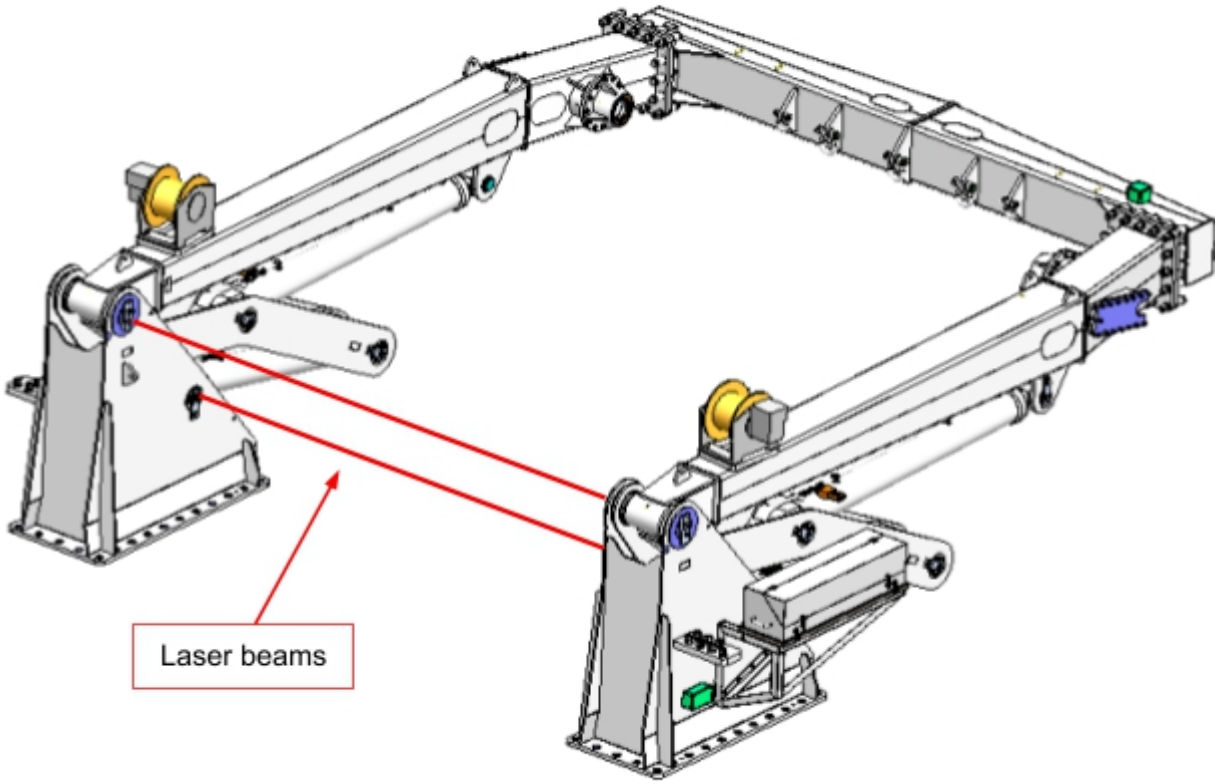
The hydraulic pipe layout should be installed with reference to existing pipe installation charts. It is important to keep all components clean while installing the hydraulic pipe system.

A-Frame Stern Installation Instruction



	COG of assembled foundations with gantry legs and cylinders, on Starboard and Port side of the vessel.		

2.	Connect Gantry beam to gantry legs by tightening Bolts and nuts on Starboard and Port side. Bolts: ISO 4014 M30 x 220 - 10.9 Apply torque of 1840 Nm. Mass of Gantry Beam assembly is approx **1000 kg.** (Ref. drawings 24959 Main assem. And 24957 Gantry beam)	

3.	Check if foundation on Starboard and Port side are in tolerance line. Use a laser mounted at the end and in the center of the bearing pin(needs to be perpendicular). The laser shall hit the other bearing pin in the center with tolerance of 0-1mm. This procedure needs to be done from Starboard to Port side and from Port to Starboard on main bearing pin and cylinder bearing pin. (Ref. drw. 25480 Installation-Sheet 2)		

4.	Function test to be done without loads to check if everything is aligned.		
5.	Hydraulic connections according to drawing 25480 Installation drawing.		

Personnel Safety Precautions

CRANES













MACGREGOR

Rev.	Date	Reason for issue	Prepared	Checked	Approved
03	15.03.2022	Removed table and added text	ÅS		
02	03.03.2022	Added text and table	ÅS		
01	24.02.2022	Printed	ÅS		

Personnel Safety Precautions for Cranes

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Table of contents

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4 General
4 Introduction
5 GENERAL SAFETY INFORMATION
5 OPERATORS DUTIES AND RESPONSIBILITIES
6 ACTIONS AT ERROR
6 DAILY VISUAL INSPECTION
7 AVOID DANGER OF CRUSHING
8 Keep distance from power lines
8 Safe distances from electric power lines
9 Please observe the following in connection with load lifting gear:
9 Hook:
9 Safety Instructions radio controller
10 Working with hydraulic systems
11 Working with electric systems

General

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- Damage or cracks on the supporting components
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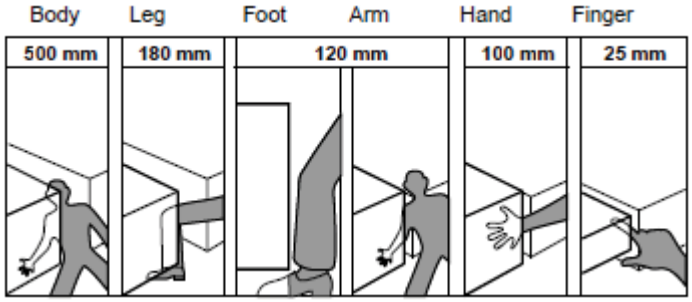
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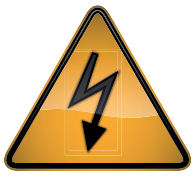
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- Use the deck crane only to hoist the load and never break, hit, pull (towing) load, press and run against fixed obstacles or towing.
- Do not lift the load higher than necessary for moving in the work area.
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- Move the lifted load so that this does not violate the deck crane or other obstacles
- Loading should only be hung and removed by complete standstill of the deck crane.
- Make sure the person hanging on or taking off the load is no longer in the danger area before moving the load arm.
- Do not run the deck crane at full operating speed to estimates, this increases wear and shortens life of the deck crane.
- Do not run the deck crane at full working speed to the end, this increases wear and shortens the life of the deck crane.
- Use approved lifting straps / chains with a higher strength than the weight of the load.



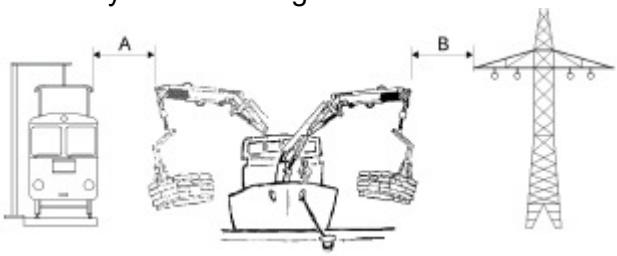
Keep distance from power lines

Keep the required minimum distances away from power lines. If this is not possible because of the particular work being carried out the lines must be disconnected (switched off).
The appearance and height of electric power lines gives no indication of their voltage.
In the case of lines where the voltage is not known a distance of at least 5 metres between the crane and the line must be maintained. This also applies to all load lifting gear and ancillary equipment attached to the crane.
Take into account that in a wind a power line can sway out or the load arm of the crane can be caused to swing by sudden movements (also upwards). Even unintentional approaching can lead to flashover. Flashover can occur even on just approaching a power line.

This entails the risk of fatal injury for the crane operator and auxiliary personnel.

Safe distances from electric power lines

For overhead power lines and contact lines of electric railways the following minimum distances apply:



A

= DC
up to ..... à 1.500 V ..... 1,0 m
over ..... à 1.500 V ..... 1,5 m

~ AC
up to ..... à 1.000 V ..... 1,0 m
over ..... à 1.000 V ..... 1,5 m

B

up to ..... 1.000 V ..... 1,0 m
1.000 ..... 110.000 V ..... 3,0 m
110.000 ..... 220.000 V ..... 4,0 m
220.000 ..... 380.000 V ..... 5,0 m
unknown voltage ..... 5,0 m



Please observe the following in connection with load lifting gear:

The weights of the load lifting gear and accessory equipment count as part of the load.
The load lifting gear must be matched to the crane in terms of size and lifting capacity.
A type plate must be attached to the load lifting gear showing details such as manufacturer, type designation, manufacture number, weight, operating pressure, capacity, maximum permissible lifting capacity and year of manufacture.
The maximum lifting capacity of your crane is always determined by the weakest unit of load lifting gear used.
Please therefore always observe the lifting capacities stated on the load lifting gear.
Familiarize yourself with the content of the operating instructions of the respective load carrying equipments.

Hook:

On your crane only use certified load hooks which match your crane and the load to be lifted.
The lifting capacity of the load hook and the shackle must correspond to the maximum lifting capacity of the crane.
Fasten and secure the load hook properly.
Ensure that the safety catch closes again by spring pressure after the load has been hooked.

Safety Instructions radio controller

- The radio system serves to control machines and for data transfer. Observe the job safety and accident prevention.
- The intended use also includes reading the operating instructions and adhering to all safety information contained therein.
- The radio system must not be used in areas where there is a risk of explosion, nor for the control of machines used to convey persons, unless it is explicitly approved by the manufacturer for these uses.
- Modifications to the radio system may only be carried out by specialist personnel who have been trained and authorized by HBC-radiomatic. All modifications must be documented at the factory in the radio control master file.
- The radio control system safety devices must not be modified, removed or bypassed. In particular, modifications to any part of the radio system's complete E-STOP system are impermissible.



Working with hydraulic systems

Hydraulic systems often store hot and pressurized fluid. For safety reasons please note the following:

- All maintenance and repair of hydraulic systems can only be carried out by qualified personnel.
- Personnel are exposed to 3 kinds of hazards:

  o Burns from hot, high-pressure fluid.
  o Bruises, cuts or abrasions from failing hydraulic lines.
  o Injections of fluid into the skin.

- Before work: Review the Material Safety Data Sheets for all chemicals used. Know location of emergency shower, eyewash station and other first aid equipment.
- During work: Always use protection goggles, chemical-resistant gloves and solid workwear.
- After work: Cleanse and wash affected skin and apply moisturizing cream. Immediately change and wash affected workwear.
- Never use bare fingers or hands to find leaks in the hydraulic system. Pinhole leaks in the hydraulic system can cause a jet of hydraulic fluid that easily can penetrate the skin and cause severe internal damage to the body.
- Hydraulic systems can contain high pressure even when switched off. One must therefore always assure that pressure in the hydraulic system is released before disassembly of hydraulic components. Be aware that hydraulic supply can come from more than one hydraulic power unit.
- Use extreme caution when disconnecting hydraulic components and lines as hot hydraulic oil can cause severe burns to the body.
- It is forbidden to tighten connections when hydraulic pumps are running (mainly to prevent oil leakage).
- Pump room can be a zone with high level of noise, it is therefore recommended to use ear protection inside pump rooms.
- If hydraulic fluid is spilled it must be cleaned up immediately.
- Hydraulic systems under maintenance and repair should be locked and tagged according to a Lock-out/Tag-out procedure.

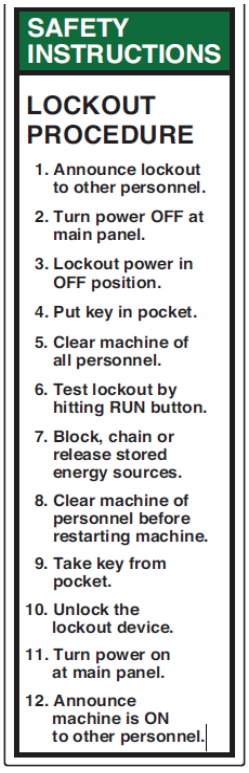
As a vessel may contain several types of hydraulic systems from various suppliers and with different pressure levels, Macgregor deck machinery and its hydraulic components must be included in a complete safety analysis. A complete safety regulation and correct personal protective equipment should be detailed in the vessel's Safety Management System.



Working with electric systems

Electricity is a very potent energy form and if used carelessly it can cause severe injury to the human body. For safety reasons please note the following:

- All maintenance and repair of electric systems can only be carried out by qualified personnel.
- Qualification and personal protection needed for working on electric systems are dependent on which voltage level the system has.
- Electric systems can contain high voltage even when switched off.
- Make sure that the electric system is switched off and de-energized before disassembly of
- electric components.
- *NOTICE, Main boards usually have main power and heating which comes from separate circuit The same applies to I / O circuit boxes and panels that can contain both 230VAC and 24VDC. Starter controls panels may have control power supply from separated starter cabinets.
- Do not wear conductive articles like jewelry, clothing, watches etc. when working with or near electric systems.
- Use of protective eyewear is recommended.
- Protective gloves made of rubber or leather is recommended although it can make work with electric components and equipment harder.
- Only use insulated tools when working with or near electric systems.
- Fuses or safety breakers must not be replaced or reset until it is determined that a circuit is safe to operate.
- Do not bypass any protective system or device designed to protect employees from contact with electrical energy.
- Water and other conductive fluids are electric components worst enemy and can damage or reduce service life to electric components and subsequently make a threat for personnel.
- Electric systems under maintenance and repair should be locked and tagged according to a Lockout/ Tag-out procedure.



As a vessel may contain several types of electric systems from various
suppliers and with different voltage levels, MacGregor Bodø's deck machinery and its electric components must be included in a complete
safety analysis. A complete safety regulation and correct personal protective equipment should be detailed in the vessel's Safety Management System.

Example of Lockout procedure.

MACGREGOR

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Wherever needed, you can rely on our support.
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- Hydramarine
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- KGW
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- KYB - Kayaba Industries / Navire Cargo Gear
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MacGregor is a leader in intelligent maritime cargo and load handling with a strong portfolio of MacGregor, Hatlapa, Porsgrunn, Pusnes, Rapp and Triplex products, services and solutions, all designed to perform with the sea. Shipbuilders, shipowners and operators are able to optimise the lifetime profitability, safety, reliability and environmental sustainability of their operations by working in close cooperation with MacGregor.

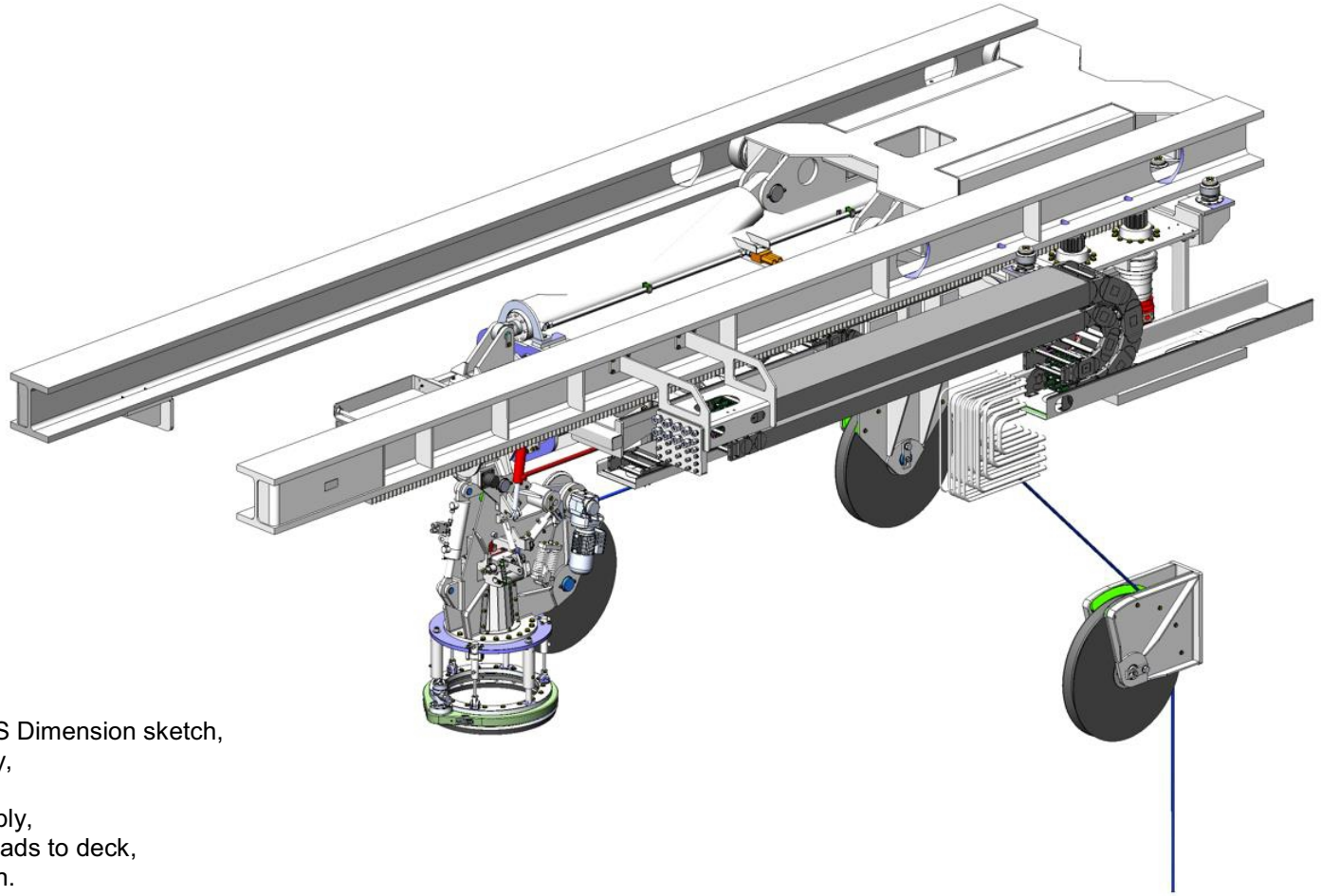
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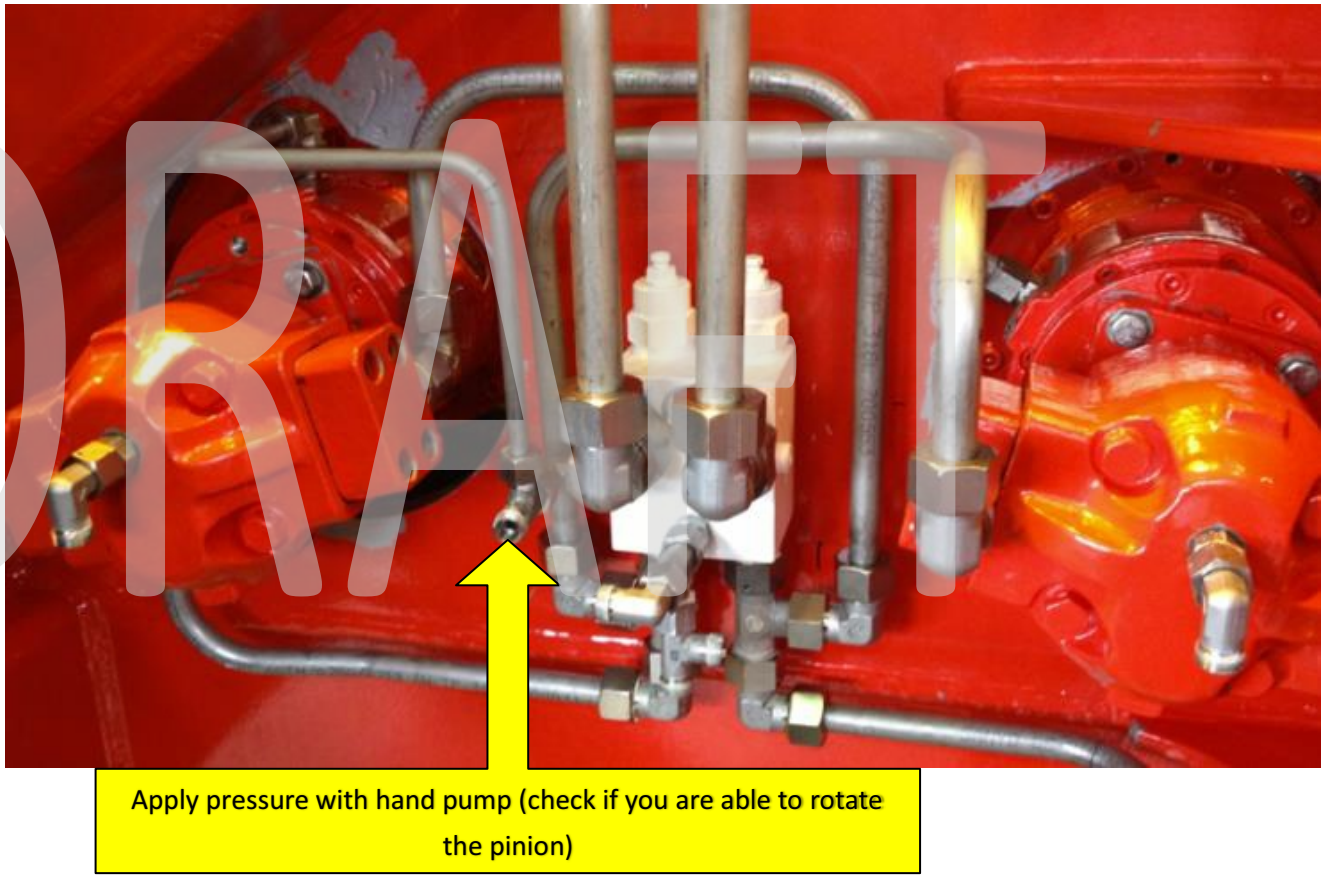
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ROV LARS
INSTALLATION INSTRUCTION

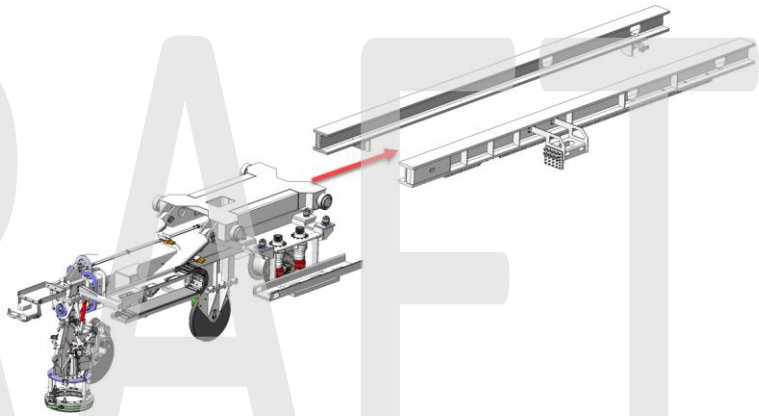
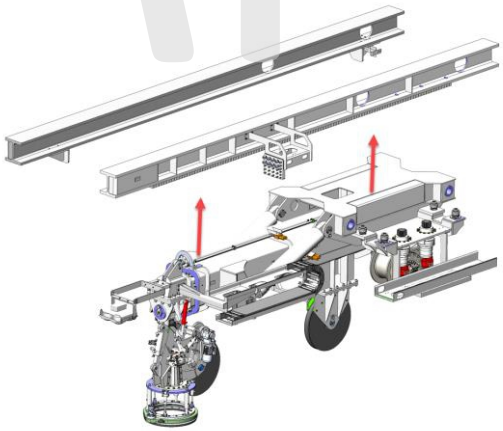


References:

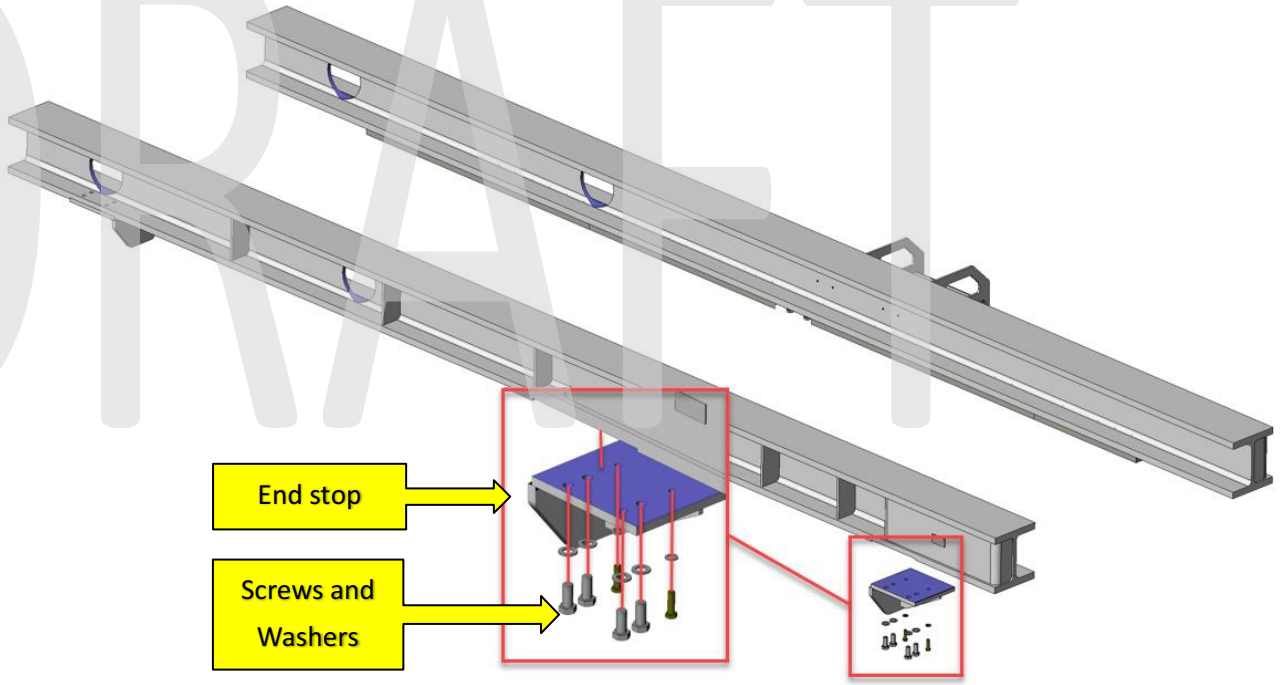
20673 ROV OH LARS Dimension sketch,
25234 Main assembly,
25001 Frame rail,
25004 Trolley assembly,
24891 ROV LARS Loads to deck,
25479 Rail Installation.

Description	Ilustration
In order to release the pressure on the spring brake and rotate the pinion motors and pipes/hoses will need to be reconnected after the trolley is installed in the rails.	

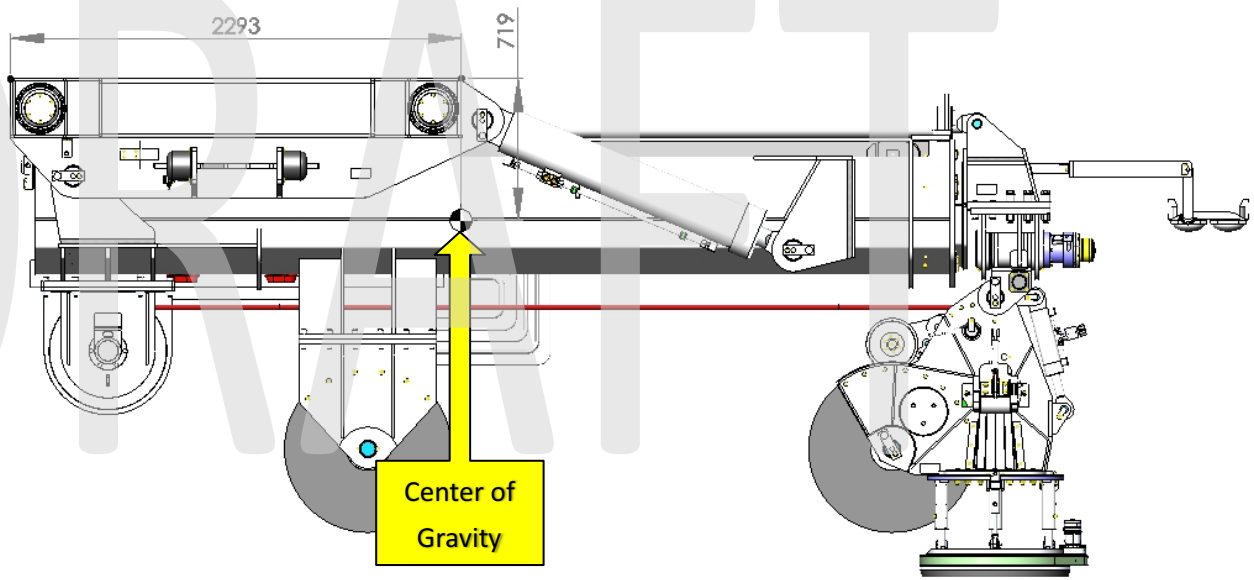
DRAFT

Description	Ilustration
Rails to be installed acc. to drw. no. **25479 Rail installation.** Moving parts can be installed in two ways:	
1. Inserting the complete assembly from STB side into the rails.	
2. Inserting the complete assembly from underneath by removing the wheels from Trolley and reassembling them through holes on the rails.	

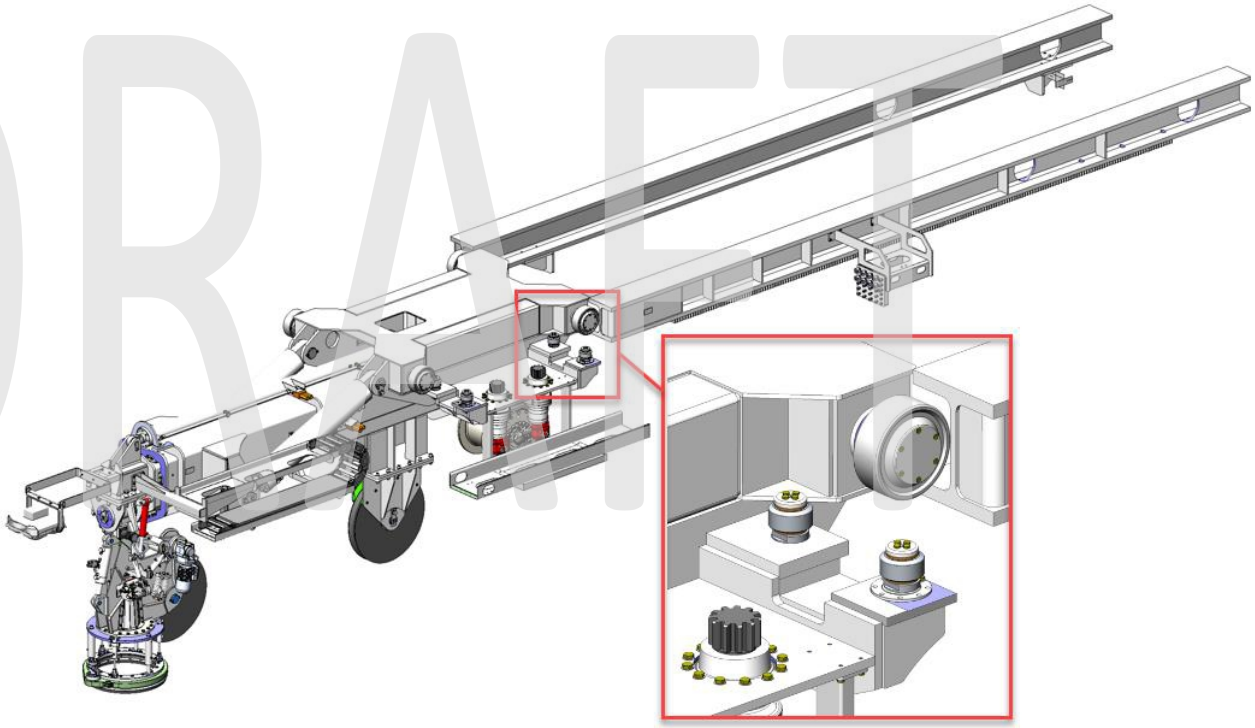
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1. Inserting the complete assembly from STB side into the rails	
Description	**Ilustration**
1. Remove STB End stop, screws and washers from Rail.	

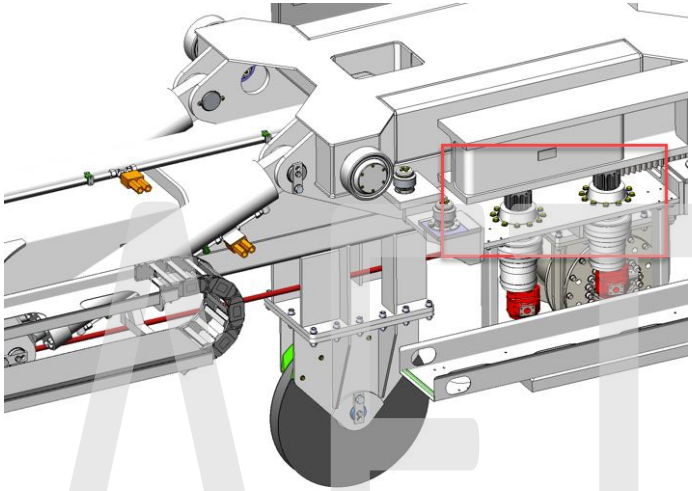
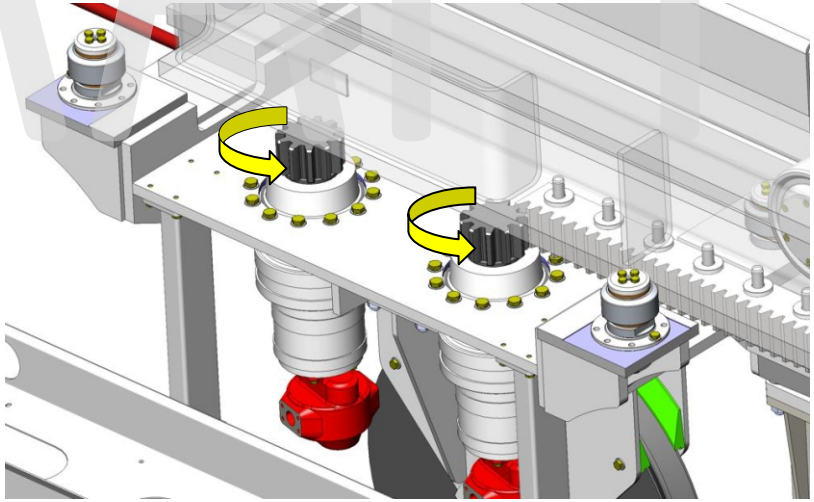
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Description	Ilustration
Weight of Trolley with moving parts (approx.) is 8000 kg.	

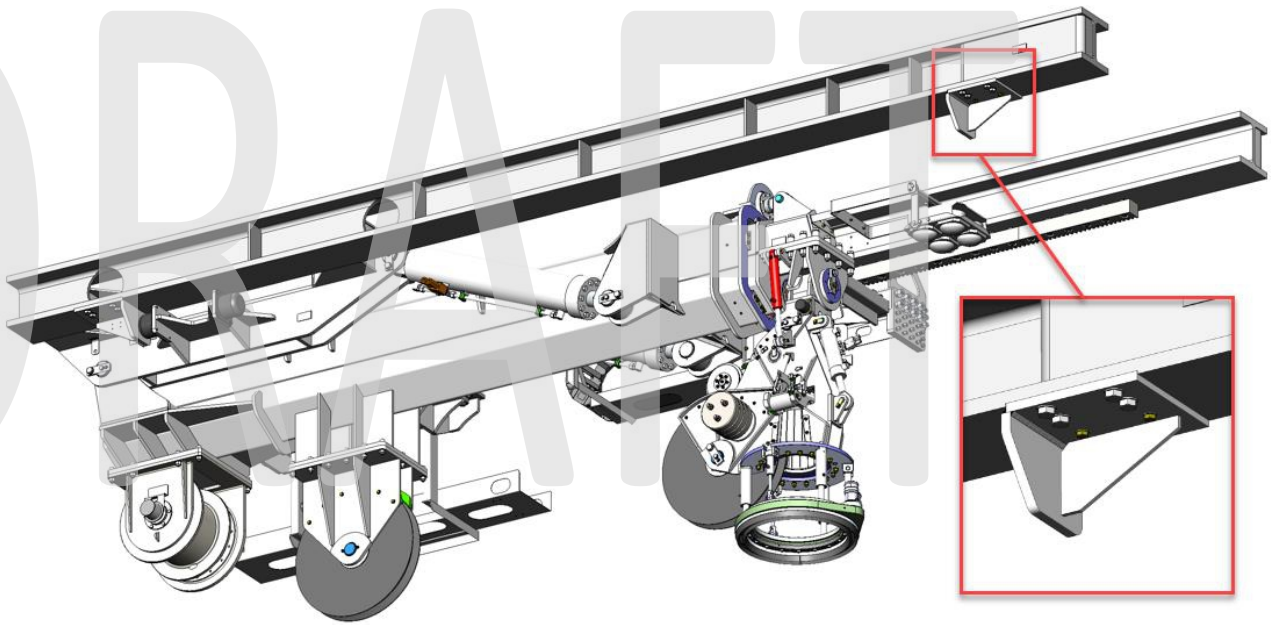
DRAFT

Description	Ilustration
2. Main wheels, guide wheels and pinions are on the fore side of the trolley and special attention is to be made here when inserting the crane.	

DRAFT

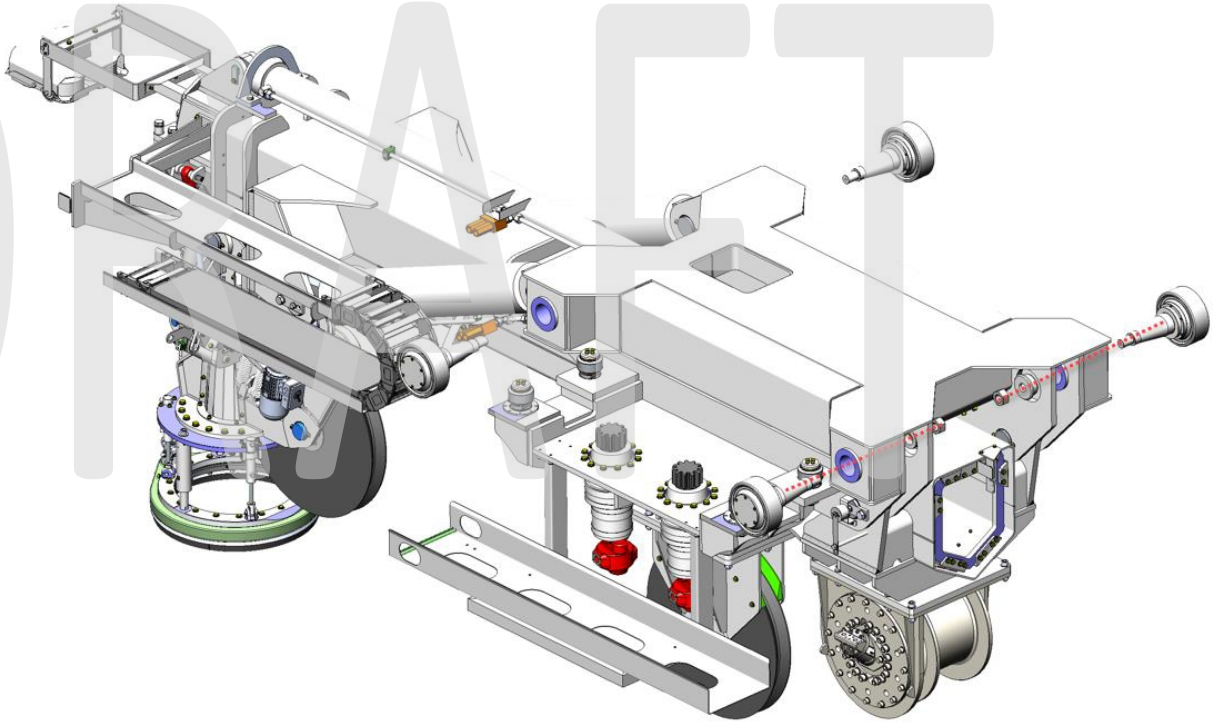
Description	Illustration
3. Apply pressure with hand pump to enable rotation of pinion. Align pinion with rack tooths.	
	

DRAFT

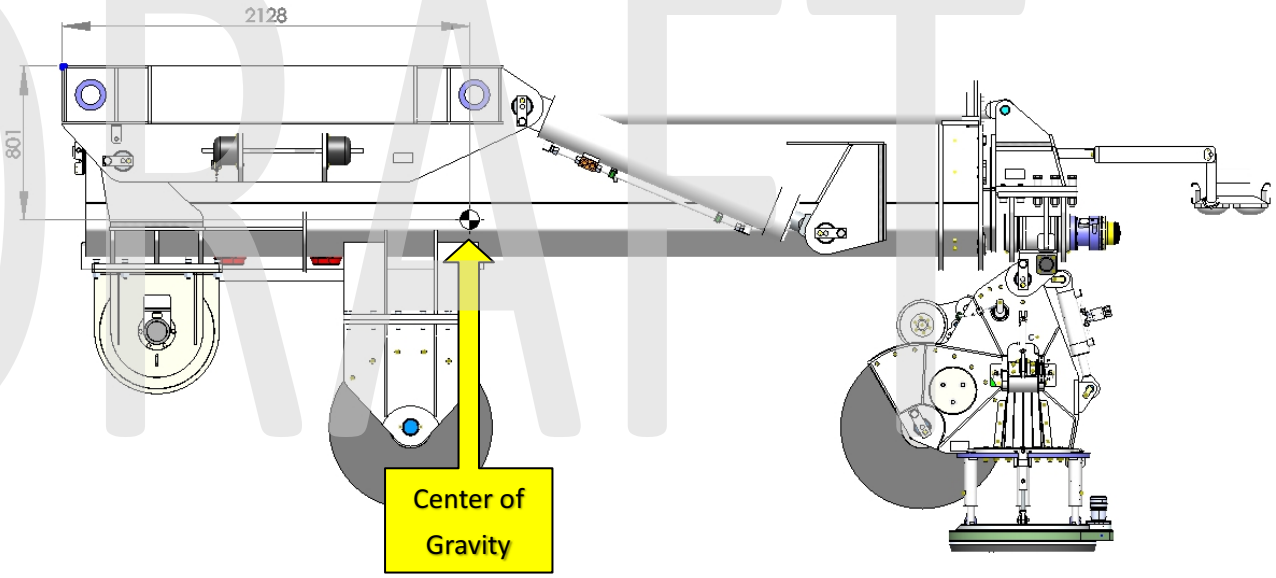
Description	Ilustration
4. Move trolley and moving parts to PORT side. Return STB End stop. Apply torque of 935 Nm (screws M24) and 197 Nm (screws M16).	

DRAFT

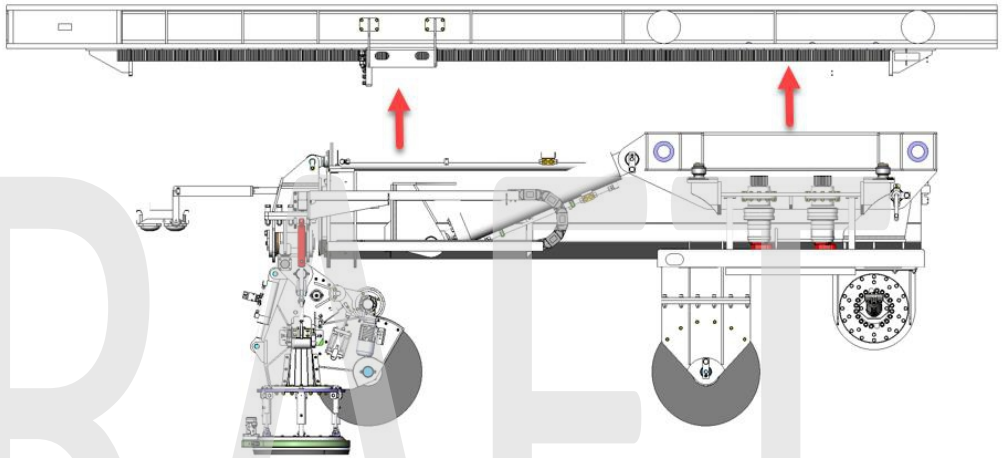
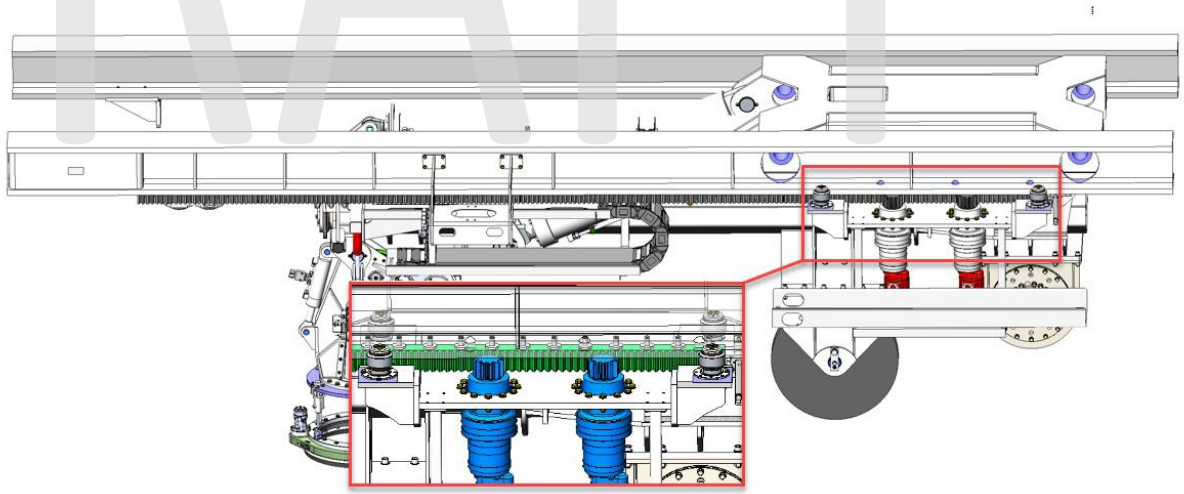
2. Inserting the complete assembly from underneath

Description	Ilustration
1. When inserting Trolley from underneath, all four Main wheels must be removed from trolley. Remove Washers and Nuts from Main wheels, and remove Wheels from Trolley.	

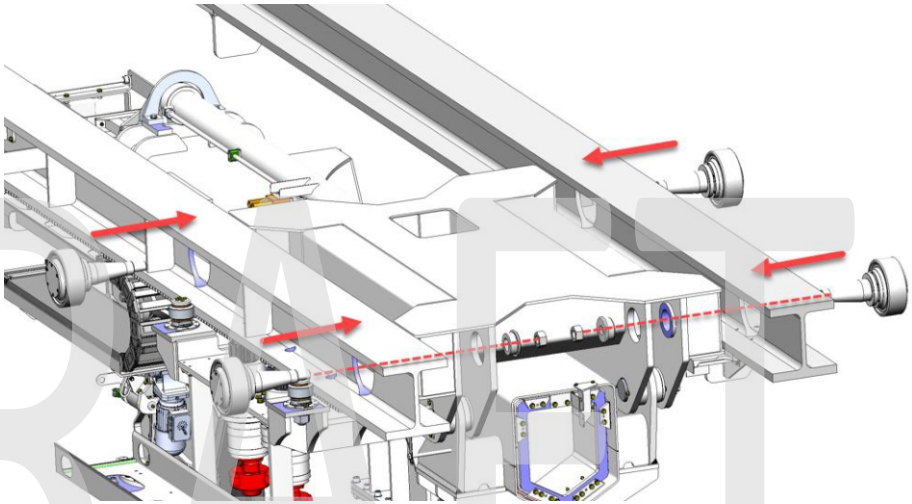
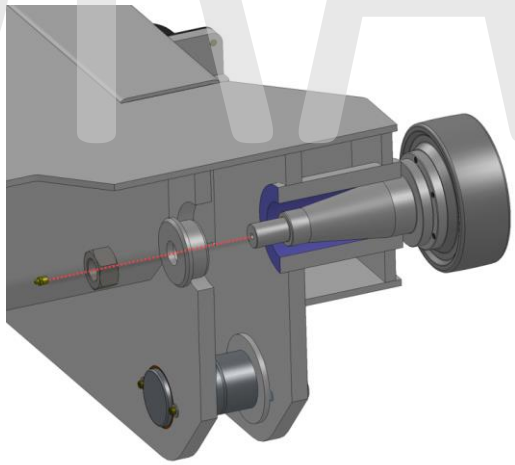
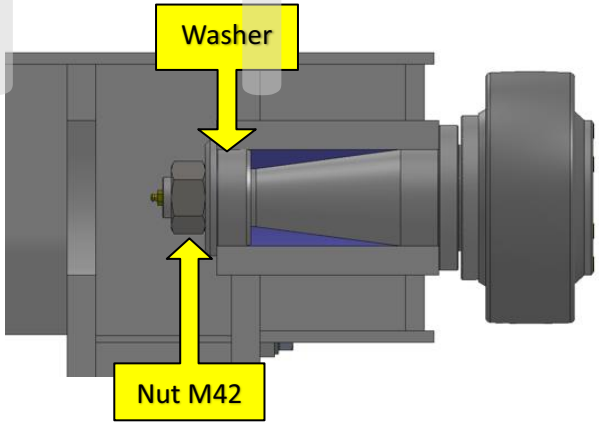
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Description	Illustration
Weight of Trolley (without Wheels – 4 pcs.) with moving parts is 7800 kg (approx.). One wheel has a weight of 60 kg (approx.).	

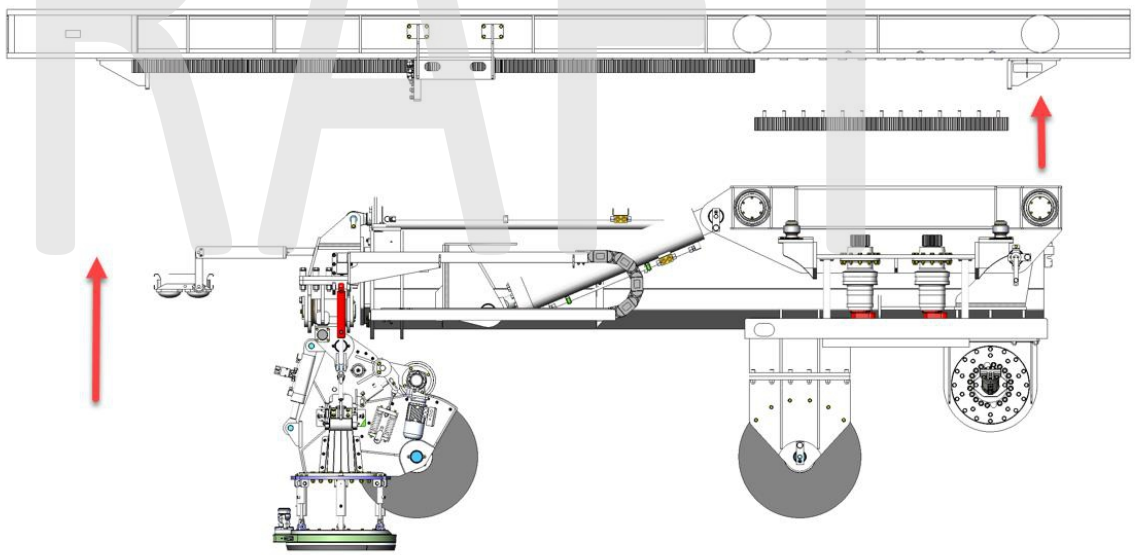
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Description	Illustration
2. Lift up Trolley and moving parts up to mounting position on Rails.	
3. Apply pressure with hand pump to enable rotation of pinion. Align pinion with rack tooths.	

DRAFT

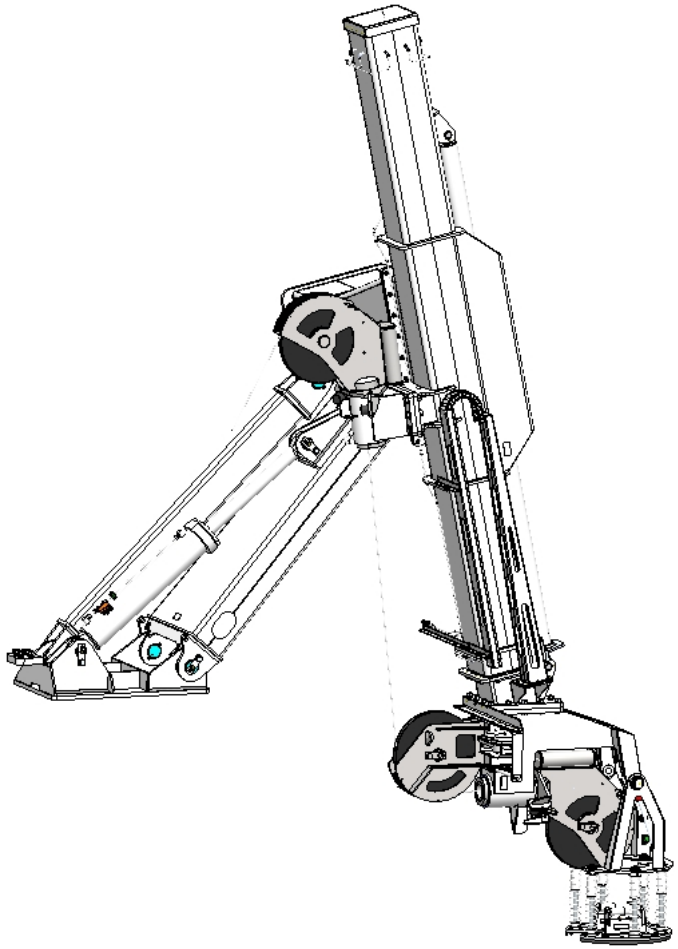
Description	Illustration
4. Align the holes on Trolley (Wheels) with holes on Rails (FORE and AFT side). Assemble Main wheels with Trolley through the holes on Rails using Washers and Nuts. Apply torque of 4604 Nm.	
	
	

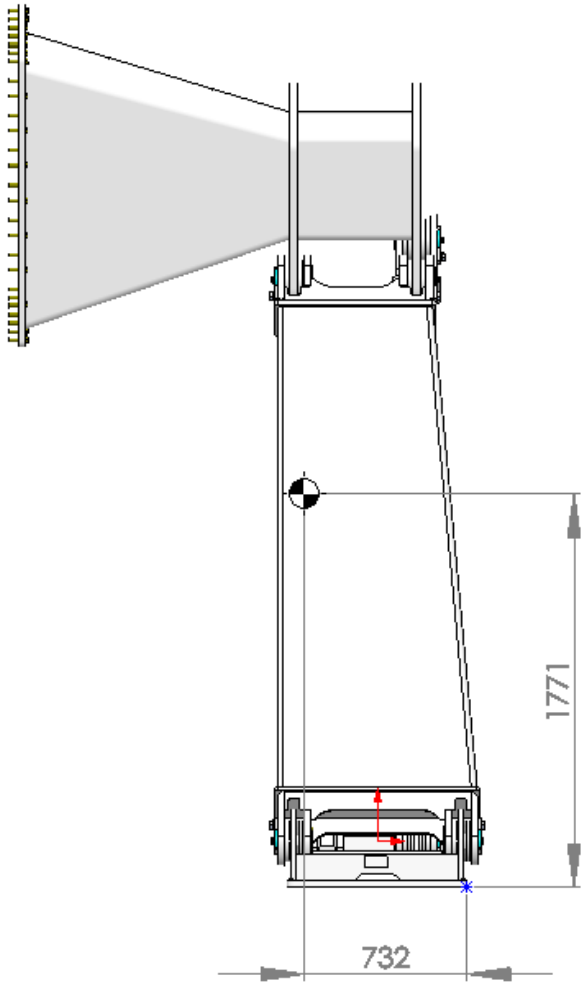
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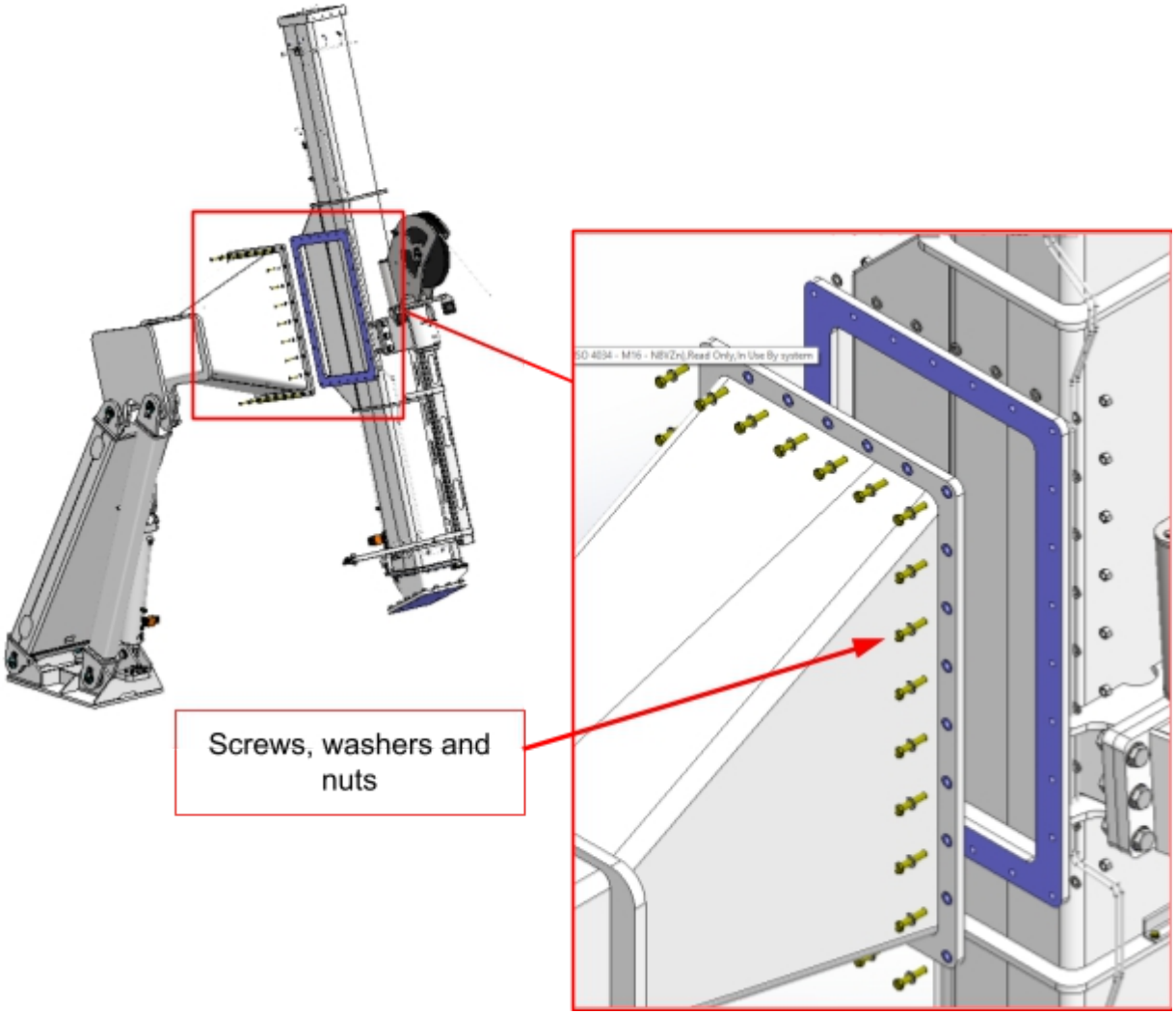
Description	Illustration
5. If a hand pump cannot be used, then one Rack section can be removed from Rail (first Rack from the PORT side). Lift Trolley and moving parts up to Rail.	 

DRAFT

CTD DAVIT INSTALLATION INSTRUCTION

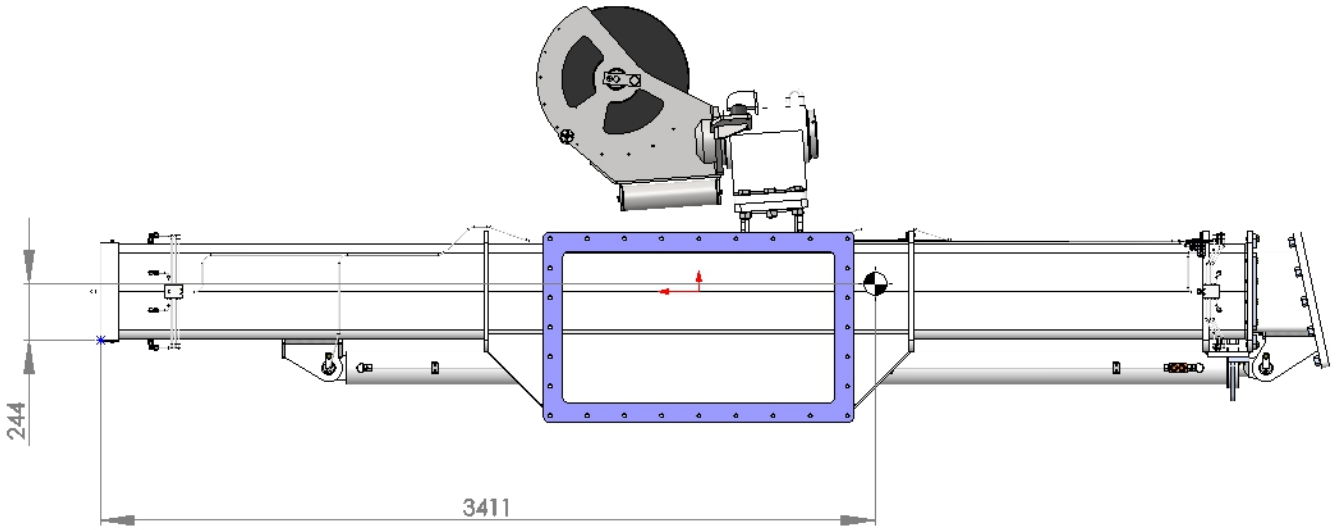


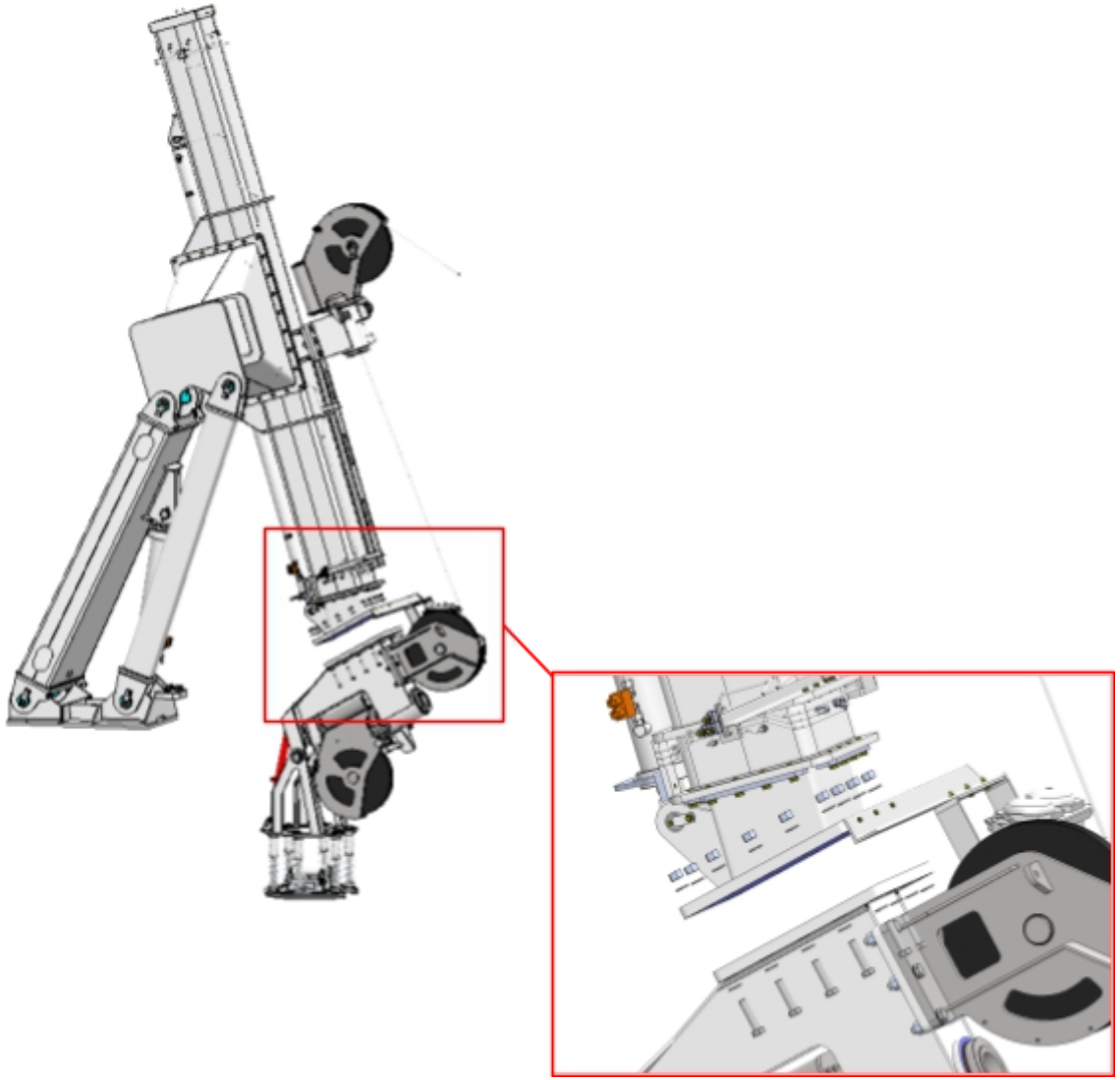
	COG of foundation, arm, outer boom and cylinder assembly. Weight of shown assembly is approx.: **2600kg.**		

2.	Connect telescope assembly to assembly of foundation, arm, outer boom and cylinder. Use screws: ISO4014 M16x80- 8.8 and washers DIN125 A17. Apply torque of 197 Nm. (Ref. drw. 25059 main assembly, 24914 telescope assembly and 25487 shipment plan)		

COG of Telescope assembly.

Weight of Telescope assembly approx.: **3000kg.**



3.	Connect Wire block with docking head to telescope assembly. Use screws ISO4014 M24x100-10.9 and nuts M24. Apply torque of 1840 Nm. Weight of Wire block and docking head assembly approx.: **1300kg.**		

4.	Hydraulic connections according to drawing 25482 Installation drawing.		

ASSEMBLY

COLUMN INSTALLATION

The deck area where the crane is to be installed must be reinforced and supported from underneath in relation to the loads that the crane will carry.

It must not be welded closer to the leveled flange more than 250 mm.

INSTALLATION OF CRANE ON COLUMN

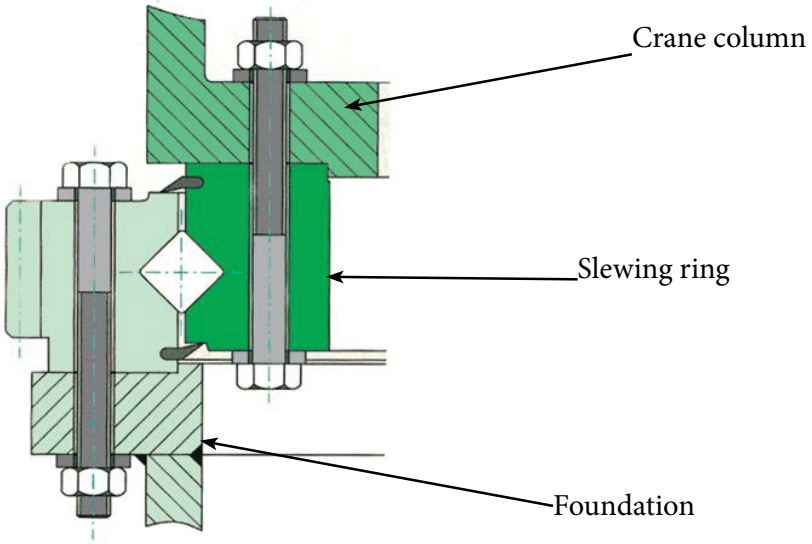
The entire crane undergoes a trial assembly in the factory before being dismantled for transportation.
The crane is delivered with the main slewing bearing mounted and gearbacklash finally
Adjusted. The slewing bearing must not be desmantled during the crane installation.

The crane is lowered into position. The bolts of the sleeve ring should be tightened diagonally with the same torque.Pipes are then connected.

ELECTRICAL JUNCTION BOX

This must be positioned inside a dry room where the temperature will not rise above 50 C.
The box has a socket on the outside where the portable control panels flexible cable is to be connected.
The positioning of the junction box will therefore determine the length of this flexible control cable.

Tightening torque for slewing ring



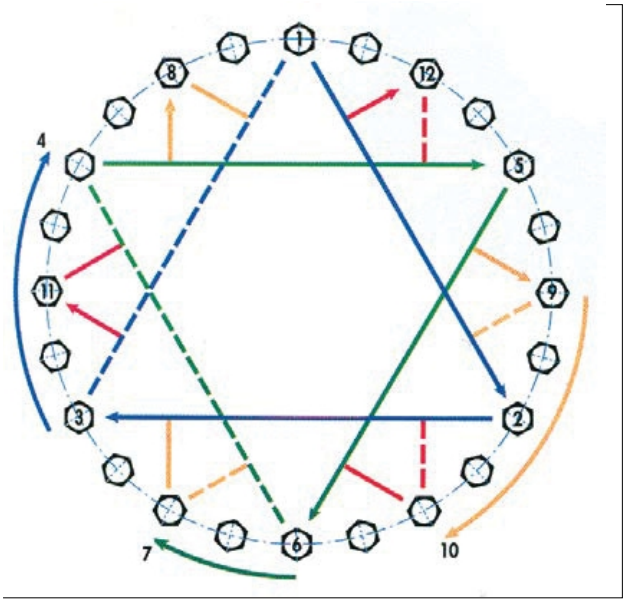
Each crane is delivered with a !xation kit of bolts, washers, (nuts and spacers) for !xing the crane to the foundation.

"e minimum lenght of the bolts has to be at least 5 times the bolt diameter.

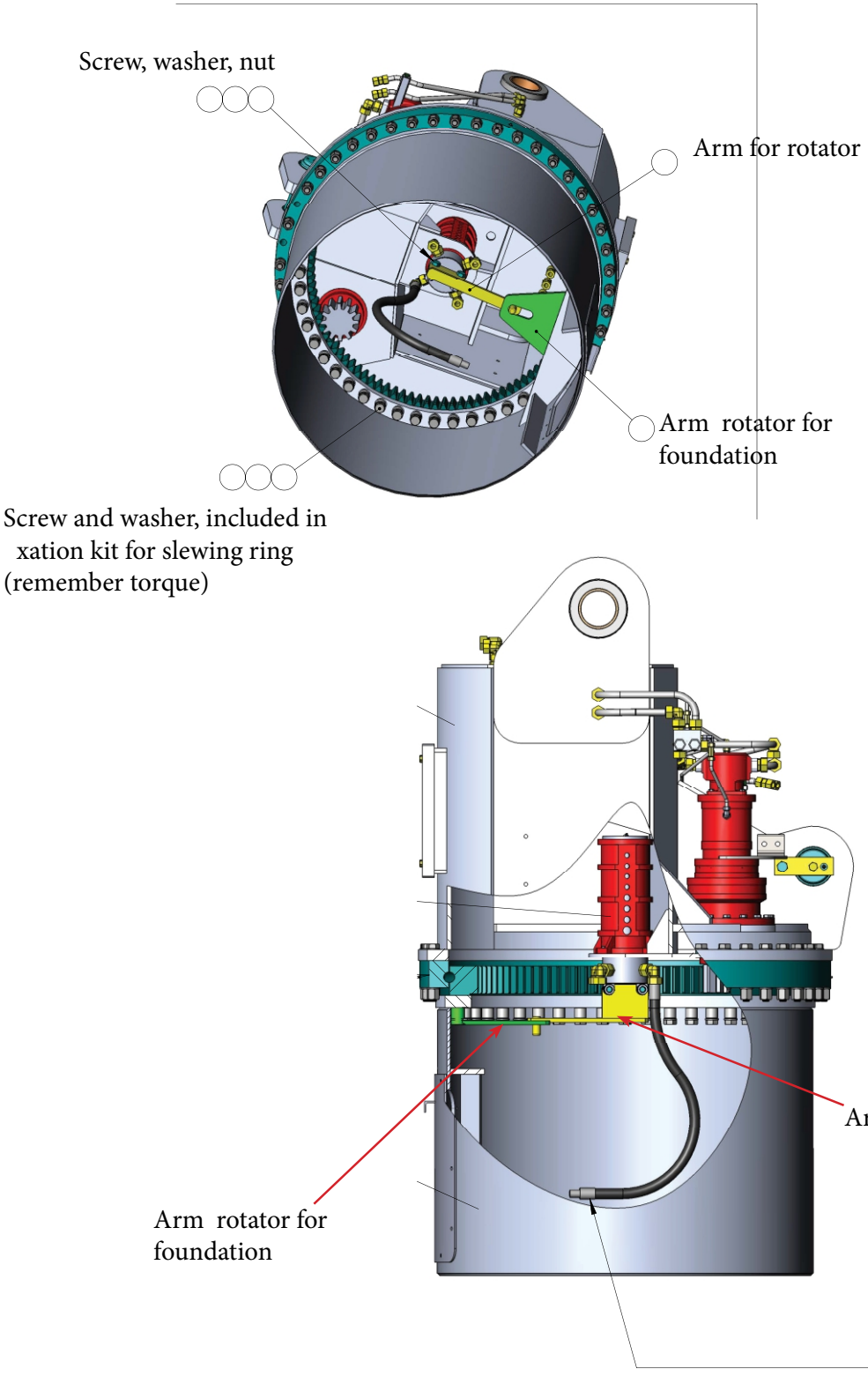
If not otherwise indicated please refer to the attached table for torque values.

During the operation it is useful, that the crane con!guration will give less moment to the foundation. Relieve the pressure from the crane so that foundation and slewing ring is lying #at against each other.

"e tightening has to be carried out in accordance with sketch below.



Kit for connection to rotating coupling



HYDRAULIC SYSTEM

The hydraulic pipe layout should be installed with reference to existing pipe installation charts.
It is important to keep all components clean whilst installing the hydraulic pipe system.
The same applies to the electric pump unit if this is included in the installation.
The pump should be placed under the deck as close to the oil tank as possible.
The oil tank should be positioned higher than the pump.

STARTING UP

The pumps can be started up after the crane is installed, the pipe system connected and the oil tank filled with the correct oil.
It is important that the pumps are run for 15 mins. before any manoeuvring valves are operated. This is to allow for the filtration of the oil in the pipe system.
After this the hydraulic cylinders must be moved their entire length backwards and forwards to ensure that they fill up with oil. While this operation is beeing carried out the crane MUST be held safely by another crane.
When all these functions have been thoroughly tried and tested the gaskets in the high pressure filters must be changed. The main filter for each spool on the proportional valves should also be thoroughly cleaned at this time.
To prevent the cylinders dropping when the crane is loaded and the pump pressure is "off", the overcentre valves on the cylinders should be adjusted inwards until the crane holds the load.

IMPORTANT:

The bearing race on sleewing bearing must be lubricated before use.
See lubrication chart.

01	28.02.2022	Issued for release	J.P.	J.J.	J.J
Rev./ Status	Date	Description	Made by	Checked by	Appr. by

Customer: N/A	Project:	
General instruction	**Mechanical installation of MacGregor Deck Machinery**	
	Purchase order no.: N/A	Order date: N/A

Commission no.: N/A	Document file: **Mechanical installation of deck machinery**	
Date: 23.02.2022	Name: J. Pettersen	Identification no.: **EN-IM Mechanical installation of deck machinery**

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1. Depreservation and preparation for installation

Deck machinery and hydraulic equipment must be preserved and packed at the manufacturer to provide guaranteed time of storage, provided that the buyer fulfills storage instructions.

Depreservation of external and internal surfaces of equipment is allowed just before installation, connection to hydraulic system etc.

Winch supporting surfaces are to be depreserved just before installation of the winch on the foundation. Depreservation to be done by scraping bright supporting surface and sponging it with cleaning cloth moistened in solvent.

Screws and level wind are to be depreserved just before the winch trial run. Depreservation is to be done by removing surplus preservative. The diamond screw and working surfaces of the level wind guide shaft must be oiled with a layer of lubricant.

Prior to installation of deck machinery, proper foundations for winches must be ready in accordance with the requirements of this document.

By the time of the installation the shipyard must prepare the following:

- Oil and grease for gearboxes and spooling arrangement.
- Ropes of required type and size.
- Device for rope winding.

2. Requirements to foundations

Deck machinery (winches) and power packs must be installed on foundations.

On the dimensional drawings for the winches the following characteristics are normally given:

- Weight;
- Dimensions;
- Service areas;
- Deck interface of the machinery;
- Size, strength class and number of fastening bolts;
- Angle of rope (chain) run-down;
- Flatness of support surface (table for unspecified tolerances);

Foundation stoppers to be mounted if specified at the dimensional drawing or in the loads to deck document.

Strength and quality of foundations must meet requirements of the Ship Classification Rules.

3. Installation procedures

Winches are to be installed on foundations in accordance with the diagram (fig. 1) and procedure of installation below.

- Place un-machined shims of thickness 20-25 mm on the surfaces of the deck foundation. Two shims on each side.
- Move the winch into position on the deck foundation and make sure that all shims are bearing.
- Fit the hold-down bolts. Tighten the bolts lightly.
- Check the drum for easy rotation.
- Now machine new shims of thickness according to the exact measurement of the space between the foundation parts on each screw position.
- Remove the hold-down bolts and the un-machined shims.

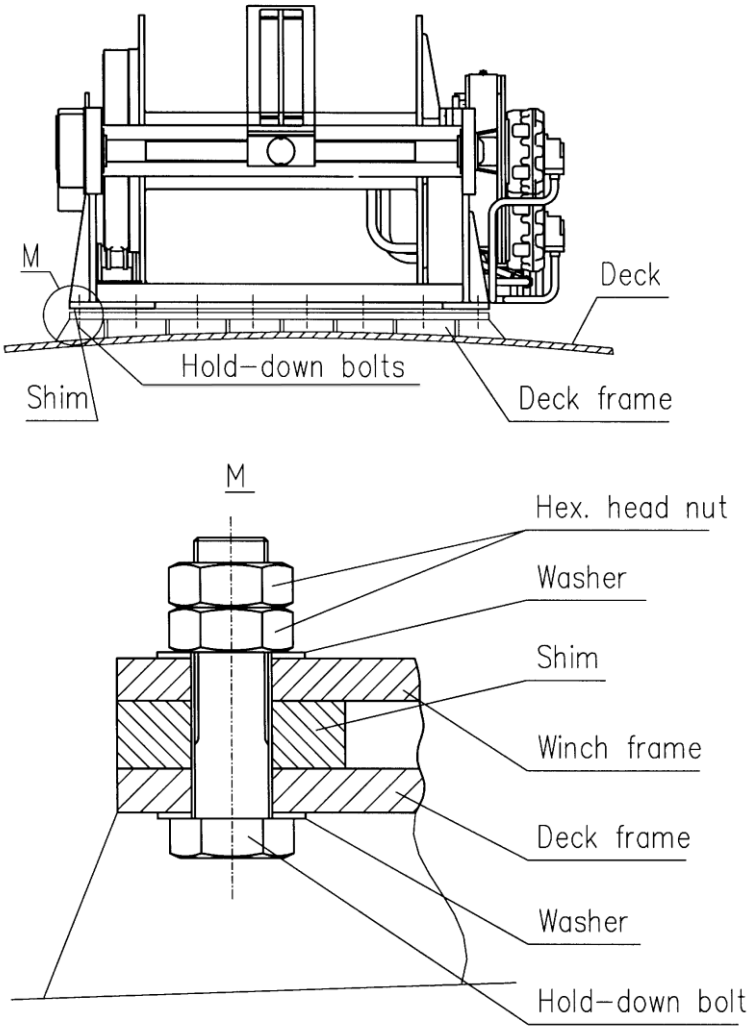

M
Deck
Hold–down bolts
Shim
Deck frame
M
Hex. head nut
Washer
Shim
Winch frame
Deck frame
Washer
Hold–down bolt

Fig. 1.

- Fit the new machined shims under the hold-down bolts and make sure that each of the shims are located in the correct place in relation to the measurement.

- Check the clearance between the shim and the support surface of the winch and between the shim and the foundation. The clearance gauge 0.06 mm thick shall not pass by 2/3 of the support surface.

- Fit the hold-down bolts. Tighten the bolts with prescribed tightening torque, shown on the dimensional drawing for the winch.

- Check the drum for easy rotation. If the drums do not rotate as freely as they did before tightening, the foundation alignment is not good.

- Loosen bolts, check shims and repeat procedure until all bolts are tight and drums are free.

The checklist must be filled out for each winch with the results of the installation control.

Note! Installation procedure for gear drive winches is described in a separate instruction.

4. Control of installation

Results of the control of the deck machinery installation shall be presented to the representative of MacGregor.

This documentation shall present the following parameters.

1. For deck machinery:

    - Clearances on connections to the support surfaces;

    - Parameters of fastening bolts tightness;

    - Coordinates for the first block (wire guides) position.

2. For oil and grease selection:

    - Type/brand of oil/grease;

    - Certificates for oil quality;

    - Oil analysis results.

Note! One copy of above documentation shall be submitted to the representative of MacGregor.

Item	Description		Check point	Remarks	Accepted date / sign.	
1	Winches	A	No mechanical defects			
		B	Foundation type, accepted			
		C	Foundation stoppers mounted according to dim. sketches			
		D	Correct distance to first block			
		E	Block mounted in center line of drum			
		F	Service distances correct			
		G	Support of connection pipes			
		H				
2	Gear winches	A	Installed according to MacGregor instructions			
		B	Run out tolerances checked after installation			
		C	Pull test for foundation stiffness			
		D	Correct type of gear oil filled			
		E				
3	Servicing	A	Future servicing of all components possible			
		B				

A GENERAL INSTRUCTION:

INSTALLATION OF ELECTRICAL SYSTEMS

Read these installation instructions carefully and take note of the content before installing, maintenance or repair to the electrical system.

MACGREGOR

Revision history

06	23/08/19	Added info on ferrite rings, page 11 + new company logo and web address	ST	TR	MB
05	14/02/19	Updated EMC information. Also, other minor corrections and new layout.	TAA	RAJ	MB
04	07/04/16	Added extra; regards to motor and encoder cables	TR	ØS	BB
03	12/04/15	Added extra info	RAJ	BB	BB
02	18/03/15	Added extra info	RAJ	BB	BB
01	11/02/13	Added extra info	TR	BB	BB
00	20/01/11	Issued for Project Acceptance	TAA	HD	BB
Rev.	**Date DD/MM/YY**	**Description**	**Made by**	**Checked by**	**Approved by**

Terms and abbreviations

Term / abbr.	Definition
CAN	Controller Area Network
EL	Electric / Electrical
CAN	Controller Area Network
CANOpen	A communication protocol and device profile specification for embedded systems used in automation.
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
HF	High Frequency
Inverter	An inverter converts the DC voltage to AC voltage.
I/O	Input / Output
MRU	Motion Reference Unit
NMEA	National Marine Electronics Association
PE	Protective Earth
PLC	Programmable Logic Controller
RS-232	Standard for serial binary single-ended data and control signals
VFD	Variable Frequency Drive

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Introduction

This manual should give the reader sufficient general knowledge to install any delivered Rapp Marine electrical system.

Contact information

If you have any questions, please do not hesitate to contact us:

Phone	+47 75 55 01 00
Service phone, 24 hours	+47 91 81 29 99
Fax	+47 75 55 01 11
E-mail	rapp.office.no@macgregor.com
Service inquiries	rapp.service.no@macgregor.com
Spare parts	rapp.parts.no@macgregor.com
Home page	www.macgregor.com
Address	Nordstrandveien 41, 8012 Bodø, NORWAY

Warnings

	**Frequency drives and/or inverters**; power supplies that have been powered up can remain charged for about 25 minutes after disconnected.
	**Pressure switches, pressure sensors and temperature sensors** can have locked in pressure on the sensor side. If removing unit is necessary, make sure that the pressure is released before removing the component.

Prepare for installation

Before installation, electrical equipment must be carefully taken out of container.
IMPORTANT! Packaging/preservation material must not be removed before final powering of system.
For termination of cables, remove only necessary wrapping to get access to cable gate and termination points.

Check all items in the shipment for damage and compare the contents with the packing list, enclosed with the shipment. Inform Rapp Marine AS as soon as possible if you notice any damaged or missing components.

Make sure that ventilation holes of electric motors for input and outlet of cooling air are not plugged.

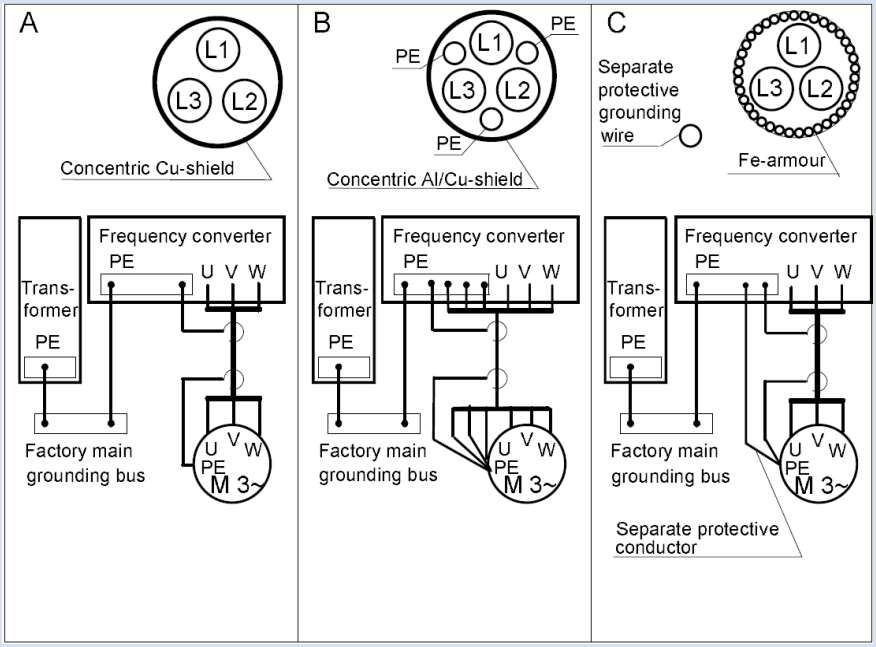
For further and general guidelines on topic,
please see the Rapp Marine **Preservation Manual** Doc ID#6243

Electrical installation

Cables

All cables used in the system must be according or equivalent to Rapp Marines drawings and within class regulation on-board the ship, such as ABS, DNV, LOYDS or others.

NOTE! Cables between motor, frequency inverter/brake choppers, brake resistance and control panels, must be **EMC/EMI screened.**



A.
Shield which also have requirement to be PE conductor

B.
Symmetric PE conductors

C.
Shielded cable and separate PE conductor

For recommended cables, see Appendix A; a list in end of this document.

Cable type and quality, examples

Cable types have to be suited for the working environment (examples);

- Outdoors on deck:
  Cable(s) must be of a quality that can withstand sun light/UV radiation, or else be sufficient protected from it (by protection hose)
- Outdoor temperature:
  Select cables that can handle the normal working temperatures on deck.
- Oil or chemical environments:
  Cable type must be resistant to oil or chemicals
- Cables in a drag-chain:
  Flexible cable, designed for bending

Make sure that all cables used for connection of electrical equipment doesn't have broken cores or damages of insulation.

Device net and CANOpen net cables must only be *special* cables.
-The net can have a drop cable of max 4m (T arm)

NOTE! Cables connected to solenoid boxes filled with oil, shall have oil-resistant insulation.

Cables for VFD controlled motor and/or brake resistor

- Screened cable
- Cable with 3+3 Cores twisted concentrically (this is a symmetrical cable with 3 conductors for power, and 3 conductors for PE),
  or a screened 3 conductor cable with screen suitable for PE,
  or separate PE conductor on the outside of the cable.
- EMC cable glands for connecting the cables to the motor
- EMC clamp inside the cabinet
- Motor cable: Maximum length 40m (if there is need for longer, contact Rapp Marine)
- Brake resistor cable: Max length 20m (if there is need for longer, contact Rapp Marine)

Encoder cables

- Screened twisted Pair cable
- Fine stranded cable (never compromise on the size):
  0.25mm2 is the size for encoder cables, based on the pins in the encoder plug and the terminals in the encoder board
- Distance between the motor/power cables and encoder cables:
  Minimum 500mm

Cable Sizes

All cable sizes to be used in the system to be according Rapp Marine`s drawings or equivalent and within regulation on board the ship as ABS, DNV, LOYDS or others.

Rapp Marine has specified minimum cable sizes normal for cables. Due to applicative use and overrating of motors, the cable size will not match nominal current of the motor.

Cable Glands

Cable gland on electric motors with frequency drives/inverters and cable glands for cables to the brake resistor from the chopper, must to be of type with EMC screening.



The opening/inlet of the cable glands is recommended to point down (if possible) to avoid water penetrating.

Unused cable glands must be plugged or sealed.

Protection of electric cables

All cables for connection of electrical equipment shall be laid inside the pipes/ cable tray or have other protection against mechanical damage.

Motor cable must be supported and/or fastened minimum at each 0.5 meter.
Signal cable 0.2m and within regulation on board the ship as ABS, DNV, LOYDS or others.

Categorization of cables

Category definitions:

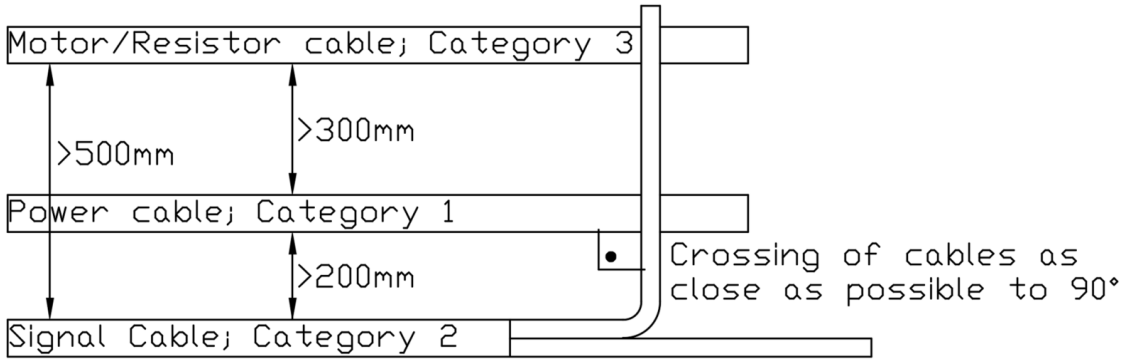
- **CATEGORY 1**
  EMI-generating, not EMI-susceptible cables:
  - Power supplies 24V / 230V / 400V / 690V

- **CATEGORY 2**
  Moderately EMI-generating, EMI-susceptible cables:
  - Signal cables, analogue/digital

- **CATEGORY 3**
  Highly EMI-generating cables:
  - Motor cables (VFD) and brake resistor

Separate laying of cables

Power cables / motor cables and cables to the brake resistor must be installed **minimum 500 mm from the signal and encoder cables**, when laying on a cable tray.



- ✓ Between cables in category 2 and 3;
  cable through walls/floors must be separated with as good distance as possible.
- ✓ Between cables in category 1 and 3;
  a distance of minimum 300 mm (between power cables and signal cables).
- ✓ Between power cables and signal cables in category 1 and 2;
  a distance of minimum 200 mm.

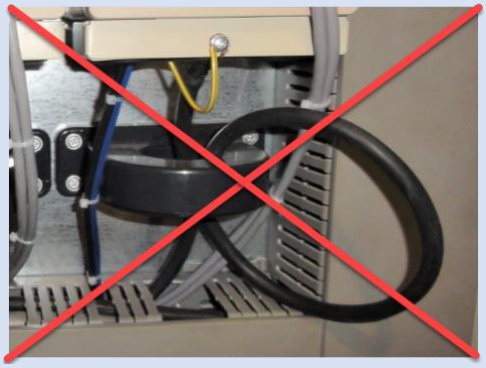
Chokes / Ferrite rings (common mode filter)

All frequency drives/inverter outputs to electric motors must have installed a choke/ferrite ring. Some of the ABB drives have them placed on the inside of the frequency drives/inverter. To reduce EMC, the cable must be connected direct to the drive.

IMPORTANT! Minimum 2 coils around the choke (cable to pass 3 times through the coil.)

System inverters from ABB have built in common mode filter in the cabinet.





Each conductor have to be through the coil, screen removed.



When three (3) blue ferrite rings are delivered, make sure to:

- ✓ Mount them as close to converter/connection points as possible
- ✓ Lead all three (3) phase conductors through

Safety Grounding

- ✓ All electrical equipment with metal housings shall be properly grounded.

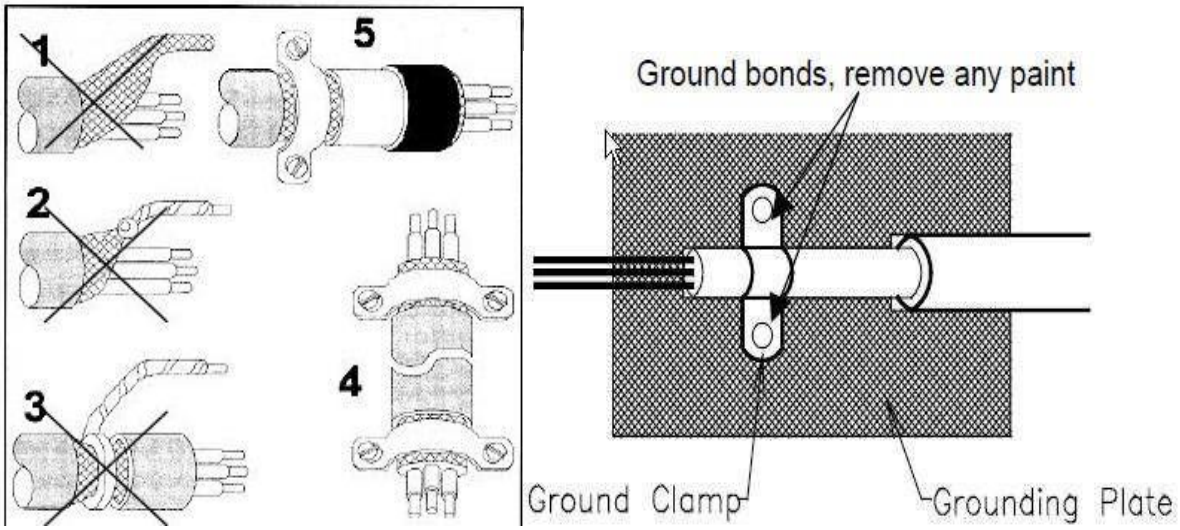
- ✓ For connection of electrical equipment to the ground, use grounded terminals in connection box.
- ✓ All cabinets must be grounded to deck.
- ✓ The main earth reference points shall be earth bosses welded to the structure, and as close as possible to the cabinets.
- ✓ Electric winches to be grounded to deck
  NOTE! The bolt connections between the winch frame and deck are not accepted as ground connections due to paint.
- ✓ Electric motors to be grounded to the winch or to deck.
- ✓ Electric motors from 5,5kw shall have earthing to deck.
- ✓ VFD motors shall have ***stainless steel earth braids*** to grounding point on deck.



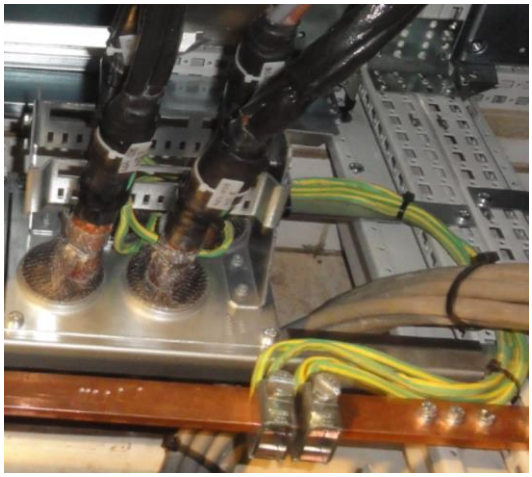
EMC Grounding

When using the screen as a ground cable on the connection to the frequency drives/inverters, the cable have to be with a ground clamp or similar. This to ensure 360 degrees grounding to reduce EMC noise. When ground clamp is used, do not tighten the clamp too much.

NOTE! If the clamp provided is not suitable due to cable size, **the company installing the equipment is responsible** to find suitable solutions and clamps.



Number 1, 2, 3 shows not *proper ways to earth a cable screen.*
- A combination of 2 and 5 is preferred (as showed in picture below).

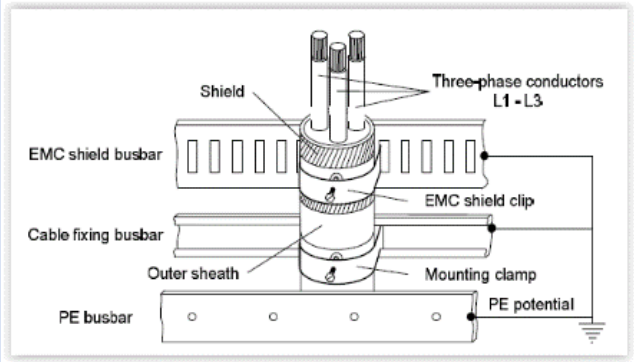


Some examples of EMC ground system used in switchboards:

Screen clamp



EMC Shield clip



EMC shield tube



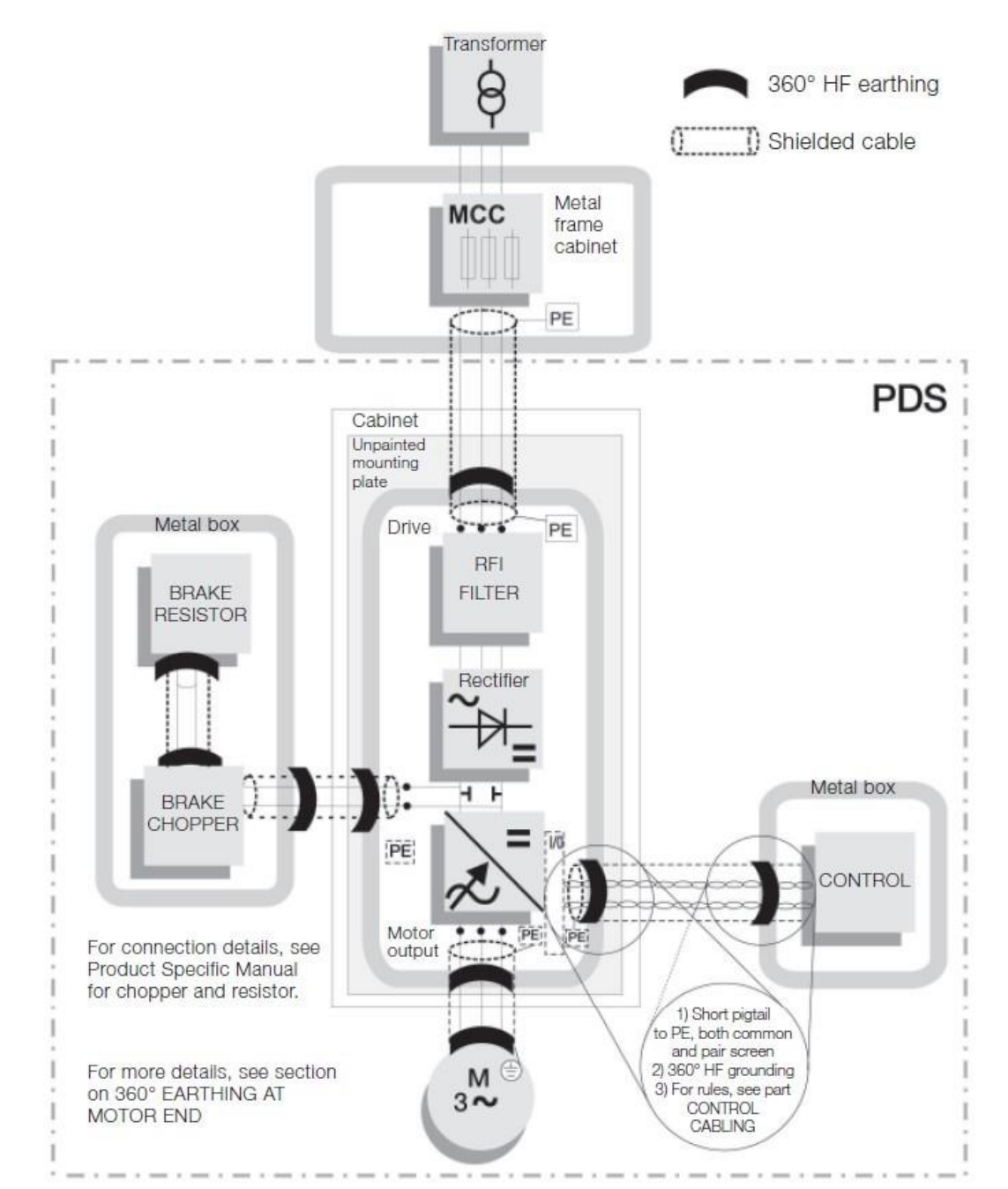


Figure from ABB Technical guide No. 3:
EMC compliant installation and configuration for a PDS.

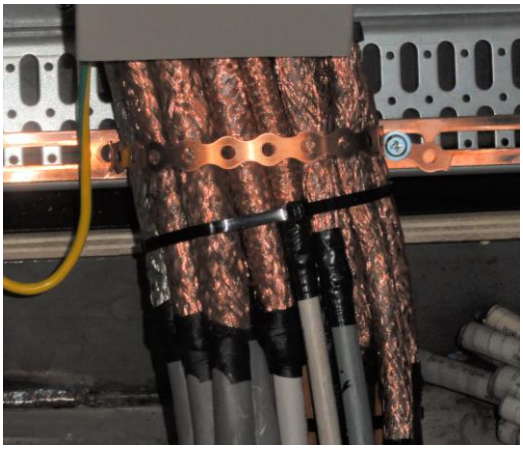
All cabinets with frequency converters shall have a bonding at each 1m of cabinet doors. Required bonding is **steel earth braids**; a flat wide braided strap wire.

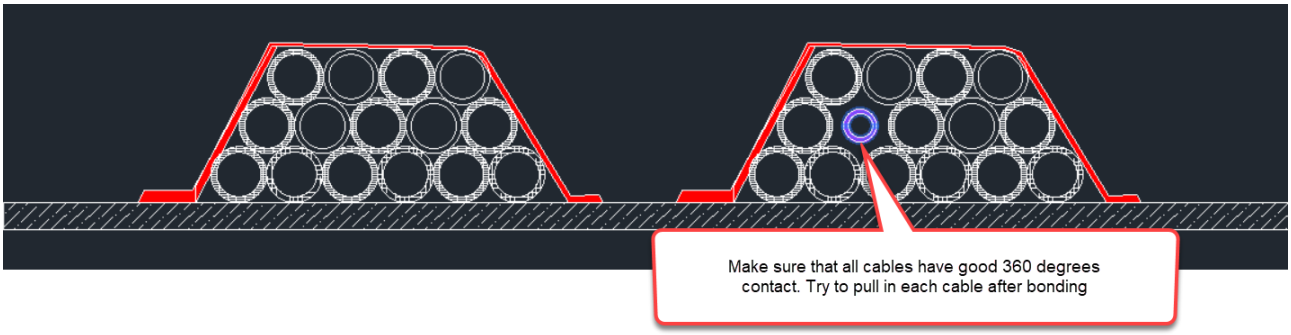


- Cabinets with total less than 40kw installed frequency drives/inverters, shall have a 16mm² bounding.
- Cabinets with total from or more than 40kw installed frequency drives/inverters, shall have a 50mm² bounding.

NOTE! A cabinet welded to the deck will **still** require the bonding, as the cabinet is powder coated**.**

For sensor and communication cables, the screen ought to be connected at the entrance of the cabinet, and the isolation must be retained close to the termination point.



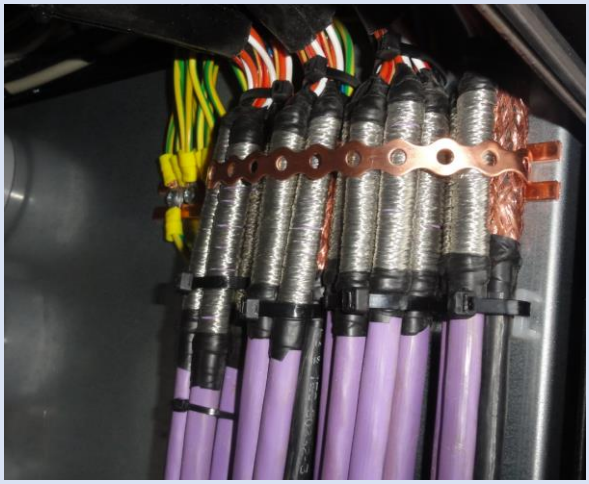


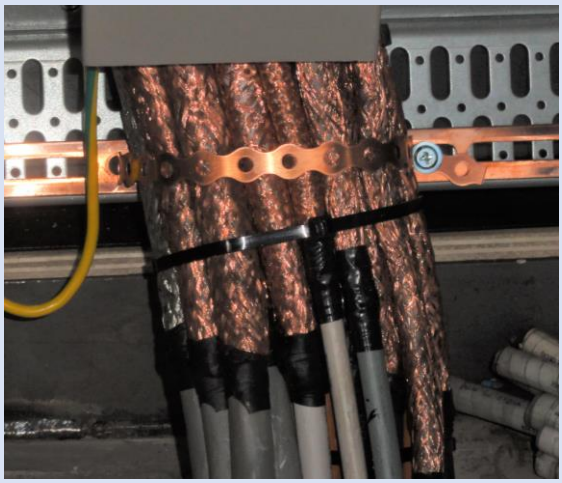
When more than 3 cables are bundled together it is required that there is a minimum 20 cm of strip-off of the outside isolation. Make sure that the cables in center are not lose.

Encoder cables are normally wired directly into the encoder card on the inverter, and grounded to ground terminal on encoder card.

IMPORTANT! Grounding of screen in both ends on sensors/valves on winches and control panels, is important to prevent antenna effect and distribution of electric noise.

Example of a bridge panel's 360° degrees HF earthing:





- The 360° degrees HF earthing point need to have a **steel earth braid**;
a flat wide braided strap wire



Encoder Connections

Encoder with plug, and encoder with 8 conductors must be wired.

Make sure that when soldering the female plug, also check that the numbering is according to the drawing.

**If the Frequency inverter/ Drive is shared between two winches, the encoder is connected directly to relay on the terminal row.*

Encoder card ABB



Encoder card Omron Sx



Terminal X1 has the following terminal configuration starting from the left:

Table 3 Encoder interface, terminal X1

X1	Name	Function	Remarks
1	Gnd	Signal ground	
2	A	Signal A	See the specification Table 5.
3	A'	Signal A' (inverted)	
4	B	Signal B	
5	B'	Signal B' (inverted)	
6	½ V_{sup}	Half power supply voltage	Used for non-differential encoder inputs
7	V_{sup}	Supply voltage to encoder; +24 VDC or +5 VDC.	Correct supply voltage must be set with S1 on the option board

NOTE: When the encoder is powered by an external supply (i.e. not by the Encoder option board itself) a +5V or +24V voltage source should be used.

Terminal Connections

The electrical motors can normally use different voltage supplies depending on connections of star or delta in the terminal connections, In accordance with the plate on the motor jumpers/loops to be installed corresponding to the supplied voltage from the starter or inverter.

NOTE! On a start/delta starter the jumpers have to be removed.

Terminal Torques

Motor terminals should be torqued as follows:

Thread dim.	M4	M5	M6	M8	M10	M12	M16
Torque (Nm)	0,8-1,2	1,8-2,5	2,7-4	5,5-8	9-13	14-20	27-40

NOTE! All 6 terminal bolts* have to be torqued

Rapp electrical motor should be torqued as follows:

Thread dim.	M5	M12 delivered before 2011	M12 delivered from 2011
Torque (Nm)	0,8	12	20

NOTE! All 6 terminal bolts* have to be torqued

Frequency inverters/drives should be torqued as follows:

Thread dim.	M4	M5	M6	M8	M10	M12	M16
Torque (Nm)	1,2-1,5	2,5	4-5	9-10	18-22	31-39	79-98

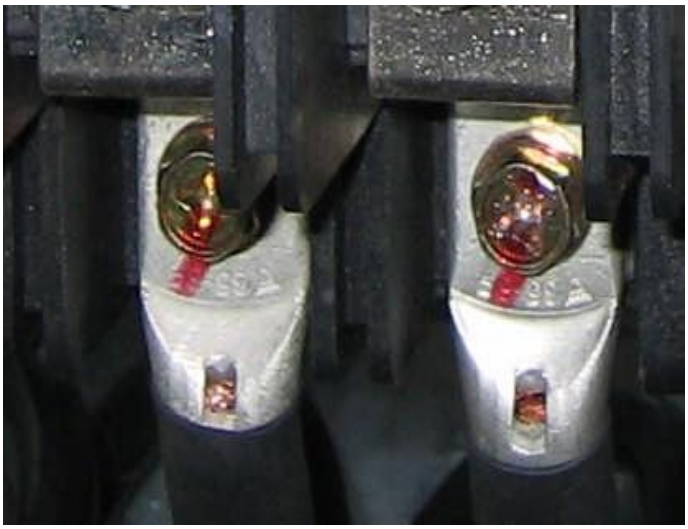
NOTE! Contactors and fuses might be marked with torque settings.

* *Bolt no. U1 – V1 – W1 – U1 – U2 – W2. See check list table on next page.*

After torqueing the bolts; mark them and make a **check list** with following info.:

Motor no.	Bolt no..	Torque	Sign.	Date
	U1			
	V1			
	W1			
	U2			
	V2			
	W2			

Example:



Climatic Requirements

Indoors equipment's

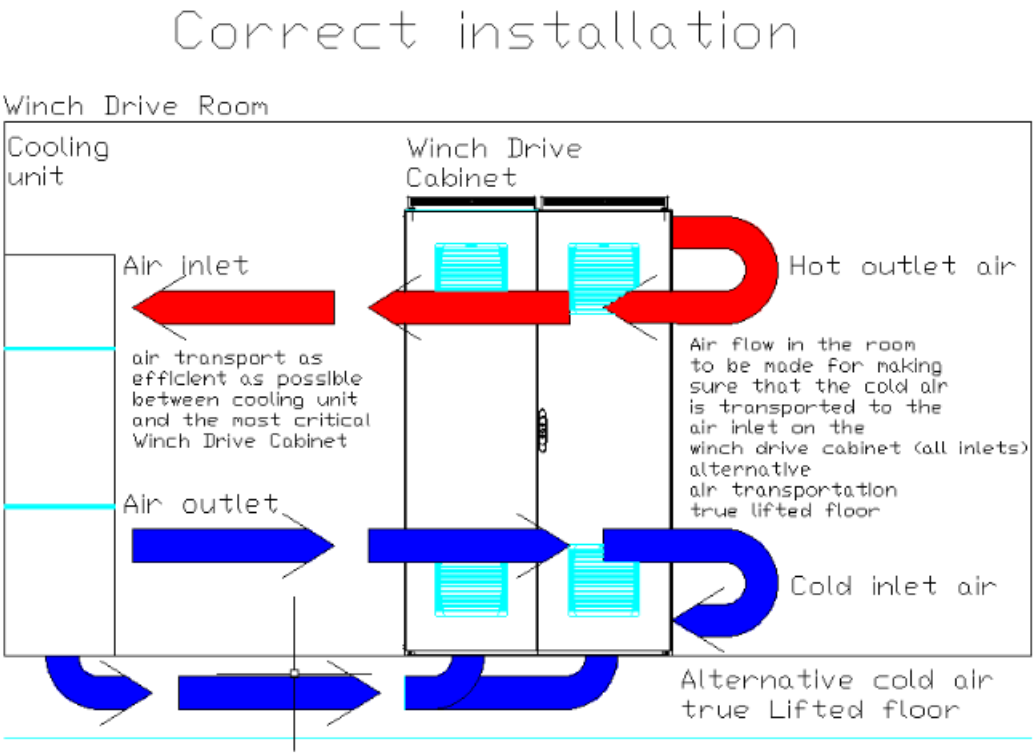
EL motors, control panels, frequency inverters/drives and magnetic starters shall all be installed in spaces having temperature from +1 to +40°C and relative humidity 70%.

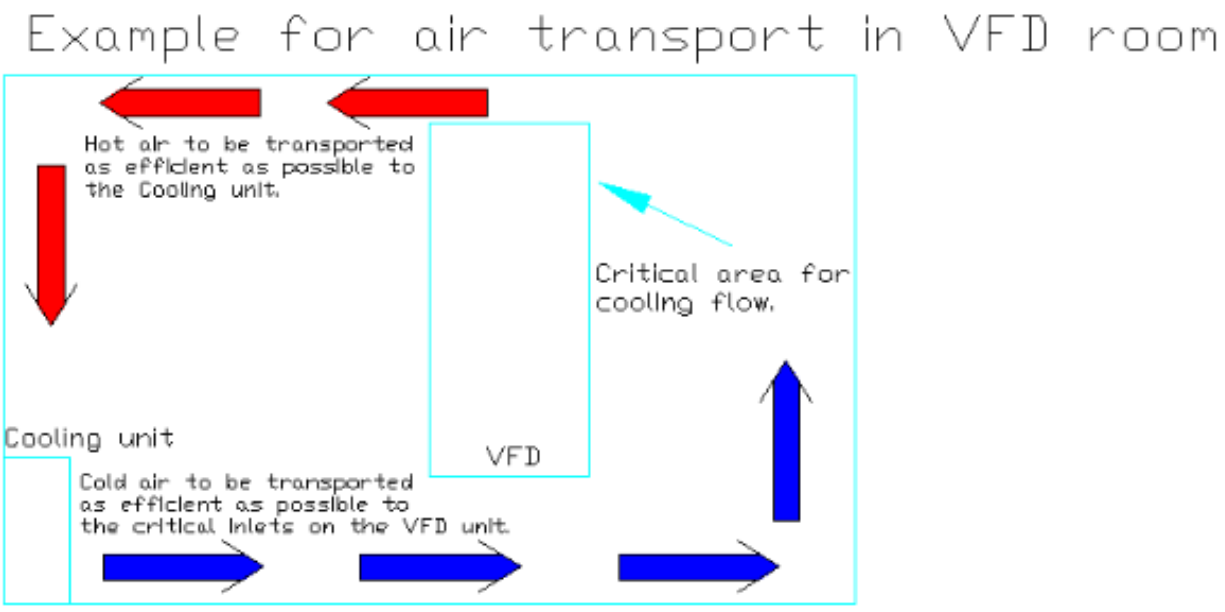
-At **max** humidity 98% and temperature +35°C.

Operational conditions shall be according to above, to exclude ingress of water, oil and other liquids, as well as impurities onto above electric equipment.

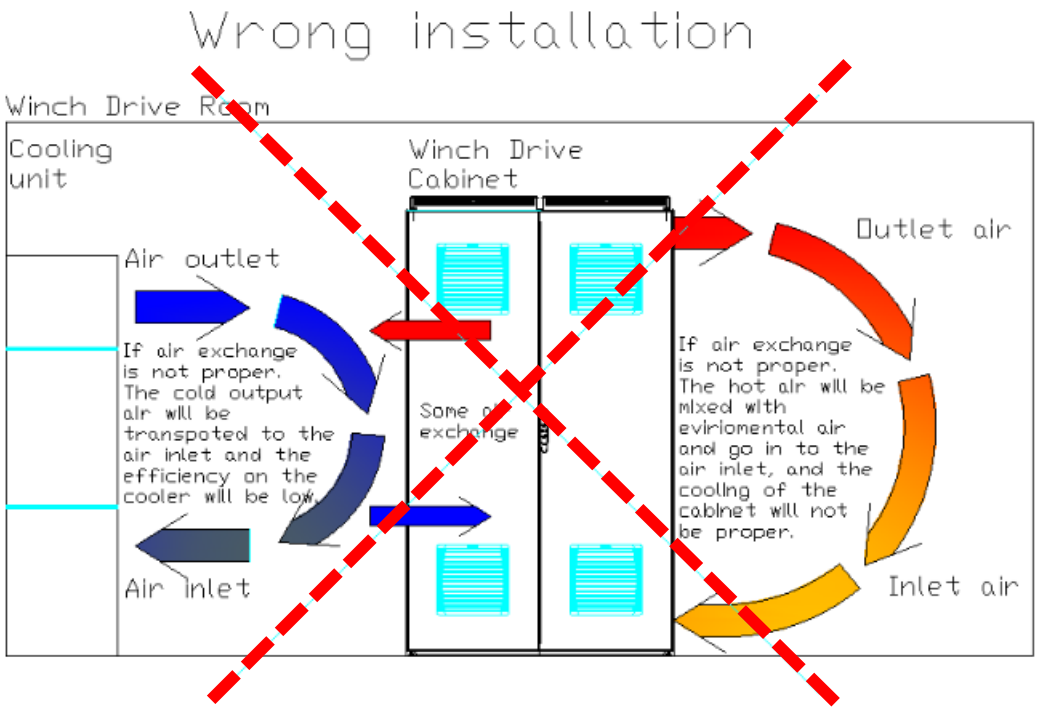
The VFDs require an ***air cooling unit*** installed in the room, to maintain a controlled air temperature not higher than 40°C degrees in the room. Size of cooling capacity need to be according to requirement in the project specific "Technical specification". The cooling air needs to be designed so that cold air in flows into the bottom of the room and air locks are avoided.

Optimal Cooling





Do not make the cooling like this:



Outdoors equipment's

Electric motors, Control panels, Frequency inverters/ Drives and magnetic starters shall be installed with heater unit inside. This is for reducing possibility of humidity inside the unit.

Equipment's installed outdoors is designed for a temperature from -40 to +40°C and relative humidity 70% at max humidity 98% and temperature +35°C, if not differently stated in contract.

Operational conditions shall be such as to exclude ingress of water, oil and other liquids, as well as impurities onto above electric equipment.

Sealing / Solenoid boxes

After connection of cables, all cable inputs of EL equipment shall be sealed and waterproof. Junction boxes mounted by the shipyard shall be waterproof. Solenoid box must be filled with hydraulic oil.

Foundations and shock-absorbers

Foundations for control panels shall be reliable and provide proper operation in different sailing conditions. Rigid fastening of panels to supporting surfaces is acceptable, but shock-absorbers can be also used.

Maximum allowed movement from foundation surfaces is 0.5 mm.

For further and general guidelines on topic “Installation of the winches”, please see the Rapp Marine **Mechanical Installation** document.

Example:



CAN Open and Device Net Connections

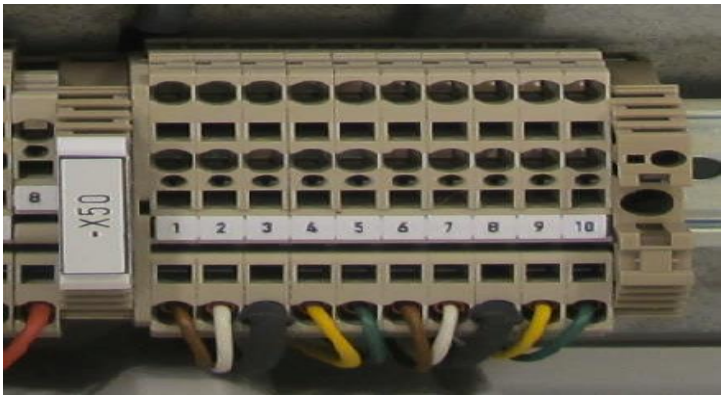
The connection of the CAN bus (Can open) and the device net is similar, but they are two separate systems.

The **CAN Bus** is used between the PLC (Cort 21), Multi I/O cards and the Joystick panels.

The **device net** is used between the PLC (Drm 21) and the Frequency converter.

In the special cable used for these connections there are 2 pairs surrounded by screening mesh.

Red and Black is one pair. Power
White and Blue is one pair. Signals



1. Black – Power 0V
2. Blue - Signal Low
3. Screen
4. White - Signal Hi
5. Red - Power +24V

IMPORTANT!

- ✓ The screen on the cable must be isolated and only be connected to the correct terminal.
- ✓ Keep wires short after stripping the cable
- ✓ Never connect the shield to the ground system



Termination of Cat.7 cables

- ✓ When connecting the cables for the Cat.7 Network
- ✓ Keep the wires as short as possible.
- ✓ Connect the shield conductor to the S connector.
- ✓ Clamp the shield (screen) of the cable in the clamping saddle, and secure the cable with it
- ✓ Test and verify connections with network tester
- ✓ Deliver test report to Rapp representatives.



Pin Nr	Color	Pair
1	Orange / White	2
2	Orange	2
3	Green / White	3
4	Blue	1
5	Blue / White	1
6	Green	3
7	Brown / White	4
8	Brown	4
S	Shield	

Cables that are not used

When using multi conductor cables there is always some spare conductors. Please isolate them in both ends so they can do no harm, keep them long so they can be used if we need more conductors.

Exceptions for cables to solenoid valve plug, where there‘s no room for spare conductors.

Cable tags inside cabinets

When stripping cables inside cabinets, please tag the cable where the cable is stripped and the isolated unused conductors (marker or pen is OK)

MRU Positioning

The maximum cable distance from the PLC to the MRU must not exceed 15 meters.
-This is due to RS232 / NMEA Signal

Encoder placing

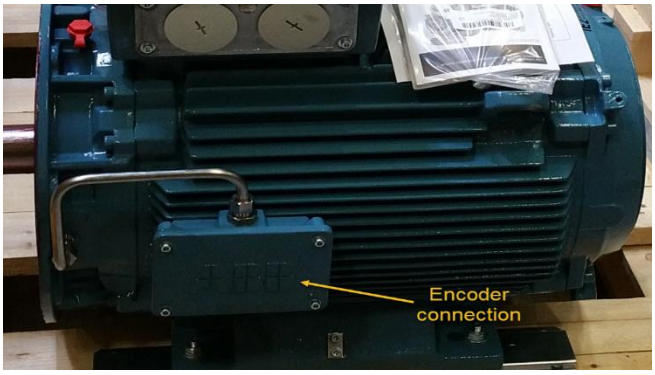
The placing of the encoder is either *in front* or *in the back* of the motor, and connected either with plug or connection box. The encoder with plug is usually placed under a cover.

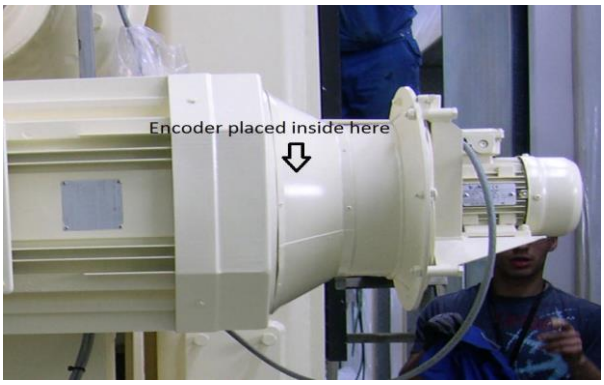
Sometimes an **external cooling fan** can cover them.
-If so;

- ✓ make a hole for cable gland in the funnel
- ✓ solder the connector plug, and
- ✓ fasten the cable with cable ties

to prevent the encoder from getting damaged by the external cooling fan.

Encoders for spooling motors comes with a cable, they are connected via a connection box.











Roxtec Cable Transits

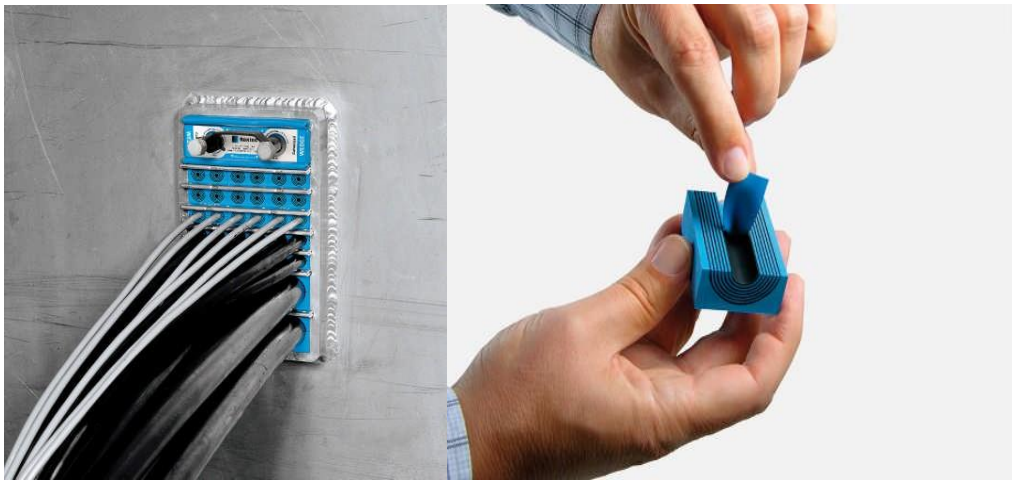
In cabinets with Roxtec Cable Transits, the cabinet is supplied with Roxtec modules ready for use.

Where there are section separation inside the ship, it is recommended to use EMC Roxtec to reduce the EMC/EMI noise problems, but not to use them on penetration to outside deck due to risk of water entrance into the cable.

The modules are easily shaped;
peel off the onion shaped half's of rubber to fit the diameter of the cable.

If the modules supplied with the cabinet doesn't fit the cables that is used under the installation, the installing company must supply new modules and install them according to Roxtec specifications.

For more information and installation instructions, visit www.roxtec.com



APPENDIX A – Recommended cables

Cable list and approved alternatives

	Supplier/Vendor	**Main supply / Motor Cables** (frequency controlled)	**Normal power cables** (heating, small pump motors, signals)	**Signal cables** (twisted pair)	**CANBus / Device net** (special cable)	**Ethernet cables**
Preferred cables by Rapp:	Lapp Group	Öflex 2YSLCYK-JB	Öflex 855CP, Öflex Robust 215C	Unitronic FD CP (TP) pluss	Unitronic Device Net Thick (Pur) (2x18AWG+2x15AWG)	Etherline Cat 7 Lapp group Pur
Alternative 1	**Belden Cable**				Belden 3082A / Belden 3082F (2x18AWG+2x15AWG)	
Alternative 2	**Amo Kabel**		EFK 300CP	EFK Li9YC11Y	N/A	
Alternative 3	**DDA Cables**	2YSLCYK-J 0,6-1kV			N/A	
Alternative 4	**BV Twentsche Kabelfabriek**			Marine Com YOZc 250V	N/A	
Alternative 5	**Helukabel**			Super Paar Tronic 340 C Pur	Device Net Pur Cable 81909	Helucat 600IND S-FTP Cat.7
Alternative 6	**Ünika**	RFOU VFD 06/1kV	RFOU / BFOU	U-HFAT m/ (I) / (C) / (I+C)	N/A	
Alternative 7	**Nexans**	MPRXCX Flexiship EMC (Symetrical 3+3)	MPRXCX	TCX©/(I)	Devicenet PUR Cables	LANmark-7 Cat.7

02	01.09.16	Revision, sec. 2.2.3 re: Through-hole connections	ST	BB	BB
01	01.06.12	Revision, sec.2.2.6. re: Cleanliness level.	SMA	HD	BB
00	02.01.10	Issued for Project Acceptance	SMA	HD	BB
Rev./ Status	Date	Description	Made by	Checked by	Appr. by

U:\System\INSTRUKS\Installasjons Instr El & Hyd\IMHydraulic2011\Originaler i word doc\EN-IM Installation of Hydraulic System, June2012 rev 01.doc

Customer: N/A	Project: **Installation of Rapp Marine Hydraulic Deck Machinery.**	
General instruction.	Purchase order no.: N/A	Order date: N/A

Commission no.: N/A	Document file: **Installation of hydraulic systems**	
Date: 23.11.2018	Name: BB	Identification no.: **EN-IM installation of hydraulic system**
		Page: 1 of 29

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Introduction:

This manual should give the reader sufficient knowledge to install any RAPP Marine AS hydraulic system in this delivery.
The manual is divided into main sections as follows:

- Depreservation and preparation for installation
- Hydraulic installation
- Climatic requirements
- Requirements to pipe lines
- Requirements to installation tubing and hoses
- Protection of tubing and valves during installation
- Requirements to arrangement of pump room
- Requirements to cleanliness
- Preparation to filling oil tank

If you have any questions, please do not hesitate to contact us:

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2.1.0 DE preservation and preparation for installation

After the equipment is received, following things need to be done.

The parts shall carefully be taken out of the container and preservation material removed.

Check all items in the shipment for damage and compare the contents with the packing list, enclosed with the shipment. Inform the Rapp Marine A/S as soon as possible if you notice any damaged or missing components.

All equipment to be installed indoors, shall be stored in dry and warm environment. Storage longer than 6 months requires special protection against corrosion. All primed components shall be treated with anti corrosion oil/paint.

During installation all plugs and protection for pumps and hydraulic valves shall not be removed before the pipe or hose is connected.

It is strictly forbidden to connect hydraulic equipment to hydraulic system, until piping system and hydraulic tank are accepted after flushing. Due to this the proper adapters shall be made prior to the start of installation.

CAUTION:

THE CIRCUITS BEHIND THE CONNECTIONS MIGHT BE PRESSURIZED.

CONNECTIONS TO BE OPENED CAREFULLY.

2.2.0 Hydraulic installation

Today's high pressure hydraulic systems demand a high level of cleanliness in order to operate satisfactorily.

Valves, pumps and motors have fine tolerances that prohibit pollutants. It is commonly agreed upon within the field of hydraulics that pollutants in the hydraulic fluid cause 8 out of 10 problems in hydraulic systems.

Based on this it is imperative that all components, that from time to time is in contact with the hydraulic fluid, is free of pollutants.

Polluted hydraulic fluid causes:

- excessive wear - reduced life-time;
- frequent change of filter elements - high cost;
- seized or clogged valves - stop in operation/down-time/lost income.

The installation instructions below must be complied with in order to avoid unpleasant surprises during trial-run and regular operation.

Note! The yard is responsible for the hydraulic installation being in accordance with specifications supplied by Rapp Hydema A/S.

2.2.1 Climatic requirements

The winches are installed on the open deck and are intended for installation on ships of unlimited area of operation.

Electric equipment to be installed on winches is placed in junction boxes filled with oil.

All other equipment with electric components shall be installed in dry warm room. Operating conditions must be such as to exclude ingress of water or other liquids.

In case of special requirements to components, protection class (**IP**) to be indicated on dimensional drawings.

2.2.2 Requirements to pipe lines

Hydraulic diagrams of the supplier show required diameter and thickness of pipes in accordance with standards DIN 2391C (NS 2503) for pressure lines -seamless, cold-treated precision steel tubing and DIN 2448 (NS 583) for return and suction lines - steel tubing. Above standards specify certain ratio between diameter, thickness and pressure of working fluid.

In system design Rapp Marine A/S using following pipe sizes:

Nominal size - ∅ x thickness, mm	**Internal ∅, mm**	**St. 52.4 – max. Working pressure, bar**
12 x 1.5	9	304
15 x 1.5	12	239
20 x 2	16	256
25 x 2	21	202
25 x 3	19	335
30 x 2	26	167
30 x 3	24	275
38 x 3	32	214
38 x 4	30	300
50 x 3	44	167
50 x 5	40	290
60 x 3	54	138
60 x 5	50	239
75 x 3	DN65/70	76
80 x 10	60	384
90 x 3.5	DN80	154
100 x 4	DN100	113
115 x 4	DN100	97
140 x 4.5	DN125	91

On diagrams minimum allowable sizes of pipes are indicated.

Ensure that the wall thickness of pipes you have chosen is sufficient to withstand pressure in the system considering required safety coefficient and test pressure.

Note! The shipyard takes responsibility for the choice of fittings for pipes, laid outside the package delivery.

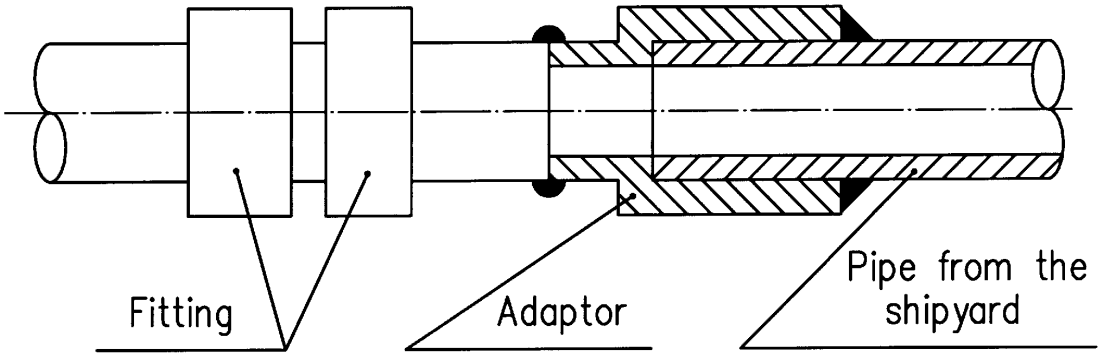
For pipe connections the supplier uses fittings approved for max. pressure:

- Parker Triple-Lok 37 deg. non collar;
- Ermeto;
- GS-Hydro.

Note! Parts from different types/brands of fittings shall not be mixed or interchanged.

For installation of return pipe lines PN16 flanges shall be used.

Diameter and thickness of tubes to be installed by the shipyard shall correspond to those specified on drawings, for each external connection there will be supplied an adaptor (see fig.) suitable for the tube size.



Material of adapter corresponds to the group of weldability of steels.

Connections of this type exclude ingress of the welding scale into the system and does not require special flaring equipment for pipes.

Tubing dimensions for components not supplied by Rapp Marine A/S, but connected to the same system, must given by the individual supplier.

Note! Rapp Marine A/S is not responsible for tube connections to components they do not supply. Each individual supplier shall in this case be consulted.

2.2.3 Requirements to installation tubing and hoses

In order to get a "silent and soundless" system it is imperative that the number of bends are kept at a minimum, and that necessary bends are as "slack" as possible (2…3 of outside pipe diameter). This is particularly important with suction lines to the pumps.

General requirements

- Choice of flanges and fittings must be approved by Rapp Marine A/S.
- All tubing shall be rinsed inside as described in the installation instruction.
- Use TIC welding.
- All welded tubing must be pressure tested prior to installation on board.
- Welded tubing shall be pickled and post treated.
- Outside and inside burr shall be removed from the cut ends of the tubing.
- All components shall be completely rid of pollutants prior to installation.
- The number of angle fittings for the complete system must be kept at a minimum.

Bending the tube

All tubing must be cold when bent, never use heat.

Use pipe bending machines for bending. Thus you will avoid reduction of the tube inner diameter at the bend.

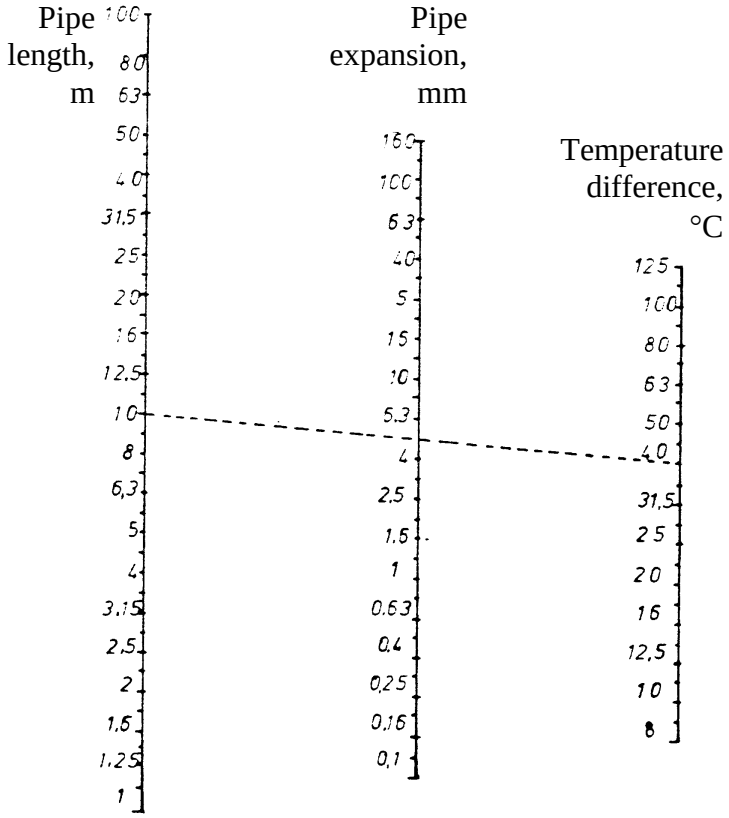
Tube expansion due to temperature changes

Hydraulic deck arrangements are exposed to extensive temperature variations.

On our latitudes the temperature may vary from -40°C on a winter day to +75°C during operation in summer. This means a temperature difference of 115°C.

As the coefficient of expansion for steel is approx. (12 x 10 6K1) a temperature difference of 115°C will give a longitudinal expansion of 1,4 mm per meter tubing.

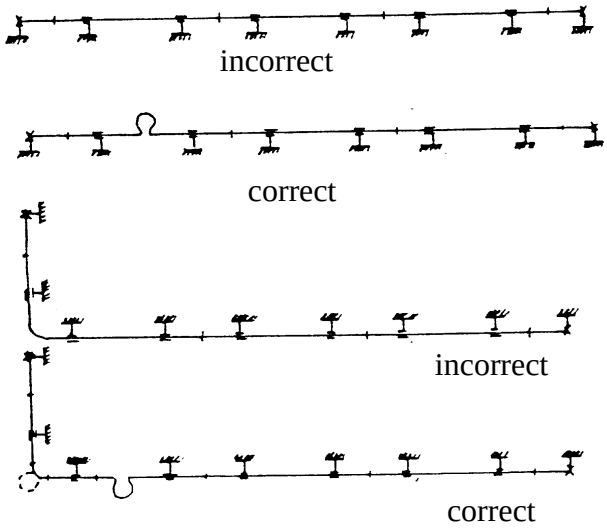
To calculate steel pipe expansion follow next diagram:

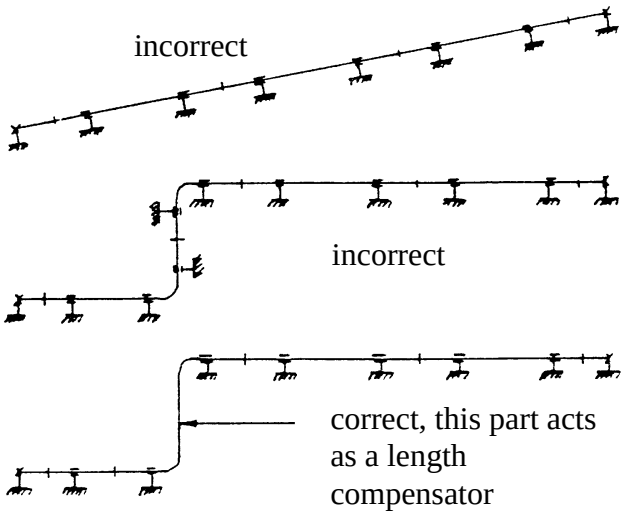


Choose first point on the left graph as pipe length. Choose second point on the right graph as temperature difference. Draw line between those points and find out value of pipe expansion from intersection point on the mid graph.

Long lines must have an expansion “bend” along the line, to avoid problem.

Tube bends for length compensation must, however, not be “locked”.





If space permits, the length compensator placed in the corner as indicated

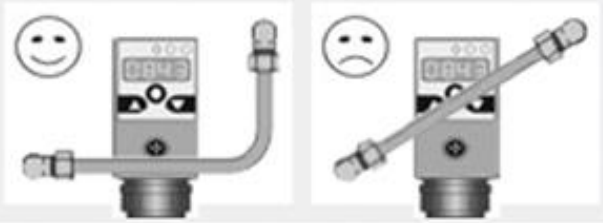
Tube line fabrication guide for leak free systems

Every hydraulic, pneumatic and lubrication system requires some form of tube fabrication and fitting installation for completion. Proper fabrication and installation are essential for the overall efficiency, leak free performance, and general appearance of any system.

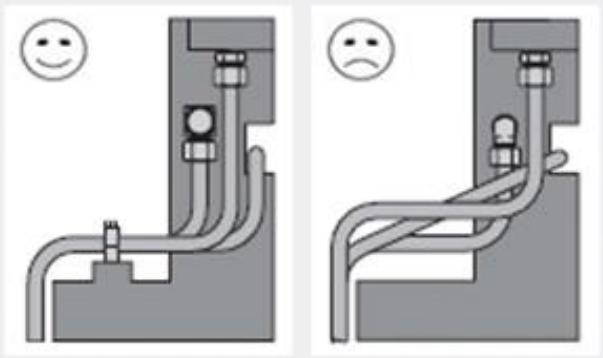
After sizing the tube lines and selecting the appropriate style of fitting, consider the following in the design of your system:

1. Accessibility of joints
2. Proper routing of lines
3. Adequate tube line supports
4. Available fabricating tools

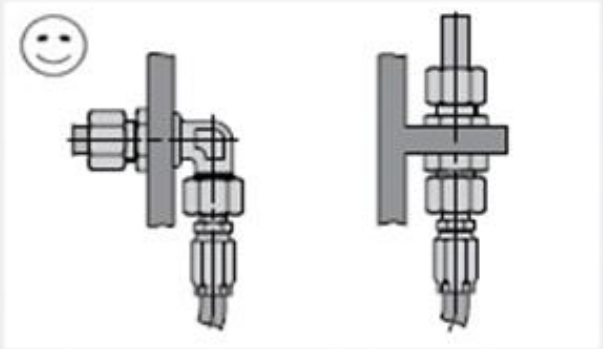
- Keep tube lines away from components that require regular maintenance:



- Right-angled – parallel – clear
- Have a neat appearance and allow for easy trouble-shooting, maintenance and repair:

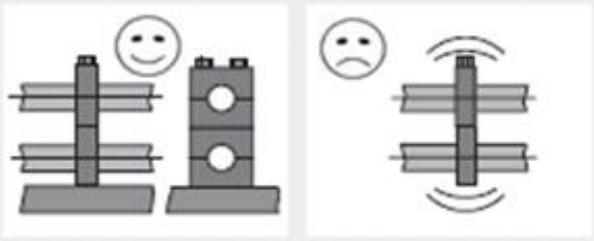


- Example for tube to hose connection:

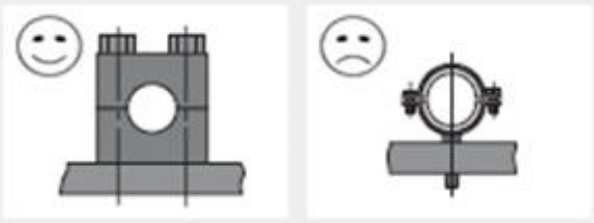


Tube line fabrication guide for leak free systems

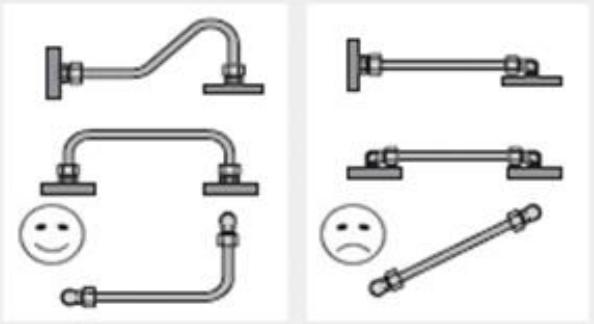
- Do not use tube lines to support other tubes
- Always fix tubes onto a rigid point with tube clamps
- Do not use cable channels to support tubes



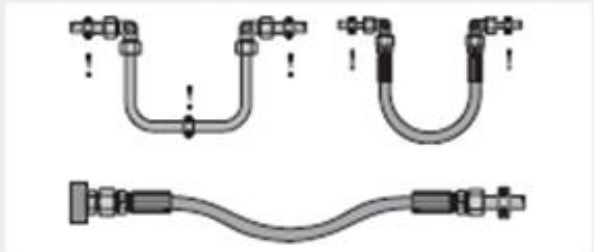
- Use appropriate tube clamps:



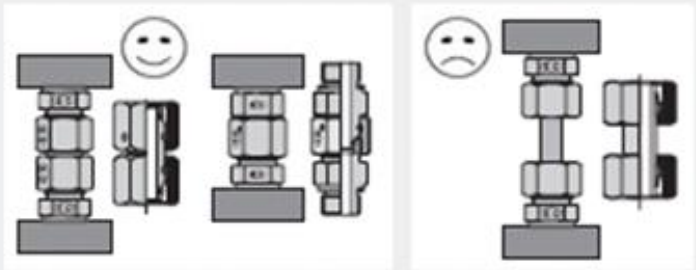
- Avoid excessive strain on joint:
  A strained joint will eventually leak



- Allow for expansion effects

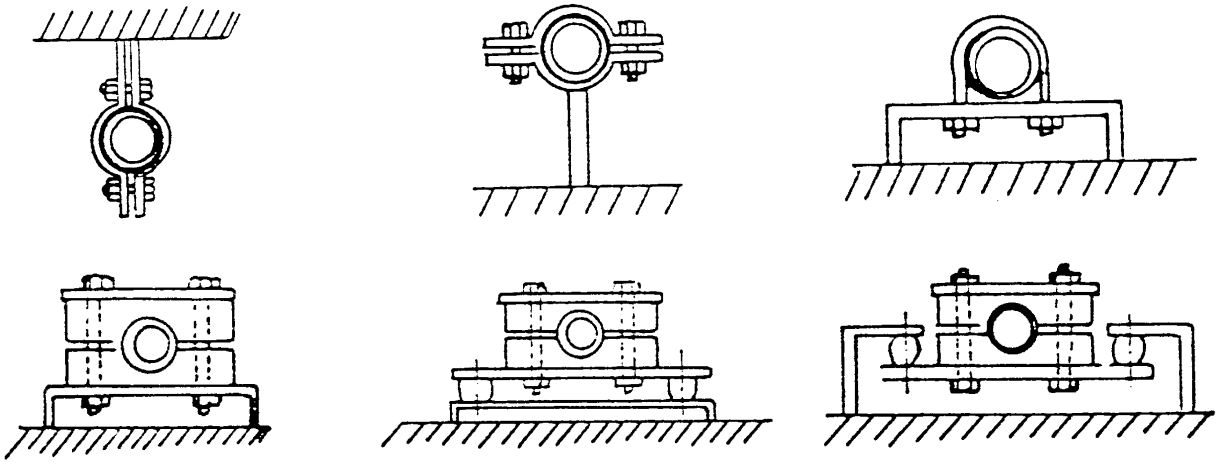


- Avoid short tube length:
- ⚠ Short tube lengths increase chance of fatigue fractures
- Use adapter GZR or swivel connector for swivel fittings instead of short tube lengths



Tube clamps / brackets

Proper clamping is important. Careful consideration must be taken when choosing type of clamps. Correct use of these must be closely observed. Next figure shows some examples of clamp types:



The tube clamp shall prevent cross line vibrations and at the same time allow for a certain longitudinal movement.

The clamp must be mechanically strong enough to absorb all forces from the tubing., i.e. the weight of the tubing, reactions from pressure shocks and forces due to longitudinal changes in the tubing.

It must not wear on the tubing and not be worn by the tube movements. Use of sound absorbing material in the clamp is an advantage.

The clamp must be easy to install, and allow for adjustments due to difference in distance between centers in tubing where several parallel tube lines are located. The clamp must also allow for separate removal of the tubing.

Only elastic clamps may be used (plastic or rubber type).

The distance between the clamps will vary, depending on the stress normally imposed on the tubing (pressure, oil velocity, vibration) as well as the tube dimensions.

Normally a distance between the clamps equal to 25...50 times the outside tube diameter is sufficient.

Assembly Information

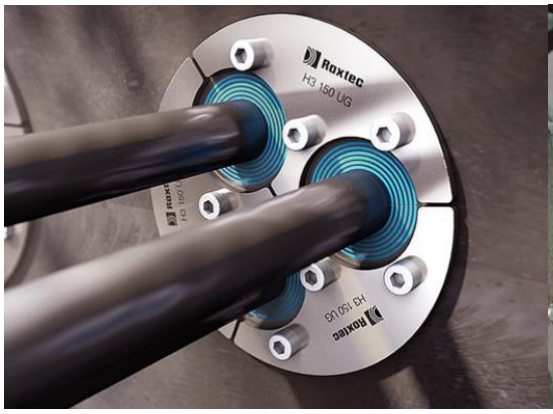
Maximum distance between clamps for hydraulic Piping

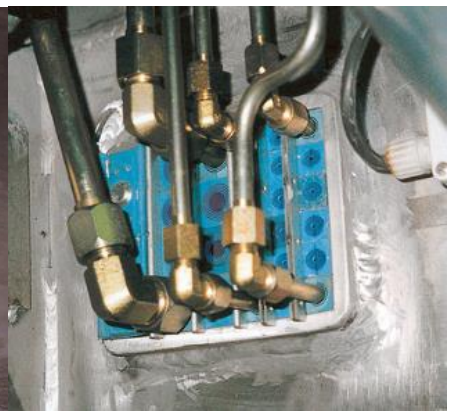
O.D x W.T	Marine Hydraulics	Industrial Hydraulics
20 x 2	1,1 m	1,2 m
25 x 2,5	1,3 m	1,5 m
30 x 3	1,4 m	2,1 m
38 x 4	1,5 m	2,1 m
42 x 4	1,6 m	2,3 m
46 x 8,5	1,7 m	2,7 m
50 x 3	1,7 m	2,7 m
50 x 5	1,8 m	2,7 m
56 x 8,5	1,9 m	2,8 m
60 x 3	1,9 m	3,0 m
60 x 5	2,0 m	3,0 m
66 x 8,5	2,0 m	3,2 m
75 x 3	2,1 m	3,5 m
80 x 10	2,2 m	3,6 m
90 x 3,5	2,3 m	3,7 m
90 x 5	2,4 m	3,7 m
97 x 12	2,5 m	4,0 m
100 x 4	2,4 m	4,0 m
115 x 4	2,6 m	4,3 m
115 x 15	2,7 m	4,3 m
130 x 15	2,9 m	4,6 m
140 x 4,5	2,8 m	4,9 m
150 x 15	3,1 m	5,0 m
165 x 15	3,0 m	5,2 m
190 x 20	3,5 m	5,4 m
220 x 6	3,5 m	5,8 m
250 x 25	4,0 m	6,0 m
273 x 6	3,5 m	5,4 m

Vibration calculations are based on ship with maximum propellervelocity of 2 rev/sec. and maximum 6 propeller blades / frequency 12 Hz.

Trough-hole connections

Through-hole connections, bulkhead pipe layout, deck penetrations for hydraulic pipes.
All through-hole connections are recommended to be with elastic bulkhead sealing system, to avoid structural born noise.





Pressure testing of welded tubing

It is permitted to use on the return and suction lines welded tubes. All welded tubes must be pressure tested prior to connection to the system.

Pressure testing of the piping system must be carried out before the system is put into operation.

If nothing else is specified, a test pressure 1.5 times nominal working pressure, limited to maximum 70 bar overpressure (above maximum working pressure).

NOTE! It is the piping system that is to be tested, not the power pack and other hydraulic components (pumps, motors, and cylinders).

Hoses installation

Different types of hydraulic hoses are to be used in the system for connection of equipment staying on rubber legs (such as pump units).

Check pressure ratio indicated on the hose prior to connection. For pressure lines only high pressure hoses shall be used.

Rapp Marine AS supplied standard length suction hoses, which are not permitted to cut. During installation of suction hoses good alignments of the connected ends must be considered. This is important to avoid leaks. Use bend-type of clamps. For more secure tightness use two clamps on each end of hose.

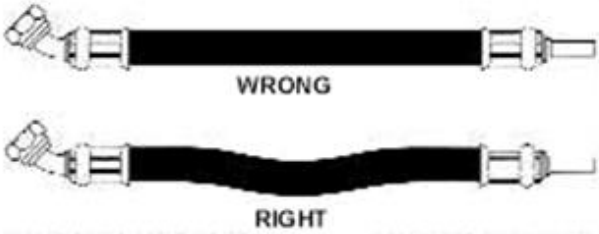
During installation

As a “rule-of-thumb” for minimum bending radius of the hose the following may be used:

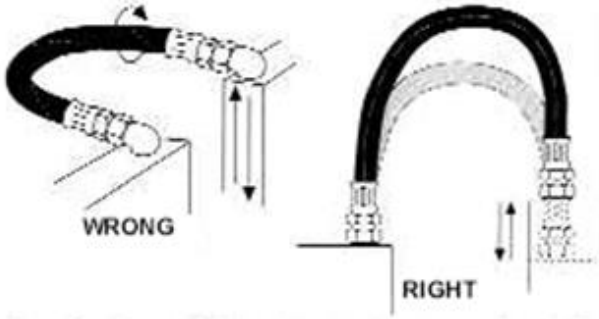
Outside hose diameter - D, mm	0…25	25…40	40…55	55…>
Minimum bending radius, mm	6 x D	7 x D	8 x D	9 x D

HOSE ASSEMBLY ROUTING TIPS

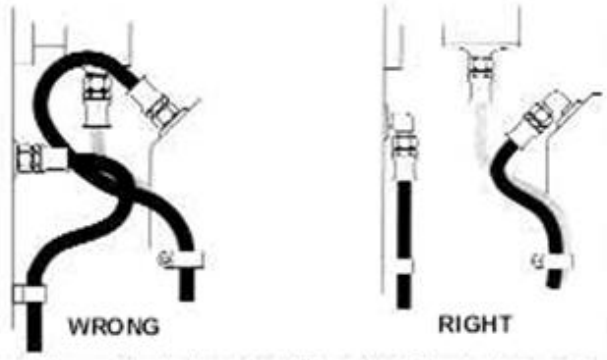
Proper hose installation is essential for satisfactury performance. If hose length is excessive, the appearance of the installation will be unsatisfactury and unnecessary cost of equipment will be involved. If hose assemblies are too short to permit adequate flexing and changes in length due to expansion or contraction, hose service life will be reduced.
The following diagrams show proper hose installations which provide maximum performance and cost savings. Consider these examples in determining length of a specific assembly.



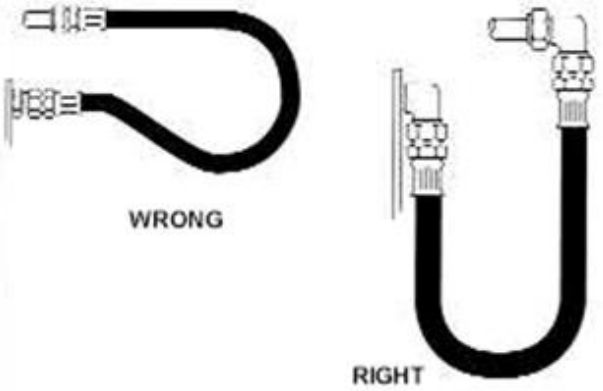
When hose installation is straight, allow enough slack in hose line to provide for length changes which will occur when pressure is applied.



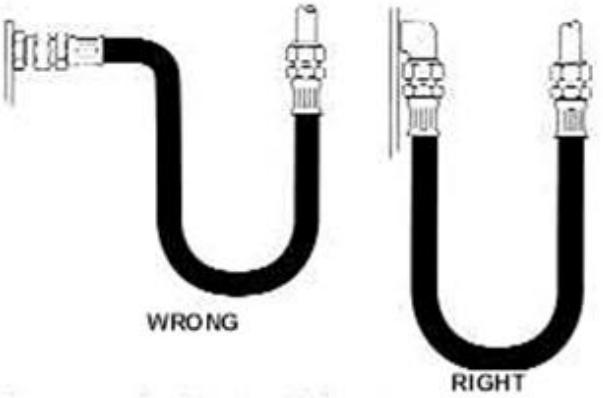
Prevent twisting and distortion by bending hose in same plane as the motion of the boss to which hose is connected.



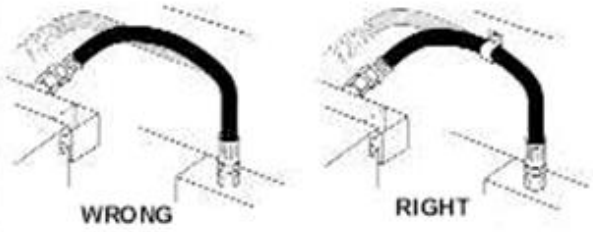
Route hose directly by using 45° and/or 90° adaptors and fittings. Avoid excessive hose length to improve appearance.



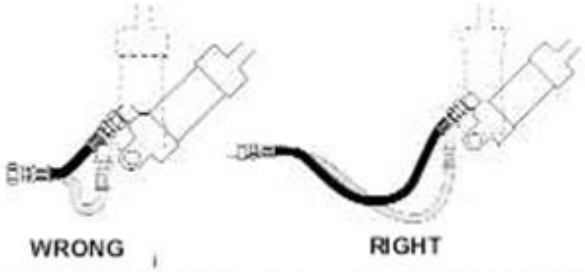
When radius is below the required miimum, use an angle adaptor to avoid sharp bends.



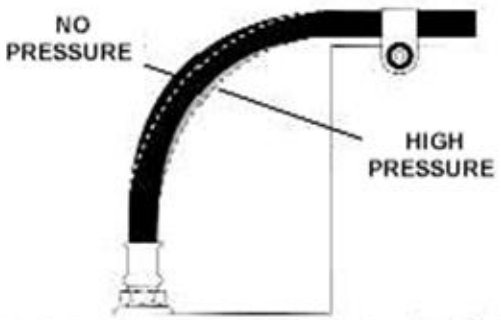
Use proper angle adaptors to avoid sharp twist or bend in hose.



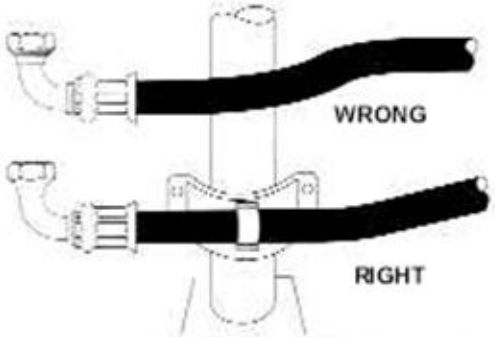
Avoid twisting of hose lines bent in two planes by clamping hose at change of plane.



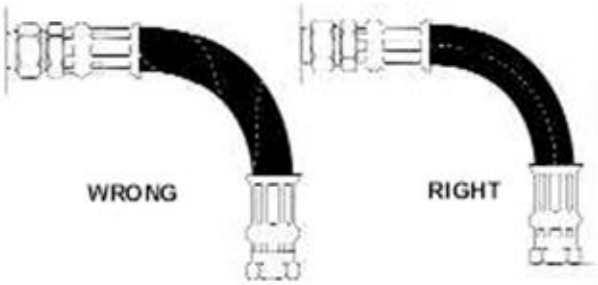
Adequate hose length is necessary to distribute movement on flexing applications and to avoid abrasion.



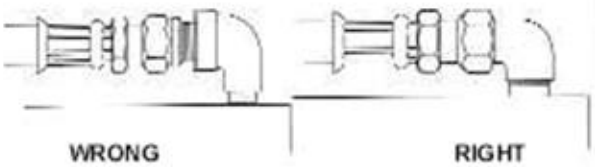
To allow for length changes when hose is pressurised, do not clamp at bends so that curves will absorb changes. Do not clamp high and low pressure lines together.



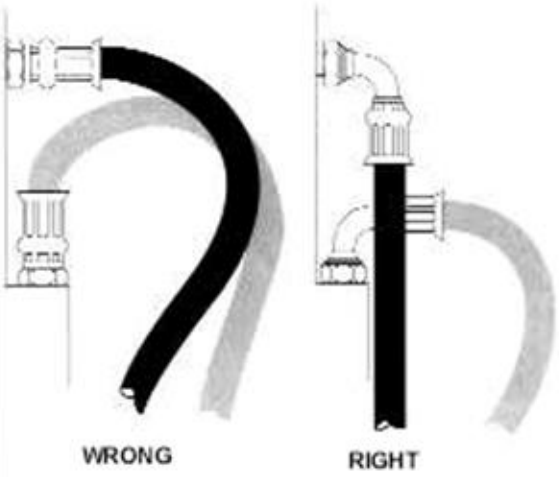
High ambient temperatures shorten hose life. Make sure hose is kept away from hot parts. If possible, insulate the hose.



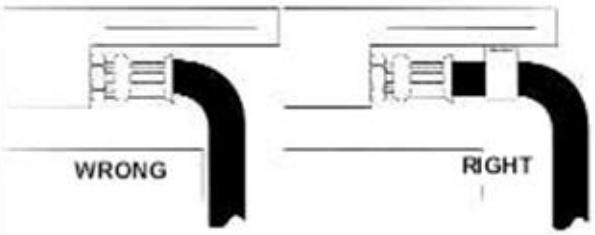
When installing hose, make sure it is not twisted. Pressure applied to a twisted hose can result in hose failure or loosening of connections.



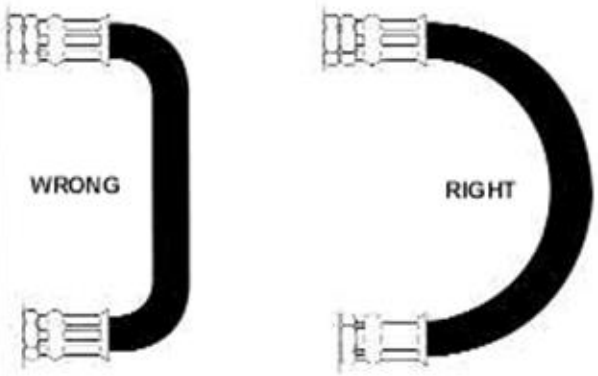
Reduce number of pipe thread joints by using proper hydraulic adaptors instead of pipe fittings.



Elbows and adaptors should be used to relieve strain on the assembly, and to provide neater installations which will be more accessible for inspection and maintenance.



Run hose in the installation so that it avoids rubbing and abrasion. Often, clamps are required to support long hose runs or to keep hose away from moving parts. Use clamps of the correct size. Too large a clamp allows hose to move inside the clamp and cause abrasion.



To avoid hose collapse and flow restriction, keep hose bend radii as large as possible. Refer to hose specification tables for minimum bend radii.

2.2.4 Protection of tubing and valves during installation

During installation ensure that tube ends, filter openings, valves, etc. remain closed until you are ready to complete the installation and fill the tank.

USE PLASTIC PLUGS OR CAPS - NOT RAGS OR PAPER PLUGS

Note! Remember to remove plugs before final hook-up!

2.2.5 Requirements to arrangement of pump room

Installation of equipment in the pump room shall be made in strict conformity with hydraulic diagram and specifications from the supplier.

Arrangement of the pump room shall provide access to equipment for adjustment and repair.

Oil tank

If oil tank is not part of Rapp Marine AS delivery, but other supplier or manufactured by yard, written acceptance of tank drawing is required. In this case order from Rapp Hydema A/S mounting equipment for oil tank – parts for connection of oil level switch, return filters etc.

Hydraulic oil tank must be made from stainless steel or painted inside with oil resistance paint.

Hydraulic oil tank shall be installed as follows:

It is important that the tank is situated as close as possible to the hydraulic oil pumps. The minimum distance between tank bottom and center of the pumps to be 200 mm (vertically).

The oil tank must not be positioned directly connected to the side of the ship or close to the cooling tanks room, stable temperature reduces risk for condensation inside the oil tank.

Service and inspection through the manholes must be possible.

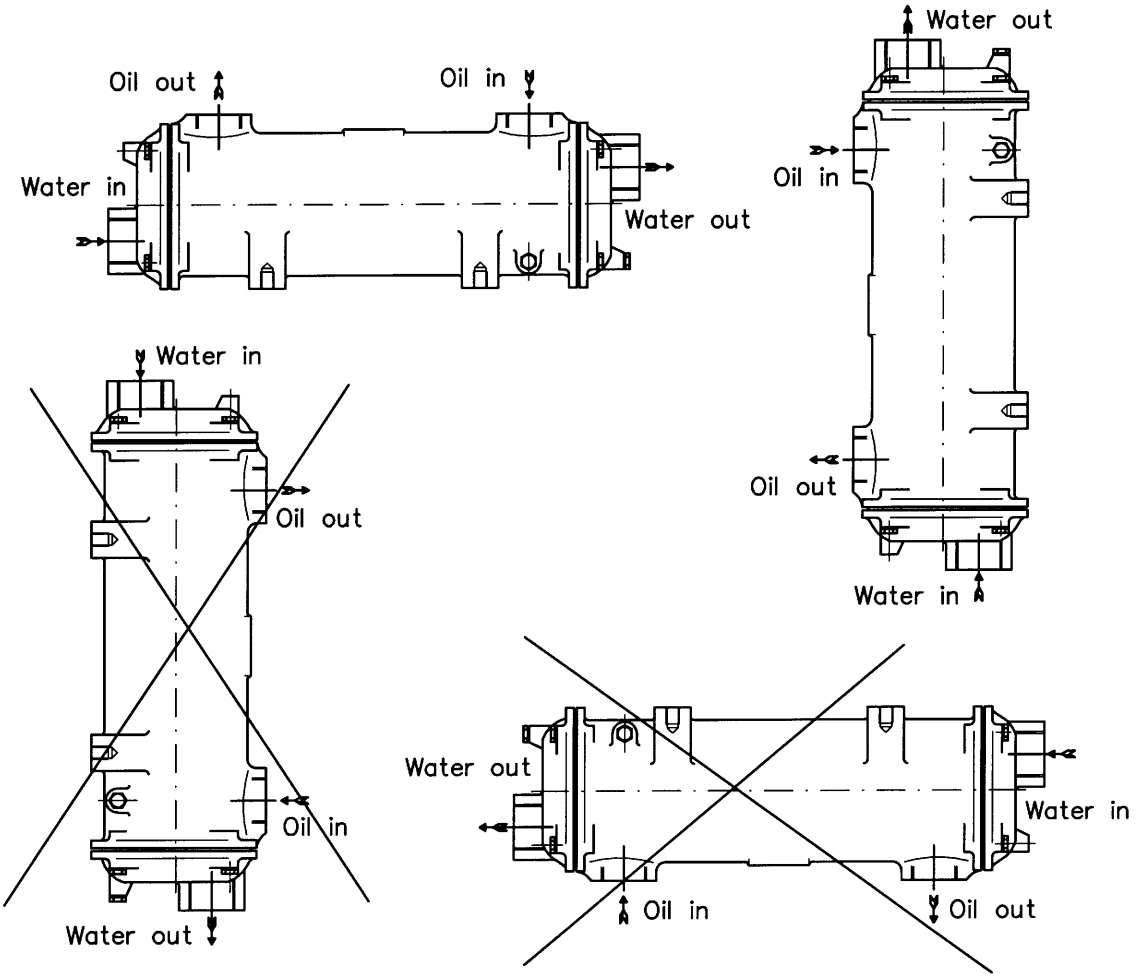
Oil cooler

Service distance as indicated on dimensional sketch to get access for service of oil cooler. To avoid extra oil spill during servicing all ball and check valves to be installed as close to the cooler as possible.

The water IN end shall be positioned so that “UP STREAM” cooling is achieved.

Normally every cooler has its own separate pump for cooling water supply. If not, the supplier shall be contacted for approval.

Also ensure that the cooling water pump has sufficient capacity.



Hydraulic pumps

All el. motors shall be installed on “rubber legs”/rubber elements or other elastic surfaces. These are normally NOT supplied.

The electric motors can be positioned horizontally or vertically for best use of space in the hydraulic room. During installation pay special attention to the future servicing, as per dimensional sketches.

For connection of hydraulic pumps to the system use hydraulic hoses. This to avoid extra vibration forces from the pumps to the pipe lines.

Do not use 90° fittings direct mounted on the pumps outlets. For most types of hydraulic pumps it is allowed to turn their sections (both pressure and suction sections) in relation to each other. Use this possibility to optimize pipe layout from the pumps.

Filters

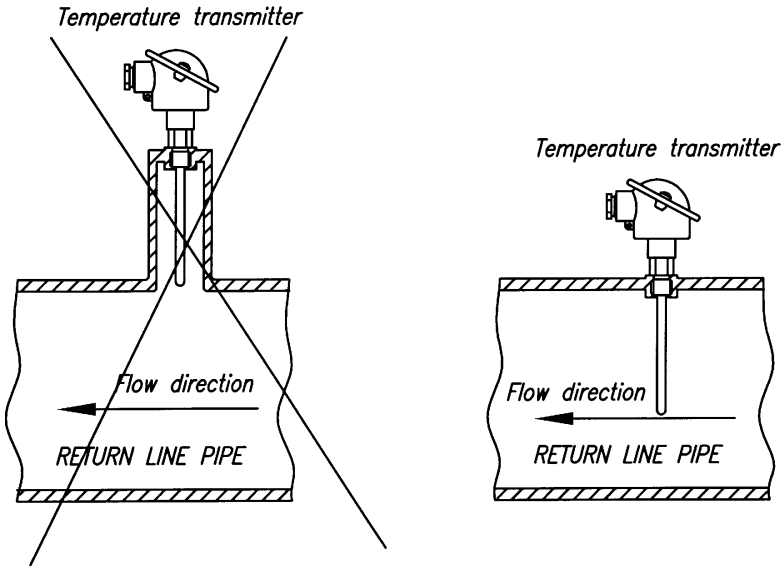
Service distance and accessibility for filter replacement shall be provided.

It must be easy to inspect the filter indicators.

Pipe length from the pump to the filter to be as short as possible.

Temperature transmitter

The temperature transmitter shall be positioned before the oil cooler and assembled with the temperature detector directly in contact with the main flow. See fig. below:



If diameter of pipe is not big enough for this type of installation, use one of the 90° bends in the return line.

Valves

The hydraulic and electro/magnetic valves shall be easily available for service, testing and adjustment.

Electrohydraulic valves without waterproof protection shall be installed in dry environment correspondent to the **IP** class.



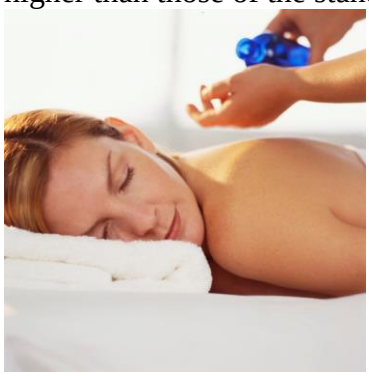
"No system has ever failed from being too clean"

2.2.6 Requirements to cleanliness

This Part is based on NS 5910 - "Cleaning of hydraulic pipe systems".

The objective of this standard is to ensure that hydraulic system has a proper initial cleanliness level to ensure that desired reliability and expected life can be obtained

The standard can be a supplement to, but cannot replace the recommendations of the supplier of the components and the customer requirements, especially when their requirements are higher than those of the standard.



Clean oil for proper function.



Tube treatment and cleaning

All tubes must be 100% clean before the installation starts.

Precision steel tubing is normally without solid pollutants (except shaving from cutting). Preferably the tubes are to be cleaned by blowing (compressed air) special soft plugs through the tubes. If such equipment is not available, pull a clean cloth rag (not polishing yarn or paper) through the tube, then oil it before plugging the ends.

Other kinds of tubing must be cleaned with a suitable solvent such as white spirit, trichlorethylene or similar, before being pickled in an acid solution.

Welding connections at flanges, bends, branch-outs must be made completely mechanically clean from particles before cleaning and pickling.

When cutting the tubing, the tubing must be carefully rinsed and inspected.

Any sandblasting must be carried out with special care, as the sand tend to settle in corners, bends, etc. inside the tubing.

During any sandblasting ensure that all open hydraulic connection points are sealed.

Requirements for achieving a desired level of cleanliness.

Flushing the system

The main purpose of flushing is to achieve the cleanliness level specified by the supplier of the system or the components.

The level of particles content (ISO 4406-1999, max.: 18/16/13). *

Actions to achieve a satisfactory cleanliness level in a hydraulic system comprise of:

1) cleaning and internal surface treatment of tubes;

2) drying of fitted piping system;

3) flushing;

4) verification of cleanliness level.

Presupposition for retaining a high cleanliness level after flushing are the selection of suitable and properly located system filters, and that oil filling is done through a system filter or another suitable filter.

In the design phase it is important to plan for system flushing.

Circuits shall be connected in series, when flushing. Areas without circulation shall not exist.

Flushing units capacity shall be calculated to ensure high oil flow for efficient cleaning of the internal surfaces of the system pipes .

Components which may prevent high flow velocity or which may be damaged in high flow velocity or high particle content shall be disconnected from the circuit.

It shall be possible to flush all connections of the piping.

All equipment supplied by Rapp Hydema A/S is cleaned, flushed and ready for operation. If the shipyard uses assemblies or components which turned out to be un-cleaned, they shall be flushed separately. This is also valid where space does not allow flushing of installed piping system.

It is important that a representative flushing fluid sample can be taken.

Components cleanliness level

Components and assemblies are often connected to the pipe system after flushing. The cleanliness of these components and assemblies should be at least as good as the desired cleanliness of the main system.

The component suppliers should be able to give information about the cleanliness level of the components.

Note! If the components contain anticorrosion agents which are not compatible with the system fluid, the components shall be flushed using system fluid with 5-10% degreasing agents added. The degreasing agent shall not influence component seals.

Cleaning and internal treatment of tubes

Mechanical cleaning of tubes

Welded tubes shall be mechanically cleaned internally to grade St. 2 according to SIS 05 59 00.

Grinding or brushing is recommended. Sand-blasting shall not take place.

Note! After mechanical cleaning, tube and tube flanges shall be smooth and free from slag, welding beads, baking, pores and foreign particles.

Chemical cleaning of tubes

Tubes with scale and/or corrosion shall be treated according to the following procedure:

Alkaline degreasing;

Water rinsing;

Pickling;

Water rinsing;

Neutralization;

Water rinsing;

Drying.

The current guidelines from the Directorate of Labor Inspection and the National Pollution Control Authority are to be followed.

Alkaline degreasing

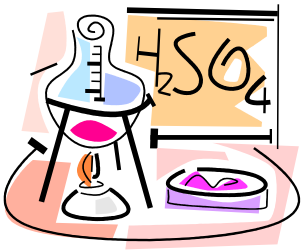
The tubes shall be cleaned with an approved degreasing agent.

Note! Oil and grease reduce the effect of the pickling process. An alkaline bath which removes most of the organic dirt (lacquer, oil, fat) may consist of 10% NaOH (caustic soda) and 90% water. Treatment time is approximately one hour at 90°C. Certain types of fat are not removed by this procedure.

Water rinsing

The tubes shall be thoroughly washed with fresh water.

Pickling



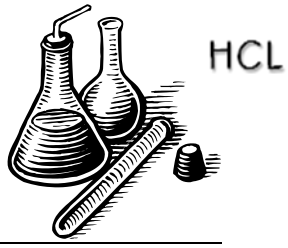
Pickling by sulphuric acid

The tubes are preferably pickled in a sulphuric acid bath consisting of 10-25% H_2SO_4 (sulphuric acid) in water, 1-2 ml/l inhibitor (hexamine).

Maximum bath temperature 80°C. Alternatively the tubes are filled completely with pickling fluid.

Note! Always pour acid concentrates into water, not vice versa. The acids must be treated carefully as they are highly corrosive. Protect skin and eyes and follow the recommendations of the acid supplier.

Alternative pickling



Hydrochloric acid pickling

50% hydrochloric acid in water (hydrochloric acid in 35-38% concentration, non-arsenic) 1-2 ml/l inhibitor (hexamine).

Maximum bath temperature 35°C.

Pickling time 10-60 min.

Hydrochloric acid is very reactive and leads to immediate corrosion if neutralization measures are not taken immediately after the pickling. Also pickling in hydrochloric acid may lead to hydrogen embrittlement in the steel if the inhibitor is not effective enough.

Phosphoric acid pickling

Phosphoric acid pickling gives a small amount of corrosion and normally requires neutralization.

Water rinsing

The tubes shall be washed thoroughly with fresh water immediately after the acid pickling.

Neutralization

The tubes shall be washed with an adequate neutralizing liquid.

Note! An adequate neutralizing liquid may consist of 2% Na3PO4 (triosodiumphosphate) in water. Bath temperature 80-90°C. Treatment time 1-2 minutes.

Water rinsing

The tubes shall be washed thoroughly with fresh water to remove the neutralizing liquid.

Drying

The tubes shall be dried with warm, dry air within 30 minutes after rinsing.

Surface treatment

To maintain the obtained cleanliness until installation, the tubes shall be treated with a suitable protection liquid. The liquid used should give corrosion protection for at least five months and shall not alter the properties of the flushing fluid or the system fluid.

Storing of tubes and tube parts

Cleaned and surface treated tubes and fittings shall be capped immediately and should be stored in a dry place.

Drying of piping systems

Before the piping system is connected to machines, panels, pump stations etc. all tubes shall be thoroughly blown through with dry, filtered compressed air or nitrogen. Dew point is to be 45°C at normal atmospheric pressure.

Sizing of external flushing filters

It is a generally good economy to use large flushing filter; the smallest flushing filter which should be accepted has a pressure drop through a clean element of 5% of the opening pressure of the bypass valve or the indicator setting, calculated at the relevant flushing fluid viscosity.

Criteria for proper flushing

A flushing procedure should be adapted to the practical conditions. Certain main criteria shall, however, be fulfilled to obtain a satisfactory result (see level of cleanliness).

The reservoir of a flushing unit shall be cleaned to the level required for the system.

The system shall be filled through a suitable filter. Air should not be brought into the system when filling. If necessary, top up and bleed the system.

Removing particles from internal surfaces

To remove contaminants effectively from internal surfaces, the main requirement is that the flushing fluid has a turbulent flow. This condition is fulfilled when Reynolds number is larger than 3000.

If the flushing is done with Reynolds number smaller than 3000, there will be different degrees of laminar flow within the tubes. In the area close to the tube wall, where the particles are situated, the fluid velocity is approximately zero. This stationary fluid does not possess the ability to remove particles from tube and component walls.

With Reynolds number larger than 3000 there will be a turbulent flow. Having this condition t01he fluid wipes the surfaces with high energy and tears off the contaminants effectively.

Flushing Procedures and Formula

The aim of flushing is to remove contamination from the inside of pipes and components which are introduced during system assembly or maintenance. This is accomplished by passing fluid through the system, usually at a velocity higher than that during normal operation.

Omission or curtailment of flushing will inevitably lead to rapid wear of components, malfunction and breakdown.

Reynolds N° (Re): A non-dimensional number that provides a qualification of the degree of turbulence within a pipe or hose.



Laminar Flow | Turbulent Flow

Laminar Flow - Reynolds N° < 2,000
Transitional Flow - Reynolds N° 2,000 - 4,000
Turbulent Flow - Reynolds N° > 4,000

The flow condition in a pipe or hose can be assessed using Reynolds N° as follows:

$$Re = \frac{Ud}{\nu} \times 1{,}000 \quad \text{or} \quad Re = 21{,}200 \times Q / (\nu \times d)$$

Re = Reynolds N°
U = Mean flow velocity (m/s)
d = Pipe internal diameter (mm)
ν = Kinematic viscosity of fluid in cSt (mm^2/s)
Q = Flow rate (L/min)

It is often difficult to obtain a Reynolds number larger than 3000. The following methods are recommended to increase the Reynolds number:

Increasing the fluid flow “Q”.

This may not be practically acceptable and this is expensive as it requires a larger flushing power unit.

Reduction of the viscosity “v”

In most cases this is the best way to achieve a turbulent flow. The reduction may be obtained by increasing the temperature, thus lowering the viscosity.

If a special flushing fluid is used, it shall be compatible with the system oil which is to be used in operation. The only general recommendation is to use the same type of fluid, possibly with a lower viscosity.

Note! When studying the equation for the Reynolds number, it may look as if a reduction of the tube diameter may contribute to increase Reynolds number. The pressure drop through a tube, however inversely proportionally with the inside tube diameter to the 5th power. Narrow tubes are therefore very difficult to flush because the flow resistance becomes too high.

The use of vibration, high frequency sound or changing flow direction, will contribute to a faster removal of particles. This is, however, a supplement and not an alternative to turbulent flow.

A turbulent fluid flow will also ensure transportation of the contaminants from the system to the filters.

Selection of filtration performance

The filters used for flushing are quite decisive for two essential reasons. They set the final cleanliness level which can be expected and how fast this level can be reached.

The choice of an optimal filtration ratio is important. Using filters with a poor filtration ratio, situations may arise where the specified cleanliness level is not achieved, or is achieved after a very long flushing time.

Filtration performance is measured according to ISO 4572.

ISO 4572 defines Beta ratio (filtration ratio) as the relationship between the number of particles greater than a given size upstream of the filter, and the number of particles greater than the same size downstream of the filter. If there are 20 times as many particles greater than 5 µm in the oil upstream of the filter compared to downstream of the filter, the Beta ration for µm equals 20. This may be presented as: Beta-5 = 20.

Filters with Beta-5 values considerably higher than 1 should be used.

Recommended minimum value is Beta-5 equal to 20.

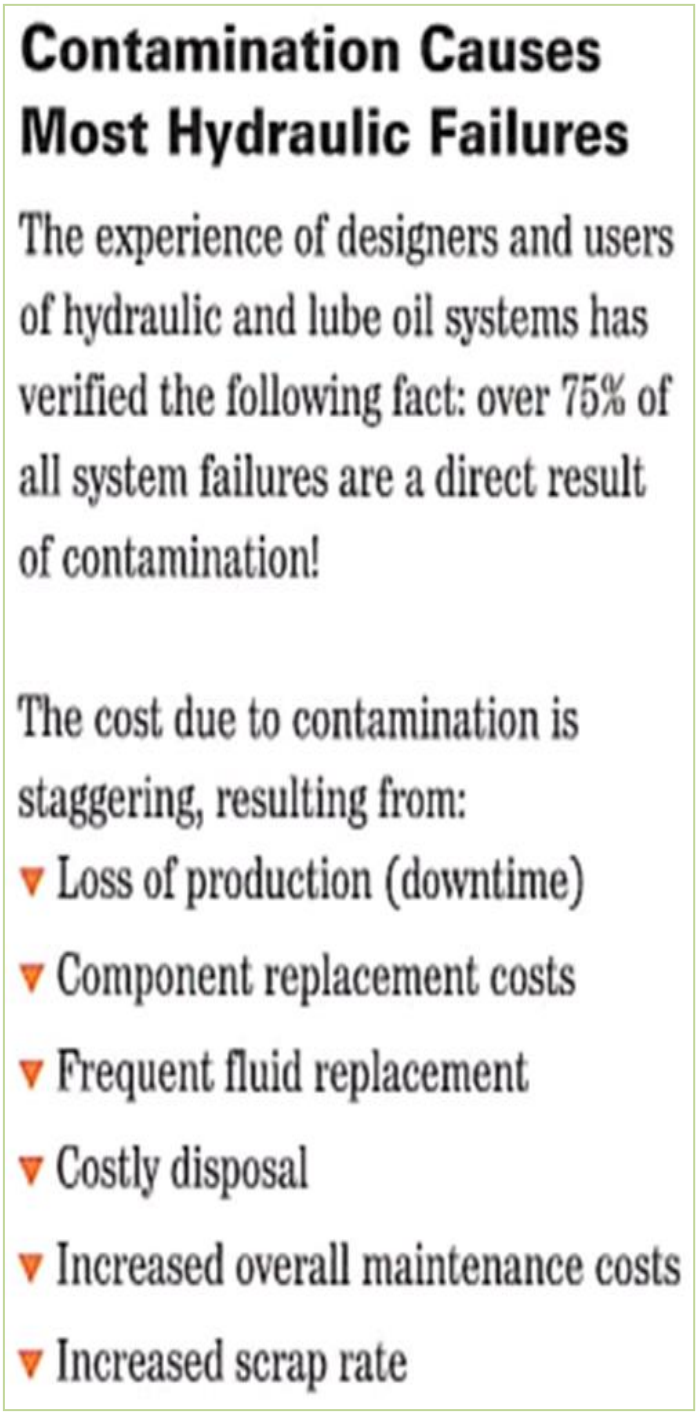
External flushing filters

In several cases external filters are used during flushing.

The reason for this may be that the selected filter rating deviates from that of the system filters, or it may be for economical reasons.

Minimum flushing time

The flushing time depends on the system capacity and its complexity. Even if samples from the system indicate that the specified cleanliness level is reached after a short time, the flushing shall continue for at least three hours at turbulent flow. The probability of removing particles sticking hard to the tube walls therefore increase.





Verification of the cleanliness level

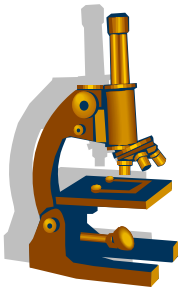
The obtained cleanliness level shall be documented before flushing operation may be considered as finalized. Use particle counting or comparison membrane.

Particle counting

The use of an automatic particle counting is the fastest method for particle counting in a flushing fluid sample. See ISO 4402.

When required cleanliness level is specified according to ISO 4406-1999, it is sufficient to count particles larger than 4,6 and 14 µm.

Particles may alternatively be separated on a membrane filter and counted by using a microscope. See ISO 5884.



Comparison membrane

The equipment for microscopic particle counting may also be used by applying comparison membrane. The procedure is the same except for the counting.

Instead of counting particles, the relevant test membrane is compared to a reference membrane by using a microscope. For a trained operator it is easy to ascertain that the sample is equal to or better than the reference. The reference membrane should be made for the relevant type of system, and it shall represent the cleanliness level required.

Note! The membranes shall be compared using a microscope only. Dye pigment and other substances which create color nuances may give completely misleading results. Samples should be verified by counting of particles.

Cleanliness level (only for particles counting) defined in other standards shall correspond to ISO 4406-1999 level 18/16/13:

ISO 4406	NAS 1638	SAE 749
18/16/13	7	4

☆

Solid contaminant codes

In addition to ISO 4406: 1999, other standards are used to express the fluid cleanliness level. A comparison between the codes is given below.

ISO 4406: 1999	ISO 4406: 1987	NAS 1638 CLASS
13/11/8	11/8	2
14/12/9	12/9	3
15/13/10	13/10	4
16/14/9	14/9	-
16/14/10	14/10	5
17/15/9	15/9	-
17/15/10	15/10	-
17/15/12	15/12	6
18/16/10	16/10	-
18/16/11	16/11	-
18/16/13	16/13	7
19/17/12	17/12	-
19/17/14	17/14	8
20/18/12	18/12	-
20/18/13	18/13	-
20/18/15	18/15	9
21/19/13	19/13	-
21/19/16	19/16	10
22/20/13	20/13	-
22/20/17	20/17	11

☆

Components	ISO Code
Servo control valves	16/14/11
Proportional valves	17/15/12
Valve & piston pumps/motors	18/16/13
Directional & pressure control valves	18/16/13
Gear pumps/motors	19/17/14
Flow control valves	20/18/15
Cylinders	20/18/15

☆

Especially cold environment

In cold environment the flushing of pipe systems may suffer from loss of heat. To verify that the Reynolds number is larger than 3000, the temperature shall be checked at the estimated coldest spot of the system. The flushing is only real when the lowest temperature gives a Reynolds number larger than 3000. See data for the viscosity and temperature of the relevant flushing fluid.

Under specially cold conditions, the pipe system etc. should be insulated to keep the temperature above the necessary minimum level.

2.2.7 Preparation to filling oil tank

Check again cleanliness of the oil tank and suction lines. This is very important in case suction filters are not used in the system.

Before first filling of oil tank it must be inspected and approved be representative of Rapp Hydema A/S.

Use only oil recommended by Rapp Hydema A/S, see “Oil and Lubricant Requirements”.

Inspect the oil drums to see if they are properly sealed. Let drums rest for 1…2 hours by the oil tank to separate water or other contaminants.

Ensure that oil pump, hoses, other relevant equipment are clean and have not been used for pumping motor oil or other fluids.

Always use filter 10μm between drum and tank, new oil is not clean. It is possible to use one of the system return filters.

There may be water/contaminants even in new, sealed oil drums. Therefore it is a good rule to leave the last 5-6 cm oil in the drum.

It is necessary to have spare amount of oil for topping up oil tank after pumps start and oil is pumped to the system pipelines. Volume of the system pipes can be up to 20% of the oil tank volume. Spare oil is also used for compensating loss of oil during trouble shouting / servicing of hydraulic system.

Title: Winch Alignment		Date: 06.11.2018	Doc. Id: 6440	Version: 6
Author: Tobias Schaer	Approver: Ben Bolsøy			Page: 1 (11)
Doc. Applies to: Rapp Marine		Department: Engineering & Technology		

1. Introduction & FAQ

The information contained in this procedure is to allow installing personnel to correctly align Rapp Marine winches that have a WDU-style gearbox. This is typically present for multi-motor winches, both electrical and hydraulic.

There are two parts to the procedure: winch alignment (also known as "clocking") and contact pattern test (also called "blueprint test"). Three check forms are provided, one each for Winch Alignment, Foundation Deflection, and Maintenance.

Note: The blueprint test must only be repeated if no factory test data is available.

1.1. What is a WDU?

A WDU is a *Winch Drive Unit* and is a large gearbox mounted to the drum shaft of some Rapp winches. Onto this gearbox, hydraulic motors may be mounted directly, or electric motors are mounted via angle gearboxes.

1.2. What are gearbox runouts?

When a WDU is manufactured, the gears inside must be aligned so that they do not cause the main output shaft to experience uneven forces, leading to high wear on the gears.

The gearbox *runout numbers* record this alignment from the gearbox manufacturer.

1.3. What's the objective of the procedure?

When installing the winch on the vessel, it must be perfectly aligned on its foundation to avoid wobble and wear. Aligning the winch is done by measuring the actual gearbox runout, and adjusting the winch (using shims and bolts, procedure below) until the factory runouts are achieved.

1.4. Why does gearbox orientation matter?

The gearbox is typically aligned right-side up, and the runout numbers match this orientation. See ***Figure 1*** . But the gearbox may be mounted sideways on a winch (***Figure 2***) – but the original "up" direction must still be used as "up" when doing the winch alignment.

2. Required Equipment & Materials

The following are required for installation:

- Check Form 1 from factory (for reference numbers)
- Blank Check Form 1 to be filled out (included in this document)
- Clocking device
- Gear marking compound (blueprint ink – only needed if factory runouts are not known)
- Spanners for adjustment bolts
- Shims (should be provided)
- Chockfast

Also required is the ability to turn the winch, either manually with brakes free and chain hoist, or with winch in operation.

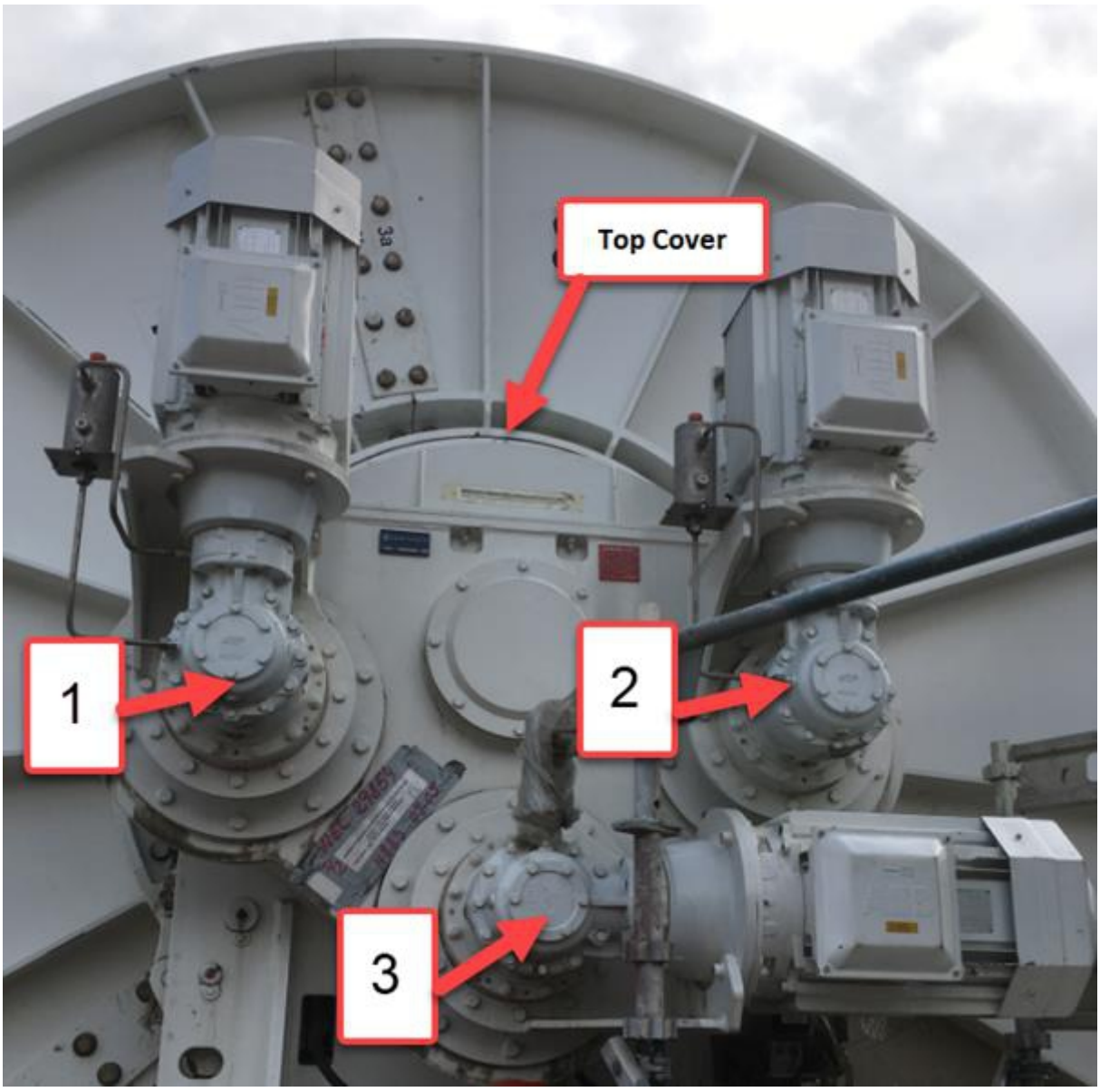


Figure 1: WDU gearbox right side up. Up is where the top cover is.

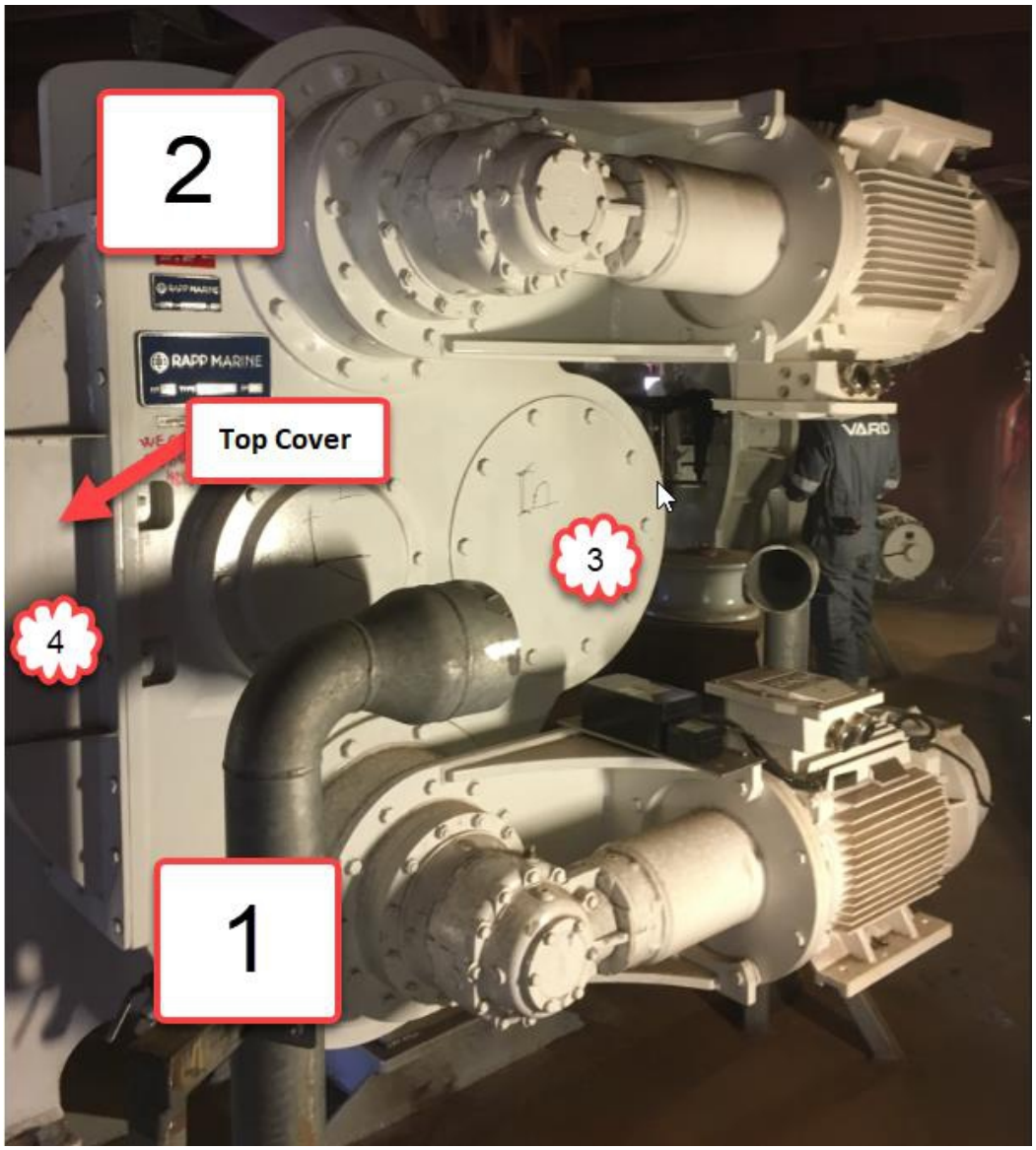


Figure 2: WDU mounted sideways. "Up" direction for clocking is still towards the top cover!

3. Installation Procedure

The following is to be carried out on board the vessel at winch installation time.

1. Deck machinery covered by the Scope of Delivery, Part 1 of Installation Manual, shall be installed on foundations.
2. Strength and quality of foundations shall meet requirements of the Ship Classification Rules.
3. A copy of a filled out *Check Form 1 – Winch Alignment* should be provided with the winch. These are numbers from the factory. Check the winch serial number (a 4-digit code on the winch tag plate) and gearbox serial numbers against ones written in the form. Contact Rapp Marine site personnel or project management if the form has not been provided.

4. Winches shall be installed on foundations in accordance with Figure 3, and follow the installation procedure given below, beginning before the winch is moved on the foundation:

   4.1. Prepare gearbox side: Checks if shims have already been welded under winch feet from gearbox side, otherwise place shims of thickness 20-25 mm on the surfaces of the deck foundation on the gearbox side of the winch, one shim under each frame corner.

   4.2. Prepare bearing side: Fit adjusting bolts on the bearing side of the winch. Adjust bolts to be the same height as shims on gearbox side.

   4.3. Move the winch into position on the deck foundation.

   4.4. Fit the hold-down bolts on both sides of the winch. Tighten gearbox side bolts. At this point the installation of the winch to the vessel, for example hydraulic lines, electrical connections etc. can proceed. It is helpful to the alignment procedure if the winch can rotate under its own power.

   4.5. Mount the clocking device on the winch and check rotation as described in Steps 1.1 to 1.3 of *Check form 1 – Winch alignment*. Adjust the clock so it gives 0mm deflection at the 0 degree position (Up direction for clocking – See "Why does gearbox orientation matter?" above).

   4.6. When gearbox side of the winch frame is fixed, use the adjusting bolts together with hold-down bolts on the non-motor side of the winch to roughly line up winch drum axle position (see Figure 4). From now on all adjustment manipulations are performed on the non-motor side of the winch.

   4.7. Turn the drum to get initial values of the gearbox runouts (clocking values) (4 readings, one each at 0 degrees, 90 degrees, 180 degrees and 270 degrees). Write these down.

   4.8. Make an adjustment based on the drawings in Figure 5 and Figure 6. Turn the drum again to see the new gearbox runouts. Write these down again.

   4.9. Repeat above step until the runout figures match, as close as possible, those achieved at the factory (the filled-in Check Form 1 that came with the winch) *Note: it is important that the factory numbers be matched, and not improved upon.*

   4.10. Once the winch has been aligned, apply chockfast on each bolt position. This typically takes 24 hours to set properly.

   4.11. Fit the hold-down bolts. Tighten the bolts with prescribed tightening torque, shown on dimensional drawing for the winch.

   4.12. Check the drum for easy rotation.

5. Record the final runout figures in *Check Form 1 – Winch Alignment.*

6. Once the winch is in operation and has wire spooled on to it, a deflection test must be performed as per *Check Form 2 – Foundation Deflection.*

7. Forward copies of Check Form 1 and 2 to Rapp Marine, or to Rapp onsite representatives.

,

Signs on winches.





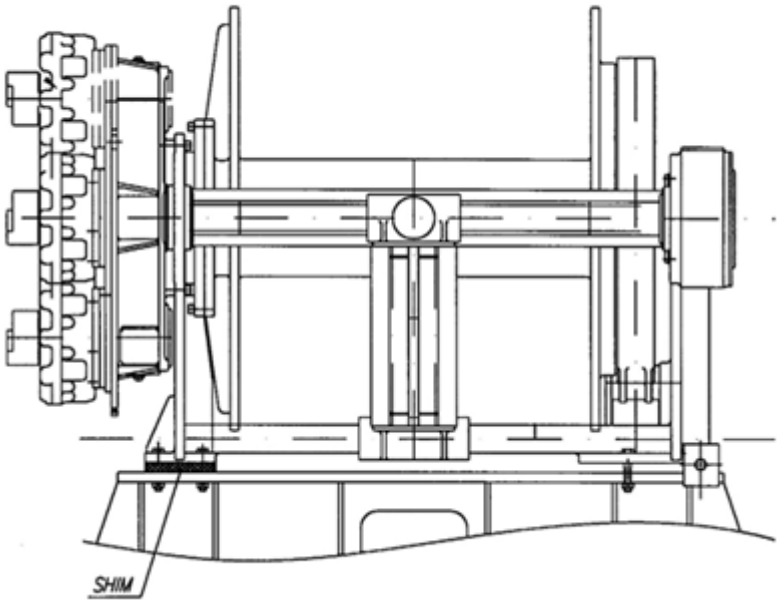


Figure 3: Winch foundation with shims on gearbox side

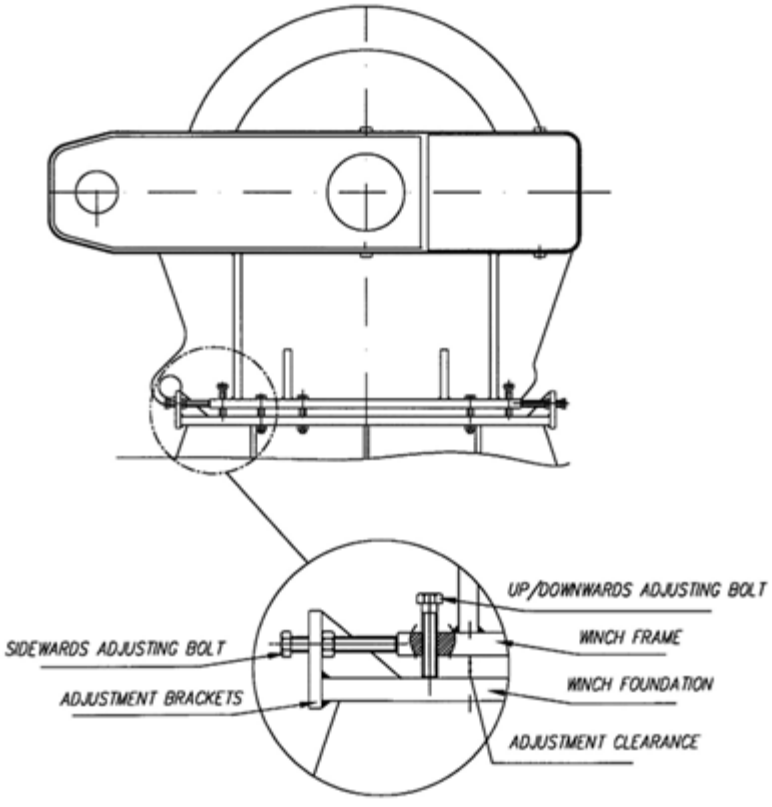


Figure 4: Aligning the winch using adjustment bolts

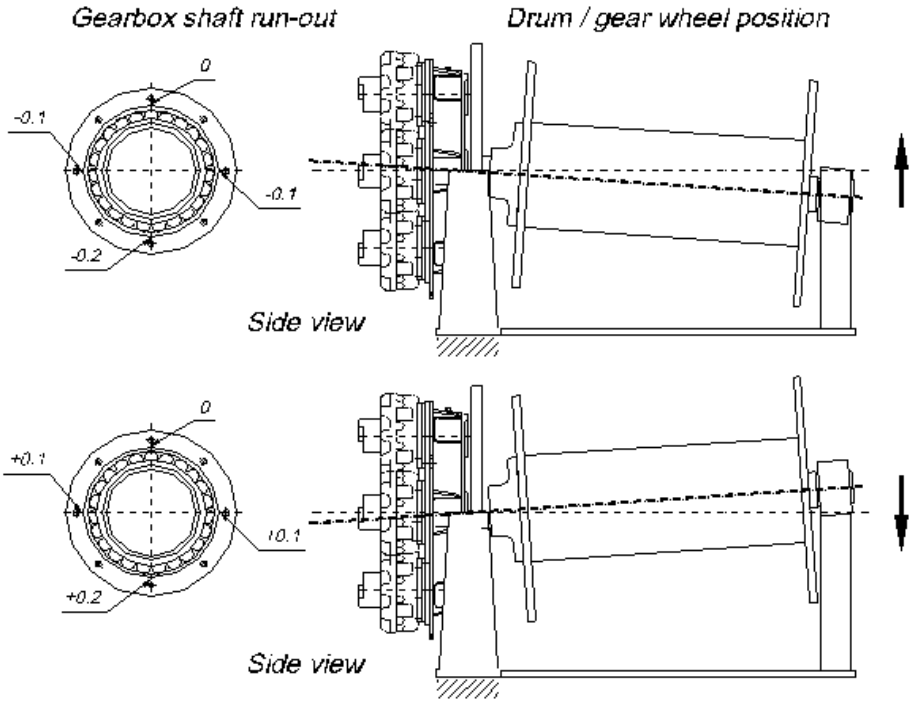


Figure 5: Example runouts (clocking values) due to vertical misalignment

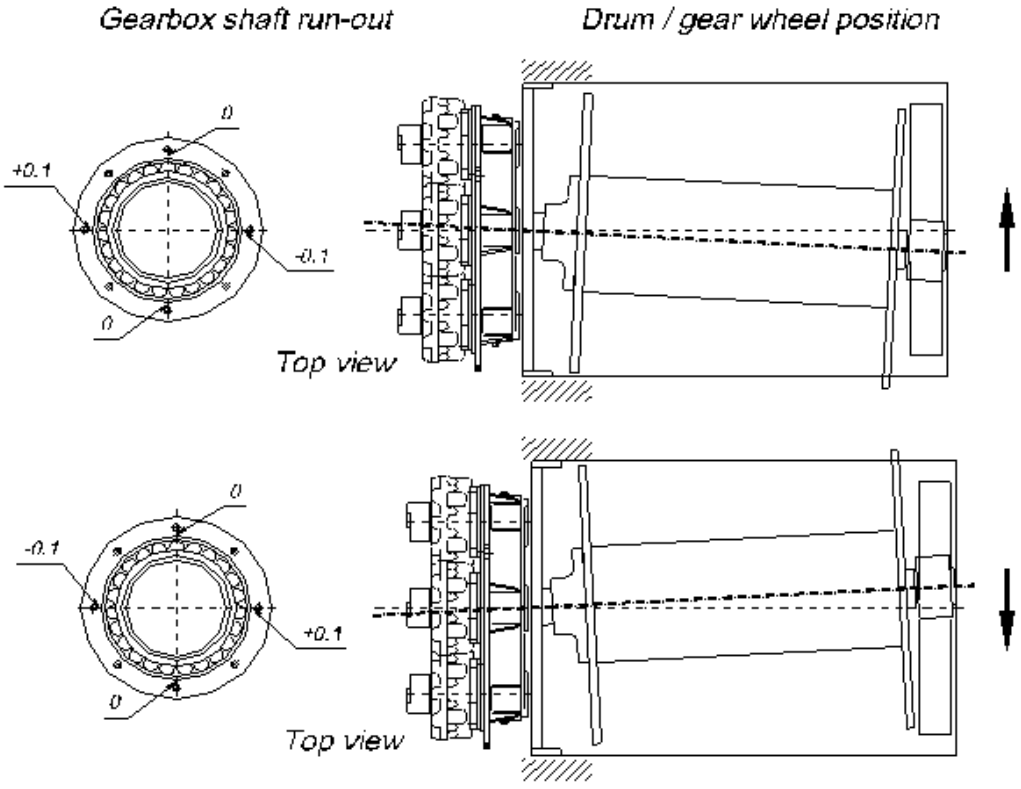


Figure 6: Example runouts (clocking values) due to horizontal misalignment

4. Contact Pattern Test (Blue Print Test)

In case there is a lack of factory original test data for the winch/gearbox, the alignment has to be performed based on visual inspection of contact distribution pattern between each pinion and gear wheel. This procedure is often referred to as a *blue print test*.

The overall winch installation is carried out as described in Section 3. However teeth imprints pattern is used for "navigation" of alignment instead of reference to clock indicator reference figures.

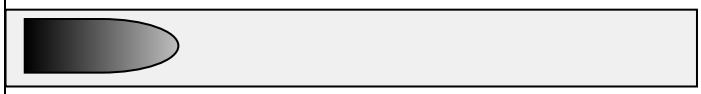
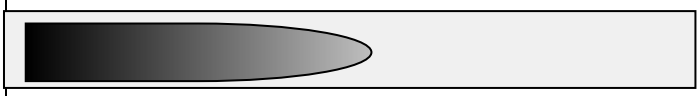
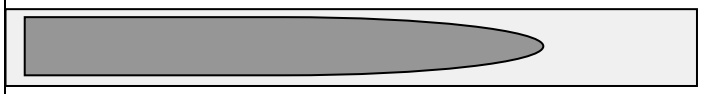
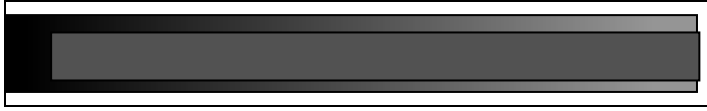
Satisfactory contact distribution pattern is to be in range 80% - 100%, see illustrated reference patterns in *Table 1* below. Each and every tooth on all pinions has to be inspected for proper contact.

For the blue print test, following procedure is suggested:

1. Lubrication oil inside WDU to be drained.
2. Pinion inspection covers to be opened.
3. Pinions and gear wheel teeth rim to be wiped off excess of oil/debris.
4. "Blue paint" to be applied to the teeth of all *pinions* only.
5. Winch to be run with 10-30% load of max pull.
6. Imprint marks on all pinions and gear wheel to be thoroughly inspected and evaluated.

If distribution pattern shows insufficient contact, the winch has to be re-aligned (see Section 3) and re-checked as per steps 3, 4, 5 & 6 above.

Table 1

Contact area after the test	Contact area approx., %
	**10-20**
	**30-40**
	**50-70**
	**80-90**
	**100**

5. CHECK FORM 1 – WINCH ALIGNMENT

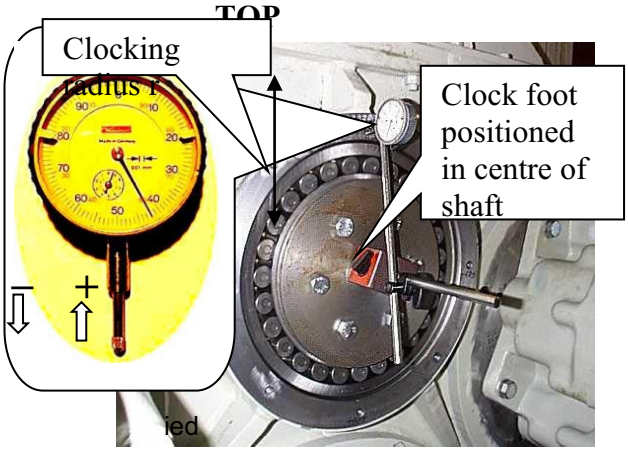


Figure 1: Clocking device setup

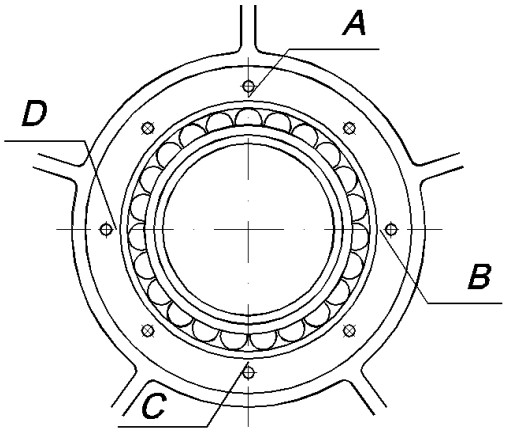


Figure 2: Measurement Points

Alignment of winch during installation

This test applies only for winches with WDU gearboxes.

1. Dismantle gearbox main bearing cover. Keep all parts (cover, spacing ring if present and bolts) together.
2. Mount clock indicator on the gearbox shaft face as shown on Fig.1, and align with Point A. Set clock needle to zero.
3. Rotate the winch drum/gearbox shaft slowly without load. Make a few turns to ensure the clock returns to zero when circle has completed.
4. In *Table 1* below, Test No. 1 is for runout numbers obtained at the factory. If the numbers are not available, they are often found written on the back side of the bearing cover. Copy these into Test No. 1
5. Perform the winch alignment as in Section 3, Step 4. Record in *Table 1* below, in the entry for Test No. 2 data measured in mm during the test. Specify only results obtained in points A, B, C and D Fig.2. **Important:** *while clocking watch the sign of deviation (+) or (-)! The sign has to be mentioned in Table 1.*
6. Try to achieve results as close as possible to the factory figures. **Deviation from these figures should not exceed +/- 0,03mm** at each of check points – B, C & D.
7. When field alignment is completed, send a copy of the completed form to Rapp Marine AS

Winch Data

Winch model	Winch ID No.	Gearbox ID No.	Vessel name (project No.)	HA No.

Table 1: Test Data

No.	Type	Measurements, mm (+) or (-)				Date	Tested by
		A	*B*	*C*	*D*		
1	Dynamic, unloaded. (**Factory**)	***0.00***					
2	Dynamic, unloaded. (**Shipyard**)	***0.00***					

6. CHECK FORM 2 – FOUNDATION DEFLECTION

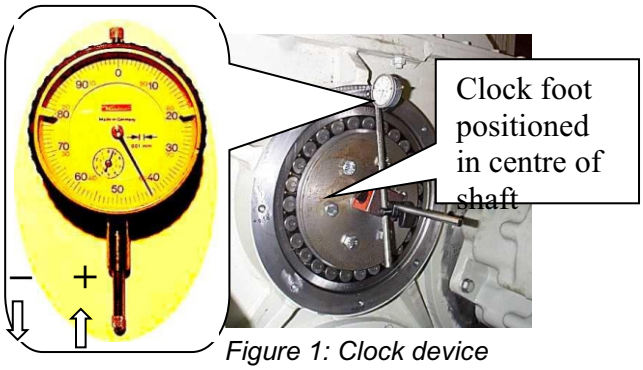


Figure 1: Clock device

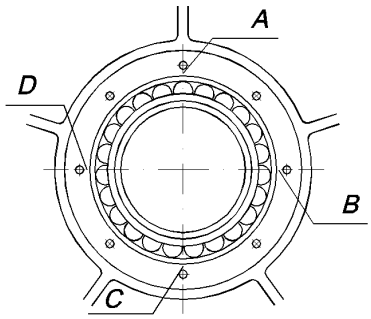


Figure 2: Measurement Points

Deflection test at shipyard

In addition to alignment of winch (Check Form 1), the shipyard performs a foundation deflection test to estimate winch drum, frame and deck foundation deflection under the maximum load.

1. Dismantle gearbox main bearing cover. Keep all parts (cover, spacing ring if present and bolts) together.
2. Load is to be applied with the wire in two different positions, one at each end of the drum.
3. Load, winding type and traction diameter is logged in *Table 1* during the test. (Max. allowed distortion/deflection of the winch main shaft is **as per listed in drawing RH315495**.)
4. Axial movement of bearing house to be eliminated by using a thrust disc or equal to eliminate original clearance in the gearbox (internal clearance in bearing is still to be intact).
    a. Pre-load the winch with 10% of nominal winch pull, or 2 ton minimum.
    b. Set two clock indicators on the gearbox shaft in position A and B, adjust clock radius(r) as suggested in table below and set indicator scale for 0.
5. Measure net movement in position A and B when increasing winch pull to maximum nominal pull. Result to be logged in *Table 2* during the test. Calculate gearbox shaft movements as square root of sum $A^2 + B^2$.

Clock indicator radius to be used as following figures:

WDU2500/4500 (**r** 137 mm)	WDU7501/10000(**r** 164mm)	WDU20000/26000(**r** 195mm)

Winch Data

Winch model	Winch ID No.	Gearbox ID No.	Vessel name (project No.)	HA No.

Table 1: Load conditions

Wire position on the drum		Load, ton	Winding, over / under	Traction diameter, mm
a)	Close to the gearbox side			
b)	Close to bearing side			

Table 2: Winch Deflection Under Load

TYPE of TEST		A	B	C	D	Date	Tested by
Static load. **Shipyard**	a)	Δ	Δ	-x-	-x-		
	b)	Δ	Δ	-x-	-x-		

7. CHECK FORM 3 – MAINTENANCE-/REPAIR WORK

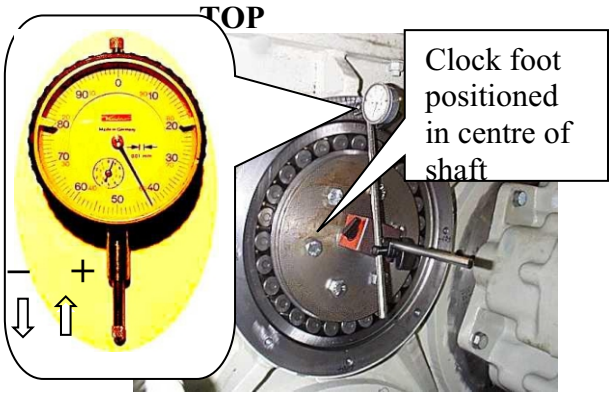


Figure 1: Clock device setup

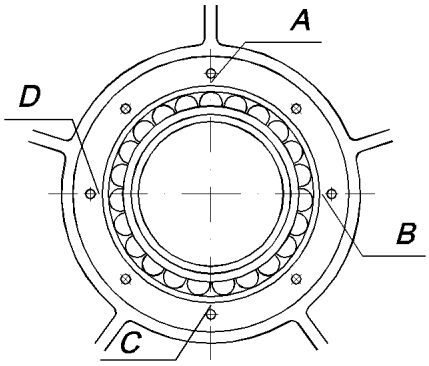


Figure 2: Measurement Points

Maintenance on board vessel.

In case of maintenance-/repair work of any kind that may influence on foundation alignment or strength, or repairs to the gearbox, the unloaded alignment and foundation deflection must both be rechecked.

1. Repeat the alignment check as in Check Form 1, and make any adjustments necessary to return the runout numbers to what was obtained at the factory. Copy the original numbers into *Table 1* below (Test 1/**Factory**) and fill in the new numbers (Test 2/**Field**) when alignment is complete.
2. Repeat the deflection test as in Check Form 2, noting down the load condition in *Table 2*, and the deflection values in *Table 3*

Winch Data

Winch model	Winch ID No.	Gearbox ID No.	Vessel name (project No.)	HA No.

Table 1: Winch alignment

Nr./TYPE of TEST		Measurements, mm (+) or (-)				Date	Tested by
		A	B	C	D		
1	Dynamic, unloaded. (**Factory**)	***0.00***					Fill in from Check Form 1
2	Dynamic, unloaded. **(Field)**	***0.00***					

Table 2: Load conditions

Wire position on the drum		Load, ton	Winding, over / under	Traction diameter, mm
a)	Close to the gearbox side			
b)	Close to bearing side			

Table 3: Winch Deflection Under Load

TYPE of TEST			Measurements, mm (+) or (-)				Date	Tested by
			A	B	C	D		
1	Static load. (**Shipyard**)	a)	Δ	Δ	-x-	-x-		
		b)	Δ	Δ	-x-	-x-		

Title:		Date:	Doc.Id:	Version:
Guidance for wire spooling		01.09.2021	1389	10
Author:	Approver:			Page:
Christian Saue	Mads Bergdal			1 (22)
Doc.Applies to:		Department		
MacGregor Bodø		Engineering & Technology		

Purpose:

The purpose with this procedure is to describe and Quality secure wire spooling process.

Scope:

The procedure goes for everybody who do wire spooling operations on behalf of Rapp Marine..

Responisibillity:

Quality – HSE Manager are formally responsible for this routine and must ensure that it is updated. Persons managing or involved in work covered by the procedure are responsible for taking note of and observing its contents, pointing out faults and coming up with proposals for changes/improvements.

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   1.3 “Breaking in” The Wire Rope 4

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General Information

This guide contains instructions and guidelines for wire spooling on to a plain (smooth) drum as well as a drum fitted with a bolt on Lebus sleeve. The purpose of these instructions and guidelines is to ensure successful spooling and to enhance the service life of the wire rope.

1. The Wire rope

1.1 Measuring the Wire Rope

Before installation it is of the utmost importance to check the diameter of the delivered rope. Make sure that the rope diameter meets the specified requirements for the given machine or equipment.

Should the rope diameter be undersized, the stresses experienced by the rope will be higher than what it was designed for, resulting in an increased probability of breaking the rope. Should the rope diameter be oversized, pinching in the grooves of the sheave and drum will cause the rope to wear out prematurely.

1.2 How to Measure the Size of a Wire Rope

The size of a wire rope is the diameter or circumference of a circumscribed circle which will enclose all the strands. Measurements are to be taken three places along the length of the wire rope, at least 5 feet apart. The diameter of the rope is equal to the average of the three measurements.

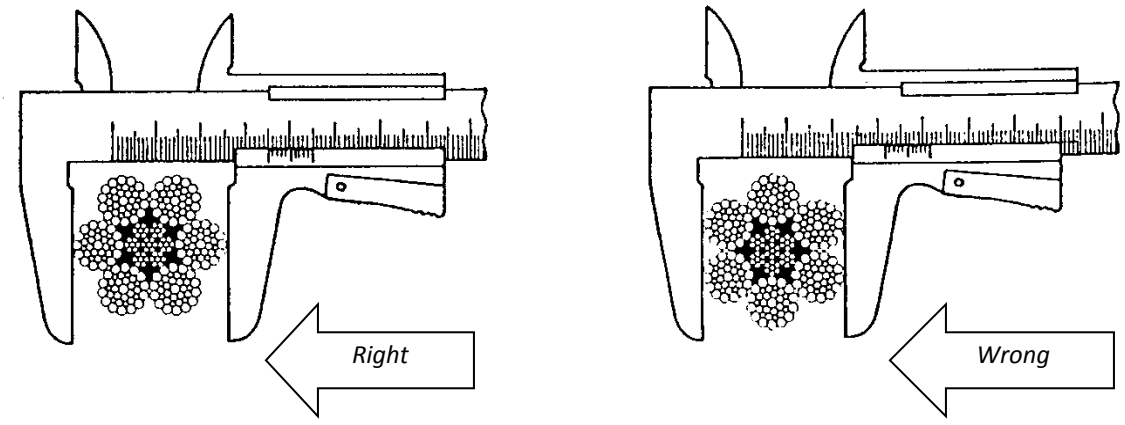


Fig. 1

Tolerances:
See wire-rope suppliers catalog for tolerances.
Tolerances according to NS 5200, ISO 2408 and API 9A.

1.3 “Breaking in” The Wire Rope

After installing a new wire rope it is recommended to do several run-throughs with low tension and low speed. This will gradually “break in” the wire rope, making it settle and adjust to the operating conditions. This process will make the strands fit the permanent “grooves”. There will be a certain change in length, and the wire rope diameter will be slightly reduced as the strands and wire core are compacted. Breaking in the wire rope will make it more resistant against damage when maximum load is applied. The cost associated with the time spent on “breaking in” the rope is considered a good investment as it will save the cost of the rope several times over in repairs and downtime.

2. Handling the wire rope

2.1 Unreeling and Uncoiling

Wire rope is shipped in cut lengths, either in coils or on reels. Great care should be taken when the rope is unpacked as it can be permanently damaged by improper unreeling or uncoiling. Looping the rope over the head of the reel or pulling the rope off a coil while it is lying on the ground, will create loops in the line. Pulling on a loop will, at the very least, produce imbalance in the rope and may result in open or closed kinks. A light coil of rope may be unrolled along the ground but should always be kept under control. A reel may be placed on a turntable, or mounted on stands and supported by a bar or tube through the hole in its center.

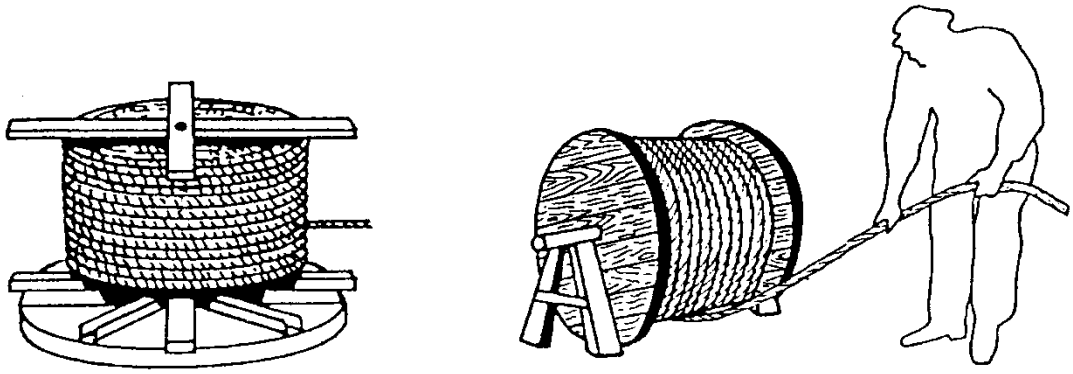


Fig.2

2.2 Winding onto Drum or Reel

When winding a rope onto a machine drum or onto another reel, make sure that it bends in the same direction. Re-reel from the top of one reel to the top of another, or from the bottom of one reel to the bottom of another. Follow the same procedure when winding onto machine drums. It is also necessary to apply a tensioning load to the rope to achieve good spooling. A simple brake such as a plank, rigged to rub against the reel flanges will provide ample rope tension throughout the winding.

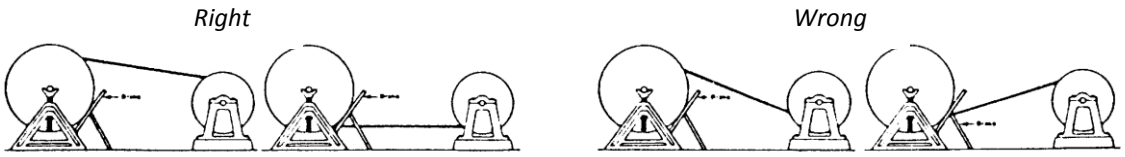


Fig. 3

WARNING **Using wire rope that has been spliced, wire rope with wire marks connected to it (e.g. fire rope) or 3-part wire rope will make it impossible to obtain optimal spooling.**

3. Installation of Wire Rope

3.1 Drums – Plain (Smooth)

Installation of wire rope onto a plain (smooth) faced drum requires a great deal of care. The starting position should be at the drum end so that each turn of the rope will wind tightly against the preceding turn (see figure).

Close supervision should be maintained during the installation to ensure that:

1. The rope is properly attached to the drum.
2. Appropriate tension on the rope is maintained as it is wound on to the drum.
3. Each turn is guided as close to the preceding turn as possible, so that there are no gaps between turns.
4. There are at least three dead turns on the drum when the rope is fully unwound during normal operating cycles.

Loose and uneven windings on a plain (smooth) faced drum can, and usually will, create excessive wear, crushing and distortion of the rope. Resulting in decreased operating performance and a reduction in the rope's effective strength

For right-hand lay rope, use right hand.

For left-hand lay rope, use left hand.

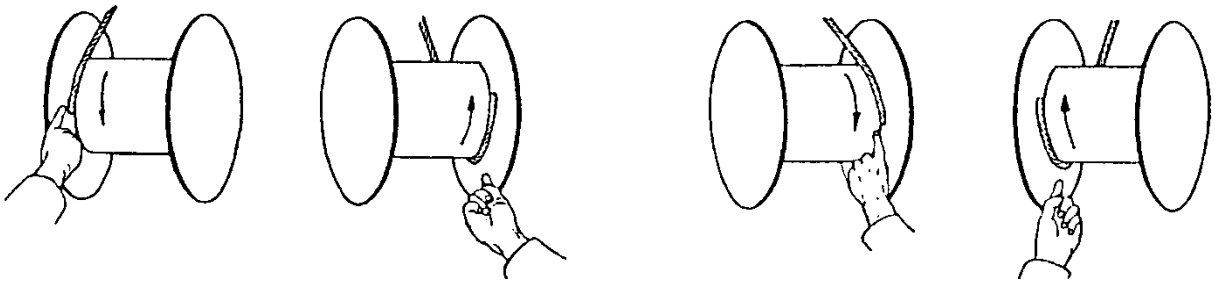


Fig. 4

3.2 Drums – Bolt on Lebus sleeve

Spooling on to a drum with a bolt on Lebus sleeve should be more or less automatic due to its fixed pattern. However, close supervision should be maintained during the installation to ensure that:

1. The wire rope is properly attached to the drum (strung up and anchored in the rope clamps on the flange).
2. Appropriate tension on the rope is maintained as it is wound onto the drum.
3. Every winding spools tightly into its designated groove. A mallet can be used to tap the windings tightly into the grooves.
4. When the wire rope rises from one layer to the next, the wire rope crosses half a winding after half a revolution of the drum in order to maintain the pyramid pattern.
5. There are at least three dead turns on the drum when the rope is fully unwound during normal operating cycles.

Even though correct spooling is achieved, the first layer will eventually lose some of its pretension and become slack. When this occurs, the first layer has to be re-spooled to prevent the tensioned top layers from crushing the bottom layers. This has to be done in intervals throughout the lifetime of the wire rope.

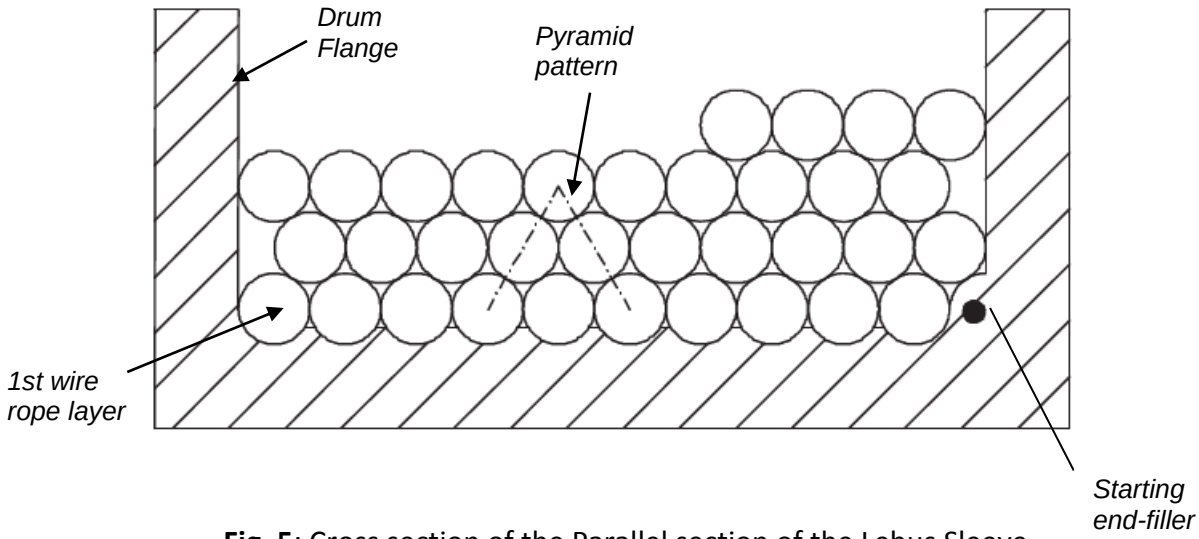


Fig. 5: Cross section of the Parallel section of the Lebus Sleeve.

3.3 Fleet Angle

The fleet angle is the included angle between the rope running to or from the extreme left or right of the drum and a line drawn from the center of the sheave normal to the axis of the drum. When determining the fleet angle for grooved drums, the pitch angle of the helical groove should also be taken into account. If the fleet angle is larger than the recommended limits, the rope may rub badly against the flanges of the grove in the sheave or be subjected to crushing and abrasion of the drum. Too small a fleet angle will cause the rope to pile up against the flange head – damaging both rope and equipment. Severe scuffing of the grooved drums can be the result when the rope wears against the groove walls. This action also bruises and crushes the rope. The appropriate fleet angle will reduce the possibility of damaging the wire rope.

3.3.1 Winch without Level Winding Device

The fleet angle for grooved and smooth drums should lie between 1/4° and 1 1/2°. The distance between the sheave and the drum center line should be 15 to 20 times the length of the drum.

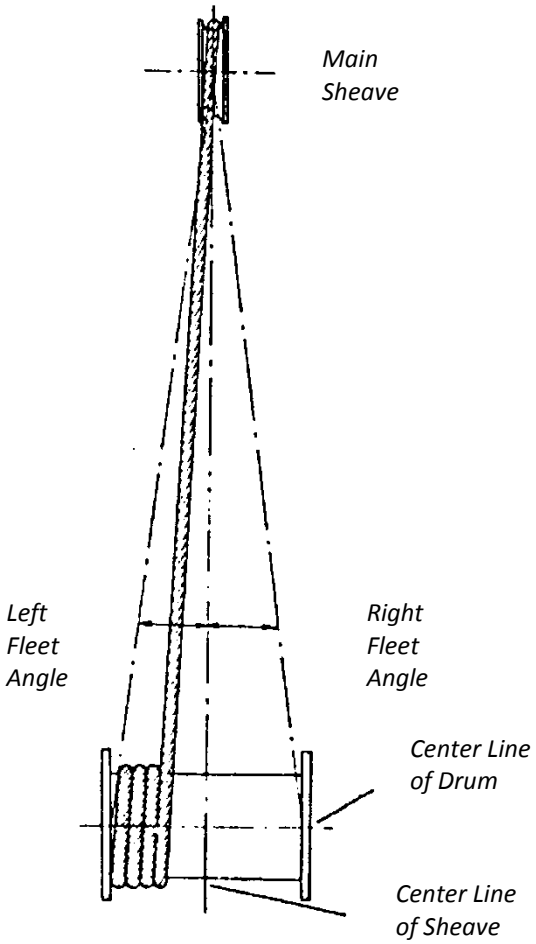


Fig. 6

3.3.2 Winch with Level Winding Device

The maximum fleet angle (**φ**) for grooved and smooth drums with a level winding device is 6°. For winches with a level winding device the drum fleet angle (Lebus fleet angle) must also be considered. The drum fleet angle is the included angle between the wire rope running from the level wind to the drum and a line drawn from the level wind normal to the axis of the drum; see ***α*** in the figure below. The drum fleet angle should lie between ½ ˚ and 1 ½ ˚.

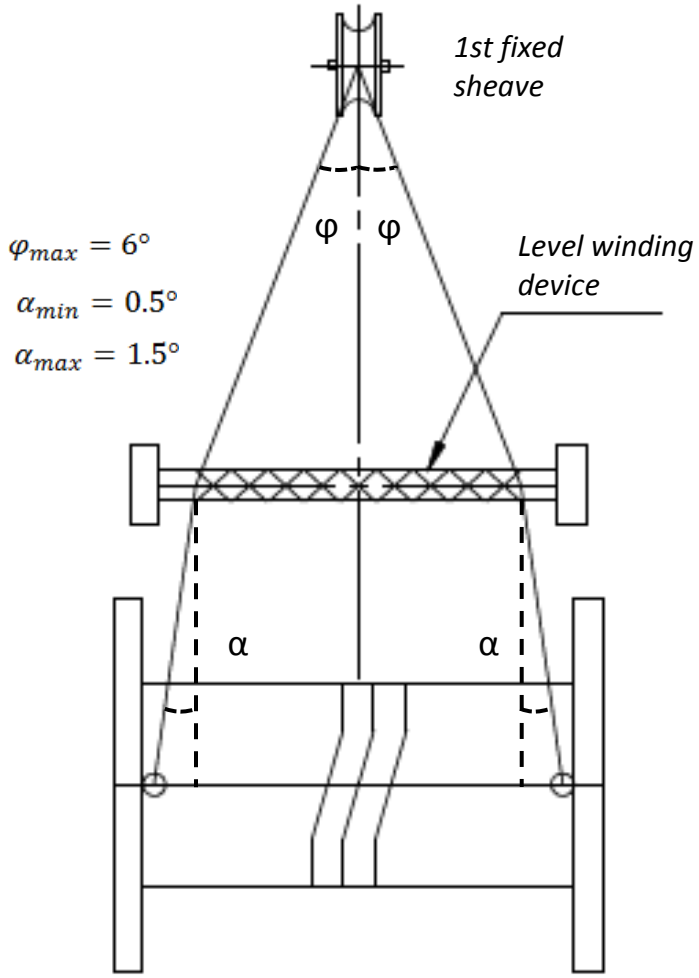


Fig. 7

4. Important Considerations

4.1 Drum (Plain, smooth surface.)

4.1.1 Drum flanges

Check that drum flanges are parallel.

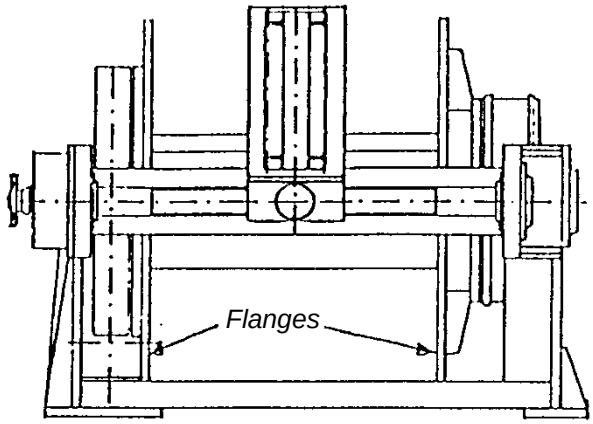


Fig. 8

4.1.2 Level Wind Carriage Position

Check that distance X between the flange and guide roller B is equal to the Y-distance between the opposite flange and guide roller A. Distance X and Y have to be equal for the level wind carriage to operate symmetrically relative to the radial center of the drum.

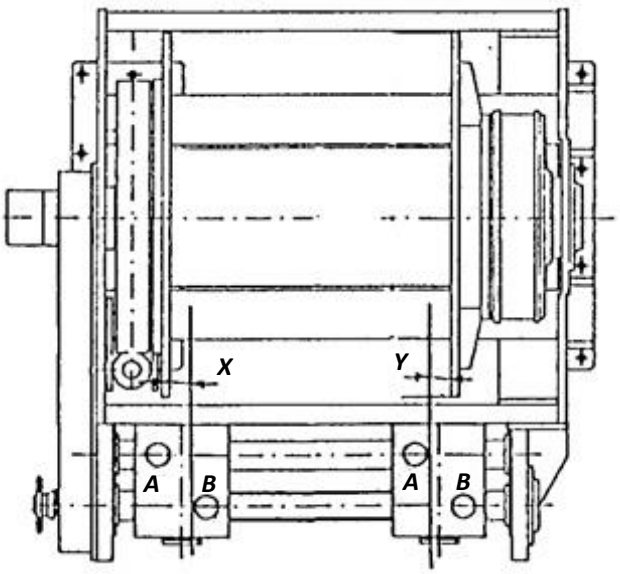


Fig. 9

4.1.3 Roller Distance

Check that the distance between the rollers is equal to the wire diameter + 1 to 2 mm*. The roller distance is measured in parallel, perpendicular to the drum center. See **Fig. 10**

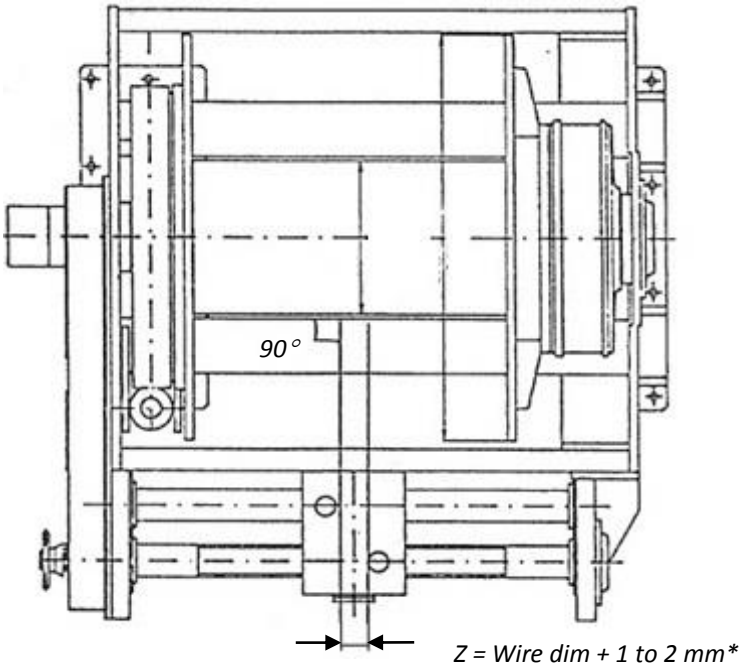


Fig. 10

***For smaller wire rope diameters 1 mm is sufficient, for larger wire rope diameters (greater than 25 mm) use 2 mm clearance.**

4.1.4 Roller Angle

Check that the vertical angle of the guide rollers relative to the drum is 90°.

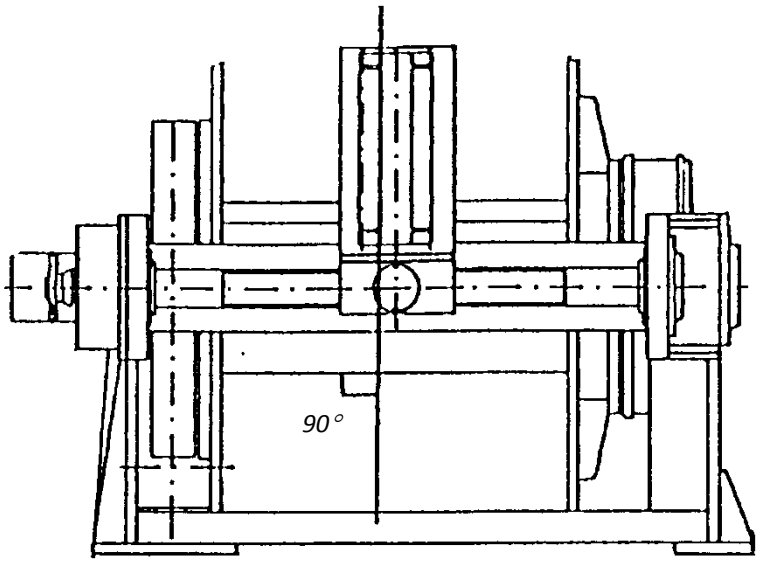


Fig. 11

4.1.5 Arc Radius

The radius of the arc between the drum core and the drum flange (R_t) has to be smaller or equal to the radius of the wire rope (R_w). It must be possible for the wire rope to fill the radius (R_t) from the very first layer.

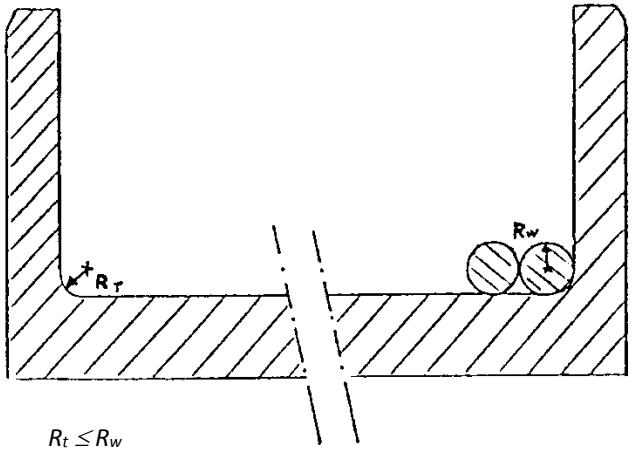


Fig. 12

4.2 Drum with bolt on Lebus sleeve

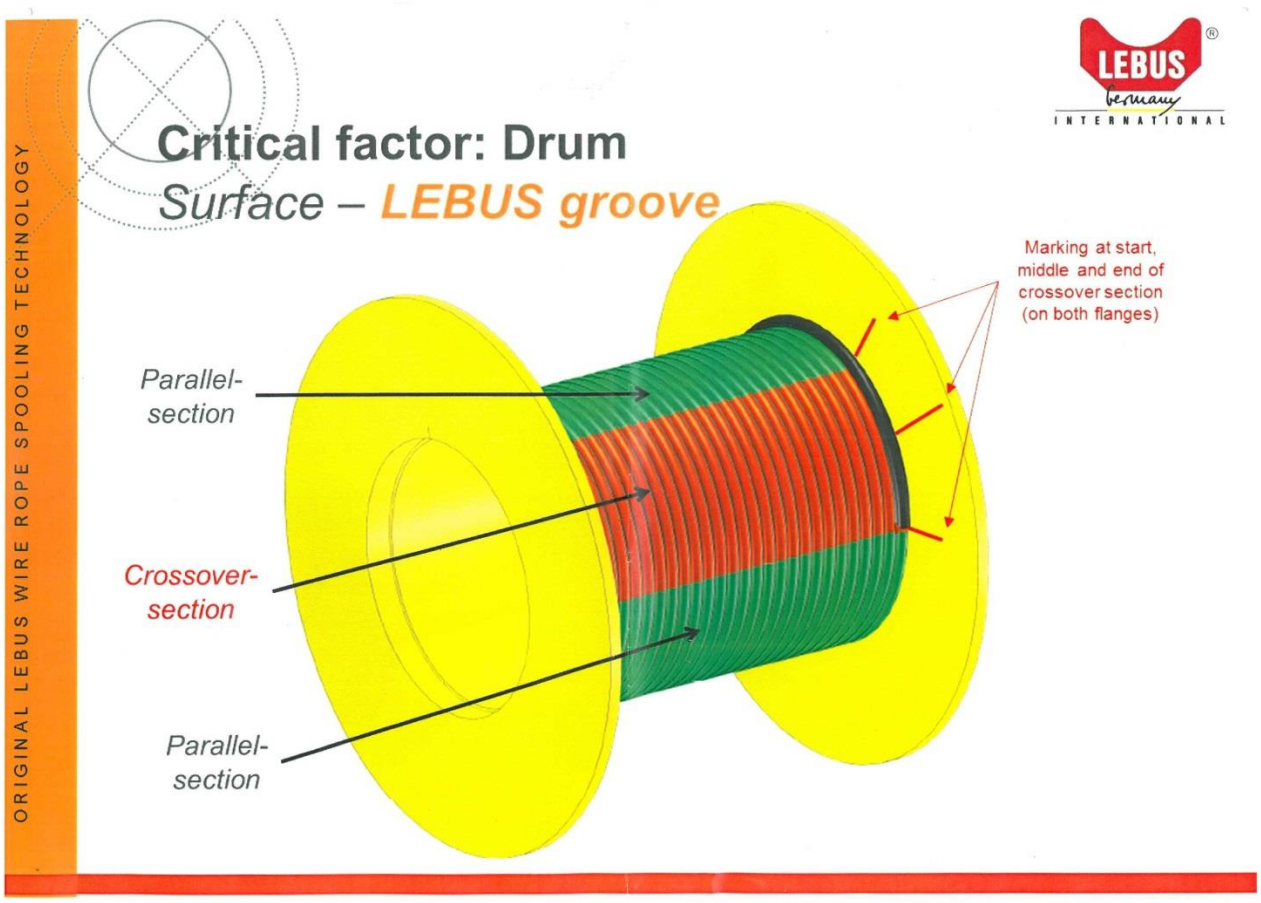


Fig. 13: Shows the different sections of a Lebus sleeve.

WARNING **As the wire rope is spooled onto the drum it can be hard to keep track of where the crossover section starts and ends. Therefore, it is strongly recommended to mark both flanges with the start, middle and end of the crossover section (as seen in Fig.13).**

When spooling on to a drum with a Lebus sleeve some considerations have to be made. Section 4.1.1 – 4.1.4 also apply to spooling with Lebus.

4.1.1 Drum flanges
4.1.2 Level Wind Carriage Position
4.1.3 Roller Distance
4.1.4 Roller Angle

After these considerations have been conducted, proceed with the following steps:

4.2.1 Gear ratio for spooling

Check that the gear ratio is according to the calculations for the Lebus sleeve and spec.

4.2.2 Lebus Sleeve position

Check that the distance between the Lebus sleeve and the drum flanges is uniform on both sides around the sleeve. Check that the sleeve has the right direction on the drum. This is done by checking the direction signs on the sleeve.

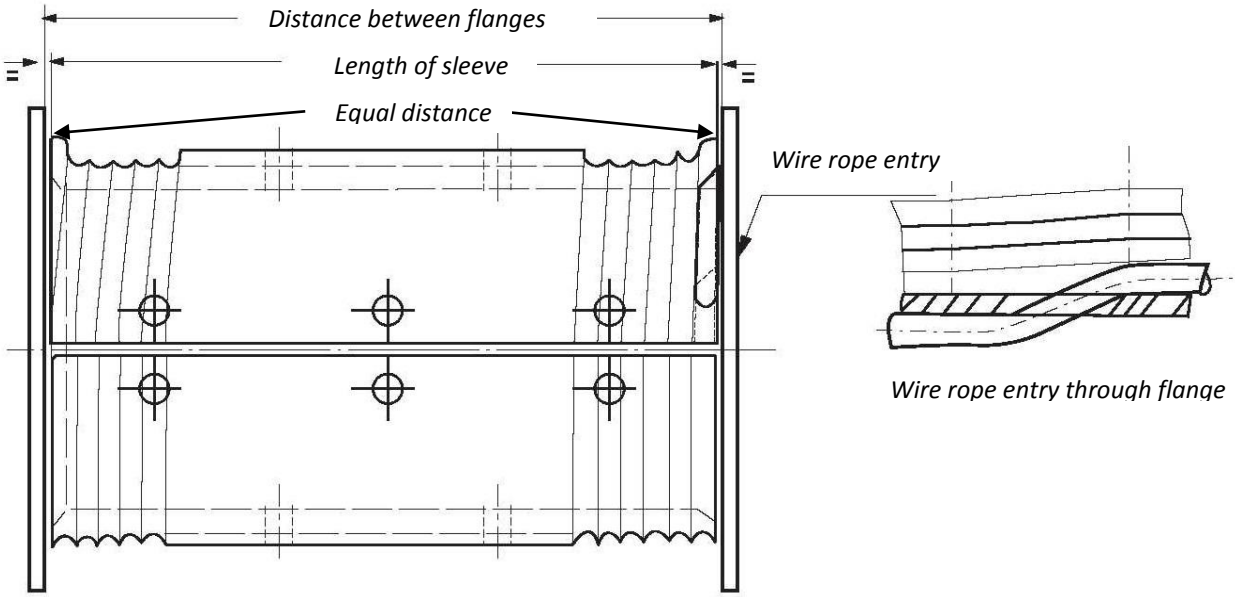


Fig. 14

4.2.3 Lebus sleeve position 2

Check that the Lebus sleeve is positioned so that the crossover area lines up with the cable entrance hole in the drum. This is crucial for achieving perfect spooling with a Lebus sleeve. See points **A** and **B** in the figure below.

WARNING **This is the most important checkpoint. Inaccurate alignment of the cable entrance hole is one of the leading causes for unsuccessful spooling.**

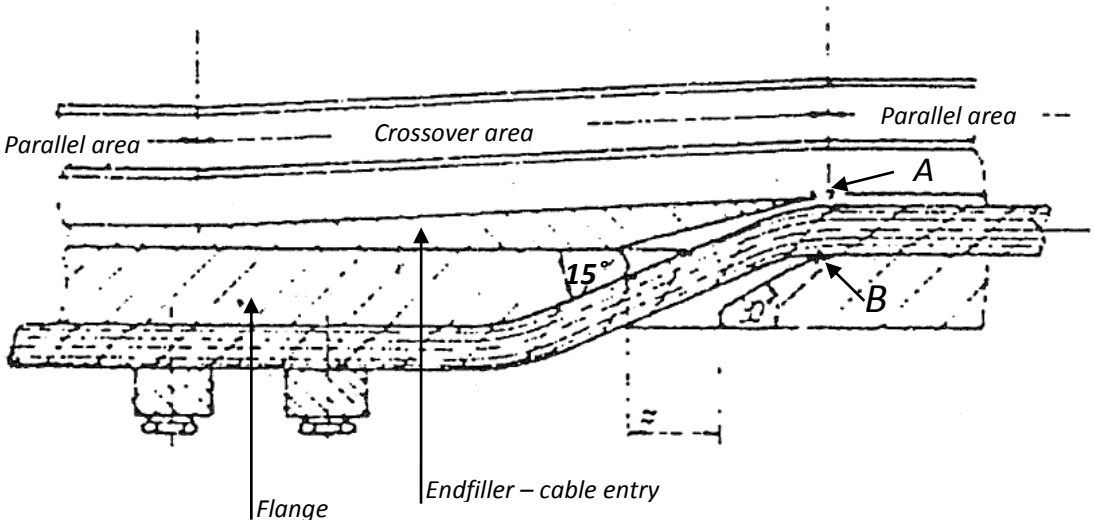


Fig. 15: Illustrates a right hand cable entry, for a left hand cable entry it would be in the opposite direction.

If done correctly, point B on the flange should align perfectly with the boundary line between the crossover - and parallel area (A).

4.2.4 Lebus sleeve position 3

Check that the sleeve grooves on the top sleeve are aligned with the grooves on the bottom half.

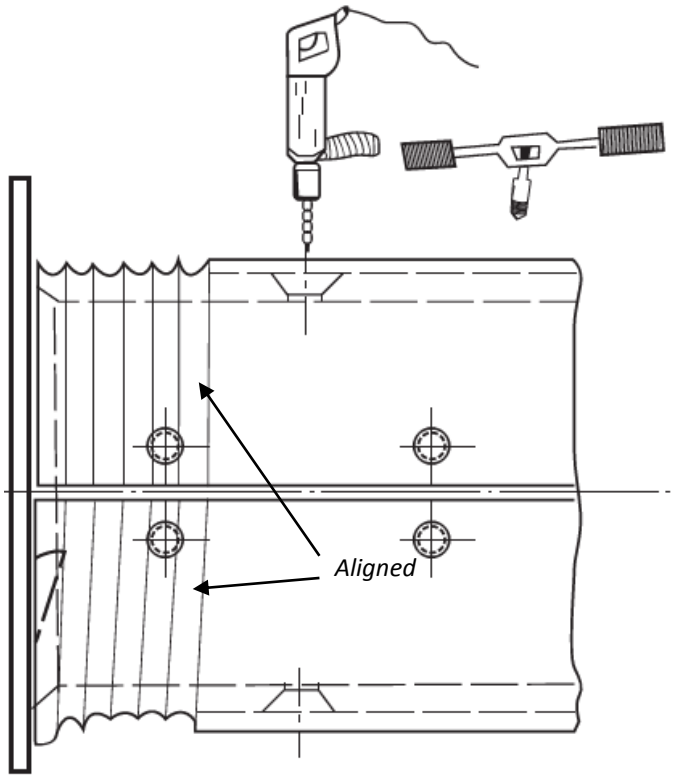


Fig. 16

4.2.5 Lebus sleeve position 4

Check that the gap between the sleeve halves is uniform along the whole length of the sleeve.

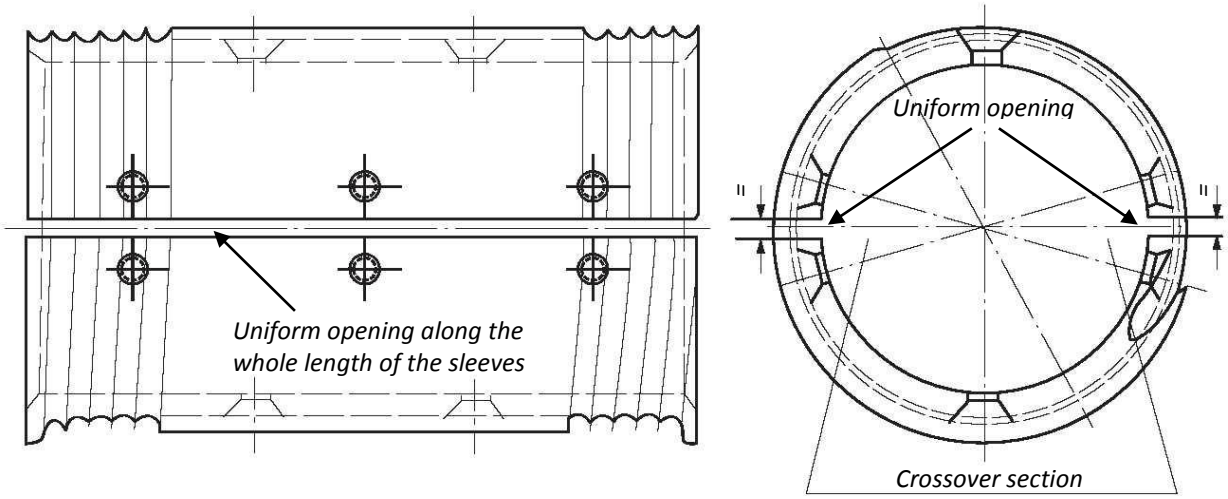


Fig. 17

4.3 Level Wind Carriage Calculations

The movement of the level wind carriage is calculated by RAPP MARINE A/S for the specified wire rope and winch. Should the wire rope be changed to a wire rope with a different diameter, the ratio between the drum- and diamond screw rotation has to be changed.

The amount of windings for the first layer is calculated based on the wire diameter. In order to achieve optimal spooling it is crucial to make sure that the calculations apply to the real conditions. Spooling the first layer correctly is paramount to the end result, seeing as the first layer works as a track for subsequent layers.

Some winches have single ratio, others have double.

The following formulas are to be used for calculation of chain sprockets:

The calculations are based on estimating the number of all-around windings on the 1st layer and the number of full threads or full + ½ thread on the diamond screw.

Number of windings: $$A = \frac{Distance\ between\ Drum\ flanges}{Wire\ Diameter} - 1(approx.)$$

Number of threads $$G = \frac{Length\ thread\ area}{Pitch\ threads}$$

Diamond screw:

Ratio: $$i = \frac{A}{G}$$

Single ratio: $$i = \frac{Z1\ (sprocket\ drum)}{Z2\ (sprocket\ diamond\ screw)}$$

Double ratio: $$i = \frac{Z1*Z3}{Z4*Z2}$$

1st ratio:

2ND ratio.:

Z2=Sprocket intermediate
Z1=Sprocket drum
Z4=Sprocket diamond screw
Z3=Sprocket intermediate

See **Fig.18** next page.

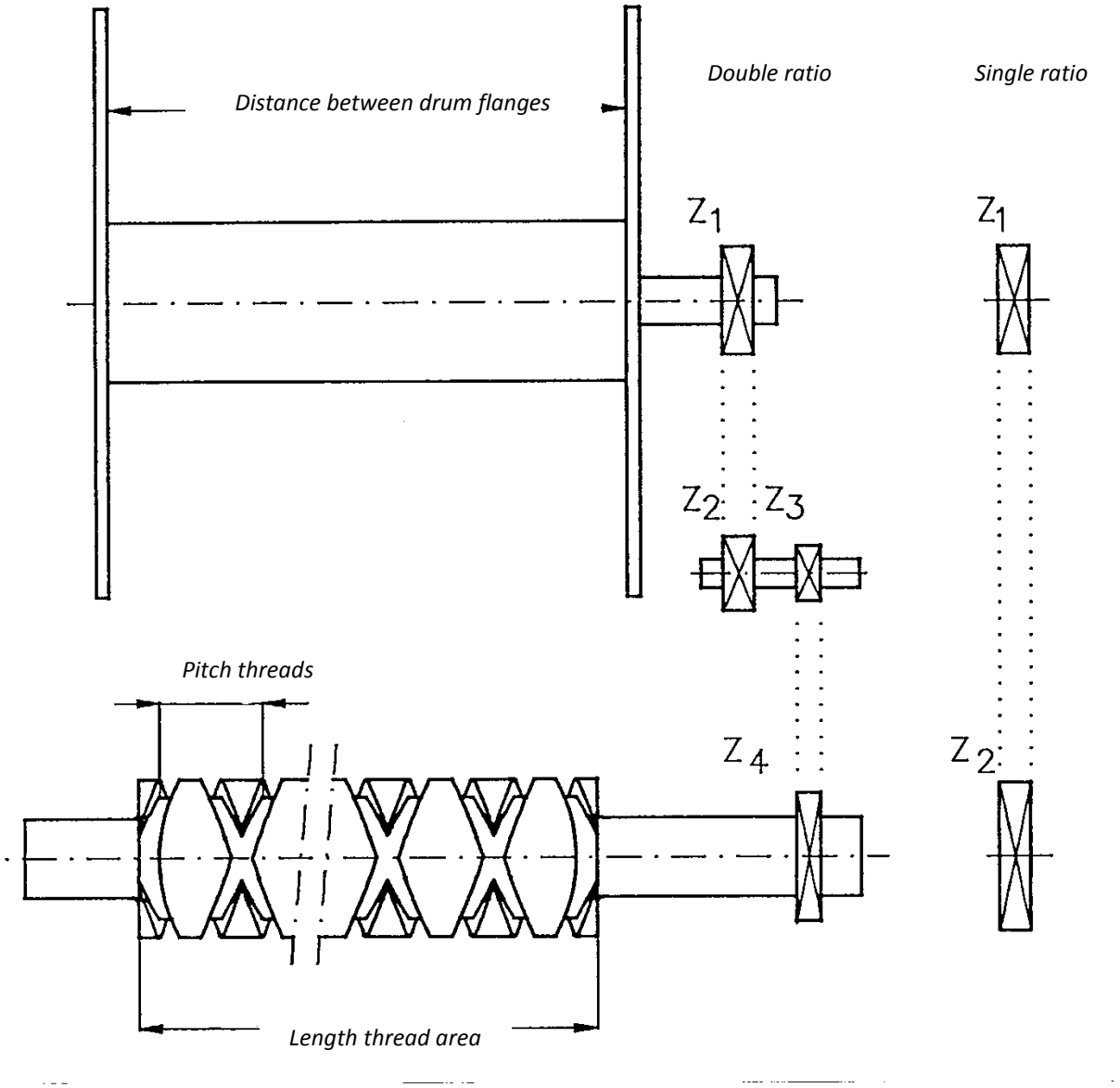

Distance between drum flanges
Double ratio
Single ratio
Z1
Z1
Z2
Z3
Pitch threads
Z4
Z2
Length thread area

Fig. 18

5. Spooling

5.1 The 1st layer

It is important to keep adequate wire tension to prevent the 1st layer from shifting and the upper layers from pulling down into the lower layers; creating nests which can destroy the wire. Preferably, a tensioning device that is self-powered should be used at the dock. This is better than dragging the chain overboard at sea, because you can make timing adjustments on the first layer without the risk of losing the wire. Another reason is that the technician and the crew can take the time to do it right - one less reason for prolonged sea trials.

In general the following tension settings apply:

Single Winches	
When spooling	***Tension***
Wire	~20% of the pull on the winch, or ~50% of the recommended work load on the cable.
Rope	~20% of the pull on the winch (*), or ~50% of the recommended work load on the cable. (*)
Cable (signal cable, umbilical etc.)	~20% of the pull on the winch, or maximum ~50% of the recommended work load on the cable.

(*) Depends on the application + Lebus pitch – rope diameter.

Traction winch system	
When spooling	***Tension***
Wire	~50% - 100% of the pull on the winch storage drum.
Rope	~50% - 100% of the pull on the winch storage drum. (*)
Cable	~50% - 100% of the pull on the winch, or maximum ~50% of the recommended work load on the cable.

(*) Depends on the application + Lebus pitch – rope diameter.

5.2 Before starting

Before starting, the winch should be run until the level wind carriage is in the middle of the diamond screw turn-around and the cable entrance in the drum is located at the top of the drum for overwound spooling, and at the bottom for underwound spooling.

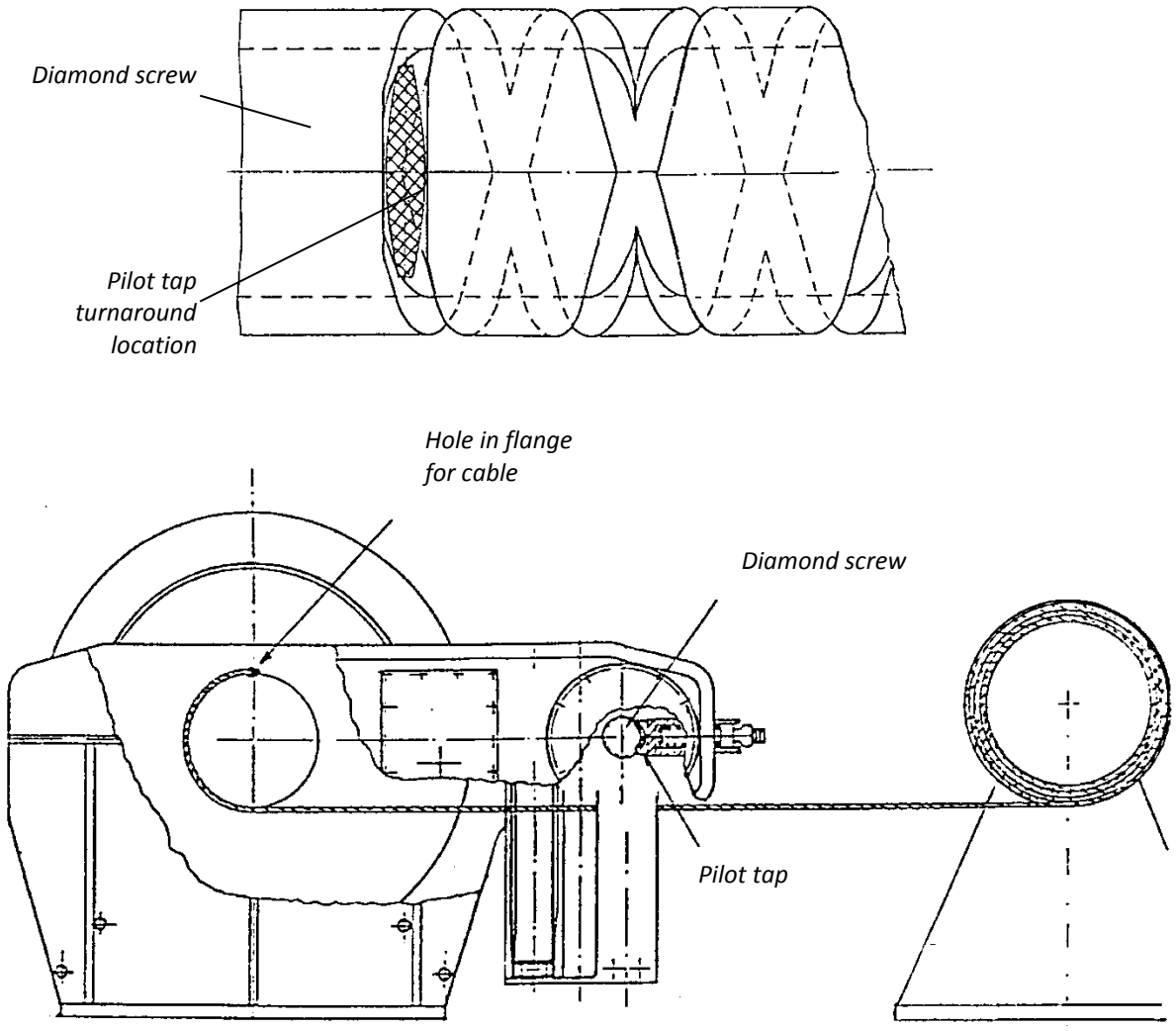


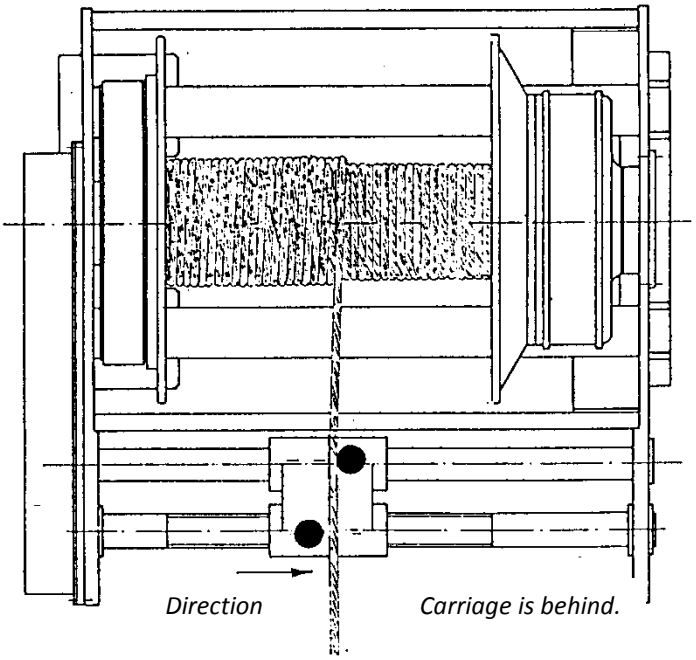
Fig. 19 Details show an underwound set up.

The wire rope may now be hauled in.
If the timing of the level wind carriage is in sync with the position of the wire on the drum after 2 to 3 layers, the spooling is deemed successful.

5.3 Correction Procedure

If the level wind carriage gets ahead of where the cable is wound on to the drum, then there are too many windings on the 1st layer. If the level wind carriage gets behind, then there are too few windings on the 1st layer.

Carriage is behind.
Too few windings on the 1st layer.



Carriage is ahead.
Too many windings on the 1st layer.

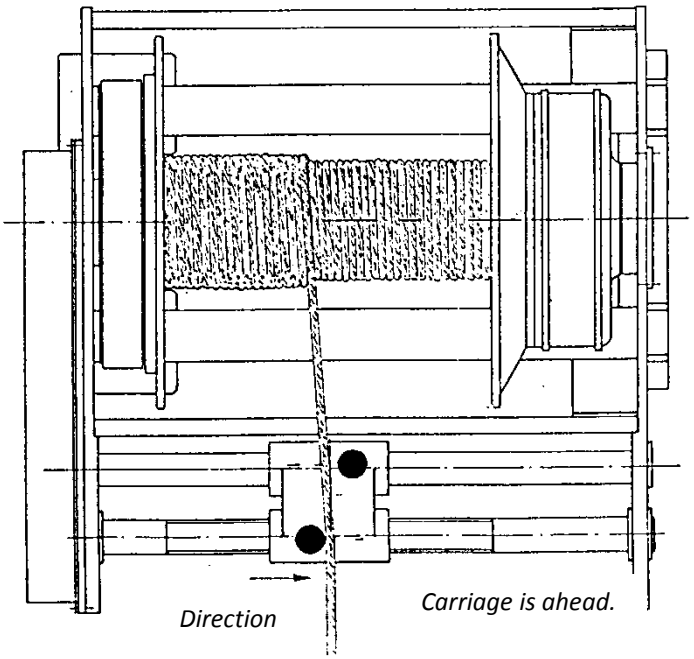


Fig. 20

The easiest way to change the number of windings on the first layer is to go back to the very beginning and change the location of the wire anchor in relation to the pilot tap and diamond screw. This requires disconnecting the level wind drive chain. If the timing is done at sea you must leave about 4 or 5 windings on the drum and make sure the wire anchor is secured. Then you can disconnect the chain and move the carriage ahead or back slightly.

Approved wire spooling: The spooling repeated twice from first layer without adjustments of the wire carriage.

5.4 Final adjustment

Minimum alignment errors can be corrected for smooth drums by retiming the level wind carriage when approximately half (½) of the fishing length remains to be spooled. This requires disconnecting the chain between the drum and the level winds respective sprockets. By doing this correction, the error is minimized by putting half of the error at each extreme of the wire length.

Title: RM Standard for Packing		Date: 12.11.2015	Doc. Id: 5867	Version: 3
Author: Stian Pedersen Lillevik	Approver: Inge H. Andersen			Page: 1 (18)
Doc. Applies to: Rapp Marine		Department: Operations		

1. Introduction

1.1. Purpose of procedure

The purpose of the RM Standard for Packing is to ensure that the goods are safely and securely packed to avoid any damage to the goods or personnel during handling and shipment.

A good standard of packing will prevent cost and schedule consequences during installation, due to substandard packing and subsequently damages to the goods.

The Standard will also help securing that the goods can leave the supplier without undue delay or deviation.

1.2. Extent / Scope

The RM Standard for Packing applies for all products, manufactured by main- or sub-suppliers, which are part of a Rapp Marine delivery.

Departments affected by this standard are:

- Production
- Project Management
- Sales and Marketing
- Purchase and Logistic

The RM standard for packing aim to ensure that packing is done in such a manner that it will maximize the safety and security of personnel during handling and lifting of the goods.

The RM standard for packing will contain the minimum requirements that is needed to maintain the integrity of the goods and avoid damages during handling, transport and storage.

The Packing shall withstand all foreseeable forces, to which the goods may be exposed, during handling, shipment and storage.

Before packing, the goods shall be preserved and protected against high and low temperatures, humidity, wind, dust, debris, sand and liquid during transport to and storage at Customer/Yard. See also Doc. No. 5866 - RM Standard for Preservation.

IMPORTANT: *Additional Customer or Project specific requirements may apply.*

The basic assumption is that the personnel assigned to do the packing are qualified to perform the stated tasks in the procedure.

1.3. Abbreviations

HSE Health Safety and Environment
IATA International Air Transport Association
IMO International Maritime Organization
IPPC International Plant Protective Convention
RM Rapp Marine
SVP Senior Vice President
SWL Safe Working Load

1.4. Reference documents

Doc. No.	Document Title
5866	RM Standard for Preservation

2. Responsibilities

*Operations (Purchase & Logistic) is responsible for the content of this standard, the maintenance and improvement of the same and the implementation in the departments to whom it applies.

It is the responsibility of the Sales and Marketing Department to make the RM standard for Packing known to the Customer and that any additional requirements are included in the contract and the technical specification.

It is the responsibility of the Purchase and Logistic Department to make the RM standard for Packing and any additional requirements known to main- and sub-suppliers and that the requirements are fully understood.

The supplier is responsible for performing preparations for shipment, the physical packing, labelling and handling of goods before shipment.

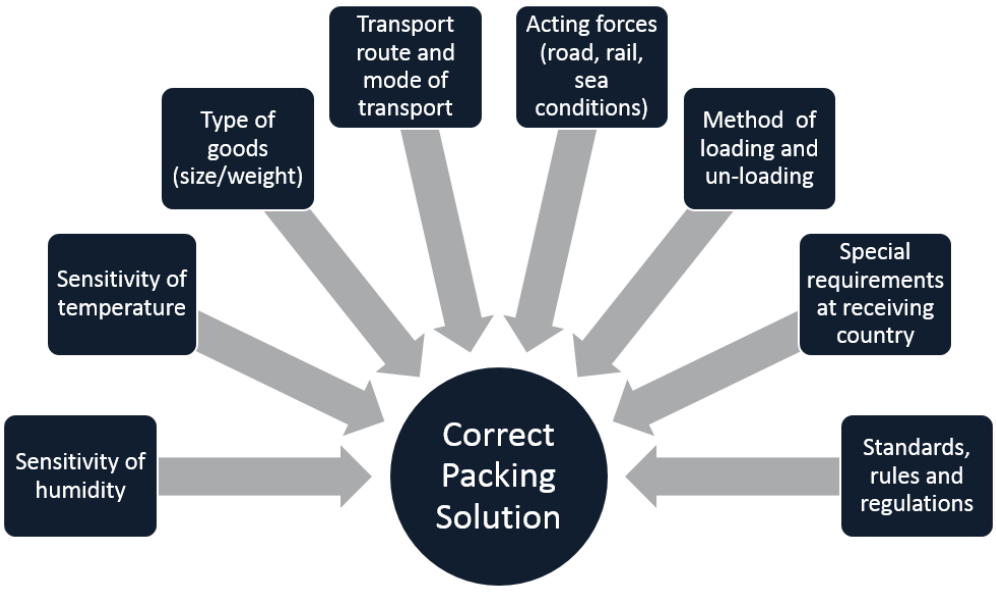
The supplier is responsibility for coordination of shipments of goods from the supplier according to the information provided on the Sales Order.

It is the responsibility of the supplier that the freight manifest and packing lists are correct. The Logistic department distributes other documentation.

Responsibility for loading, please see Section 7 – Handling and Loading, of this presentation.

It is the responsibility of all personnel, for whom this standard applies, to know, perform and act in accordance with the standard and to participate in identifying its weaknesses and proposing improvements.

3. Preparation for packing



First and foremost, transport packing must serve to maintain the integrity of the goods. Protect against damage during handling, transport, storage and maximize safe and secure handling.

The packing solution must be able to meet the national and international standards, rules and regulations for cargo shipment, as well as special requirements in the country of origin and the receiving country.

Control measurements of outer dimensions shall be taken on larger products to ensure that the goods is not “oversize” and will fit into the light-opening of any container.

To avoid oversize loads and to fit the goods into a container, it may be necessary to disassemble parts of the product, e.g. motors, sheaves etc.

The Packing shall be performed in a manner that protect against/absorb unintended shock or impact of forces, of any kind, given by the nature of the road/rail infrastructure or the sea transport conditions, such as heavy seas.

Wave forces and movement during sea transport shall be given special attention and the goods shall be secured against forces in all directions.

The packing solution shall be as individual as the product itself and perfectly match the consistency, size and dimensions of the product.

The Packing shall be robust, easy to handle and take up as little space as possible and take into account the ability to be stacked.

The packing must be versatile enough to facilitate the possibility of multiple stages in transit before the goods reaches its final destination. This includes multiple off-loading, re-loading and possibly storage of the goods

Note that sea transport packing may have to be checked and approved by authorized personnel (Marine Warranty Surveyor) before shipment.

If product requires heating during transport, the shipping documentation shall also include wiring diagram for temporary heating during transport.

*Before packing, it must be taken in considiration the customers requirements. Customer might require special type of packing such as shipping marks, additional protecion agains dust etc.

4. Packing Material / Products

In the following is described the RM Standard packing material and products that shall be used.

WOOD - used for shipping crates, foundations, skids, edge protection, fill etc.

- All wood shall be untreated – no paint, no coating, no waterproofing.
- If especially required wood shall be certified according to government agriculture rules and IPPC.
- Screws shall be used for assembly of crates, foundations, skids etc. DO NOT USE NAILS.

PLYWOOD - used for crates and boxes, covers etc. DO NOT USE CHIPWOOD.

PROFILES - Lightweight metal profiles for protection of edges and corners of crates and boxes.

METAL - may be used for bearings, brackets, foundations etc. Take measures to avoid galvanic corrosion where metal is touching metal.

PLASTIC FILM - min. 0,2mm thickness – Flameproof if required (Cover Guard).

BUBBLE PLASTIC - min. bubble diam. 10mm / bubble height 4mm.

TAPE - self-adhesive type – Make: Sure Tape.

STEEL BAND – used for strapping and securing goods.

PLASTIC WRAPPING - may be used with restrictions and shall not replace steel bands as protection for sideways movements.

FASTENERS - bolts, washers and nuts shall to be of same material grade as used on the goods being secured.

FILL MATERIAL - only use wood, corrugated cardboard, paper or bubble plastic.

IMPORTANT: *Be aware that special requirements for the recipient country may apply.*

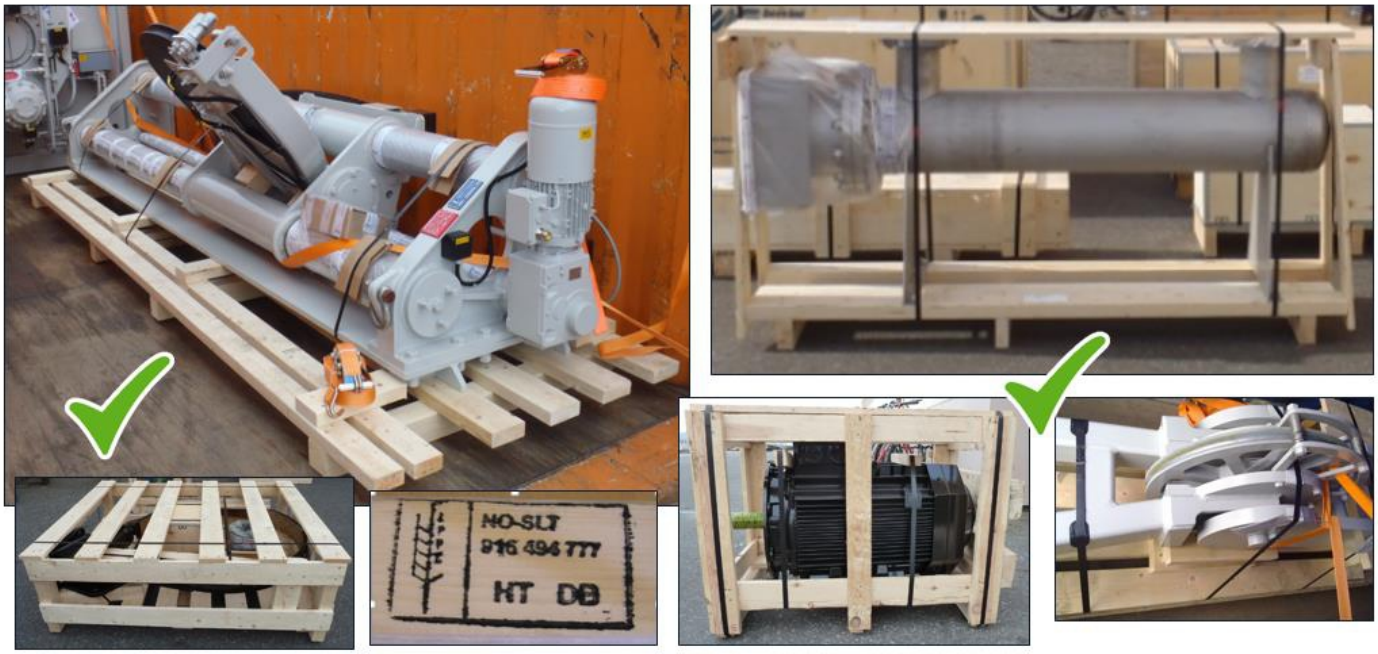
5. Packing

The packing solution shall be as individual as the product itself and perfectly match the consistency, size and dimensions of the product.

The Packing shall be robust and able to withstand impact forces during handling and shipping.

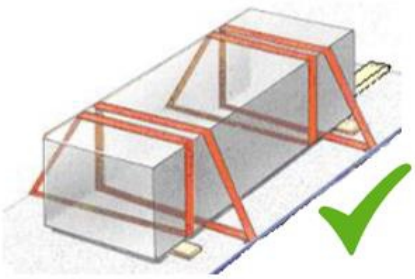
If it is possible, the packing shall take into account the ability to be stacked.

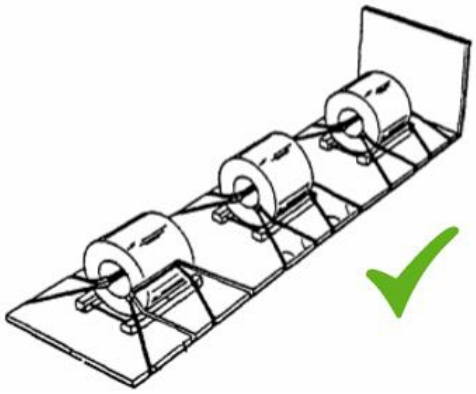
The packed goods must be easy to handle and the packing must facilitate multiple off-loading, re-loading and possibly storage of the goods.



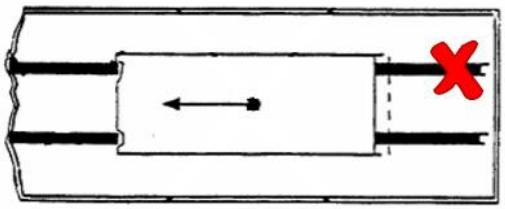
IMPORTANT: *Only screws must be used for assembly of crates, foundations, skids etc.*
DO NOT USE NAILS

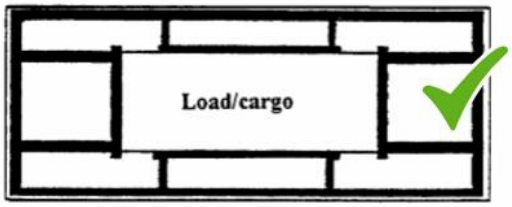
Use loop lashing to prevent sideways movement on heavy goods and secure each single item independently.



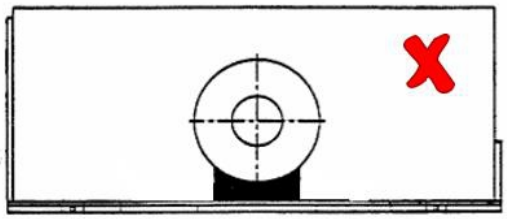


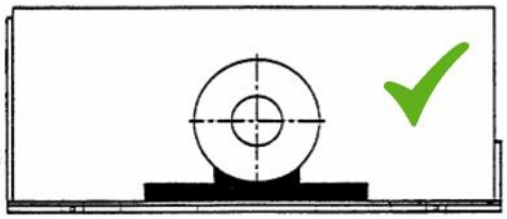
Secure load from sideways movement in crates or containers.



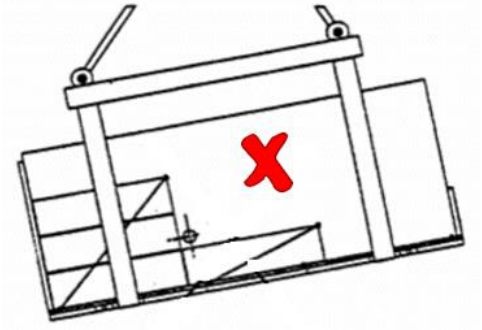


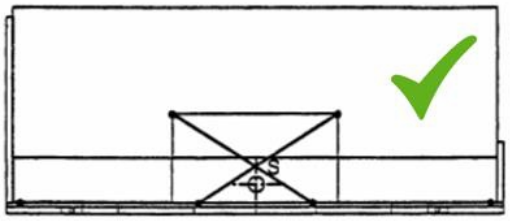
Distribute heavy loads over larger area.





If possible, centre of gravity must be in centre of foundation, crate, skid or container.





Corners and edges of freight crates built of Wood or Plywood shall be protected by lightweight metal profiles. Top cover shall be framed by lightweight metal profile.

Airfreight crates shall be fitted with an easy accessible and watertight sniffer hole (dim. 15x15cm).



IMPORTANT: *DO NOT USE CHIPBOARD.*

All components packed in crates or boxes shall be secured against movement in all directions. Especially heavy components shall be secured in a safe and secure manner.

If fill material is needed, only use wood, corrugated cardboard, paper or bubble plastic.

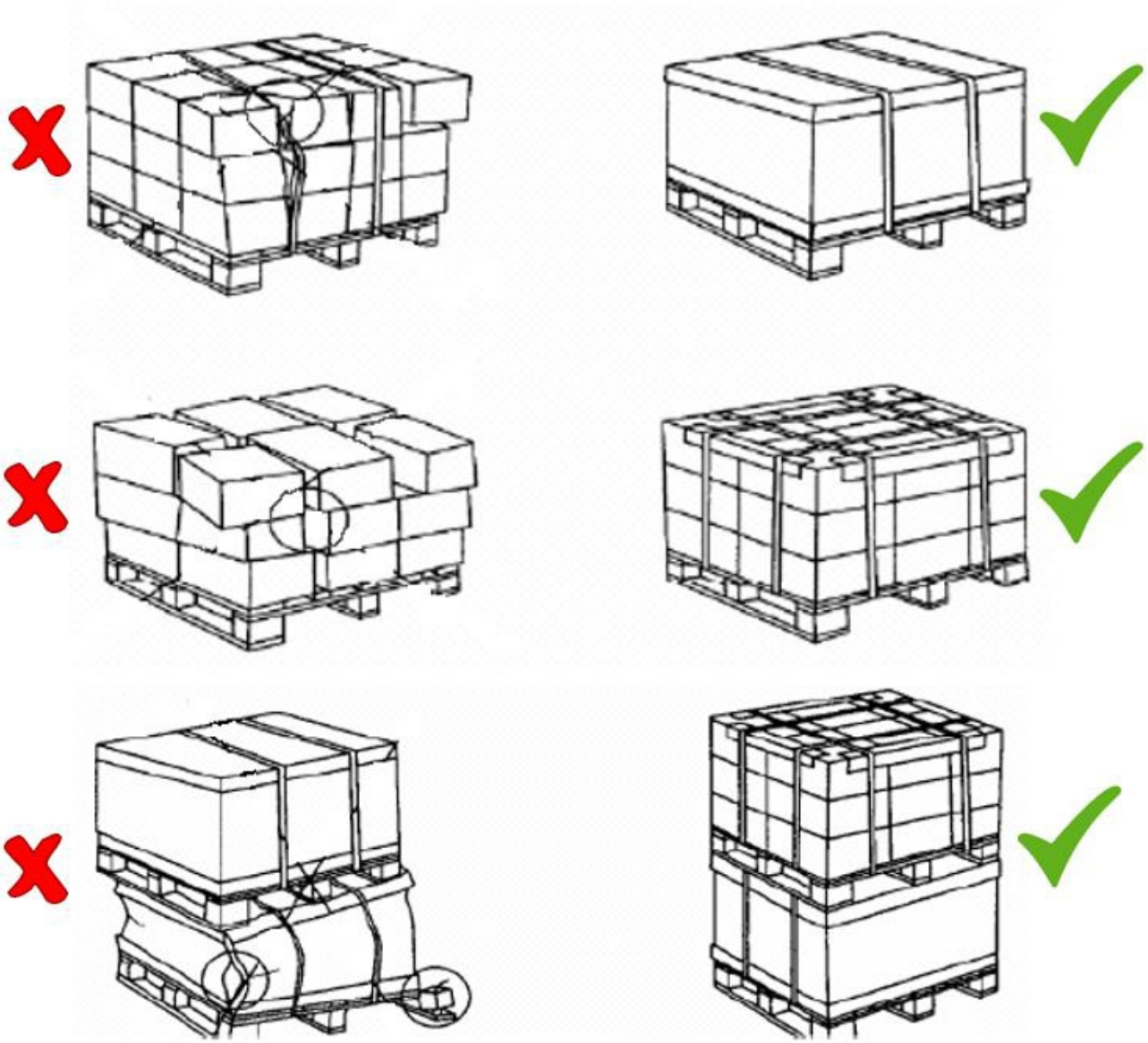


Plastic wrapping shall only be used in combination with steel band strapping – NEVER on its own.



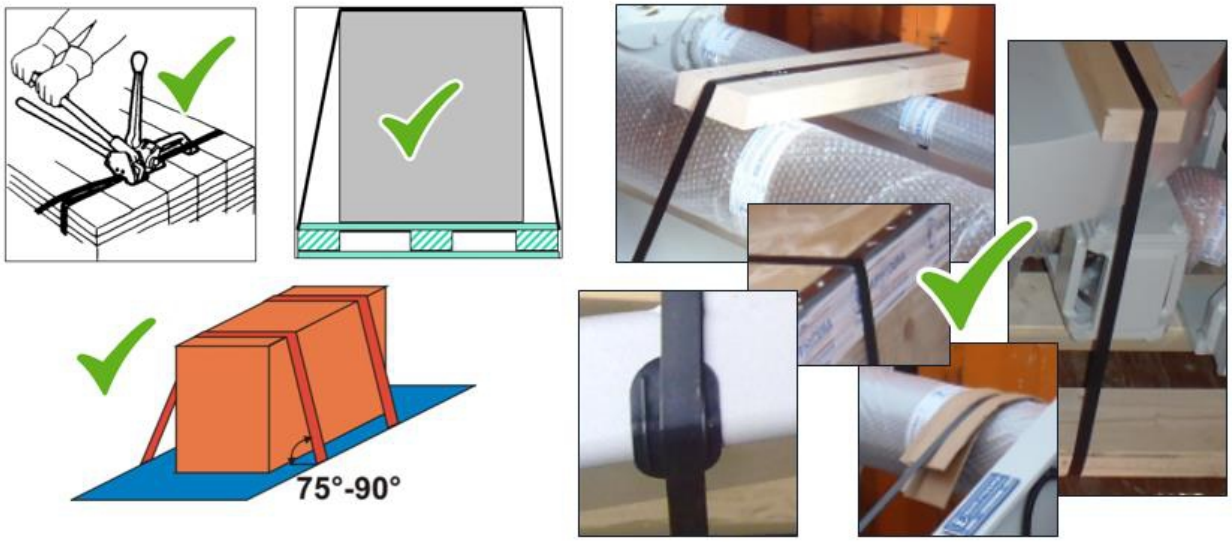






Steel band straps are used for securing loads onto pallets, crates, skids, foundations etc.
When used for top-over lashing, please observe that angle of band should be between 75° and 90 °
to prevent goods from shifting.

When using steel bands strapping, edges and surfaces of goods and packing crates must be protected.
Material used for protection shall be wood, metal profiles, corrugated cardboards or thick plastic profiles.



Check that lifting and latching points are clearly marked with SWL, that they are easy accessible and fit the required shackles.



6. Labelling

When packing is finished, goods shall be marked with labels for handling according to international freight standards.

All goods, each pallet, package or component shall be clearly labelled with:

- Sales order number.
- Customer reference – if required.
- Name and address of the recipient.
- Sender name and address.
- Sender contact person – in case of questions regarding the shipment.
- Gross Weight.

The labels shall be attached to min. two sides of the goods, pallet, package or component. Sniffer holes in airfreight crates shall be clearly marked with printed label saying “SNIFFER HOLE”.

IMPORTANT: *The labels shall be printed – NOT HANDWRITTEN.*



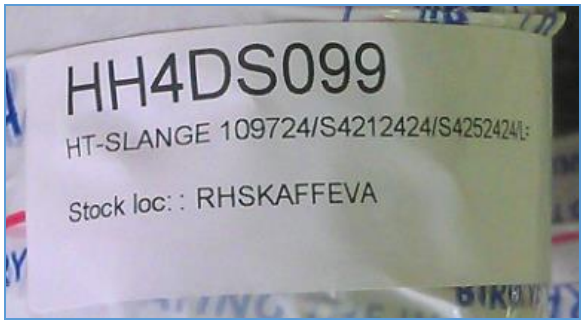




A printed, NOT handwritten, packing list must be attached to each goods, pallet, package or component so that it is evident:

- Who sent it.
- Who shall receive it.
- Which products are packed
- Which vessel/Installation is it intended for.
- Weight.
- Dimensions.
- Number of packages.

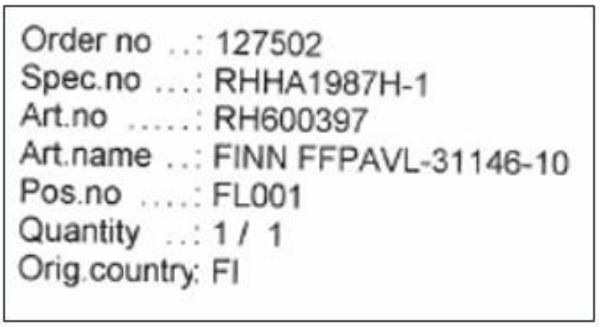
For loose items in a box/crate, each item shall be labelled with item number and item name. The labels shall be printed – NOT handwritten.

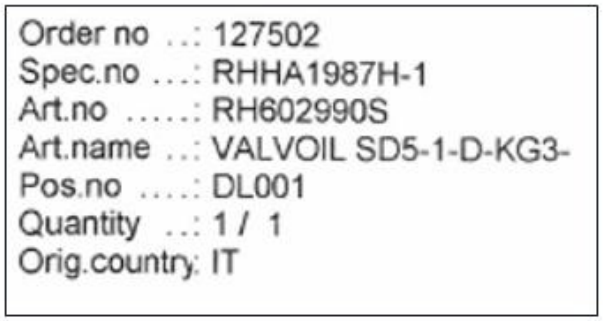


When packing hydraulic and electric parts, special labelling applies.
For easier installation at recipient, each item shall be marked with the following information:

- Order number.
- Spec. number.
- Article number.
- Article name.
- Pos. number.
- Quantity.
- Originator country.

The labels shall be printed – NOT handwritten.





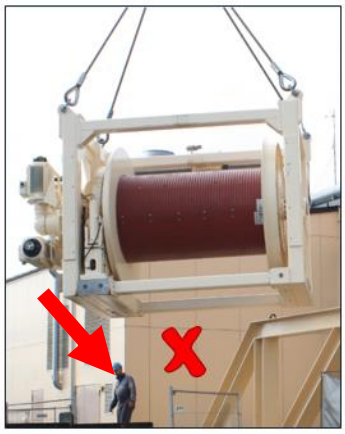
*Before labelling goods, customer requirements must be taken in consideration. Customer might need to know what type of crates; pallets or boxes are used. Shipping documents as custom invoice, packing lists, AWB should be approved by customer before shipment

7. Handling and Loading

Personnel involved in handing and loading of goods shall have the necessary competence for the operation. All handling and loading shall be done in accordance with the HSE requirements. Prior to handling/loading commences the goods shall be sufficiently secured.

The secure load shall be handled in such a way that the load remains stable during the entire operation. Maximum attention shall be taken to avoid risk of damage to personnel and goods. If required area shall be cordoned off prior to the operation and loads shall NEVER be carried over personnel.



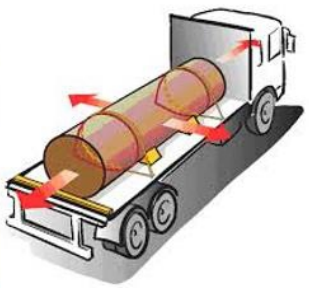




The supplier is responsible for the actual handling, lifting and loading operation.

<u>Road transport – goods directly on vehicle:</u>
When goods is loaded on the vehicle where the driver is present, it is the driver/vehicle owner's responsibility that the goods are placed correctly on the vehicle and securely fastened to avoid shifting of the load during transport.







NOTE: National and International rules and regulation for rail transport applies.

Road / Rail transport – goods in container:

The supplier is responsible for secure loading in containers and that the goods are securely fastened to avoid shifting of the load during transport.



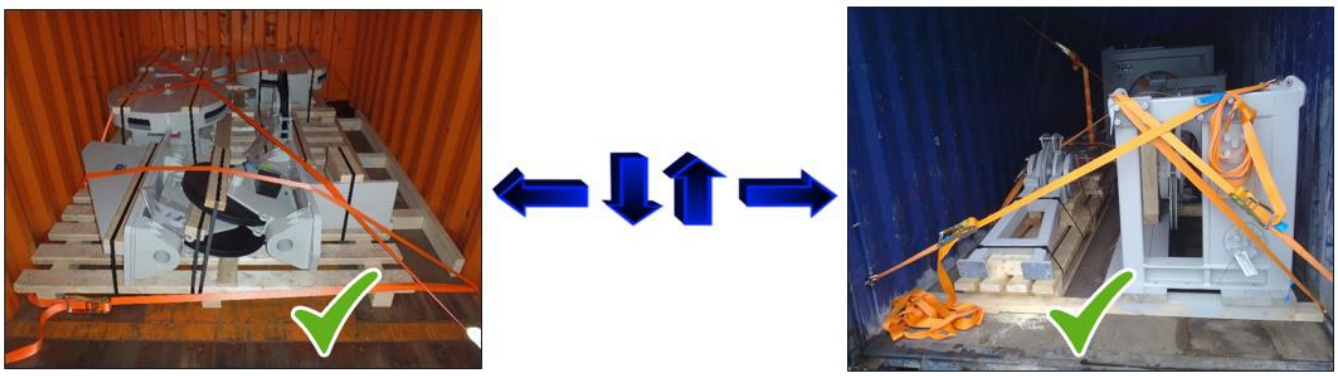
NOTE: National and International rules and regulation for road and rail transport applies.

Sea transport – goods in container:

The supplier is responsible for secure loading in containers and that the goods are securely fastened to avoid shifting of the load during transport.

Special note shall be taken to wave forces and movement during sea transport. It is enormous forces at work when the vessel moves in big waves and the goods shall be secured against more of less constant forces in all directions.

Not everybody is allowed to secure goods in overseas containers. Authorized personnel (Marine Warranty Surveyor) shall check and approve the securing of the goods before shipment.



NOTE: National and International rules and regulation for sea transport (IMO) applies.

Air transport – goods in crates and boxes:
The supplier is responsible for secure loading in crates or boxes and that the goods are securely fastened to avoid shifting of the load during transport.

Airfreight rules and regulations may require special packing of goods in a primary protection, a secondary form of packing and a ridged outer form of packing.

The primary protected goods must be packed in secondary packing in such a way that, under normal conditions of transport, packing cannot break. The secondary packing must be secured in the outer packing with suitable fill/cushioning material.

Pay special attention to weight restriction.

Airfreight crates shall be fitted with a clearly marked and easy accessible sniffer hole (dim. 15x15cm). Sniffer hole shall be protected against ingress of dust and liquid.





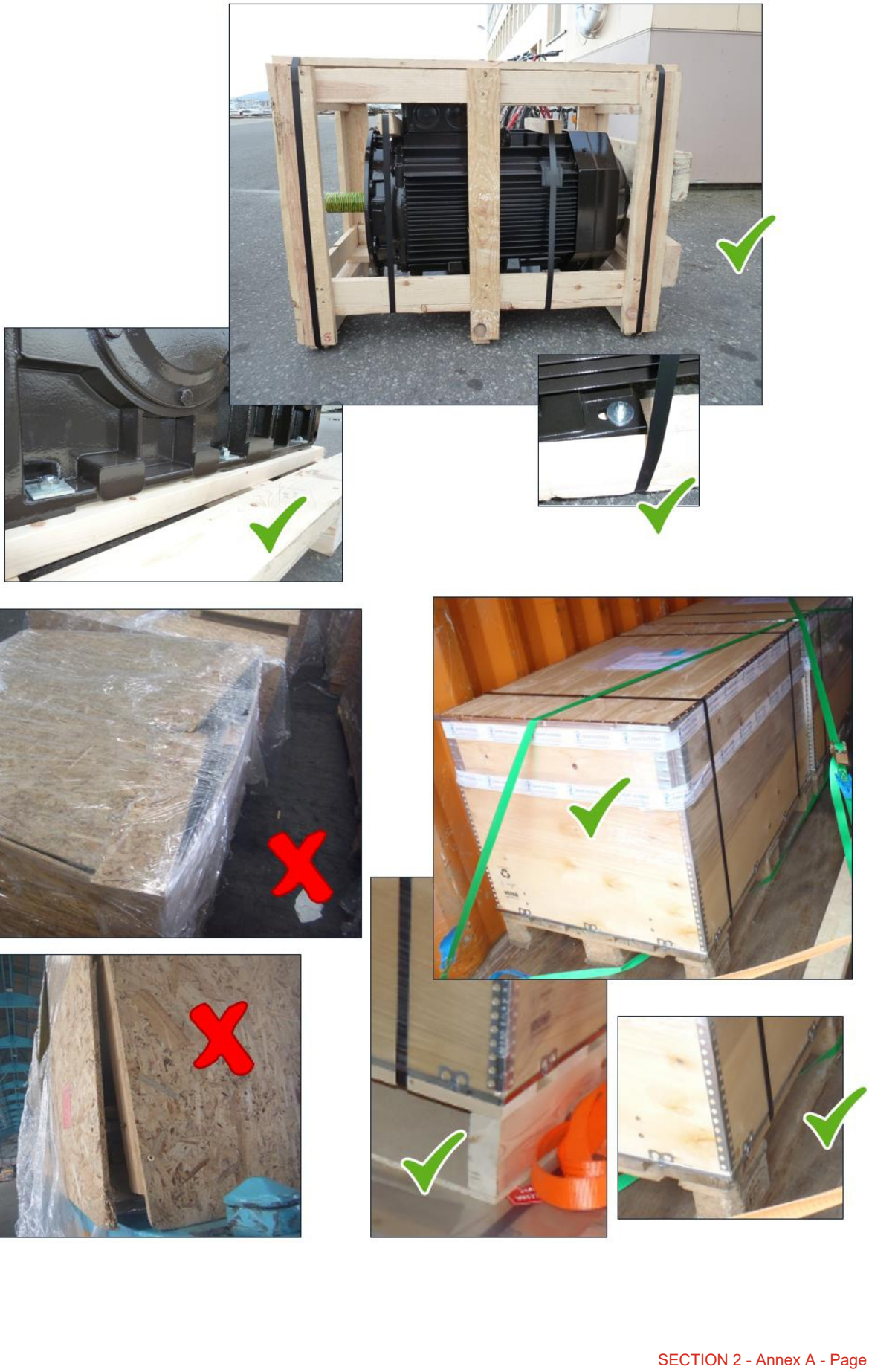
NOTE: National and International rules and regulation for air transport (IATA) applies.

8. Packing Posters

Poster showing Packing material/products		Packing Poster
Presentation of RM standard for Packing		RM Standard for Packing

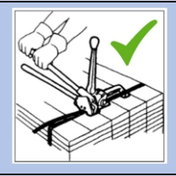
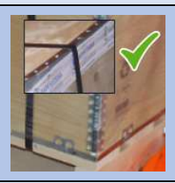
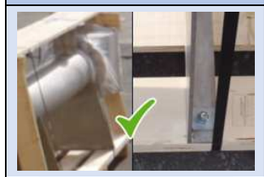
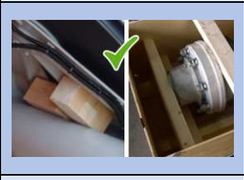
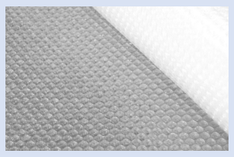
9. Best Practice







RM standard packing material/products

Image	Material / Product	Info	Image	Material / Product	Info
	**Wood** – used for shipping crates, foundations, skids, edge protection, fill etc.	All wood shall be untreated – no paint, no coating, no waterproofing. IPPC marked if required.		**Self-adhesive tape**	Make: Suretape
	**Plywood** - used for crates and boxes, covers etc.	Min. thickness 6 mm DO NOT USE CHIPWOOD		**Steel Band** – used for strapping and securing goods	Approved standard tools and steel band
	**Screws** - used for assembly of crates, foundations, skids etc.	DO NOT USE NAILS.		**Steel Band Protection** – used to protect edges and surfaces	Wood Metal Profiles Plastic Profiles Cardboard
	**Profiles** - used for protection of edges and corners of crates and boxes.	Lightweight metal profiles		**Plastic Wrapping** - used with restrictions	Only to be used in combination with steel band strapping Min. thickness 0,02mm 100% sunlight stabilized
	**Metal** - used for bearings, brackets, foundations etc.	Take measures to avoid galvanic corrosion where metal is touching metal.		**Fasteners** – bolts, washers and nuts	Must to be of same material grade as used on the goods being secured
	**Plastic film** – used for covering of goods	Min. 0,2mm thickness 100% sunlight stabilized Flameproof is required (Cover Guard)		**FILL MATERIAL** – used to avoid movement of goods during transport	Only use wood, corrugated cardboard, paper or bubble plastic.
	**Bubble Plastic** – used for covering of goods	Min. bubble diam. 10mm Min. bubble height 4mm 100% sunlight stabilized		**Labelling**	Only use printed labels DO NOT use handwritten

Title: Packing of Cabinets		Date: 23.09.2019	Doc. Id: 6267	Version: 4
Author: Ben Bolsøy	Approver: Ben Bolsøy			Page: 1 (12)
Doc. Applies to: MacGregor Bodø		Department: Engineering & Technology		

Purpose:
To secure that the electrical cabinets are correct packed when leaving the factory in order to make sure no dust or dirt is entering the cabinets when standing on the yard before installing.

Scope:
This procedure goes for all deliveries to customers of goods mentioned in this document.

Responsibility:
The logistic manager are responsible to make sure all parties that are involved in packing of cabinets understand the procedure.

Description:

Packing philosophy

The main reason to pack the cabinets like this is to prevent damage by dust and debris that comes flying in a highly dusty environment like a Shipyard. Mostly heavy particles will settle and fall, and as long as we can minimise the risk of that happening inside the vfd`s and inside electronic components.

By minimising the area that the yard is going to open (by using small windows) we can have the plastic cover on until we need to put power on the cabinets.

We need to label the goods so that we can tell the yard where they need to open and connect, and in the same time that there is no other place they need to open. If the plastic is opened or broken when we arrive, we will void the warranty of the cabinets.

VFD Cabinets

Parts used: 300 & 200mm Sticky wrapping plastic

1. Start by packing the top side of the DC bus rails, make sure the film is covering most of the DC Bus rail and down on the side of the fuses. This is mostly to prevent dust and debris to fall and attach to the top side of the copper rails. Also, to make the cleaning easier.



2. Cover the top of the vfd. make sure the film sticks to the back wall, split it for the cables and let it go down on the front of the vfd. its easiest to use the 300mm film for this. Take some of the 200mm film and twist around the cables to make sure there is no openings so dust and debris can fall inn to the vfd. If needed tape the film to the back wall to make sure it holds its position



Make sure its sealed between the cables down to the vfd



3. Loosen the front frame from the cabinet and secure it. Disconnect all the plugs going to the vfd control card. Wrap all of the plugs (exept for the PTC / Encoder plug, Purple wires) Wrap them togheter to the frame and shave the PTC connector loose. Wrap over the realys in the top of the frame



4. Wrap the front of the vfd securing all the air holes and entries are covered. Make sure you curve in between the control cards. So, you can mount the frame back without damaging the film. Cut an opening around the encoder connection, place an small piece of film over it to cover and attach the label for “Encoder Connection”.

Now the yard can open a small piece to connect the encoder, instead of taking of all the plastic cover



5. Cover the front of the terminal row with plastic film, place the lable “Terminal Connections” on top of

it.



6. Cover the fans in the bottom of the vfd, place plastic film over it, **and remember to punch a small hole in the plastic so "moist/water" can drain out**



7. Mount the protection grill in the top. Fasten the plastic in the upper lip, outside the cabinet and cover the whole front of the protection grill and down passed the realys. The more that is sealed the less will be able to enter inside



8. Cover the back of the lamps and switches and the back of the exhaust filter



9. Cover the font of the lamp and switches, and the air vents in the front of the cabinet



Cabinets with components

1. Start by covering the components from top to bottom in the cabinet.and make sure it fits all the way to the side son no debris can enter. Cut out or cover separately where the yard needs to connect inside the cabinet. Make lables to indicate where the yard can open / remove the plastic.



2. Cover all electronics in the door, and cover fan and exhaust vents, lamps and switches 

3. Other components like contactors and brake chopper need to be packed in the same way, so it can't be damaged

Cleaning and removal

1. Vacume the cabinets and use compressed air to get the dust out of the cabinet if needed
2. Use a moist cloth to clean the interior of the cabinet, start from the top so everything can fall to the bottom.
3. When removing the plastic inside the cabinet, start at the top at the DC bus rails, then take of the cover on the top of the vfd`s. make sure nothing falls inn to the vfd drives.
4. Fasten all the protection covers that has been dismantled so the cabinet is safe

Title: RM Standard for Preservation		Date: 12.11.2015	Doc. Id: 5866	Version: 4
Author: Stian Pedersen Lillevik	Approver: Inge H. Andersen			Page: 1 (14)
Doc. Applies to: Rapp Marine		Department: Operations		

1. Introduction

1.1. Purpose of procedure

The purpose of this procedure is to set the standard for preservation for Rapp Marine (RM).

It shall identify the necessary activities involved in preserving the deliveries from main- and sub-supplier, so that the product will maintain the quality and functionality from delivery until Harbour Acceptance Test (HAT) has commenced.

We preserve the products to avoid any damages, due to high and low temperatures, humidity, wind, dust, sand and liquid, during storage at manufacturer, transport to Yard/Customer and storage/installation at Yard/Customer.

We also preserve the products to avoid cost and schedule consequences due to substandard preservation and subsequently damages to the product.

1.2. Extent / Scope

The RM Standard for Preservation applies for all products, manufactured by main- or sub-suppliers, which are part of a Rapp Marine delivery.

Departments affected by this standard are:

- Production
- Project Management
- Sales and Marketing
- Purchase and Logistic
- Engineering & Technology

Initial preservation is based on 6 months of storage AFTER delivery from supplier.

IMPORTANT: Additional Customer or Project specific requirements may apply.

The product shall be protected against high and low temperatures, humidity, wind and in gress of dust, debris, sand and liquid during transport to and storage/installation at fabrication yard or Customer.

The product shall also be protected against sandblasting, spatter from welding, grinding, painting and other forces during storage and installation at fabrication yard or Customer before HAT.

HSE considerations shall be taken into account in the choice of preservation material.

The basic assumption is that the personnel assigned to do the preservation are qualified to perform the stated tasks in the procedure.

1.3. *Abbreviations

HAT Harbour Acceptance Test
HPU Hydraulic Pump Unit
HSE Health Safety Environment
RM Rapp Marine
SVP Senior Vice President
VCI Vapour Corrosion Inhibitor

1.4. *Reference documents

Doc. No.	Document Title
6104	Checklist for preservation - Mechanical
6100	Checklist for preservation - Hydraulic
6095	Checklist for preservation - Electrical
5867	RM Standard for Packing

2. Responsibilities

*Operations (Purchase & Logistic) is responsible for the content of this standard, the maintenance and improvement of the same and the implementation in the departments to whom it applies.

It is the responsibility of the Sales and Marketing Department to make the RM standard for Preservation known to the Customer and that any additional requirements are included in the contract and the technical specification.

It is the responsibility of the Purchase and Logistic Department to make the RM standard for Preservation and any additional requirements known to main- and sub-suppliers and that the requirements are fully understood.

The Manufacturer/Supplier is responsible for the maintenance preservation at their facilities before delivery and for the initial preservation to RM standard upon delivery.

The installation Yard or Customer is responsible for maintaining the initial preservation from Manufacturer/ Supplier. Preservation maintenance at Customer/Yard shall be part of the basis for the warranty period.

It is the responsibility of all personnel, for whom this standard applies, to know, perf orm and act in accordance with the standard and to participate in identifying its weaknesses and proposing improvements.

3. Documentation requirements

The Preservation at the manufacturer/supplier shall be documented by means of checklists and by photos.

It is the responsibility of the personnel responsible for the preservation to fill out and sign the preservation checklists mentioned in sub-section 1.4 of this standard.

Photos shall document all preservation.

When the checklists have been filled out and signed, they shall be included in the MC Dossier together with the photos, so they are available for the Finished Control Team.

The Supplier shall issue an instruction to the installation Yard or Customer on how to maintain the initial preservation during storage and installation. As a minimum, it shall contain the following:

- Instruction on how to carry out preservation maintenance.
- List of what preservation material/products to use.
- Toxicological data sheets for preservation material/products.
- Requirements to storage conditions – indoor/outdoor etc.
- Requirement to temporary heating during storage – if required.
- De-preservation instructions.
- Safe disposal of used preservation material.

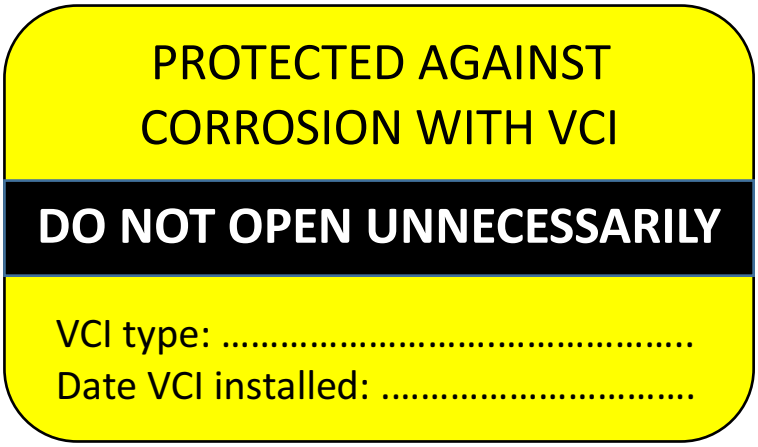
Instruction shall also include other warranty requirements.

4. Preservation Products

Listed in below table is the RM standard preservation materials/products.
Use of equivalent material/products are allowed as long as the standard of quality remain the same.

Preservation Material / Product	Make / Type
Teflon based oil	Interflon fin lube TF
Teflon based coating	Interflon fin film WB
Tectyl	Tectyl Multi Purpose 506
Grease	Acid-free sticky type for industrial use
Vaseline	Resin and acid-free type for industrial use
Sewn Geotextile	Polyfelt min. Class 2 - 100% sunlight stabilized polypropylene fibre
Plastic film	Min. 0,2mm - 100% sunlight stabilized - Flameproof is required (Cover Guard)
Bubble Plastic	Min. bubble diam. 10mm / bubble height 4mm - 100% sunlight stabilized
Wrapping Plastic	Min. thickness 0,02mm - 100% sunlight stabilized
Aluminium sheeted glass fibre cloth	WG200-1AF - 100% sunlight stabilized
Self-adhesive tape	Suretape (PC622).
Plywood	Min. thickness 6 mm
Vapour Corrosion inhibitor (VCI)	Zerust, Cortec or Silica Gel
VCI Label	Size: 10 x 6 cm / Colour: Yellow, black stripe, see example below
Denso Tape	Denso Tape

In all instances where VCI is used, it shall be indicated with visibly printed label on the outside, with VCI type used and date. See example below:



5. Preservation of Winches, Reels and Storage Drums

In the following, all winch, reel, storage drum and sheave products will only be referred to as product.

In the table is listed the preservation activities for the winch components and the corresponding preservation aid.

Preservation activities varies, as the components varies, for the different type of winches. Preserve the relevant component for the winch in question.

IMPORTANT: *Verify whether additional Customer or Project specific requirements applies before preservation commences.*

Note: *The table may continue on the next page*

Product Component	Preservation activity to be carried out	Preservation Aid
Gearbox	- Drain gearbox for oil. - Install drain plug. - Plug Filling with breather cap. - Flush gearbox with oil before shipment (only if winch is stored before delivery).	- Remaining oil film will act as preservation. - Steel Drain plug with seal ring. - Breather Cap. - Flushing oil type according to lubrication chart.
Chain-box	- Grease chain-box inside - Cover all surfaces of chains, sprockets and diamond screw bearing with grease.	- Acid-free sticky grease.
Hydraulic Motor on winch (all)	- Drain hyd. motors for oil. - Install drain plug. - Flush hyd. motors with oil before shipment (only if winch is stored before delivery).	- Remaining oil film will act as preservation. - Steel Drain plug with seal ring. - Flushing oil type according to lubrication chart.
Dismantled Hydraulic Motor (all)	- Drain hyd. motors for oil. - Install drain plug. - Flush hyd. motors with oil before shipment (only if motor is stored before delivery). - Grease motor shaft, wrap it in bubble plastic and tape. - Spray flange face with Teflon based coating. - Wrap the whole motor in bubble plastic and tape.	- Remaining oil film will act as preservation. - Steel Drain plug with seal ring. - Flushing oil type according to lubrication chart. - Acid-free sticky grease. - Interflon Film WB. - Bubble plastic. - Self-adhesive tape.
Flange connection on winch for dismantled hydraulic motor	- Cover flange face with gasket and plywood cover. - Fasten Plywood cover with min 4 bolts and tape all way round.	- Gasket. - Plywood cover, 6mm thickness. - Bolts and nuts - Self-adhesive tape.
Hydraulic Valve-box (all)	- Drain hyd. valve boxes for oil. - Spray inside of valve boxes with Teflon based oil.	- Interflon Fin Lube TF

Hydraulic Ports (all)	- Plug all ports with steel flanges / plugs.	- Steel Blind flange and gasket. - Standard steel plugs of same material grade as port.
*Diamond Screw	- Grease diamond screw. - Cover all surface with Denso tape. - Spray ends and top with Teflon based coating if these parts cannot be covered with Denso tape.	- Acid-free sticky grease. - Denso tape - Teflon based spray
*Guide Shaft	- Grease Guide shaft. - Cover all surface with Denso tape. - Spray ends and top with Teflon based coating if these parts cannot be covered with Denso tape.	- Acid-free sticky grease. - Denso tape - Teflon based spray
Drum (with wire)	- Cover drum fully with Geo-textile. - Cover Geo-textile fully with Plastic film and tape. - Make cover dust and liquid proof.	- Geo-textile, min. class 2. - Plastic film - min. 0,2mm - Self-adhesive tape.
Brake Cylinder	- Drain brake cylinder for oil. - Drain plug installed on In/outlet. - Flush brake cylinder with oil before shipment (only if winch is stored before delivery).	- Remaining oil film will act as preservation. - Steel plug with seal ring. - Flushing oil type according to lubrication chart.
Brake Cylinder Rod	- Grease brake cylinder rod. - Wrap rod in bubble plastic and tape.	- Acid-free sticky grease. - Bubble plastic. - Self-adhesive tape.
Brake Cylinder Seals	- Grease or spray seals with Teflon based coating. - Wrap in plastic and tape.	- Acid-free sticky grease or Interflon Film WB. - Wrapping plastic. - Self-adhesive tape.
Shaft Seals	- Grease or spray seals with Teflon based coating. - Wrap in plastic and tape.	- Acid-free sticky grease or Interflon Film WB. - Wrapping plastic. - Self-adhesive tape.
Sheaves	- Spray with Teflon based coating.	- Interflon Film WB.
All other machined surfaces	- Spray with Teflon based coating.	- Interflon Film WB.
Oil tank (self-contained units)	- Drain tank for oil. - Close all openings with flanges/plugs. - Breather cap wrapped in plastic, taped and strapped onto unit or packed separately. - Grease all adjustment screws. - Wrap all adjustment screws in plastic and tape.	- Remaining oil film will act as preservation. - Steel Blind flange and gasket. - Steel Drain plug with seal ring. - Breather cap. - Acid-free sticky grease. - Wrapping plastic. - Self-adhesive tape. - Plastic strips
Instruments (glass fronted)	- Cover instrument glass with plywood and tape.	- Plywood, 6 mm thickness. - Self-adhesive.
All grease nipples	- Cover with grease nipple cap.	- Plastic cap.
*Open Shaft	- Cover surface with Denso tape.	- Denso tape

6. Preservation of Hydraulic Pump Unit (HPU)

In the table is listed the preservation activities for the HPU components and the corresponding preservation aid.
Preservation activities varies, as the components varies, for the different type of HPU's.
Preserve the relevant component for the HPU in question.

For purchased goods, observe Supplier's requirements when using VCI.

In all instances where VCI is used, it shall be indicated with visibly printed label on the outside, with VCI type used and date.

IMPORTANT: *Verify whether additional Customer or Project specific requirements applies before preservation commences.*

HPU Component	Preservation activity to be carried out	Preservation Aid
Oil Tank	- Drain tank for oil. - Install drain plug.	- Remaining oil film will act as preservation. - Steel Drain plug with seal ring
Flange connections (all)	- Close openings with flanges.	- Steel Blind flange and gasket.
Screw connections (all)	- Close openings with plugs.	- Standard steel plugs of same material grade as port.
Adjustment Screws	- Grease all adjustment screws. - Wrap in plastic and tape.	- Acid-free sticky grease. - Wrapping plastic. - Self-adhesive tape.
Breather Cap (filling)	- Pack breather cap separately in bubble plastic and tape. - Cap strapped to the unit or packed separately.	- Bubble plastic. - Self-adhesive tape. - Plastic strips.
Hydraulic Hoses	- Pack hoses separately in bubble plastic and tape. - Hoses strapped to the unit or packed separately.	- Bubble plastic. - Self-adhesive tape. - Plastic strips.
Electric Motors	- Pack motors separately in bubble plastic. - Place VCI on the inside of bubble plastic, tape and make wrapping dust and liquid proof. - Place VCI label on outside of wrapping.	- Bubble plastic. - VCI - Self-adhesive tape. - VCI label.
Hydraulic Coolers	- Pack coolers separately in bubble plastic, taped and make wrapping dust and liquid proof.	- Bubble plastic. - Self-adhesive tape.
Instruments (glass fronted)	- Cover instrument glass with plywood and tape.	- Plywood, 6 mm thickness. - Self-adhesive tape.

7. Preservation of Electrical components

In the table is listed the preservation activities for electrical components and the corresponding preservation aid.
Preservation activities varies, as the products varies. Perform the relevant preservation activities for the component in question.

For purchased goods, observe Supplier's requirements when using VCI.

In all instances where VCI is used, it shall be indicated with visibly printed label on the outside, with VCI type used and date.

IMPORTANT: *Verify whether additional Customer of Project specific requirements applies before preservation commences.*

Note: *The table may continue on the next page*

Electrical Component	Preservation activity to be carried out	Preservation Aid
Junction and Termination Boxes (loose boxes)	- Seal cable entry holes temporarily with threaded plastic or metal blind plug. - Place VCI inside. - Coat gasket with Vaseline. - Close junction box and make it dust and liquid proof. - Wrap box in plastic and tape. - Place VCI label on outside of plastic wrapping.	- Threaded plastic blind plug or metal plug of the same material as the component. - VCI - Resin and acid-free Vaseline. - Plastic film - min. 0,2mm or Bubble plastic. - Self-adhesive tape. - VCI label.
Junction and Termination Boxes (part of assembled product)	- Place VCI inside. - Coat gasket with Vaseline. - Close junction box and make it dust and liquid proof. - Place VCI label on outside of box.	- VCI - Resin and acid-free Vaseline. - VCI label.
Transmitters	- Place VCI inside. - Coat gasket with Vaseline. - Close transmitter and make it dust and liquid proof. - Place VCI label on outside of wrapping.	- VCI - Resin and acid-free Vaseline. - VCI label.
Sensitive components inside panels and cabinets	- Wrap items independently in bubble plastic. - Place VCI inside wrapping and tape. - Place VCI label on outside of plastic wrapping.	- Bubble plastic. - VCI - Self-adhesive tape. - VCI label.
VFD (when shipped loose)	- Wrap VFD in bubble plastic. - Place VCI inside bubble plastic. - Wrap in plastic and tape. - Make wrapping dust and liquid proof. - Place VCI label on outside of plastic wrapping.	- Bubble plastic. - VCI - Plastic film - min. 0,2mm or Bubble plastic. - Self-adhesive tape. - VCI label.

Panels and Cabinets	- Seal cable entry holes temporarily with threaded plastic or metal blind plug. - When necessary install drain plug. - Leave drain plug open. - Place VCI inside. - Coat gasket with Vaseline. - Close cabinet and make it dust and liquid proof. - Wrap cabinet in plastic and tape. - Place VCI label on outside of plastic wrapping. - Cover cabinet with customized hood. - Place VCI label on outside of hood.	- Threaded plastic blind plug or metal plug of the same material as the component. - Plastic drain plug or metal plug of the same material as the component. - VCI - Resin and acid-free Vaseline. - Plastic film - min. 0,2mm or Bubble plastic. - Self-adhesive tape. - VCI label. - Customized Hood made of aluminium sheeted glass fibre cloth.

8. Preservation Posters

Poster showing Preservation material/products		Preservation Poster 1
Poster showing Preservation standard/methodes for Winches, Reels and Storage Drums		Preservation Poster 2
Poster showing Preservation standard/methodes for Hydraulic Pump Unit and Electrical Components		
Presentation of RM standard for Preservation		RM Standard for Preservation

9. Best Practice

Preservation of Drums with wire!





Customer requirements for galvanized metal sheet cover.

Preservation of Seals!





Open shaft



Greased Chain box!





Sealing of connection ports!
Steel plugs and steel flanges.





Typical Steel Drain plug!



Typical Grease nipple cover cap!





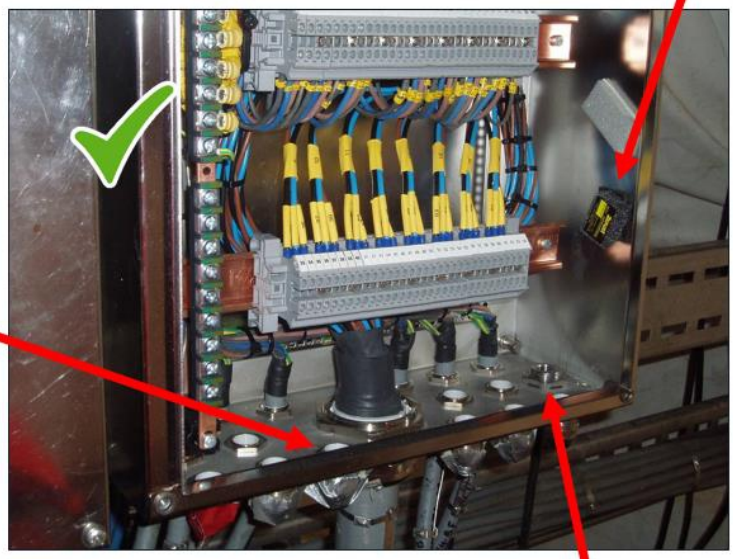
Preservation of Diamond Screw and Shafts!





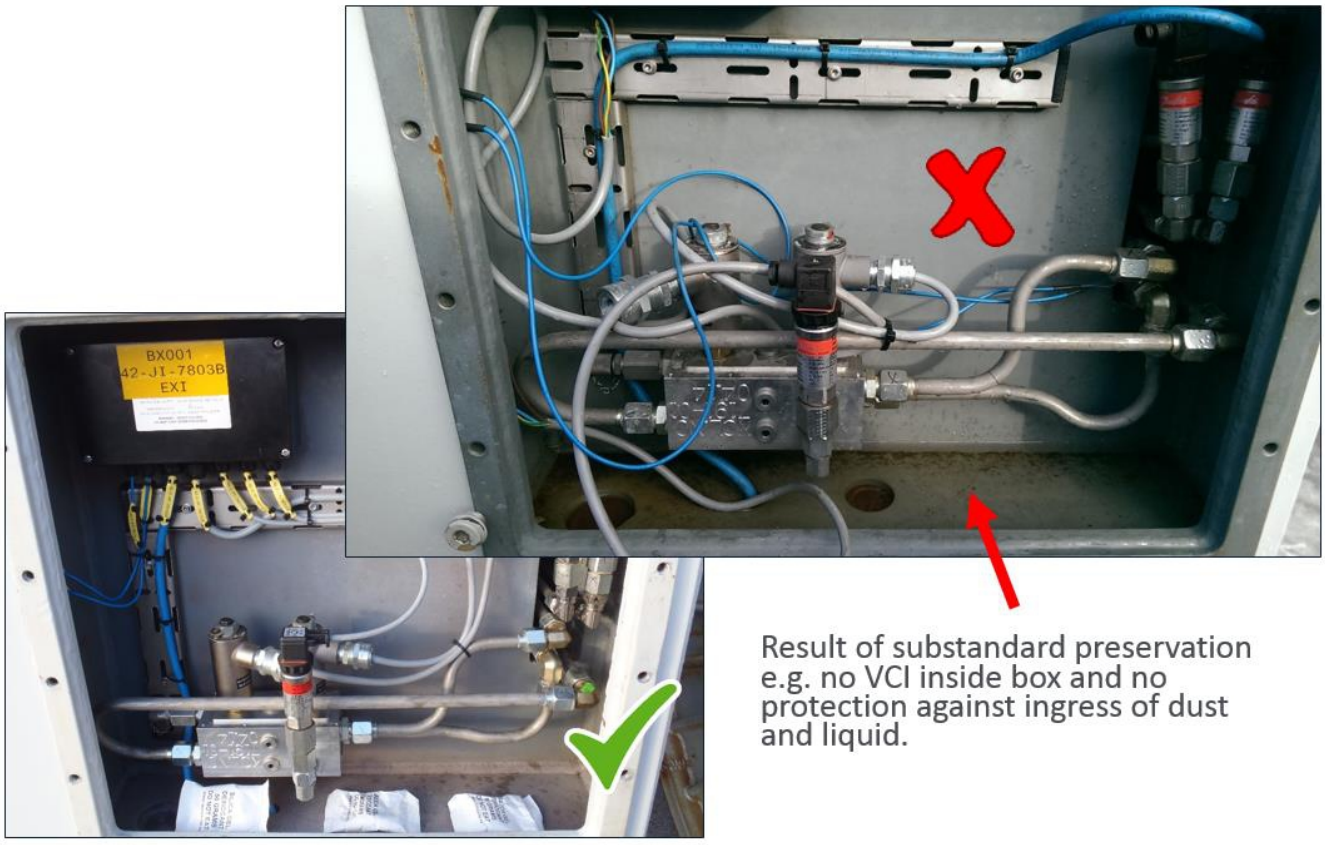
VCI placed inside.

All cable entry holes shall be sealed temporarily with a threaded plastic or metal blind plug.



IMPORTANT: the metal plug shall be of the same material as the component being plugged.

Drain plug shall be installed and left "open".



Result of substandard preservation e.g. no VCI inside box and no protection against ingress of dust and liquid.

Potential damage to inside of cabinet due to ingress of dust and liquid due to substandard or missing preservation (open door).



Damage to outside of cabinet due to substandard or missing preservation.



Title:		Date:	Doc. Id:	Version:
Preservation manual		26.01.2018	6243	6
Author:	Approver:			Page:
Stian Pedersen Lillevik	Stian Pedersen Lillevik			1 (3)
Doc. Applies to:		Department:		
Rapp Marine		RH		

Purpose:
How to maintain and preserve goods manufactured and delivered by Rapp Marine AS

Scope:
This procedure goes for all deliveries to customer of goods mentioned in this document.

Responsibility:
The logistics team leader are responisble to inform personell that can be affected by this procedure.

How to maintain and preserve goods manufactured and delivered by Rapp Marine AS

The purpose of this instruction, is to describe how to perform an inspection on arrival and further to store and preserve goods manufactured and delivered by Rapp Marine AS

How to check and inspect a delivery.

If possible, the inspection shall be supervised by Rapp personnel or personnel appointed by Rapp Marine AS.
Check in following order;

- **all goods are delivered according to packing list.**
- **all goods are delivered without any visible damage.**
- **all goods are delivered according to pictures from sender.**
- **all goods are packed and preserved according to Rapp standard (appendix 1).**
- **If damages, immediately contact your Rapp Marine contact for further action.**

If it`s necessary to open or remove the preservation (plastic, grease, boxes etc.) make sure that goods are re-preserved in the same or better manner than before. This must be done before goods are delivered to warehouse/storage location.

How to store and preserve winches and parts for winches.

- **All goods should be stored in a dry and protective warehouse.**
- Main gearboxes (WDU) are drained for oil. If stored longer than 3 months, the gear must be filled with preservation oil.
- *The planetary/angular – Brevini gears are drained for oil. If the gears are to be stored longer than 2 months, they must be filled with preservation oil.*
- *Do not take the protective covers (zinc or plastic) of the spooled drum. If there are any suspicions that cable/wire are damaged, the protection can be removed and inspected. After inspection, the protection must be put back in the same condition as before removal.*
- *Electric motors/gears that are not assembled on the winch are more exposed for damage and must be stored indoors in a dry and dust free environment. Check that all machined parts are well covered with grease and plastic wrapping.*
- *The shaft seals, brake cylinder seals, the break cylinder rods to be crosschecked that they are covered with oil/grease and wrapped in plastic/densotape.*
- *The level wind shafts to be crosschecked that they are well covered with grease and wrapped in plastic. Ensure that the level wind drive motor are wrapped in plastic to avoid dust and rain.*
- *The deck sheaves must be checked that they are well greased and protected with plastic cover before storing them in the warehouse.*
- *HPU`s are usually boxed. Remove lid if so and inspect for damages. HPU itself must be protected from dust, moist and rain. If possible HPU`s must be stored inside. The HPU oil reservoir are drained for oil.*
- Spare parts can contain all different kind of goods like drives, motors, gears etc general, the spare parts must be stored in a dry and dust free place with between +10 to 40 C and a relative humidity of 95% max.

How to store and preserve Variable frequency drives (VFD), panels and electrical components.

- *Motor drive units are disassembled from the cabinet before shipping to avoid any contamination during shipment and at the shipyard. All the motor drivers need to be stored in a dry warehouse completely protected against dust and moist.*
- *Temperature for storing goods under this section, are between +10 to 40 C and a relative humidity of 95% max.*
- *If there are any danger that the goods are going to be exposed for high humidity, rain, dust ore other type of contamination, goods must be covered in form of tarp or thick plastic on all sides including the bottom. This plastic cover will protect the goods for a period.*
  Note; the plastic cover can collect moist over time, and must be checked and vented for moist/water from time to time.
- *All the electrical local panels, radio controls, and HMI (touchscreens) that are not installed, should be stored in a dry, dust-free place to avoid contamination. If they need to be installed, cover them with a protective plastic cover after installation to avoid contamination and ensure that they are "visible" so they are not destroyed. If possible, tag/label the panels with signs like "Warning, Caution, Fragile" etc.*
- *Goods under this section must not be exposed for shock that are over 100m/s^2 (330 ft. s^2), 11m/s.*

Disposal of goods if necessary.

The goods contain raw materials that should be recycled to preserve energy and natural resources. The package materials are environmentally compatible and recyclable.
All metal parts can be recycled. The plastic parts can either be recycled or burned under controlled circumstances, according to local regulations. Most recyclable parts are marked with recycling marks.
If recycling is not feasible, all parts excluding electrolytic DC capacitors (C1-1 to C1-x) and printed circuit boards can be land filled. They are classified as hazardous waste within the EU. They must be removed and handled according to local regulations.
For further information on environmental aspects and more detailed recycling instructions, please contact your local authorities.

*Appendix

1) Rapp Marine standard packing and preserving of goods doc no 5952, 5953 and 5954

Preservation of Winches, Reels and Storage Drums

Product Component	Preservation activity to be carried out	Preservation Aid
Gearbox	- Drain gearbox for oil. - Install drain plug. - Plug Filling with breather cap. - Flush gearbox with oil before shipment (only if winch is stored before delivery).	- Remaining oil film will act as preservation. - Steel Drain plug with seal ring. - Breather Cap. - Flushing oil type according to lubrication chart.
Chain-box	- Grease chain-box inside - Cover all surfaces of chains, sprockets and diamond screw bearing with grease.	- Acid-free sticky grease.
Hydraulic Motor on winch (all)	- Drain hyd. motors for oil. - Install drain plug. - Flush hyd. motors with oil before shipment (only if winch is stored before delivery).	- Remaining oil film will act as preservation. - Steel Drain plug with seal ring. - Flushing oil type according to lubrication chart.
Disassembled Hydraulic Motor (all)	- Drain hyd. motors for oil. - Install drain plug. - Flush hyd. motors with oil before shipment (only if motor is stored before delivery). - Grease motor shaft, wrap it in bubble plastic and tape. - Spray flange face with Teflon based coating. - Wrap the whole motor in bubble plastic and tape.	- Remaining oil film will act as preservation. - Steel Drain plug with seal ring. - Flushing oil type according to lubrication chart. - Acid-free sticky grease. - Interflon Film WB. - Bubble plastic. - Self-adhesive tape.
Flange connection on winch for disassembled hydraulic motor	- Cover flange face with gasket and plywood cover. - Fasten Plywood cover with min 4 bolts and tape all way round.	- Gasket. - Plywood cover, 6mm thickness. - Bolts and nuts - Self-adhesive tape.
Hydraulic Valve-box (all)	- Drain hyd. valve boxes for oil. - Spray inside of valve boxes with Teflon based oil.	- Interflon Fin Lube TF
Hydraulic Ports (all)	- Plug all ports with steel flanges / plugs.	- Steel Blind flange and gasket. - Standard steel plugs of same material grade as port.
Diamond Screw	- Grease diamond screw. - Wrap in plastic and tape. - Make cover dust and liquid proof. - Spray ends and top with Teflon based coating.	- Acid-free sticky grease. - Plastic film - min. 0,2mm or Bubble plastic. - Self-adhesive tape. - Interflon Film WB.
Guide Shaft	- Grease Guide shaft. - Wrap in plastic and tape. - Make cover dust and liquid proof. - Spray ends and top with Teflon based coating.	- Acid-free sticky grease. - Plastic film - min. 0,2mm or Bubble plastic. - Self-adhesive tape. - Interflon Film WB.
Drum (with wire)	- Cover drum fully with Geo-textile. - Cover Geo-textile fully with Plastic film and tape. - Make cover dust and liquid proof.	- Geo-textile, min. class 2. - Plastic film - min. 0,2mm - Self-adhesive tape.
Brake Cylinder	- Drain brake cylinder for oil. - Drain plug installed on In/outlet. - Flush brake cylinder with oil before shipment (only if winch is stored before delivery).	- Remaining oil film will act as preservation. - Steel plug with seal ring. - Flushing oil type according to lubrication chart.
Brake Cylinder Rod	- Grease brake cylinder rod. - Wrap rod in bubble plastic and tape.	- Acid-free sticky grease. - Bubble plastic. - Self-adhesive tape.
Brake Cylinder Seals	- Grease or spray seals with Teflon based coating. - Wrap in plastic and tape.	- Acid-free sticky grease or Interflon Film WB. - Wrapping plastic. - Self-adhesive tape.
Shaft Seals	- Grease or spray seals with Teflon based coating. - Wrap in plastic and tape.	- Acid-free sticky grease or Interflon Film WB. - Wrapping plastic. - Self-adhesive tape.
Sheaves	- Spray with Teflon based coating.	- Interflon Film WB.
All other machined surfaces	- Spray with Teflon based coating.	- Interflon Film WB.
Oil tank (self-contained units)	- Drain tank for oil. - Close all openings with flanges/plugs. - Breather cap wrapped in plastic, taped and strapped onto unit or packed separately. - Grease all adjustment screws. - Wrap all adjustment screws in plastic and tape.	- Remaining oil film will act as preservation. - Steel Blind flange and gasket. - Steel Drain plug with seal ring. - Breather cap. - Acid-free sticky grease. - Wrapping plastic. - Self-adhesive tape. - Plastic strips
Instruments (glass fronted)	- Cover instrument glass with plywood and tape.	- Plywood, 6 mm thickness. - Self-adhesive.
All grease nipples	- Cover with grease nipple cap.	- Plastic cap.

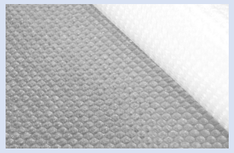
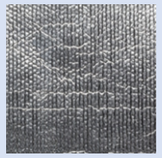
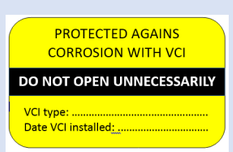
Preservation of Hydraulic Pump Unit (HPU)

HPU Component	Preservation activity to be carried out	Preservation Aid
Oil Tank	- Drain tank for oil. - Install Drain plug.	- Remaining oil film will act as preservation. - Steel Drain plug with seal ring.
Flange connections (all)	- Close openings with flanges.	- Steel Blind flange and gasket.
Screw connections (all)	- Close openings with plugs.	- Standard steel plugs of same material grade as port.
Adjustment Screws	- Grease all adjustment screws. - Wrap in plastic and tape.	- Acid-free sticky grease. - Wrapping plastic. - Self-adhesive tape.
Breather Cap (filling)	- Pack breather cap separately in bubble plastic and tape. - Strap the cap to the unit or pack separately.	- Bubble plastic. - Self-adhesive tape. - Plastic strips.
Hydraulic Hoses	- Pack hoses separately in bubble plastic and tape. - Strap the hoses to the unit or pack separately.	- Bubble plastic. - Self-adhesive tape. - Plastic strips.
Electric Motors	- Pack motors separately in bubble plastic. - Place VCI on the inside of bubble plastic, tape and make wrapping dust and liquid proof. - Place VCI label on outside of wrapping.	- Bubble plastic. - VCI - Self-adhesive tape. - VCI label.
Hydraulic Coolers	- Pack coolers separately in bubble plastic, taped and make wrapping dust and liquid proof.	- Bubble plastic. - Self-adhesive tape.
Instruments (glass fronted)	- Cover instrument glass with plywood and tape.	- Plywood, 6 mm thickness. - Self-adhesive tape.

Preservation of Electrical Components

Electrical Component	Preservation activity to be carried out	Preservation Aid
Junction and Termination Boxes (loose boxes)	- Seal cable entry holes temporarily with threaded plastic or metal blind plug. - Place VCI inside. - Coat gasket with Vaseline. - Close junction box and make it dust and liquid proof. - Wrap box in plastic and tape. - Place VCI label on outside of plastic wrapping.	- Threaded plastic blind plug or metal plug of the same material as the component. - VCI - Resin and acid-free Vaseline. - Plastic film - min. 0,2mm or Bubble plastic. - Self-adhesive tape. - VCI label.
Junction and Termination Boxes (part of assembled product)	- Place VCI inside. - Coat gasket with Vaseline. - Close junction box and make it dust and liquid proof. - Place VCI label on outside of box.	- VCI - Resin and acid-free Vaseline. - VCI label.
Transmitters	- Place VCI inside. - Coat gasket with Vaseline. - Close transmitter and make it dust and liquid proof. - Place VCI label on outside of wrapping.	- VCI - Resin and acid-free Vaseline. - VCI label.
Sensitive components inside cabinets	- Wrap items independently in bubble plastic. - Place VCI inside wrapping and tape. - Place VCI label on outside of plastic wrapping.	- Bubble plastic. - VCI - Self-adhesive tape. - VCI label.
VFD (when shipped loose)	- Wrap VFD in bubble plastic. - Place VCI inside bubble plastic. - Wrap in plastic and tape. - Make wrapping dust and liquid proof. - Place VCI label on outside of plastic wrapping.	- Bubble plastic. - VCI - Plastic film - min. 0,2mm or Bubble plastic. - Self-adhesive tape. - VCI label.
Cabinets and Panels	- Seal cable entry holes temporarily with threaded plastic or metal blind plug. - When necessary install drain plug. - Leave drain plug open. - Place VCI inside. - Coat gasket with Vaseline. - Close cabinet and make it dust and liquid proof. - Wrap cabinet in plastic and tape. - Place VCI label on outside of plastic wrapping. - Cover cabinet with customized hood. - Place VCI label on outside of hood.	- Threaded plastic blind plug or metal plug of the same material as the component. - Plastic drain plug or metal plug of the same material as the component. - VCI - Resin and acid-free Vaseline. - Plastic film - min. 0,2mm or Bubble plastic. - Self-adhesive tape. - VCI label. - Customized Hood made of aluminium sheeted glass fibre cloth.

RM standard preservation material/products

Image	Material / Product	Make / Type	Image	Material / Product	Make / Type
	Teflon based oil	Interflon fin lube TF or equivalent product		Bubble Plastic	Min. bubble diam. 10mm / bubble height 4mm - 100% sunlight stabilized
	Teflon based coating	Interflon fin film WB or equivalent product		Wrapping Plastic	Min. thickness 0,02mm - 100% sunlight stabilized
	Tectyl	Tectyl Multi Purpose 506 or equivalent product		Aluminium sheeted glass fibre cloth	WG200-1AF - 100% sunlight stabilized or equivalent product
	Grease	Acid-free sticky type for industrial use		Self-adhesive tape	Suretape
	Vaseline	Resin and acid-free type for industrial use		Plywood	Min. thickness 6 mm
	Sewn Geotextile	Polyfelt min. Class 2 - 100% sunlight stabilized polypropylene fibre		Vapour Corrosion inhibitor (VCI)	Zerust, Cortec or Silica Gel
	Plastic film	Min. 0,2mm - 100% sunlight stabilized - Flameproof is required (Cover Guard)		VCI Label	Size: 10 x 6 cm Colour: Yellow, black stripe

Note: Use of equivalent material/products are allowed as long as the standard of quality remain the same

Section 3

Technical Description

Technical Specifications

DESCRIPTION	DOC/DRW #	REV #	PAG #
Technical Specification Winches	140041.12	12	2
Technical Specification Deck Handling Equipment	4-60185 Technical specification 10190007.09 - Averøy	-	31

MBARI
“New Research Vessel”

TECHNICAL SPECIFICATION FOR ELECTRIC DRIVEN RESEARCH WINCH SYSTEM.

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REVISION HISTORY

Rev.	Date	Done by	Approved by	Comment/ Changes
00	07.01.2019	DHN		Issued for review
01	21.03.2019	DHN		ROV winch – alternative as TRW-system
02	08.04.2019	DHN		ROV Winch – alternative with direct pull winch removed. Dim. sketch number for TRW corrected.
03	07.06.2019	DHN		CTD winch redesigned – RH328323 Storage drum redesigned – RH328252 Level wind incl. slack wire compensator redesigned – RH328253
04	05.05.2020	WSB		Cable and slip rings included, HPU's included, misc. corrections. Issued as draft.
05	14.05.2020	WSB		Misc corrections /adjustments after review. Released for bid.
06	17.07.2021	DHN	WSB	Setup of traction winch system "mirrored" as per final winch room layout. • Traction Winch RH329031 replacing RH327920 • Level Wind w/Slack Wire Compensator RH330303 replacing RH328781
07	03.08.2021	RAJ	JFN	Main supply voltage changed to 480V 60Hz
08	31.08.2021	DHN/RAJ	WSB	Various updates as per client remarks. -
09	17.09.2021	WSB	WSB	Various updates as per discussions with Freire, as per B731-Techspec-MBARI-140041.07 10190007 dated 16.09.2021.
10	04.10.2021	WSB	WSB	Motor size Storage Reel corrected from IEC225 to IEC200. Technical Specification 15110.01-800-00 is referred to. Index / chapter numbering is corrected.
11	21.12.21	FFA	FFA	HPU dim. drawings updated. Performance and pull diagram updated for ROV & CTD system Dimensional drawing CTD updated RAL-code confirmed
12	21.01.2021	FFA	FFA	Dimensional drawing and weight CTD updated Dimensional drawing TRW Updated Dimensional drawing Level wind/SWC updated Dimensional drawing storage drum updated

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1. GENERAL DESIGN CRITERIA FOR THE EQUIPMENT

- ✓ Ambient operating temperature for winches and handling equipment installed on deck -20°C to + 45°C with 100% relative humidity
- ✓ Operating temperature for equipment installed under deck/indoor 0°C to + 40°C with 50% relative humidity
- ✓ Survival temperature (not operating) - 30°C to + 60°C
- ✓ Operational limit: Winches are designed for operation at Sea State 5, but we cannot guaranty that all the scientific equipment will be possible to launch and recover at this sea state.
- ✓ Recovery limit: Winches are designed for recovery at Sea State 6, but we cannot guaranty that all the scientific equipment will be possible to recover at this sea state.
- ✓ Main Power supply 480V 60Hz
- ✓ Control System voltage AC230V60Hz
- ✓ All Electric motors are TEFC (total enclosed fan cooled) anti-condensation heaters, above 10kW. Insulation Class F and thermal rated with Class B temperature rise.
- ✓ Electric motors for the winch drives have internal PTC temperature sensor
- ✓ All electric winch drive motors have enclosed rating IP56
- ✓ All HPU electric motors have enclose rating IP54
- ✓ Enclosure rating for other electric equipment (installed on deck or under deck):
  - Encoders IP66
  - Proximity switches IP67
  - Load Cells IP66
  - Control Panels on deck/hangar IP66
- ✓ Enclosure rating for other electric equipment (installed under deck and in control rooms):
  - VFD Cabinets without AC IP54
  - Starters for HPU's IP54
  - Control Panels IP22
- ✓ Scientific winches are designed and produced in accordance with DNV Lifting Appliances for Offshore Crane No.2,22 -2013 and with Subpart 189.35 of 46 CFR Subchapter U Based on Dynamic Amplifying Factor (DAF) 1.8
- ✓ Certification of winches is not included.
- ✓ Equipment is delivered according to Technical Specification 18110.01-800-00 MNV Contract Spec_RevD_2021_04_08_FINAL, limited to section 070, 300, 301, 302, 303, 304, 305, 324, 556, 710 and 711
- ✓ All winches and sheaves have included foundations for installation to reinforced ship deck structure provided by the customer.
- ✓ Basis for our drag force/dynamic calculations:
  - Friction factor for cable/wire (C_{df}) 0,03
  - Drag factor for "tools" (C_{dz}) 2,5
  - Average hauling speed 1,0 – 1,7m/s
  - Vessel motion 1m/s
- ✓ All storage/take-up drums has 3 – 4mm wear plates of stainless steel installed inside the drum shield.
- ✓ All drum core's and sheave diameters in the total winch and handling system complies with the rope/cable/wire manufacture minimum bending requirement or better.
- ✓ On research winches, functionality for constant speed setting (compensate for change in diameter for different wire layers).
- ✓ MacGregor will fulfill DNV requirements of Class Notation Cyber Secure Essential (+) with OHS (Overboard Handling System) to a security level SP3; and collaborate with Shipyard's

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consultant.

- ✓ MacGregor will collaborate with Shipyard's consultant (TSI) in respect of Noise & Vibration recommendations

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2. CLARIFICATIONS

- ✓ The estimated noise level for airborne noise is stated under each winch in this specification. The noise level will vary from nominal to maximum speed of the winch.
  Note: The noise data recorded during FAT might be different from the noise recorded after installation on the ship in a closed winch room – due to other background noise and structural vibrations.
  It's important to categorize the maximum noise requirements between "unmanned" and "manned" in the different compartments like, Main Winch Room and "Working Deck". During "launch/recovery" operation, the winches are working at very slow speed and could comply with a "manned" requirement without ear protectors, in opposite to the operation when the scientific package is in water and the winches are working at full speed and maximum noise level – "unmanned" requirement.
- ✓ To make sure that the winches and handling system is designed and dimensioned to handle the related dynamic loads, we strongly suggest that all the scientific packages are identified and described with size and weight along with planned maximum cast depth.
- ✓ Winch system described is not EX certified
- ✓ Minimum cross section on power cable to be 1,5mm², signal cables may be below this
- ✓ Cable, cable glands, terminal pads etc internally on equipment are of IEC, DIN EN standard.
- ✓ Cable types and sizes prescribed on cable diagram are according to IEC, DIN EN standards.
- ✓ Cable glands related to external connections on equipment are considered Yard supply.
- ✓ Electric starters are furnished with disconnecting switch.
- ✓ Wire routing still to be agreed upon/confirmed.
- ✓ Type of slip rings still to be agreed upon/confirmed.
- ✓ Type of cable/rope/wire still to be confirmed/approved by CUSTOMER.
- ✓ CUSTOMER needs to confirm the speed and acceleration at the overboard sheave.
- ✓ To make sure that the winches and handling system is designed and dimensioned to handle the related dynamic loads, we strongly suggest that all the scientific packages are identified and described with size and weight along with planned maximum cast depth.

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3. RESERVATIONS AND LIMITATIONS

General

Based on a cast depth, our presented dynamic studies of winch/cable loads need to be further discussions/considerations as to the related MBL/RWL and operational safety factors – see graphs under items
For this above reason, we cannot guarantee the service life of any of the EM/EOM/COAX cables included into this specification.

The wire routing for the required locations of deployment, involve several guide sheaves with 90°bending, reverse bending and bending in different planes.
For this reason, the service life of the cables/rope/wire will be reduced.

Integration towards third party's systems and such is not included, but may be subject to variations after necessary interface details of such is submitted to MacGregor. Variations may or may not be subject to additional cost.

Cable Loading During Operations

Cable Conditioning: "Spin Out" during the Initial Deployment All new cables/wires need to be relieved of the constructional stretch and cast that become stored within the armor package as a part of the normal manufacturing process. This initial "spin out" can be accomplished by deploying the cable/wire to full depth with either the payload attached or just a clump weight while allowing it to rotate freely. While one such deployment may not completely relieve the cable of all trapped energy, it has been shown to remove a significant portion of it. If a full-depth spin out can't be performed, going through this process to the depth of the project at hand will still aid in conditioning the cable. A record of all such cable/wires conditioning will help to ensure they are performed each time the cable is used on a project that exceeds the previous deepest deployment.

Further, over time the cable/wire might be subject to diametrical contraction due to elongation, compression and wear when loaded/used. Also, a large variation in linepull might result in diametrical variation of the cable/wire in respect to the underlaying layers spooled on the drum.

For the above reasons, we cannot guarantee any changes to occur in the quality of the spooling on the winches. It might be necessary to make a complete rewind to ensure quality of the spooling on the winches after some time in operation.

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Cable spooling

MacGregor cannot take the full liability for the final result of the spooling of customer supplied cables unless any errors are directly caused by the winch not being in compliance to the agreed technical specifications. In such a case MacGregor liability shall be limited to rectifying the non-compliance on the winch.

The condition of a customer supplied cable and its conformity with respective data sheet is the customer's sole liability at and upon arrival at mutually agreed place of delivery.

Cable termination

It is the Customer responsibility to perform termination of winch end and mission equipment end. The Customer holds the liability of the integrity and conducting performance of the cable under and after the work of termination. It is also the Customer's responsibility to control the integrity / performance of cable before work of termination is initiated.

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4. CTD WINCH

1.ea Research Winch HW515T90.
Drum winch with top inlet 90-degree spooling.
Spooling with 90deg swivel function.

Winch model HW-515-T90 acc. to drawing 2000004676

Wire capacity: 6650m of cable 8,18 mm in 25 layers.
Drum size: dia. 502/990 x 982mm
Singe motor drive – ABB electric motor, IEC 200 – High output motor.
Planetary/bevel/parallel gearbox – BPH323, ratio 35,67:1
SWL 4,0 tons
Electro hydraulic actuated band brake with capacity SWLx1,8
Electric driven and synchronized level wind for 8,18 mm cable.
Lebus sleeve for 8,18 mm cable.
Tension control.
Slip ring prepared for and included; 4 pass - 7A/1000V. Focal 180
Cable included, 6500m of Rochester A301592
Winding of 6500 m of cable A301592 under tension is included.
Type of electric system: Frequency controlled system.
Active Heave Compensation (AHC) included.
Est. weight 4250kg – ex. cable

Winch performance as described in table below is related to:

Power Requirement 46kW

Wire layer	Dia.(mm)	Nominal speed				Maximum speed			
		Motor speed		1336	RPM	Motor speed		2806	RPM
First layer	510	4,0	t/	60	m/min.	1,9	t/	126	m/min.
Half length	739	2,8	t/	87	m/min.	1,3	t/	183	m/min.
Top layer	903	2,3	t/	106	m/min.	1,1	t/	223	m/min.

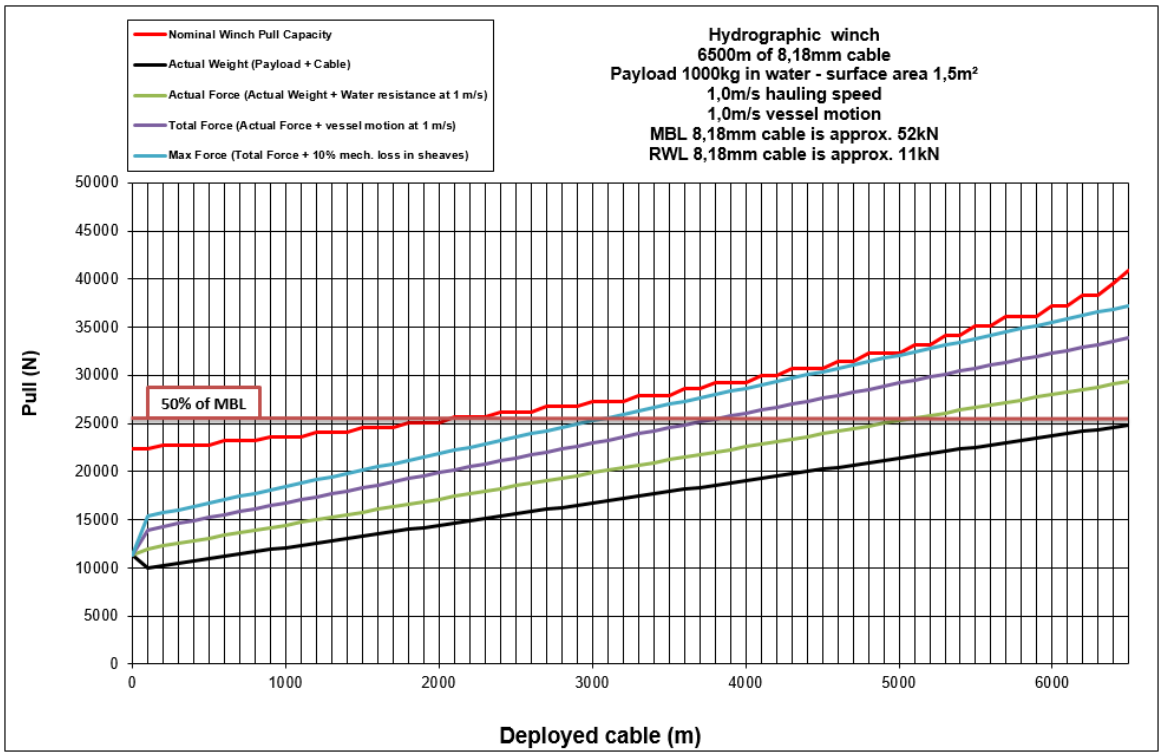
Table based upon 6500meter of 8,18mm cable

Control panel for local and emergency control installed close to the winch:

- ✓ Activate winch switch
- ✓ Control here
- ✓ Alarms
- ✓ Joystick for Pay-out and haul in
- ✓ Emergency stop switch
- ✓ Manual spooling
- ✓ “one button launch & recovery”

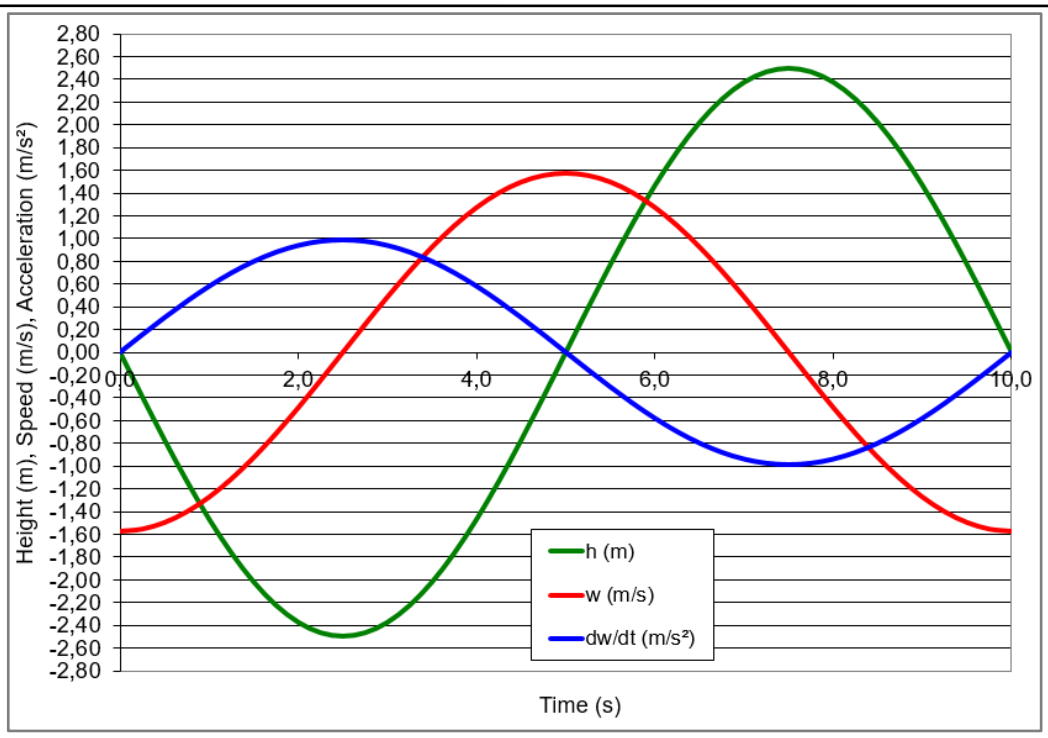
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Performance and Pull diagram
Diagram showing load case with deployed 6500m of cable at nominal load.



Active Heave Compensation capabilities
Diagram for definition of required acceleration (dw/dt) and speed (m/s) based on pure Wave height Hs5 and period10s. Vessel movement must be calculated by ship designer to verify that acceleration and speed at position of overboard sheave does not succeed these values.
If so, power requirement of winch has to be recalculated and corrected.

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Image of winch (side operation)

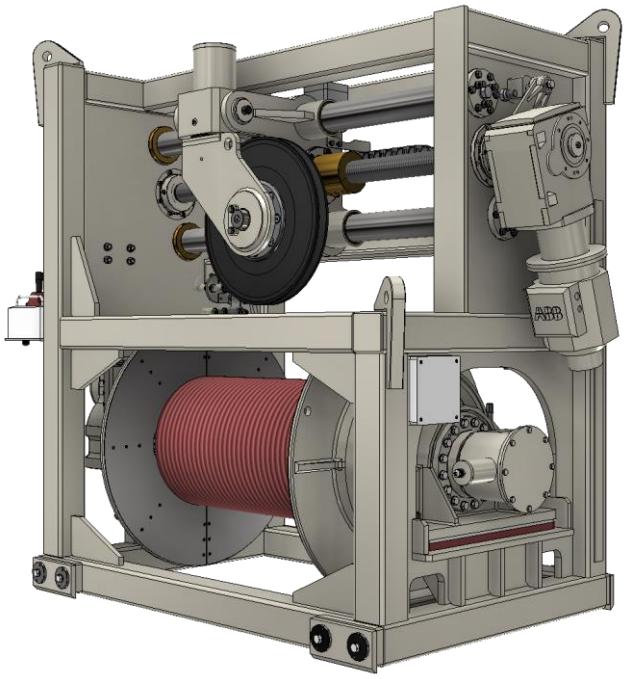


Image: Iso view of winch (image might deviate from actual product)

Image of winch (aft operation)

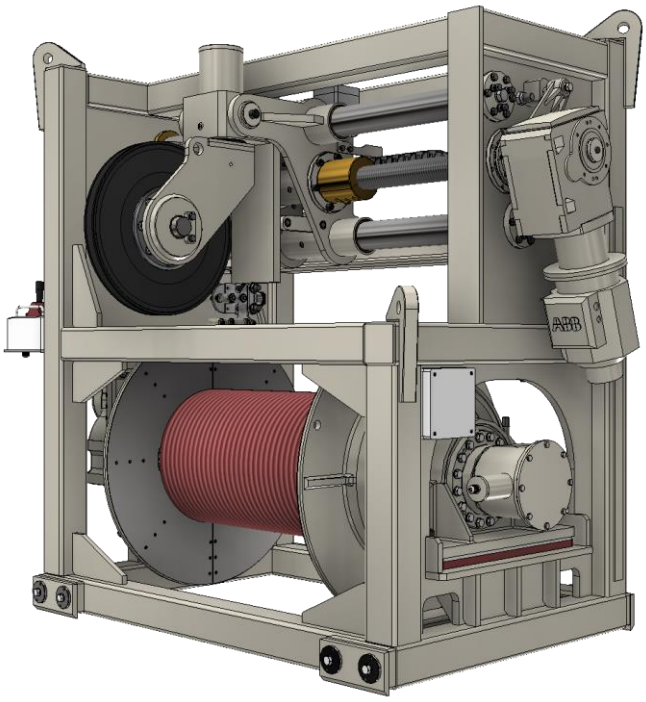


Image: Iso view of winch (image might deviate from actual product)

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5. ROV WINCH – TRACTION WINCH

General Technical Requirement for the System:

Cable spec:

Umbilical wire, length	= 5000 meters
Diameter	= 20,0 +/-0,3mm (Fibron, ref dwg RM0058)
Weight	= 1,26kg/m in air – 0,94kg/m in seawater.

Minimum bending diameter is 800mm (dynamic)

ROV/Cage.

Weight ROV/TMS/WP in air	= 5760kg.
Weight ROV/TMS/WP in sea	= 250kg. (ROV considered buoyant)

Wire + ROV/Cage in max water debt:

Max. dept = 5000meter, cable weight (5000m x 0,92kg/m)	=	4600 kg
ROV/TMS/WP in sea water	=	250 kg
Total weight in sea water (at 5000m depth)	=	4850 kg

Drum parameters on winch:

1. Drum flange diameter = 2050mm
2. Drum length = 2000mm
3. Drum core min. = 1505mm
4. Wire dia = 20,0mm
5. Wire capacity: = 5000m
6. Wire turns = 99,5
7. wire layer = 11

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1.ea ROV Winch – TRW SYSTEM

15T Traction Winch System for AHC comprising of

1ea. Traction Winch
Model: TRW-4004E-01R1.
Drawing: 400092475.
Traction heads with PCD 1238mm fitted with split sleeve for easy replacement/change.
Dual Electric Motor drive/ABB air cooled high output type/IEC225.
Sleeves for 20 mm. dia cable.
Traction head sleeves is of split type design.
Deck interface: Winch equipped with brackets for welded connection to deck.

Image of winch

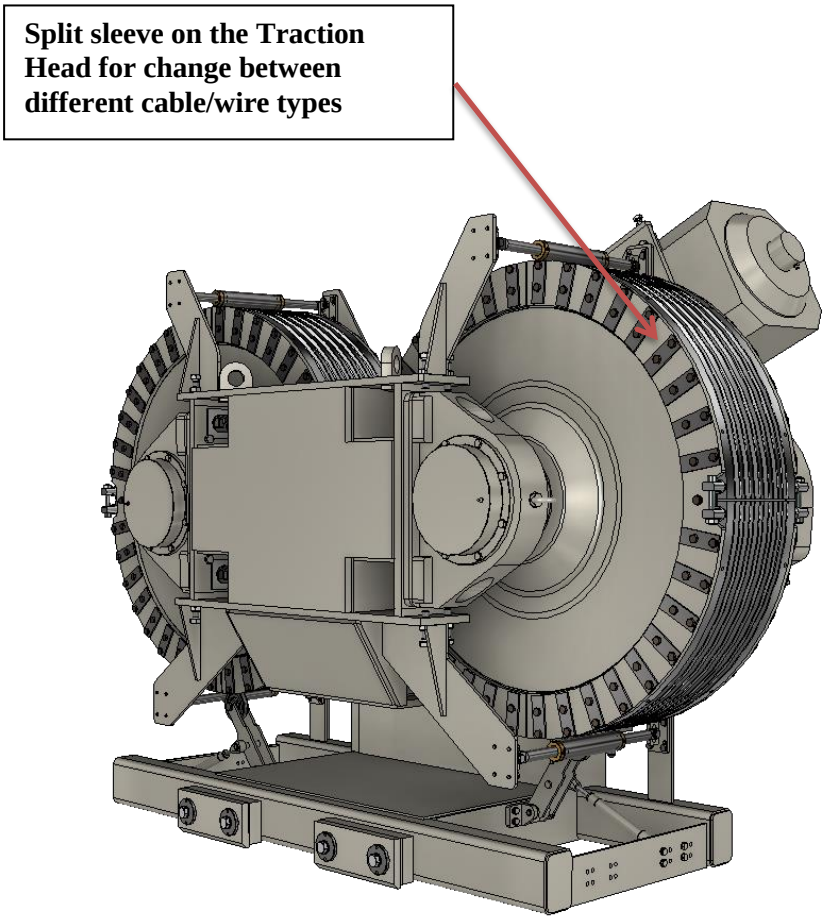


Image: Iso view of winch (image might deviate from actual product)

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1ea. Combined Level Wind incl Slack Wire Compensator.
Model: ELSWC5000-L2000.
Drawing: 400092566

Level Wind
Electric driven and electronic synchronized.
Sheave PCD diameter: 1ea. 900 mm.
Material in sheave: Composite.

Slack Wire Compensator
Sheave PCD diameter: 2ea. 900mm + 1ea. 900mm.
Material in sheave: Composite The Slack Wire Compensators position is logically positioned in relation to the operational sequence of the Traction Winch and the Storage drum.

Deck interface: Winch equipped with brackets for welded connection to deck.

Image of level wind

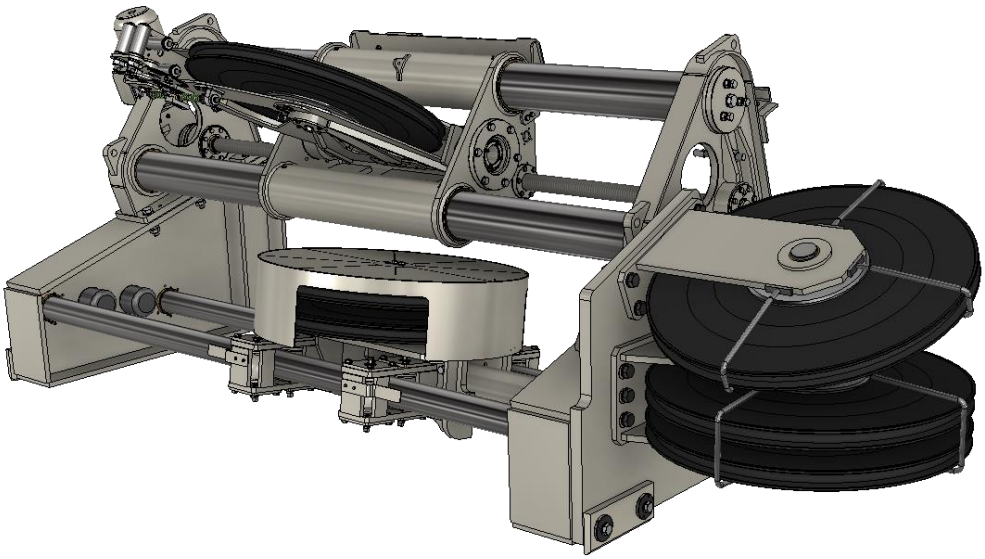


Image: Iso view of winch (image might deviate from actual product)

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1ea. Storage Drum.

Model: RW-2372EB

Drawing: 400092447

Storage Drum size: dia. 1470/2050 x 2000mm.
Lebus sleeve with PCD=1525mm. Mounted with wear plates on drum shields.
Deck interface: Winch equipped with brackets for welded connection to deck.
Maximum storage capacity is 5000m. of 20mm. dia. cable at 9 layers and OD=1950mm.
Single motor drive/ABB air cooled high output/M3BP200 frame.
Slipring included, type Focal 176/291, 5 pass 4500V/20A, 4 pass 1000V/7A, 6 SM fibre pass.
Cable is not included.
Winding of 5000 m of cable Fibron 20 mm umbilical, acc. to dwg. RM0058 under tension, is included. **Cable must be provided by customer to MacGregor facilities to conduct the winding. Required time of delivery for cable and cable sample will be adviced by MacGregor.**
Maximum cast depth: 4050m (4700m. cable deployed).

Image of winch

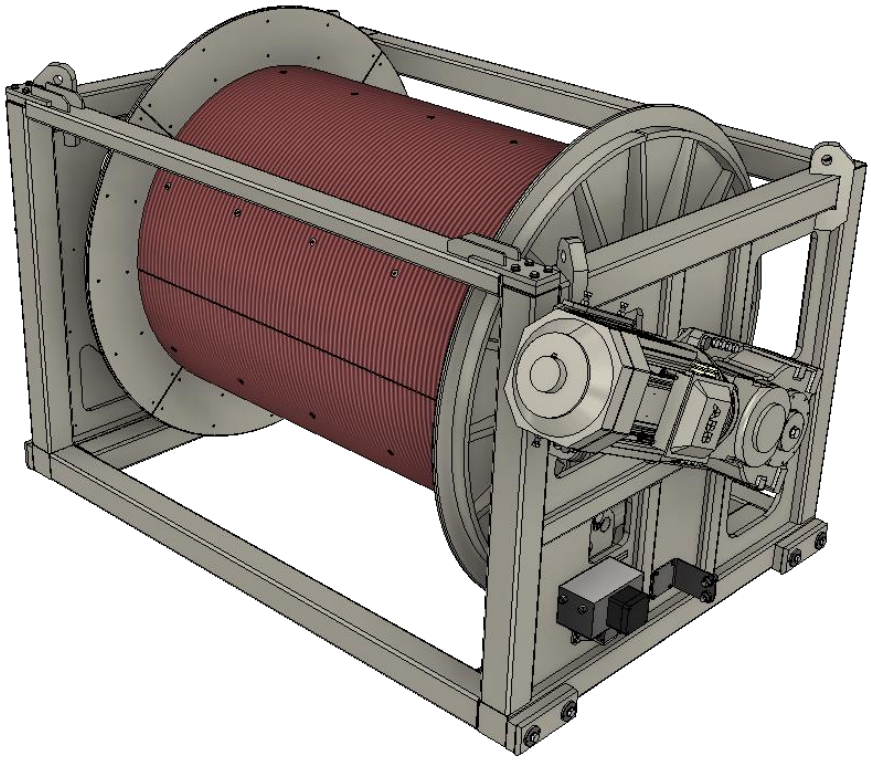


Image: Iso view of winch (image might deviate from actual product)

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Control panel for local and emergency control installed close to the winch:

- ✓ Activate / select winch switch
- ✓ Control here
- ✓ Alarms
- ✓ Joystick for Pay-out and haul in
- ✓ Emergency stop switch
- ✓ Manual spooling

Total Combined winch system performance:

SWL 15,0 tons.
Hydraulic operated fail safe brake with capacity SWLx1,8
Constant Tension control.
Local and Remote control.

Winch performance at power requirement 190kW – including driving one Storage Drum and one Level Wind.

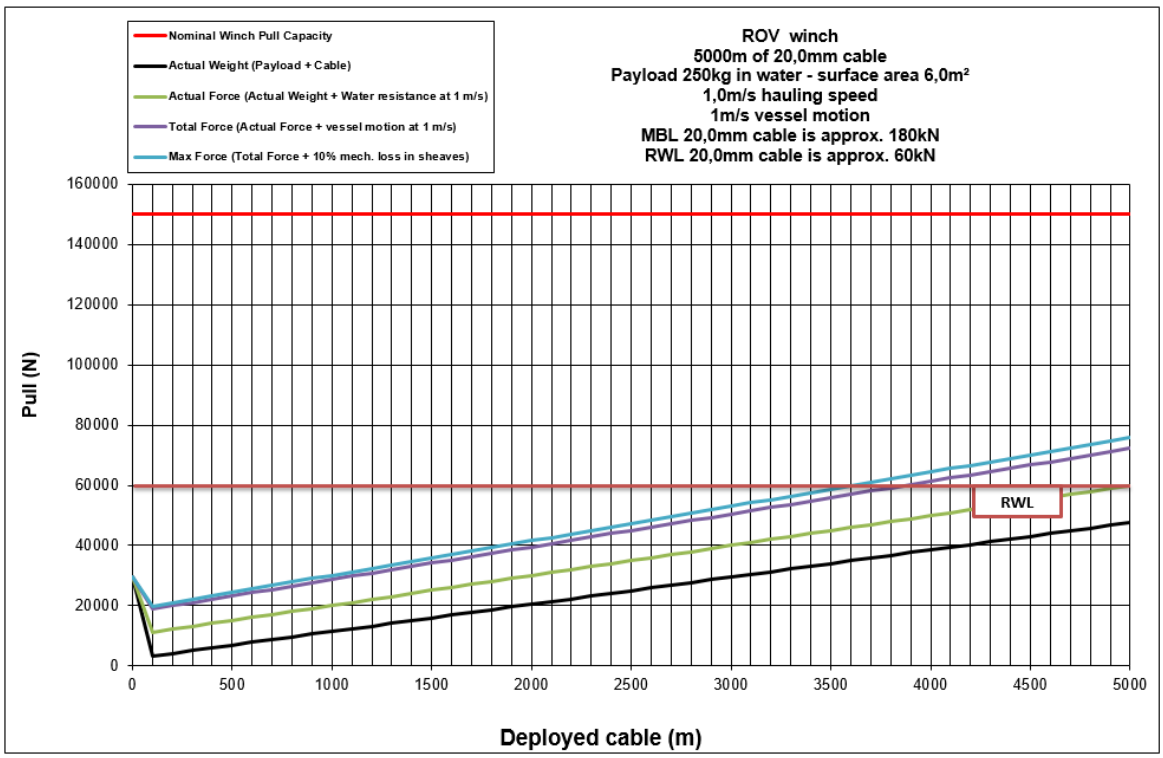
Peak power requirement for AHC operation (HS5 Period10) is 225kW - including driving one Storage Drum and one Level Wind.

Wire layer	Dia.(mm)	Electric motor at 1500 RPM	Electric motor at 2500 RPM
Traction head	1238	**15,0** t/ **60.0** m/min.	**9,0** t/ **100.0** m/min.

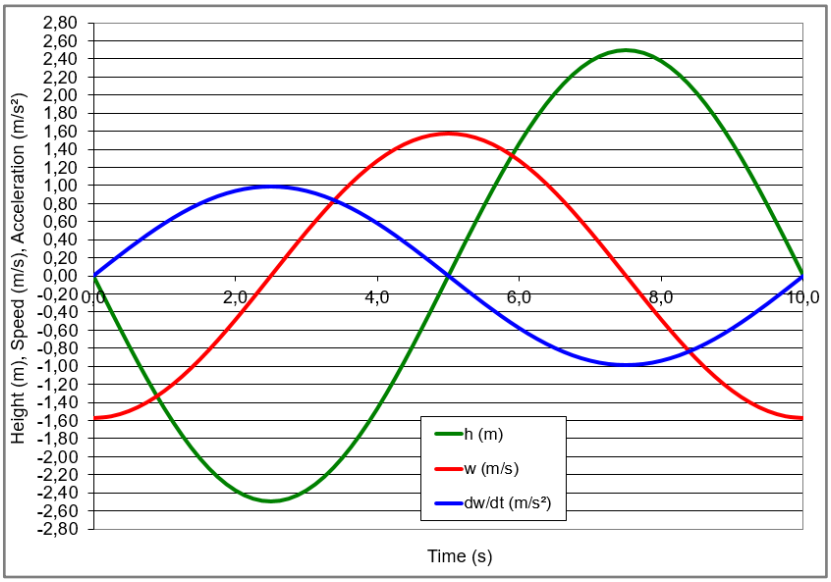
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Performance and Load diagram

Diagram showing load cases with deployment of 5000m of cable:



Active Heave Compensation capabilities
Diagram for definition of required acceleration (dw/dt) and speed (m/s) based on pure Wave height Hs5 and period10s. Vessel movement must be calculated by ship designer to verify that acceleration and speed at position of overboard sheave does not succeed these values.
If so, power requirement of winch has to be recalculated and corrected.



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6. MAIN DRIVE SYSTEM FOR THE WINCHES

Electric main drive system
Main power 480V/60Hz
Power requirement: 190kW (peak power 225kW)
Dimmensional sketch: RH330319
Single line diagram: RH330320

CTD Winch

- 2 ea. Frequency converter low noise regenerating for the drive of:
  1 off for main drive CTD Winch (5).
  1 of level wind CTD Winch (5)

ROV TRACTION WINCH SYSTEM

- 2 ea. Frequency converter low noise regenerating for the drive of:
  1 off for Traction Winch (6).
- 1 ea. Frequency converter low noise regenerating for the drive of:
  1 off for Storage winch (6).
- 1 ea. Frequency converter low noise regenerating for the drive of:
  1 off for Level wind (6).

NOTE!! The Frequency Drives are AFE type meaning that the vessels main Switch Board and electric system need to have the facility to receive all the regenerated power from the winches. PMS integration with floating limits.

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7. HYDRAULIC BRAKE AND COOLING SYSTEM

Hydraulic one line diagram TBC

Item 7a **Hydraulic system for brake and slack wire compensator.**
1 ea. Hydraulic Power Unit (HPU), mainly comprising of:
2ea. Elec. hydraulic power pack 3,0 kW/3x480V/60Hz/IP55
S6-40% load rating, fixed displacement hydraulic pumps, included Oil tank, oil cooler and Accumulator.
2 ea. Starters as part of the complete control system.
Prepared for bio degradable oil, type and brand to be sent to Macgregor for approval.
According to dim sketch 2000004113

Item 7b **Hydraulic cooling system for the winch drive gearboxes.**
1 ea. Hydraulic Power Unit (HPU), mainly comprising of:
2ea. Elec. hydraulic power pack 1,5 kW/3x480V/60Hz/IP55
S1-100% load rating, including fixed displacement hydraulic pumps, oil reservoir as well as filters, necessary valves, thermal switch, check valves and hoses.
Oil cooler approx. 30kW cooling capacity at 38°C water temperature installed on HPU
2 ea. Starters as part of the complete control system.
Prepared for bio degradable oil, type and brand to be sent to Macgregor for approval.
According to dim sketch 2000004110.

Required fresh water cooling supply@ maximum 38°C is
8a = 25l/min & 8b = 50l/min.
Note: The water supply on/off solenoid valves for water inlet are yard supply, but controlled from the MacGregor control system.
Water pressure shall be sufficient to overcome cooler cross port pressure at max. 2 bar.

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8. COMMON CONTROL SYSTEM

8.1 Integration:

The Pentagon provide a wide range of opportunities to integrate third party equipment/suppliers, here under.:

- ✓ Power Management System (PMS)
- ✓ Integration true OPC/UA, winch data and alarms.

8.2 Motion Reference Unit:

Required available signal from Kongsberg MRU-H, generation 5 unit or similar**.**
MRU is optional, not included in this quote.

8.3 Over stern/over the side operation

System is integrated with radio control for handling, ref specification 101900007.09

The radio control has following functions for the winches:

- ✓ Activate winch switch
- ✓ Control here
- ✓ Alarms
- ✓ Joystick for Pay-out and haul in (switching between the three winches)
- ✓ Tension control
- ✓ Display for speed, length and tension monitoring
- ✓ Emergency stop switch

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9.4 Common Control in Control Room

Pentagon™, Computerized Winch Control System

Pentagon Control/monitoring panel for remote control and automatic control of winches under item 5 & 6 – dwg.RH311505 with the following functions:

Pentagon Research system with touch screen for:

- ✓ Automatic pay-out and haul back at pre-set lengths, speed and tension.
- ✓ AHC – active heave compensation control for the winches
- ✓ Alarms
- ✓ Joystick for Pay-out and haul in for one winch at the time.
- ✓ Length, speed and tension monitoring
- ✓ Switching between winches
- ✓ Split screen when operating two winches simultaneously.
- ✓ Emergency switch
- ✓ Settings of display and system
- ✓ Setting control priority
- ✓ Logging facility of relevant winch data.





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9. CONTROL FEATURS

Speed control accuracy on the electric driven winches

Down to 0,1m/s in normal mode and down to 0,02m/s in “creep mode”
In the Rapp control system, we have two modes of manual control. When the operator wants to have a very fine and accurate control he switches over to “creep control” which will give **continuous variable speed in increments of down to 0.02m/s**

Monitoring systems for cable/wire/rope tension, length and speed

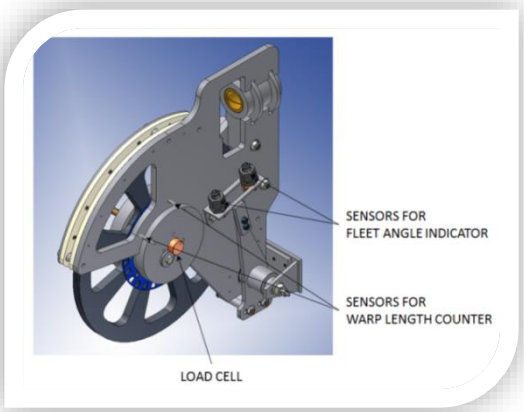
Standard System # 1 for research winches: Calculated values

- ✓ Using the encoders on the electric motors for calculation of length and speed.
- ✓ Using the torque loading (from the VFD) on the electric motors for calculation of tension.

System # 2 for research winches: Measured values

- ✓ Load cell in the spooling sheave or in deck sheave for measurement of tension.
- ✓ Encoder in the spooling sheave or in deck sheave for counting of revolution with corresponding calculation of length and speed.

The monitoring system to be used is chosen by the operator from the control system.
System #1 and system #2 is back up to each other – means we have 100% redundancy.



Electric driven and synchronized level wind system

- ✓ Synchronized based on a fixed adjustable pitch (ratio between the winch drum and the movement of the level wind carrier)
- ✓ Fleet angle sensor spooling (sensing the fleet angle on the wire between the layer on the drum and the level wind carrier)
- ✓ Combination of synchronized spooling and fleet angle sensor (fleet angle sensor will “reset” position of the level wind carrier if the synchronized spooling is lacking behind or is ahead). This is a feature used when spooling long cables – 5000m or more.

Tension control/auto rendering and heave compensation

- ✓ All winches has tension control and “auto rendering” features – means that that the winch will stop/or give out at the pre-set tension.
- ✓ Active Heave Compensation (AHC) is included for the winches.

Safety system in winch room

- ✓ Flashing lights when winches are in operation

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10. DOCUMENTATION AND ASSISTANCE INCLUDED

Service and assistance included:

A) 3 ea hard copy and electronic (pdf) Engineering manuals in English language including:

- Hydraulic system schematics
- Electric wiring diagrams.
- General installation instruction.
- Dimension sketches of winches.
- Dimension sketches of control panels and cabinets.
- Flushing and cleaning procedures for hydraulic pipes.

B) 3 ea hard copy and electronic (pdf) Operational manuals and spare part catalogues in English language including:

- All relevant drawings with part lists and specifications.
- Operational instruction for the Pentagon control system and winches.
- Manufacturer's test certificates of winches.
- Lubrication chart
- Manufacturer´s test certificates of winches.
- On board Repair Part List as recommended by MacGregor, based on:
  - Cruise duration of 21 days in remote areas
  - Frequency semi –annual or greater (daily, weekly, monthly etc)
  - Hourly maintenance of under 2000 hrs frequency
  - The list shall contain prices of the parts.
- Vendor Recommended Spares List as recommended by MacGregor:
  - Items required for preventive maintenance cycles greater than semi – annual, and greater than 2000 hrs.
  - The list shall contain items not readily stocked by vendor, with a greater than 90 day lead time. Frequency semi –annual or greater (daily, weekly, monthly etc)
  - The list shall contain prices and weights of the parts.

C) Project and production QA will be provide as following:

- Project schedule plan with progress reporting

D) Start-up assistance/training:

- Technical supervision and inspection of installation, start up assistance and dock trials will be carried out by one of our service engineers. According to mutually agreed and approved protocols. Included are travel expenses, lodging and labour hours for inspection and guidance.
  A total stay of 10 days (one trip) at the yard is included. Each working day shall not exceed 10 hours and shall be executed mainly during normal working hours and normal working week. We require a notice from the yard 20 days before such assistance is to be performed.

- Assistance during full scale trials out at sea, according to mutually agreed and approved protocols, including training of crew in operation and maintenance from one of our

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engineers is included with a stay of maximum 10 days out at sea. This activity is to take place after dock testing and will be executed by personnel departing from Norway. Customer is responsible for covering cost of travel and other related expenses arising from travels to and from the place of execution.

- If the allocated number of work hours for supervision and trials are exceeded due to reasons and delays at the yard which are beyond MacGregor´s control and/or responsibility, MacGregor will charge EURO. 1890,- per additional working day (Monday – Friday) at the yard, plus expenses.

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- The hydraulic- and electric installation, winch foundations and alignments must be completed before the trials can start at shipyard. MacGregor's representative's involvement during start-up and final testing/sea trials is limited to ensuring that pipes are properly sealed and do not show any leakage under working conditions i.e. full system pressure and that all equipment supplied by MacGregor is operating as specified.

- MacGregor is not responsible for installation that has been carried out differently from submitted specifications.
  MacGregor is not responsible for starting prime movers or supervision of same during start-up or trials.
  The yard and-/or the owner are responsible for allocating their own personnel to carry out any supervision or remedial work required at their own expense.

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11. ALIGNMENT AND FOUNDATION OF WINCHES ON BOARD THE VESSEL

All winches mounted on board the vessel shall by Ship Yard be aligned in accordance with normal practice for this kind of machinery and as per instructions from MacGregor found in engineering manual.

Design, engineering and production of deck foundations for specific winches are the buyer's (shipyard or vessel owner) responsibility. Such foundations must comply with:

- Common practice and well-known engineering principals for marine rotating appliances for installation on deck.
- Class society requirements for marine rotating appliances for installation on deck (e.g. DNVGL Rules for Ship, section – Foundations for deck machinery, towing equipment and lifting appliances).

For the main winches, deck foundation must have sufficient stiffness to avoid excessive deflections, in respect to the above, under winch load. If not otherwise specified, such winch load is to be taken as rated line pull for the winch at half/mid wire layer (ref. performance table for actual winch). Deflection values, as result of structure analysis, can be submitted to MacGregor for information and comments/ evaluation.

12. SURFACE TREATMENT

Products manufactured by MacGregor, in this case all items in this technical specification are surface treated according to our standard specification:

- Shot blasting to Grade SA 2,5-3,0/ISO standard 8501-1.
- Zinc metallizing Minimum Thickness 60µ but average 80µ
- Tie coat (primer) Thickness Intercure 202, 50% diluted
- Hi-build Thickness Intercure 202
- Top coat Thickness Interfine 691

Total thickness paint is minimum 240µ but average will be above 315µ

- Color code RAL-9016 Confirmed

Note:
Sand blasting and zinc metallizing does not apply for Electric motors with aluminum housing, Delicate hydraulic components, Stainless steel components, Aluminum components, and if there are used Allen bolts with strength class 12,9.

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13. SPARE PARTS FOR WINCHES

Standard package of spare parts and special tools not included – To Be Considered

14. LICENCE PRODUCTION/COUNTRY OF ORIGIN

MacGregor has an international production and service organization where components, complete products and services listed in the technical specification could have a different country of origin than Norway. Shipyard and the owners accept accordingly this information as a general and final notification that some of the specified products (or services) may have been manufactured at different locations and consequently have another country of origin than Norway.

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15. ALIGNMENT AND FOUNDATION OF WINCHES

All winches mounted on board the vessel shall by Ship Yard be aligned in accordance with normal practice for this kind of machinery and as per instructions from MacGregor found in engineering manual.

Design, engineering and production of deck foundations for specific winches are the buyer's (shipyard or vessel owner) responsibility. Such foundations must comply with:

- Common practice and well-known engineering principals for marine rotating appliances for installation on deck.
- Class society requirements for marine rotating appliances for installation on deck (e.g. DNVGL Rules for Ship, section – Foundations for deck machinery, towing equipment and lifting appliances).

For the main winches, deck foundation must have sufficient stiffness to avoid excessive deflections, in respect to the above, under winch load. If not otherwise specified, such winch load is to be taken as rated line pull for the winch at half/mid wire layer (ref. performance table for actual winch). Deflection values, as result of structure analysis, can be submitted to MacGregor for information and comments/ evaluation.

November 4th, 2021

MacGregor

_____sign_____

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TECHNICAL SPECIFICATION

CNP Freire
Vigo.
Spain

Att: Ramón Borrás

Date:	**15.09.21**
Our ref.:	Andreas Vie Murvold
Direct phone:	+47 95 70 14 12
Direct mail:	Andreas.Murvold@macgregor.com
Your ref.:	016-2020
Project no.:	4/60185
Project description:	MBARI
RFQ Doc. No.	

TECHNICAL SPECIFICATION NO.: 10190007-09

Dear Ramón Borrás

We thank you for your enquiry and look forward to learning of your comments to our technical specification in due course.

Kindly note that this document “Technical Specification” represents our understanding of the technical specifications / requirements as presented to us in your enquiry.

If responding to our technical specification, please refer to our technical spec. number stated in the heading of this document. The reference will assist us to quickly identify your project in our records.

Yours sincerely,
Macgregor Norway AS, TRIPLEX site

Andreas Vie Murvold

MacGregor Norway AS, Triplex site
Heimgardsveien 21
6530, Norway
914 248 965 MVA

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REVISION TABLE

Rev. no.	Sent Date	Approved By	Description
01	31.01.2019	JKH	Preliminary Technical Specification
02	15.03.2019	AVM	Updated according to18110.01rev C
03	03.07.2019	AVM	Updated Item 2 and 2.1. Added HPU Updated Item 3
04	10.07.2019	AVM	General Update
05	28.04.2020	AVM	Updated based on Shipyard RFQ
06	15.05.2020	AVM	Main crane and AUV docking head as an option.
07	26.03.2021	AVM	Updated based on latest communication with yard.
08	11.07.2021	AMV	Updated main crane, and documentation schedule. Removed one HPU.
09	15.09.2021	AMV/FM	Removed Spare Parts – To Be Considered

SCOPE OF SUPPLY

Item no.	QTY	Drawing no.	Rev. no.	Description
1	1	20549	01	Stern A-frame 100 kN
2	1	20673	02	Overhead Crane
2.1	1	20673	01	Docking Head
3	1	20547	02	CTD Davit
4	1	1998565	01	2x75kW HPU
5	1	23460	03	KNR- 60
5.1	1	23412	01	AUV Docking Head

OPTIONS

Option no.:	QTY	Description

CLARIFICATIONS

Needs to be agreed upon before signing a PO.

#	Item no.:	Description

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GENERAL DESIGN CRITERIA

TEMPERATURES			FROM	TO
A	Ambient operating temperature with 100% relative humidity	Equipment installed on deck	+ 40°C	-10 °C
B	Operating temperature with relative humidity up to 70 %	Equipment installed under deck/indoor	+ 40°C	0°C
C	Seawater temperature		+ 32°C	-2°C

ELECTRIC / POWER				
A	Power supply Voltage (HPU)	480V, 60Hz - 3 phases	☐ Fixed ☐ Variable	
B	Control system Voltage	AC 230V, 60Hz		
C	Enclosure rating for el equip. installed <u>on deck</u>	Encoders & Load Cells Control Panels on deck/hangar Proximity switches Radio remote controls with Gore-Tex	IP IP IP IP	66 66 67 65
D	Enclosure rating for el. equip. installed <u>under deck</u>	Starters for HPU's Control Panels	IP IP	55 65
E	Floodlights	LED Type	lm	9000

MATERIALS			
A	Major steel structures (According to the applicable rules and regulations)	minimum type	S355
B	Hydraulic pipes	up to OD42mm	Stainless Steel
C	Hydraulic fittings	up to OD42mm	Stainless Steel
D	Hose ends	up to OD42mm	Stainless Steel
E	Grease lines & grease nipples		Stainless Steel
F	Cylinders piston rods		Stainless Steel + Hard Chrome
G	All bushings		Bronze material
H	Hydraulic hoses	rubber in accordance with	EN 857

HYDRAULICS			
A	Oil type *(oil itself not included)*	☐ Mineral oil ☒ Bio oil	Type if applicable: Type if applicable:
B	Cooling system	☒ Freshwater ☐ Seawater ☐ Air	

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DESIGN & TESTING OF LIFTING APPLIANCES		
A	Design of according to	USCG 46 CFR 189.35 – Weight Handling Gear requirements
B	3rd party Class Certification of the equipment in this specification:	☐ Included ☒ Not Included
B1	Class society if Class Certification included	
B2	Type of Class Certification if included	☐ Design Approval ☐ Type Approval?
	FAT Witness by Class Surveyor	☐ Included ☒ Not Included
C	Testing according to Norwegian Maritime Authority (NMA) according to ILO convention No. 152 rules	☒ Included ☐ Not Included
D	FAT test report	Will be issued for each item

SURFACE TREATMENT / COLOR		
A	Surface treatment: All products	Metallized – See surface treatment
B	Color Item	RAL 9016 White (Gloss: High)
C	Color Macgregor letters	RAL 3000 Red

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ITEM 1: 100 kN - 170° STERN A-FRAME



Illustration 1 – Illustration of a 170° Stern A-Frame

DESCRIPTION
Complete stern a-frame with 170° stroke, 2 LED floodlights,2 Aux winches, 3 pad eyes and 4 sheave block (included) • Distance between the legs (free space) 4 300mm • Distance from deck up to main sheave 6 100mm • Distance of block aft of transom minimum 5 855mm • Distance of block forward of transom minimum 4 600mm The A-Frame is bolted to the deck. Bolts is shipyard scope of supply, and not included in Macgregor Scope of supply.

#	TECHNICAL DATA – A-FRAME		
A	According to dimensional sketch	20549	
1	P1 (Working area 40°-170°) – SDL	100	kN
2	P2 (Winch Working Area 10°-170°)	SWL 2x3	Ton
3	Hydraulic pressure	200	Bar
4	Tilting time out/in	120/120	Seconds
5	Recommended oil flow	200	L/min
6	Weight of crane (moving parts) approx.	10000	Kg
7	Weight of foundation approx.	2x1 900	Kg

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STERN A-FRAME CONTROLS	
EMERGENCY CONTROL	Operated from levers on directional valves mounted in stainless steel cabinet with access through hinged hatch. The Emergency control cabinet can be located at a desirable location for optimal operation. This control is used for emergency operation. Normal operation is from the radio control panel.
RADIO REMOTE CONTROL 	The A-Frame will be delivered with complete HBC radio control of all functions, including receiver cabinet with power supply and required relays. Portable control unit with belt, antenna in drip proof box, battery charger and two batteries are also included. Additional information: 1. All movement functions of the A-Frame takes place from this control panel. 2. All movement functions of the aux winches takes place form this control panel. 3. All motions can be controlled at step-less variable speed (infinite variable) from zero to full speed. 4. Operating simultaneously different functions is fully possible. Each function will be clearly marked. 5. HPU with necessary performance can be started from a starter switch on the radio remote console.
CONTROL STATION PANEL The control station panel, will be delivered as a part of the Winch scope.	One (1) remote control panel for stern control room with the following functions: 1. Start/Stop HPU 2. One 2- ways joystick for the tilt function. 3. Two 2- ways joysticks for Hoist/pay-out of the winches 4. Emergency switch  *Figure 1 - Remote Control Pane*

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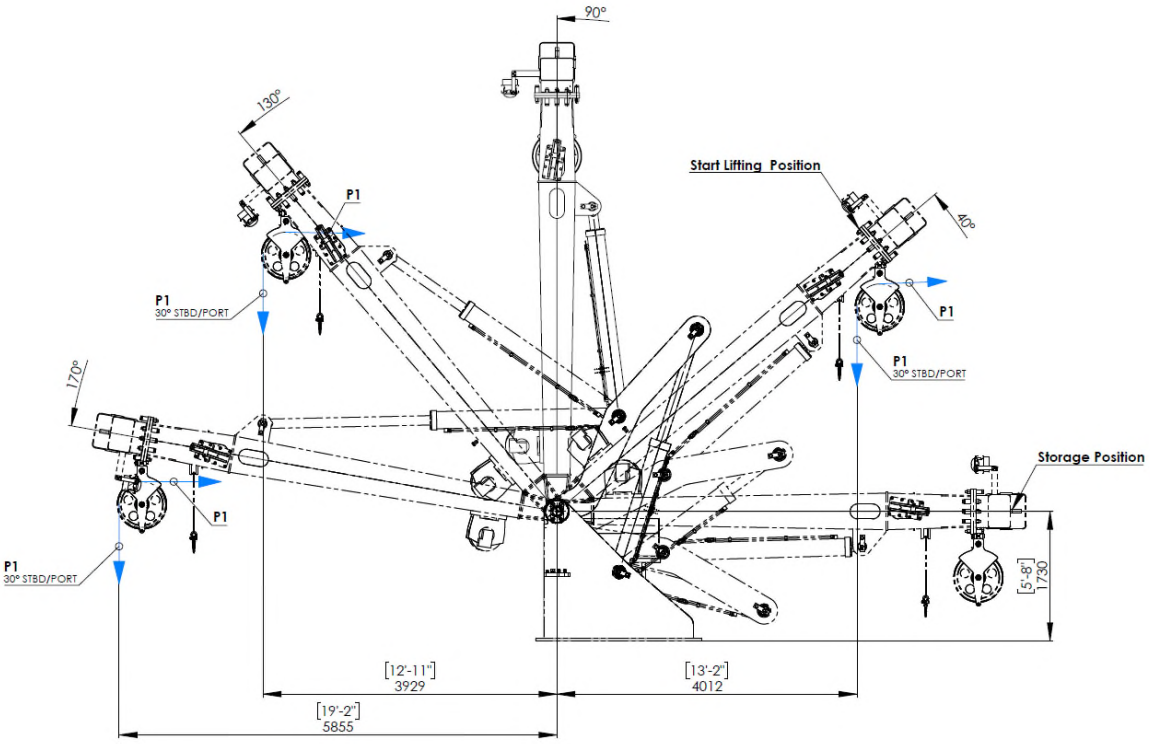


Illustration 2 – Side illustration Stern A-frame

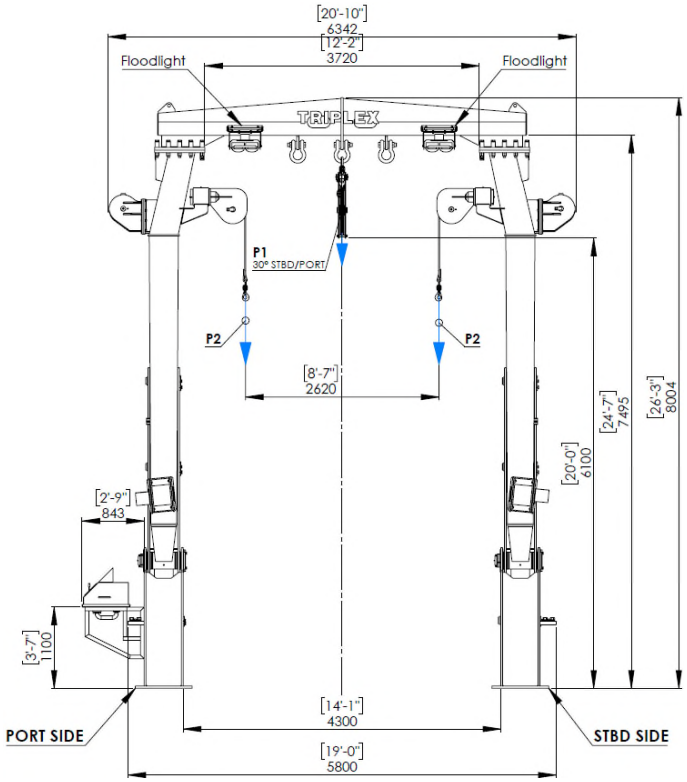


Illustration 3 –Stern A-frame

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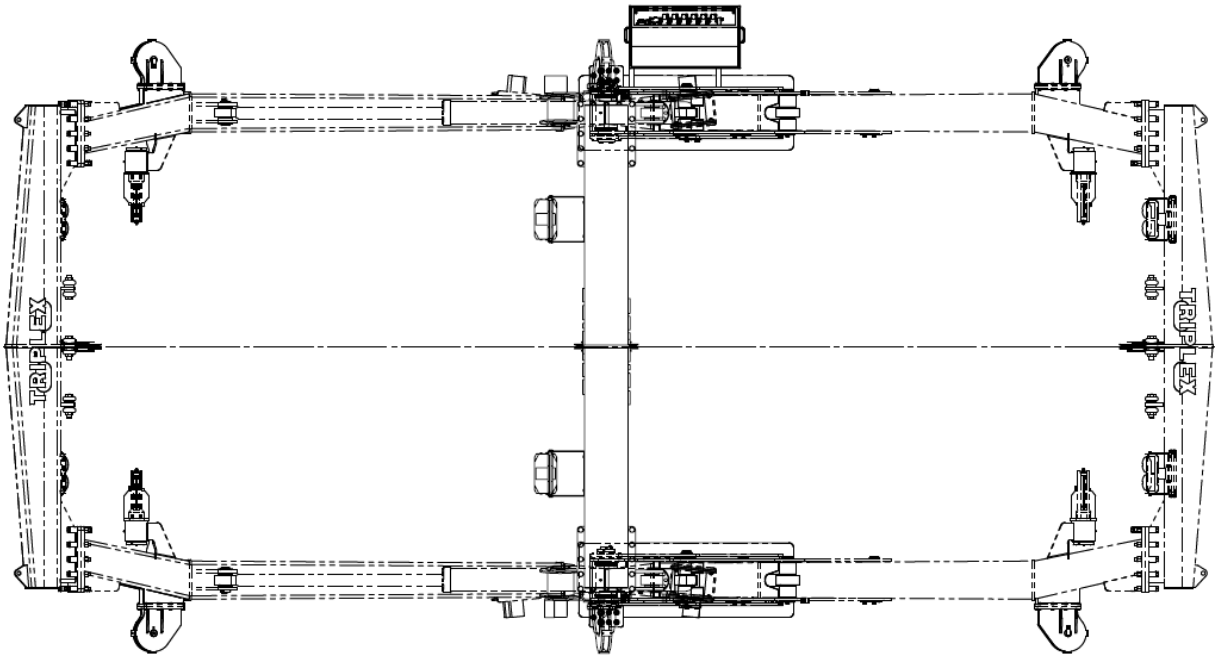


Illustration 4 – Stern A-Frame

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ITEM 2: 200 kN OVERHEAD CRANE



Illustration 5 – OHC Crane

DESCRIPTION
Complete OHC crane, including docking head (see ITEM 2.1 DOCKING HEAD) • For installation to the hangar ceiling. The OCH is designed to launch and recover and ROV, with a dedicated lifting line winch mounted on the crane, routed through the Docking head.

#	TECHNICAL DATA - OHC			
A	According to dimensional sketch	20673		
1	Design line tension (cast pos.) – DL		200	kN
2	Luffing load- Auxiliary Winch (lashed) – SWL		6	Ton
3	Line Speed (on 2. Layer)		35	m/min
4	Working pressure		200	Bar
5	Recommended oil flow		220	L/min
6	Mass of rail (approx.)		4 500	Kg
7	Mass of moving parts (approx.)		10 000	Kg

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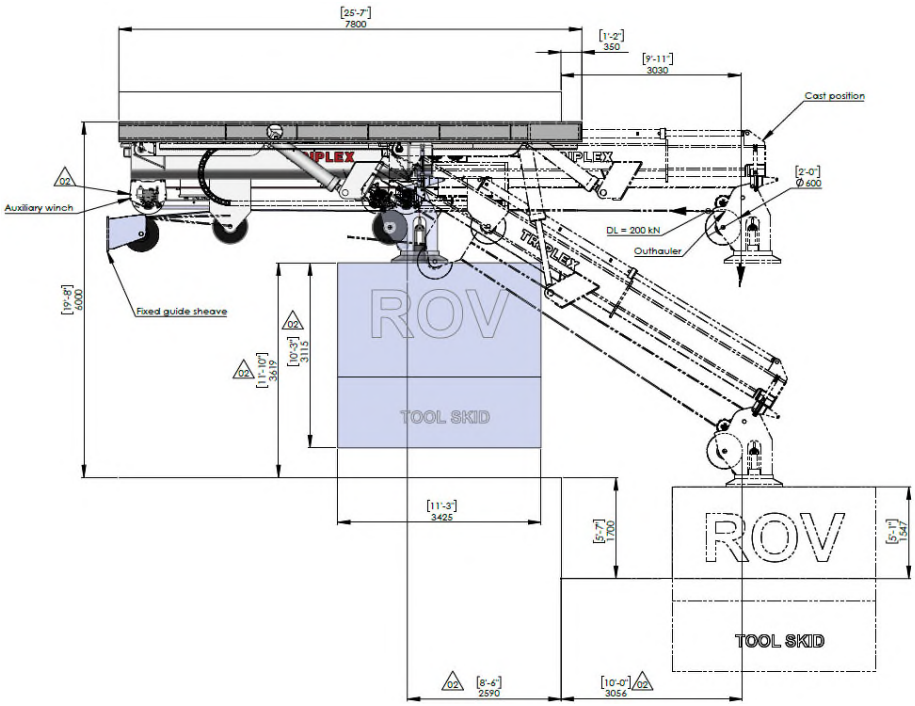


Illustration 6 –OHC Crane

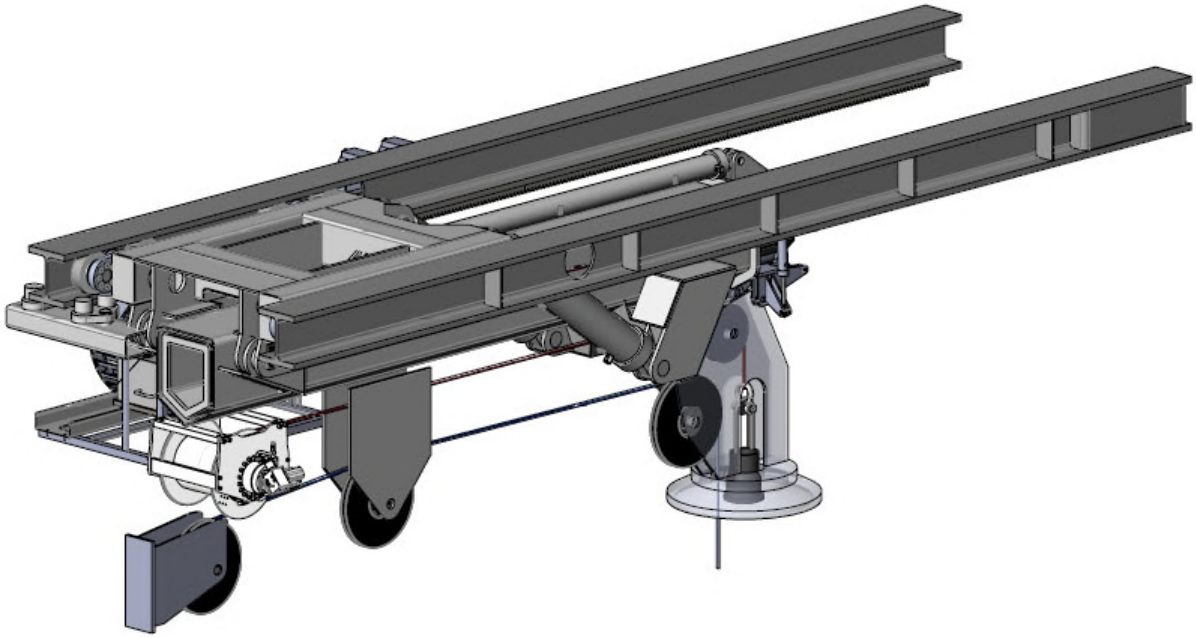


Illustration 7 –OHC Crane

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OHC CONTROLS (INCLUDING THE DOCKING HEAD)	
EMERGENCY CONTROL	Operated from levers on directional valves mounted in stainless steel cabinet with access through hinged hatch. The Emergency control cabinet can be located at a desirable location for optimal operation. This control is used for emergency operation. Normal operation is from the radio control panel.
RADIO REMOTE CONTROL 	The crane will be delivered with complete HBC radio control of all functions, including receiver cabinet with power supply and required relays. Portable control unit with belt, antenna in drip proof box, battery charger and two batteries are also included. Additional information: 1. All movement functions of the OHC will take place from this control panel. 2. All motions can be controlled at step-less variable speed (infinite variable) from zero to full speed. This includes the functions for the docking head. 3. Operating simultaneously different functions is fully possible. Each function will be clearly marked. 4. HPU with necessary performance can be started from a starter switch on the radio remote console.
CONTROL STATION PANEL HANGAR The control station panel will be delivered as a part of the Winch scope.	One (1) remote control panel for hangar control room with the following functions: 5. Start/Stop HPU 6. All movement functions of the OHC will take place from this control panel. 7. Emergency switch  *Figure 2- Remote Control Panel*

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ITEM 2.1 DOCKING HEAD

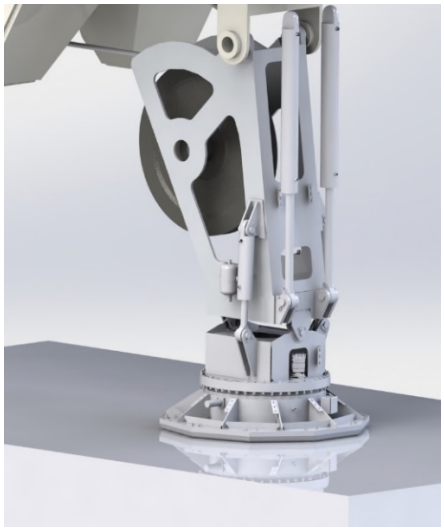


Illustration 8–Docking Head

DESCRIPTION
One (1) docking head for handling a ROV with the max weight of 6 Ton The docking head is designed to be mechanically interfaced to the OHC. Its main purpose is to secure a ROV during launch and recovery at the side of the vessel. Load always in vertical position during operation. Damping of transverse and longitudinal movements **Functions:** • 180 deg rotating snubber • ROV latching • Lock swing in longitudinal direction Information about the Bullet is required before final drawing of the Docking Head can be released.

DOCKING HEAD CONTROL	
EMERGENCY CONTROL	See the control for the OHC (one common control).
RADIO REMOTE CONTROL 	See the control for the OHC. One common radio control.

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ITEM 3: 3T CTD DAVIT



Illustration 9 –CTD Davit

DESCRIPTION
Complete CTD Davit, including docking head. • For deck installation on vessel side (outside – open deck) Including sheaves to handle 0.322'' conducting cable and 0,393 EOM Cable

#	TECHNICAL DATA - CRANE			
A	According to dimensional sketch	20547		
1	DLT-P1 (cast position)		73,5	kN
2	SWT-P1 (towing in cast)		14	kN
3	Luffing load		12	kN
4	Working pressure at consumer		200	bar
5	Tilting time		18	s
6	Telescoping time		40	s
7	Recommended oil flow		80	l/min
8	Mass of crane (approx.)		6 400	kg
9	Mass of foundation		700	Kg

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CTD DAVIT CONTROLS	
EMERGENCY CONTROL	Operated from levers on directional valves mounted in stainless steel cabinet with access through hinged hatch. The Emergency control cabinet can be located at a desirable location for optimal operation. This control is used for emergency operation. Normal operation is from the radio control panel.
RADIO REMOTE CONTROL 	The CTD davit will be delivered with complete HBC radio control of all functions, including receiver cabinet with power supply and required relays. Portable control unit with belt, antenna in drip proof box, battery charger and two batteries are also included. Additional information: 1. All movement functions of the CTD Davit will take place from this control panel. 2. All motions can be controlled at step-less variable speed (infinite variable) from zero to full speed. 3. Operating simultaneously different functions is fully possible. Each function will be clearly marked. 4. HPU with necessary performance can be started from a starter switch on the radio remote console.
CONTROL STATION PANEL The control station panel, will be delivered as a part of the Winch scope.	One (1) remote control panel for stern control room with the following functions: 5 Start/Stop HPU 6 One 2- ways joystick for the tilt function. 7 Emergency switch  *Figure 3 - Remote Control Pane*

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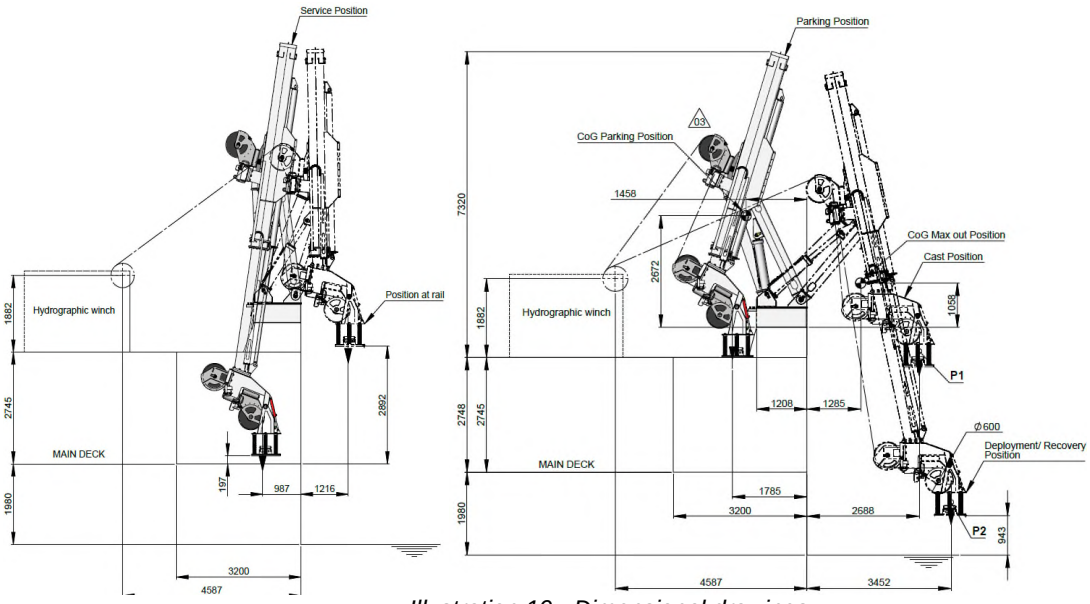


Illustration 10 - Dimensional drawings

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ITEM 4: 1ea 2x75kW HPU



Illustration 11 – HPU

DESCRIPTION
1 ea. Electro-Hydraulic Power unit. One unit dedicated to item 1-5. Electric motors 75 kW AC480V, 3-phase 60HZ IP 54, with direct- coupled (by flexible coupling) hydraulic variable displacement piston pumps. It will further be equipped with: • Fill cap • High pressure, return and drain filters • Level & heating indicators • Reservoir heater • Low level switch for motor and reservoir heater stop • Connections required for supply, return and drain • Gate valves • Gauges • Manhole • Drain connection with ball valve shut-off and plug • Soft Starters for el. Motors with remote control connections • The aggregates will have flexible rubber connections to the frame • The HPU will be of low noise level type (low flow/pressure – pulsation led to low noise emission) • Each pressure line from pumps equipped with pressure valve, pressure filter, check • Oil Flow: 400 L/min (2 pumps with 200L/min each) • Working pressure: 210 bar

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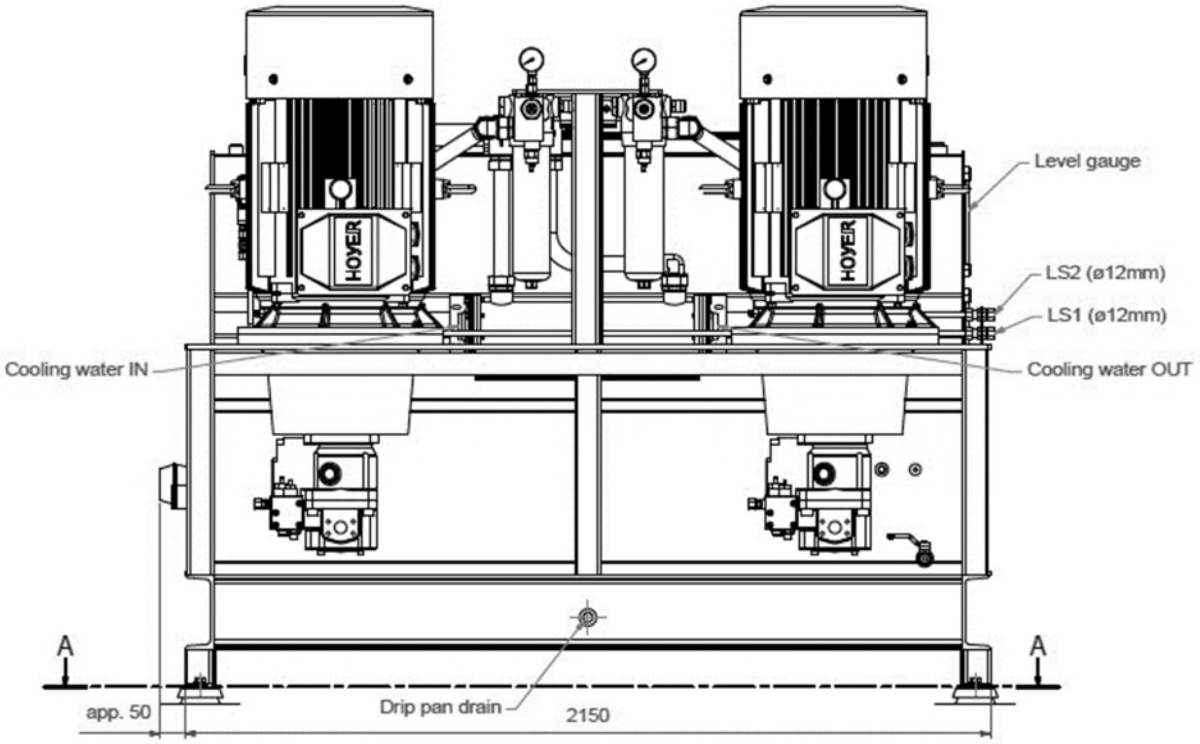


Illustration 12 – HPU

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ITEM 5: KN-75 CRANE



Illustration 13 – KN-75 crane

DESCRIPTION
Complete knuckle boom. Crane with two winches and docking head for AUV. The maximum reach of the winch hook (SWL 2.5 T) is 13.2 m. Winch with SWL 2.5 tons lifting capacity with 40 m certified wire and safety hook. Winch mounted on jib with wire guided through free-rotating double sheave head Separate winch with 8.2 tons lifting capacity with a maximum reach 9.0 m. Winch mounted on main boom, with wire routed through a sheave on the side. Slewing angle is limited to 3x360°, to prevent damage on the electrical cabling for the Docking Head. The limitation system is equipped with alarms and indicators to help the operator during operation of the crane. Pedestal 1.395 m (to be agreed upon) with machined flange, including bolts and nuts for mounting of crane to pedestal. The pedestal has a hinged hatchway. AUV Docking Head, the crane will be equipped with all the necessary piping and cabling necessary for the AUV docking Head in item 5.1

#	TECHNICAL DATA - CRANE		
A	According to dimensional sketch	23460	
B	Type of crane	Shipboard	
2	Dimensioned lifting capacity	75	Tm
3	SWL-1 in port or at sea	2.5	Tons
4	SWL-2 in port	8.2	Tons
5	SWL-3 AUV Docking Head	1.0	Tons
6	Slewing torque	150	kNm
7	Slewing angle	360 °	°
8	Working pressure	230	Bar
9	Line speed at rec. flow	30	m/min
10	Required oil supply	200	l/min
11	Max heel when slewing	10	°
12	Slewing speed	1.0	Rpm

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13	Weight without crane pedestal, approx.	11 560	Kg
14	Weight crane pedestal, approx.	1 200	Kg

#	TECHNICAL DATA – CRANE PEDESTAL	
A	Dimensional drawing of pedestal:	TBA-rev
1	Height of pedestal	to be agreed upon
2	Location of service hatch(es)	to be agreed upon

CRANE CONTROLS	
EMERGENCY CONTROL	Operated from levers on directional valves mounted in stainless steel cabinet with access through hinged hatch. The Emergency control cabinet can be located at a desirable location for optimal operation. This control is used for emergency operation. Normal operation is from the radio control panel.
RADIO REMOTE CONTROL	The crane will be delivered with complete HBC radio control of all functions, including receiver cabinet with power supply and required relays. Portable control unit with belt, antenna in drip proof box, battery charger and two batteries are also included.
	Additional information: 1. All movement functions of the crane and both winches take place from this control panel. 2. All functions of the Docking Head take place from this control panel. 3. All motions can be controlled at step-less variable speed (infinite variable) from zero to full speed. 4. Operating simultaneously different functions is fully possible. Each function will be clearly marked. 5. HPU with necessary performance can be started from a starter switch on the radio remote console.

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ADDITIONAL		
DESCRIPTION	**INCLUDED / NOT INCLUDED**	**INFORMATION / REFERENCE**
MOPS (Manual Overload Protection System)	☐ Included ☒ Not Included	Only applicable for offshore cranes
AOPS (Automatic Overload Protection System)	☐ Included ☒ Not Included	Only applicable for offshore cranes
Constant tension (CT)	☐ Included ☒ Not Included	
Personnel Lift	☐ Included ☒ Not Included	
Operators Platform	☐ Included ☒ Not Included	
Operators Cabin	☐ Included ☒ Not Included	
Crane Boom Rest	☐ Included ☒ Not Included	
Floodlights	☒ Included ☐ Not Included	1 x LED
Load Indicator	☐ Included ☒ Not Included	
Lubrication system	☐ Included ☒ Not Included	

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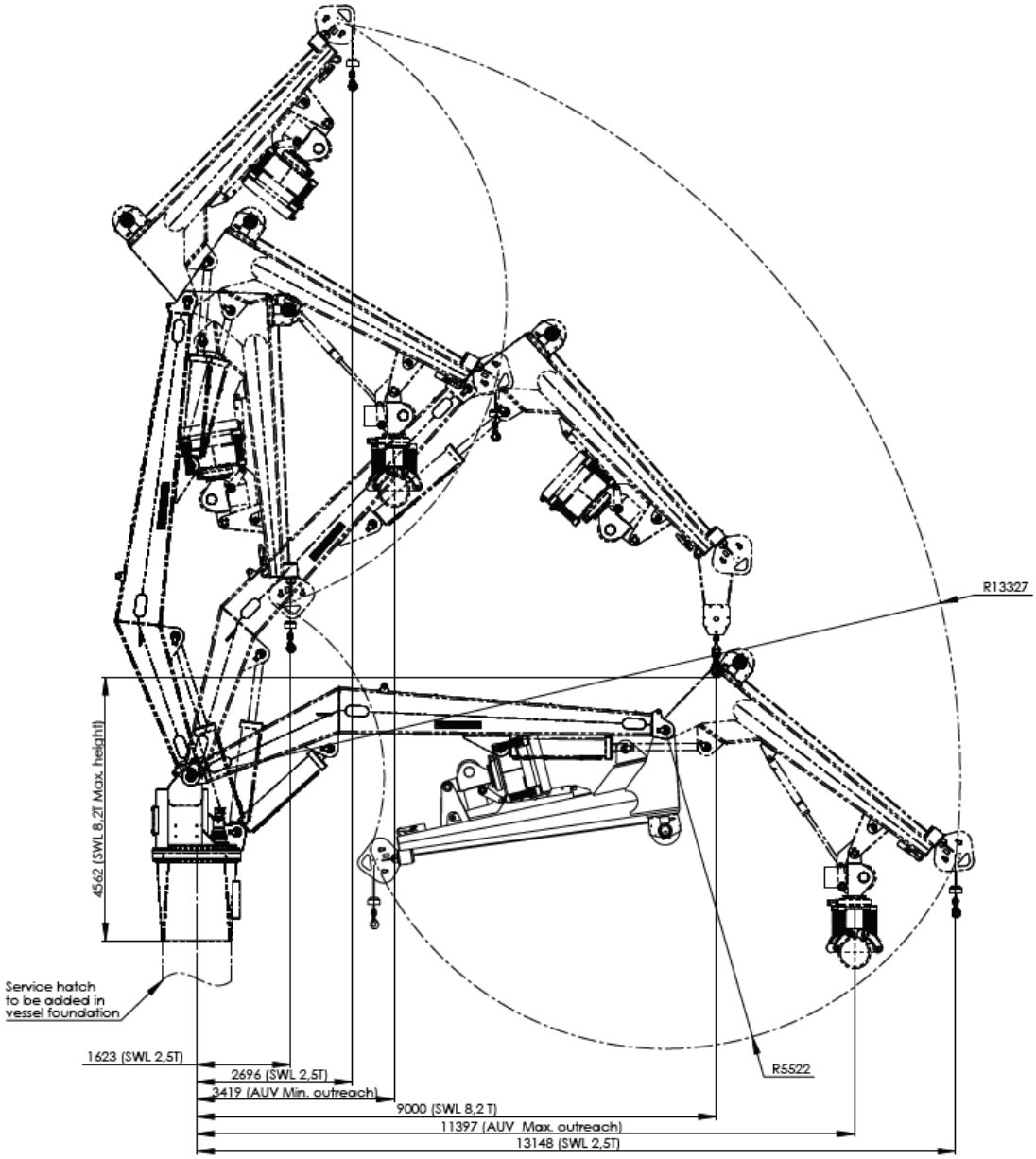


Illustration 14 –KNR-75 with Docking Head

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ITEM 5.1 AUV DOCKING HEAD

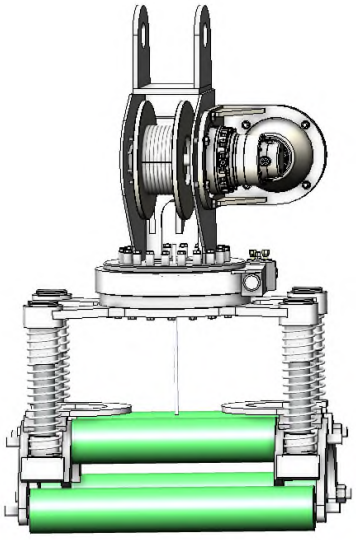


Illustration 15 –AUV Docking Head

DESCRIPTION
AUV Docking head mounted on the crane as show in illustration 10, and all function can be controlled by the cranes radio remote control. The docking head will be equipped with one electrical winch for securing the AUV during Launch and Recovery, the winch will have a hook which is manually attached or detached to the lifting point of the AUV-

TECHNICAL DATA DOCKING HEAD According to dimensional sketch 23412	
Working Pressure	230 Bar
AUV Max weight	1 Ton
DAF (inboard)	1.7
DAF (Outboard)	2.25
Mass of Docking Head (approx.)	1 400 kg

DOCKING HEAD CONTROL	
EMERGENCY CONTROL	See the control for the Main Crane (one common control).
RADIO REMOTE CONTROL 	See the control for the Main Crane. One common radio control.

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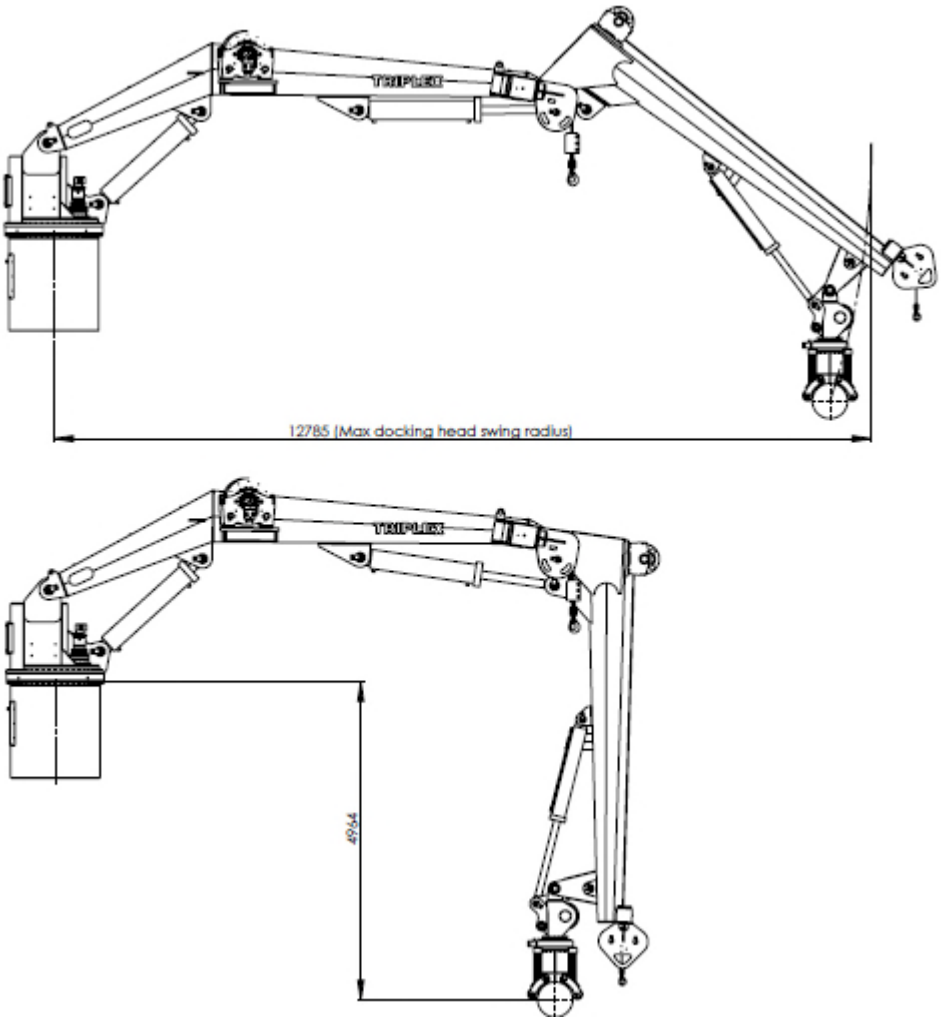


Illustration 16 –KN-75 with Docking Head

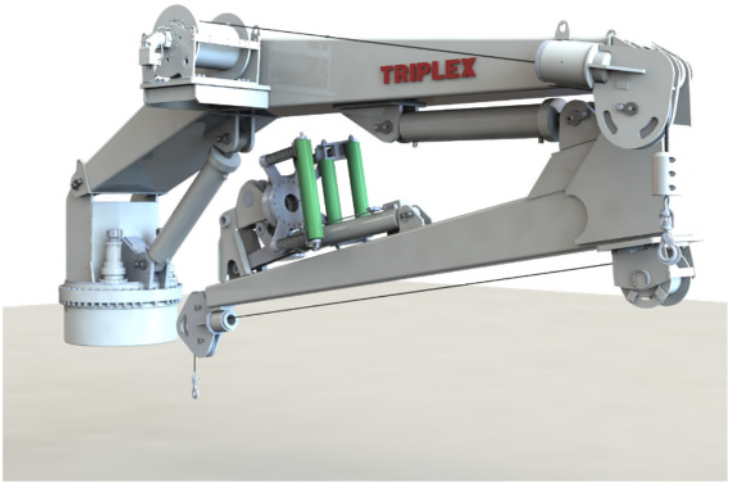


Illustration 17 –KN-75 with Docking Head

1

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GENERAL TERMS, DOCUMENTATION AND ASSISTANCE

CONTACT PERSON / PROJECT MANAGER

Contact person (single point of contact) and/or project manager:
Will be appointed and presented towards a confirmed order.

LICENSE PRODUCTION / COUNTRY OF ORIGIN

Macgregor Norway AS has an international production and service organization.
The products, components and services in this technical specification may have countries of origin other than Norway.

SPARE PARTS

To Be Considered

START-UP ASSISTANCE

Macgregor service engineer to perform:

- technical supervision and inspection of installation
- start-up

STAGE	DESCRIPTION	DAY(S)
1	Shop Inspections and Factory Acceptance Tests (FAT) for the handling system at our site at Europe.	
2	Technical assistance and inspection of installation at the shipyard	12 days
3	Start up and Performance Test at the shipyard (HAT)	8 days
4	Training of the crew	12 days

A total stay of 32 days (two trip) at the yard is included.

Training of crew at yard includes one session in classroom and one session onboard.

Lodging and travel expenses are included.
Each working day shall not exceed 10 hours and shall be executed mainly during normal working hours and normal working week, between Monday and Friday.

If the allocated number of work hours for supervision and trials are exceeded due to reasons and delays at the yard which are beyond Macgregor's control and/or responsibility, Macgregor will charge EUR 1 890,- per service engineer per additional working day at the yard, plus expenses.

We require a notice from the customer/yard 30 days before such assistance is to be performed. We also require the customer/yard to fill out a "pre commissioning checklist" to make sure that everything is ready for us to start working. This shall be returned to Macgregor at latest 30 Days before commissioning.

The information contained in this document is confidential and is for the attention of the named recipients only.

DOCUMENTATION

Included for the equipment listed in "scope of supply".
Delivered electronically (PDF file / DWG file) to the customer/shipyard.

When the below listed terms are confirmed by the customer by **July 2021**, we commit to the following documentation time schedule:

1. Signed contract
2. Approval of technical specification
3. Confirmation of cable/wire size and type including technical data
4. Confirmed vessel GA (for designing wire routing and related sheaves)

DOCUMENTATION TIMESCHEDULE:

MECHANIC / HYDRAULIC / ELECTRIC DOCUMENTATION		
WHAT	**WHEN**	**DESCRIPTION**
Priority 1	**End of November 2021**	1. Outline dimensions of all major equipment 2. Pedestal / foundation drawing 3. Load to deck + Weight and COG
Customer to provide comments/approval of the above priority 1 documentation within 14 days – after the documentation is sent from MacGregor Norway, Triplex site. *Priority 1.1, 1.2, 1,3 documentation requires customer approval by date, signature and/or company stamp.*		
Priority 2	**End of February 2022**	1. Hydraulic main piping diagram 2. Electric single-line diagram of the system 3. Outline dimensions of cabinets, panels and other smaller items

TEST PLANS AND INSTALLATION DOCUMENTATION		
WHAT	**WHEN**	**DESCRIPTION**
Priority 3	**End of July 2022**	1. FAT test plan and procedure 2. Draft HAT test plan and procedures 3. Complete installation documentation and related procedures 4. Detailed electric single-line diagram of the system with cable dimensions and locations 5. Piping diagrams with locations and size of pipe connections, flexible hoses and counter flanges

OPERATIONAL MANUAL		
WHAT	**WHEN**	**DESCRIPTION**
Priority 4	**6 weeks** *(from the last equipment shipping date)*	Operational manual to be delivered (electronic – pdf format) in English language including: 1. All relevant drawings with part lists and specifications 2. Operational instruction for the system 3. Lubrication charts 4. Manufacturer´s test certificates 5. Manufacturing Record Book (MRB) / as build drawings

NOTE: *The delivery dates for documentation (priority 1 to 4) and the equipment delivery dates are only valid when comments/approval from customer/shipyard is received within the above deadlines.*

The information contained in this document is confidential and is for the attention of the named recipients only.

SURFACE TREATMENT PROCEDURE

Macgregor has developed its own surface treatment procedures. Please see procedure and painting specification below.

All above quoted equipment will be delivered surface treated according to our standard specification:

SURFACE PREPARATION			
STEP	**DESCRIPTION**	**QUALITY**	**STANDARD**
1.1	All parts are grit blasted to standard:	Sa 2,5	ISO 8501-1 (2007)
1.2	Roughness	min. segment 2 (G 201) 50-70 µm (microns)	ISO 8503-1 (2012)
COATING			
STEP	**DESCRIPTION**	**QUALITY**	**STANDARD**
2.	Metallized (thermally sprayed with sink, Zn)	75 µm	
3.	All surfaces: Applied “tie-coat”	40 µm	Carboguard E 19
	Welds, corners, angles & notches: “stripe-coat”		Carboxane 2000 WG
4.	All surfaces: Applied full coat	125 µm	Carboxane 2000 WG
5.	Topcoat applied, all surfaces:	75 µm	Carboxane 2000 TC
Total film thickness included thermally sprayed zinc: **315 microns**			

GENERIC TYPE: Two component silane modified multi-polymer.
Compatible coatings: Zinc epoxies, polyurethanes, most epoxies or others as recommended by Carboline Norge AS.

Coating system in accordance with the requirements in NS-EN ISO 12944-5 (C5-M).

Surface treatment is according to MACGREGOR NORWAY AS, Triplex site standard.

Alternative treatment and paint type / quality can be agreed at an additional cost within 2 months after signed contract.

Ref: 5.1.0 SURFACE TREARMET

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Section 4

Operating Instructions

Main Mechanical Drawings

DESCRIPTION	DOC/DRW #	REV #	PAG #
ID:8513 CTD WINCH HW-515E-T90	2000004676	B	3
ID:8514 TRACTION WINCH, TRW-4004E-01R1	400092475	A	4
ID:8515 LEVELWIND W/SWC, ELSWC5000-L2000	400092566	A	6
ID:8516 STORAGE DRUM, RW-2372EB	400092447	C	7
Aux Winch ROV Overhead Crane	2000003571	D	8
Aux Winch KN-75 Main Crane	2000004293	D	9
A-Frame	20549	A	10
ROV OH LARS	20673	A	11
CTD Davit	20547	A	12
KN-75	23460	A	13

Hydraulic Diagrams

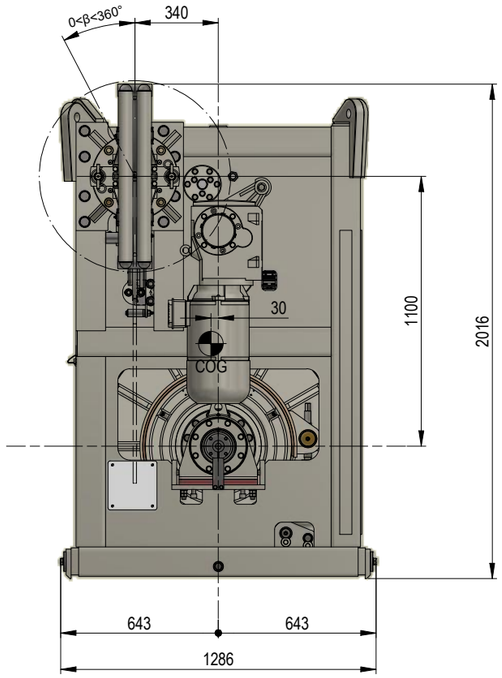
DESCRIPTION	DOC/DRW #	REV #	PAG #
Brake and Cooling System-MBARI	2000004171	A	14
HPU Gear Cooling	2000008163	A	15
HPU Brake	2000008113	A	16
ID:8513 CTD WINCH HW-515E-T90	RH411171	A	17
ID:8514 TRACTION WINCH, TRW-4004E-01R1	RH411181	C	18
ID:8516 STORAGE DRUM, RW-2372EB	RH411171	A	19
ID:8515 LEVELWIND W/SWC, ELSWC5000-L2000	RH319631	F	20
Deck Handling Equipment	S1739	05	21
A-Frame	24854	A	22
KN-75 Main Crane	24855	A	23
CTD Davit	24856	A	24
ROV Overhead Crane	24857	A	25

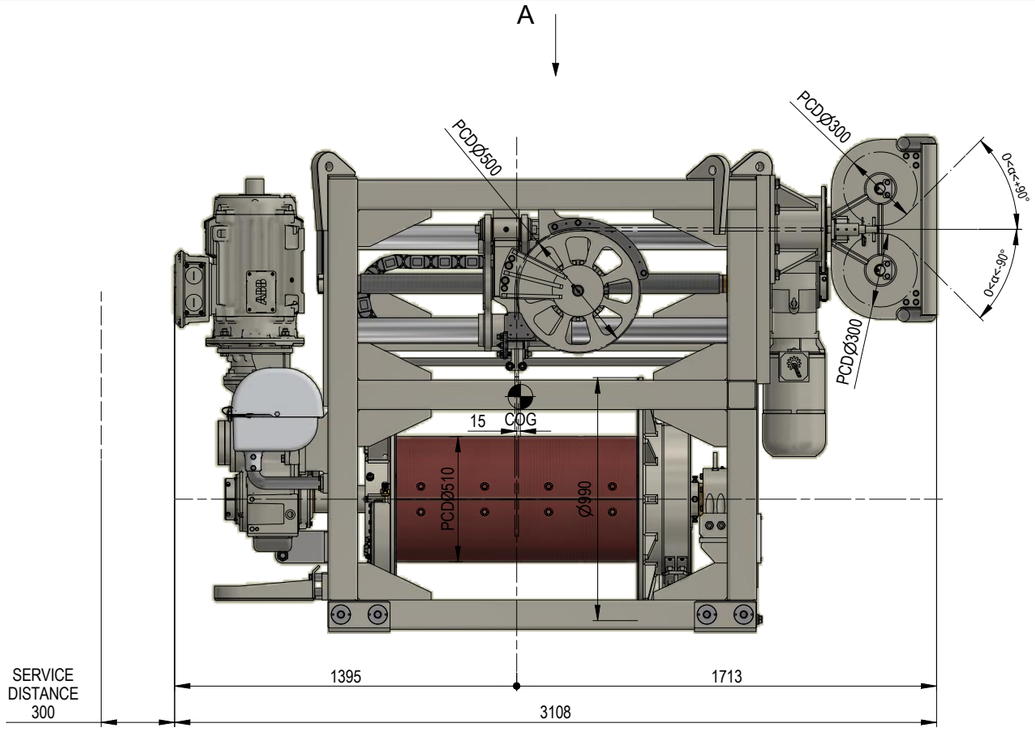
Section 4

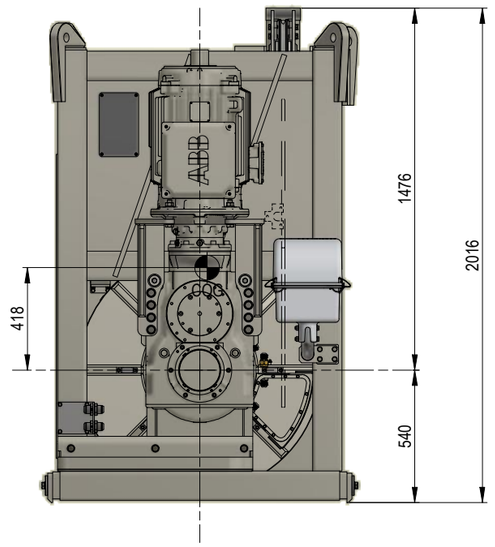
Operating Instructions

Electrical Diagrams

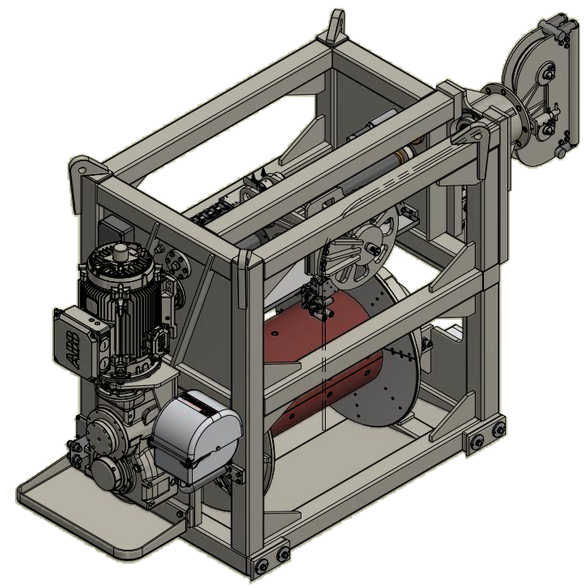
DESCRIPTION	DOC/DRW #	REV #	PAG #
10070 Mbari - 140041	10070	G	26
General	E-4500	3	189
A-Frame Stern	E-4501	3	197
OHC	E-4502	4	240
CTD Davit	E-4503	5	298
KN-75	E-4505	4	327
Control Panel Overview	2000005332	D	365
Drive Cabinet	2000005807	A	366
Deck Control Panel	2000004949	A	367
Control Room Panel	2000003404	B	368
Bridge Panel	2000005997	A	369
AFT Control Room Panel	2000005996	A	370
AFT Control Room Panel	2000005995	A	371



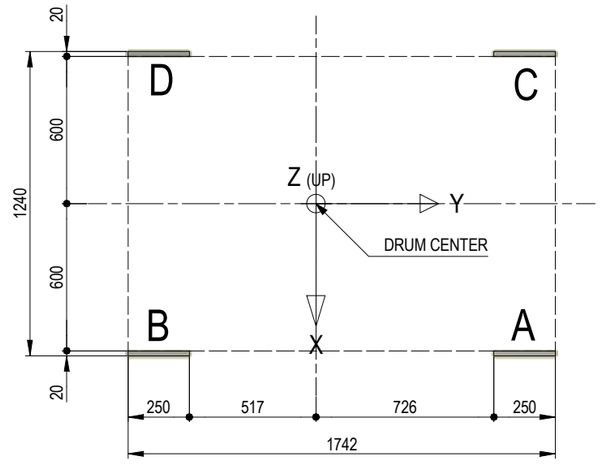


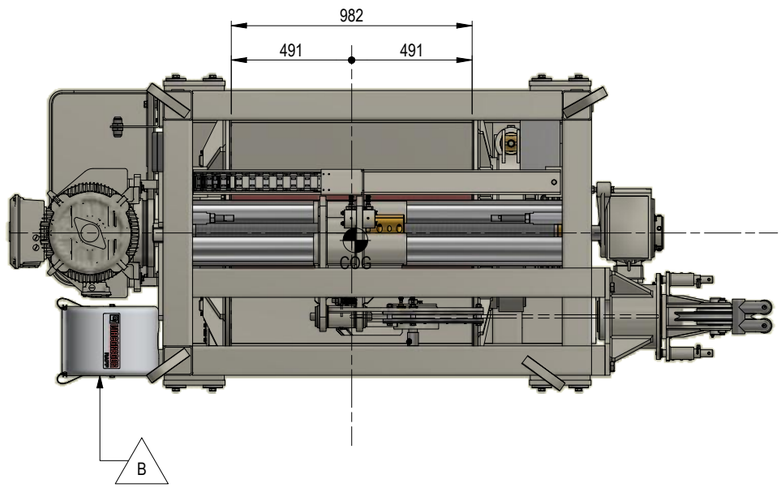


ISO VIEW (1 : 30)



FOUNDATION PLAN
A (1 : 25)





NOTE:
For specific foundation forces, contact MacGregor

B

Unspecified Tolerances According to:	
Standard	Tolerance Class
NS-ISO 2768-1	m Medium
NS-ISO 2768-2	K

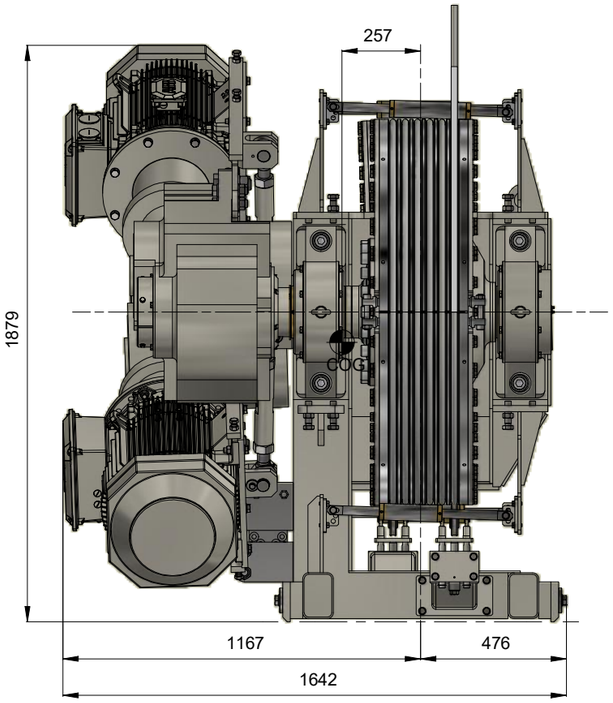
Designed by	Date	Modified by	ECO / CO			
RZAVA	05.11.2021.	P Pantovic	ECO-2056698			

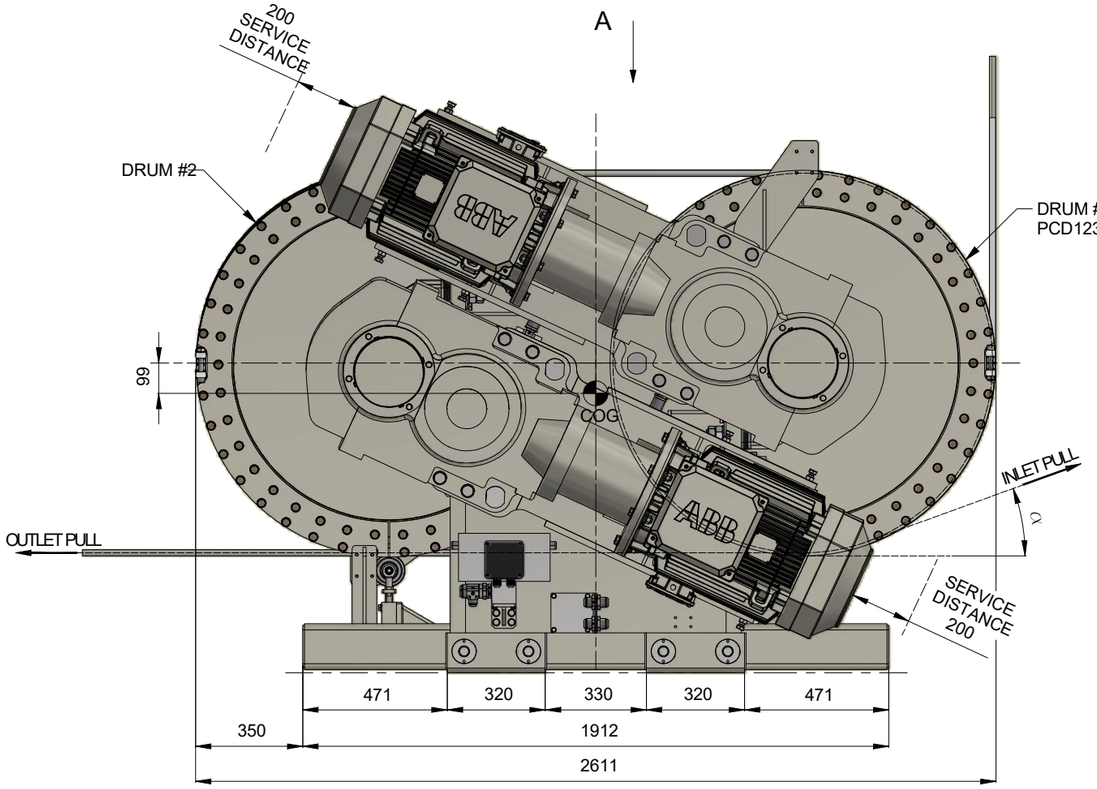
MACGREGOR

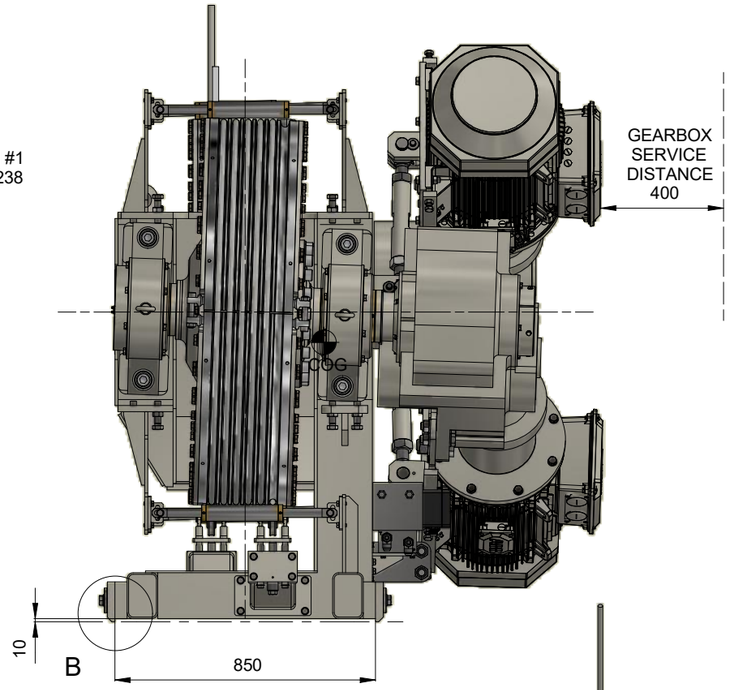
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Name	Weight (kg)
DIMENSIONAL SKETCH	4250
Description	Scale (A3)
HW-515E-F-T90/URP	1 : 25
Document ID	Revision / Sheet
2000004676	B / 1 / 1

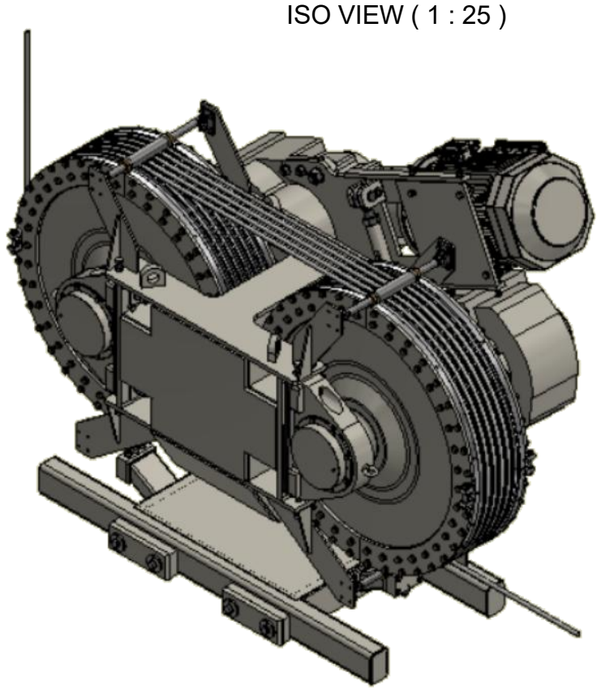
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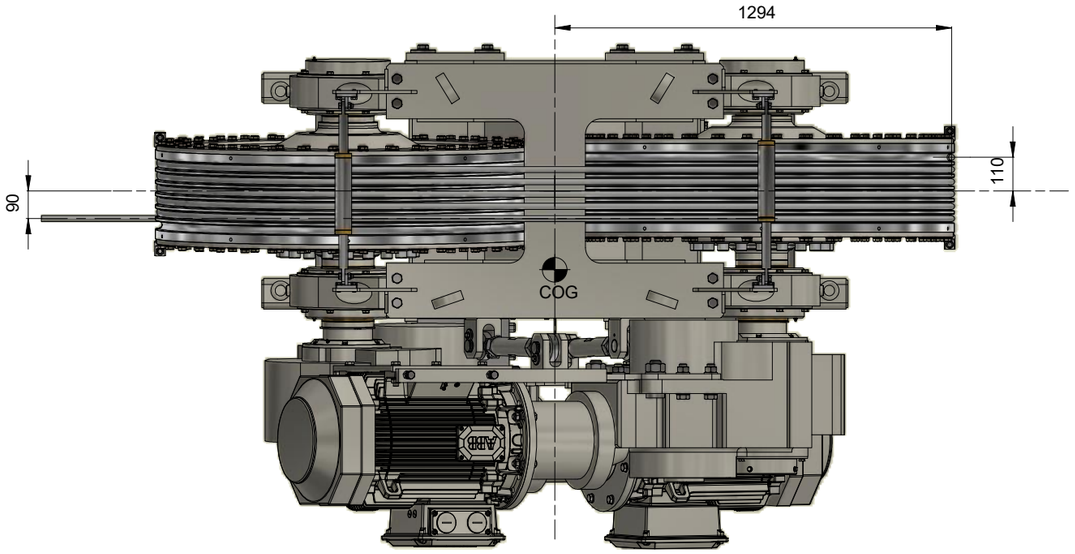




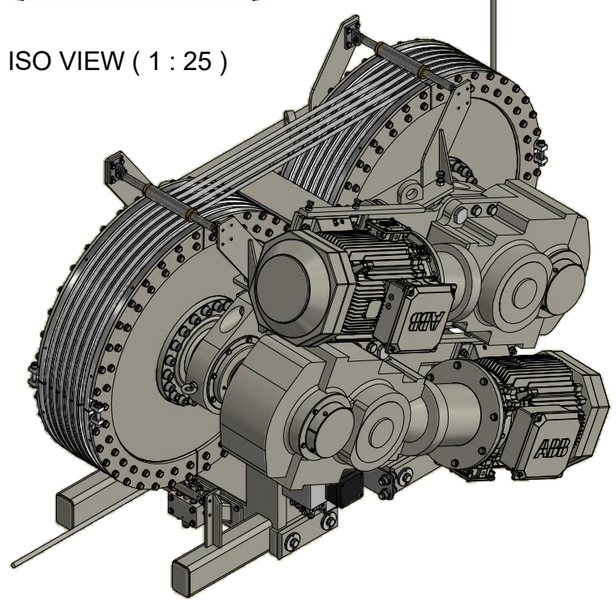


ISO VIEW (1 : 25)





ISO VIEW (1 : 25)



REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
1		Issued for comments	04.10.2019.	RHDHN
2		Sales number RH329031 replaced with production number	13.10.2021/RZPPA	RZPPA
A		Production model introduced	26.10.2021/PETRODO	RZPPA

Weight 7400 kg

Scale (A3) 1 : 20 *Sheet* 1 / 2

TRACTION WINCH
TRW-4004E-01R1
DIMENSIONAL SKETCH

MACGREGOR
Designed to perform with the sea

Drw number 400092475-DIM

Material (for part)

Status Proposal

Drawn by / Date (dd/mm/yy) IVITOD 04.10.2019.

Checked by / Date (dd/mm/yy) RHDHN 04.10.2019.

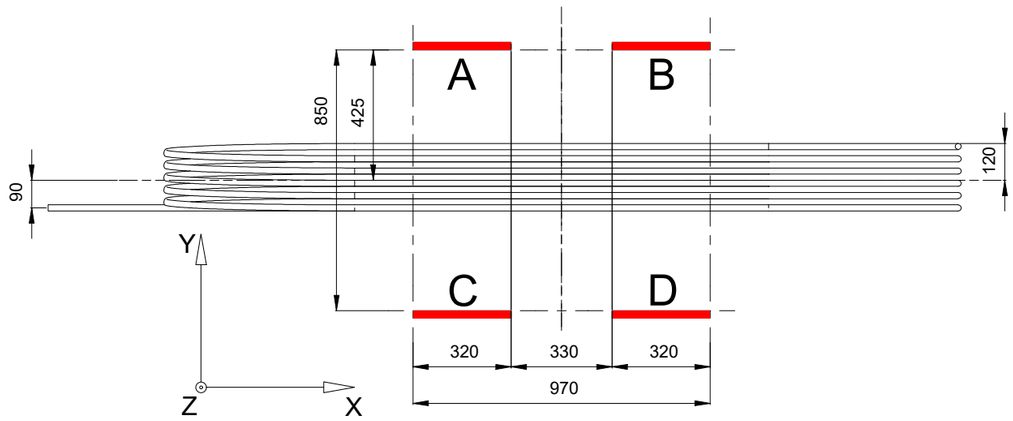
Partlist

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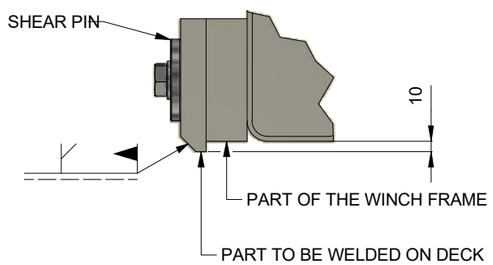
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ALTERNATIVE #1
WELDED CONNECTION

FOUNDATION PLAN (1 : 20)
WELDING PADS

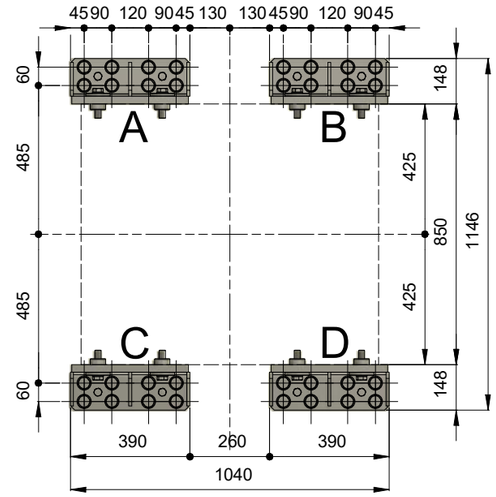


WELDING PAD DETAIL
B (1 : 6)

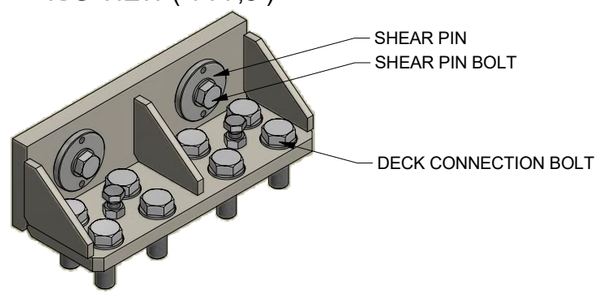


ALTERNATIVE #2
BOLTED CONNECTION

FOUNDATION PLAN (1 : 20)
BOLTED CONNECITON



BOLTED CONNECTION DETAIL
ISO VIEW (1 : 7,5)



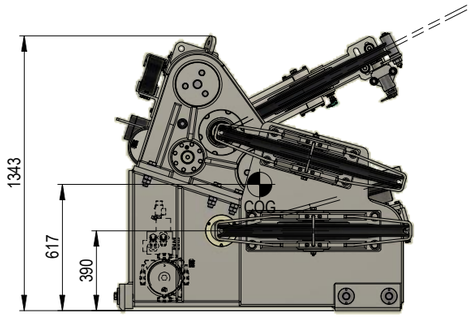
TIGHTENING TORQUE:
SHEAR PIN BOLTS - M20 - 250 Nm
DECK CONNECTION BOLTS - M24 - 665 Nm
Apply threadlocker (Loctite 243 or similar) on all threads

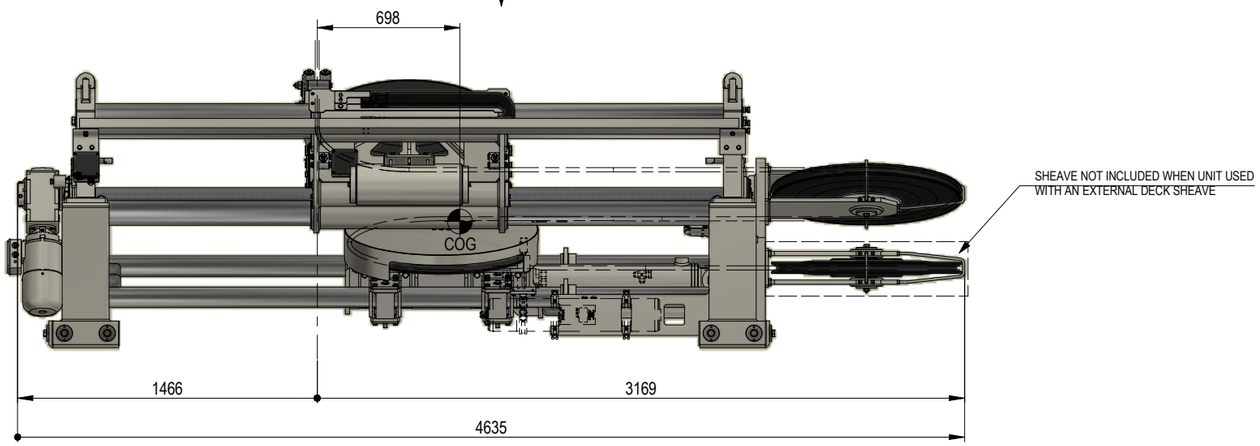
For specific foundation forces, please contact RAPP MARINE.

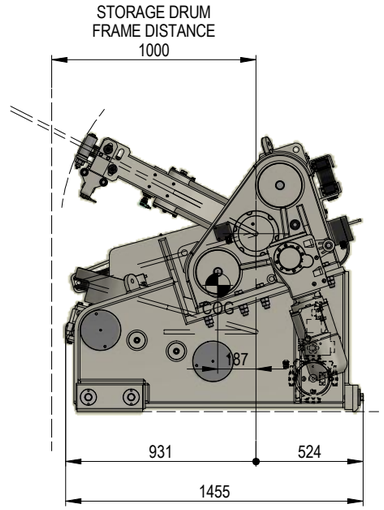
REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
1		Issued for comments	04.10.2019.	RHDHN
2		Sales number RH329031 replaced with production number	13.10.2021/RZPPA	RZPPA
A		Production model introduced	26.10.2021/PETRODO	RZPPA

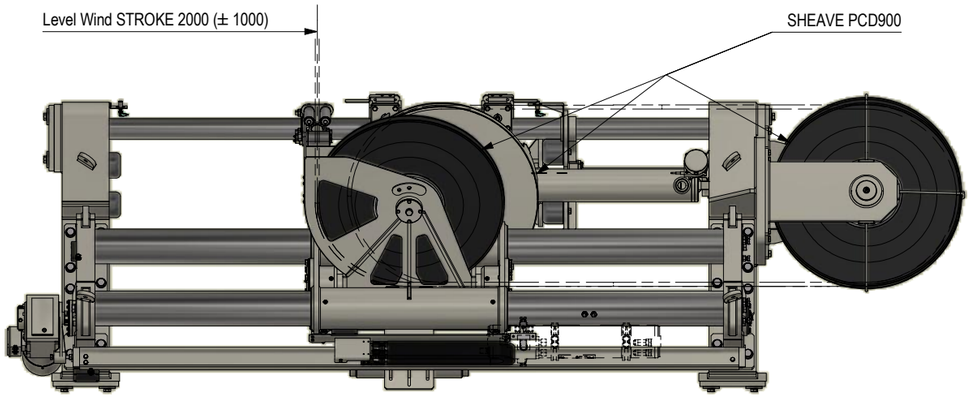
Weight 7400 kg	TRACTION WINCH TRW-4004E-01R1 DIMENSIONAL SKETCH			MACGREGOR Designed to perform with the sea
Scale (A3) 1 : 20 *Sheet* 2 / 2				*Drw number* 400092475-DIM
	Material (for part)	*Status* Proposal	*Drawn by / Date (dd/mm/yy)* IVITOD 04.10.2019.	*Checked by / Date (dd/mm/yy)* RHDHN 04.10.2019.
				Partlist

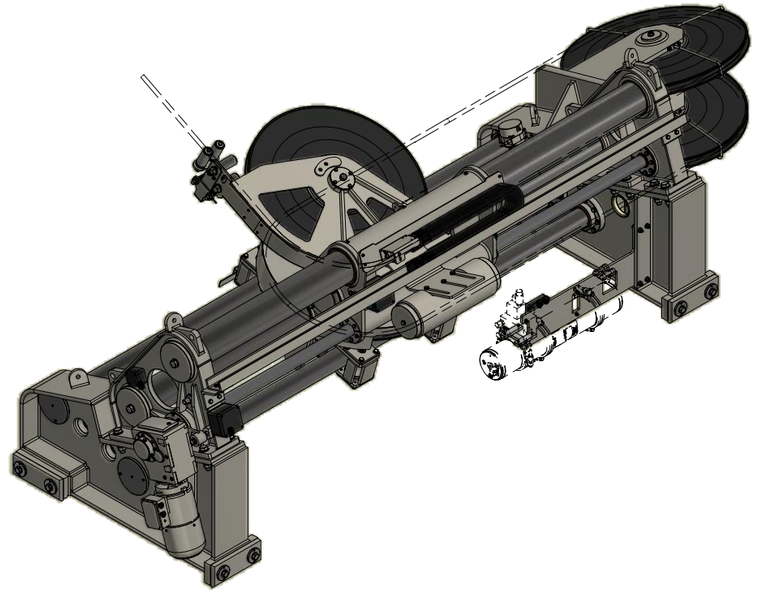
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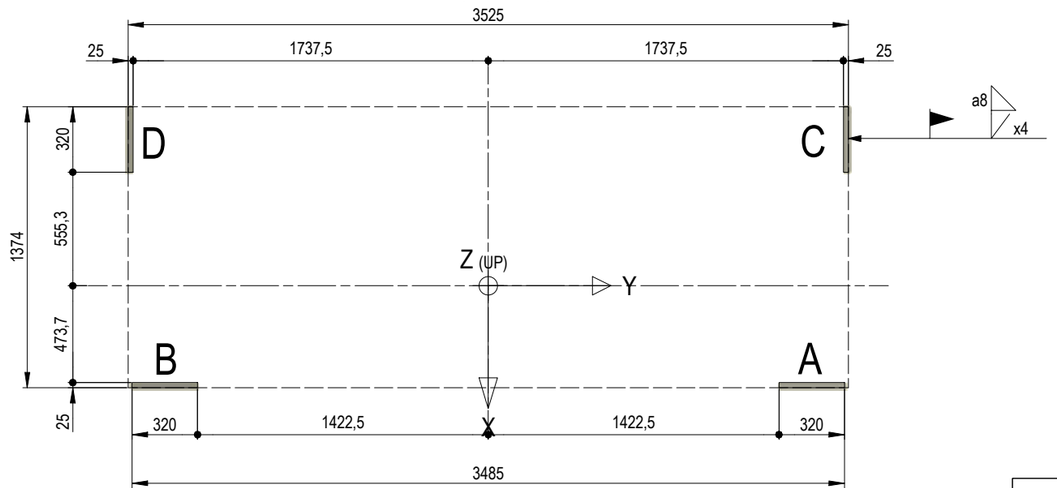








FOUNDATION PLAN
A (1 : 30)



NOTE:
For specific foundation forces, please contact MACGREGOR.

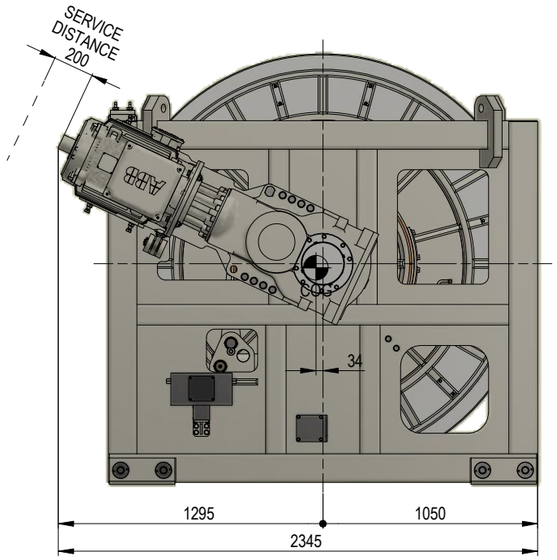
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Standard	Tolerance Class
NS-ISO 2768-1	m Medium
NS-ISO 2768-2	K

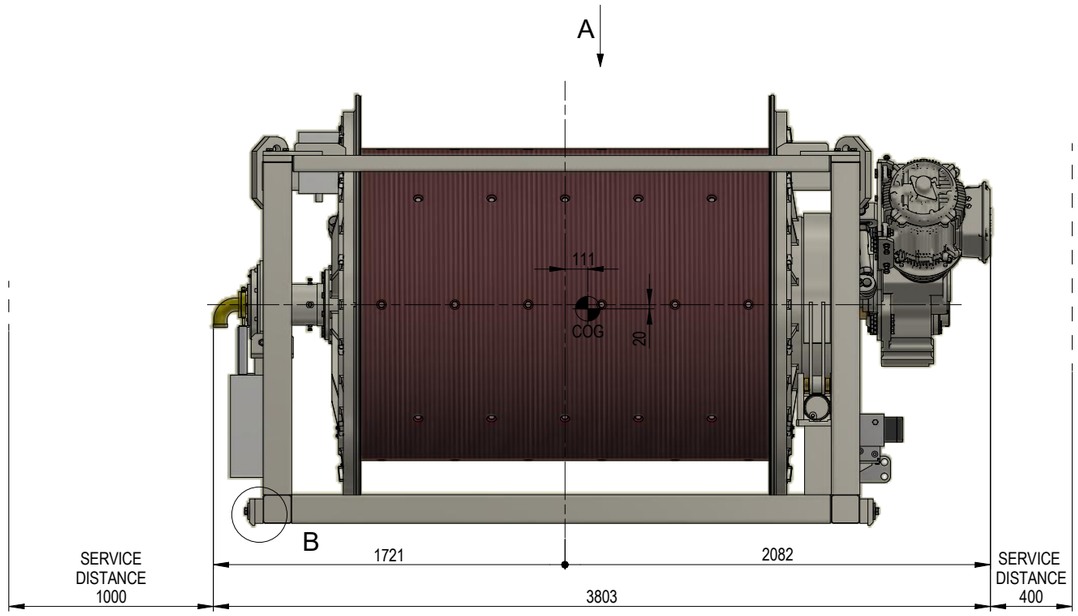
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P Pantovic	27.12.2021.	P Pantovic	ECO-2056483			

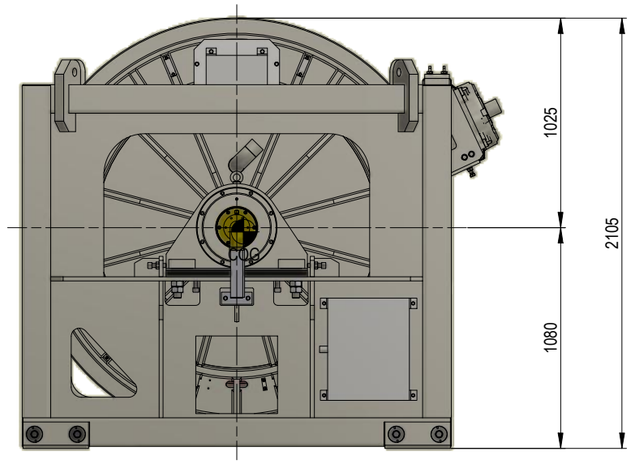
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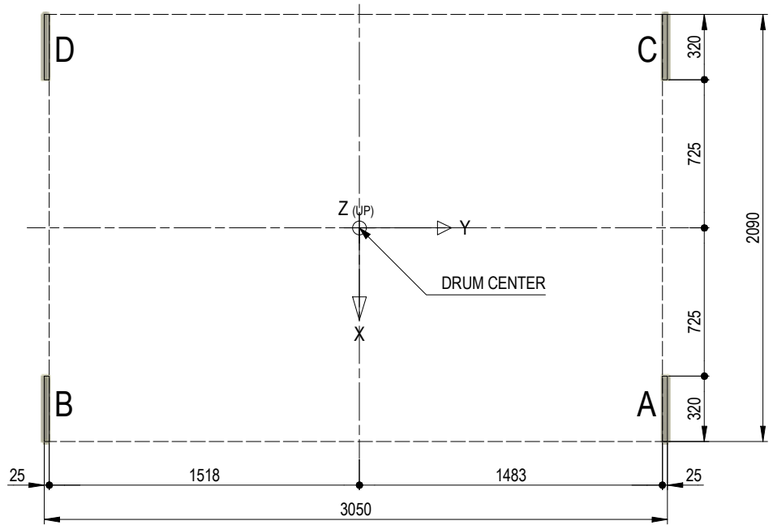
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Description		Scale (A3)
LEV. WITH SLACK WIRE, LSWC5000/01L1		1 : 30
Document ID	Revision	Sheet
400092566-DIM	A	1 / 1

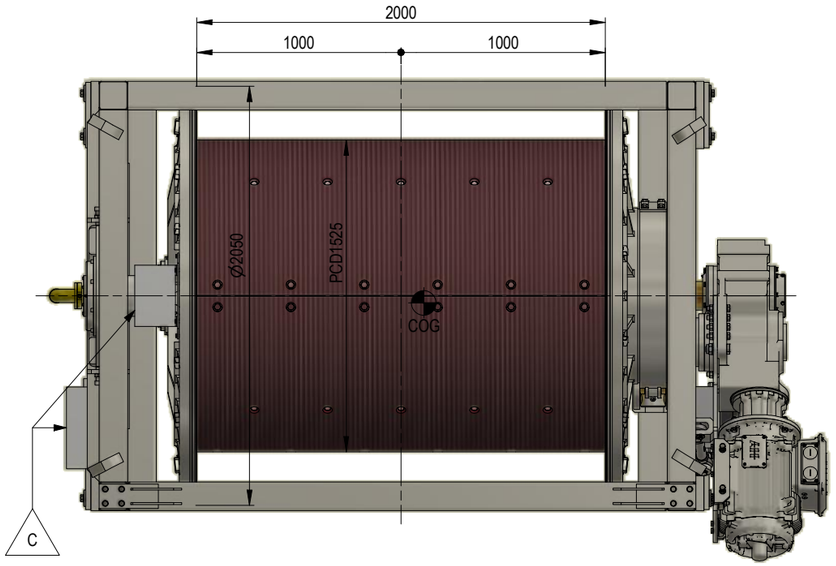




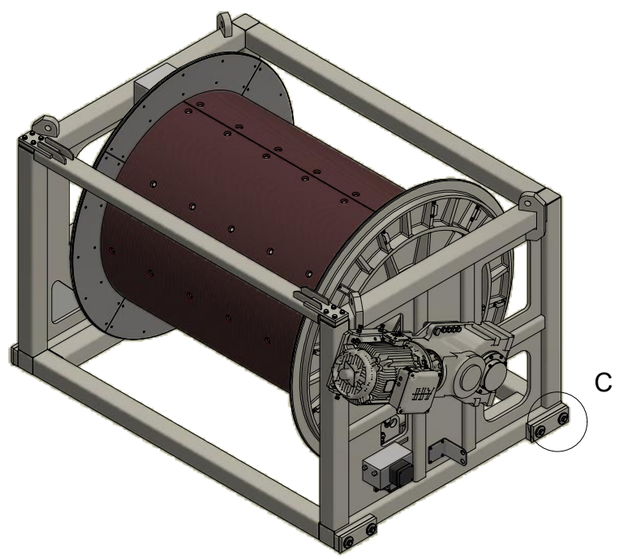


FOUNDATION PLAN
A (1 : 30)



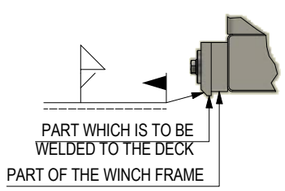


ISO VIEW (1 : 40)

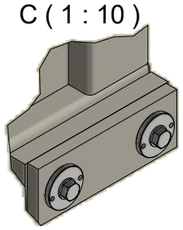


WELDING PAD DETAIL

B (1 : 15)



C (1 : 10)



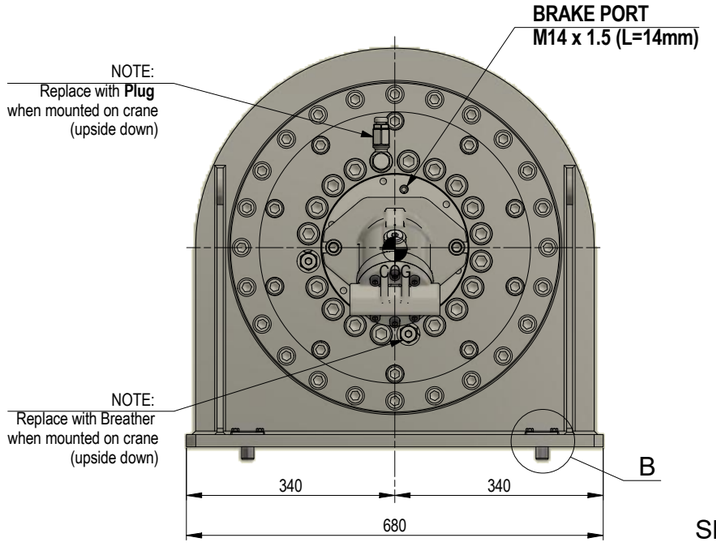
NOTE:
For specific foundation forces, please contact MACGREGOR.

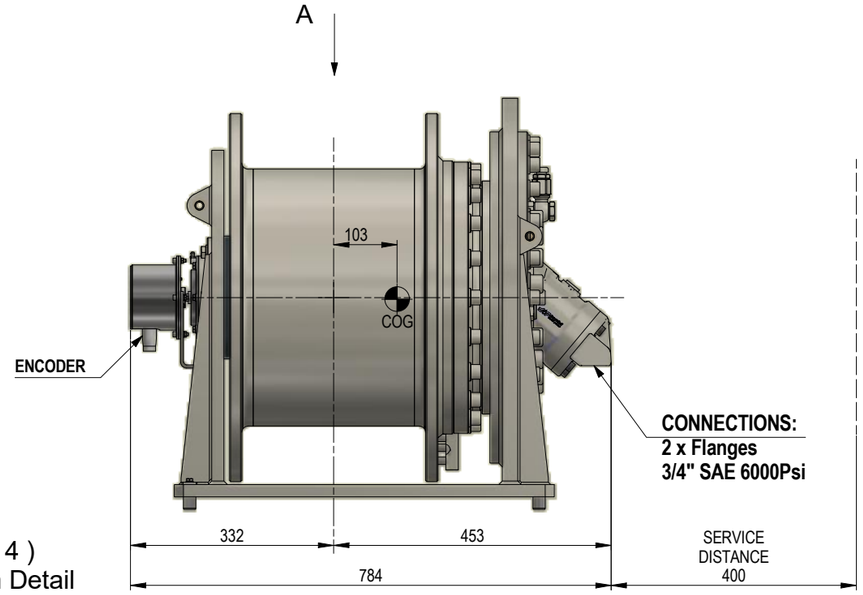
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RZAVA	02.08.2019.	P Pantovic	ECO-2056896			

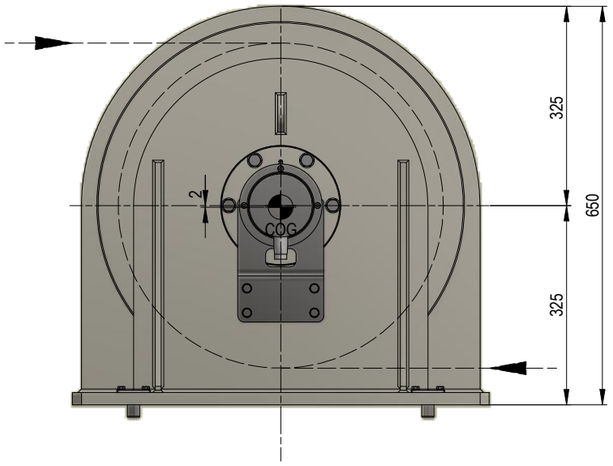
MACGREGOR

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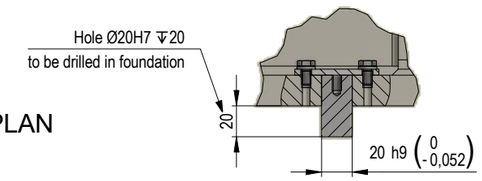
Name	Weight
DIMENSIONAL SKETCH	9500 kg
Description	Scale (A3)
RW-2372BS, OLN	1 : 30
Document ID 400092447-DIM	Revision C / Sheet 1 / 1



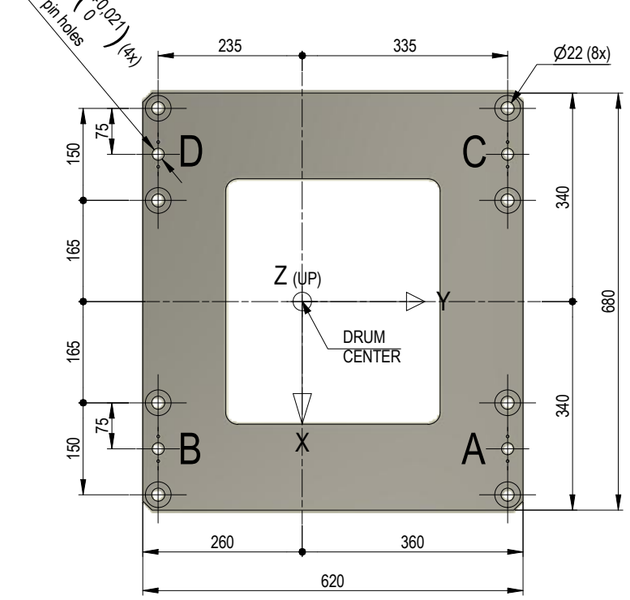


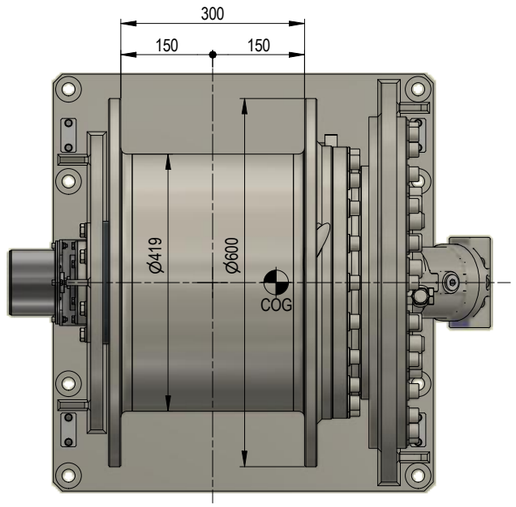


B (1 : 4)
Shear Pin Detail

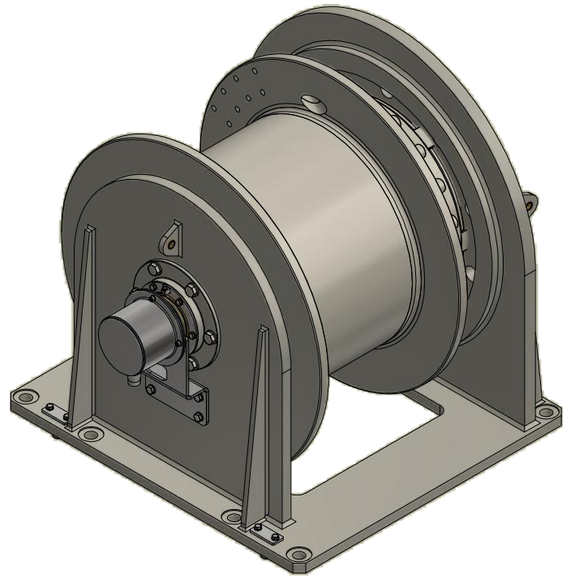


FOUNDATION PLAN
A (1 : 10)





ISO VIEW (1 : 10)



Requirements:
1. Foundation deflection - ref. dwg. RH315495
2. Foundation/brake bolts: M20, grade 8.8. Tightening torque 385Nm.
3. Alignment and installation instruction as per order conf. and tech.spec.
4. Shear pins to be used instead of stop blocks.

Foundation forces:
For specific foundation forces, contact Macgregor

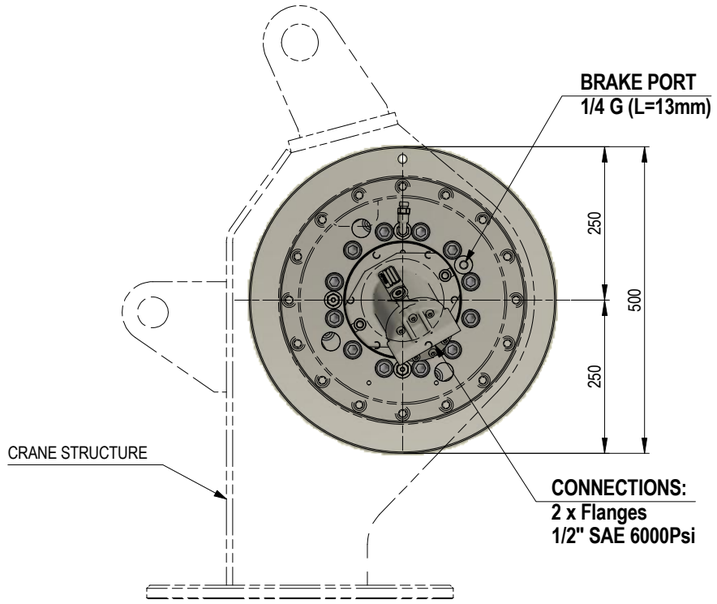
NOTE:
Make sure that not less than 5 windings of rope is left on drum during operation!

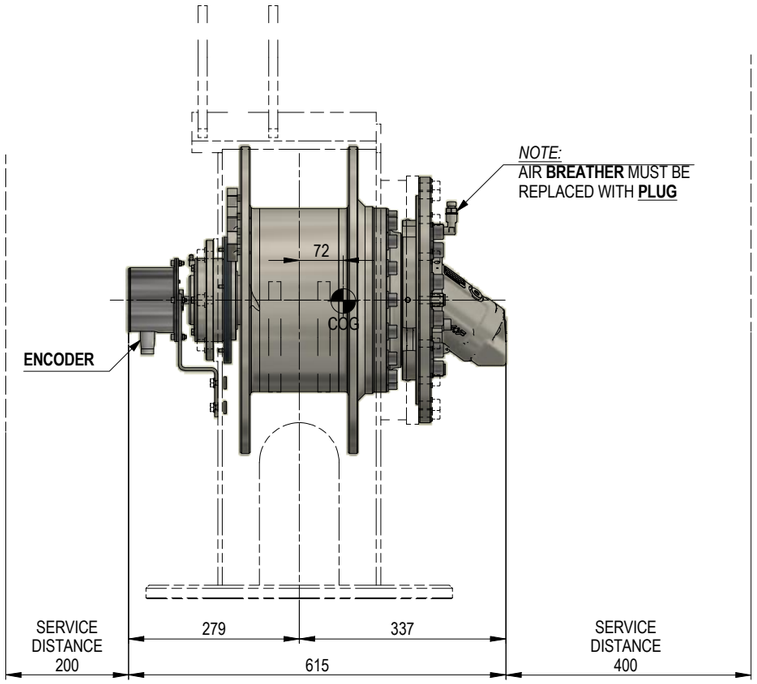
Designed by	Date	Modified by	ECO / CO			
I Todorovic	30.11.2021.	B Simic	ECO-2058000			

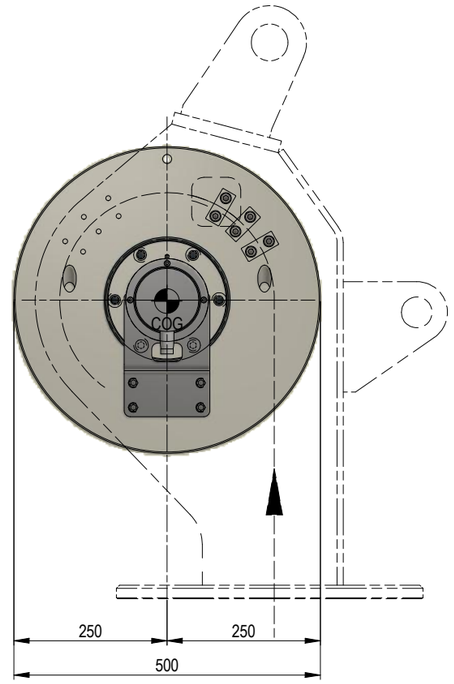
MACGREGOR

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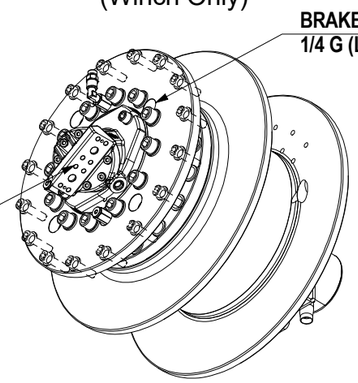
Name	Weight
DIMENSIONAL SKETCH	540 kg
Description	Scale (A3)
GILSON WINCH, GW-1000-ROV, LU, RO	1 : 10
Document ID: 2000003571	Revision: D / Sheet: 1 / 1

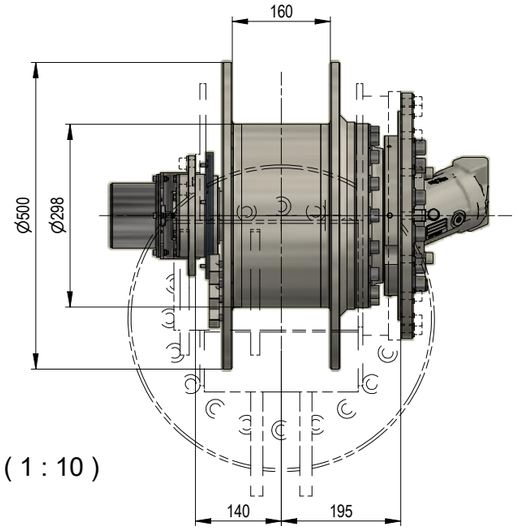




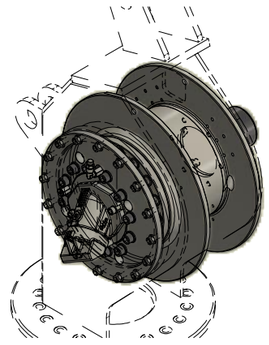


ISO VIEW (1 : 10)
(Winch Only)

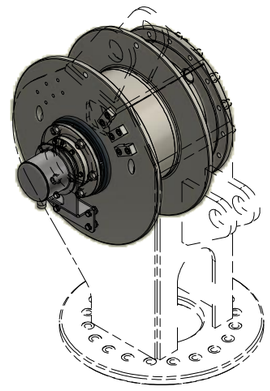




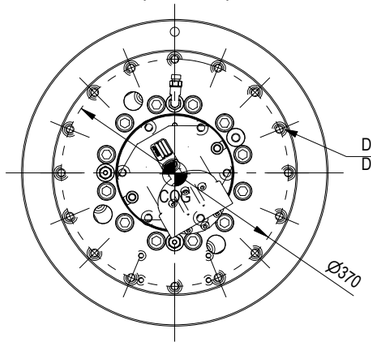
ISO VIEW (1 : 15)



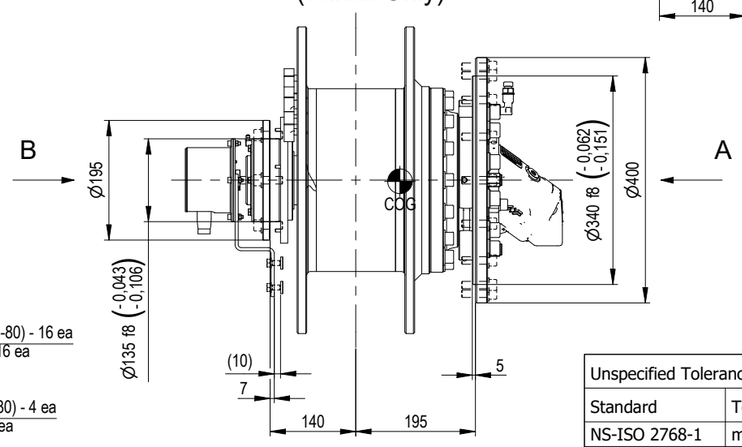
ISO VIEW (1 : 15)



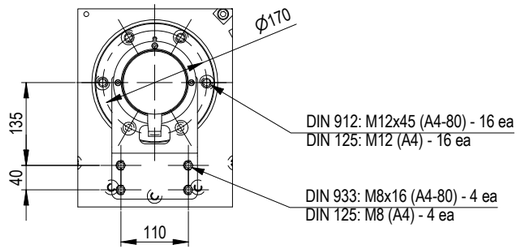
A (1 : 10)



INSTALATION DETAILS (1 : 10)
(Winch Only)



B (1 : 10)



NOTE:
Make sure that not less than 5 windings of rope is left on drum during operation!

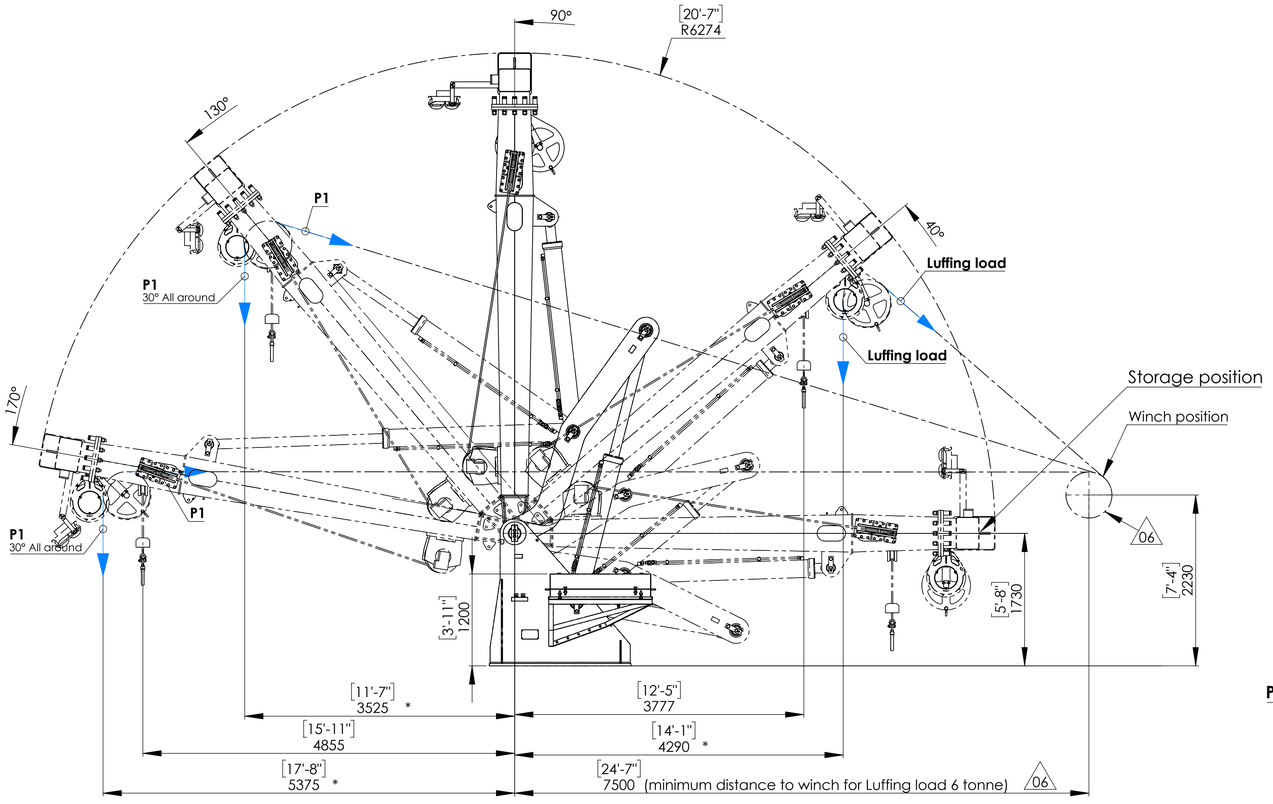
Unspecified Tolerances According to:	
Standard	Tolerance Class
NS-ISO 2768-1	m Medium
NS-ISO 2768-2	K

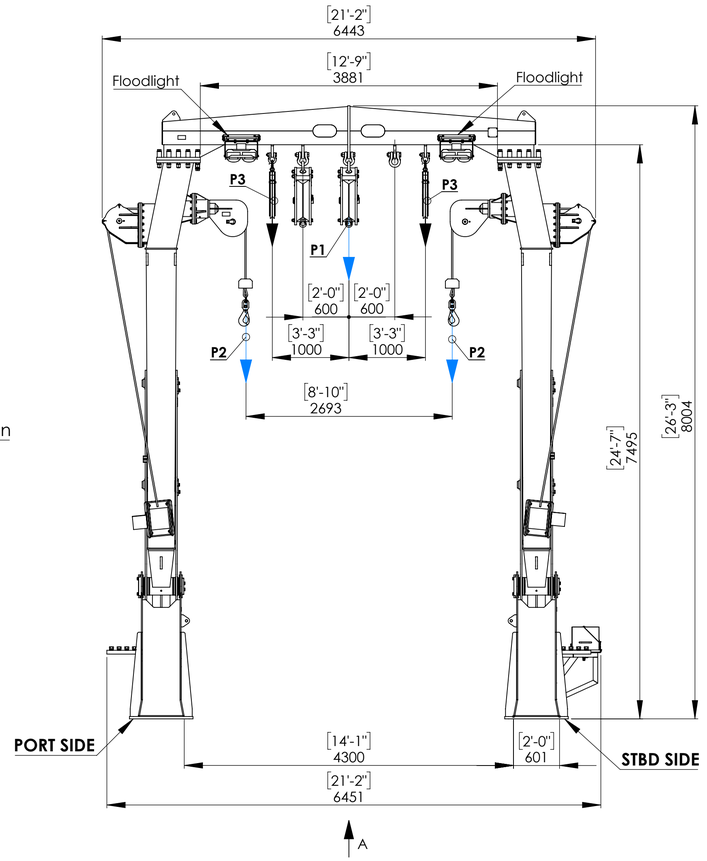
Designed by	Date	Modified by	ECO / CO			
I Todorovic	24.12.2021.	B Simic	ECO-2058000			

MACGREGOR

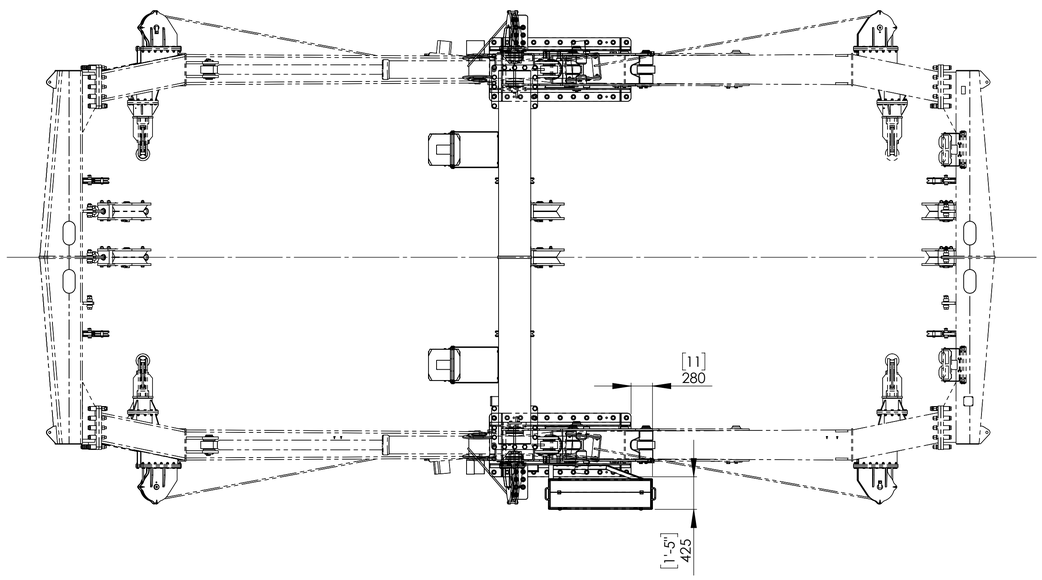
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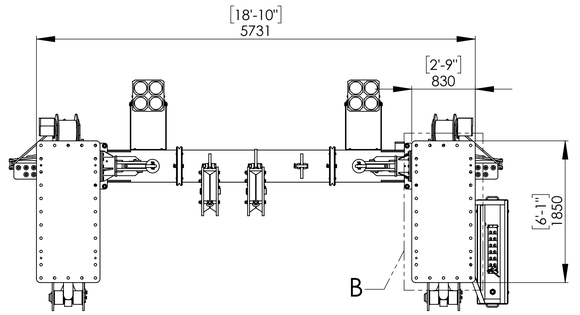
Name	Weight
DIMENSIONAL SKETCH	178 kg
Description	Scale (A3)
GILSON WINCH, GW-1000-UV, LO	1 : 10
Document ID 2000004293	Revision D / Sheet 1 / 1

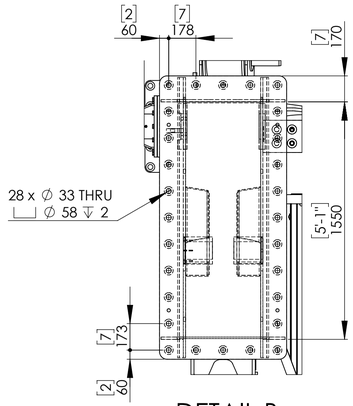




TECHNICAL DATA	
P1 (Working area 40°-170°)	SDL = 100 kN
P2 (Winch working area 10°-170°)	SWL = 2 x 3 tonne
P3 (Working area 40°-170°)	SDL= 50 kN
Luffing load (center sheave 40°-170°)	SWL = 6 tonne
Luffing load - Vertical hanging (center pad eye 40°-170°)	SWL = 6 tonne
Hydraulic pressure	200 bar
Tilting time out/in	100 s / 100 s
Recomended oil flow	160 l/min
Weight of crane (moving parts) approx.	12800 kg







DETAIL B
SCALE 1 : 20

VIEW A

* Dimensions may vary with different block

REV.	DESCRIPTION	DATE	APPROVED
A	Added lufing load for 6t vertical hanging	15/12/2022	SS
06	Changed position of main winch, added valve central, speed of tilting and weight. Revision 06 acc to PDM.	26.01.2022	CI
03	Changed dimensional sketch according to the customer comments.	17.12.2021	CI
01	Added winches, valve central and wireblocks.	22.03.2019	KJ

REVISIONS

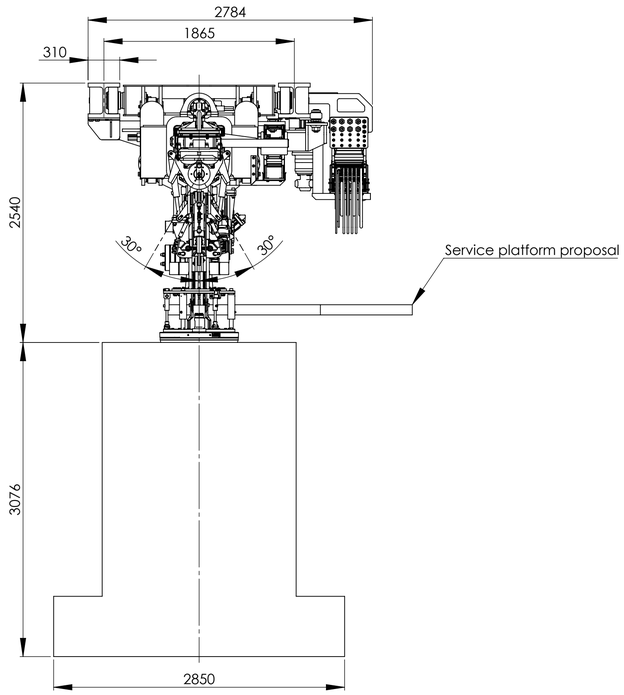
FRAME
A-FRAME
DIMENSION SKETCH

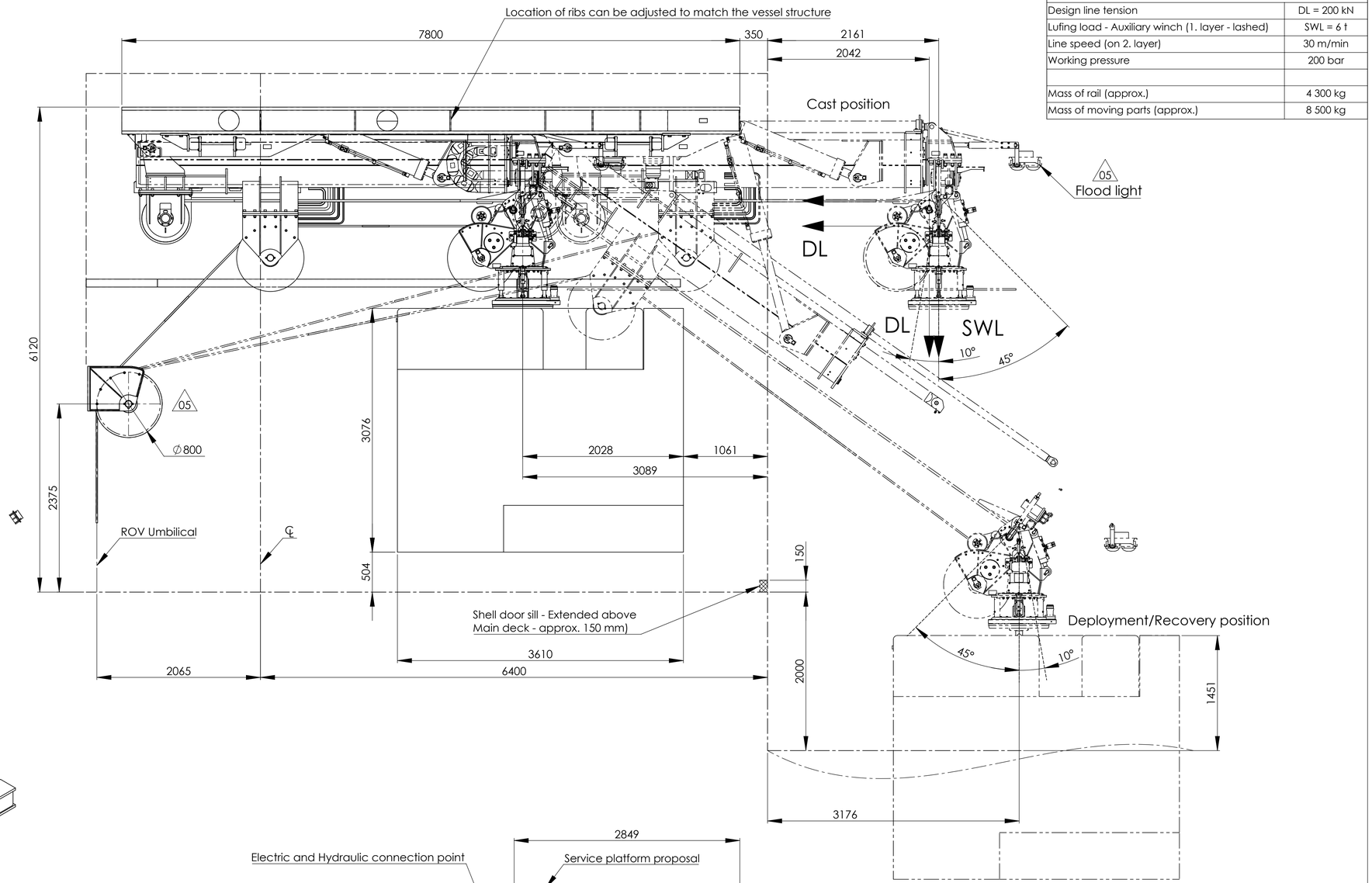
MACGREGOR

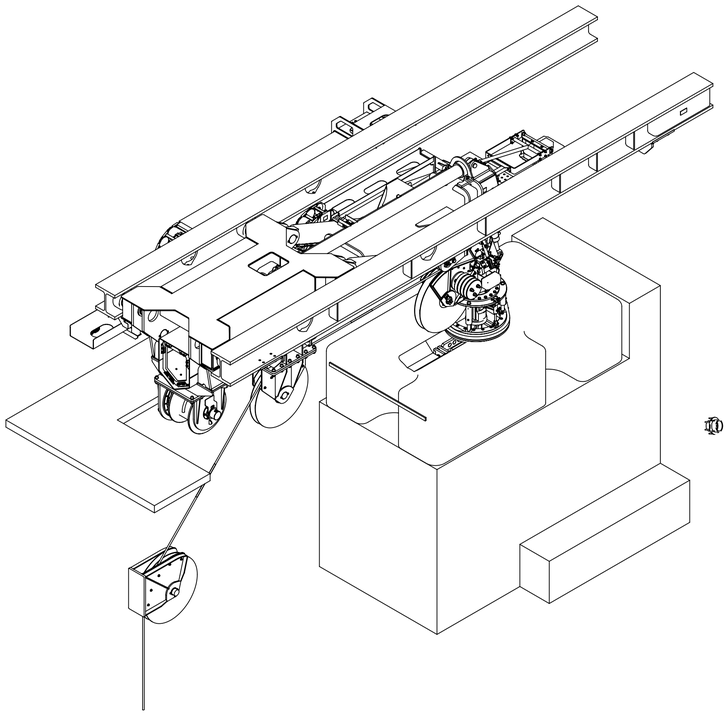
Unspec. tolerances in compliance with	
Weight (kg)	Kg
Date	08.01.2019
Scale 1:40	Projection
Format A1	
Created by	SS
Approved date	15/12/2022
MPS no.	
Approved by	SS
Drawing no. 20549	Revision A
SHEET1 OF 1	

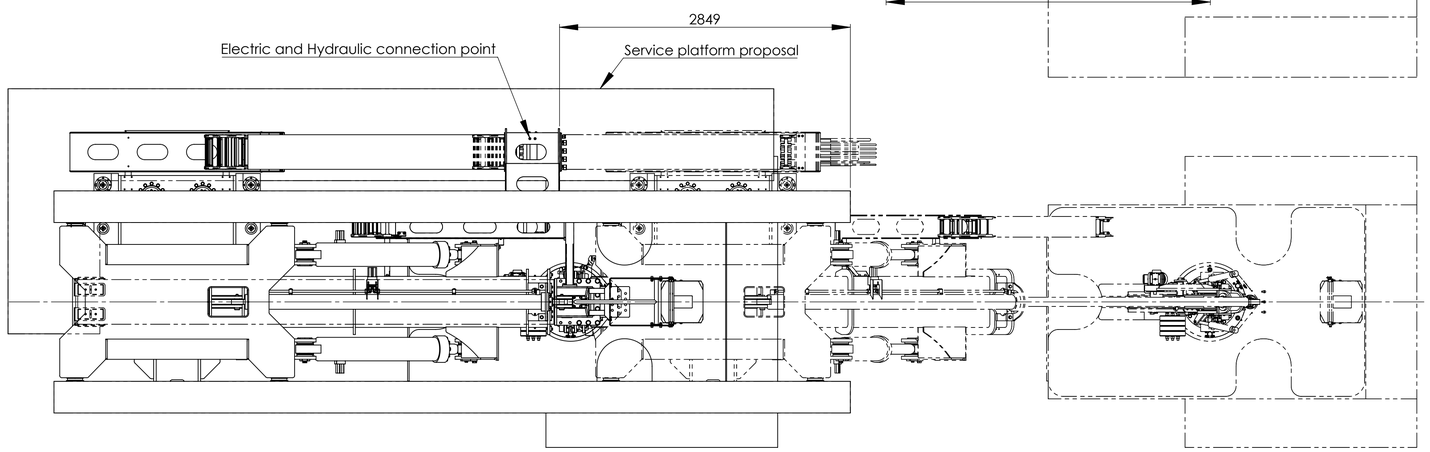
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TECHNICAL DATA	
Design line tension	DL = 200 kN
Lufing load - Auxiliary winch (1. layer - lashed)	SWL = 6 t
Line speed (on 2. layer)	30 m/min
Working pressure	200 bar
Mass of rail (approx.)	4 300 kg
Mass of moving parts (approx.)	8 500 kg









REV.	DESCRIPTION	DATE	APPROVED
A	Approved by customer	03.10.2023	LS
05	Guide block and Flood light positions changed. Updated Mass of moving parts (tech. data)	24.03.2022.	KJ
04	Updated acc. to comments from client.	29.12.2021.	KJ
03	Redesigned.	29.11.2021.	HK
02	Added auxiliary winch, docking head redesigned and updated according to latest GA.	28.06.2019.	LK

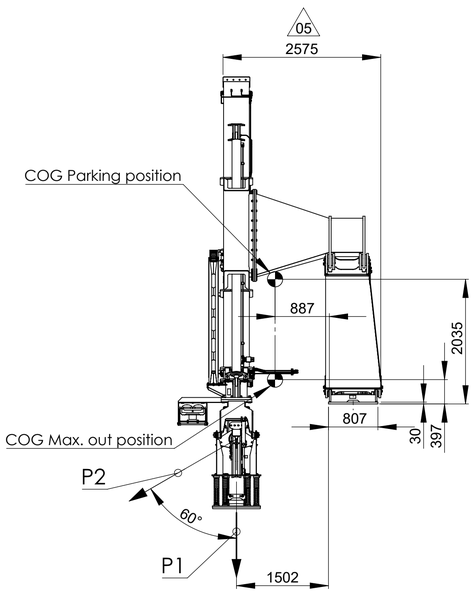
REVISIONS

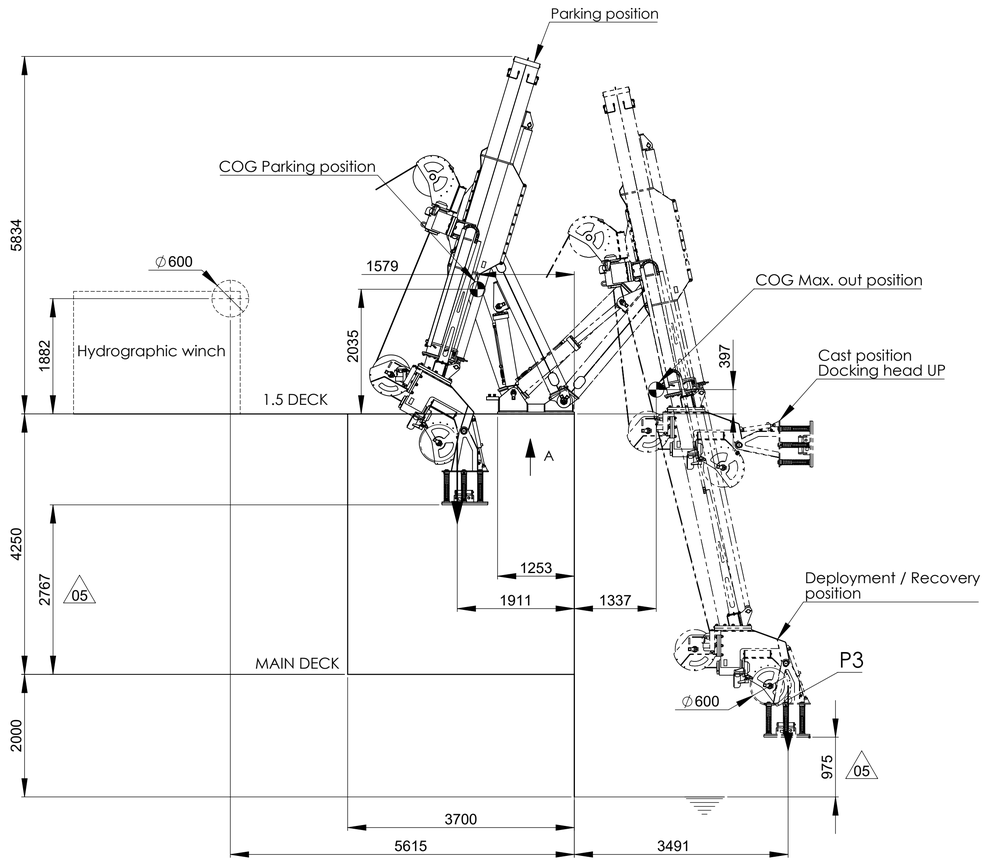
OH CRANE
ROV LARS
DIMENSION SKETCH

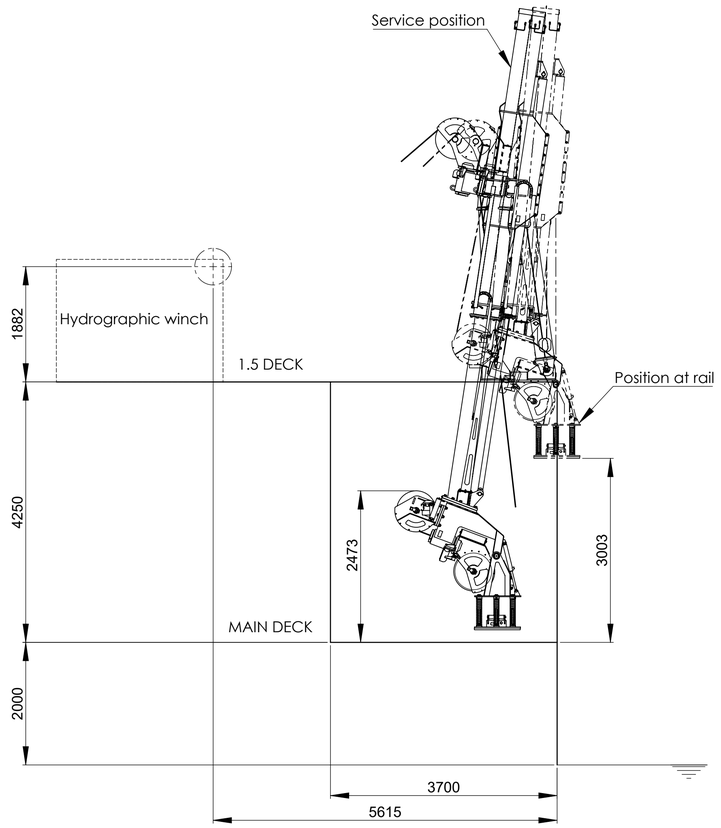
MACGREGOR

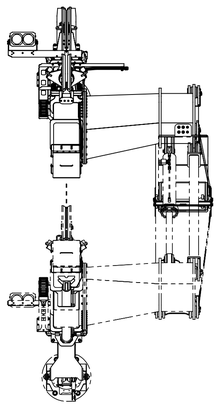
Unispec. tolerances in compliance with	NS-ISO 2768 M
Scale	1:30
Projection	
Format	A1
MPS no.	
Drawing no.	20673
Revision	A
SHEET1 OF 1	
Weight (kg)	
Date	31.01.2019
Created by	HK
Approved date	
Approved by	

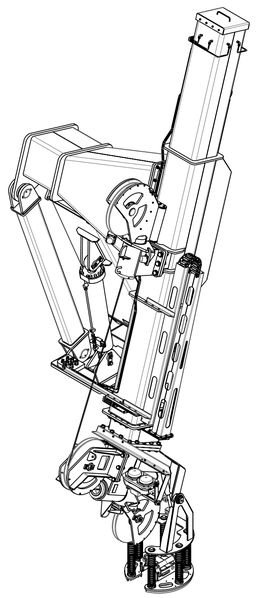
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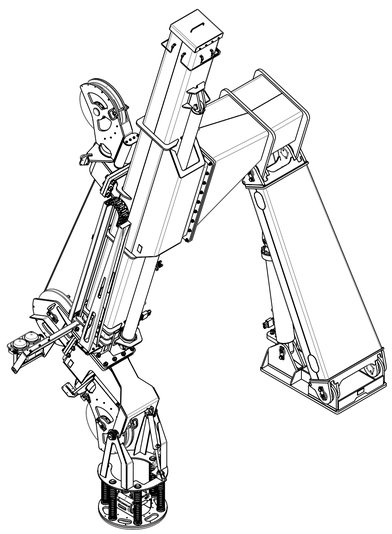


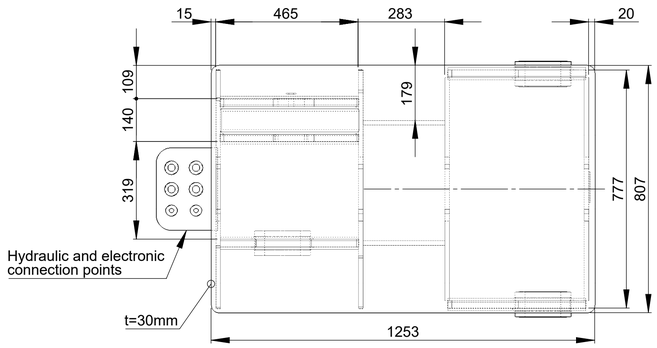












VIEW A
SCALE 1 : 10
FOUNDATION FOOTPRINT

TECHNICAL DATA	
P1 - (Cast position)	DLT = 73,5 kN
P2 - (Towing in Cast position)	SWL = 3,2 tonne
P3 - Luffing load	12 kN
Working pressure at consumer	200 bar
Tilting time	18 s
Telescoping time	40 s
Recomended oil flow	80 l/min
Mass of moving parts (approx.)	7 110 kg
Mass of foundation (approx.)	550 kg

ISSUED FOR APPROVAL

REV.	DESCRIPTION	DATE	APPROVED
A		02.03.2023	
06	Changed technical data SWT= 146N to SWL= 3.21	16. 12. 2022.	BH
05	Foundation redesigned, width increased and height adjusted.	17.11.2021	AT
04	Docking head UP configuration added on drawing.	26.10.2021.	KJ
03	Pivoting sheave added. CoG added.	08.05.2020.	EK

REVISIONS

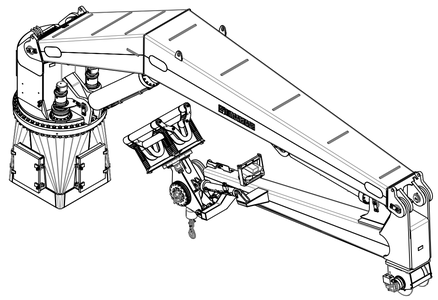
DAVIT
CTD DAVIT
DIMENSION SKETCH

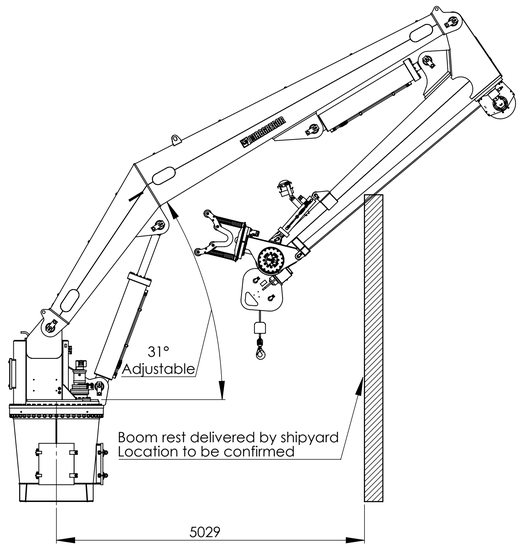
MACGREGOR

Unspec. tolerances in compliance with
Weight (kg) Kg
Date 07.01.2019
Scale 1:50
Projection
Format A1
Created by ÅS
Approved date
MPS no.
Approved by
Drawing no. 20547
Revision A
SHEET1 OF 1

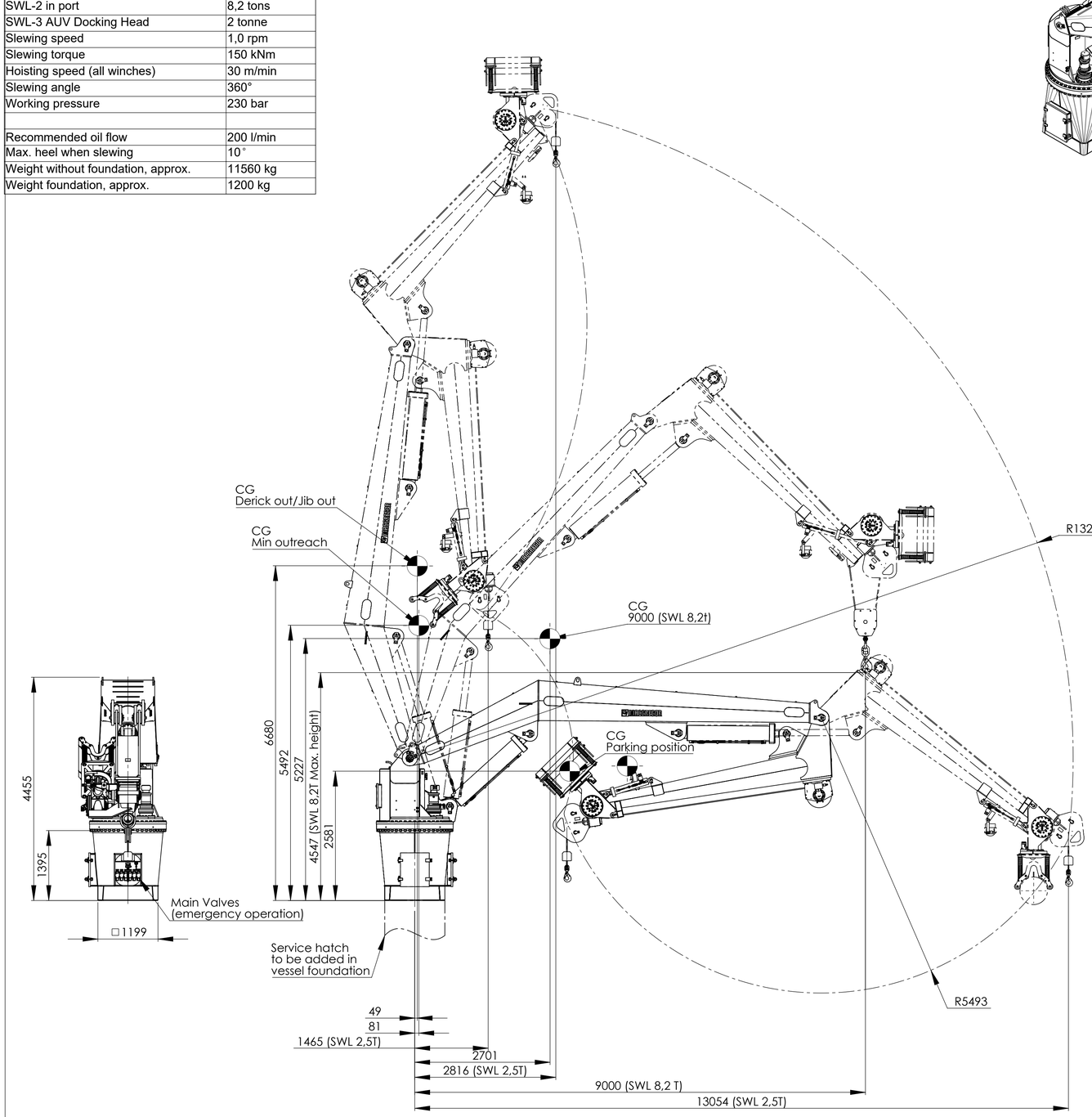
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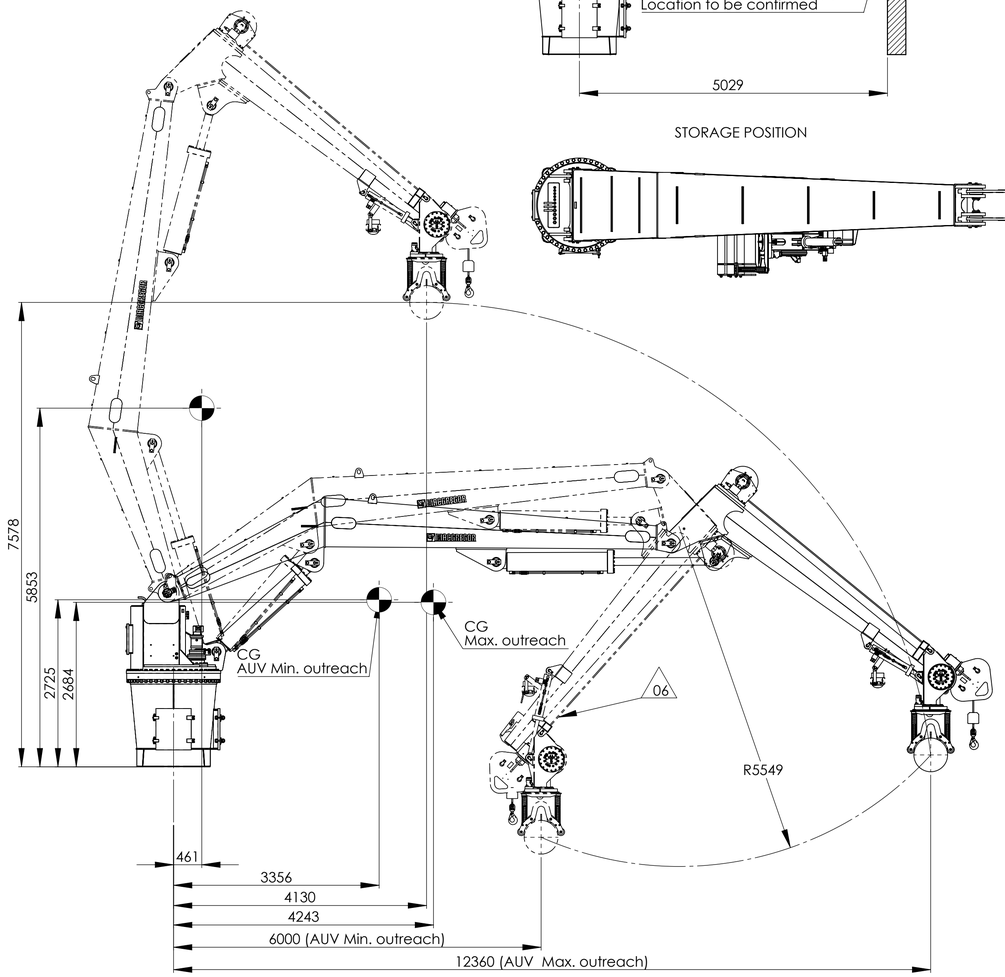
TECHNICAL DATA	
Dimensioned lifting capasity	75 tm
SWL-1 in port or at sea	2,5 tons
SWL-2 in port	8,2 tons
SWL-3 AUV Docking Head	2 tonne
Slewing speed	1,0 rpm
Slewing torque	150 kNm
Hoisting speed (all winches)	30 m/min
Slewing angle	360°
Working pressure	230 bar
Recommended oil flow	200 l/min
Max. heel when slewing	10 °
Weight without foundation, approx.	11560 kg
Weight foundation, approx.	1200 kg

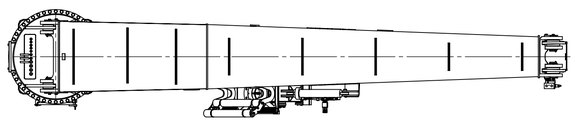




STORAGE POSITION







REV.	DESCRIPTION	DATE	APPROVED
A		15.03.2022	
A	Approved by Customer on 30.11.2021	11.03.2022	HK
06	Docking head changed position.	18.11.2021	PM
05	Center of gravity added for all configurations.	20.09.2021	AT
04	Redesigned from KN-60. Increased outreach for 8,2t.	17.08.2021	HK

REVISIONS

TRIPLEX DECK CRANE
KN-75/2,5/8,2/__/__
DIMENSION SKETCH

MACGREGOR

Unspec. tolerances in compliance with	Weight (kg)
	Date 27.03.2020
Scale 1:50 / Format A1 / Projection	Created by HK
	Approved date
MPS no.	Approved by
Drawing no. 23460 SHEET1 OF 1	Revision A

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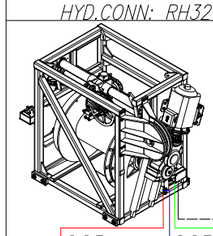
DECK MOUNTED (DECK 01)

WINCH ROOM MOUNTED

CTD WINCH
HW-515E-T90

HYD.DWG.: RH411171

HYD.CONN: RH326078

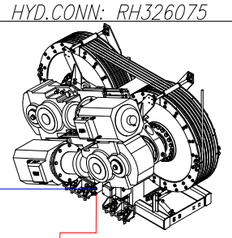


GCP GCR F D

TRACTION WINCH
TRW-4004E-L1

HYD.DWG.: RH411181

HYD.CONN: RH326075

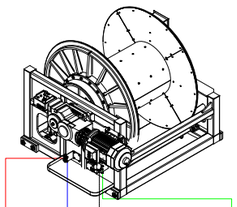


GCR GCP D F

STORAGE DRUM
RW-2372EB

HYD.DWG.: RH411171

HYD.CONN: RH326077

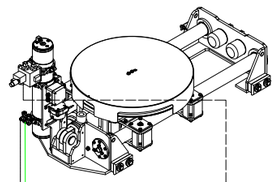


GCP GCR D F

SLACK WIRE COMPENSATOR
ELSWC5000-L2000

HYD.DWG.: RH319631

HYD.CONN: RH326076



D F Dr

Internal Piping on winches
Delivered by MacGregor

Piping Delivered by Yard

ø 20 x 2 — 7/9 l/min. WP Max 5 Bar — 803

ø 25 x 2 — 16/19 l/min. WP Max 2 Bar — 804

ø 15 x 1,5 — 805

ø 15 x 1,5 — 30 l/min. WP Max 2 Bar — ø 38 x 2,5 — 807

ø 25 x 2 — 804

ø 20 x 2 — 805

ø 15 x 1,5 — 807

ø 12 x 1,5 — 807

ø 15 x 1,5 — 807

ø 20 x 2 — 807

ø 15 x 1,5 — 807

ø 15 x 1,5 — 807

ø 25 x 3 — Inst. 70 l/min. WP Max 130 Bar — 806

ø 25 x 3 — Inst. 70 l/min. WP Max 2 Bar — 804

ø 15 x 1,5 — 808

ø 15 x 1,5 — 807

ø 25 x 2

ø 25 x 2

ø 25 x 2

ø 25 x 2

ø 25 x 2

ø 25 x 2

Counter stream
Fresh water, max inlet temperature 38°C
25 l/min
Max△P-Cooler: 1 Bar

ID min. ø1" — Max. 10 Bar — Dimensions (min. ID) are based on fluid speed of max 1,5 m/s on pressure lines and 1 m/s on return lines — ID min. ø1"

Counter stream
Fresh water, max inlet temperature 38°C
50 l/min
Max△P-Cooler: 1 Bar

ID min. ø1" — Max. 10 Bar — Dimensions (min. ID) are based on fluid speed of max 1,5 m/s on pressure lines and 1 m/s on return lines — ID min. ø1"

Note 1.

GC2 GC1 GCR WI WO

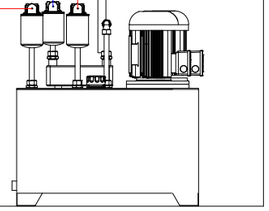
801

Relief valve setting: TBA

HYDRAULIC POWER PACK (HPU)-GEAR COOLING

HYD. DWG: 2000008163

DIM./CON.DWG: 2000004110



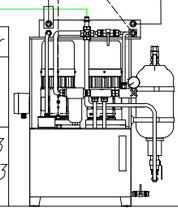
P D Dr WI WO

Relief valve setting:130 Bar

HYDRAULIC POWER PACK (HPU)- BRAKE CONTROL

HYD. DWG: 2000008113

DIM./CON.DWG: 2000004113



802

Internal Piping on HPU's delivered by Macgregor

NOTE 1:
External pipes in accordance to DIN2391C (NS2503)
Ref: installation instruction
Fitting type:
JIC Triple-Lok 37deg.

NOTE 2:
HPU's 801 and 802
-To be installed as close as possible to the winches (no more than 25m eq. piping length)
-Hoses 803-808 to be installed directly on the HPUs

809 TESTING EQUIPMENT

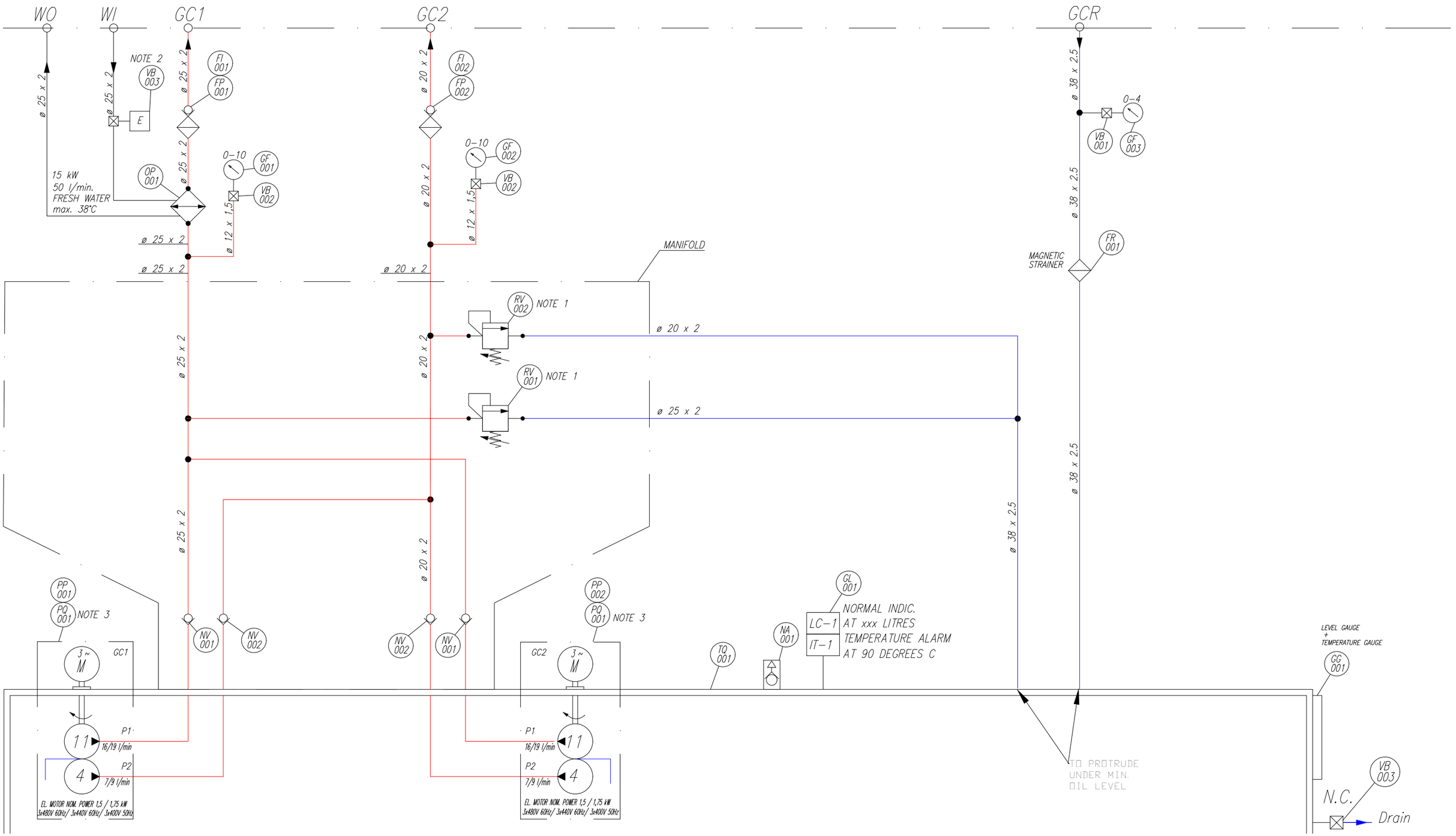
Note 1.: 70 l/min when accumulator is unloading

RHHA10070H-1

Designed by	Modified by	Date	ECO			
H Johansen		21-Dec-21	ECO-2056654			

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Name	Weight
MBARI 4/10070 HYDRAULIC SYSTEM	% kg
Description: BRAKE & GEAR COOL. (Old no. RH330398)	Scale (A3): %
Document ID: 2000004171	Revision: A



(Note: This diagram is developed from RH325930)

NOTES:
1. Default setting 4 bar. To be adjusted at HAT, for optimal flow.
2. Valve to be open when oil temperature in side of the tank is above XX °C. FC valve.
3. Only one of the pumps will run at a time. (Designed with two pumps in order to achieve redundancy)
4. Dim. DWG / Connect. DWG: 2000004110
5. Oil specification GEAR OIL ISO VG 68
6. This system to be installed acc. to RAPP MARINE'S "Installation instruction for high pressure hydraulic systems", Doc.: 3035

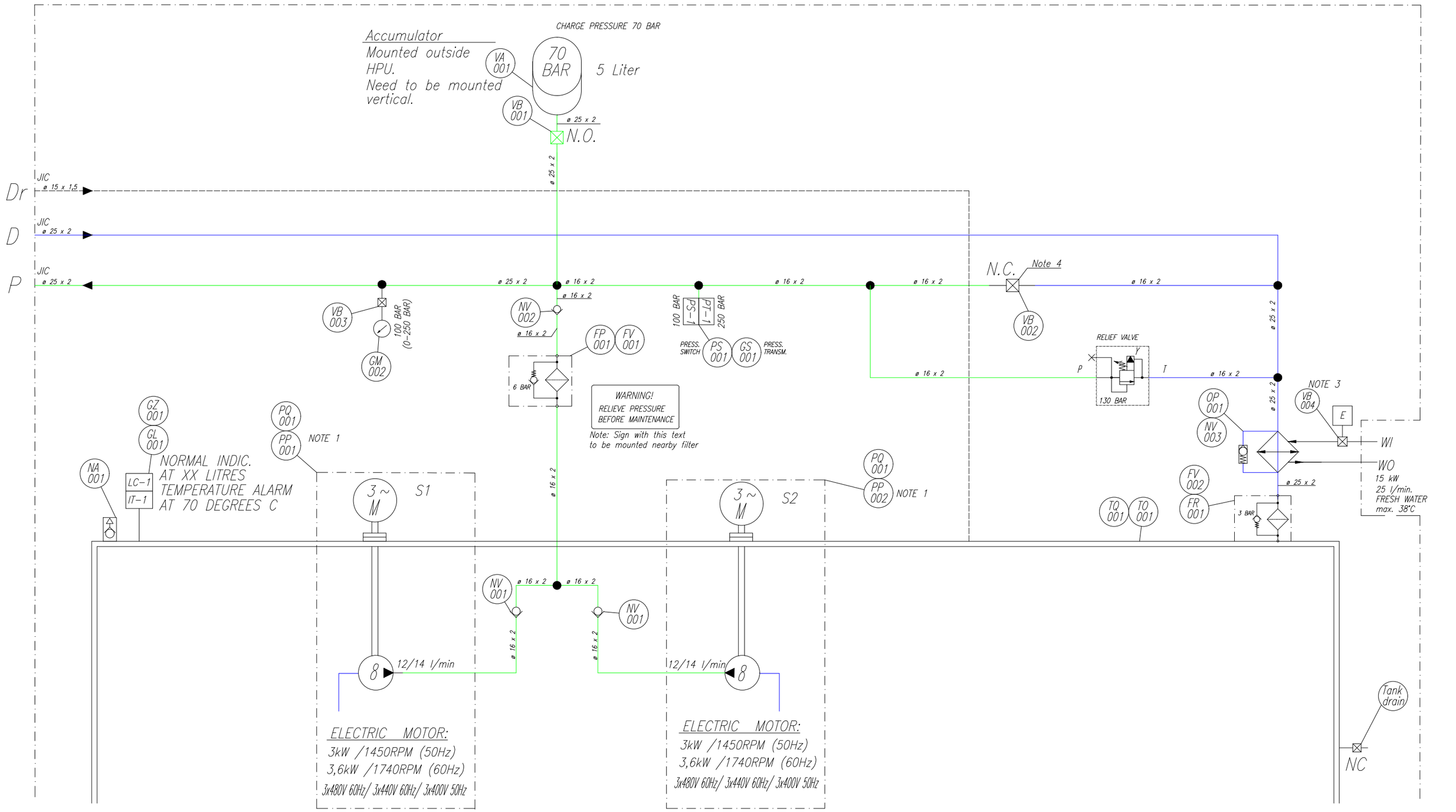
SUCTION / RETURN LINES
PRESSURE LINES
DRAIN LINES
CONTROL LINES

Designed by	Modified by	Date	ECO			
H Johansen		05-Apr-22				

MACGREGOR

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Name	Weight
Hydraulic Diagram	0 kg
Description	Scale (A3)
HPU for Gear Cooling	
Document ID: 2000008163	Revision: A



(Note: This diagram is developed from RH322323)

TANK DESIGN SPECIFICATION:
OPERATING OIL VOLUME: APPROX. 70 LITRES
TYPE OF OIL: HYDRAULIC OIL ISO VG 46

1. Only one of the pumps will run at a time. (Designed with two pumps in order to achieve redundancy)
2. General note: Dim. sketch / Conn. dwg.: 2000004113
3. Valve to be open when oil temperature in side of the tank is above xx °C, FC Valve.
4. Pressure must be relieved before maintenance (including replacement of filter element)

SUCTION / RETURN LINES
PRESSURE LINES
DRAIN LINES
CONTROL LINES

Designed by	Modified by	Date	ECO
H Johansen		04-Apr-22	ECO-2057101

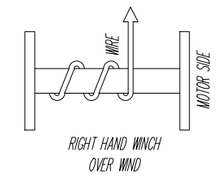
MACGREGOR

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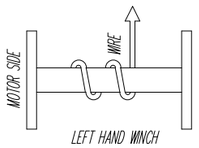
Name: Hydraulic Diagram
Weight: 0 kg
Description: HPU for Brake, with cooler & accum.
Scale (A3)
Document ID: 2000008113
Revision: A

PIPING/ TUBING ON USA - MOUNTED WINCHES:

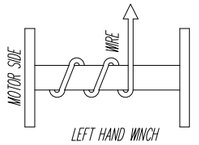
1/2" x .049 (ø 12 x 1.5)
3/4" x .049 (ø 15 x 1.5 / ø 20 x 2)
1" x .072 (ø 25 x 3)
1 1/4" x .095 (ø 30 x 3)
1 1/2"x .134 (ø 30 x 3)
1 1/2" sch 80 (ø 50 x 5)
2" sch 80 (ø 60 x 5)



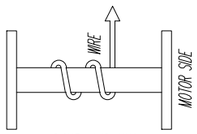
RIGHT HAND WINCH
OVER WIND



LEFT HAND WINCH
UNDER WIND



LEFT HAND WINCH
OVER WIND

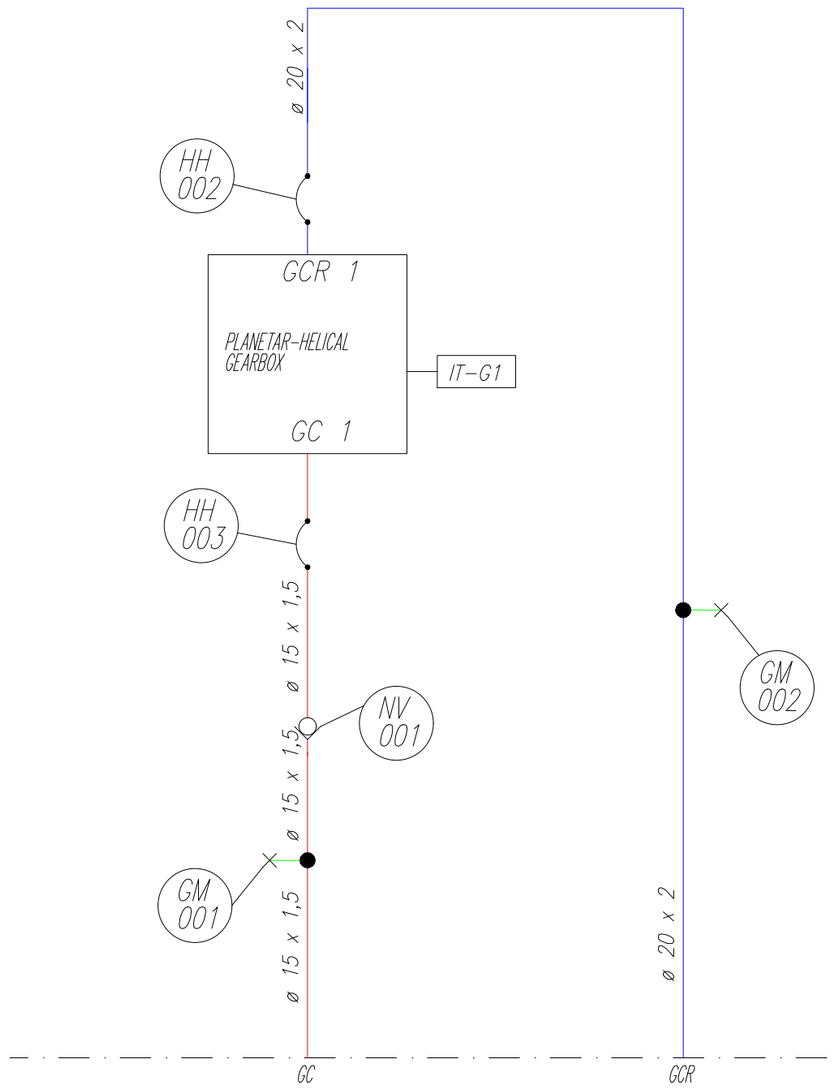


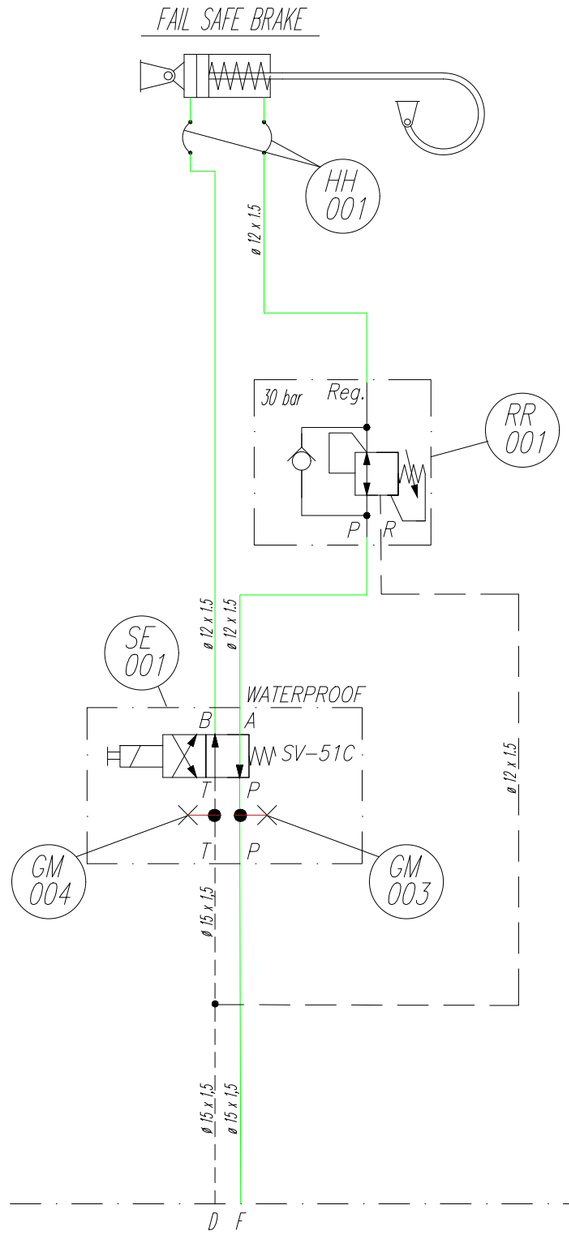
RIGHT HAND WINCH
UNDER WIND

DRAIN
SERVO
RETURN
PRESSURE

Note 1)
Gear cooling inlet to be in the center of the angle gearbox, and gear cooling outlet to be on the top of the angled part.
If plug on the outlet is located down, input part on the gear to be turned in position.

PIPE LENGTHS, FITTINGS AND BENDS ARE THUS TO BE CHOSEN WITH CARE. PLEASE CONSULT SYSTEM DEPARTMENT.





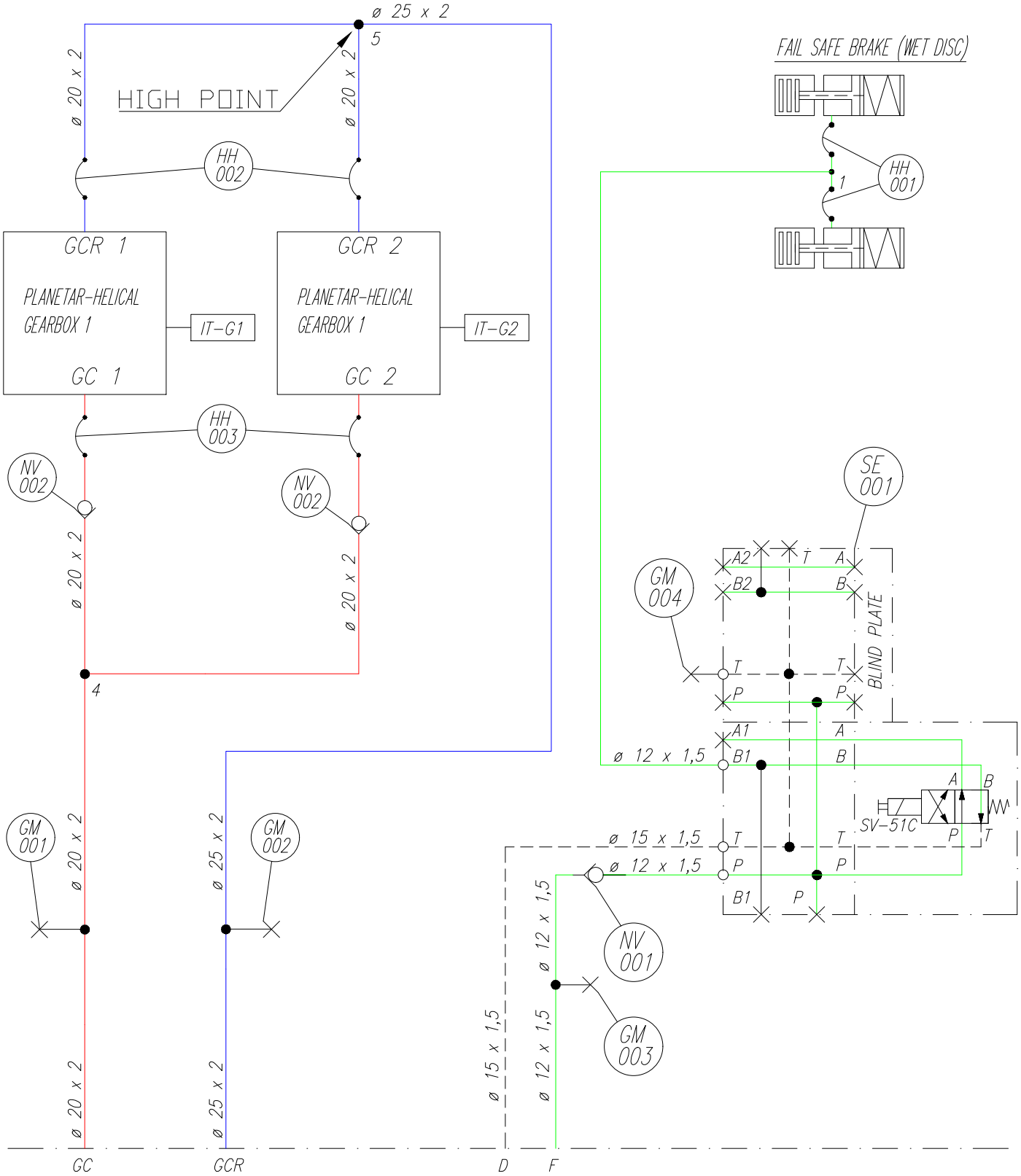
XQ 001 Extra mounting equipment.

Designed by	Modified by	Date	ECO			
H Johansen		21-Feb-22	ECO-2056897			

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Name	Weight
HYDRAULIC BRAKE & COOLING SYSTEM,	0 kg
Description	Scale (A3)
Document ID: RH411171	Revision: A



Designed by	Modified by	Date	ECO			
H Johansen		21-Feb-22	ECO-2056897			

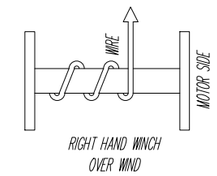
MACGREGOR

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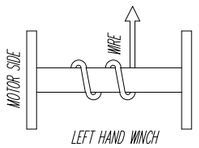
Name	Weight
HYDRAULIC BRAKE & COOLING SYSTEM,	0 kg
Description	Scale (A4)
Document ID: RH411181	Revision: C

PIPING/ TUBING ON USA - MOUNTED WINCHES:

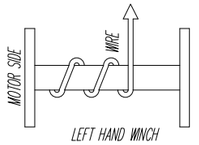
1/2" x .049 (ø 12 x 1.5)
3/4" x .049 (ø 15 x 1.5 / ø 20 x 2)
1" x .072 (ø 25 x 3)
1 1/4" x .095 (ø 30 x 3)
1 1/2"x .134 (ø 30 x 3)
1 1/2" sch 80 (ø 50 x 5)
2" sch 80 (ø 60 x 5)



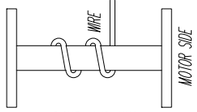
RIGHT HAND WINCH
OVER WIND



LEFT HAND WINCH
UNDER WIND



LEFT HAND WINCH
OVER WIND

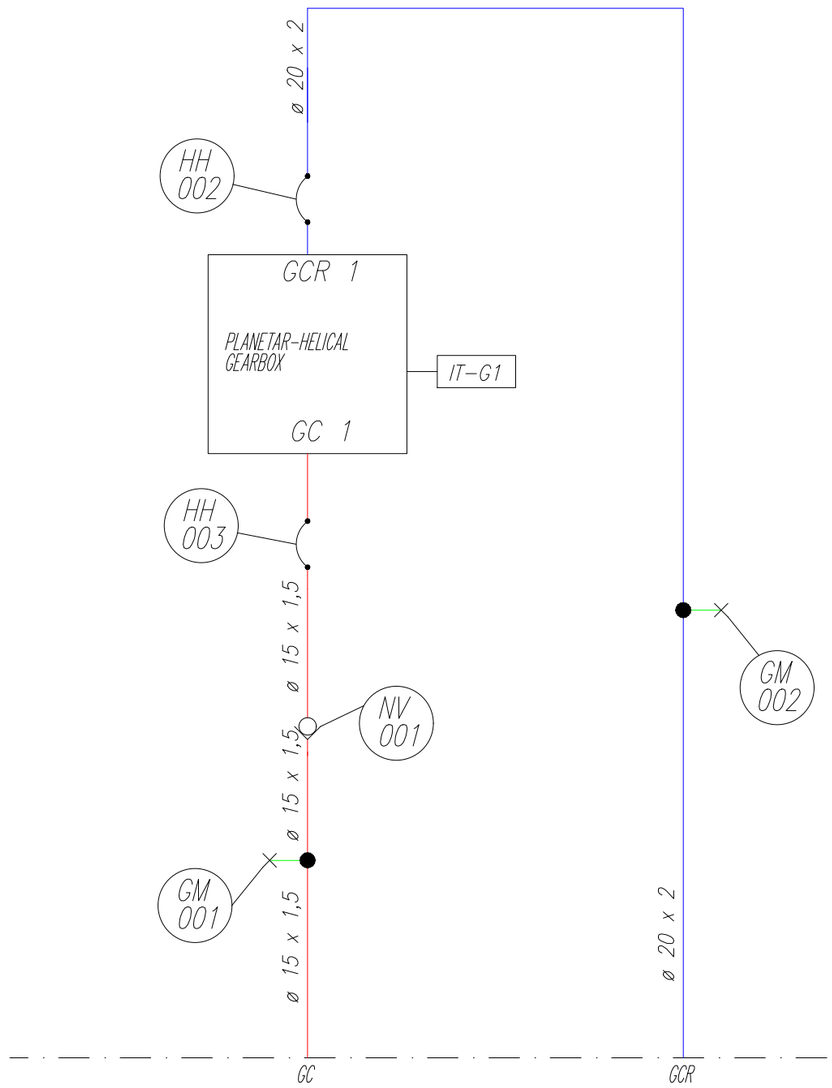


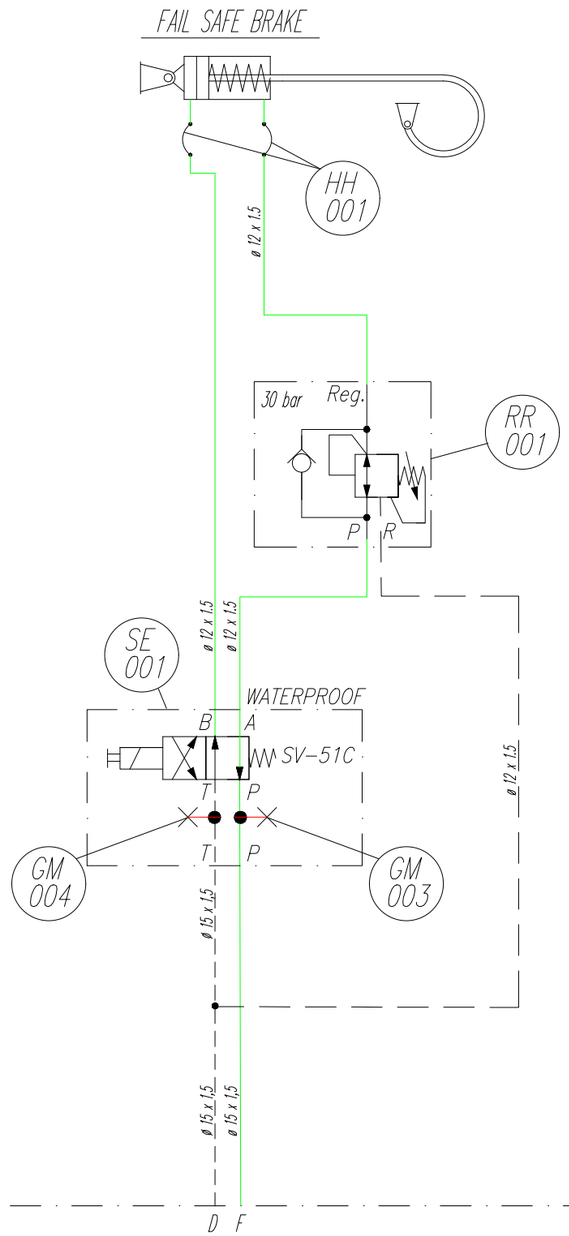
RIGHT HAND WINCH
UNDER WIND

DRAIN
SERVO
RETURN
PRESSURE

Note 1)
Gear cooling inlet to be in the center of the angle gearbox, and gear cooling outlet to be on the top of the angled part.
If plug on the outlet is located down, input part on the gear to be turned in position.

PIPE LENGTHS, FITTINGS AND BENDS ARE THUS TO BE CHOSEN WITH CARE. PLEASE CONSULT SYSTEM DEPARTMENT.





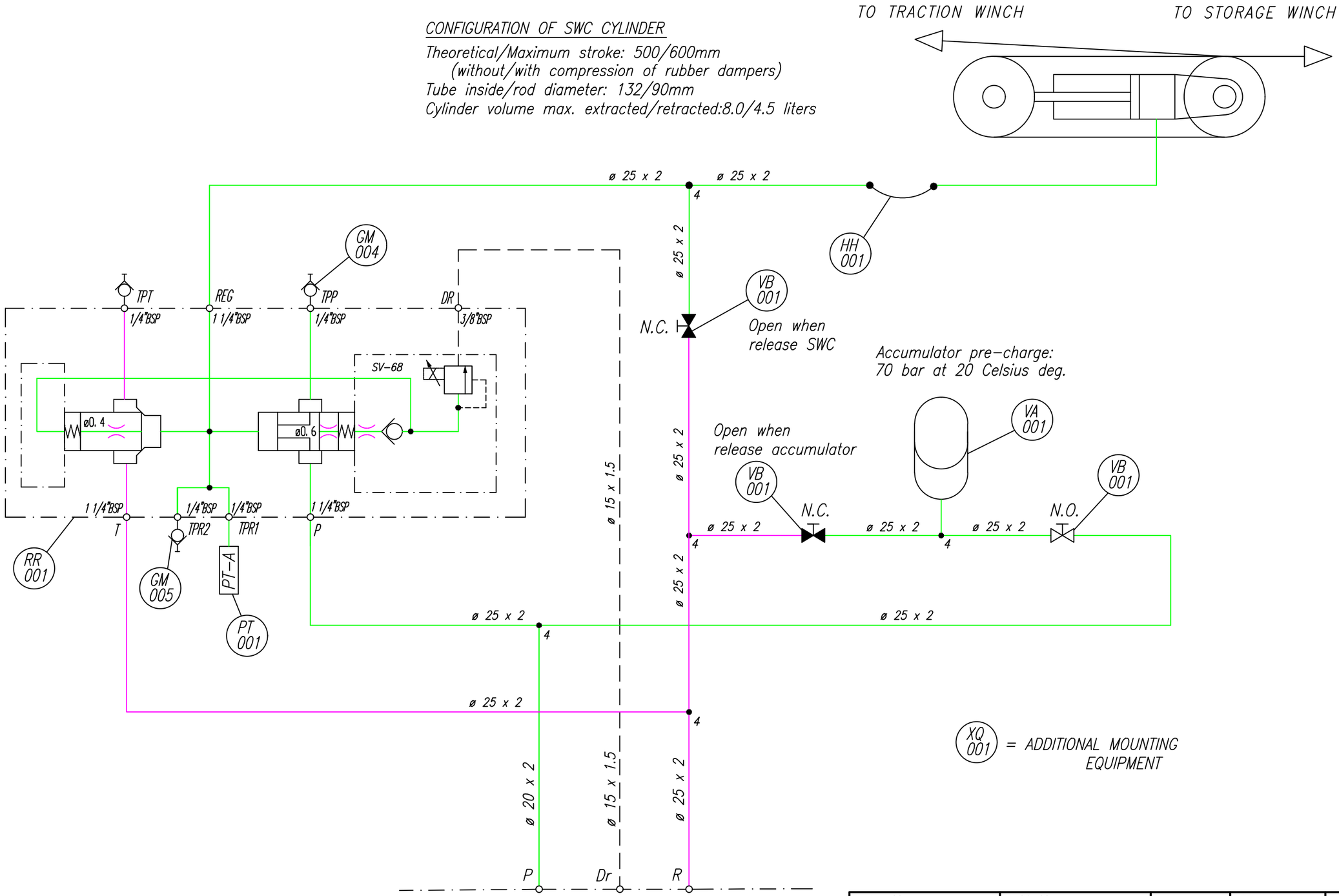
XQ 001 Extra mounting equipment.

Designed by	Modified by	Date	ECO			
H Johansen		21-Feb-22	ECO-2056897			

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Name	Weight
HYDRAULIC BRAKE & COOLING SYSTEM,	0 kg
Description	Scale (A3)
Document ID: RH411171	Revision: A



Part list: RHHSWC-E

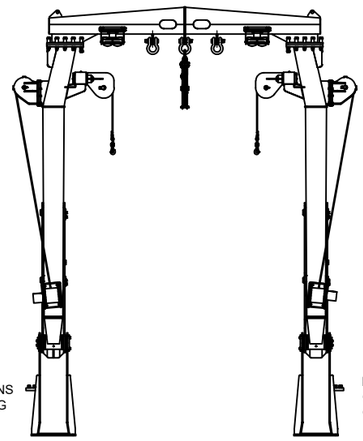
Designed by	Modified by	Date	ECO			
D Boc		03.06.2022	ECO-2057408			

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Name	Weight
Hydraulic Diagram	
Description	Scale (A3)
Slack Wire Compensator	
Document ID: RH319631	Revision: F

STERN A-FRAME



HYDRAULIC CONNECTIONS ON PORT LEG

HYDRAULIC CONNECTIONS ON STB LEG

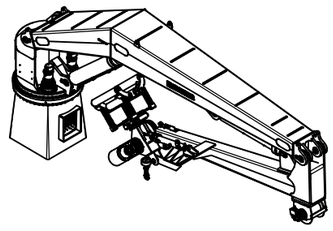
STERN A-FRAME
Dim.drw. : 20549
Hydr. drw. : 24854
200 l/min
210 bar

VALVE CENTRAL
Delivered loose
Drw.no.: 24821

P R D LS

Ø38x4 Ø38x3 Ø30x2 Ø12x1.5

MAIN CRANE



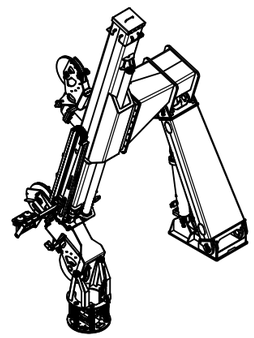
MAIN CRANE KN-75
Dim. drw. : 23460
Hydr. drw. : 24855
200 l/min
210 bar

VALVE CENTRAL
IN FOUNDATION
Drw.no.: 24845

P R D LS

Ø38x4 Ø38x3 Ø30x2 Ø12x1.5

CTD DAVIT



CTD DAVIT
Dim.drw. : 20547
Hydr. drw. : 24856
80 l/min
210 bar

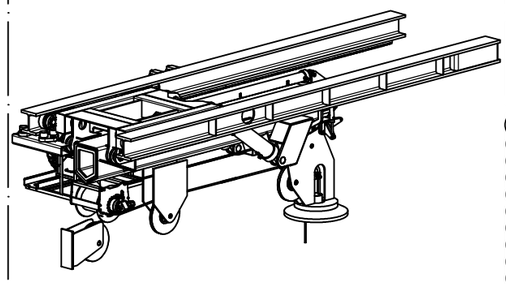
Ø20x2 Ø20x2 Ø20x2 Ø20x2 Ø12x1.5 Ø12x1.5

VALVE CENTRAL
Delivered loose
Drw.no.: 24820

P R D LS

Ø25x2.5 Ø38x3 Ø18x2 Ø12x1.5

ROV LARS



ROV LARS
Dim.drw. : 20673
Hydr. drw. : 24857
200 l/min
210 bar

Ø25x2.5 Ø25x2.5 Ø25x2.5 Ø25x2.5 Ø25x2.5 Ø25x2.5 Ø20x2 Ø20x2 Ø12x1.5 Ø12x1.5 Ø12x1.5 Ø12x1.5 Ø12x1.5 Ø12x1.5 Ø18x2

VALVE CENTRAL
Delivered loose
Drw.no.: 24859

P R D LS

Ø38x4 Ø38x3 Ø30x2 Ø12x1.5

PORTABLE VERTICAL HYDRAULIC CAPSTANS CVH-3500

Drw.no.: 55303

Ø25x3 Ø25x3 Ø25x3 Ø25x3

DIRECTIONAL CONTROL VALVE PS
70 l/min
110 bar

DIRECTIONAL CONTROL VALVE STB
70 l/min
110 bar

Ø25x3 Ø30x2 Ø12x1.5 Ø25x3 Ø30x2 Ø12x1.5

PANTOGRAPHIC SHELL DOORS

Drw. no.: PF731/1/200

Ø16x2.5 Ø16x2.5 Ø16x2.5 Ø16x2.5 Ø16x2.5 Ø16x2.5 Ø16x2.5 Ø12x2 Ø12x2

DIRECTIONAL CONTROL VALVE LP
16 l/min
250 bar

DIRECTIONAL CONTROL VALVE UP
16 l/min
250 bar

Ø20x3 Ø20x2 Ø12x1.5 Ø20x3 Ø20x2 Ø12x1.5

Shut-off valves are shipyard supply. See note.
To be installed as close as possible to valve central.

Ø30x2
Ø60x3
Ø50x5
Ø12x1.5

Shuttle valves are shipyard supply.

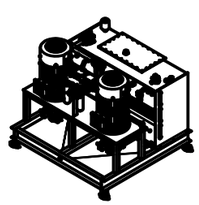
Hoses and shut-off valves are shipyard supply.
See note for shut-off valves.

Ø50x5 Ø60x3 Ø30x2 Ø12x1.5

P R D LS

HYDRAULIC POWER PACK
Dimensional drawing no. : 1998565
Hydraulic drawing no. : 2350417
Electrical drawing no. : E-4504
2 x 87.5 kW / 480V / 60Hz
2 x 200 l/min = 400 l/min
Maximum working pressure: 250 bar
Maximum back pressure on drain line : 2 bar
Maximum back pressure on return line : 5 bar

OIL COOLER
Fresh water supply: 280 l/min
Max pressure: 3 bar
Max temperature: 38° C



Note:

- FLARE FITTINGS acc. to SAE J 514 (ISO 8434-2)
- Pipe Ø50x5: FLANGE 1 1/2" SAE 6000 psi on HPU
- Pipe Ø60x3: FLANGE 2" SAE 3000 psi on HPU
- HOSE FITTING CONNECTION acc. to ISO 12151-5
- All exposed hydraulic hoses to be abrasion and UV protected
- Shut-off valves for pressure, return and drain lines must include indicators. Shut-off valves are a recommendation.

Pressure testing:

- Pressure Line 375 bar
- Return Line 135 bar
- Drain Line 135 bar
- LS Line 375 bar

Fluid Cleanliness: ISO Class 17-15-12

Released for Production !

PROJECT : 4/60185 MBARI

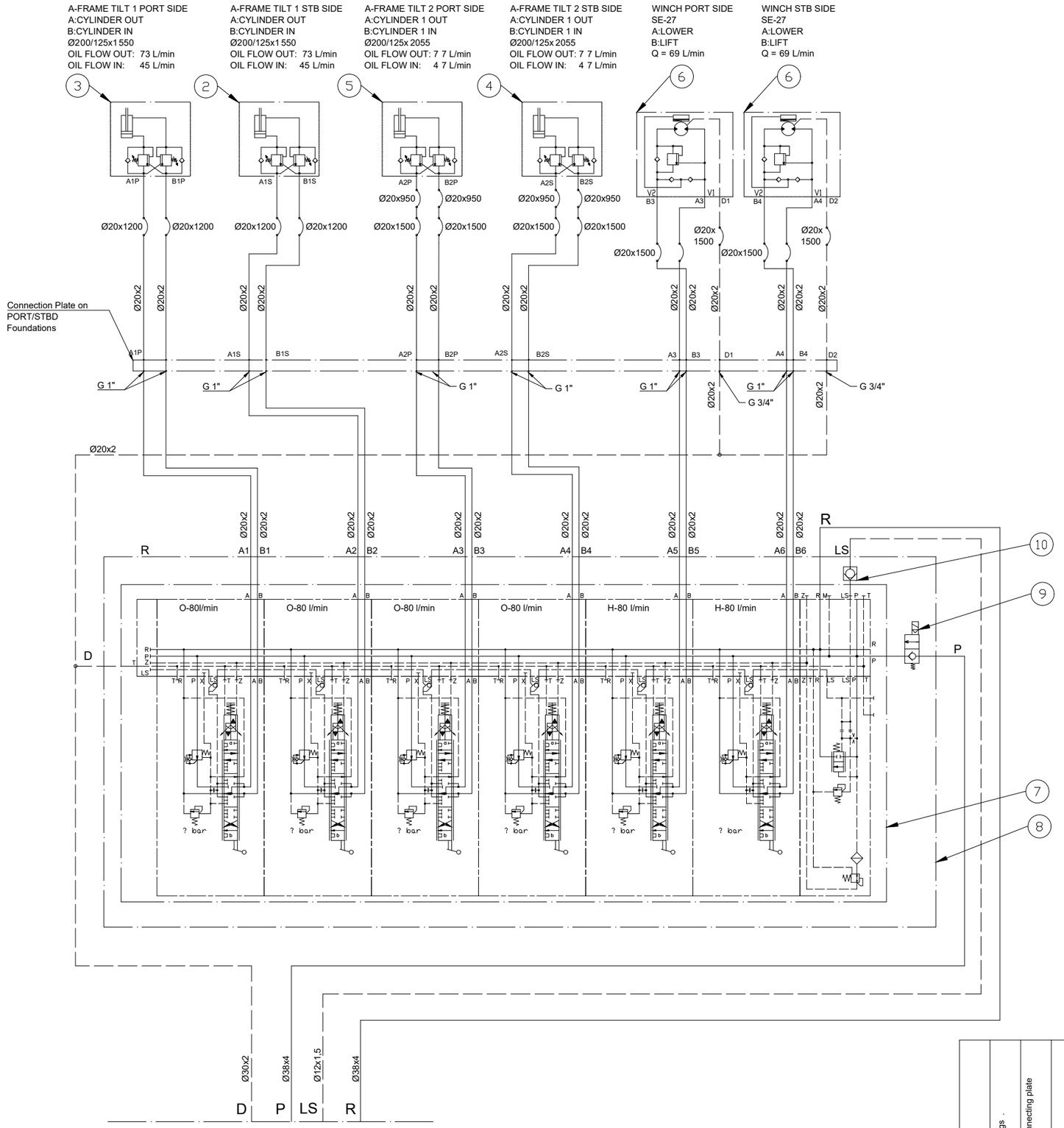
Ver.	Rev	Description
05	05	Updated pipe dim. acc. to JIC standard. Added additional ship equipment. 17.11.2021 KRK.
04	04	Updated pipe dim. 16.08.2021 SIS/EMJ
03	03	ROV LARS added, one more consumer for ROV, ARS and connected to other ship equipment. 13.12.2021 HK
02	02	Fluid cleanliness changed to 17-15-12. 26.11.2021 HK
01	01	Released. 25.11.2021 HK

MBARI
HANDLING EQUIPMENT
HYDRAULIC DIAGRAM

MACGREGOR

Drawing no. S1739
Revision 05
Unspec. tolerances in compliance with
Weight (kg)
Date 25.11.2021
Scale %
Projection
Created by HK
Format A1
Approved date
MPS no.
Approved by

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Main hydraulic diagram: S173 9

NOTE: Additional pipes and hoses for protection of electrical cables will be needed during the assembly.

NOTE !
- JIC 37° FLARE FITTINGS acc. to ISO 8434-2
- FITTINGS MATERIAL : ACID PROOF
- H.P.HOSES acc. to ISO 12151-6
- HOSE COUPLING MATERIAL : ACID PROOF

PROJECT : 4/60185 MBARI

Qty.	Pos.	Description	Material	Drawing no.	Rev	Comment
1	10	CHECK VALVE	07511041			RHD-12 L
1	9	VALVE ON/OFF	07843016			SV-13
1	8	VALVE CENTRAL	400185989	24821		
1	7	CONTROL VALVE	400202238			HAWE 6 SL.
2	6	WINCH	07610233			DINAMIC SE27 3V CW
1	5	CYLINDER TILT 2 PORT	400052574	20175		FJ Ø200/125X2055
1	4	CYLINDER TILT 2 STB	400052573	20175		FJ Ø200/125X2055
1	3	CYLINDER TILT 1 PORT	400052670	20181		FJ Ø200/125X1550
1	2	CYLINDER TILT 1 STB	400052669	20181		FJ Ø200/125X1550
1	1	A-FRAME	400186005	24954		

Ver.	Rev	Description
A	04	As built. 26.06.2023 KRK.
	03	Changed standard for fittings . 27.12.2022 SS.
	02	Removed hoses from connecting plate 12.10.2022 SS.
	01	Added note and BOM 11.08.2022 SS.
		Released 12.04.2022 SS

TRIPLEX FRAME
A-FRAME STERN
HYDRAULIC DIAGRAM

MACGREGOR

Unspec. tolerances in compliance with
Weight (kg)
Date 12.04.2022
Scale %
Projection
Created by SS
Format A2
Approved date
MPS no.
Approved by
Drawing no. 24854
Revision A

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SWING
A: COUNTER CLOCKWICE
B: CLOCKWICE

MAIN DERRICK
A = DOWN = CYL IN
B = UP = CYL OUT

JIB
A = JIB OUT = CYL OUT
B = JIB IN = CYL IN

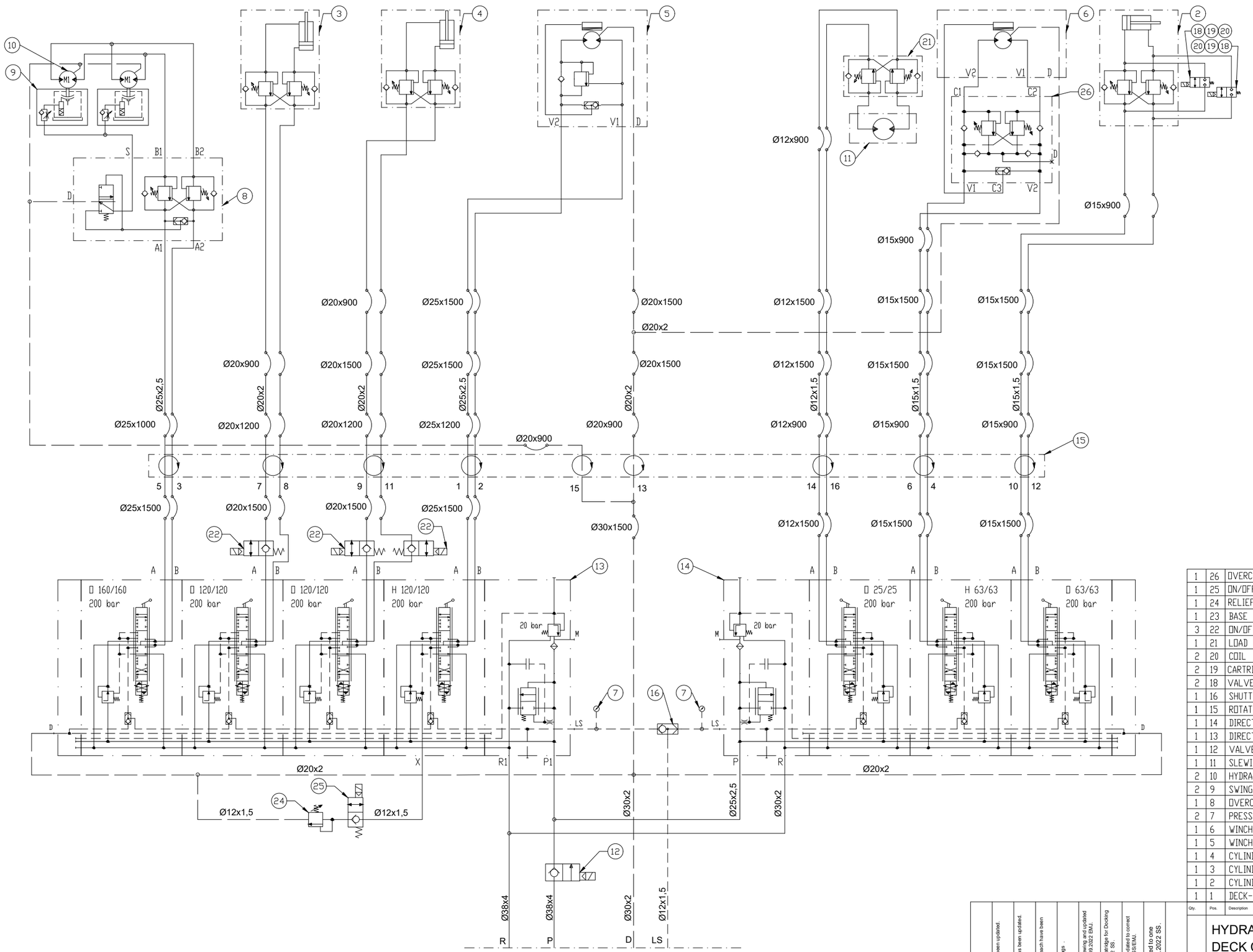
WINCH 1
A = WINCH OUT = LOWER V1
B = WINCH IN = LIFT/HOIST V2

SLEWING DOCKING HEAD
A:CLOCKWICE
B:COUNTER CLOCKWICE

WINCH DOCKING HEAD
A = WINCH OUT = LOWER V1
B = WINCH IN = LIFT/HOIST V2

TILT DOCKING HEAD
B = TILT OUT = CYL OUT
A = TILT IN = CYL IN

NOTE !
- JIC 37° FLARE FITTINGS acc. to ISO 8434-2
- FITTINGS MATERIAL : ACID PROOF
- H.P.HOSES acc. to ISO 12151-6
- HOSE COUPLING MATERIAL : ACID PROOF
- DRILLING ESV : 1775A28



Main hydraulic diagram: S173 9

Qty.	Pos.	Description	Material	Drawing no.	Rev	Comment
1	26	OVERCENTRE VALVE	HRODC013			VAA-B-SICN150-ST-VF-05.71.45
1	25	ON/OFF VALVE	07843017			VEI-8A-2A-06-NC
1	24	RELIEF VALVE	07842716			HAWE MVS 42 C
1	23	BASE BLOCK X PORT	6783943O3			HAWE 5 SUBPLATE
3	22	ON/OFF VALVE	07843008			VEI-C-12
1	21	LOAD HOLDING VALVE	07845019			HAWE LHK 22G
2	20	COIL	400112838			VDC 740-224
2	19	CARTRIDGE	400161192			DTDA-MCN
2	18	VALVE BLOCK	07843020			GCU/S
1	16	SHUTTLE VALVE	07834001			WV-12
1	15	ROTATING COUPLING	07820007			BINI DI-125-16
1	14	DIRECTIONAL VALVE	400202459			HAWE 3
1	13	DIRECTIONAL VALVE	400067999			HAWE 5
1	12	VALVE ON/OFF	07843016			SV-13-20-C
1	11	SLEWING RING W/MOTOR	400191273			P-10411/2 W/MOTOR MPY160CP
2	10	HYDRAULIC MOTOR-SWING	07821006			HAMWORTHY 1911
2	9	SWINGGEAR	07611015			HAMWORTHY RE-1023
1	8	OVERCENTERVALVE	07845002			INTEGR CXP6397-02
2	7	PRESSURE GAUGE	07872002			0-250 BAR 1/4"R
1	6	WINCH	400192348			RHMGW0100B
1	5	WINCH	400033552			SE-45V
1	4	CYLINDER, JIB	05160130	14843		Ø250/125X1400
1	3	CYLINDER, MAIN DERRICK	05160130	14843		Ø250/125X1400
1	2	CYLINDER, JIB-AUV DH	05160236	15743		Ø110/60x525
1	1	DECK-CRANE	400186065	24966		KN-75

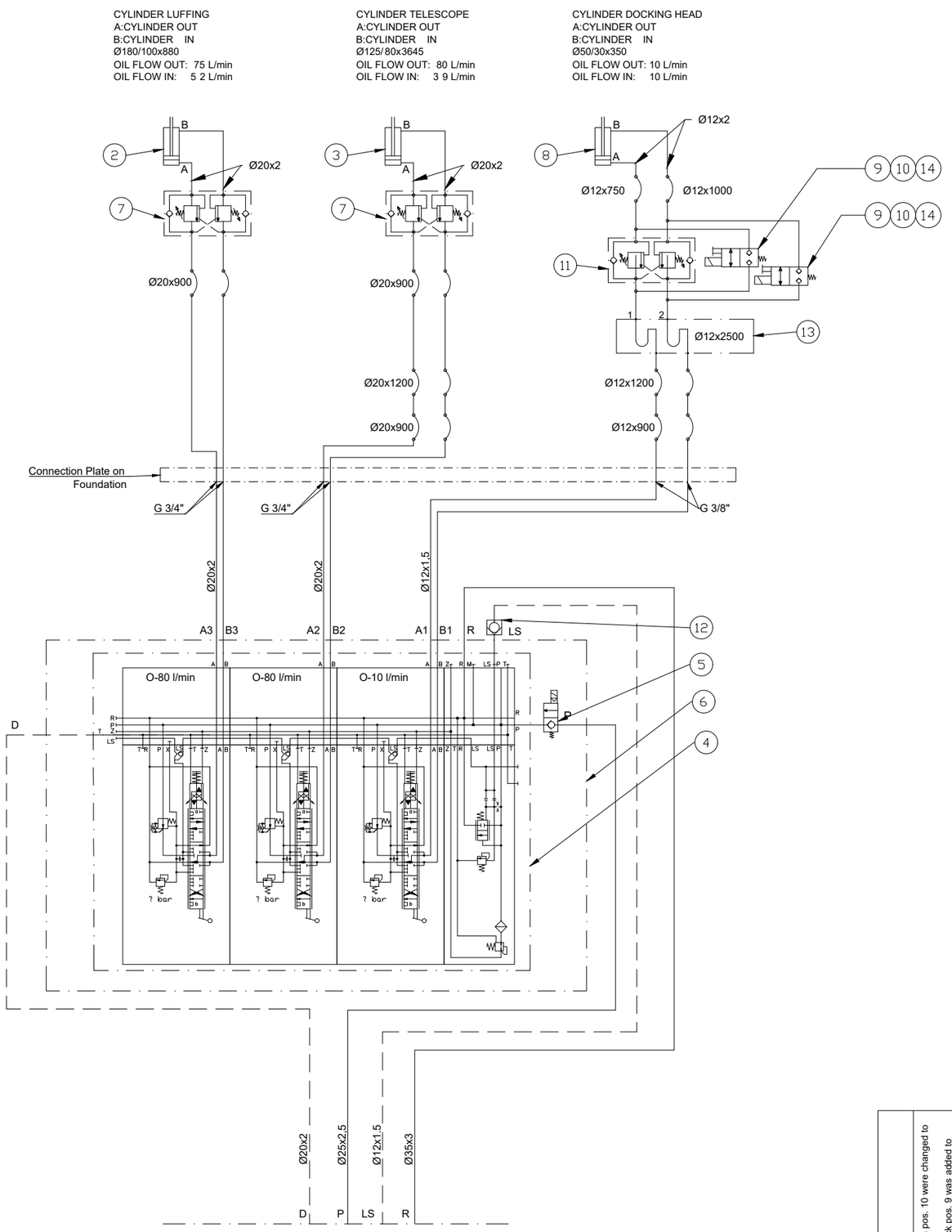
Ver.	Rev	Released. 30.03.2022 SS.
01		Both sections conected to one P,R,D,LS 31.05.2022 SS.
02		Added note and BOM, updated to correct spool sizes. 11.08.2022 SS/EMJ.
03		Added Valve block and Cartrige for Docking head cylinder. 19.08.2022 SS
04		Added LHK on docking slewing and updated valves for docking tilt. 23.09.2022 EMJ.
05		Changed standard for fittings . 27.12.2022 SS.
06		Hydraulic valves limit outreach have been added. 14.03.2023 KRK.
07		Hydraulic winch system has been updated. 16.03.2023 KRK.
08		Winch no.6 & BOM have been updated. 19.05.2023 KRK.
09		As built. 26.06.2023 KRK.
A		

HYDRAULIC DIAGRAM
DECK CRANE TYPE KN-75
60185, MBARI

MACGREGOR

Unspec. tolerances in compliance with
Weight (kg)
Date 30.03.2022
Scale N/A
Projection
Created by HK
Format A1
Approved date
MPS no.
Approved by
Drawing no. 24855
Revision A

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Main hydraulic diagram : S173 9

NOTE: Additional pipes and hoses for protection of electrical cables will be needed during the assembly.

NOTE !
- JIC 37° FLARE FITTINGS acc. to ISO 8434-2
- FITTINGS MATERIAL : ACID PROOF
- H.P.HOSES acc. to ISO 12151-6
- HOSE COUPLING MATERIAL : ACID PROOF

PROJECT : 4/60185 MBARI

Qty.	Pos.	Description	Material	Drawing no.	Rev	Comment
2	14	COIL	400112838			24 VDC 740-224
1	13	E-CHAIN	400065118	20882		
1	12	CHECK VALVE	07511041			RHD-12 L
1	11	OVER CENTRE VALVE	07845019			LHK 22G
2	10	CARTRIDGE	400161192			DTDF-MCN
2	9	VALVE BLOCK	07843020			GCU/S
1	8	CYLINDER	05160155	12940		KM Ø50/25-350
2	7	OVER CENTRE VALVE	07845020			LHK-33
1	6	VALVE CENTRAL	400180306	24820		
1	5	VALVE ON/OFF	07843007			VEI-
1	4	CONTROL VALVE	400073970			HAWE-3 5SL.
1	3	CYLINDER TELESCOPE	400064044	20864		KM Ø125/80-3645
1	2	CYLINDER LUFFING	400064313	16542		MA Ø180/100-880
1	1	CTD DAVIT	400186055	25059		

Ver.	Rev	Description
A	05	As built. 26.06.2023 KRK. Symbol of cartridges pos. 10 were changed to correct. One more valve block pos. 9 was added to BOM. Two coils pos. 14 have been added to diagram and BOM. 15.05.2023 KRK.
	04	Changed standard for fittings . 27.12.2022 SS.
	03	Threads on connectionplate added 12.10.2022 SS
	02	Added note and BOM 11 .08.2022 SS
	01	Released 08.05.2022 SS

DAVIT
CDT DAVIT
HYDRAULIC DIAGRAM

MACGREGOR

Unspec. tolerances in compliance with

Weight (kg)

Date 11.04.2022

Scale %

Projection

Created by SS

Format A2

Approved date

MPS no.

Approved by

Drawing no. 24856

Revision A

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ROV DOCKING HEAD

MAIN BOOM
A = CYL OUT
B = CYL IN
Ø200/100x1050
OIL FLOW OUT: 60 L/min
OIL FLOW IN: 45 L/min

TROLLEY MOTOR
A = LARS STBD
B = LARS PORT
Q =113 L/min

TELESCOPE BOOM
A = CYL OUT
B = CYL IN
Ø125/90 x 2700
OIL FLOW OUT: 80 L/min
OIL FLOW IN: 37 L/min

WINCH
A:LOWER
B:LIFT
Q = 120 L/min

ALONG TILT CYLINDER
A = CYLINDER OUT
Ø80/45 x 200
OIL FLOW OUT: 23 l/min
OIL FLOW IN: 18 l/min

LATCH CYLINDER 1
A = CYLINDER OUT
Ø25/12 x 75
OIL FLOW OUT: 1 l/min
OIL FLOW IN: 1 l/min

LATCH CYLINDER 2
A = CYLINDER OUT
Ø25/12 x 75
OIL FLOW OUT: 1 l/min
OIL FLOW IN: 1 l/min

DH TWIST
A = CCW
OIL FLOW: 16 l/min

OUT HAULER CYLINDER
A = CYL OUT
B = CYL IN
OIL FLOW: 16 L/min

RESEARCH SHEAVE ACROSS TILT
V1: AFT
V2: FORWARD
OIL FLOW: ? L/min

SPRING PLATE CYLINDERS (x3)
Ø32/20 x 100

Piping motor cable
Piping for sensor cable
Piping for floodlight cable
Fresh water nozzle on tip sheave
Docking head connection plate
Energy Chain Telescope Boom
Inner energy chain on trolley
Outer energy chain on trolley

NOTE: Additional pipes and hoses for protection of electrical cables will be needed during the assembly.

NOTE !
- JIC 37° FLARE FITTINGS acc. to ISO 8434-2
- FITTINGS MATERIAL : ACID PROOF
- H.P.HOSES acc. to ISO 12151-6
- HOSE COUPLING MATERIAL : ACID PROOF

BOM ON SHEET 2

PROJECT : 4/60185 MBARI

Sheet 1/2

MAIN HYDRAULIC DIAGRAM: S-1739

Rev	Ver.	Qty.	Pos.	Description	Material	Drawing no.	Rev	Comment
A	A							
11								
10								
09								
08								
07								
06								
05								
04								
03								
02								
01								

As built. 26.06.2023 KRK
Changed standard for fittings . 27.12.2022 SS.
Added eli. names on hyd. valves on the docking head. 16.12.2022 KRK.
Change BOM pos 12- Overcenter valve 13.12.2022 SS.
Updated electrical cable dimension in energy chain from Ø18 to Ø10. 21.11.2022 KRK.
Added constant tension function to Winch. Updated BOM list. 04.11.2022 KRK.
Added hoses length, added connection plate on docking head 12. 10.2022 EMJ.
Updated hydraulic on docking head. 07.09.2022 EMJ.
Changed hydraulic rotator with hydraulic cylinder for the swing. 09.09.2022 HK
Added note.
08.07.2022 EMJ.
Changed from 2 sec to one section, added pipe for accumulator, added accumulator on swing for damping. 10.02.2022 HK
Released. 06.01.2022 HK

Unspec. tolerances in compliance with	Weight (kg)
Scale %	Projection
Format A1	Created by HK
MPS no.	Approved date
Drawing no. 24857	Approved by
	Revision A
	Date 05.01.2022

OVERHEAD CRANE
ROV LARS
HYDRAULIC DIAGRAM

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Customer: CNP Freire

Project: MBari

Document Type	Drawing number	Drawing Description	BOM Article number
Front page	FP		
Drawing list	DL		
Cable list	CD		400209341
Termination list	TL	Termination list	
Installation Notes	00-IS		
Locations	00-LO	Locations	
Cable Diagram	00-CD	Ship Connections	
Circuit Diagram	00-CC	Ship Connections	
Cable Diagram	01-CD	Main VFD Cabinet Pentagon	400092375
Circuit Diagram	01-CC	Main VFD Cabinet Pentagon	400092375
Panel Layout	01-GA	Main VFD Cabinet Pentagon	400092375
Part list	01-PL	Main VFD Cabinet Pentagon	400092375
Cable Diagram	02-CD	CTD Winch	400182376
Circuit Diagram	02-CC	CTD Winch	400182376
Panel Layout	02-GA	CTD Winch	400182376
Cable Diagram	03-CD	ROV Traction Winch	400182377
Circuit Diagram	03-CC	ROV Traction Winch	400182377
Panel Layout	03-GA	ROV Traction Winch	400182377
Cable Diagram	04-CD	Levelwind & Slack Wire Compensator	400182378
Circuit Diagram	04-CC	Levelwind & Slack Wire Compensator	400182378
Panel Layout	04-GA	Levelwind & Slack Wire Compensator	400182378
Cable Diagram	05-CD	Storage Drum	400182467
Circuit Diagram	05-CC	Storage Drum	400182467
Panel Layout	05-GA	Storage Drum	400182467
Cable Diagram	06-CD	Local Panel CTD Winch	400182468
Circuit Diagram	06-CC	Local Panel CTD Winch	400182468
Panel Layout	06-GA	Local Panel CTD Winch	400182468
Cable Diagram	07-CD	Deck Panel ROV Winch System	400182477
Circuit Diagram	07-CC	Deck Panel ROV Winch System	400182477

				Date	17/11-2021
	Removed CP02	28.11.2022	ANP	User	GSK
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ
Status	Change	Date	Name	Standard	

CNP Freire
MBari

Origin | Repl. f. | Repl. by

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Front page

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Sheet 1
Next 2

AD7C40B1747540CBF652D56B6311BE9

Customer: CNP Freire

Project: MBari

Document Type	Drawing number	Drawing Description	BOM Article number
Panel Layout	07-GA	Deck Panel ROV Winch System	400182477
Cable Diagram	08-CD	ROV Control Room Panel Winches	400182478
Circuit Diagram	08-CC	ROV Control Room Panel Winches	400182478
Panel Layout	08-GA	ROV Control Room Panel Winches	400182478
Cable Diagram	10-CD	AFT Control Station Panel Winches	400186798
Circuit Diagram	10-CC	AFT Control Station Panel Winches	400186798
Panel Layout	10-GA	AFT Control Station Panel Winches	400186798
Cable Diagram	11-CD	AFT Control Station Panel A-Frame Stern	400186799
Circuit Diagram	11-CC	AFT Control Station Panel A-Frame Stern	400186799
Panel Layout	11-GA	AFT Control Station Panel A-Frame Stern	400186799
Cable Diagram	12-CD	AFT Control Station Panel CTD Davit	400186802
Circuit Diagram	12-CC	AFT Control Station Panel CTD Davit	400186802
Panel Layout	12-GA	AFT Control Station Panel CTD Davit	400186802
Cable Diagram	16-CD	Brake HPU System	NA
Circuit Diagram	16-CC	Brake HPU System	NA
Panel Layout	16-GA	Brake HPU System	NA
Cable Diagram	17-CD	Gear Cooling HPU System	NA
Circuit Diagram	17-CC	Gear Cooling HPU System	NA
Panel Layout	17-GA	Gear Cooling HPU System	NA
Cable Diagram	18-CD	Connections To Triplex System	NA
Circuit Diagram	18-CC	Signal Connections	NA
Cable Diagram	19-CD	Hangar Control Panel	400209341
Circuit Diagram	19-CC	Hangar Control Panel	400209341
Panel Layout	19-GA	Hangar Control Panel	400209341
Part list	19-PL	Hangar Control Panel	400209341
Cable Diagram	20-CD	Overhead Crane Outhauler Motor	NA

				Date	17/11-2021
	Removed CP02	28.11.2022	ANP	User	GSK
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ
Status	Change	Date	Name	Standard	

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Origin	Repl. f.	Repl. by

MACGREGOR

Front page

10070 - FP Rev. G

Sheet 2
Next 1

AD7C40B1747540CBF652D56B6311BE9

Document Type	Drawing number	Title	Location (+)	Function (=)	Sheet	Rev.
Front page	FP	Front page Front page			1 2	
Drawing list	DL	Drawing list Drawing list Drawing list Drawing list Drawing list Drawing list			1 2 3 4 5 6	
Cable list	CD	Cable list Cable list Cable list Cable list			1 2 3 4	
Termination list	TL	Termination list			1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	
Installation Notes	00-IS				1	
Locations	00-LO	Locations System Equipment Overview Cabinet Overview Network Topology Emergency Stop			1 2 3	
Cable Diagram	00-CD	Ship Connections Supply from Ship Power Supply Connections Supply from Ship Signal Connections		=SHIP =SHIP	1 2	
Circuit Diagram	00-CC	Ship Connections Power Connections 440VAC, 230VAC PMS, Alarm, Internet Optional Alarm	+Power +Signal	=SHIP =SHIP	1 2	
Cable Diagram	01-CD	Main VFD Cabinet Pentagon WCS01 Cabinet		=WCS01	1	

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Drawing list	
	Updated after CP02 removed	28.11.2022	ANP	User	GSK				
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ				
Status	Change	Date	Name	Standard		Version	Index	Repl. by	

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AD7C40B1747540CBF652D56B6311BE9

Document Type	Drawing number	Title	Location (+)	Function (=)	Sheet	Rev.
Circuit Diagram	01-CC	Main VFD Cabinet Pentagon				
		Cabinet Overview		=WCS01	1	
		Main Power input 1 Control Power, Charging Circuit	+UH01	=WCS01	2	
		Control Inputs Contactor Control	+UH01	=WCS01	3	
		Fan Thermal Switch Control Card Power	+UH01	=WCS01	4	
		Reference Overview	+UH01	=WCS01	5	
		Levelwindes Frequency Inverter	+UH01	=WCS01	6	
		Levelwindes Encoder Cards, PTC Connection	+UH01	=WCS01	7	
		Levelwindes Brakes & Heating	+UH01	=WCS01	8	
		Levelwind Storage Drum Emergency Control Connection	+UH01	=WCS01	9	
		Levelwind CTD Winch Emergency Control Connection	+UH01	=WCS01	10	
		Levelwindes Storage Drum & CTD Winch Frequency Inverter References	+UH01	=WCS01	11	
		Levelwindes Frequency Inverter	+UH01	=WCS01	12	
		Levelwindes Safe Torque Off	+UH01	=WCS01	13	
		Traction Winch, SD & CTD Winch Frequency Inverter	+UH02	=WCS01	14	
		Traction Winch, SD & CTD Winch Encoder Cards	+UH02	=WCS01	15	
		Traction Winch, SD & CTD Winch PTC Connections	+UH02	=WCS01	16	
		Traction Winch, SD & CTD Winch Brake & Heating	+UH02	=WCS01	17	
		Traction Winch Emergency Control Connection	+UH02	=WCS01	18	
		Storage Drum Emergency Control Connection	+UH02	=WCS01	19	
		CTD Winch Emergency Control Connection	+UH02	=WCS01	20	
		Traction Winch Frequency Converter Referenceses	+UH02	=WCS01	21	
		Storage Drum & CDT Winch Frequency Converter Referenceses	+UH02	=WCS01	22	
		Traction Winch, SD & CTD Winch Frequency Converters	+UH02	=WCS01	23	
		Traction Winch, SD & CTD Winch Winch System Deactivation / Activation	+UH02	=WCS01	24	
		Pentagon Control Cabinet Main Power Connections	+UH03	=WCS01	25	
		Pentagon Control Cabinet 230V Distribution, Cabinet Cooling	+UH03	=WCS01	26	
		Pentagon Control Cabinet Heating Distribution, Cabinet Heating	+UH03	=WCS01	27	
		Pentagon Control Cabinet 24V Power Supply	+UH03	=WCS01	28	
		Pentagon Control Cabinet VFD Controlcard Powersupply	+UH03	=WCS01	29	
		Pentagon Control Cabinet Network and Switches	+UH03	=WCS01	30	
		Pentagon Control Cabinet PLC & I/Os	+UH03	=WCS01	31	
		Pentagon Control Cabinet PLC & I/Os	+UH03	=WCS01	32	
		CAN Bus Connection	+UH03	=WCS01	33	
		Pentagon Control Cabinet Brake HPU 1	+UH03	=WCS01	34	
		Pentagon Control Cabinet Gear Cooling HPU	+UH03	=WCS01	35	
		Pentagon Control Cabinet Gear Temp, Brake Inhibit, Traction Winch	+UH03	=WCS01	36	
		Pentagon Control Cabinet Gear Temp Storage Drum & CDT Winch	+UH03	=WCS01	37	
		Pentagon Control Cabinet Storage Drum, Levelwinde / SWC Sensors	+UH03	=WCS01	38	
		Pentagon Control Cabinet CTD Winch, Levelwinde Sensors	+UH03	=WCS01	39	

Status	Change	Date	Name		
				Date	17/11-2021
	Updated after CP02 removed	28.11.2022	ANP	User	GSK
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ

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Drawing list

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Sheet 2
Next 3

AD7C40B1747540CBF652D56B6311BE9

Document Type	Drawing number	Title	Location (+)	Function (=)	Sheet	Rev.
		Pentagon Control Cabinet Deck Sheave, Traction Winch System Load Cell	+UH03	=WCS01	40	
		Pentagon Control Cabinet Emergency Control & Emergency Stop	+UH03	=WCS01	41	
		Pentagon Control Cabinet Control Panel, Traction Winch & Storage Drum	+UH03	=WCS01	42	
		Pentagon Control Cabinet Control Panel, CTD Winch	+UH03	=WCS01	43	
		Pentagon Control Cabinet Control Room Panels 24VDC	+UH03	=WCS01	44	
		PMS & System Alarms	+UH03	=WCS01	45	
		Pentagon Control Cabinet External Emergency Stop	+UH03	=WCS01	46	
		Outhauler Motor Encoder, PTC, Heat, References	+UH01	=WCS01	47	
Panel Layout	01-GA	Main VFD Cabinet Pentagon				
		Panel Layout		=WCS01	1	
		Panel Layout		=WCS01	2	
Part list	01-PL	Main VFD Cabinet Pentagon				
		Part list		=WCS01	1	
		Part list		=WCS01	2	
		Part list		=WCS01	3	
		Part list		=WCS01	4	
		Part list		=WCS01	5	
Cable Diagram	02-CD	CTD Winch				
		CTD Winch		=HW01	1	
		Connection Point Overview		=HW01	2	
Circuit Diagram	02-CC	CTD Winch				
		Winch Internal Connection Box	+UC01	=HW01	1	
		Emergency Control	+UC01	=HW01	2	
Panel Layout	02-GA	CTD Winch				
		Winch Internal Connection Box	+UC01	=HW01	1	
		Winch Internal Connection Box	+UC01	=HW01	2	
Cable Diagram	03-CD	ROV Traction Winch				
		ROV Traction Winch		=TRW01	1	
		Connection Point Overview		=TRW01	2	
Circuit Diagram	03-CC	ROV Traction Winch				
		Winch Connection Box	+UC01	=TRW01	1	
Panel Layout	03-GA	ROV Traction Winch				
		Winch Connection Box	+UC01	=TRW01	1	
		Winch Connection Box	+UC01	=TRW01	2	
Cable Diagram	04-CD	Levelwind & Slack Wire Compensator				
		Levelwind & Slack Wire Compensator		=LEV01	1	
		Connection Point Overview		=LEV01	2	
Circuit Diagram	04-CC	Levelwind & Slack Wire Compensator				
		Level Wind Connection Box Internal Connection	+UC01	=LEV01	1	
Panel Layout	04-GA	Levelwind & Slack Wire Compensator				
		Level Wind Connection Box Internal Connection	+UC01	=LEV01	1	
		Level Wind Connection Box Internal Connection	+UC01	=LEV01	2	

				Date	17/11-2021
	Updated after CP02 removed	28.11.2022	ANP	User	GSK
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ
Status	Change	Date	Name	Standard	

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Drawing list

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Sheet 3
Next 4

AD7C40B1747540CBF652D56B6311BE9

Document Type	Drawing number	Title	Location (+)	Function (=)	Sheet	Rev.
Cable Diagram	05-CD	Storage Drum Storage Drum Connection Point Overview		 =RW01 =RW01	 1 2	
Circuit Diagram	05-CC	Storage Drum Winch Connection Box	 +UC1	 =RW01	 1	
Panel Layout	05-GA	Storage Drum Winch Connection Box Winch Connection Box	 +UC1 +UC1	 =RW01 =RW01	 1 2	
Cable Diagram	06-CD	Local Panel CTD Winch Local Panel CTD Winch		 =WP01	 1	
Circuit Diagram	06-CC	Local Panel CTD Winch Winch 1, EMS, Spooling, Heater	 +WP01	 =WP01	 1	
Panel Layout	06-GA	Local Panel CTD Winch Panel layout	 +WP01	 =WP01	 1	
Cable Diagram	07-CD	Deck Panel ROV Winch System Deck Panel ROV Winch System		 =WP02	 1	
Circuit Diagram	07-CC	Deck Panel ROV Winch System Circuit Diagram Traction Winch, EMS, Spooling, Heater Activate Circuit Diagram Storage Drum Emergency Control Switches	 +WP02 +WP02 +WP02	 =WP02 =WP02 =WP02	 1 2 3	
Panel Layout	07-GA	Deck Panel ROV Winch System Panel Layout	 +WP02	 =WP02	 1	
Cable Diagram	08-CD	ROV Control Room Panel Winches Control Room Panel		 =CP01	 1	
Circuit Diagram	08-CC	ROV Control Room Panel Winches Panel PC, 1 Joystick Panel PC, 1 Joystick Panel PC, 1 Joystick	 +CP01 +CP01 +CP01	 =CP01 =CP01 =CP01	 1 2 3	
Panel Layout	08-GA	ROV Control Room Panel Winches Panel Layout	 +CP01	 =CP01	 1	
Cable Diagram	10-CD	AFT Control Station Panel Winches Control Room Panel		 =CP03	 1	
Circuit Diagram	10-CC	AFT Control Station Panel Winches Panel PC, 1 Joystick Panel PC, 1 Joystick Panel PC, 1 Joystick	 +CP03 +CP03 +CP03	 =CP03 =CP03 =CP03	 1 2 3	
Panel Layout	10-GA	AFT Control Station Panel Winches Panel Layout	 +CP03	 =CP03	 1	
Cable Diagram	11-CD	AFT Control Station Panel A-Frame Stern Control Room Panel		 =CP04	 1	

Status	Change	Date	Name			Version	Index	Repl. by
				Date	17/11-2021	CNP Freire MBari		
	Updated after CP02 removed	28.11.2022	ANP	User	GSK			
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ			
				Standard				

MACGREGOR

Drawing list

10070 - DL Rev. G

Sheet 4
Next 5

AD7C40B1747540CBF652D56B6311BE9

Document Type	Drawing number	Title	Location (+)	Function (=)	Sheet	Rev.
Circuit Diagram	11-CC	AFT Control Station Panel A-Frame Stern Tilt Control, CAN-bus Winch STBD Control, CAN-bus Winch PORT Control, CAN-bus	 +CP04 +CP04 +CP04	 =CP04 =CP04 =CP04	 1 2 3	
Panel Layout	11-GA	AFT Control Station Panel A-Frame Stern Panel Layout	 +CP04	 =CP04	 1	
Cable Diagram	12-CD	AFT Control Station Panel CTD Davit Control Room Panel		 =CP05	 1	
Circuit Diagram	12-CC	AFT Control Station Panel CTD Davit CTD Davit Control, CAN-bus	 +CP05	 =CP05	 1	
Panel Layout	12-GA	AFT Control Station Panel CTD Davit Panel Layout	 +CP05	 =CP05	 1	
Cable Diagram	16-CD	Brake HPU System Brake HPU System		 =HPUBR01	 1	
Circuit Diagram	16-CC	Brake HPU System HPU Brake, Connection Box	 +UC01	 =HPUBR01	 1	
Panel Layout	16-GA	Brake HPU System HPU Brake, Connection Box HPU Brake, Connection Box	 +UC01 +UC01	 =HPUBR01 =HPUBR01	 1 2	
Cable Diagram	17-CD	Gear Cooling HPU System Gear Cooling HPU System		 =HPUGC01	 1	
Circuit Diagram	17-CC	Gear Cooling HPU System HPU Gear Cooling Connection Box	 +UC01	 =HPUGC01	 1	
Panel Layout	17-GA	Gear Cooling HPU System HPU Gear Cooling Connection Box HPU Gear Cooling Connection Box	 +UC01 +UC01	 =HPUGC01 =HPUGC01	 1 2	
Cable Diagram	18-CD	Connections To Triplex System Triplex System		 =TRIP01	 1	
Circuit Diagram	18-CC	Signal Connections Systems Connection EtherCAT to TRIPLEX	 +Signal	 =TRIP01	 1	
Cable Diagram	19-CD	Hangar Control Panel Cable Diagram		 =WP03	 1	
Circuit Diagram	19-CC	Hangar Control Panel Supply and Heating Circuit Diagram PLC Supply, Emergency Stop & Touch Panel Circuit Diagram PLC & I/Os Circuit Diagram Trolley/Telescope Control Tilt/DH Tilt Control Winch/Damper Control ROV Winch Control & Signaling	 +WP03 +WP03 +WP03 +WP03 +WP03 +WP03 +WP03	 =WP03 =WP03 =WP03 =WP03 =WP03 =WP03 =WP03	 1 2 3 4 5 6 7	
Panel Layout	19-GA	Hangar Control Panel Panel Layout		 =WP03	 1	

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	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ
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Document Type	Drawing number	Title	Location (+)	Function (=)	Sheet	Rev.
Part list	19-PL	Hangar Control Panel Part list Part list		 =WP03 =WP03	 1 2	
Cable Diagram	20-CD	Overhead Crane Outhauler Motor		 =OHC	 1	

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Cable	Cable type	Connection A Item designation	Location	Connection B Item designation	Location	Comment	OD mm.
-WD1	FD 855 CP 3G0.75	=WCS01-X201	+UH03	=HW01-X2	+UC01		5 7,6
-WD2	FD 855 CP 4G0.75	=WCS01-X500	+UH01	=HW01-X400	+UC01		5 8,3
-WD3	2YSLCYK-JB 3x2.5+3x0.5	=WCS01-TA3	+UH01	=HW01-MA2			5 12,2
-WD4	FD 855 CP 3G1.5	=WCS01-X300	+UH01	=HW01-MA2			5 8,9
-WD5	FD 855 CP 4G0.75	=WCS01-X501	+UH02	=HW01-X400	+UC01		5 8,3
-WD6	2YSLCYK-JB 3x35+3x6	=WCS01-TA7	+UH02	=HW01-MA1			5 26,9
-WD7	FD 855 CP 3G1.5	=WCS01-X301	+UH02	=HW01-MA1			5 8,9
-WD8	FD 855 CP 3G0.75	=WCS01-X201	+UH02	=TRW01-X2	+UC01		5 7,6
-WD9	2YSLCYK-JB 3x70+3x10	=WCS01-TA4	+UH02	=TRW01-MA1			5 36,4
-WD10	FD 855 CP 3G1.5	=WCS01-X301	+UH02	=TRW01-MA1			5 8,9
-WD11	2YSLCYK-JB 3x70+3x10	=WCS01-TA5	+UH02	=TRW01-MA2			5 36,4
-WD12	FD 855 CP 3G1.5	=WCS01-X301	+UH02	=TRW01-MA2			5 8,9
-WD13	FD 855 CP 3G0.75	=WCS01-X202	+UH03	=LEV01-X2	+UC01		5 7,6
-WD14	2YSLCYK-JB 3x2.5+3x0.5	=WCS01-TA2	+UH01	=LEV01-MA1			5 12,2
-WD15	FD 855 CP 3G1.5	=WCS01-X200	+UH01	=LEV01-MA1			5 8,9
-WD16	FD 855 CP 3G1.5	=WCS01-X300	+UH01	=LEV01-MA1			5 8,9
-WD17	FD 855 CP 3G0.75	=WCS01-X201	+UH02	=RW01-X2	+UC1		5 7,6
-WD18	2YSLCYK-JB 3x16+3x2.5	=WCS01-TA6	+UH02	=RW01-MA1			5 20,2
-WD19	FD 855 CP 3G1.5	=WCS01-X301	+UH02	=RW01-MA1			5 8,9
-WD20	FD 855 CP 3G1.5	=WCS01-X302	+UH03	=WP01-X300	+WP01		5 8,9
-WD21	FD 855 CP 3G1.5	=WCS01-X302	+UH03	=WP02-X300	+WP02		5 8,9
-WD22	FD 855 CP 4G0.75	=WCS01-X500	+UH01	=WP02-X400	+WP02		5 8,3

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Cable	Cable type	Connection A Item designation	Location	Connection B Item designation	Location	Comment	OD mm.
-WD23	FD 855 CP 7G0.75	=WCS01-X501	+UH02	=WP02-X400	+WP02		5 10,6
-WD24	FD 855 CP 3G1.5	=WCS01-X402	+UH03	=CP01-X1	+CP01		5 8,9
-WD25	FD 855 CP 3G1.5	=WCS01-X402	+UH03	=CP03-X1	+CP03		5 8,9
-WD26	2YSLCY-JB BK 4G1.5	=WCS01-X10	+UH03	=HPUBR01-MA1			5 11,4
-WD27	2YSLCY-JB BK 4G1.5	=WCS01-X10	+UH03	=HPUBR01-MA2			5 11,4
-WD28	2YSLCYK-JB 3x2.5+3x0.5	=WCS01-X10	+UH03	=HPUGC01-MA1			5 12,2
-WD29	2YSLCYK-JB 3x2.5+3x0.5	=WCS01-X10	+UH03	=HPUGC01-MA2			5 12,2
-WD30	FD 855 CP 3G1.5	=WCS01-X2	+UH03	=WP03-X1	+WP03		5 8,9
-WD31	FD 855 CP 3G1.5	=WCS01-X302	+UH03	=WP03-X300	+WP03		5 8,9
-WDS1	Supply Cable From Ship Supply 3X	=WCS01-QB1	+UH01	=SHIP-X1	+480VAC		5 6,7
-WDS2	Supply Cable From Ship Supply 2X	=WCS01-X3	+UH03	=SHIP-X4	+230VAC		5 6
-WDS3	Supply Cable From Ship Supply 2X	=WCS01-X2	+UH03	=SHIP-X3	+230VAC		5 6
-WF1	DeviceNet Unitronic Thick 1x2xAWG18+1x2xAWG15	=WCS01-X50	+UH03	=CP01-X50	+CP01		5 12,2
-WF2	EtherLine 4x2xAWG22 CAT7	=WCS01-RJ3	+UH03	=CP01-XG3	+CP01		5 8,7
-WF3	EtherLine 4x2xAWG22 CAT7	=WCS01-RJ4	+UH03	=CP01-XG4	+CP01		5 8,7
-WF5	DeviceNet Unitronic Thick 1x2xAWG18+1x2xAWG15	=WCS01-X50	+UH03	=CP03-X50	+CP03		5 12,2
-WF6	EtherLine 4x2xAWG22 CAT7	=WCS01-RJ5	+UH03	=CP03-XG3	+CP03		5 8,7
-WF7	EtherLine 4x2xAWG22 CAT7	=WCS01-RJ6	+UH03	=CP03-XG4	+CP03		5 8,7
-WF8	DeviceNet Unitronic Thick 1x2xAWG18+1x2xAWG15	=CP04-X50	+CP04	=CP03-X50	+CP03		5 12,2
-WF9	DeviceNet Unitronic Thick 1x2xAWG18+1x2xAWG15	=CP04-X50	+CP04	=CP05-X50	+CP05		5 12,2
-WF13	EtherLine 4x2xAWG22 CAT7	=WCS01-RJ1	+UH03	=TRIP01-X91	+TRIP01		5 8,7
-WF14	EtherLine 4x2xAWG22 CAT7	=WCS01-RJ8	+UH03	=WP03-RJ1	+WP03		5 8,7

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Cable	Cable type	Connection A Item designation	Location	Connection B Item designation	Location	Comment	OD mm.
-WF15	EtherLine 4x2xAWG22 CAT7	=WCS01-RJ2	+UH03	=WP03-RJ2	+WP03		5 8,7
-WFS1	Ship Cable Ethernet	=WCS01-RJ7	+UH03	=SHIP-X4	+Ethernet		5 4,2
-WFS2	Ship Cable Ethernet	=WCS01-RJ9	+UH03	=SHIP-X5	+MRU		5 4,2
-WG1	FD CP (TP) plus 6x2x0.75	=WCS01-X104	+UH03	=HW01-X1	+UC01		5 12,8
-WG2	FD CP (TP) plus 4x2x0.25	=WCS01-TA3.KF2:X82	+UH01	=HW01-MA2			5 7,4
-WG3	FD CP (TP) plus 1x2x0.75	=WCS01-X70	+UH01	=HW01-MA2			5 6,6
-WG4	FD CP (TP) plus 4x2x0.25	=WCS01-TA7.KF2:X82	+UH02	=HW01-MA1			5 7,4
-WG5	FD CP (TP) plus 1x2x0.75	=WCS01-X71	+UH02	=HW01-MA1			5 6,6
-WG6	FD CP (TP) plus 2x2x0.5	=WCS01-X100	+UH03	=TRW01-X1	+UC01		5 8,9
-WG7	FD CP (TP) plus 4x2x0.25	=WCS01-TA4.KF2:X82	+UH02	=TRW01-MA1			5 7,4
-WG8	FD CP (TP) plus 1x2x0.75	=WCS01-X71	+UH02	=TRW01-MA1			5 6,6
-WG9	FD CP (TP) plus 4x2x0.25	=WCS01-TA5.KF2:X82	+UH02	=TRW01-MA2			5 7,4
-WG10	FD CP (TP) plus 1x2x0.75	=WCS01-X71	+UH02	=TRW01-MA2			5 6,6
-WG11	FD CP (TP) plus 8x2x0.75	=WCS01-X103	+UH03	=LEV01-X1	+UC01		5 15,2
-WG12	FD CP (TP) plus 4x2x0.25	=WCS01-TA2.KF2:X82	+UH01	=LEV01-MA1			5 7,4
-WG13	FD CP (TP) plus 2x2x0.75	=WCS01-X101	+UH03	=RW01-X1	+UC1		5 8,9
-WG14	FD CP (TP) plus 4x2x0.25	=WCS01-TA6.KF2:X82	+UH02	=RW01-MA1			5 7,4
-WG15	FD CP (TP) plus 1x2x0.75	=WCS01-X71	+UH02	=RW01-MA1			5 6,6
-WG16	FD CP (TP) plus 10x2x0.75	=WCS01-X401	+UH03	=WP01-X1	+WP01		5 17,3
-WG17	FD CP (TP) plus 8x2x0.75	=WCS01-X400	+UH03	=WP02-X1	+WP02		5 15,2
-WG18	FD CP (TP) plus 6x2x0.75	=WCS01-X400	+UH03	=WP02-X2	+WP02		5 12,8
-WG19	FD CP (TP) plus 4x2x0.25	=WCS01-X40	+UH03	=CP01-X40	+CP01		5 12,2

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Cable	Cable type	Connection A Item designation	Location	Connection B Item designation	Location	Comment	OD mm.
-WG20	FD CP (TP) plus 4x2x0.25	=WCS01-X40	+UH03	=CP03-X40	+CP03		5 7,4
-WG24	FD CP (TP) plus 4x2x0.75	=WCS01-X30	+UH03	=HPUBR01-X1	+UC01		5 12,2
-WG25	FD CP (TP) plus 4x2x0.75	=WCS01-X31	+UH03	=HPUGC01-X1	+UC01		5 12,2
-WGS1	Ship Signal Cable 6x2x0.75	=WCS01-X82	+UH03	=SHIP-X1	+PMS		5 7,9
-WGS2	Ship Signal Cable 4x2x0.75	=WCS01-X80	+UH03	=SHIP-X3	+CSCS		5 6,5
-WGS3	Ship Signal Cable 4x2x0.75	=WCS01-X81	+UH03	=SHIP-X2	+Alarm		5 6,5

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WD1	Ölflex FD 855 CP 3G0.75	=WCS01-X201	+UH03	=HW01-X2	+UC01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X201:3	01/17.D2	=HW01-X2:1	02/1.D7	
	2	=WCS01-X201:4	01/17.D2	=HW01-X2:2	02/1.D7	
	GNYE	=WCS01-X201:PE	01/17.D2	=HW01-X2:PE	02/1.D7	
	SH1	EMC	02/1.D7	EMC	01/17.D3	
-WD2	Ölflex FD 855 CP 4G0.75	=WCS01-X500	+UH01	=HW01-X400	+UC01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X500:4	01/10.D1	=HW01-X400:4	02/2.D3	
	2	=WCS01-X500:5	01/10.D1	=HW01-X400:5	02/2.D3	
	3	=WCS01-X500:6	01/10.D2	=HW01-X400:6	02/2.D3	
	GNYE	=WCS01-X500:PE	01/10.D2	=HW01-X400:PE	02/2.D4	
	SH1	EMC	02/2.D4	EMC	01/10.D2	
-WD3	Ölflex Servo	=WCS01-TA3	+UH01	=HW01-MA2		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	BN	=WCS01-TA3:U2	01/6.D3	=HW01-MA2:U	01/6.E3	
	BK	=WCS01-TA3:V2	01/6.D3	=HW01-MA2:V	01/6.E3	
	GY	=WCS01-TA3:W2	01/6.D3	=HW01-MA2:W	01/6.E3	
	GNYE	PE	01/6.D3	=HW01-MA2:PE	01/6.E3	
	GNYE	PE	01/6.D3	=HW01-MA2:PE	01/6.E3	
	GNYE	PE	01/6.D3	=HW01-MA2:PE	01/6.E3	
	SH1	EMC	01/6.D3	EMC	01/6.E3	
-WD4	Ölflex FD 855 CP 3G1.5	=WCS01-X300	+UH01	=HW01-MA2		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X300:3	01/8.D4	=HW01-MA2:H1	01/8.F4	
	2	=WCS01-X300:4	01/8.D5	=HW01-MA2:H2	01/8.F4	
	GNYE	=WCS01-X300:PE	01/8.D5		01/8.F5	
	SH1	EMC	01/8.D5	EMC	01/8.F5	
-WD5	Ölflex FD 855 CP 4G0.75	=WCS01-X501	+UH02	=HW01-X400	+UC01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X501:7	01/20.D1	=HW01-X400:1	02/2.D1	
	2	=WCS01-X501:8	01/20.D1	=HW01-X400:2	02/2.D1	
	3	=WCS01-X501:9	01/20.D2	=HW01-X400:3	02/2.D2	
	GNYE	=WCS01-X501:PE	01/20.D2	=HW01-X400:PE	02/2.D2	
	SH1	EMC	01/20.D2	EMC	02/2.D2	
-WD6	Ölflex Servo	=WCS01-TA7	+UH02	=HW01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	BN	=WCS01-TA7:U2	01/14.D6	=HW01-MA1:U	01/14.F6	
	BK	=WCS01-TA7:V2	01/14.D6	=HW01-MA1:V	01/14.F6	
	GY	=WCS01-TA7:W2	01/14.D6	=HW01-MA1:W	01/14.F6	
	GNYE	PE	01/14.D6	=HW01-MA1:PE	01/14.F6	
	GNYE	PE	01/14.D6	=HW01-MA1:PE	01/14.F6	
	GNYE	PE	01/14.D6	=HW01-MA1:PE	01/14.F6	
	SH1	EMC	01/14.D6	EMC	01/14.F6	

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WD7	Ölflex FD 855 CP 3G1.5	=WCS01-X301	+UH02	=HW01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X301:7	01/17.D7	=HW01-MA1:1HE1	01/17.F7	
	2	=WCS01-X301:8	01/17.D7	=HW01-MA1:1HE2	01/17.F7	
	GNYE	=WCS01-X301:PE	01/17.D7		01/17.F7	
	SH1	EMC	01/17.D7	EMC	01/17.F7	
-WD8	Ölflex FD 855 CP 3G0.75	=WCS01-X201	+UH02	=TRW01-X2	+UC01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X201:1	01/17.D1	=TRW01-X2:1	03/1.D7	
	2	=WCS01-X201:2	01/17.D1	=TRW01-X2:2	03/1.D7	
	GNYE	=WCS01-X201:PE	01/17.D1	=TRW01-X2:PE	03/1.D7	
	SH1	EMC	03/1.D7	EMC	01/17.D2	
-WD9	Ölflex Servo	=WCS01-TA4	+UH02	=TRW01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	BN	=WCS01-TA4:U2	01/14.D1	=TRW01-MA1:U	01/14.F1	
	BK	=WCS01-TA4:V2	01/14.D1	=TRW01-MA1:V	01/14.F1	
	GY	=WCS01-TA4:W2	01/14.D1	=TRW01-MA1:W	01/14.F1	
	GNYE	PE	01/14.D2	=TRW01-MA1:PE	01/14.F1	
	GNYE	PE	01/14.D2	=TRW01-MA1:PE	01/14.F1	
	GNYE	PE	01/14.D2	=TRW01-MA1:PE	01/14.F1	
	SH1	EMC	01/14.D2	EMC	01/14.F2	
-WD10	Ölflex FD 855 CP 3G1.5	=WCS01-X301	+UH02	=TRW01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X301:1	01/17.D4	=TRW01-MA1:1HE1	01/17.F4	
	2	=WCS01-X301:2	01/17.D4	=TRW01-MA1:1HE2	01/17.F4	
	GNYE	=WCS01-X301:PE	01/17.D4		01/17.F4	
	SH1	EMC	01/17.D4	EMC	01/17.F4	
-WD11	Ölflex Servo	=WCS01-TA5	+UH02	=TRW01-MA2		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	BN	=WCS01-TA5:U2	01/14.D3	=TRW01-MA2:U	01/14.F3	
	BK	=WCS01-TA5:V2	01/14.D3	=TRW01-MA2:V	01/14.F3	
	GY	=WCS01-TA5:W2	01/14.D3	=TRW01-MA2:W	01/14.F3	
	GNYE	PE	01/14.D3	=TRW01-MA2:PE	01/14.F3	
	GNYE	PE	01/14.D3	=TRW01-MA2:PE	01/14.F3	
	GNYE	PE	01/14.D3	=TRW01-MA2:PE	01/14.F3	
	SH1	EMC	01/14.D3	EMC	01/14.F3	
-WD12	Ölflex FD 855 CP 3G1.5	=WCS01-X301	+UH02	=TRW01-MA2		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X301:3	01/17.D5	=TRW01-MA2:1HE1	01/17.F5	
	2	=WCS01-X301:4	01/17.D5	=TRW01-MA2:1HE2	01/17.F5	
	GNYE	=WCS01-X301:PE	01/17.D5		01/17.F5	
	SH1	EMC	01/17.D5	EMC	01/17.F5	

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WD13	Ölflex FD 855 CP 3G0.75	=WCS01-X202	+UH03	=LEV01-X2	+UC01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X202:1	01/38.D6	=LEV01-X2:1	04/1.D8	
	2	=WCS01-X202:2	01/38.D6	=LEV01-X2:2	04/1.D8	
	GNYE	=WCS01-X202:PE	01/38.D6	=LEV01-X2:PE	04/1.D8	
	SH1	EMC	04/1.D8	EMC	01/38.D6	
-WD14	Ölflex Servo	=WCS01-TA2	+UH01	=LEV01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	BN	=WCS01-TA2:U2	01/6.D2	=LEV01-MA1:U	01/6.E2	
	BK	=WCS01-TA2:V2	01/6.D2	=LEV01-MA1:V	01/6.E2	
	GY	=WCS01-TA2:W2	01/6.D2	=LEV01-MA1:W	01/6.E2	
	GNYE	PE	01/6.D2	=LEV01-MA1:PE	01/6.E2	
	GNYE	PE	01/6.D2	=LEV01-MA1:PE	01/6.E2	
	GNYE	PE	01/6.D2	=LEV01-MA1:PE	01/6.E2	
	SH1	EMC	01/6.D2	EMC	01/6.E2	
-WD15	Ölflex FD 855 CP 3G1.5	=WCS01-X200	+UH01	=LEV01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X200:1	01/8.D1	=LEV01-MA1:BR1	01/8.F1	
	2	=WCS01-X200:2	01/8.D1	=LEV01-MA1:BR2	01/8.F1	
	GNYE	=WCS01-X200:PE	01/8.D1		01/8.F1	
	SH1	EMC	01/8.D1	EMC	01/8.F1	
-WD16	Ölflex FD 855 CP 3G1.5	=WCS01-X300	+UH01	=LEV01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X300:1	01/8.D3	=LEV01-MA1:H1	01/8.F3	
	2	=WCS01-X300:2	01/8.D4	=LEV01-MA1:H2	01/8.F4	
	GNYE	=WCS01-X300:PE	01/8.D4		01/8.F4	
	SH1	EMC	01/8.D4	EMC	01/8.F4	
-WD17	Ölflex FD 855 CP 3G0.75	=WCS01-X201	+UH02	=RW01-X2	+UC1	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X201:5	01/17.D3	=RW01-X2:1	05/1.D4	
	2	=WCS01-X201:6	01/17.D3	=RW01-X2:2	05/1.D4	
	GNYE	=WCS01-X201:PE	01/17.D3	=RW01-X2:PE	05/1.D4	
	SH1	EMC	05/1.D4	EMC	01/17.D3	
-WD18	Ölflex Servo	=WCS01-TA6	+UH02	=RW01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	BN	=WCS01-TA6:U2	01/14.D4	=RW01-MA1:U	01/14.F4	
	BK	=WCS01-TA6:V2	01/14.D4	=RW01-MA1:V	01/14.F4	
	GY	=WCS01-TA6:W2	01/14.D4	=RW01-MA1:W	01/14.F4	
	GNYE	PE	01/14.D5	=RW01-MA1:PE	01/14.F4	
	GNYE	PE	01/14.D5	=RW01-MA1:PE	01/14.F4	
	GNYE	PE	01/14.D5	=RW01-MA1:PE	01/14.F4	
	SH1	EMC	01/14.D5	EMC	01/14.F5	

Status	Change	Date	Name	Standard	
	Updated Term. after CP02 removed	28.11.2022	ANP	User	GSK
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ
				Date	17/11-2021

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WD19	Ölflex FD 855 CP 3G1.5	=WCS01-X301	+UH02	=RW01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X301:5	01/17.D6	=RW01-MA1:1HE1	01/17.F6	
	2	=WCS01-X301:6	01/17.D6	=RW01-MA1:1HE2	01/17.F6	
	GNYE	=WCS01-X301:PE	01/17.D6		01/17.F6	
	SH1	EMC	01/17.D6	EMC	01/17.F6	
-WD20	Ölflex FD 855 CP 3G1.5	=WCS01-X302	+UH03	=WP01-X300	+WP01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X302:1	01/27.D6	=WP01-X300:1	06/1.D8	
	2	=WCS01-X302:2	01/27.D6	=WP01-X300:2	06/1.D8	
	GNYE	=WCS01-X302:PE	01/27.D7	=WP01-X300:PE	06/1.D8	
	SH1	EMC	06/1.D8	EMC	01/27.D7	
-WD21	Ölflex FD 855 CP 3G1.5	=WCS01-X302	+UH03	=WP02-X300	+WP02	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X302:3	01/27.D7	=WP02-X300:1	07/1.D8	
	2	=WCS01-X302:4	01/27.D7	=WP02-X300:2	07/1.D8	
	GNYE	=WCS01-X302:PE	01/27.D7	=WP02-X300:PE	07/1.D8	
	SH1	EMC	07/1.D8	EMC	01/27.D7	
-WD22	Ölflex FD 855 CP 4G0.75	=WCS01-X500	+UH01	=WP02-X400	+WP02	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X500:1	01/9.D1	=WP02-X400:7	07/3.D4	
	2	=WCS01-X500:2	01/9.D1	=WP02-X400:8	07/3.D5	
	3	=WCS01-X500:3	01/9.D2	=WP02-X400:9	07/3.D5	
	GNYE	=WCS01-X500:PE	01/9.D2	=WP02-X400:PE	07/3.D5	
	SH1	EMC	01/9.D2	EMC	07/3.D6	
-WD23	Ölflex FD 855 CP 7G0.75	=WCS01-X501	+UH02	=WP02-X400	+WP02	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X501:1	01/18.D1	=WP02-X400:1	07/3.D1	
	2	=WCS01-X501:2	01/18.D1	=WP02-X400:2	07/3.D2	
	3	=WCS01-X501:3	01/18.D2	=WP02-X400:3	07/3.D2	
	4	=WCS01-X501:4	01/19.D1	=WP02-X400:4	07/3.D3	
	5	=WCS01-X501:5	01/19.D1	=WP02-X400:5	07/3.D3	
	6	=WCS01-X501:6	01/19.D2	=WP02-X400:6	07/3.D4	
	GNYE	=WCS01-X501:PE	01/19.D2	=WP02-X400:PE	07/3.D4	
	SH1	EMC	07/3.D4	EMC	01/18.D2	
-WD24	Ölflex FD 855 CP 3G1.5	=WCS01-X402	+UH03	=CP01-X1	+CP01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X402:1	01/44.D1	=CP01-X1:1	08/1.D1	
	2	=WCS01-X402:2	01/44.D1	=CP01-X1:2	08/1.D1	
	GNYE	=WCS01-X402:PE	01/44.D2	PE	08/1.D2	
	SH1	EMC	08/1.D2	EMC	01/44.D2	

			Date	17/11-2021	CNP Freire MBari
	Updated Term. after CP02 removed	28.11.2022	ANP	User	GSK
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ
Status	Change	Date	Name	Standard	

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WD25	Ölflex FD 855 CP 3G1.5	=WCS01-X402	+UH03	=CP03-X1	+CP03	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X402:3	01/44.D2	=CP03-X1:1	10/1.D1	
	2	=WCS01-X402:4	01/44.D2	=CP03-X1:2	10/1.D1	
	GNYE	=WCS01-X402:PE	01/44.D2	PE	10/1.D2	
	SH1	EMC	01/44.D3	EMC	10/1.D2	
-WD26	Ölflex Servo	=WCS01-X10	+UH03	=HPUBR01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	BN	=WCS01-X10:1	01/25.D2	=HPUBR01-MA1:U	01/25.E2	
	BK	=WCS01-X10:2	01/25.D2	=HPUBR01-MA1:V	01/25.E2	
	GY	=WCS01-X10:3	01/25.D2	=HPUBR01-MA1:W	01/25.E2	
	GNYE	=WCS01-X10:PE	01/25.D2	=HPUBR01-MA1:PE	01/25.E2	
-WD27	Ölflex Servo	=WCS01-X10	+UH03	=HPUBR01-MA2		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	BN	=WCS01-X10:4	01/25.D3	=HPUBR01-MA2:U	01/25.E3	
	BK	=WCS01-X10:5	01/25.D3	=HPUBR01-MA2:V	01/25.E3	
	GY	=WCS01-X10:6	01/25.D3	=HPUBR01-MA2:W	01/25.E3	
	GNYE	=WCS01-X10:PE	01/25.D3	=HPUBR01-MA2:PE	01/25.E3	
-WD28	Ölflex Servo	=WCS01-X10	+UH03	=HPUGC01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	BN	=WCS01-X10:7	01/25.D3	=HPUGC01-MA1:U	01/25.E3	
	BK	=WCS01-X10:8	01/25.D4	=HPUGC01-MA1:V	01/25.E4	
	GY	=WCS01-X10:9	01/25.D4	=HPUGC01-MA1:W	01/25.E4	
	GNYE	=WCS01-X10:PE	01/25.D4	=HPUGC01-MA1:PE	01/25.E4	
	GNYE	=WCS01-X10:PE	01/25.D4	=HPUGC01-MA1:PE	01/25.E4	
	GNYE	=WCS01-X10:PE	01/25.D4	=HPUGC01-MA1:PE	01/25.E4	
	SH1	EMC	01/25.D4	EMC	01/25.E4	
-WD29	Ölflex Servo	=WCS01-X10	+UH03	=HPUGC01-MA2		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	BN	=WCS01-X10:10	01/25.D4	=HPUGC01-MA2:U	01/25.E4	
	BK	=WCS01-X10:11	01/25.D4	=HPUGC01-MA2:V	01/25.E4	
	GY	=WCS01-X10:12	01/25.D4	=HPUGC01-MA2:W	01/25.E4	
	GNYE	=WCS01-X10:PE	01/25.D5	=HPUGC01-MA2:PE	01/25.E5	
	GNYE	=WCS01-X10:PE	01/25.D5	=HPUGC01-MA2:PE	01/25.E5	
	GNYE	=WCS01-X10:PE	01/25.D5	=HPUGC01-MA2:PE	01/25.E5	
	SH1	EMC	01/25.D5	EMC	01/25.E5	
-WD30	Ölflex FD 855 CP 3G1.5	=WCS01-X2	+UH03	=WP03-X1	+WP03	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	1	=WCS01-X2:3	01/26.D2	=WP03-X1:1	19/1.D3	
	2	=WCS01-X2:4	01/26.D2	=WP03-X1:2	19/1.D3	
	GNYE	=WCS01-X2:PE	01/26.D2	=WP03-X1:PE	19/1.D3	
	SH1	EMC	01/26.D2	EMC	19/1.D3	

Status	Change	Date	Name			
				Date	17/11-2021	
	Updated Term. after CP02 removed	28.11.2022	ANP	User	GSK	
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ	

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WD31	Ölflex FD 855 CP 3G1.5 1 2 GNYE SH1	=WCS01-X302 =WCS01-X302:5 =WCS01-X302:6 =WCS01-X302:PE EMC	+UH03 01/27.D7 01/27.D8 01/27.D8 01/27.D8	=WP03-X300 =WP03-X300:1 =WP03-X300:2 =WP03-X300:PE EMC	+WP03 19/1.D1 19/1.D1 19/1.D1 19/1.D2	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
-WDS1	Ship Internal Supply Cable To Winch System 1 2 3 GNYE	=WCS01-QB1 =WCS01-QB1:2 =WCS01-QB1:4 =WCS01-QB1:6 PE Bar	+UH01 01/2.D1 01/2.D1 01/2.D1 01/2.E1	=SHIP-X1 =SHIP-X1:1 =SHIP-X1:2 =SHIP-X1:3 =SHIP-X1:PE	+480VAC 00/1.D2 00/1.D2 00/1.D2 00/1.D2	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
-WDS2	Ship Internal Supply Cable To Winch System 1 2 GNYE	=WCS01-X3 =WCS01-X3:1 =WCS01-X3:2 =WCS01-X3:PE	+UH03 01/27.D1 01/27.D1 01/27.D1	=SHIP-X4 =SHIP-X4:1 =SHIP-X4:2 =SHIP-X4:PE	+230VAC 00/1.D6 00/1.D6 00/1.D6	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
-WDS3	Ship Internal Supply Cable To Winch System 1 2 GNYE	=WCS01-X2 =WCS01-X2:1 =WCS01-X2:2 =WCS01-X2:PE	+UH03 01/26.D1 01/26.D1 01/26.D1	=SHIP-X3 =SHIP-X3:1 =SHIP-X3:2 =SHIP-X3:PE	+230VAC 00/1.D5 00/1.D5 00/1.D5	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
-WF1	DeviceNet Thick Shield WH BU TW1 RD BK TW2 SH1	=WCS01-X50 =WCS01-X50:3 =WCS01-X50:4 =WCS01-X50:2 =WCS01-X50:5 =WCS01-X50:1 EMC	+UH03 01/33.D2 01/33.D3 01/33.D2 01/33.D3 01/33.D2 01/33.E3	=CP01-X50 =CP01-X50:3 =CP01-X50:4 =CP01-X50:2 =CP01-X50:5 =CP01-X50:1 EMC	+CP01 08/2.D6 08/2.D6 08/2.D6 08/2.D7 08/2.D6 08/2.E7	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground

Status	Change	Date	Name	Standard	
	Updated Term. after CP02 removed	28.11.2022	ANP	User	GSK
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ
				Date	17/11-2021

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WF2	EtherLine CAT7	=WCS01-RJ3	+UH03	=CP01-XG3	+CP01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WHBU	=WCS01-RJ3:5	01/30.D3	=CP01-XG3:5	08/1.D5	
	BU	=WCS01-RJ3:4	01/30.D3	=CP01-XG3:4	08/1.D5	
	TW1					
	WHOR	=WCS01-RJ3:1	01/30.D3	=CP01-XG3:1	08/1.D5	
	OR	=WCS01-RJ3:2	01/30.D3	=CP01-XG3:2	08/1.D5	
	TW2					
	WHGN	=WCS01-RJ3:3	01/30.D4	=CP01-XG3:3	08/1.D5	
	GN	=WCS01-RJ3:6	01/30.D4	=CP01-XG3:6	08/1.D5	
	TW3					
	WHBN	=WCS01-RJ3:7	01/30.D4	=CP01-XG3:7	08/1.D5	
	BN	=WCS01-RJ3:8	01/30.D4	=CP01-XG3:8	08/1.D5	
	TW4					
	SH1	=WCS01-RJ3:S	01/30.D4	=CP01-XG3:S	08/1.D5	
-WF3	EtherLine CAT7	=WCS01-RJ4	+UH03	=CP01-XG4	+CP01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WHBU	=WCS01-RJ4:5	01/30.D4	=CP01-XG4:5	08/1.D6	
	BU	=WCS01-RJ4:4	01/30.D4	=CP01-XG4:4	08/1.D6	
	TW1					
	WHOR	=WCS01-RJ4:1	01/30.D4	=CP01-XG4:1	08/1.D6	
	OR	=WCS01-RJ4:2	01/30.D4	=CP01-XG4:2	08/1.D6	
	TW2					
	WHGN	=WCS01-RJ4:3	01/30.D4	=CP01-XG4:3	08/1.D6	
	GN	=WCS01-RJ4:6	01/30.D5	=CP01-XG4:6	08/1.D6	
	TW3					
	WHBN	=WCS01-RJ4:7	01/30.D5	=CP01-XG4:7	08/1.D6	
	BN	=WCS01-RJ4:8	01/30.D5	=CP01-XG4:8	08/1.D6	
	TW4					
	SH1	=WCS01-RJ4:S	01/30.D5	=CP01-XG4:S	08/1.D7	
-WF5	DeviceNet Thick	=WCS01-X50	+UH03	=CP03-X50	+CP03	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	Shield	=WCS01-X50:3	01/33.D2	=CP03-X50:3	10/2.D6	
	WH	=WCS01-X50:4	01/33.D3	=CP03-X50:4	10/2.D6	
	BU	=WCS01-X50:2	01/33.D2	=CP03-X50:2	10/2.D6	
	TW1					
	RD	=WCS01-X50:5	01/33.D3	=CP03-X50:5	10/2.D7	
	BK	=WCS01-X50:1	01/33.D2	=CP03-X50:1	10/2.D6	
	TW2					
	SH1	EMC	01/33.E4	EMC	10/2.E7	

Status	Change	Date	Name	Standard	
				Date	17/11-2021
	Updated Term. after CP02 removed	28.11.2022	ANP	User	GSK
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WF6	EtherLine CAT7	=WCS01-RJ5	+UH03	=CP03-XG3	+CP03	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WHBU	=WCS01-RJ5:5	01/30.D6	=CP03-XG3:5	10/1.D5	
	BU	=WCS01-RJ5:4	01/30.D6	=CP03-XG3:4	10/1.D5	
	TW1					
	WHOR	=WCS01-RJ5:1	01/30.D6	=CP03-XG3:1	10/1.D5	
	OR	=WCS01-RJ5:2	01/30.D6	=CP03-XG3:2	10/1.D5	
	TW2					
	WHGN	=WCS01-RJ5:3	01/30.D6	=CP03-XG3:3	10/1.D5	
	GN	=WCS01-RJ5:6	01/30.D6	=CP03-XG3:6	10/1.D5	
	TW3					
	WHBN	=WCS01-RJ5:7	01/30.D6	=CP03-XG3:7	10/1.D5	
	BN	=WCS01-RJ5:8	01/30.D7	=CP03-XG3:8	10/1.D5	
	TW4					
	SH1	=WCS01-RJ5:S	01/30.D7	=CP03-XG3:S	10/1.D5	
-WF7	EtherLine CAT7	=WCS01-RJ6	+UH03	=CP03-XG4	+CP03	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WHBU	=WCS01-RJ6:5	01/30.D7	=CP03-XG4:5	10/1.D6	
	BU	=WCS01-RJ6:4	01/30.D7	=CP03-XG4:4	10/1.D6	
	TW1					
	WHOR	=WCS01-RJ6:1	01/30.D7	=CP03-XG4:1	10/1.D6	
	OR	=WCS01-RJ6:2	01/30.D7	=CP03-XG4:2	10/1.D6	
	TW2					
	WHGN	=WCS01-RJ6:3	01/30.D7	=CP03-XG4:3	10/1.D6	
	GN	=WCS01-RJ6:6	01/30.D7	=CP03-XG4:6	10/1.D6	
	TW3					
	WHBN	=WCS01-RJ6:7	01/30.D7	=CP03-XG4:7	10/1.D6	
	BN	=WCS01-RJ6:8	01/30.D7	=CP03-XG4:8	10/1.D6	
	TW4					
	SH1	=WCS01-RJ6:S	01/30.D7	=CP03-XG4:S	10/1.D7	
-WF8	DeviceNet Thick	=CP04-X50	+CP04	=CP03-X50	+CP03	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	Shield	=CP04-X50:3	11/1.D7	=CP03-X50:3	10/2.D6	
	WH	=CP04-X50:4	11/1.D7	=CP03-X50:4	10/2.D6	
	BU	=CP04-X50:2	11/1.D6	=CP03-X50:2	10/2.D6	
	TW1					
	RD	=CP04-X50:5	11/1.D7	=CP03-X50:5	10/2.D7	
	BK	=CP04-X50:1	11/1.D6	=CP03-X50:1	10/2.D6	
	TW2					
	SH1	EMC	10/2.E8	EMC	11/1.E7	
-WF9	DeviceNet Thick	=CP04-X50	+CP04	=CP05-X50	+CP05	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	Shield	=CP04-X50:3	11/1.D7	=CP05-X50:3	12/1.D6	
	WH	=CP04-X50:4	11/1.D7	=CP05-X50:4	12/1.D6	
	BU	=CP04-X50:2	11/1.D6	=CP05-X50:2	12/1.D6	
	TW1					
	RD	=CP04-X50:5	11/1.D7	=CP05-X50:5	12/1.D6	
	BK	=CP04-X50:1	11/1.D6	=CP05-X50:1	12/1.D6	

Status	Change	Date	Name	Standard	
				Date	17/11-2021
	Updated Term. after CP02 removed	28.11.2022	ANP	User	GSK
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
	TW2					
	SH1	EMC	11/1.E8	EMC	12/1.E7	
-WF13	EtherLine CAT7	=WCS01-RJ1	+UH03	=TRIP01-X91	+TRIP01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WHBU	=WCS01-RJ1:5	01/30.D1	=A-FRAME STERN-X91:5	18/1.D1	
	BU	=WCS01-RJ1:4	01/30.D1	=A-FRAME STERN-X91:4	18/1.D1	
	TW1					
	WHOR	=WCS01-RJ1:1	01/30.D1	=A-FRAME STERN-X91:1	18/1.D1	
	OR	=WCS01-RJ1:2	01/30.D1	=A-FRAME STERN-X91:2	18/1.D2	
	TW2					
	WHGN	=WCS01-RJ1:3	01/30.D1	=A-FRAME STERN-X91:3	18/1.D2	
	GN	=WCS01-RJ1:6	01/30.D1	=A-FRAME STERN-X91:6	18/1.D2	
	TW3					
	WHBN	=WCS01-RJ1:7	01/30.D1	=A-FRAME STERN-X91:7	18/1.D2	
	BN	=WCS01-RJ1:8	01/30.D1	=A-FRAME STERN-X91:8	18/1.D2	
	TW4					
	SH1	=WCS01-RJ1:S	01/30.D1	=A-FRAME STERN-X91:S	18/1.D2	
-WF14	EtherLine CAT7	=WCS01-RJ8	+UH03	=WP03-RJ1	+WP03	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WHBU	=WCS01-RJ8:5	01/30.D2	=WP03-RJ1:5	19/2.D6	
	BU	=WCS01-RJ8:4	01/30.D2	=WP03-RJ1:4	19/2.D6	
	TW1					
	WHOR	=WCS01-RJ8:1	01/30.D3	=WP03-RJ1:1	19/2.D6	
	OR	=WCS01-RJ8:2	01/30.D3	=WP03-RJ1:2	19/2.D6	
	TW2					
	WHGN	=WCS01-RJ8:3	01/30.D3	=WP03-RJ1:3	19/2.D6	
	GN	=WCS01-RJ8:6	01/30.D3	=WP03-RJ1:6	19/2.D6	
	TW3					
	WHBN	=WCS01-RJ8:7	01/30.D3	=WP03-RJ1:7	19/2.D6	
	BN	=WCS01-RJ8:8	01/30.D3	=WP03-RJ1:8	19/2.D6	
	TW4					
	SH1	=WCS01-RJ8:S	01/30.D3	=WP03-RJ1:S	19/2.D6	
-WF15	EtherLine CAT7	=WCS01-RJ2	+UH03	=WP03-RJ2	+WP03	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WHBU	=WCS01-RJ2:5	01/30.D1	=WP03-RJ2:5	19/2.D7	
	BU	=WCS01-RJ2:4	01/30.D2	=WP03-RJ2:4	19/2.D8	
	TW1					
	WHOR	=WCS01-RJ2:1	01/30.D2	=WP03-RJ2:1	19/2.D8	
	OR	=WCS01-RJ2:2	01/30.D2	=WP03-RJ2:2	19/2.D8	
	TW2					
	WHGN	=WCS01-RJ2:3	01/30.D2	=WP03-RJ2:3	19/2.D8	
	GN	=WCS01-RJ2:6	01/30.D2	=WP03-RJ2:6	19/2.D8	
	TW3					
	WHBN	=WCS01-RJ2:7	01/30.D2	=WP03-RJ2:7	19/2.D8	
	BN	=WCS01-RJ2:8	01/30.D2	=WP03-RJ2:8	19/2.D8	
	TW4					
	SH1	=WCS01-RJ2:S	01/30.D2	=WP03-RJ2:S	19/2.D8	

Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WFS1	Ship Ethernet Cable	=WCS01-RJ7	+UH03	=SHIP-X4	+Ethernet	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WHBU	=WCS01-RJ7:5	01/30.D8	=SHIP-X4:1	00/2.D6	
	BU	=WCS01-RJ7:4	01/30.D8	=SHIP-X4:2	00/2.D6	
	TW1					
	WHOR	=WCS01-RJ7:1	01/30.D8	=SHIP-X4:3	00/2.D6	
	OR	=WCS01-RJ7:2	01/30.D8	=SHIP-X4:4	00/2.D6	
	TW2					
	WHGN	=WCS01-RJ7:3	01/30.D8	=SHIP-X4:5	00/2.D6	
	GN	=WCS01-RJ7:6	01/30.D8	=SHIP-X4:6	00/2.D6	
	TW3					
	WHBN	=WCS01-RJ7:7	01/30.D8	=SHIP-X4:7	00/2.D7	
	BN	=WCS01-RJ7:8	01/30.D8	=SHIP-X4:8	00/2.D7	
	TW4					
	SH1	=WCS01-RJ7:S	01/30.D8	EMC	00/2.D7	
-WFS2	Ship Ethernet Cable	=WCS01-RJ9	+UH03	=SHIP-X5	+MRU	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WHBU	=WCS01-RJ9:5	01/30.D5	=SHIP-X5:1	00/2.D7	
	BU	=WCS01-RJ9:4	01/30.D5	=SHIP-X5:2	00/2.D7	
	TW1					
	WHOR	=WCS01-RJ9:1	01/30.D5	=SHIP-X5:3	00/2.D7	
	OR	=WCS01-RJ9:2	01/30.D5	=SHIP-X5:4	00/2.D7	
	TW2					
	WHGN	=WCS01-RJ9:3	01/30.D5	=SHIP-X5:5	00/2.D8	
	GN	=WCS01-RJ9:6	01/30.D5	=SHIP-X5:6	00/2.D8	
	TW3					
	WHBN	=WCS01-RJ9:7	01/30.D6	=SHIP-X5:7	00/2.D8	
	BN	=WCS01-RJ9:8	01/30.D6	=SHIP-X5:8	00/2.D8	
	TW4					
	SH1	=WCS01-RJ9:S	01/30.D6	EMC	00/2.D8	
-WG1	Unitronic Lapp Cable 6x2x0.75	=WCS01-X104	+UH03	=HW01-X1	+UC01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X104:1	01/39.D1	=HW01-X1:1	02/1.D1	
	BN	=WCS01-X104:2	01/39.D1	=HW01-X1:2	02/1.D1	
	TW1					
	GN	=WCS01-X104:3	01/39.D2	=HW01-X1:4	02/1.D1	
	YE	=WCS01-X104:4	01/39.D2	=HW01-X1:8	02/1.D2	
	TW2					
	GY	=WCS01-X104:5	01/39.D2	=HW01-X1:12	02/1.D3	
	PK	=WCS01-X104:6	01/39.D3	=HW01-X1:18	02/1.D4	
	TW3					
	BU	=WCS01-X104:7	01/39.D3	=HW01-X1:22	02/1.D4	
	RD	=WCS01-X104:8	01/39.D4	=HW01-X1:24	02/1.D5	
	TW4					
	BK	=WCS01-X102:3	01/37.D3	=HW01-X1:29	02/1.D6	
	VT					
	TW5					
	GYPK					
	RDBU					
	TW6					

			Date	17/11-2021	CNP Freire MBari
	Updated Term. after CP02 removed	28.11.2022	ANP	User	GSK
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ
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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
	SH1	EMC	01/39.D4	EMC	02/1.D6	
-WG2	Unitronic Lapp Cable 4x2x0.25	=WCS01-TA3.KF2:X82	+UH01	=HW01-MA2		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-TA3.KF2:X82:5	01/7.B4	=HW01-MA2:7	01/7.E4	
	BN	=WCS01-TA3.KF2:X82:6	01/7.B4	=HW01-MA2:8	01/7.E4	
	TW1					
	GN	=WCS01-TA3.KF2:X82:3	01/7.B4	=HW01-MA2:5	01/7.E4	
	YE	=WCS01-TA3.KF2:X82:4	01/7.B4	=HW01-MA2:6	01/7.E4	
	TW2					
	GY	=WCS01-TA3.KF2:X82:2	01/7.B4	=HW01-MA2:4	01/7.E4	
	PK	=WCS01-TA3.KF2:X82:1	01/7.B3	=HW01-MA2:3	01/7.E3	
	TW3					
	BU	=WCS01-TA3.KF2:X81:5	01/7.B3	=HW01-MA2:2	01/7.E3	
	RD	=WCS01-TA3.KF2:X81:4	01/7.B3	=HW01-MA2:1	01/7.E3	
	TW4					
	SH1	=WCS01-TA3.KF2:X82:7	01/7.B4	=HW01-MA2:9	01/7.E4	
-WG3	Unitronic Lapp Cable 1x2x0.75	=WCS01-X70	+UH01	=HW01-MA2		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X70:3	01/7.D7	=HW01-MA2:PTC1	01/7.F7	
	BN	=WCS01-X70:4	01/7.D7	=HW01-MA2:PTC2	01/7.F7	
	TW1					
	SH1	EMC	01/7.D7	EMC	01/7.F7	
-WG4	Unitronic Lapp Cable 4x2x0.25	=WCS01-TA7.KF2:X82	+UH02	=HW01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-TA7.KF2:X82:5	01/15.B7	=HW01-MA1:4	01/15.E7	
	BN	=WCS01-TA7.KF2:X82:6	01/15.B8	=HW01-MA1:3	01/15.E8	
	TW1					
	GN	=WCS01-TA7.KF2:X82:3	01/15.B7	=HW01-MA1:6	01/15.E7	
	YE	=WCS01-TA7.KF2:X82:4	01/15.B7	=HW01-MA1:5	01/15.E7	
	TW2					
	GY	=WCS01-TA7.KF2:X82:2	01/15.B7	=HW01-MA1:7	01/15.E7	
	PK	=WCS01-TA7.KF2:X82:1	01/15.B7	=HW01-MA1:8	01/15.E7	
	TW3					
	BU	=WCS01-TA7.KF2:X81:5	01/15.B7	=HW01-MA1:1	01/15.E7	
	RD	=WCS01-TA7.KF2:X81:4	01/15.B7	=HW01-MA1:2	01/15.E7	
	TW4					
	SH1	=WCS01-TA7.KF2:X82:7	01/15.B8	=HW01-MA1:PE	01/15.E8	
-WG5	Unitronic Lapp Cable 1x2x0.75	=WCS01-X71	+UH02	=HW01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X71:7	01/16.D4	=HW01-MA1:1TP1	01/16.F4	
	BN	=WCS01-X71:8	01/16.D4	=HW01-MA1:1TP2	01/16.F4	
	TW1					
	SH1	EMC	01/16.D4	EMC	01/16.F4	

			Date	17/11-2021	CNP Freire MBari
	Updated Term. after CP02 removed	28.11.2022	ANP	User	GSK
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ
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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WG6	Unitronic Lapp Cable 2x2x0.5	=WCS01-X100	+UH03	=TRW01-X1	+UC01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X100:1	01/36.D1	=TRW01-X1:1	03/1.D1	
	BN	=WCS01-X100:2	01/36.D1	=TRW01-X1:2	03/1.D1	
	TW1					
	GN	=WCS01-X100:3	01/36.D2	=TRW01-X1:5	03/1.D2	
	YE	=WCS01-X100:4	01/36.D2	=TRW01-X1:9	03/1.D2	
	TW2					
	SH1	EMC	01/36.D2	EMC	03/1.D2	
-WG7	Unitronic Lapp Cable 4x2x0.25	=WCS01-TA4.KF2:X82	+UH02	=TRW01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-TA4.KF2:X82:5	01/15.B2	=TRW01-MA1:4	01/15.E2	
	BN	=WCS01-TA4.KF2:X82:6	01/15.B2	=TRW01-MA1:3	01/15.E2	
	TW1					
	GN	=WCS01-TA4.KF2:X82:3	01/15.B2	=TRW01-MA1:6	01/15.E2	
	YE	=WCS01-TA4.KF2:X82:4	01/15.B2	=TRW01-MA1:5	01/15.E2	
	TW2					
	GY	=WCS01-TA4.KF2:X82:2	01/15.B1	=TRW01-MA1:7	01/15.E1	
	PK	=WCS01-TA4.KF2:X82:1	01/15.B1	=TRW01-MA1:8	01/15.E1	
	TW3					
	BU	=WCS01-TA4.KF2:X81:5	01/15.B1	=TRW01-MA1:1	01/15.E1	
	RD	=WCS01-TA4.KF2:X81:4	01/15.B1	=TRW01-MA1:2	01/15.E1	
	TW4					
	SH1	=WCS01-TA4.KF2:X82:7	01/15.B2	=TRW01-MA1:PE	01/15.E2	
-WG8	Unitronic Lapp Cable 1x2x0.75	=WCS01-X71	+UH02	=TRW01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X71:1	01/16.D1	=TRW01-MA1:1TP1	01/16.F1	
	BN	=WCS01-X71:2	01/16.D1	=TRW01-MA1:1TP2	01/16.F1	
	TW1					
	SH1	EMC	01/16.D2	EMC	01/16.F2	
-WG9	Unitronic Lapp Cable 4x2x0.25	=WCS01-TA5.KF2:X82	+UH02	=TRW01-MA2		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-TA5.KF2:X82:5	01/15.B4	=TRW01-MA2:4	01/15.E4	
	BN	=WCS01-TA5.KF2:X82:6	01/15.B4	=TRW01-MA2:3	01/15.E4	
	TW1					
	GN	=WCS01-TA5.KF2:X82:3	01/15.B3	=TRW01-MA2:6	01/15.E3	
	YE	=WCS01-TA5.KF2:X82:4	01/15.B4	=TRW01-MA2:5	01/15.E4	
	TW2					
	GY	=WCS01-TA5.KF2:X82:2	01/15.B3	=TRW01-MA2:7	01/15.E3	
	PK	=WCS01-TA5.KF2:X82:1	01/15.B3	=TRW01-MA2:8	01/15.E3	
	TW3					
	BU	=WCS01-TA5.KF2:X81:5	01/15.B3	=TRW01-MA2:1	01/15.E3	
	RD	=WCS01-TA5.KF2:X81:4	01/15.B3	=TRW01-MA2:2	01/15.E3	
	TW4					
	SH1	=WCS01-TA5.KF2:X82:7	01/15.B4	=TRW01-MA2:PE	01/15.E4	

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	Updated Term. after CP02 removed	28.11.2022	ANP	User	GSK	MBari		
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ			

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WG10	Unitronic Lapp Cable 1x2x0.75	=WCS01-X71	+UH02	=TRW01-MA2		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X71:3	01/16.D2	=TRW01-MA2:1TP1	01/16.F2	
	BN	=WCS01-X71:4	01/16.D2	=TRW01-MA2:1TP2	01/16.F2	
	TW1					
	SH1	EMC	01/16.D3	EMC	01/16.F3	
-WG11	Unitronic Lapp Cable 8x2x0.75	=WCS01-X103	+UH03	=LEV01-X1	+UC01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X103:1	01/38.D1	=LEV01-X1:1	04/1.D1	
	BN	=WCS01-X103:2	01/38.D1	=LEV01-X1:2	04/1.D1	
	TW1					
	GN	=WCS01-X103:3	01/38.D2	=LEV01-X1:4	04/1.D1	
	YE	=WCS01-X103:4	01/38.D2	=LEV01-X1:8	04/1.D2	
	TW2					
	GY	=WCS01-X103:5	01/38.D2	=LEV01-X1:12	04/1.D3	
	PK	=WCS01-X103:6	01/38.D3	=LEV01-X1:18	04/1.D3	
	TW3					
	BU	=WCS01-X103:7	01/38.D3	=LEV01-X1:22	04/1.D4	
	RD	=WCS01-X103:8	01/38.D4	=LEV01-X1:24	04/1.D5	
	TW4					
	BK	=WCS01-X103:9	01/38.D4	=LEV01-X1:28	04/1.D5	
	VT	=WCS01-X103:10	01/38.D4	=LEV01-X1:33	04/1.D6	
	TW5					
	GYPK	=WCS01-X103:11	01/38.D5	=LEV01-X1:36	04/1.D7	
	RDBU					
	TW6					
	WHGN					
	BNGN					
	TW7					
	WHYE					
	YEBN					
	TW8					
	SH1	EMC	01/38.D5	EMC	04/1.D7	
-WG12	Unitronic Lapp Cable 4x2x0.25	=WCS01-TA2.KF2:X82	+UH01	=LEV01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-TA2.KF2:X82:5	01/7.B2	=LEV01-MA1:7	01/7.E2	
	BN	=WCS01-TA2.KF2:X82:6	01/7.B2	=LEV01-MA1:8	01/7.E2	
	TW1					
	GN	=WCS01-TA2.KF2:X82:3	01/7.B2	=LEV01-MA1:5	01/7.E2	
	YE	=WCS01-TA2.KF2:X82:4	01/7.B2	=LEV01-MA1:6	01/7.E2	
	TW2					
	GY	=WCS01-TA2.KF2:X82:2	01/7.B2	=LEV01-MA1:4	01/7.E2	
	PK	=WCS01-TA2.KF2:X82:1	01/7.B2	=LEV01-MA1:3	01/7.E2	
	TW3					
	BU	=WCS01-TA2.KF2:X81:5	01/7.B1	=LEV01-MA1:2	01/7.E1	
	RD	=WCS01-TA2.KF2:X81:4	01/7.B1	=LEV01-MA1:1	01/7.E1	
	TW4					
	SH1	=WCS01-TA2.KF2:X82:7	01/7.B2	=LEV01-MA1:9	01/7.E2	

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				Date	17/11-2021
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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WG13	Unitronic Lapp Cable 2x2x0.75	=WCS01-X101	+UH03	=RW01-X1	+UC1	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X101:1	01/37.D1	=RW01-X1:1	05/1.D2	
	BN	=WCS01-X101:2	01/37.D1	=RW01-X1:2	05/1.D2	
	TW1					
	GN	=WCS01-X101:3	01/37.D2	=RW01-X1:3	05/1.D2	
	YE	=WCS01-X101:4	01/37.D2	=RW01-X1:4	05/1.D2	
	TW2					
	SH1	EMC	01/37.D2	EMC	05/1.D2	
-WG14	Unitronic Lapp Cable 4x2x0.25	=WCS01-TA6.KF2:X82	+UH02	=RW01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-TA6.KF2:X82:5	01/15.B6	=RW01-MA1:4	01/15.E6	
	BN	=WCS01-TA6.KF2:X82:6	01/15.B6	=RW01-MA1:3	01/15.E6	
	TW1					
	GN	=WCS01-TA6.KF2:X82:3	01/15.B5	=RW01-MA1:6	01/15.E5	
	YE	=WCS01-TA6.KF2:X82:4	01/15.B5	=RW01-MA1:5	01/15.E5	
	TW2					
	GY	=WCS01-TA6.KF2:X82:2	01/15.B5	=RW01-MA1:7	01/15.E5	
	PK	=WCS01-TA6.KF2:X82:1	01/15.B5	=RW01-MA1:8	01/15.E5	
	TW3					
	BU	=WCS01-TA6.KF2:X81:5	01/15.B5	=RW01-MA1:1	01/15.E5	
	RD	=WCS01-TA6.KF2:X81:4	01/15.B5	=RW01-MA1:2	01/15.E5	
	TW4					
	SH1	=WCS01-TA6.KF2:X82:7	01/15.B6	=RW01-MA1:PE	01/15.E6	
-WG15	Unitronic Lapp Cable 1x2x0.75	=WCS01-X71	+UH02	=RW01-MA1		Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X71:5	01/16.D3	=RW01-MA1:1TP1	01/16.F3	
	BN	=WCS01-X71:6	01/16.D3	=RW01-MA1:1TP2	01/16.F3	
	TW1					
	SH1	EMC	01/16.D3	EMC	01/16.F3	

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				Date	17/11-2021
	Updated Term. after CP02 removed	28.11.2022	ANP	User	GSK
	Updated after adding WP03	21.11.2022	ANP	Approved	RAJ

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WG16	Unitronic Lapp Cable 10x2x0.75	=WCS01-X401	+UH03	=WP01-X1	+WP01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X401:1	01/43.D1	=WP01-X1:1	06/1.D1	
	BN	=WCS01-X401:2	01/43.D1	=WP01-X1:2	06/1.D1	
	TW1					
	GN	=WCS01-X401:3	01/43.D2	=WP01-X1:3	06/1.D1	
	YE	=WCS01-X401:4	01/43.D2	=WP01-X1:4	06/1.D2	
	TW2					
	GY	=WCS01-X401:5	01/43.D2	=WP01-X1:5	06/1.D2	
	PK	=WCS01-X401:6	01/43.D2	=WP01-X1:6	06/1.D2	
	TW3					
	BU	=WCS01-X401:7	01/43.D2	=WP01-X1:7	06/1.D3	
	RD	=WCS01-X401:8	01/43.D3	=WP01-X1:8	06/1.D3	
	TW4					
	BK	=WCS01-X401:9	01/43.D3	=WP01-X1:9	06/1.D3	
	VT	=WCS01-X401:10	01/43.D3	=WP01-X1:10	06/1.D4	
	TW5					
	GYPK	=WCS01-X401:11	01/43.D4	=WP01-X1:11	06/1.D4	
	RDBU	=WCS01-X401:12	01/43.D4	=WP01-X1:12	06/1.D5	
	TW6					
	WHGN	=WCS01-X401:13	01/43.D4	=WP01-X1:13	06/1.D5	
	BNGN	=WCS01-X401:14	01/43.D4	=WP01-X1:14	06/1.D5	
	TW7					
	WHYE	=WCS01-X401:15	01/43.D5	=WP01-X1:16	06/1.D6	
	YEBN	=WCS01-X401:16	01/43.D5	=WP01-X1:15	06/1.D5	
	TW8					
	WHGR	=WCS01-X401:17	01/43.D6	=WP01-X1:17	06/1.D6	
	GRBN	=WCS01-X401:18	01/43.D6	=WP01-X1:18	06/1.D7	
	TW9					
	WHPK					
	PKBN					
	TW10					
	SH1	EMC	06/1.D7	EMC	01/43.D7	

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WG17	Unitronic Lapp Cable 8x2x0.75	=WCS01-X400	+UH03	=WP02-X1	+WP02	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X400:1	01/42.D1	=WP02-X1:1	07/1.D1	
	BN	=WCS01-X400:2	01/42.D1	=WP02-X1:2	07/1.D1	
	TW1					
	GN	=WCS01-X400:3	01/42.D2	=WP02-X1:3	07/1.D2	
	YE	=WCS01-X400:4	01/42.D2	=WP02-X1:4	07/1.D2	
	TW2					
	GY	=WCS01-X400:5	01/42.D2	=WP02-X1:5	07/1.D2	
	PK	=WCS01-X400:6	01/42.D2	=WP02-X1:6	07/1.D2	
	TW3					
	BU	=WCS01-X400:7	01/42.D2	=WP02-X1:7	07/1.D3	
	RD	=WCS01-X400:8	01/42.D3	=WP02-X1:8	07/1.D3	
	TW4					
	BK	=WCS01-X400:9	01/42.D3	=WP02-X1:9	07/1.D4	
	VT	=WCS01-X400:10	01/42.D3	=WP02-X1:10	07/1.D4	
	TW5					
	GYPK	=WCS01-X400:11	01/42.D4	=WP02-X1:11	07/1.D5	
	RDBU	=WCS01-X400:12	01/42.D4	=WP02-X1:12	07/1.D5	
	TW6					
	WHGN	=WCS01-X400:13	01/42.D4	=WP02-X1:13	07/1.D5	
	BNGN	=WCS01-X400:14	01/42.D4	=WP02-X1:14	07/1.D5	
	TW7					
	WHYE	=WCS01-X400:15	01/42.D5	=WP02-X1:15	07/1.D6	
	YEBN					
	TW8					
	SH1	EMC	07/1.D7	EMC	01/42.D5	
-WG18	Unitronic Lapp Cable 6x2x0.75	=WCS01-X400	+UH03	=WP02-X2	+WP02	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X400:16	01/42.D5	=WP02-X2:3	07/2.D2	
	BN	=WCS01-X400:17	01/42.D6	=WP02-X2:4	07/2.D2	
	TW1					
	GN	=WCS01-X400:18	01/42.D6	=WP02-X2:5	07/2.D2	
	YE	=WCS01-X400:19	01/42.D6	=WP02-X2:6	07/2.D2	
	TW2					
	GY	=WCS01-X400:20	01/42.D6	=WP02-X2:7	07/2.D3	
	PK	=WCS01-X400:21	01/42.D7	=WP02-X2:8	07/2.D3	
	TW3					
	BU	=WCS01-X400:22	01/42.D7	=WP02-X2:9	07/2.D4	
	RD	=WCS01-X400:23	01/42.D8	=WP02-X2:10	07/2.D4	
	TW4					
	BK	=WCS01-X400:24	01/42.D8	=WP02-X2:11	07/2.D5	
	VT					
	TW5					
	GYPK					
	RDBU					
	TW6					
	SH1	EMC	01/42.D8	EMC	07/2.D6	

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WG19	Unitronic Lapp Cable 4x2x0.75	=WCS01-X40	+UH03	=CP01-X40	+CP01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X40:1	01/46.D1	=CP01-X40:1	08/3.D6	
	BN	=WCS01-X40:2	01/46.D1	=CP01-X40:2	08/3.D6	
	TW1					
	GN	=WCS01-X40:3	01/46.D1	=CP01-X40:3	08/3.D6	
	YE	=WCS01-X40:4	01/46.D2	=CP01-X40:4	08/3.D7	
	TW2					
	GY	=WCS01-X40:5	01/46.D2	=CP01-X40:5	08/3.D7	
	PK	=WCS01-X40:6	01/46.D2	=CP01-X40:6	08/3.D7	
	TW3					
	BU					
	RD					
	TW4					
	SH1	EMC	08/3.D8	EMC	01/46.D3	
-WG20	Unitronic Lapp Cable 4x2x0.25	=WCS01-X40	+UH03	=CP03-X40	+CP03	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X40:7	01/46.D3	=CP03-X40:1	10/3.D6	
	BN	=WCS01-X40:8	01/46.D3	=CP03-X40:2	10/3.D6	
	TW1					
	GN	=WCS01-X40:9	01/46.D3	=CP03-X40:3	10/3.D6	
	YE	=WCS01-X40:10	01/46.D3	=CP03-X40:4	10/3.D7	
	TW2					
	GY	=WCS01-X40:11	01/46.D4	=CP03-X40:5	10/3.D7	
	PK	=WCS01-X40:12	01/46.D4	=CP03-X40:6	10/3.D7	
	TW3					
	BU					
	RD					
	TW4					
	SH1	EMC	10/3.D8	EMC	01/46.D4	
-WG24	Unitronic Lapp Cable 4x2x0.75	=WCS01-X30	+UH03	=HPUBR01-X1	+UC01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X30:1	01/34.D1	=HPUBR01-X1:1	16/1.D2	
	BN	=WCS01-X30:2	01/34.D1	=HPUBR01-X1:2	16/1.D2	
	TW1					
	GN	=WCS01-X30:3	01/34.D2	=HPUBR01-X1:3	16/1.D2	
	YE	=WCS01-X30:4	01/34.D2	=HPUBR01-X1:4	16/1.D2	
	TW2					
	GY	=WCS01-X30:5	01/34.D3	=HPUBR01-X1:5	16/1.D3	
	PK	=WCS01-X30:6	01/34.D3	=HPUBR01-X1:6	16/1.D3	
	TW3					
	BU					
	RD					
	TW4					
	SH1	EMC	16/1.D3	EMC	01/34.D3	

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
-WG25	Unitronic Lapp Cable 4x2x0.75	=WCS01-X31	+UH03	=HPUGC01-X1	+UC01	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X31:1	01/35.D1	=HPUGC01-X1:1	17/1.D2	
	BN	=WCS01-X31:2	01/35.D1	=HPUGC01-X1:2	17/1.D2	
	TW1					
	GN	=WCS01-X31:3	01/35.D2	=HPUGC01-X1:3	17/1.D2	
	YE	=WCS01-X31:4	01/35.D2	=HPUGC01-X1:4	17/1.D3	
	TW2					
	GY	=WCS01-X31:5	01/35.D3	=HPUGC01-X1:5	17/1.D3	
	PK					
	TW3					
	BU					
	RD					
	TW4					
	SH1	EMC	17/1.D5	EMC	01/35.D3	
-WGS1	Ship Signal Cable 4x2x0.75	=WCS01-X82	+UH03	=SHIP-X1	+PMS	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X82:1	01/45.D1	=SHIP-X1:1	00/2.D1	
	BN	=WCS01-X82:2	01/45.D1	=SHIP-X1:2	00/2.D1	
	TW1					
	GN	=WCS01-X82:3	01/45.D2	=SHIP-X1:3	00/2.D1	
	YE	=WCS01-X82:4	01/45.D2	=SHIP-X1:4	00/2.D1	
	TW2					
	GY	=WCS01-X82:5	01/45.D2	=SHIP-X1:5	00/2.D2	
	PK	=WCS01-X82:6	01/45.D2	=SHIP-X1:6	00/2.D2	
	TW3					
	BU	=WCS01-X82:7	01/45.D3	=SHIP-X1:7	00/2.D2	
	RD	=WCS01-X82:8	01/45.D3	=SHIP-X1:8	00/2.D2	
	TW4					
	BK					
	VT					
	TW5					
	GYPK					
	RDBU					
	TW6					
	SH1	EMC	00/2.D2	EMC	01/45.D3	
-WGS2	Ship Signal Cable 4x2x0.75	=WCS01-X80	+UH03	=SHIP-X3	+CSCS	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X80:3	01/35.D8	=SHIP-X3:1	00/2.D5	
	BN	=WCS01-X80:4	01/35.D8	=SHIP-X3:2	00/2.D5	
	TW1					
	GN					
	YE					
	TW2					
	GY					
	PK					
	TW3					
	BU					
	RD					
	TW4					

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Cable	Cable type Core	Connection A Item designation	Location	Connection B Item designation	Location	Instruction
	SH1	EMC	00/2.D5	EMC	01/35.D8	
-WGS3	Ship Signal Cable 4x2x0.75	=WCS01-X81	+UH03	=SHIP-X2	+Alarm	Cable shield to be connected in both ends of the cable. Connectio by 360* connection to ground
	WH	=WCS01-X81:1	01/45.D7	=SHIP-X2:1	00/2.D4	
	BN	=WCS01-X81:2	01/45.D7	=SHIP-X2:2	00/2.D4	
	TW1					
	GN	=WCS01-X81:3	01/45.D7	=SHIP-X2:3	00/2.D4	
	YE	=WCS01-X81:4	01/45.D7	=SHIP-X2:4	00/2.D4	
	TW2					
	GY					
	PK					
	TW3					
	BU					
	RD					
	TW4					
	SH1	EMC	00/2.D4	EMC	01/45.D8	

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General Installation Notes

Note 1!
Electrical installation to be installed according to
Rapp Marine Electrical Installation Procedure (Document ID: 4251),
Good craftsmanship and National regulations

Note 2!
Cable ID description:
WDS= Power cables, Ship power supply (Cable type, not specified by Rapp Marine)
WD= Power cables
WG= Signal cables
WGS= Signal cables, Ship signals (Cable type, not specified by Rapp Marine)
WF= Data cables / Communication Bus

Note 3!
Cable types to be evaluated by the yard
in accordance with aplicable regulations
and installation enviroment,
Cables have to be equal or better then Rapp Marine suggestions
All cables must be of screened type

Note 4!
Motor cabel conductor sizes are minimum sizes
Max cable length 40m, For lengths over 40m contact Rapp Marine

Note 5!
Distance between motor and high power cables to encoder and signal cables
to be MIN 500mm

Note 6!
Encoder plugs for encoders is
delivered by Rapp Marine
Must be Soldered by Yard under installation

Note 7!
Yard to supply all cables in cable list
Exceptions are indicated in the cabel list

Note 8!
Cables for main supply VFD cabinet & from VFD cabinet to motors
must be "Symetrical Cables with screen"
(3x Cables) (3x + 3xPE Cables)

Note 9!
Device Net / Can Bus Cables must be of approved type:
Unitronic DeviceNet (Thick) or Belden 3082

Note 10!
Standard cable entries in cabinets is from the bottom
Products are delivered without cable glands for
external / yard cables

Note 11!
All cable shields must be connected with 360 degree
connection to ground (PE), or suitable EMC connection
in both ends.
This is to reduce the EMI from the VFD cabinet

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Location Overview System Equipment

=WCS01 Main VFD Cabinet

=HW01 CTD Winch

=TRW01 ROV System Traction Winch
=LEV01 ROV System Levelwinde/Slack Wire
=RW01 ROV System Storage Drum
=DS01 ROV System Load Cell

=WP01 Local Control Panel CTD Winch
=WP02 Local Control Panel Traction System
=WP03 Hangar Control Panel

=CP01 ROV Control Room Panel Winches

=CP03 AFT Control Station Panel Winches
=CP04 AFT Control Station Panel A-Frame Stern
=CP05 AFT Control Station Panel CTD Davit

=TRIP01 Triplex Communication

=HPUBR01 Brake HPU
=HPUGC01 Gear Cooling HPU

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Locations
System Equipment Overview

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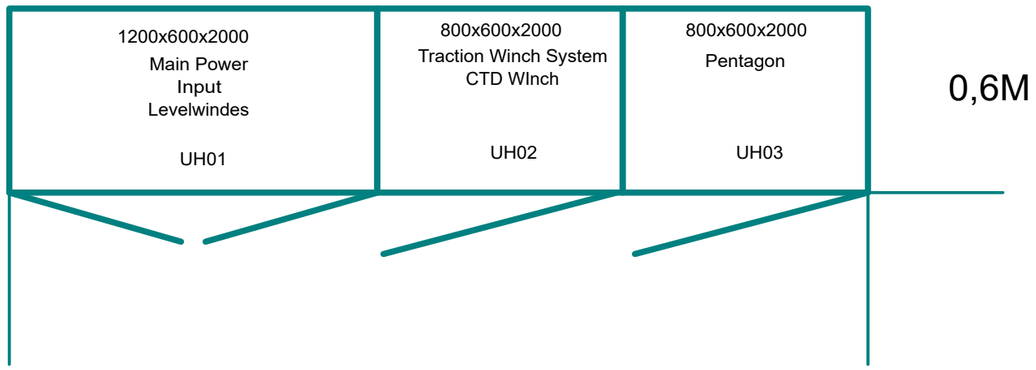
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Cabinet Overview

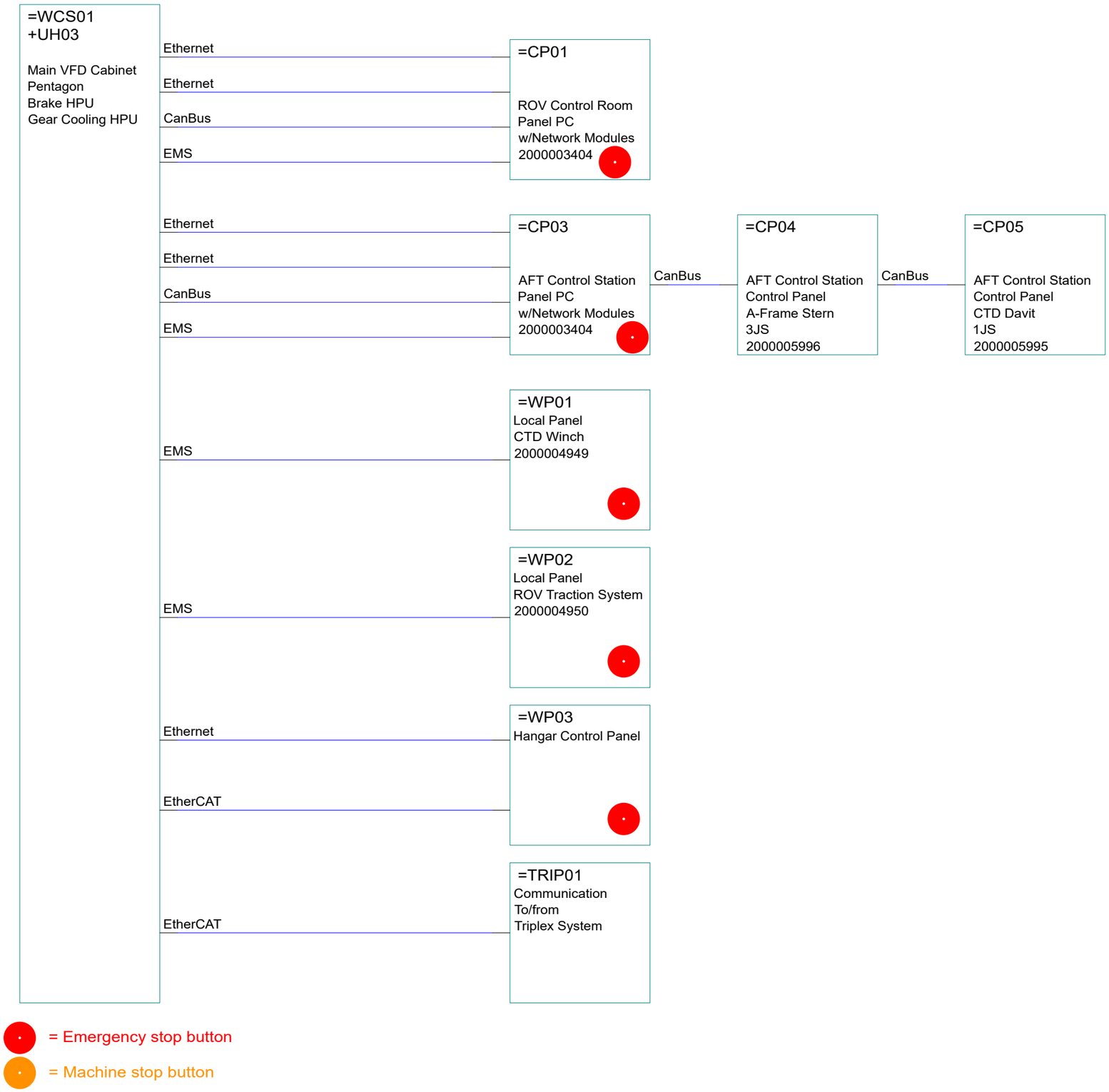
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Emergency Stop

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+480VAC

Power Supply
480VAC
60Hz

-WDS1 Supply Cable From Ship Supply 3X → =WCS01+UH01 480VAC → 01/1.A1

-WDS1 = 200kW Main Power

+230VAC
Control & Heating
Power

-WDS2 Supply Cable From Ship Supply 2X → =WCS01+UH03 230VAC HT → 01/1.C1

-WDS2 = 20A Heater

-WDS3 Supply Cable From Ship Supply 2X → =WCS01+UH03 230VAC CTRL → 01/1.C1

-WDS3 = 20A Control Power

				Date	17/11-2021	CNP Freire MBari		MACGREGOR	Ship Connections Supply from Ship Power Supply Connections Cable Diagram		=SHIP
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+PMS

PMS Connections

-WGS1 Ship Signal Cable 6x2x0.75 =WCS01+UH03 PMS 01/1.D1

IGBT ON
System Active
- Potential free contact

Actual Power +/-
From IGBT
- Signal Out 4-20mA

Regeneration Power Limit
From PMS
- Signal In 4-20mA

Harbour Mode
From PMS
- 24VDC To Potential Free Contact

Power Available
From PMS
- Signal In 4-20mA

+CSCS

IAS connection
Cooling Water
Control System

-WGS2 Ship Signal Cable 4x2x0.75 =WCS01+UH03 CSCS 01/1.D1

CSCS = Cooling Control System.
Output from the Pentagon system for control of
the cooling water valve for the HPU.(Potential free contact)

+Ethernet

Etnernet
Internett Conn

-WFS1 Ship Cable Ethernet =WCS01+UH03 Ethernet 01/1.D1

Internet
Connection To Internet for the Pentagon system.

+Alarm

Alarm/Light
Connections

-WGS3 Ship Signal Cable 4x2x0.75 =WCS01+UH03 Alarm 01/1.D1

Alarm/Light
Output from the Pentagon system for activation
of Alarm/Light etc.(2xPotential free contact)

+MRU

Ethernet

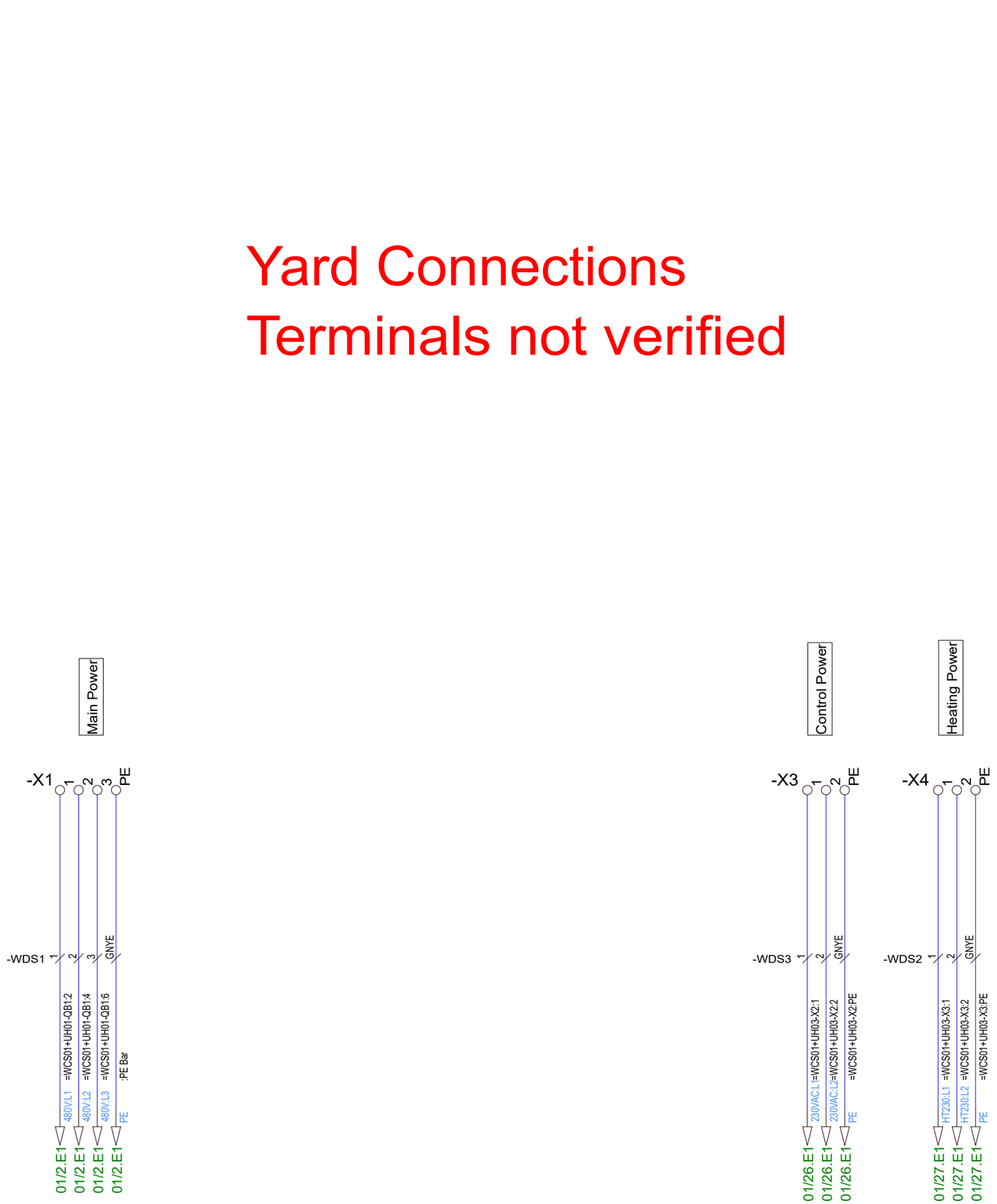
-WFS2 Ship Cable Ethernet =WCS01+UH03 Ethernet 01/1.D1

Ethernet
MRU Connection to the Pentagon system.

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Ship Connections Supply from Ship Signal Connections Cable Diagram		=SHIP	
				User	GSK						
	Added MRU connection	21.11.2022	ANP	Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-00 CD Rev. G	Sheet 2 Next 1

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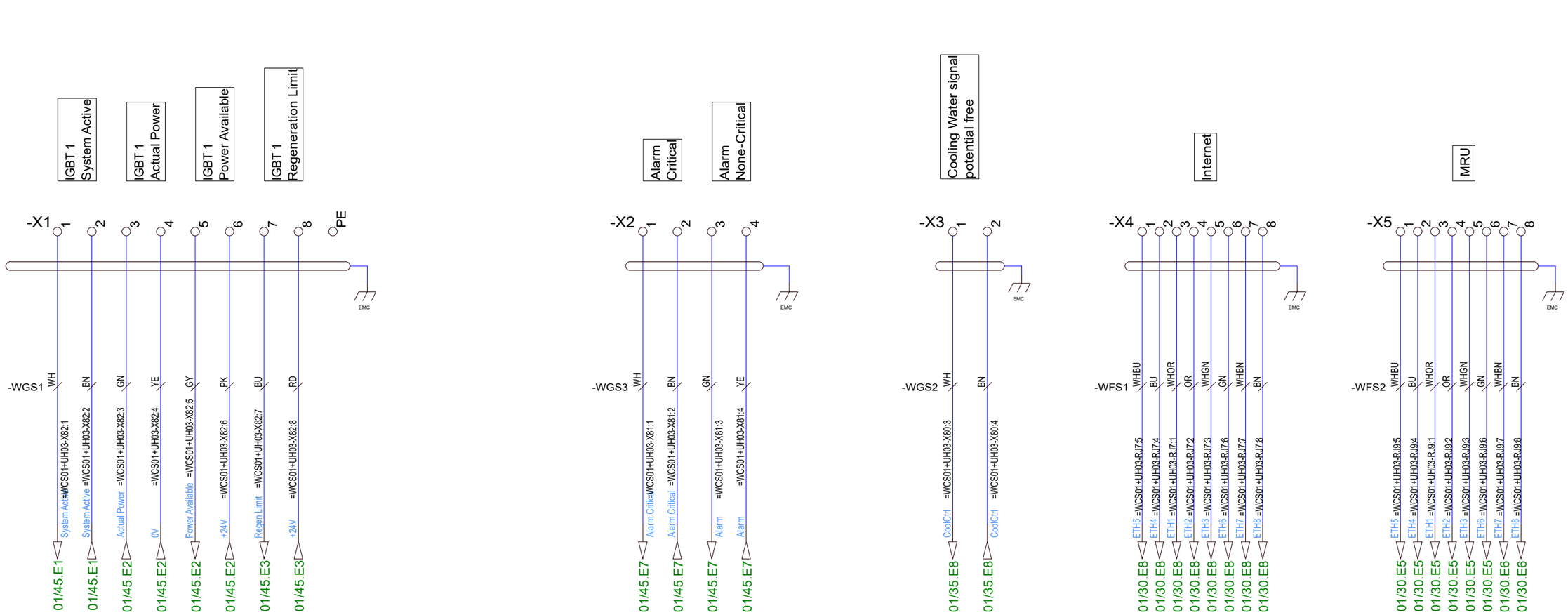
Yard Connections
Terminals not verified



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Ship Connections Power Connections 440VAC, 230VAC		=SHIP	
				User	GSK					+Power	
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-00 CC Rev. G	Sheet 1 Next 2

PMS Signals | Alarm Connections | SGCS | Internet | MRU

Yard Connections
To be verified



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Ship Connections PMS, Alarm, Internet Optional Alarm		=SHIP
				User	GSK					+Signal
	Added MRU Connection	21.11.2022	ANP	Approved	RAJ				10070-00 CC	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 2 / Next 1

00/1.A4 480VAC =SHIP+480VAC -WDS1 Supply Cable From Ship Supply 3X

00/1.C4 230VAC HT =SHIP+230VAC -WDS2 Supply Cable From Ship Supply 2X

00/1.C4 230VAC CT =SHIP+230VAC -WDS3 Supply Cable From Ship Supply 2X

00/2.A4 PMS =SHIP+PMS -WGS1 Ship Signal Cable 6x2x0.75

00/2.B4 CSCS =SHIP+CSCS -WGS2 Ship Signal Cable 4x2x0.75

00/2.C4 Ethernet =SHIP+Ethernet -WFS1 Ship Cable Ethernet

00/2.D4 Alarm =SHIP+Alarm -WGS3 Ship Signal Cable 4x2x0.75

00/2.E4 Ethernet =SHIP+MRU -WFS2 Ship Cable Ethernet

+UH01

Main VFD Cabinet
Power Input
Levelwinds

+UH03

Main VFD Cabinet
Pentagon
Brake HPU
Gear Cooling HPU

				Date	17/11-2021
	Added MRU Connection	21.11.2022	ANP	User	GSK
	AS BUILT	19.08.2022	SS	Approved	RAJ
Status	Change	Date	Name	Standard	

CNP Freire
MBari

Version	Index	Repl. by

MACGREGOR

Main VFD Cabinet Pentagon
WCS01 Cabinet

=WCS01

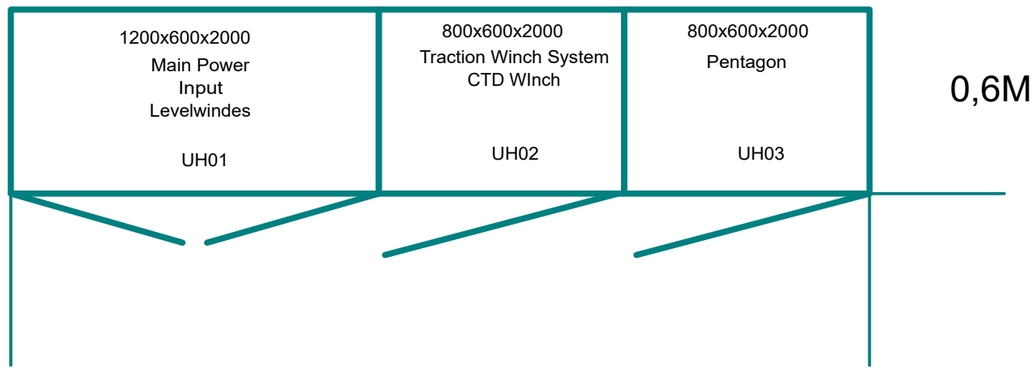
10070-01 CD

Rev. G

Sheet 1
Next 1

Cabinet Overview

WCS01
2000005807



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Cabinet Overview	400092375	=WCS01	
				User	GSK						
	AS BUILT	19.08.2022	SS	Approved	RAJ				10070-01 CC	Rev. G	Sheet 1
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 2

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Main Power Input
480V

Cabinet Cooling

LCL Filter Fan

Charging Circuit

IGBT Supply Unit

-Q1 /3.F6

-QB1 400A 170M5808D;3

-EC1 L N PE

-BT1 °C

-RF1 X50

-Q3 /3.F7

-QB2 Fuse NH00 16A 690V GL/GG;4

-F3.1 C14G16 -F3.2 1-50A 1-50A

-Q2 /3.F6

-RA2 5 Ohm

-RA3 5 Ohm

-RF1 LCL Filter /4.B2 /2.B5

-TA1 210A AC DC /5.B1 + -

-FE1

-QA1 450A -QA2 450A

TB1 DC+ /6.A1

TB1 DC- /6.A1

+UH03-QA17:2 480V:L1 /25.D1

+UH03-QA17:4 480V:L2 /25.D1

+UH03-QA17:6 480V:L3 /25.D1

230V:L1 /3.A1

230V:L2 /3.A1

-WDS1 GNYE

PE Bar

=SHIP+Power-X1:1 480V:L1 00/1.E2

=SHIP+Power-X1:2 480V:L2 00/1.E2

=SHIP+Power-X1:3 480V:L3 00/1.E2

=SHIP+Power-X1:PE PE 00/1.E2

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Main Power input 1 Control Power, Charging Circuit IGBT Modules	400092375	=WCS01 +UH01
	AS BUILT	19.08.2022	SS	Approved	RAJ					
Status	Change	Date	Name	Standard		Version / Index / Repl. by			10070-01 CC	Rev. G; Sheet 2; Next 3

AD7C40B1747540CBF652D56B6311BE9

Emergency Control Start

Contactor Control

/2.D6 230V:L1
/2.D6 230V:L2

230V:L1 /8.A1
230V:L2 /8.A1
+24V-XPOW1 /4.A1
0V-XPOW1 /4.A1

-TA1
IGBT Control
Run Enable
/5.B1
DigIn 2
XDI 2

-K1
12 14
11
/3.E5

-TA1
IGBT Control
Charging Circuit
/5.B2
XRO1
COM NC NO
XRO1 12 11 13

-TA1
IGBT Control
Main Contactor
/5.C2
XRO3
COM NC NO
XRO3 32 31 33

-Q3
13
14
/3.F7

-TA1
Feedback
Main Contactor
/5.B1
DigIn 3
XDI 3

-Q1
13
14
/3.F6

-Q2
A1
A2
/3.E6

-Q1
A1 1+ 2+
Electronic Coil
A2 3-
/3.E6

-Q3
A1
A2
/3.E7

Emergency Control

EM.CTRL /12.D7

-K1
A1
A2
/3.E5

0V /9.A1

-K1
/3.D5
/3.C5
11 12
14
21 22
24

-Q2
/3.C6
/2.C6

-Q1
/3.C6
/2.A6
/3.C8
5 6
3 4
1 2
13 14
21 22

-Q3
/3.C7
/2.C5
/3.B7
1 2
3 4
5 6
13 14

				Date	17/11-2021	CNP Freire MBari		MACGREGOR	Main VFD Cabinet Pentagon Control Inputs Contactor Control Control Power Indication	400092375	=WCS01 +UH01
	AS BUILT	19.08.2022	SS	User	GSK						
Status	Change	Date	Name	Approved	RAJ					10070-01 CC	Rev. G
				Standard		Version	Index	Repl. by			Sheet 3 Next 4

BLCL Filter Temp Sensor

Power to Control Card

Common 0V Digital Inputs

Safe Torque Off Interlock

/3.A8 +24V-XPOW1

/3.A8 0V-XPOW1 -Q1:3-

+24V-XPOW1 /12.E1

0V-XPOW1 /12.E1

-RF1 X50 3 9

/2.B8

-TA1

IGBT Control
Filter Temp Fault
/5.B1
DigIn 1

XDI 1

-TA1

IGBT Control
BCU-02 Control Card
/5.C2
24V DC
+ -

XPOW 1 2

-TA1

IGBT Control
0V Common Dig In
/5.B2
DICOM

XD24 3

-TA1

IGBT Control
/5.C2
Safe Torque Off

XSTO 1 2 3 4

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Fan Thermal Switch Control Card Power	400092375	=WCS01
				User	GSK					+UH01
	AS BUILT	19.08.2022	SS	Approved	RAJ					
Status	Change	Date	Name	Standard		Version	Index	Repl. by	10070-01 CC	Rev. G

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ACS880-204-0210A-5

210A -TA1

XDI	Ref
DigIn 1	/4.B2
DigIn 2	/3.B5
DigIn 3	/3.B8
DigIn 4	
DigIn 5	
DigIn 6	

XDIO	Ref
DIO 1	
DIO 2	

XAI	Ref
+VREF	
-VREF	
AGND	
AI 1	
AI 2	

XAO	Ref
AO 1	
AO 2	

XD24	Ref
DIIL	
+24VD	
DICOM	/4.B4
+24VD	
DIOGND	

XRO 1-3	Ref
XRO1	/3.B6
XRO2	
XRO3	/3.B6

XPOW	Ref
24V DC	/4.B4

XSTO	Ref
Safe Torque Off	/4.B7

XD2D	Ref
Drive To Drive Link	

Function	Jumper	Setting
A In 1	J1	V
A In 2	J2	V
D2D	J3	On
DI Com - DIOGND	J6	Split / Open

Control Panel BUS

Control Panel/ PC Connection

Control Panel BUS

X12

-TA1.PH1
DPMP-02 R6/7

-TA1.KF1
FECA-01
Adress:
X1 X2

-WF2
Patch Cord 1.5M Cat.6 SFTP
-TA2.KF1:X1 EtherCAT /11.D1

-WF1
Patch Cord 1.5M Cat.6 SFTP
+UH03-XF1:X1 EtherCAT /30.B1

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Reference Overview	400092375	=WCS01	
				User	GSK					+UH01	
	AS BUILT	19.08.2022	SS	Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by	10070-01 CC	Rev. G	Sheet 5 / Next 6

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Levelwinde Storage Drum

Levelwinde CTD Winch

Out Hauler OHC

/2.D8 TB1 DC+ -QA1 → TB1 DC+ /14.A1

/2.D8 TB1 DC- -QA2 → TB1 DC- /14.A1

-FE2

-QA3 FR27UQ69V50T 50-250A

-QA4 FR27UQ69V50T 50-250A

-QA5 FWP-10A14F 1-50A

-QA6 FWP-10A14F 1-50A

-QA7 FWP-10A14F 1-50A

-QA8 FWP-10A14F 1-50A

-QA18 FWP-10A14F 1-50A

-QA19 FWP-10A14F 1-50A

-TA2 5,5kW-10,5A DC/AC

/11.A1 U2 V2 W2 PE EMC

-WD14 BN BK GY GNYE,GNYE,GNYE

=LEV01 U V W PE

-MA1 M 3 ~

2,2kW
5,22A
400V/50Hz

-TA3 5,5kW-10,5A DC/AC

/11.A5 U2 V2 W2 PE EMC

-WD3 BN BK GY GNYE,GNYE,GNYE

=HW01 U V W PE

-MA2 M 3 ~

5.5kW
11,4A
400V/50Hz

-TA13 0,75kW-2,1A AC/AC

L1 L2 L3 PE

UDC- R- R+

/47.A5 U V W PE EMC

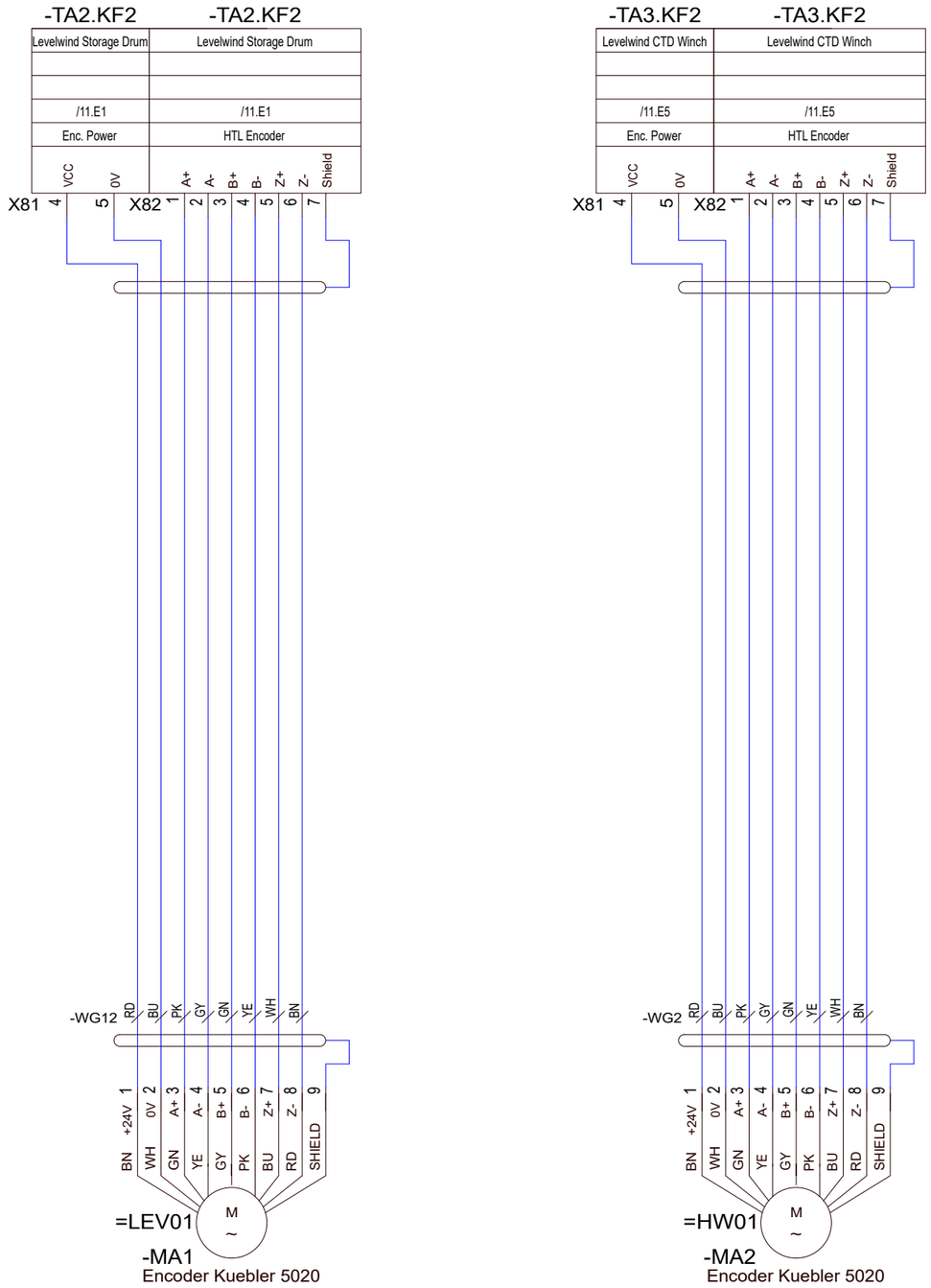
-WD32 BN BK GY GNYE,GNYE,GNYE

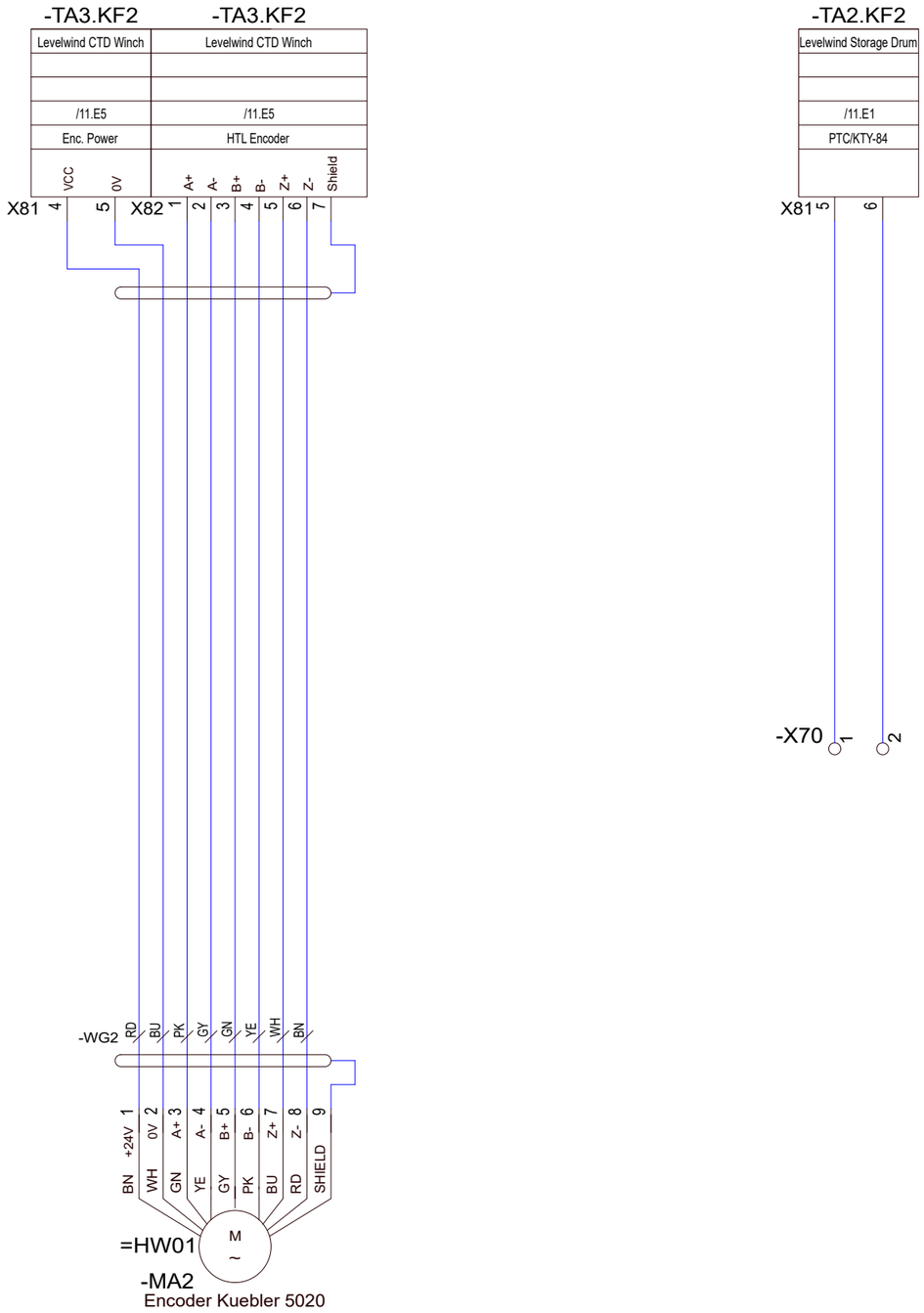
=OHC U V W PE

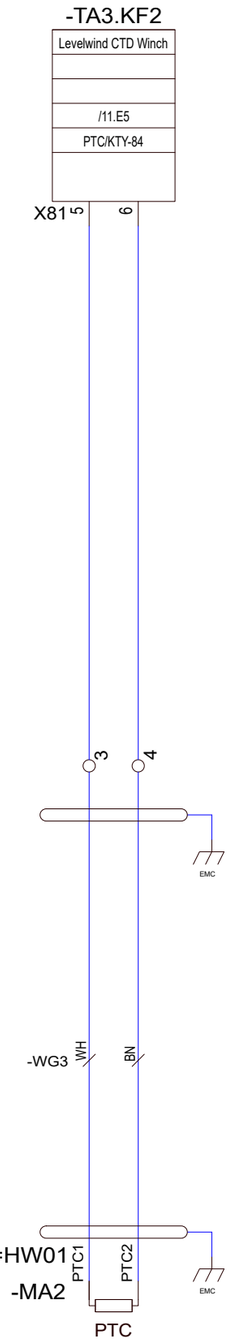
-MA1 M 3 ~

Out Hauler Motor
0.25kW
0,76A
400V/50Hz

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Levelwindes Frequency Inverter	400092375	=WCS01 +UH01
	AS BUILT	19.08.2022	SS	User	GSK					
				Approved	RAJ					
Status	Change	Date	Name	Standard		Version / Index / Repl. by			10070-01 CC	Rev. G
										Sheet 6 / Next 7







				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Levelwindes Encoder Cards, PTC Connection	400092375	=WCS01 +UH01	
	AS BUILT	19.08.2022	SS	User	GSK						
				Approved	RAJ				10070-01 CC	Rev. G	Sheet 7 Next 8
Status	Change	Date	Name	Standard		Version	Index	Repl. by			

AD7C40B1747540CBF652D56B6311BE9

Brake LW Storage Drum

Brake LW CTD Winch

Motor Heating LW Storage Drum

Motor Heating LW CTD Winch

/3.A8 230V:L2
/3.A8 230V:L1

230V:L2 /26.A1
230V:L1 /26.A1
HT230:L1 /17.A1
HT230:L2 /17.A1

/12.F6 11 -K2 12 14

/9.F7 11 -K4 12 14

/10.F7 11 -K5 12 14

/9.F7 11 -K6 12 14 /9.F7 21 -K6 22 24

/10.F7 11 -K7 12 14 /10.F7 21 -K7 22 24

-X200 1 Glass Fuse 5x20mm 1A 2 PE
3 Glass Fuse 5x20mm 1A 4 PE

-X300 1 Glass Fuse 5x20mm 1A 2 PE
3 Glass Fuse 5x20mm 1A 4 PE

EMC

-WD15 1 2 GNYE

-WD16 1 2 GNYE

-WD4 1 2 GNYE

=LEV01 -MA1 BR1 BR2 Motor Brake

=LEV01 -MA1 H1 H2 Heater

=HW01 -MA2 H1 H2 Heater

				Date	17/11-2021	CNP Freire MBari		Main VFD Cabinet Pentagon Levelwindes Brakes & Heating	400092375	=WCS01
				User	GSK					+UH01
	AS BUILT	19.08.2022	SS	Approved	RAJ				10070-01 CC	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 8 / Next 9

Emergency JOG

Brake Lift & Heating

24VDC
0V
/3.D5
-K1:A2

24VDC
0V
/10.A1
/10.A1

-TA2	-TA2
Levelwind Storage Drum	Levelwind Storage Drum
Spool Left	Spool Right
/11.A1	/11.A1
DigIn 1	DigIn 2
XDI 1	XDI 2

-TA2
Levelwind Storage Drum
Brake Lift
/11.B2
XRO1
COM NC NO
XRO1 12 11 13

-K4 A1 /9.F7 A2
-K6 A1 /9.F8 A2

-X500 1 2 3 PE
EMC

-WD22 1 2 3 GNYE

=WP02+WP02-X400:7	=WP02+WP02-X400:8	=WP02+WP02-X400:9	=WP02+WP02-X400:PE
24VDC	Haul In	Pay Out	PE
07/3.E4	07/3.E5	07/3.E5	07/3.E5

-K4 /9.D7
/8.C1 11 12 14 21 22 24

-K6 /9.D8
/8.B3 11 12 14 21 22 24 /8.B4

				Date	17/11-2021
				User	GSK
	AS BUILT	19.08.2022	SS	Approved	RAJ
Status	Change	Date	Name	Standard	

CNP Freire
MBari

Version	Index	Repl. by

MACGREGOR

Main VFD Cabinet Pentagon
Levelwind Storage Drum
Emergency Control Connection
Brake and Motor Heating Control

400092375

=WCS01
+UH01

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Emergency JOG

Brake Lift & Heating

/9.A8 24VDC
/9.A8 0V

24VDC /12.A1
0V /12.A1

-TA3 -TA3

Levelwind CTD Winch	Levelwind CTD Winch
Spool Left	Spool Right
/11.A5	/11.A5
DigIn 1	DigIn 2

XDI 1 XDI 2

-TA3

Levelwind CTD Winch
Brake Lift
/11.B6
XRO1
COM NC NO

XRO1 12 11 13

A1 A1
-K5 -K7
/10.F7 /10.F8
A2 A2

-X500 4 5 6 PE

EMC

-WD2 1 2 3 GNYE

=HW01+UC01-X400:4 =HW01+UC01-X400:5 =HW01+UC01-X400:6 =HW01+UC01-X400:PE

24VDC Haul In Pay Out PE

02/2.E3 02/2.E3 02/2.E3 02/2.E4

-K5 /10.D7

/8.C2 11 12 14 21 22 24

-K7 /10.D8

/8.B4 11 12 14 21 22 24 /8.B5

				Date	17/11-2021	CNP Freire	MACGREGOR	Main VFD Cabinet Pentagon	400092375	=WCS01	
				User	GSK	MBari		Levelwind CTD Winch		+UH01	
	AS BUILT	19.08.2022	SS	Approved	RAJ			Emergency Control Connection			
Status	Change	Date	Name	Standard		Version	Index	Repl. by	Brake and Motor Heating Control	10070-01 CC Rev. G	Sheet 10 / Next 11

Levelwinde
Storage Drum

ACS880-104-0011A-5
5,5kW-10,5A -TA2

XDI	Ref
DigIn 1	/9.B1
DigIn 2	/9.B2
DigIn 3	/12.B6
DigIn 4	
DigIn 5	
DigIn 6	

XD24	Ref
DIIL	
+24VD	
DICOM	/12.B1
+24VD	
DIOGND	

XDIO	Ref
DIO 1	
DIO 2	

XRO 1-3	Ref
XRO1	/9.B7
XRO2	
XRO3	

XAI	Ref
+VREF	
-VREF	
AGND	
AI 1	
AI 2	

XPOW	Ref
24V DC	/12.E1

XSTO	Ref
Safe Torque Off	/13.B1

XAO	Ref
AO 1	
AO 2	

XD2D	Ref
Drive To Drive Link	

Function	Jumper	Setting
A In 1	J1	V
A In 2	J2	V
D2D	J3	On
DI Com - DIOGND	J6	Split / Open

Control Panel BUS | Control Panel/ PC Connection | Control Panel BUS

X12

-TA2.PH1
ACS-AP-W

-TA2.KF1
FECA-01
Adress:
X1 X2

/5.D6 EtherCAT -TA1.KF1:X2

-WF2 Patch Cord 1.5M Cat.6 SFTP

Levelwinde
CTD Winch

ACS880-104-0011A-5
5,5kW-10,5A -TA3

XDI	Ref
DigIn 1	/10.B1
DigIn 2	/10.B2
DigIn 3	/12.B7
DigIn 4	
DigIn 5	
DigIn 6	

XD24	Ref
DIIL	
+24VD	
DICOM	/12.B2
+24VD	
DIOGND	

XDIO	Ref
DIO 1	
DIO 2	

XRO 1-3	Ref
XRO1	/10.B7
XRO2	
XRO3	

XAI	Ref
+VREF	
-VREF	
AGND	
AI 1	
AI 2	

XPOW	Ref
24V DC	/12.E2

XSTO	Ref
Safe Torque Off	/13.B3

XAO	Ref
AO 1	
AO 2	

XD2D	Ref
Drive To Drive Link	

Function	Jumper	Setting
A In 1	J1	V
A In 2	J2	V
D2D	J3	On
DI Com - DIOGND	J6	Split / Open

Control Panel BUS | Control Panel/ PC Connection | Control Panel BUS

X12

-TA3.PH1
ACS-AP-W

-TA3.KF1
FECA-01
Adress:
X1 X2

-WF3 Patch Cord 1.5M Cat.6 SFTP

-TA13.KF1:X1 EtherCAT /47.D5

-WF4 Patch Cord 1.5M Cat.6 SFTP

FEN-31
-TA2.KF2

X81	Ref
Power Latch	/12.B4
Enc. Power	/7.B1
PTC/KTY-84	/7.B6

X22	Ref
TTL Encoder	

X82	Ref
HTL Encoder	/7.B2

X84	Ref
Power	
Dig In 1	
Dig In 2	

DIP Sw.	Pos
DIP 1	0
DIP 2	0
DIP 3	0
DIP 4	0

Internal Pull-Up Resistor
DIP Switches
Located under plastic cover
Default position 0

FEN-31
-TA3.KF2

X81	Ref
Power Latch	/12.B4
Enc. Power	/7.B3
PTC/KTY-84	/7.B7

X22	Ref
TTL Encoder	

X82	Ref
HTL Encoder	/7.B4

X84	Ref
Power	
Dig In 1	
Dig In 2	

DIP Sw.	Pos
DIP 1	0
DIP 2	0
DIP 3	0
DIP 4	0

Internal Pull-Up Resistor
DIP Switches
Located under plastic cover
Default position 0

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Levelwindes Storage Drum & CTD Winch Frequency Inverter References	400092375	=WCS01
				User	GSK					+UH01
	AS BUILT	19.08.2022	SS	Approved	RAJ				10070-01 CC	Rev. G
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0V Common
Digital Signals

Encoder Power Latch
Frequency Converters

Emergency JOG mode
Activation

/10.A8 24VDC
/10.A8 0V

24VDC /17.A1
0V /17.A1

-TA2	-TA3	-TA13
Levelwind Storage Drum	Levelwind CTD Winch	Out Hauler Motor
/11.B2	/11.B6	/47.B6
DICOM	DICOM	DICOM
XD24 3	XD24 3	XD24 3

Open J6 on the ZCU Card

-TA2.KF2	-TA3.KF2	-TA13.KF2
Levelwind Storage Drum	Levelwind CTD Winch	Out Hauler Motor
/11.E1	/11.E5	/47.E5
Power Latch	Power Latch	Power Latch
+15V VCC +24V	+15V VCC +24V	+15V VCC +24V
X81 1 2 3	X81 1 2 3	X81 1 2 3

/12.F7
-K3 11 12 14

-TA2	-TA3
Levelwind Storage Drum	Levelwind CTD Winch
JOG Mode	JOG Mode
/11.B1	/11.B5
DigIn 3	DigIn 3
XDI 3	XDI 3

-TA2	-TA3	-TA13
Levelwind Storage Drum	Levelwind CTD Winch	Out Hauler Motor
/11.B2	/11.B6	/47.B6
24V DC	24V DC	24V DC
+ -	+ -	+ -
XPOW 1 2	XPOW 1 2	XPOW 1 2

/4.A8 +24V-XPOW1
/4.A8 0V-XPOW1

+24V-XPOW1 /23.E1
0V-XPOW1 /23.E1

Emergency Stop &
Emergency Control

EM.Stop /23.D6
/3.D5 EM.CTRL -K1:A1 EM.CTRL /23.D7

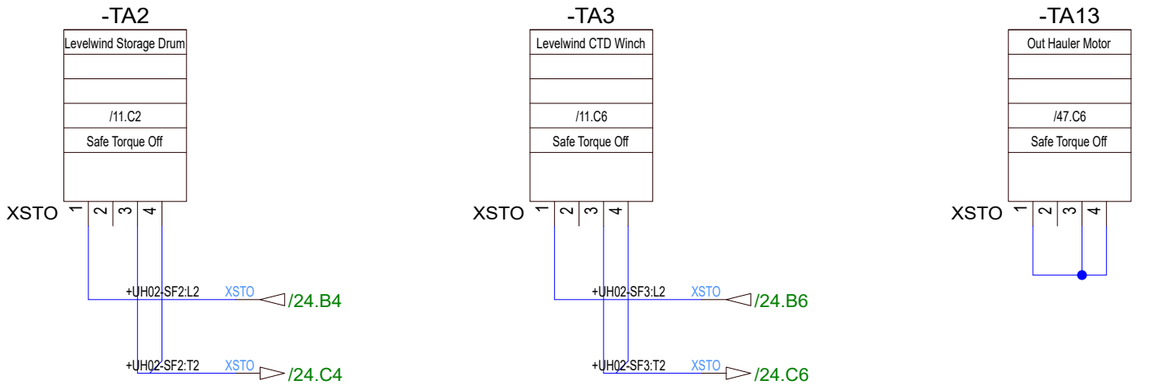
-K2 A1 /12.F6 A2
-K3 A1 /12.F7 A2

-K2
/12.E6
/8.B1 11 12 14 21 22 24

-K3
/12.E7
/12.B6 11 12 14 21 22 24

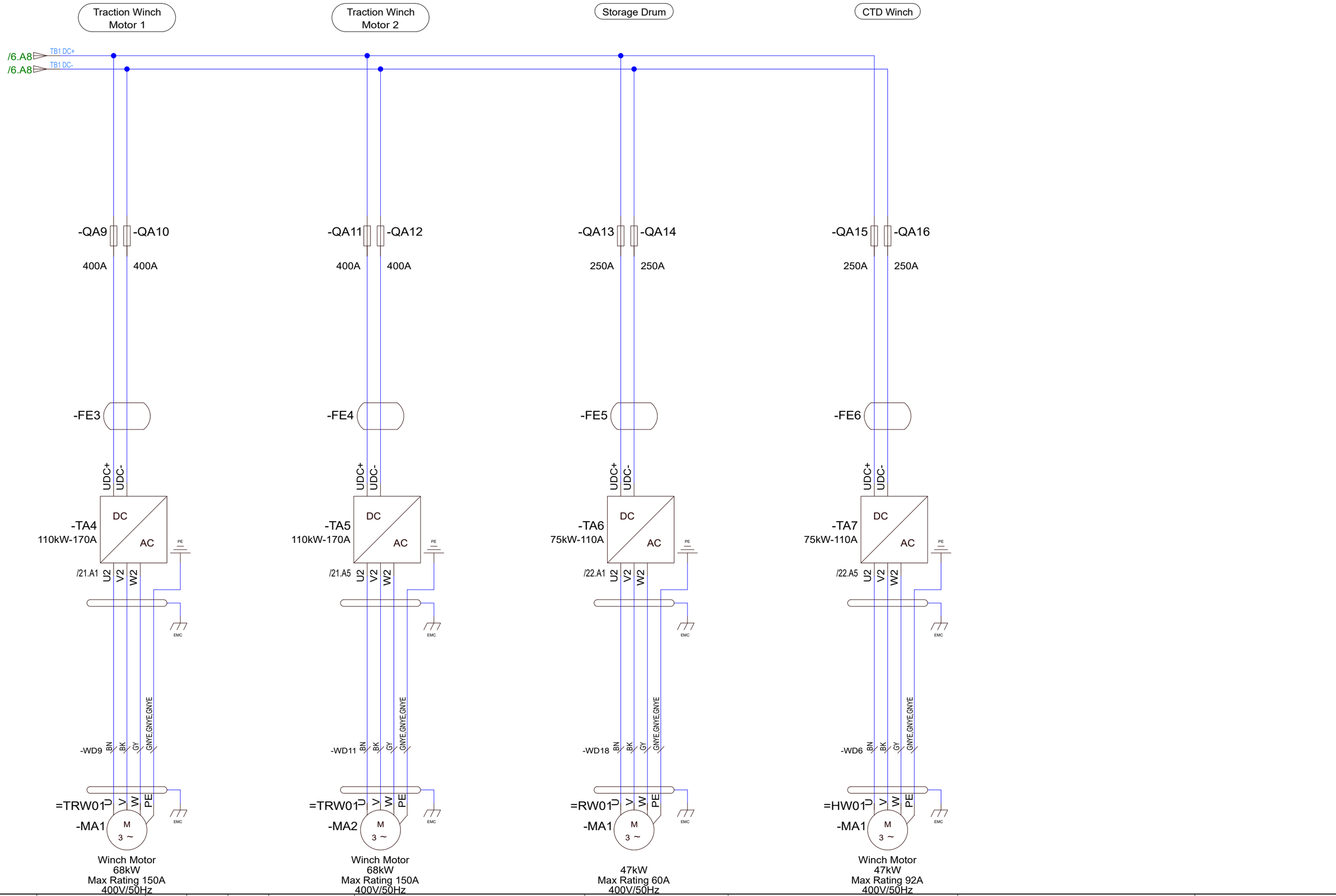
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				User	GSK					+UH01
	AS BUILT	19.08.2022	SS	Approved	RAJ					
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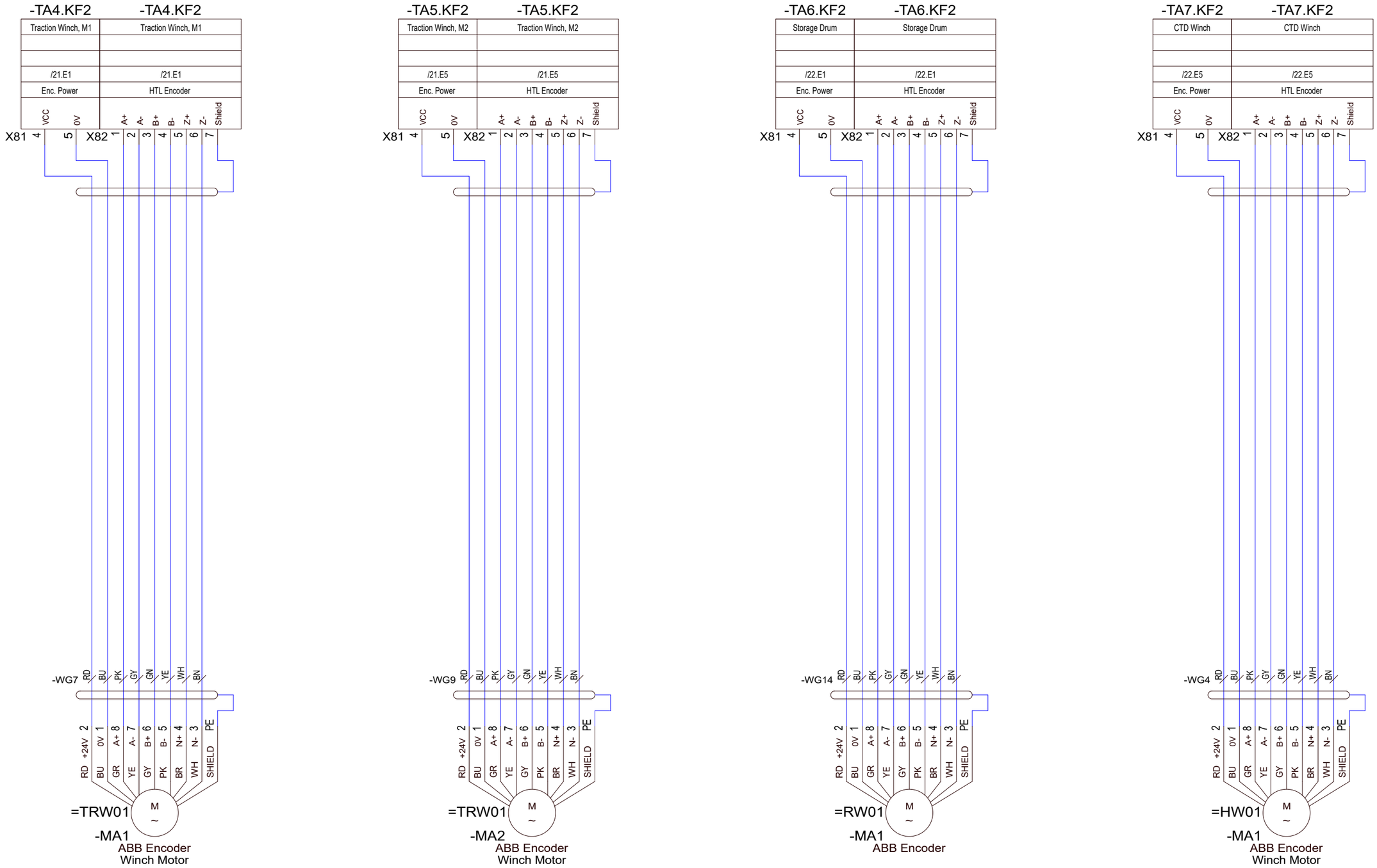


				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Levelwindes Safe Torque Off	400092375	=WCS01 +UH01	
	AS BUILT	19.08.2022	SS	User	GSK						
Status	Change	Date	Name	Approved	RAJ				10070-01 CC	Rev. G	Sheet 13 Next 14
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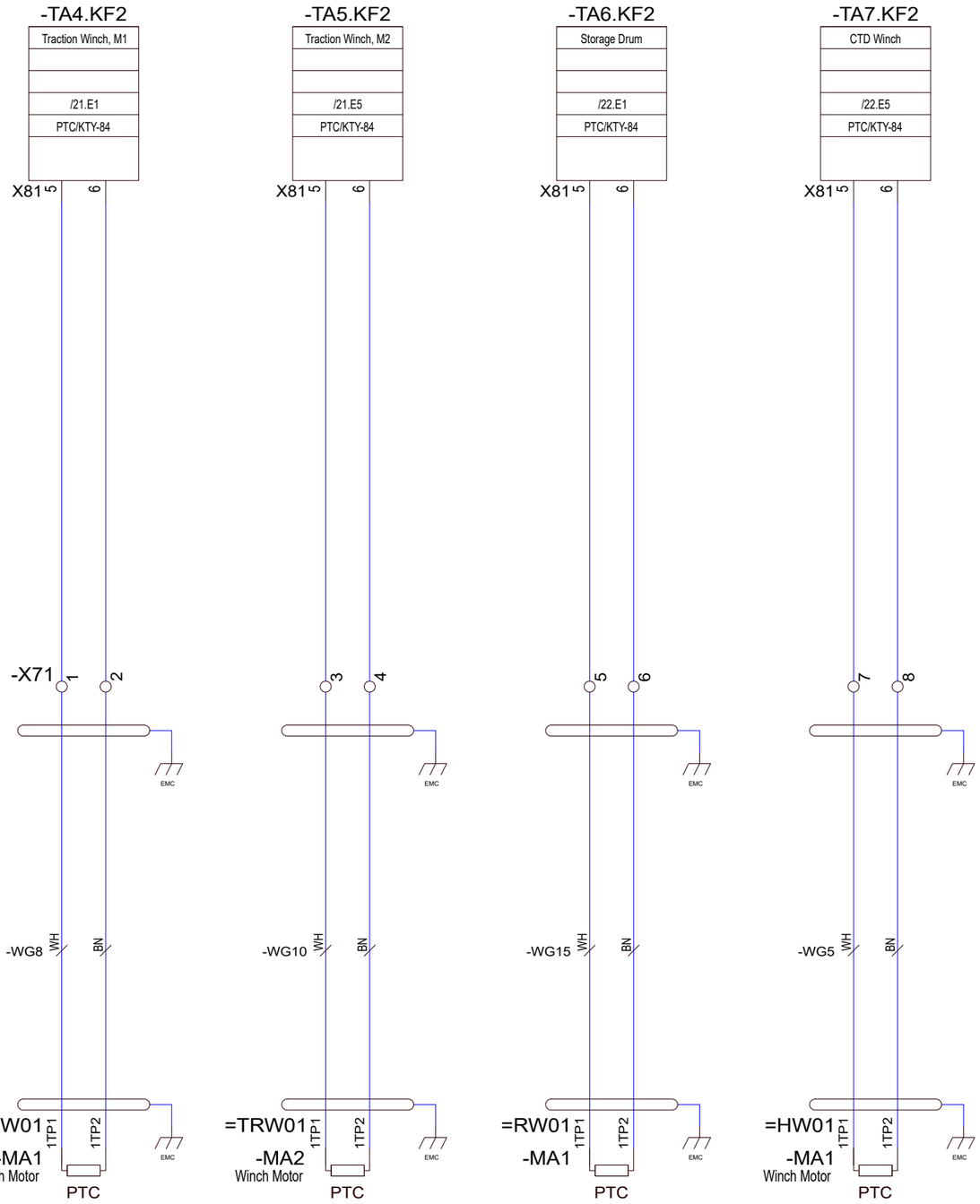
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				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Traction Winch, SD & CTD Winch Frequency Inverter	400092375	=WCS01 +UH02
				User	GSK					
	AS BUILT	19.08.2022	SS	Approved	RAJ				10070-01 CC	Rev. G
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				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Traction Winch, SD & CTD Winch Encoder Cards	400092375	=WCS01 +UH02
				User	GSK					
	AS BUILT	19.08.2022	SS	Approved	RAJ					
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				Date	17/11-2021	CNP Freire MBari		MACGREGOR	Main VFD Cabinet Pentagon Traction Winch, SD & CTD Winch PTC Connections	400092375	=WCS01 +UH02
	AS BUILT	19.08.2022	SS	User	GSK						
				Approved	RAJ						
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Brake Valve

Motor Heating Traction Winch

Motor Heating Storage Drum

Motor Heating CTD Winch

/12.A8 24VDC
/12.A8 0V
/8.A8 HT230:L1
/8.A8 HT230:L2

24VDC /18.A1
0V /18.A1
HT230:L1 /27.A1
HT230:L2 /27.A1

/23.F6 11 -K8 12 14

/18.F7 11 -K14 12 14
/18.F7 21 -K14 22 24

/19.F7 11 -K15 12 14
/19.F7 21 -K15 22 24

/20.F7 11 -K16 12 14
/20.F7 21 -K16 22 24

/23.F5 11 -K10 12 14
Brake Inhibit

/18.F7 11 -K11 12 14

/19.F7 11 -K12 12 14

/20.F7 11 -K13 12 14

-X201 1 2 PE
Glass Fuse 5x20mm 3.15A
3 4 PE
5 6 PE

-X301 1 2 PE
3 4 PE
5 6 PE
7 8 PE
Glass Fuse 5x20mm 1A

-WD8 1 2 GNYE
=TRW01+UC01-X2:1 Brake
=TRW01+UC01-X2:2 0V
=TRW01+UC01-X2:PE PE
03/1.E7 03/1.E7 03/1.E7

-WD1 1 2 GNYE
=HW01+UC01-X2:1 Brake
=HW01+UC01-X2:2 0V
=HW01+UC01-X2:PE PE
02/1.E7 02/1.E7 02/1.E7

-WD17 1 2 GNYE
=RW01+UC1-X2:1 Brake
=RW01+UC1-X2:2 0V
=RW01+UC1-X2:PE PE
05/1.E4 05/1.E4 05/1.E4

-WD10 1 2 GNYE
=TRW01 -MA1 1HE1 1HE2 EMC
Heater Winch Motor

-WD12 1 2 GNYE
=TRW01 -MA2 1HE1 1HE2 EMC
Heater Winch Motor

-WD19 1 2 GNYE
=RW01 -MA1 1HE1 1HE2 EMC
Heater

-WD7 1 2 GNYE
=HW01 -MA1 1HE1 1HE2 EMC
Heater Winch Motor

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Traction Winch, SD & CTD Winch Brake & Heating	400092375	=WCS01
				User	GSK					+UH02
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Emergency JOG

Brake & Heating Control

/17.A8 24VDC
/17.A8 0V

24VDC /19.A1
0V /19.A1

-TA4	-TA5
Traction Winch, M1	Traction Winch, M2
Haul In	Haul In
/21.A1	/21.A5
DigIn 1	DigIn 1
XDI 1	XDI 1

-TA4	-TA5
Traction Winch, M1	Traction Winch, M2
Pay Out	Pay Out
/21.A1	/21.A5
DigIn 2	DigIn 2
XDI 2	XDI 2

-TA4	-TA5
Traction Winch, M1	Traction Winch, M2
Brake Lift	Brake Lift
/21.B2	/21.B6
XRO1	XRO1
COM NC NO	COM NC NO
XRO1 12 11 13	XRO1 12 11 13

-X501 1 2 3 PE

EMC

-WD23 1 2 3

1 =WP02+WP02-X400:1 24VDC 07/3.E1
2 =WP02+WP02-X400:2 Haul In 07/3.E2
3 =WP02+WP02-X400:3 Pay Out 07/3.E2
PE PE

-K11 A1 /18.F7 A2
-K14 A1 /18.F8 A2

-K11 /18.D7
/17.C1 11 12 14 21 22 24

-K14 /18.D8
/17.B4 11 12 14 21 22 24
/17.B4

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Traction Winch Emergency Control Connection	400092375	=WCS01	
				User	GSK					+UH02	
	AS BUILT	19.08.2022	SS	Approved	RAJ				10070-01 CC	Rev. G	Sheet 18
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Emergency JOG

Brake & Heating Control

/18.A8 24VDC
/18.A8 0V

24VDC /20.A1
0V /20.A1

-TA6
Storage Drum
Haul In
/22.A1
DigIn 1
XDI 1

-TA6
Storage Drum
Pay Out
/22.A1
DigIn 2
XDI 2

-TA6
Storage Drum
Brake Lift
/22.B2
XRO1
COM NC NO
XRO1 12 11 13

-X501 4 5 6 PE

EMC

-WD23 4 5 6 GNYE

=WP02+WP02-X400:4 24VDC → 07/3.E3
=WP02+WP02-X400:5 Haul In → 07/3.E3
=WP02+WP02-X400:6 Pay Out → 07/3.E4
=WP02+WP02-X400:PE PE → 07/3.E4

-K12 A1 /19.F7 A2
-K15 A1 /19.F8 A2

-K12 /19.D7
/17.C2 11 12 14 21 22 24

-K15 /19.D8
/17.B6 11 12 14 21 22 24
/17.B6

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Storage Drum Emergency Control Connection	400092375	=WCS01
				User	GSK					+UH02
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Emergency JOG

Brake & Heating Control

/19.A8 24VDC

/19.A8 0V

24VDC /23.A1

0V /23.A1

-TA7

CTD Winch
Haul In
/22.A5
DigIn 1

XDI 1

-TA7

CTD Winch
Pay Out
/22.A5
DigIn 2

XDI 2

-TA7

CTD Winch
Brake Lift
/22.B6
XRO1
COM NC NO

XRO1 12 11 13

-K13 A1 /20.F7 A2

-K16 A1 /20.F8 A2

-X501 7 8 9 PE

EMC

-WD5 1 2 3 GNYE

1 =HW01+UC01-X400:1 24VDC → 02/2.E1

2 =HW01+UC01-X400:2 Haul In → 02/2.E1

3 =HW01+UC01-X400:3 Pay Out → 02/2.E2

GNYE =HW01+UC01-X400:PE PE → 02/2.E2

-K13 /20.D7

/17.C3 11 12 14 21 22 24

-K16 /20.D8

/17.B7 11 12 14

/17.B7 21 22 24

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon CTD Winch Emergency Control Connection	400092375	=WCS01
				User	GSK					+UH02
	AS BUILT	19.08.2022	SS	Approved	RAJ					
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Traction Winch Motor 1

ACS880-104-0170A-5
110kW-170A -TA4

XDI	Ref
DigIn 1	/18.B1
DigIn 2	/18.B2
DigIn 3	/23.B6
DigIn 4	
DigIn 5	
DigIn 6	

XD24	Ref
DIIL	
+24VD	
DICOM	/23.B1
+24VD	
DIOGND	

XDIO	Ref
DIO 1	
DIO 2	

XRO 1-3	Ref
XRO1	/18.B6
XRO2	
XRO3	

XAI	Ref
+VREF	
-VREF	
AGND	
AI 1	
AI 2	

XPOW	Ref
24V DC	/23.D1

XSTO	Ref
Safe Torque Off	/24.B1

XAO	Ref
AO 1	
AO 2	

XD2D	Ref
Drive To Drive Link	

Function	Jumper	Setting
A In 1	J1	V
A In 2	J2	V
D2D	J3	On
DI Com - DIOGND	J6	Split / Open

Control Panel BUS | Control Panel/ PC Connection | Control Panel BUS

X12

-TA4.PH1
DPMP-02 R6/7

-TA4.KF1
FECA-01
Adress:
X1 X2

/47.D8 EtherCAT +UH01-TA13.KF1:X2

-WF21 Patch Cord 1.5M Cat.6 SFTP

FEN-31
-TA4.KF2

X81	Ref
Power Latch	/23.B3
Enc. Power	/15.B1
PTC/KTY-84	/16.B1

X22	Ref
TTL Encoder	

X82	Ref
HTL Encoder	/15.B2

X84	Ref
Power	
Dig In 1	
Dig In 2	

DIP Sw.	Pos
DIP 1	0
DIP 2	0
DIP 3	0
DIP 4	0

Internal Pull-Up Resistor
DIP Switches
Located under plastic cover
Default position 0

Traction Winch Motor 2

ACS880-104-0170A-5
110kW-170A -TA5

XDI	Ref
DigIn 1	/18.B2
DigIn 2	/18.B3
DigIn 3	/23.B7
DigIn 4	
DigIn 5	
DigIn 6	

XD24	Ref
DIIL	
+24VD	
DICOM	/23.B2
+24VD	
DIOGND	

XDIO	Ref
DIO 1	
DIO 2	

XRO 1-3	Ref
XRO1	/18.B7
XRO2	
XRO3	

XAI	Ref
+VREF	
-VREF	
AGND	
AI 1	
AI 2	

XPOW	Ref
24V DC	/23.D2

XSTO	Ref
Safe Torque Off	/24.B2

XAO	Ref
AO 1	
AO 2	

XD2D	Ref
Drive To Drive Link	

Function	Jumper	Setting
A In 1	J1	V
A In 2	J2	V
D2D	J3	On
DI Com - DIOGND	J6	Split / Open

Control Panel BUS | Control Panel/ PC Connection | Control Panel BUS

X12

-TA5.PH1
DPMP-02 R6/7

-TA5.KF1
FECA-01
Adress:
X1 X2

-TA6.KF1:X1 EtherCAT /22.D1

-WF5 Patch Cord 1.5M Cat.6 SFTP

-WF6 Patch Cord 1.5M Cat.6 SFTP

FEN-31
-TA5.KF2

X81	Ref
Power Latch	/23.B4
Enc. Power	/15.B3
PTC/KTY-84	/16.B2

X22	Ref
TTL Encoder	

X82	Ref
HTL Encoder	/15.B4

X84	Ref
Power	
Dig In 1	
Dig In 2	

DIP Sw.	Pos
DIP 1	0
DIP 2	0
DIP 3	0
DIP 4	0

Internal Pull-Up Resistor
DIP Switches
Located under plastic cover
Default position 0

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Traction Winch Frequency Converter Referenceses	400092375	=WCS01 +UH02
				User	GSK					
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Storage Drum

ACS880-104-0110A-5
75kW-110A -TA6

XDI	Ref
DigIn 1	/19.B1
DigIn 2	/19.B2
DigIn 3	/23.B7
DigIn 4	
DigIn 5	
DigIn 6	

XD24	Ref
DIIL	
+24VD	
DICOM	/23.B2
+24VD	
DIOGND	

XDIO	Ref
DIO 1	
DIO 2	

XRO 1-3	Ref
XRO1	/19.B7
XRO2	
XRO3	

XAI	Ref
+VREF	
-VREF	
AGND	
AI 1	
AI 2	

XPOW	Ref
24V DC	/23.D3

XSTO	Ref
Safe Torque Off	/24.B3

XAO	Ref
AO 1	
AO 2	

XD2D	Ref
Drive To Drive Link	

Function	Jumper	Setting
A In 1	J1	V
A In 2	J2	V
D2D	J3	On
DI Com - DIOGND	J6	Split / Open

Control Panel BUS | Control Panel/ PC Connection | Control Panel BUS

X12

-TA6.PH1
DPMP-02 R6/7

-TA6.KF1
FECA-01
Adress:
X1 X2

/21.D8 EtherCAT -TA5.KF1:X2

-WF6 Patch Cord 1.5M Cat.6 SFTP

FEN-31
-TA6.KF2

X81	Ref
Power Latch	/23.B4
Enc. Power	/15.B5
PTC/KTY-84	/16.B3

X22	Ref
TTL Encoder	

X82	Ref
HTL Encoder	/15.B5

X84	Ref
Power	
Dig In 1	
Dig In 2	

DIP Sw.	Pos
DIP 1	0
DIP 2	0
DIP 3	0
DIP 4	0

Internal Pull-Up Resistor
DIP Switches
Located under plastic cover
Default position 0

CTD Winch

ACS880-104-0110A-5
75kW-110A -TA7

XDI	Ref
DigIn 1	/20.B1
DigIn 2	/20.B2
DigIn 3	/23.B8
DigIn 4	
DigIn 5	
DigIn 6	

XD24	Ref
DIIL	
+24VD	
DICOM	/23.B3
+24VD	
DIOGND	

XDIO	Ref
DIO 1	
DIO 2	

XRO 1-3	Ref
XRO1	/20.B7
XRO2	
XRO3	

XAI	Ref
+VREF	
-VREF	
AGND	
AI 1	
AI 2	

XPOW	Ref
24V DC	/23.D3

XSTO	Ref
Safe Torque Off	/24.B5

XAO	Ref
AO 1	
AO 2	

XD2D	Ref
Drive To Drive Link	

Function	Jumper	Setting
A In 1	J1	V
A In 2	J2	V
D2D	J3	On
DI Com - DIOGND	J6	Split / Open

Control Panel BUS | Control Panel/ PC Connection | Control Panel BUS

X12

-TA7.PH1
DPMP-02 R6/7

-TA7.KF1
FECA-01
Adress:
X1 X2

-WF7 Patch Cord 1.5M Cat.6 SFTP

+UH03-XF1:X2 EtherCAT /30.B1

-WF8 Patch Cord 1.5M Cat.6 SFTP

FEN-31
-TA7.KF2

X81	Ref
Power Latch	/23.B5
Enc. Power	/15.B7
PTC/KTY-84	/16.B4

X22	Ref
TTL Encoder	

X82	Ref
HTL Encoder	/15.B7

X84	Ref
Power	
Dig In 1	
Dig In 2	

DIP Sw.	Pos
DIP 1	0
DIP 2	0
DIP 3	0
DIP 4	0

Internal Pull-Up Resistor
DIP Switches
Located under plastic cover
Default position 0

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Storage Drum & CDT Winch Frequency Converter Referenceses	400092375	=WCS01
				User	GSK					+UH02
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0V Common Digital Signals

Encoder Power Latch Frequency Converters

Emergency JOG mode Actiavation

/20.A8 24VDC

/20.A8 0V

24VDC /28.C1

0V /28.C1

-TA4	-TA5	-TA6	-TA7
Traction Winch, M1	Traction Winch, M2	Storage Drum	CTD Winch
/21.B2	/21.B6	/22.B2	/22.B6
DICOM	DICOM	DICOM	DICOM

XD24 3 XD24 3 XD24 3 XD24 3

-TA4.KF2	-TA5.KF2	-TA6.KF2	-TA7.KF2
Traction Winch, M1	Traction Winch, M2	Storage Drum	CTD Winch
/21.E1	/21.E5	/22.E1	/22.E5
Power Latch	Power Latch	Power Latch	Power Latch
+15V VCC +24V	+15V VCC +24V	+15V VCC +24V	+15V VCC +24V

X81 1 2 3 X81 1 2 3 X81 1 2 3 X81 1 2 3

-K9 12 14 /23.F7 11

-TA4	-TA5	-TA6	-TA7
Traction Winch, M1	Traction Winch, M2	Storage Drum	CTD Winch
JOG Mode	JOG Mode	JOG Mode	JOG Mode
/21.B1	/21.B5	/22.B1	/22.B5
DigIn 3	DigIn 3	DigIn 3	DigIn 3

XDI 3 XDI 3 XDI 3 XDI 3

Open J6 on the ZCU Card

Emergency Stop & Emergency Control

-TA4	-TA5	-TA6	-TA7
Traction Winch, M1	Traction Winch, M2	Storage Drum	CTD Winch
/21.B2	/21.B6	/22.B2	/22.B6
24V DC	24V DC	24V DC	24V DC
+ -	+ -	+ -	+ -

XPOW 1 2 XPOW 1 2 XPOW 1 2 XPOW 1 2

/12.E3 +24V-XPOW1 +UH03-TA12 XPOW:+24V-XPOW1 /29.C1

/12.E3 0V-XPOW1 +UH03-TA12 XPOW:-0V-XPOW1 /29.C1

/12.D7 EM.Stop +UH01-K2:A1 +UH03-KF20:6 EM.Stop /41.C4

/12.D8 EM.CTRL +UH03-SF4:3 EM.CTRL /41.C1

+UH03-KF10:7 BrakeInhibit /36.C6

-K10 A1 /23.F5 A2

-K8 A1 /23.F6 A2

-K9 A1 /23.F7 A2

-K10 /23.E5

/17.C1 11 12 14 21 22 24

-K8 /23.E6

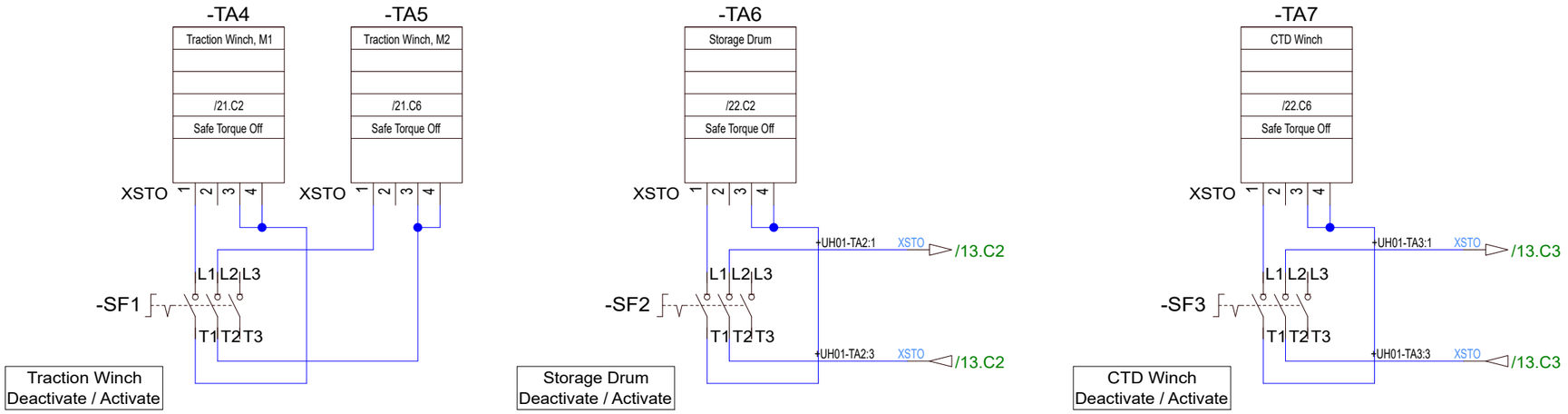
/17.B1 11 12 14 21 22 24

-K9 /23.E7

/23.B6 11 12 14 21 22 24

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Traction Winch, SD & CTD Winch Frequency Converters Signal Reference and Latched Inputs	400092375	=WCS01
				User	GSK					+UH02
	AS BUILT	19.08.2022	SS	Approved	RAJ				10070-01 CC	Rev. G
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Winch System Deactivation / Activation



Traction Winch Deactivate / Activate

Storage Drum Deactivate / Activate

CTD Winch Deactivate / Activate

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Traction Winch, SD & CTD Winch Winch System Deactivation / Activation Safe Torque Off	400092375	=WCS01 +UH02	
				User	GSK						
	AS BUILT	19.08.2022	SS	Approved	RAJ						
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480V Supply Input

Brake System 1 HPU Pump M1

Brake System 1 HPU Pump M2

Gear Cooling Pump M1

Gear Cooling Pump M2

-QA17
160A
Fuse NH00 35A 500V GL/GG;3

-FC1
6.3-10A
6,5A

-FC2
6.3-10A
6,5A

-FC3
2.5-4.0A
3,5

-FC4
2.5-4.0A
3,5A

-Q4 /34.F4

-Q5 /34.F5

-Q6 /35.F3

-Q7 /35.F4

/2.D2 480V:L1 +UH01-QB1:2
/2.D2 480V:L2 +UH01-QB1:4
/2.D2 480V:L3 +UH01-QB1:6

-X10 1 2 3 PE

-X10 4 5 6 PE

-X10 7 8 9 PE

-X10 10 11 12 PE

-WD26 BN BK GY GNYE

-WD27 BN BK GY GNYE

-WD28 BN BK GY GNYE,GNYE,GNYE

-WD29 BN BK GY GNYE,GNYE,GNYE

EMC

=HPUBR01 -MA1
HPU Motor
3kW
6,5A
400V/50Hz

=HPUBR01 -MA2
HPU Motor
3kW
6,5A
400V/50Hz

=HPUGC01 -MA1
HPU Motor
1,5kW
3,5A
400V/50Hz

=HPUGC01 -MA2
HPU Motor
1,5kW
3,5A
400V/50Hz

				Date	17/11-2021
				User	GSK
	AS BUILT	19.08.2022	SS	Approved	RAJ
Status	Change	Date	Name	Standard	

CNP Freire
MBari

Version	Index	Repl. by

MACGREGOR

Main VFD Cabinet Pentagon
Pentagon Control Cabinet
Main Power Connections

400092375

=WCS01
+UH03

10070-01 CC

Rev. G

Sheet 25
Next 26

Control Power 230V

230V Control Distribution

Cabinet Cooling

Cabinet Light

Service Socket

/8.A8 230V:L2
/8.A8 230V:L1

230V:L2 /28.A1
230V:L1 /28.A1

-X5 L1 L1 L1 L2 L2 L2

-FC5 1 3 2 4
C16A

-BT2 °C 1 2

-EA1 L1 L2

-XD1 L N
Service PC Only

-PE1 X1 Yellow 240V AC X2
Control Power

-EC2 L N PE

-X2 1 2 PE 3 4 PE 5 6 PE 7 8 PE

EMC

-WDS3 1 2 GNYE
230V/AC:L1=SHIP+Power-X3:1
230V/AC:L2=SHIP+Power-X3:2
PE =SHIP+Power-X3:PE
00/1.E5
00/1.E5
00/1.E5

-WD30 1 2 GNYE
230V/L2 =WP03+WP03-X1:1
230V/L1 =WP03+WP03-X1:2
PE =WP03+WP03-X1:PE
19/1.E3
19/1.E3
19/1.E3

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Pentagon Control Cabinet 230V Distribution, Cabinet Cooling	400092375	=WCS01	
	Added WP03 connections	21.11.2022	ANP	User	GSK					+UH03	
	AS BUILT	19.08.2022	SS	Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by	10070-01 CC	Rev. G	Sheet 26 Next 27

Heating Supply

Cabinet Heating

Panel Heating WP01

Panel Heating WP02

Panel Heating WP03

/17.A8 HT230:L1

/17.A8 HT230:L2

-X6 L1 L1 L1 L2 L2 L2

-FC6 1 3 2 4

C16A

-PF2 X1 Yellow 240V AC X2

Heating

-BT3 °C 1 2

+UH01 -EB1 L1 L2 Heater

-EB2 L1 L2 Heater

+UH01-K20:11 HT230:L1 /47.A1

+UH01-K20:21 HT230:L2 /47.A1

-X3 1 2 PE

-WDS2 1 2 GNYE

HT230:L1 =SHIP+Power-X4:1

HT230:L2 =SHIP+Power-X4:2

PE =SHIP+Power-X4:PE

00/1.E6 00/1.E6 00/1.E6

-X302 1 3 5 2 4 6 PE

Glass Fuse 5x20mm 1A

EMC

-WD20 -WD21 -WD31

HT230:L1 =WP01+WP01-X300:1

HT230:L2 =WP01+WP01-X300:2

PE =WP01+WP01-X300:PE

HT230:L1 =WP02+WP02-X300:1

HT230:L2 =WP02+WP02-X300:2

PE =WP02+WP02-X300:PE

HT230:L1 =WP03+WP03-X300:1

HT230:L2 =WP03+WP03-X300:2

PE =WP03+WP03-X300:PE

06/1.E8 06/1.E8 06/1.E8 07/1.E8 07/1.E8 07/1.E8 19/1.E1 19/1.E1 19/1.E1

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Pentagon Control Cabinet Heating Distribution, Cabinet Heating Control Panel Heating	400092375	=WCS01
	Added WP03 connections	21.11.2022	ANP	User	GSK					+UH03
	AS BUILT	19.08.2022	SS	Approved	RAJ				10070-01 CC	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 27 / Next 28

24V Control Power
PLC Controller

24V Control Power
I/O & Components

/26.A8 230V:L2
/26.A8 230V:L1

-TA12:L 230V:L2 /29.A1
-TA12:N 230V:L1 /29.A1

-TA10
L N GND
230VAC / 24VDC
ETH
10A
V+ V-

-XG1

-KF1 -KF14

PLC	
/31.A1	/32.B1
Coupler Supply	E-Bus Supply
+ -	1 +24V 5 0V

-FB1
Isolation Guard
12-48V DC
IN Out
+ - + -
1 2 3 4 5
+UH02
PE

-K19
A1
A2
/28.F4

-KF3

Pentagon Control Cabinet
Ground Fault 24V DC
/31.B3
I8
8

-K19 12 14 11
/28.F4

-TA11
L N GND
230VAC / 24VDC
ETH
20A
V+ V-

-XG2

-KF1 -KF20 -KF14

PLC		
/31.A1	/32.D4	/32.B1
Power Contacts	Power supply	Power Contacts
+ 24V 0V PE	4` + 3` -	2 +24V 3 0V 4 PE

24V.XG1 /30.A1
0V /30.A1

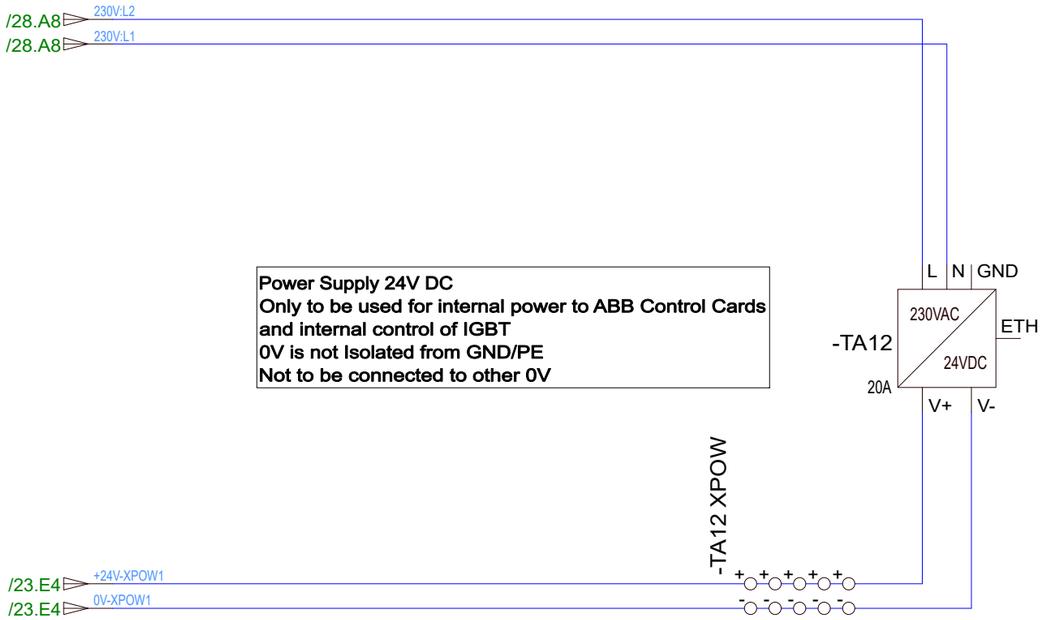
/23.A8 24VDC
/23.A8 0V

24VDC /33.A1
0V /33.A1

-K19
/28.C4
/28.C5
11 12 14
21 22 24

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Pentagon Control Cabinet 24V Power Supply	400092375	=WCS01
				User	GSK					+UH03
	AS BUILT	19.08.2022	SS	Approved	RAJ					
Status	Change	Date	Name	Standard		Version	Index	Repl. by	10070-01 CC	Rev. G / Sheet 28 / Next 29

AD7C40B1747540CBF652D56B6311BE9



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Pentagon Control Cabinet VFD Controlcard Powersupply	400092375	=WCS01 +UH03	
	AS BUILT	19.08.2022	SS	User	GSK						
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-01 CC Rev. G	Sheet 29 Next 30

AD7C40B1747540CBF652D56B6311BE9

/28.C3 24V.XG1
/28.C3 0V

-XF1
CU2508
X1 X2 X3 X4 X5 X6 X7 X8 X9
+ - PE

-XF2
FL SWITCH 1008N
1 2 3 4 5 6 7 8
24V 0V

-XF3
eWON Cosy 131
1 2 3 4 USB
+ -

/31.B3 EtherCAT -KF1:X001 -WF9 Patch Cord 1.5M Cat.6 SFTP
/5.E6 EtherCAT +UH01-TA1.KF1:X1 -WF1 Patch Cord 1.5M Cat.6 SFTP
/22.D8 EtherCAT +UH02-TA7.KF1:X2 -WF8 Patch Cord 1.5M Cat.6 SFTP
-WF10 Patch Cord 1.5M Cat.6 SFTP
/31.C3 Ethernet -KF1:X000 -WF12 Patch Cord 1.5M Cat.6 SFTP
-WF13 Patch Cord 1.5M Cat.6 SFTP

Pair	T568B	Pin
2	Orange/White	1
2	Orange	2
3	Green/White	3
1	Blue	4
1	Blue/White	5
3	Green	6
4	Brown/White	7
4	Brown	8
Screen	Screen	S

Patch Cord 1.5M Cat.6 SFTP

EtherCAT -RJ1 RJ 45 Module -WF13
=A-FRAME STERN+B11-X915:5 WHBU
=A-FRAME STERN+B11-X914:4 BU
=A-FRAME STERN+B11-X911:1 WHOR
=A-FRAME STERN+B11-X912:2 OR
=A-FRAME STERN+B11-X913:3 WHGN
=A-FRAME STERN+B11-X916:6 GN
=A-FRAME STERN+B11-X917:7 WHBN
=A-FRAME STERN+B11-X918:8 BN
ETH5 ETH4 ETH1 ETH2 ETH3 ETH6 ETH7 ETH8
18/1.E1 18/1.E1 18/1.E1 18/1.E2 18/1.E2 18/1.E2 18/1.E2 18/1.E2

EtherCAT -RJ2 RJ 45 Module -WF11 -WF15
=WP03+WP03-RJ2:5 WHBU
=WP03+WP03-RJ2:4 BU
=WP03+WP03-RJ2:1 WHOR
=WP03+WP03-RJ2:2 OR
=WP03+WP03-RJ2:3 WHGN
=WP03+WP03-RJ2:6 GN
=WP03+WP03-RJ2:7 WHBN
=WP03+WP03-RJ2:8 BN
ETH5 ETH4 ETH1 ETH2 ETH3 ETH6 ETH7 ETH8
19/2.E7 19/2.E8 19/2.E8 19/2.E8 19/2.E8 19/2.E8 19/2.E8 19/2.E8

-RJ8 RJ 45 Module -WF19 -WF14
=WP03+WP03-RJ1:5 WHBU
=WP03+WP03-RJ1:4 BU
=WP03+WP03-RJ1:1 WHOR
=WP03+WP03-RJ1:2 OR
=WP03+WP03-RJ1:3 WHGN
=WP03+WP03-RJ1:6 GN
=WP03+WP03-RJ1:7 WHBN
=WP03+WP03-RJ1:8 BN
ETH5 ETH4 ETH1 ETH2 ETH3 ETH6 ETH7 ETH8
19/2.E6 19/2.E6 19/2.E6 19/2.E6 19/2.E6 19/2.E6 19/2.E6 19/2.E6

Ethernet -RJ3 RJ 45 Module -WF14 -WF2
=CP01+CP01-XG3:5 WHBU
=CP01+CP01-XG3:4 BU
=CP01+CP01-XG3:1 WHOR
=CP01+CP01-XG3:2 OR
=CP01+CP01-XG3:3 WHGN
=CP01+CP01-XG3:6 GN
=CP01+CP01-XG3:7 WHBN
=CP01+CP01-XG3:8 BN
ETH5 ETH4 ETH1 ETH2 ETH3 ETH6 ETH7 ETH8
08/1.E5 08/1.E5 08/1.E5 08/1.E5 08/1.E5 08/1.E5 08/1.E5 08/1.E5

Ethernet -RJ4 RJ 45 Module -WF15 -WF3
=CP01+CP01-XG4:5 WHBU
=CP01+CP01-XG4:4 BU
=CP01+CP01-XG4:1 WHOR
=CP01+CP01-XG4:2 OR
=CP01+CP01-XG4:3 WHGN
=CP01+CP01-XG4:6 GN
=CP01+CP01-XG4:7 WHBN
=CP01+CP01-XG4:8 BN
ETH5 ETH4 ETH1 ETH2 ETH3 ETH6 ETH7 ETH8
08/1.E6 08/1.E6 08/1.E6 08/1.E6 08/1.E6 08/1.E6 08/1.E6 08/1.E6

-RJ9 RJ 45 Module -WF20 -WFS2
=SHIP+Signal-X5:1 WHBU
=SHIP+Signal-X5:2 BU
=SHIP+Signal-X5:3 WHOR
=SHIP+Signal-X5:4 OR
=SHIP+Signal-X5:5 WHGN
=SHIP+Signal-X5:6 GN
=SHIP+Signal-X5:7 WHBN
=SHIP+Signal-X5:8 BN
ETH5 ETH4 ETH1 ETH2 ETH3 ETH6 ETH7 ETH8
00/2.E7 00/2.E7 00/2.E7 00/2.E8 00/2.E8 00/2.E8 00/2.E8 00/2.E8

Ethernet -RJ5 RJ 45 Module -WF16 -WF6
=CP03+CP03-XG3:5 WHBU
=CP03+CP03-XG3:4 BU
=CP03+CP03-XG3:1 WHOR
=CP03+CP03-XG3:2 OR
=CP03+CP03-XG3:3 WHGN
=CP03+CP03-XG3:6 GN
=CP03+CP03-XG3:7 WHBN
=CP03+CP03-XG3:8 BN
ETH5 ETH4 ETH1 ETH2 ETH3 ETH6 ETH7 ETH8
10/1.E5 10/1.E5 10/1.E5 10/1.E5 10/1.E5 10/1.E5 10/1.E5 10/1.E5

Ethernet -RJ6 RJ 45 Module -WF17 -WF7
=CP03+CP03-XG4:5 WHBU
=CP03+CP03-XG4:4 BU
=CP03+CP03-XG4:1 WHOR
=CP03+CP03-XG4:2 OR
=CP03+CP03-XG4:3 WHGN
=CP03+CP03-XG4:6 GN
=CP03+CP03-XG4:7 WHBN
=CP03+CP03-XG4:8 BN
ETH5 ETH4 ETH1 ETH2 ETH3 ETH6 ETH7 ETH8
10/1.E6 10/1.E6 10/1.E6 10/1.E6 10/1.E6 10/1.E6 10/1.E6 10/1.E6

Ethernet Internet -RJ7 RJ 45 Module -WF18 -WFS1
=SHIP+Signal-X4:1 WHBU
=SHIP+Signal-X4:2 BU
=SHIP+Signal-X4:3 WHOR
=SHIP+Signal-X4:4 OR
=SHIP+Signal-X4:5 WHGN
=SHIP+Signal-X4:6 GN
=SHIP+Signal-X4:7 WHBN
=SHIP+Signal-X4:8 BN
ETH5 ETH4 ETH1 ETH2 ETH3 ETH6 ETH7 ETH8
00/2.E6 00/2.E6 00/2.E6 00/2.E6 00/2.E6 00/2.E6 00/2.E7 00/2.E7

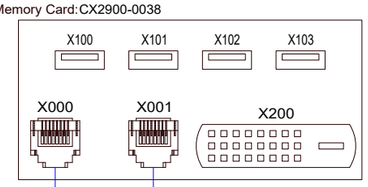
			Date	17/11-2021	CNP Freire MBari
	ETH Switch & Added WP03 conn.	21.11.2022	User	GSK	MACGREGOR
	AS BUILT	19.08.2022	Approved	RAJ	Main VFD Cabinet Pentagon Pentagon Control Cabinet Network and Switches
Status	Change	Date	Standard		400092375
			Version	Index / Repl. by	=WCS01 / +UH03
					10070-01 CC Rev. G
					Sheet 30 / Next 31

-KF1

CX5230-0175

Coupler Supply	Power Contacts	Power Contacts
/28.B2	/28.B6	

Memory Card: CX2900-0038



-KF2 -KF3

EL6070

License key terminal

TC1200-0240
TF6020-0240
TF6221-0240

-KF3

EL1008

8 Digital Inputs

	DI	Ref	Adress	Description
	I1	/34.B2		Brake HPU 1
	I2	/34.B2		Brake HPU 1
	I3	/34.B3		Brake HPU 1
	I4	/35.B1		Oil Level
	I5	/35.B2		Oil Temp
	I6	/35.B2		Oil Filter Alarm 1
	I7	/35.B3		Oil Filter Alarm 2
	I8	/28.B5		Ground Fault 24V DC

-KF4

EL1008

8 Digital Inputs

DI	Ref	Adress	Description
I1	/42.B2		Safer Input
I2	/42.B5		Storage Drum 1 Select
I3	/42.B5		Safer Input
I4	/42.B8		Spool L
I5	/42.B8		Spool R
I6	/43.B2		Safer Input
I7	/43.B5		Spool L
I8	/43.B5		Spool R

-KF5

EL1008

8 Digital Inputs

DI	Ref	Adress	Description
I1	/38.B2		End Sensor Drive
I2	/38.B2		End Sensor Bearing
I3	/38.B3		Counting Sensor 1
I4	/38.B3		Counting Sensor 2
I5	/38.B4		SWC Limit 1
I6	/38.B4		SWC Limit 2
I7	/43.B6		Launch & Recovery
I8			

-KF6

EL1008

8 Digital Inputs

DI	Ref	Adress	Description
I1	/39.B2		End Sensor Drive
I2	/39.B2		End Sensor Bearing
I3	/39.B3		Counting Sensor 1
I4	/39.B3		Counting Sensor 2
I5			
I6			
I7			
I8			

-WF9 Patch Cord 1.5M Cat.6 SFTP -XF1:X9 EtherCAT /30.B1

-WF12 Patch Cord 1.5M Cat.6 SFTP -XF2:1 Ethernet /30.B4

-KF7

EL3255

5-Ch Input Potentiometer

A-In	Ref	Adress	Description
Pot 1	/42.B2		Joystick
Pot 2	/42.B6		Joystick
Pot 3	/43.B2		Joystick
Pot 4			
Pot 5			

-KF8

EL3058

8 Analog Inputs 4-20mA

A-In	Ref	Adress	Description
I1	/34.B3		Brake HPU 1
I2	/36.B2		Gear Temp 1
I3	/36.B2		Gear Temp 2
I4	/37.B2		GearTemp 1
I5	/37.B3		GearTemp 1
I6			
I7			
I8			

-KF9

EL3058

8 Analog Inputs 4-20mA

A-In	Ref	Adress	Description
I1	/38.B2		Follow Up Sensor
I2	/38.B4		String Sensor
I3	/38.B5		Pressure Transmitter
I4	/39.B2		Follow Up Sensor
I5	/39.B4		Load Cell
I6	/40.B2		Load Cell
I7			
I8			

-KF10

EL2008

8 Digital Outputs

Outputs	Ref	Adress	Description
Out 1	/34.B4		Brake HPU 1
Out 2	/34.B5		Brake HPU 1
Out 3	/35.B4		Gear Cooling Start M1
Out 4	/35.B4		Gear Cooling Start M2
Out 5	/35.B5		Water Cooling Valve
Out 6	/36.B7		Brake Lift Inhibit
Out 7	/43.B6		Launch & Rec. IND
Out 8			

-KF11

EL2008

8 Digital Outputs

Outputs	Ref	Adress	Description
Out 1	/42.B2		Active
Out 2	/42.B3		In Control
Out 3	/42.B3		alarm
Out 4	/42.B4		Emergency Stop Light
Out 5	/42.B6		Active
Out 6	/42.B7		In Control
Out 7	/42.B7		alarm
Out 8	/43.B4		Emergency Stop Light

-KF12

EL2008

8 Digital Outputs

Outputs	Ref	Adress	Description
Out 1	/43.B2		Active
Out 2	/43.B3		In Control
Out 3	/43.B3		alarm
Out 4	/46.B2		Emergency Stop Light
Out 5	/46.B4		Emergency Stop Light
Out 6	/46.B5		Emergency Stop Light
Out 7			
Out 8			

-KF13

EL2624

4 Relay Outputs

Outputs	Ref	Adress	Description
Out 1	/45.B1		System Active
Out 2	/45.B7		Critical Alarm
Out 3	/45.B7		None Critical Alarm
Out 4			

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Pentagon Control Cabinet PLC & I/Os	400092375	=WCS01
				User	GSK					+UH03
	AS BUILT	19.08.2022	SS	Approved	RAJ				10070-01 CC	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 31 / Next 32

AD7C40B1747540CBF652D56B6311BE9

-KF14 EL9410

E-Bus Supply
/28.B2

Power Contacts
/28.B7

-KF15 EL2535-0002

2 PWM Outputs

I/O	Ref	Adress	Description
PWM 1	/38.B6		SWC Valve
PWM 2			
I1			
I2			

-KF16 EL4024

4-ch analog out 4…20 mA

Outputs	Ref	Adress	Description
Output 1	/45.B2		Actual Power
Output 2			
Output 3			
Output 4			

-KF17 EL3054

4 Analog Inputs 4-20mA

A-In	Ref	Adress	Description
I1	/45.B2		Power Available
I2	/45.B3		Regeneration Limit
I3			
I4			

-KF18 EL1918

8xDI TwinSAFE

Adress	

I/O	Ref	Adress	Description
I1	/42.B4		Emergency Stop
I2	/42.B4		Emergency Stop
I3	/43.B4		Emergency Stop
I4	/43.B4		Emergency Stop
I5			Emergency Stop
I6			Emergency Stop
I7			Emergency Stop
I8			Emergency Stop

-KF19 EL1918

8xDI TwinSAFE

Adress	

I/O	Ref	Adress	Description
I1	/46.B1		Emergency Stop
I2	/46.B2		Emergency Stop
I3	/46.B3		Emergency Stop
I4	/46.B3		Emergency Stop
I5	/46.B5		Emergency Stop
I6	/46.B5		Emergency Stop
I7			Emergency Stop
I8			Emergency Stop

-KF20 EL2911

4xDI, 1xOut TwinSAFE

Adress	

I/O	Ref	Adress	Description
I1			
I2			
I3			
I4			
Power supply	/28.B7		
Power supply			
Safe Output 1			
Safe Output 1	/41.B4		Emergency Stop

-KF21 EL6751

CANopen

I/O	Ref	Adress	Description
CAN D-sub	/33.B2		CAN BUS

-KF22

Bus End Cover

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Pentagon Control Cabinet PLC & I/Os	400092375	=WCS01
				User	GSK					+UH03
	AS BUILT	19.08.2022	SS	Approved	RAJ				10070-01 CC	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 32 / Next 33

AD7C40B1747540CBF652D56B6311BE9

/28.C8 24VDC
/28.C8 0V

24VDC /34.A1
0V /34.A1

-KF21

CAN BUS

/32.C5

CAN D-sub

X1 2 CAN- 3 Ground 6 Ground 7 CAN+

-X50 1 2 3 4 5

-WF1 BK BU Shield WH RD

=CP01+CP01-X50:1 0V
=CP01+CP01-X50:2 Can.L
=CP01+CP01-X50:3 Can.Gnd
=CP01+CP01-X50:4 Can.H
=CP01+CP01-X50:5 24VDC

08/2.E6
08/2.E6
08/2.E6
08/2.E6
08/2.E7

EMC

-WF5 BK BU Shield WH RD

=CP03+CP03-X50:1 0V
=CP03+CP03-X50:2 Can.L
=CP03+CP03-X50:3 Can.Gnd
=CP03+CP03-X50:4 Can.H
=CP03+CP03-X50:5 24VDC

10/2.E6
10/2.E6
10/2.E6
10/2.E6
10/2.E7

EMC

				Date	17/11-2021	CNP Freire MBari		Main VFD Cabinet Pentagon CAN Bus Connection	400092375	=WCS01	
				User	GSK					+UH03	
	AS BUILT	19.08.2022	SS	Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by	10070-01 CC	Rev. G	Sheet 33 / Next 34

Brake HPU 1
Oil Level, Oil Temp, Pressostat, Pressure Transmitter

Brake HPU 1
Motor 1

Brake HPU 1
Motor 2

/33.A8 24VDC
/33.A8 0V

24VDC /35.A1
0V /35.A1

-KF3	-KF3	-KF3	-KF8
Oil Level	High Oil Temp	Pressostat	Pressure Transmitter
Brake HPU 1	Brake HPU 1	Brake HPU 1	Brake HPU 1
/31.B3	/31.B3	/31.B3	/31.C2
I1	I2	I3	I1
1	5	2	1

-KF10	-KF10
Motor 1 Start	Motor 2 Start
Brake HPU 1	Brake HPU 1
/31.C5	/31.C5
Out 1	Out 2
1	5

-K17 12 14
/41.E2 11

Emergecy Control Pump Start

-Q4 A1
/34.F4 A2

-Q5 A1
/34.F5 A2

-X30 1 Glass Fuse 5x20mm 3.15A
2 PE 3 4 PE 5 6 PE
EMC

-WG24 WH =HPUBR01+UC01-X1:1 24VDC 16/1.E2
BN =HPUBR01+UC01-X1:2 0V 16/1.E2
GN =HPUBR01+UC01-X1:3 Level 16/1.E2
YE =HPUBR01+UC01-X1:4 Temp 16/1.E2
GY =HPUBR01+UC01-X1:5 Pressostat 16/1.E3
PK =HPUBR01+UC01-X1:6 A In 16/1.E3

-Q4
/34.C4
/25.C2
1 2
3 4
5 6
13 14

-Q5
/34.C5
/25.C3
1 2
3 4
5 6
13 14

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Pentagon Control Cabinet Brake HPU 1	400092375	=WCS01 +UH03
	AS BUILT	19.08.2022	SS	User	GSK					
Status	Change	Date	Name	Approved	RAJ				10070-01 CC	Rev. G
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Gear Cooling HPU
Oil Level, Oil Temp, Oil Filter

Gear Cooling HPU
Water Valve / Cooling Signal

/34.A8 24VDC
/34.A8 0V

24VDC /36.A1
0V /36.A1

-KF3	-KF3	-KF3	-KF3
Gear Cooling	Gear Cooling	Gear Cooling	Gear Cooling
Oil Level	Oil Temp	Oil Filter Alarm 1	Oil Filter Alarm 2
/31.B3	/31.B3	/31.B3	/31.B3
I4	I5	I6	I7
6	3	7	4

-KF10	-KF10	-KF10
Gear Cooling	Gear Cooling	Gear Cooling
Gear Cooling Start M1	Gear Cooling Start M2	Water Cooling Valve
/31.D5	/31.D5	/31.D5
Out 3	Out 4	Out 5
2	6	3

-Q6 A1 /35.F4 A2
-Q7 A1 /35.F4 A2
-K18 A1 /35.F5 A2

/35.F5 -K18 11 12 14

-K18 22 24 /35.F5 21

-X31 1 Glass Fuse 5x20mm 3.15A 2 PE 3 4 PE 5 6 PE EMC

-X80 1 Glass Fuse 5x20mm 3.15A 2 PE 3 4 PE EMC

-WG25 WH =HPUGC01+UC01-X1:1 24VDC 17/1.E2
BN =HPUGC01+UC01-X1:2 Level 17/1.E2
GN =HPUGC01+UC01-X1:3 Temp 17/1.E2
YE =HPUGC01+UC01-X1:4 Filter Ind 17/1.E3
GY =HPUGC01+UC01-X1:5 Filter Ind 17/1.E3

-WGS2 WH =SHIP+Signal-X3:1 CoolCtrl 00/2.E5
BN =SHIP+Signal-X3:2 CoolCtrl 00/2.E5

-Q6 /35.C4	-Q7 /35.C4	-K18 /35.C5
/25.C3	/25.C4	/35.B7
1 2	1 2	11 12
3 4	3 4	14
5 6	5 6	22
13 14	13 14	21 24
		/35.B8

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Pentagon Control Cabinet Gear Cooling HPU	400092375	=WCS01 +UH03
				User	GSK					
	AS BUILT	19.08.2022	SS	Approved	RAJ				10070-01 CC	Rev. G
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/35.A8 24VDC
/35.A8 0V

24VDC /37.A1
0V /37.A1

-KF8	-KF8
Traction Winch	Traction Winch
Gear Temp 1	Gear Temp 2
/31.C2	/31.D2
I2	I3
5	2

-KF10
Traction Winch
Brake Lift Inhibit
/31.D5
Out 6
7

/23.D6 BrakeInhibit +UH02-K10:A1

-X100 1 Glass Fuse 5x20mm 3.15A
2 PE
3
4 PE
EMC

-WG6
WH =TRW01+UC01-X1:1 24VDC 03/1.E1
BN =TRW01+UC01-X1:2 0V 03/1.E1
GN =TRW01+UC01-X1:5 Temp 03/1.E2
YE =TRW01+UC01-X1:9 Temp 03/1.E2

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Pentagon Control Cabinet Gear Temp, Brake Inhibit, Traction Winch	400092375	=WCS01
				User	GSK					+UH03
	AS BUILT	19.08.2022	SS	Approved	RAJ					
Status	Change	Date	Name	Standard		Version / Index / Repl. by			10070-01 CC	Rev. G
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/36.A8 24VDC
/36.A8 0V

24VDC /38.A1
0V /38.A1

-KF8
Storage Drum
GearTemp 1
/31.D2
I4
6

-KF8
CTD Winch
GearTemp 1
/31.D2
I5
3

-X101 1 Glass Fuse 5x20mm 3.15A
2 PE
3
4 PE
EMC

-X102 1 Glass Fuse 5x20mm 3.15A
2 PE
3
4 PE

-WG13 WH =RW01+UC1-X1:1 24VDC 05/1.E2
BN =RW01+UC1-X1:2 0V 05/1.E2
GN =RW01+UC1-X1:3 Temp 05/1.E2
YE =RW01+UC1-X1:4 Spare 05/1.E2

=HW01+UC01-X1:29 Temp 02/1.E6

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Pentagon Control Cabinet Gear Temp Storage Drum & CDT Winch	400092375	=WCS01 +UH03
	AS BUILT	19.08.2022	SS	User	GSK					
				Approved	RAJ				10070-01 CC	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 37 Next 38

/37.A8 24VDC
/37.A8 0V

24VDC /39.A1
0V /39.A1

-KF5	-KF5	-KF9	-KF5	-KF5	-KF5	-KF5	-KF9	-KF9
Storage Drum Levelwind	Storage Drum Levelwind	Storage Drum Levelwind	Storage Drum Levelwind	Storage Drum Levelwind	Storage Drum Levelwind	Storage Drum Levelwind	Storage Drum Levelwind	Storage Drum Levelwind
End Sensor Drive	End Sensor Bearing	Follow Up Sensor	Counting Sensor 1	Counting Sensor 2	SWC Limit 1	SWC Limit 2	String Sensor	Pressure Transmitter
/31.B5	/31.B5	/31.C4	/31.B5	/31.B5	/31.B5	/31.B5	/31.C4	/31.D4
I1	I2	I1	I3	I4	I5	I6	I2	I3
1	5	1	2	6	3	7	5	2

-KF15
Storage Drum Levelwind
SWC Valve
/32.B2
PWM 1
1 A1
5 A2
3 GND

-X103
1 Glass Fuse 5x20mm 3.15A
2 PE 3 4 PE 5 6 PE 7 8 PE 9 10 PE 11 12 PE
EMC

-WG11
WH =LEV01+UC01-X1:1 24VDC 04/1.E1
BN =LEV01+UC01-X1:2 0V 04/1.E1
GN =LEV01+UC01-X1:4 End Sensor 04/1.E1
YE =LEV01+UC01-X1:18 End Sensor 04/1.E2
GY =LEV01+UC01-X1:12 Follow Up 04/1.E3
PK =LEV01+UC01-X1:18 Counting 1 04/1.E3
BU =LEV01+UC01-X1:22 Counting 2 04/1.E4
RD =LEV01+UC01-X1:24 SWC Limit 04/1.E5
BK =LEV01+UC01-X1:28 SWC Limit 04/1.E5
VT =LEV01+UC01-X1:33 Sting 04/1.E6
GYPK =LEV01+UC01-X1:36 Pressure 04/1.E7

-X202
1 2 PE
EMC

-WD13
1 =LEV01+UC01-X2:1 +24V 04/1.E8
2 =LEV01+UC01-X2:2 0V 04/1.E8
GNYE =LEV01+UC01-X2:PE PE 04/1.E8

				Date	17/11-2021	CNP Freire	MACGREGOR	Main VFD Cabinet Pentagon	400092375	=WCS01	
				User	GSK	MBari		Pentagon Control Cabinet		+UH03	
	AS BUILT	19.08.2022	SS	Approved	RAJ			Storage Drum, Levelwinde / SWC Sensors			
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-01 CC	Rev. G

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/38.A8 24VDC
/38.A8 0V

24VDC /40.A1
0V /40.A1

-KF6	-KF6	-KF9	-KF6	-KF6	-KF9
CTD Winch Levelwinde	CTD Winch Levelwinde	CTD Winch Levelwinde	CTD Winch Levelwinde	CTD Winch Levelwinde	CTD Winch Levelwinde
End Sensor Drive	End Sensor Bearing	Follow Up Sensor	Counting Sensor 1	Counting Sensor 2	Load Cell
/31.B6	/31.B6	/31.D4	/31.B6	/31.B6	/31.D4
I1	I2	I4	I3	I4	I5
1	5	6	2	6	3

-X104 1 Glass Fuse 5x20mm 3.15A 2 PE 3 4 PE 5 6 PE 7 8 PE

EMC

-WG1 WH =HW01+UC01-X1:1 24VDC 02/1.E1
BN =HW01+UC01-X1:2 0V 02/1.E1
GN =HW01+UC01-X1:4 End Sensor 02/1.E1
YE =HW01+UC01-X1:8 End Sensor 02/1.E2
GY =HW01+UC01-X1:12 Follow Up 02/1.E3
PK =HW01+UC01-X1:18 Counting 1 02/1.E4
BU =HW01+UC01-X1:22 Counting 2 02/1.F4
RD =HW01+UC01-X1:24 Loadcell 02/1.E5

				Date	17/11-2021	CNP Freire	MACGREGOR	Main VFD Cabinet Pentagon	400092375	=WCS01	
				User	GSK	MBari		Pentagon Control Cabinet		+UH03	
	AS BUILT	19.08.2022	SS	Approved	RAJ			CTD Winch, Levelwinde Sensors			
Status	Change	Date	Name	Standard		Version	Index	Repl. by	10070-01 CC	Rev. G	Sheet 39 / Next 40

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/39.A8 24VDC
/39.A8 0V

24VDC /41.A1
0V /41.A1

-KF9

Deck Sheave TRW
Load Cell
/31.D4
I6

7

-X105 1 Glass Fuse 5x20mm 3.15A
2
PE
3
4
PE

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Pentagon Control Cabinet Deck Sheave, Traction Winch System Load Cell	400092375		=WCS01
				User	GSK						+UH03
	AS BUILT	19.08.2022	SS	Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-01 CC	Rev. G	Sheet 40 / Next 41

Emergency Control Internal

Emergency Stop

/40.A8 24VDC

/40.A8 0V

24VDC /42.A1

0V /42.A1

-KF20

AUX / Pentagon Cabinet
Emergency Stop
/32.D4
Safe Output 1
+ -

6 7

/23.D7 EM.Stop

-SF4

2 1 3

Normal / Emergency Control

/23.D8 EM.CTRL

A1

-K17

A2

/41.E2

-K17

/41.C2

/34.C4

11 12 14

21 22 24

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Pentagon Control Cabinet Emergency Control & Emergency Stop	400092375	=WCS01
				User	GSK					+UH03
	AS BUILT	19.08.2022	SS	Approved	RAJ					
Status	Change	Date	Name	Standard		Version	Index	Repl. by	10070-01 CC	Rev. G

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/41.A8 24VDC
/41.A8 0V

24VDC /43.A1
0V /43.A1

-KF4	-KF7	-KF11	-KF11	-KF11	-KF18	-KF18	-KF11	-KF4
Traction Winch	Traction Winch	Traction Winch	Traction Winch	Traction Winch	Traction Winch	Traction Winch	Traction Winch	Traction Winch
Safer Input	Joystick	Active	In Control	alarm	Emergency Stop	Emergency Stop	Emergency Stop Light	Storage Drum 1 Select
/31.B4	/31.C1	/31.C6	/31.C6	/31.D6	/32.C1	/32.C1	/31.D6	/31.B4
I1	Pot 1	Out 1	Out 2	Out 3	I1	I2	Out 4	I2
	0V Input 1 +10V				+ -	+ -		
1	1 2 9	1	5	2	1 2	9 10	6	5

-KF4	-KF7	-KF11	-KF11	-KF11	-KF4	-KF4
Storage Drum	Storage Drum	Storage Drum	Storage Drum	Storage Drum	Storage Drum LW	Storage Drum LW
Safer Input	Joystick	Active	In Control	alarm	Spool L	Spool R
/31.B4	/31.C1	/31.D6	/31.D6	/31.D6	/31.B4	/31.B4
I3	Pot 2	Out 5	Out 6	Out 7	I4	I5
	0V Input 2 +10V					
2	4 5 12	3	7	4	6	3

-X400

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

EMC

-WG17	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GYPK	RDBU	WHGN	BNGN	WHYE
	=WP02+WP02-X1:1	=WP02+WP02-X1:2	=WP02+WP02-X1:3	=WP02+WP02-X1:4	=WP02+WP02-X1:5	=WP02+WP02-X1:6	=WP02+WP02-X1:7	=WP02+WP02-X1:8	=WP02+WP02-X1:9	=WP02+WP02-X1:10	=WP02+WP02-X1:11	=WP02+WP02-X1:12	=WP02+WP02-X1:13	=WP02+WP02-X1:14	=WP02+WP02-X1:15
	24VDC	0V	Start	0V	A In	+10V	Active	In Control	Alarm	EM Loop 1	EM Loop 1	EM Loop 2	EM Loop 2	EM Light	Drum Select
	07/1.E1	07/1.E1	07/1.E2	07/1.E2	07/1.E2	07/1.E2	07/1.E3	07/1.E3	07/1.E4	07/1.E4	07/1.E5	07/1.E5	07/1.E5	07/1.E5	07/1.E5	07/1.E6

16	17	18	19	20	21	22	23	24						

EMC

-WG18	WH	BN	GN	YE	GY	PK	BU	RD	BK
	=WP02+WP02-X2:3	=WP02+WP02-X2:4	=WP02+WP02-X2:5	=WP02+WP02-X2:6	=WP02+WP02-X2:7	=WP02+WP02-X2:8	=WP02+WP02-X2:9	=WP02+WP02-X2:10	=WP02+WP02-X2:11
	Start	0V	A In	+10V	Active	In Control	Alarm	Spool L	Spool R
	07/2.E2	07/2.E2	07/2.E2	07/2.E2	07/2.E3	07/2.E3	07/2.E4	07/2.E4	07/2.E5

				Date	17/11-2021	CNP Freire	MACGREGOR
				User	GSK	MBari	
	AS BUILT	19.08.2022	SS	Approved	RAJ		
Status	Change	Date	Name	Standard		Version / Index / Repl. by	

Main VFD Cabinet Pentagon
Pentagon Control Cabinet
Control Panel, Traction Winch & Storage Drum

400092375

=WCS01
+UH03

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/42.A8 24VDC
/42.A8 0V

24VDC /44.A1
0V /44.A1

-KF4	-KF7	-KF12	-KF12	-KF12	-KF18	-KF18	-KF11
CTD Winch	CTD Winch	CTD Winch	CTD Winch	CTD Winch	CTD Winch	CTD Winch	CTD Winch
Safer Input	Joystick	Active	In Control	alarm	Emergency Stop	Emergency Stop	Emergency Stop Light
/31.B4	/31.D1	/31.E1	/31.E1	/31.E1	/32.D1	/32.D1	/31.D6
I6	Pot 3	Out 1	Out 2	Out 3	I3	I4	Out 8
	0V / Input 3 / +10V				+ -	+ -	
7	6 / 7 / 14	1	5	2	3 / 4	11 / 12	8

-KF4	-KF4
CTD Winch Levelwinde	CTD Winch Levelwinde
Spool L	Spool R
/31.B4	/31.B4
I7	I8
4	8

-KF5	-KF10
CTD Winch Levelwinde	CTD Winch Levelwinde
Launch & Recovery	Launch & Rec. IND
/31.B5	/31.D5
I7	Out 7
4	4

-X401 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

EMC

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
-WG16	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GYPK	RDBU	WHGN	BNGN	WHYE	YEBN	WHGR	GRBN
	=WPO1+WP01-X1:1	=WPO1+WP01-X1:2	=WPO1+WP01-X1:3	=WPO1+WP01-X1:4	=WPO1+WP01-X1:5	=WPO1+WP01-X1:6	=WPO1+WP01-X1:7	=WPO1+WP01-X1:8	=WPO1+WP01-X1:9	=WPO1+WP01-X1:10	=WPO1+WP01-X1:11	=WPO1+WP01-X1:12	=WPO1+WP01-X1:13	=WPO1+WP01-X1:14	=WPO1+WP01-X1:16	=WPO1+WP01-X1:15	=WPO1+WP01-X1:17	=WPO1+WP01-X1:18
	24VDC	0V	Start	0V	A In	+10V	Active	In Control	Alarm	EM Loop 1	EM Loop 1	EM Loop 2	EM Loop 2	EM Light	Spool L	Spool R	Launch&Rec	Launch&Rec
	06/1.E1	06/1.E1	06/1.E1	06/1.E2	06/1.E2	06/1.E2	06/1.E3	06/1.E3	06/1.E3	06/1.E4	06/1.E4	06/1.E5	06/1.E5	06/1.E5	06/1.E6	06/1.E5	06/1.E6	06/1.E7

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Pentagon Control Cabinet Control Panel, CTD Winch	400092375	=WCS01 +UH03
	AS BUILT	19.08.2022	SS	User	GSK					
				Approved	RAJ					
Status	Change	Date	Name	Standard		Version / Index / Repl. by			10070-01 CC	Rev. G
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ROV Control Room
Panel CP01

AFT Control Room
Panel CP03

/43.A8 24VDC
/43.A8 0V

+UH01-TA13:12 24VDC /46.A1
0V /46.A1

-X402
1 Glass Fuse 5x20mm 3.15A 2 PE
3 Glass Fuse 5x20mm 3.15A 4 PE
EMC
EMC

-WD24 1 2 GNYE
-WD25 1 2 GNYE

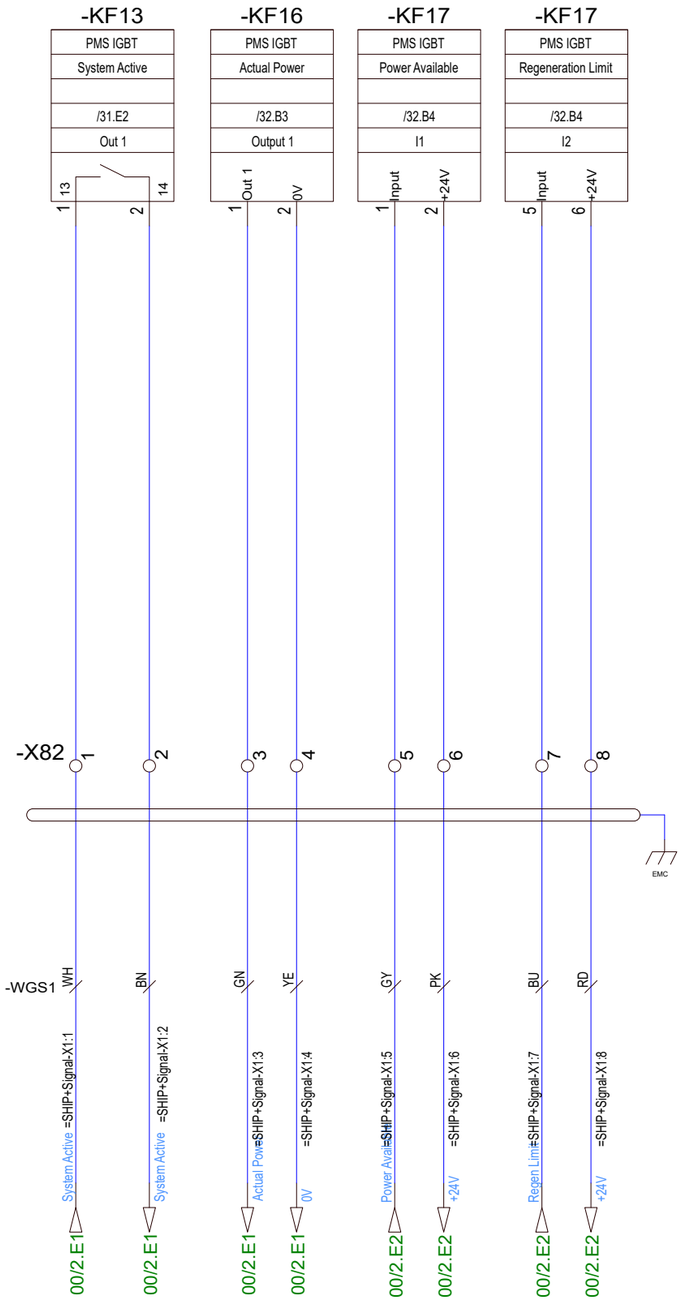
=CP01+CP01-X1:1 24VDC
=CP01+CP01-X1:2 0V
:PE PE
=CP03+CP03-X1:1 24VDC
=CP03+CP03-X1:2 0V
:PE PE

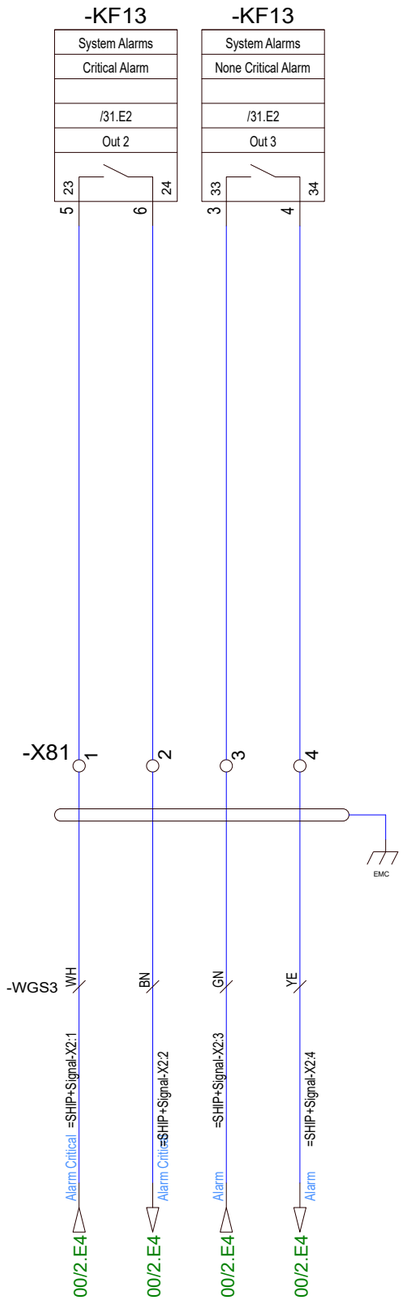
08/1.E1
08/1.E1
08/1.E2
10/1.E1
10/1.E1
10/1.E2

				Date		CNP Freire		Main VFD Cabinet Pentagon	400092375	=WCS01
				User		MBari	MACGREGOR	Pentagon Control Cabinet		+UH03
	AS BUILT	19.08.2022	SS	Approved				Control Room Panels 24VDC		
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				Date	17/11-2021	CNP Freire	MACGREGOR	Main VFD Cabinet Pentagon	400092375	=WCS01	
				User	GSK	MBari		PMS & System Alarms		+UH03	
	AS BUILT	19.08.2022	SS	Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by	10070-01 CC	Rev. G	Sheet 45 / Next 46

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/44.A8 24VDC
/44.A8 0V

+UH01-TA13:12 24VDC /47.A1
+UH01-K20:A2 0V /47.A1

-KF19	-KF19	-KF12
ROV CTRL Room Panel	ROV CTRL Room Panel	ROV CTRL Room Panel
Emergency Stop	Emergency Stop	Emergency Stop Light
/32.C3	/32.C3	/31.E1
I1	I2	Out 4
+ -	+ -	
1 2	9 10	6

-KF19	-KF19	-KF12
AFT CTRL Room Panel	AFT CTRL Room Panel	AFT CTRL Room Panel
Emergency Stop	Emergency Stop	Emergency Stop Light
/32.D3	/32.D3	/31.E1
I3	I4	Out 5
+ -	+ -	
3 4	11 12	3

-KF19	-KF19	-KF12
Spare	Spare	Spare
Emergency Stop	Emergency Stop	Emergency Stop Light
/32.D3	/32.D3	/31.E1
I5	I6	Out 6
+ -	+ -	
5 6	13 14	7

-X40: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

EMC

-WG19

WH	BN	GN	YE	GY	PK
EM.Loop 1 =CP01+CP01-X40:1	EM.Loop 1 =CP01+CP01-X40:2	EM.Loop 2 =CP01+CP01-X40:3	EM.Loop 2 =CP01+CP01-X40:4	EM.Light =CP01+CP01-X40:5	0V =CP01+CP01-X40:6
08/3.E6	08/3.E6	08/3.E6	08/3.E7	08/3.E7	08/3.E7

-WG20

WH	BN	GN	YE	GY	PK
EM.Loop 1 =CP03+CP03-X40:1	EM.Loop 1 =CP03+CP03-X40:2	EM.Loop 2 =CP03+CP03-X40:3	EM.Loop 2 =CP03+CP03-X40:4	EM.Light =CP03+CP03-X40:5	0V =CP03+CP03-X40:6
10/3.E6	10/3.E6	10/3.E6	10/3.E7	10/3.E7	10/3.E7

				Date	17/11-2021	CNP Freire MBari	MACGREGOR
				User	GSK		
	AS BUILT	19.08.2022	SS	Approved	RAJ		
Status	Change	Date	Name	Standard		Version / Index / Repl. by	

Main VFD Cabinet Pentagon
Pentagon Control Cabinet
External Emergency Stop

400092375

=WCS01
+UH03

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Motor Heating Outh Hauler

/46.A8 24VDC
/46.A8 0V
/27.A8 HT230:L1
/27.A8 HT230:L2

-TA13.KF2

Out Hauler Motor	Out Hauler Motor
/47.E5	/47.E5
Enc. Power	HTL Encoder
VCC, 0V	A+, A-, B+, B-, Z+, Z-, Shield

X81 4 5 X82 1 2 3 4 5 6 7

-TA13.KF2

Out Hauler Motor
/47.E5
PTC/KTY-84

X81 5 6

-TA13

Out Hauler Motor
Brake Lift
/47.B6
XRO1
COM, NC, NO

XRO1 12 11 13

-K20 11 12 14
-K20 21 22 24
-K20 A1 A2

-WG26 RD BU PK GY GN YE WH BN
1 +24V, 2 0V, 3 A+, 4 A-, 5 B+, 6 B-, 7 Z+, 8 Z-, 9 SHIELD
BN WH GN YE GY PK BU RD SHIELD
=OHC M ~
-MA1
Encoder Kuebler 5020
Out Hauler Motor

-WG27 WH BN
-X70 5 6
=OHC PTC1 PTC2
-MA1
Out Hauler Motor
PTC

-X300 5 Glass Fuse 5x20mm 1A 6 PE
EMC
-WD33 1 2 GNYE
EMC
=OHC H1 H2
-MA1
Heater
Out Hauler Motor

ACS880-01-02A1-5 0,75kW-2,1A -TA13

XDI	Ref
DigIn 1	
DigIn 2	
DigIn 3	
DigIn 4	
DigIn 5	
DigIn 6	

XDIO	Ref
DIO 1	
DIO 2	

XAI	Ref
+VREF	
-VREF	
AGND	
AI 1	
AI 2	

XAO	Ref
AO 1	
AO 2	

XD24	Ref
DIIL	
+24VD	
DICOM	/12.B2
+24VD	
DIOGND	

XRO 1-3	Ref
XRO1	/47.B4
XRO2	
XRO3	

XPOW	Ref
24V DC	/12.E3

XSTO	Ref
Safe Torque Off	/13.B4

XD2D	Ref
Drive To Drive Link	

Function	Jumper	Setting
A In 1	J1	V
A In 2	J2	V
D2D	J3	On
DI Com - DIOGND	J6	Split / Open

Control Panel BUS | Control Panel/ PC Connection | Control Panel BUS

X12

-TA13.PH1
DPMP-02

-TA13.KF1
FECA-01
Adress:
X1 X2

/11.D8 EtherCAT -TA3.KF1:X2
-WF4 Patch Cord 1.5M Cat.6 SFTP
+UH02-TA4.KF1:X1 EtherCAT /21.D1
-WF21 Patch Cord 1.5M Cat.6 SFTP

FEN-31

-TA13.KF2

X81	Ref
Power Latch	/12.B5
Enc. Power	/47.B1
PTC/KTY-84	/47.B2

X82	Ref
HTL Encoder	/47.B1

DIP Sw.	Pos
DIP 1	0
DIP 2	0
DIP 3	0
DIP 4	0

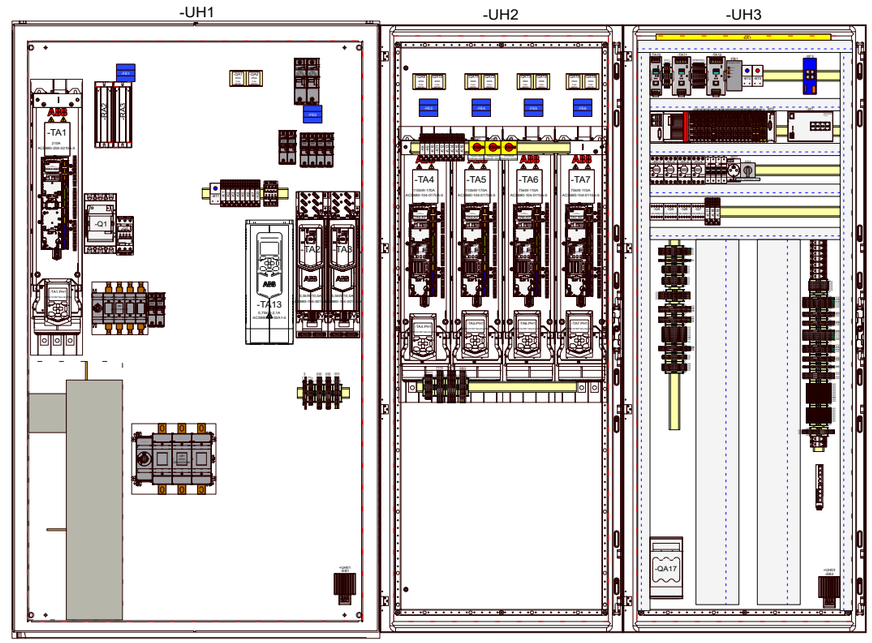
X22	Ref
TTL Encoder	

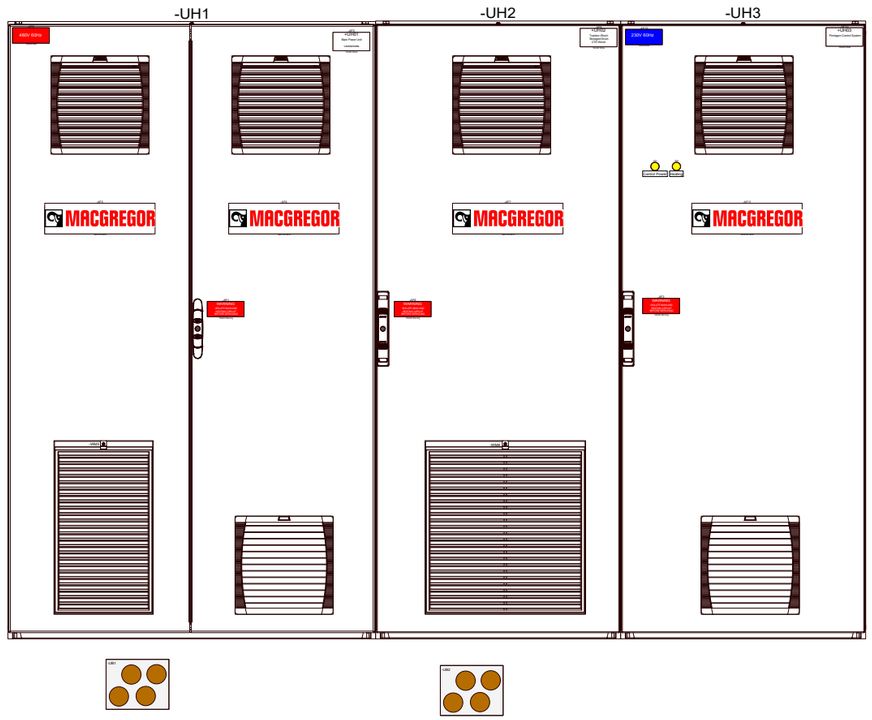
X84	Ref
Power	
Dig In 1	
Dig In 2	

Internal Pull-Up Resistor
DIP Switches
Located under plastic cover
Default position 0

				Date		CNP Freire		Main VFD Cabinet Pentagon	400092375	=WCS01	
				User		MBari	MACGREGOR	Outhauler Motor		+UH01	
				Approved				Encoder, PTC, Heat, References			
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-01 CC	Rev. G

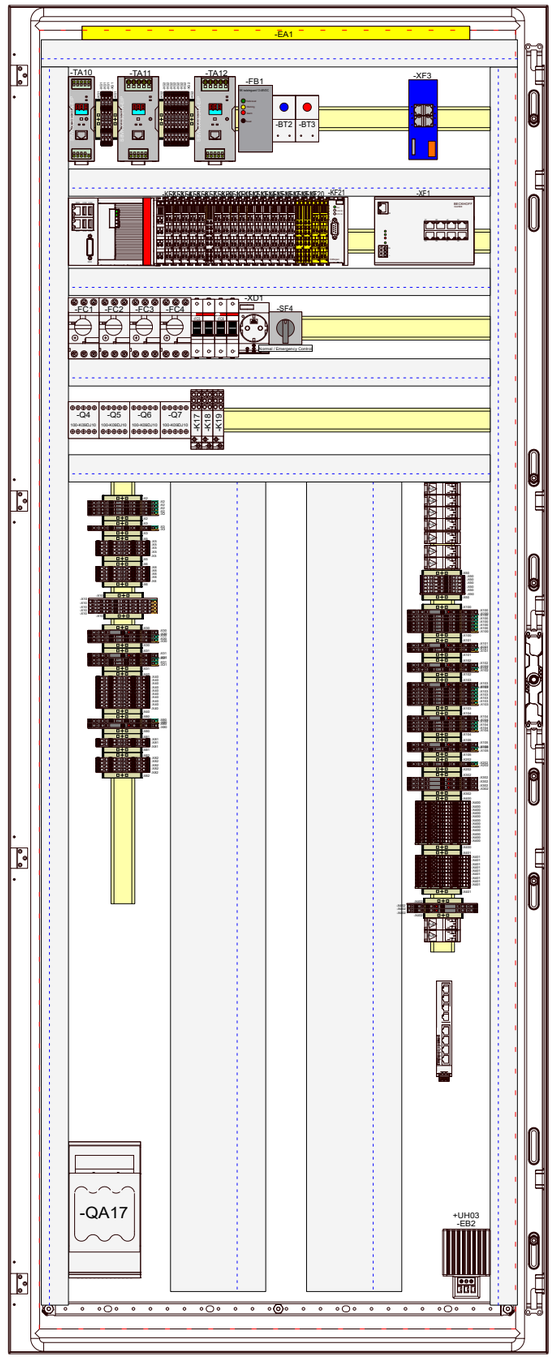
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				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Panel Layout	400092375	=WCS01	
	Added WP03 connections	21.11.2022	ANP	User	GSK						
	AS BUILT	19.08.2022	SS	Approved	RAJ				10070-01 GA	Rev. G	Sheet 1
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-UH3



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Main VFD Cabinet Pentagon Panel Layout	400092375	=WCS01	
	Added WP03 connections	21.11.2022	ANP	User	GSK						
	AS BUILT	19.08.2022	SS	Approved	RAJ				10070-01 GA	Rev. G	Sheet 2
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

AD7C40B1747540CBF652D56B6311BE9

Device ID	Device	Part Number	Qty	Unit	Description	Manufacturer	Datablad
-AF1,-AF3,-AF6	120x50 Warning	EACVA074	3	Pcs	120x50 Red Engraved Sign plate Warning		
-AF2	120x50 Red	EACVA075	1	Pcs	120x50 Red Engraved Sign plate		
-AF3..-AF4,-AF7,-AF11	360x100 MCG	RMCLOGO1	4	Pcs	360x100Macgregor Logo		
-AF5,-AF8,-AF12	120x60 White	EACVA076	3	Pcs	120x60 White Engraved Sign plate		
-AF10	120x50 Blue	EACVA082	1	Pcs	120x50 Blue Engraved Sign plate		
-BT1,-BT2	Thermostat Blue/Fan	EACHE010-2	2	Pcs	Thermostat Blue/Fan ETR 201	Eldon	ETR Thermostat.pdf
-BT3	Thermostat Red/Heating	EACHE010-1	1	Pcs	Thermostat Red/Heating ETR 202	Eldon	ETR Thermostat.pdf
-EA1	Cabinet Fluorecent Light w/Switch	EACBU0050	1	Pcs	Cabinet Cooling Fan Filter	Cenika	Cenika Cabinet Lamp. pdf
-EB1,-EB2	EHG045	EACHE0111	2	Pcs	Heater 45W	Eldon	HEG Heater.pdf
-EC1,-EC2	Eldon EF700R5 Fan	EFTRN000-009	2	Pcs	Cabinet Cooling Fan	Eldon	EF500R5.pdf
-F3.1,-F3.2	C14G16	400202703	2	Pcs	Cylindrical fuse links 690 14x51mm 16A	Bussmann	A700000006914194.pdf
-F3.1,-F3.2,-QA5..-QA8	US141	EACFU280	6	Pcs	Ultrasafe Fuse Holder 14x51mm Fuses	Ferraz Shawmut	DS-Semiconductor-Modular-Fuse-Holders-UltraSafe-US14-EN.pdf
-FB1	NK isolateguard 12-48VDC	EACAL025	1	Pcs	Isolation Guard	Omron	Brosjyre Jordfeilmonitor 490500.pdf
-FC1,-FC2	MS 132-10	ESTPA2506	2	Pcs	Manual Motor Starter 6.3-10A	ABB	ABB MS-MO Series. pdf
-FC3,-FC4	MS 132-4	ESTPA2504	2	Pcs	Manual Motor Starter 2.5-4.0A	ABB	ABB MS-MO Series. pdf
-FC5,-FC6	ABB S202-C 16A	400091945	2	Pcs	Circuit Braker 16A 2P	ABB	ABB S-Series.pdf
-FE1..-FE6	TDK Toroids	EFTRN000-0035	6	Pcs	TDK Motor Cable Chokes Di39,2mm H56,4mm	TDK	TDK Ferrit Ring.pdf
-K1..-K19	G2R-2-SNI-24VDC	EACRE039	19	Pcs	Relay	Omron	G2R-Relays.pdf
-K1..-K19	P2RF-08-PU	EACRE041	19	Pcs	Relay base	Omron	G2R-Relays.pdf
-KF1	CX2900-0038	400092258	1	Pcs	40 GB CFast card, 3D flash, extended temperature range	Beckhoff	
-KF1	CX5230-0175	ECPPEB17	1	Pcs	Basic CPU module CX5230, 2 Cores, Microsoft Windows 10 IoT Enterprise 2019 LTSC, 64 bit, TwinCAT 3 runtime (XAR), no licenses included	Beckhoff	Datasheet

				Date		CNP Freire		Main VFD Cabinet Pentagon	400092375	=WCS01	
				User		MBari	MACGREGOR	Part list			
	AS BUILT	19.08.2022	SS	Approved							
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Device ID	Device	Part Number	Qty	Unit	Description	Manufacturer	Datablad
-KF2	EL6070	400092430	1	Pcs	License key terminal	Beckhoff	Documentation
-KF2	TC1200-0240	400180043	1	Pcs	TwinCAT 3 TC3 PLC, platform 40 (Performance)	Beckhoff	
-KF2	TF6020-0240	400186110	1	Pcs	TwinCAT 3 JSON Data Interface	Beckhoff	Datasheet
-KF2	TF6220-0240	400186111	1	Pcs	TwinCAT 3 EtherCAT Redundancy 250	Beckhoff	Datasheet
-KF3..-KF6	EL1008	ECPPEB04	4	Pcs	8 Digital Inputs	Beckhoff	Datasheet
-KF7	EL3255	ECPPEB16	1	Pcs	5-Ch Input Potentiometer	Beckhoff	Datasheet
-KF8,-KF9	EL3058	ECPPEB14	2	Pcs	8 Analog Inputs 4-20mA	Beckhoff	Datasheet
-KF10..-KF12	EL2008	ECPPEB06	3	Pcs	8 Digital Outputs	Beckhoff	Datasheet
-KF13	EL2624	ECPPEB07	1	Pcs	4 Relay Outputs	Beckhoff	Datasheet
-KF14	EL9410	ECPPEB18	1	Pcs	Power Supply Terminal fro E-bus	Beckhoff	Datasheet
-KF15	EL2535-0002	ECPPEB08	1	Pcs	2 PWM Outputs, 2 Digtal Inputs	Beckhoff	Datasheet
-KF16	EL4024	400090871	1	Pcs	4-channel analog output terminal 4…20 mA, 12 bit	Beckhoff	Datasheet
-KF17	EL3054	ECPPEB13	1	Pcs	4 Analog Inputs 4-20mA	Beckhoff	Datasheet
-KF18,-KF19	EL1918	ECPPEB09	2	Pcs	TwinSAFE 8 Digital Inputs	Beckhoff	Datasheet
-KF20	EL2911	ECPPEB10	1	Pcs	TwinSAFE 4 Digital Inputs, 1x Output	Beckhoff	Datasheet
-KF21	EL6751	400090873	1	Pcs	CANopen master/slave terminal	Beckhoff	Datasheet
-KF22	EL9011	ECPPEB02	1	Pcs	Bus end cap	Beckhoff	
-PF1,-PF2	800F-ALP	400188392	6	Pcs	Plastic Mounting Latch, Contact Block Holder	Allen Bradley	800f-sg001_-en-p. pdf"
-PF1,-PF2	800F-N7W	EACBU0094	2	Pcs	Led Module White 240V AC	Allen Bradley	800f-sg001_-en-p.pdf
-PF1,-PF2	800FP-P5	EACSW0253	2	Pcs	Lamphead Yellow Ø22.5	Allen Bradley	800f-sg001_-en-p.pdf
-PF1,-PF2	AB Indicator Lamp Yellow 240V AC	EACSW25	2	Pcs	Signal Lamp Yellow 240V AC	Allen Bradley	800f-sg001_-en-p.pdf
-Q1	ABB AF205-30-11-33	ESTPA316	1	Pcs	Contactor 205A/350A AC3/AC1 230V Electronic PLC Coil	ABB	ABB\ABB AF Contactors. pdfDatasheet
-Q3	ABB AF09-30-10-13	400090760	1	Pcs	Contactor 9A/25A AC3/AC1 100-250VAC Coil	ABB	ABB AF Contactors. pdf
-Q4..-Q7	100-K09DJ10	ESTPA1123	4	Pcs	Mini Contactor 24V, 9A AC3, 20A AC1	Allen Bradley	100-K Mini Contactor.pdf
-QA1,-QA2	Fuse SBFEC 450A 690V	400201775	2	Pcs	Square Body Flush End Size 1, 450A	Bussmann	BUS_Ele_SB_Flush_End _Contact.pdf

			Date		CNP Freire
			User		MBari
	AS BUILT	19.08.2022	Approved	SS	
Status	Change	Date	Standard	Name	

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Device ID	Device	Part Number	Qty	Unit	Description	Manufacturer	Datablad
-QA3,-QA4	FR27UQ69V50T	EACFU291	2	Pcs	Ferrule FR247UQ 690V 27x60mm	Ferraz Shawmut	DS-Semiconductor-Protection-Cylindrical-Fuses-Protistor-Size-27x60-aR-URGD-600VAC-to-690VAC-EN.pdf
-QA3,-QA4	US27 1MI	EACFU290	2	Pcs	Ultrasafe Fuse Holder 27x60mm Fuses	Ferraz Shawmut	DS-Fuse-Holders-Modulostar-CMS27-Ultrasafe-US27-EN.pdf
-QA5..-QA8	FWP-10A14F	EACFU281	4	Pcs	Ferrule FWP 690/700V 14x51mm	Ferraz Shawmut	FWP Fuses.pdf
-QA9..-QA12	Fuse SBFEC 400A 690V	EACFU273	4	Pcs	Square Body Flush End Size 1, 400A	Bussmann	BUS_Ele_SB_Flush_End_Contact.pdf
-QA13..-QA16	Fuse SBFEC 250A 690V	EACFU270	4	Pcs	Square Body Flush End Size 1, 250A	Bussmann	BUS_Ele_SB_Flush_End_Contact.pdf
-QA17	Fuse NH00 35A 500V GL/GG	EACFU030	3	Pcs	Fuse NH00 35A 500V GL/GG	Siba	NH00 6-160A.pdf
-QA17	NH FUSE SWITCH-DISCON. SIZE 00 160 A	ESTPA261	1	Pcs	NH00 Fuse base 160A	Wöhner	woehner-33198000.pdf
-QB1	170M5808D	400182561	3	Pcs	HSDI Square Body DIN 43620, 400A 690V Size 2	Bussmann	Datasheet
-QB1	OS400D03K	400182421	1	Pcs	Fuse Switch	ABB	Datasheet
-QB1	OSS400G1L/3	400182423	2	Pcs	Terminal Shroud Cover 101,4mm (3pcs)	ABB	Catalogue
-RA1	ACS880 Charge Kit 13 R8i RRU	EFTRN7171	1	Pcs	Charge Kit DC	ABB	Datasheet
-RJ1..-RJ9	IE-XM-RJ45/IDC	400090935	9	Pcs	Mounting rail outlet, RJ45, RJ45 module, IP20, Cat.6A	Weidmuller	Datasheet
-SF1..-SF3	KG10A T203/58 VE21	400090765	3	Pcs	3 Pole 20A Main, Safety, Maintenance Switch	Kraus & Naimer	Datasheet
-SF4	K&N CG8-A220-VE21V (No-EM)	EACSW0193-01	1	Pcs	Rotary Switch 1P Double-throw Base Mounted (Normal-Emergency)	Kraus & Naimer	CG8_E.pdf

				Date	
	Added WP03 connections	21.11.2022	ANP	User	
	AS BUILT	19.08.2022	SS	Approved	
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Device ID	Device	Part Number	Qty	Unit	Description	Manufacturer	Datablad
-TA1	ACS880-204-0210A-5	400182355	1	Pcs	IGBT Supply Unit 210A 500V	ABB	HW Manual
-TA1.KF1,-TA2.KF1,-TA3.KF1,-TA4.KF1,-TA5.KF1,-TA6.KF1,-TA7.KF1	FECA-01	EFTRN7017	7	Pcs	EtherCAT Adaptor	ABB	Datasheet
-TA1.PH1,-TA2.PH1,-TA3.PH1,-TA4.PH1,-TA5.PH1,-TA6.PH1,-TA7.PH1	ACS-AP-W	EFTRN7001-1	7	Pcs	Control Panel Bluetooth	ABB	Datasheet
-TA1.PH1,-TA4.PH1,-TA5.PH1,-TA6.PH1,-TA7.PH1	DPMP-02 R6/7 Mounting Plate	RHEFTRNABP-01	5	Pcs	Control Panel Mounting Kit, Bracket for R6/7 Modules	ABB	DPMP-02.pdf
-TA2.KF2,-TA3.KF2,-TA4.KF2,-TA5.KF2,-TA6.KF2,-TA7.KF2	FEN-31	EFTRN7002	6	Pcs	Encoder Card	ABB	FEN_31_UM_B_HTL_Encoder_Manual.pdf
-TA2,-TA3	ACS880-104-0011A-5	EFTRN7104	2	Pcs	VFD 5,5kW /10,5A 500V	ABB	Control Card
-TA4,-TA5	ACS880-104-0170A-5	EFTRN7116	2	Pcs	VFD 110kW /170A 500V	ABB	Control Card
-TA6,-TA7	ACS880-104-0110A-5	EFTRN7114	2	Pcs	VFD 75kW /110A 500V	ABB	Control Card
-TA10	S8VK-X24024A-EIP	EACTR035-10	1	Pcs	230/24V 10A Power Supply W/Display	Omron	S8VK-X.pdf
-TA11,-TA12	S8VK-X48024A-EIP	EACTR036-10	2	Pcs	230/24V 20A Power Supply W/Display	Omron	S8VK-X.pdf
-TA12 XPOW (+,+,+,+,+),-XG1 (+,+,+),-XG2 (+,+,+,+,+,+,+)	ZDK 2.5 +/-	EACPL02055	15	Pcs	Terminal 2 Levels +/- Marking	Weidmüller	ZDK 2.5.pdf
-U1..-U2,-U4,-U6,-U8,-U10..-U12			5,261	M	MOUNT		
-U1..-U3,-U5,-U7,-U9,-U13..-U15			9,2	M	CABLE DUCT		
-UB1,-UB2	ABB EMC 4x Cable Entry	EACPGE500	2	Pcs	ABB EMC Cable entry for 4 Cables	ABB	3axd50000004817.pdf
-UH1	MCD20126R5	EACBO607	1	Pcs	Floor Cabinet	Eldon	MCD Datasheet.pdf
-UH2,-UH3	MCS20086R5	EACBO550	2	Pcs	Floor Cabinet	Eldon	MCS Datasheet.pdf
-WF1..-WF20	Patch Cord 1.5M Cat.6 SFTP	ECPPE0471-3	20	M	Patch Cord 1.5M Cat.6 SFTP		
-WM1..-WM2,-WM4..-WM5	Eldon EFA500-700R5	EFTRN000-0081	4	Pcs	Cabinet Cooling Fan Filter	Eldon	EFA500-700R5.pdf
-WM3	ABB Door Filter 400MM	EFTRN000-013-00	1	Pcs	Cabinet Cooling Fan Filter	ABB	3AUA0000116873.pdf
-WM6	ABB Door Filter 600MM	EFTRN000-013-01	1	Pcs	Cabinet Cooling Fan Filter	ABB	3AUA0000116874.pdf
-X2..-X3,-X5..-X6,-X10,-X30..-X31,-X40,-X50,-X70..-X71,-X80..-X82,-X100..-X105,-X200..-X202,-X300..-X302,-X400..-X402,-X500..-X501,-XG1..-XG2	AEB 35 SC/1	EACPL0202-2	66	Pcs	AEB 35 SC/1 End Bracket	Weidmüller	Datasheet
-X2..-X3,-X30..-X31,-X80,-X100..-X105,-X200..-X202,-X300..-X302,-X402	ZAP ZDL 2.5	EACPL02149-02	27	Pcs	End Plate For ZDL 2.5 Terminal	Weidmüller	ZAP ZDL2.5.pdf

Status	Change	Date	Name	Standard
	Added WP03 connections	21.11.2022	ANP	User
	AS BUILT	19.08.2022	SS	Approved
				Date

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AD7C40B17475400CBF652D56B6311BE9

Device ID	Device	Part Number	Qty	Unit	Description	Manufacturer	Datablad
-X2 (1,3,5,7),-X3 (1),-X30 (3, 5),-X31 (3,5),-X80 (3),-X100 (3,5,7,9,11),-X101 (3),-X102 (3),-X103 (3,5,7,9,11),-X104 (3,5,7),-X105 (3),-X202 (1)	ZDL 2.5/L/L/PE	EACPL021411	27	Pcs	Terminal 2 Tier. +PE	Weidmüller	ZDL 2.5 L-L-PE.pdf
-X5..-X6,-X40,-X70..-X71,-X81. .-X82,-XG1..-XG2	ZAP/TW ZDK2.5	400091997	9	Pcs	End Plate For ZDK2.5 Terminal	Weidmüller	Weidmuller\ZAP TW ZDK2.5.pdf
-X5 (L1,L1,L1,L1),-X6 (L1,L1, L1,L1)	ZDK 2.5 L1/L2	EACPL02055	8	Pcs	Terminal 2 Levels L1, L2 Marking	Weidmüller	ZDK 2.5.pdf
-X10 (1,4,7,10),-X500 (1,4),-X501 (1,4,7)	ZMAK 2.5	EACPL021403	9	Pcs	Terminal	Weidmüller	ZMAK 2.5.pdf
-X10,-X500..-X501	ZAP/ZMAK 2.5	EACPL02149-01	3	Pcs	End Plate For ZMAK2.5 Terminal	Weidmüller	ZMAK 2.5.pdf
-X30..-X31,-X80,-X100..-X105,-X201,-X402	Glass Fuse 5x20mm 3.15A	EACFU005	14	Pcs	Glass Fuse 5x20mm 3.15A		GSBGDG.pdf
-X30 (1),-X31 (1),-X80 (1),-X100 (1),-X101 (1),-X102 (1),-X103 (1),-X104 (1),-X105 (1),-X201 (1,3,5),-X402 (1,3)	ZDL 2.5/SI/DU/PE/LD 36V	EACPL0195	14	Pcs	Terminal Fuse 36V	Weidmüller	ZDL 2.5 SI-DU-PE-LD36V.pdf
-X40 (1,3,5,7,9,11,13,15,17),-X70 (1,3),-X71 (1,3,5,7),-X81 (1,3),-X82 (1,3,5,7)	ZDK 2.5/1.5	EACPL02055	21	Pcs	Terminal 2 Levels	Weidmüller	ZDK 2.5.pdf
-X50	ZAP/TW 2	EACPL02148	1	Pcs	End Plate For ZDU/ZPE 2.5/3AN Terminals	Weidmüller	ZAP TW 2 DB.pdf
-X50 (1-5)	ZDU 2.5/3AN	EACPL02140	5	Pcs	Terminal	Weidmüller	ZDU 2.5 3AN.pdf
-X200 (1,3),-X300 (1,3),-X301 (1,3,5,7),-X302 (1,3,5)	ZDL 2.5/SI/DU/PE/LD 230V	EACPL0196	11	Pcs	Terminal Fuse 250V	Weidmüller	ZDL 2.5 SI-DU-PE-LD36V.pdf
-X200,-X300..-X302	Glass Fuse 5x20mm 1A	EACFU0072	11	Pcs	Glass Fuse 5x20mm 1A		GSBGDG.pdf
-X400 (1,3,5,7,9,11,13,15,17, 19,21,23),-X401 (1,3,5,7,9,11, 13,15,17)	ZDT 2.5/2	EACPL021409	21	Pcs	Terminal 2 Levels	Weidmüller	ZDT 2.5 2.pdf
-X400,-X401	ZAP/TW ZDT2.5/2	EACPL02149-05	2	Pcs	End Plate For ZDT 2.5 Terminals	Weidmüller	ZAP TW ZDT2.5 2.pdf
-XD1	7Z-SD/230	EACPL052	1	Pcs	DIN Mountet Shuko Outlet	Cenika	Modular Shucko Outlet.pdf
-XF1	CU2508	ECPPEB21	1	Pcs	Real-time Ethernet Port Multiplier	Beckhoff	Datasheet
-XF2	FL SWITCH 1008N	400199566	1	Pcs	Switch 8port	Phoenix Contact	FL SWITCH 1008N. pdf
-XF3	eWON Cosy 131	ECPPA021	1	Pcs	VPN Access Gateway 4 Port+USB 12-24V DC	eWON	eWON Cosy Manual.pdf

				Date	
	Changed ETH Switch	21.11.2022	ANP	User	
	AS BUILT	19.08.2022	SS	Approved	
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AD7C40B17475400CBF652D56B6311BE9

Yard Connections

Internal Connections

CTD Winch

=WCS01
+UH03

Main VFD Cabinet
Pentagon
Brake HPU
Gear Cooling HPU

-WG1 FD CP (TP) plus 6x2x0.75

-WD1 FD 855 CP 3G0.75

=WCS01
+UH01

Main VFD Cabinet
Power Input
Levelwinds

-WD2 FD 855 CP 4G0.75
-WG2 FD CP (TP) plus 4x2x0.25
-WD3 2YSLCYK-JB 3x2.5+3x0.5
-WD4 FD 855 CP 3G1.5
-WG3 FD CP (TP) plus 1x2x0.75

ENC
PWR
HEAT
PTC

JOG Levelwind

M
3~

-MA2

11,4A
400V/50Hz

=WCS01
+UH02

Main VFD Cabinet
Traction Winch
System
CTD WInch

-WD5 FD 855 CP 4G0.75
-WG4 FD CP (TP) plus 4x2x0.25
-WD6 2YSLCYK-JB 3x35+3x6
-WD7 FD 855 CP 3G1.5
-WG5 FD CP (TP) plus 1x2x0.75

ENC
PWR
HEAT
PTC

JOG Winch

M
3~

-MA1
Winch Motor

Max Rating 92A
400V/50Hz

+UC01

Winch Internal
Connection Box
Emergency Control

-UB1 -WG1 PUR 4x0.34mm2 Shld → -BG1 End Stop 1 /1.B1

-UB2 -WG2 PUR 4x0.34mm2 Shld → -BG2 End Stop 2 /1.B2

-UB3 -WG3 PUR 4x0.34mm2 Shld → -BG3 Angle Sensor analogue /1.B3

-UB4 -WG4 PUR 4x0.34mm2 Shld → -BG4 Block Count 1 /1.B3

-UB5 -WG5 PUR 4x0.34mm2 Shld → -BG5 Block Count 2 /1.B4

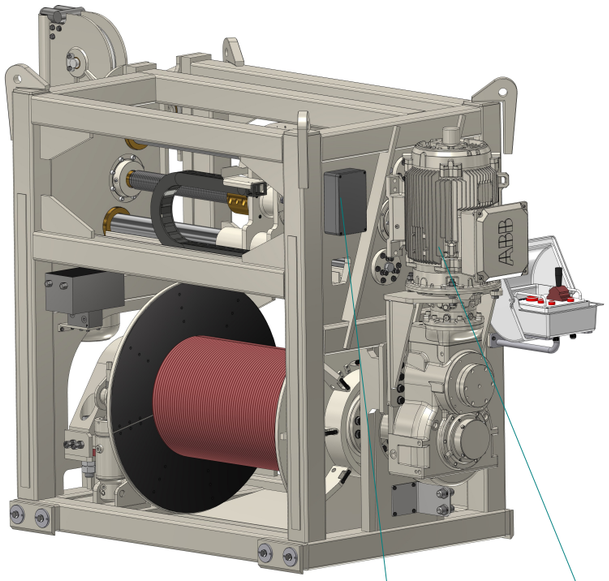
-UB6 -WG6 PUR 4x0.34mm2 Shld → Load Cell -BW1 Load Cell /1.B5

-UB7 -WG7 PUR 4x0.34mm2 Shld → Temp -BP1 Temp Sensor

-UB8 -WG8 Valve Cable 3x0.75+PE → -QM1 Solenoide Valve Brake

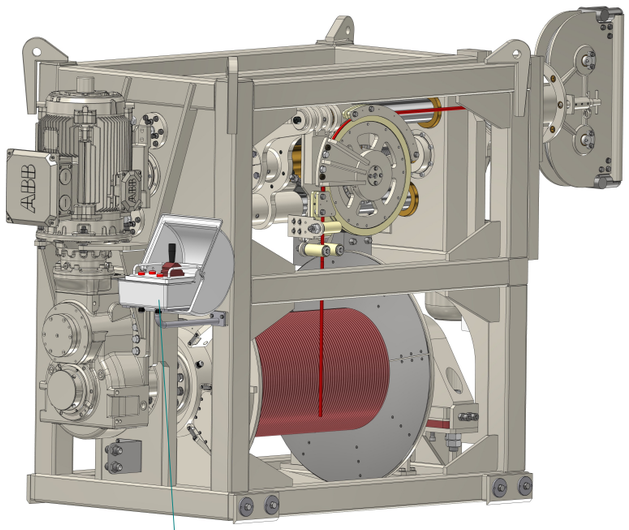
				Date	17/11-2021	CNP Freire MBari	MACGREGOR	CTD Winch CTD Winch	400182376	=HW01	
				User	GSK						
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-02 CD	Rev. G

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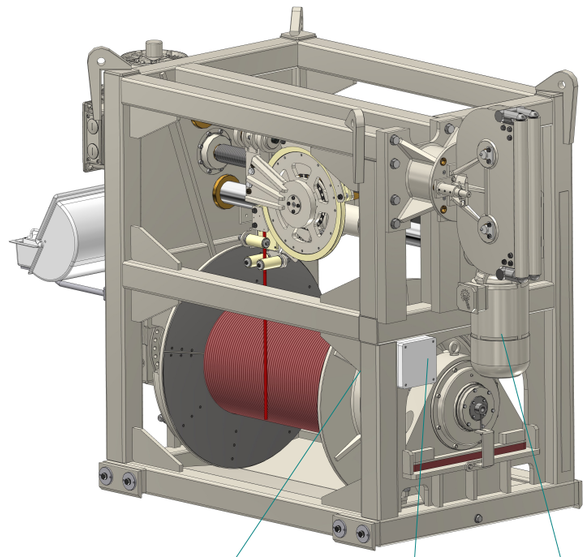


=HW01
+UC01

=HW01
-MA1



=WP01



=HW01
+DRUM

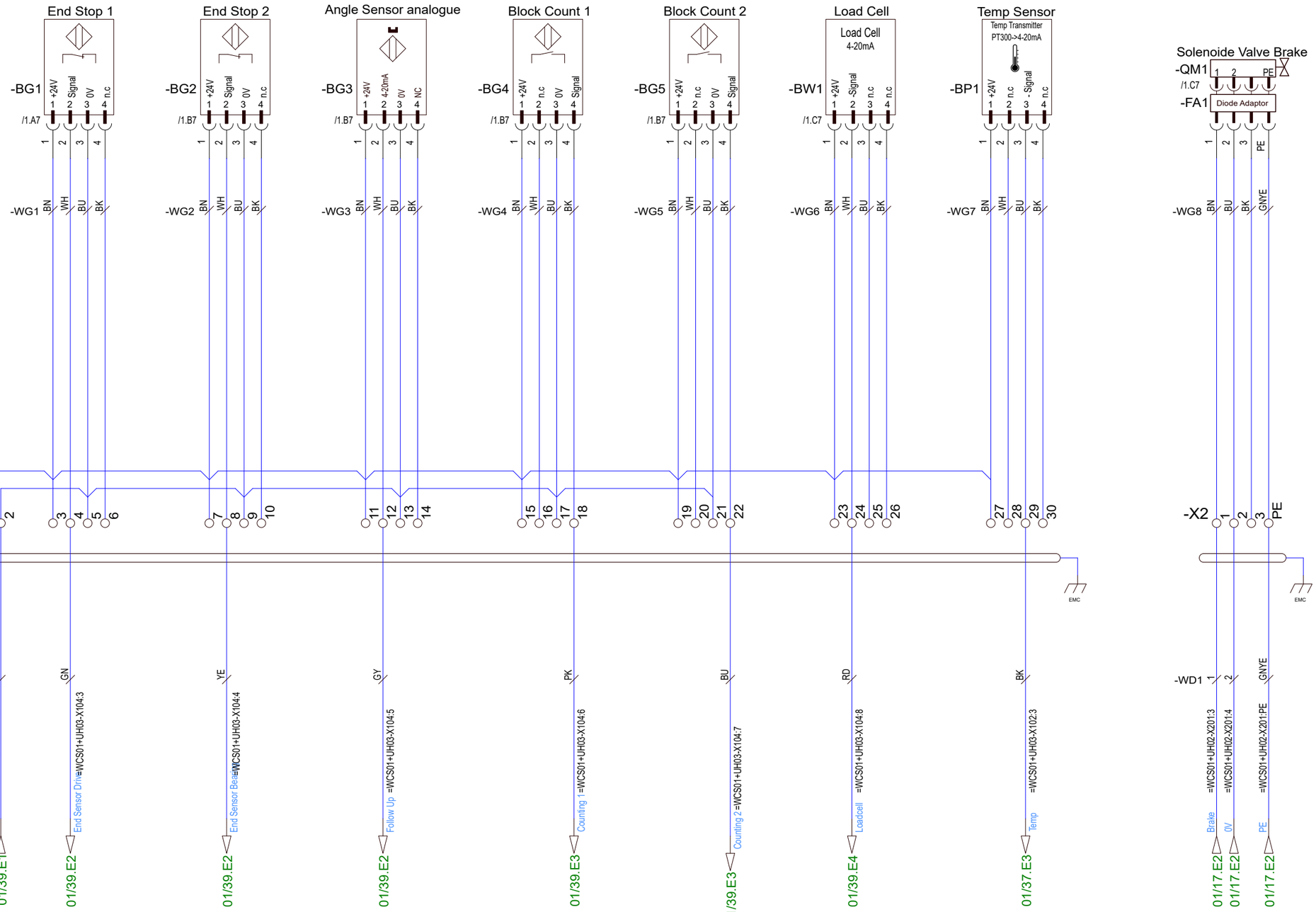
=HW01
+UC02

=HW01
-MA2

General Picture
Winch might be mirrored

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	CTD Winch Connection Point Overview	400182376	=HW01	
				User	GSK						
				Approved	RAJ					10070-02 CD Rev. G	Sheet 2
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

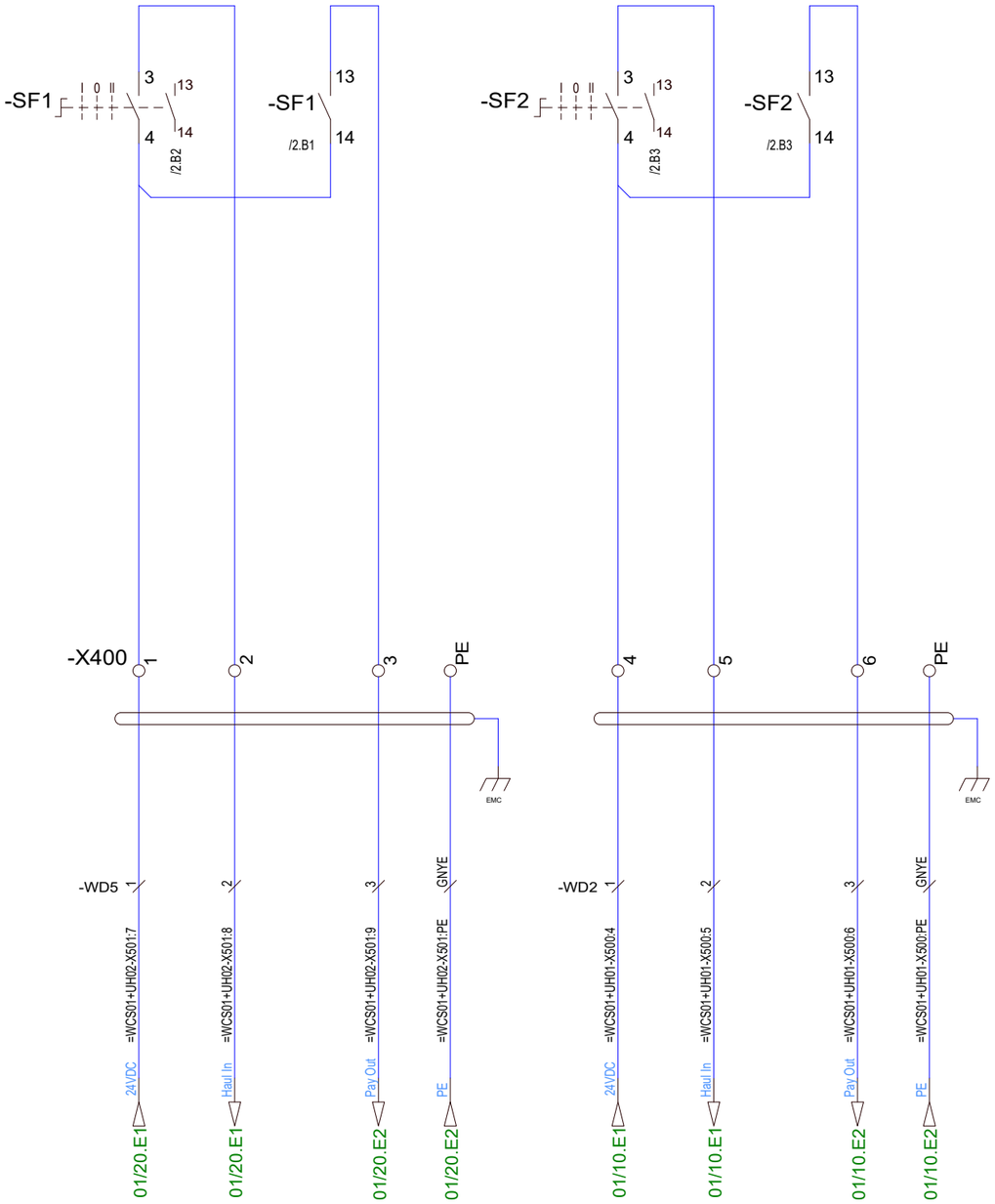
End Stop | Angle Sensor | Block Count | Load Cell | Gear Temp | Brake Solenoid Valve



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	CTD Winch Winch Internal Connection Box	400182376	=HW01 +UC01	
				User	GSK						
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-02 CC Rev. G	Sheet 1 Next 2

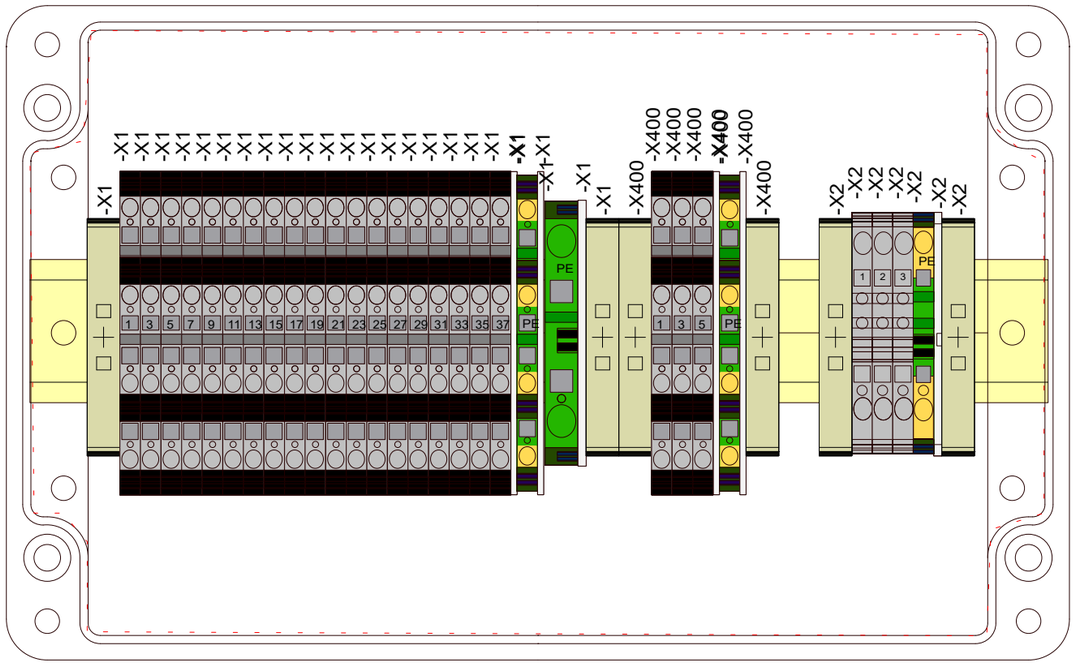
Winch Emergency Control

Levelwind Emergency Control



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	CTD Winch Emergency Control	400182376	=HW01
				User	GSK					+UC01
				Approved	RAJ				10070-02 CC	Rev. G
Status	Change	Date	Name	Standard		Version / Index / Repl. by				Sheet 2 / Next 1

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-AF5

+UC01

CTD WINCH

100x30 White

Emergency Control
IN OUT
60x15 White
-AF1

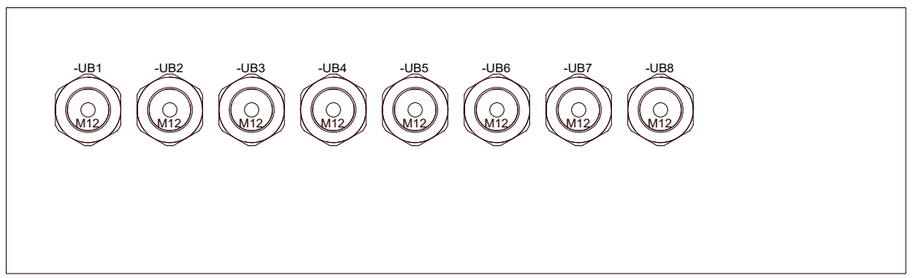
-SF1

CTD Winch
60x15 White
-AF2

Emergency Control
LEFT RIGHT
60x15 White
-AF3

-SF2

CTD Levelwind
60x15 White
-AF4



-X1
WAD 8 MC NE WS

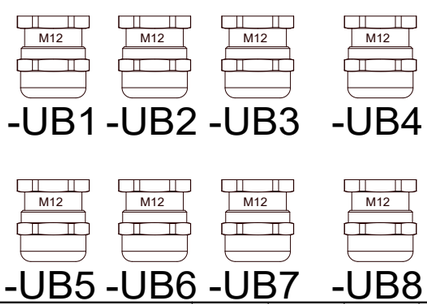
-X1
DEK 5 FWZ 1-50

-X400
WAD 8 MC NE WS

-X400
DEK 5 FWZ 1-10

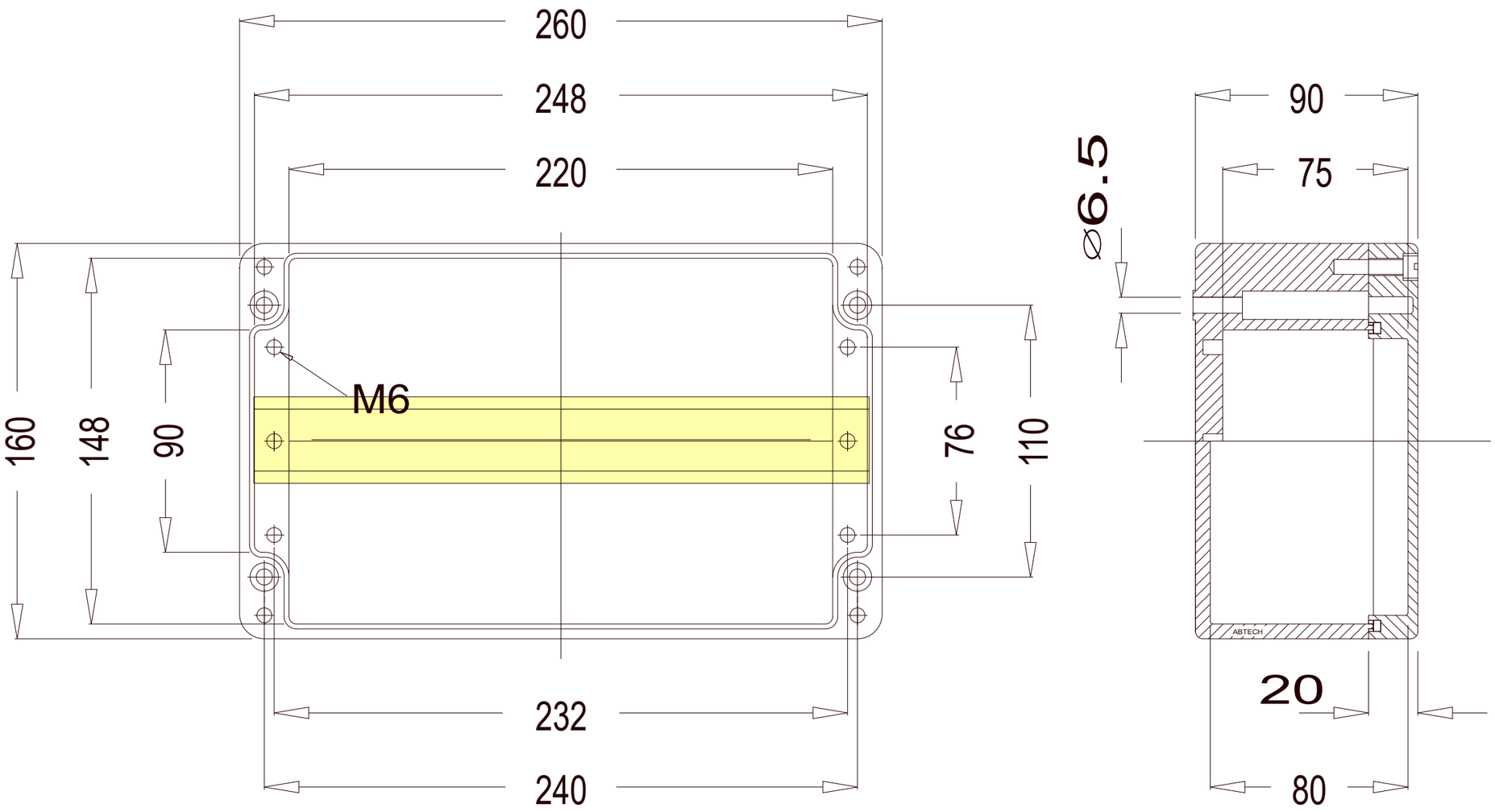
-X2
WAD 8 MC NE WS

-X2
DEK 5 FWZ 1-10



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	CTD Winch Winch Internal Connection Box	400182376	=HW01
				User	GSK					+UC01
				Approved	RAJ				10070-02 GA	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 1 / Next 2

AD7C40B1747540CBF652D56B6311BE9



				Date	17/11-2021	CNP Freire MBari		CTD Winch Winch Internal Connection Box	400182376	=HW01	
				User	GSK					+UC01	
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Rev. G	Sheet 2 / Next 1
									10070-02 GA		

AD7C40B17475400CBF652D56B6311BE9

Yard Connections

Internal Connections

Traction Winch

=WCS01
+UH03

Main VFD Cabinet
Pentagon
Brake HPU
Gear Cooling HPU

-WG6 FD CP (TP) plus 2x2x0.5

+UC01

Winch
Connection Box

-UB1 -WG1 PUR 4x0.34mm2 Shld → -BP1 Temp Sensor MA1

-UB3 -WG2 PUR 4x0.34mm2 Shld → -BP2 Temp Sensor MA2

-UB2 -WG3 Valve Cable 3x0.75+PE → -QM1 Brake Valve

=WCS01
+UH02

Main VFD Cabinet
Traction Winch
System
CTD WInch

-WD8 FD 855 CP 3G0.75

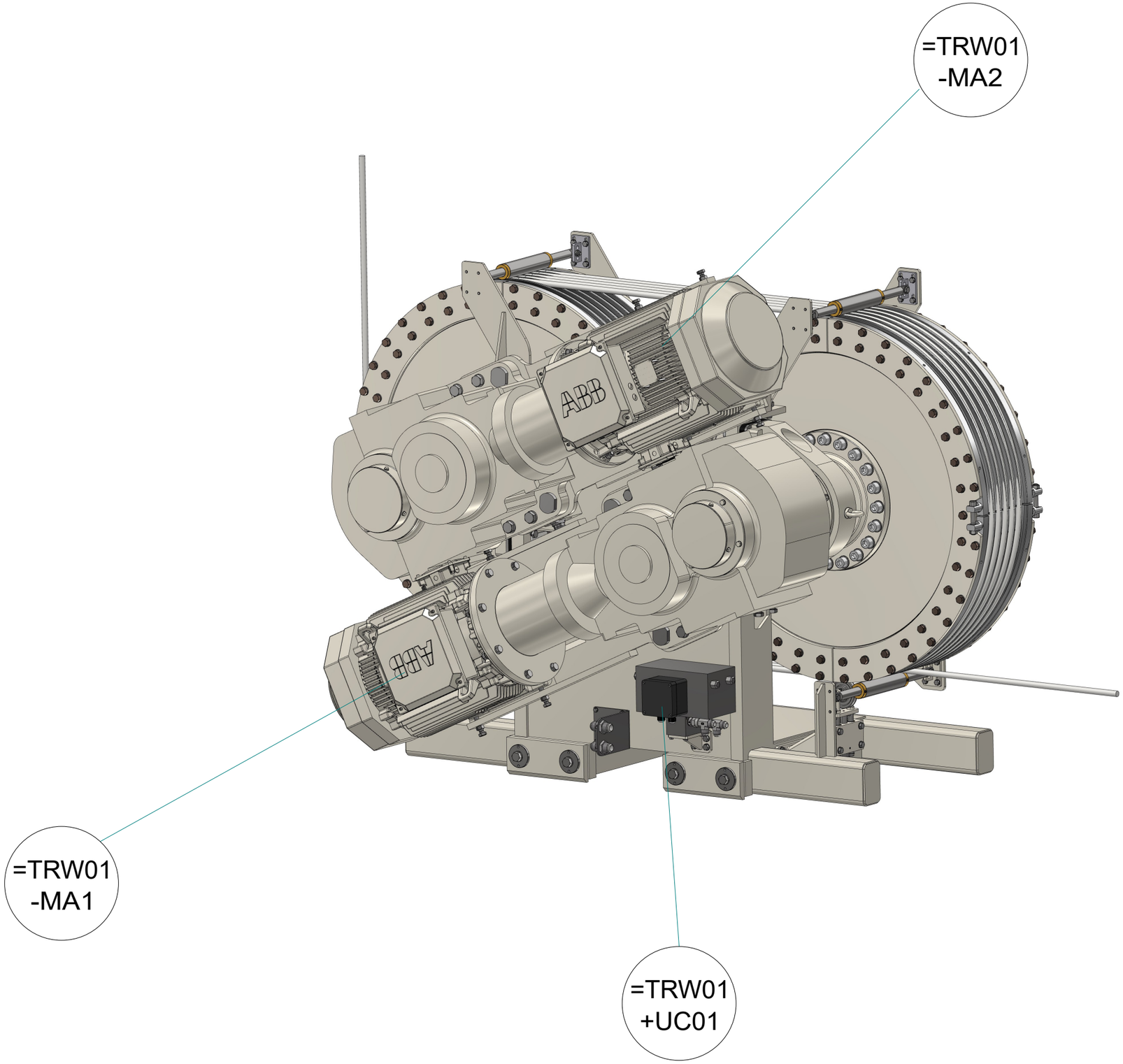
-WG7 FD CP (TP) plus 4x2x0.25 — ENC
-WD9 2YSLCYK-JB 3x70+3x10 — PWR
-WD10 FD 855 CP 3G1.5 — HEAT
-WG8 FD CP (TP) plus 1x2x0.75 — PTC

M 3~ -MA1 Winch Motor
Max Rating 150A
400V/50Hz

-WG9 FD CP (TP) plus 4x2x0.25 — ENC
-WD11 2YSLCYK-JB 3x70+3x10 — PWR
-WD12 FD 855 CP 3G1.5 — HEAT
-WG10 FD CP (TP) plus 1x2x0.75 — PTC

M 3~ -MA2 Winch Motor
Max Rating 150A
400V/50Hz

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	ROV Traction Winch ROV Traction Winch	400182377	=TRW01
				User	GSK					
				Approved	RAJ				10070-03 CD	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 1 / Next 2



Iso view of winch (image might deviate from actual product)

General Picture
Winch might be mirrored

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	ROV Traction Winch Connection Point Overview	400182377	=TRW01	
				User	GSK						
				Approved	RAJ					10070-03 CD	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Sheet 2 / Next 1

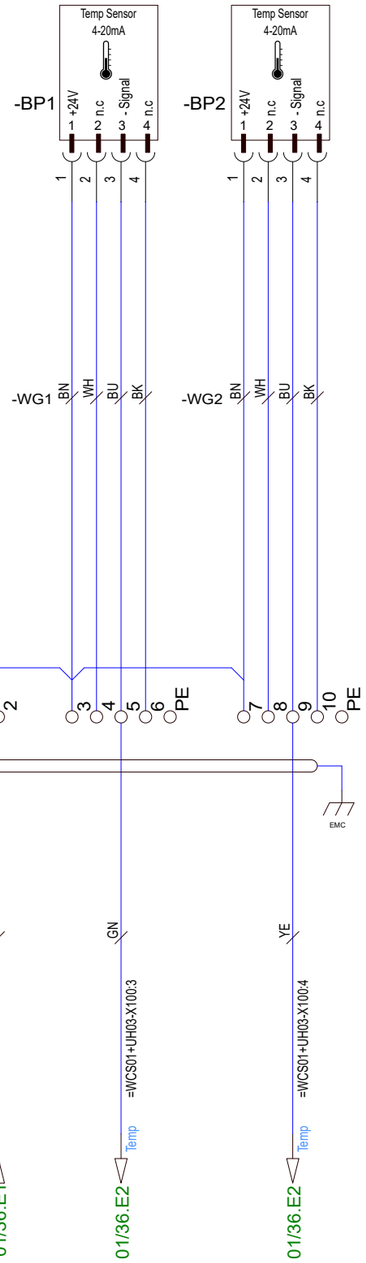
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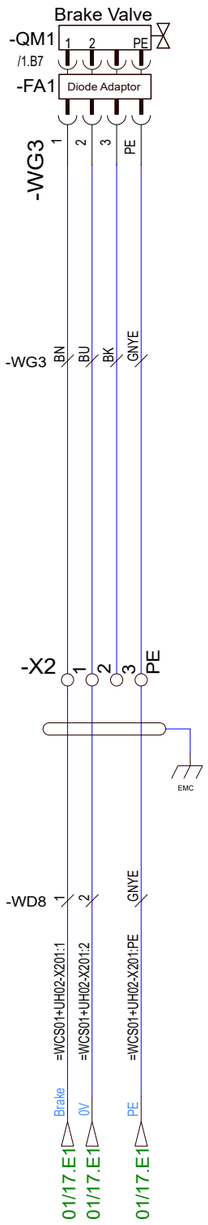
Gear Temp

Brake Solenoid Valve

Temp Sensor MA1

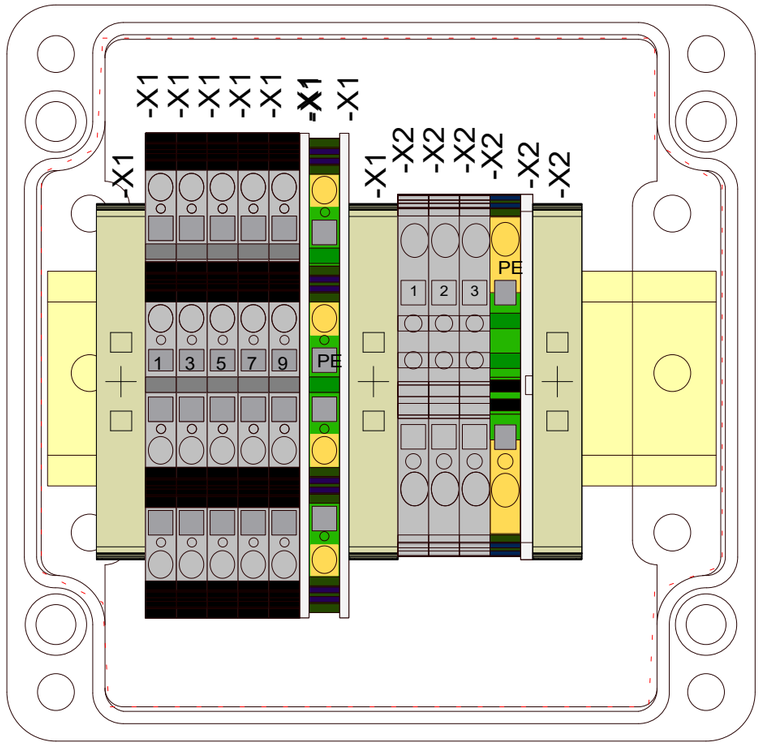
Temp Sensor MA2



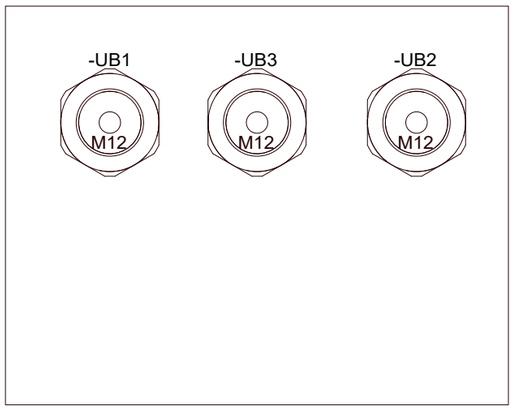


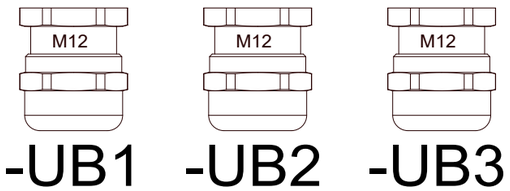
				Date	17/11-2021	CNP Freire MBari	MACGREGOR	ROV Traction Winch Winch Connection Box	400182377	=TRW01	
				User	GSK					+UC01	
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-03 CC Rev. G	Sheet 1 / Next 1

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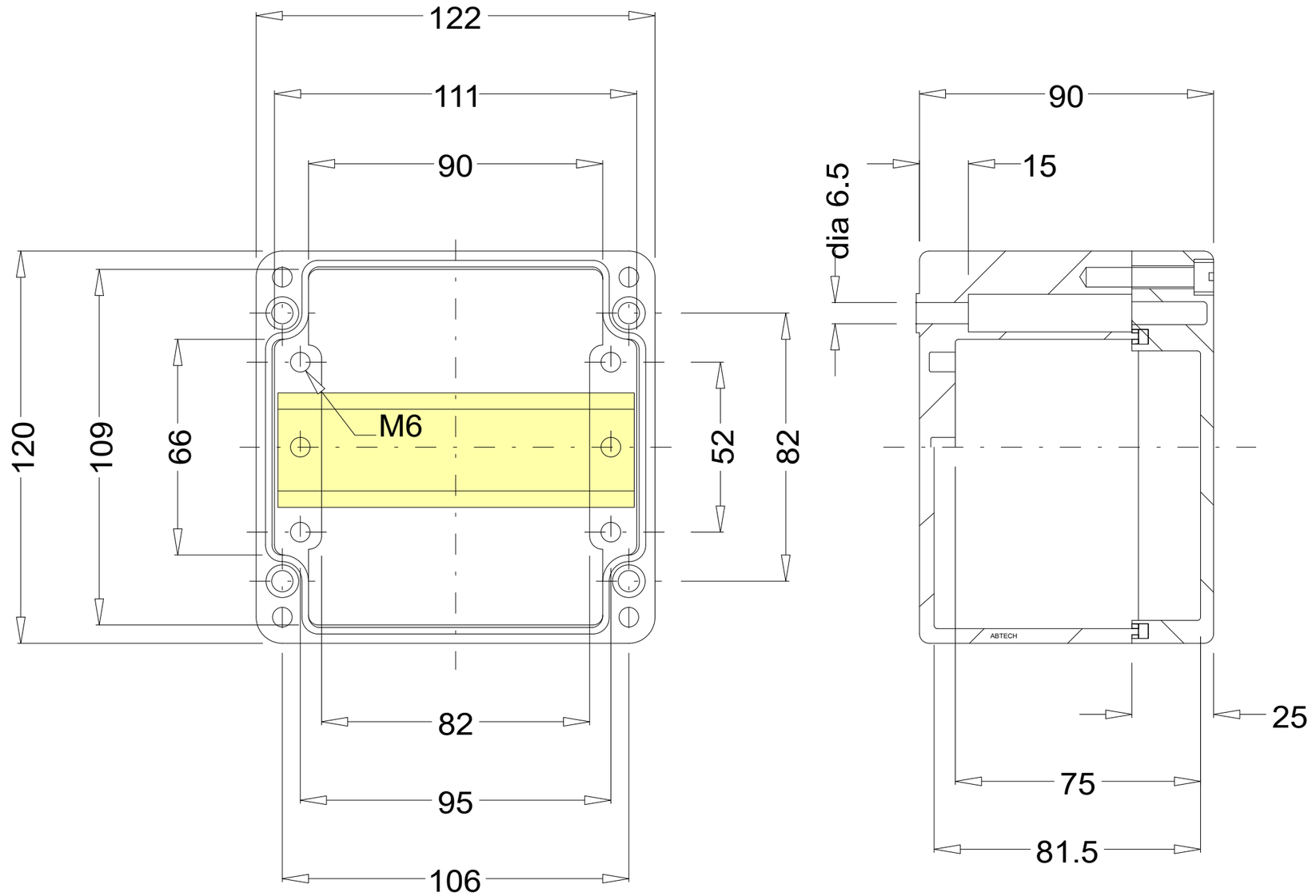






				Date	17/11-2021	CNP Freire MBari	MACGREGOR	ROV Traction Winch Winch Connection Box	400182377	=TRW01	
				User	GSK					+UC01	
				Approved	RAJ				10070-03 GA	Rev. G	Sheet 1
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 2

AD7C40B1747540CBF652D56B6311BE9



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	ROV Traction Winch Winch Connection Box	400182377	=TRW01	
				User	GSK					+UC01	
				Approved	RAJ				10070-03 GA	Rev. G	Sheet 2
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

AD7C40B1747540CBF652D56B6311BE9

Yard Connections

Internal Connections

Levelwind/Slack Wire

=WCS01
+UH03

Main VFD Cabinet
Pentagon
Brake HPU
Gear Cooling HPU

-WG11 FD CP (TP) plus 8x2x0.75

-WD13 FD 855 CP 3G0.75

+UC01

-UB6 -WG1 PUR 4x0.34mm2 Shld → -BG1 End Stop 1 /1.B1

-UB7 -WG2 PUR 4x0.34mm2 Shld → -BG2 End Stop 2 /1.B2

-UB8 -WG3 PUR 4x0.34mm2 Shld → -BG3 Follow Up Sensor 1 /1.B3

-UB9 -WG4 PUR 4x0.34mm2 Shld → -BG4 Block Count /1.B3

-UB10 -WG5 PUR 4x0.34mm2 Shld → -BG5 Block Count /1.B4

-UB1 -WG6 PUR 4x0.34mm2 Shld → -BG6 SWC Limit Sensor 1 Pos In /1.B5

-UB2 -WG7 PUR 4x0.34mm2 Shld → -BG7 SWC Limit Sensor 2 Pos Out /1.B5

-UB3 -WG8 PUR 4x0.34mm2 Shld → -BG8 String Sensor

-UB4 -WG9 Valve Cable 3x0.75+PE → -BP1 Pressure Transmitter

-UB5 -WG10 Valve Cable 3x0.75+PE → -QM1 SWC Valve

=WCS01
+UH01

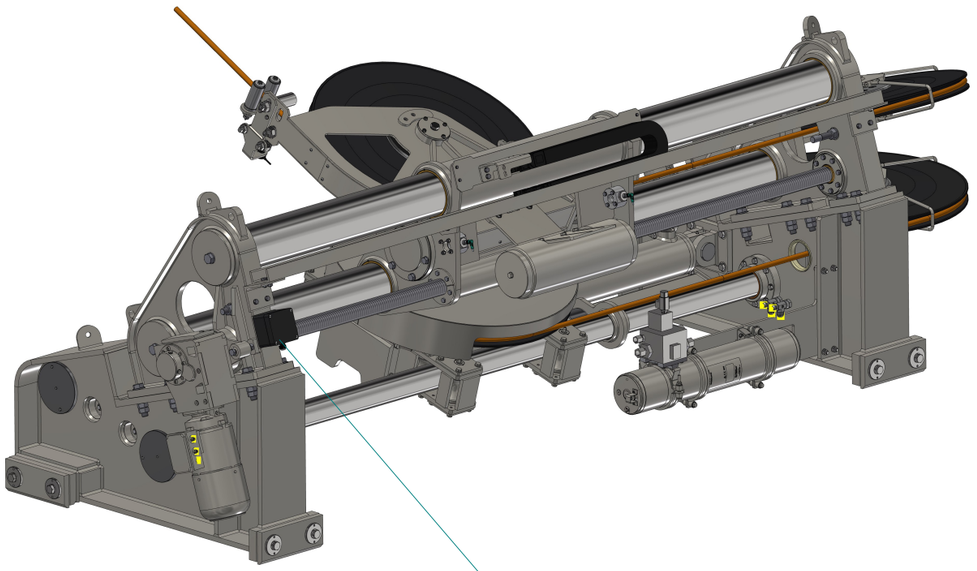
Main VFD Cabinet
Power Input
Levelwinds

-WG12 FD CP (TP) plus 4x2x0.25 → ENC
-WD14 2YSLCYK-JB 3x2.5+3x0.5 → PWR
-WD15 FD 855 CP 3G1.5 → BRAKE
-WD16 FD 855 CP 3G1.5 → HEAT

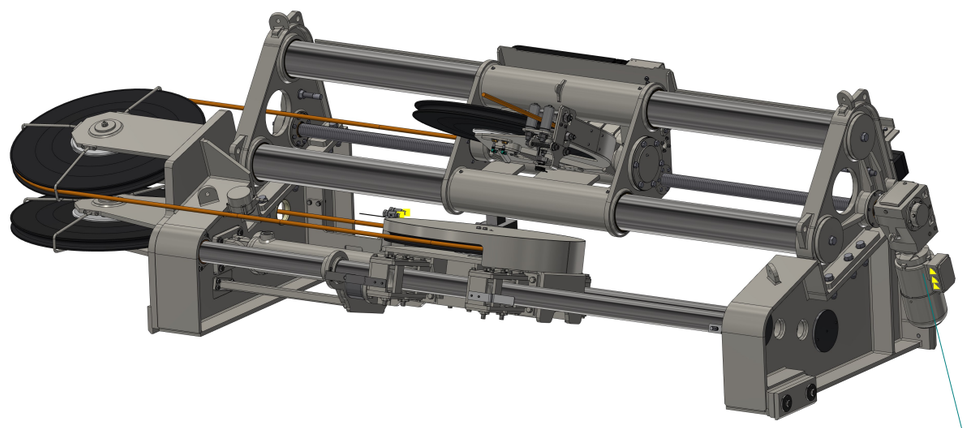
M 3~ -MA1

2,2kW
5,22A
400V/50Hz
GETBI1031 2.2kW

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Levelwind & Slack Wire Compensator Levelwind & Slack Wire Compensator	400182378	=LEV01
				User	GSK					
				Approved	RAJ				10070-04 CD	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 1 / Next 2



=LEV01
+UC01



=LEV01
-MA1

Iso view of winch (image might deviate from actual product)

General Picture
Winch might be mirrored

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Levelwind & Slack Wire Compensator Connection Point Overview	400182378	=LEV01
				User	GSK					
				Approved	RAJ				10070-04 CD	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 2 / Next 1

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End Stop Levelwind

Angle Sensor Levelwind

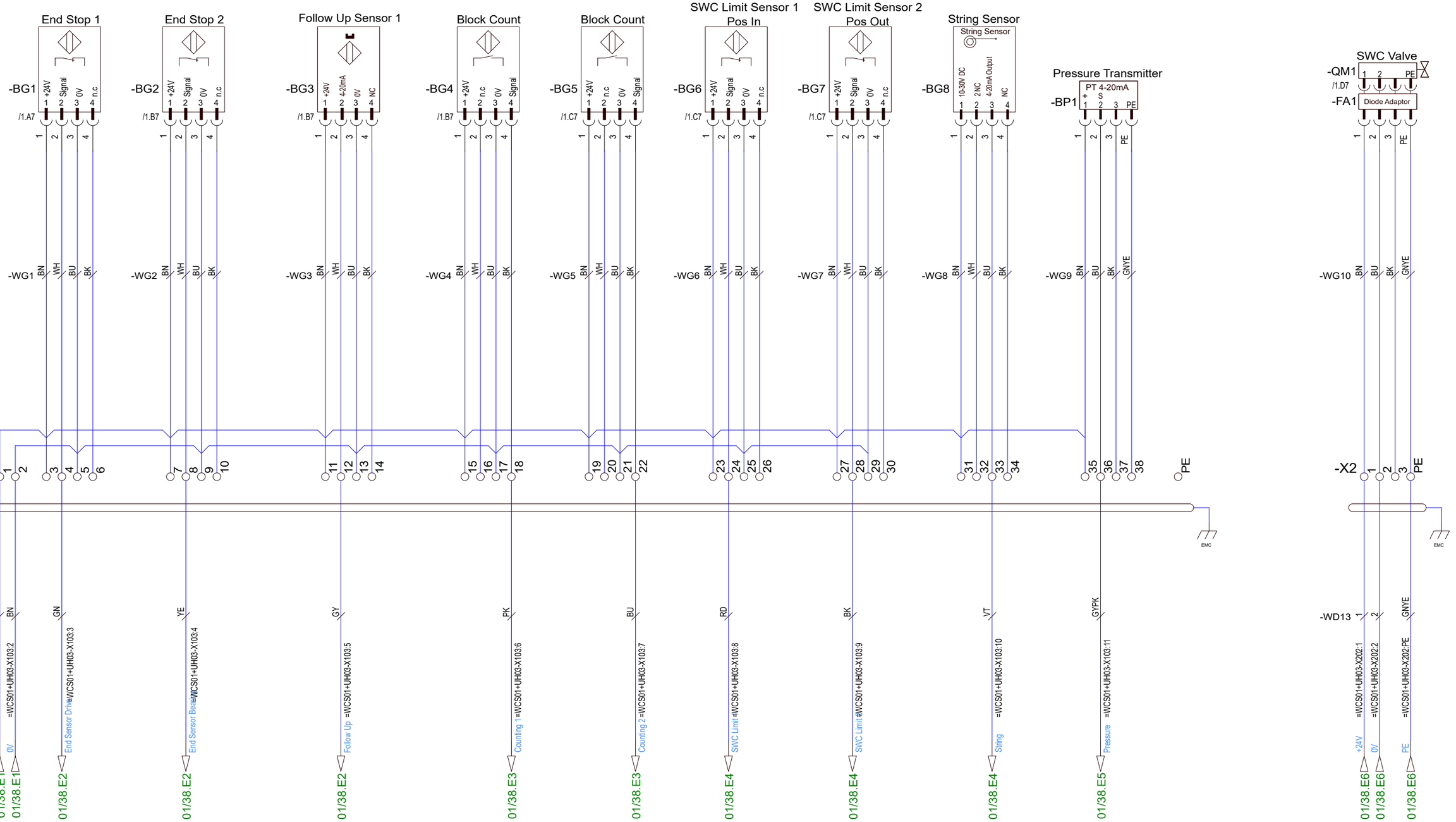
Block Count Levelwind

Limit Sensor Slack Wire

String Sensor Slack Wire

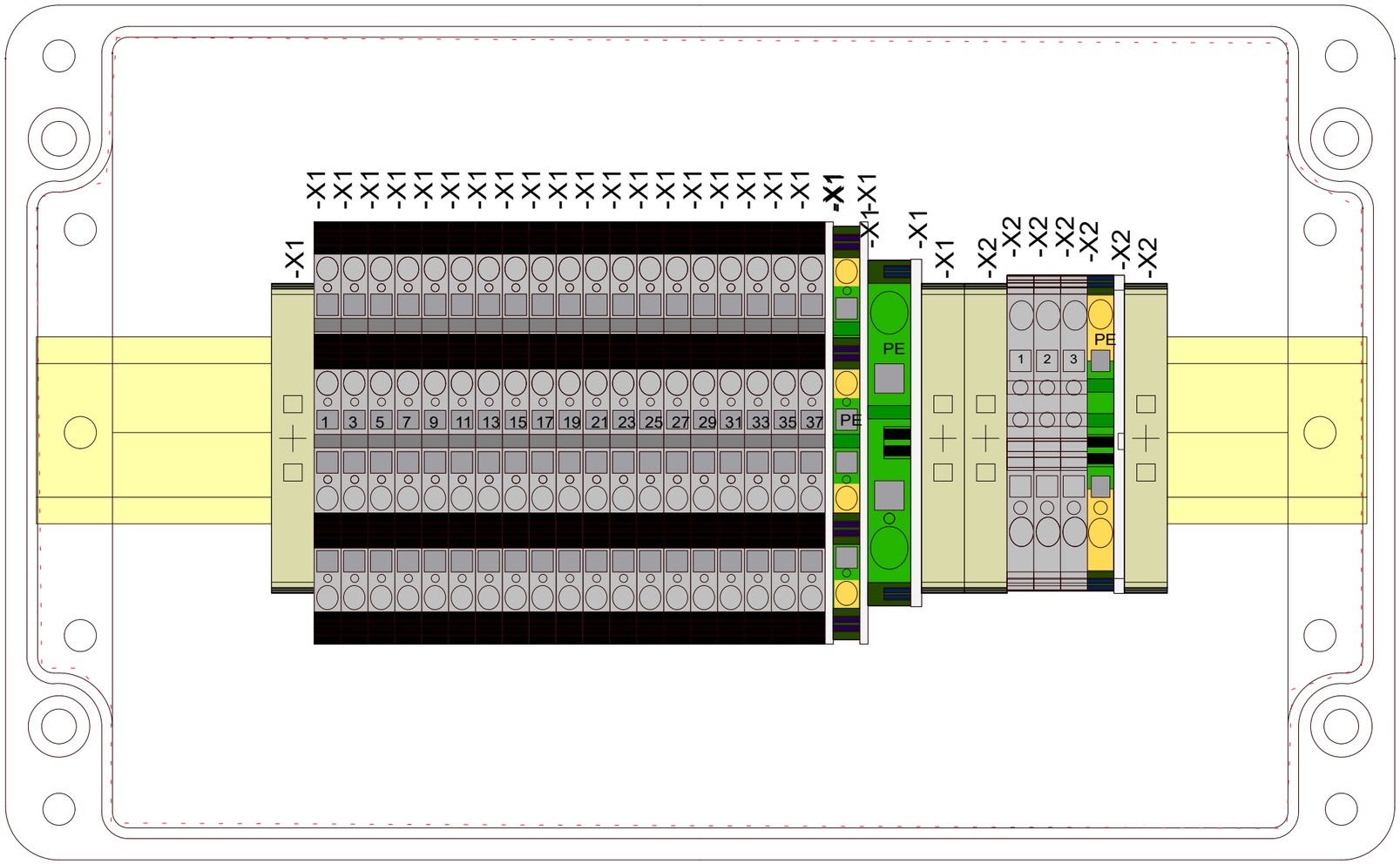
¨Pressure Transmitter

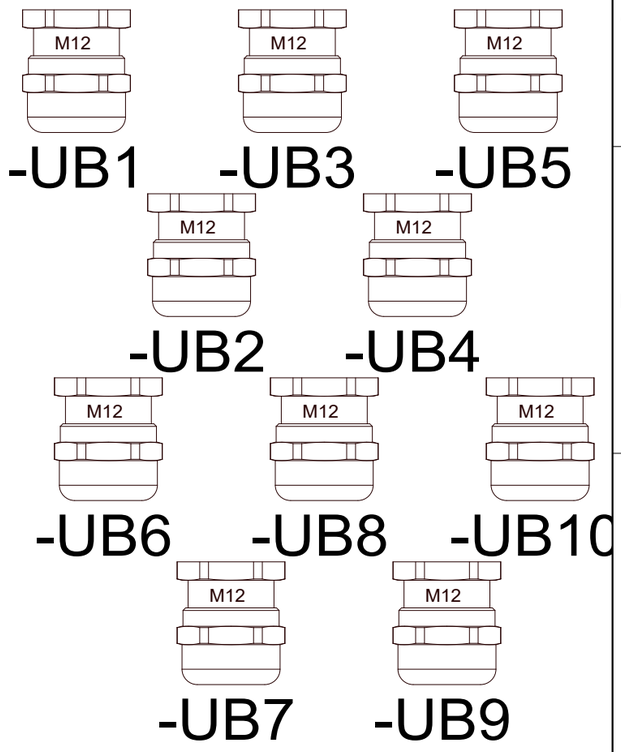
Brake Solenoid Valve

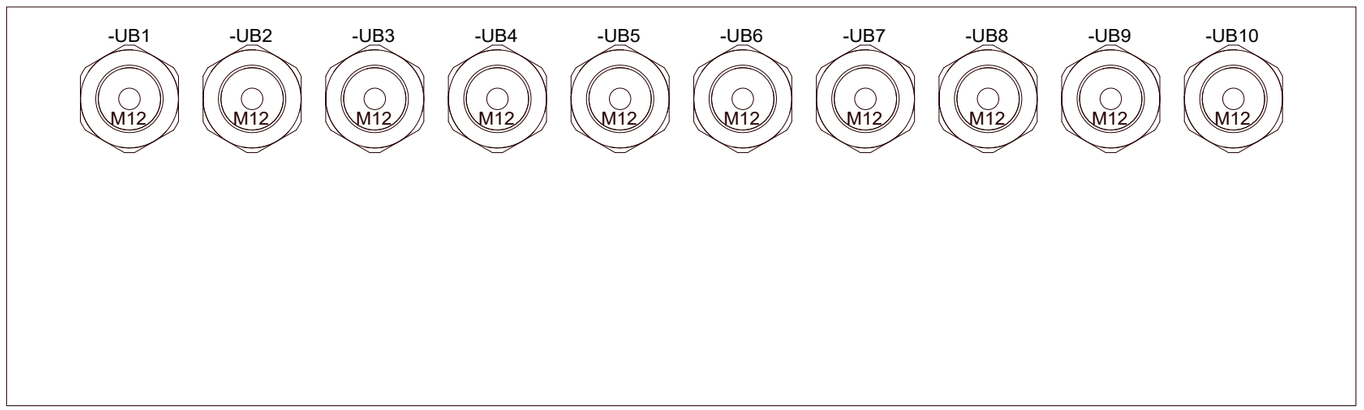


				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Levelwind & Slack Wire Compensator Level Wind Connection Box Internal Connection	400182378	=LEV01	
				User	GSK					+UC01	
				Approved	RAJ				10070-04 CC	Rev. G	Sheet 1
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

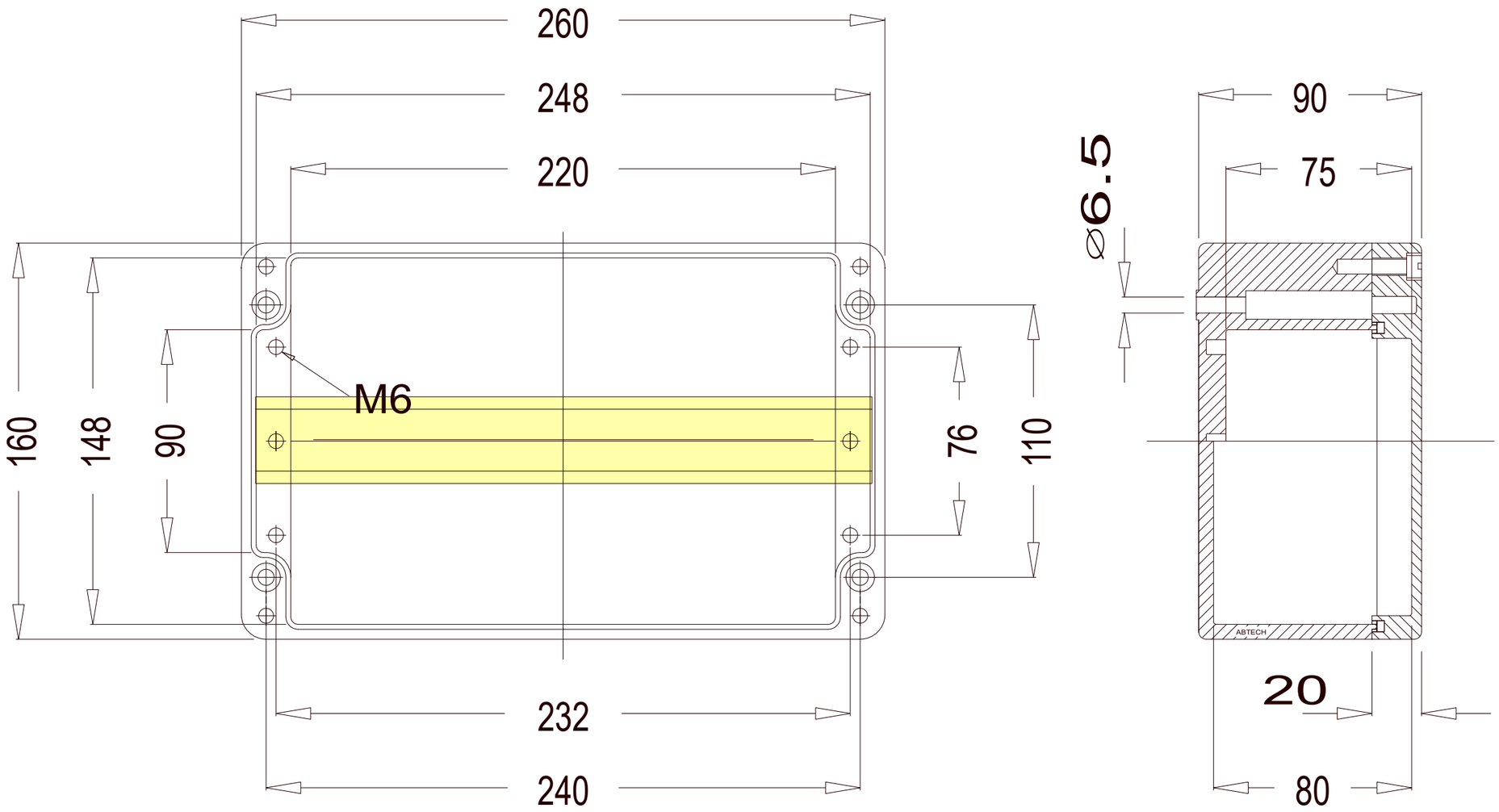
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				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Levelwind & Slack Wire Compensator Level Wind Connection Box Internal Connection	400182378	=LEV01
				User	GSK					+UC01
				Approved	RAJ				10070-04 GA	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 1 / Next 2



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Levelwind & Slack Wire Compensator Level Wind Connection Box Internal Connection	400182378	=LEV01	
				User	GSK					+UC01	
				Approved	RAJ				10070-04 GA	Rev. G	Sheet 2
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

AD7C40B1747540CBF652D56B6311BE9

Yard Connections

Internal Connections

Storage Drum

=WCS01
+UH03

Main VFD Cabinet
Pentagon
Brake HPU
Gear Cooling HPU

-WG13 FD CP (TP) plus 2x2x0.75

=WCS01
+UH02

Main VFD Cabinet
Traction Winch
System
CTD WInch

-WD17 FD 855 CP 3G0.75

+UC1

Winch Connection
Box

-WG14 FD CP (TP) plus 4x2x0.25 — ENC
-WD18 2YSLCYK-JB 3x16+3x2.5 — PWR
-WD19 FD 855 CP 3G1.5 — HEAT
-WG15 FD CP (TP) plus 1x2x0.75 — PTC

M
3~

-MA1

Max Rating 60A
400V/50Hz

-WG1 PUR 4x0.34mm2 Shld

Temp

-BP1
Temp Sensor

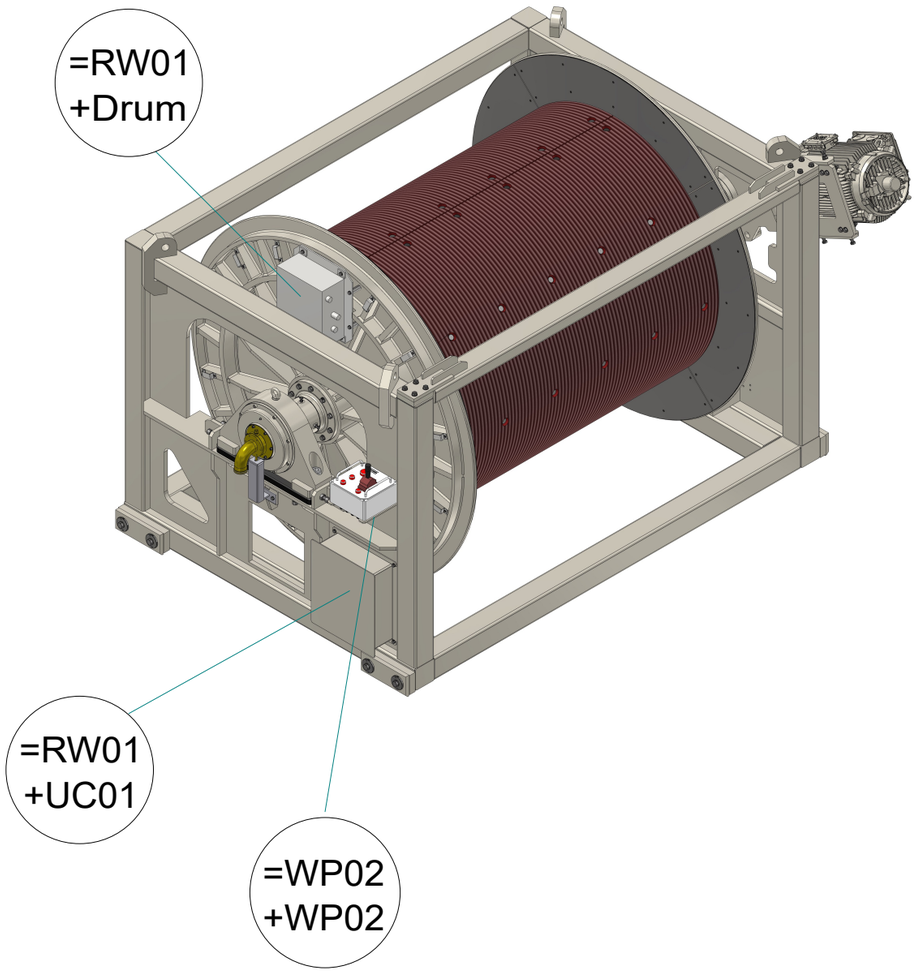
-WG2 Valve Cable 3x0.75+PE

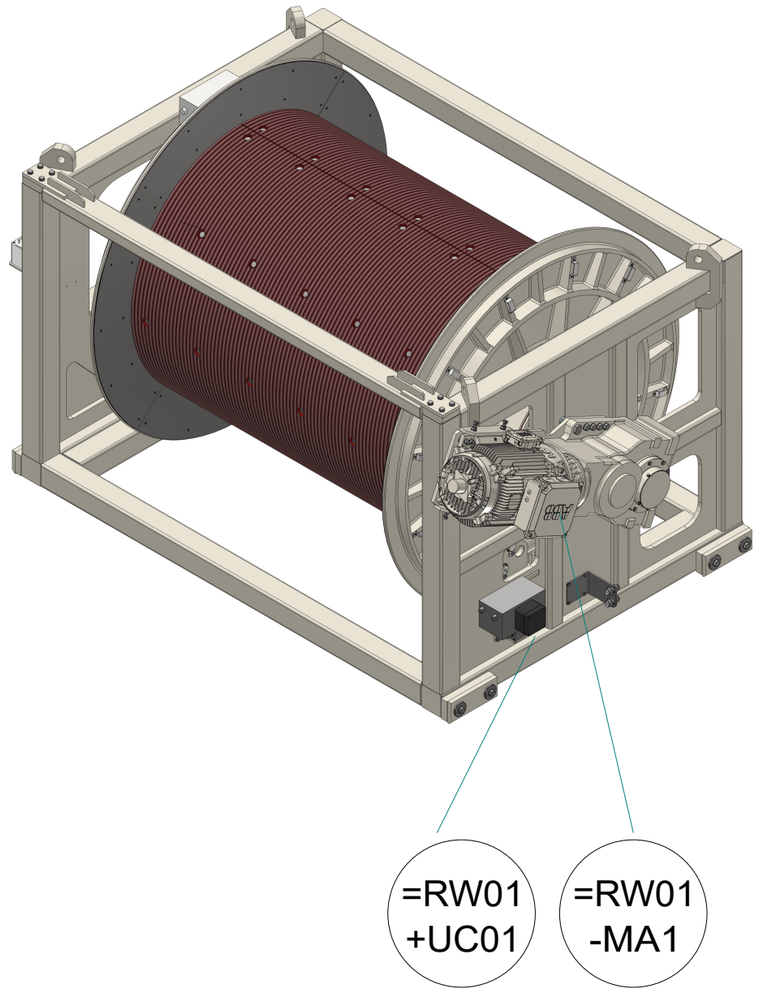
-QM1

Brake Valve

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Storage Drum Storage Drum	400182467	=RW01
				User	GSK					
				Approved	RAJ				10070-05 CD	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 1 / Next 2

AD7C40B1747540CBF652D56B6311BE9



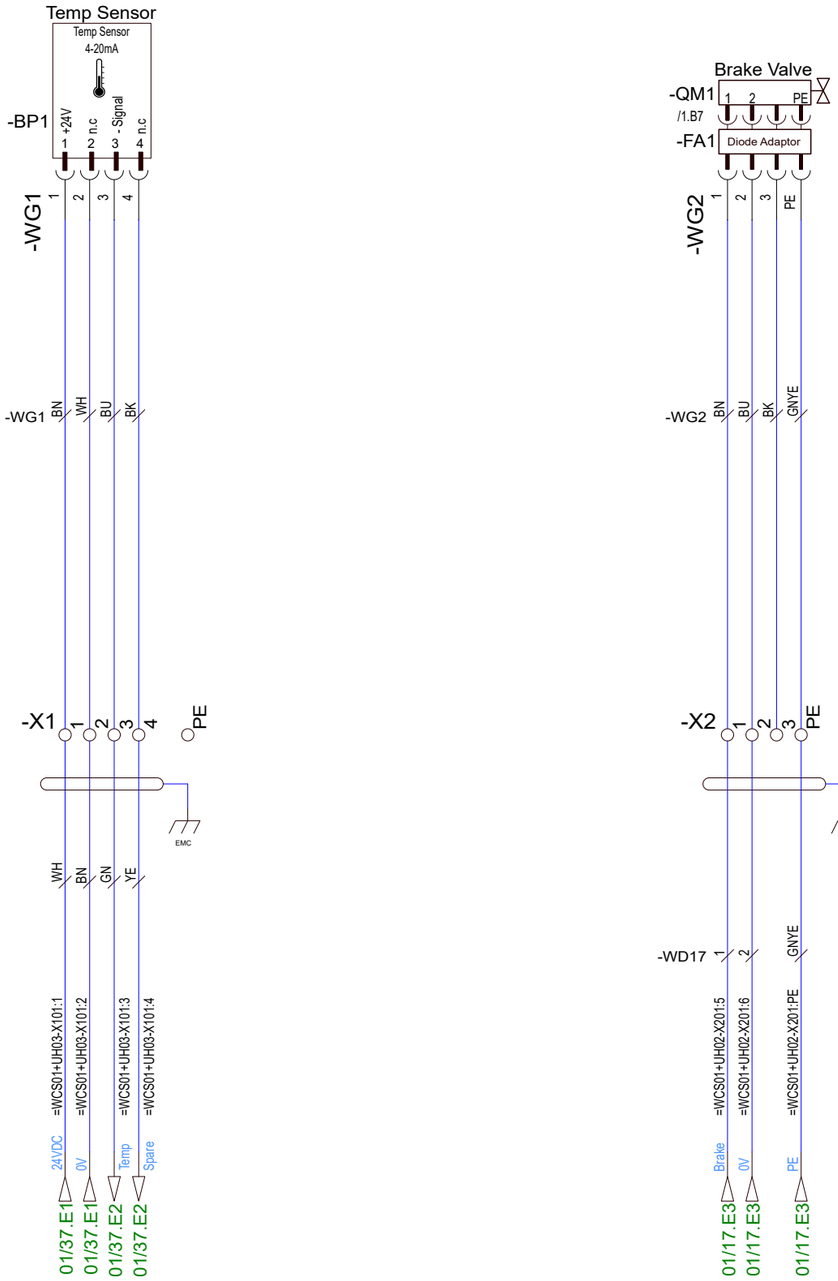


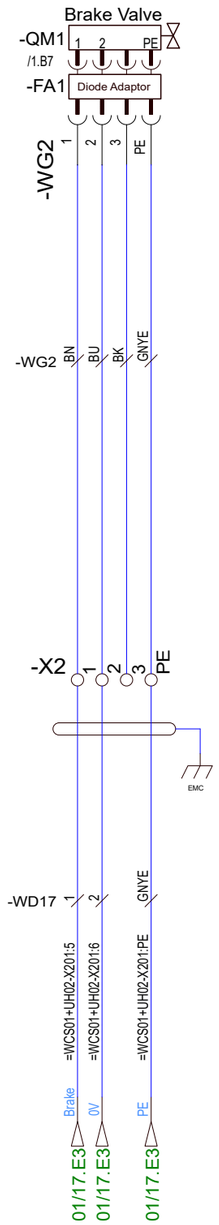
General Picture
Winch might be mirrored

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Storage Drum Connection Point Overview	400182467	=RW01	
				User	GSK						
				Approved	RAJ					10070-05 CD	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Sheet 2 / Next 1

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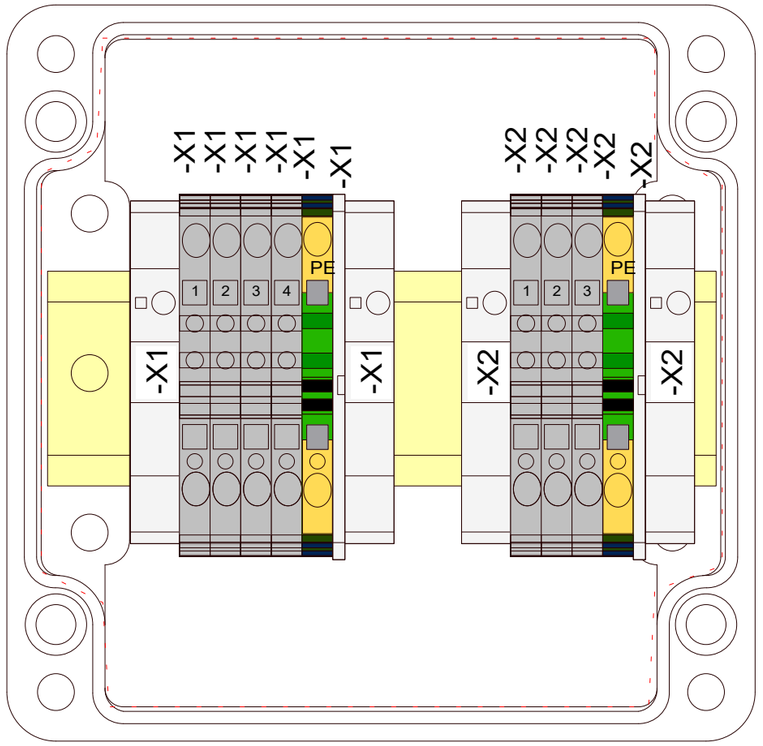
Gear Temp

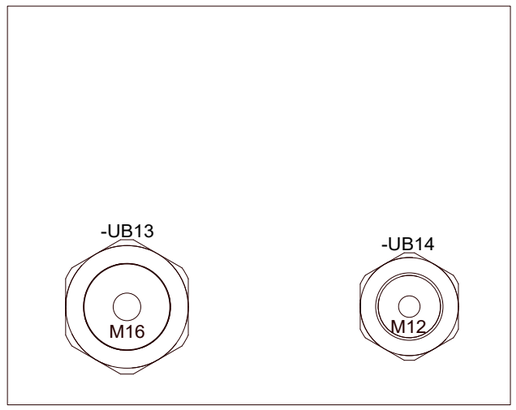


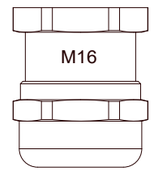


				Date	17/11-2021	CNP Freire MBari		Storage Drum Winch Connection Box	400182467	=RW01	
				User	GSK					+UC1	
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Rev. G	Sheet 1
									10070-05 CC		Next 1

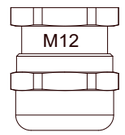
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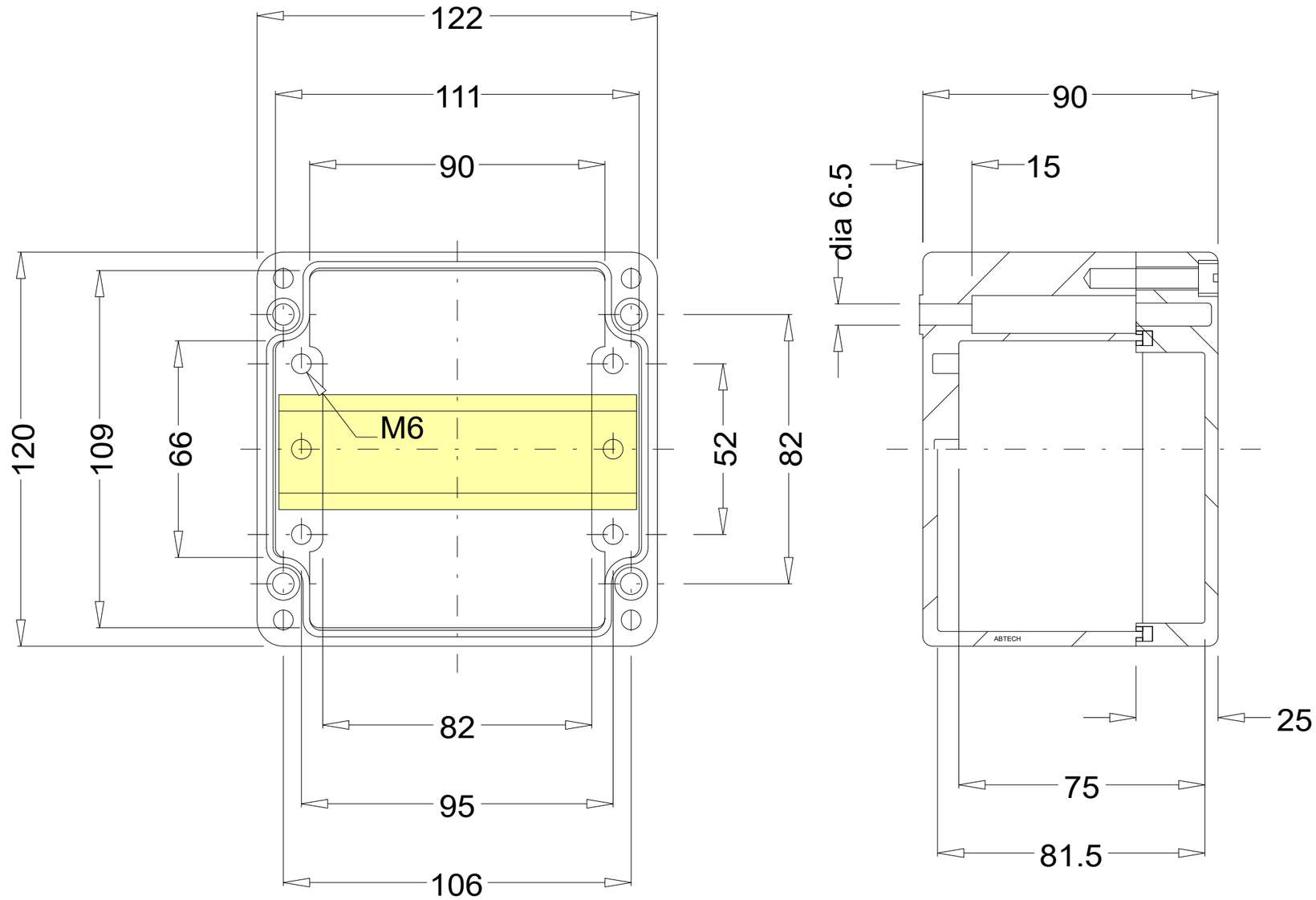
-UB13



-UB14

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Storage Drum Winch Connection Box	400182467	=RW01	
				User	GSK					+UC1	
				Approved	RAJ				10070-05 GA	Rev. G	Sheet 1
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 2

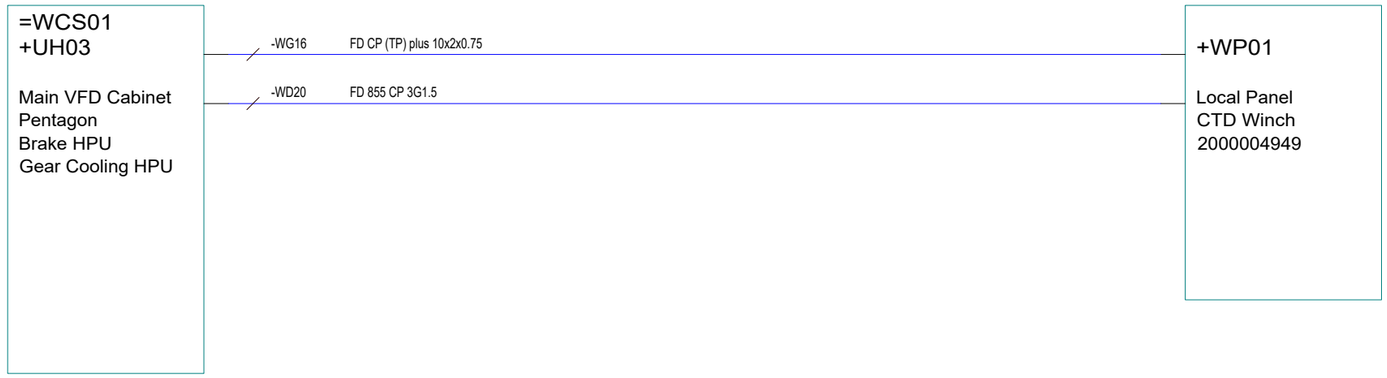
AD7C40B1747540CBF652D56B6311BE9



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Storage Drum Winch Connection Box	400182467	=RW01	
				User	GSK					+UC1	
				Approved	RAJ				10070-05 GA	Rev. G	Sheet 2
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

AD7C40B1747540CBF652D56B6311BE9

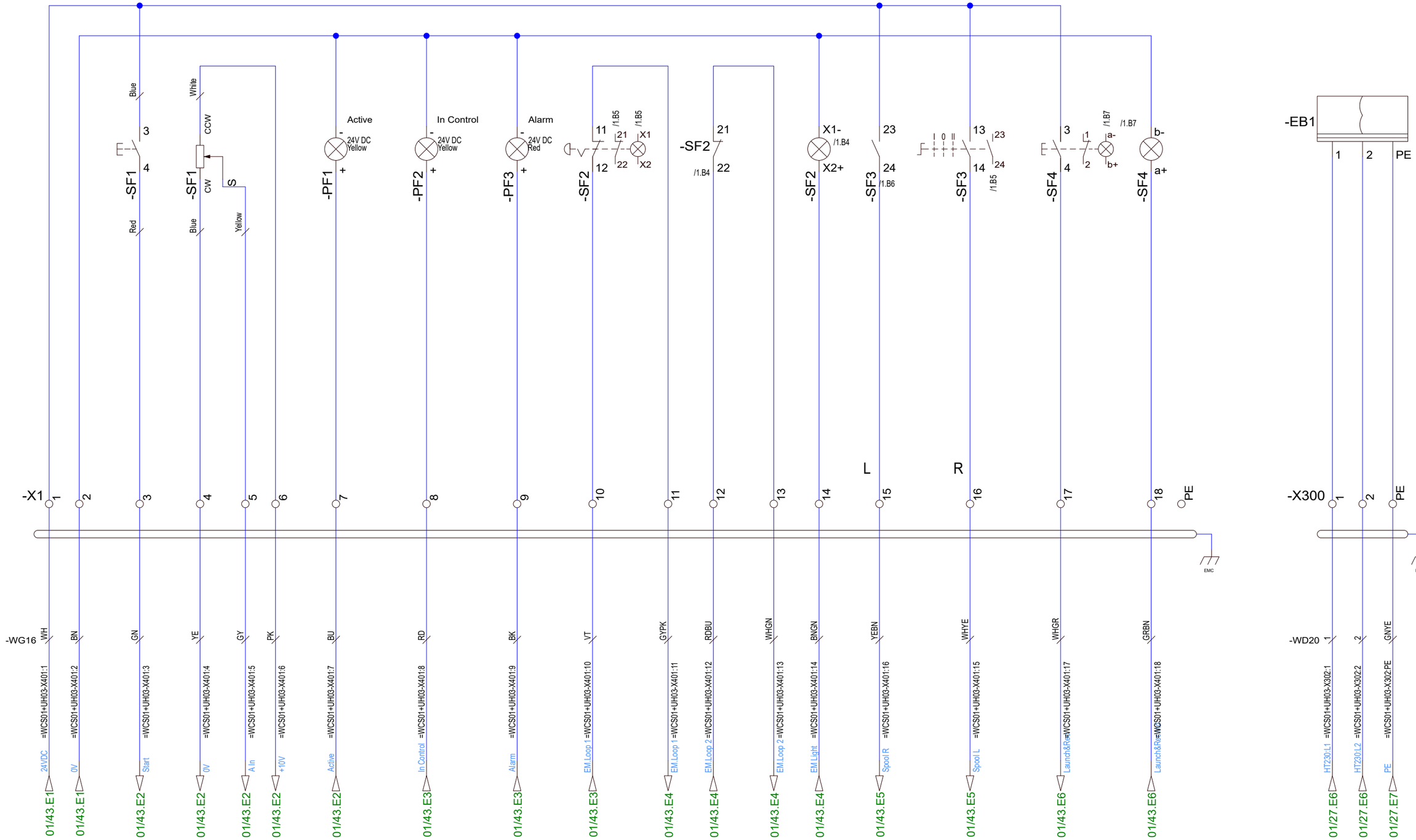
Cables That Needs To Be Connected By Yard



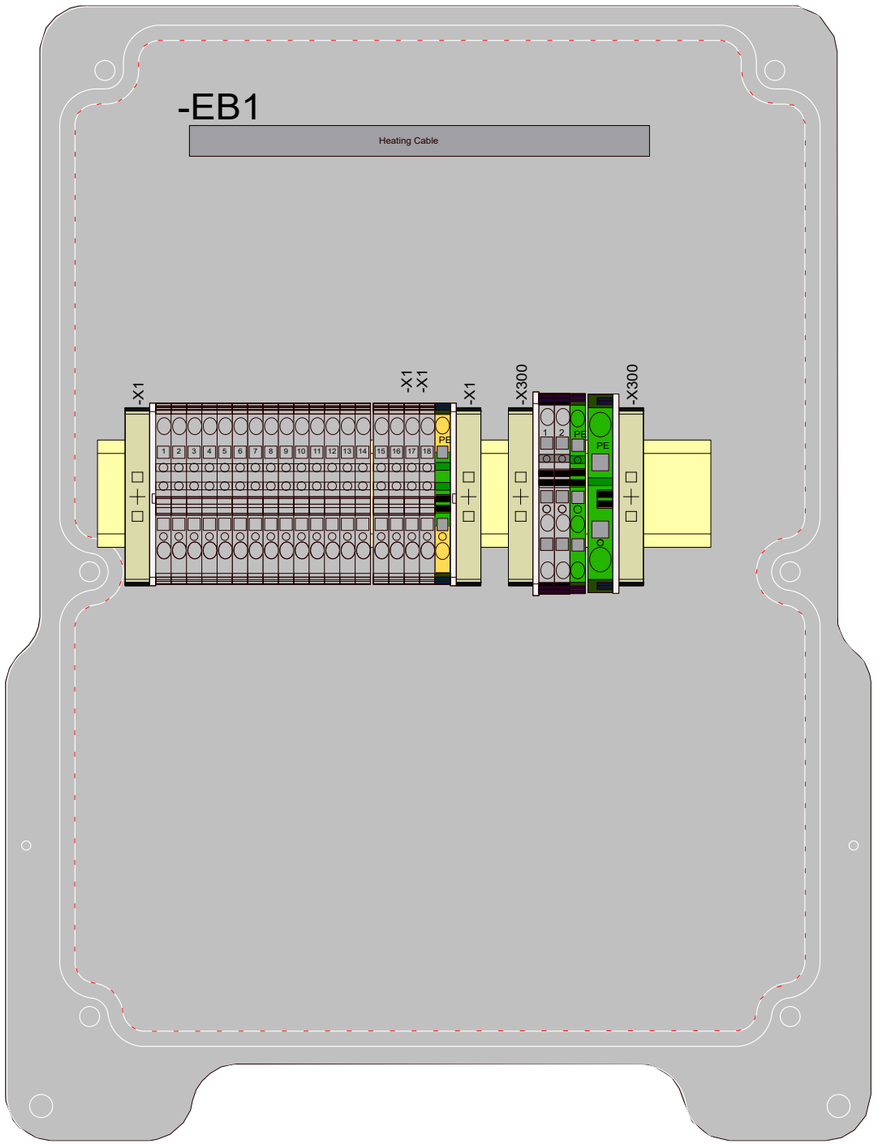
				Date	17/11-2021	CNP Freire	MACGREGOR	Local Panel CTD Winch	400182468	=WP01	
				User	GSK	MBari		Local Panel CTD Winch			
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-06 CD Rev. G	Sheet 1 / Next 1

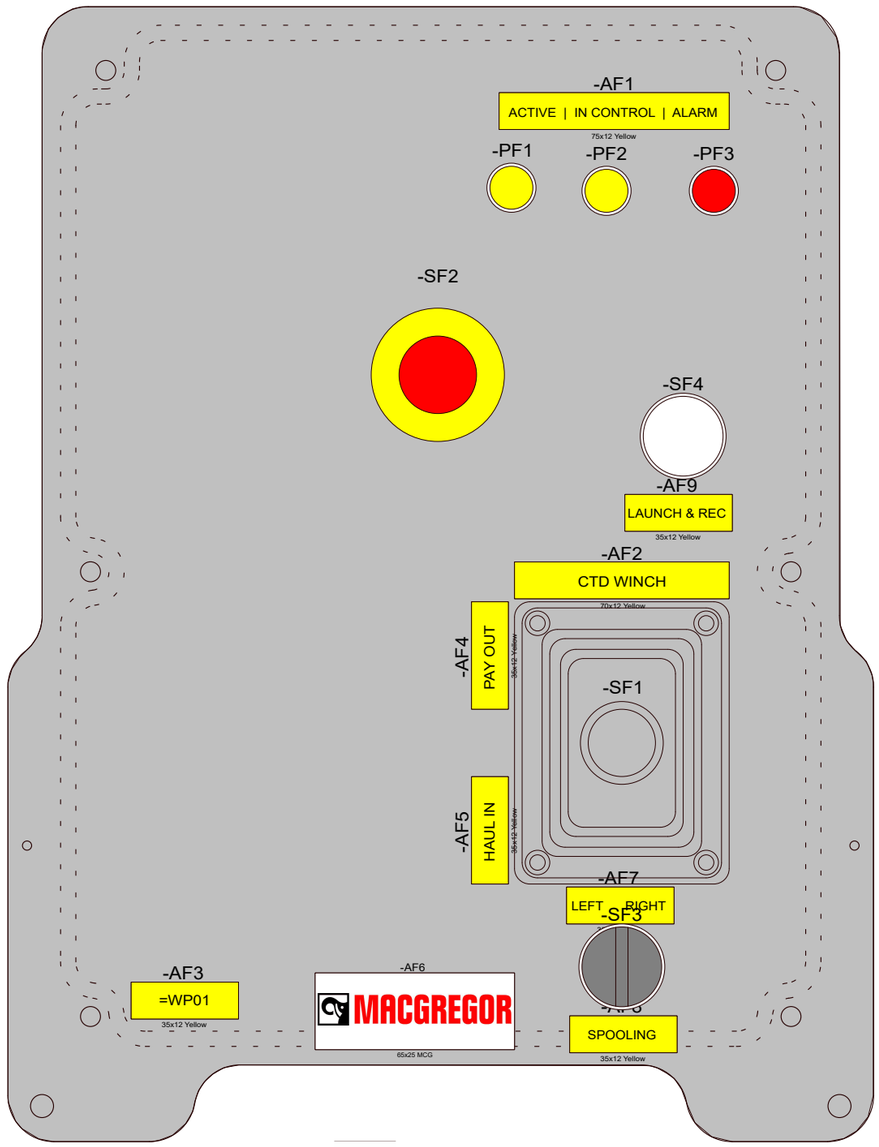
AD7C40B1747540CBF652D56B6311BE9

+24V | 0V | Safer Input | Joystick | Active | In control | Alarm | Emergency Stop | Emergency Stop Light | Spooling L/R | Launch & Recovery | Launch & Recovery Light | Panel Heater



				Date	17/11-2021	CNP Freire MBari		Local Panel CTD Winch Winch 1, EMS, Spooling, Heater	400182468	=WP01	
				User	GSK					+WP01	
				Approved	RAJ				10070-06 CC	Rev. G	Sheet 1
Status	Change	Date	Name	Standard		Version	Index / Repl. by				Next 1





-X1
DEK 5 FWZ 1-10

-X300
WAD 8 MC NE WS

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Local Panel CTD Winch Panel layout	400182468	=WP01	
				User	GSK					+WP01	
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Rev. G	Sheet 1
									10070-06 GA		Next 1

Cables That Needs To Be Connected By Yard

=WCS01
+UH03

Main VFD Cabinet
Pentagon
Brake HPU
Gear Cooling HPU

-WG17 FD CP (TP) plus 8x2x0.75

-WG18 FD CP (TP) plus 6x2x0.75

-WD21 FD 855 CP 3G1.5

JOG Levelwind

JOG Winch

+WP02

Local Panel
ROV Traction System
2000004950

=WCS01
+UH01

Main VFD Cabinet
Power Input
Levelwinds

-WD22 FD 855 CP 4G0.75

=WCS01
+UH02

Main VFD Cabinet
Traction Winch
System
CTD WInch

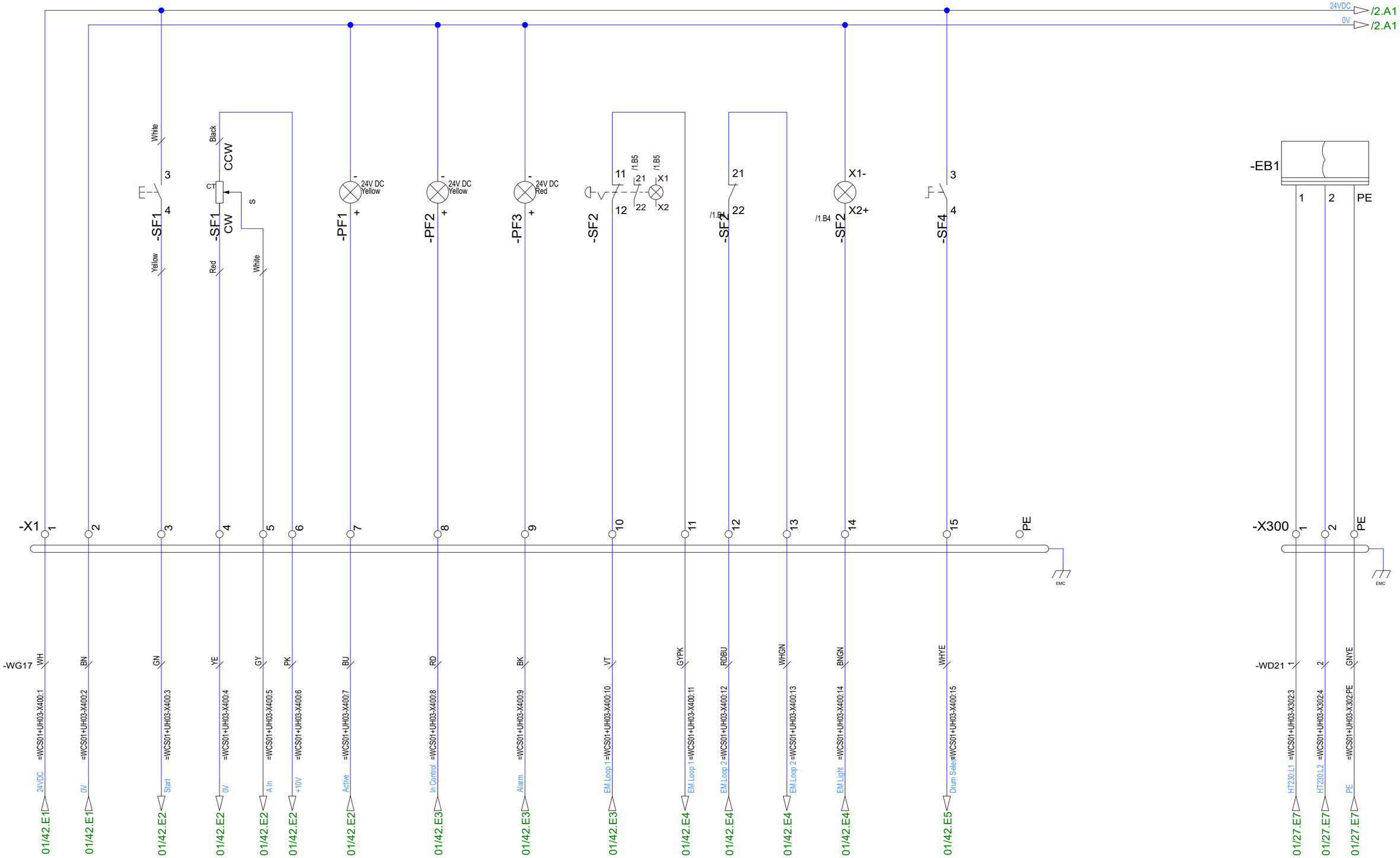
-WD23 FD 855 CP 7G0.75

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Deck Panel ROV Winch System Deck Panel ROV Winch System	400182477	=WP02	
				User	GSK						
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-07 CD	Rev. G

Sheet 1
Next 1

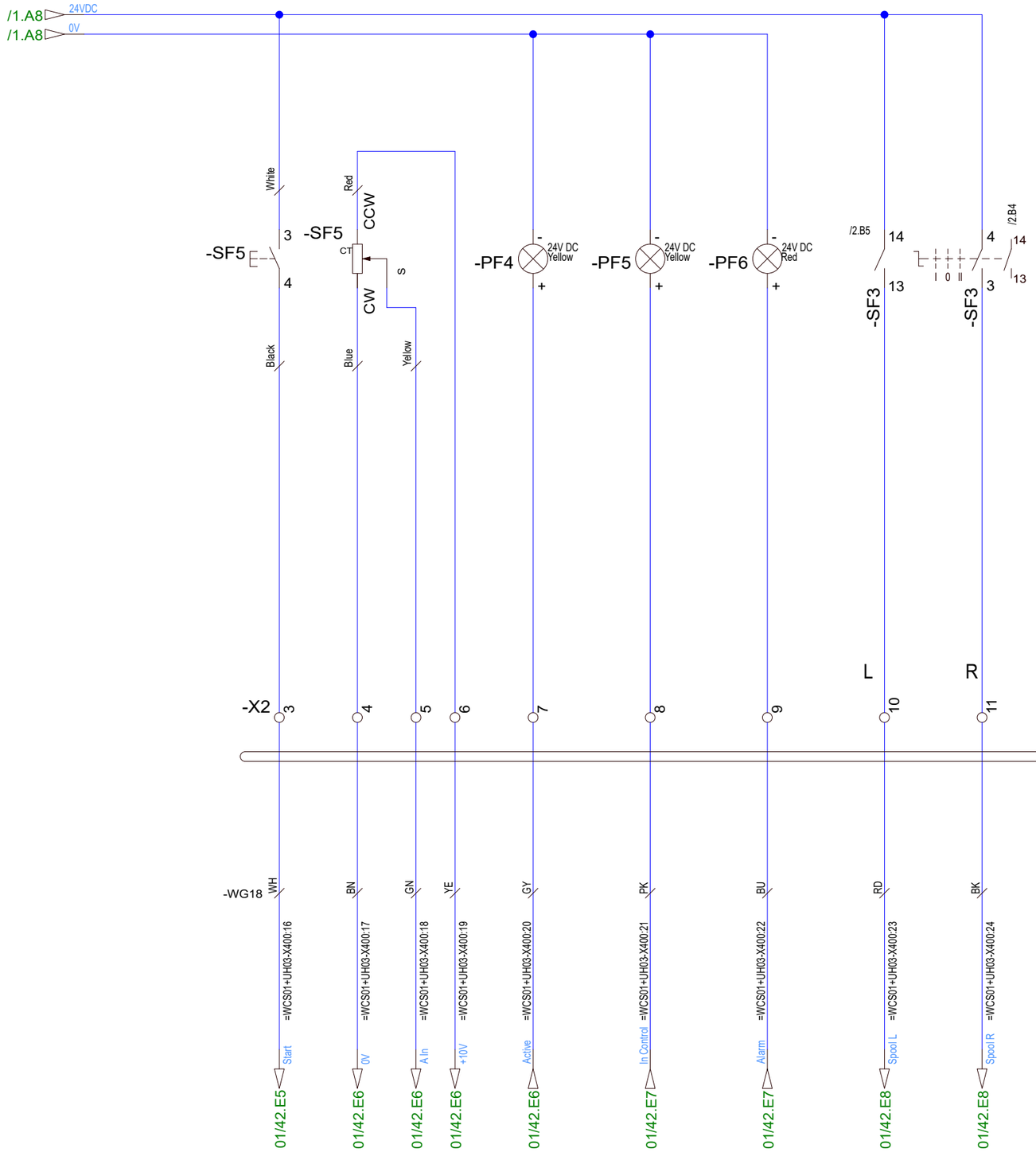
AD7C40B1747540CBF652D56B6311BE9

+24V | 0V | Safer Input | Joystick | Active | In control | Alarm | Emergency Stop Loop 1 | Emergency Stop Loop 2 | Emergency Stop Light | TRW Activate /Deactivate | Panel Heater



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Deck Panel ROV Winch System Circuit Diagram Traction Winch, EMS, Spooling, Heater Activate	400182477	=WP02 +WP02	
				User	GSK						
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-07 CC Rev. G	Sheet 1 Next 2

Safer Input | Joystick | Active | In control | Alarm | Spooling L/R



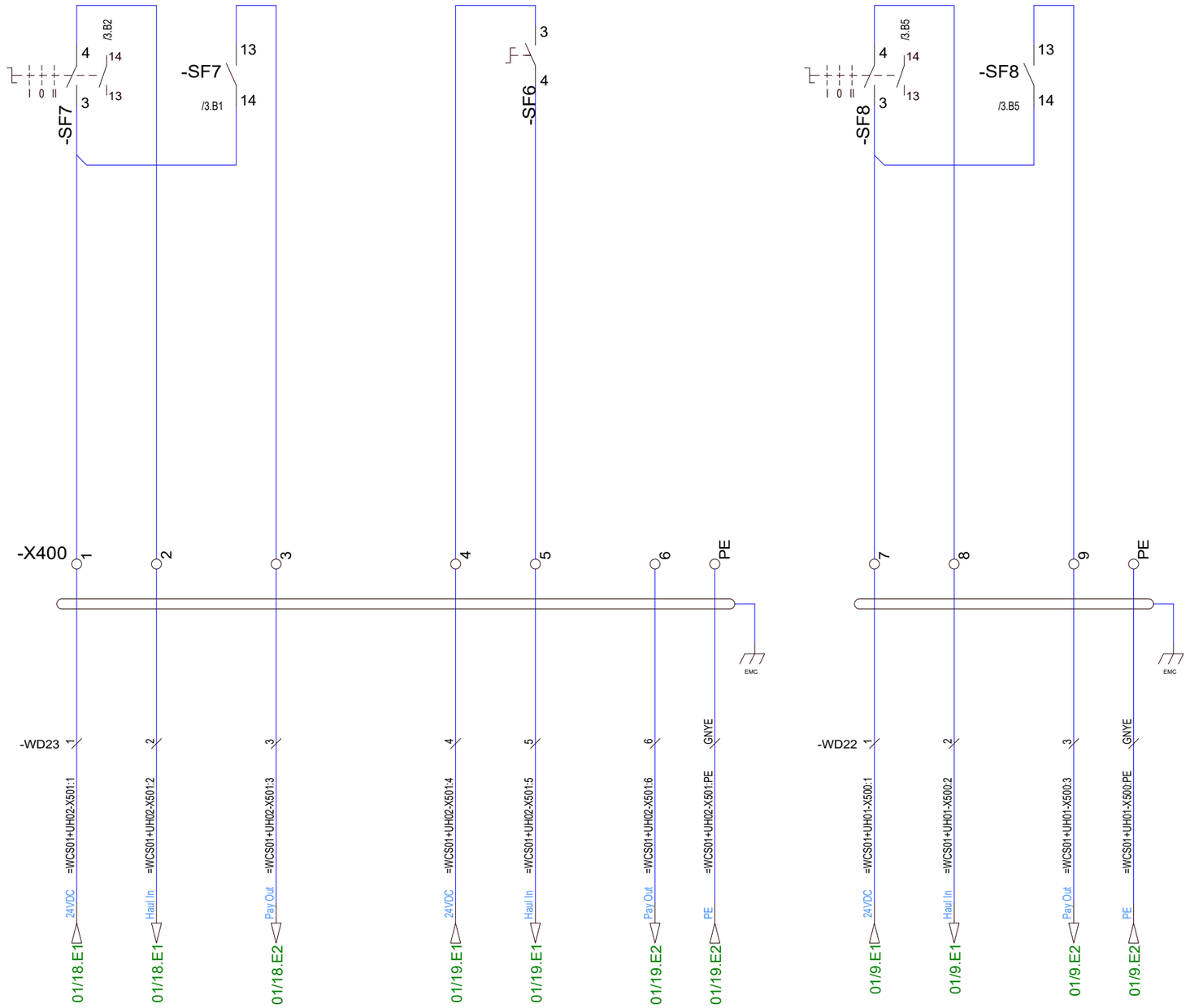
				Date	17/11-2021	CNP Freire MBari		Deck Panel ROV Winch System Circuit Diagram Storage Drum	400182477	=WP02 +WP02	
				User	GSK						
				Approved	RAJ				10070-07 CC	Rev. G	Sheet 2 Next 3
Status	Change	Date	Name	Standard		Version	Index / Repl. by				

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Traction Winch Emergency Control

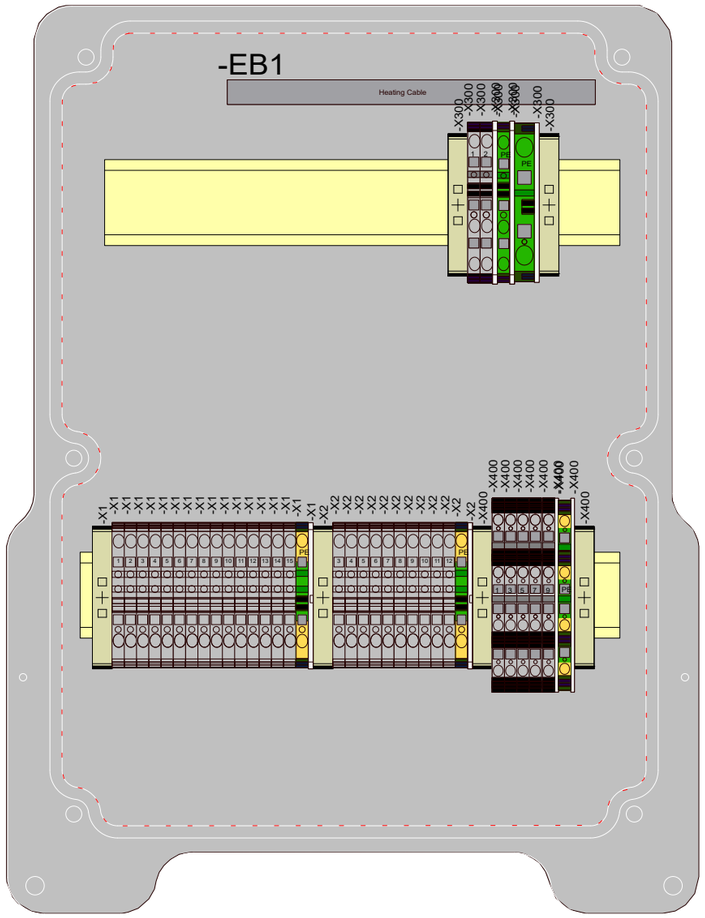
Storage Drum Tension Emergency Control

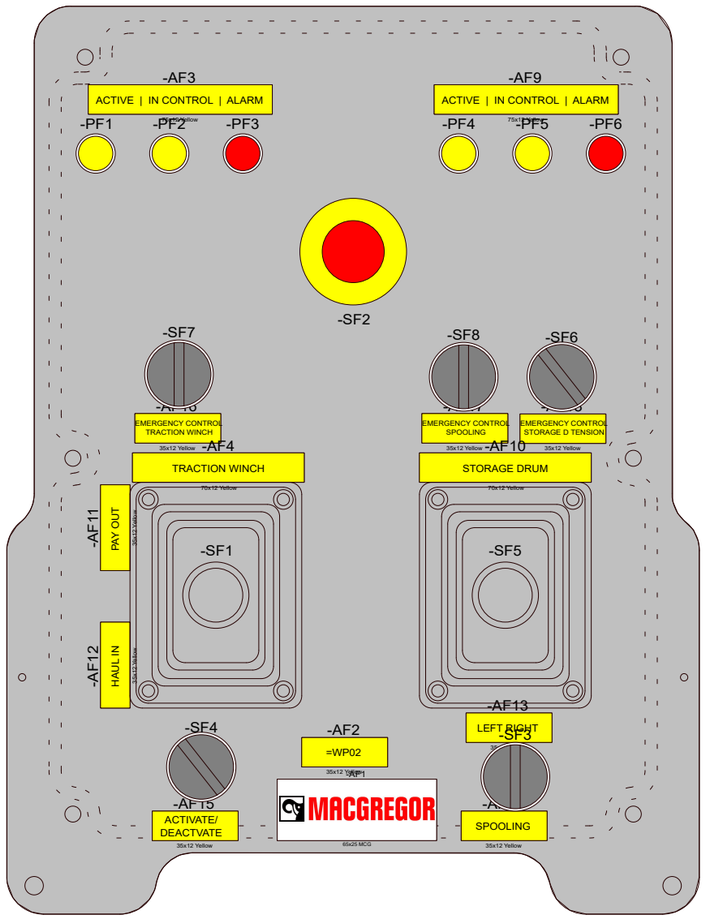
Levelwind Emergency Control



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Deck Panel ROV Winch System Emergency Control Switches	400182477	=WP02
				User	GSK					+WP02
				Approved	RAJ			Circuit Diagram	10070-07 CC	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 3 / Next 1

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				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Deck Panel ROV Winch System Panel Layout	400182477	=WP02 +WP02
				User	GSK					
				Approved	RAJ				10070-07 GA	Rev. G
Status	Change	Date	Name	Standard		Version / Index / Repl. by				Sheet 1 Next 1



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	ROV Control Room Panel Winches Control Room Panel	400182478	=CP01	
				User	GSK						
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Rev. G	Sheet 1 / Next 1

AD7C40B1747540CBF652D56B6311BE9

-PH1

DuraPANEL 12.1"

24V	0V	24V	0V	USB1	USB2	USB3	USB4	LAN1	LAN2	LAN3	LAN4	DVI	Serial
2	1	2	1										

-X1 1 2 PE EMC

-WD24 1 =WCS01+UH03-X402:1 24VDC 01/44.E1

-WD24 2 =WCS01+UH03-X402:2 0V 01/44.E1

-WD24 GNYE =WCS01+UH03-X402:PE PE 01/44.E2

-XG1 RJ-45 RJ-45

-WF3 USB 2.0 Cable A-A M/M 1m

-XG2 USB USB

-WF1 Patch Cord 0.5M

-XG3 RJ 45 Module

5	4	1	2	3	6	7	8	S
WHBU	BU	WHOR	OR	WHGN	GN	WHBN	BN	
=WCS01+UH03-RJ3:5	=WCS01+UH03-RJ3:4	=WCS01+UH03-RJ3:1	=WCS01+UH03-RJ3:2	=WCS01+UH03-RJ3:3	=WCS01+UH03-RJ3:6	=WCS01+UH03-RJ3:7	=WCS01+UH03-RJ3:8	
ETH5	ETH4	ETH1	ETH2	ETH3	ETH6	ETH7	ETH8	
01/30.E3	01/30.E3	01/30.E3	01/30.E3	01/30.E4	01/30.E4	01/30.E4	01/30.E4	

-WF2

-WF2 Patch Cord 0.5M

-XG4 RJ 45 Module

5	4	1	2	3	6	7	8	S
WHBU	BU	WHOR	OR	WHGN	GN	WHBN	BN	
=WCS01+UH03-RJ4:5	=WCS01+UH03-RJ4:4	=WCS01+UH03-RJ4:1	=WCS01+UH03-RJ4:2	=WCS01+UH03-RJ4:3	=WCS01+UH03-RJ4:6	=WCS01+UH03-RJ4:7	=WCS01+UH03-RJ4:8	
ETH5	ETH4	ETH1	ETH2	ETH3	ETH6	ETH7	ETH8	
01/30.E4	01/30.E4	01/30.E4	01/30.E4	01/30.E4	01/30.E5	01/30.E5	01/30.E5	

-WF3

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	ROV Control Room Panel Winches Panel PC, 1 Joystick	400182478	=CP01
				User	GSK					+CP01
				Approved	RAJ					
Status	Change	Date	Name	Standard		Version	Index	Repl. by	10070-08 CC	Rev. G

Sheet 1 Next 2

Activate

-KF1

Control Room Panel
Safer Switch Joystick
/2.E1
CTRL SW

P2 7 NPN In — White — 3 — -SF1 — 4

P2 8 GND — Black

Joystick

-KF1

Control Room Panel
Winch Control
/2.E1
Joystick

P2 4 +5V — Red — S

P2 5 A In — Yellow — CW — CT — -SF1

P2 6 GND — Blue — CCW

CAN-bus

-KF1

Control Room Panel
CAN-bus
/2.E1
CAN-bus

GND — CAN L — CAN H — +24V

1.3.5.6 — 4 — 2 — 7.8.9.10

10P Connector

10W

10W Ribbon Cable End

0V	Low	High	+24V
1-3-5-6	4	2	7-8-9-10

-X50 pins 1 2 3 4 5

Under Startup
Remove the 120 Ohm Resistor
Only Resistor in the Can Bus Ends

-WF1

BK	BU	Shield	WH	RD
=WCS01+UH03-X50:1	=WCS01+UH03-X50:2	=WCS01+UH03-X50:3	=WCS01+UH03-X50:4	=WCS01+UH03-X50:5
0V	Can L	Can Gnd	Can H	24VDC
01/33.E2	01/33.E2	01/33.E2	01/33.E3	01/33.E3

EMC

-KF1

CAN BUS JOYSTICK CARD

Adress

I/O	Ref	Adress	Description
Joystick	/2.B2		Winch Control
Potmeter			
CAN-bus	/2.B6		CAN-bus
Serial Display			
CTRL SW	/2.B1		Safer Switch Joystick
MAN SW			
IN 1	/3.B2		Alarm Reset
IN 2			

I/O	Ref	Adress	Description
IN 3			
DIM SW			
EM STOP			
OUT 1	/3.B3		Reset Alarm Light
OUT 2	/3.B1		Alarm Buzzer
OUT 3			
OUT 4			

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	ROV Control Room Panel Winches Panel PC, 1 Joystick	400182478	=CP01
				User	GSK					+CP01
	Removed unused CanBus Connection	28.11.2022	ANP	Approved	RAJ					
Status	Change	Date	Name	Standard		Version	Index	Repl. by	10070-08 CC	Rev. G

Sheet 2 / Next 3

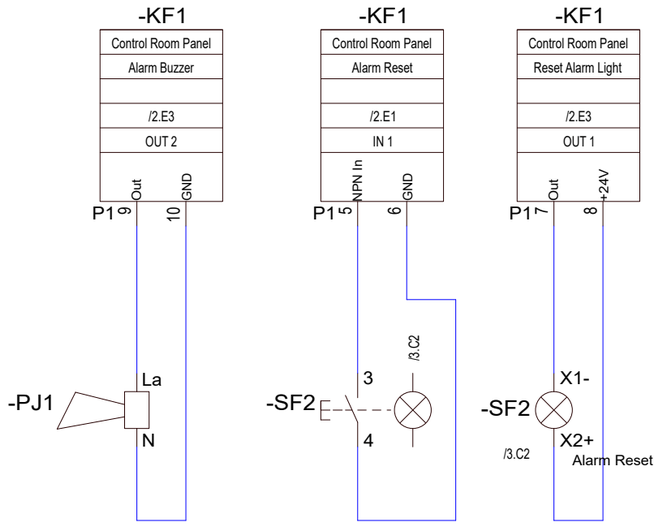
Alarm Buzzer

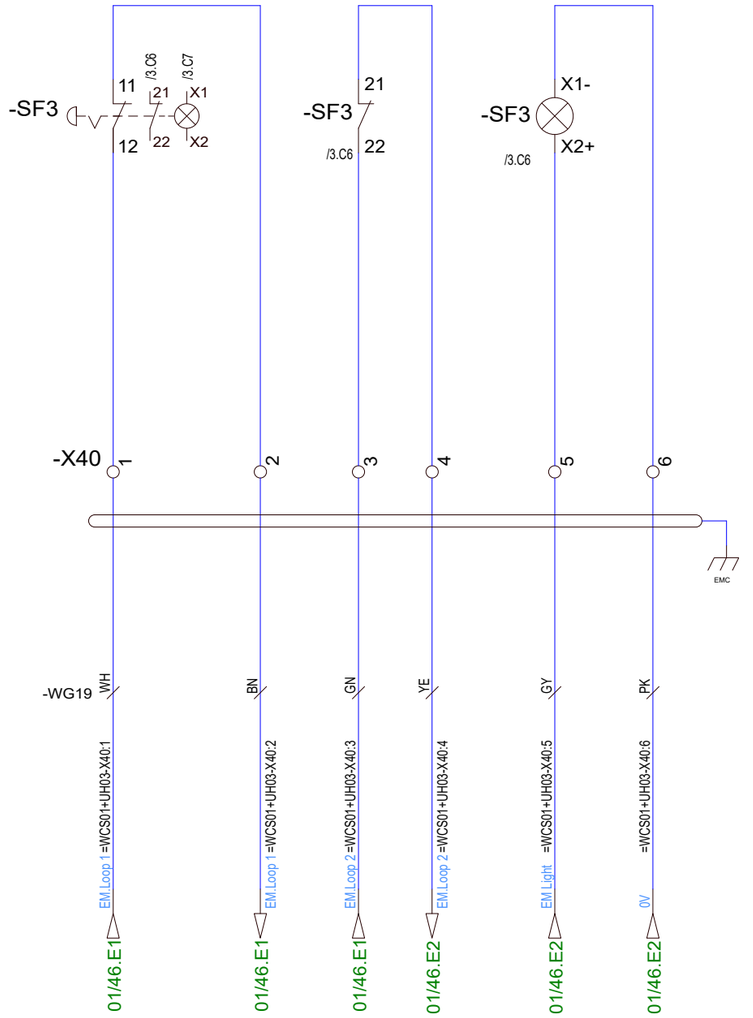
Alarm Reset Switch

Alarm Light

Emergency Stop Loop

Emergency Stop Light





				Date	17/11-2021	CNP Freire MBari	MACGREGOR	ROV Control Room Panel Winches Panel PC, 1 Joystick	400182478	=CP01
				User	GSK					+CP01
				Approved	RAJ				10070-08 CC	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 3 / Next 1

AD7C40B1747540CBF652D56B6311BE9

Emergency stop

-SF3

-PH1
DuraPANEL 12.1"

-KF1
Active
In opr.
Alarm
Em. stop

PAY OUT
HAUL IN

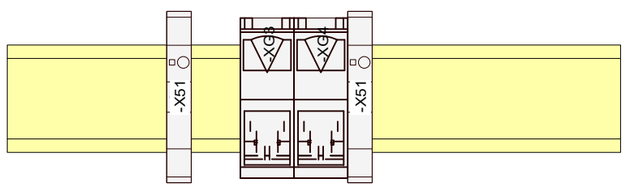
-SF1

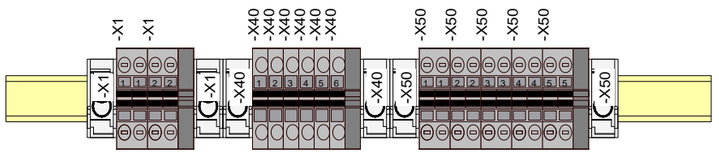
-XG2 -XG1

-AF2
=CP01
35x12 Blue

-AF4
MACGREGOR
65x25 MCG

-SF2 -PJ1





-X1 DEK 5 FWZ 1-10
-X40 DEK 5 FWZ 1-10
-X50 DEK 5 FWZ 1-10

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	ROV Control Room Panel Winches Panel Layout	400182478	=CP01
				User	GSK					+CP01
				Approved	RAJ				10070-08 GA	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 1 / Next 1



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	AFT Control Station Panel Winches Control Room Panel	400186798	=CP03	
				User	GSK						
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-10 CD Rev. G	Sheet 1 / Next 1

AD7C40B1747540CBF652D56B6311BE9

-PH1

DuraPANEL 12.1"

24V	0V	24V	0V	USB1	USB2	USB3	USB4	LAN1	LAN2	LAN3	LAN4	DVI	Serial
2	1	2	1										

-X1 1 2 PE EMC

-WD25 1 =WCS01+UH03-X402:3 24VDC → 01/44.E2

-WD25 2 =WCS01+UH03-X402:4 0V → 01/44.E2

-WD25 GNYE =WCS01+UH03-X402:PE PE → 01/44.E2

-XG1 RJ-45 RJ-45

-WF3 USB 2.0 Cable A-A M/M 1m

-XG2 USB USB

-WF1 Patch Cord 0.5M

-XG3 RJ 45 Module

5	4	1	2	3	6	7	8	S
WHBU	BU	WHOR	OR	WHGN	GN	WHBN	BN	
=WCS01+UH03-RJ5:5	=WCS01+UH03-RJ5:4	=WCS01+UH03-RJ5:1	=WCS01+UH03-RJ5:2	=WCS01+UH03-RJ5:3	=WCS01+UH03-RJ5:6	=WCS01+UH03-RJ5:7	=WCS01+UH03-RJ5:8	
ETH5	ETH4	ETH1	ETH2	ETH3	ETH6	ETH7	ETH8	
01/30.E6	01/30.E6	01/30.E6	01/30.E6	01/30.E6	01/30.E6	01/30.E6	01/30.E7	

-WF2 Patch Cord 0.5M

-XG4 RJ 45 Module

5	4	1	2	3	6	7	8	S
WHBU	BU	WHOR	OR	WHGN	GN	WHBN	BN	
=WCS01+UH03-RJ6:5	=WCS01+UH03-RJ6:4	=WCS01+UH03-RJ6:1	=WCS01+UH03-RJ6:2	=WCS01+UH03-RJ6:3	=WCS01+UH03-RJ6:6	=WCS01+UH03-RJ6:7	=WCS01+UH03-RJ6:8	
ETH5	ETH4	ETH1	ETH2	ETH3	ETH6	ETH7	ETH8	
01/30.E7	01/30.E7	01/30.E7	01/30.E7	01/30.E7	01/30.E7	01/30.E7	01/30.E7	

-WF7

-WF6

Status	Change	Date	Name	Date	17/11-2021	CNP Freire MBari	MACGREGOR	AFT Control Station Panel Winches Panel PC, 1 Joystick
				User	GSK			
				Approved	RAJ			
				Standard		Version / Index / Repl. by		

400186798

=CP03

+CP03

10070-10 CC

Rev. G

Sheet 1

Next 2

Activate

-KF1

Control Room Panel
Safer Switch Joystick
/2.E1
CTRL SW

P2 7 NPN In — White — 3 — -SF1 — 4
P2 8 GND — Black

Joystick

-KF1

Control Room Panel
Winch Control
/2.E1
Joystick

P2 4 +5V — Red
P2 5 A In — Yellow — S — CW — CT — -SF1 — CCW
P2 6 GND — Blue

CAN-bus

-KF1

Control Room Panel
CAN-bus
/2.E1
CAN-bus

GND — 1.3.5.6
CAN L — 4
CAN H — 2
+24V — 7.8.9.10

10P Connector

10W

10W Ribbon Cable End

0V	Low	High	+24V
1-3-5-6	4	2	7-8-9-10

Under Startup
Remove the 120 Ohm Resistor
Only Resistor in the Can Bus Ends

-X50 1 2 3 4 5

-WF5

	1	2	3	4	5
	BK	BU	Shield	WH	RD
	=WCS01+UH03-X50:1	=WCS01+UH03-X50:2	=WCS01+UH03-X50:3	=WCS01+UH03-X50:4	=WCS01+UH03-X50:5
	0V	Can L	Can Gnd	Can H	24VDC
	01/33.E3	01/33.E3	01/33.E3	01/33.E4	01/33.E4

EMC

-WF8

	1	2	3	4	5
	BK	BU	Shield	WH	RD
	=CP04+CP04-X50:1	=CP04+CP04-X50:2	=CP04+CP04-X50:3	=CP04+CP04-X50:4	=CP04+CP04-X50:5
	0V	Can L	Can Gnd	Can H	24VDC
	11/1.E6	11/1.E6	11/1.E7	11/1.E7	11/1.E7

EMC

-KF1

CAN BUS JOYSTICK CARD

Adress	

I/O	Ref	Adress	Description
Joystick	/2.B2		Winch Control
Potmeter			
CAN-bus	/2.B6		CAN-bus
Serial Display			
CTRL SW	/2.B1		Safer Switch Joystick
MAN SW			
IN 1	/3.B2		Alarm Reset
IN 2			

I/O	Ref	Adress	Description
IN 3			
DIM SW			
EM STOP			
OUT 1	/3.B3		Reset Alarm Light
OUT 2	/3.B1		Alarm Buzzer
OUT 3			
OUT 4			

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	AFT Control Station Panel Winches Panel PC, 1 Joystick	400186798	=CP03 +CP03
				User	GSK					
				Approved	RAJ				10070-10 CC	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 2 Next 3

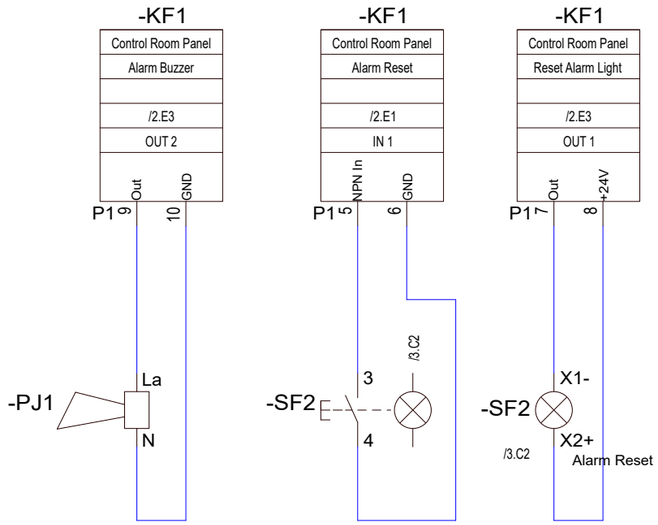
Alarm Buzzer

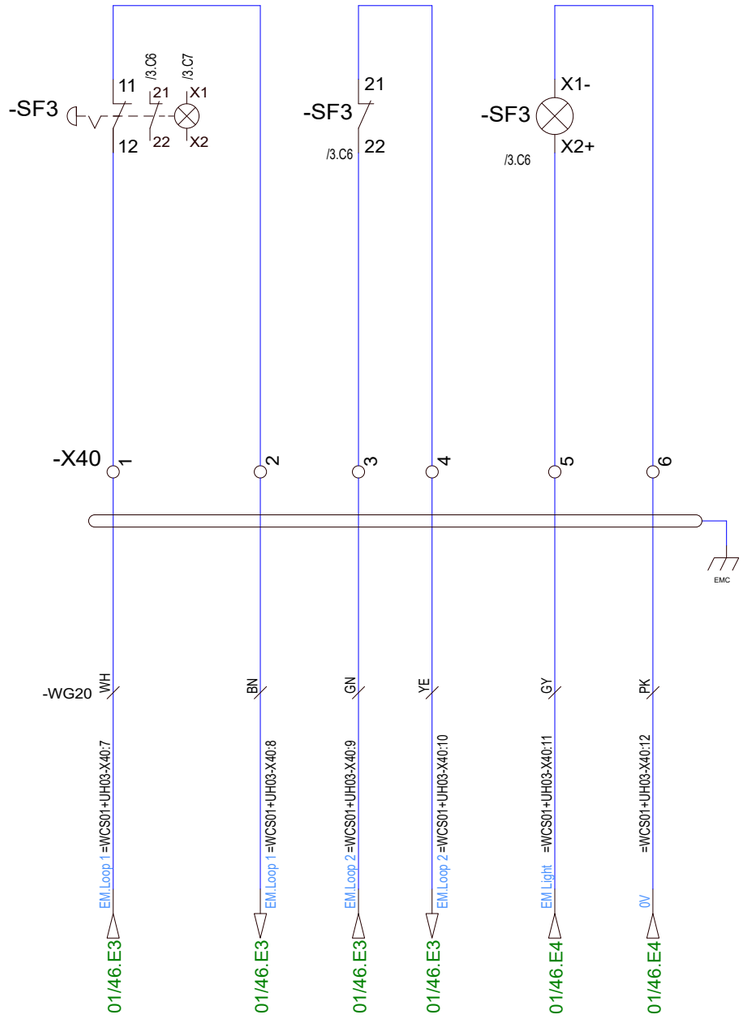
Alarm Reset Switch

Alarm Light

Emergency Stop Loop

Emergency Stop Light





				Date	17/11-2021	CNP Freire MBari		AFT Control Station Panel Winches Panel PC, 1 Joystick	400186798	=CP03	
				User	GSK					+CP03	
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-10 CC Rev. G	Sheet 3 / Next 1

AD7C40B1747540CBF652D56B6311BE9

Emergency stop

-SF3

-PH1
DuraPANEL 12.1"

-KF1
Active
In opr.
Alarm
Em. stop

PAY OUT
HAUL IN

-SF1

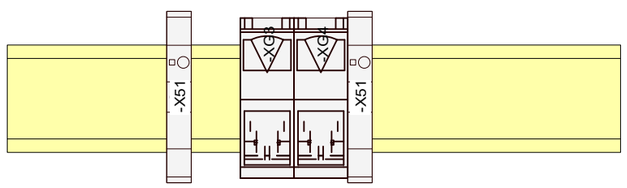
-XG2 -XG1

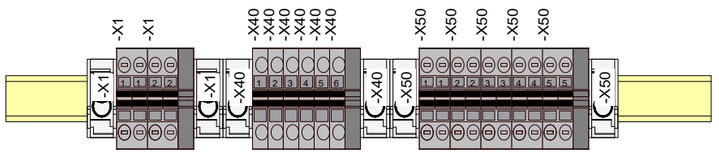
-AF2
=CP03
35x12 Blue

-AF4
MACGREGOR
65x25 MCG

-SF2

-PJ1





-X1 DEK 5 FWZ 1-10

-X40 DEK 5 FWZ 1-10

-X50 DEK 5 FWZ 1-10

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	AFT Control Station Panel Winches Panel Layout	400186798	=CP03
				User	GSK					+CP03
				Approved	RAJ				10070-10 GA	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 1 / Next 1

=CP03
+CP03

AFT Control Station
Panel PC
w/Network Modules
2000003404

-WF8 DeviceNet Unitronic Thick 1x2xAWG18+1x2xAWG15

+CP04

AFT Control Station
Control Panel
A-Frame Stern
3JS
2000005996

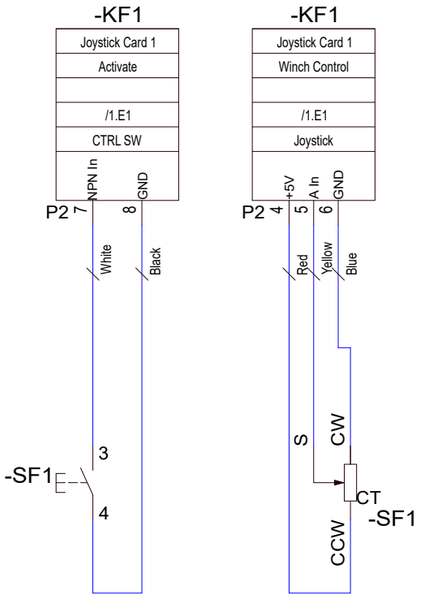
				Date	17/11-2021	CNP Freire MBari	MACGREGOR	AFT Control Station Panel A-Frame Stern Control Room Panel	400186799	=CP04	
				User	GSK						
				Approved	RAJ				10070-11 CD	Rev. G	Sheet 1
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

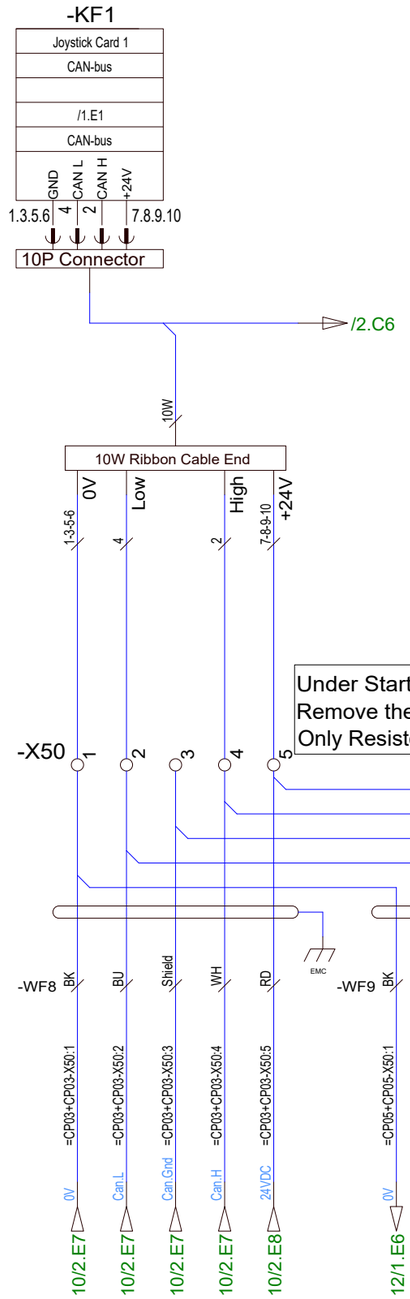
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Activate

Joystick

CAN-bus





-KF1

CAN BUS JOYSTICK CARD

Adress	Node XX

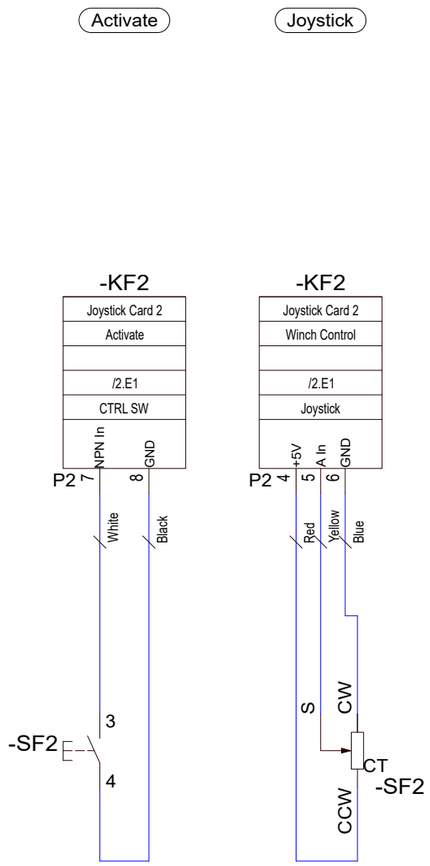
I/O	Ref	Adress	Description
Joystick	/1.B2		Winch Control
Potmeter			
CAN-bus	/1.B6		CAN-bus
Serial Display			
CTRL SW	/1.B1		Activate
MAN SW			
IN 1			
IN 2			

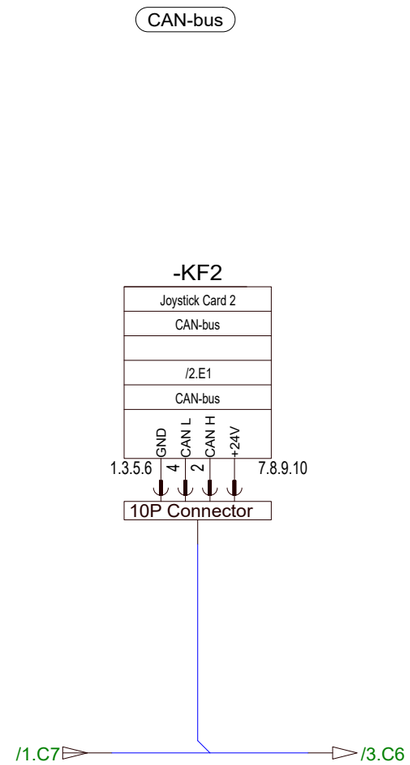
I/O	Ref	Adress	Description
IN 3			
DIM SW			
EM STOP			
OUT 1			
OUT 2			
OUT 3			
OUT 4			

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	AFT Control Station Panel A-Frame Stern Tilt Control, CAN-bus	400186799	=CP04
				User	GSK					+CP04
				Approved	RAJ					
Status	Change	Date	Name	Standard		Version	Index	Repl. by	10070-11 CC	Rev. G

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Next 2

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-KF2

CAN BUS JOYSTICK CARD

Adress	Node XX

I/O	Ref	Adress	Description
Joystick	/2.B2		Winch Control
Potmeter			
CAN-bus	/2.B6		CAN-bus
Serial Display			
CTRL SW	/2.B1		Activate
MAN SW			
IN 1			
IN 2			

I/O	Ref	Adress	Description
IN 3			
DIM SW			
EM STOP			
OUT 1			
OUT 2			
OUT 3			
OUT 4			

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	AFT Control Station Panel A-Frame Stern Winch STBD Control, CAN-bus	400186799	=CP04
				User	GSK					+CP04
				Approved	RAJ					
Status	Change	Date	Name	Standard		Version	Index	Repl. by	10070-11 CC	Rev. G

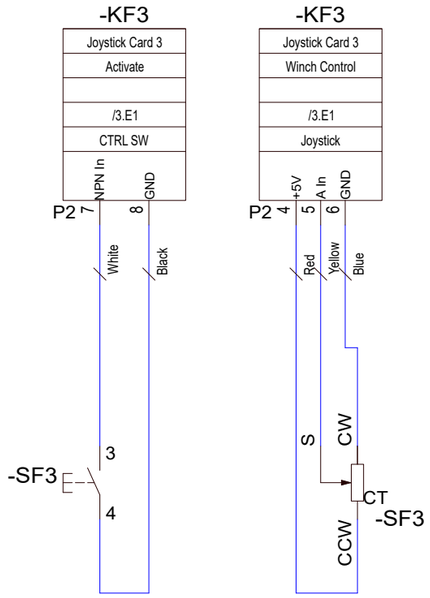
Sheet 2
Next 3

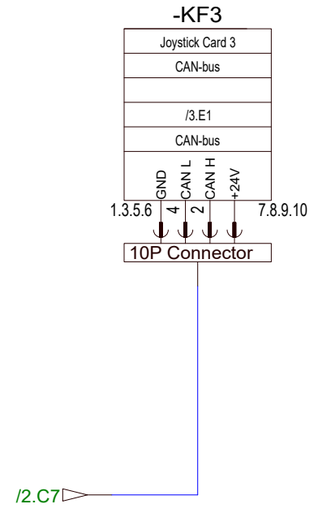
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Activate

Joystick

CAN-bus





-KF3

CAN BUS JOYSTICK CARD

Adress	Node XX

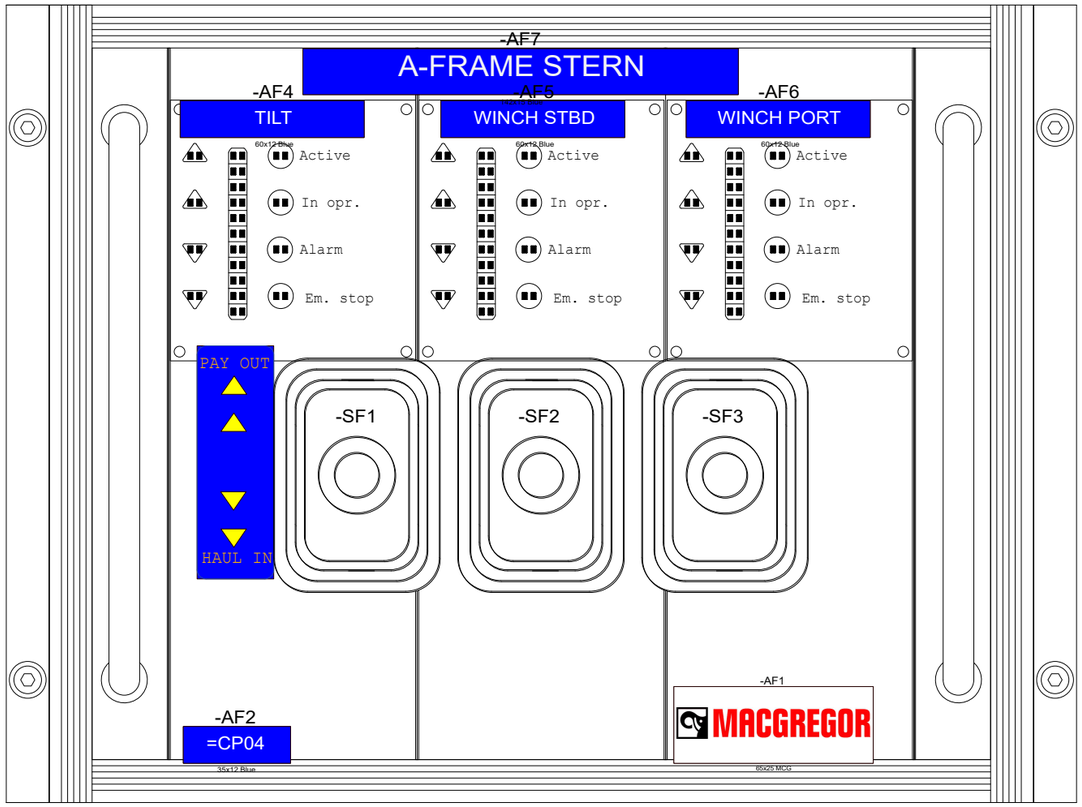
I/O	Ref	Adress	Description
Joystick	/3.B2		Winch Control
Potmeter			
CAN-bus	/3.B6		CAN-bus
Serial Display			
CTRL SW	/3.B1		Activate
MAN SW			
IN 1			
IN 2			

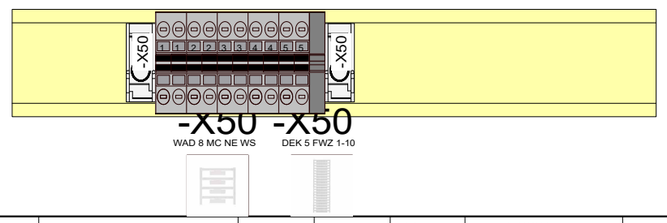
I/O	Ref	Adress	Description
IN 3			
DIM SW			
EM STOP			
OUT 1			
OUT 2			
OUT 3			
OUT 4			

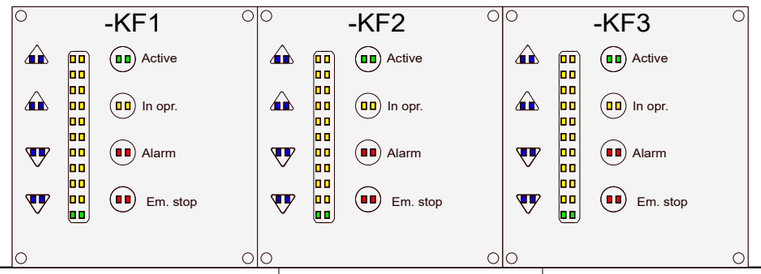
				Date	17/11-2021	CNP Freire MBari	MACGREGOR	AFT Control Station Panel A-Frame Stern Winch PORT Control, CAN-bus	400186799	=CP04
				User	GSK					+CP04
				Approved	RAJ					
Status	Change	Date	Name	Standard		Version	Index	Repl. by	10070-11 CC	Rev. G

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Next 1

AD7C40B1747540CBF652D56B6311BE9







				Date	17/11-2021	CNP Freire MBari	MACGREGOR	AFT Control Station Panel A-Frame Stern Panel Layout	400186799	=CP04	
				User	GSK					+CP04	
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Rev. G	Sheet 1
									10070-11 GA		Next 1

=CP04
+CP04

AFT Control Station
Control Panel
A-Frame Stern
3JS
2000005996

-WF9 DeviceNet Unitronic Thick 1x2xAWG18+1x2xAWG15

+CP05

AFT Control Station
Control Panel
CTD Davit
1JS
2000005995

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	AFT Control Station Panel CTD Davit Control Room Panel	400186802	=CP05	
				User	GSK						
				Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-12 CD	Rev. G

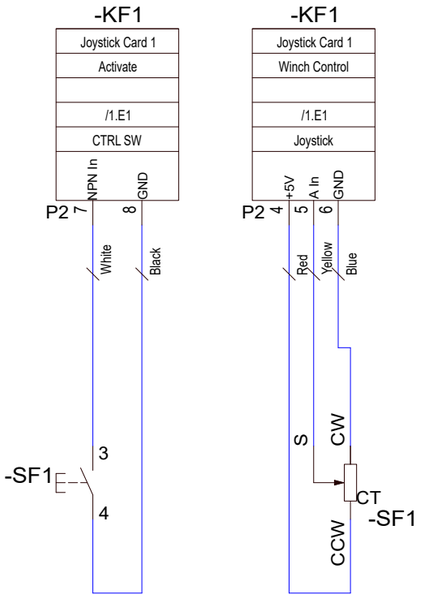
Sheet 1
Next 1

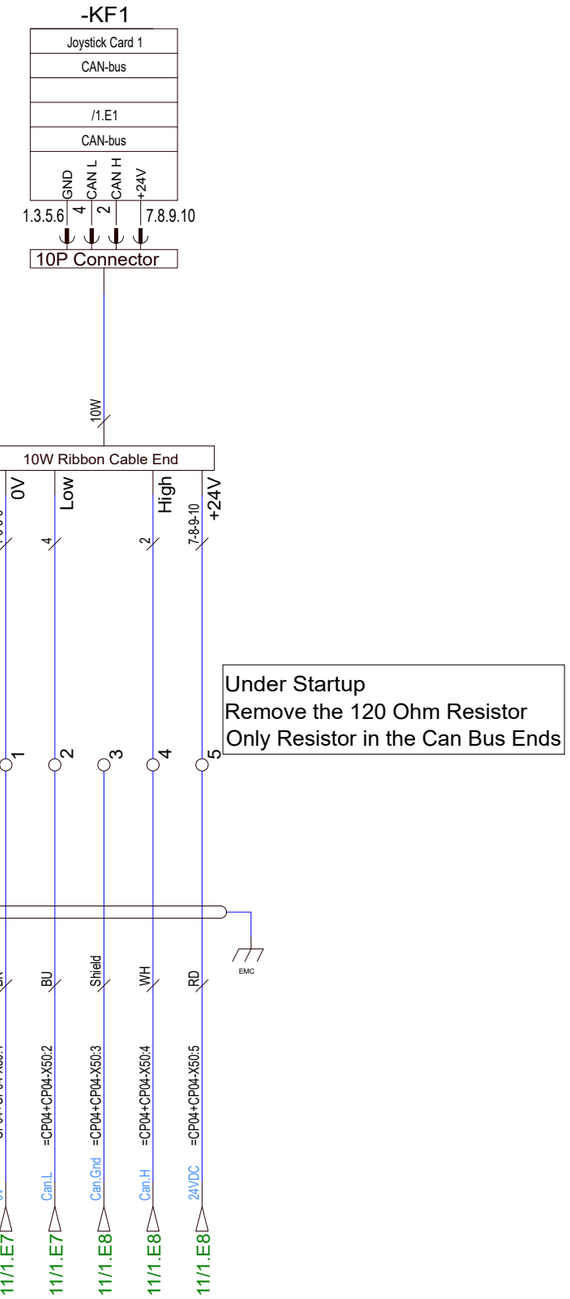
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Activate

Joystick

CAN-bus





-KF1

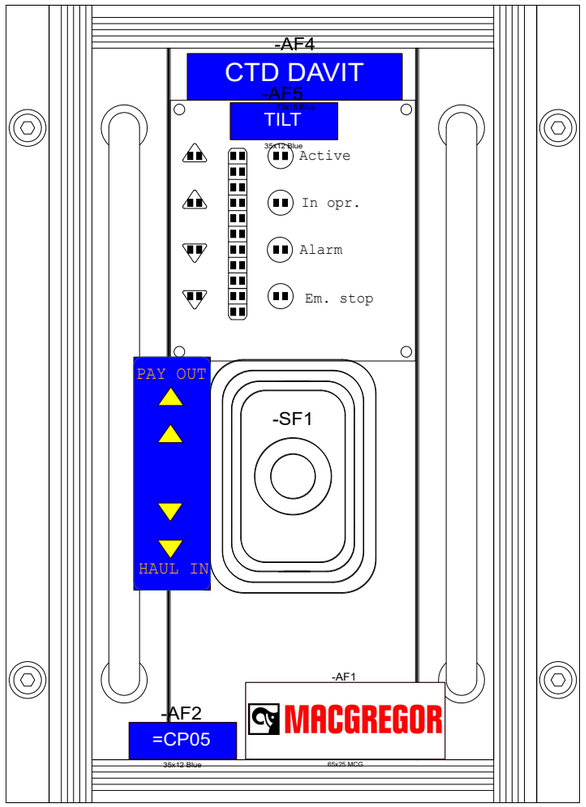
CAN BUS JOYSTICK CARD

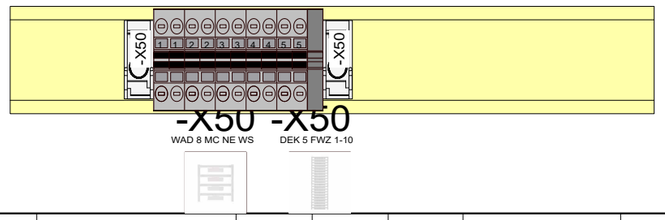
Adress	Node XX

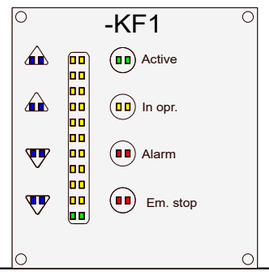
I/O	Ref	Adress	Description
Joystick	/1.B2		Winch Control
Potmeter			
CAN-bus	/1.B6		CAN-bus
Serial Display			
CTRL SW	/1.B1		Activate
MAN SW			
IN 1			
IN 2			

I/O	Ref	Adress	Description
IN 3			
DIM SW			
EM STOP			
OUT 1			
OUT 2			
OUT 3			
OUT 4			

				Date	17/11-2021	CNP Freire MBari	MACGREGOR	AFT Control Station Panel CTD Davit CTD Davit Control, CAN-bus	400186802	=CP05 +CP05
				User	GSK					
	Removed unused CanBus cable	28.11.2022	ANP	Approved	RAJ					
Status	Change	Date	Name	Standard		Version / Index / Repl. by			10070-12 CC	Rev. G; Sheet 1; Next 1







				Date	17/11-2021	CNP Freire MBari		MACGREGOR	AFT Control Station Panel CTD Davit Panel Layout	400186802	=CP05
				User	GSK						+CP05
				Approved	RAJ					10070-12 GA	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Sheet 1 / Next 1

AD7C40B17475400CBF652D56B6311BE9

Yard Connections

Internal Connections

Brake HPU

=WCS01
+UH03

Main VFD Cabinet
Pentagon
Brake HPU
Gear Cooling HPU

-WG24 FD CP (TP) plus 4x2x0.75

+UC01

HPU Brake
Connection Box

-UB1 -WG1 Valve Cable 3x0.75+PE

-BZ1
Level & Temp Switch

-UB2 -WG2 M12 Plugg & Cable

-BP1
Pressure
Transmitter/Pressostat

-WD26 2YSLCY-JB BK 4G1.5

M
3~

-MA1
HPU Motor
3kW
6,5A
400V/50Hz

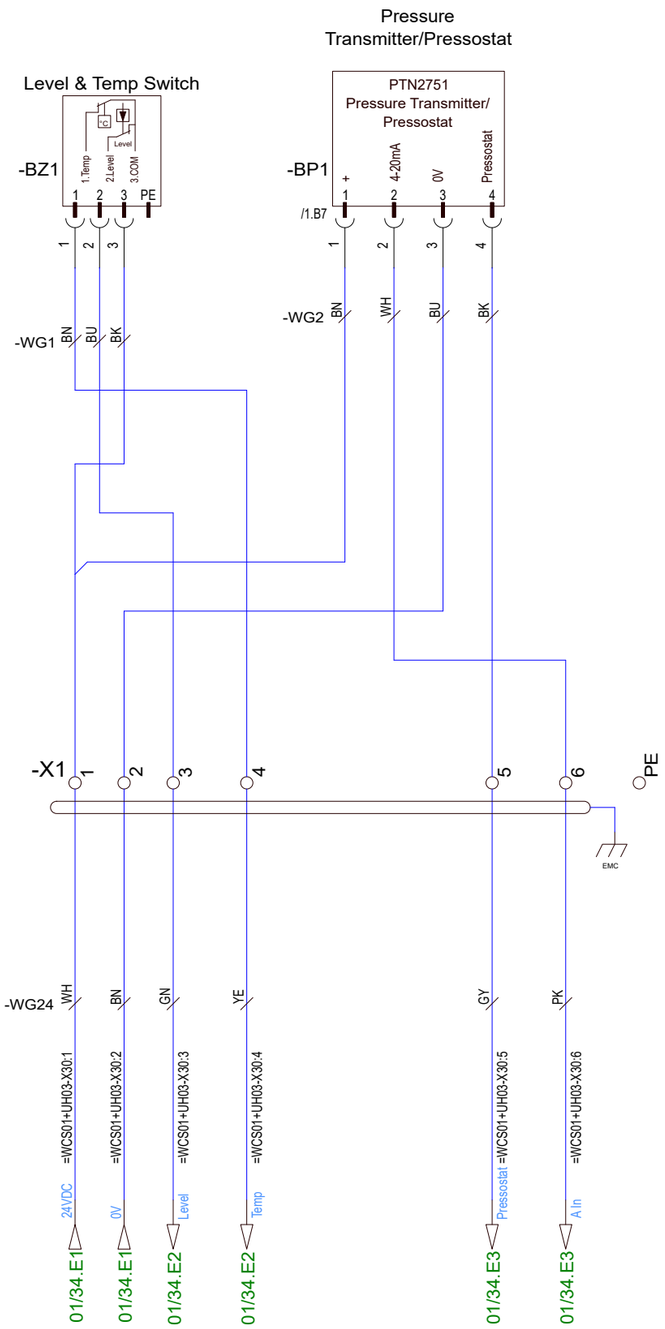
-WD27 2YSLCY-JB BK 4G1.5

M
3~

-MA2
HPU Motor
3kW
6,5A
400V/50Hz

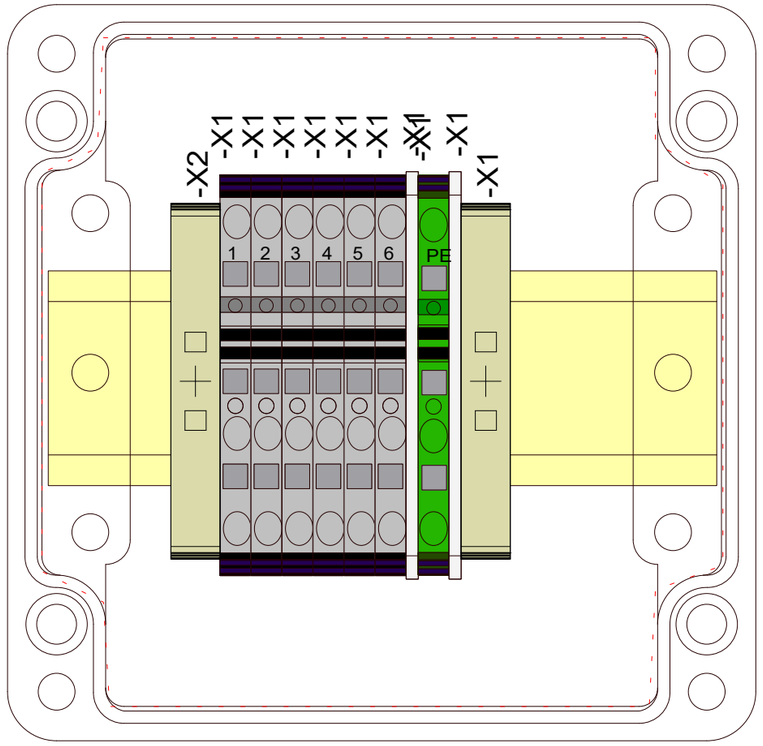
				Date	17/11-2021	CNP Freire MBari		MACGREGOR	Brake HPU System Brake HPU System	NA	=HPUBR01
				User	GSK						
				Approved	RAJ					10070-16 CD	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Sheet 1 Next 1

AD7C40B1747540CBF652D56B6311BE9



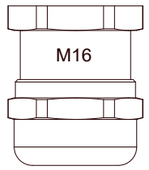
				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Brake HPU System HPU Brake, Connection Box	NA	=HPUBR01	
				User	GSK					+UC01	
				Approved	RAJ				10070-16 CC	Rev. G	Sheet 1
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

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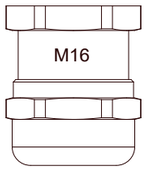


-X1
WAD 8 MC NE WS

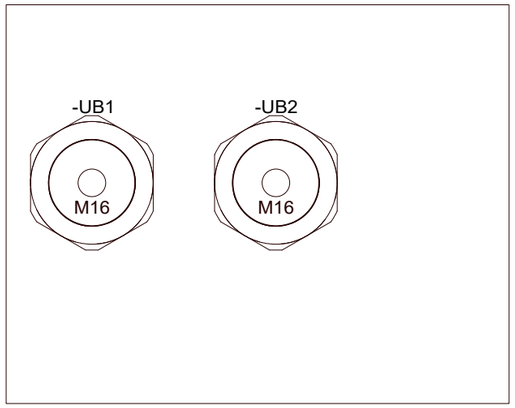
-X1
DEK 5 FWZ 1-10



-UB1

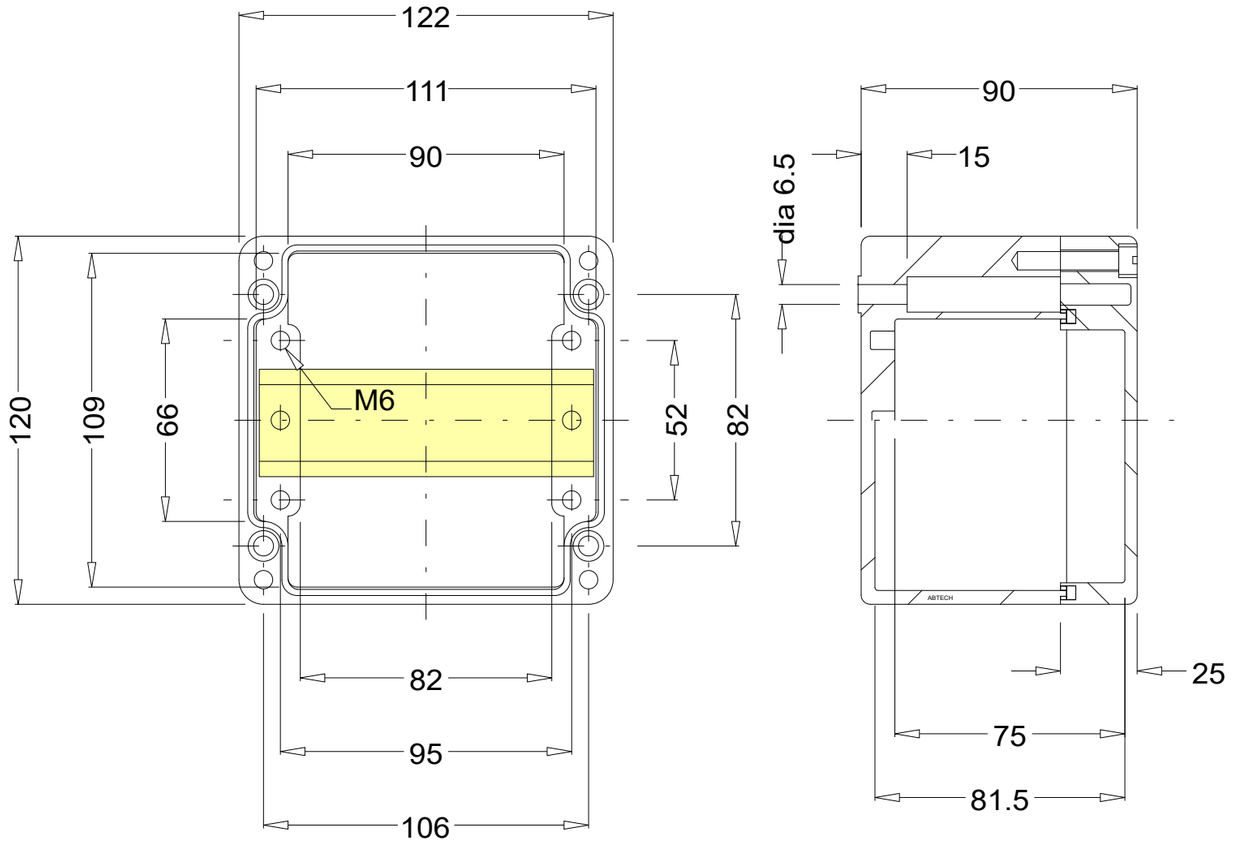


-UB2



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Brake HPU System HPU Brake, Connection Box	NA	=HPUBR01	
				User	GSK					+UC01	
				Approved	RAJ				10070-16 GA	Rev. G	Sheet 1
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 2

AD7C40B1747540CBF652D56B6311BE9



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Brake HPU System HPU Brake, Connection Box	NA	=HPUBR01	
				User	GSK					+UC01	
				Approved	RAJ				10070-16 GA	Rev. G	Sheet 2
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

AD7C40B1747540CBF652D56B6311BE9

Yard Connections

Internal Connections

=WCS01
+UH03

Main VFD Cabinet
Pentagon
Brake HPU
Gear Cooling HPU

-WG25 FD CP (TP) plus 4x2x0.75

-WD28 2YSLCYK-JB 3x2.5+3x0.5

-WD29 2YSLCYK-JB 3x2.5+3x0.5

Gear Cooling

+UC01

HPU Motor Cooling
Connection Box

-UB1 -WG1 Valve Cable 3x0.75+PE

-UB2 -WG2 Valve Cable 3x0.75+PE

-UB3 -WG3 Valve Cable 3x0.75+PE

-BZ1
Level &
Temp Switch

-BG1
Filter Indicator

-BG2
Filter Indicator

M
3~

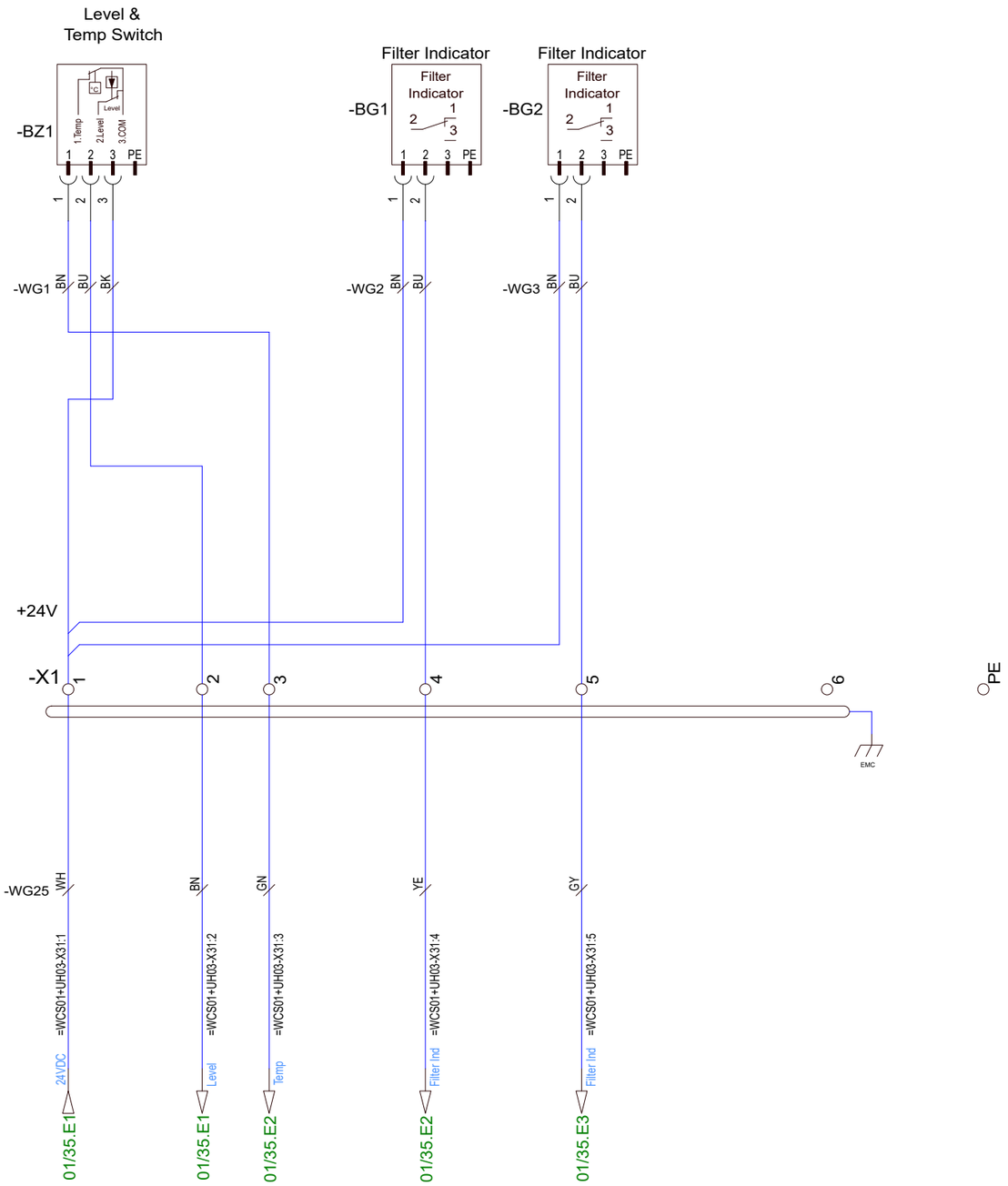
-MA1
HPU Motor
1,5kW
3,5A
400V/50Hz

M
3~

-MA2
HPU Motor
1,5kW
3,5A
400V/50Hz

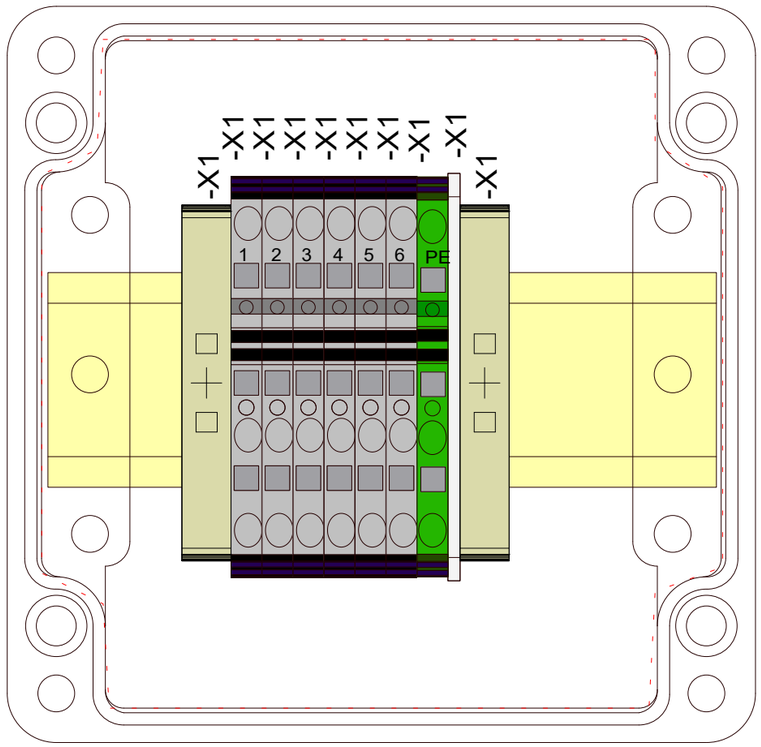
				Date	17/11-2021	CNP Freire MBari		MACGREGOR	Gear Cooling HPU System Gear Cooling HPU System	NA	=HPUGC01
				User	GSK						
				Approved	RAJ					10070-17 CD	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Sheet 1 Next 1

AD7C40B1747540CBF652D56B6311BE9



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Gear Cooling HPU System HPU Gear Cooling Connection Box	NA	=HPUGC01	
				User	GSK					+UC01	
				Approved	RAJ				10070-17 CC	Rev. G	Sheet 1
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

AD7C40B1747540CBF652D56B6311BE9

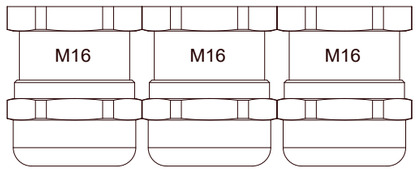


-X1

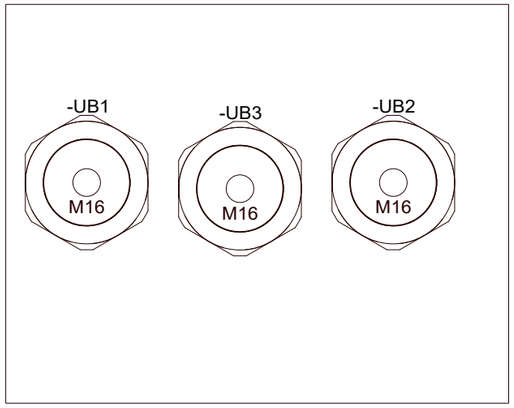
WAD 8 MC NE WS

-X1

DEK 5 FWZ 1-10

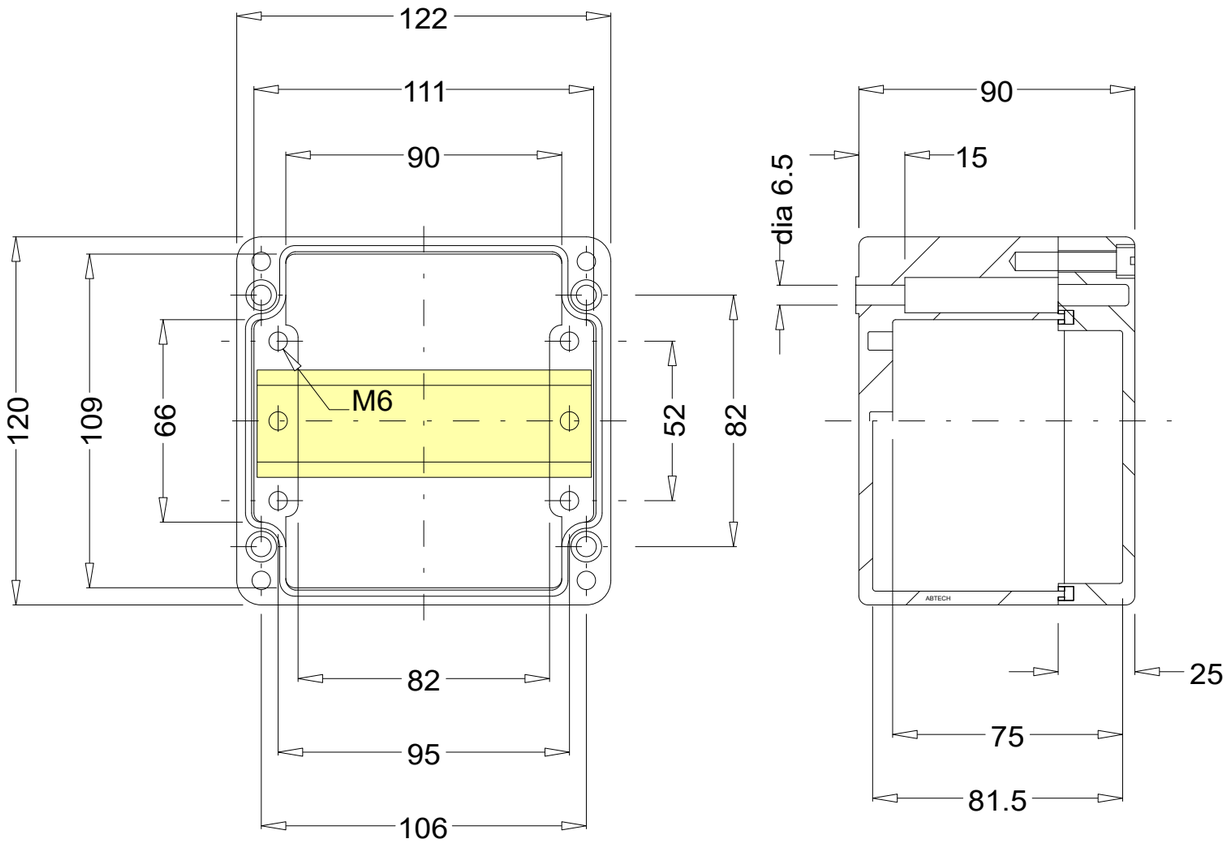


-UB1-UB2-UB3



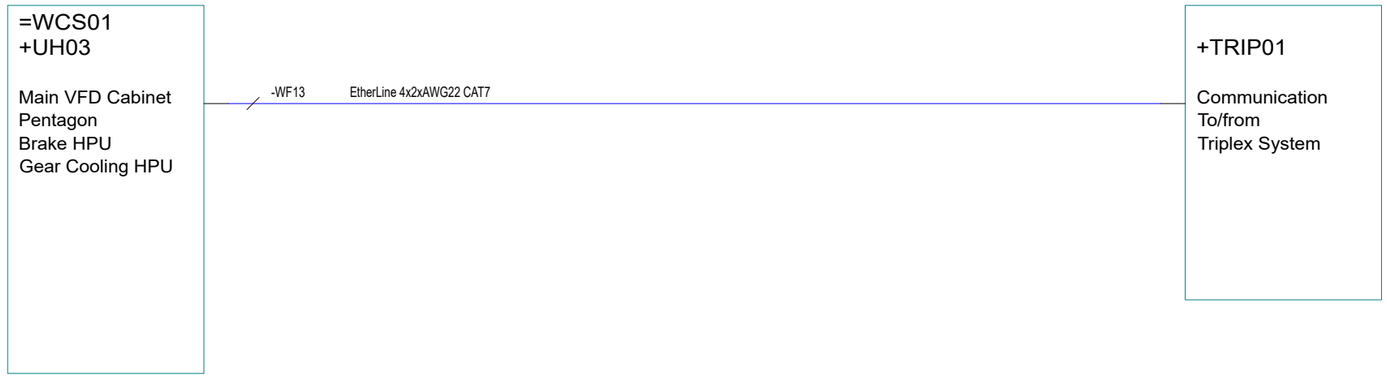
				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Gear Cooling HPU System HPU Gear Cooling Connection Box	NA	=HPUGC01	
				User	GSK					+UC01	
				Approved	RAJ				10070-17 GA	Rev. G	Sheet 1
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 2

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				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Gear Cooling HPU System HPU Gear Cooling Connection Box	NA	=HPUGC01	
				User	GSK					+UC01	
				Approved	RAJ				10070-17 GA	Rev. G	Sheet 2
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

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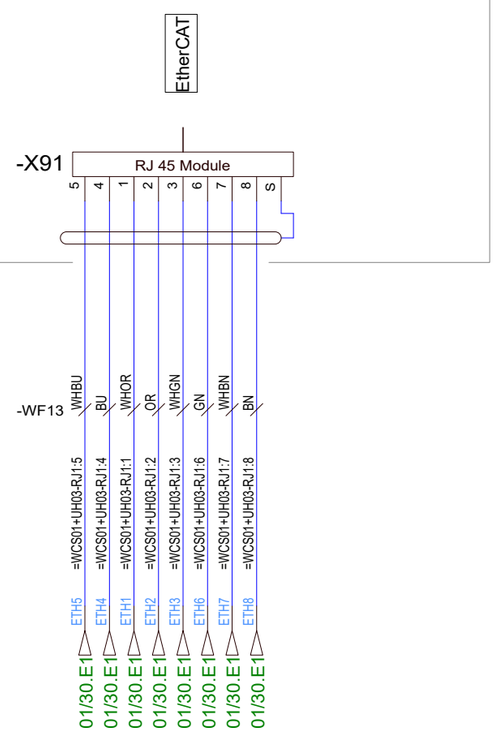


				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Connections To Triplex System Triplex System	NA	=TRIP01	
				User	GSK						
				Approved	RAJ				10070-18 CD	Rev. G	Sheet 1
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

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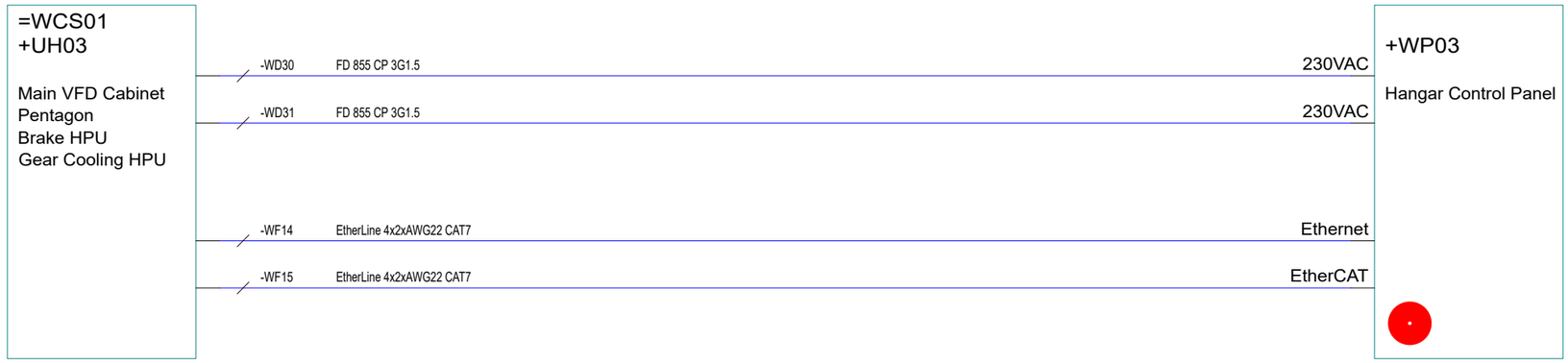
to TRIPLEX Handling System

=A-FRAME STERN
+B11
Control Cabinet



				Date	17/11-2021	CNP Freire MBari	MACGREGOR	Signal Connections Systems Connection EtherCAT to TRIPLEX	NA	=TRIP01	
				User	GSK					+Signal	
	Updated acc. Triplex drawings	28.11.2022	ANP	Approved	RAJ						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-18 CC Rev. G	Sheet 1 / Next 1

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= Emergency stop button

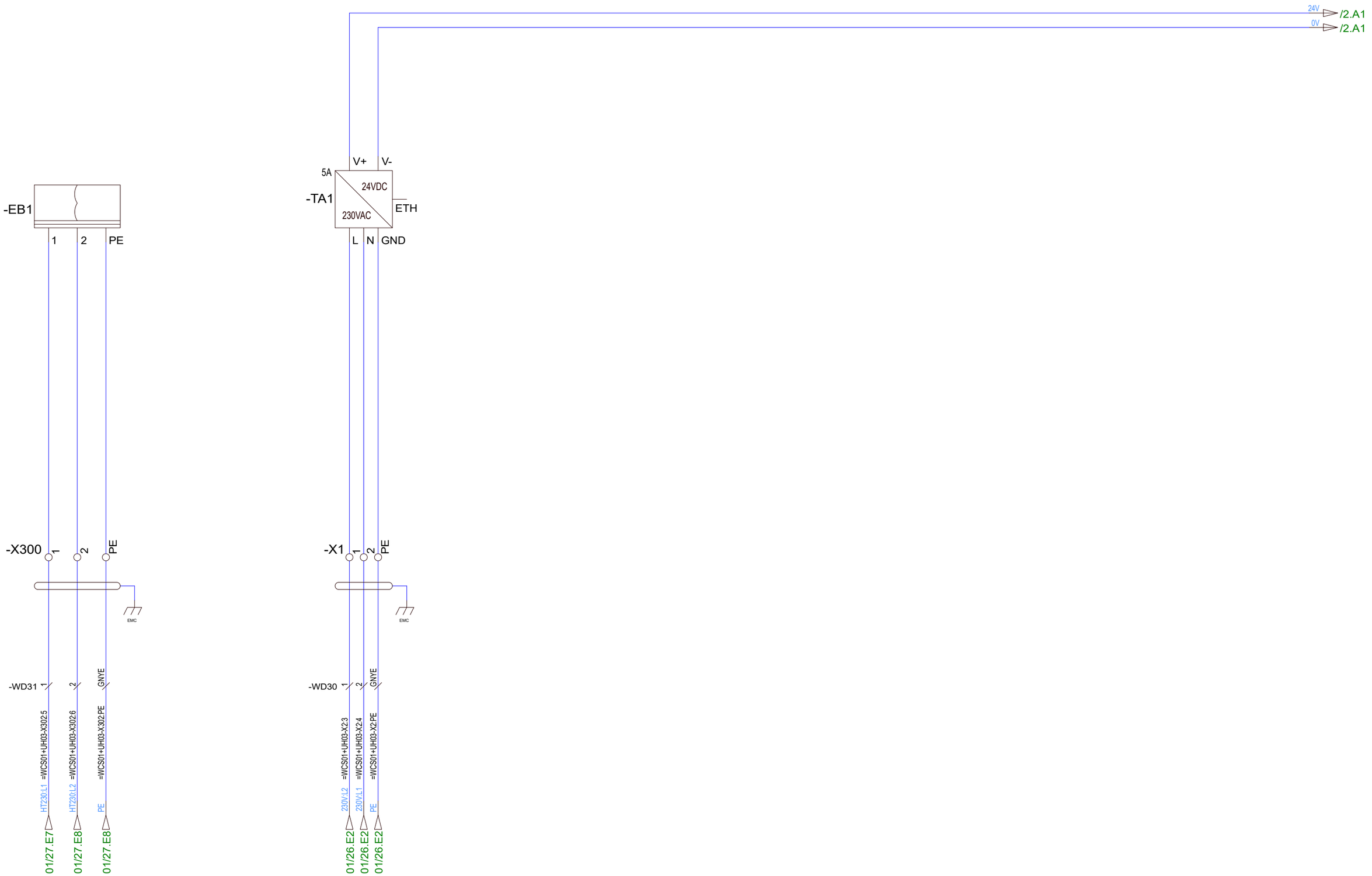
Cables Supplied & Connected by Customer
Cables Supplied & Connected by MacGregor

				Date	21.11.2022	CNP Freire MBari	MACGREGOR	Hangar Control Panel Cable Diagram	400209341	=WP03	
				User	ANP						
	Added WP03	21.11.2022	ANP	Approved	TR						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-19 CD	Rev. G
											Sheet 1 / Next 1

AD7C40B1747540CBF652D56B6311BE9

Panel Heater

Power Supply 230VAC



				Date	21.11.2022	CNP Freire MBari		Hangar Control Panel Supply and Heating Circuit Diagram	400209341	=WP03	
				User	ANP					+WP03	
	Added WP03	21.11.2022	ANP	Approved	TR				10070-19 CC	Rev. G	Sheet 1
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 2

MACGREGOR

AD7C40B1747540CBF652D56B6311BE9

PLC Supply

/1.A8 24V -TA1:V+
/1.A8 0V -TA1:V-

-XG3 ' +

-KF1	-KF1
PLC	PLC
/3.B2	/3.B2
Coupler Supply	Power Contacts
+	- + - PE

Emergency stop

-KF7	-KF7	-KF5
Control Panel	Control Panel	Control Panel
Emergency Stop	Emergency Stop	Emergency Stop Light
/3.C5	/3.C5	/3.B6
I1	I2	Out 1
Input + (1) Input - (2)	Input + (5) Input - (6)	(1)

-SF1.1: 11 / 12
-SF1.2: 21 / 22
-SF1: X2+ Red, X1-

Touch Operator Panel

24V /4.A1
0V /4.A1

-XG3 ' +

-PH1
+1 -2
RJ45 RJ45 RJ45/ 1Gbit Serial USB2 USB1 EXP 2 EXP 1

RJ1-RJ2

Pair	T568B	Pin
2	Orange/White	1
2	Orange	2
3	Green/White	3
1	Blue	4
1	Blue/White	5
3	Green	6
4	Brown/White	7
4	Brown	8
Screen	Screen	S

-KF1:X1 EtherCAT /3.C1

Patch Cord 0.5M -WF1
Ethernet
WCS01
-RJ1 RJ 45 Module (5 4 1 2 3 6 7 8 S)
-WF14 WHBU BU WHOR OR WHGN GN WHBN BN
-RJ/8:5 -RJ/8:4 -RJ/8:1 -RJ/8:2 -RJ/8:3 -RJ/8:6 -RJ/8:7 -RJ/8:8
ETH5 ETH4 ETH1 ETH2 ETH3 ETH6 ETH7 ETH8
01/30.E2 01/30.E2 01/30.E3 01/30.E3 01/30.E3 01/30.E3 01/30.E3 01/30.E3

Patch Cord 0.5M -WF2
EtherCAT
WCS01
-RJ2 RJ 45 Module (5 4 1 2 3 6 7 8 S)
-WF15 WHBU BU WHOR OR WHGN GN WHBN BN
-RJ/2:5 -RJ/2:4 -RJ/2:1 -RJ/2:2 -RJ/2:3 -RJ/2:6 -RJ/2:7 -RJ/2:8
ETH5 ETH4 ETH1 ETH2 ETH3 ETH6 ETH7 ETH8
01/30.E1 01/30.E2 01/30.E2 01/30.E2 01/30.E2 01/30.E2 01/30.E2 01/30.E2

=WCS01
+UH03

				Date	21.11.2022	CNP Freire MBari	MACGREGOR	Hangar Control Panel PLC Supply, Emergency Stop & Touch Panel Circuit Diagram	400209341	=WP03
				User	ANP					+WP03
	Added WP03	21.11.2022	ANP	Approved	TR				10070-19 CC	Rev. G
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 2 / Next 3

-KF1 EK1101

ID switch

Coupler Supply	Power Contacts
/2.B2	/2.B2

X1 X2

/2.C8 EtherCAT -RJ2 -WF2 Patch Cord 0.5M

-KF2 EL1008

8 Digital Inputs

DI	Ref	Adress	Description
I1	/4.B1		Selector
I2	/4.B2		Activate
I3	/5.B1		Float / Lock
I4	/5.B2		Float / Lock
I5	/5.B2		Twist CCW
I6	/5.B3		Twist CW
I7	/5.B3		Swing Left
I8	/5.B4		Swing Right

-KF3 EL1008

8 Digital Inputs

DI	Ref	Adress	Description
I1	/5.B4		Selector
I2	/5.B5		Activate
I3	/6.B1		Float / Lock
I4	/6.B2		On/Off
I5	/6.B2		Selector
I6	/6.B3		Activate
I7	/7.B1		On/Off
I8	/7.B2		Swich

-KF4 EL1008

8 Digital Inputs

DI	Ref	Adress	Description
I1	/7.B3		Swich
I2	/7.B4		Activate
I3	/7.B6		Switch
I4			
I5			
I6			
I7			
I8			

-KF5 EL2008

8 Digital Outputs

Outputs	Ref	Adress	Description
Out 1	/2.B4		Emergency Stop Light
Out 2	/7.B2		Indication
Out 3	/7.B3		Indication
Out 4	/7.B4		Indication
Out 5	/7.B6		Indication
Out 6			
Out 7			
Out 8			

-KF6 EL3255

5-Ch Input Potentiometer

A-In	Ref	Adress	Description
Pot 1	/4.B2		Joystick
Pot 2	/5.B5		Joystick
Pot 3	/6.B3		Joystick
Pot 4	/7.B5		Joystick
Pot 5	/7.B7		Adjustment

-KF7 EL1904

4 Digital Inputs

Adress

I/O	Ref	Adress	Description
I1	/2.B3		Emergency Stop
I2	/2.B4		Emergency Stop
I3			
I4			

-KF8

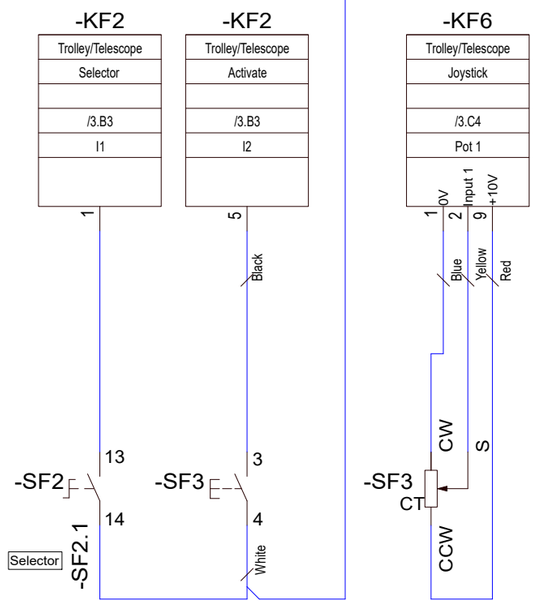
Bus End Cover

				Date	21.11.2022	CNP Freire MBari	MACGREGOR	Hangar Control Panel PLC & I/Os Circuit Diagram	400209341	=WP03	
				User	ANP					+WP03	
	Added WP03	21.11.2022	ANP	Approved	TR						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Rev. G	Sheet 3 / Next 4

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Function Selection | Activate | Joystick

/2.A8 24V → 24V /5.A1
/2.A8 0V → 0V /5.A1



				Date	21.11.2022	CNP Freire MBari	MACGREGOR	Hangar Control Panel Trolley/Telescope Control Circuit Diagram	400209341	=WP03	
	As-Build update	30.01.2023	ANP	User	ANP					+WP03	
	Added WP03	21.11.2022	ANP	Approved	TR						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Rev. G	Sheet 4 / Next 5

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Lock | Lock | Twist | Swing | Function Selection | Activate | Joystick

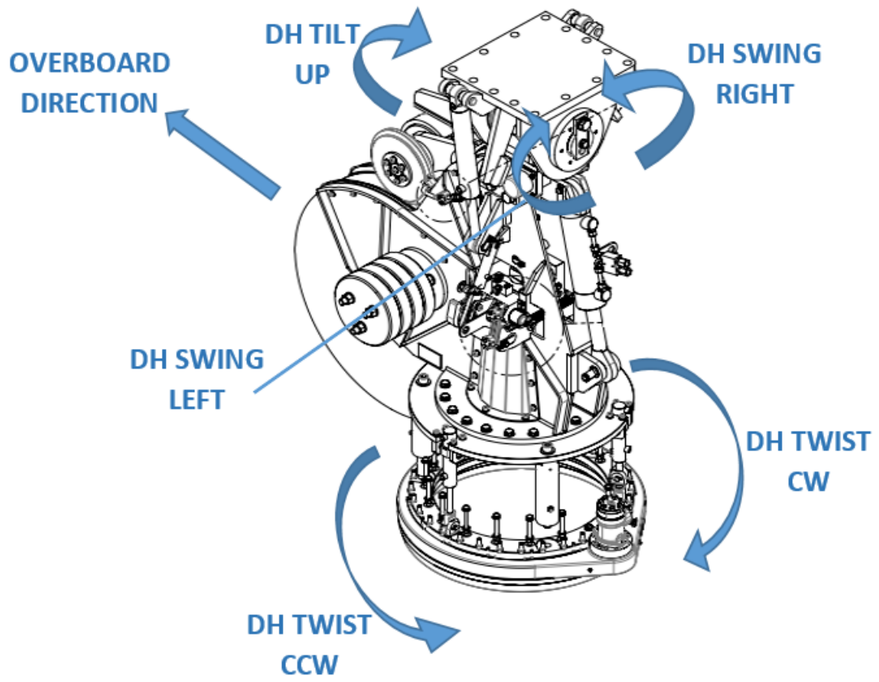
/4.A8 24V
/4.A8 0V

24V /6.A1
0V /6.A1

-KF2	-KF2	-KF2	-KF2	-KF2	-KF2	-KF3	-KF3
DH Tilt	DH Swing	DH Twist	DH Twist	DH Swing	DH Swing	Tilt/DH Tilt	Tilt/DH Tilt
Float / Lock	Float / Lock	Twist CCW	Twist CW	Swing Left	Swing Right	Selector	Activate
/3.B3	/3.B3	/3.B3	/3.B3	/3.B3	/3.B3	/3.B4	/3.B4
I3	I4	I5	I6	I7	I8	I1	I2
2	6	3	7	4	8	1	5

-KF6
Tilt/DH Tilt
Joystick
/3.C4
Pot 2
4 0V
5 Input 2
12 +10V

-SF4 13 14 -SF4.1 Float/Lock
-SF5 13 14 -SF5.1 Float/Lock
-SF6 23 24 -SF6.2
-SF6 13 14 -SF6.1
-SF7 23 24 -SF7.2
-SF7 13 14 -SF7.1
-SF8 13 14 -SF8.1 Selector
-SF9 3 4 White
Black
Blue
Yellow
Red
-SF9 CT CW S CCW

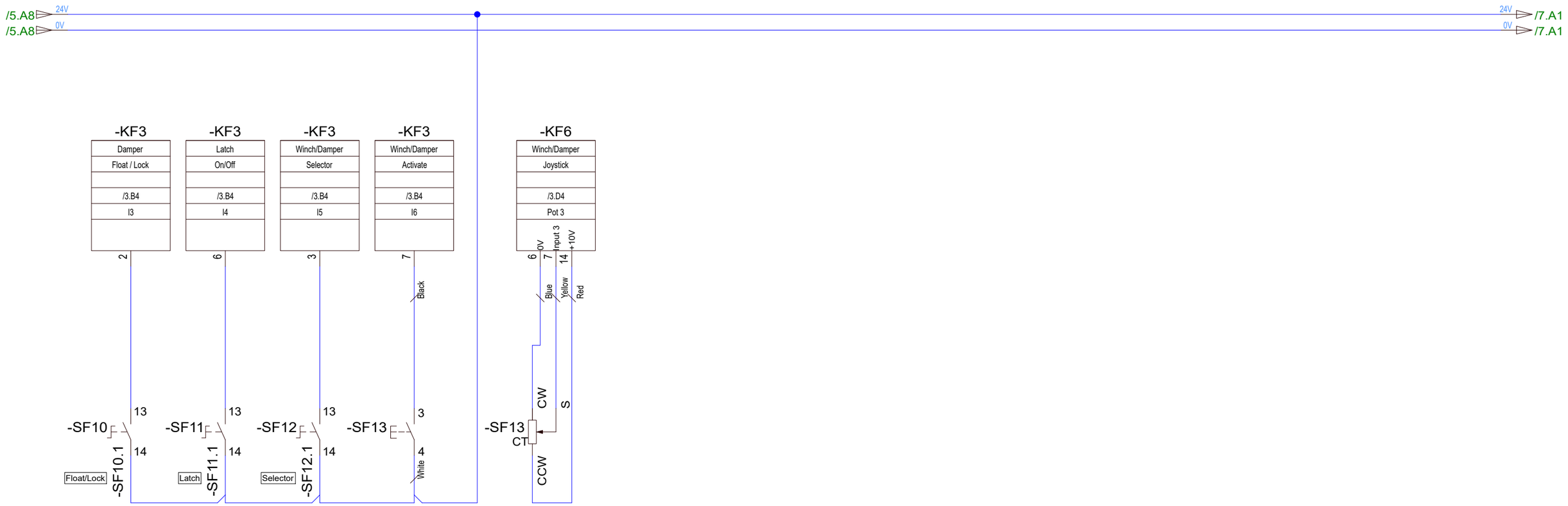


				Date	21.11.2022	CNP Freire MBari	MACGREGOR	Hangar Control Panel Tilt/DH Tilt Control Circuit Diagram	400209341	=WP03	
	As-Build update	30.01.2023	ANP	User	ANP					+WP03	
	Added WP03	21.11.2022	ANP	Approved	TR						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Rev. G	Sheet 5 / Next 6

10070-19 CC

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Lock | Latch | Function Selection | Activate | Joystick



				Date	21.11.2022	CNP Freire MBari	MACGREGOR	Hangar Control Panel Winch/Damper Control Circuit Diagram	400209341	=WP03	
	As-Build update	30.01.2023	ANP	User	ANP					+WP03	
	Added WP03	21.11.2022	ANP	Approved	TR						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Rev. G	Sheet 6 / Next 7

AD7C40B1747540CBF652D56B6311BE9

Light | Outhauler | CT Follow LARS | Activate | Joystick | Tension Activate | Tension Adjustment

/6.A8 24V
/6.A8 0V

-KF3	-KF5	-KF3	-KF5	-KF4	-KF5	-KF4
Light	Light	Outhauler	Outhauler	CT Follow LARS	CT Follow LARS	ROV Winch
On/Off	Indication	Swich	Indication	Swich	Indication	Activate
/3.B4	/3.B6	/3.B4	/3.B6	/3.B5	/3.B6	/3.B5
I7	Out 2	I8	Out 3	I1	Out 4	I2
4	5	8	2	1	6	5

-SF14 x2+ x1- /7.C2
-SF15 x2+ x1- /7.C3
-SF16 x2+ x1- /7.C4
Black

-SF14 I3 I1 II3 II1 x1- /7.C2 I4 I2 II4 II2 x2+
-SF15 I3 I1 II3 II1 x1- /7.C3 I4 I2 II4 II2 x2+
-SF16 I3 I1 II3 II1 x1- /7.C3 I4 I2 II4 II2 x2+
-SF17 3 4 White

-KF6
ROV Winch
Joystick
/3.D4
Pot 4
3

0V 10 Input 4 11 +10V
Blue Yellow Red
-SF17 CT CW S CCW

-KF4	-KF5
Tension Activate	Tension Activate
Switch	Indication
/3.B5	/3.B6
I3	Out 5
2	3

-SF18 x2+ x1- /7.C6
-SF18 I3 I1 II3 II1 x1- /7.C6 I4 I2 II4 II2 x2+

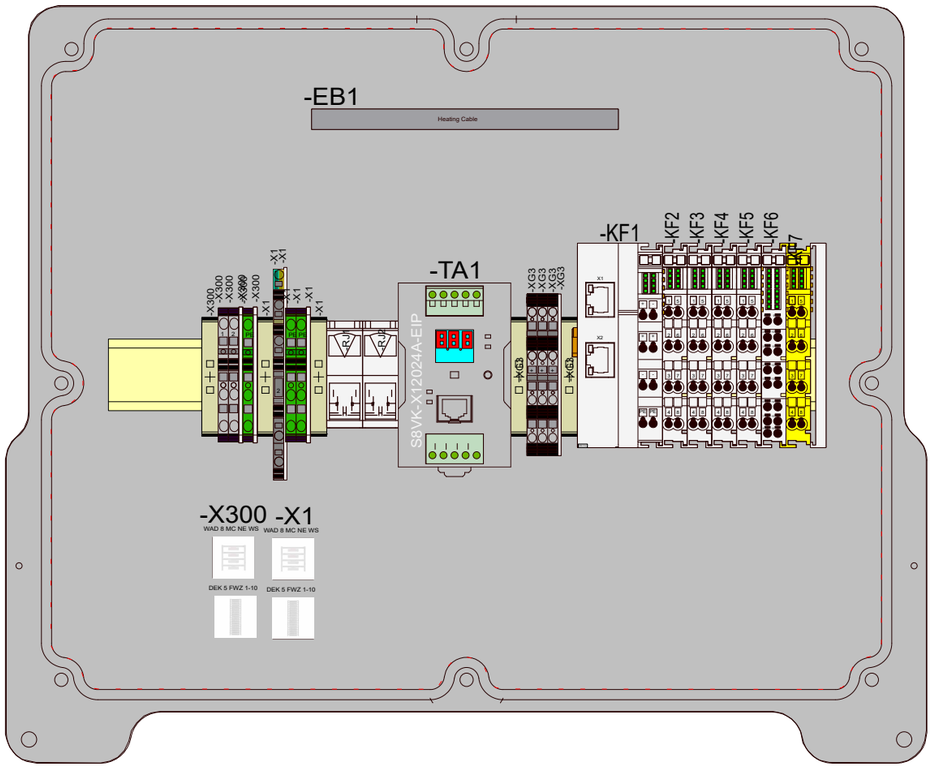
-KF6
Tension
Adjustment
/3.D4
Pot 5
8

0V 15 Input 5 16 +10V
Blue Yellow Red
2=S 1=CCW 3=CW -RA1

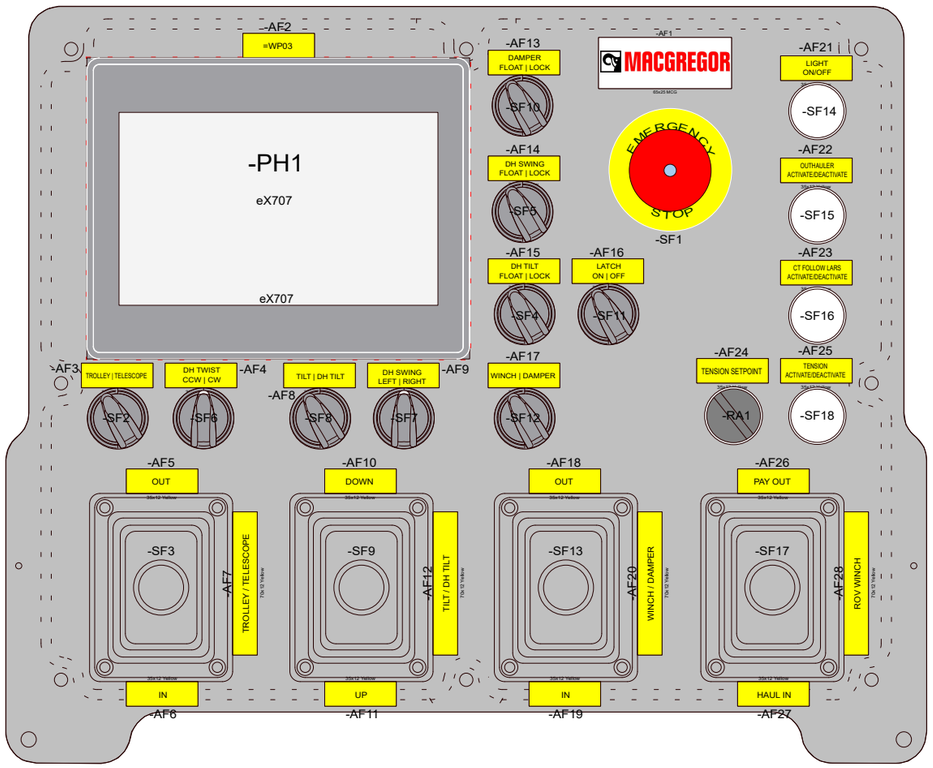
				Date	21.11.2022	CNP Freire MBari	MACGREGOR	Hangar Control Panel ROV Winch Control & Signaling Circuit Diagram
	As-Build update	30.01.2023	ANP	User	ANP			
	Added WP03	21.11.2022	ANP	Approved	TR			
Status	Change	Date	Name	Standard		Version / Index / Repl. by		

400209341 | =WP03 | +WP03
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INNER VIEW



FRONT VIEW



NOTE: Dimension Sketch - PLM No. 2000012940

				Date	21.11.2022	CNP Freire MBari	MACGREGOR	Hangar Control Panel Panel Layout	400209341	=WP03	
				User	ANP						
	Added WP03	21.11.2022	ANP	Approved	TR						
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-19 GA	Rev. G
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											Next 1

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Device ID	Device	Part Number	Qty	Unit	Description	Manufacturer	Datablad
-AF1	65x25 MCG	CROMLOGO6	1	Pcs	65x25 Macgregor Logo		
-AF2..-AF6,-AF8..-AF11,-AF13..-AF19,-AF21..-AF27	35x12 Yellow	400090866	23	Pcs	35x12 Yellow Engraved Sign plate		
-AF7,-AF12,-AF20,-AF28	70x12 Yellow	400090867	4	Pcs	70x12 Yellow Engraved Sign plate		
-EB1	Heating Cable 5BTV2-CT 15W/M V/+10GR Assy	RHEACHE032	1	Pcs	Heating Cable 5BTV2-CT 15W/M V/+10GR Assy 60cm	Raychem	EN-RaychemBTVpipefreezeprotection-DS-H51086_tcm432-26253.pdf
-KF1	EK1101	ECPPEB01	1	Pcs	EtherCAT Coupler w ID settings	Beckhoff	Datasheet
-KF2..-KF4	EL1008	ECPPEB04	3	Pcs	8 Digital Inputs	Beckhoff	Datasheet
-KF5	EL2008	ECPPEB06	1	Pcs	8 Digital Outputs	Beckhoff	Datasheet
-KF6	EL3255	ECPPEB16	1	Pcs	5-Ch Input Potentiometer	Beckhoff	Datasheet
-KF7	EL1904	400209336	1	Pcs	4-channel digital input, 24 V DC, TwinSAFE	Beckhoff	Datasheet
-KF8	EL9011	ECPPEB02	1	Pcs	Bus end cap	Beckhoff	
-PH1	eX707	EPECC120	1	Pcs	Exorl 7" Touch Panel	EXOR	Exor\eX700 Series.pdfManual
-RA1	800FP-POT5A 5kohm IP66	EACPO012	1	Pcs	Potensiometre	Allen Bradley	800f-sg001_-en-p.pdf
-RJ1,-RJ2	IE-XM-RJ45/IDC	400090935	2	Pcs	Mounting rail outlet, RJ45, RJ45 module, IP20, Cat.6A	Weidmuller	Datasheet
-SF1	45-2D36.1920	EACSW0047	1	Pcs	E-Stop switch w/light IP69 Ø40mm	EAO	EAO_MC_45_Main-Catalogue_EN.pdf
-SF1	45-320.1E16	400187718	1	Pcs	RED Illumination element 24 VAC/DC	EAO	Datasheet
-SF1	45-2300.1000.000	400187718	1	Pcs	Holder for 3 elements EAO Serie 45	EAO	Datasheet
-SF1	800F-15YE112	400187723	1	Pcs	Emergency Stop Lable Ø60mm	Allen Bradley	800f-sg001_-en-p.pdf
-SF1.1,-SF1.2	45-312.1Z10	400187719	2	Pcs	Switching element NC 10A Front mounting	EAO	Datasheet
-SF2.1,-SF4.1..-SF6.1,-SF6.2,-SF7.1,-SF7.2,-SF8.1,-SF10.1..-SF12.1	800F-X10	EACSW1142	11	Pcs	Contact Element NO	Allen Bradley	800f-sg001_-en-p.pdf
-SF2,-SF4..-SF5,-SF8,-SF10..-SF12	800FP-SM22	EACSW114	7	Pcs	2-Pos Selector Switch 60*Maintained	Allen Bradley	800f-sg001_-en-p.pdf
-SF2,-SF4..-SF8,-SF10..-SF12	800F-ALP	400188392	9	Pcs	Plastic Mounting Latch, Contact Block Holder	Allen Bradley	800f-sg001_-en-p.pdf"
-SF3,-SF9,-SF13,-SF17	Joystick IP68+ w/ Topswitch Short	400212904	4	Pcs	Joystick IP68+ w/Topswitch Short Version		
-SF6,-SF7	800FP-SB32	400090891	2	Pcs	3-Pos Selector Switch, Spring Return	Allen Bradley	800f-sg001_-en-p.pdf

Status	Change	Date	Name	Standard		Version	Index	Repl. by
	As-Build New Joy.&Switch Types	18.01.2023	ANP	Date	21.11.2022			
	Updated As-Build	28.11.2022	ANP	User	ANP			
	Added WP03	21.11.2022	ANP	Approved	TR			

CNP Freire
MBari

MACGREGOR

Hangar Control Panel
Part list

400209341

=WP03

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Sheet 1
Next 2

Device ID	Device	Part Number	Qty	Unit	Description	Manufacturer	Datablad
-SF14..-SF16,-SF18	10-2112.1069	EACBU014	4	Pcs	Single-Led Diode T5,5 24V White	EAO	Serie 10.pdf
-SF14..-SF16,-SF18	14-132.0252	EACSW000122	4	Pcs	Illuminated pushbutton, IP 67, Momentary 2xNC+2xNO	EAO	Serie 14.pdf
-SF14..-SF16,-SF18	704.600.2	EACSW0002	4	Pcs	Front Protective Ring IP67 (Transparent Silicone/Brass)	EAO	eao_704.600.2_-_Front_protective_ring.pdf
-SF14..-SF16,-SF18	704.602.7	EACSW0003	4	Pcs	Lens Plastic Round Flat (Transparent), W/Difusor & Front Protective ring	EAO	Serie 14.pdf
-SF14..-SF16,-SF18	704.609.9	EACSW0004	4	Pcs	Marking plate for lens round flat (Diffusor)	EAO	Serie 14.pdf
-TA1	S8VK-X12024A-EIP	EACTR034-10	1	Pcs	230/24V 5A Power Supply W/Display	Omron	S8VK-X.pdf
-U1			0,35	M	MOUNT		
-UC1	Console Deck Panel 400x450x340	EACBO401	1	Pcs	400x450x340mm Control Panel BBQ type	Molstad	Dim Sketch
-WF1,-WF2	Patch Cord 0.5M	ECPPE0471-1	2	M	Patch Cord 0.5M		
-X1	ZAP ZDL 2.5	EACPL02149-02	1	Pcs	End Plate For ZDL 2.5 Terminal	Weidmüller	ZAP ZDL2.5.pdf
-X1 (1)	ZDL 2.5/L/L/PE	EACPL021411	1	Pcs	Terminal 2 Tier. +PE	Weidmüller	ZDL 2.5 L-L-PE.pdf
-X1 (PE,PE),-X300 (PE)	ZPE 2.5/3AN	EACPL02025-1	3	Pcs	Terminal	Weidmüller	ZPE 2.5 3AN.pdf
-X1,-X300	DEK 5 FWZ 1-10	EACPL020T1-10	2	Pcs	Terminal No 1-10 (Dekafix)	Weidmüller	DEK 5 FWZ 1-10.pdf
-X1,-X300	WAD 8 MC NE WS	EACPL02150	2	Pcs	End Stop Label plate	Weidmüller	WAD 8 MC NE WS.pdf
-X1,-X300	ZAP/TW 2	EACPL02148	3	Pcs	End Plate For ZDU/ZPE 2.5/3AN Terminals	Weidmüller	ZAP TW 2 DB.pdf
-X1,-X300,-XG3	AEB 35 SC/1	EACPL0202-2	5	Pcs	AEB 35 SC/1 End Bracket	Weidmüller	Datasheet
-X300 (1-2)	ZDU 2.5/3AN	EACPL02140	2	Pcs	Terminal	Weidmüller	ZDU 2.5 3AN.pdf
-XG3	ZAP/TW ZDK2.5	400091997	1	Pcs	End Plate For ZDK2.5 Terminal	Weidmüller	Weidmuller\ZAP TW ZDK2.5.pdf
-XG3 (+,+,+)	ZDK 2.5 +/-	EACPL02055	3	Pcs	Terminal 2 Levels +/- Marking	Weidmüller	ZDK 2.5.pdf

Status	Change	Date	Name	Standard	
	As-Build New Joy.&Switch Types	18.01.2023	ANP	Date	21.11.2022
	Updated As-Build	28.11.2022	ANP	User	ANP
	Added WP03	21.11.2022	ANP	Approved	TR

CNP Freire
MBari

Version	Index	Repl. by

MACGREGOR

Hangar Control Panel
Part list

400209341

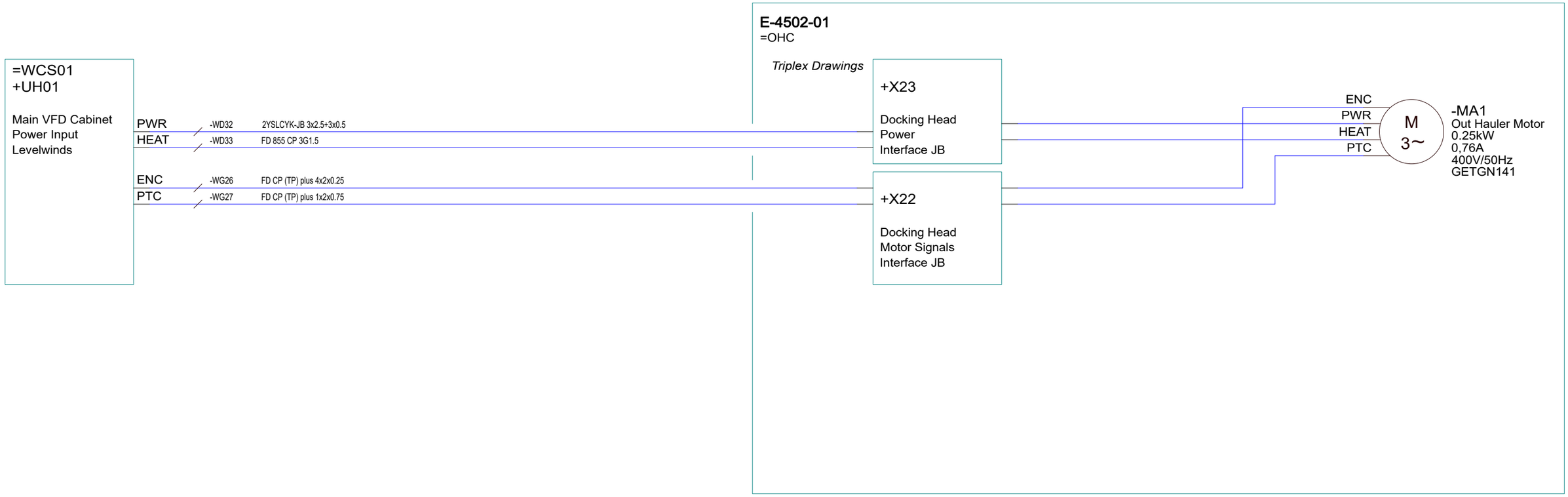
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10070-19 PL

Rev. G

Sheet 2
Next 1

AD7C40B1747540CBF652D56B6311BE9



				Date		CNP Freire		Overhead Crane Outhauler Motor	NA	=OHC	
				User		MBari					
				Approved							
Status	Change	Date	Name	Standard		Version	Index	Repl. by		10070-20 CD	Rev. G	Sheet 1 / Next

AD7C40B1747540CBF652D56B6311BE9

=GENERAL

Customer : CNP Freire
Ship/Hull : MBARI
Project no. : 4/60185
Drawing no.: E-4500

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	07.07.2023	GM	Date	14.10.2021
02	For customer review	29.08.2022	RSI	Drawn by	KS
01	For customer review	22.12.2021	KS	Appr. by	EE

4/60185
CNP Freire
MBARI

TRIPLEX
A MacGregor company

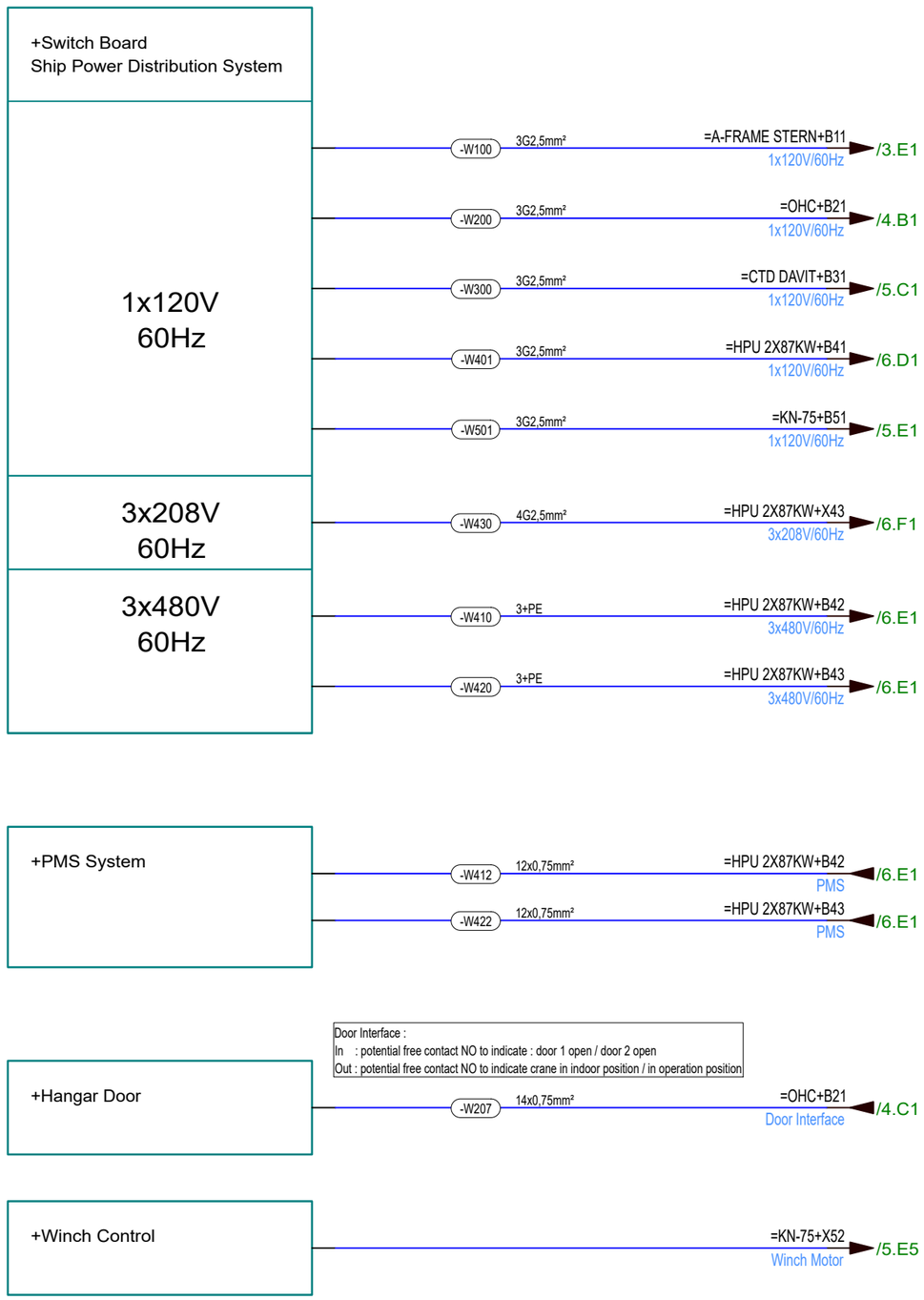
Front Page

=GENERAL

E-4500 - 00

Rev. 03

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Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	07.07.2023	GM	Date	14.10.2021
02	For customer review	29.08.2022	RSI	Drawn by	KS
01	For customer review	22.12.2021	KS	Appr. by	EE

4/60185
CNP Freire
MBARI

TRIPLEX
A MacGregor company

Single Line

=GENERAL

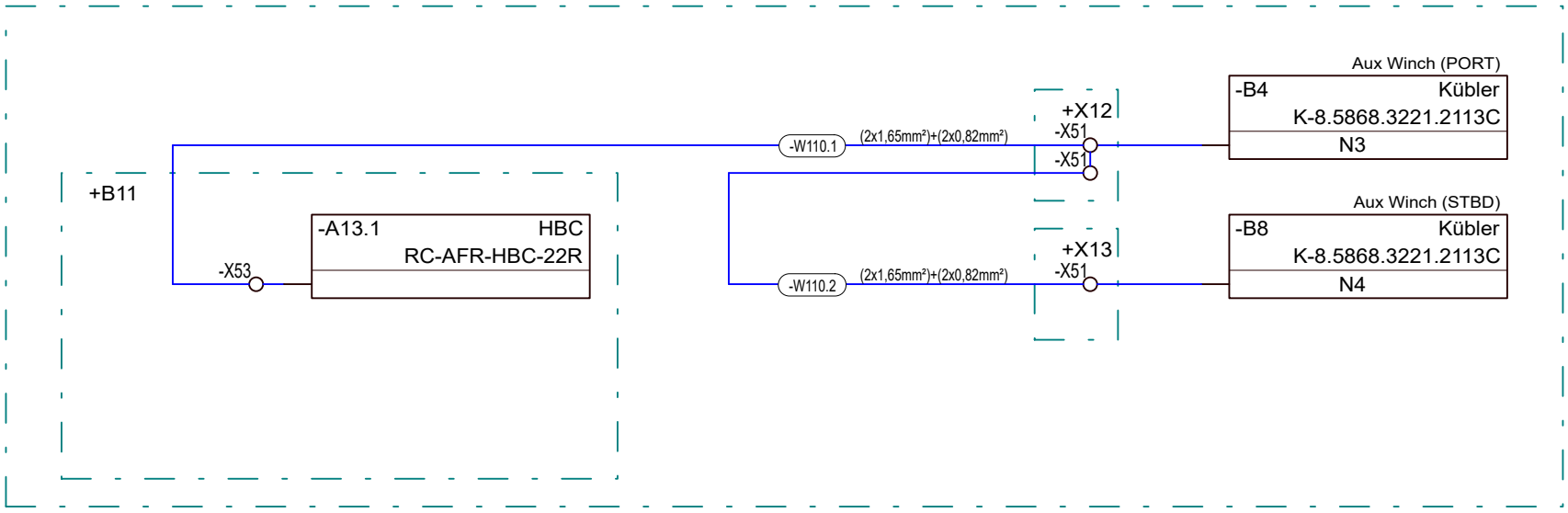
E-4500 - 01

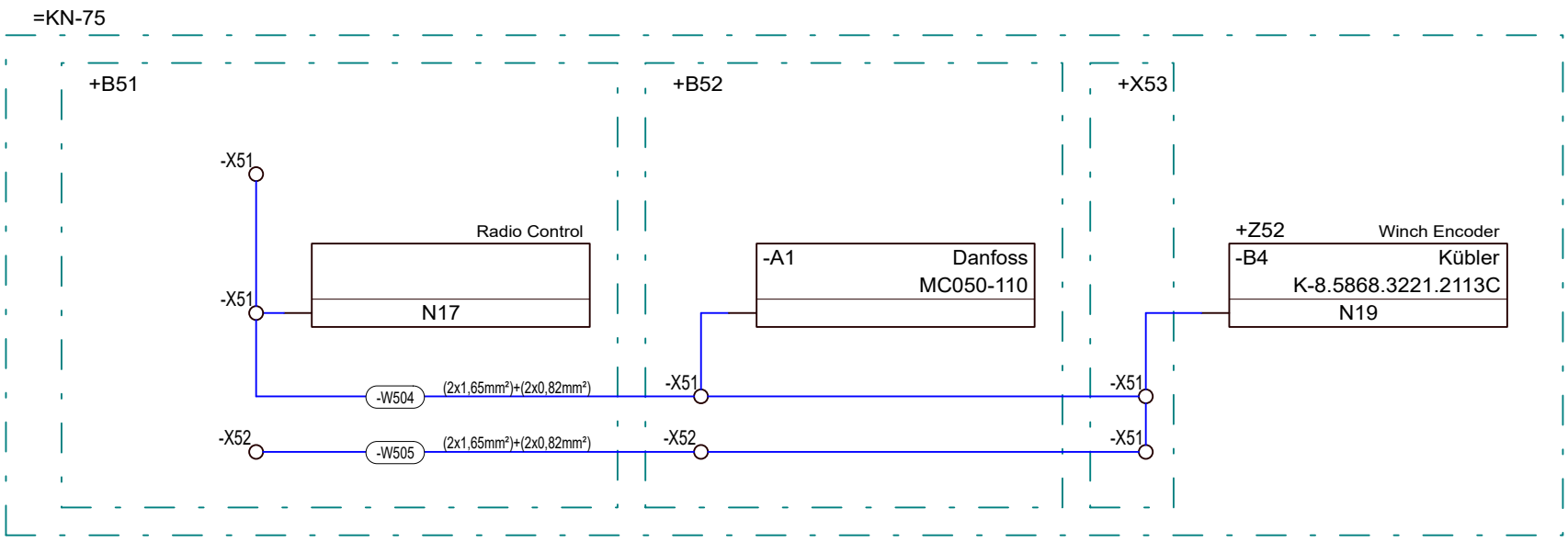
Rev. 03

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Printed: 07-Jul-23 11:21

Template:





4/60185
CNP Freire
MBARI

TRIPLEX
A MacGregor company

BUS

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	07.07.2023	GM	Date	14.10.2021
02	For customer review	29.08.2022	RSI	Drawn by	KS
01	For customer review	22.12.2021	KS	Appr. by	EE

=GENERAL

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Rev. 03

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Etercat from Rapp Systems

=A-FRAME STERN

Etercat

+B11
Control Cabinet

Special pre terminated antenna cable, length must be specified and ordered with vendor.

-W102 4x0,34mm²

+Z10 Deck Equipment Area

-A13.2
Radio Control
Antenna

Stationary control panel is integrated in the winch control system console and will be communicating via CAN-bus.

Winch control system drawing: ....

+Z12 Crane Body

-W105 38x1,5mm²

+X11
JB Valves

-W108 4x2x0,75mm² Shielded

-W110.1 (2x1,65mm²)+(2x0,82mm²)

-W110.2 (2x1,65mm²)+(2x0,82mm²)

+X12
JB Sensor PS

-W109 3G2,5mm²

+X14
JB Floodlight

-W107 4x2x0,75mm² Shielded

+X13
JB Sensor SB

/1.B4 +Switch Board
1x120V/60Hz

-W100 3G2,5mm²

-W010 4x(2x0,5mm²) CAT7

Eldon
MAS0605030
HxWxD:600x500x300
IP 66
RAL 7035 (Grey)

Etercat
=OHC+B21
/4.A1

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	07.07.2023	GM	Date	14.10.2021
02	For customer review	29.08.2022	RSI	Drawn by	KS
01	For customer review	22.12.2021	KS	Appr. by	EE

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CNP Freire
MBARI

TRIPLEX
A MacGregor company

Single Line

A-Frame

=GENERAL

E-4500 - 01

Rev. 03

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Printed: 07-Jul-23 11:21

Template:

=OHC

/3.F1
Etercat
=A-FRAME STERN+B11
-W010 4x(2x0,5mm²) CAT7

/1.B4 +Switch Board
1x120V/60Hz
-W200 3G2,5mm²

Door Interface :
In : potential free contact NO to indicate : door 1 open / door 2 open
Out : potential free contact NO to indicate crane in indoor position / in operation position

/1.E4 +Hangar Door
Door Interface
-W207 14x0,75mm²

+B21
Control Cabinet

Special pre terminated antenna cable, length must be specified and ordered with vendor.
-W202 4x0,34mm²

+Z20 Deck Equipment Area

-A20.2

Stationary control panel is integrated in the winch control system console and will be communicating via CAN-bus.

Winch control system drawing: ....

-W201 6x0,75mm²

-S1

+Z22 OHC

+Z23 Valves

-W204 20x1,5mm²

-W215 20x1,5mm²

+X21
JB Valves

-W206 18G1,5mm²

+X24.1
OHC Trolley
Interface JB

-WI-58 18G0,75mm²

+X24
OHC Trolley
JB

-W214 3G1,5mm²

+X23
DOC. HEAD
Power
Interface JB

+Rapp Drive

-W210 4G1,5mm²

-W211 3G1,5mm²

-W212 4x2x0,25

-W213 3G1,5mm²

+X22
DOC. HEAD
Motor Signals
Interface JB

+Z25 Docking Head

-W205 18G1,5mm²

+X25.1
Docking Head
Interface
Right JB

-WI-57 18G0,75mm²

+X25
Docking Head
Right JB

-W011 4x(2x0,5mm²) CAT7

-W208 18G1,5mm²

+X26.1
Docking Head
Interface
Left JB

-WI-59 18G0,75mm²

+X26
Docking Head
Left JB

Eldon
MAS0605030
HxWxD:600x500x300
IP 66
RAL 7035 (Grey)

=CTD DAVIT+B31
Etercat
/5.A1

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	07.07.2023	GM	Date	14.10.2021
02	For customer review	29.08.2022	RSI	Drawn by	KS
01	For customer review	22.12.2021	KS	Appr. by	EE

4/60185
CNP Freire
MBARI

TRIPLEX
A MacGregor company

Single Line

=GENERAL

E-4500 - 01

Rev. 03

4 / 6

=CTD DAVIT

/4.F1
=OHC+B21
Etercat

-W011 4x(2x0,5mm²) CAT7

+B31
Control Cabinet

Special pre terminated antenna cable, length must be specified and ordered with vendor.

-W302 4x0,34mm²

+Z30 Deck Equipment Area

-A31.2
RC Antenna

Stationary control panel is integrated in the winch control system console and will be communicating via CAN-bus.

Winch control system drawing: ....

-W305 28x1,5mm² Shielded

+Z33 Valve Bank

+X31
Valve Central
Junction box

+Z31 Pedestal

+X32
JB Power

/1.B4 +Switch Board
1x120V/60Hz

-W300 3G2,5mm²

-W306 3G2,5mm²

-W012 4x(2x0,5mm²) CAT7

Eldon
MAS0605030
HxWxD:600x500x300
IP 66
RAL 7035 (Grey)

=KN-75

+Z50 Equipment Deck Area

A minimum of 1,5m spare cable inside cabinet.

+B51
Control Cabinet

-W502 Coax RG58U

-A1.2

HxWxD: 75x160x55

+Z51 Pedestal

+Z53 Valve Bank

-W503 28x1,5mm² Shielded

-W504 (2x1,65mm²)+(2x0,82mm²)

-W505 (2x1,65mm²)+(2x0,82mm²)

+X51
JB Valves

/1.C4 +Switch Board
1x120V/60Hz

-W501 3G2,5mm²

-W507 3G2,5mm²

+X52
JB Power

/1.F4 =GENERAL+Winch Control
Winch Motor

-W013 4x(2x0,5mm²) CAT7

Eldon
MAS0605030
HxWxD:600x500x300
IP 66
RAL 7035 (Grey)

=HPU 2X87KW+B41
Etercat
/6.A1

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	07.07.2023	GM	Date	14.10.2021
02	For customer review	29.08.2022	RSI	Drawn by	KS
01	For customer review	22.12.2021	KS	Appr. by	EE

4/60185
CNP Freire
MBARI

TRIPLEX
A MacGregor company

Single Line

=GENERAL

E-4500 - 01

Rev. 03

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=HPU 2X87KW

=KN-75+B51 /5.F1 Elercat

+B41
Control Cabinet Starters

Eldon
MAS0605030
HxWxD:600x500x300
IP 66
RAL 7035 (Grey)

-W013 4x(2x0,5mm²) CAT7

-W014 4x(2x0,5mm²) CAT7

-W441 12x0,75mm²

-W442 12x0,75mm²

-W401 3G2,5mm²

-W412 12x0,75mm²

-W410 3+PE

-W422 12x0,75mm²

-W420 3+PE

-W430 4G2,5mm²

-W402 6x0,75mm²

-W411 12x0,75mm²

-W421 12x0,75mm²

-W432 12x0,75mm²

+X45
-S1
E-Stop External
To be placed in deck area.

Stationary control panel is integrated in the winch control system console and will be communicating via CAN-bus.

Winch control system drawing: ....

+Z40 HPU Unit

+B42
Soft Starter 1
HPU

Eldon
MAS0806030
HxWxD:800x600x300
IP 66
RAL 7035 (Grey)

-W413 3+PE
-W414 2x0,75mm²
-W415 2x0,75mm²

-M1
3~
Pump Motor 1
480V/60Hz
87kW - 129A
Motor Heater
100W
PTC

+B43
Soft Starter 2
HPU

Eldon
MAS0806030
HxWxD:800x600x300
IP 66
RAL 7035 (Grey)

-W423 3+PE
-W424 2x0,75mm²
-W425 2x0,75mm²

-M2
3~
Pump Motor 2
480V/60Hz
87kW - 129A
Motor Heater
100W
PTC

+X41
Installed on eqipment by vendor.

CPG-320
HxWxD:360x160x91
IP 67

+X43
Oil Heater Switch

+Winch Control

+IMACS
HPU Remote Control
(Optional)

/1.C4 +Switch Board
1x120V/60Hz

/1.D4 +PMS System
PMS

/1.C4 +Switch Board
3x480V/60Hz

/1.D4 +PMS System
PMS

/1.D4 +Switch Board
3x480V/60Hz

/1.C4 +Switch Board
3x208V/60Hz

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	07.07.2023	GM	Date	14.10.2021
02	For customer review	29.08.2022	RSI	Drawn by	KS
01	For customer review	22.12.2021	KS	Appr. by	EE

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TRIPLEX
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Single Line
HPU

=GENERAL

E-4500 - 01

Rev. 03

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Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-W010..-W014	CAT 7 LLDS BLUE LSZH 500 4x2x0.5	07915071		5	Pcs	CABLE, 4x2x0.5mm², SHIELDED	Nexans	
-W100,-W109,-W200,-W300,-W306, -W401,-W501,-W507	SHIP CABLE 3G2.5			8	Pcs	Cable Ship 3G2,5mm²	Draka (Or similar)	
-W102,-W202,-W302	HBC DECT 50M 4x0.34	6793400086		3	Pcs	Cable Antenna DECT 50M	HBC	
-W105	SHIP CABLE 38x1.5			1	Pcs	Cable Ship 38x1,5mm²	Draka (Or similar)	
-W107,-W108	SHIP CABLE 4PAIRx0.75 Shield			2	Pcs	Cable Ship 4x2x0,75mm²	Draka (Or similar)	
-W110.1,-W110.2,-W110.3,-W110. 4,-W504..-W505	UNITRONIC BUS DN THICK FRNC			6	Pcs	CABLE, 2x1,65mm²+2x0,82mm², -25°C	Lapp	
-W201,-W402	SHIP CABLE 6x0.75			2	Pcs	Cable Ship 6x0,75mm²	Draka (Or similar)	
-W204,-W215	SHIP CABLE 20x1.5			2	Pcs	Cable Ship 20x1,5mm²	Draka (Or similar)	
-W205..-W206,-W208	SHIP CABLE 18G1.5 Shield			3	Pcs	Cable Ship 18G1,5mm², SHIELDED	Draka (Or similar)	
-W207	SHIP CABLE 14x0.75			1	Pcs	Cable Ship 14x0,75mm²	Draka (Or similar)	
-W210	SHIP CABLE 4G1.5 Shield			1	Pcs	Cable Ship 4G1,5mm², SHIELDED	Draka (Or similar)	
-W211,-W213	ØLFLEX FD 855 CP 3G1.5			2	Pcs	CABLE, 3x1,5mm², SHIELDED	Lapp	
-W212	UNITRONIC FD CP (TP) plus 4x2x0.25	07915073		1	Pcs	CABLE, 4x2x0,25mm², -40°C, OD 8,3mm	Lapp	
-W214	ROFLEX 3X1.5	07915019		1	Pcs	CABLE, 3x1,5mm²	Lapp	
-W305,-W503	SHIP CABLE 28x1.5 Shield			2	Pcs	Cable Ship 28x1,5mm²	Draka (Or similar)	
-W410,-W413,-W420,-W423	SHIP CABLE 3+PE			4	Pcs	Cable Ship 3+PE	Draka (Or similar)	
-W411..-W412,-W421..-W422,-W432,-W441..-W442	SHIP CABLE 12x0.75			7	Pcs	Cable Ship 12x0,75mm²	Draka (Or similar)	
-W414..-W415,-W424..-W425	SHIP CABLE 2x0.75			4	Pcs	Cable Ship 2x0,75mm²	Draka (Or similar)	
-W430	SHIP CABLE 4G2.5			1	Pcs	Cable Ship 4G2.5mm²	Draka (Or similar)	
-W502	COAX RG58U	07915201		1	Pcs	CABLE, COAX, SHIELDED	Nexans	
-W506	SHIP CABLE 10x1.5 Shield			1	Pcs	Cable Ship 10x1,5mm²	Draka (Or similar)	

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	07.07.2023	GM	Date	14.10.2021
02	For customer review	29.08.2022	RSI	Drawn by	KS
01	For customer review	22.12.2021	KS	Appr. by	EE

4/60185
CNP Freire
MBARI

TRIPLEX
A MacGregor company

Part List

=GENERAL

E-4500 - 07

Rev. 03

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Printed: 07-Jul-23 11:21

Template:

=A-FRAME STERN

Customer : CNP Freire
Ship/Hull : MBARI
Project no. : 4/60185
Drawing no.: E-4501

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

4/60185
CNP Freire
MBARI

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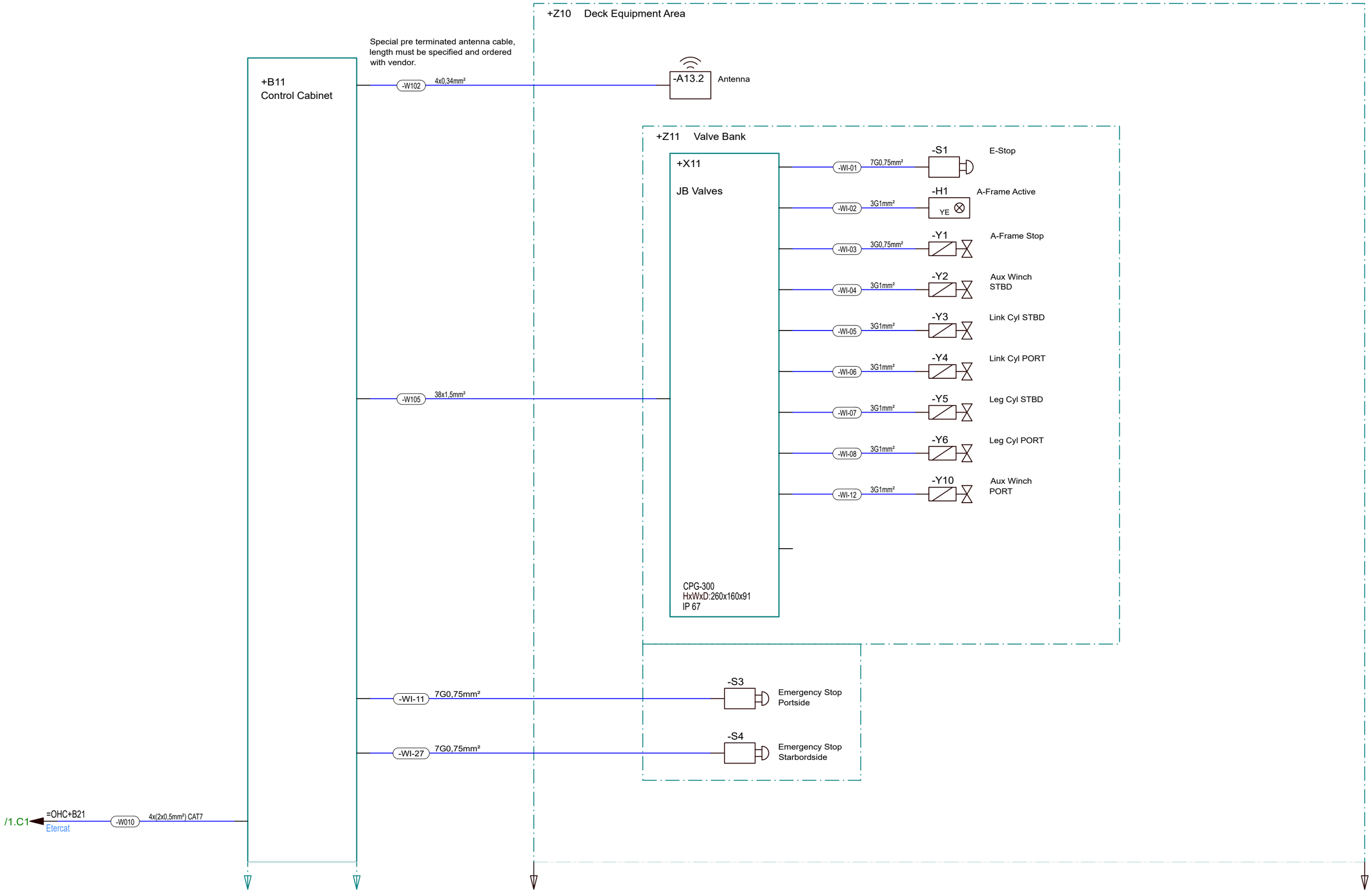
Front Page
A-Frame Stern

=A-FRAME STERN

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Rev. 03

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Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

4/60185
CNP Freire
MBARI

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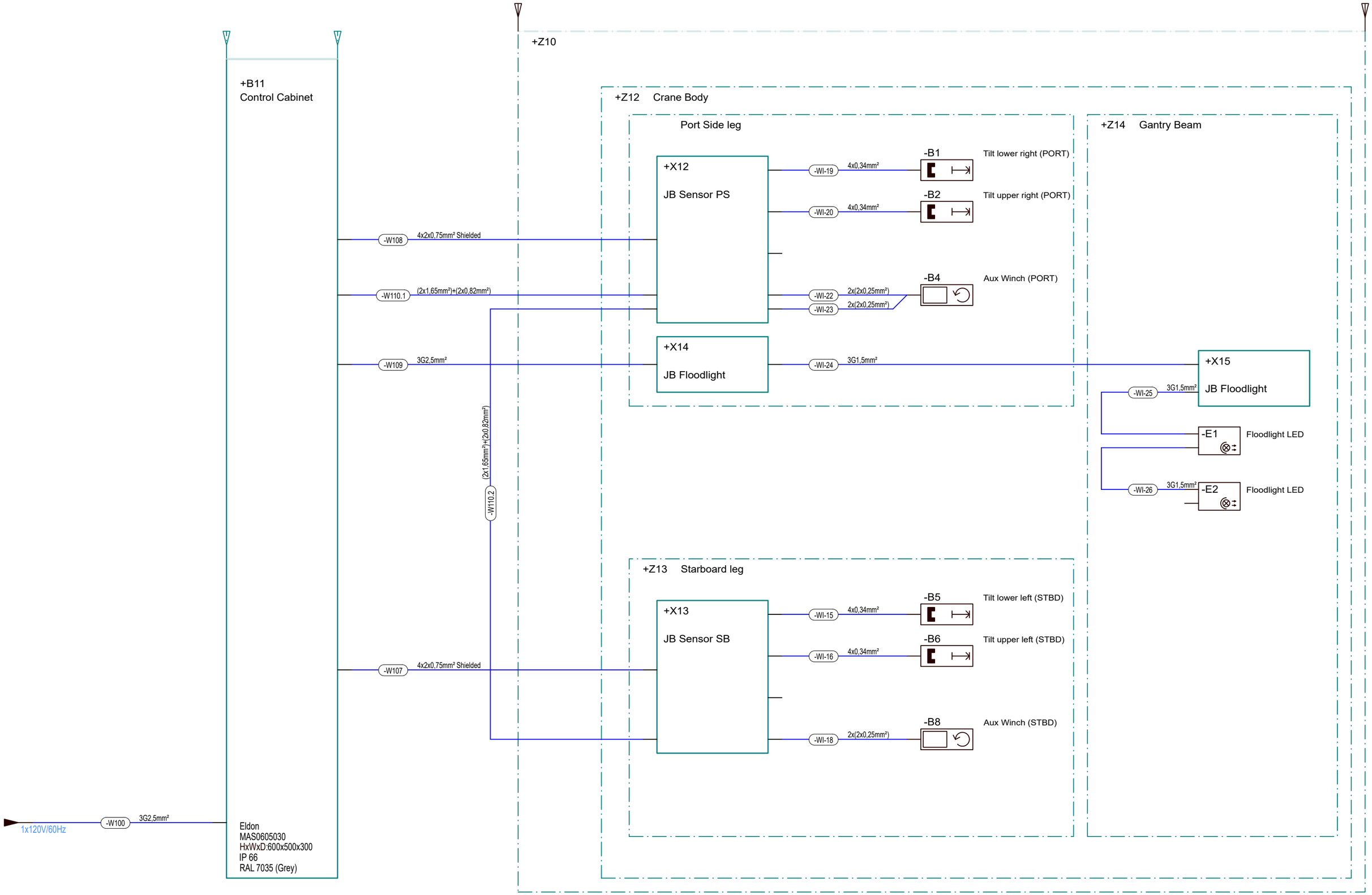
Single Line
A-Frame Stern

=A-FRAME STERN

E-4501-01

Rev. 03

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Rev.	Description	Date	Rev. by	Standard	
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02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

4/60185
CNP Freire
MBARI

TRIPLEX
A MacGregor company

Single Line
A-Frame Stern

=A-FRAME STERN

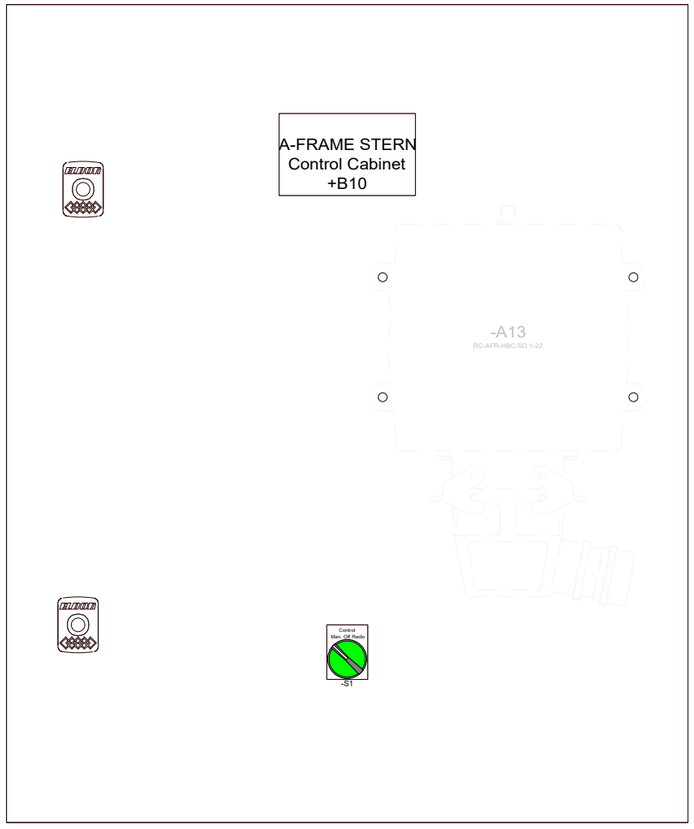
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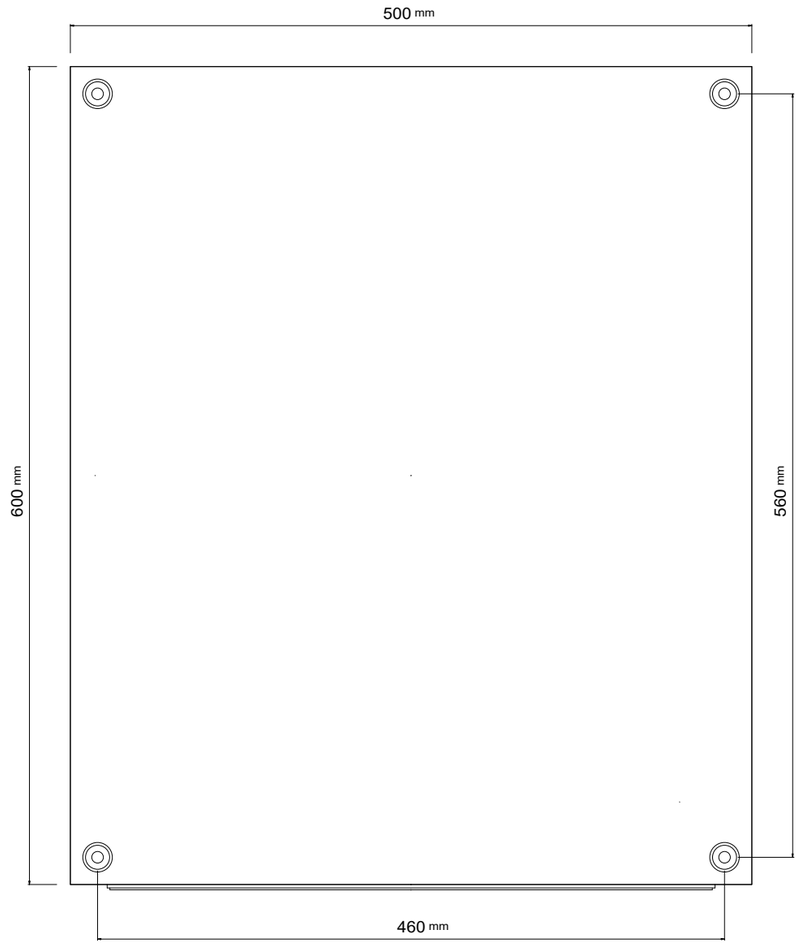
Rev. 03

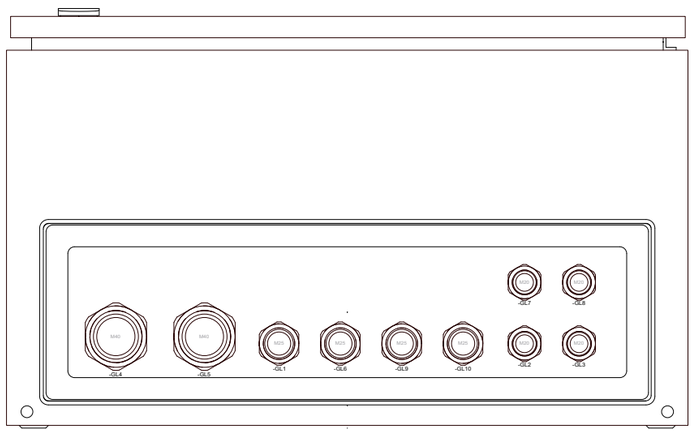
2 / 2

Printed: 16-Feb-23 07:14

Template:







Product Data	
Manufacturer	Eldon
Article name	MAS0605030
WxHxD	600x500x300
IP	IP 66
RAL Code	RAL 7035 (Grey)
Material	Steel, Painted

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

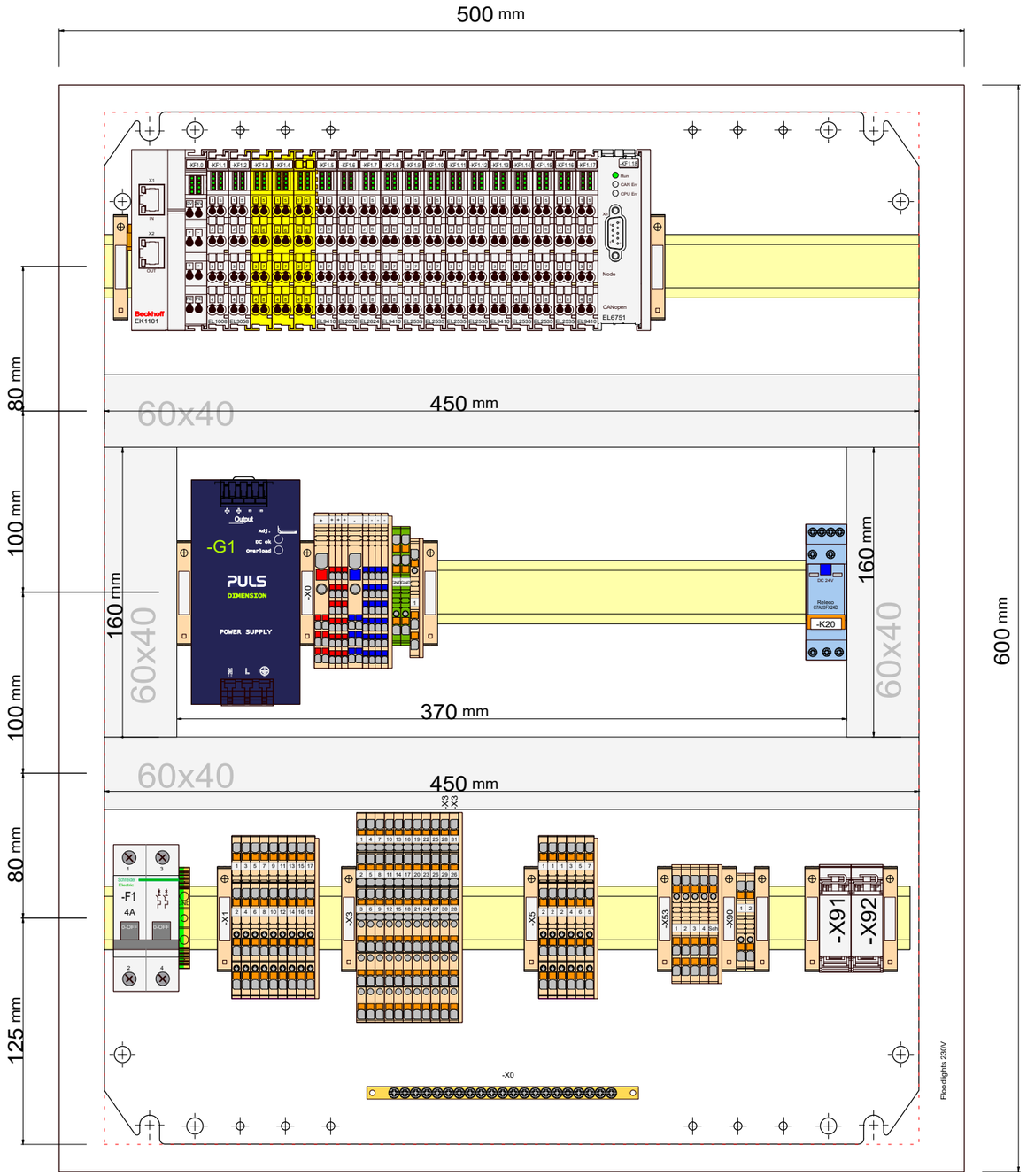
4/60185
CNP Freire
MBARI

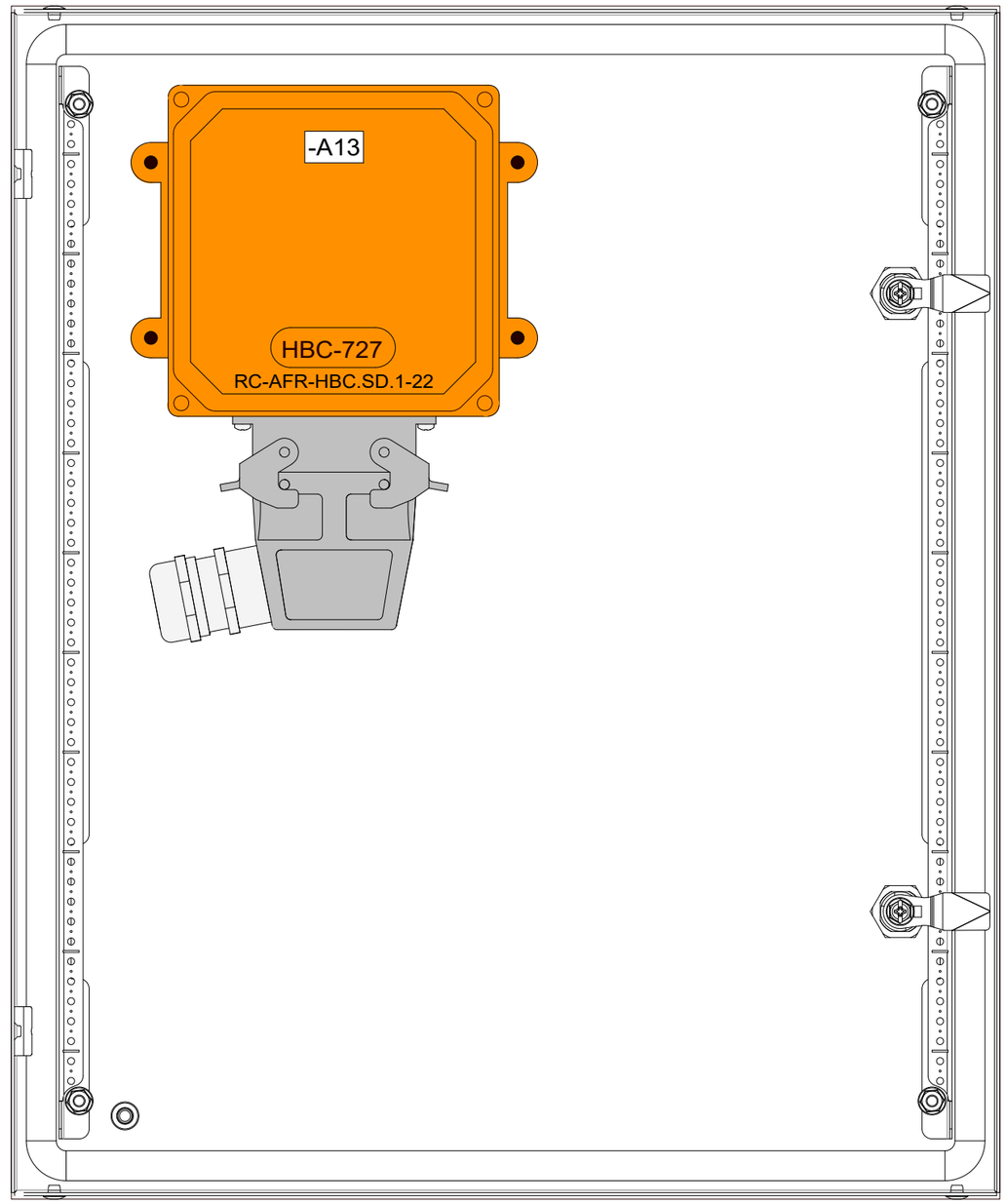
TRIPLEX
A MacGregor company

Layout
A-Frame Stern
Control Cabinet Radio - Outside

=A-FRAME STERN
+B11

E-4501-03
Rev. 03
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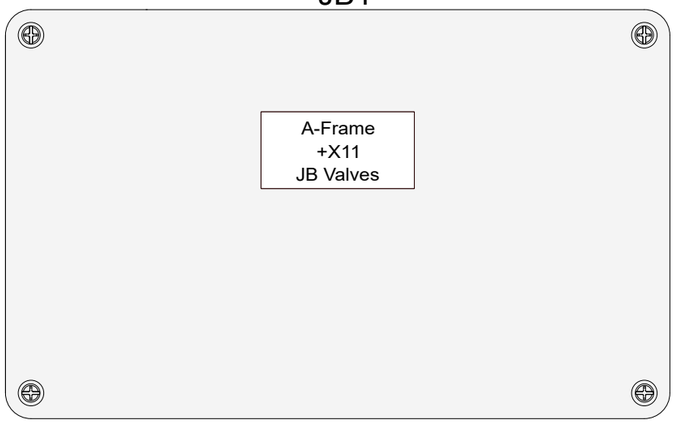
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02	For customer review	29.08.2022	RSI	User	KS		
01	For customer review	22.12.2021	KS	Approved	GM		
Rev.	Description	Date	Rev. by	Standard			

Layout
A-Frame Stern
Control Cabinet Radio - Inside

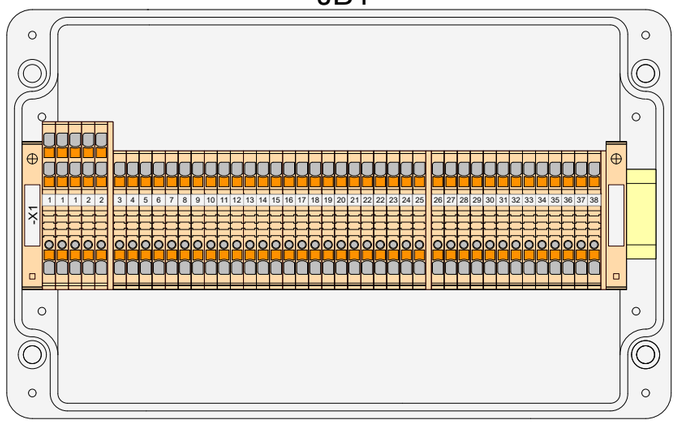
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+B11 | Rev. 03 | 2 / 10

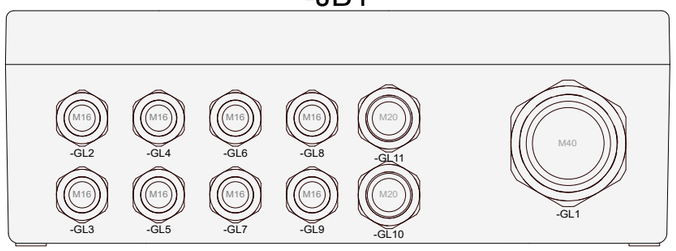
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-JB1



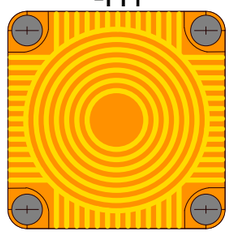
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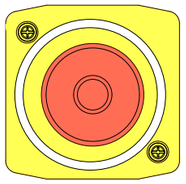
Bernstein
CPG-300
260x160x91
IP 67
RAL 7000 (Grey)

-H1



Inluded Cable Gland and 2 meter cable, ROFLEX 3G1 pre terminated.

-S1



Front View

Inluded Cable Gland and 2 meter cable, ROFLEX 7G0.75 pre terminated.

Component installed on equipment

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

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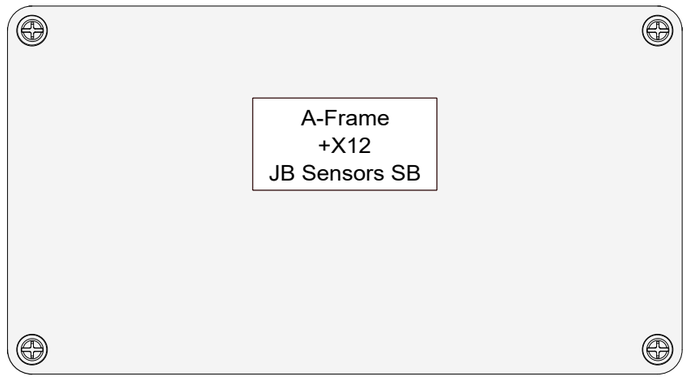
TRIPLEX
A MacGregor company

Layout
A-Frame Stern
JB Valves

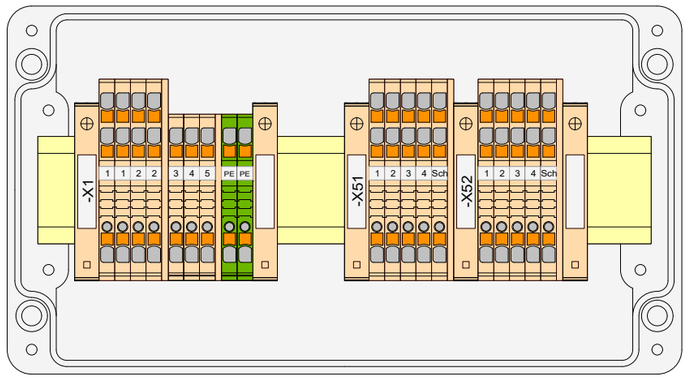
=A-FRAME STERN
+X11

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Rev. 03
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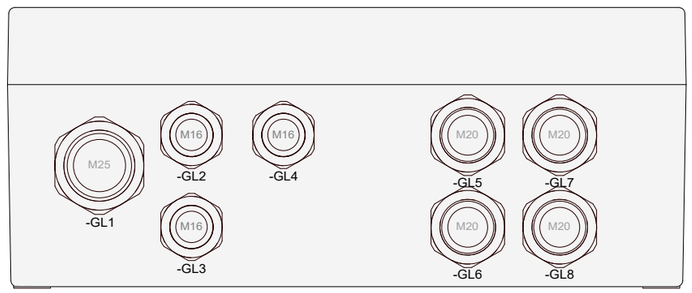
-JB1



-JB1

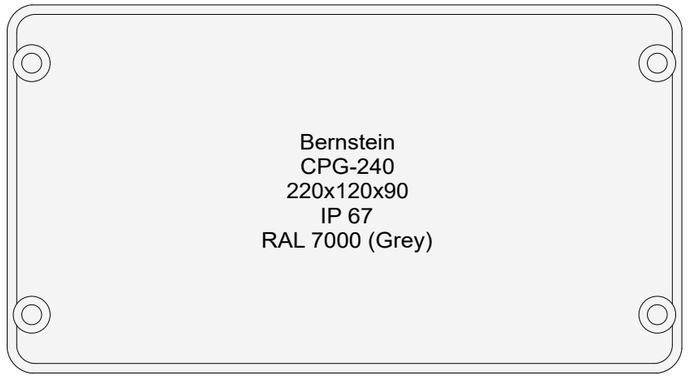


-JB1



Note:
Arrange glands to make room for aditional glands.
-GL4, -GL6 and -GL8 to be equped with sealing plug.

-JB1



Rear View

Component installed on equipment

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

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Layout
A-Frame Stern
JB Port Side Sensors

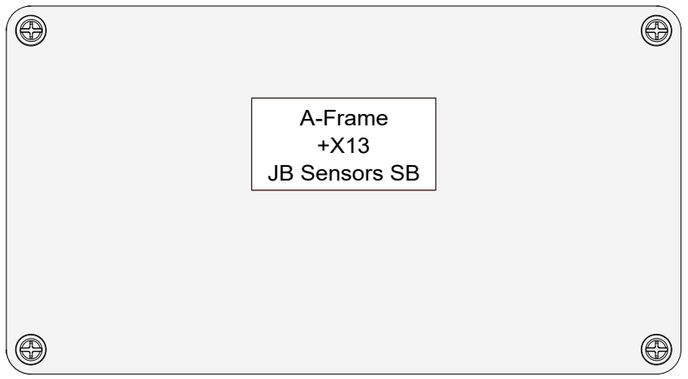
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+X12

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Rev. 03
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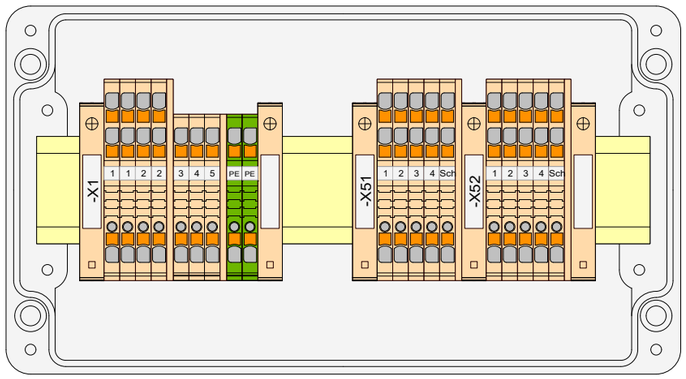
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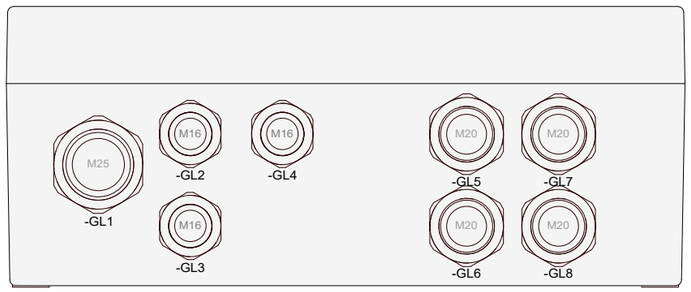
-JB2



-JB2

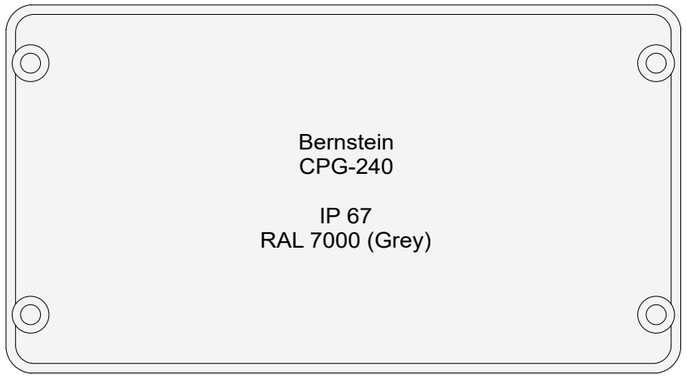


-JB2



Note:
Arrange glands to make room for aditional glands.
-GL4, -GL6 and -GL8 to be equped with sealing plug.

-JB2



Rear View

Component installed on equipment

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03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

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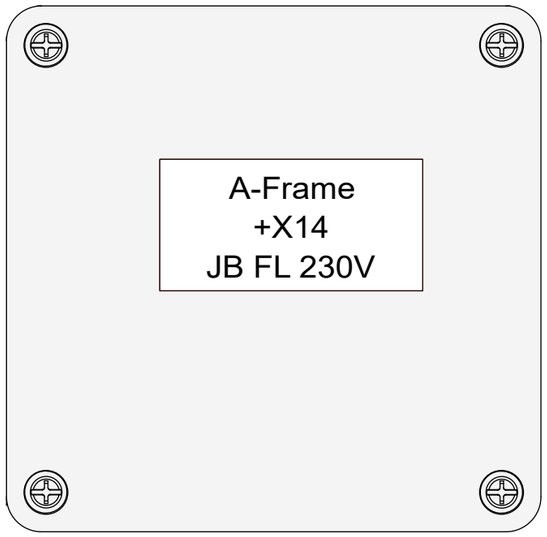
Layout
A-Frame Stern
JB Stbd. Side Sensors

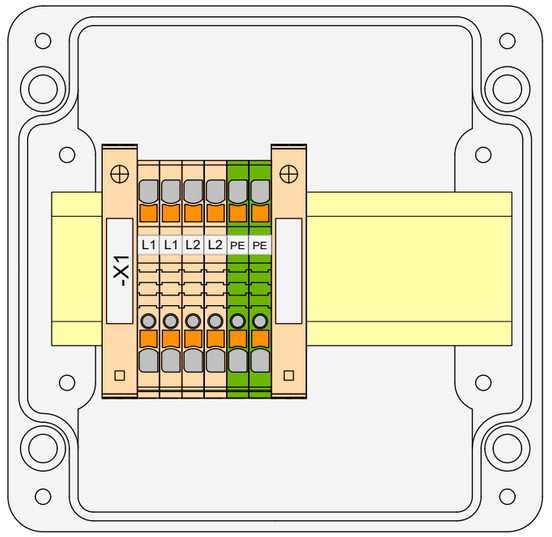
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+X13

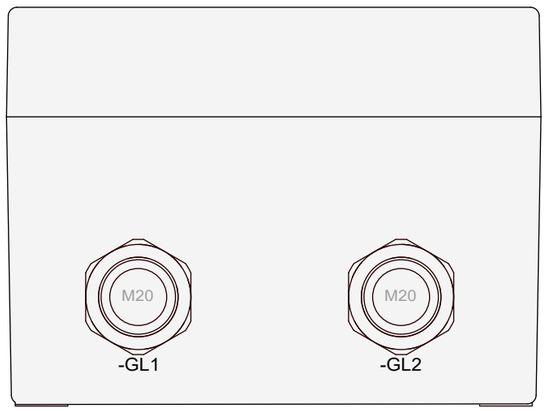
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Rev. 03
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Printed: 16-Feb-23 07:14

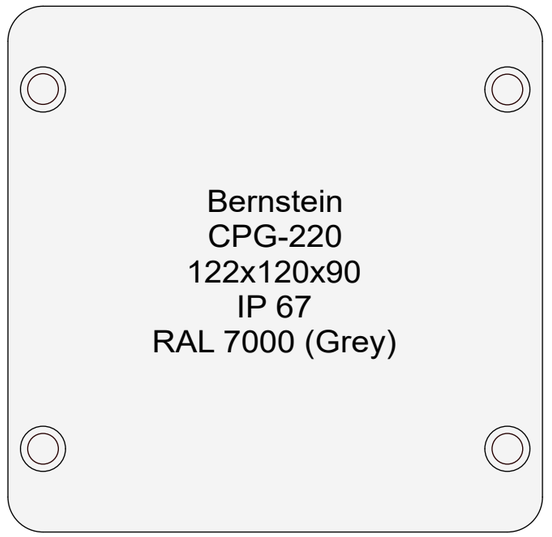
Template:







Arrange glands to make room for aditional glands



Component installed on equipment

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

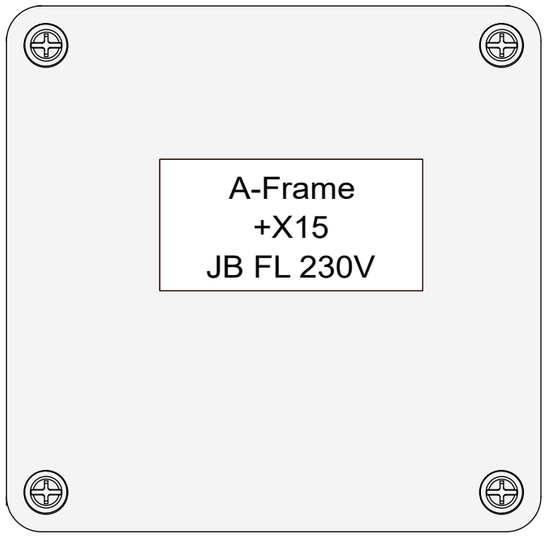
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MBARI

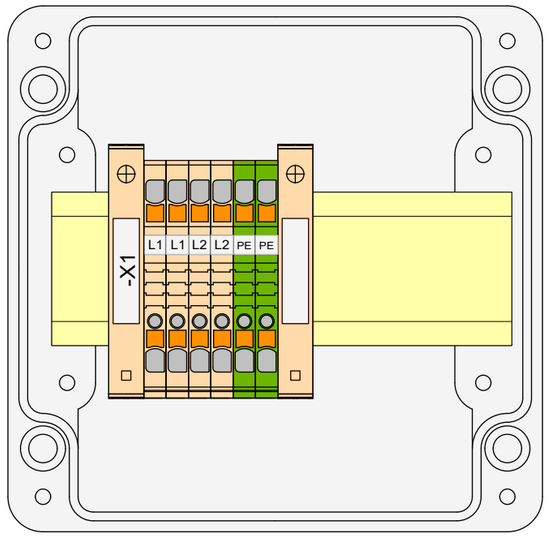
TRIPLEX
A MacGregor company

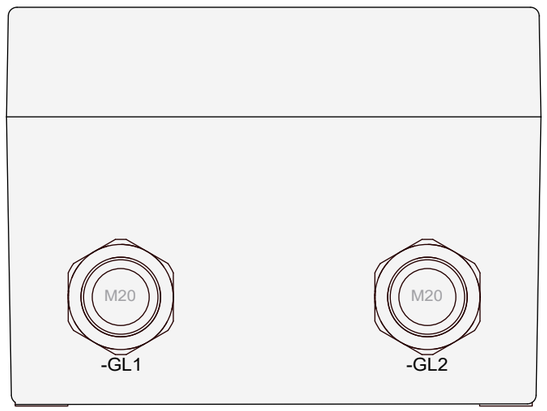
Layout
A-Frame Stern
JB Floodlights 230V

=A-FRAME STERN
+X14

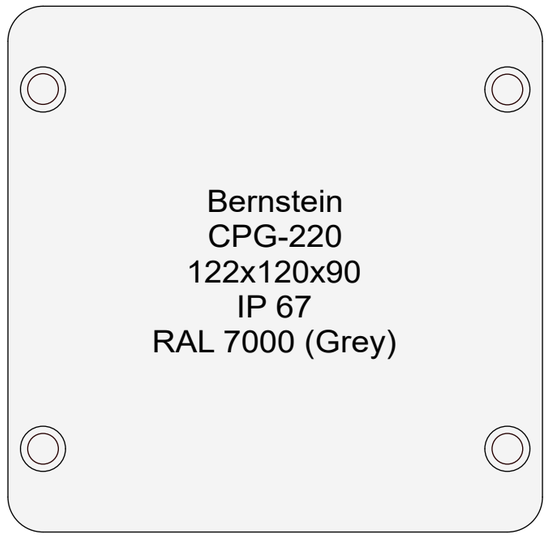
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Rev. 03
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Arrange glands to
make room for
aditional glands



Component installed on equipment

Rev.	Description	Date	Rev. by		
03	Issued for production	16.02.2023	EE	Date	14.10.2021
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				Standard	

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Layout
A-Frame Stern
JB Floodlights 230V

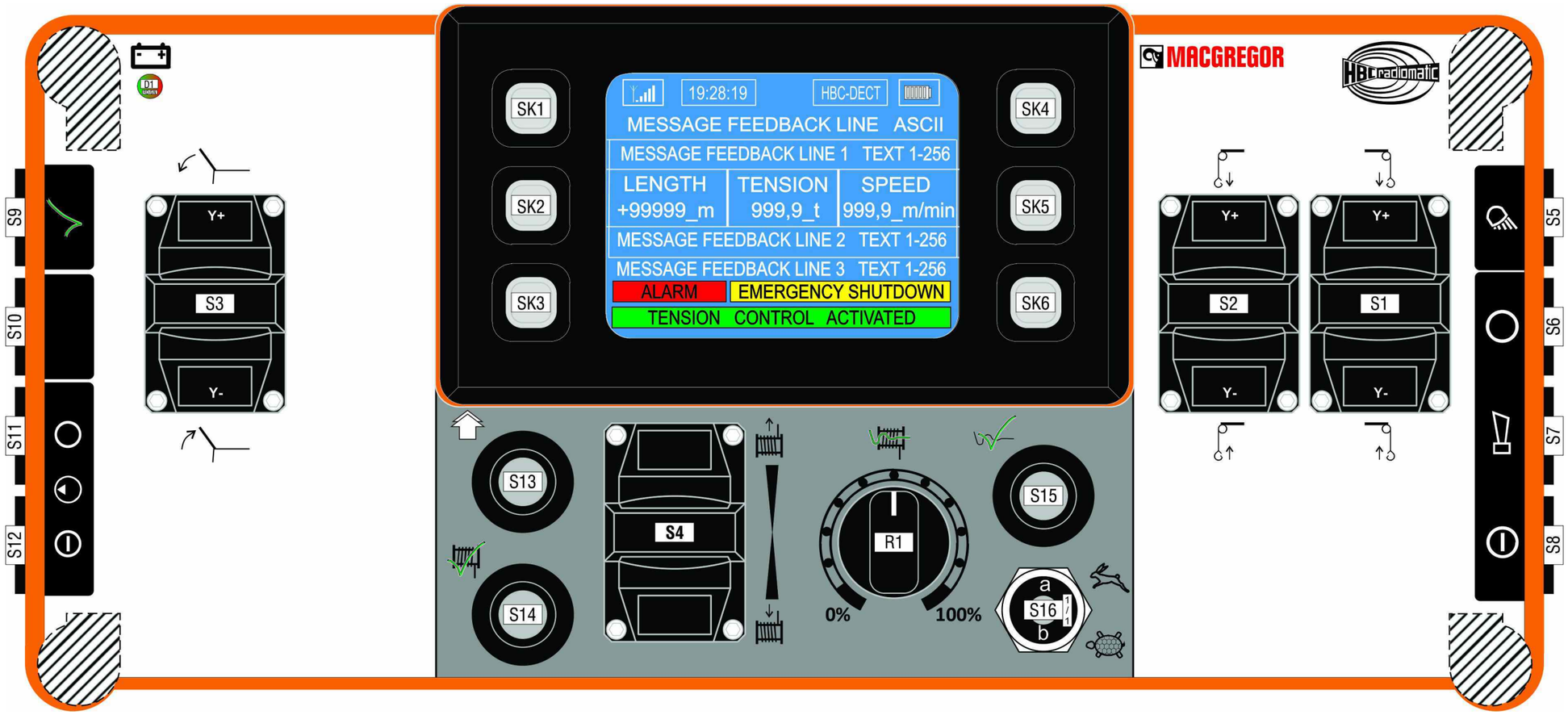
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+X15

E-4501-03
Rev. 03
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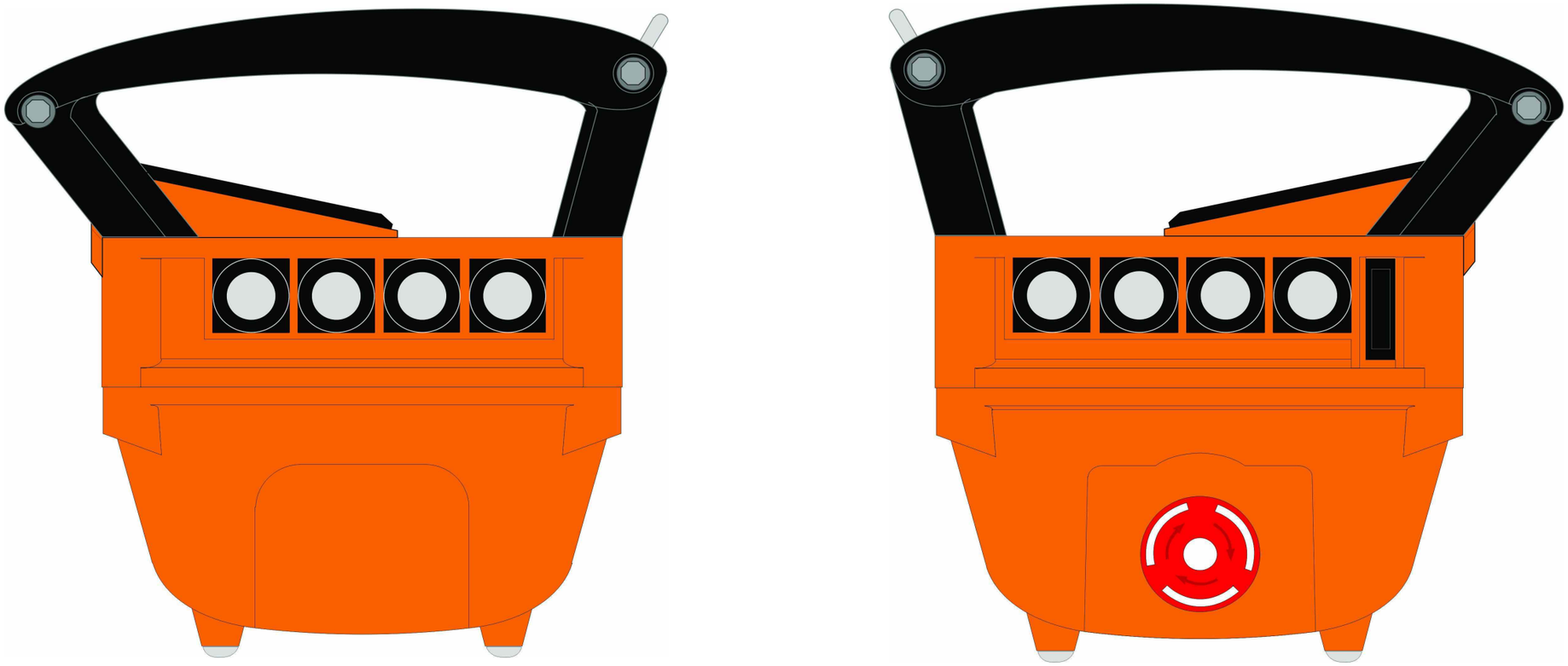
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-A13.3



03	Issued for production	16.02.2023	EE	Date	14.10.2021	4/60185 CNP Freire MBARI	TRIPLEX A MacGregor company
02	For customer review	29.08.2022	RSI	User	KS		
01	For customer review	22.12.2021	KS	Approved	GM		
Rev.	Description	Date	Rev. by	Standard			

Layout A-Frame Stern RC Transmitter	=A-FRAME STERN		E-4501-03
	+B11		Rev. 03
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Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

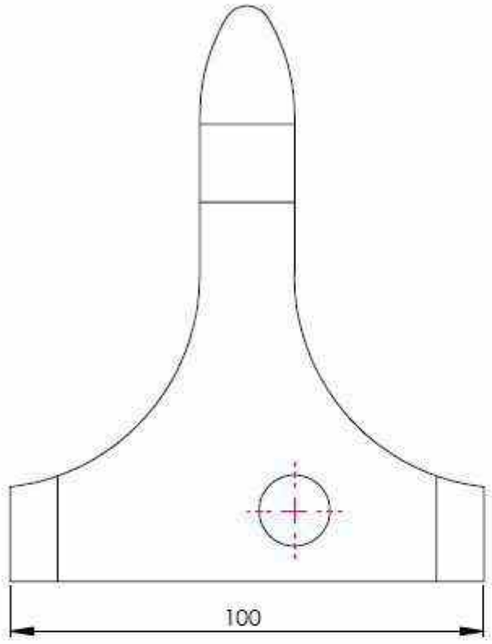
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CNP Freire
MBARI

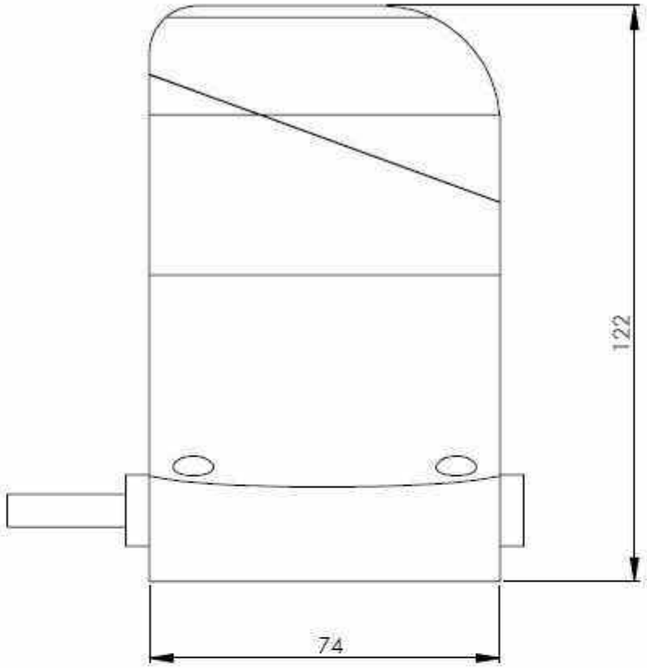
TRIPLEX
A MacGregor company

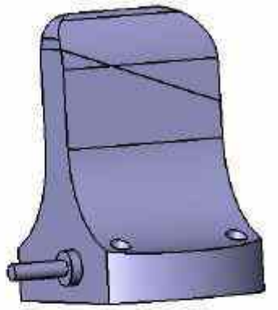
Layout
A-Frame Stern
RC Transmitter Side View

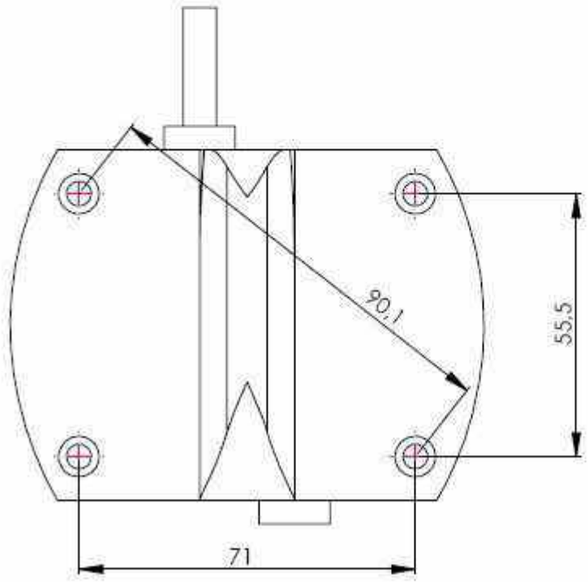
=A-FRAME STERN
+B11

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Rev. 03
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Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
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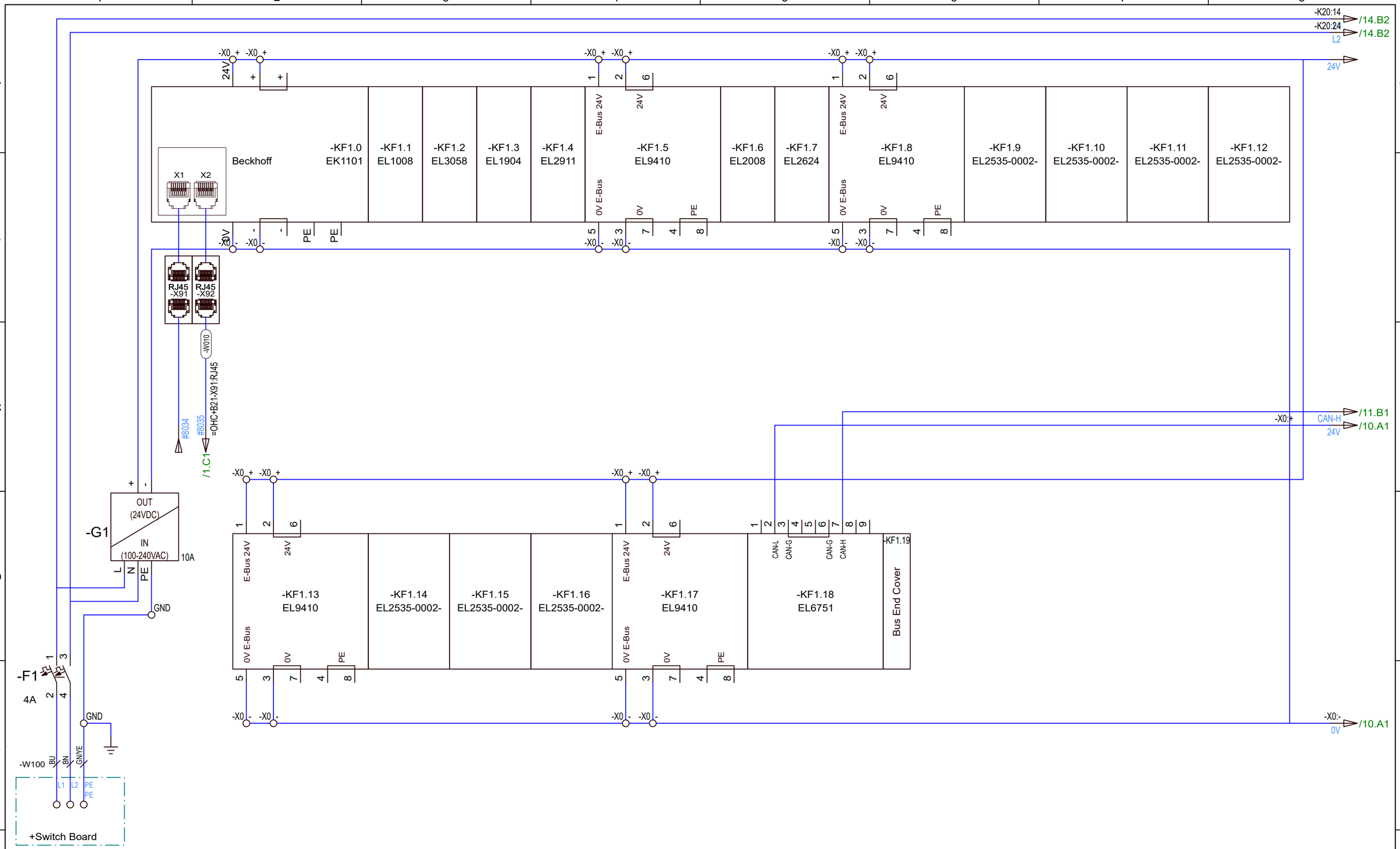
Layout
A-Frame Stern
RC Antenna

=A-FRAME STERN
+B11

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Rev. 03
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Template:



Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

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Circuit Diagram
A-Frame Stern
Control Cabinet

=A-FRAME STERN
+B11

E-4501-04
Rev. 03
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Template:

-KF1.3 Beckhoff EL1904

Pin	Pin Description	IO Type	Ref	PLC Comment 1	PLC Comment 2	PLC Symboilic Adress
1		I1	/10.B1	Emergency Stop	+Z13-S1-1	DIN/DOUT
2						
3		I2	/10.B1	Emergency Stop	+Z13-S1-2	DIN/DOUT
4						
5		I3	/10.B3	Emergency Stop	A-Frame PORT	DIN/DOUT
6						
7		I4	/10.B3	Emergency Stop	A-Frame PORT	DIN/DOUT
8						

-KF1.1 Beckhoff EL1008

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Digital Input	DI1	/11.C1	Control Cabinet	Switch	A-Frame Stern	Manual Control	DI	
5	Digital Input	DI2	/11.C3	Control Cabinet	Switch	A-Frame Stern	Radio Control	DI	
2	Digital Input	DI3	/13.C2	Valve Bank	Switch	HPU	Start	DI	
6	Digital Input	DI4	/13.C4	Valve Bank	Switch	HPU	Stop	DI	
3	Digital Input	DI5						DI	
7	Digital Input	DI6						DI	
4	Digital Input	DI7						DI	
8	Digital Input	DI8						DI	

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

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Circuit Diagram
A-Frame Stern
IO List

=A-FRAME STERN
+B11

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-KF1.2 Beckhoff EL3058

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Analog Input	AI1	/14.B4	PS	Sensor		Tilt Lower Right	AI	4-20mA
5	Analog Input	AI2	/14.B5	PS	Sensor		Tilt Upper Right	AI	4-20mA
2	Analog Input	AI3	/14.B5	SPARE	-		-	AI	4-20mA
6	Analog Input	AI4	/15.B4	STBD	Sensor		Tilt Lower Left	AI	4-20mA
3	Analog Input	AI5	/15.B5	STBD	Sensor		Tilt Upper Left	AI	4-20mA
7	Analog Input	AI6	/15.B5	SPARE	-		-	AI	4-20mA
4	Analog Input	AI7						AI	4-20mA
8	Analog Input	AI8						AI	4-20mA

Rev.	Description	Date	Rev. by		
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

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Circuit Diagram
A-Frame Stern
IO List

=A-FRAME STERN
+B11

E-4501-04
Rev. 03
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Printed: 16-Feb-23 07:14

Template:

-KF1.6 Beckhoff EL2008

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Digital Output	DO1	/10.B2	+Z13-S1	Emergency Stop		Light	DO	
5	Digital Output	DO2	/10.B4	A-Frame PORT	Emergency Stop		Light	DO	
2	Digital Output	DO3	/10.B6	A-Frame STBD	Emergency Stop		Light	DO	
6	Digital Output	DO4	/10.B7	Spare	Emergency Stop		Light	DO	
3	Digital Output	DO5	/13.C3	Valve Bank	Lamp	HPU	Run	DO	
7	Digital Output	DO6						DO	
4	Digital Output	DO7						DO	
8	Digital Output	DO8						DO	

Rev.	Description	Date	Rev. by		
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

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Circuit Diagram
A-Frame Stern
IO List

=A-FRAME STERN
+B11

E-4501-04
Rev. 03
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Printed: 16-Feb-23 07:14

Template:

-KF1.7 Beckhoff EL2624

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Com	RO1	/11.C7	Control Cabinet	Relay	A-Frame Stern	Floodlight	RO	NO
2	Relay Output NO								
5	Com	RO2						RO	NO
6	Relay Output NO								
3	Com	RO3						RO	NO
4	Relay Output NO								
7	Com	RO4						RO	NO
8	Relay Output NO								

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

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TRIPLEX
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Circuit Diagram
A-Frame Stern
IO List

=A-FRAME STERN
+B11

E-4501-04
Rev. 03
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-KF1.9 Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/12.B2	Valve Bank	Winch STBD	Prop. Valve	Out	AO+	PWM
5	PWM Output A2								
3	0Va								
4	Digital Input	DI1	/12.B3					DI	
2	PWM Output B1	PWM2		Valve Bank	Winch STBD	Prop. Valve	In	AO+	PWM
6	PWM Output B2								
7	0Vb								
8	Digital Input	DI2						DI	

-KF1.10 Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/12.B3	Valve Bank	Link CYL STBD	Prop. Valve	Out	AO+	PWM
5	PWM Output A2								
3	0Va								
4	Digital Input	DI1	/12.B3					DI	
2	PWM Output B1	PWM2		Valve Bank	Link CYL STBD	Prop. Valve	In	AO+	PWM
6	PWM Output B2								
7	0Vb								
8	Digital Input	DI2						DI	

-KF1.11 Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/12.B4	Valve Bank	Link Cyl PORT	Prop. Valve	Out	AO+	PWM
5	PWM Output A2								
3	0Va								
4	Digital Input	DI1	/12.B4					DI	
2	PWM Output B1	PWM2		Valve Bank	Link Cyl PORT	Prop. Valve	In	AO+	PWM
6	PWM Output B2								
7	0Vb								
8	Digital Input	DI2						DI	

-KF1.12 Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/12.B4	Valve Bank	Leg Cyl STBD	Prop. Valve	Out	AO+	PWM
5	PWM Output A2								
3	0Va								
4	Digital Input	DI1	/12.B5					DI	
2	PWM Output B1	PWM2		Valve Bank	Leg Cyl STBD	Prop. Valve	In	AO+	PWM
6	PWM Output B2								
7	0Vb								
8	Digital Input	DI2						DI	

-KF1.14 Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/12.B5	Valve Bank	Leg Cyl PORT	Prop. Valve	Out	AO+	PWM
5	PWM Output A2								
3	0Va								
4	Digital Input	DI1	/12.B5					DI	
2	PWM Output B1	PWM2		Valve Bank	Leg Cyl PORT	Prop. Valve	In	AO+	PWM
6	PWM Output B2								
7	0Vb								
8	Digital Input	DI2						DI	

Rev.	Description	Date	Rev. by		
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01	For customer review	22.12.2021	KS	Approved	GM
				Standard	

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Circuit Diagram
A-Frame Stern
IO List

=A-FRAME STERN
+B11

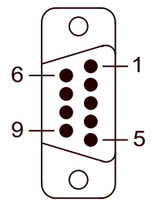
E-4501-04
Rev. 03
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Template:

-KF1.18 Beckhoff EL6751

DSUB-9	Pin Description	IO Type	Ref
1		CAN	/1.E5
2	CAN-L		
3	CAN-G		
4			
5			
6	CAN-G		
7	CAN-H		
8			
9			



D-SUB
9-Pin
Male

Rev.	Description	Date	Rev. by		
03	Issued for production	16.02.2023	EE	Date	14.10.2021
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Circuit Diagram
A-Frame Stern
IO List

=A-FRAME STERN
+B11

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Template:

-KF1.18:2
/1.C8
24V
/1.E8
0V

-X0 -

-X0:+
24V
-X0:-
0V
/11.C1
/11.E1

-KF1.3
+Z13-S1-1
Emergency Stop
DIN/DOUT
/1.B3
I1
+ -
1 2

-KF1.3
+Z13-S1-2
Emergency Stop
DIN/DOUT
/1.B3
I2
+ -
3 4

-KF1.6 DO1
+Z13-S1
Emergency Stop
Light
DO
1

-KF1.3
A-Frame PORT
Emergency Stop
DIN/DOUT
/1.B3
I3
+ -
5 6

-KF1.3
A-Frame PORT
Emergency Stop
DIN/DOUT
/1.B3
I4
+ -
7 8

-KF1.6 DO2
A-Frame PORT
Emergency Stop
Light
DO
5

-KF1.4 DIO1
A-Frame STBD
Emegrency Stop
IN
+ 1 - 2 /1.B3

-KF1.4 DIO2
A-Frame STBD
Emegrency Stop
IN
+ 5 - 6 /1.B3

-KF1.6 DO3
A-Frame STBD
Emergency Stop
Light
DO
2

-KF1.4 DIO3
Spare
+ 3 - 4 /1.B3

-KF1.4 DIO4
Spare
+ 7 - 8 /1.B3

-KF1.6 DO4
Spare
Emergency Stop
Light
DO
6

-X3 26 27 28 29 30 31
-X1 1 2 3 4 5 6
-X1 7 8 9 10 11 12
-X1 13 14 15 16 17 18

-W105 26 27 28 29 30 31
1 2 3 4 5 6
1 2 3 4 5 6

+Z13
+X11
-X1 26 27 28 29 30 31
-WI-01 1 2 3 4 5 6
+Z11 -S1 21 22
+Z11 -S1 23 24
+Z11 -S1 X1 X2

+Z10 Deck Equipment Area
-S3 21 22
-S3 23 24
-S3 X1 X2
-S4 21 22
-S4 23 24
-S4 X1 X2

Emergency Stop
Portside

Emergency Stop
Starbordside

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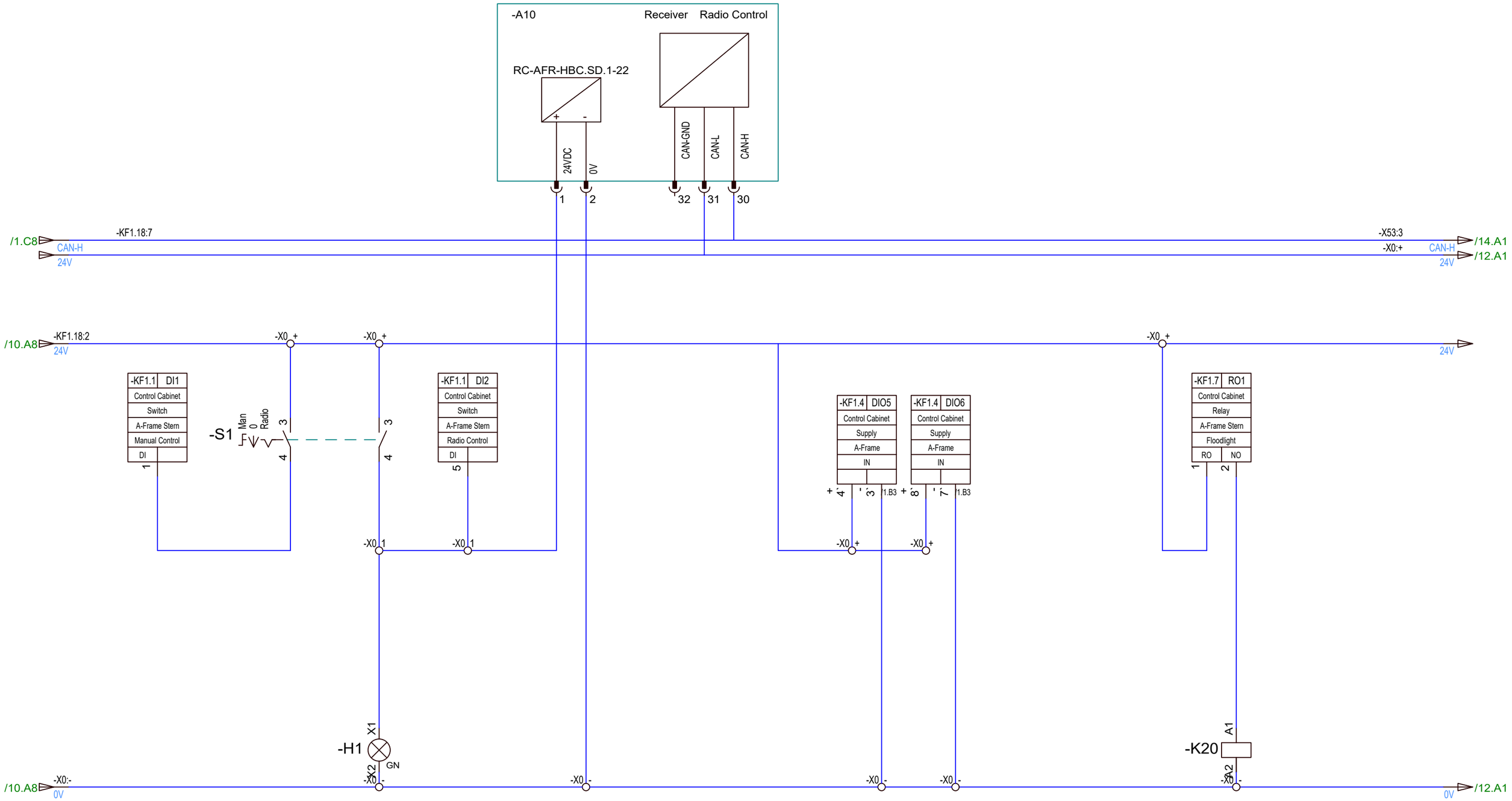
Circuit Diagram
A-Frame Stern
Control Cabinet

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+B11

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Template:



Control From Radio

Floodlights

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Circuit Diagram
A-Frame Stern
Control Cabinet

=A-FRAME STERN
+B11

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Template:

/11.B8
/11.E8
-X0:-
0V

-X0:+
24V
0V
/13.A1
/13.A1

-KF1.4	DIO7
Valve Bank	
Stop	
Stop Valve	
OUT	

+ 2 - 3 /1.B3

-X0 -
-X0 -

-KF1.9	PWM1	-KF1.9	PWM2	-KF1.10	PWM1	-KF1.10	PWM2	-KF1.11	PWM1	-KF1.11	PWM2	-KF1.12	PWM1	-KF1.12	PWM2	-KF1.14	PWM1	-KF1.14	PWM2	-KF1.16	PWM1	-KF1.16	PWM2
Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank	
Winch STBD		Winch STBD		Link CYL STBD		Link CYL STBD		Link Cyl PORT		Link Cyl PORT		Leg Cyl STBD		Leg Cyl STBD		Leg Cyl PORT		Leg Cyl PORT		Winch PORT		Winch PORT	
Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve	
Out		In		Out		In		Out		In		Out		In		Out		In		Out		In	
AO+	AO-	AO+	AO-	AO+	AO-	AO+	AO-	AO+	AO-	AO+	AO-	AO+	AO-	AO+	AO-	AO+	AO-	AO+	AO-	AO+	AO-	AO+	AO-

-X3 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

-W105 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

+Z13

+X11

-X1 1 2 2 1 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

-WI-02 BU BN
-WI-03 2 1
-WI-04 BU BN GY
-WI-05 BU BN GY
-WI-06 BU BN GY
-WI-07 BU BN GY
-WI-08 BU BN GY
-WI-12 BU BN GY

+Z11 X1 -H1 X2 YE
-Y1 1 2
+Z11 -Y2 1 2 3 B A
+Z11 -Y3 1 2 3 B A
+Z11 -Y4 1 2 3 B A
+Z11 -Y5 1 2 3 B A
+Z11 -Y6 1 2 3 B A
+Z11 -Y10 1 2 3 B A

+X11-X1:1
0V
/13.D3

A-Frame Active	A-Frame Stop	Aux Winch STBD		Link Cyl STBD		Link Cyl PORT		Leg Cyl STBD		Leg Cyl PORT		Aux Winch PORT	
		2 Out	3 In	2 Out	3 In	2 Out	3 In	2 Out	3 In	2 Out	3 In	2 Out	3 In

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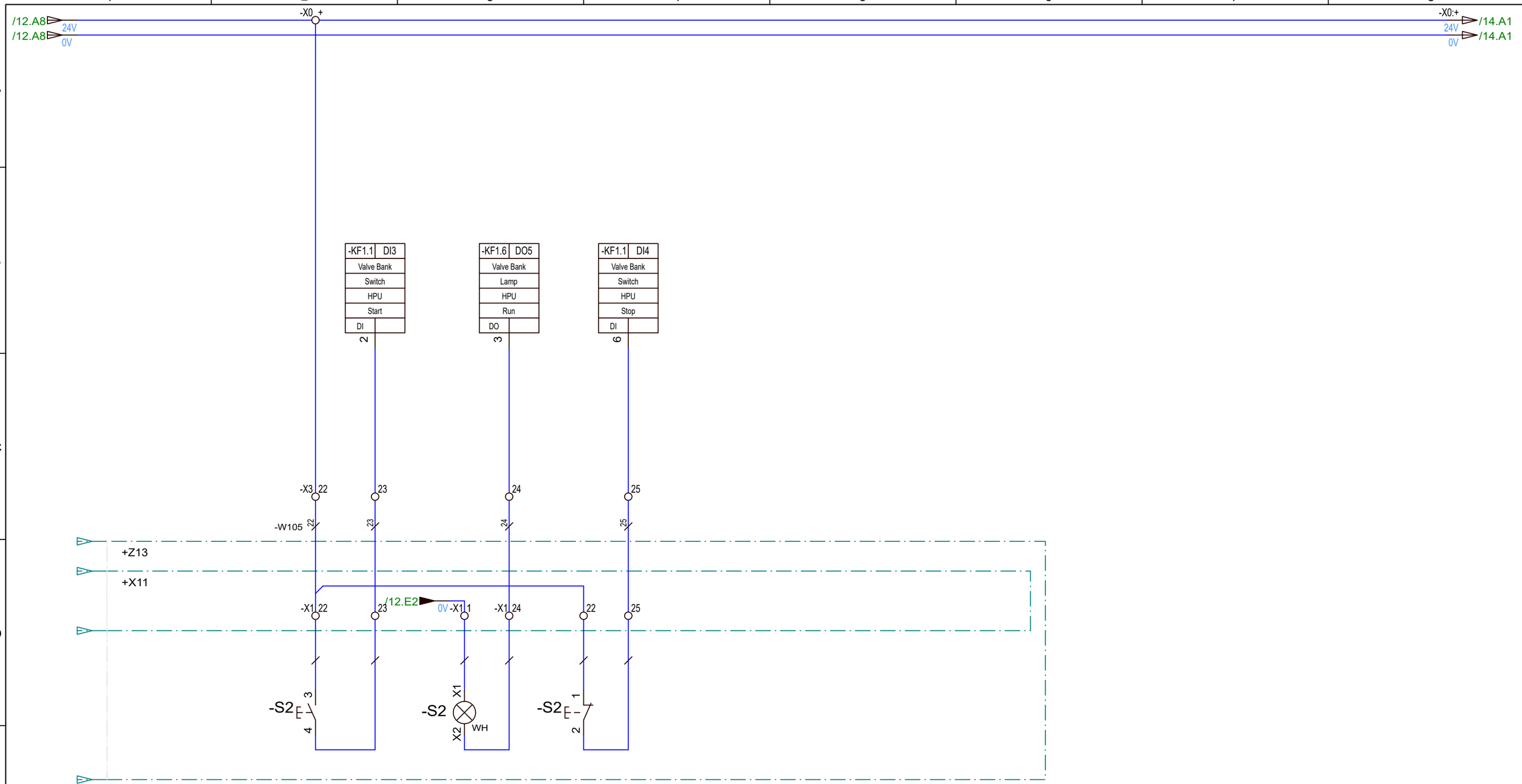
Circuit Diagram
A-Frame Stern
Control Cabinet

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+B11

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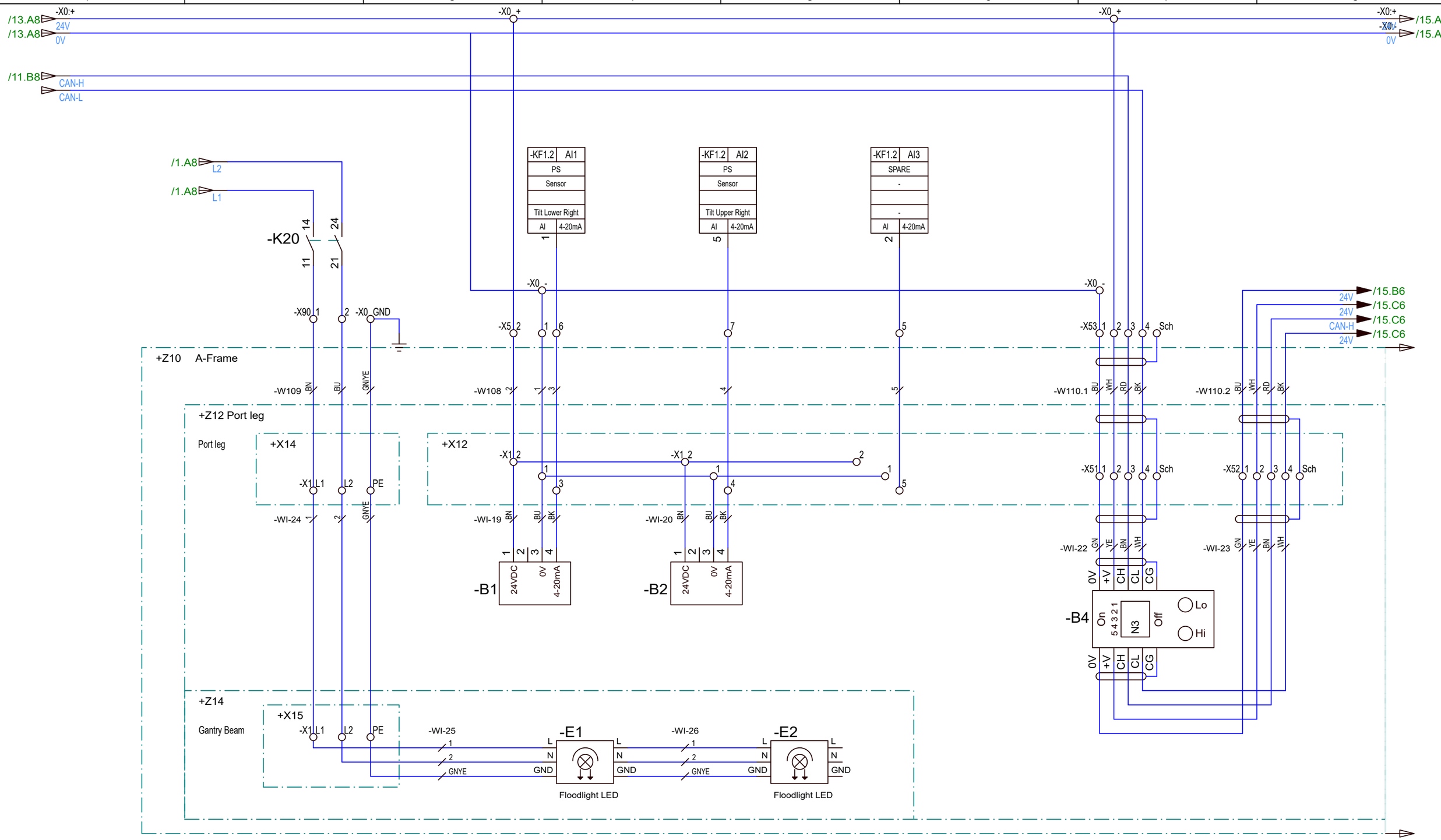
Template:



HPU Start Button		HPU Run Light		HPU Stop Button

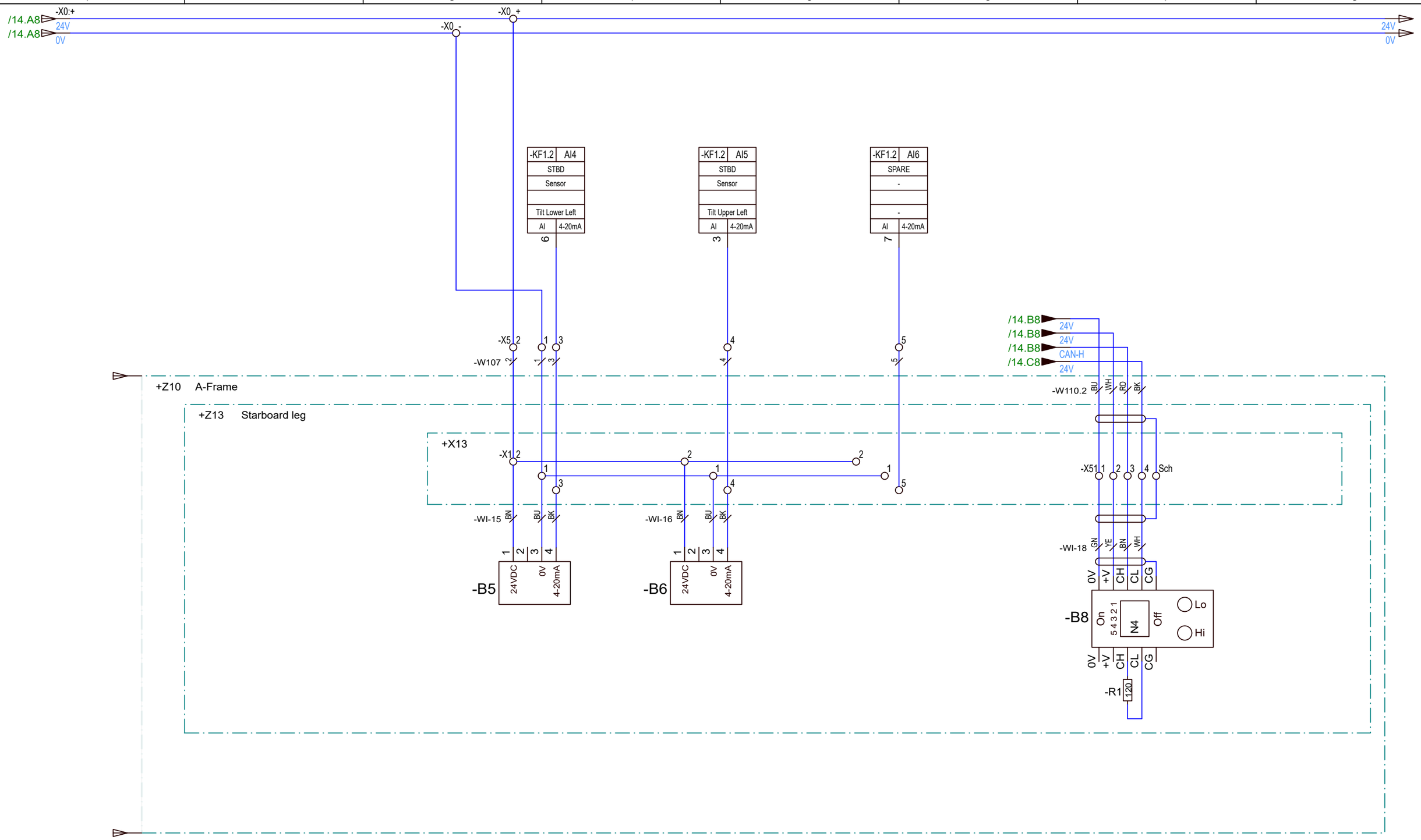
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Tilt lower right (PORT)	Tilt upper right (PORT)	Aux Winch (PORT)

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Tilt lower left (STBD)

Tilt upper left (STBD)

Aux Winch (STBD)

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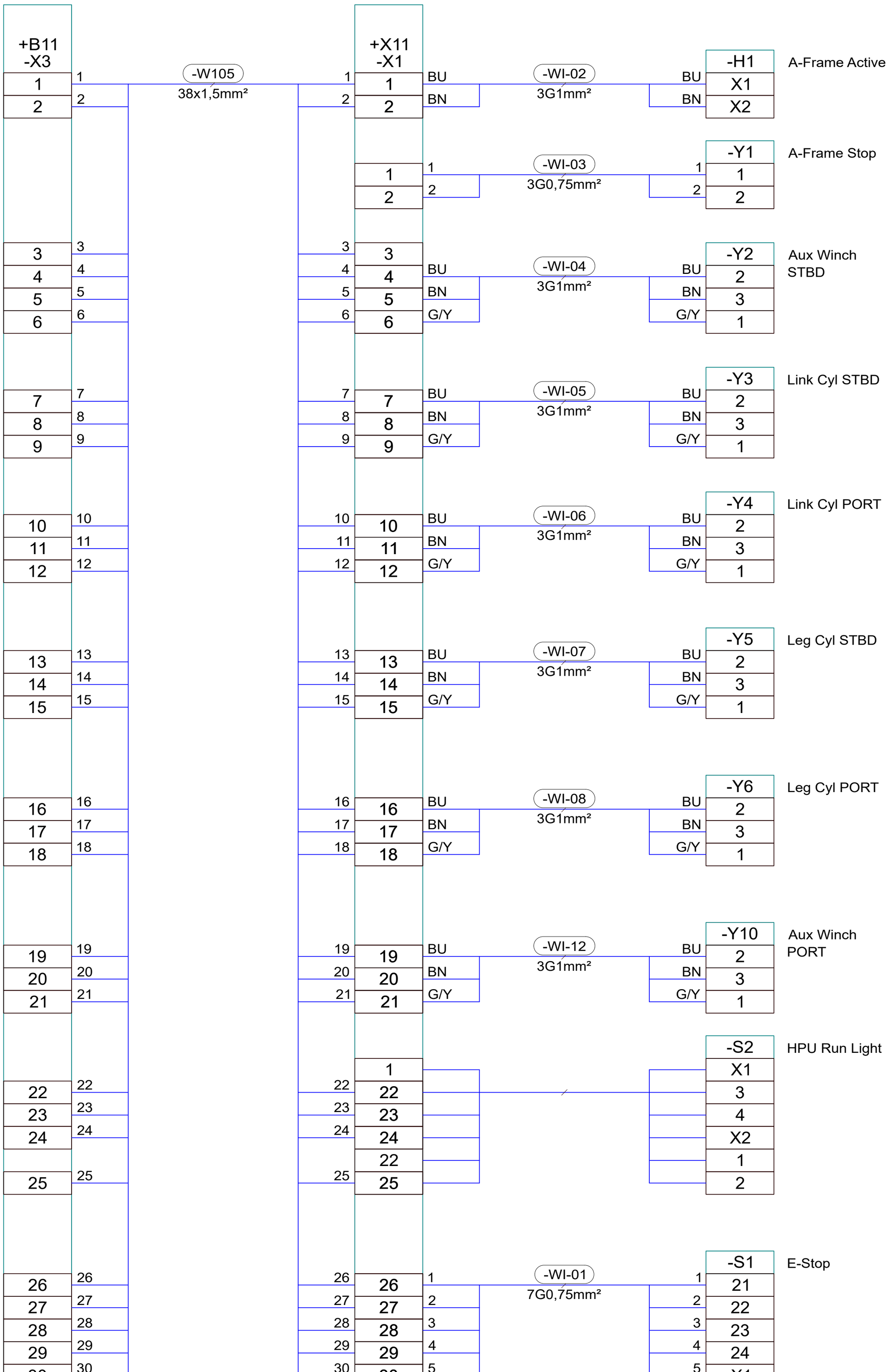
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Circuit Diagram
A-Frame Stern
Control Cabinet

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Termination Diagram
A-Frame Stern

=A-FRAME STERN

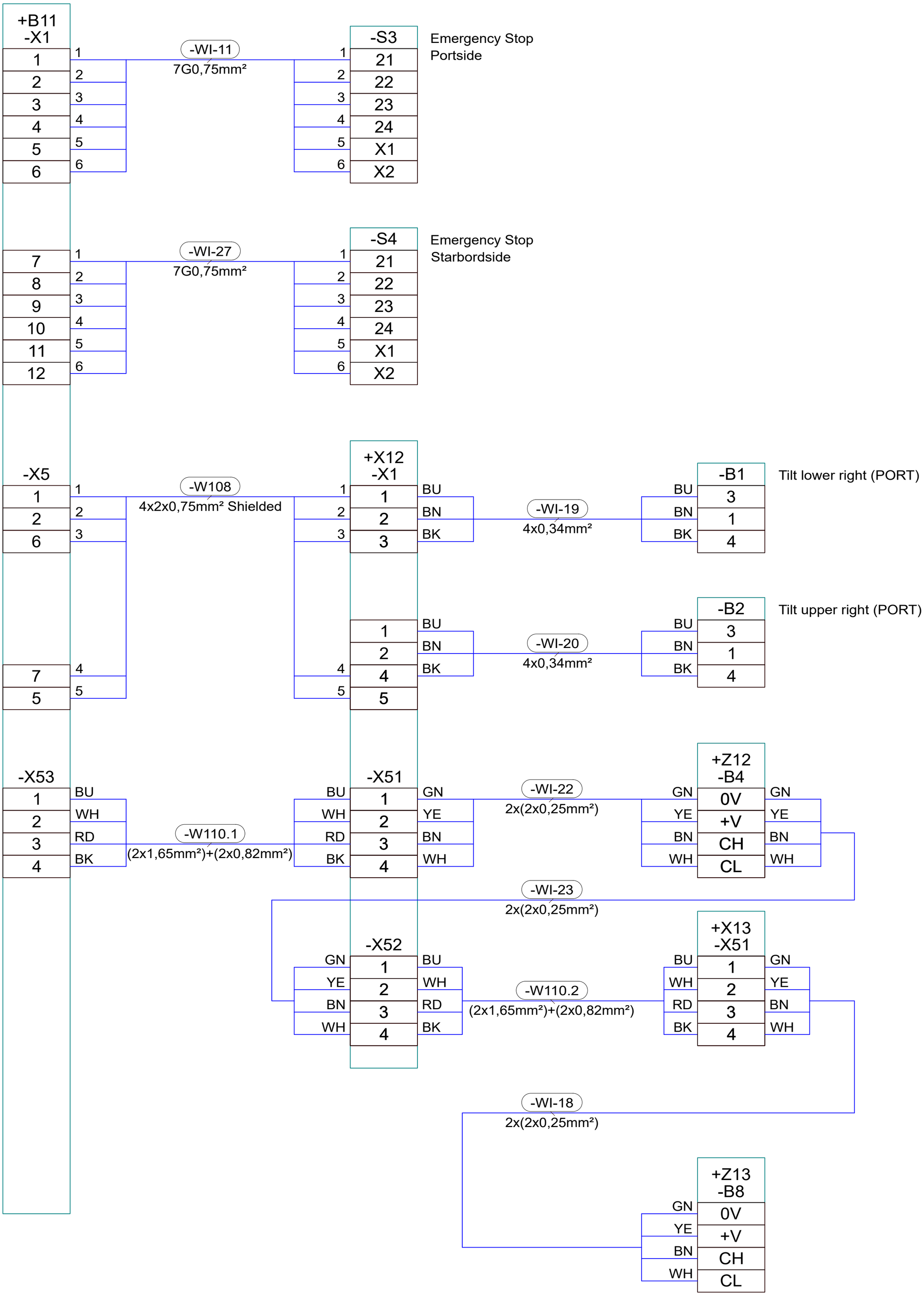
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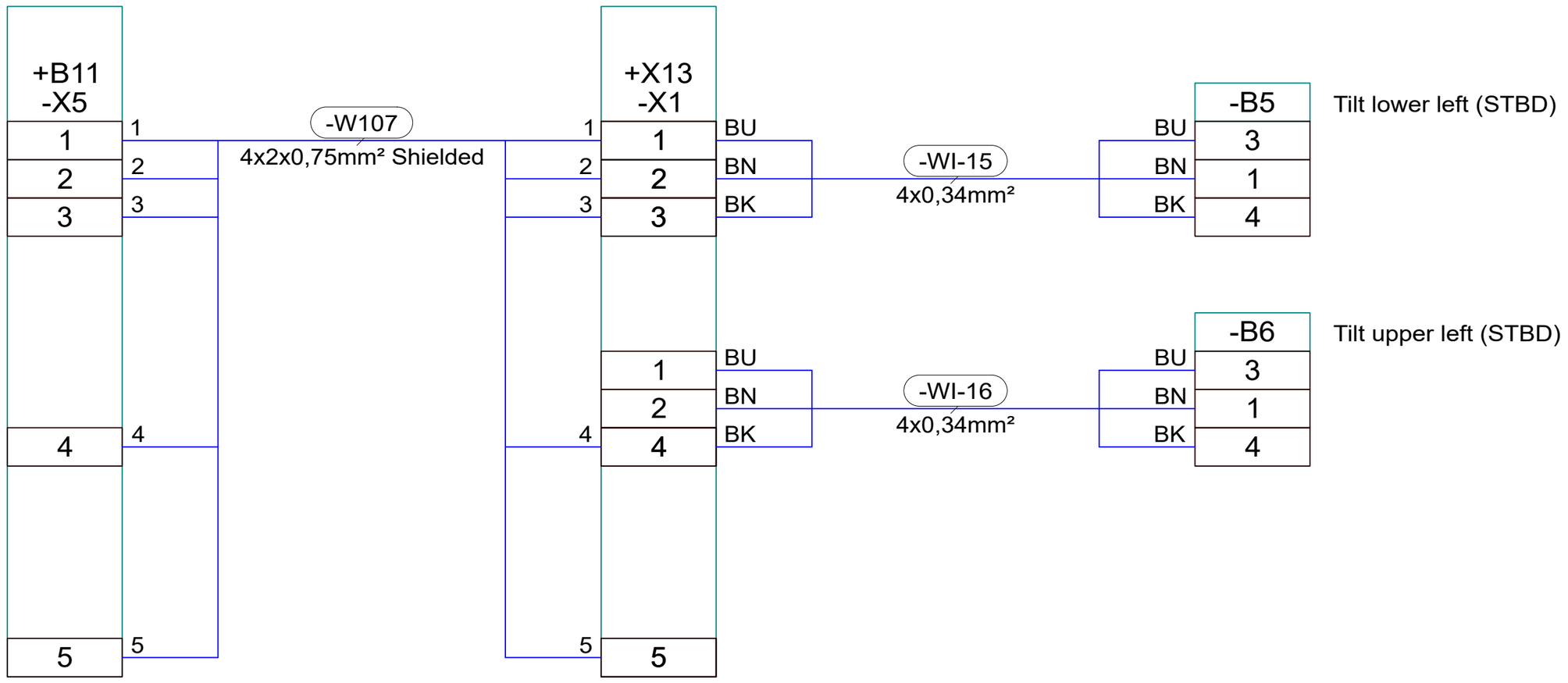
Termination Diagram
A-Frame Stern

=A-FRAME STERN

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03	Issued for production	16.02.2023	EE	Date	14.10.2021
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Termination Diagram
A-Frame Stern

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-S3,-S4	XALK178W3B140G	400208317	4322660	2	Pcs	CONTR. PUSH, EM STOP	Schneider	
-WI-01	ROFLEX 7G0.75	07915015		1	Pcs	CABLE, 7G0,75mm²	Lapp	
-WI-02,-WI-04,-WI-05,-WI-06,-WI-07,-WI-08,-WI-12	ROFLEX 3G1	07915017		7	Pcs	CABLE, 3G1mm²	Lapp	
-WI-03	7074-18021-2360500	07930051		1	Pcs	CONNECTOR, VALVE, MURR, 5M, SS	Murr	
-WI-11,-WI-27	ØLFLEX FD 855 CP 7G0.75	400111231	10 905 14	2	Pcs	CABLE, 7x0,75mm², SHIELDED	Lapp	
-WI-15,-WI-16,-WI-19,-WI-20	V1-WV4A-10M-PUR-ABG0	07917048		4	Pcs	GIVER KABEL M12 4-PIN VINK 10M SKJERM	Pepperl & Fuchs	
-WI-18,-WI-22,-WI-23	BUS FD P CAN UL/CSA 2x2x0.25	07915044		3	Pcs	CABLE, 2x2x0,25mm²	Lapp	
-WI-24,-WI-25,-WI-26	ØLFLEX FD 855 CP 3G1.5			3	Pcs	CABLE, 3x1,5mm², SHIELDED	Lapp	

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Part List
A-Frame Stern

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-A13	RC-AFR-HBC.SD.1-22	400198449		1	Pcs	A-Frame 19 with Display	HBC	
-CAB1	ADO201	07939034	24 138 75	1	Pcs	CABINET, DOORSTOPPER, ADO, ELDON	Eldon	
-CAB1	MAS0605030	400089006	24 174 95	1	Pcs	CABINET, 600x500x300 ELDON*	Eldon	
-DUCT1..-DUCT4	HA760040	07920015	12 857 18	1.22	M	CABLE TRAY, 60X40, GREY, W/LID	Tehalit Hager	
-F1	C60H/C 04-2	07938005	16 760 63	1	Pcs	SIKRING AUTOMAT 4A, 2-POL	Schneider	
-G1	CS10.241	07949016	66 040 29	1	Pcs	POWER SUPPLY, PULSE, 10A, 230/24	Puls	
-GL1,-GL10	WADI-TEC EMC M25 Ø13.5-18	07928085	12 492 72	2	Pcs	CABLE GLAND, BRASS, EMC, Ø13,5-18	Elis	
-GL2..-GL3,-GL7..-GL8	WADI-TEC EMC M20 Ø8-12.5	07928083	12 492 68	4	Pcs	CABLE GLAND, BRASS, EMC, Ø8-12,5	Elis	
-GL4,-GL5	WADI-TEC EMC M40 Ø24-30	400075304	12 492 78	2	Pcs	CABLE GLAND, BRASS, EMC, Ø24-30	Elis	
-GL6,-GL9	WADI-TEC EMC M25 Ø10-14.5	07928084	12 492 70	2	Pcs	CABLE GLAND, BRASS, EMC, Ø10-14,5	Elis	
-H1	ZBVB3	07924016	43 032 26	1	Pcs	LAMP, LED, GN, 24V	Schneider	
-K20	C7A20FX24D	07936015	43 783 87	1	Pcs	RELAY, RELECO, 2-POLE, 24V DC, 10A	Releco	
-K20	S7-I/O	07936015	43 783 87	1	Pcs	RELAY, SOCKET	Releco	
-KF1.0	EK1101	400142335		1	Pcs	EtherCAT Coupler w ID settings	Beckhoff	
-KF1.1	EL1008	400142339		1	Pcs	8 Digital Inputs	Beckhoff	
-KF1.2	EL3058	400142349		1	Pcs	8 Analog Inputs 4-20mA 2-wire	Beckhoff	
-KF1.3	EL1904			1	Pcs	TwinSAFE 4 Digital Inputs	Beckhoff	
-KF1.4	EL2911	400142346		1	Pcs	TwinSAFE 4 Digital Inputs, 1x Output	Beckhoff	
-KF1.5,-KF1.8,-KF1.13,-KF1.17	EL9410	400142412		4	Pcs	Power Supply Terminal fro E-bus	Beckhoff	
-KF1.6	EL2008	400142342		1	Pcs	8 Digital Outputs	Beckhoff	
-KF1.7	EL2624	400142344		1	Pcs	4 Relay Outputs	Beckhoff	
-KF1.9,-KF1.10,-KF1.11,-KF1.12,-KF1.14,-KF1.15,-KF1.16	EL2535-0002-	400142343		7	Pcs	2 PWM Outputs, 2 Digtal Inputs	Beckhoff	
-KF1.18	EL6751	400142409		1	Pcs	CANopen master/slave terminal	Beckhoff	
-KF1.19	EL9011	400142410		1	Pcs	Bus end cap	Beckhoff	
-R1..-R6	RND 155M207F249RTKRTB5K0	07998012		6	Pcs	Resistor, 249Ω, 0.6W, 1%	RND Components	
-R7,-R8	RND 155M207F120RTKRTB5K0	07998018		2	Pcs	Resistor, 120Ω, 0.6W, 1%	RND Components	
-RAIL1..-RAIL3	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	1.265	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-S1	ZB4BK1333	07960019	43 025 24	1	Pcs	CONTR. SWITCH, 3 POS, LED GN	Schneider	
-S1	ZB4BZ009	07961012	43 027 45	1	Pcs	CONTR. ACC, SOCKET, METAL	Schneider	
-S1	ZBE101	07961013	43 004 23	2	Pcs	CONTR. ACC, CONTACTBLOCK, 1NO	Schneider	
-TAG1	US-EMLP 100X60 4 Line	07958308		1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	

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Part List
A-Frame Stern

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Rev. 03

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-TAG2	US-EMLP-HA 24	400075270		1	Pcs	TAG, SIGN, THERMOMARK CARD	Phoenix Contact	
-X0	AEP AP11			1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X0..-X1,-X3,-X5,-X53,-X90	AEB 35 SC/1	400073887	12 654 34	15	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X0 (1),-X53 (1-4,Loop)	A3C 2.5	400069932	12 654 01	6	Pcs	TERMINAL BLOCK, SNAP-IN, DOUBLE	Weidmüller	
-X0 (-)	AAP11 6/6X1.5 LO-LI BL	400074009		1	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (-,-,-,-)	AAP11 1.5 LI BL	400074009		4	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (+)	AAP11 6/6X1.5 LO-LI RD	400074009		1	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (+,+,+)	AAP11 1.5 LI RD	400074009		3	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (GND)	JORDSKINNE 21	07918007		1	Pcs	RAIL, GRN, BRASS, 21 SLOT	Weidmüller	
-X0 (GND)	WPE 4	07918003	12 688 16	1	Pcs	-TERMINAL BLOCK, GND, 101010	Weidmüller	
-X0 (GND,GND)	A3C 2.5 PE	400074010	12 654 16	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	
-X0,-X53	AEP 3C 2.5	400069937	12 694 11	2	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1,3,5,7,9,11,13,15,17),-X5 (1,1,1,3,5,7)	A2T 2.5	400073880	12 654 14	15	Pcs	TERMINAL BLOCK, SNAP-IN, TWO HIGHTS	Weidmüller	
-X1,-X5	AEP 2T 2.5	400073883	12 694 40	2	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X3	AEP 3T 2.5	400209845	12 694 40	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X3 (1,4,7,10,13,16,19,22,25,28,31)	A3T 2.5			11	Pcs	TERMINAL BLOCK, SNAP-IN, THREE HIGHTS	Weidmüller	
-X90 (1-2)	A2C 2.5	400069931	12 654 00	2	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X91,-X92	IE-TO-RJ45-FJ-B	07930061		2	Pcs	CONNECTOR, FEMALE, RJ45, RAIL MOUNT	Weidmüller	

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Part List
A-Frame Stern

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+B11

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Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1	ST-M 40 x 1.5	07928036	12 477 17	1	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø20-32	Lapp	
-GL2..-GL9	ST-M 16 x 1.5	07928032	12 477 13	8	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3,5-8	Lapp	
-GL10,-GL11	ST-M 20 x 1.5	07928033	12 477 14	2	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø6-12	Lapp	
-JB1	CPG-300	07904005		1	Pcs	JUNCTION BOX, POLYESTER, 260x160x91	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.248	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1	AEP 2C 2.5	400069933	12 694 10	2	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1	AEP 3C 2.5	400069937	12 694 11	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1,1,1-2,2)	A3C 2.5	400069932	12 654 01	5	Pcs	TERMINAL BLOCK, SNAP-IN, DOUBLE	Weidmüller	
-X1 (3-22,22-38)	A2C 2.5	400069931	12 654 00	37	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	

Rev.	Description	Date	Rev. by		
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
01	For customer review	22.12.2021	KS	Approved	GM

4/60185
CNP Freire
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TRIPLEX
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Part List
A-Frame Stern

=A-FRAME STERN
+X11

E-4501-07
Rev. 03
4 / 12

Printed: 16-Feb-23 07:14

Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1	ST-M 25 x 1.5	07928034	12 477 15	1	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø12-18	Lapp	
-GL2..-GL4	ST-M 16 x 1.5	07928032	12 477 13	3	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3,5-8	Lapp	
-GL5..-GL8	ST-M 20 x 1.5	07928033	12 477 14	4	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø6-12	Lapp	
-JB1	CPG-240	07904004		1	Pcs	JUNCTION BOX, POLYESTER, 220x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.2	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X51 (1,1-2,2-3,3-4,4,CAN-Loop)	A3C 2.5	400069932	12 654 01	9	Pcs	TERMINAL BLOCK, SNAP-IN, DOUBLE	Weidmüller	

Rev.	Description	Date	Rev. by		
03	Issued for production	16.02.2023	EE	Date	14.10.2021
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01	For customer review	22.12.2021	KS	Approved	GM

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Part List
A-Frame Stern

=A-FRAME STERN
+X12

E-4501-07
Rev. 03
5 / 12

Printed: 16-Feb-23 07:14

Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1	ST-M 25 x 1.5	07928034	12 477 15	1	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø12-18	Lapp	
-GL2..-GL4	ST-M 16 x 1.5	07928032	12 477 13	3	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3,5-8	Lapp	
-GL5..-GL8	ST-M 20 x 1.5	07928033	12 477 14	4	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø6-12	Lapp	
-JB2	CPG-240	07904004		1	Pcs	JUNCTION BOX, POLYESTER, 220x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.2	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEP 3C 2.5	400069937	12 694 11	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1,1-2,2),-X51 (1-4,CAN-Loop,Sch),-X52 (1-4,Sch)	A3C 2.5	400069932	12 654 01	15	Pcs	TERMINAL BLOCK, SNAP-IN, DOUBLE	Weidmüller	
-X1 (1,1,1,1-2,2,2,2-3,3-4,4-5,5)	A2C 2.5	400069931	12 654 00	14	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X1 (PE,PE)	A2C 2.5 PE	400074009	12 654 15	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	
-X1,-X51..-X52	AEB 35 SC/1	400073887	12 654 34	7	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
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Part List
A-Frame Stern

=A-FRAME STERN
+X13

E-4501-07
Rev. 03
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Printed: 16-Feb-23 07:14

Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1,-GL2	ST-M 20 x 1.5	07928033	12 477 14	2	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø6-12	Lapp	
-JB1	CPG-220	07904002		1	Pcs	JUNCTION BOX, POLYESTER, 122x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.105	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1 (L1,L1,L2,L2)	A2C 2.5	400069931	12 654 00	4	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X1 (PE,PE)	A2C 2.5 PE	400074009	12 654 15	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
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Part List
A-Frame Stern

=A-FRAME STERN

+X14

E-4501-07

Rev. 03

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Printed: 16-Feb-23 07:14

Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1,-GL2	ST-M 20 x 1.5	07928033	12 477 14	2	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø6-12	Lapp	
-JB2	CPG-220	07904002		1	Pcs	JUNCTION BOX, POLYESTER, 122x120x90	Bernstein	
-RAIL2	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.105	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG2	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1 (L1,L1,L2,L2)	A2C 2.5	400069931	12 654 00	4	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X1 (PE,PE)	A2C 2.5 PE	400074009	12 654 15	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
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Part List
A-Frame Stern

=A-FRAME STERN

+X15

E-4501-07

Rev. 03

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-H1	853 310 55	07959005		1	Pcs	LAMP, BEACON, LED, YE, FLASH, 24V	Werma	
-S1	XALK178W3B140G	400208317	4322660	1	Pcs	CONTR. PUSH, EM STOP	Schneider	

Rev.	Description	Date	Rev. by	Standard	
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01	For customer review	22.12.2021	KS	Approved	GM

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Part List
A-Frame Stern

=A-FRAME STERN
+Z11

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Rev. 03
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Printed: 16-Feb-23 07:14

Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-B1,-B2	ROTA LJ			2	Pcs	SENSOR, LENGTH, INDUCTIVE, CYLINDER, 4.. 20mA	ROTA	
-B4	K-8.5868.3221.2113C	07917203		1	Pcs	SENSOR, ROTATION, ABSOLUT, MULTITURN, 10x20mm	Kübler	

Rev.	Description	Date	Rev. by		
03	Issued for production	16.02.2023	EE	Date	14.10.2021
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01	For customer review	22.12.2021	KS	Approved	GM

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Part List
A-Frame Stern

=A-FRAME STERN

+Z12

E-4501-07

Rev. 03

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Printed: 16-Feb-23 07:14

Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-B5,-B6	ROTA LJ			2	Pcs	SENSOR, LENGTH, INDUCTIVE, CYLINDER, 4.. 20mA	ROTA	
-B8	K-8.5868.3221.2113C	07917203		1	Pcs	SENSOR, ROTATION, ABSOLUT, MULTITURN, 10x20mm	Kübler	
-R1	RND 155M207F120RTKRTB5K0	07998018		1	Pcs	Resistor, 120Ω, 0.6W, 1%	RND Components	
-S2				1	Pcs			
-S2	ZB4BW7L3741	07960023	43 014 34	1	Pcs	CONTR. PUSH, I-0 W/LED, DOUBLE	Schneider	
-S2	ZBE101	07961013	43 004 23	1	Pcs	CONTR. ACC, CONTACTBLOCK, 1NO	Schneider	
-S2	ZBE102	07961015	43 004 24	1	Pcs	CONTR. ACC, CONTACTBLOCK, 1NC	Schneider	
-S2	ZBVB1	07924015	43 032 23	1	Pcs	LAMP, LED, WH, 24V	Schneider	

Rev.	Description	Date	Rev. by	Standard	
03	Issued for production	16.02.2023	EE	Date	14.10.2021
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01	For customer review	22.12.2021	KS	Approved	GM

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Part List
A-Frame Stern

=A-FRAME STERN
+Z13

E-4501-07
Rev. 03
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Printed: 16-Feb-23 07:14

Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-E1,-E2	FL60 18000 850 120 M25 NB US	400110503		2	Pcs	FLOODLIGHT, LED, 160W, 120V, NARROW BEAM	Glamox	

Rev.	Description	Date	Rev. by		
03	Issued for production	16.02.2023	EE	Date	14.10.2021
02	For customer review	29.08.2022	RSI	User	KS
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Part List
A-Frame Stern

=A-FRAME STERN
+Z14

E-4501-07
Rev. 03
12 / 12

Printed: 16-Feb-23 07:14

Template:

=OHC

Customer : CNP Freire
Ship/Hull : MBARI
Project no. : 4/60185
Drawing no.: E-4502

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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Front Page
OHC ROV LARS

=OHC

E-4502 - 00

Rev. 04 | 1 / 1

+Z20 Deck Equipment Area

Special pre terminated antenna cable, length must be specified and ordered with vendor.

+B21
Control Cabinet

-W202 4x0,34mm²

-A20.2

-W201 6x0,75mm²

-S1

+Z23 Valve Bank

+X21

JB Valves

-WI-01 7G0,75mm² -S1 E-Stop

-WI-02 3G1mm² -H1 YE OHC ROV Active

-WI-03 3G0,75mm² -Y1 OHC ROV Stop

-WI-04 3G1mm² -Y2 OHC ROV Main Boom

-WI-05 3G1mm² -Y3 OHC ROV Trolley Motor

-WI-06 3G1mm² -Y4 OHC ROV Telescope Boom

-WI-07 3G1mm² -Y5 OHC ROV Winch

-WI-08 3G1mm² -Y6 OHC ROV Along Tilt Cylinder

-WI-09 3G1mm² -Y7 OHC ROV Latch Cylinder

-WI-10 3G1mm² -Y8 OHC ROV DH Twist

-WI-11 3G1mm² -Y9 OHC ROV Out Hauler

-WI-12 3G1mm² -Y10 OHC ROV Research Sheave Across Tilt

-WI-13 3G1mm² -Y11 OHC ROV Spring Plate

CPG-320
HxWxD:360x160x91
ID:
400202650

/1.F1 =A-FRAME STERN+B11 Etercat -W010 4x(2x0,5mm²) CAT7

/1.B1 =CTD DAVIT+B31 Etercat -W011 4x(2x0,5mm²) CAT7

-W204 20x1,5mm²

-W215 20x1,5mm²

-W207 14x0,75mm² Door Interface

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Single Line
OHC ROV LARS

=OHC

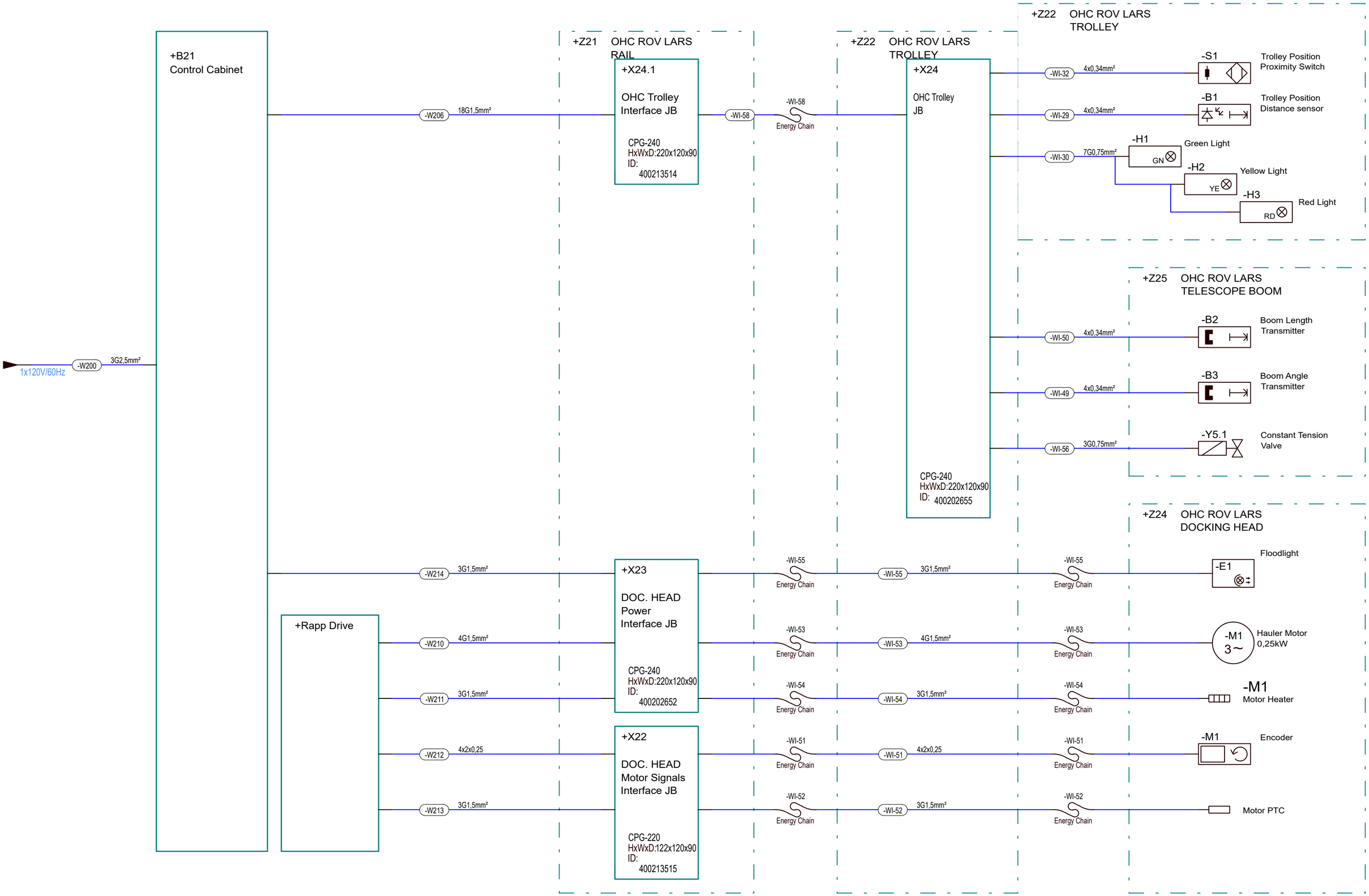
E-4502 - 01

Rev. 04

1 / 3

Printed: 07-Jul-23 11:33

Template:



Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
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Single Line
OHC ROV LARS

=OHC

E-4502 - 01

Rev. 04

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+B21
Control Cabinet

Eldon
MAS0605030
HxWxD:600x500x300
RAL 7035 (Grey)
ID:
400202649

-W205 18G1,5mm²

-W208 18G1,5mm²

+Z21 OHC ROV LARS RAIL

+X25.1
Docking Head Interface Right JB

CPG-240
HxWxD:220x120x90
ID:
400202670

+X26.1
Docking Head Interface Left JB

CPG-240
HxWxD:220x120x90
ID:
400213513

-WI-57 18G0,75mm² Energy Chain

-WI-59 18G0,75mm² Energy Chain

+Z24 OHC ROV LARS DOCKING HEAD

+X25
Docking Head Right JB

CPG-240
HxWxD:220x120x90
ID:
400202666

-WI-15	3G0,75mm²	-Y6.1	Along Tilt Free Valve 1
-WI-16	3G0,75mm²	-Y6.2	Along Tilt Free Valve 2
-WI-17	3G0,75mm²	-Y6.8	Spring Plate Free Valve 1
-WI-18	3G0,75mm²	-Y6.9	Spring Plate Free Valve 2
-WI-19	3G0,75mm²	-Y6.10	Spring Plate Damping Valve 1
-WI-20	3G0,75mm²	-Y6.11	Spring Plate Damping Valve 2
-WI-21	4x0,34mm²	-B6	DH Bullet In Latch Sensor Right
-WI-22	4x0,34mm²	-B7	DH Right Latch Open Sensor
-WI-23	4x0,34mm²	-B8	DH Right Latch Closed Sensor

+X26
Docking Head Left JB

CPG-240
HxWxD:220x120x90
ID:
400202668

-WI-38	3G0,75mm²	-Y6.3	Across Tilt Free Valve 1
-WI-39	3G0,75mm²	-Y6.4	Across Tilt Free Valve 2
-WI-40	3G0,75mm²	-Y6.5	Across Tilt Damping Valve 1
-WI-41	3G0,75mm²	-Y6.6	Across Tilt Damping Valve 2
-WI-42	3G0,75mm²	-Y6.7	Across Tilt Damping Valve 3
-WI-43	4x0,34mm²	-B1	Bullet Upper Posiiton Sensor 1
-WI-44	4x0,34mm²	-B2	Bullet Upper Posiiton Sensor 2
-WI-45	4x0,34mm²	-B3	DH Bullet In Latch Sensor Left
-WI-46	4x0,34mm²	-B4	DH Left Latch Open Sensor
-WI-47	4x0,34mm²	-B5	DH Left Latch Closed Sensor

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Single Line
OHC ROV LARS

=OHC

E-4502 - 01

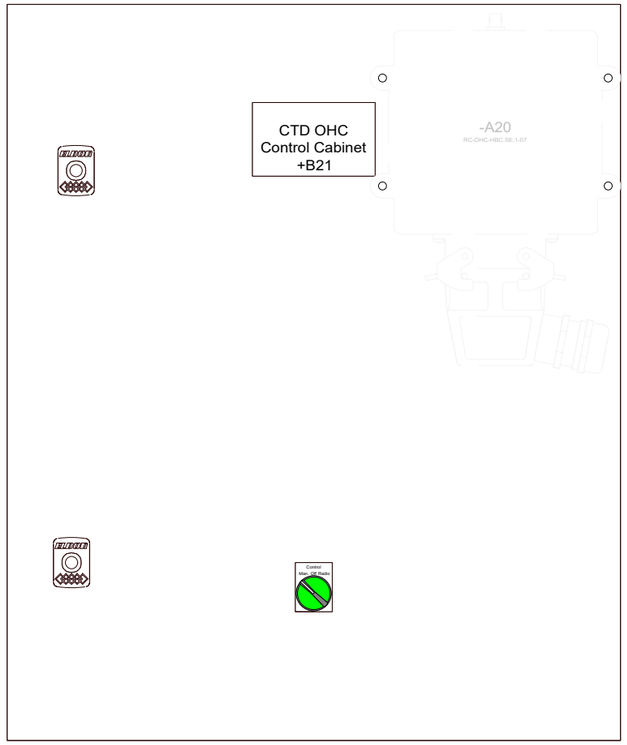
Rev. 04

3 / 3

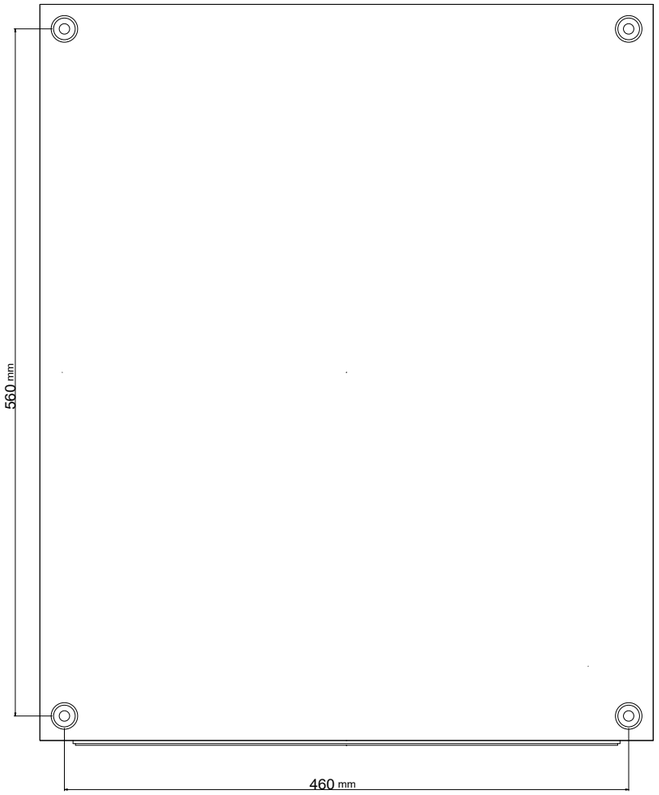
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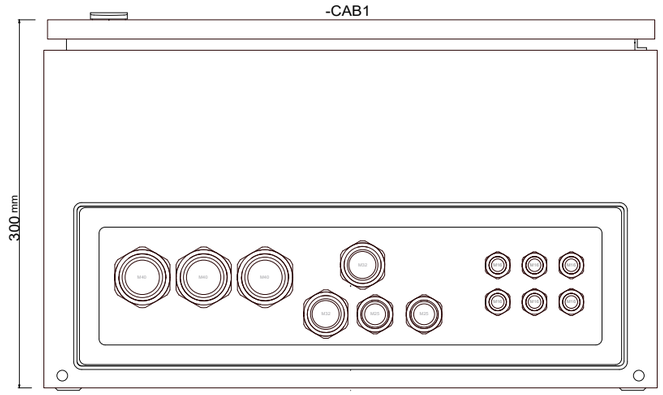
-CAB1



-CAB1



-CAB1



Product Data	
Manufacturer	Eldon
Article name	MAS0605030
WxHxD	600x500x300
IP	IP 66
RAL Code	RAL 7035 (Grey)
Material	Steel, Painted

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04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

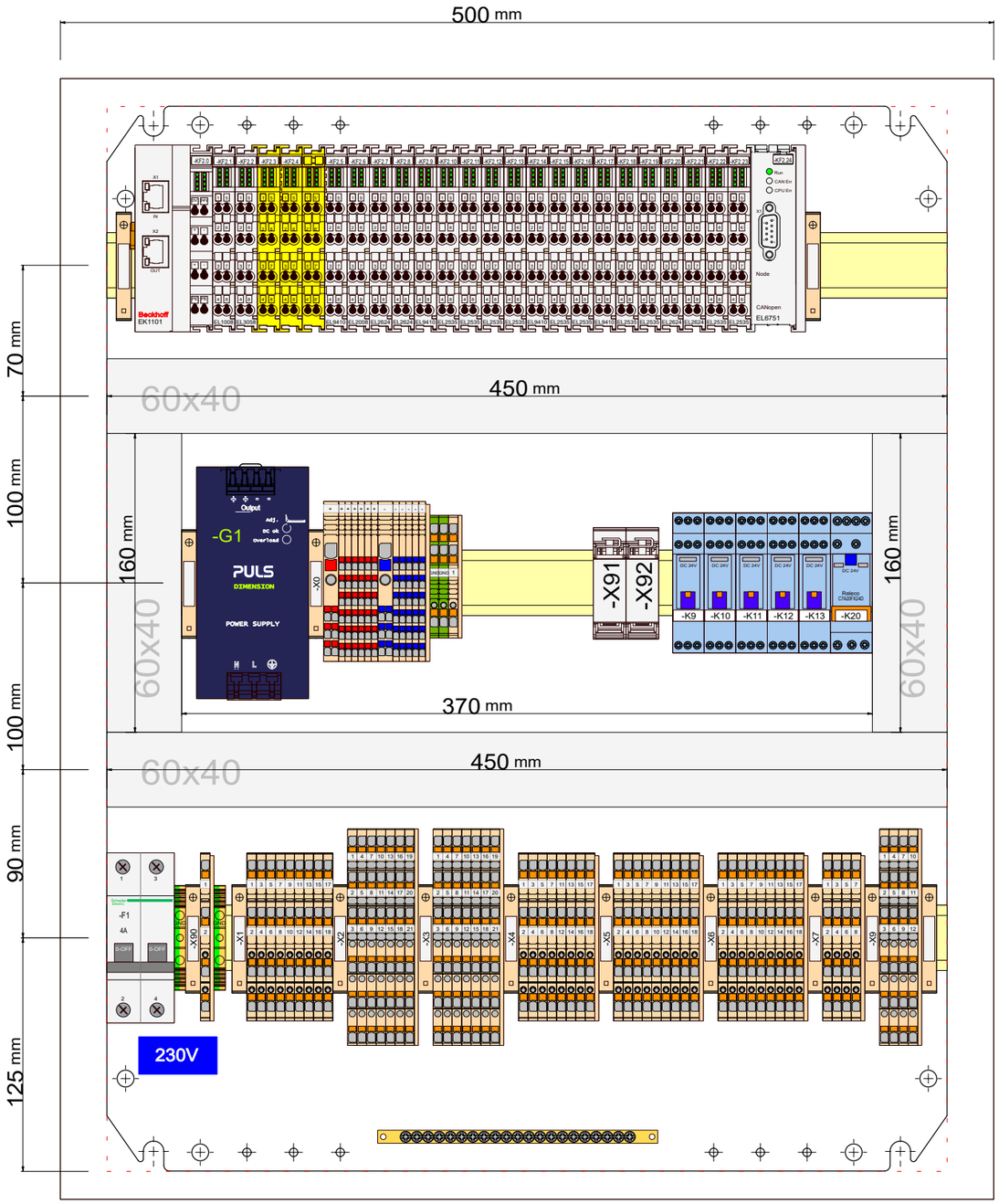
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MBARI

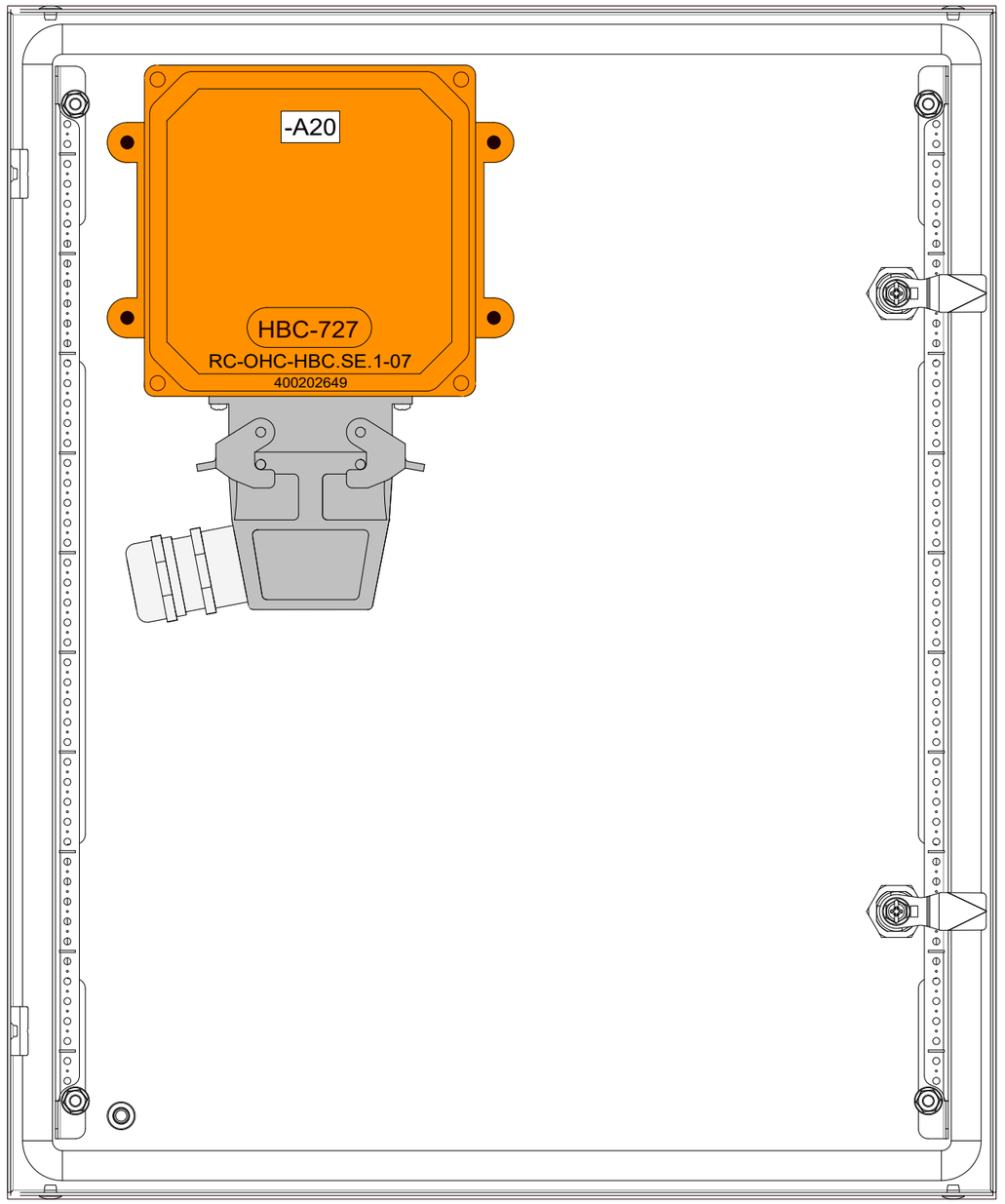
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Layout
OHC ROV LARS
Control Cabinet Radio - Outside

=OHC
+B21

E-4502 - 03
Rev. 04
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Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

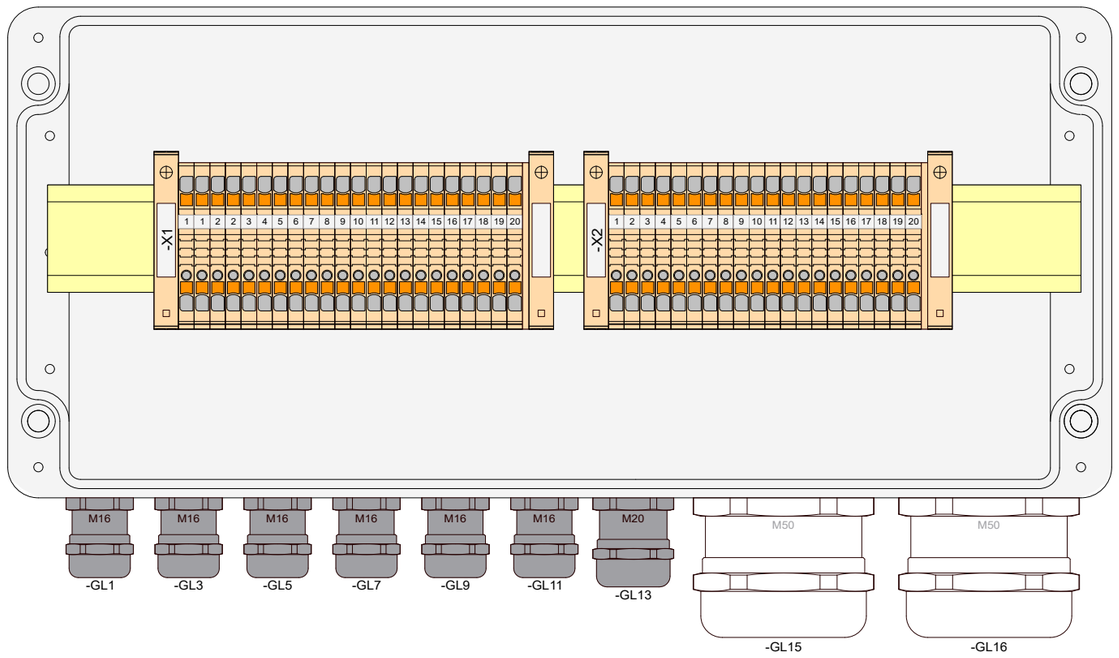
4/60185
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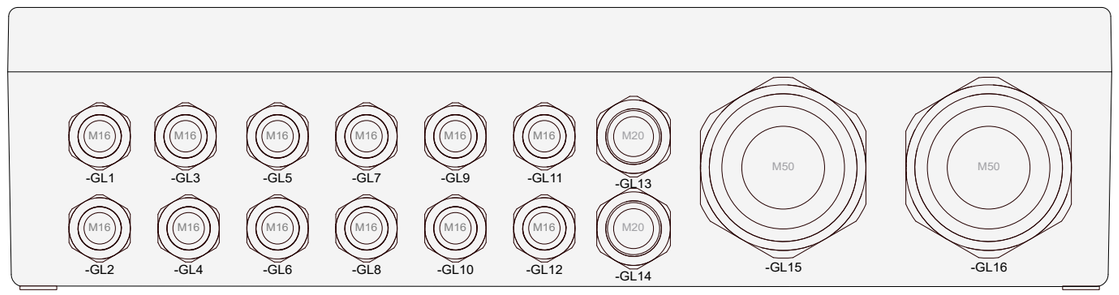
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Layout
OHC ROV LARS
Control Cabinet Radio - Inside

=OHC
+B21

E-4502 - 03
Rev. 04
2 / 14

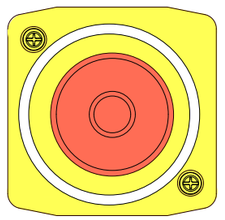




+X21
JB Valves

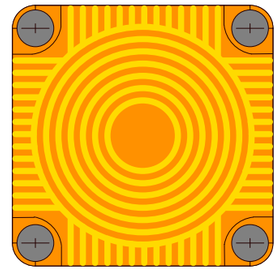


-S1



Front View

-H1



Component installed on equipment

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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Layout
OHC ROV LARS
JB Valves

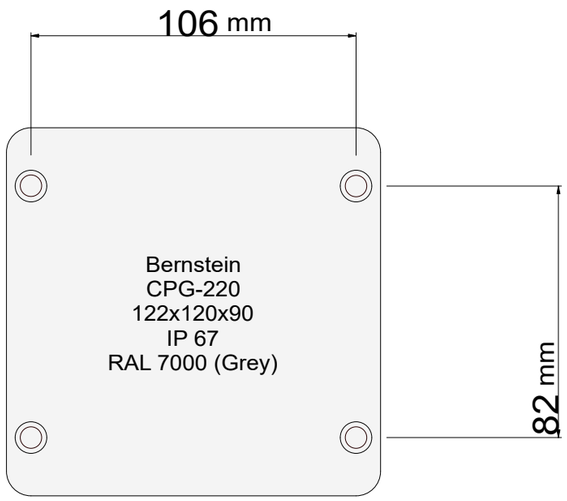
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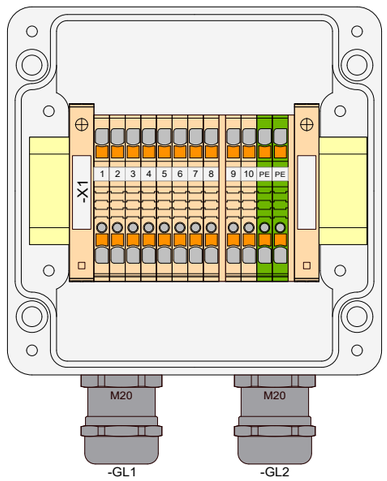
E-4502 - 03
Rev. 04
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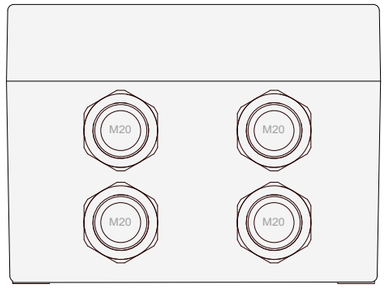
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Template:









Component installed on equipment

Product Data	
Manufacturer	Bernstein
Article name	CPG-220
WxHxD	122x120x90
IP	IP 67
RAL Code	RAL 7000 (Grey)
Material	Polyester

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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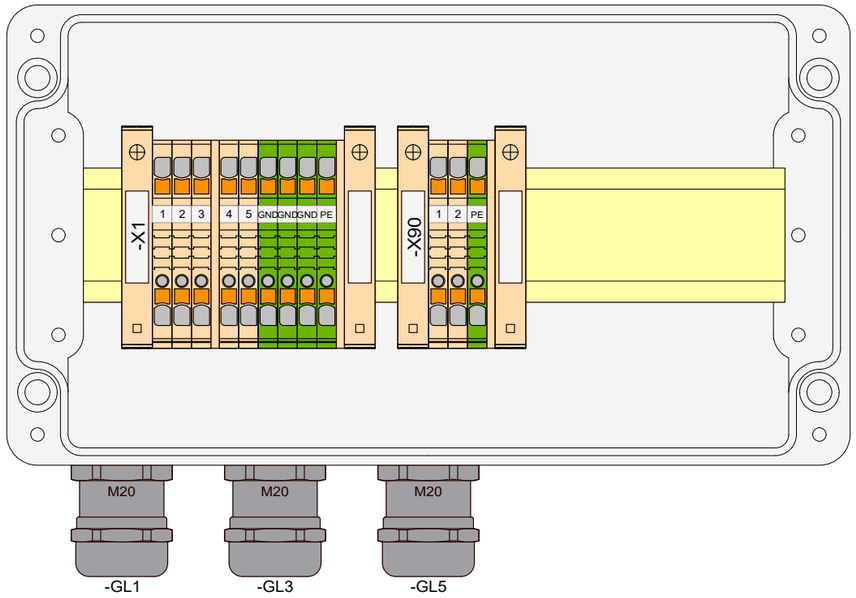
Layout
OHC ROV LARS
JB Motor Signals

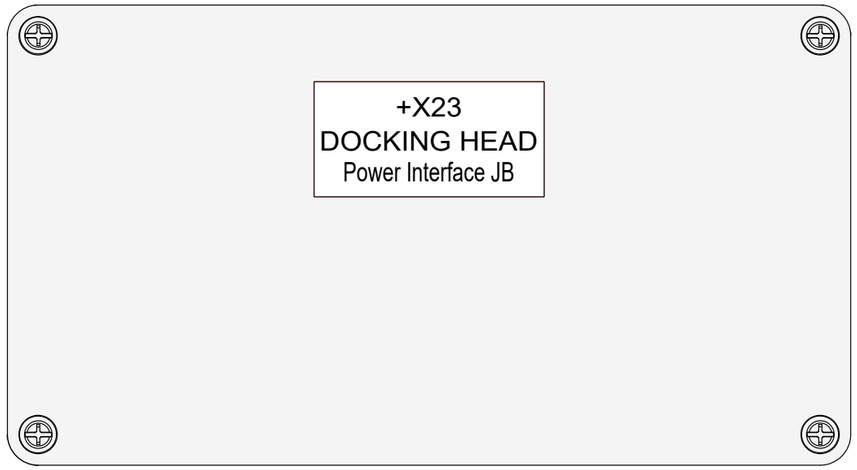
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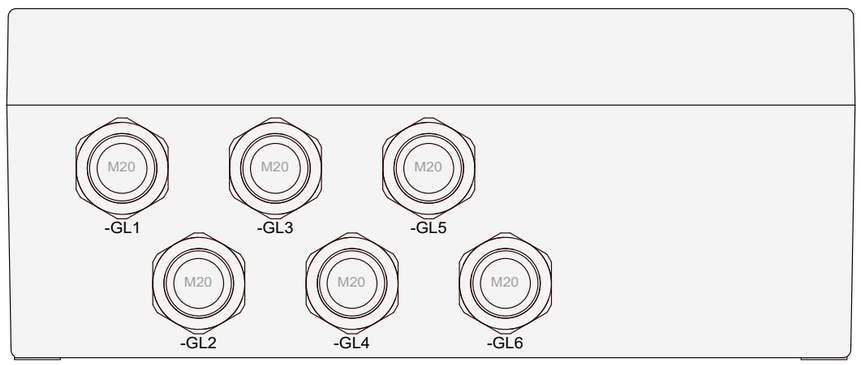
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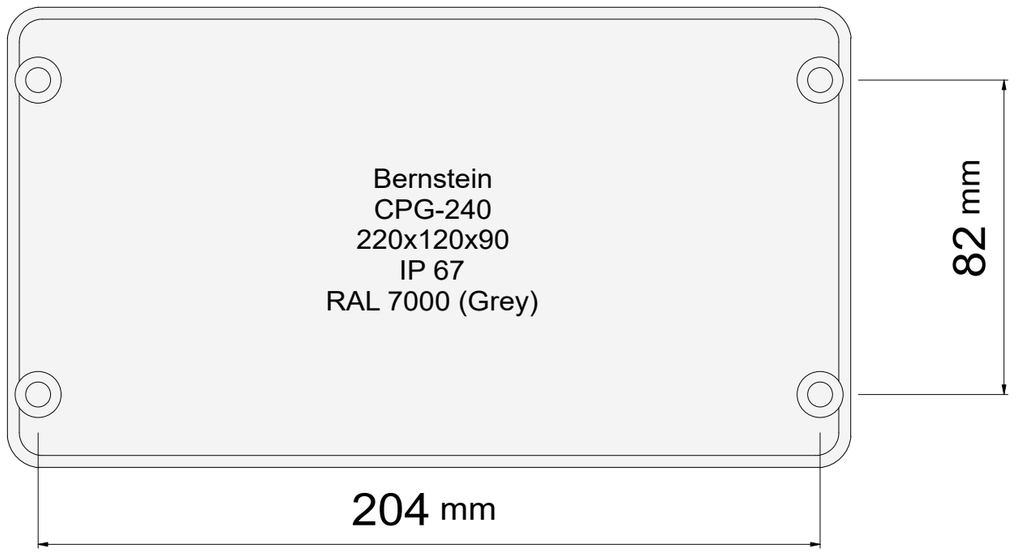
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Template:









Rear View

Component installed on equipment

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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Layout
OHC ROV LARS
JB Motor Power

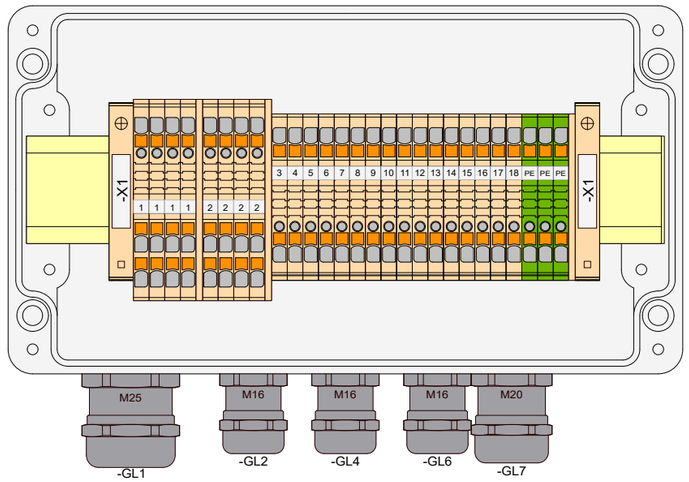
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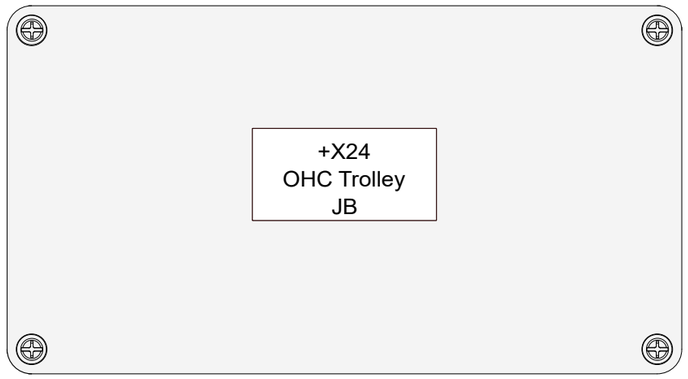
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Rev. 04
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Printed: 07-Jul-23 11:33

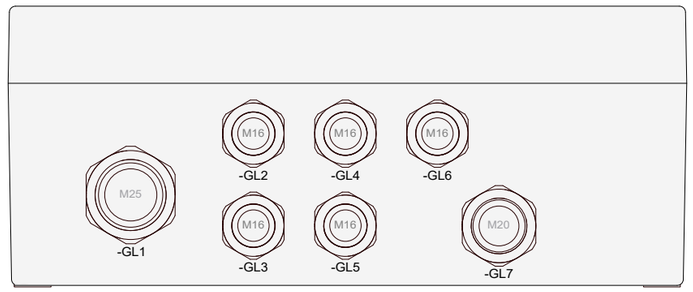
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All -X1:2 to be lasked

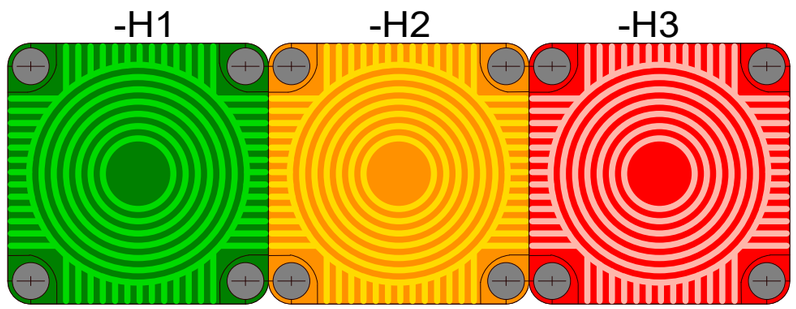








Rear View



ed on equipment

Product Data	
Manufacturer	Bernstein
Article name	CPG-240
WxHxD	220x120x90
IP	IP 67
RAL Code	RAL 7000 (Grey)
Material	Polyester

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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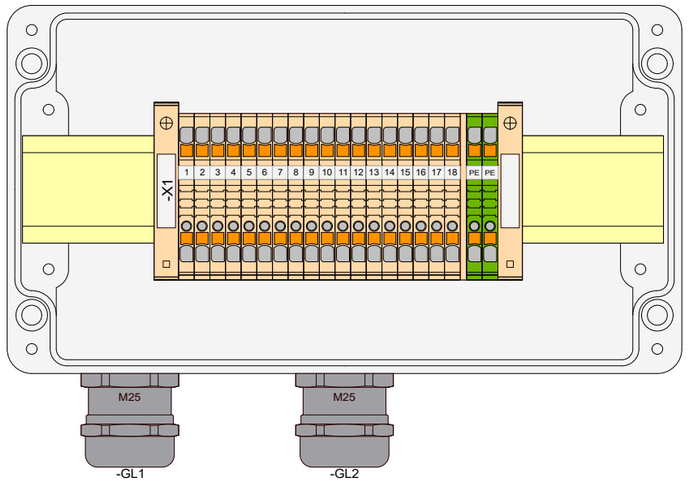
TRIPLEX
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Layout
OHC ROV LARS
JB Sensors Crane

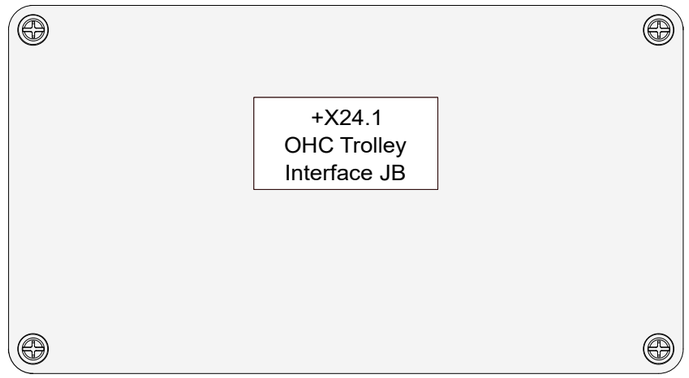
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+X24

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Rev. 04
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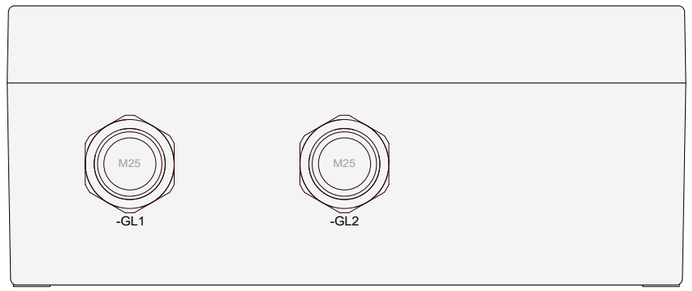
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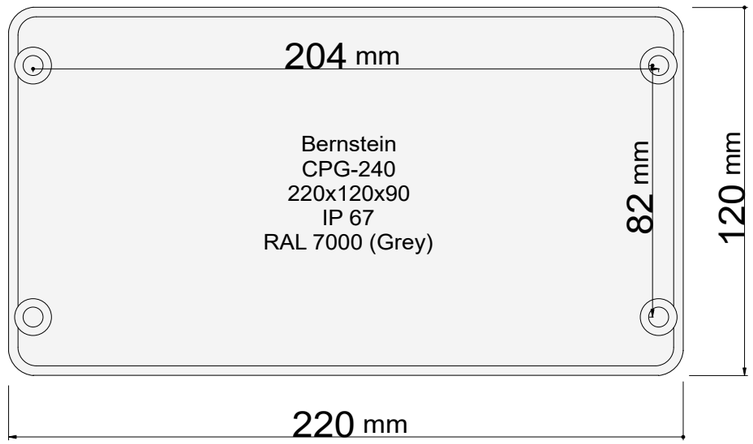
-JB1



-JB1



-JB1



Rear View

Component installed on equipment

Product Data					
Manufacturer	Bernstein				
Article name	CPG-240				
WxHxD	220x120x90				
IP	IP 67				
RAL Code	RAL 7000 (Grey)				
Material	Polyester				

04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE
Rev.	Description	Date	Rev. by	Standard	

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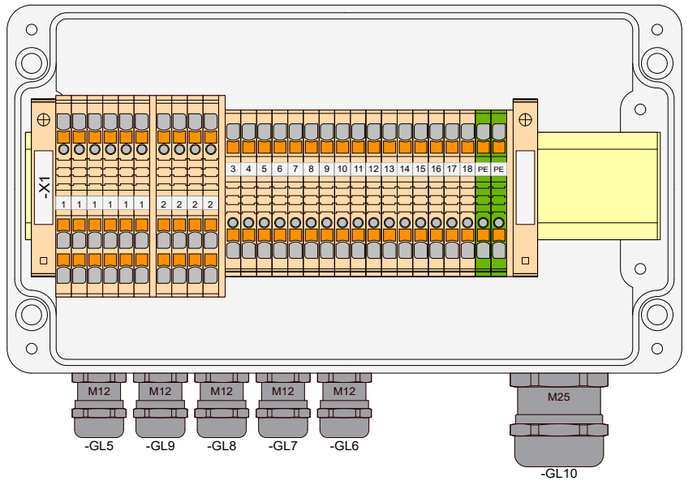
TRIPLEX
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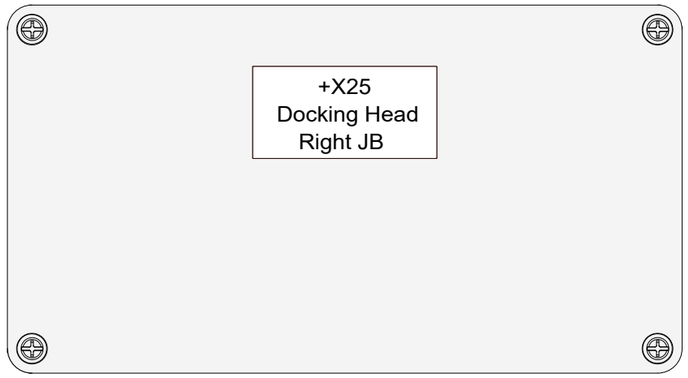
Layout
OHC ROV LARS
JB Sensors Crane Interface

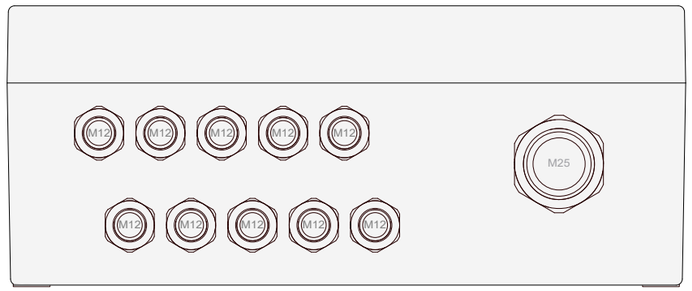
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+X24.1

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All -X1:1 to be lasked
All -X1:2 to be lasked









Rear View

Component installed on equipment

Product Data					
Manufacturer	Bernstein				
Article name	CPG-240				
WxHxD	220x120x90				
IP	IP 67				
RAL Code	RAL 7000 (Grey)				
Material	Polyester				

04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE
Rev.	Description	Date	Rev. by	Standard	

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Layout
OHC ROV LARS
JB Docking Head Right

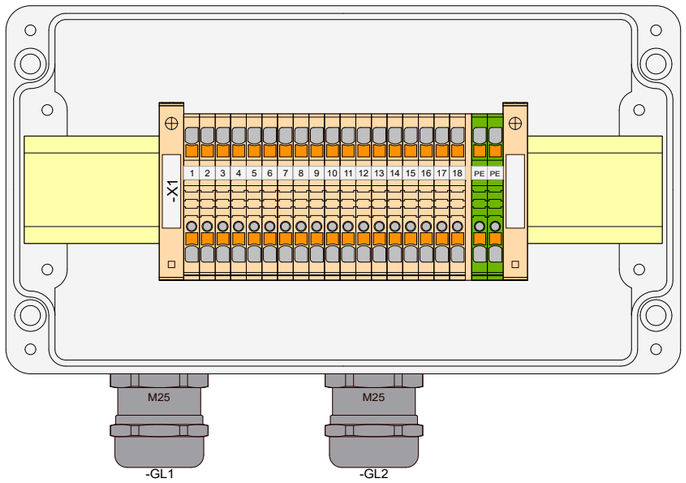
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Rev. 04
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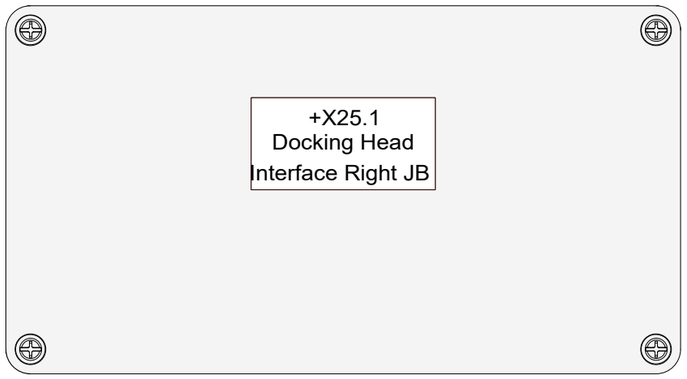
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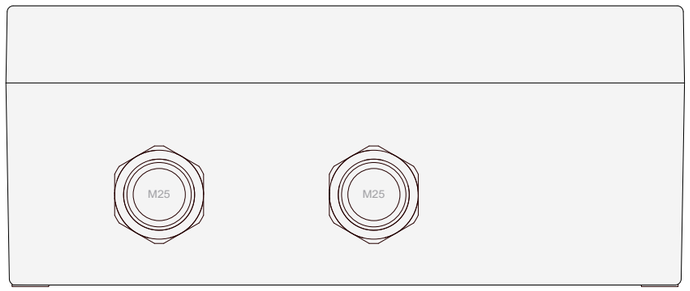
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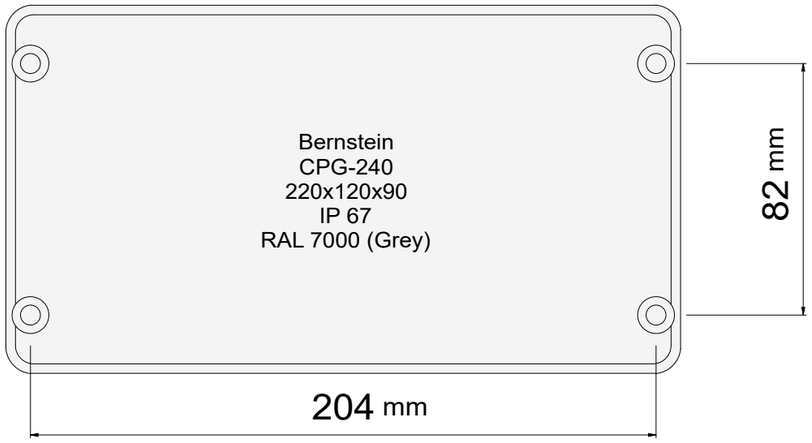
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-JB1



-JB1



Rear View

Component installed on equipment

Product Data	
Manufacturer	Bernstein
Article name	CPG-240
WxHxD	220x120x90
IP	IP 67
RAL Code	RAL 7000 (Grey)
Material	Polyester

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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Layout
OHC ROV LARS
JB Docking Head Interface

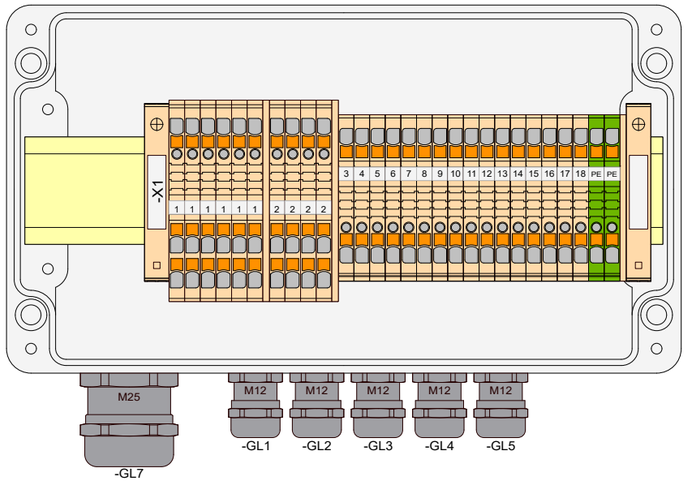
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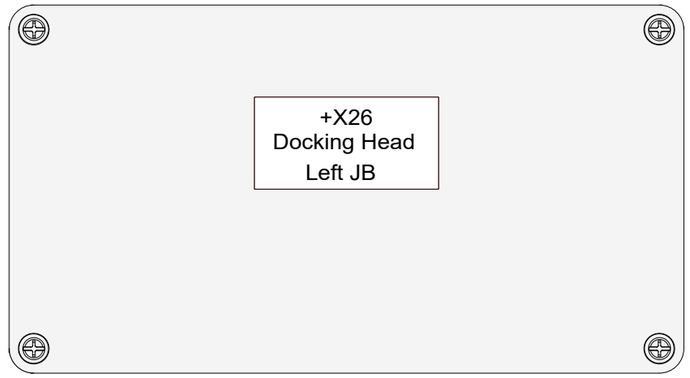
E-4502 - 03
Rev. 04
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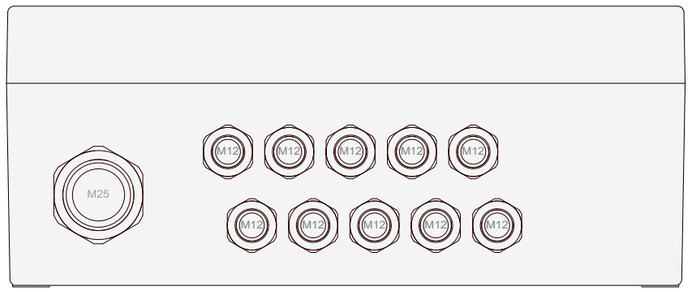
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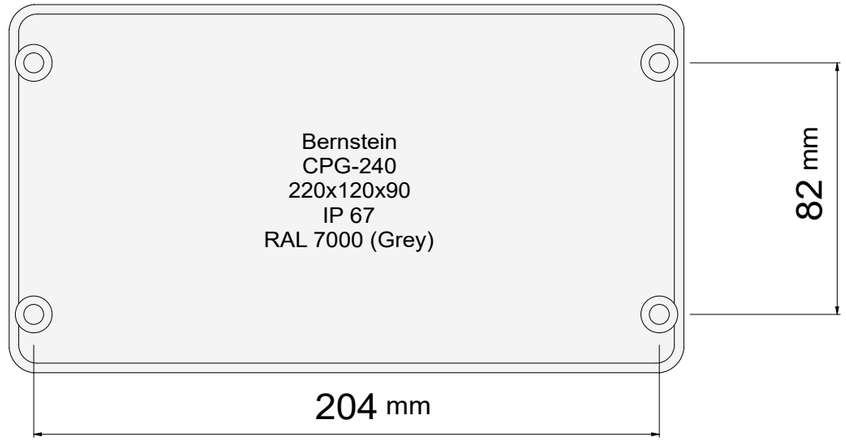
Template:

All -X1:1 to be lasked
All -X1:2 to be lasked









Rear View

Product Data	
Manufacturer	Bernstein
Article name	CPG-240
WxHxD	220x120x90
IP	IP 67
RAL Code	RAL 7000 (Grey)
Material	Polyester

Component installed on equipment

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
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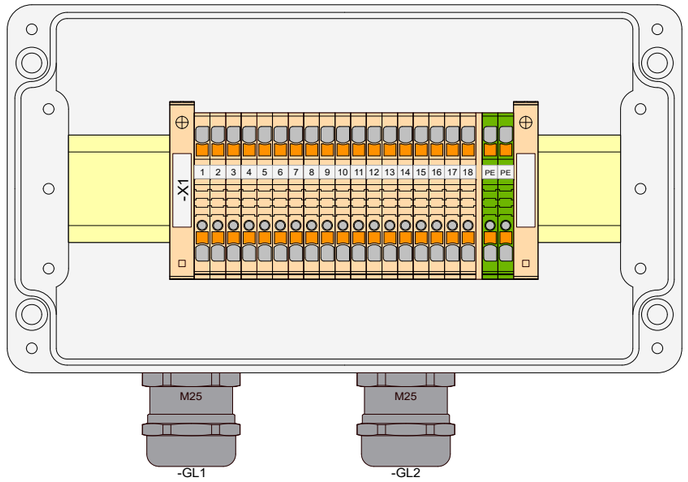
Layout
OHC ROV LARS
JB Docking Head Left

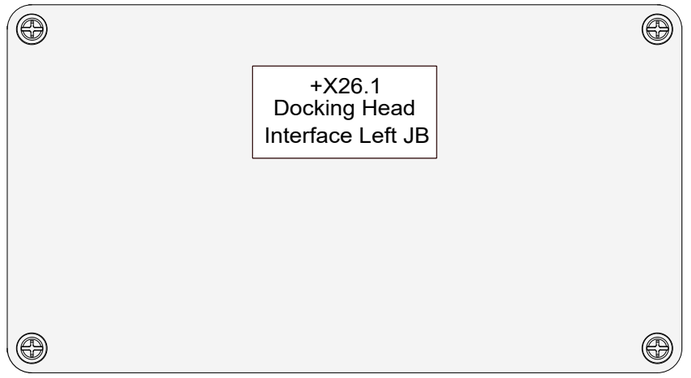
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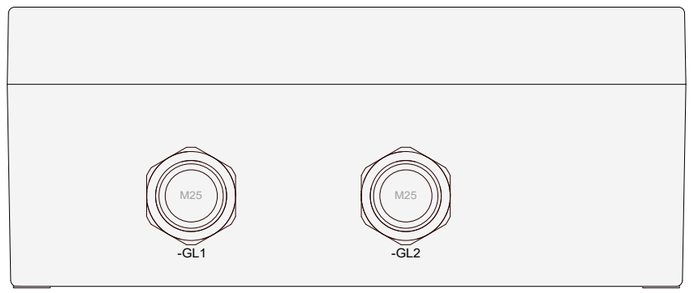
E-4502 - 03
Rev. 04
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Printed: 07-Jul-23 11:33

Template:









Rear View

Product Data	
Manufacturer	Bernstein
Article name	CPG-240
WxHxD	220x120x90
IP	IP 67
RAL Code	RAL 7000 (Grey)
Material	Polyester

Component installed on equipment

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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Layout
OHC ROV LARS
JB Docking Head Interface

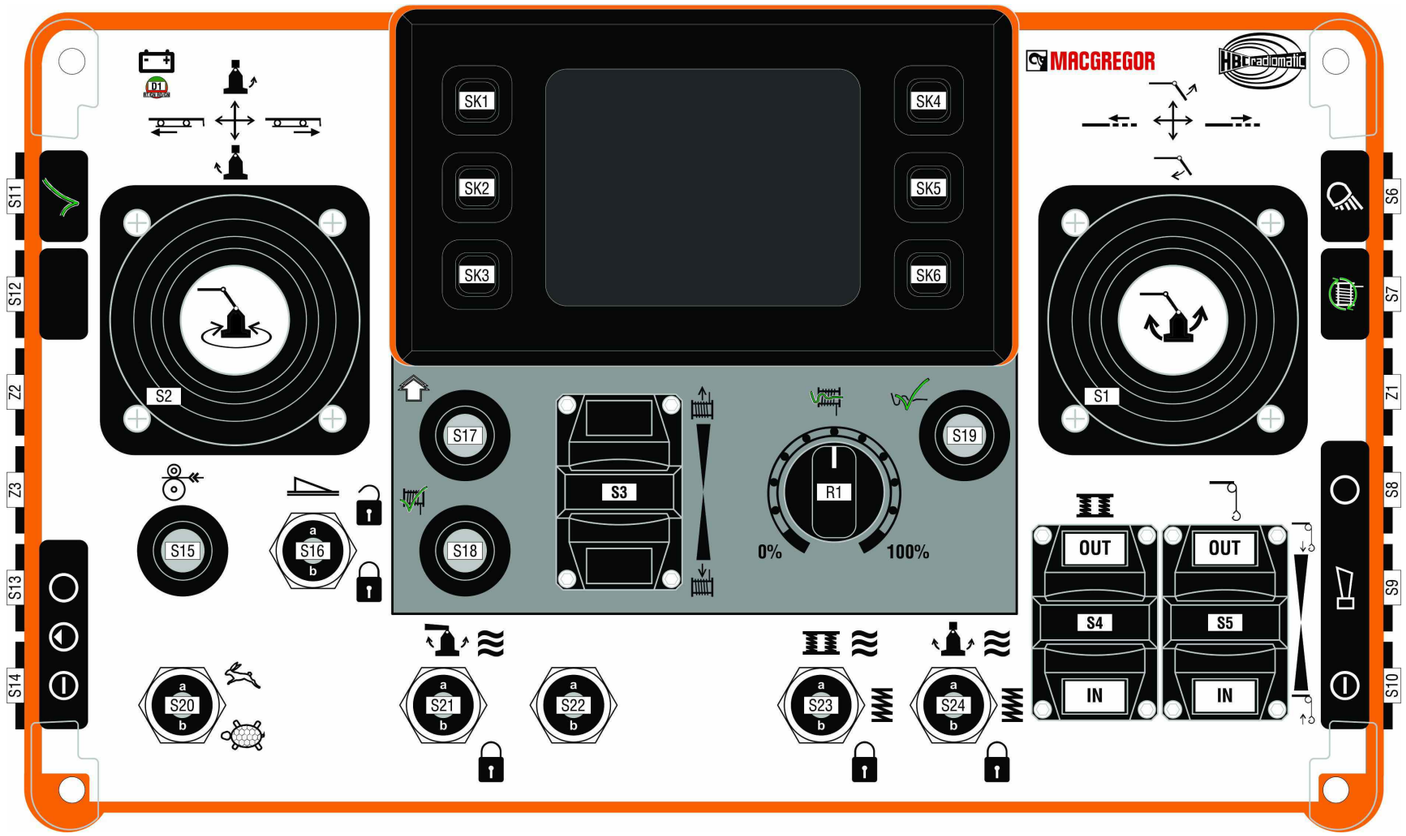
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Rev. 04
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Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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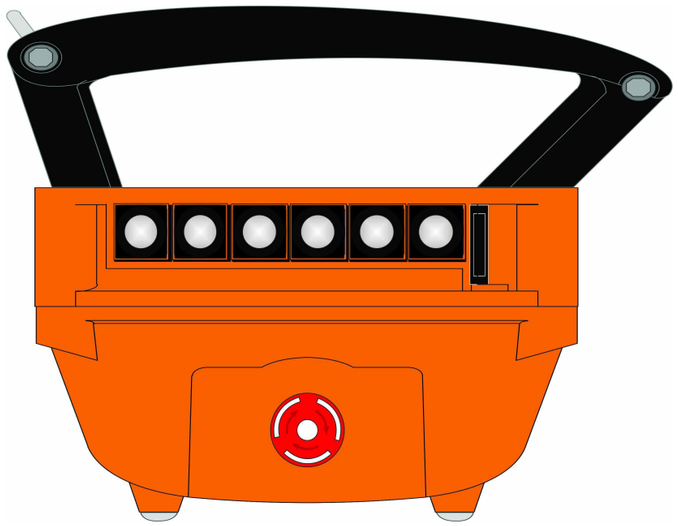
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RC Transmitter

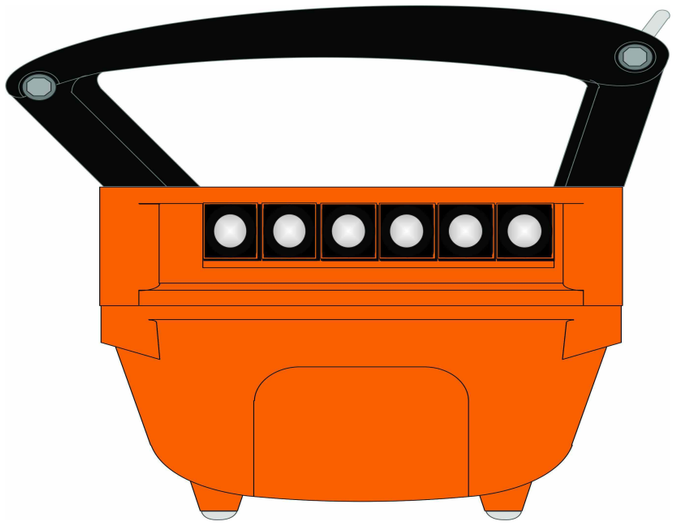
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Rev. 04
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Template:





Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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CNP Freire
MBARI

TRIPLEX
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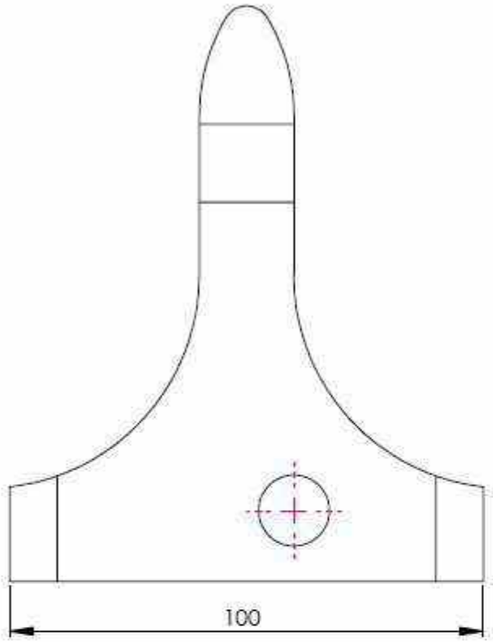
Layout
OHC ROV LARS
RC Transmitter Side View

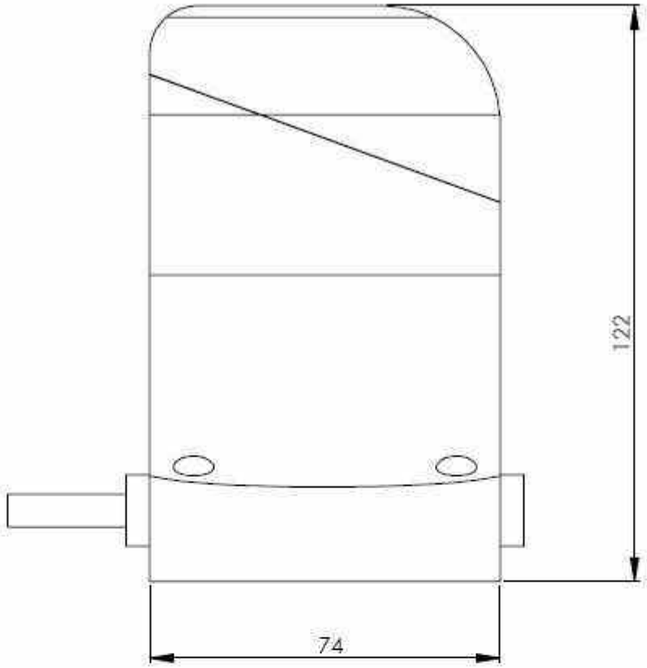
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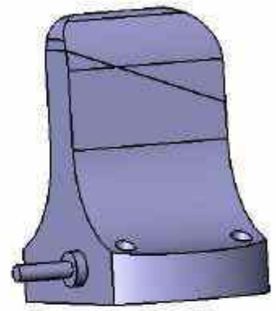
E-4502 - 03
Rev. 04
13 / 14

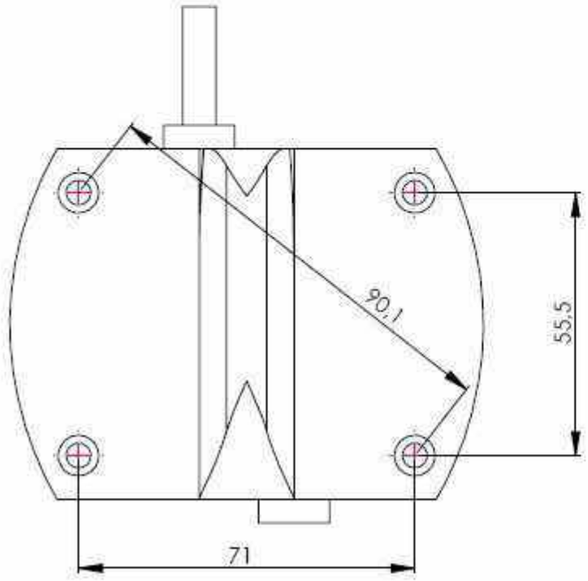
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Rev.	Description	Date	Rev. by	Standard	
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03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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CNP Freire
MBARI

TRIPLEX
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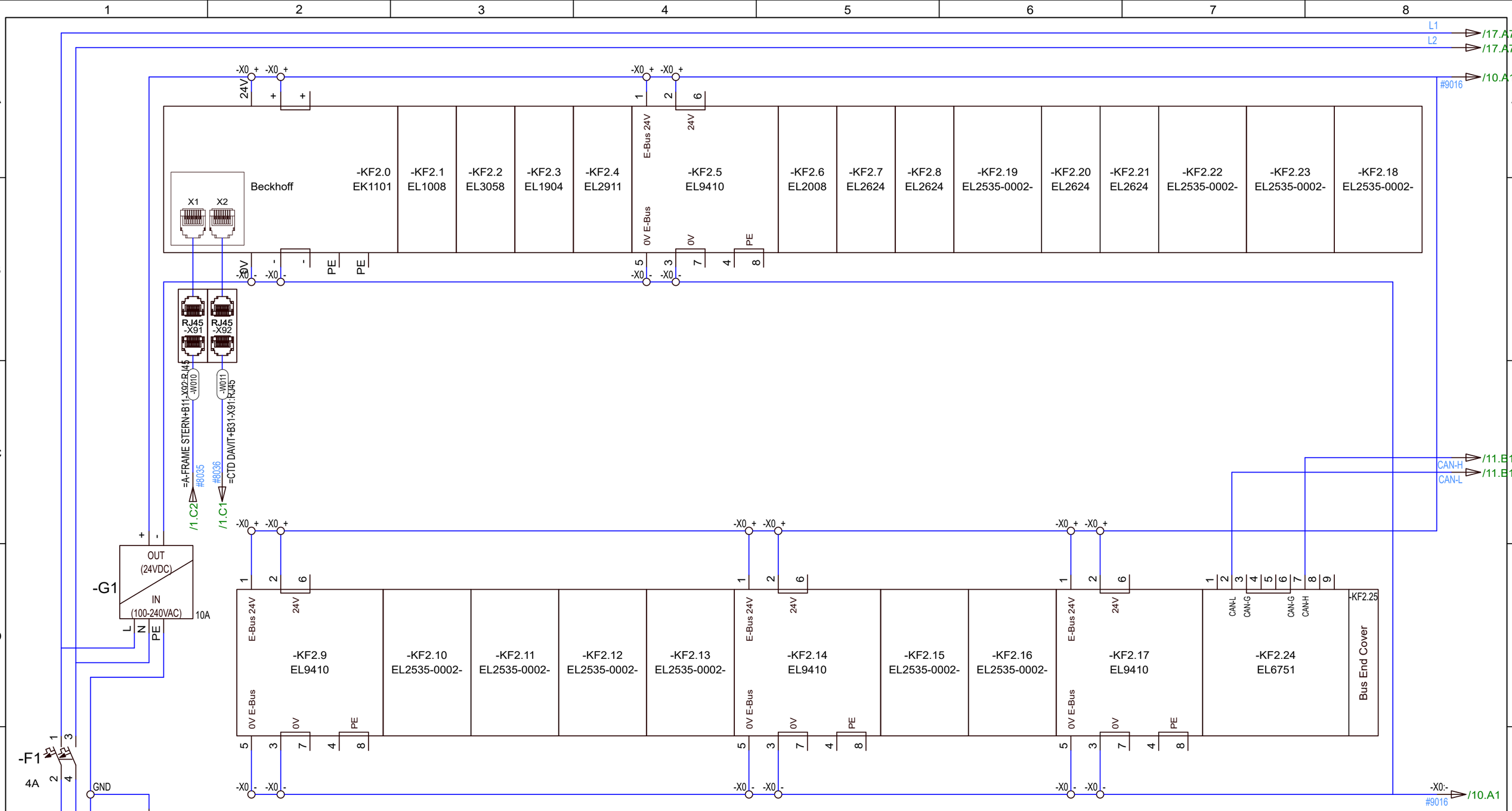
Layout
OHC ROV LARS
RC Antenna

=OHC
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Rev.	Description	Date	Rev. by	Standard	
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03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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TRIPLEX
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Circuit Diagram
OHC ROV LARS
Control Cabinet

=OHC
+B21

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Rev. 04
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-KF2.1 Beckhoff EL1008

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Digital Input	DI1	/11.C1	Control Cabinet	Switch	OHC	Manual Control	DI	
5	Digital Input	DI2	/11.C3	Control Cabinet	Switch	OHC	Radio Control	DI	
2	Digital Input	DI3	/12.B5	Control Cabinet	Contacts	OHC	Hangar Door 1 open	DI	
6	Digital Input	DI4	/12.B5	Control Cabinet	Contacts	OHC	Hangar Door 2 open	DI	
3	Digital Input	DI5		Control Cabinet	Switch	OHC	Pulse Switch	DI	
7	Digital Input	DI6	/14.A2	Trolley	Sensor	OHC	Prox Switch	DI	
4	Digital Input	DI7						DI	
8	Digital Input	DI8						DI	

-KF2.2 Beckhoff EL3058

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Analog Input	AI1	/14.A1	Trolley	Sensor	OHC	Distance Sensor	AI	4-20mA
5	Analog Input	AI2	/14.A5	Boom	Sensor	OHC	Angle Transmitter	AI	4-20mA
2	Analog Input	AI3	/14.A4	Boom	Sensor	OHC	Lenght Transmitter	AI	4-20mA
6	Analog Input	AI4						AI	4-20mA
3	Analog Input	AI5						AI	4-20mA
7	Analog Input	AI6						AI	4-20mA
4	Analog Input	AI7						AI	4-20mA
8	Analog Input	AI8						AI	4-20mA

-KF2.3 Beckhoff EL1904

Pin	Pin Description	IO Type	Ref	PLC Comment 1	PLC Comment 2	PLC Symboilic Adress
1	+	I1	/10.B1	Emergency Stop		DIN/DOUT
2	-					
3	+	I2	/10.B1	Emergency Stop		DIN/DOUT
4	-					
5	+	I3	/10.B3	Emergency Stop		DIN/DOUT
6	-					
7	+	I4	/10.B3	Emergency Stop		DIN/DOUT
8	-					

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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Circuit Diagram
OHC ROV LARS
IO List

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-KF2.4 Beckhoff EL2911

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	+	DIO1	/10.B5	Spare	Emergency Stop	OHC	IN		
2	-								
5	+	DIO2	/10.B5	Spare	Emergency Stop	OHC	IN		
6	-								
3	+	DIO3	/10.B6	Spare	Emergency Stop	OHC	IN		
4	-								
7	+	DIO4	/10.B7	Spare	Emergency Stop	OHC	IN		
8	-								
4`	+	DIO5	/11.C5	Control Cabinet	Supply	OHC	IN		
3`	-								
8`	+	DIO6	/11.C5	Control Cabinet	Supply	OHC	IN		
7`	-								
2`	+	DIO7	/13.B1	Valve Bank	OHC	Stop Valve	OUT		
3`	-								
6`		DIO8							
7`	-								

-KF2.6 Beckhoff EL2008

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Digital Output	DO1	/10.B2	Valve Bank	Emergency Stop	OHC	Light	DO	
5	Digital Output	DO2	/10.B4	Deck Area	Emergency Stop	OHC	Light	DO	
2	Digital Output	DO3	/10.B6	Spare	Emergency Stop	OHC	Light	DO	
6	Digital Output	DO4	/10.B7	Spare	Emergency Stop	OHC	Light	DO	
3	Digital Output	DO5	/14.A3	Trolley	Light	OHC	Green Light	DO	
7	Digital Output	DO6	/14.A3	Trolley	Light	OHC	Red Light	DO	
4	Digital Output	DO7	/14.A3	Trolley	Light	OHC	Yellow Light	DO	
8	Digital Output	DO8						DO	

-KF2.7 Beckhoff EL2624

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Com	RO1	/11.C7	Control Cabinet	Relay	OHC	Floodlight	RO	NO
2	Relay Output NO								
5	Com	RO2	/12.B1	Control Cabinet	Relay	OHC	In Indor Position	RO	NO
6	Relay Output NO								
3	Com	RO3	/12.B2	Control Cabinet	Relay	OHC	In Oper. Position	RO	NO
4	Relay Output NO								
7	Com	RO4	/12.B6	Control Cabinet	Relay	OHC	LauRec Position	RO	NO
8	Relay Output NO								

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
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Template:

-KF2.8 — Beckhoff EL2624

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Com	RO1	/14.A6		Valve	OHC	Constant Tension	RO	NO
2	Relay Output NO								
5	Com	RO2	/16.B1	Docking Head	Valves	OHC	Along Tilt Valve 1	RO	NO
6	Relay Output NO								
3	Com	RO3	/16.B2	Docking Head	Valves	OHC	Along Tilt Valve 2	RO	NO
4	Relay Output NO								
7	Com	RO4	/16.B2	Docking Head	Valves	OHC	Spring Free Valve1	RO	NO
8	Relay Output NO								

-KF2.10 — Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/13.B2	Valve Bank	Main Boom	Prop. Valve	Out	AO+	PWM
5	PWM Output A2								
3	0Va		/15.B2						
4	Digital Input	DI1	/13.B2					DI	
	PWM Output B1	PWM2		Valve Bank	Main Boom	Prop. Valve	In	AO+	PWM
6	PWM Output B2		/15.B3						
7	0Vb								
8	Digital Input	DI2						DI	

-KF2.11 — Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/13.B3	Valve Bank	Trolley Motor	Prop. Valve	STBD	AO+	PWM
5	PWM Output A2								
3	0Va		/15.B3						
4	Digital Input	DI1	/13.B3					DI	
	PWM Output B1	PWM2		Valve Bank	Trolley Motor	Prop. Valve	PORT	AO+	PWM
6	PWM Output B2		/12.B8						
7	0Vb								
8	Digital Input	DI2						DI	

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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-KF2.12 Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/13.B3	Valve Bank	OHC Telescope	Prop. Valve	Out	AO+	PWM
5	PWM Output A2								
3	0Va		/15.B4						
4	Digital Input	DI1	/13.B4					DI	
	PWM Output B1	PWM2		Valve Bank	OHC Telescope	Prop. Valve	In	AO+	PWM
6	PWM Output B2		/12.B7						
7	0Vb								
8	Digital Input	DI2						DI	

-KF2.13 Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/13.B4	Valve Bank	OHC Winch	Prop. Valve	Lower	AO+	PWM
5	PWM Output A2								
3	0Va		/12.B7						
4	Digital Input	DI1	/13.B4					DI	
	PWM Output B1	PWM2		Valve Bank	OHC Winch	Prop. Valve	Lift	AO+	PWM
6	PWM Output B2		/12.B8						
7	0Vb								
8	Digital Input	DI2						DI	

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
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-KF2.15 Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/13.B5	Valve Bank	Along Tilt Cylinder	Prop. Valve	Out	AO+	PWM
5	PWM Output A2								
3	0Va		/16.B6						
4	Digital Input	DI1	/13.B5					DI	
	PWM Output B1	PWM2		Valve Bank	Along Tilt Cylinder	Prop. Valve	In	AO+	PWM
6	PWM Output B2		/16.B6						
7	0Vb								
8	Digital Input	DI2						DI	

-KF2.16 Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/13.B8	Valve Bank	Spring Plate	Prop. Valve	Out	AO+	PWM
5	PWM Output A2								
3	0Va		/16.B5						
4	Digital Input	DI1	/13.B8					DI	
	PWM Output B1	PWM2		Valve Bank	Spring Plate	Prop. Valve	In	AO+	PWM
6	PWM Output B2		/15.B2						
7	0Vb								
8	Digital Input	DI2						DI	

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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-KF2.18 — Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/13.B5	Valve Bank	Latch Cylinder	Prop. Valve	Out		
5	PWM Output A2								
3	0Va								
4	Digital Input	DI1	/13.B6						
	PWM Output B1	PWM2		Valve Bank	Latch Cylinder	Prop. Valve	In		
6	PWM Output B2								
7	0Vb								
8	Digital Input	DI2							

-KF2.19 — Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
	PWM Output A1	PWM1	/13.B6	Valve Bank	DH Twist	Prop. Valve	Out		
5	PWM Output A2								
3	0Va								
4	Digital Input	DI1	/13.B6						
2	PWM Output B1	PWM2		Valve Bank	DH Twist	Prop. Valve	In		
6	PWM Output B2								
7	0Vb								
8	Digital Input	DI2							

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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OHC ROV LARS
IO List

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-KF2.20 Beckhoff EL2624

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Com	RO1	/16.B3	Docking Head	Valves	OHC	Spring Free Valve2	RO	NO
2	Relay Output NO								
5	Com	RO2	/16.B3	Docking Head	Valves	OHC	Spring Damping Valve1	RO	NO
6	Relay Output NO								
3	Com	RO3	/16.B4	Docking Head	Valves	OHC	Spring Damping Valve2	RO	NO
4	Relay Output NO								
7	Com	RO4	/15.B5	Docking Head	Valves	OHC	Across Tilt Free V.2	RO	NO
8	Relay Output NO								

-KF2.21 Beckhoff EL2624

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Com	RO1	/15.B4	Docking Head	Valves	OHC	Across Tilt Free V.1	RO	NO
2	Relay Output NO								
5	Com	RO2	/15.B5	Docking Head	Valves	OHC	Across Tilt Damp V.1	RO	NO
6	Relay Output NO								
3	Com	RO3	/15.B6	Docking Head	Valves	OHC	Across Tilt Damp V.2	RO	NO
4	Relay Output NO								
7	Com	RO4	/15.B6	Docking Head	Valves	OHC	Across Tilt Damp V.3	RO	NO
8	Relay Output NO								

-KF2.22 Beckhoff EL2535-0002-

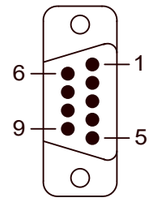
Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/13.B7	Valve Bank	OUT Hauler	Prop. Valve	Out		
5	PWM Output A2								
3	0Va								
4	Digital Input	DI1	/13.B7						
	PWM Output B1	PWM2		Valve Bank	OUT Hauler	Prop. Valve	In		
6	PWM Output B2								
7	0Vb								
8	Digital Input	DI2							

-KF2.23 Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/13.B7	Valve Bank	Research Sheave	Prop. Valve	Tilt Out		
5	PWM Output A2								
3	0Va								
4	Digital Input	DI1	/13.B8						
	PWM Output B1	PWM2		Valve Bank	Research Sheave	Prop. Valve	Tilt In		
6	PWM Output B2								
7	0Vb								
8	Digital Input	DI2							

-KF2.24 Beckhoff EL6751

DSUB-9	Pin Description	IO Type	Ref
1		CAN	/1.E7
2	CAN-L		
3	CAN-G		
4			
5			
6	CAN-G		
7	CAN-H		
8			
9			



D-SUB
9-Pin
Male

Rev.	Description	Date	Rev. by		
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
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Circuit Diagram
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IO List

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Template:

/1.A8 #9016
/1.E8 #9016

-X0 -

/11.C1 #9016
/11.E1 #9016

-KF2.3
Emergency Stop
DIN/DOUT
/1.B3
I1
+ -
1 2

-KF2.3
Emergency Stop
DIN/DOUT
/1.B3
I2
+ -
3 4

-KF2.6 DO1
Valve Bank
Emergency Stop
OHC
Light
DO
1

-KF2.3
Emergency Stop
DIN/DOUT
/1.B3
I3
+ -
5 6

-KF2.3
Emergency Stop
DIN/DOUT
/1.B3
I4
+ -
7 8

-KF2.6 DO2
Deck Area
Emergency Stop
OHC
Light
DO
5

-KF2.4 DIO1
Spare
Emergency Stop
OHC
IN
+ 1 - 2 1.B3

-KF2.4 DIO2
Spare
Emergency Stop
OHC
IN
+ 5 - 6 1.B3

-KF2.6 DO3
Spare
Emergency Stop
OHC
Light
DO
2

-KF2.4 DIO3
Spare
Emergency Stop
OHC
IN
+ 3 - 4 1.B3

-KF2.4 DIO4
Spare
Emergency Stop
OHC
IN
+ 7 - 8 1.B3

-KF2.6 DO4
Spare
Emergency Stop
OHC
Light
DO
6

-X3 14 15 16 17 18 19
-X1 1 2 3 4 5 6
-X1 7 8 9 10 11 12
-X1 13 14 15 16 17 18

-W215 14 15 16 17 18 19
-W201 1 2 3 4 5 6

+Z23
+X21
14 15 16 17 18 19
-WI-01 1 2 3 4 5 6
+S1 21 22 23 24
X1 X2
Valve Bank

+Z20
+S1 21 22 23 24
X1 X2
Deck Equipment Area

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

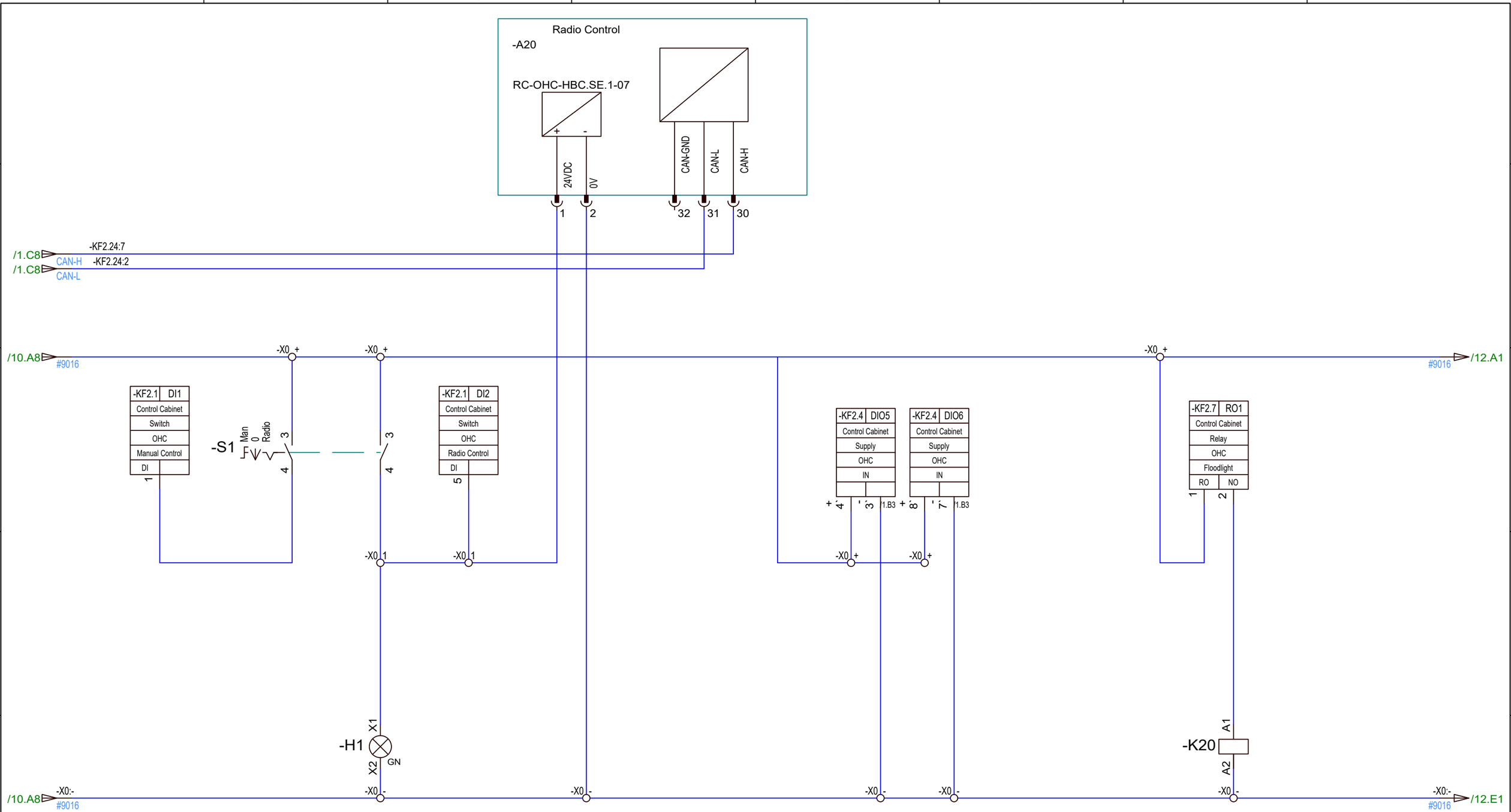
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Circuit Diagram
OHC ROV LARS
Control Cabinet

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Control From Radio

Floodlight

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
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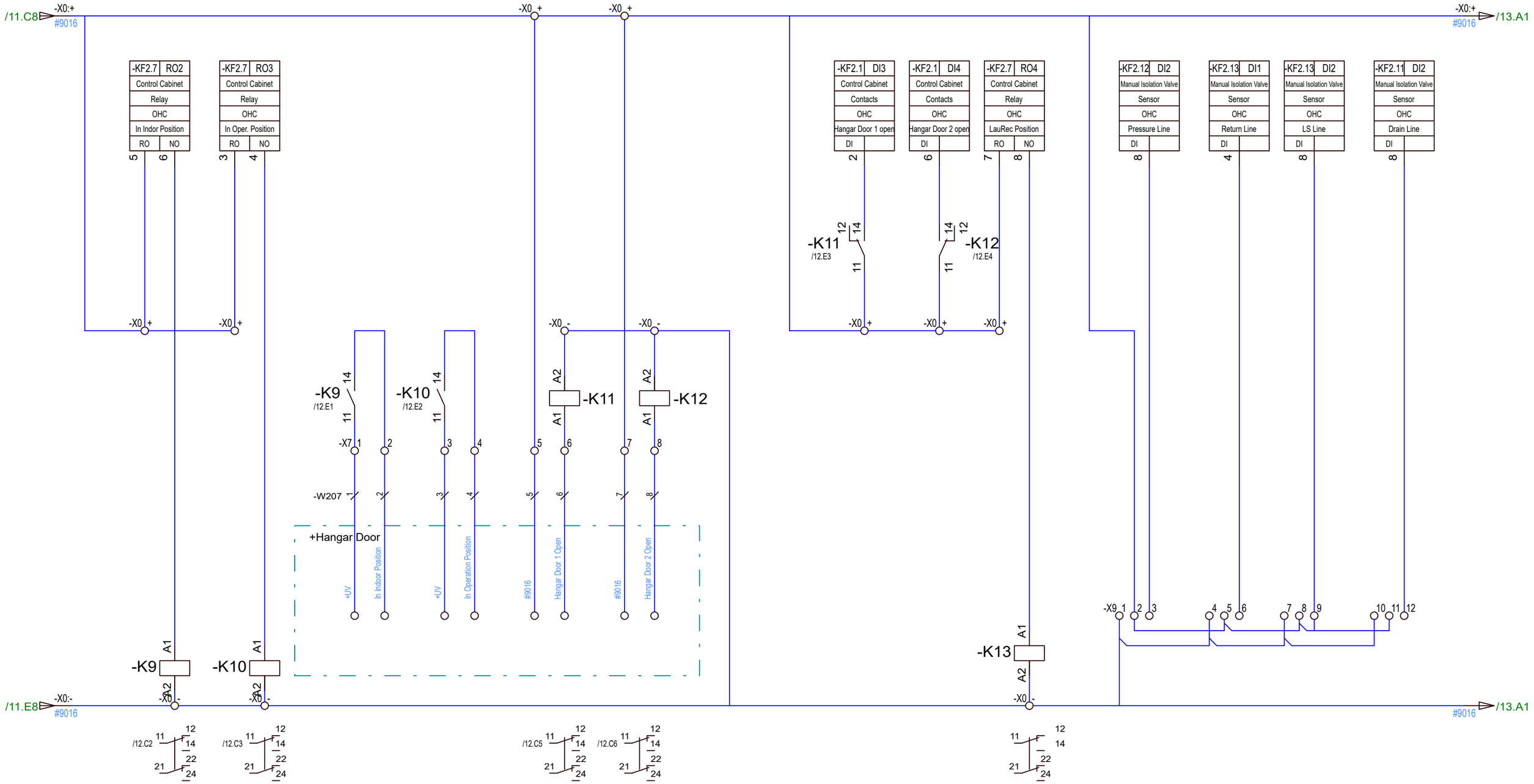
Circuit Diagram
OHC ROV LARS
Control Cabinet

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Template:



In Indoor Position	In Operation Position	Hangar Door 1 Open	Hangar Door 2 Open	Option In LauRec Position

04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Rev.	Description	Date	Rev. by	Standard	

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Circuit Diagram
OHC ROV LARS
Control Cabinet

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Template:

/12.A8 #9016
/12.E8 #9016

#9016 /14.A1
#9016 /14.A1

-KF2.4	DIO7
Valve Bank	
OHC	
Stop Valve	
OUT	

+ 2 ' 3 1.B3

-KF2.10	PWM1	-KF2.10	PWM2	-KF2.11	PWM1	-KF2.11	PWM2	-KF2.12	PWM1	-KF2.12	PWM2	-KF2.13	PWM1	-KF2.13	PWM2	-KF2.15	PWM1	-KF2.15	PWM2	-KF2.18	PWM1	-KF2.18	PWM2
Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank	
Main Boom		Main Boom		Trolley Motor		Trolley Motor		OHC Telescope		OHC Telescope		OHC Winch		OHC Winch		Along Tilt Cylinder		Along Tilt Cylinder		Latch Cylinder		Latch Cylinder	
Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve	
Out		In		STBD		PORT		Out		In		Lower		Lift		Out		In		Out		In	
	A2		B2		A2		B2		A2		B2		A2		B2		A2		B2		A2		B2
1	5	6	1	5	6	1	5	6	1	5	6	1	5	6	1	5	6	1	5	6	1	5	6

-KF2.19	PWM2	-KF2.19	PWM1	-KF2.22	PWM1	-KF2.22	PWM2	-KF2.23	PWM1	-KF2.23	PWM2	-KF2.16	PWM1	-KF2.16	PWM2
Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank		Valve Bank	
DH Twist		DH Twist		OUT Hauler		OUT Hauler		Research Sheave		Research Sheave		Spring Plate		Spring Plate	
Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve		Prop. Valve	
In		Out		Out		In		Tilt Out		Tilt In		Out		In	
	A2		B2		A2		B2		A2		B2		A2		B2
2	6	5	1	5	6	1	5	6	1	5	6	1	5	6	

-X0 -X0

-X2 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 -X3 1 -W215

-W204 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 1 2 3 4 5 6 7 8 9 10 11 12 13

+Z23

+X21

-X1 1 2 2 1 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 -X2 1 2 3 4 5 6 7 8 9 10 11 12 13

-WI-02 BU BN -WI-03 2 1 -WI-04 BU BN GrY -WI-05 BU BN GrY -WI-06 BU BN GrY -WI-07 BU BN GrY -WI-08 BU BN GrY -WI-09 BU BN GrY -WI-10 BU BN GrY -WI-11 BU BN GrY -WI-12 BU BN GrY -WI-13 BU BN GrY

-H1 X1 X2 YE

-Y1 2 1

-Y2 2 3 B A 1

-Y3 2 3 B A 1

-Y4 2 3 B A 1

-Y5 2 3 B A 1

-Y6 2 3 B A 1

-Y7 2 3 B A 1

-Y8 2 3 B A 1

-Y9 2 3 B A 1

-Y10 2 3 B A 1

-Y11 2 3 B A 1

OHC ROV Active	OHC ROV Stop	OHC ROV Main Boom		OHC ROV Trolley Motor		OHC ROV Telescope Boom		OHC ROV Winch		OHC ROV Along Tilt Cylinder		OHC ROV Latch Cylinder		OHC ROV DH Twist		OHC ROV Out Hauler		OHC ROV Research Sheave		OHC ROV Spring Plate	
		2 Out	3 In	2 STBD	3 PORT	2 Out	3 In	2 Lower	3 Lift	2 Out	3 In	2 Out	3 In	2 Out	3 In	2 Out	3 In	2 Out	3 In	2 Out	3 In

Rev.	Description	Date	Rev. by		
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

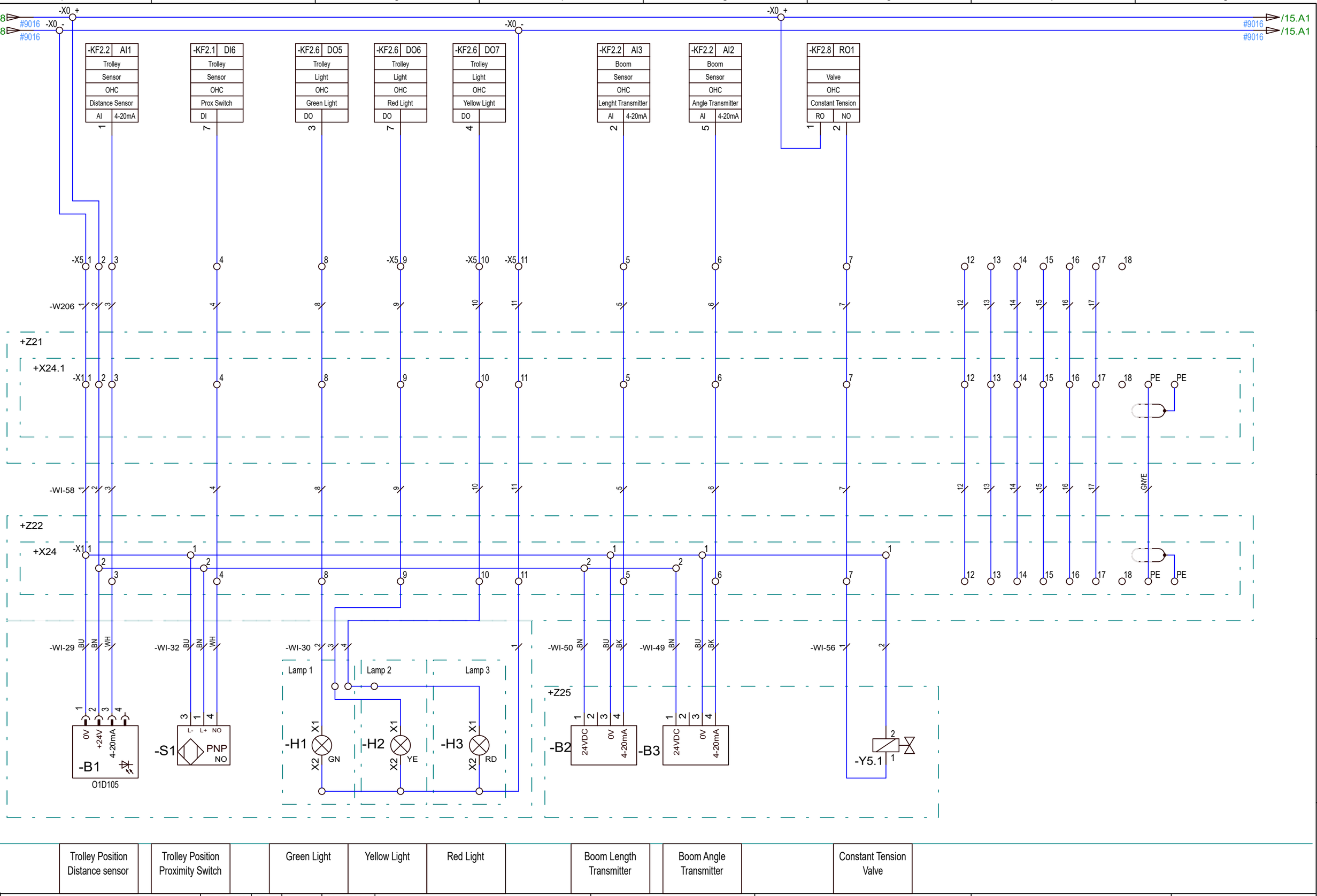
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Circuit Diagram
OHC ROV LARS
Control Cabinet - Valve Bank

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+B21

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Trolley Position Distance sensor	Trolley Position Proximity Switch		Green Light	Yellow Light	Red Light		Boom Length Transmitter	Boom Angle Transmitter		Constant Tension Valve

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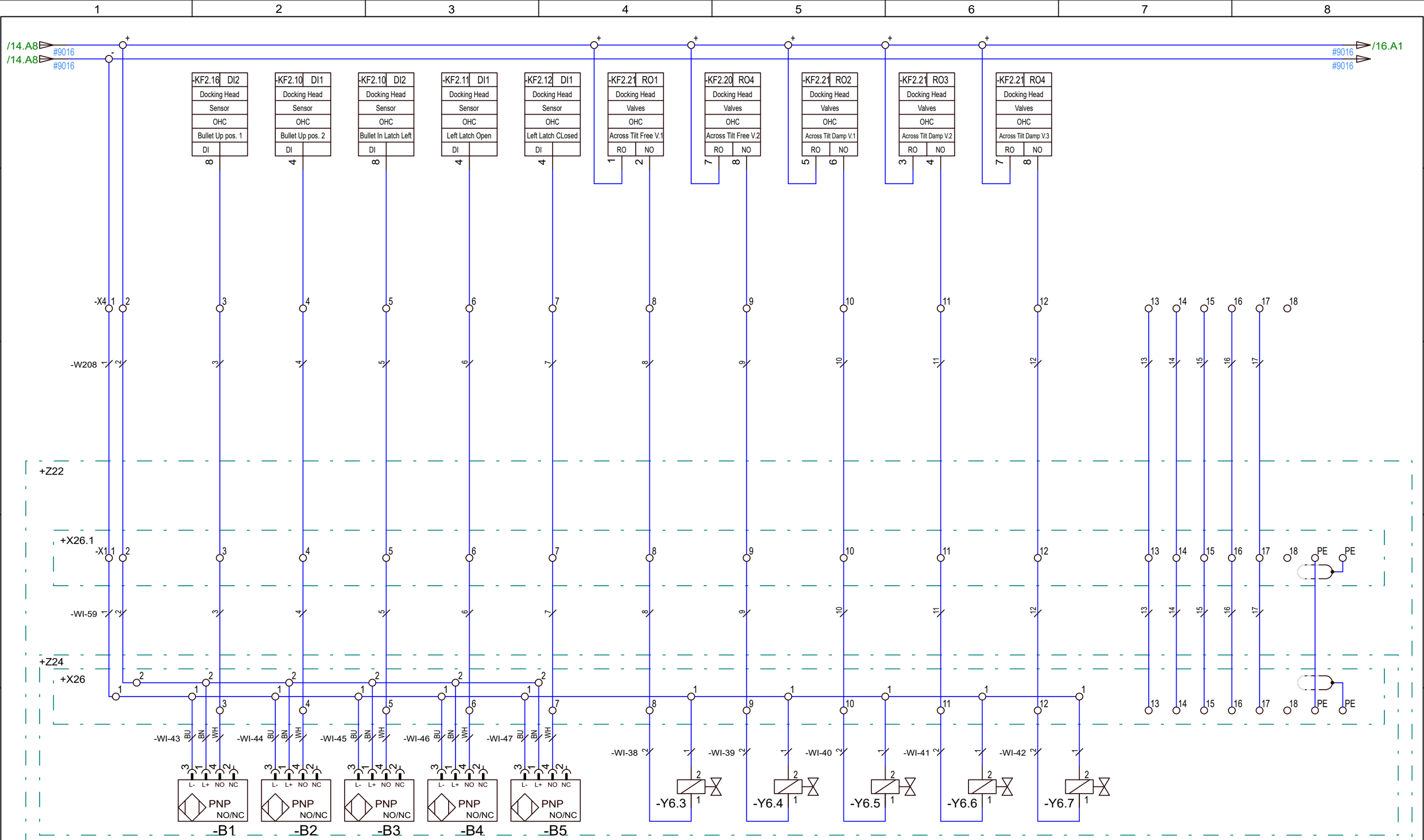
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Circuit Diagram
OHC ROV LARS
Control Cabinet - Sensors

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Bullet Upper Posiiton Sensor 1	Bullet Upper Posiiton Sensor 2	DH Bullet In Latch Sensor Left	DH Left Latch Open Sensor	DH Left Latch Closed Sensor	Across Tilt Free Valve 1	Across Tilt Free Valve 2	Across Tilt Damping Valve 1	Across Tilt Damping Valve 2	Across Tilt Damping Valve 3

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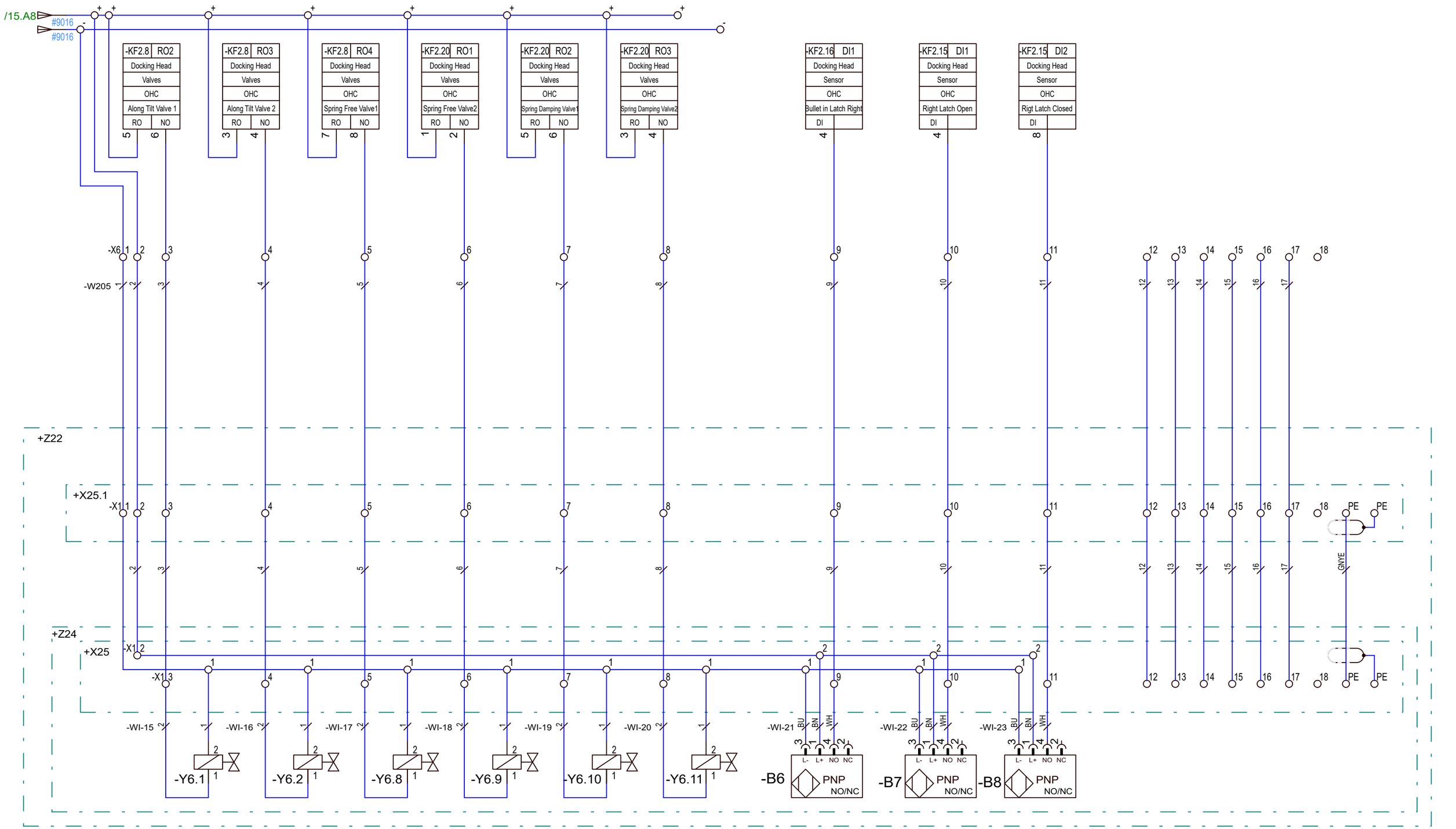
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Circuit Diagram
OHC ROV LARS
Control Cabinet - DH Left JB

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Along Tilt Free Valve 1	Along Tilt Free Valve 2	Spring Plate Free Valve 1	Spring Plate Free Valve 2	Spring Plate Damping Valve 1	Spring Plate Damping Valve 2	DH Bullet In Latch Sensor Right	DH Right Latch Open Sensor	DH Right Latch Closed Sensor

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Circuit Diagram
OHC ROV LARS
Control Cabinet - DH Right JB

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Template:

For detailed cable information see rapp documentation

For detailed cable information see rapp documentation

+B21

-X102 19 20

-W213 1 2

-TA14 1 2 3 4 5 6 7 8

-W212 RD BU PK GY GN YE WH BN

-TA15 U2 V2 W2 GND

-W210 1 2 3 GNYE

-TA15 1 2

-W211 1 2

/1.A8 /1.A8

L1 L2

14 24

-K20

11 21

-X90 1 -X90 2 GND

-W214 BN BU GNYE

+X22
JB Interface

-X1 9 10

-X1 1 2 3 4 5 6 7 8 PE

+X23
JB Motor Power

-X1 1 2 3 GND PE -X1 4 5

-X90 1 2 PE

-WI-52 1 2

-WI-51 RD BU PK GY GN YE WH BN

-WI-53 1 2 3 GNYE

-WI-54 1 2

-WI-55 2 1 GNYE

+Z24 Docking Head

n.c. 4 - Signal ω n.c. 2 +24V ⊥ 1

-BP1

Temp Transmitter
PT300->4-20mA

PT2 PT1

PT100

PTC

+t°c +t°c +t°c

2 1 8 7 6 5 4 3 PE

+ 24V 0V A+ A- B+ B- Z+ Z- GND

Encoder

U V W PE

-M1
3 ~

Hauler Motor

0,25kW

-M1

Motor Heater

L N GND

-E1

Floodlight

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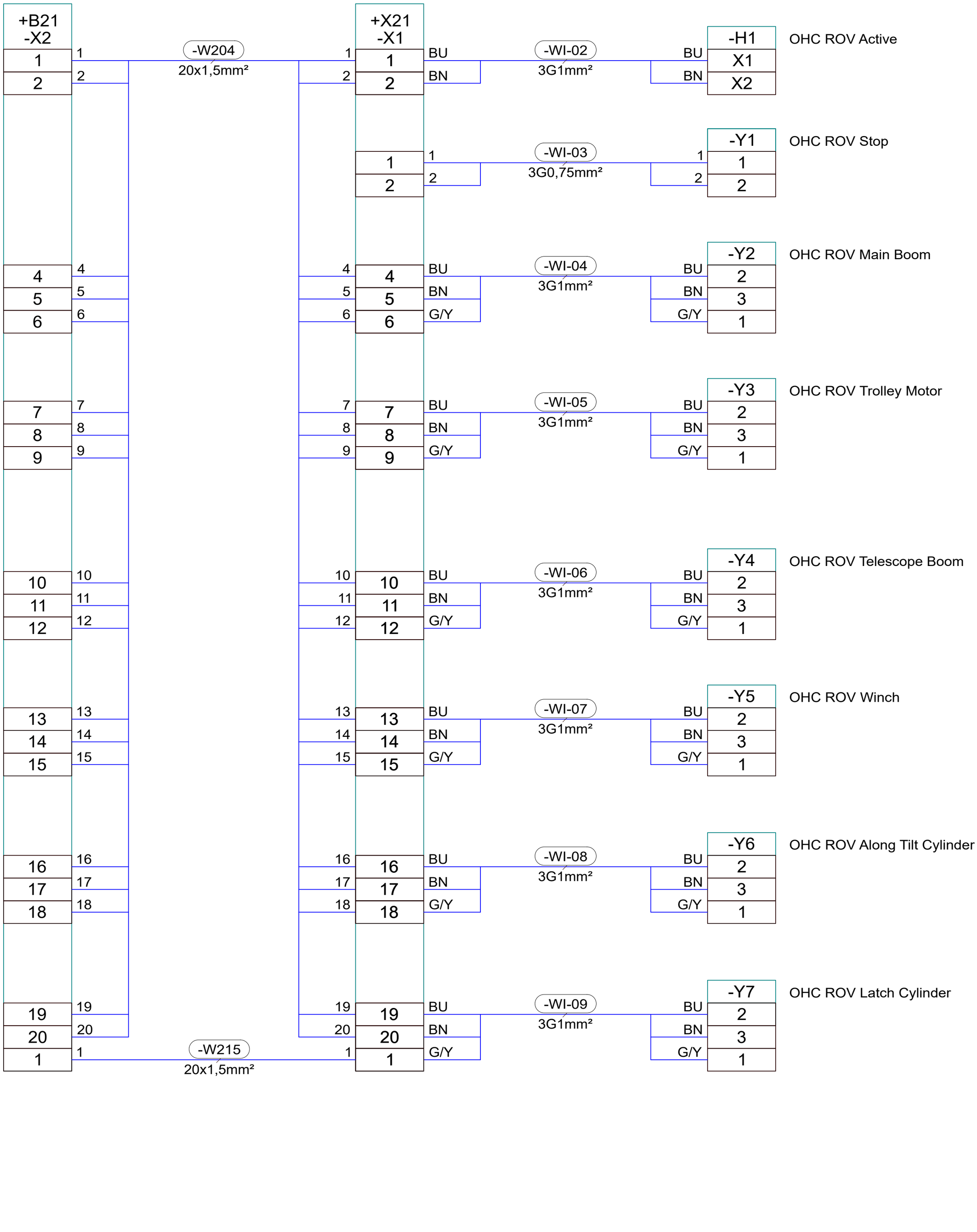
Circuit Diagram
OHC ROV LARS
Control Cabinet - Motor Hauler

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+Rapp Drive

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Termination Diagram
OHC ROV LARS

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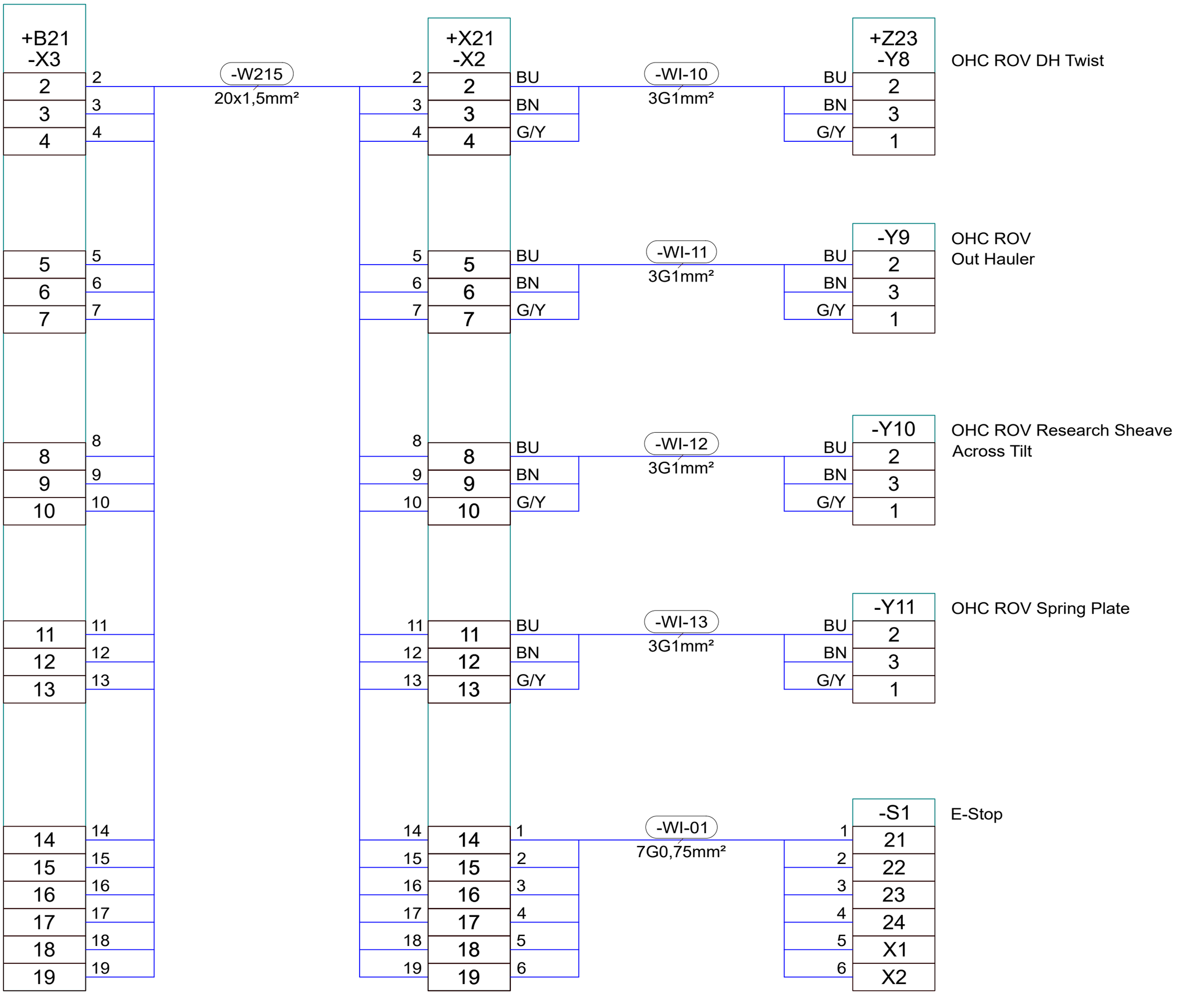
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Rev.	Description	Date	Rev. by	Standard	
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Termination Diagram
OHC ROV LARS

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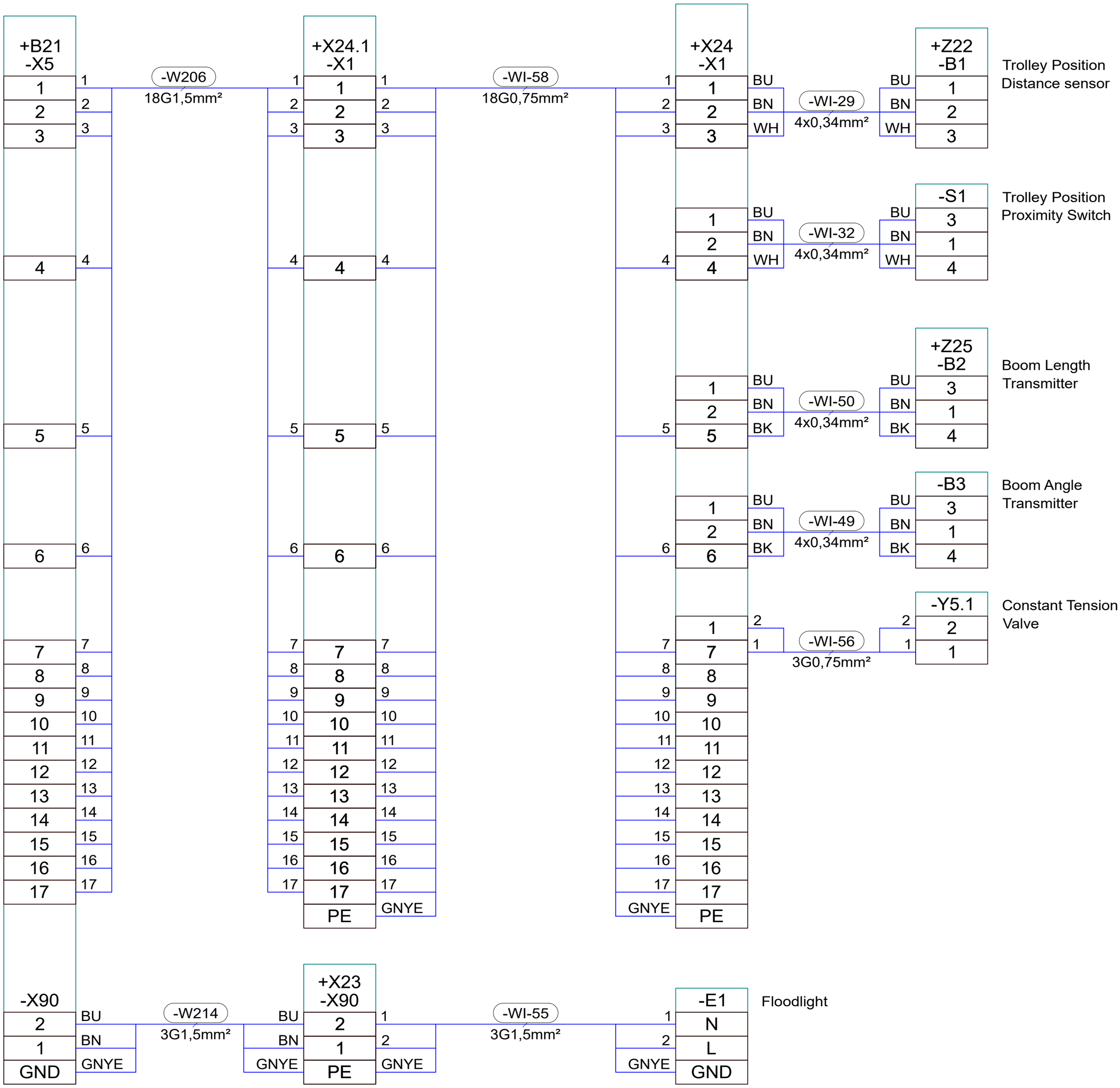
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Termination Diagram
OHC ROV LARS

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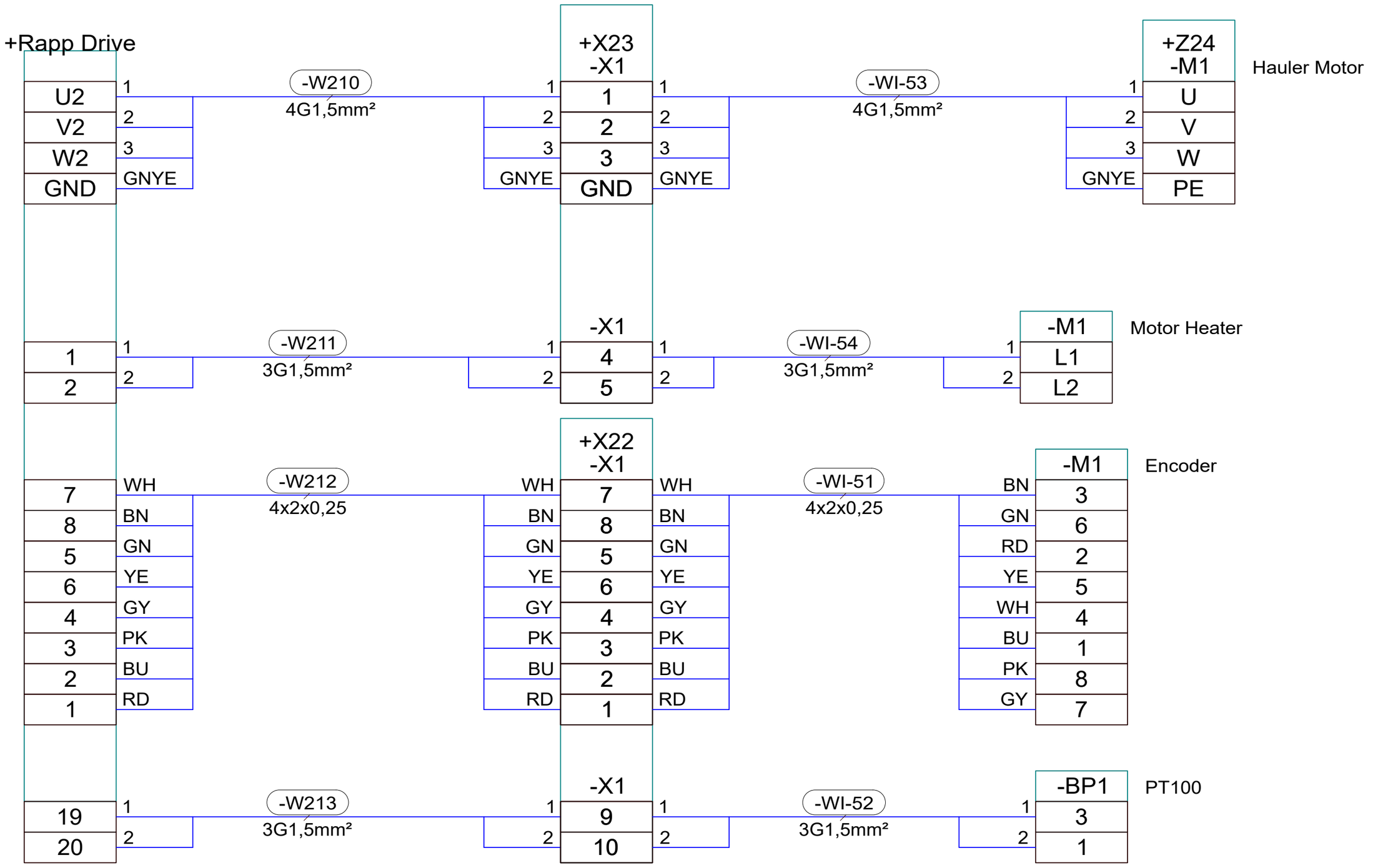
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Termination Diagram
OHC ROV LARS

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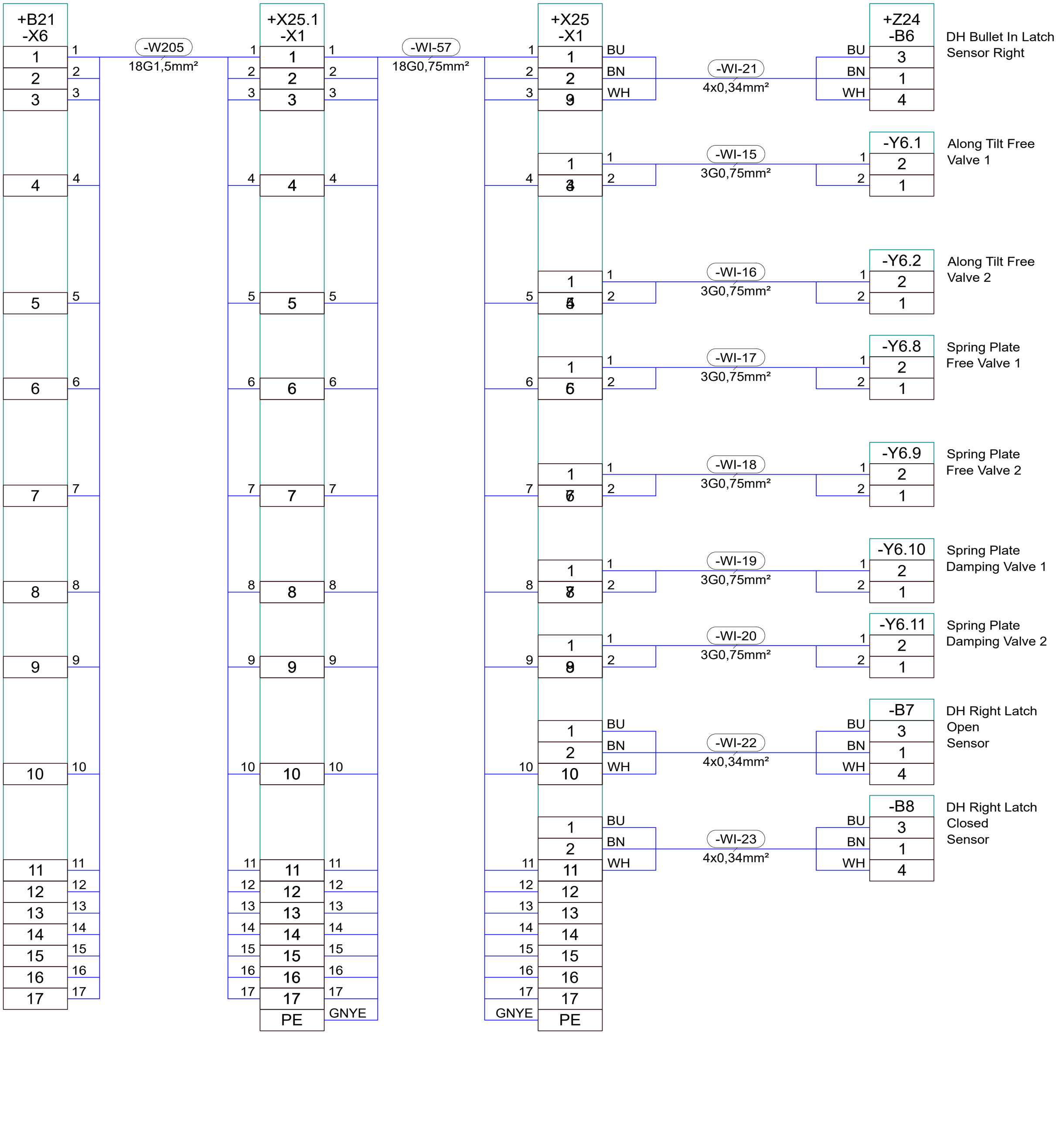
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Termination Diagram
OHC ROV LARS

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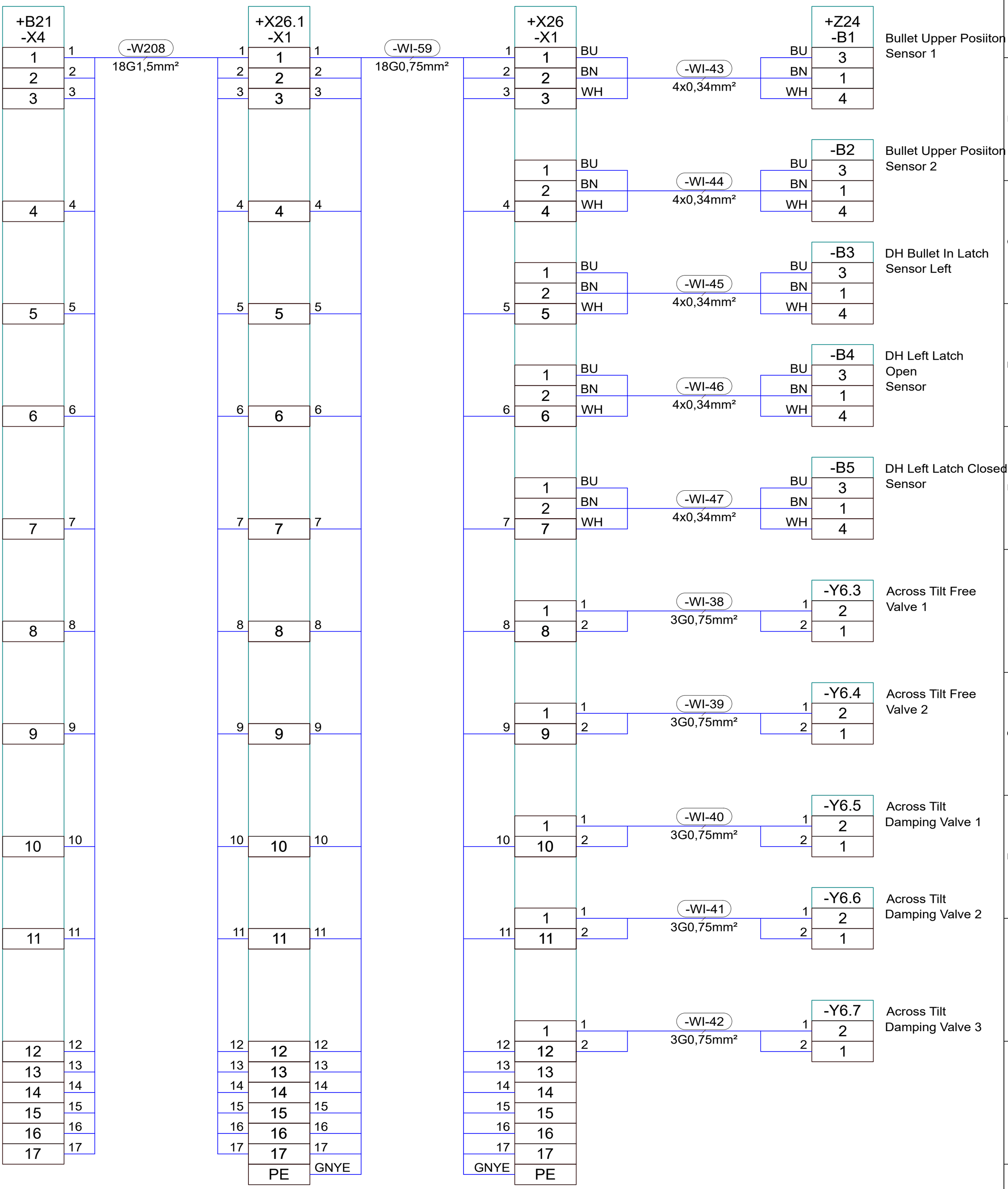
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Termination Diagram
OHC ROV LARS

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Rev. 04

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-WI-01	ROFLEX 7G0.75	07915015		1	Pcs	CABLE, 7G0,75mm²	Lapp	
-WI-02,-WI-04,-WI-05,-WI-06,-WI-07,-WI-08,-WI-09,-WI-10,-WI-11,-WI-12,-WI-13	ROFLEX 3G1	07915017		11	Pcs	CABLE, 3G1mm²	Lapp	
-WI-03,-WI-15,-WI-16,-WI-17,-WI-18,-WI-19,-WI-20,-WI-38,-WI-39,-WI-40,-WI-41,-WI-42,-WI-56	7074-18021-2360500	07930051		13	Pcs	CONNECTOR, VALVE, MURR, 5M, SS	Murr	
-WI-21,-WI-22,-WI-23,-WI-43,-WI-44,-WI-45,-WI-46,-WI-47	V1-WV4A-5M-PUR	07917043		8	Pcs	SENSOR, CABLE, M12, 4-PIN, ANGLE, 5M	Pepperl & Fuchs	
-WI-29,-WI-32,-WI-49,-WI-50	V1-WV4A-30M-PUR	400090572		4	Pcs	SENSOR, CABLE, M12, 4-PIN, ANGLE, 30M	Pepperl & Fuchs	
-WI-30	ØLFLEX FD 855 CP 7G0.75	400111231	10 905 14	1	Pcs	CABLE, 7x0,75mm², SHIELDED	Lapp	
-WI-51	UNITRONIC FD CP (TP) plus 4x2x0.25	07915073		1	Pcs	CABLE, 4x2x0,25mm², -40°C, OD 8,3mm	Lapp	
-WI-52,-WI-54,-WI-55	ØLFLEX FD 855 CP 3G1.5			3	Pcs	CABLE, 3x1,5mm², SHIELDED	Lapp	
-WI-53	ØLFLEX FD 855 CP 4G1.5	400213974		1	Pcs	CABLE, 4x1,5mm², SHIELDED	Lapp	
-WI-57,-WI-58,-WI-59	ØLFLEX FD 855 CP 18G0.75	400213543		3	Pcs	CABLE, 18x0,75mm², SHIELDED	Lapp	

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Part List
OHC ROV LARS

=OHC

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-A20	RC-OHC-HBC.SE.1-07	400198450		1	Pcs	CTD OHC 07 with Display	HBC	
-CAB1	ADO201	07939034	24 138 75	1	Pcs	CABINET, DOORSTOPPER, ADO, ELDON	Eldon	
-CAB1	MAS0605030	400089006	24 174 95	1	Pcs	CABINET, 600x500x300 ELDON*	Eldon	
-DUCT1,-DUCT3..-DUCT5	HA760040	07920015	12 857 18	1.22	M	CABLE TRAY, 60X40, GREY, W/LID	Tehalit Hager	
-F1	iC60H/C 04-2	07938005	16 760 63	1	Pcs	FUSE, AUTOMAT, 4A, 2-POLE, C	Schneider	
-G1	CS10.241	07949016	66 040 29	1	Pcs	POWER SUPPLY, PULSE, 10A, 230/24	Puls	
-GL1,-GL9..-GL10	WADI-TEC EMC M40 Ø24-30	400075304	12 492 78	3	Pcs	CABLE GLAND, BRASS, EMC, Ø24-30	Elis	
-GL2,-GL3	WADI-TEC EMC M32 Ø17-24	07928087	12 492 76	2	Pcs	CABLE GLAND, BRASS, EMC, Ø17-24	Elis	
-GL4,-GL5	WADI-TEC EMC M25 Ø10-14.5	07928084	12 492 70	2	Pcs	CABLE GLAND, BRASS, EMC, Ø10-14,5	Elis	
-GL11..-GL15	WADI-TEC EMC M16 Ø5-8.5	07928081	12 492 64	5	Pcs	CABLE GLAND, BRASS, EMC, Ø5-8,5	Elis	
-GL16	WADI-TEC EMC M16 Ø4-6.5	07928080	12 492 62	1	Pcs	CABLE GLAND, BRASS, EMC, Ø4-6,5	Elis	
-H1	ZBVB3	07924016	43 032 26	1	Pcs	LAMP, LED, GN, 24V	Schneider	
-K9..-K13	C12A21X24D	07936028	43 791 08	5	Pcs	RELAY, RELECO, 2-POLE, 24V, DC, 5A	Releco	
-K9..-K13	S-12	07942015	43 791 01	5	Pcs	RELAY, SOCKET, RELECO, 2-POLE	Releco	
-K20	C7A20FX24D	07936015	43 783 87	1	Pcs	RELAY, RELECO, 2-POLE, 24V DC, 10A	Releco	
-K20	S7-I/O			1	Pcs	RELAY, SOCKET	Releco	
-KF2.0	EK1101	400142335		1	Pcs	EtherCAT Coupler w ID settings	Beckhoff	
-KF2.1	EL1008	400142339		1	Pcs	8 Digital Inputs	Beckhoff	
-KF2.2	EL3058	400142349		1	Pcs	8 Analog Inputs 4-20mA 2-wire	Beckhoff	
-KF2.3	EL1904			1	Pcs	TwinSAFE 4 Digital Inputs	Beckhoff	
-KF2.4	EL2911	400142346		1	Pcs	TwinSAFE 4 Digital Inputs, 1x Output	Beckhoff	
-KF2.5,-KF2.9,-KF2.14,-KF2.17	EL9410	400142412		4	Pcs	Power Supply Terminal fro E-bus	Beckhoff	
-KF2.6	EL2008	400142342		1	Pcs	8 Digital Outputs	Beckhoff	
-KF2.7,-KF2.8,-KF2.20,-KF2.21	EL2624	400142344		4	Pcs	4 Relay Outputs	Beckhoff	
-KF2.10,-KF2.11,-KF2.12,-KF2.13,-KF2.15,-KF2.16,-KF2.18,-KF2.19,-KF2.22,-KF2.23	EL2535-0002-	400142343		10	Pcs	2 PWM Outputs, 2 Digtal Inputs	Beckhoff	
-KF2.24	EL6751	400142409		1	Pcs	CANopen master/slave terminal	Beckhoff	
-KF2.25	EL9011	400142410		1	Pcs	Bus end cap	Beckhoff	
-R1,-R5	RND 155M207F120RTKRTB5K0	07998018		2	Pcs	Resistor, 120Ω, 0.6W, 1%	RND Components	
-R2..-R4	RND 155M207F249RTKRTB5K0	07998012		3	Pcs	Resistor, 249Ω, 0.6W, 1%	RND Components	
-RAIL1..-RAIL4	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	1.32	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-S1	ZB4BK1333	07960019	43 025 24	1	Pcs	CONTR. SWITCH, 3 POS, LED GN	Schneider	

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Part List
OHC ROV LARS

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Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-S1	ZB4BZ009	07961012	43 027 45	1	Pcs	CONTR. ACC, SOCKET, METAL	Schneider	
-S1	ZBE101	07961013	43 004 23	2	Pcs	CONTR. ACC, CONTACTBLOCK, 1NO	Schneider	
-TAG1	US-EMLP 100X60 4 Line	07958308		1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-TAG2	US-EMLP-HA 24	400075270		1	Pcs	TAG, SIGN, THERMOMARK CARD	Phoenix Contact	
-X0	AEP 3C 2.5	400069937	12 694 11	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X0	AEP AP11			1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X0..-X7,-X9,-X90	AEB 35 SC/1	400073887	12 654 34	14	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X0 (1)	A3C 2.5	400069932	12 654 01	1	Pcs	TERMINAL BLOCK, SNAP-IN, DOUBLE	Weidmüller	
-X0 (-)	AAP11 6/6X1.5 LO-LI BL	400074009		1	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (-,-,-,-,-)	AAP11 1.5 LI BL	400074009		5	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (+)	AAP11 6/6X1.5 LO-LI RD	400074009		1	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (+,+,+,+,+,+)	AAP11 1.5 LI RD	400074009		6	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (GND)	JORDSKINNE 21	07918007		1	Pcs	RAIL, GRN, BRASS, 21 SLOT	Weidmüller	
-X0 (GND),-X90 (GND)	WPE 4	07918003	12 688 16	2	Pcs	-TERMINAL BLOCK, GND, 101010	Weidmüller	
-X0 (GND,GND)	A3C 2.5 PE	400074010	12 654 16	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	
-X1 (1,3,5,7,9,11,13,15,17),-X4 (1,3,5,7,9,11,13,15,17),-X5 (1,3,5,7,9,11,13,15,17),-X6 (1,3,5,7,9,11,13,15,17),-X7 (1,3,5,7),-X90 (1)	A2T 2.5	400073880	12 654 14	41	Pcs	TERMINAL BLOCK, SNAP-IN, TWO HIGHTS	Weidmüller	
-X2..-X3,-X9	AEP 3T 2.5	400209845	12 694 40	3	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X2 (1,1,4,4,7,10,13,16,19),-X3 (1,4,7,10,13,16,19),-X9 (1, 4,7,10)	A3T 2.5			20	Pcs	TERMINAL BLOCK, SNAP-IN, THREE HIGHTS	Weidmüller	
-X4..-X7,-X90	AEP 2T 2.5	400073883	12 694 40	5	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X91,-X92	IE-TO-RJ45-FJ-B	07930061		2	Pcs	CONNECTOR, FEMALE, RJ45, RAIL MOUNT	Weidmüller	
-X93 (1)	A3T 2.5 DL			1	Pcs	TERMINAL BLOCK, SNAP-IN, THREE HIGHTS	Weidmüller	

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1..-GL12	ST-M 16 x 1.5	07928032	12 477 13	12	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3,5-8	Lapp	
-GL13,-GL14	ST-M 20 x 1.5	07928033	12 477 14	2	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø6-12	Lapp	
-GL15,-GL16	ST-M 50 x 1.5	07928037	12 477 18	2	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø26-38	Lapp	
-JB1	CPG-320	07904006		1	Pcs	JUNCTION BOX, POLYESTER, 360x160x91	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.337	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1 (1,1-2,2-20),-X2 (1-20)	A2C 2.5	400069931	12 654 00	42	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X1,-X2	AEB 35 SC/1	400073887	12 654 34	4	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1,-X2	AEP 2C 2.5	400069933	12 694 10	2	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	

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04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	13.01.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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Part List
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1..-GL4	ST-M 20 x 1.5	07928033	12 477 14	4	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø6-12	Lapp	
-JB1	CPG-220	07904002		1	Pcs	JUNCTION BOX, POLYESTER, 122x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.11	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1	AEP 2C 2.5	400069933	12 694 10	2	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1-10)	A2C 2.5	400069931	12 654 00	10	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X1 (PE,PE)	A2C 2.5 PE	400074009	12 654 15	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Part List
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1..-GL6	ST-M 20 x 1.5	07928033	12 477 14	6	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø6-12	Lapp	
-JB1	CPG-240	07904004		1	Pcs	JUNCTION BOX, POLYESTER, 220x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.183	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEP 2C 2.5	400069933	12 694 10	3	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1-5),-X90 (1-2)	A2C 2.5	400069931	12 654 00	7	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X1 (GND,GND,GND,PE),-X90 (PE)	A2C 2.5 PE	400074009	12 654 15	5	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	
-X1,-X90	AEB 35 SC/1	400073887	12 654 34	4	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	

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Part List
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1	ST-M 25 x 1.5	07928034	12 477 15	1	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø12-18	Lapp	
-GL2..-GL6	ST-M 16 x 1.5	07928032	12 477 13	5	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3,5-8	Lapp	
-GL7	ST-M 20 x 1.5	07928033	12 477 14	1	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø6-12	Lapp	
-JB1	CPG-240	07904004		1	Pcs	JUNCTION BOX, POLYESTER, 220x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.208	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1	AEP 2C 2.5	400069933	12 694 10	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1	AEP 3C 2.5	400069937	12 694 11	2	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1,1,1,1-2,2,2,2)	A3C 2.5	400069932	12 654 01	8	Pcs	TERMINAL BLOCK, SNAP-IN, DOUBLE	Weidmüller	
-X1 (3-18)	A2C 2.5	400069931	12 654 00	16	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X1 (PE,PE,PE)	A2C 2.5 PE	400074009	12 654 15	3	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	

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04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Part List
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Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1,-GL2	ST-M 25 x 1.5	07928034	12 477 15	2	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø12-18	Lapp	
-JB1	CPG-240	07904004		1	Pcs	JUNCTION BOX, POLYESTER, 220x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.209	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1	AEP 2C 2.5	400069933	12 694 10	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1-18)	A2C 2.5	400069931	12 654 00	18	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X1 (PE,PE)	A2C 2.5 PE	400074009	12 654 15	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	

Rev.	Description	Date	Rev. by	Standard	
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Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1..-GL9,-GL11	ST-M 12 x 1.5	07928031	12 477 12	10	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3-6,5	Lapp	
-GL10	ST-M 25 x 1.5	07928034	12 477 15	1	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø12-18	Lapp	
-JB1	CPG-240	07904004		1	Pcs	JUNCTION BOX, POLYESTER, 220x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.207	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1	AEP 2C 2.5	400069933	12 694 10	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1	AEP 3C 2.5	400069937	12 694 11	2	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1,1,1,1,1,1-2,2,2,2)	A3C 2.5	400069932	12 654 01	10	Pcs	TERMINAL BLOCK, SNAP-IN, DOUBLE	Weidmüller	
-X1 (3-18)	A2C 2.5	400069931	12 654 00	16	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X1 (PE,PE)	A2C 2.5 PE	400074009	12 654 15	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	

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Part List
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1,-GL2	ST-M 25 x 1.5	07928034	12 477 15	2	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø12-18	Lapp	
-JB1	CPG-240	07904004		1	Pcs	JUNCTION BOX, POLYESTER, 220x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.208	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1	AEP 2C 2.5	400069933	12 694 10	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1-18)	A2C 2.5	400069931	12 654 00	18	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X1 (PE,PE)	A2C 2.5 PE	400074009	12 654 15	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1..-GL6,-GL8..-GL11	ST-M 12 x 1.5	07928031	12 477 12	10	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3-6,5	Lapp	
-GL7	ST-M 25 x 1.5	07928034	12 477 15	1	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø12-18	Lapp	
-JB1	CPG-240	07904004		1	Pcs	JUNCTION BOX, POLYESTER, 220x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.208	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1	AEP 2C 2.5	400069933	12 694 10	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1	AEP 3C 2.5	400069937	12 694 11	2	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1,1,1,1,1,1-2,2,2,2)	A3C 2.5	400069932	12 654 01	10	Pcs	TERMINAL BLOCK, SNAP-IN, DOUBLE	Weidmüller	
-X1 (3-18)	A2C 2.5	400069931	12 654 00	16	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X1 (PE,PE)	A2C 2.5 PE	400074009	12 654 15	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Part List
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1,-GL2	ST-M 25 x 1.5	07928034	12 477 15	2	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø12-18	Lapp	
-JB1	CPG-240	07904004		1	Pcs	JUNCTION BOX, POLYESTER, 220x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.18	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1	AEP 2C 2.5	400069933	12 694 10	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1-18)	A2C 2.5	400069931	12 654 00	18	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X1 (PE,PE)	A2C 2.5 PE	400074009	12 654 15	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	

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04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-S1	XALK178W3B140G	400208317	4322660	1	Pcs	CONTR. PUSH, EM STOP	Schneider	

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-B1	O1D105	07917210		1	Pcs	SENSOR, LENGTH, LASER, 0,2..10M	Ifm	
-H1	853 200 55	400063430		1	Pcs	LAMP, BEACON, LED, GN, 24V	Werma	
-H2	853 300 55	400063431		1	Pcs	LAMP, BEACON, LED, YE, 24V	Werma	
-H3	853 100 55	400063429		1	Pcs	LAMP, BEACON, LED, RD, 24V	Werma	
-S1	NEN20-18GM50-E2-V1	07917052		1	Pcs	SENSOR, PROX, Ø18, NO, SN20, M12	Pepperl & Fuchs	
-S2,-S3	NBB8-18GM50-A2-V1-M1	400112793		2	Pcs	SENSOR, PROX, Ø18, NO/NC, SN8, M12, -40. .70°C	Pepperl & Fuchs	

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04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Part List
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-H1	853 300 55	400063431		1	Pcs	LAMP, BEACON, LED, YE, 24V	Werma	
-S1	XALK178W3B140G	400208317	4322660	1	Pcs	CONTR. PUSH, EM STOP	Schneider	
-Y1	HAWE STOP VALVE			1	Pcs	VALVE, ON/OFF	Hawe	
-Y2..-Y13	HAWE PROP VALVE			12	Pcs	VALVE, PROPOTIONAL	Hawe	

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Part List
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-B1..-B8	NBB4-12GM50-A2-V1-M1	400112792		8	Pcs	SENSOR, PROX, Ø12, NO/NC, SN4, M12, -40. .70°C	Pepperl & Fuchs	
-BP1	INO-OEM202P-PT300	400091230		1	Pcs	PT300 ->, 4-20mA Transmitter, AUTEK-INO-OEM202P-PT300--50/150°C-M12-Ø13,5x72	AUTEK	
-E1	FL60 9000 850 120 M24 MB	400072975		1	Pcs	FLOODLIGHT, LED, 80W, 120V, MEDIUM BEAM	Glamox	
-Y6.1,-Y6.2,-Y6.3,-Y6.4,-Y6.5, -Y6.6,-Y6.7,-Y6.8,-Y6.9,-Y6. 10,-Y6.11	HAWE STOP VALVE			11	Pcs	VALVE, ON/OFF	Hawe	

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Part List
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-B2,-B3	ROTA LJ			2	Pcs	SENSOR, LENGTH, INDUCTIVE, CYLINDER, 4.. 20mA	ROTA	
-Y5.1	HAWE STOP VALVE			1	Pcs	VALVE, ON/OFF	Hawe	

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Customer : CNP Freire
Ship/Hull : MBARI
Project no. : 4/60185
Drawing no.: E-4503

Rev.	Description	Date	Rev. by	Standard	
05	For customer review	24.02.2023	GM	Date	14.10.2021
04	For customer review	17.02.2023	GM	Drawn by	KS
03	For customer review	14.02.2023	GM	Appr. by	BK

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CTD Davit

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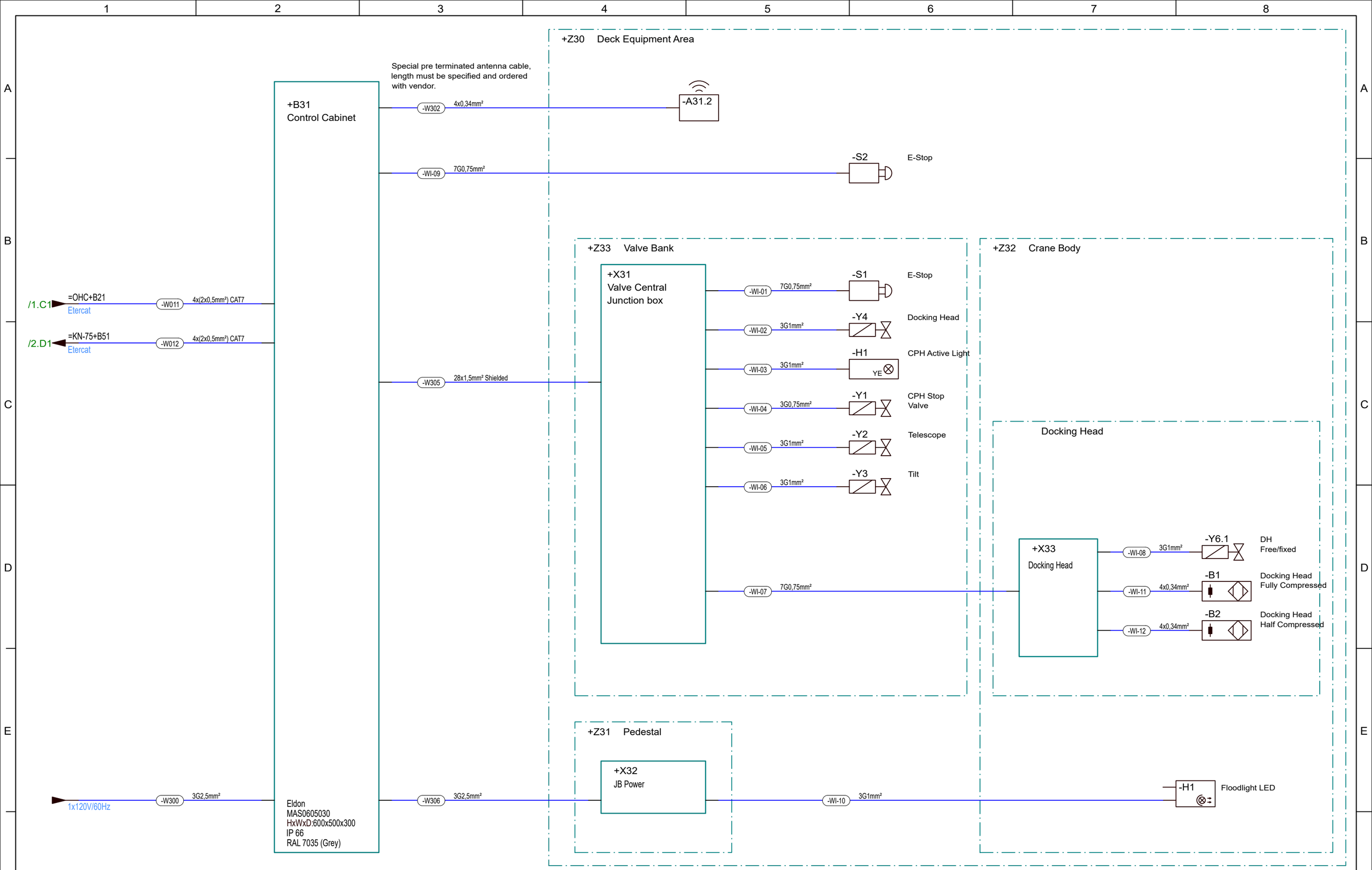
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05	For customer review	24.02.2023	GM	Date	14.10.2021
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03	For customer review	14.02.2023	GM	Appr. by	BK

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Single Line
CTD Davit

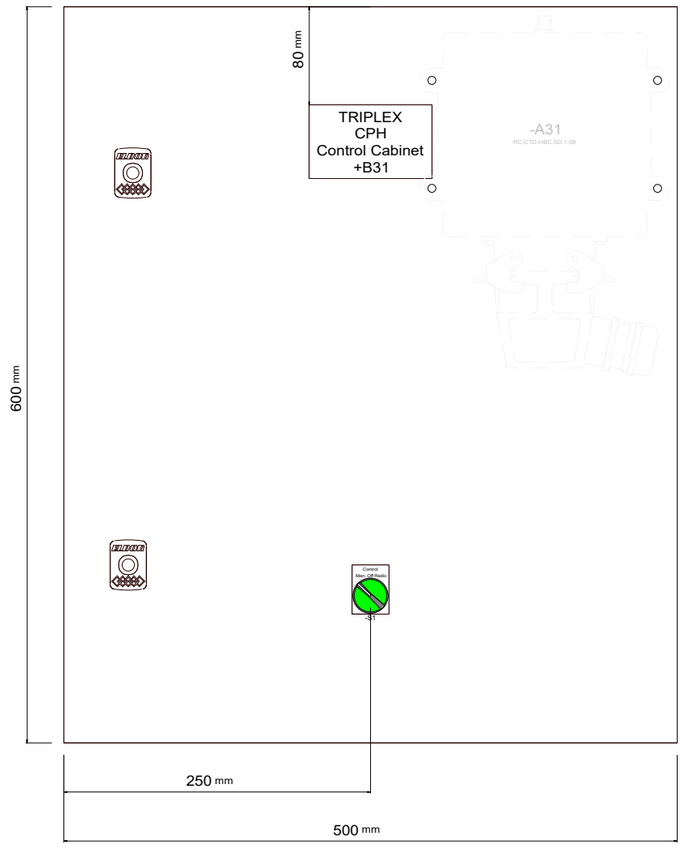
=CTD DAVIT

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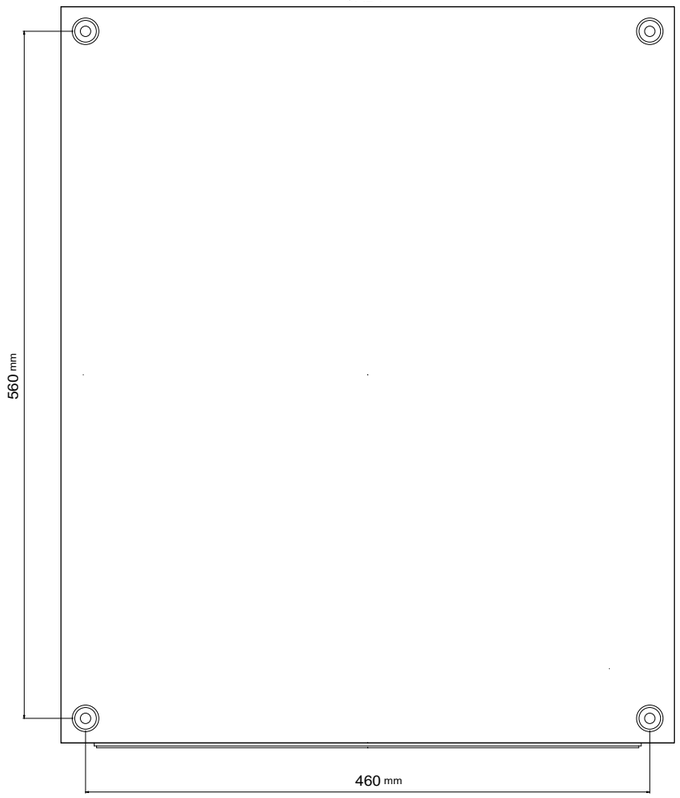
Rev. 05

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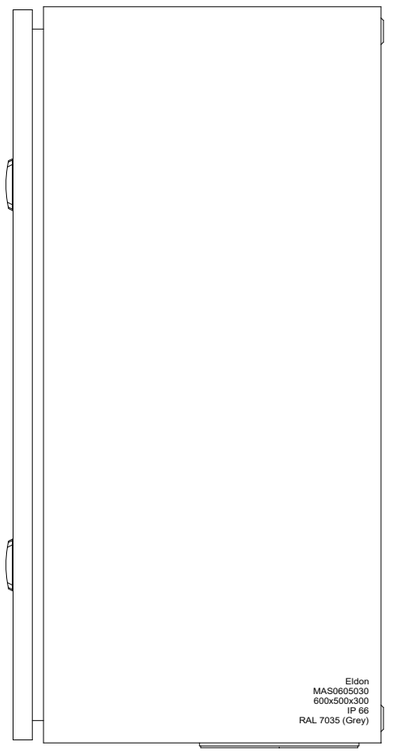
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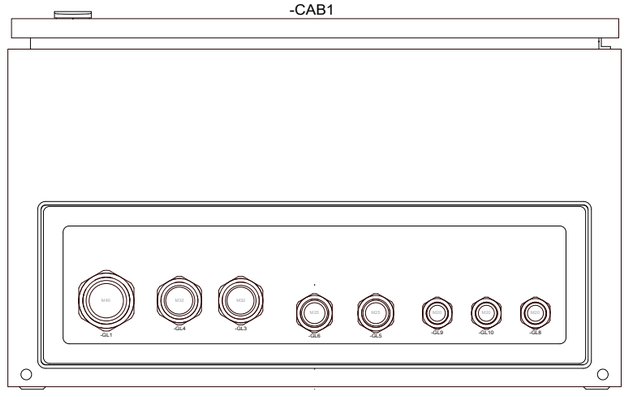
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-CAB1



-CAB1



Product Data	
Manufacturer	Eldon
Article name	MAS0605030
WxHxD	600x500x300
IP	IP 66
RAL Code	RAL 7035 (Grey)
Material	Steel, Painted

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03	For customer review	14.02.2023	GM	Appr. by	BK

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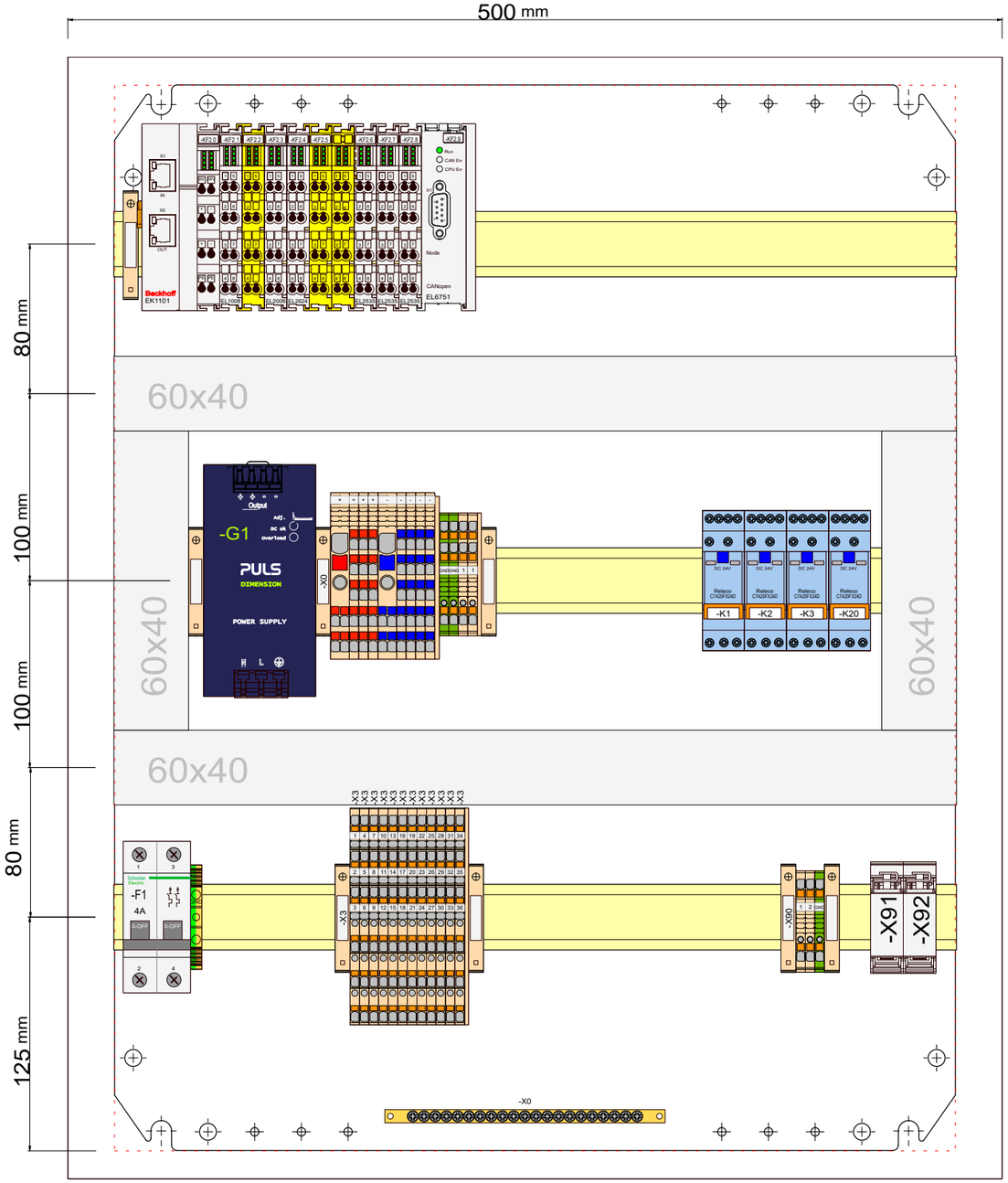
Layout
CTD Davit
Control Cabinet Radio - Outside

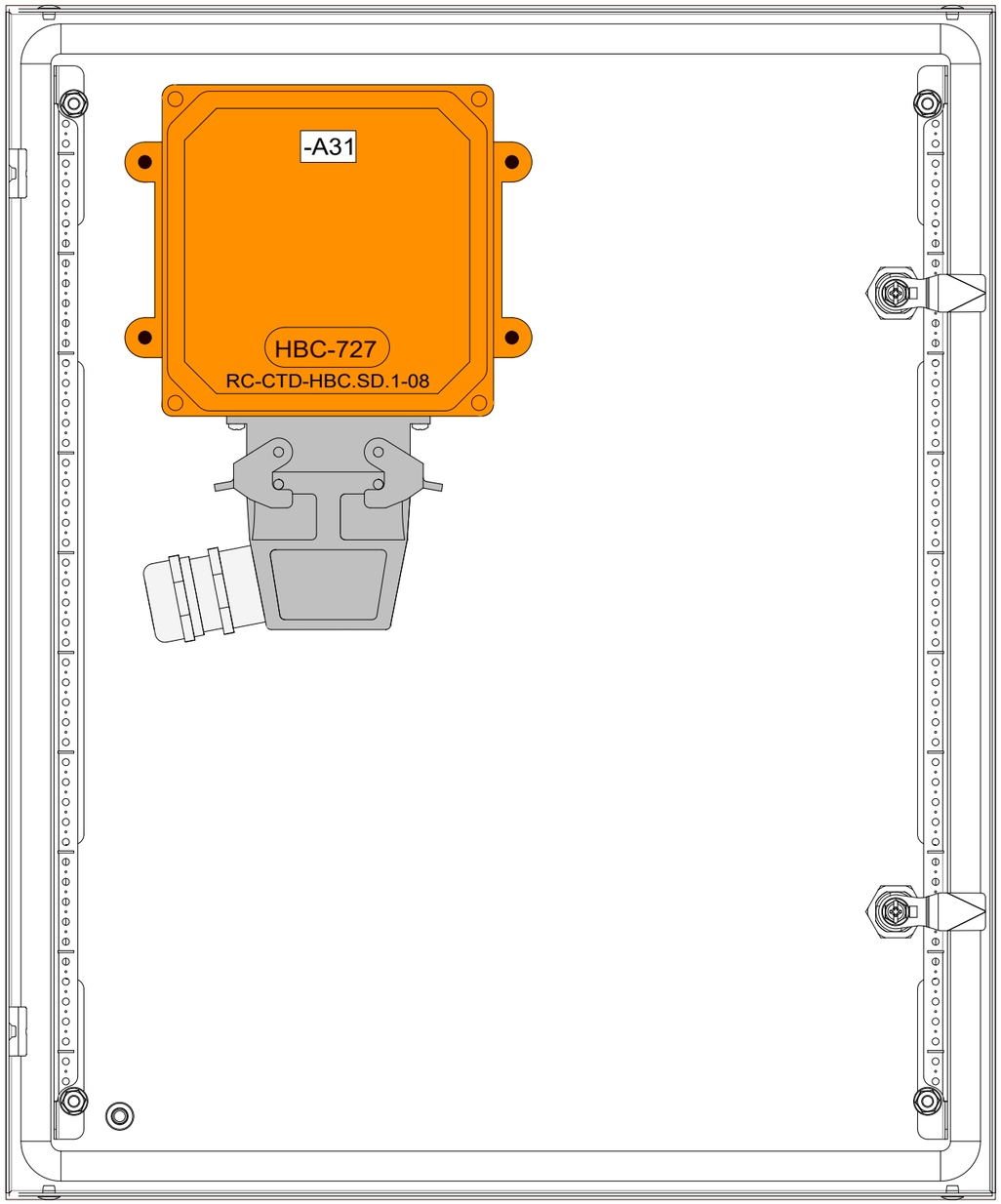
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Template:





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05	For customer review	24.02.2023	GM	Date	14.10.2021
04	For customer review	17.02.2023	GM	Drawn by	KS
03	For customer review	14.02.2023	GM	Appr. by	BK

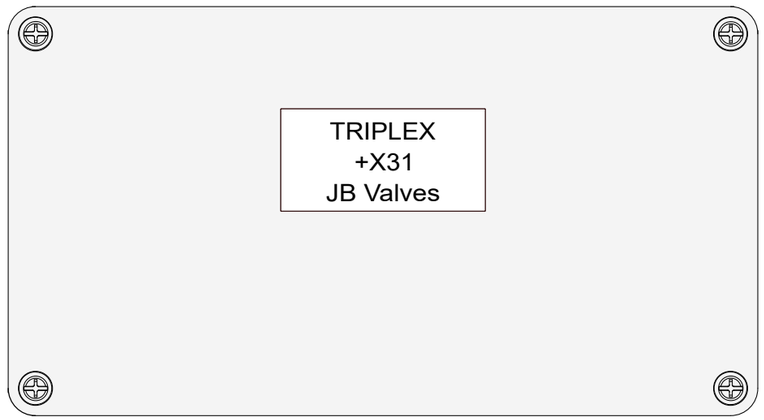
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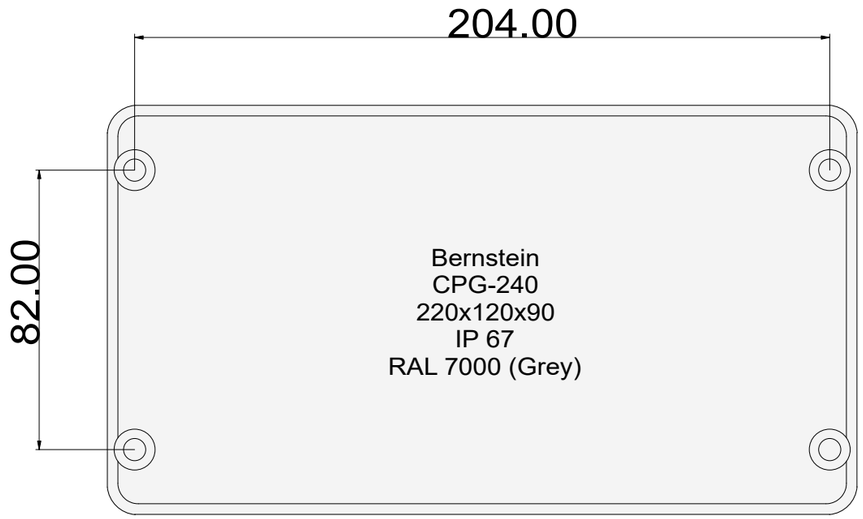
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Layout
CTD Davit
Control Cabinet Radio - Inside

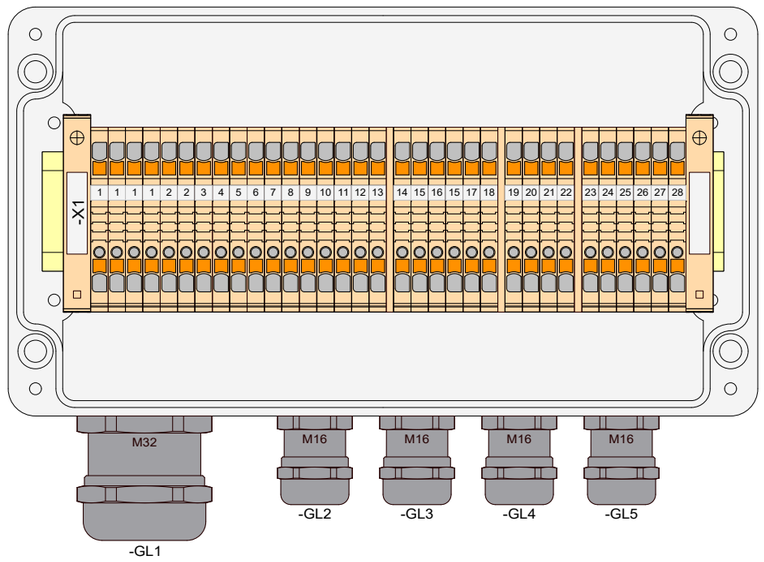
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Rev. 05
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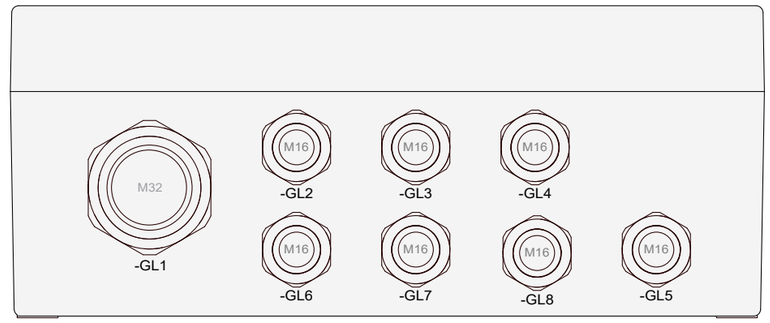




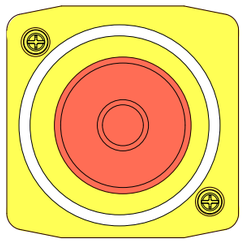
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Rear View

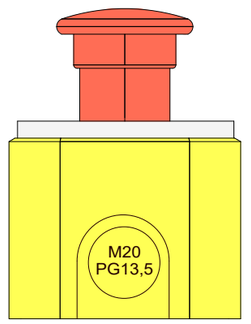


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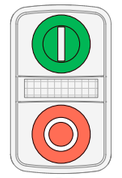


Front View

-S1



Top/Bottom View



Component installed on equipment

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04	For customer review	17.02.2023	GM	Drawn by	KS
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Layout
CTD Davit
JB Valves

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05	For customer review	24.02.2023	GM	Date	14.10.2021
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Layout
CTD Davit
RC Transmitter

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+A31

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03	For customer review	14.02.2023	GM	Appr. by	BK

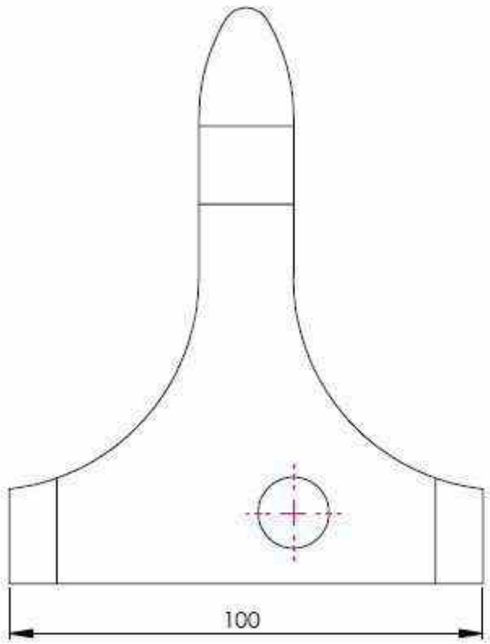
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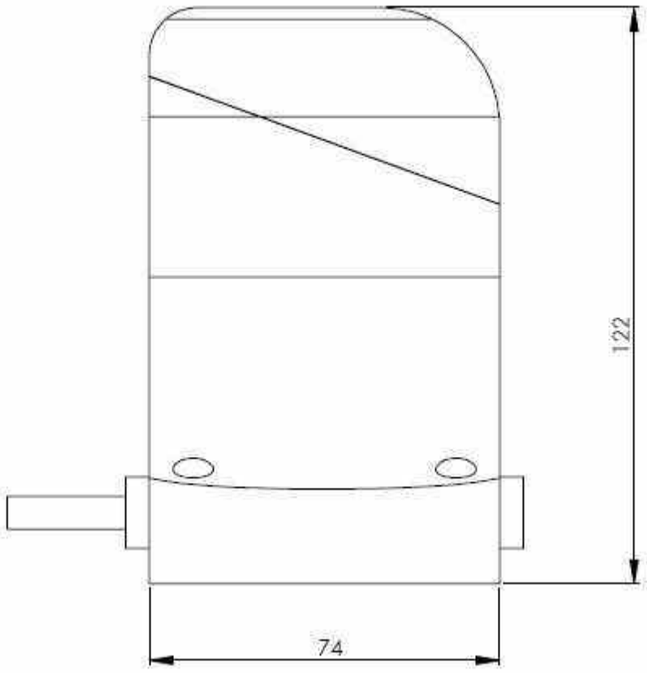
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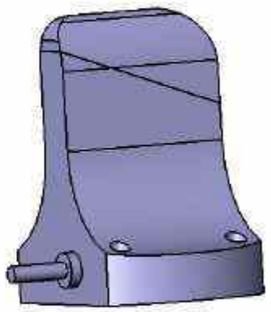
Layout
CTD Davit
RC Transmitter Side View

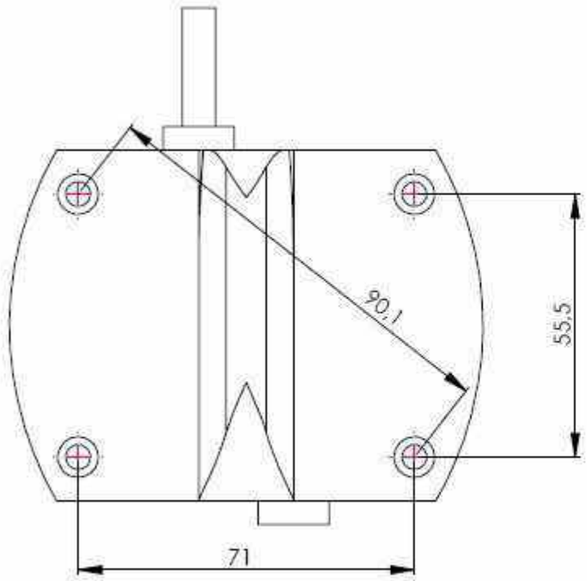
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05	For customer review	24.02.2023	GM	Date	14.10.2021
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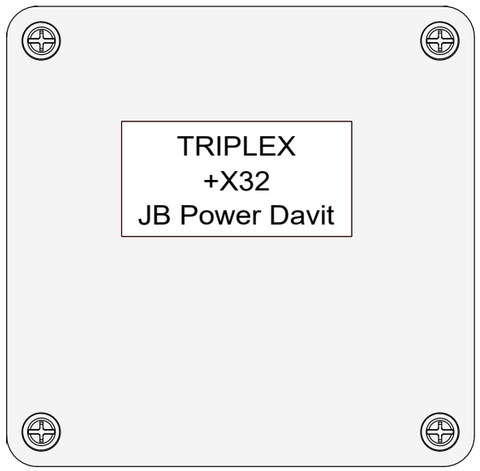
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Layout
CTD Davit
RC Antenna

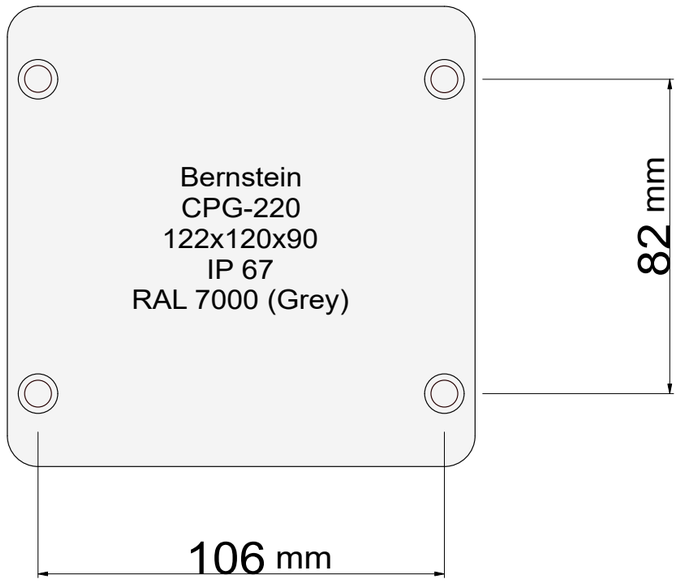
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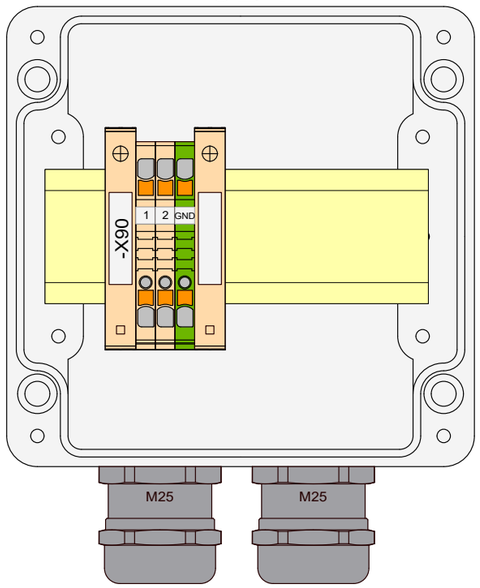
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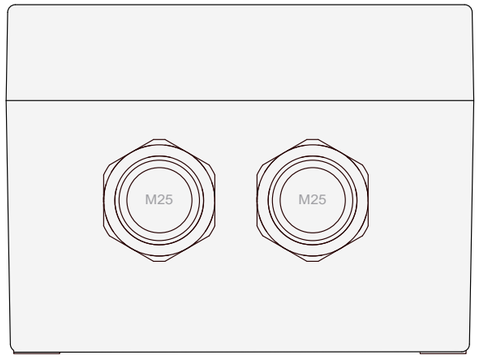
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-JB1



-JB1



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03	For customer review	14.02.2023	GM	Appr. by	BK

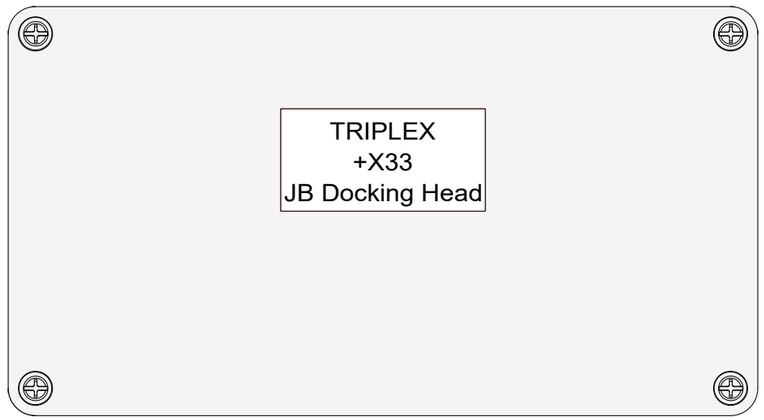
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Layout
CTD Davit
JB Interface

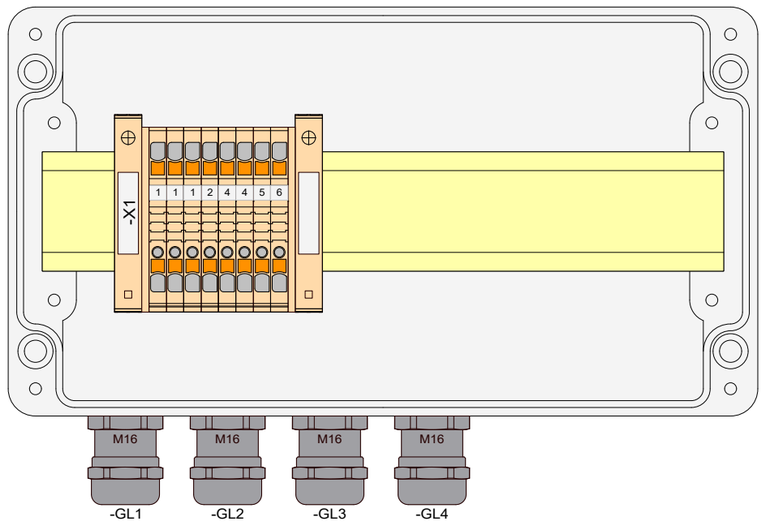
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Rev. 05
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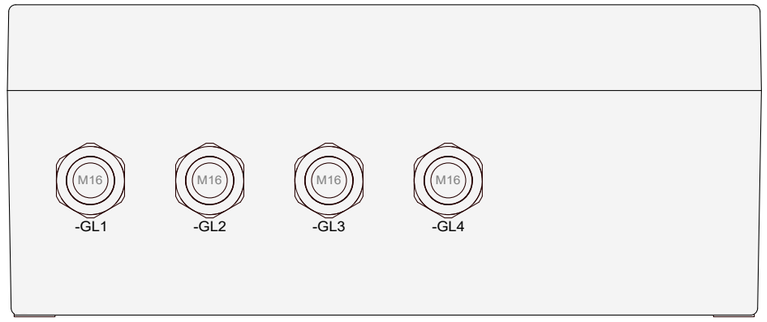




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Rear View



Component installed on equipment

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03	For customer review	14.02.2023	GM	Appr. by	BK

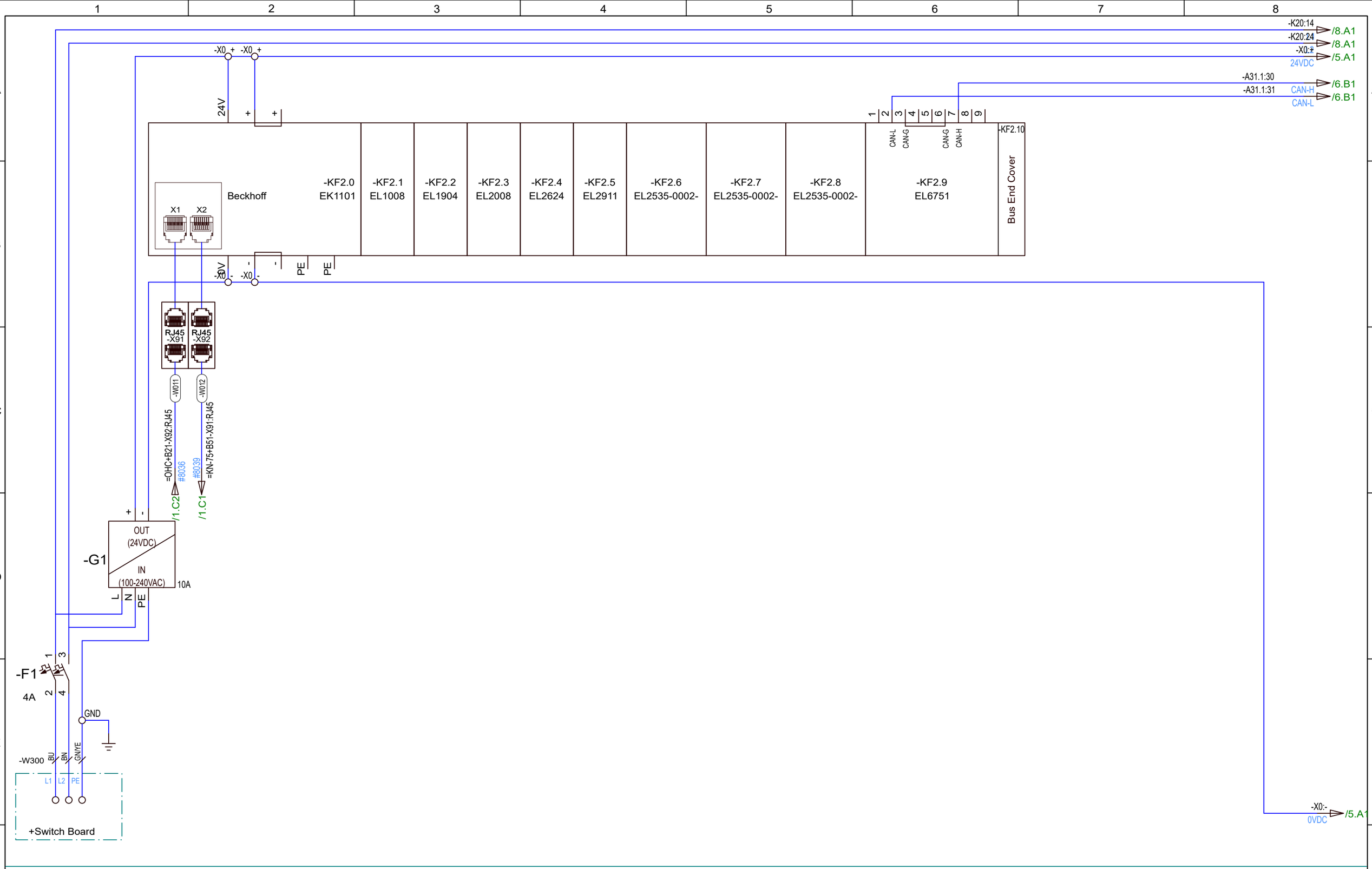
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Layout
CTD Davit
JB Docking Head

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+X33

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03	For customer review	14.02.2023	GM	Appr. by	BK

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Circuit Diagram
CTD Davit
Control Cabinet

=CTD DAVIT
+B31

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Rev. 05
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Template:

-KF2.1 Beckhoff EL1008

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Digital Input	DI1	/6.C1	Control Cabinet	Switch	CTD	Manual Control	DI	
5	Digital Input	DI2	/7.B8	Valve Bank	Switch	HPU	Start		
2	Digital Input	DI3	/7.B8	Valve Bank	Switch	HPU	Stop		
6	Digital Input	DI4	/7.B6	Docking Head	Sensor	CTD	Fully Copressed	DI	
3	Digital Input	DI5	/7.B6	Docking Head	Sensor	CTD	Half Copressed	DI	
7	Digital Input	DI6						DI	
4	Digital Input	DI7						DI	
8	Digital Input	DI8						DI	

-KF2.2 Beckhoff EL1904

Pin	Pin Description	IO Type	Ref	PLC Comment 1	PLC Comment 2	PLC Symboilic Adress
1		I1	/5.B3	Emergency Stop		DIN/DOUT
2						
3		I2	/5.B4	Emergency Stop		DIN/DOUT
4						
5		I3	/5.B1	Emergency Stop		DIN/DOUT
7		I4	/5.B1	Emergency Stop		DIN/DOUT

-KF2.3 Beckhoff EL2008

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Digital Output	DO1	/5.B4	Deck Area	Emergency Stop		Light	DO	
5	Digital Output	DO2	/6.C6	Control Cabinet	CTD	Activate CTD Davit	Relay	DO	
2	Digital Output	DO3	/7.B7	Valve Bank	Lamp	HPU	Run Light	DO	
6	Digital Output	DO4	/5.B2	Valve Bank	Emergency Stop		Light	DO	
3	Digital Output	DO5						DO	
7	Digital Output	DO6	/6.C7	Control Cabinet	Relay	CTD	DH Free/Fixed	DO	
4	Digital Output	DO7						DO	
8	Digital Output	DO8						DO	

-KF2.4 Beckhoff EL2624

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Com	RO1	/8.B2	Control Cabinet	Switch	Floodlight	ON	RO	NO
2	Relay Output NO								
5	Com	RO2						RO	NO
6	Relay Output NO								
3	Com	RO3						RO	NO
4	Relay Output NO								
7	Com	RO4						RO	NO
8	Relay Output NO								

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Circuit Diagram
CTD Davit
IO List

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-KF2.5 Beckhoff EL2911

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	+	DIO1							
2	-								
5	+	DIO2							
6	-								
3	+	DIO3							
4	-								
7	+	DIO4							
8	-								
4`	+	DIO5							
3`	-								
8`	+	DIO6							
7`	-								
2`	+	DIO7	/7.B1	Valve Bank	CTD	Stop Valve	OUT		
3`	-								
6`		DIO8							
7`	-								

-KF2.6 Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/7.B2	Valve Bank	Valve	Telescope	In	AO+	PWM
5	PWM Output A2								
3	0Va								
4	Digital Input	DI1	/7.B3					DI	
2	PWM Output B1	PWM2		Valve Bank	Valve	Telescope	Out	AO+	PWM
6	PWM Output B2								
7	0Vb								
8	Digital Input	DI2						DI	

Rev.	Description	Date	Rev. by	Standard	
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Circuit Diagram
CTD Davit
IO List

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-KF2.7 — Beckhoff EL2535-0002-

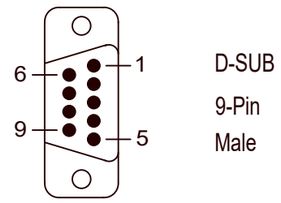
Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/7.B3	Valve Bank	Valve	Tilt	In	AO+	PWM
5	PWM Output A2								
3	0Va								
4	Digital Input	DI1	/7.B4					DI	
2	PWM Output B1	PWM2		Valve Bank	Valve	Tilt	Out	AO+	PWM
6	PWM Output B2								
7	0Vb								
8	Digital Input	DI2						DI	

-KF2.8 — Beckhoff EL2535-0002-

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	PWM Output A1	PWM1	/7.B4	Valve Bank	Valve	Docking Head	In	AO+	PWM
5	PWM Output A2								
3	0Va								
4	Digital Input	DI1	/7.B4					DI	
2	PWM Output B1	PWM2		Valve Bank	Valve	Docking Head	Out	AO+	PWM
6	PWM Output B2								
7	0Vb								
8	Digital Input	DI2						DI	

-KF2.9 — Beckhoff EL6751

DSUB-9	Pin Description	IO Type	Ref
1		CAN	/1.B6
2	CAN-L		
3	CAN-G		
4			
5			
6	CAN-G		
7	CAN-H		
8			
9			



Rev.	Description	Date	Rev. by		
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Circuit Diagram
CTD Davit
IO List

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/1.A8 -X0:+ 24VDC
/1.E8 -X0:- 0VDC

-X0 -

-X0 -

/6.C1 -X0:+ 24VDC
/6.E1 -X0:- 0VDC

-KF2.2
Emergency Stop
DIN/DOUT
/1.B3
I3
+ -
5

-KF2.2
Emergency Stop
DIN/DOUT
/1.B3
I4
+ -
7

-KF2.3 DO4
Valve Bank
Emergency Stop
Light
DO
6

-KF2.2
Emergency Stop
DIN/DOUT
/1.B3
I1
+ -
1 2

-KF2.2
Emergency Stop
DIN/DOUT
/1.B3
I2
+ -
3 4

-KF2.3 DO1
Deck Area
Emergency Stop
Light
DO
1

-X3 23 24 25 26 27 28

-X3 31 32 33 34 35 36

-W305 23 24 25 26 27 28

-WI-09 1 2 3 4 5 6

+Z33

+X31

23 24 25 26 27 28

-WI-01 1 2 3 4 5 6

-S1 21 22

-S1 23 24

-S1 X1 X2

Valve Bank

+Z30

-S2 21 22

23 24

X1 X2

Deck Equipment Area

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03	For customer review	14.02.2023	GM	Appr. by	BK
Rev.	Description	Date	Rev. by	Standard	

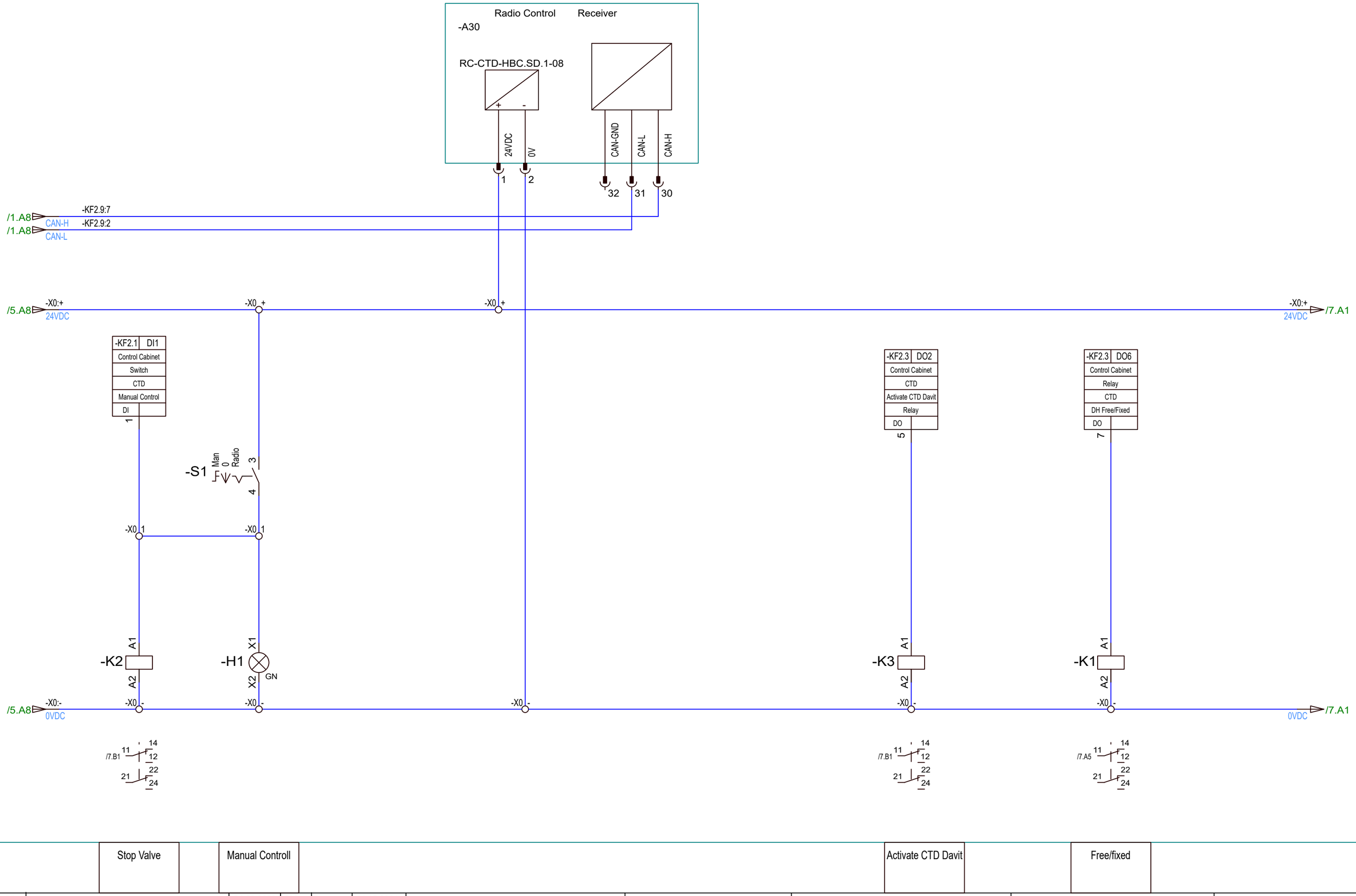
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Circuit Diagram
CTD Davit
Control Cabinet

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Rev.	Description	Date	Rev. by		
05	For customer review	24.02.2023	GM	Date	14.10.2021
04	For customer review	17.02.2023	GM	Drawn by	KS
03	For customer review	14.02.2023	GM	Appr. by	BK
				Standard	

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Circuit Diagram
CTD Davit
Control Cabinet

=CTD DAVIT
+B31

E-4503 - 04
Rev. 05
6 / 8

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Template:

/6.C8 /6.E8 -X0:+ 24VDC -X0 - 0VDC

-X0 + -X0 + -X0 + -X0:+ 24VDC 0VDC /8.B1 /8.E1

-KF2.5	DIO7
Valve Bank	
CTD	
Stop Valve	
OUT	

+ 2 - 3 /1.B4

-KF2.6	PWM1	-KF2.6	PWM2
Valve Bank		Valve Bank	
Valve		Valve	
Telescope		Telescope	
In		Out	
AO+	AO-	AO+	AO-

1 5 2 6

-KF2.7	PWM1	-KF2.7	PWM2
Valve Bank		Valve Bank	
Valve		Valve	
Tilt		Tilt	
In		Out	
AO+	AO-	AO+	AO-

1 5 2 6

-KF2.8	PWM1	-KF2.8	PWM2
Valve Bank		Valve Bank	
Valve		Valve	
Docking Head		Docking Head	
In		Out	
AO+	AO-	AO+	AO-

1 5 2 6

-K2 /6.E1 14 11

-K3 /6.E6 14 11

-K1 /6.E7 14 11

-KF2.1	DI4
Docking Head	
Sensor	
CTD	
Fully Copressed	
DI	

6

-KF2.1	DI5
Docking Head	
Sensor	
CTD	
Half Copressed	
DI	

3

-KF2.3	DO3
Valve Bank	
Lamp	
HPU	
Run Light	
DO	

2

-KF2.1	DI2
Valve Bank	
Switch	
HPU	
Start	

5

-KF2.1	DI3
Valve Bank	
Switch	
HPU	
Stop	

2

-X3 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

-W305 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

+Z33

+X31

-X1 1 2 2 1 3 4 5 6 7 8 9 10 11 12 13 1 14 15 16 17 18 1 19 20 21 22

-WI-03 BU BN -WI-04 2 1

-H1 X1 X2 YE

-Y1 -WI-04 2 1

-WI-05 BU BN GY

-Y2 2 3 B A 1

-WI-06 BU BN GY

-Y3 2 3 B A 1

-WI-02 BU BN GY

-Y4 2 3 B A 1

-WI-07 1 2 4 5 6

+Z32
Docking Head

+X33

-X1 1 -X1 2 -X1 4 -X1 5 -X1 6

-X1 1 -X1 1 -X1 1

-WI-08 BN BU

-Y6.1 2 1

-WI-11 BU BN WH

-B1 3 1 4 2 L- L+ NO NC PNP

-WI-12 BU BN WH

-B2 3 1 4 2 L- L+ NO NC PNP

CPH Active Light	CPH Stop Valve		Telescope		Tilt		Docking Head		DH Free/fixed	Docking Head Fully Compressed	Docking Head Half Compressed
			2 In	3 Out	2 In	3 Out	2 In	3 Out			

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04	For customer review	17.02.2023	GM	Drawn by	KS
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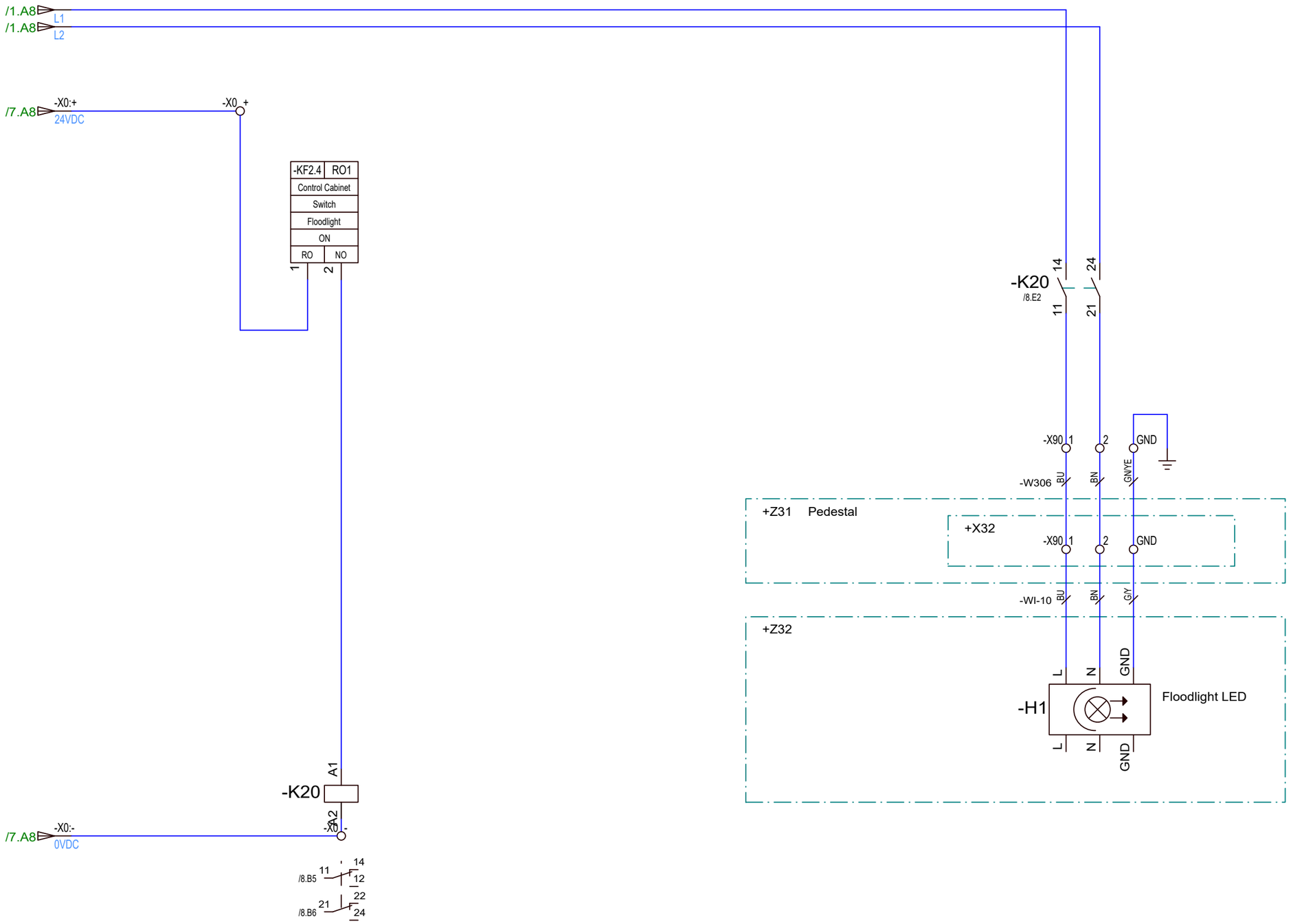
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Circuit Diagram
CTD Davit
Control Cabinet

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Floodlight

Floodlight LED

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03	For customer review	14.02.2023	GM	Appr. by	BK

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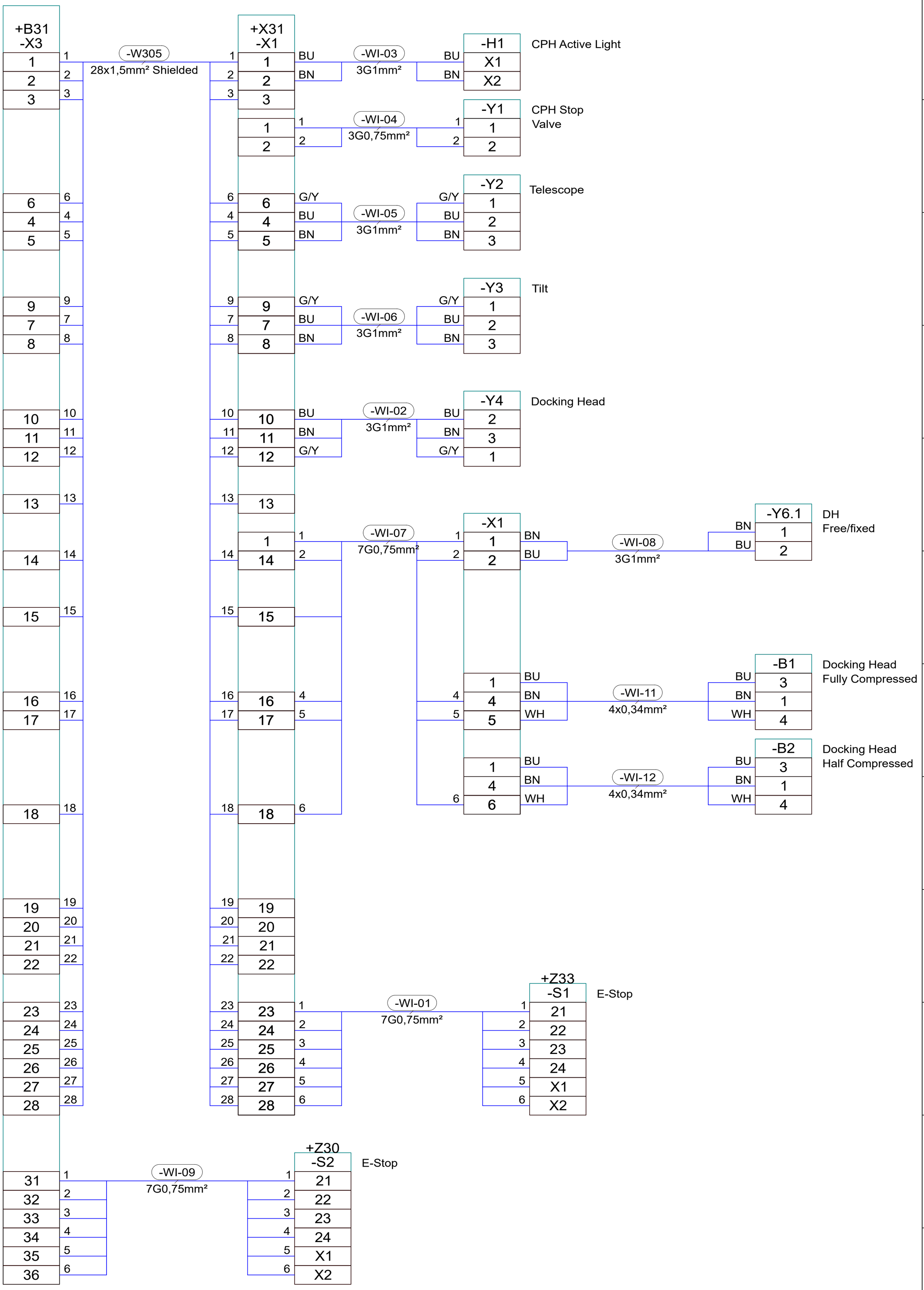
Circuit Diagram
CTD Davit
Control Cabinet

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Template:



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04	For customer review	17.02.2023	GM	Drawn by	KS
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Termination Diagram
CTD Davit

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Rev. 05

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-WI-01,-WI-07,-WI-09	ROFLEX 7G0.75	07915015		3	Pcs	CABLE, 7G0,75mm²	Lapp	
-WI-02,-WI-03,-WI-05,-WI-06,-WI-08,-WI-10	ROFLEX 3G1	07915017		6	Pcs	CABLE, 3G1mm²	Lapp	
-WI-04	7074-18021-2360500	07930051		1	Pcs	CONNECTOR, VALVE, MURR, 5M, SS	Murr	
-WI-11,-WI-12	V1-WV4A-5M-PUR	07917043		2	Pcs	SENSOR, CABLE, M12, 4-PIN, ANGLE, 5M	Pepperl & Fuchs	

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Part List
CTD Davit

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Rev. 05

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Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-A31	RC-CTD-HBC.SD.1-08	400198451		1	Pcs	CTD-Davit 08	HBC	
-CAB1	ADO201	07939034	24 138 75	1	Pcs	CABINET, DOORSTOPPER, ADO, ELDON	Eldon	
-CAB1	MAS0605030	400089006	24 174 95	1	Pcs	CABINET, 600x500x300 ELDON*	Eldon	
-DUCT1..-DUCT4	HA760040	07920015	12 857 18	1.222	M	CABLE TRAY, 60X40, GREY, W/LID	Tehalit Hager	
-DUCT5	HA760025	07920014	12 857 17	0.2	M	CABLE TRAY, 60X25, GREY, W/LID	Tehalit Hager	
-F1	iC60H/C 02-2	07938004	16 760 61	1	Pcs	FUSE, AUTOMAT, 2A, 2-POLE, C	Schneider	
-G1	CS10.241	07949016	66 040 29	1	Pcs	POWER SUPPLY, PULSE, 10A, 230/24	Puls	
-GL1	WADI-TEC EMC M40 Ø24-30	400075304	12 492 78	1	Pcs	CABLE GLAND, BRASS, EMC, Ø24-30	Elis	
-GL3,-GL4	WADI-TEC EMC M32 Ø17-24	07928087	12 492 76	2	Pcs	CABLE GLAND, BRASS, EMC, Ø17-24	Elis	
-GL5,-GL6	WADI-TEC EMC M25 Ø10-14.5	07928084	12 492 70	2	Pcs	CABLE GLAND, BRASS, EMC, Ø10-14,5	Elis	
-GL8..-GL10	WADI-TEC EMC M20 Ø8-12.5	07928083	12 492 68	3	Pcs	CABLE GLAND, BRASS, EMC, Ø8-12,5	Elis	
-H1	ZBVB3	07924016	43 032 26	1	Pcs	LAMP, LED, GN, 24V	Schneider	
-K1..-K3,-K20	C7A20FX24D	07936015	43 783 87	4	Pcs	RELAY, RELECO, 2-POLE, 24V DC, 10A	Releco	
-K1..-K3,-K20	S7-I/O			4	Pcs	RELAY, SOCKET	Releco	
-KF2.0	EK1101	400142335		1	Pcs	EtherCAT Coupler w ID settings	Beckhoff	
-KF2.1	EL1008	400142339		1	Pcs	8 Digital Inputs	Beckhoff	
-KF2.2	EL1904			1	Pcs	TwinSAFE 4 Digital Inputs	Beckhoff	
-KF2.3	EL2008	400142342		1	Pcs	8 Digital Outputs	Beckhoff	
-KF2.4	EL2624	400142344		1	Pcs	4 Relay Outputs	Beckhoff	
-KF2.5	EL2911	400142346		1	Pcs	TwinSAFE 4 Digital Inputs, 1x Output	Beckhoff	
-KF2.6,-KF2.7,-KF2.8	EL2535-0002-	400142343		3	Pcs	2 PWM Outputs, 2 Digtal Inputs	Beckhoff	
-KF2.9	EL6751	400142409		1	Pcs	CANopen master/slave terminal	Beckhoff	
-KF2.10	EL9011	400142410		1	Pcs	Bus end cap	Beckhoff	
-RAIL1..-RAIL4	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	1.323	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-S1	ZB4BK1333	07960019	43 025 24	1	Pcs	CONTR. SWITCH, 3 POS, LED GN	Schneider	
-S1	ZB4BZ009	07961012	43 027 45	1	Pcs	CONTR. ACC, SOCKET, METAL	Schneider	
-S1	ZBE101	07961013	43 004 23	2	Pcs	CONTR. ACC, CONTACTBLOCK, 1NO	Schneider	
-TAG1	US-EMLP 100X60 4 Line	07958308		1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-TAG2	US-EMLP-HA 24	400075270		1	Pcs	TAG, SIGN, THERMOMARK CARD	Phoenix Contact	
-X0	AEP 3C 2.5	400069937	12 694 11	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X0	AEP AP12			1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X0 (1,1)	A3C 2.5	400069932	12 654 01	2	Pcs	TERMINAL BLOCK, SNAP-IN, DOUBLE	Weidmüller	
-X0 (-)	AAP12 10/4X2.5 LO-LI BL			1	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	

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Part List
CTD Davit

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+B31

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Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-X0 (-,-,-,-,2)	AAP12 2.5 LI BL			5	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (+)	AAP12 10/4X2.5 LO-LI RD			1	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (+,+,+)	AAP12 2.5 LI RD			3	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (GND)	JORDSKINNE 21	07918007		1	Pcs	RAIL, GRN, BRASS, 21 SLOT	Weidmüller	
-X0 (GND)	WPE 4	07918003	12 688 16	1	Pcs	-TERMINAL BLOCK, GND, 101010	Weidmüller	
-X0 (GND,GND)	A3C 2.5 PE	400074010	12 654 16	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	
-X0,-X3,-X90	AEB 35 SC/1	400073887	12 654 34	8	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X3	AEP 3T 2.5	400209845	12 694 40	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X3 (1,4,7,10,13,16,19,22,25, 28,31,34)	A3T 2.5			12	Pcs	TERMINAL BLOCK, SNAP-IN, THREE HIGHTS	Weidmüller	
-X90 (1-2)	A2C 2.5	400069931	12 654 00	2	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X90 (GND)	A2C 2.5 PE	400074009	12 654 15	1	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	
-X91,-X92	IE-TO-RJ45-FJ-B	07930061		2	Pcs	CONNECTOR, FEMALE, RJ45, RAIL MOUNT	Weidmüller	

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Part List
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Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1	ST-M 32 x 1.5	07928035	12 477 16	1	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø17-25	Lapp	
-GL2..-GL8	ST-M 16 x 1.5	07928032	12 477 13	7	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3,5-8	Lapp	
-JB1	CPG-240	07904004		1	Pcs	JUNCTION BOX, POLYESTER, 220x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.2	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEP 2C 2.5	400069933	12 694 10	3	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1,1,1,1-2,2-15,15-28),-X2 (1-2)	A2C 2.5	400069931	12 654 00	35	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X1,-X2	AEB 35 SC/1	400073887	12 654 34	4	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	

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05	For customer review	24.02.2023	GM	Date	14.10.2021
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Part List
CTD Davit

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+X31

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1,-GL2	ST-M 25 x 1.5	07928034	12 477 15	2	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø12-18	Lapp	
-JB1	CPG-220	07904002		1	Pcs	JUNCTION BOX, POLYESTER, 122x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.1	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X90	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X90 (1-2)	A2C 2.5	400069931	12 654 00	2	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X90 (GND)	A2C 2.5 PE	400074009	12 654 15	1	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	

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Part List
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1..-GL4	ST-M 16 x 1.5	07928032	12 477 13	4	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3,5-8	Lapp	
-JB1	CPG-240	07904004		1	Pcs	JUNCTION BOX, POLYESTER, 220x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.2	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1	AEP 2C 2.5	400069933	12 694 10	2	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1,1,1-2,4,4-6)	A2C 2.5	400069931	12 654 00	8	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-S2	XALK178W3B140G	400208317	4322660	1	Pcs	CONTR. PUSH, EM STOP	Schneider	

Rev.	Description	Date	Rev. by	Standard	
05	For customer review	24.02.2023	GM	Date	14.10.2021
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Part List
CTD Davit

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+Z30

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Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-S2	XB4BW73731B5_Mod	07961026	43 014 04	1	Pcs	CONTR. PUSH BUTTON, DOUBLE, I - 0 W/LED	Schneider	

Rev.	Description	Date	Rev. by	Standard	
05	For customer review	24.02.2023	GM	Date	14.10.2021
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Part List
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Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-B1,-B2	NBN40-L2-A2-V1	07917215		2	Pcs	SENSOR, PROX, 40X40, NO/NC, SN40, M12	Pepperl & Fuchs	
-H1	FL60 9000 850 120 M24 MB	400072975		1	Pcs	FLOODLIGHT, LED, 80W, 120V, MEDIUM BEAM	Glamox	
-Y6.1	HAWE STOP VALVE			1	Pcs	VALVE, ON/OFF	Hawe	

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Part List
CTD Davit

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-H1	853 310 55	07959005		1	Pcs	LAMP, BEACON, LED, YE, FLASH, 24V	Werma	
-S1	XALK178W3B140G	400208317	4322660	1	Pcs	CONTR. PUSH, EM STOP	Schneider	
-Y1	HAWE STOP VALVE			1	Pcs	VALVE, ON/OFF	Hawe	
-Y2..-Y4	HAWE PROP VALVE			3	Pcs	VALVE, PROPOTIONAL	Hawe	

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Template:

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Customer : CNP Freire
Ship/Hull : MBARI
Project no. : 4/60185
Drawing no.: E-4505

Rev.	Description	Date	Rev. by		
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	01.03.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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Deck Crane AUV

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+Z50 Deck Equipment Area

All cables tagged WI are pre-installed by vendor.

+Z52 Crane Body

+B51
Control Cabinet

A minimum of 1,5m spare cable inside cabinet.

-W502 Coax RG58U

-A1.2

+B51

+Z51 Pedestal

+Z53 Valve Bank

+X51
JB Valves

-WI-01	12G0,75mm²	-S1	Function Stop
-WI-03	3G0,75mm²	-Y0	Stop Valve
-WI-04	3G1mm²	-Y1	Swing Valve
-WI-05	3G1mm²	-Y2	Boom Valve
-WI-06	3G1mm²	-Y3	Jib Valve
-WI-07	3G1mm²	-Y4	Winch 1 Valve
-WI-08	3G1mm²	-Y5	Winch DH Valve
-WI-09	3G1mm²	-Y6	Slewing DH Valve
-WI-10	3G1mm²	-Y7	Tilting DH Valve
-WI-23	3G0,75mm²	-Y8	M Boom Down Stop
-WI-24	3G0,75mm²	-Y9	Jib Out (Up) Stop
-WI-25	3G0,75mm²	-Y10	Jib In (Down) Stop
-WI-26	3G0,75mm²	-Y11	Heavy Lift Active
-WI-02	3G1mm²	-H1 YE	Heavy Lift Active Lamp
-WI-11	3G1mm²		
-WI-14	12G0,75mm²		

-W503 28x1,5mm² Shielded

1x120V/60Hz -W501 3G2,5mm²

+B52 /2.A6

-Docking Head

+X54
CPG-220
HxWxD:122x120x90
ID:
400218595

-WI-12	3G1mm²	-Y7.1	DH Tilt Float
-WI-13	3G1mm²	-Y7.2	DH Tilt Float

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	01.03.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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MBARI

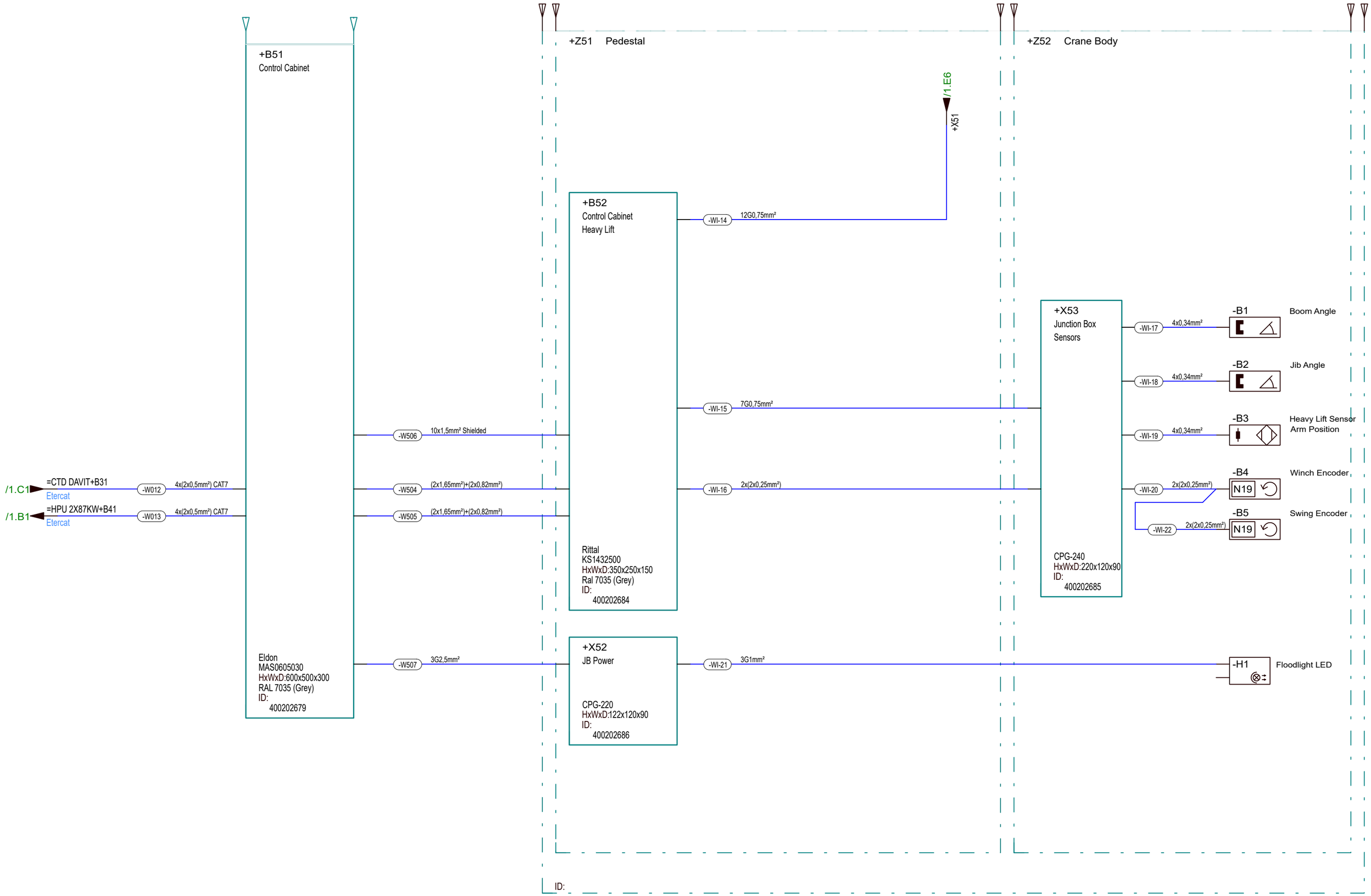
TRIPLEX
A MacGregor company

Single Line
Deck Crane AUV

=KN-75

E-4505 - 01

Rev. 04 1 / 2



Rev.	Description	Date	Rev. by		
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	01.03.2023	GM	Drawn by	KS
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Single Line
Deck Crane AUV

=KN-75

E-4505 - 01

Rev. 04

2 / 2

-CAB1

Triplex
Control Cabinet
KN-75
+B51







04	Issued for production	07.07.2023	GM	Date	14.10.2021
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02	For customer review	29.08.2022	RSI	Appr. by	EE
Rev.	Description	Date	Rev. by	Standard	

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CNP Freire
MBARI

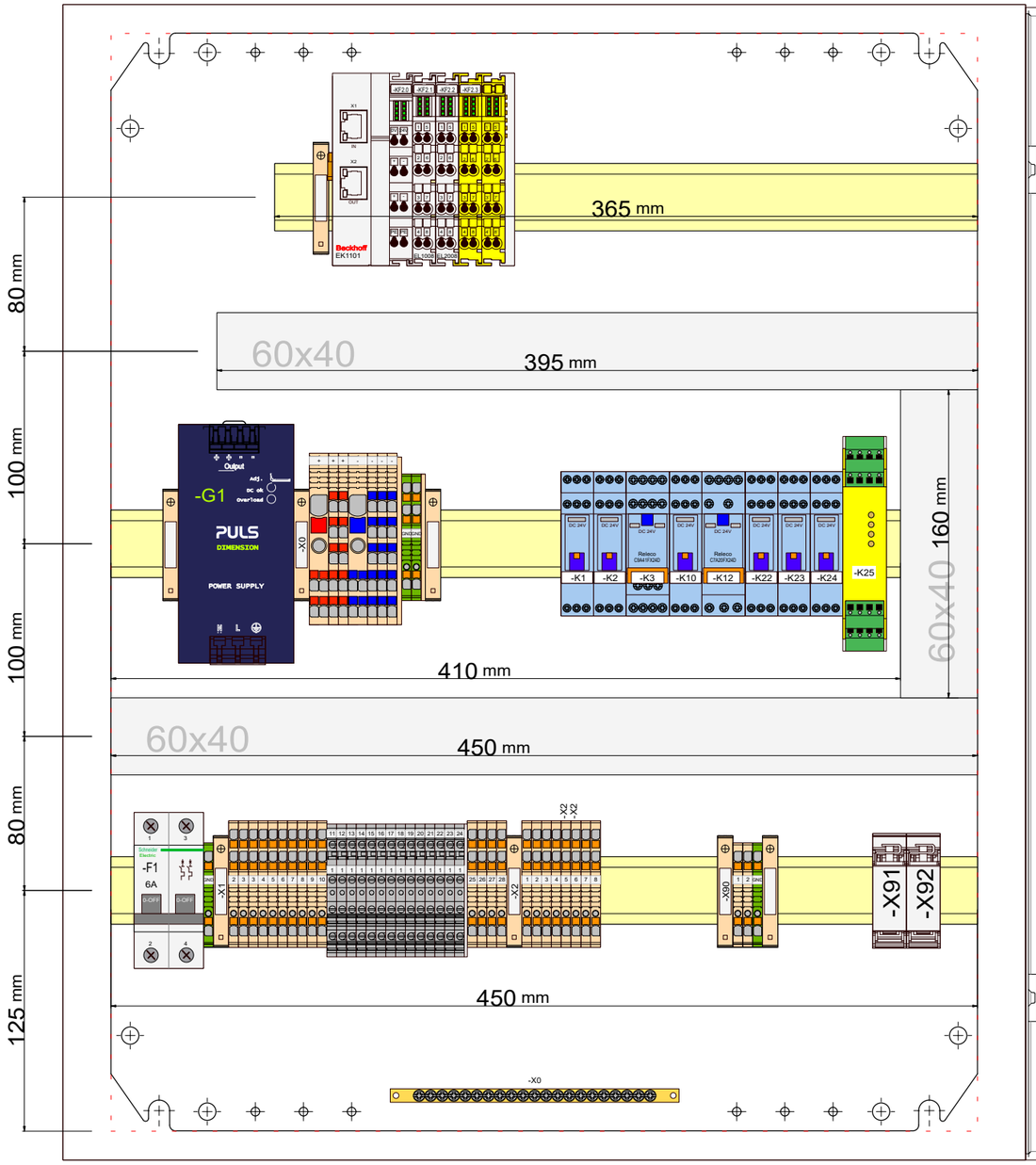
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A MacGregor company

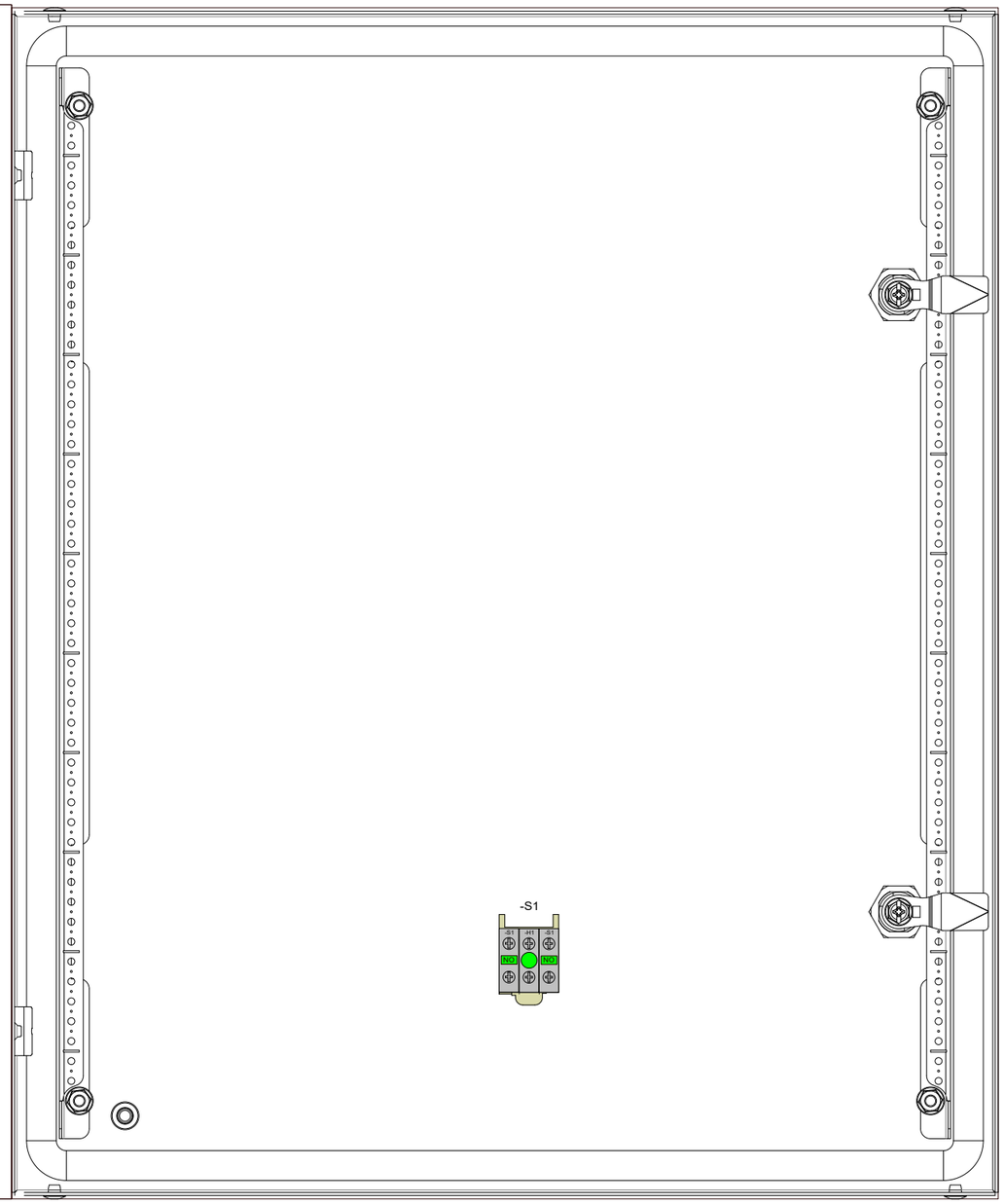
Layout
Deck Crane AUV
Control Cabinet Radio - Outside

=KN-75
+B51

E-4505 - 03
Rev. 04
1 / 11

-CAB1





Door Inside

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	01.03.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

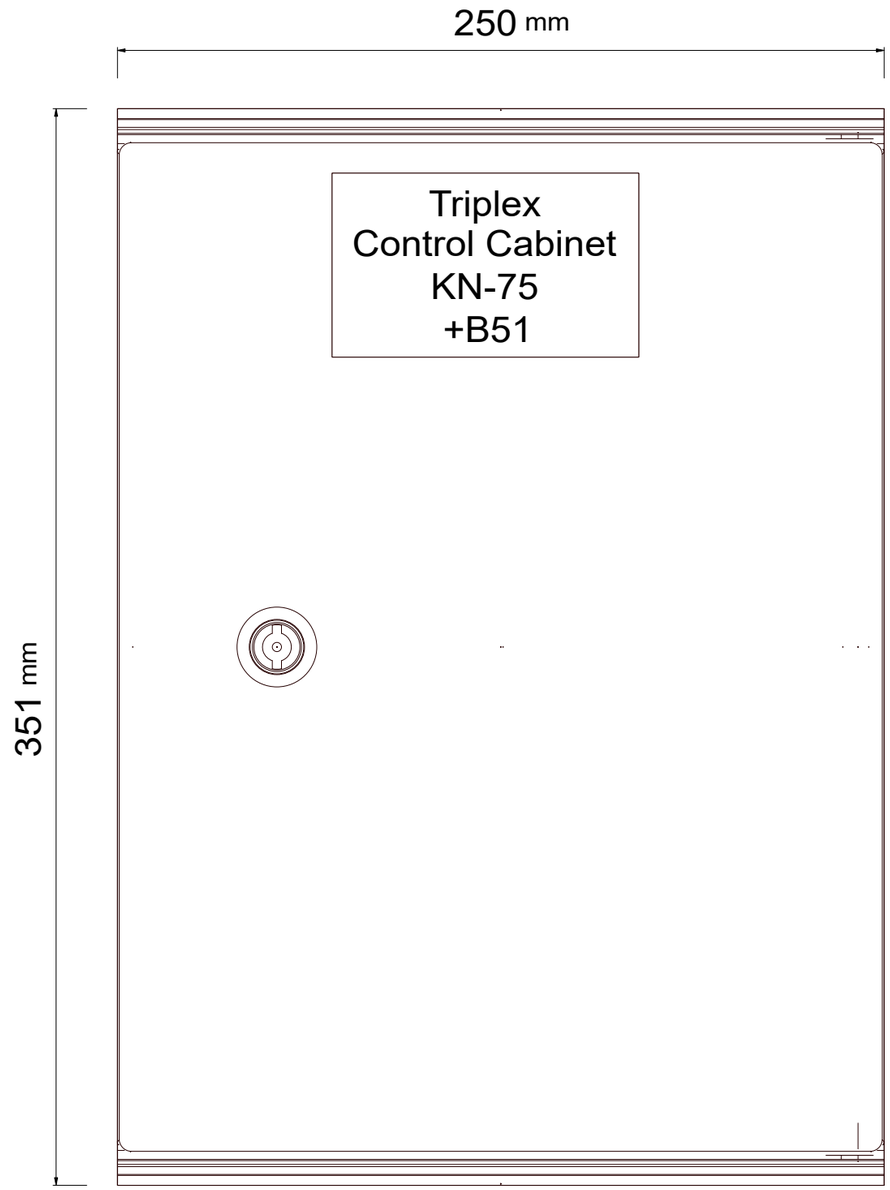
4/60185
CNP Freire
MBARI

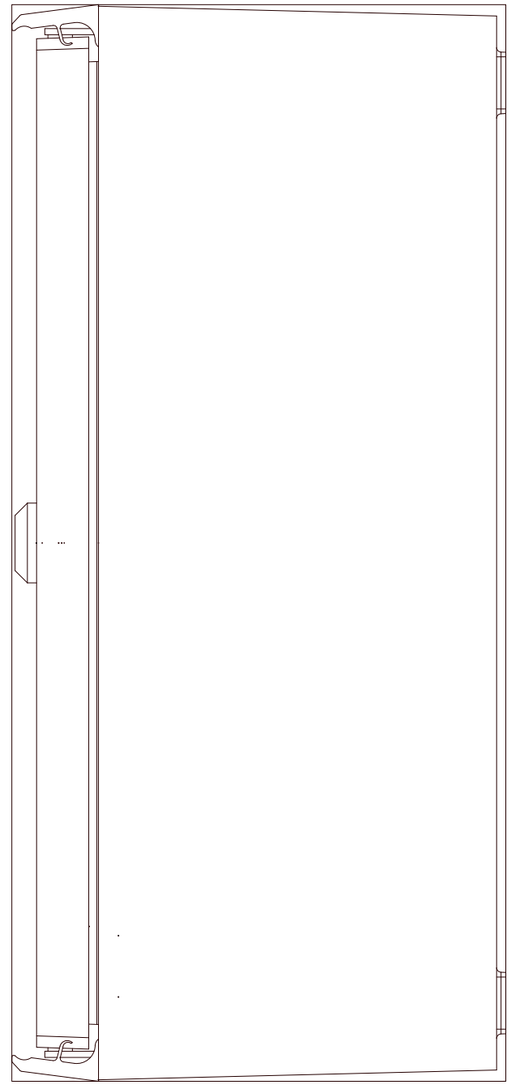
TRIPLEX
A MacGregor company

Layout
Deck Crane AUV
Control Cabinet Radio - Inside

=KN-75
+B51

E-4505 - 03
Rev. 04
2 / 11





Component installed on equipment

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CNP Freire
MBARI

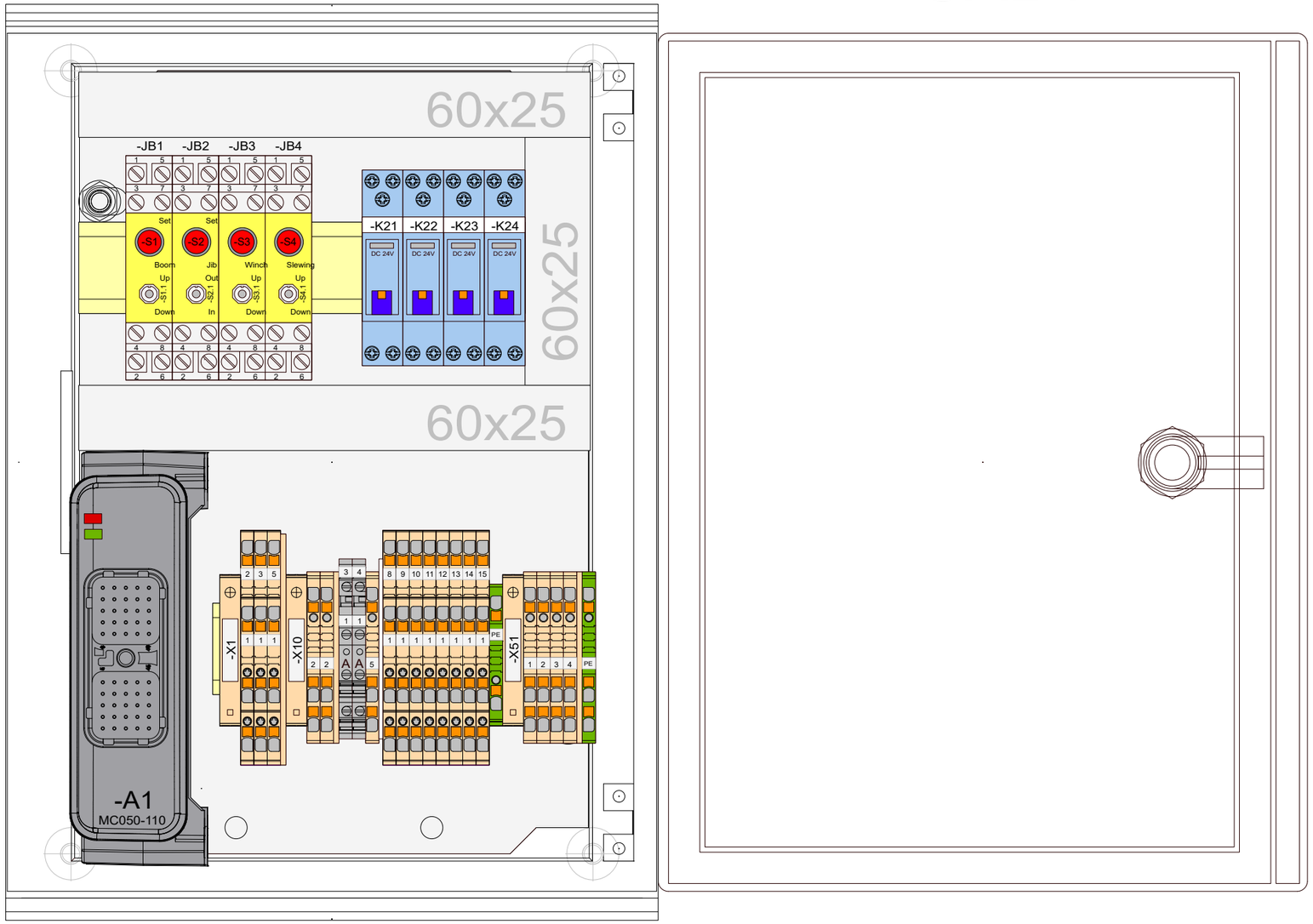
TRIPLEX
A MacGregor company

Layout
Deck Crane AUV
Control Cabinet Heavy Lift

=KN-75
+B53

E-4505 - 03
Rev. 04
3 / 11

-CAB1



Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
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TRIPLEX
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Layout
Deck Crane AUV
Control Cabinet Heavy Lift

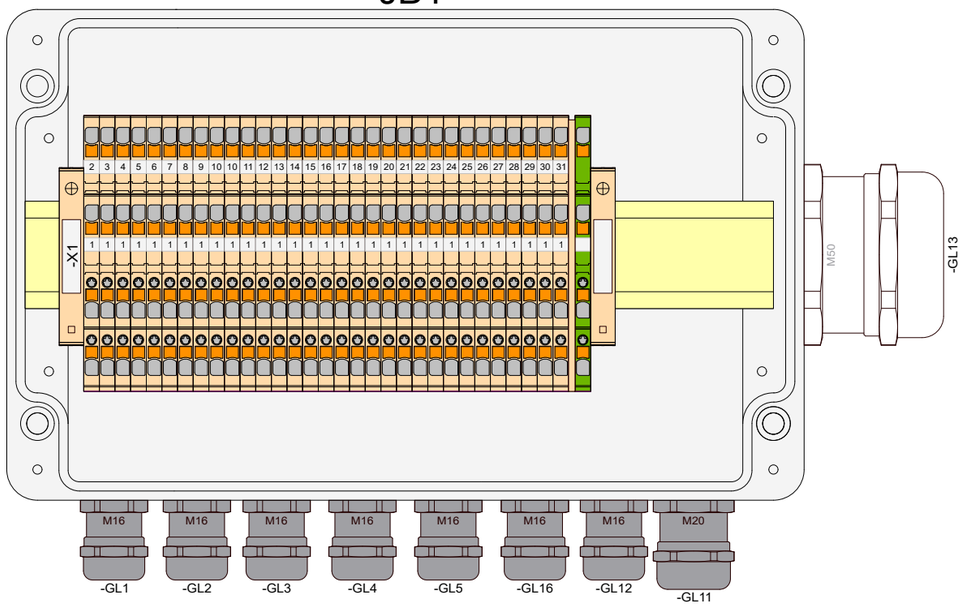
=KN-75
+B52

E-4505 - 03
Rev. 04
4 / 11

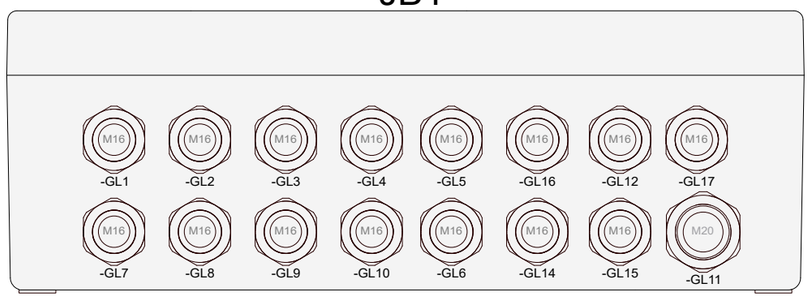
-JB1

+X51
Junction Box
Valves

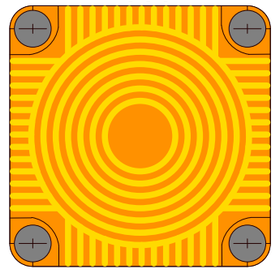
-JB1



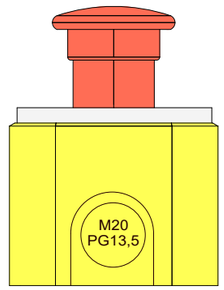
-JB1



-H1

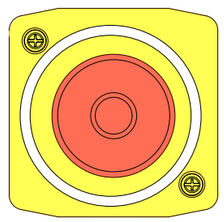


-S1



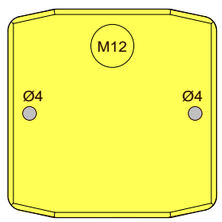
Top/Bottom View

-S1



Front View

-S1



Rear View

Component installed on equipment

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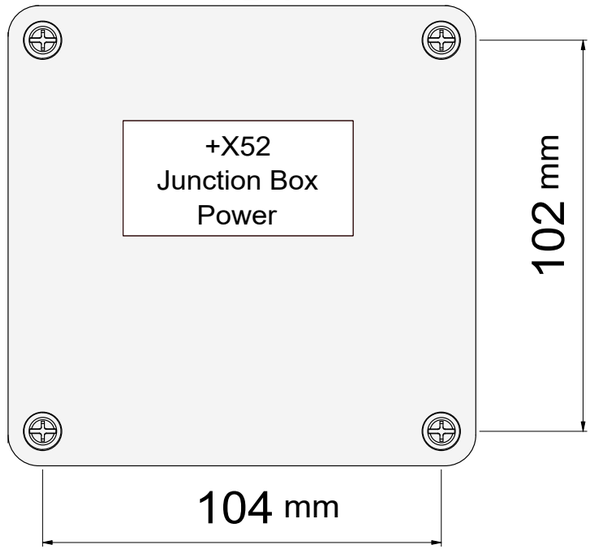
TRIPLEX
A MacGregor company

Layout
Deck Crane AUV
JB Valves

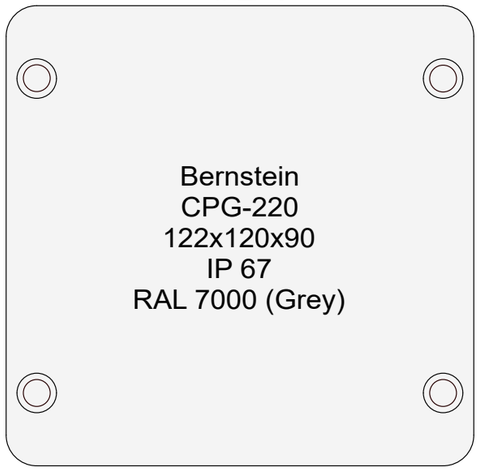
=KN-75
+X51

E-4505 - 03
Rev. 04
5 / 11

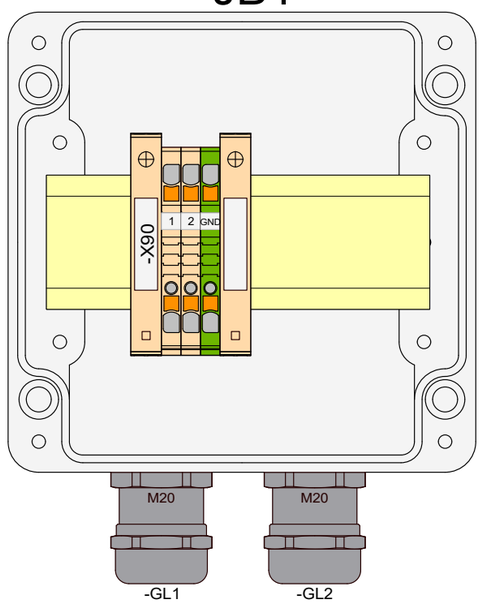
-JB1



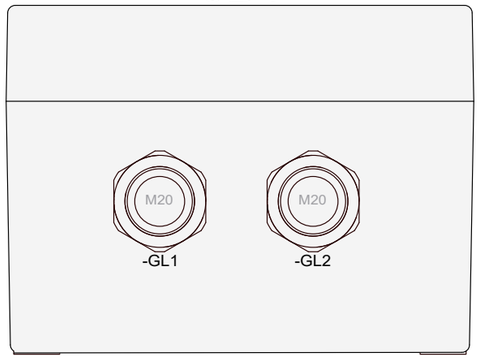
-JB1



-JB1



-JB1



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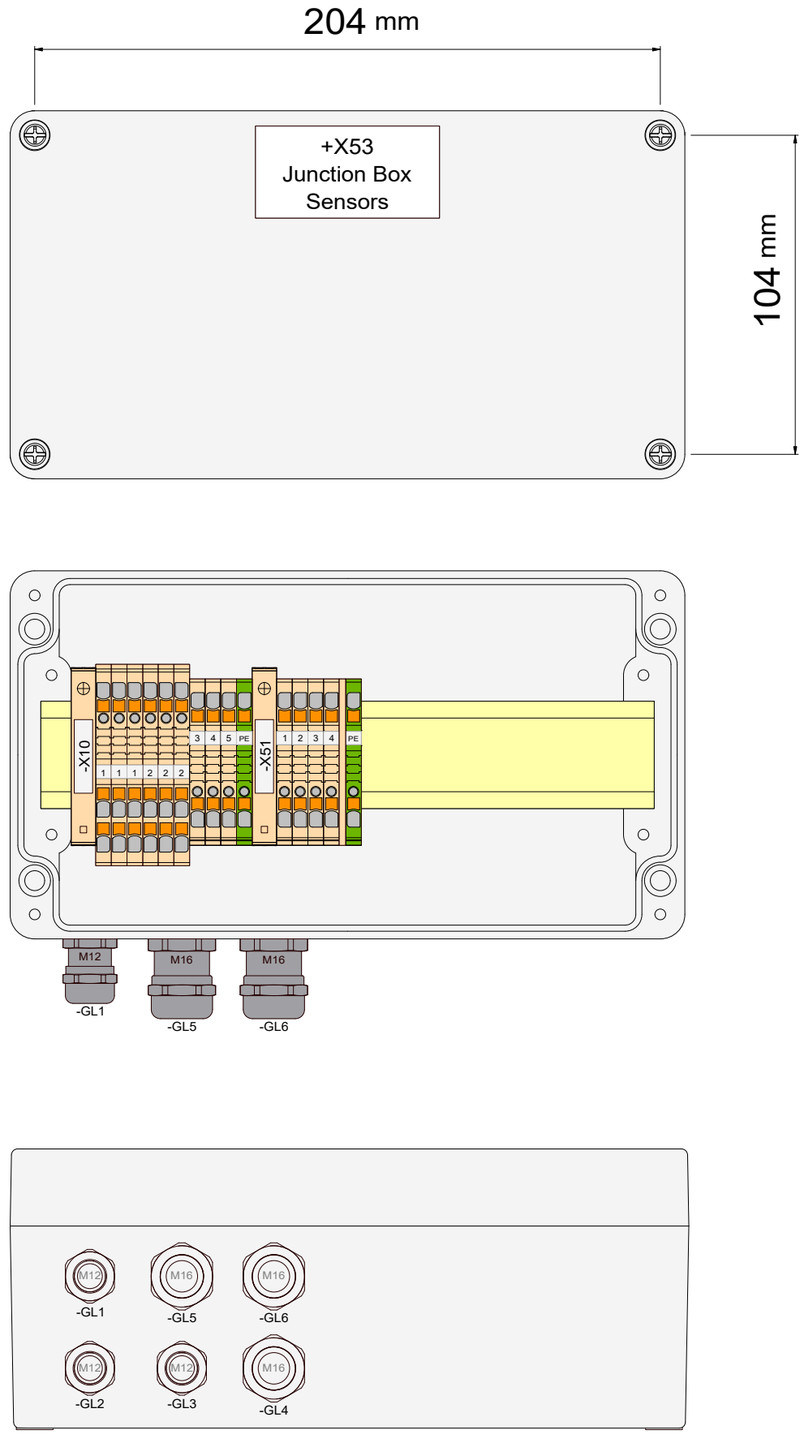
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CNP Freire
MBARI

TRIPLEX
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Layout
Deck Crane AUV
JB Power

=KN-75
+X52

E-4505 - 03
Rev. 04
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Component installed on equipment

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
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02	For customer review	29.08.2022	RSI	Appr. by	EE

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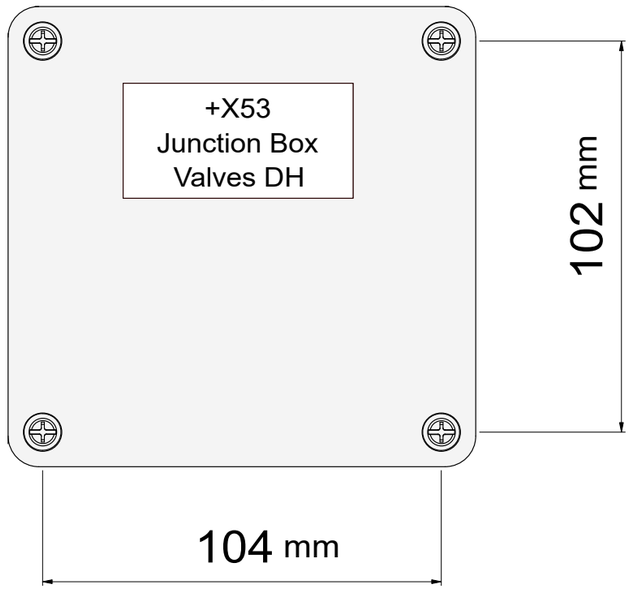
TRIPLEX
A MacGregor company

Layout
Deck Crane AUV
JB Sensors

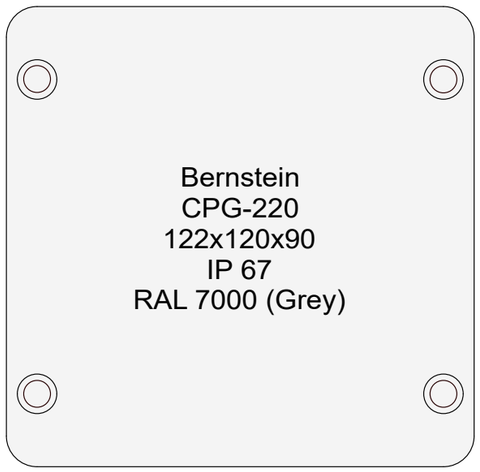
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+X53

E-4505 - 03
Rev. 04
7 / 11

-JB1

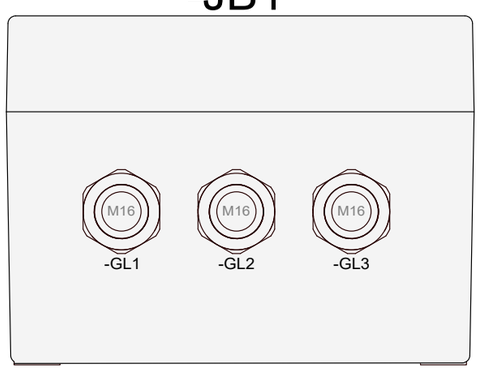


-JB1



-JB1

-JB1



Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Layout
Deck Crane AUV
JB Valves DH

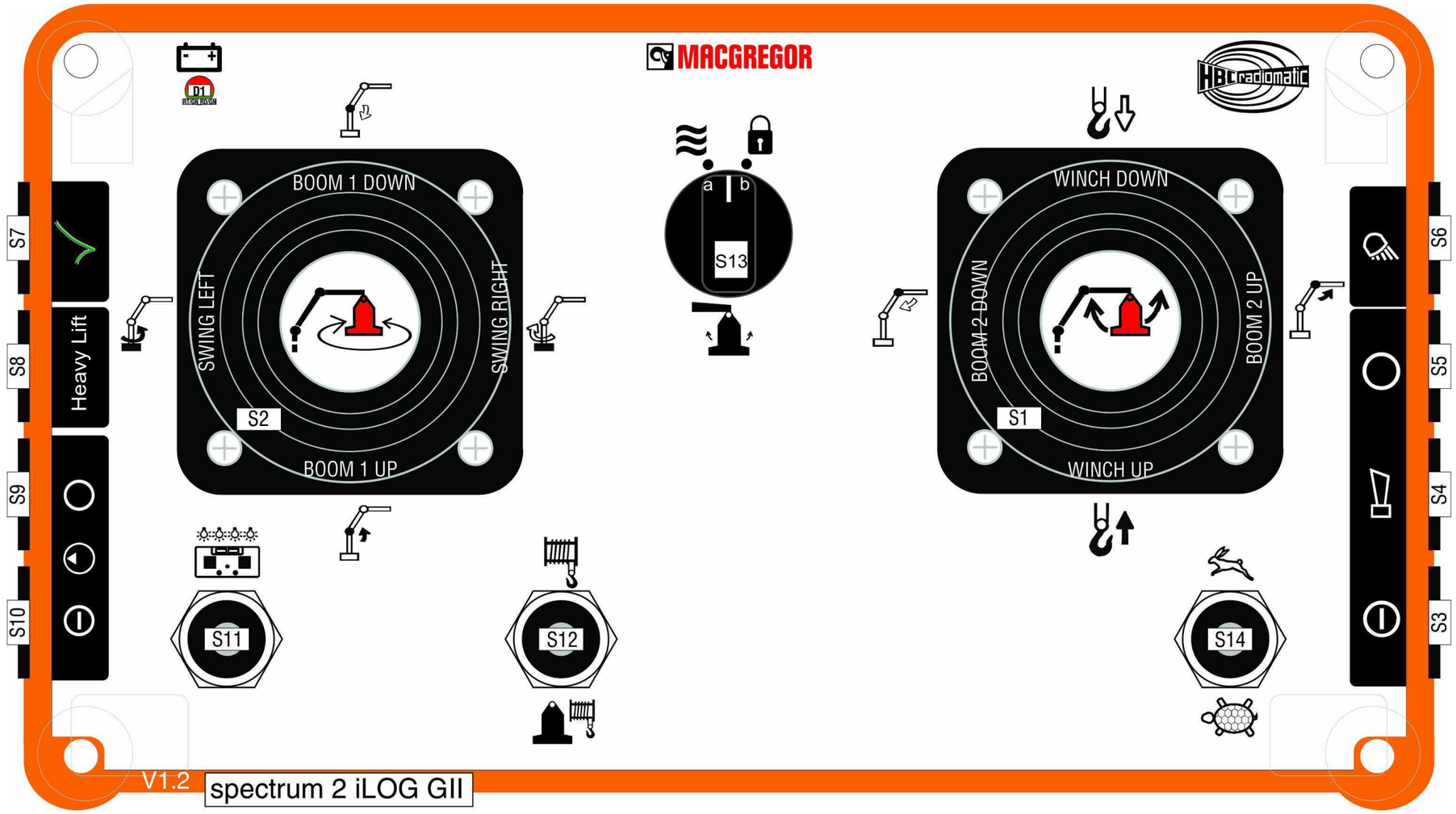
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+X54

E-4505 - 03
Rev. 04
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Printed: 07-Jul-23 12:32

Template:

-A1.3



Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Layout
Deck Crane AUV
RC Transmitter

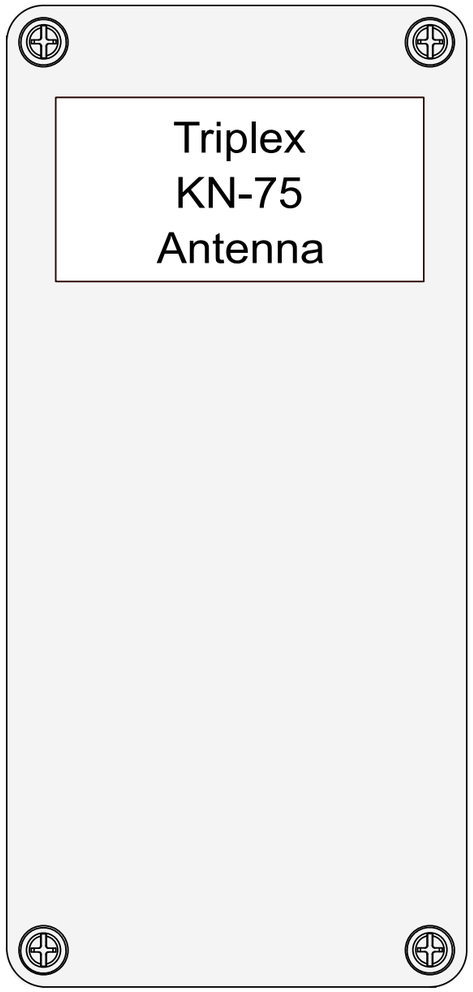
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+B51

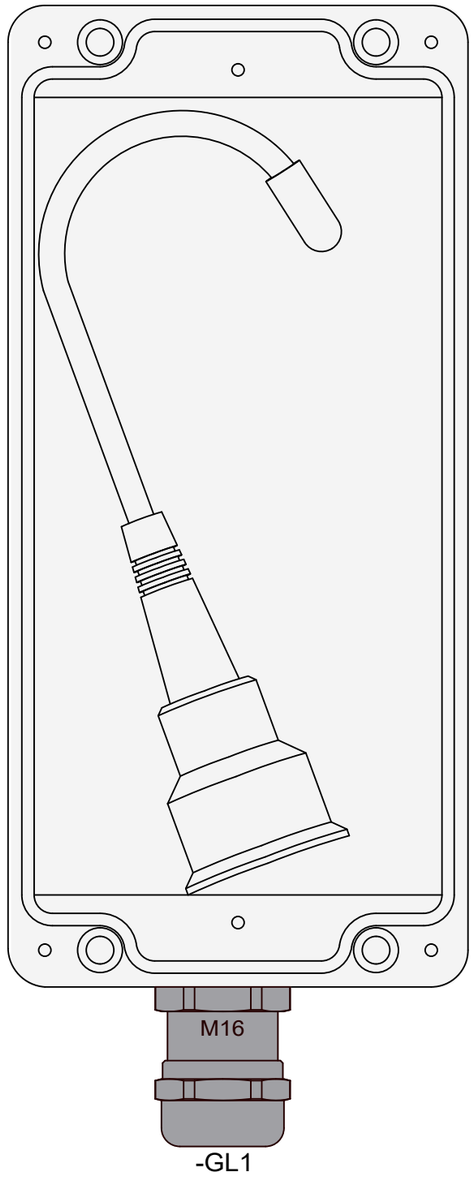
E-4505 - 03
Rev. 04
9 / 11

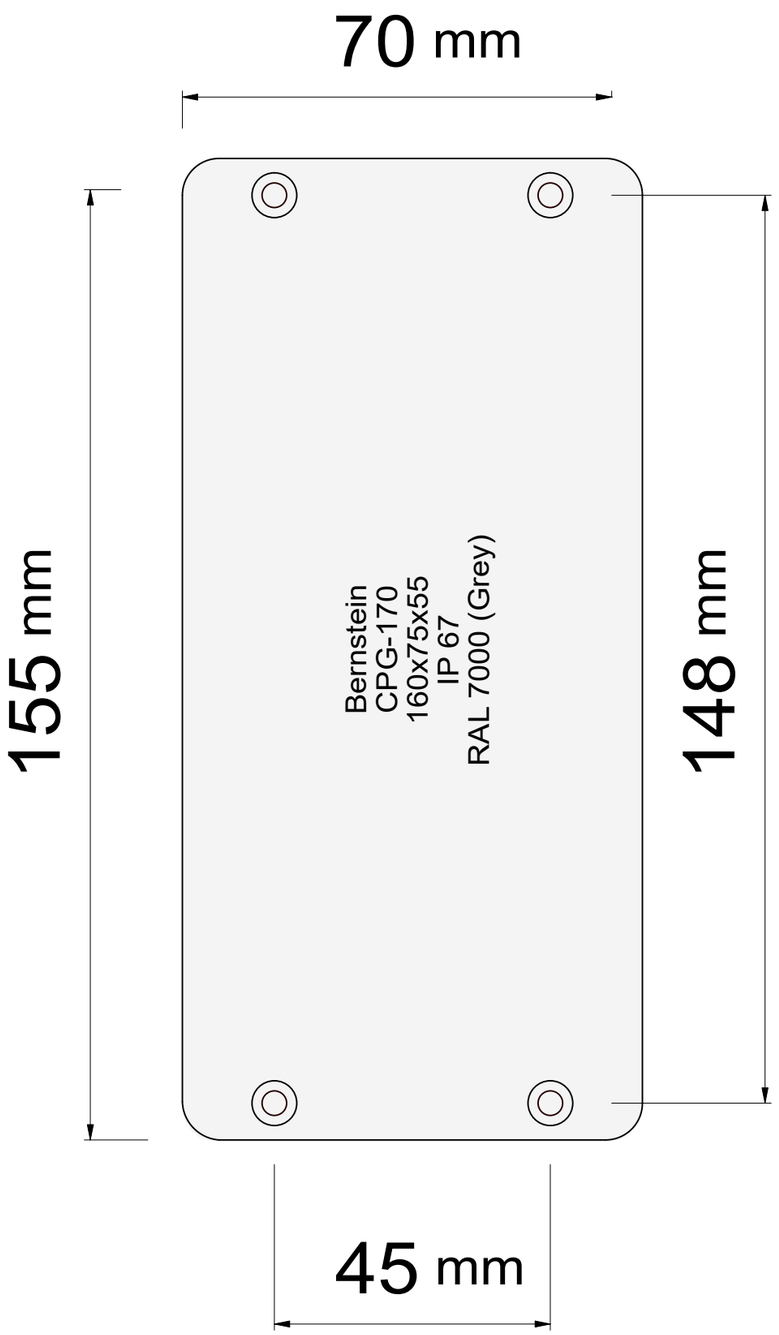


04	Issued for production	07.07.2023	GM	Date	14.10.2021	4/60185 CNP Freire MBARI	TRIPLEX A MacGregor company	Layout Deck Crane AUV RC Transmitter Side View	=KN-75	E-4505 - 03
03	For customer review	01.03.2023	GM	Drawn by	KS				+B51	Rev. 04 10 / 11
02	For customer review	29.08.2022	RSI	Appr. by	EE					
Rev.	Description	Date	Rev. by	Standard						

- To be placed outdoor as near as poosible to the main control cabinet.
- Free view to the operational area with no large obsticles to get the best signal perfomance.
- Cable gland facing downwards.
- It is recommended to find a spot that is protected from the environmental effects.
- Recommended cable length <30m.







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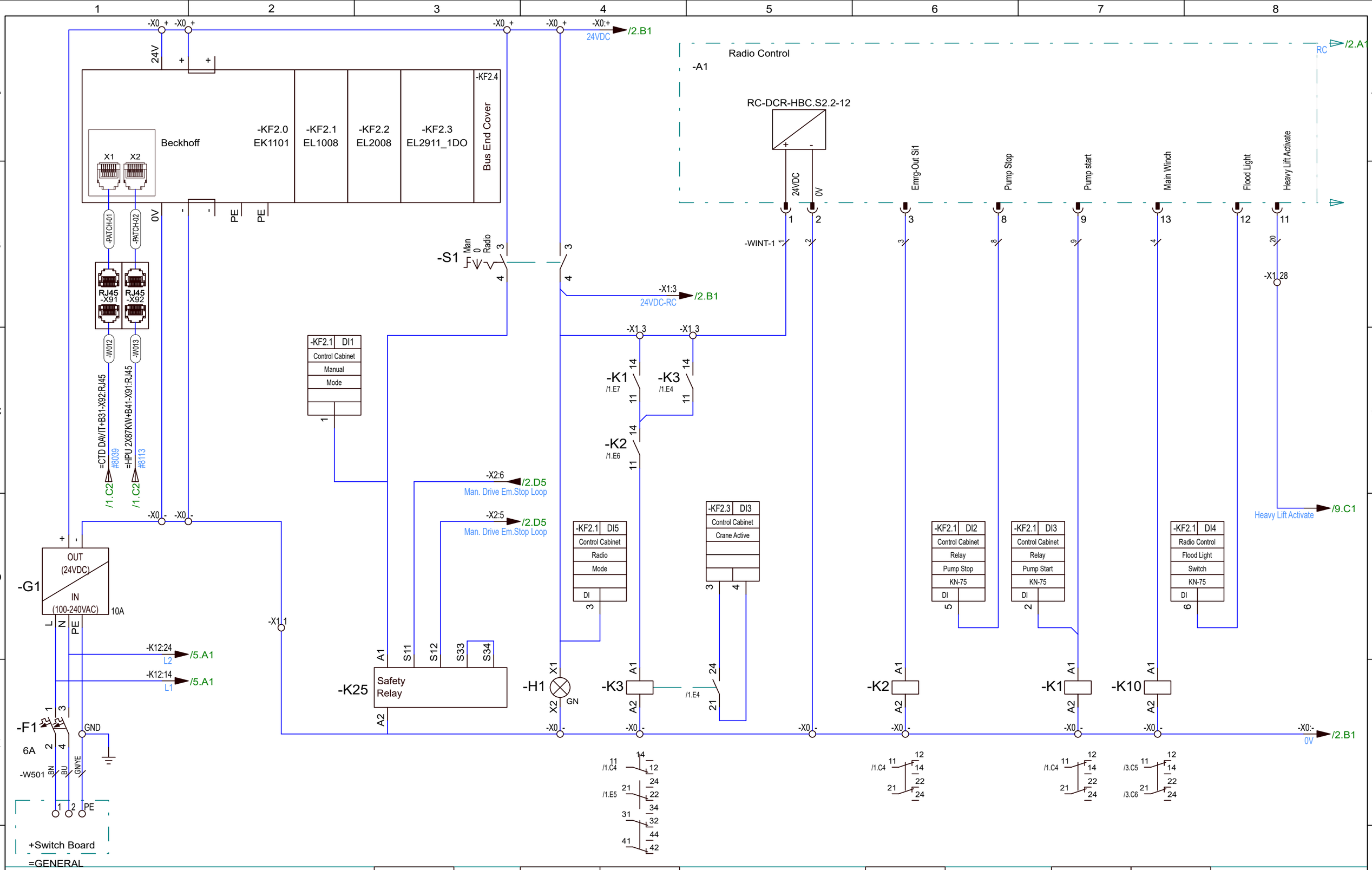
Layout
Deck Crane AUV
RC Antenna

=KN-75
+B51

E-4505 - 03
Rev. 04
11 / 11

Printed: 07-Jul-23 12:32

Template:



	Man. Drive Em.Stop Relay		Control From Radio	Crane Active		Crane Function Stop		Activate Crane	Main Winch

04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Rev.	Description	Date	Rev. by	Standard	

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Circuit Diagram
Deck Crane AUV
Control Cabinet Radio

=KN-75
+B51

E-4505 - 04
Rev. 04
1 / 11

/1.A8 RC

RC /3.A1

/1.E8 -X0:- 0V

-X0:- 0V /3.D1

-X0 -

/1.B4 -S1:4 24VDC-RC

/1.A4 -X0:+ 24VDC

-X0 +

-X0 +

-X0:+ 24VDC /3.B1

-KF2.3 DI1
Valve Bank
Emergency Stop
Button
KN-75
DI
1 2

-KF2.3 DI2
Valve Bank
Emergency Stop
Contacts
KN-75
DI
5 6

-KF2.2 DO2
Valve Bank
Emergency Stop
Light
KN-75
DO
5

/1.C3 Man. Drive Em.Stop Loop -K25:S11

/1.D3 -K25:S12 Man. Drive Em.Stop Loop

-X1 2 3 4

-W503 2

+X51 JB Valves

-X1 2

+B52-X1:2 24VDC /6.C1

-X2 1 2 3 4 5 6 7 8

-W503 3 4 5 6 7 8 9 25 /3.E1

-X1 3 4 5 6 7 8 9 25

-WI-01 1 2 3 4 5 6 7 8 /3.E1

+Z53 Valves

-S1 21 22 23 24 11 12

X1 X2 RD

04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Rev.	Description	Date	Rev. by	Standard	

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Circuit Diagram
Deck Crane AUV
Control Cabinet Radio

=KN-75
+B51

E-4505 - 04
Rev. 04
2 / 11

/2.A8 RC — RC /4.A1

Swing CCW - 1 (27) · Swing CW - 1 (26) · Boom Down - 1 (25) · Boom Up - 1 (24) · Jib In - 1 (21) · Jib Up - 1 (20) · Winch Up (18) · Winch Down (19) · Slewing DH CCW - 1 (28) · Slewing DH CW - 1 (29) · Tilt DH In- 1 (22) · Tilt DH Out- 1 (23)

/2.B8 -X0 + 24VDC

-KF2.3 | DO1
Control Cabinet
Relay
Stop Valve

-K25 Man. Drive Em.Stop Relay /1.E3

-K23 /4.F6 · -K24 /4.F6 · -K10 /1.E7 · -K22 /4.F5

/2.B8 -X0:- 0V — -X0 - 0V /4.E1

-X1 · -W503 · /2.E8 +X51 JB Valves · +B52-X1:5 #9408 /6.C1 · -X1:1 0V /4.C1

/2.E8 +Z53 Valves

-WI-03 · -WI-04 · -WI-05 · -WI-06 · -WI-07 · -WI-08 · -WI-09 · -WI-10 (GY BU BN)

-Y0 · -Y1 · -Y2 · -Y3 · -Y4 · -Y5 · -Y6 · -Y7

Stop Valve	Swing Valve		Boom Valve		Jib Valve		Winch 1 Valve		Winch DH Valve		Slewing DH Valve		Tilting DH Valve	
	2 CCW	3 CW	2 Down	3 Up	2 In	3 Out	2 Lift	3 Lower	2 Lift	3 Lower	2 In	3 Out	2 In	3 Out

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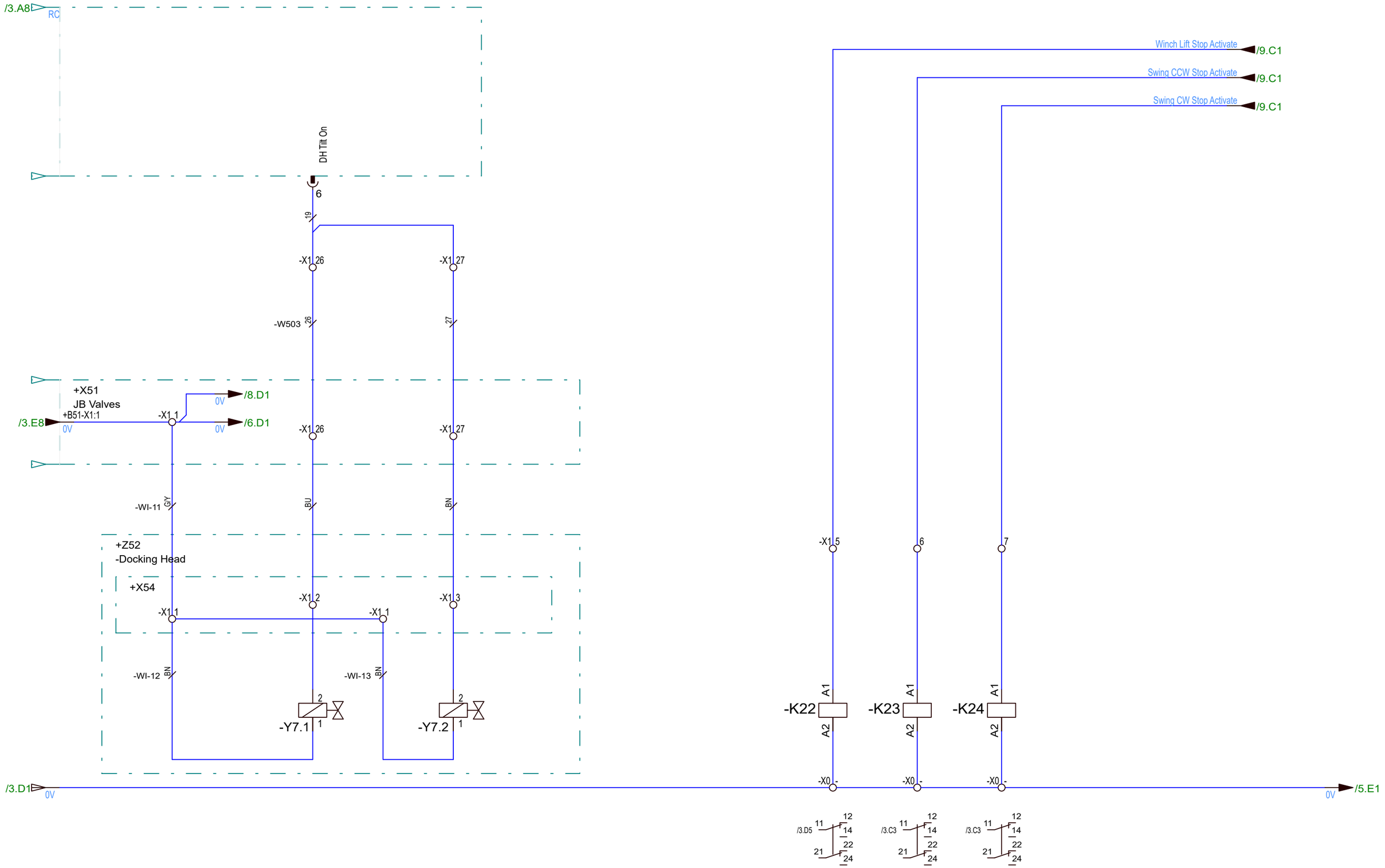
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Circuit Diagram
Deck Crane AUV
Control Cabinet Radio

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+B51

E-4505 - 04
Rev. 04
3 / 11



DH Tilt Float		DH Tilt Float	Winch Lift Stop
			Swing CCW Stop
			Swing CW Stop

Rev.	Description	Date	Rev. by	Standard	
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Circuit Diagram
Deck Crane AUV
Control Cabinet Radio

=KN-75
+B51

E-4505 - 04
Rev. 04
4 / 11

/1.E1 L2

/1.E1 L1

-KF2.2	DO1
Control Cabinet	
Floodlight	
Reley	
ON	
DO	

1

-K12
/5.E2 /5.E2
12 14 22 24
11 21

-X90 1 2 GND

-W507 BN BU GN/YE

+Z51 Pedestal

+X52

-X90 1 2 GND

-WI-21 BN BU GNY

+Z52

L N GND

-H1 Floodlight LED

L N GND

-K12
A1
A2

-X0 -

/4.E8 0V

/5.B5 11 14 12
/5.B5 21 22 24

Floodlight

Rev.	Description	Date	Rev. by	Standard	
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03	For customer review	01.03.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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Circuit Diagram
Deck Crane AUV
Control Cabinet Radio

=KN-75
+B51

E-4505 - 04
Rev. 04
5 / 11

+Z52

-WI-22 WH BN YE GN

-B4 (0V +V CH CL CG) On 5 4 3 2 1 Off, N19, Lo, Hi

-B5 (0V +V CH CL CG) On 5 4 3 2 1 Off, N19, Lo, Hi, R120

-B1 360° (0V +24V 4-20mA) 3 1 2 4

-B2 360° (0V +24V 4-20mA) 3 1 2 4

-B3 NO/NC PNP (L- L+ NO NC) 3 1 4 2

-WI-20 GN YE BN WH

-WI-17 BU BN WH

-WI-18 BU BN WH

-WI-19 BU BN WH

+X53

-X51 1 2 3 4

-X10 1 2 3 / 1 2 4 / 1 2 5 PE

-WI-16 GN YE BN WH

-WI-15 1 2 3 4 5 GNYE

+B52 Control Cabinet Heavy Lift

-X51 1 2 3 4 R120

-X10 1 2 / 1 2 / 1 2 PE

-WI-14

+X51-X1:2 2 -X1 2 — 24VDC — /2.E5

3

+X51-X1:10 5 5 — #9408 — /3.E2

1 -X1 1 — 0V — /4.C2

/7.C1 24VDC

/7.C1 0V

-X10 3 R250 1 3

-X10 4 R250 1 4

-X10 5

C1-P2 C2-P47 C2-P48 C2-P49 C2-P50 C1-P3 C1-P4 C1-P20 C1-P21

PWR+ PWR+ PWR+ PWR+ PWR+ CAN0-H CAN0-L CAN1-H CAN1-L

Danfoss
MC050-110

-A1

Node:

0V 0V Sensor

C1-P1 C1-P9

C1-P6 C1-P14 C1-P15 C1-P13

Crane Active	Boom Angle	Jib Angle	Arm Position
KN-75	KN-75	KN-75	KN-75
Cabinet HL	Cabinet HL	Cabinet HL	Cabinet HL
DIN	DIN/AIN	DIN/AIN	DIN
MC050-110	MC050-110	MC050-110	MC050-110
-A1	-A1	-A1	-A1

Winch Encoder | Swing Encoder | Boom Angle | Jib Angle | Heavy Lift Sensor Arm Position

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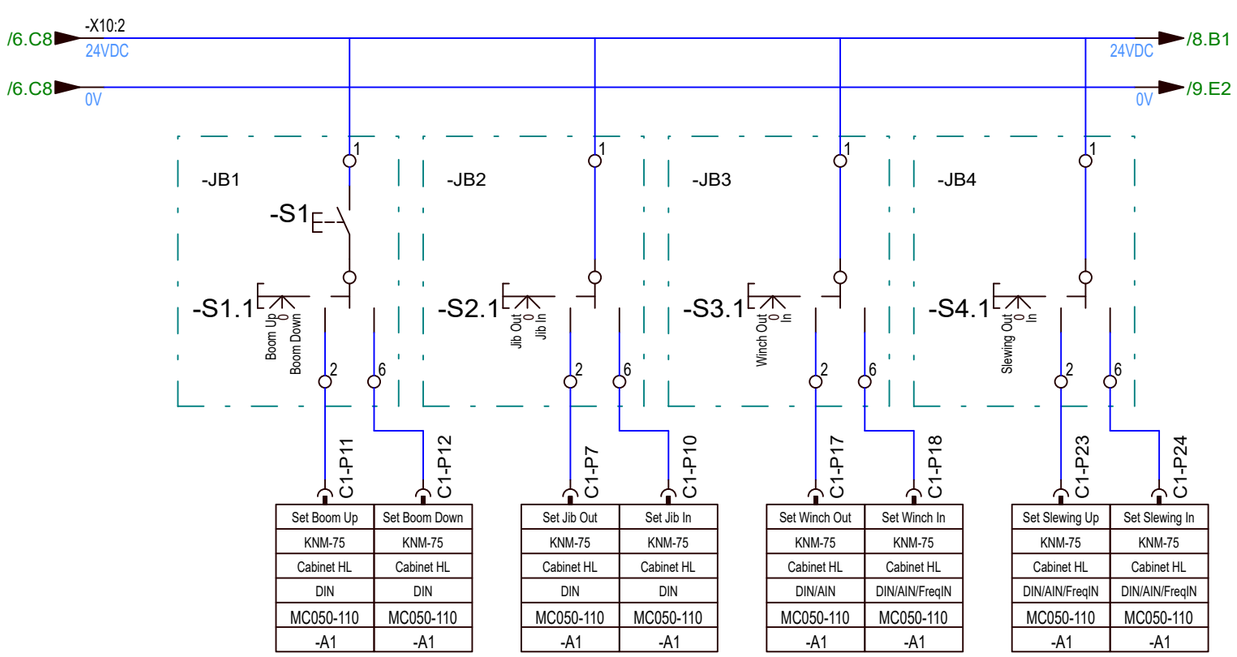
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Circuit Diagram
Deck Crane AUV
Control Cabinet Heavy Lift

=KN-75
+B51

E-4505 - 04
Rev. 04
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+B52 Control Cabinet
Heavy Lift



Set Boom Up	Set Boom Down
KNM-75	KNM-75
Cabinet HL	Cabinet HL
DIN	DIN
MC050-110	MC050-110
-A1	-A1

Set Jib Out	Set Jib In
KNM-75	KNM-75
Cabinet HL	Cabinet HL
DIN	DIN
MC050-110	MC050-110
-A1	-A1

Set Winch Out	Set Winch In
KNM-75	KNM-75
Cabinet HL	Cabinet HL
DIN/AIN	DIN/AIN/FreqIN
MC050-110	MC050-110
-A1	-A1

Set Slewing Up	Set Slewing In
KNM-75	KNM-75
Cabinet HL	Cabinet HL
DIN/AIN/FreqIN	DIN/AIN/FreqIN
MC050-110	MC050-110
-A1	-A1

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Circuit Diagram
Deck Crane AUV
Control Cabinet Heavy Lift

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+B52 Control Cabinet
Heavy Lift

/7.C4
24VDC

-K21 /9.F6 12 14 11
-K22 /9.F6 12 14 11
-K23 /9.F7 12 14 11
-K24 /9.F8 12 14 11

-X1 8 9 10 11

-WI-14 8 9 10 11

+X51 JB Valves

/4.C2
0V

-X1 28 28 29 30 31
1 1 1 1 1 1

-WI-02 BN BU
-WI-26 1 2
-WI-23 1 2
-WI-24 1 2
-WI-25 1 2

+Z53 Valves

-H1 X1 X2 YE
-Y11 2 1
-Y8 2 1
-Y9 2 1
-Y10 2 1

Heavy Lift Active Lamp	Heavy Lift Active		M Boom Down Stop		Jib Out (Up) Stop		Jib In (Down) Stop

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Circuit Diagram
Deck Crane AUV
Control Cabinet Heavy Lift

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Template:

+B52 Control Cabinet
Heavy Lift

-W506

/1.D8 Heavy Lift Activate 4 -X1 12
/4.A7 Winch Lift Stop Activate 1 13
/4.A7 Swing CCW Stop Activate 2 14
/4.A7 Swing CW Stop Activate 3 15

C1-P37 C1-P38 C1-P39 C1-P19

-A1
MC050

Swing CW Stop	Swing CCW Stop	Winch Lift Stop	HL Active
KN-75	KN-75	KN-75	KN-75
Cabinet HL	Cabinet HL	Cabinet HL	Cabinet HL
MF-Out	MF-Out	MF-Out	DIN/AIN/FreqIN
MC050-110	MC050-110	MC050-110	MC050-110
-A1	-A1	-A1	-A1

C1-P43 C1-P40 C1-P41 C1-P42

HL Active	Boom Down Stop	Jib Up (Out) Stop	Jib Down (In) Stop
KN-75	KN-75	KN-75	KN-75
Cabinet HL	Cabinet HL	Cabinet HL	Cabinet HL
MF-Out	MF-Out	MF-Out	MF-Out
MC050-110	MC050-110	MC050-110	MC050-110
-A1	-A1	-A1	-A1

-K21 -K22 -K23 -K24
A1
A2

/7.C4 0V

/8.C2 11 12 14
/8.C3 11 12 14
/8.C3 11 12 14
/8.C4 11 12 14

Heavy Lift Active	M Boom Down Stop	Jib Up (Out) Stop	Jib Down (In) Stop

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Circuit Diagram
Deck Crane AUV
Control Cabinet Heavy Lift

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-A1		Danfoss MC050-110			Node:	
Pin	Dest.	Pin Type	Ref	Item	Function	Signal Type
C1-P1		GND	/6.D1			
C1-P2		PWR+				
C1-P3		CAN-H				
C1-P4		CAN-L				
C1-P5		AIN/CAN0				
C1-P6		DIN	/6.D4	Cabinet HL	KN-75	Crane Active
C1-P7		DIN	/7.D2	Cabinet HL	KNM-75	Set Jib Out
C1-P8		Sensor 5VDC+				
C1-P9		GND Sensor				
C1-P10		DIN	/7.D3	Cabinet HL	KNM-75	Set Jib In
C1-P11		DIN	/7.D1	Cabinet HL	KNM-75	Set Boom Up
C1-P12		DIN	/7.D2	Cabinet HL	KNM-75	Set Boom Down
C1-P13		DIN	/6.D5	Cabinet HL	KN-75	Arm Position
C1-P14		DIN/AIN	/6.D4	Cabinet HL	KN-75	Boom Angle
C1-P15		DIN/AIN	/6.D5	Cabinet HL	KN-75	Jib Angle
C1-P16		DIN/AIN				
C1-P17		DIN/AIN	/7.D3	Cabinet HL	KNM-75	Set Winch Out
C1-P18		DIN/AIN/FreqIN	/7.D3	Cabinet HL	KNM-75	Set Winch In
C1-P19		DIN/AIN/FreqIN	/9.D3	Cabinet HL	KN-75	HL Active
C1-P20		CAN1-H				
C1-P21		CAN1-L				
C1-P22		AIN/CAN1				
C1-P23		DIN/AIN/FreqIN	/7.D4	Cabinet HL	KNM-75	Set Slewing Up
C1-P24		DIN/AIN/FreqIN	/7.D4	Cabinet HL	KNM-75	Set Slewing In
C1-P25		DIN/AIN/FreqIN				
C1-P26		DIN/AIN/FreqIN				
C1-P27		AIN/Temp/Rheo				
C1-P28		AIN/Temp/Rheo				
C1-P29		AIN/Temp/Rheo				
C1-P30		AIN/Temp/Rheo				
C1-P31		DOUT				
C1-P32		DOUT				
C1-P33		DOUT				
C1-P34		DOUT/PVG PWR				
C1-P35		DOUT/PVG PWR				
C1-P36		DOUT/PVG PWR				
C1-P37		MF-Out	/9.D2	Cabinet HL	KN-75	Swing CW Stop
C1-P38		MF-Out	/9.D2	Cabinet HL	KN-75	Swing CCW Stop
C1-P39		MF-Out	/9.D3	Cabinet HL	KN-75	Winch Lift Stop
C1-P40		MF-Out	/9.D4	Cabinet HL	KN-75	Boom Down Stop
C1-P41		MF-Out	/9.D4	Cabinet HL	KN-75	Jib Up (Out) Stop
C1-P42		MF-Out	/9.D5	Cabinet HL	KN-75	Jib Down (In) Stop
C1-P43		MF-Out	/9.D4	Cabinet HL	KN-75	HL Active
C1-P44		MF-Out				
C1-P45		MF-Out				
C1-P46		MF-Out *				
C2-P47		PWR+				
C2-P48		PWR+				
C2-P49		PWR+				
C2-P50		PWR+				

-KF2.1 Beckhoff EL1008

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Digital Input	DI1	/1.C2	Control Cabinet	Manual	Mode			
5	Digital Input	DI2	/1.D6	Control Cabinet	Relay	Pump Stop	KN-75	DI	
2	Digital Input	DI3	/1.D7	Control Cabinet	Relay	Pump Start	KN-75	DI	
6	Digital Input	DI4	/1.D8	Radio Control	Flood Light	Switch	KN-75	DI	
3	Digital Input	DI5	/1.D4	Control Cabinet	Radio	Mode		DI	
7	Digital Input	DI6						DI	
4	Digital Input	DI7						DI	
8	Digital Input	DI8						DI	

-KF2.3 Beckhoff EL2911_1DO

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	+	DI1	/2.C6	Valve Bank	Emergency Stop	Button	KN-75	DI	
2	-								
5	+	DI2	/2.C6	Valve Bank	Emergency Stop	Contacts	KN-75	DI	
6	-								
3		DI3	/1.D5	Control Cabinet	Crane Active				
4									
7		DI4							
8									
2`	Digital Output	DO1	/3.C2	Control Cabinet	Relay	Stop Valve		DO	
3`	0VDC								
4`	24VDC								
6`		DO1							
7`									
8`									

-KF2.2 Beckhoff EL2008

Pin	Pin Description	IO Type	Ref	IO Device Location	IO Device Type	IO Function Target	IO Function	IO Used	Signal
1	Digital Output	DO1	/5.B2	Control Cabinet	Floodlight	Reley	ON	DO	
5	Digital Output	DO2	/2.C7	Valve Bank	Emergency Stop	Light	KN-75	DO	
2	Digital Output	DO3						DO	
6	Digital Output	DO4						DO	
3	Digital Output	DO5						DO	
7	Digital Output	DO6						DO	
4	Digital Output	DO7						DO	
8	Digital Output	DO8						DO	

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Circuit Diagram
Deck Crane AUV
IO List

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+Switch Board

+B51 -F1

2	BN	-W501 3G2,5mm²	BN	1
4	BU		BU	2
GND	GN/YE		GN/YE	PE

+B51 -X1 — **+X51 -X1**

1	1	-W503 28x1,5mm² Shielded	1	1
2	2		2	2
3			3	3
4			4	4

+B51 -X2

1	3		5	5
2	4		6	6
3	5		7	7
4	6		8	8
7	9		9	9
8	25		25	25

-X1

10	10		1	1
			10	10
11	11		1	G/Y
			11	BU
12	12		12	BN
13	13		1	G/Y
			13	BU
14	14		14	BN
15	15		1	G/Y
			15	BU
16	16		16	BN
17	17		1	G/Y
			17	BU
18	18		18	BN
19	19		1	G/Y
			19	BU
20	20		20	BN
21	21		1	G/Y
			21	BU
22	22		22	BN
23	23		1	G/Y
			23	BU
24	24		24	BN
26	26		1	G/Y
			26	BU
27	27		27	BN

-WI-01 12G0,75mm²	1	-S1	Function Stop	
	2	21		
	3	22		
	4	23		
	7	24		
	8	X1		
		X2		
-WI-03 3G0,75mm²	1	-Y0	Stop Valve	
	2	1		
		2		
-WI-04 3G1mm²	G/Y	-Y1	Swing Valve	
	BU	1		
	BN	2		
		3		
-WI-05 3G1mm²	G/Y	-Y2	Boom Valve	
	BU	1		
	BN	2		
		3		
-WI-06 3G1mm²	G/Y	-Y3	Jib Valve	
	BU	1		
	BN	2		
		3		
-WI-07 3G1mm²	G/Y	-Y4	Winch 1 Valve	
	BU	1		
	BN	2		
		3		
-WI-08 3G1mm²	G/Y	-Y5	Winch DH Valve	
	BU	1		
	BN	2		
		3		
-WI-09 3G1mm²	G/Y	-Y6	Slewing DH Valve	
	BU	1		
	BN	2		
		3		
-WI-10 3G1mm²	G/Y	-Y7	Tilting DH Valve	
	BU	1		
	BN	2		
		3		
-WI-11 3G1mm²	G/Y	+X54 -X1		
	BU	1		
		2		
-WI-12 3G1mm²	BN	1	-Y7.1	DH Tilt Float
	BU	2	1	
			2	
-WI-13 3G1mm²	BN	3	-Y7.2	DH Tilt Float
	BU		1	
			2	

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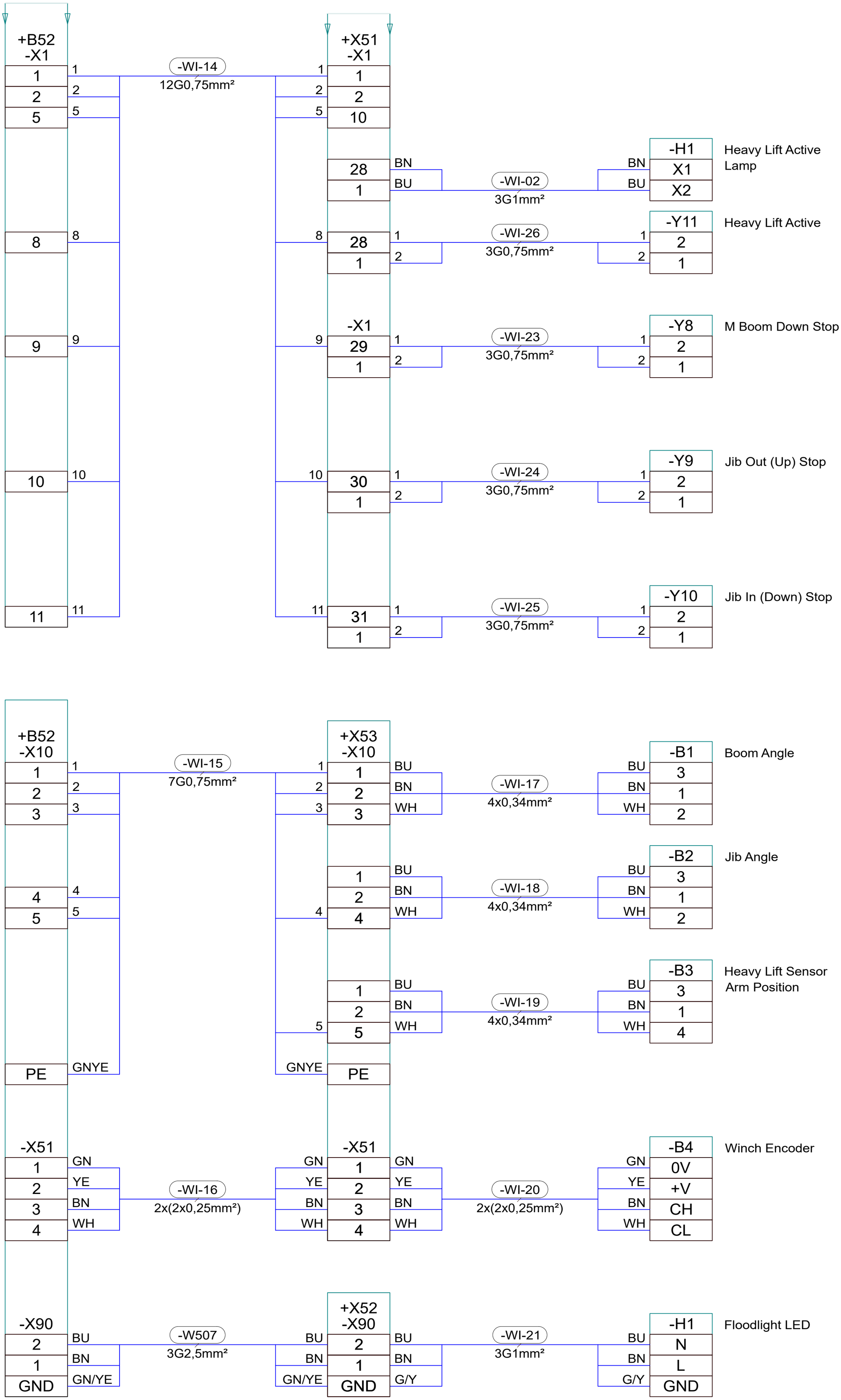
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Termination Diagram
Deck Crane AUV

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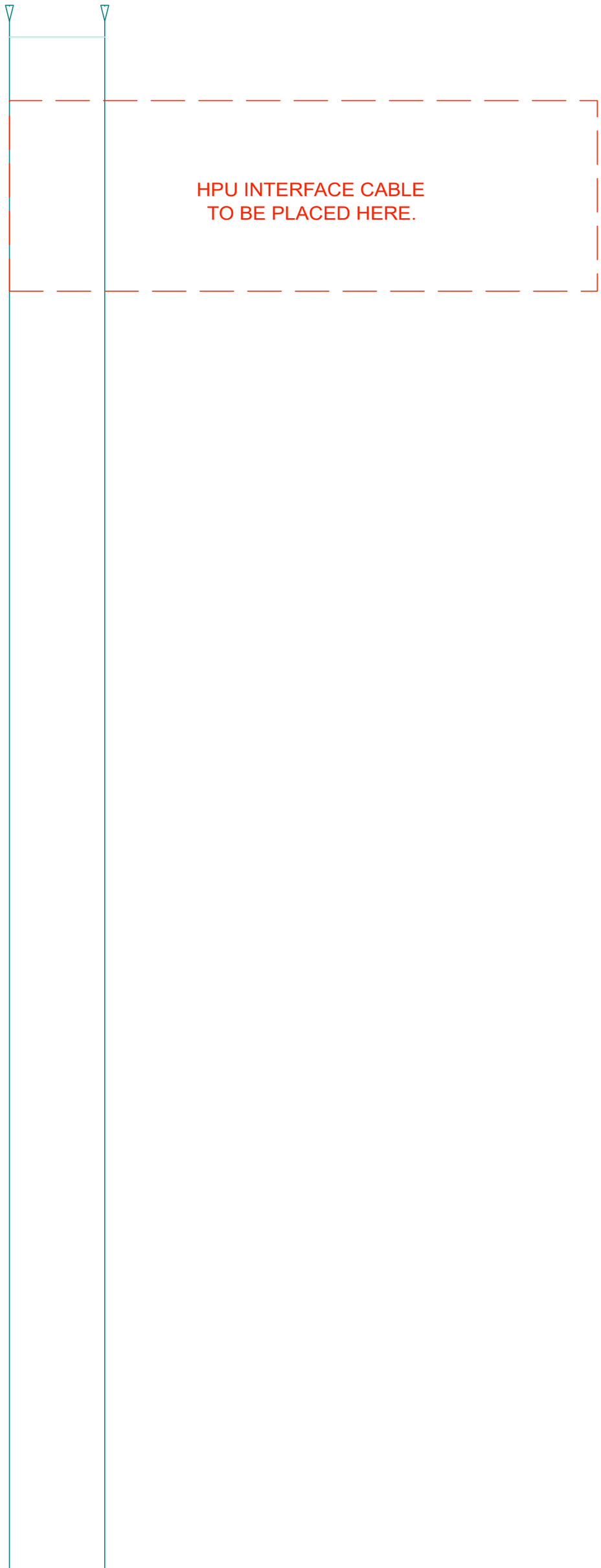
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Template:



Rev.	Description	Date	Rev. by	Standard	
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Termination Diagram
Deck Crane AUV

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-WI-01	ROFLEX 7G0.75	07915015		1	Pcs	CABLE, 7G0,75mm²	Lapp	
-WI-02,-WI-04,-WI-05,-WI-06,-WI-07,-WI-08,-WI-09,-WI-10,-WI-11,-WI-12,-WI-13,-WI-21	ROFLEX 3G1	07915017		12	Pcs	CABLE, 3G1mm²	Lapp	
-WI-03,-WI-23,-WI-24,-WI-25,-WI-26	7074-18021-2360500	07930051		5	Pcs	CONNECTOR, VALVE, MURR, 5M, SS	Murr	
-WI-14	ROFLEX 12G0.75	07915014		1	Pcs	CABLE, 12G0.75mm²	Lapp	
-WI-15	ØLFLEX FD 855 CP 7G0.75	400111231	10 905 14	1	Pcs	CABLE, 7x0,75mm², SHIELDED	Lapp	
-WI-16,-WI-20,-WI-22	BUS FD P CAN UL/CSA 2x2x0.25	07915044		3	Pcs	CABLE, 2x2x0,25mm²	Lapp	
-WI-17,-WI-18,-WI-19	V1-WV4A-30M-PUR	400090572		3	Pcs	SENSOR, CABLE, M12, 4-PIN, ANGLE, 30M	Pepperl & Fuchs	

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Part List
Deck Crane AUV

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Rev. 04

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-A1	RC-DCR-HBC.S2.2-12	400198452		1	Pcs	Deck Crane 12	HBC	
-CAB1	ADO201	07939034	24 138 75	1	Pcs	CABINET, DOORSTOPPER, ADO, ELDON	Eldon	
-CAB1	MAS0605030	400089006	24 174 95	1	Pcs	CABINET, 600x500x300 ELDON*	Eldon	
-DUCT1..-DUCT3	HA760040	07920015	12 857 18	1.005	M	CABLE TRAY, 60X40, GREY, W/LID	Tehalit Hager	
-F1	C60H/C 06-2	07938006	1676064	1	Pcs	FUSE, AUTOMAT, 6A, 2-POLE, C	Schneider	
-G1	CS10.241	07949016	66 040 29	1	Pcs	POWER SUPPLY, PULSE, 10A, 230/24	Puls	
-GL1	ST-M 16 x 1.5	07928032	12 477 13	1	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3,5-8	Lapp	
-H1	ZBVB3	07924016	43 032 26	1	Pcs	LAMP, LED, GN, 24V	Schneider	
-JB1	CPG-170	07904003		1	Pcs	JUNCTION BOX, POLYESTER, 160x75x55	Bernstein	
-K1..-K2,-K10,-K22..-K24	C12A21X24D	07936028	43 791 08	6	Pcs	RELAY, RELECO, 2-POLE, 24V, DC, 5A	Releco	
-K1..-K2,-K10,-K22..-K24	S-12	07942015	43 791 01	6	Pcs	RELAY, SOCKET, RELECO, 2-POLE	Releco	
-K3	C9A41FX24D	07936016	43 785 77	1	Pcs	RELAY, RELECO, 4-POLE, 24V DC, 5A	Releco	
-K3	S9-M	07942014	43 786 79	1	Pcs	RELAY, SOCKET, 4-POLE	Releco	
-K12	C7A20FX24D	07936015	43 783 87	1	Pcs	RELAY, RELECO, 2-POLE, 24V DC, 10A	Releco	
-K12	S7-I/O	07936015	43 783 87	1	Pcs	RELAY, SOCKET	Releco	
-K25	PSR-SPP- 24UC/ESA2/4X1/ 1X2/B	400109393	29 639 54	1	Pcs	SAFETY RELAY	Phoenix Contact	
-KF2.0	EK1101	400142335		1	Pcs	EtherCAT Coupler w ID settings	Beckhoff	
-KF2.1	EL1008	400142339		1	Pcs	8 Digital Inputs	Beckhoff	
-KF2.2	EL2008	400142342		1	Pcs	8 Digital Outputs	Beckhoff	
-KF2.3	EL2911_1DO	400142346		1	Pcs	TwinSAFE 4 Digital Inputs, 1x Output	Beckhoff	
-KF2.4	EL9011	400142410		1	Pcs	Bus end cap	Beckhoff	
-PATCH-01,-PATCH-02	Patch Cable STP Kat.6A 1m	400221331		2	Pcs	CABLE, S/FTP 4x2x0,16mm², SHIELDED	Lanse	
-RAIL1..-RAIL3	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	1.225	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-S1	ZB4BK1333	07960019	43 025 24	1	Pcs	CONTR. SWITCH, 3 POS, LED GN	Schneider	
-S1	ZB4BZ009	07961012	43 027 45	2	Pcs	CONTR. ACC, SOCKET, METAL	Schneider	
-S1	ZBE101	07961013	43 004 23	2	Pcs	CONTR. ACC, CONTACTBLOCK, 1NO	Schneider	
-TAG1	US-EMLP-HA 24	400075270		1	Pcs	TAG, SIGN, THERMOMARK CARD	Phoenix Contact	
-TAG2	US-EMLP 100X60 4 Line	07958308		1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-TAG3	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X0	AEP 3C 2.5	400069937	12 694 11	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X0	AEP AP12			1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X0..-X2,-X90	AEB 35 SC/1	400073887	12 654 34	8	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	

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04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	01.03.2023	GM	Drawn by	KS
02	For customer review	29.08.2022	RSI	Appr. by	EE

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Part List
Deck Crane AUV

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Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-X0 (-)	AAP12 10/4X2.5 LO-LI BL			1	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (-,-,-)	AAP12 2.5 LI BL			3	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (+)	AAP12 10/4X2.5 LO-LI RD			1	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (+,+)	AAP12 2.5 LI RD			2	Pcs	TERMINAL BLOCK, SNAP-IN,	Weidmüller	
-X0 (GND)	JORDSKINNE 21	07918007		1	Pcs	RAIL, GRN, BRASS, 21 SLOT	Weidmüller	
-X0 (GND,GND)	A3C 2.5 PE	400074010	12 654 16	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	
-X1	WAP WDK 2.5	07935011	12 689 10	1	Pcs	TERMINAL BLOCK, END PLATE	Weidmüller	
-X1 (2-3,3-10,25-28),-X2 (1-8) ,-X51 (1-4,CAN-Loop),-X52 (CAN-Loop)	A3C 2.5	400069932	12 654 01	28	Pcs	TERMINAL BLOCK, SNAP-IN, DOUBLE	Weidmüller	
-X1 (11-24)	WDK 2.5/D/3 Transient	05914001		14	Pcs	TERMINAL BLOCK, 102310, ELECTRONICS	Triplex	
-X1 (GND,GND,GND),-X90 (GND)	A2C 2.5 PE	400074009	12 654 15	4	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	
-X90 (1-2)	A2C 2.5	400069931	12 654 00	2	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X91,-X92	IE-TO-RJ45-FJ-B	07930061		2	Pcs	CONNECTOR, FEMALE, RJ45, RAIL MOUNT	Weidmüller	

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Part List
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-A1	DTM-50	6796300502		1	Pcs	CONNECTOR, SET, DANFOSS, MC050, TERMINATED	Danfoss	
-A1	MC050-110	07963055		1	Pcs	PLC, DANFOSS, MICROCONTROLLER, 22IN/ 16OUT	Danfoss	
-CAB1	KS1432500	07939008	24 302 52	1	Pcs	CABINET, 350x250x150 RITTAL PLASTIC	Rittal	
-DUCT1..-DUCT3	HA760025	07920014	12 857 17	0.487	M	CABLE TRAY, 60X25, GREY, W/LID	Tehalit Hager	
-JB1..-JB4	CMEB	07904039		4	Pcs	JUNCTION BOX, PLASTIC, CMEB, F/DIN TS35	Camdenboss	
-K21..-K24	C10A10X24D	07936014	43 781 45	4	Pcs	RELAY, RELECO, 1-POLE, 24V, DC, 10A	Releco	
-K21..-K24	S-10	07942012	43 782 84	4	Pcs	RELAY, SOCKET, RELECO 1-POLE	Releco	
-R1	RND 155M207F120RTKRTB5K0	07998018		1	Pcs	Resistor, 120Ω, 0.6W, 1%	RND Components	
-RAIL1,-RAIL2	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.317	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-S1.1..-S3.1,-S4.1	5637AB	07905040		4	Pcs	SWITCH, ROCKER 1-0-1	Apem	
-S1..-S4	1.15.106.301/0313	07905041		4	Pcs	PUSH BUTTON, 0-1, Ø9.1MM, RD	Rafi	
-TAG1	US-EMLP 100X60 4 Line	07958308		1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEP 2T 2.5	400073883	12 694 40	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (2-3,5,8-15)	A2T 2.5	400073880	12 654 14	11	Pcs	TERMINAL BLOCK, SNAP-IN, TWO HIGHTS	Weidmüller	
-X1 (PE)	A2C 2.5 PE	400074009	12 654 15	1	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	
-X1,-X10,-X51	AEB 35 SC/1	400073887	12 654 34	3	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X10	WAP WDK 2.5	07935011	12 689 10	1	Pcs	TERMINAL BLOCK, END PLATE	Weidmüller	
-X10 (3-4)	WDK 2.5 ANALOG	05914006		2	Pcs	TERMINAL BLOCK	Triplex	
-X10,-X51	AEP 3C 2.5	400069937	12 694 11	2	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X51 (1-4,CAN-Loop),-X52 (CAN-Loop)	A3C 2.5	400069932	12 654 01	6	Pcs	TERMINAL BLOCK, SNAP-IN, DOUBLE	Weidmüller	
-X51 (PE)	A3C 2.5 PE	400074010	12 654 16	1	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	

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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1..-GL10,-GL12,-GL14..-GL17	ST-M 16 x 1.5	07928032	12 477 13	15	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3,5-8	Lapp	
-GL11	ST-M 20 x 1.5	07928033	12 477 14	1	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø6-12	Lapp	
-GL13	ST-M 50 x 1.5	07928037	12 477 18	1	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø26-38	Lapp	
-JB1	CPG-300	07904005		1	Pcs	JUNCTION BOX, POLYESTER, 260x160x91	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.244	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1	AEP 2T 2.5 PE	400074011	12 654 22	1	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	
-X1	AEP 2T 2.5	400073883	12 694 40	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (2-10,10-28,28-31)	A2T 2.5	400073880	12 654 14	32	Pcs	TERMINAL BLOCK, SNAP-IN, TWO HIGHTS	Weidmüller	

Rev.	Description	Date	Rev. by	Standard	
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1,-GL2	ST-M 20 x 1.5	07928033	12 477 14	2	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø6-12	Lapp	
-JB1	CPG-220	07904002		1	Pcs	JUNCTION BOX, POLYESTER, 122x120x90	Bernstein	
-RAIL2	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.1	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X90	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X90 (1-2)	A2C 2.5	400069931	12 654 00	2	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	
-X90 (GND)	A2C 2.5 PE	400074009	12 654 15	1	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	

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04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1..-GL3	ST-M 12 x 1.5	07928031	12 477 12	3	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3-6,5	Lapp	
-GL4..-GL6	ST-M 16 x 1.5	07928032	12 477 13	3	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3,5-8	Lapp	
-JB1	CPG-240	07904004		1	Pcs	JUNCTION BOX, POLYESTER, 220x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.2	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X10 (PE),-X51 (PE)	A2C 2.5 PE	400074009	12 654 15	2	Pcs	TERMINAL BLOCK, SNAP-IN, GND	Weidmüller	
-X10,-X51	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X51	AEP 2C 2.5	400069933	12 694 10	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	

Rev.	Description	Date	Rev. by	Standard	
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-GL1..-GL3	ST-M 16 x 1.5	07928032	12 477 13	3	Pcs	CABLE GLAND, PLASTIC, SKINTOP, Ø3,5-8	Lapp	
-JB1	CPG-220	07904002		1	Pcs	JUNCTION BOX, POLYESTER, 122x120x90	Bernstein	
-RAIL1	TS 35X7.5 6.2MM HULLET	07940001	12 692 14	0.1	M	RAIL, PERFORATED, TS35 x 7,5 x 6,2mm	Weidmüller	
-TAG1	US-EMLP 60X30	07958306	12 684 08	1	Pcs	TAG, SIGN, THERMOMARK CARD, W/GLUE	Phoenix Contact	
-X1	AEB 35 SC/1	400073887	12 654 34	2	Pcs	TERMINAL BLOCK, SNAP-IN, END LOCK	Weidmüller	
-X1	AEP 2C 2.5	400069933	12 694 10	1	Pcs	TERMINAL BLOCK, SNAP-IN, END PLATE	Weidmüller	
-X1 (1,1-3)	A2C 2.5	400069931	12 654 00	4	Pcs	TERMINAL BLOCK, SNAP-IN, SINGLE	Weidmüller	

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	01.03.2023	GM	Drawn by	KS
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-B1,-B2	RFC 4801 636 121 501	07917056		2	Pcs	SENSOR, ANGLE, 24V, 4-20mA, 360°, M12	Novotechnik	
-B3	NBN40-L2-A2-V1	07917215		1	Pcs	SENSOR, PROX, 40X40, NO/NC, SN40, M12	Pepperl & Fuchs	
-B4,-B5	K-8.5868.3221.2113C	07917203		2	Pcs	SENSOR, ROTATION, ABSOLUT, MULTITURN, 10x20mm	Kübler	
-H1	FL60 9000 850 120 M24 MB	400072975		1	Pcs	FLOODLIGHT, LED, 80W, 120V, MEDIUM BEAM	Glamox	
-R2	RND 155M207F120RTKRTB5K0	07998018		1	Pcs	Resistor, 120Ω, 0.6W, 1%	RND Components	
-Y7.1,-Y7.2	HAWE STOP VALVE			2	Pcs	VALVE, ON/OFF	Hawe	

Rev.	Description	Date	Rev. by	Standard	
04	Issued for production	07.07.2023	GM	Date	14.10.2021
03	For customer review	01.03.2023	GM	Drawn by	KS
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Template:

Device ID	Device	Part No.	El. No.	Qty	Unit	Description	Manufacturer	Link
-H1	853 310 55	07959005		1	Pcs	LAMP, BEACON, LED, YE, FLASH, 24V	Werma	
-S1	XALK178W3B140G	400208317	4322660	1	Pcs	CONTR. PUSH, EM STOP	Schneider	
-S1	ZBE102	07961015	43 004 24	1	Pcs	CONTR. ACC, CONTACTBLOCK, 1NC	Schneider	
-Y8..-Y11	HAWE ON/OFF VALVE			4	Pcs	VALVE, ON/OFF	Hawe	

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04	Issued for production	07.07.2023	GM	Date	14.10.2021
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Template:



RADIO CONTROL



RADIO CONTROL

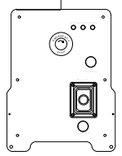
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A-FRAME
(2x Aux W)

CTD
WINCH

CTD
DAVIT

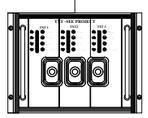
Hydraulic Local
Emergency Control

Hydraulic Local
Emergency Control

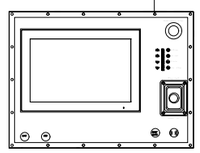


LOCAL
2000004949
LxBxH 370x282x?

AFT
CONTROL
STATION



CONTROL ROOM PANEL
2000005996
LxBxH
260x349x127



CONTROL ROOM PANEL
2000003404
LxBxH
355x480x140



CONTROL ROOM PANEL
2000005995
LxBxH
260x187x127



RADIO CONTROL



RADIO CONTROL

ROV
STORAGE
DRUM

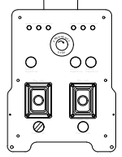
ROV
TRACTION
WINCH

OVERHEAD
CRANE
(1x Aux W)

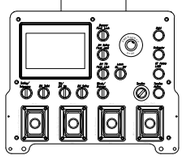
KN-75
CRANE
(2x Aux W)

Hydraulic Local
Emergency Control
(In pedestal)

Hydraulic Local
Emergency Control

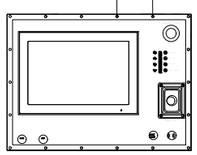


LOCAL
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LxBxH 370x282x?



HANGAR
2000012940
LxBxH 370x450x?

ROV
CONTROL
ROOM



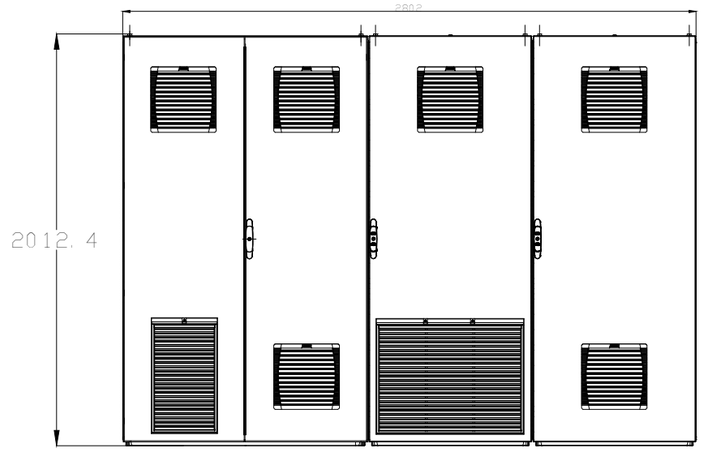
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2000003404
LxBxH
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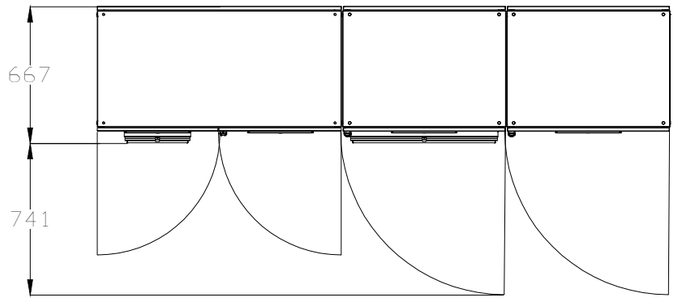
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R Olsen	13.10.2022	13.10.2022	ECO-2058122			

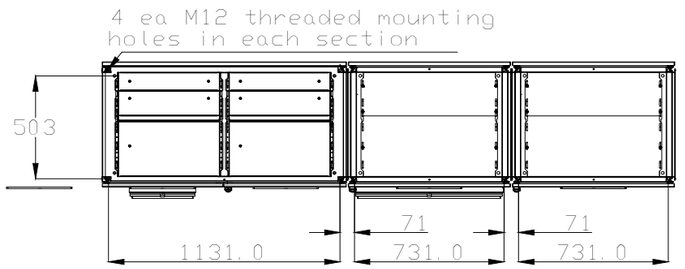
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Name	Weight
System overview	0 kg
Description	Scale (A3)
Panel overview - MBARI	
Document ID: 2000005332	Revision: D







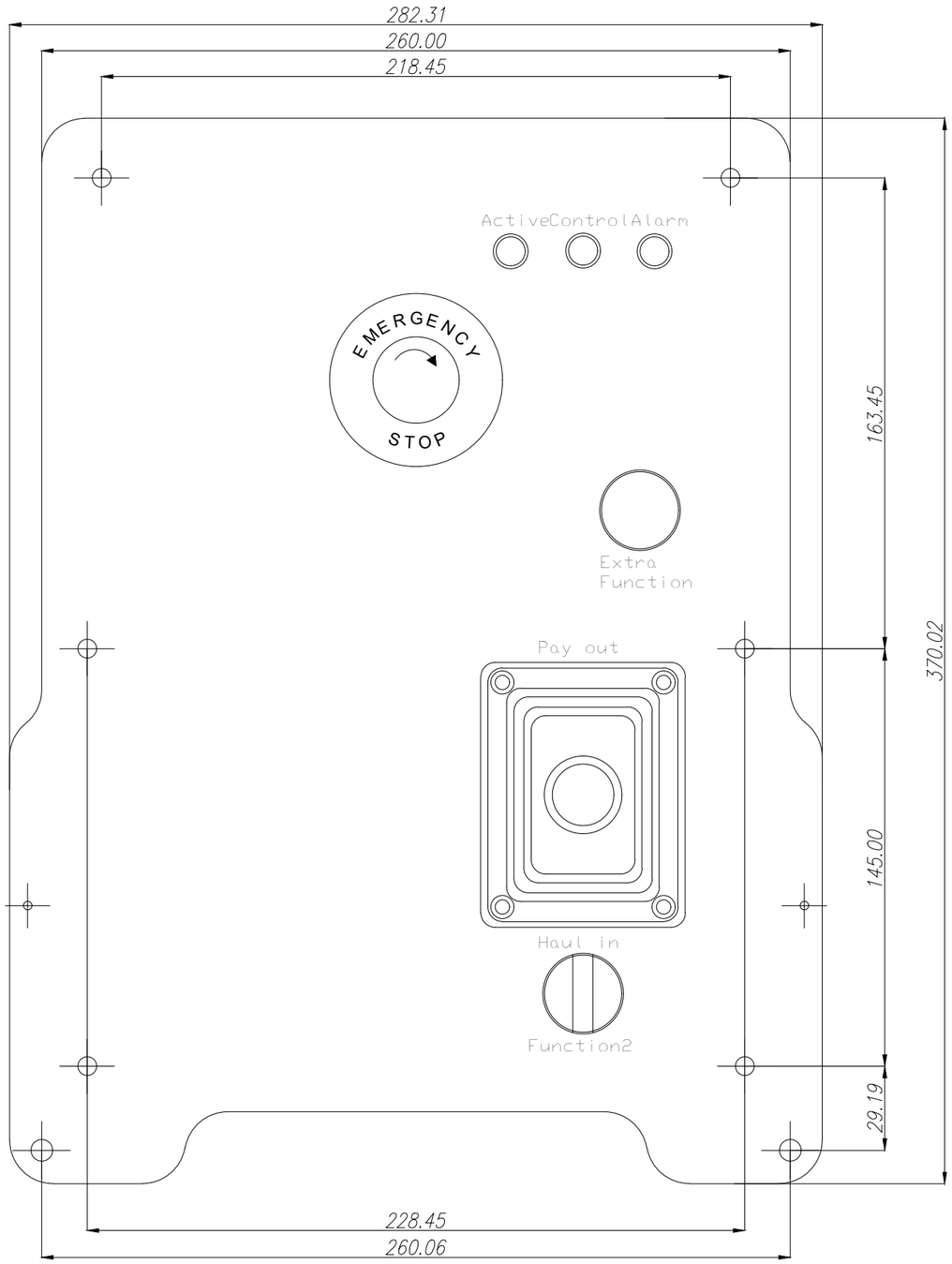
CABLE POSSITION	-UH1	-U2	-UH3

Designed by	Modified by	Date	ECO			
T Rånes		15.02.2022	ECO-2056868			

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Name	Weight
Dimension Drawing	0 kg
Description	Scale (A3)
MBARI VFD Cabinet	
Document ID 2000005807	Revision A

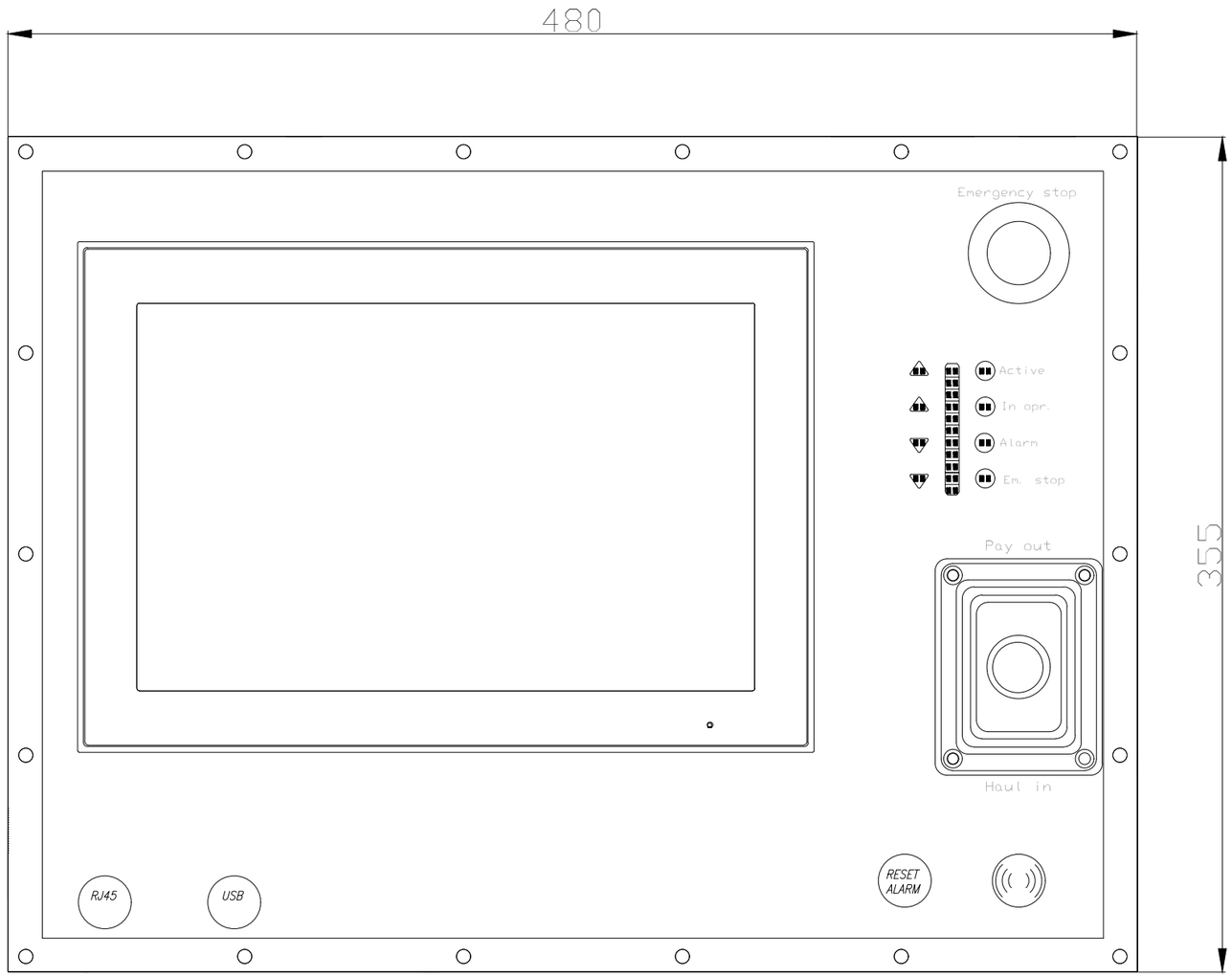


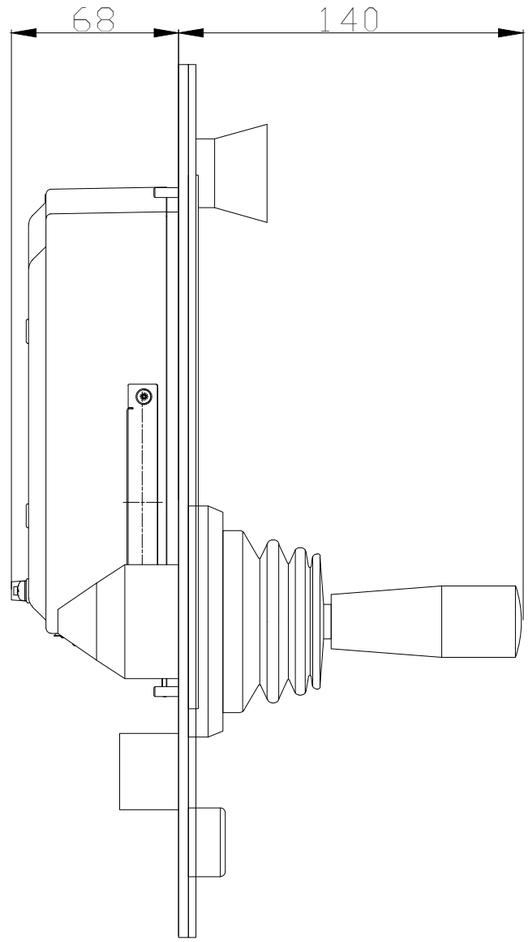
Designed by	Modified by	Date	ECO			
G Skaiå		19.01.2022	ECO-2056901			

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Name	Weight
Dimension Drawing	0 kg
Description	**Scale (A3)**
Console Deck Panel J1P0C2EMS (BBQ type)	
Document ID	**Revision**
2000004949	A



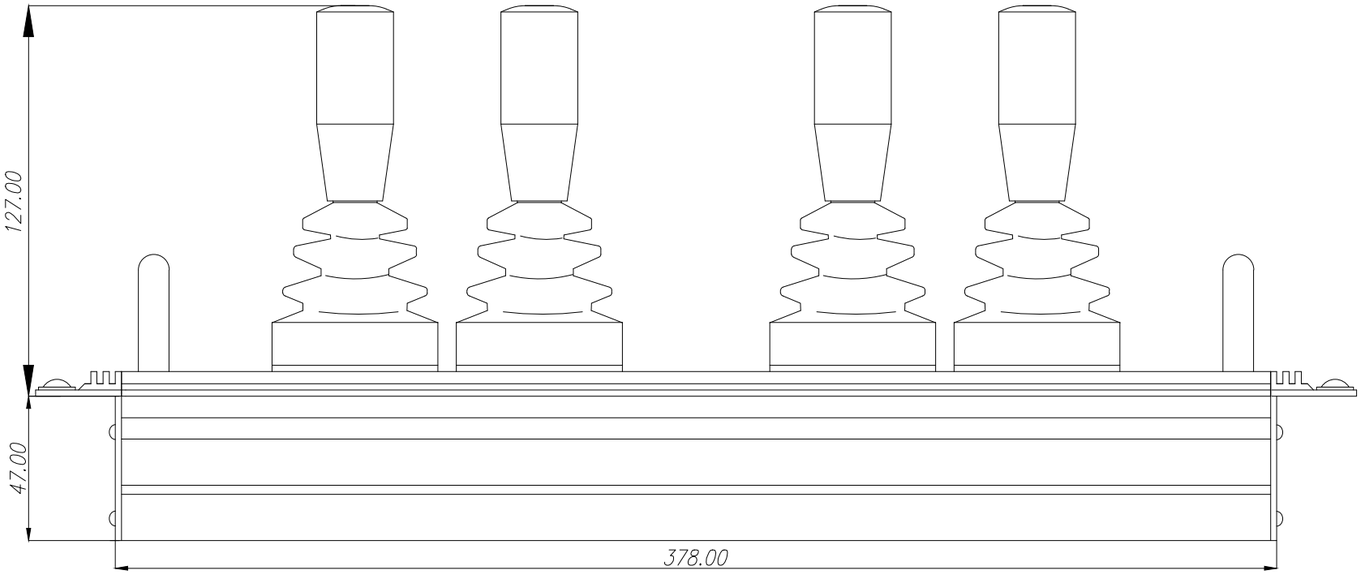


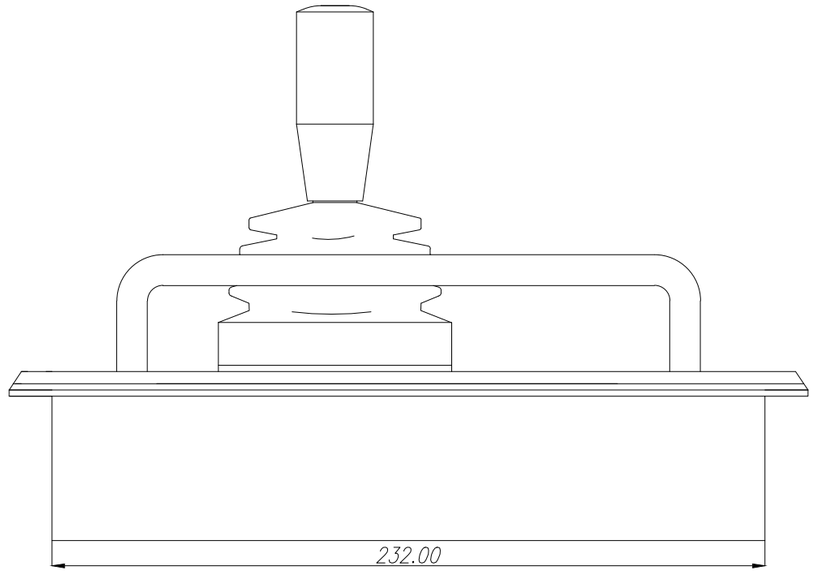
Designed by	Modified by	Date	ECO			
G Skaiå	22.02.2022	22.02.2022	ECO-2056901			

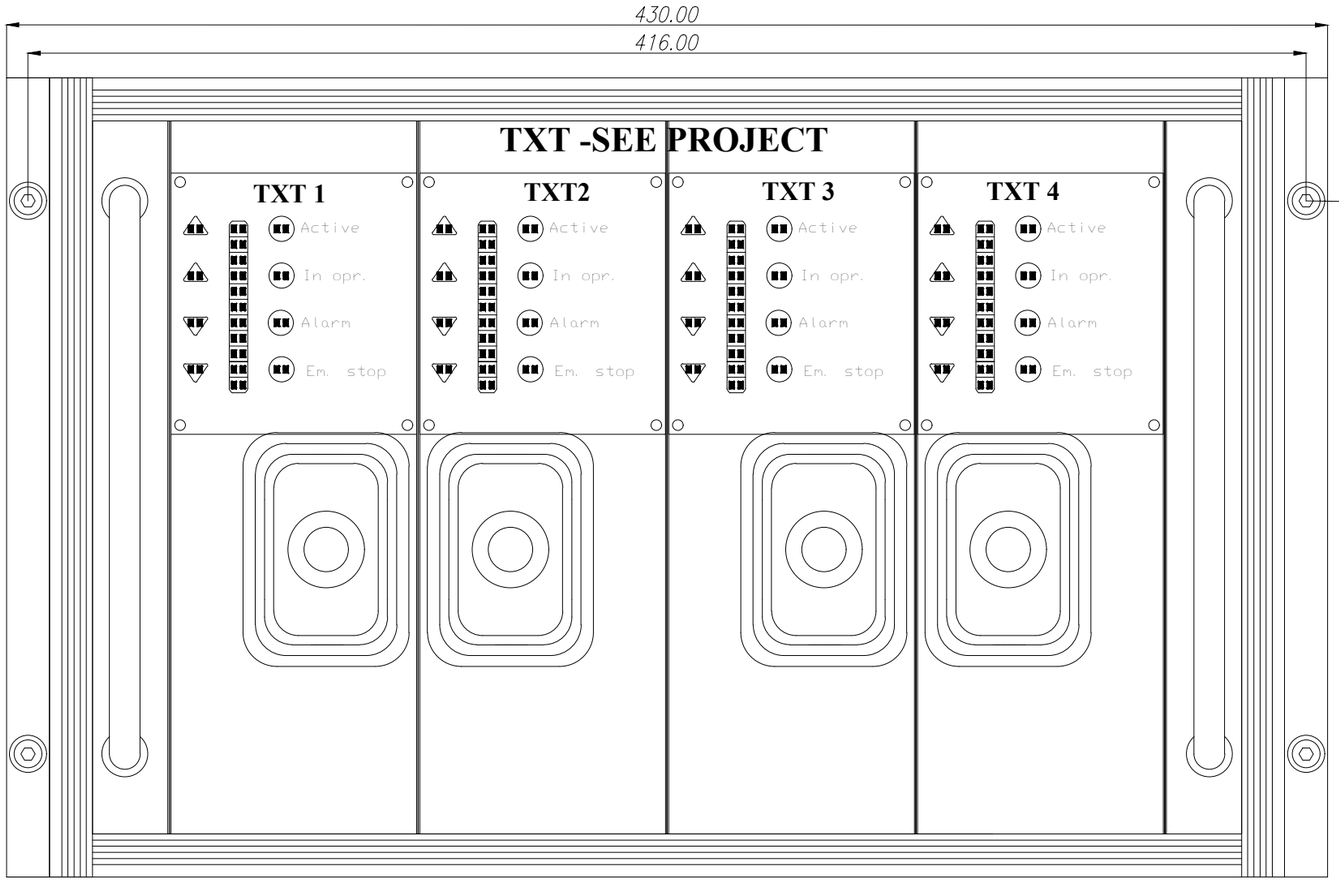
MACGREGOR

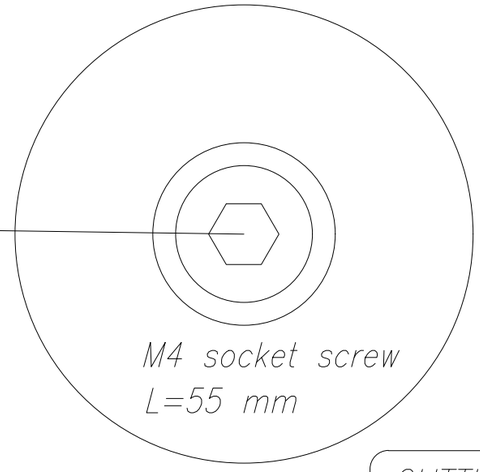
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Name	Weight
Dimension Drawing	0 kg
Description	Scale (A3)
Control Room Panel PC-Touch,J1P0C4EMS	
Document ID: 2000003404	Revision: B









CUTTING DIMENSION IN BOARD FOR THE PANEL IS 388 x 242 mm.

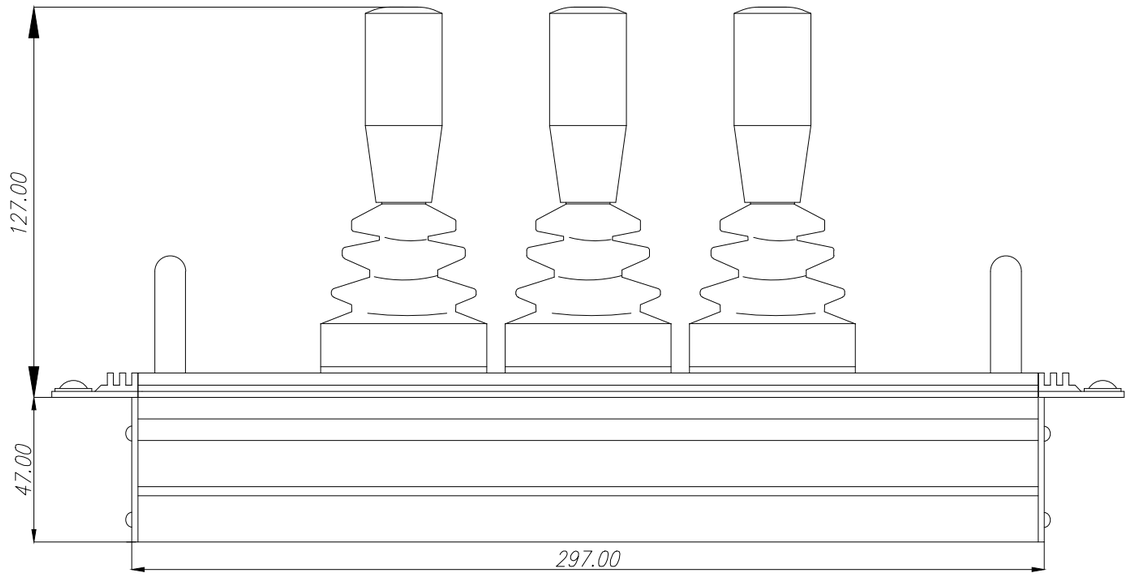
Panel labels are only for illustration purposes
It can vary as project specifics

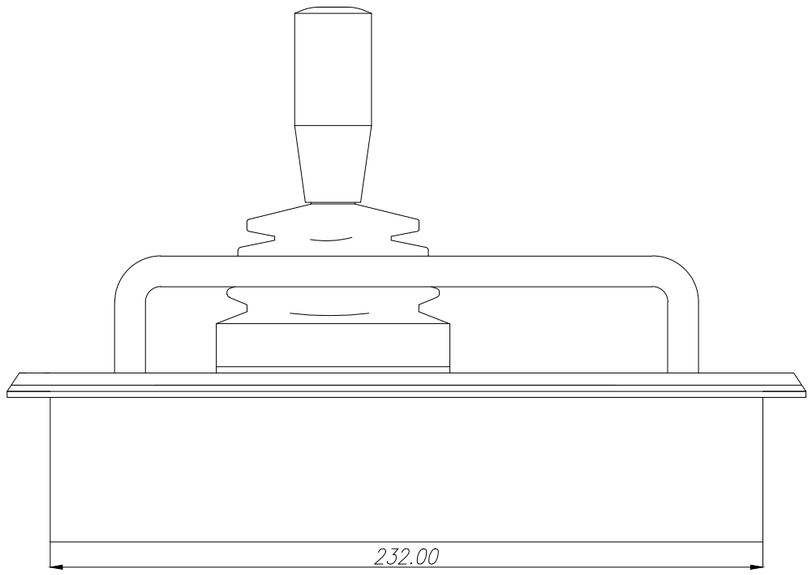
Designed by	Modified by	Date	ECO			
G Skaiå		24.02.2022	ECO-2056928			

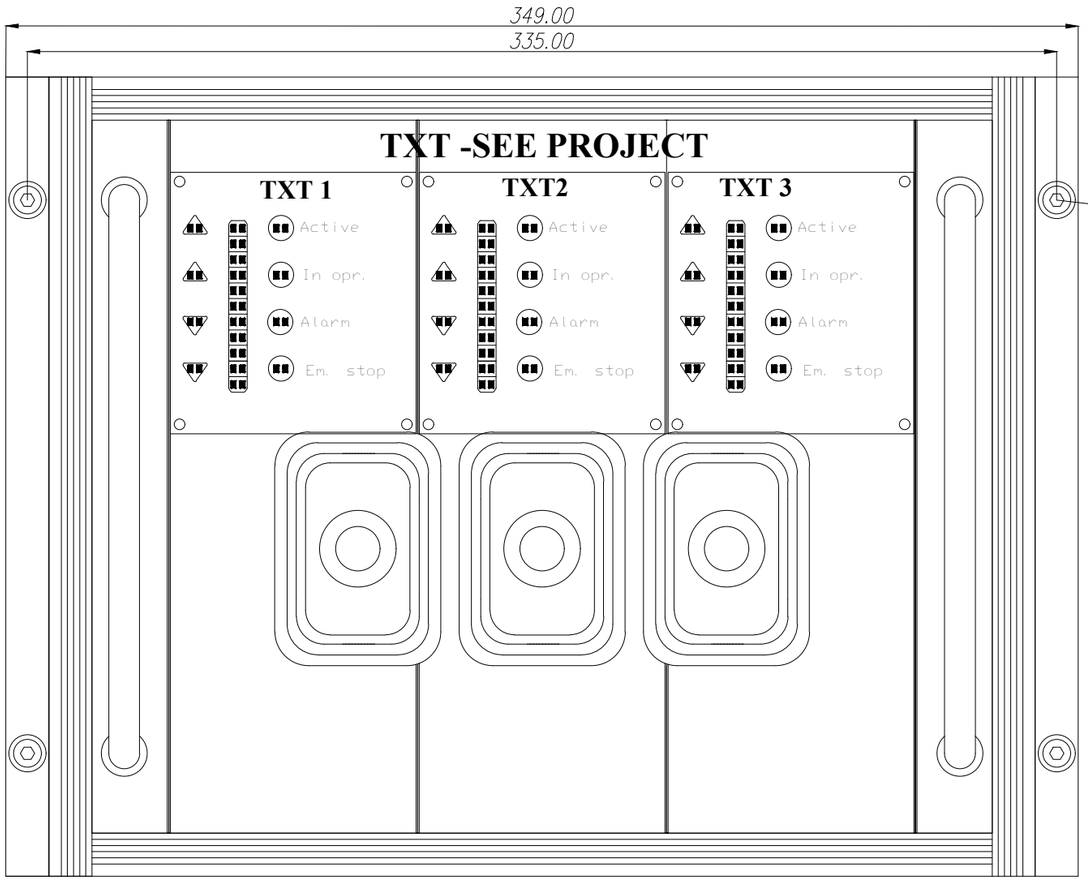
MACGREGOR

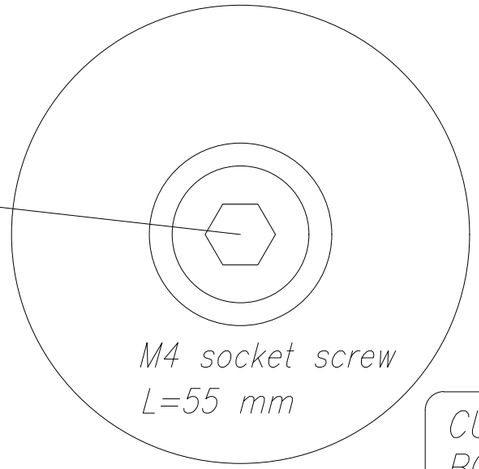
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Name	Weight
Dimension Drawing	0 kg
Description: Bridge Panel J4P0C0 Layout	Scale (A3)
Document ID: 2000005997	Revision: A









CUTTING DIMENSION IN BOARD FOR THE PANEL IS 307 x 242 mm.

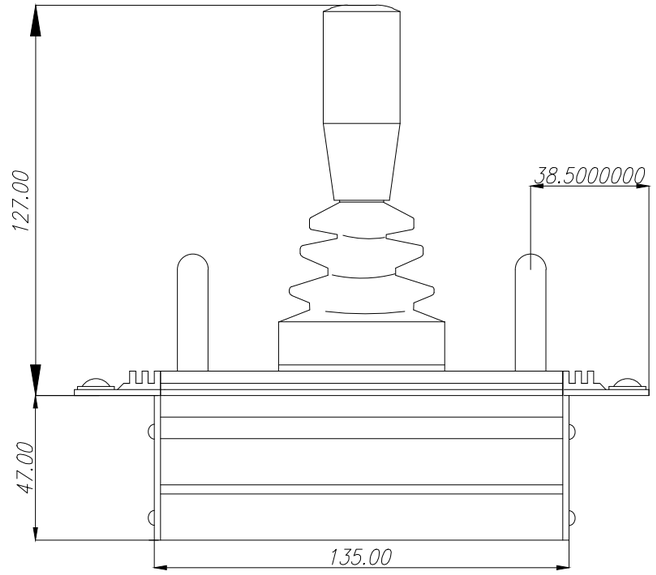
Panel labels are only for illustration purposes
It can vary as project specifics

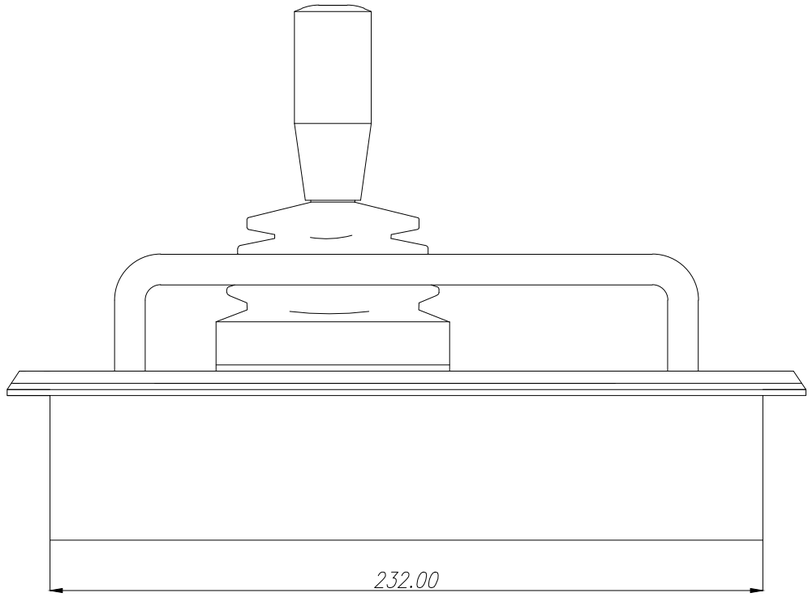
Designed by	Modified by	Date	ECO			
G Skaiå	25.02.2022	25.02.2022	ECO-2056928			

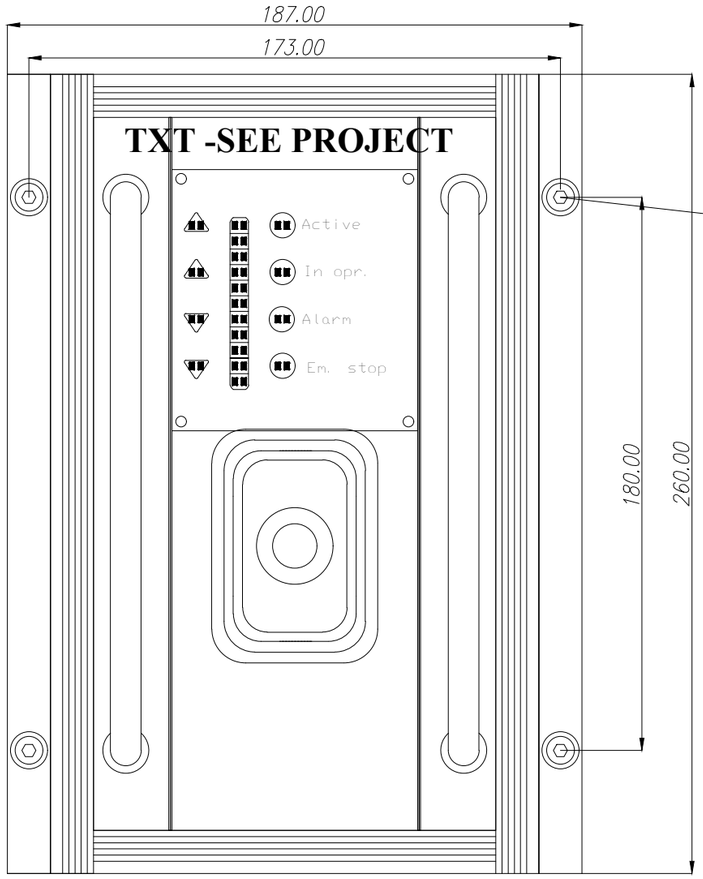
MACGREGOR

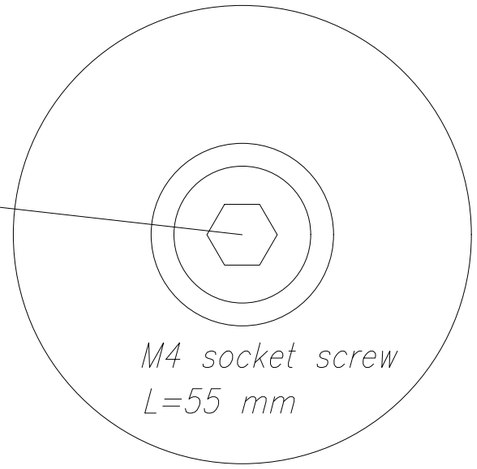
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Name	Weight
Dimension Drawing	0 kg
Description	Scale (A3)
Bridge Panel J3P0C0 Layout	
Document ID 2000005996	Revision A









CUTTING DIMENSION IN BOARD FOR THE PANEL IS 145 x 242 mm.

Panel labels are only for illustration purposes
It can vary as project specifics

Designed by	Modified by	Date	ECO			
G Skaiå		24.02.2022	ECO-2056928			

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Name	Dimension Drawing
Description	Bridge Panel J1P0C0 Layout
Document ID	2000005995
Revision	A
Weight	0 kg
Scale (A3)	

Section 4

Operating Instructions

Annex B – User Manuals

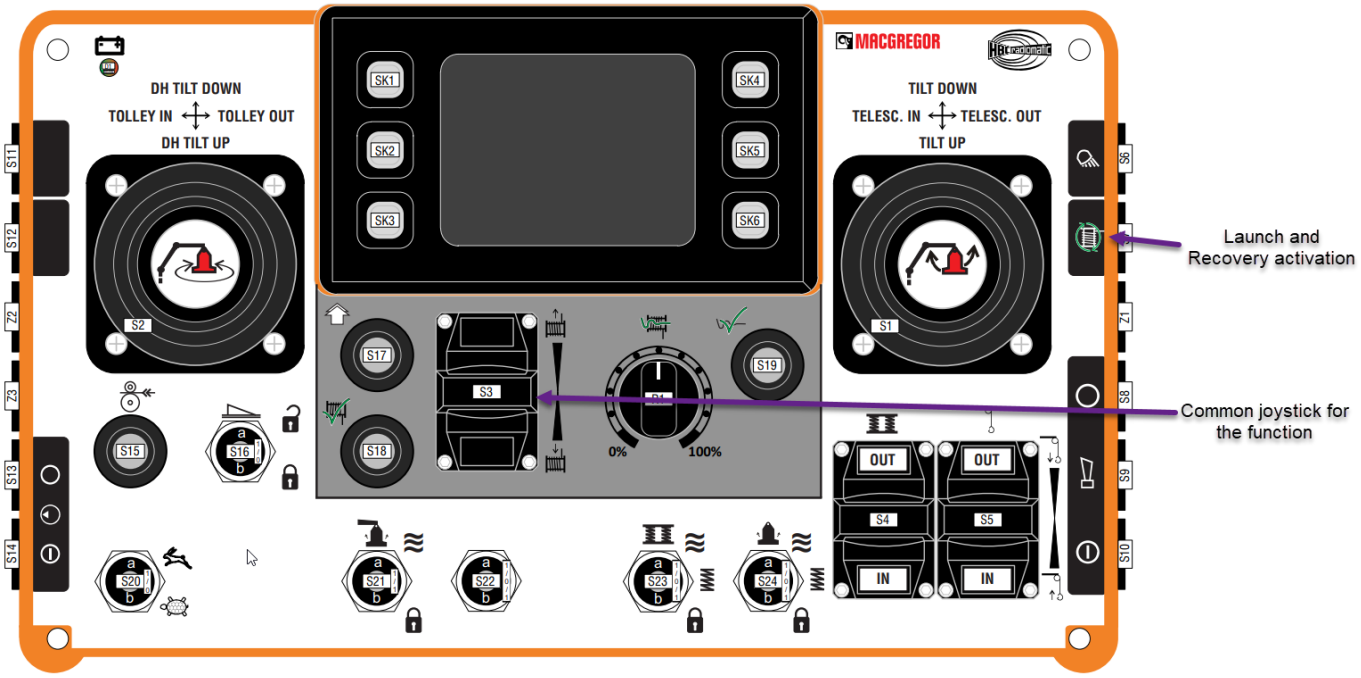
DESCRIPTION	DOC/DRW #	REV #	PAG #
One Stick Launch and Recovery	-	A	2
Radiocontrol Valve Central	-	-	3

Note: *Pentagon 7 Seas User's Manual to be added*

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One stick launch/recovery system

Radio control has function «One stick launch/Recovery» function selection



One Stick Launch function

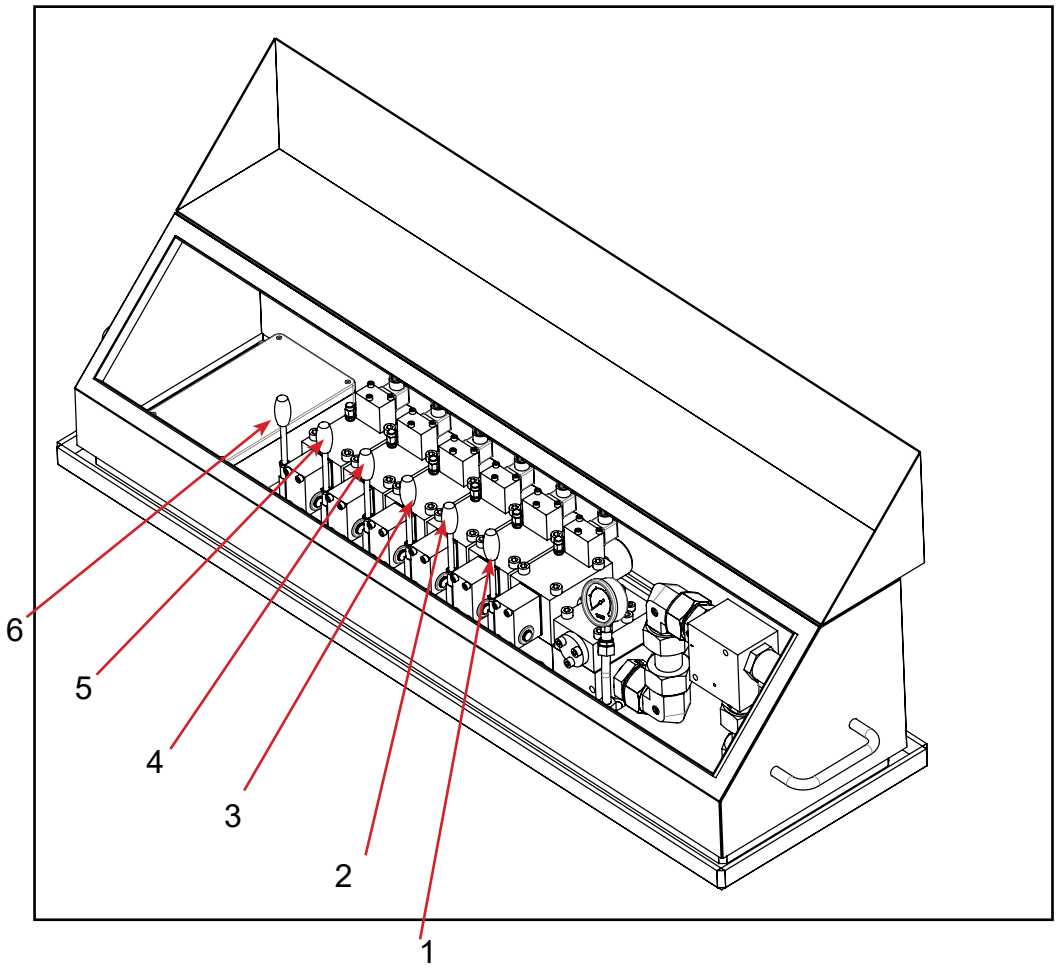
When the ROV OHC is in inboard position and the ROV is located in the snubber, the system is ready for launch and the “One Stick Launch” function is available, by pressing activation button. Control system is launching the ROV in sequences with the Overhead crane and ROV winch synchronized. All movements are controlled by using common joystick for the function.

Sequences are: manually latch the ROV to the docking head by hoisting the lifting winch. Automatic movements: trolley out – tilt down - extension out. After the sequence is completed, the operator shall manually activate the lifting winch, lift the ROV in order to release the fail-safe latching mechanism and release the ROV while it’s in the splash zone. When the ROV is released from the docking head, the boom shall be tilted up and the ROV latch is to be released manually by pulling the wire from the ROV Latch release mechanism. In order to add umbilical floats and remove the ROV latch, the boom tip shall be driven in close to the door for the operator to be able to reach the umbilical cable. When the ROV latch is removed and the umbilical floats are added, the Overhead LARS can be driven fully out by trolley movement and kept in most outboard position. Telescope can be extracted or retracted, depending on the needed outreach while the ROV is buoyant, but in case of recovery with the boom horizontally out, the telescope shall be retracted.

One stick Recovery

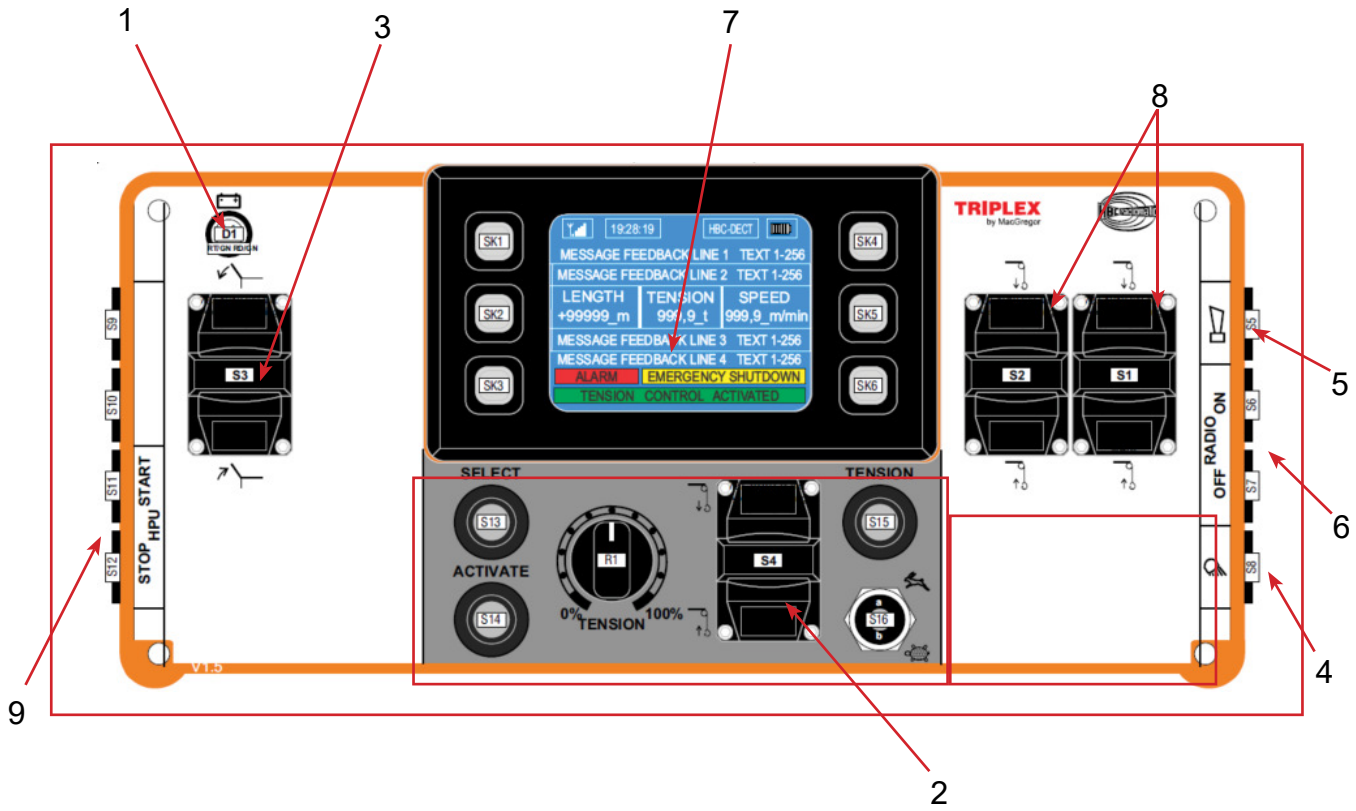
When the ROV is operated through the splash zone, umbilical floats removed and ROV Latch attached to the ROV, and latched in docking head, the system is ready for recovery, the “One Stick Recovery” function is available. By pressing the activation button, control system is recovering the ROV in sequences with the ROV LARS and winch synchronized with the common joystick. Extension in – tilt up - trolley in. When inboard, the ROV shall be manually lowered to deck by the lifting winch.

MANUAL CONTROL



POS.	DESCRIPTION
1	Winch stb : A: Lower B: Lift
2	Winch port: A: Lower B: Lift
3	A-Frame Tilt 2 stb: A: Cylinder 1 out B: Cylinder 1 in
4	A-Frame Tilt 2 port: A: Cylinder 1 out B: Cylinder 1 in
5	A-Frame Tilt 1 stb: A: Cylinder out B: Cylinder in
6	A-Frame Tilt 1 port: A: Cylinder out B: Cylinder in

RADIOCONTROL



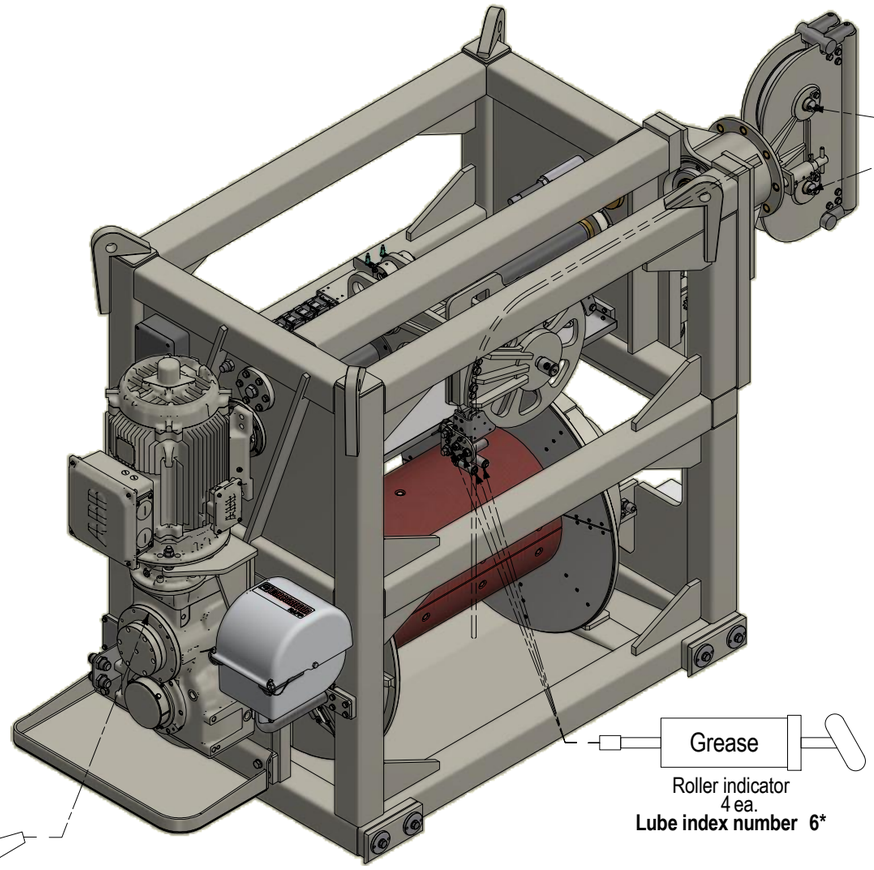
POS.	DESCRIPTION
1	Battery indicator
2	External winch control (ref: manual for RAPP winch)
3	Tilt: A-Frame out/in
	Sliding beam: Left/right
4	Lights: on/off
5	Horn
6	Radio control: On/Off
7	Display
8	Winches stb/port side of frame: In/Out
9	HPU: start /stop

Section 5

Periodic Maintenance

Lube Charts

DESCRIPTION	DOC/DRW #	REV #	PAG #
WINCHES			
ID:8513 CTD WINCH HW-515E-T90	2000005634	A	2
ID:8514 TRACTION WINCH, TRW-4004E-01R1	400092475-LUBE	A	3
ID:8516 STORAGE DRUM, RW-2372EB	400092447-LUBE	A	4
ID:8516 STORAGE DRUM, RW-2372EB	2000004322	A	5
CRANES			
Aux Winch ROV Overhead Crane	2000011851	B	6
Aux Winch KN-75 Main Crane	2000012051	B	7
ROV Overhead crane	ROV Overhead crane lubrication	-	8
CTD DAVIT	Lubrication CTD DAVIT	-	17

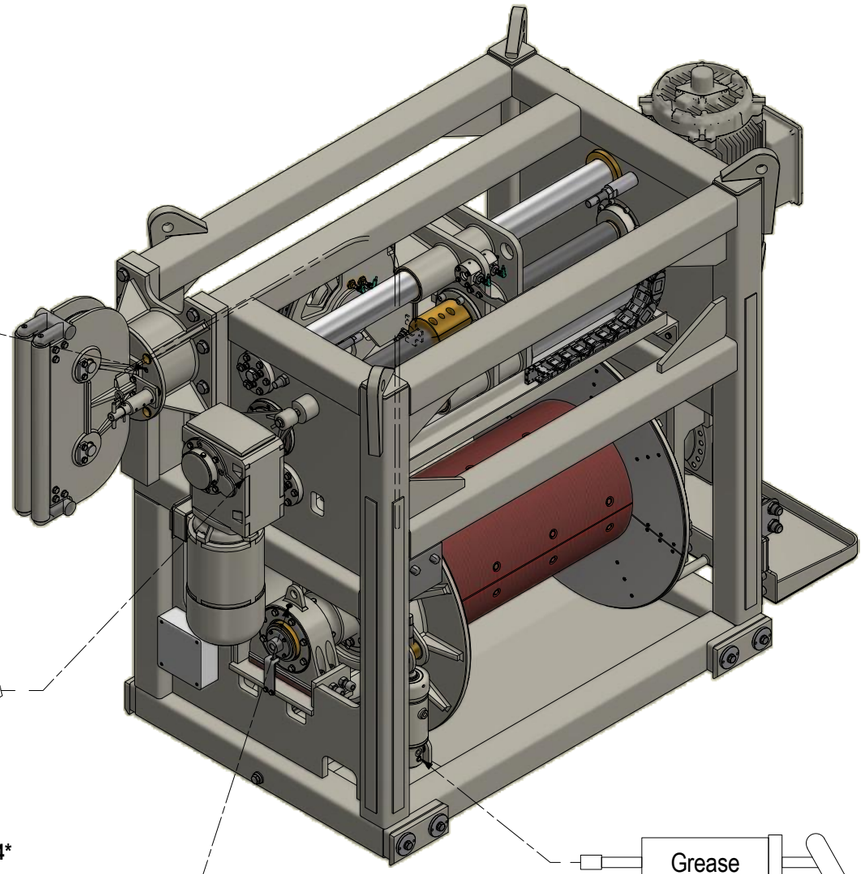


Grease
Pivot sheave
2 ea.
Lube index number 6*

Grease
Pivot sheave bracket
1 ea.
Lube index number 6*

Grease
Roller indicator
4 ea.
Lube index number 6*

Oil
Gearbox - BPH323K
Oil volume: 25 L
1 ea.
Lube index number 4*

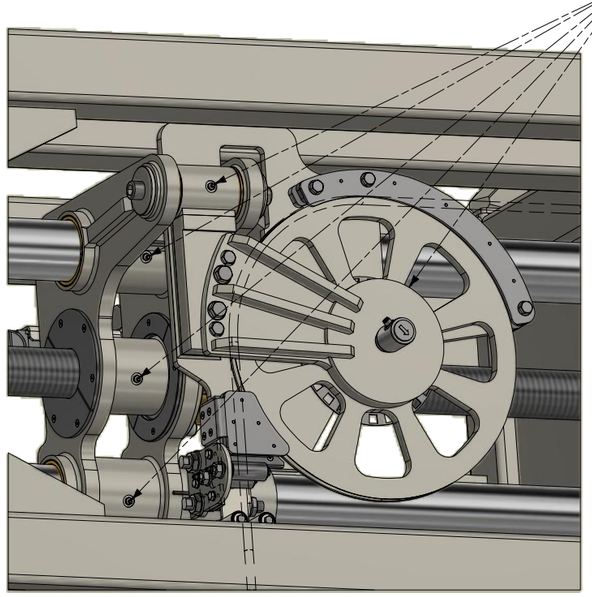


Oil
Gearbox - SK9032.1
Oil volume: 5.2 L
1 ea.
Lube index number 4*

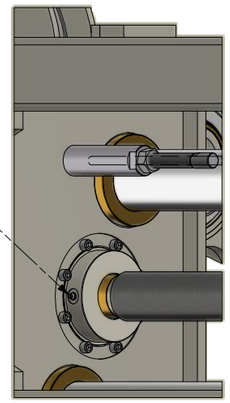
Grease
Drum bearing
1 ea.
Lube index number 6*

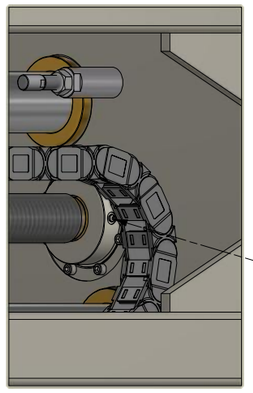
Grease
Brake arrangement
3 ea.
Lube index number 6*

Grease
Pivot hub and shafts
4 ea.
Lube index number 6*



Grease
Trapeziodal screw bearing
1 ea.
Lube index number 6*





Grease
Trapeziodal screw bearing
1 ea.
Lube index number 6*

***NOTE!** See document **#6313 RAPP MARINE Lubrication Chart** for Lube Index No.

Designed by	Date	Modified by	ECO / CO			
D Petrovic	09.02.2022.	P Pantovic	ECO-2056698			

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Name	Weight (kg)
LUBRICATION PLAN	4215
Description	Scale (A3)
CTD WINCH, HW515FST90/URP	1 : 20
Document ID	Revision / Sheet
2000005634	A / 1 / 1

HYDRAULIC AND BRAKE SYSTEM:
- Gearboxes connected to the Cooling System
- Brakes supplied with oil from Hdraulic Brake System (*)

Oil

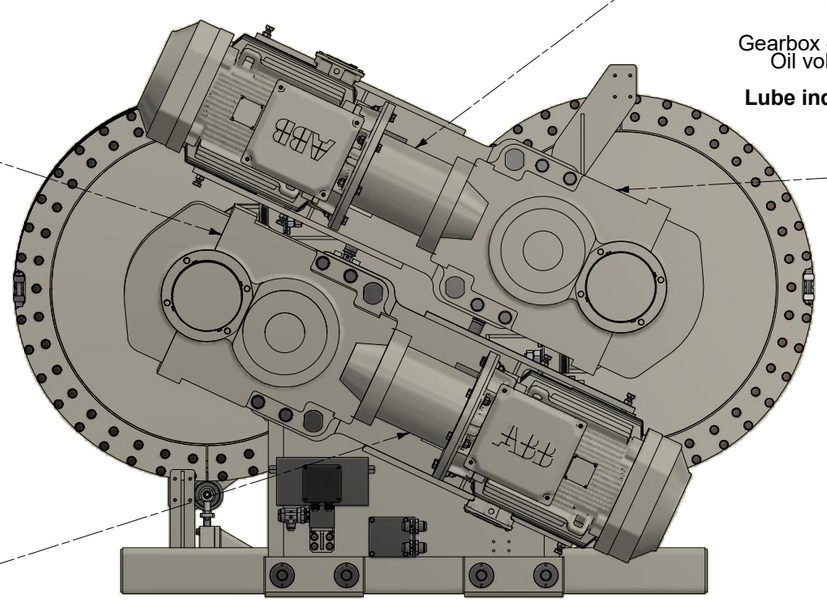
Gearbox - Wet Disk Brake
Oil volume: L
1ea.
Lube index number 2*

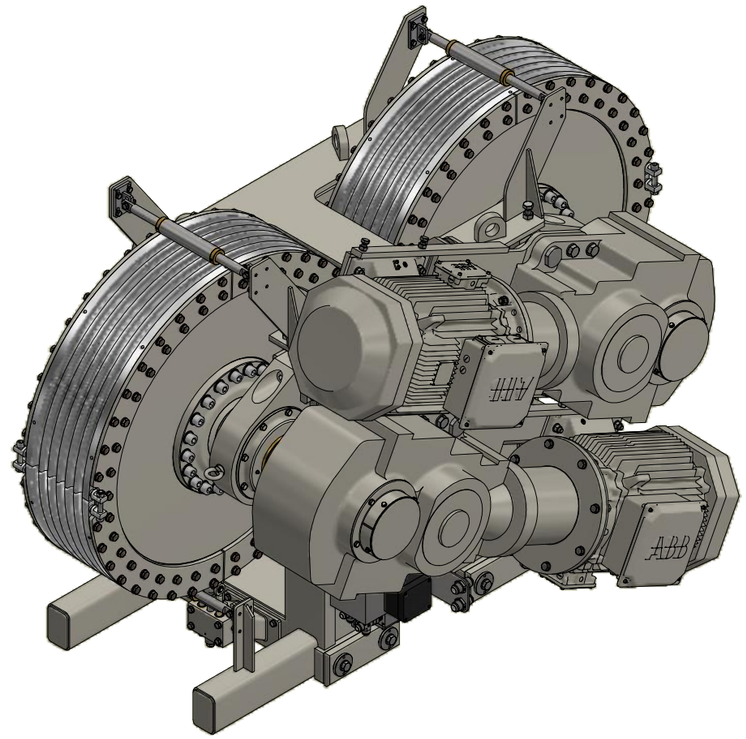
Oil

Gearbox - BPH328K
Oil volume:60L
1ea.
Lube index number 5*

Oil

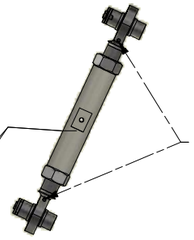
Gearbox - BPH328K
Oil volume:60L
1ea.
Lube index number 5*





Oil

Gearbox - Wet Disk Brake
Oil volume: L
1ea.
Lube index number 2*

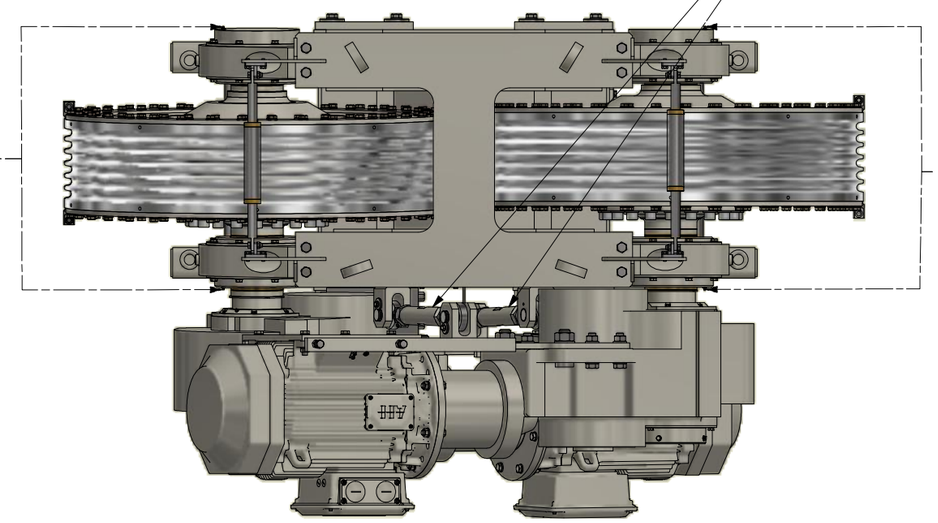


Grease

Moment bar
4ea.
Lube index number 3*

Grease

Bearing housing cover
2ea.
Lube index number 6*



Grease

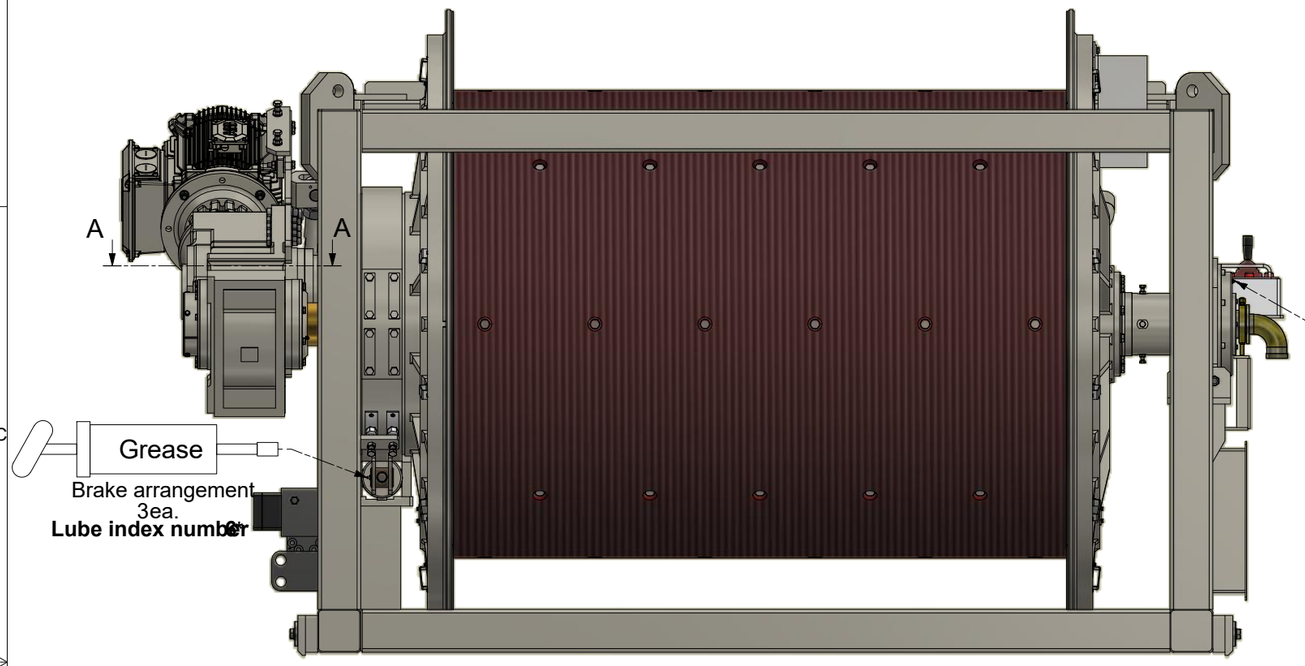
Bearing housing cover
2ea.
Lube index number 6*

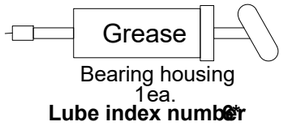
***NOTE:** See document **#6313 RAPP MARINE Lubrication Chart** for Lube Index No.

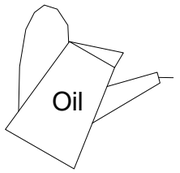
REV	ZONE	DESCRIPTION	DATE	APPROVED
A		Issued for production	26.10.2021.	RZPPA

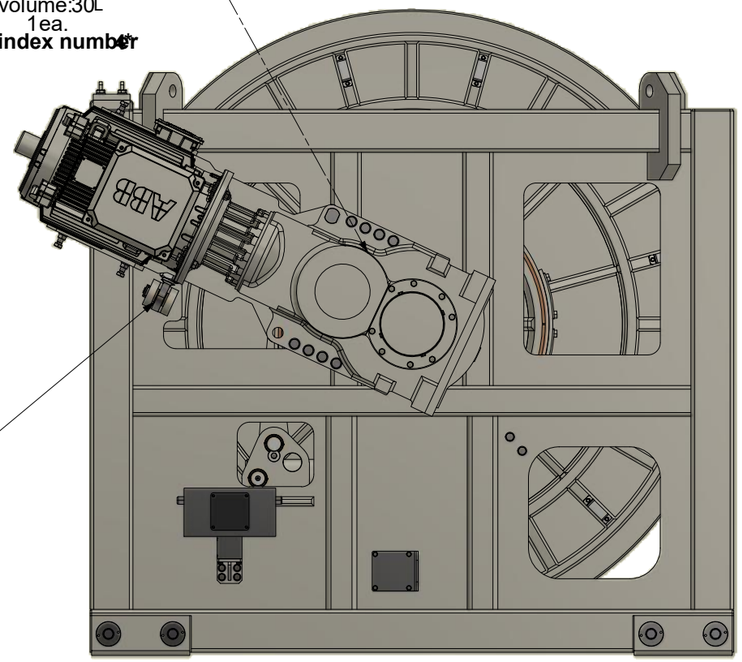
Weight 7400 kg	TRACTION WINCH TRW-4004E-01R1 LUBRICATION PLAN			MACGREGOR
Scale (A3) 1 : 20 / *Sheet* 1 / 1				*Drw number* 400092475-LUBE
	Material (for part)	*Status* Production	*Drawn by / Date (dd/mm/yy)* PETRODC 26.10.2021. / *Checked by / Date (dd/mm/yy)* RZPPA 26.10.2021.	*Partlist* 400092475

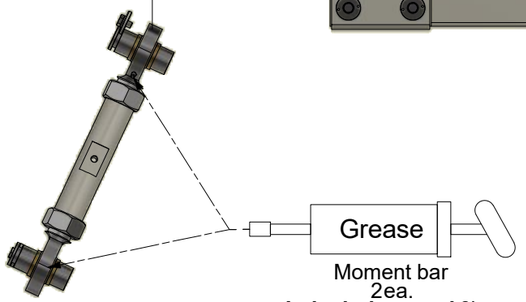
THIS DRAWING IS THE EXCLUSIVE INTELLECTUAL PROPERTY OF RAPP MARINE. THIS DRAWING IS CONFIDENTIAL AND CANNOT BE REPRODUCED, REPLICATED, OR TRANSFERRED IN HARD COPY, ELECTRONIC OR ANY OTHER FORMAT TO ANY THIRD PARTY, WHETHER IN WHOLE OR IN PART, WITHOUT THE EXPRESS WRITTEN CONSENT OF AN AUTHORIZED REPRESENTATIVE OF RAPP MARINE





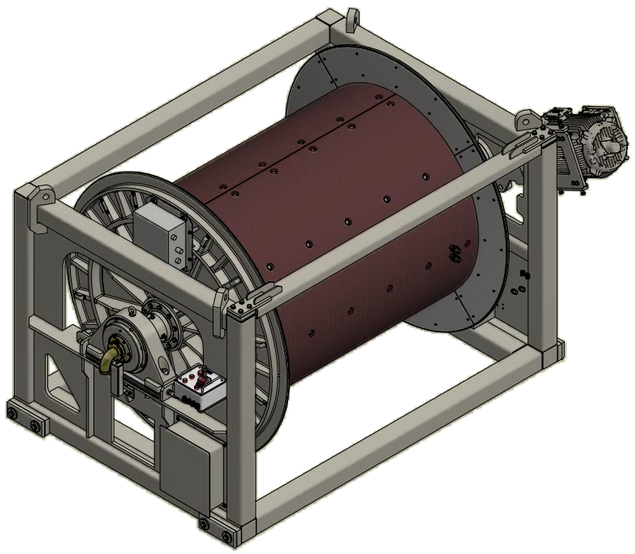






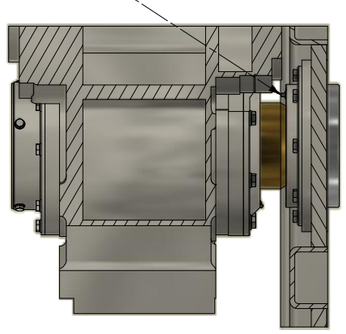
TYPE #1 OF MOMENT BAR: **6 POINTS (NO GREASING REQUIRED)**
TYPE #2 OF MOMENT BAR: **2 POINTS (GREASING REQUIRED)**

ISO VIEW (1 : 40)





A-A (1 : 10)

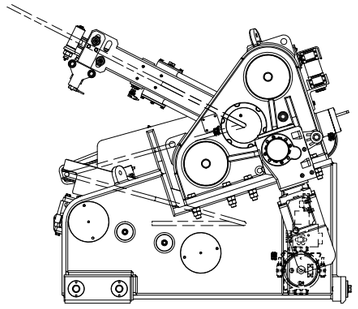


***NOTE:** See document **#6313 RAPP MARINE Lubrication Chart** for Lube Index No.

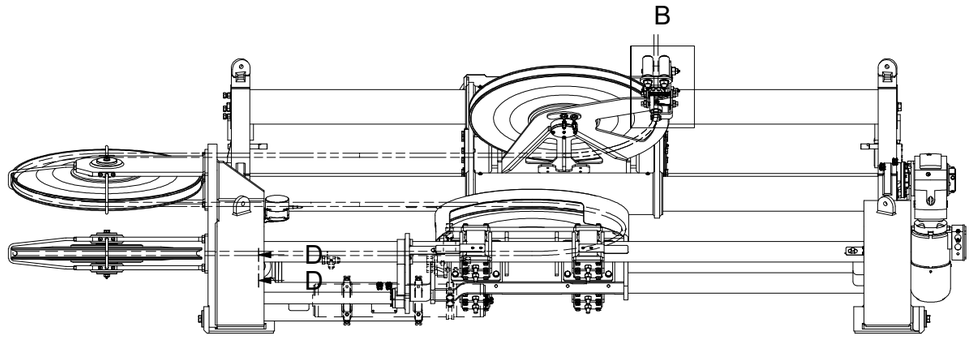
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A		Issued for production	20.10.2021.	RZPPA

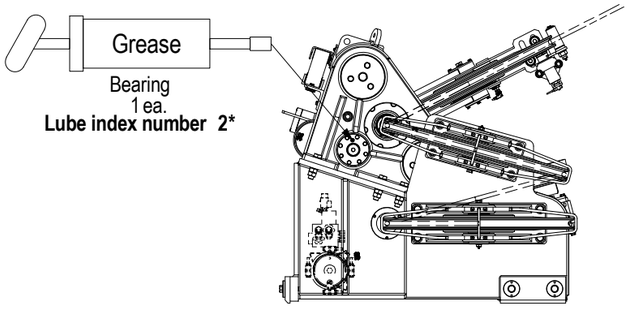
Weight 9500 kg	STORAGE DRUM RW-2372EBS, OLN LUBRICATION CHART		MACGREGOR	
Scale (A3) 1 : 20	*Sheet* 1 / 1		*Drw number* 400092447-LUBE	
Material (for part)	*Status* Production	*Drawn by / Date (dd/mm/yy)* PETRODO 20.10.2021.	*Checked by / Date (dd/mm/yy)* RZPPA 20.10.2021.	*Partlist* 400092447

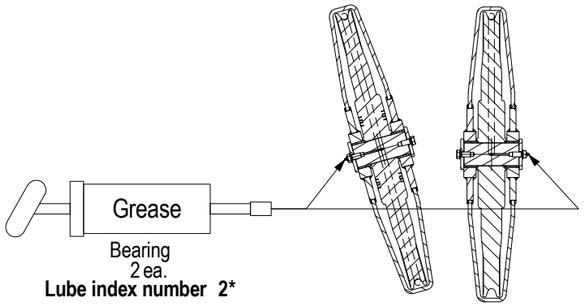
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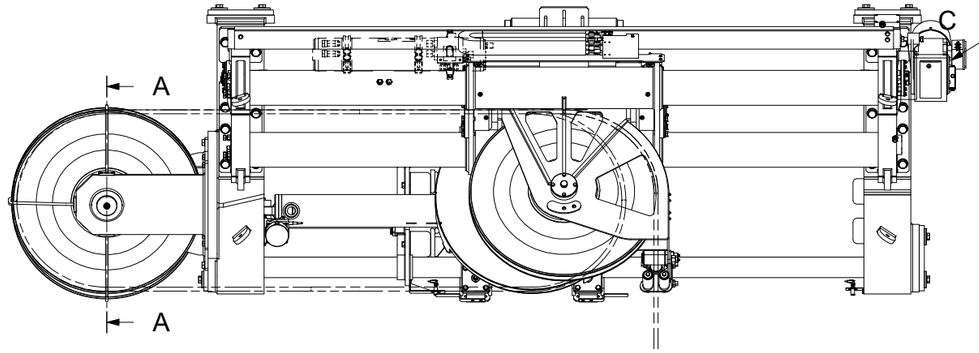


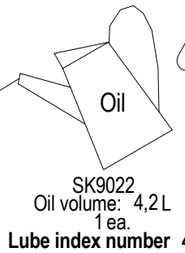
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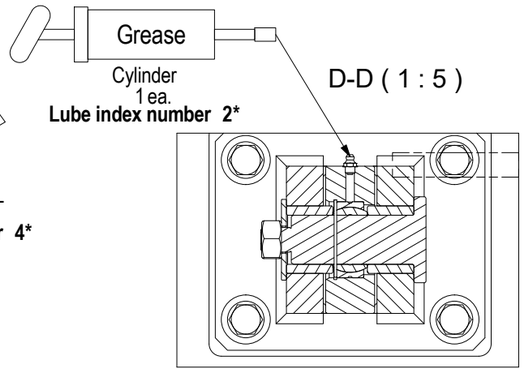




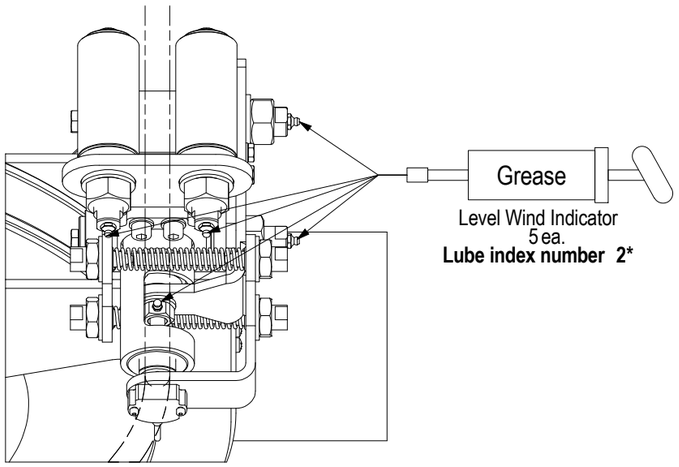




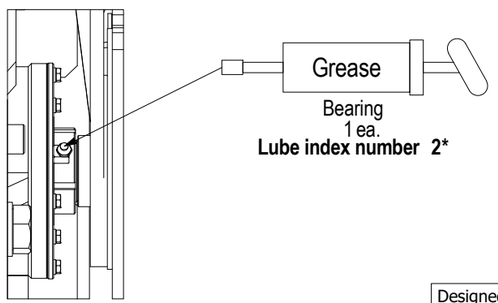


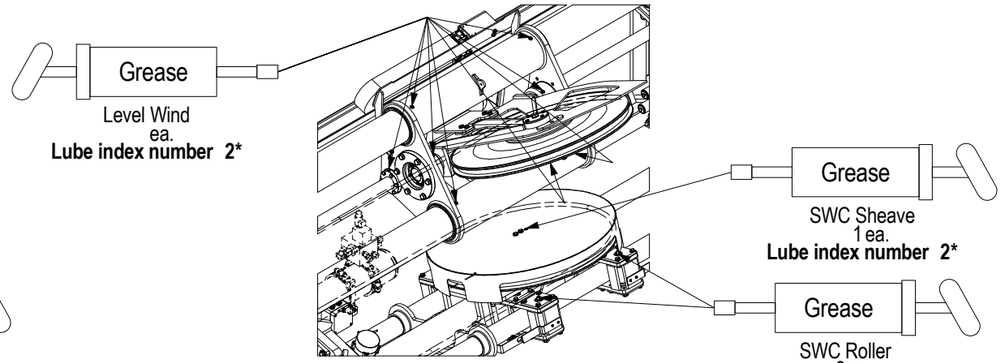


B (1 :5)



C (1 : 5)





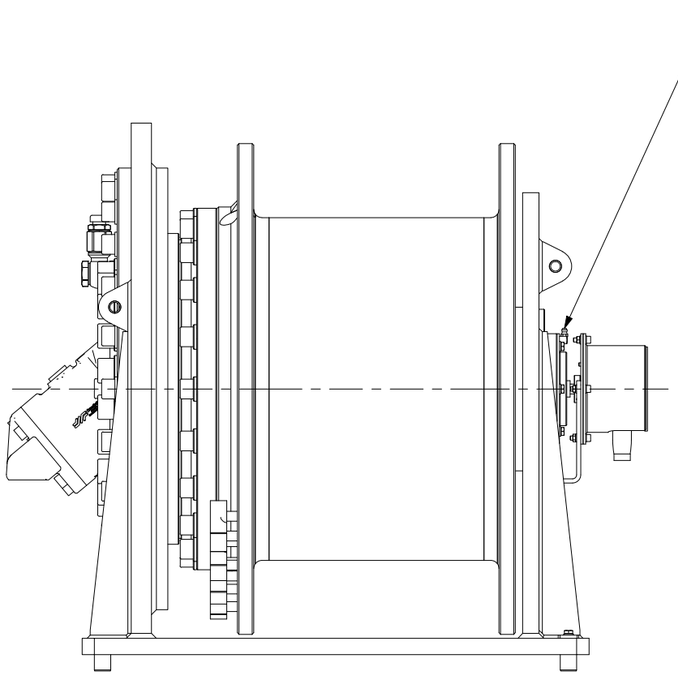
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P Pantovic	27.12.2021.	P Pantovic	ECO-2056483			

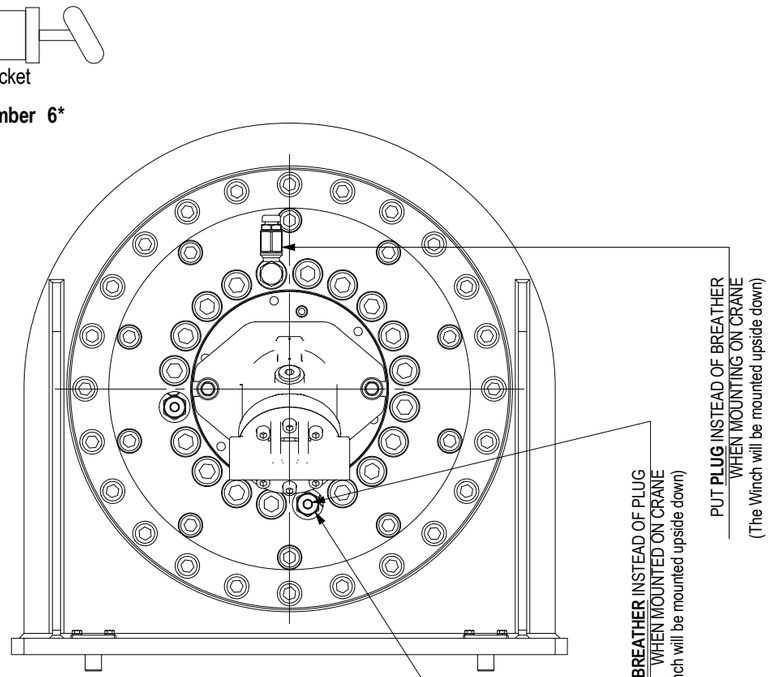
MACGREGOR

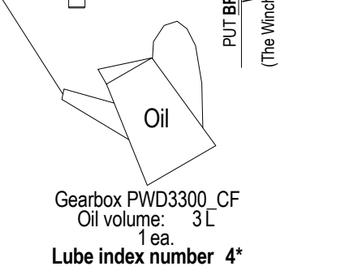
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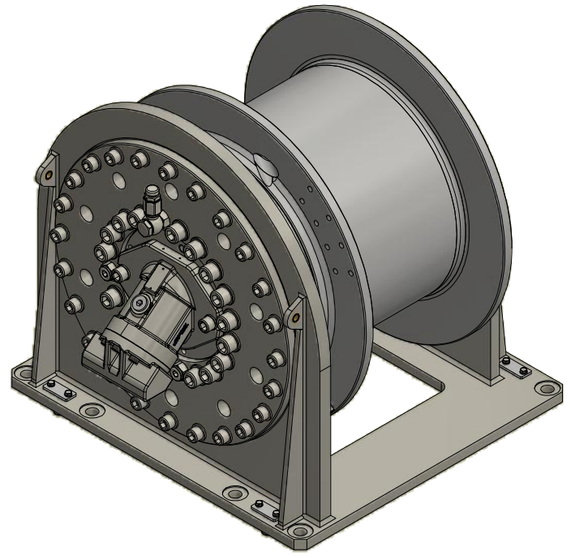
Name	Weight
LUBRICATION PLAN	4540 kg
Description	Scale (A3)
LEV. WITH SLACK WIRE, LSWC5000/01L1	1 : 30
Document ID: 2000004322	Revision: A / Sheet: 1 / 1

***NOTE!** See document **#6313 RAPP MARINE Lubrication Chart** for Lube Index No.









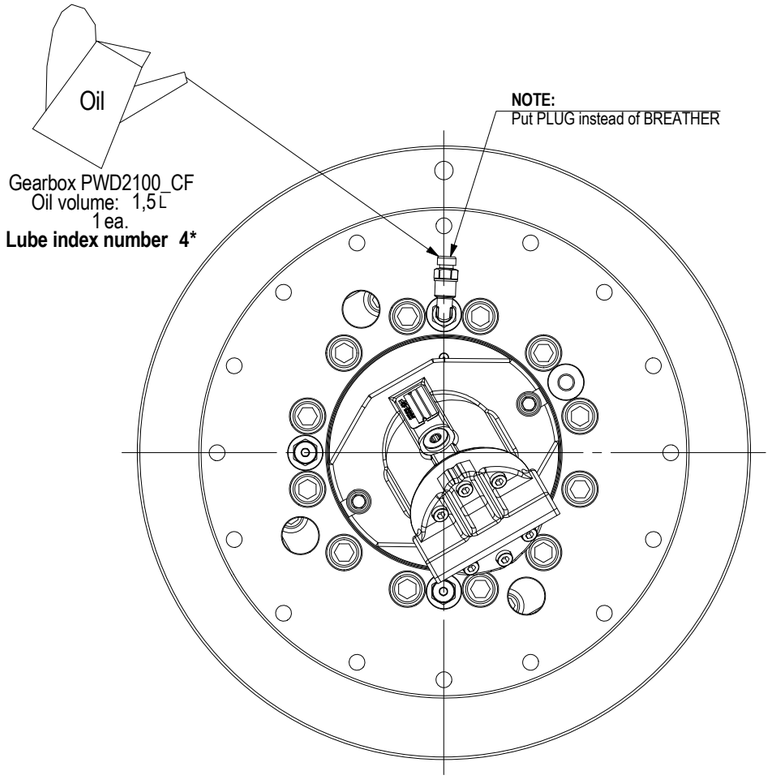
***NOTE!** See document **#6313 RAPP MARINE Lubrication Chart** for Lube Index No.

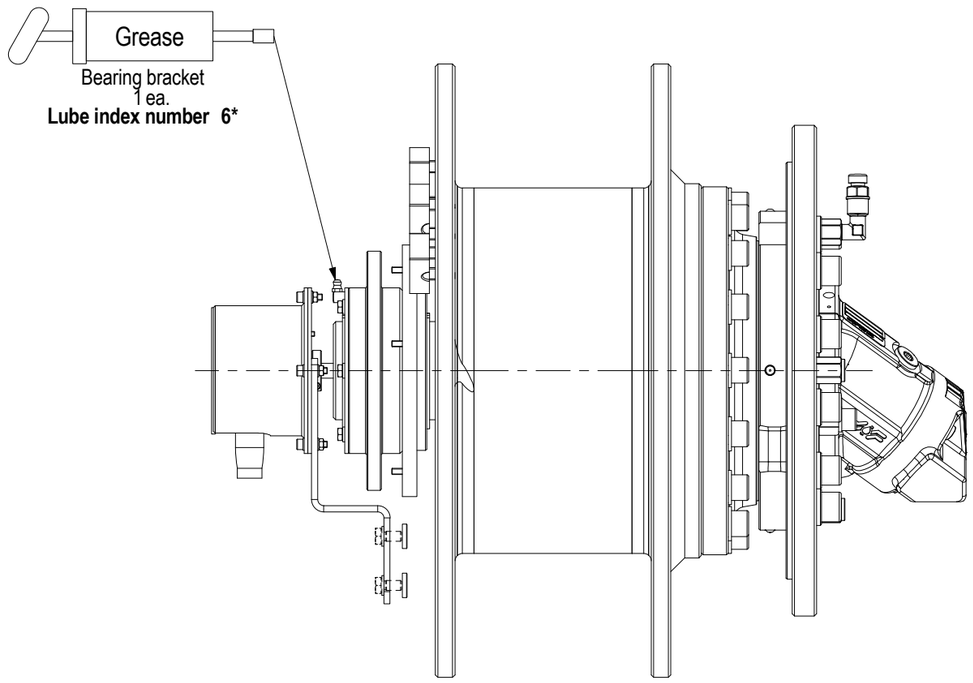
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S Vasilijevic	2.9.2022.	A Karaic	ECO-2058000			

MACGREGOR

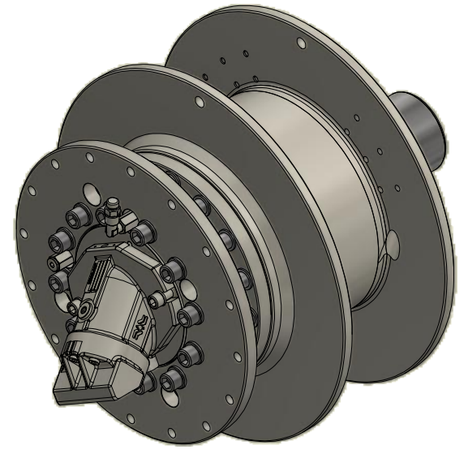
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Name	Weight (kg)
LUBRICATION CHART	531
Description	Scale (A3)
Gilson Winch GW-1000, LU, RO	1 : 7,5
Document ID: 2000011851	Revision: B / Sheet: 1 / 1





ISO VIEW (1 : 7.5)



ISO VIEW (1 : 7.5)



***NOTE!** See document **#6313 RAPP MARINE Lubrication Chart** for Lube Index No.

Designed by	Date	Modified by	ECO / CO			
S Vasilijevic	09.09.2022.	B Simic	ECO-2058000			

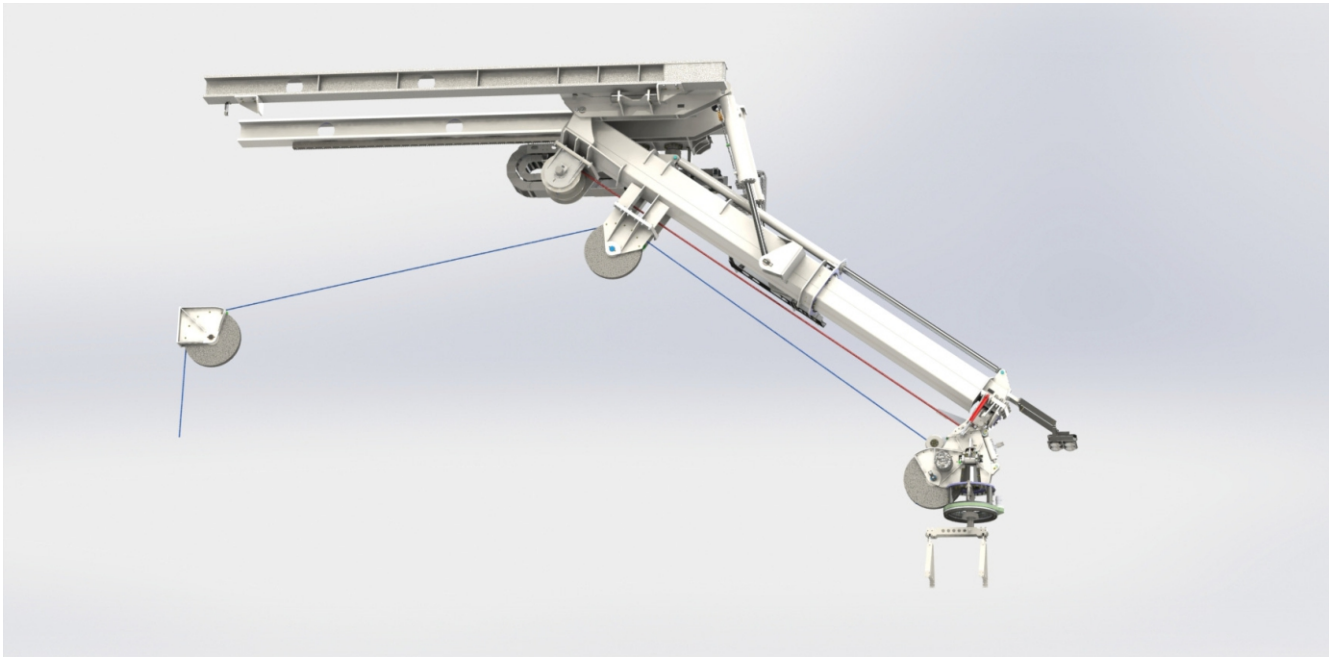
MACGREGOR

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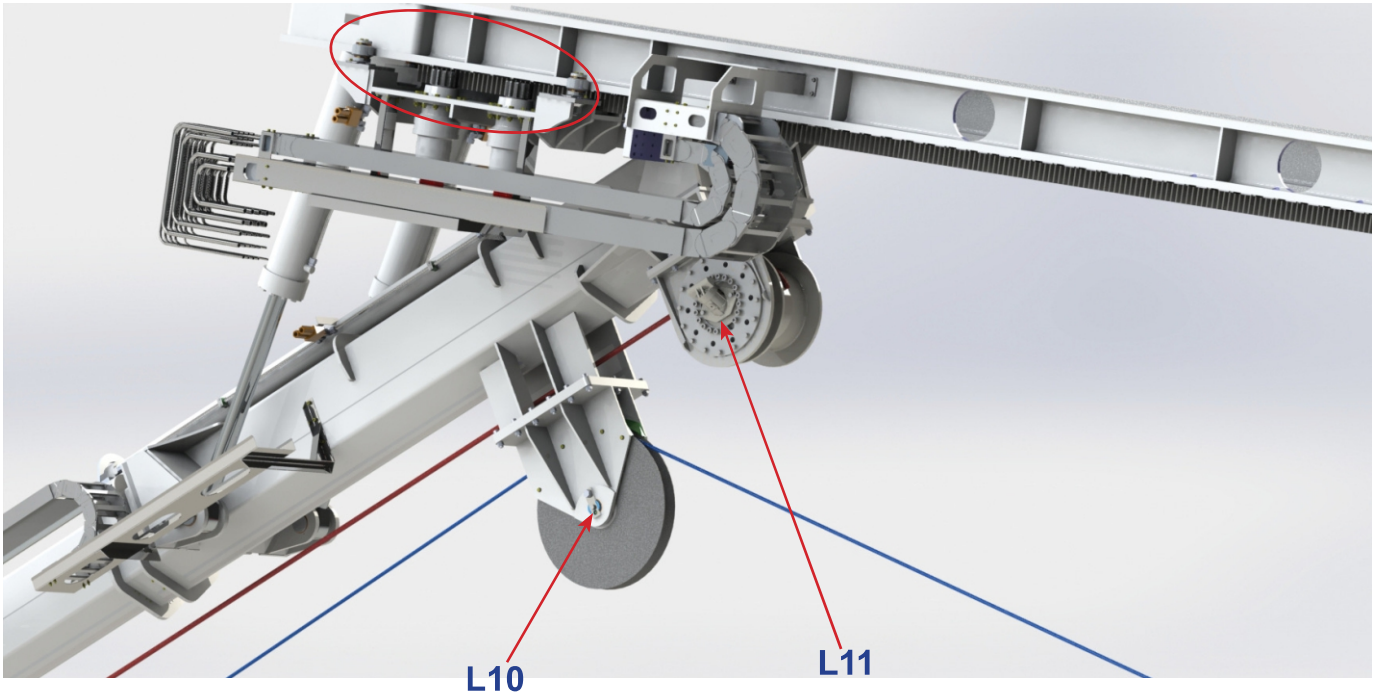
Name	Weight (kg)
LUBRICATION CHART	178
Description	Scale (A3)
GW-1000-UV, LO	1 : 5
Document ID	Revision / Sheet
2000012051	B / 1 / 1

Overhead Crane Lubrication

Lubrication chart

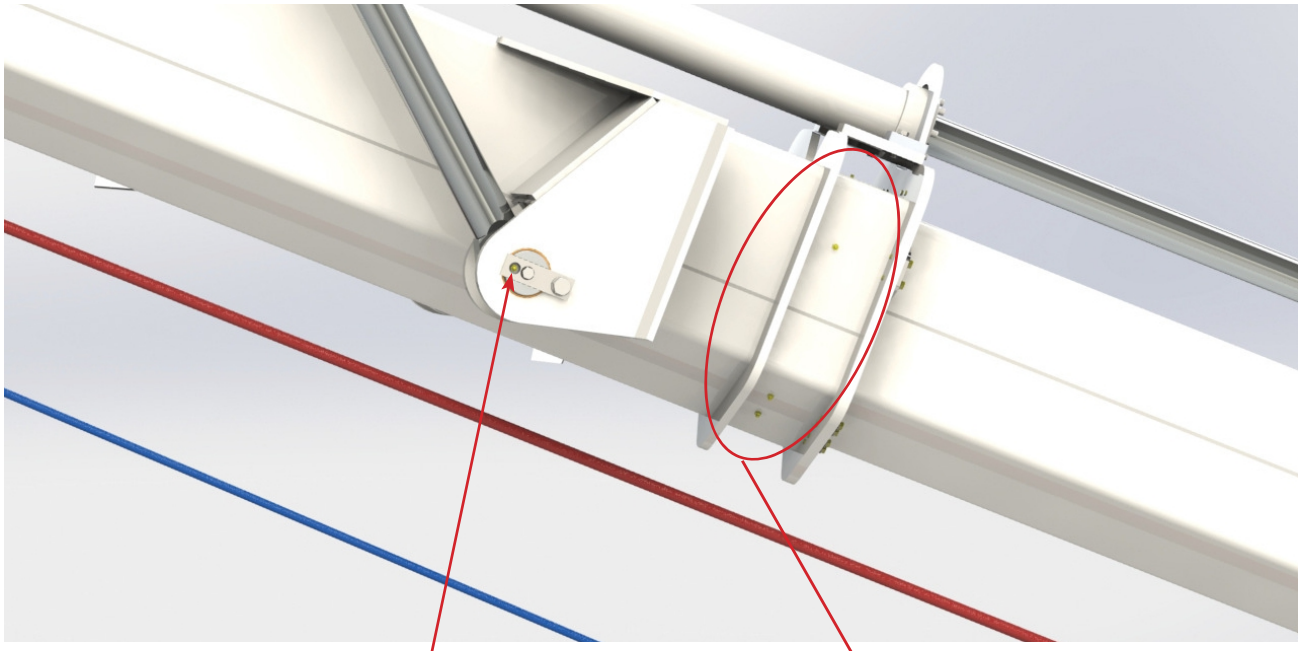


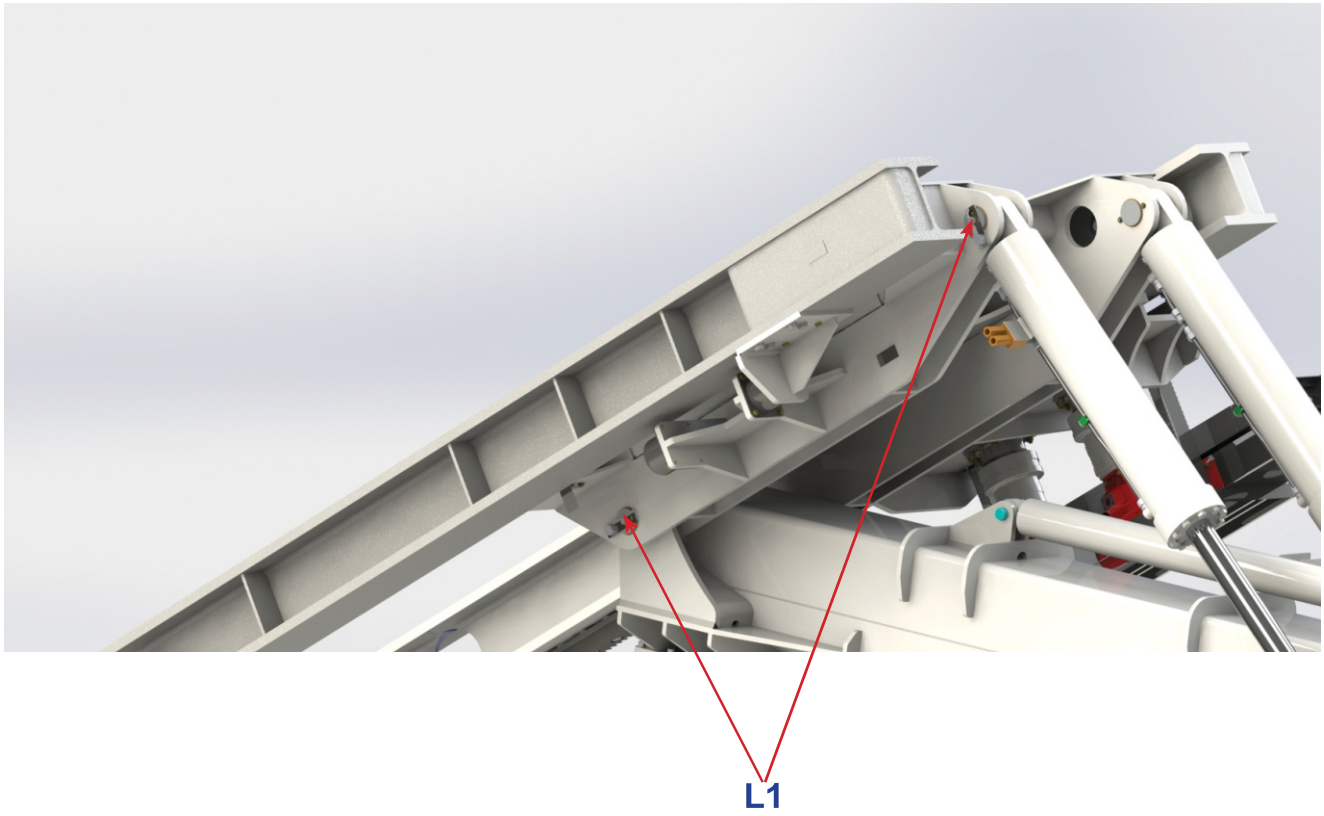




Overhead Crane Lubrication

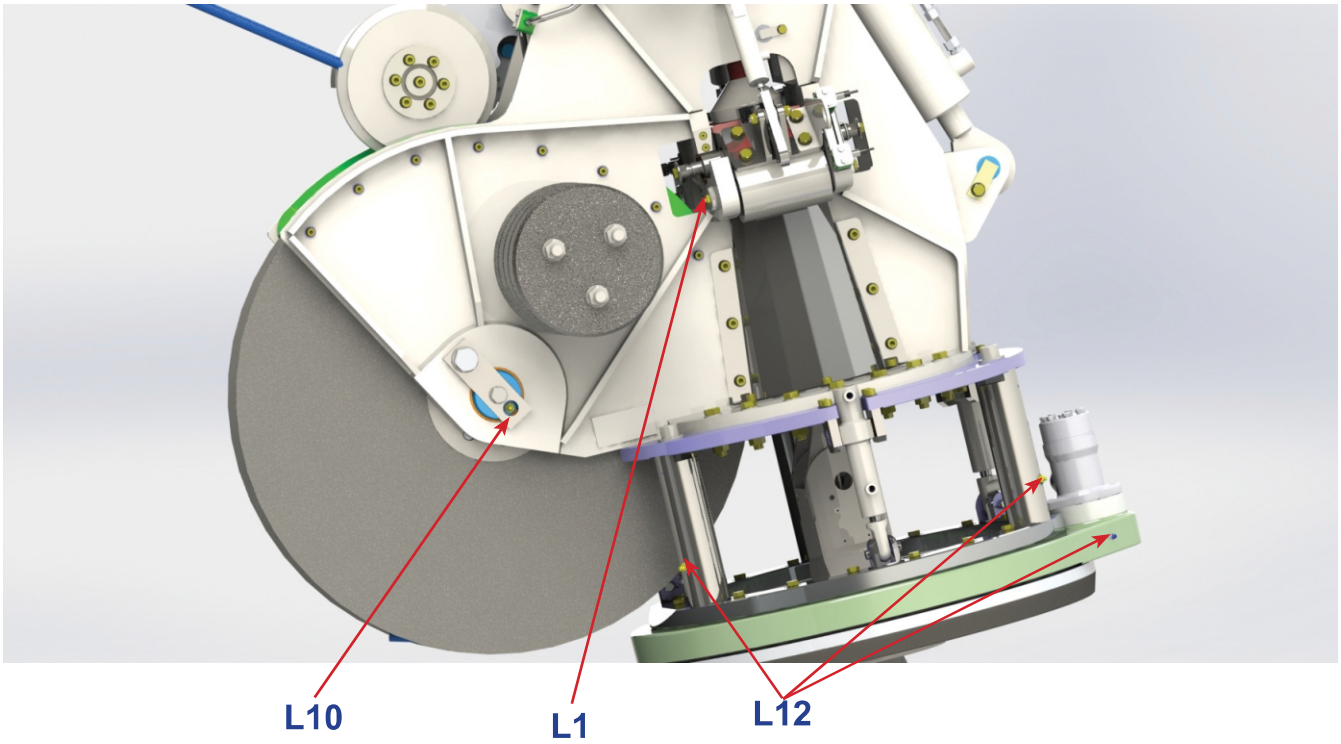
Lubrication chart

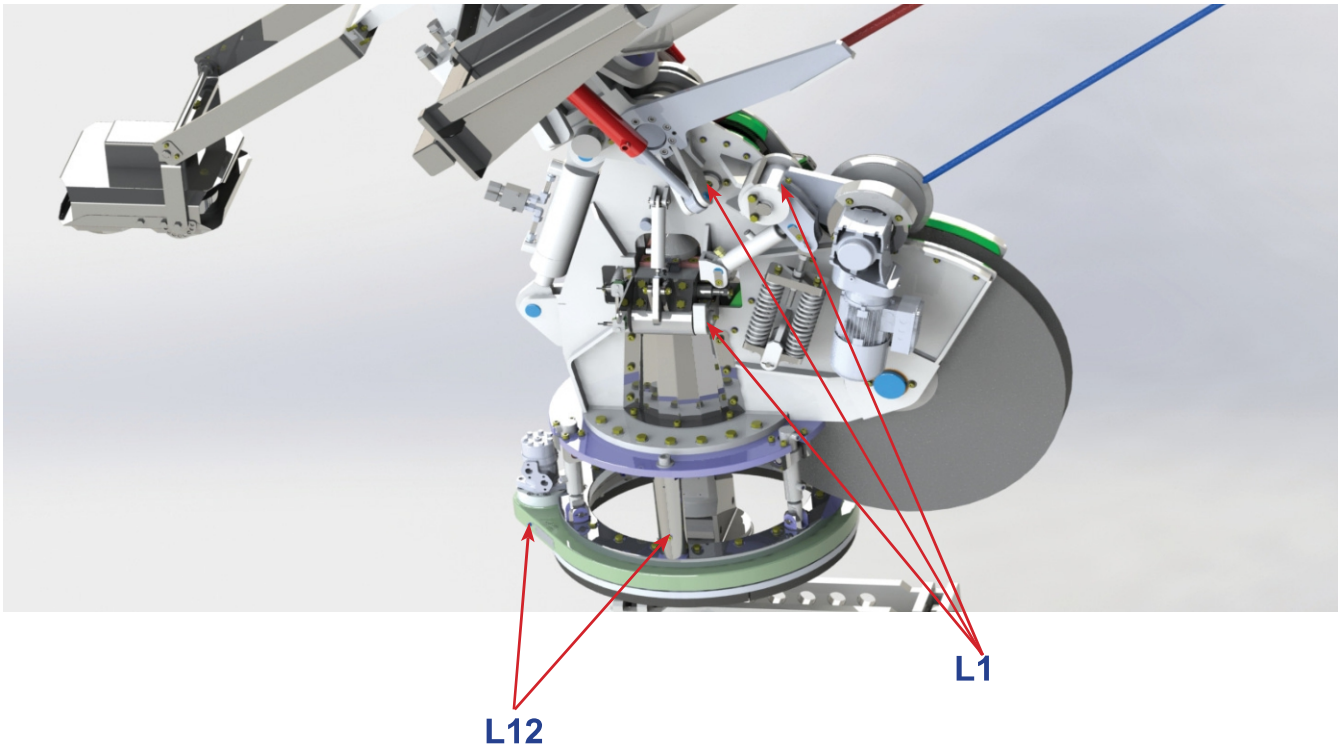




Overhead Crane Lubrication

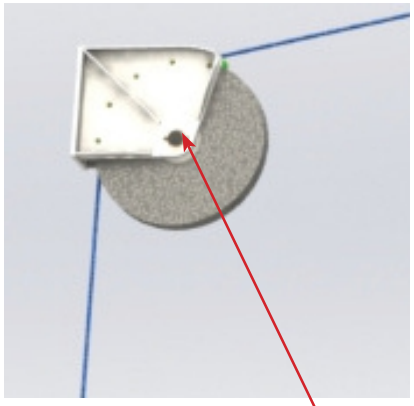
Lubrication chart

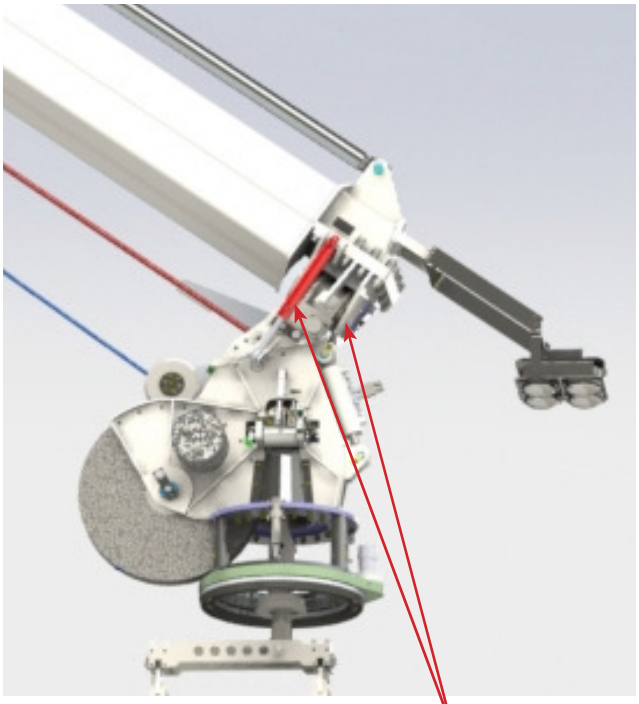


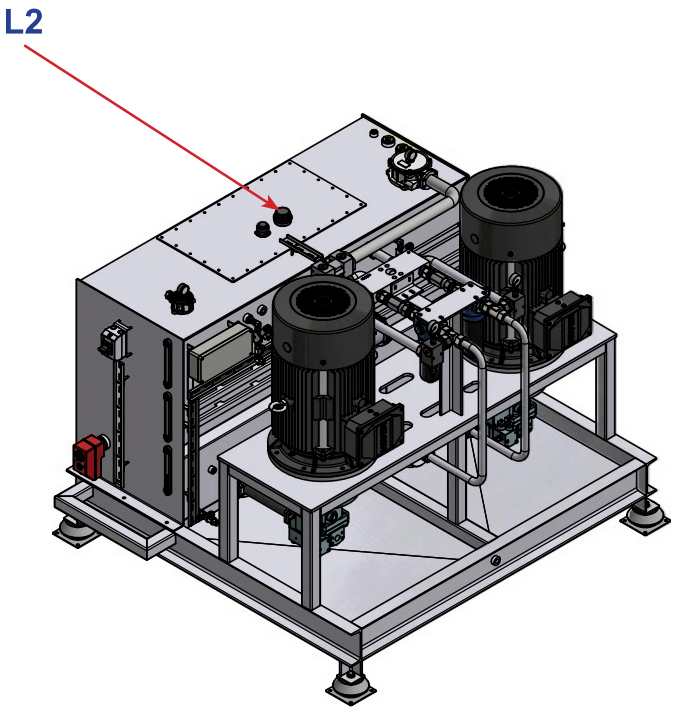


Overhead Crane Lubrication

Lubrication chart







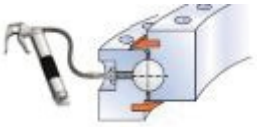
Overhead Crane Lubrication

Pos.	Item	Oil Quality	Volume	Schedule
L1	Bolts	Shell Gadus S2 V220		Monthly lubrication daily control
L2	Hydraulic system	Recomended oil type 20-40°C Shell Tellus S2 V 32 40-50°C Shell Tellus S2 V 46 50-60°C Shell Tellus S2 V 68 60-70° Shell Tellus S2 V 100 or equivalent dependent on system temp.		Weekly control. Yearly oil change.
L3	Gearbox	Shell Omala S2 G Shell Omala S4GX / VI	2,6 l	See: "RE-gearbox maintenance"
L4	Brake	Shell Tellus S2 V32	Level plug	See: "RE-gearbox maintenance"
L6	Telescope	Shell Gadus S2 V220		Monthly lubrication daily control
L7	Tooth bar	Shell Gadus S3 A1300C **(Open gear grease)**		Monthly lubrication daily control
L8	Trolley wheels	Shell Gadus S2 V220		Monthly lubrication daily control
L10	Wire block	Shell Gadus S2 V220		Monthly lubrication daily control
L11	Winch	**Shell Omala S2 G150 (220 from TRIPLEX) (ISO VG 150)**	**Fill the drum to it's horizontal axis.**	**Oil change every 6 months or afther 600 hours of use**
L12	Docking head	Shell Gadus S2 V220		Monthly lubrication daily control



MPORTANT:

Lubricate gear teeth and pinion with open gear grease. This lubrication should be carried out by opening hatches on the side of the foundation. Use spray or brush for applying grease on gear teeth.



Press grease into all grease nipples connected to the slewing ring while revolving the slewing ring, until a continuos grease collar forms under both of the seals.

Overhead Crane Lubrication

Lubricants specification

Shell Gadus V220			Method	2
NLGI Consistency				2
Soap Type				Lithium
Base Oil				Mineral
Kinematic Viscosity	@ 40°C	cSt		220
	@ 100°C	cSt	IP 71 / ASSM D445	19
Dropping Point		°C	IP 396	180
Cone Penetration	@ 25°C	0.1mm	IP 50 / ASTSM D217	265-295

Shell Tellus S2 V		Method	32	46	68	100
Iso Viscosity grade		ISO 3448	32	46	68	100
ISO Oil Type		ISO fluid type	HV	HV	HV	HV
Kinematic Viscosity	@ -20°C	ASTM D445	1300	2350	*	*
	@ 40°C	ASTM D445	32	46	68	100
	@ 100°C	ASTM D445	6,1	7,9	8,6	14
Viscosity Index		ISO 2909	143	143	142	142
Density	@ 15°C kg/m^3	ISO 12185	0872	0.872	0.877	0.880

Shell Omala S2 G			Method	150
Iso Viscosity grade			ISO 3448	150
Kinematic viscosity	@ 40°C	cSt	ISO 3104	150
	@ 100°C	cSt	ISO 3104	15
Viscosity Index			ISO 2909	100
Density	@ 15°C kg/m3		ISO 12185	897
Flash Point		°C	ISO 2592	240
Pour Point		°C	ISO 3016	-24

Overhead Crane Lubrication

Shell Gadus S3 A1300C			Method	
NLGI Consistency				2
Penetration, worked 60 strokes		0.1mm	IP 50 / ASTM D217	265-295
Dropping Point		°C	IP 396	>140
Base Oil Viscosity	@400°C	cSt	IP 71 / ASTM D445	1300
	@1000°C	cSt	IP 71 / ASTM D445	106
Rust Preventing Properties : SKF Emcor distilled water				Pass
Rust Preventing Properties : SKF Emcor WWO distilled water				Pass
Lubricating Ability SKF R2F A				Pass
Lubricating Ability SKF R2F B	@120°C			Pass
Water Washout			ASTM D1264	5%
Colour				Red
Temperature Range (temporarily)		°C		-25/+110 (120)

Equivalent oils/lubricants from different manufacturers

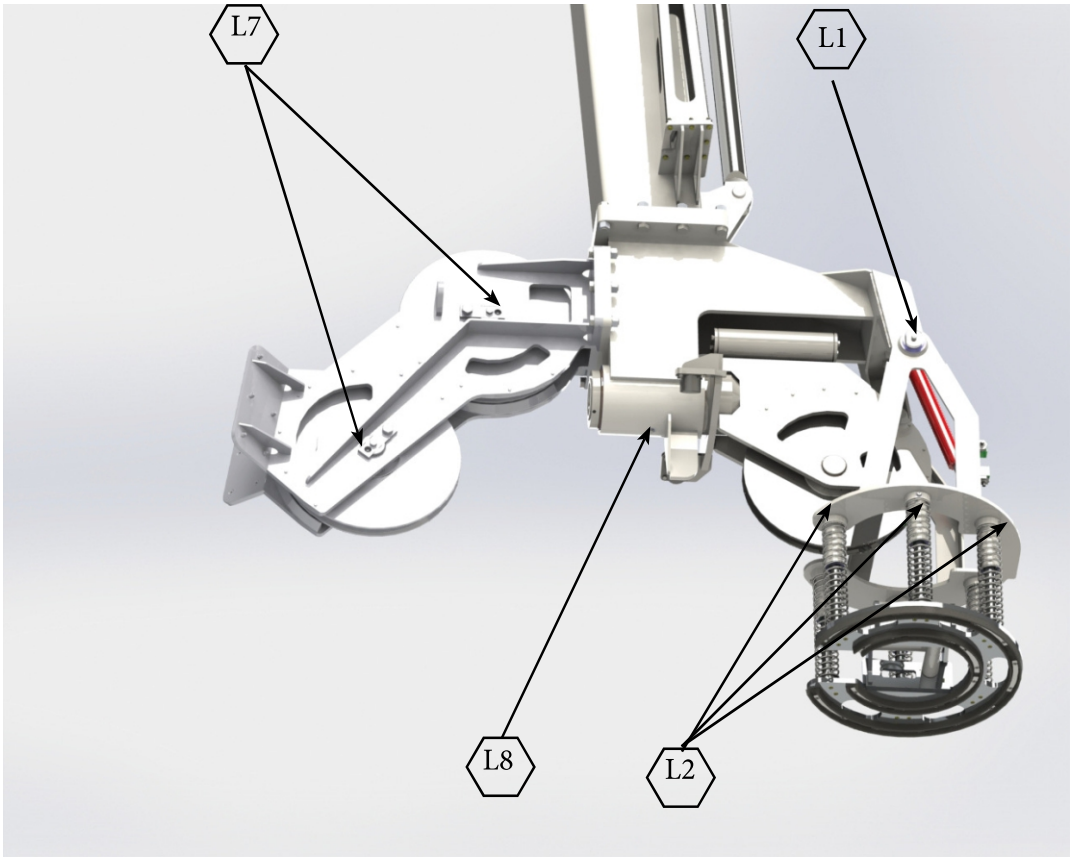
MANUFACTURER:	MINERAL OILS:	GEAR OILS:	GREASE:	GEAR FAT: WIRE FAT:
EXXON MOBIL	Mobil DTE 10 Excel 15 Mobil DTE 10 Excel 32 Mobil DTE 10 Excel 46	Mobilgear 600 XP 68 Mobilgear 600 XP 150 Mobil SHC 630 (synth) Mobil SHC 220 (synth)	Mobilgrease XHP 222 Mobilith SHC 460 (synth) Mobilith SHC 100 (synth)	Mobiltac 375 NC
SHELL	Tellus S2 VX15 Tellus S2 VX32 Tellus S2 VX46	Omala S2 G 68 Omala S2 G 150	Gadus S2 V220AC 2 Gadus S2 OG 40 Gadus S5 V100 2	Gadus S2 A320 2 Gadus S2 OG 40
ESSO	Unvis N 15 Unvis N 32 Unvis N 46	Spartan EP 68 Spartan EP 150	Beacon EP 2 Unirex N3 unirex N2	Dynagear
FINA	Hydran HV 15 Hydran HV 32 Hydran HV 46	Giran 68 Giran 150	Marson EPL 2	
TOTAL	Equivis ZS 15 Equivis ZS 32 Hydroflo CT Equivis ZS 46	Carter EP 68 Carter EP 150 Carter SH 220	Multis Complex EP 2 Multiplex S 2 A	Ceran AD Plus
CASTROL	Hyspin AWH-M 15 Hyspin AWH-M 32 Hyspin AWH-M 46	Alpha SP 68 Alpha SP 150 Alpha SYN HG 220	Castrol High Temp. Grease Molub-Alby OG 936 SF havy	Molub-Alloy OG 936 SF Heavy
CHEVRON	Mechanism LPS 15 Mechanism LPS 32 Mechanism LPS 46	NL Gear Compound 68 NL Gear Compound 150	Dura-Lith Grease EP 2	Open Gear grease
TEXACO	Rando oil HD Z 15 Rando oil HD Z 32 Rando oil HD Z 46	Meropa 68 Meropa 150	Multifac EP 2	Texclad 2
EQUINOR	Hydraway HVXA 15 Hydraway HVXA 32 Hydraway HVXA 46	LoadWay Marine 68 LoadWay Marine 150	UniWay EP 2	GreaseWay OG
FAM	HIDO HV 15 HIDO HV 32 HIDO HV 46	Famredol Ultra 68 Famredol Ultra 150	FOR LPD Famredol Ultra 150	
Q8	Handel 15 Handel 32 Handel 46	Goya 68 Goya 150 El Greco 220 Schumann 220	Rubens WB	Giotto com-plex
KLÜBER	TBD	Klüberoil GEM1-68 N Klüberoil GEM1-150 N	Klüberplex AG 11-462 Klüberplex BEM 41-132	Klübeflex AG 11-462

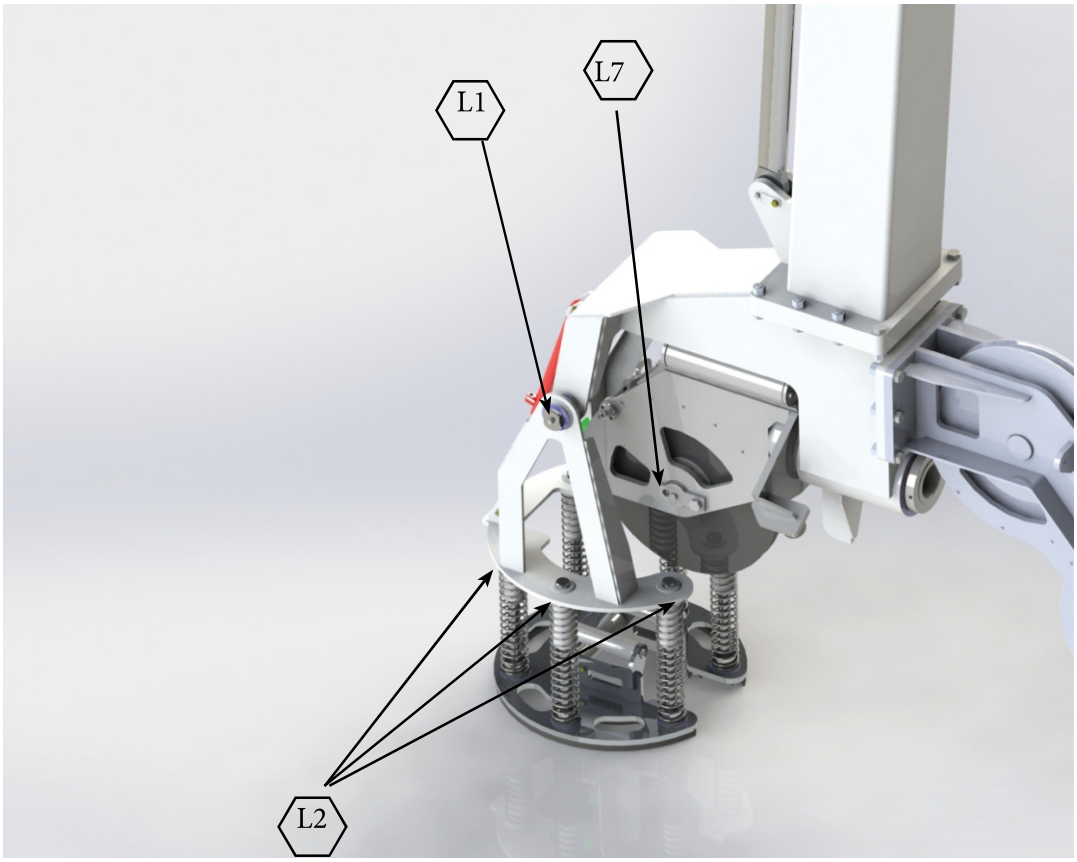
SPARE PART LIST

RECOMMENDED SPARE PARTS

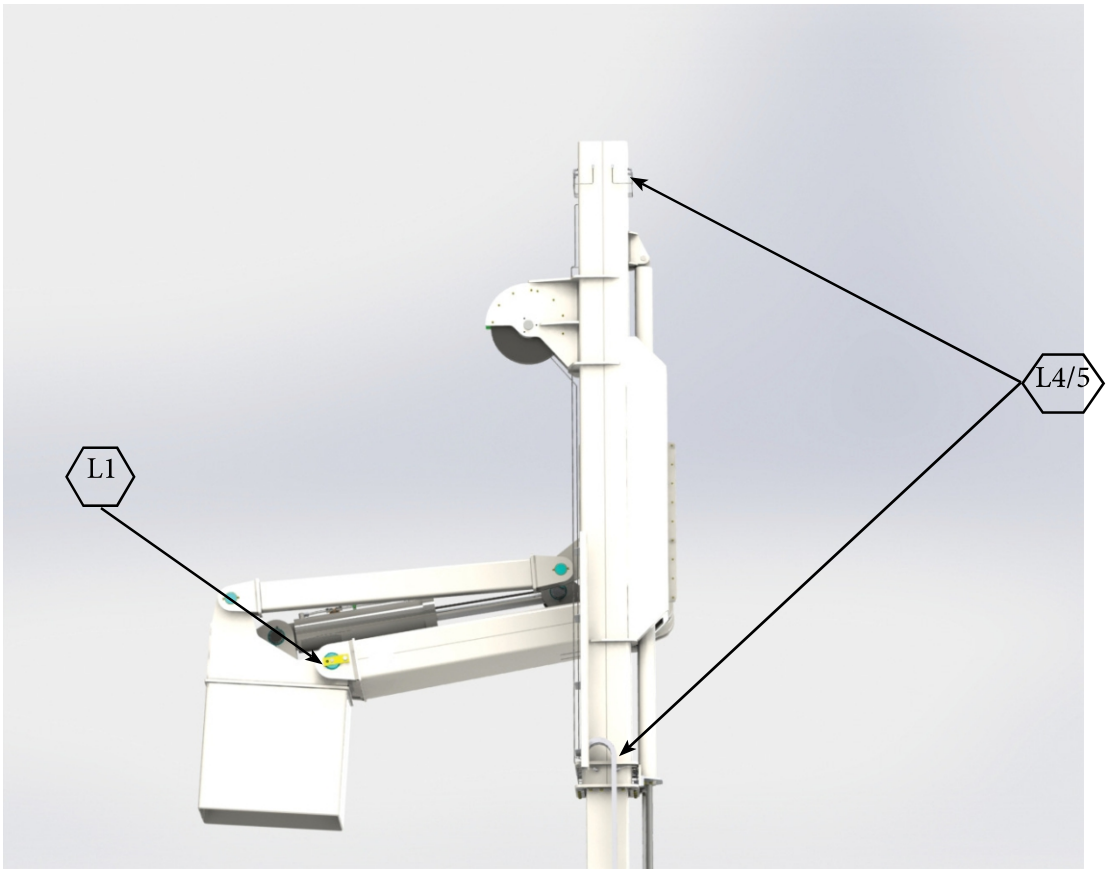
- Hose kit (one hose of each length and dimension)
- Sliding blocks (only for crane with telescope)
- Seal kit for lifting cylinder main boom
- Seal kit for telescope cylinder (only for crane with telescope)
- Seal kit for cylinders regarding docking head
- Winch rope
- Grease nipples
- Repair paint
- Spare parts for HBC radiocontrol

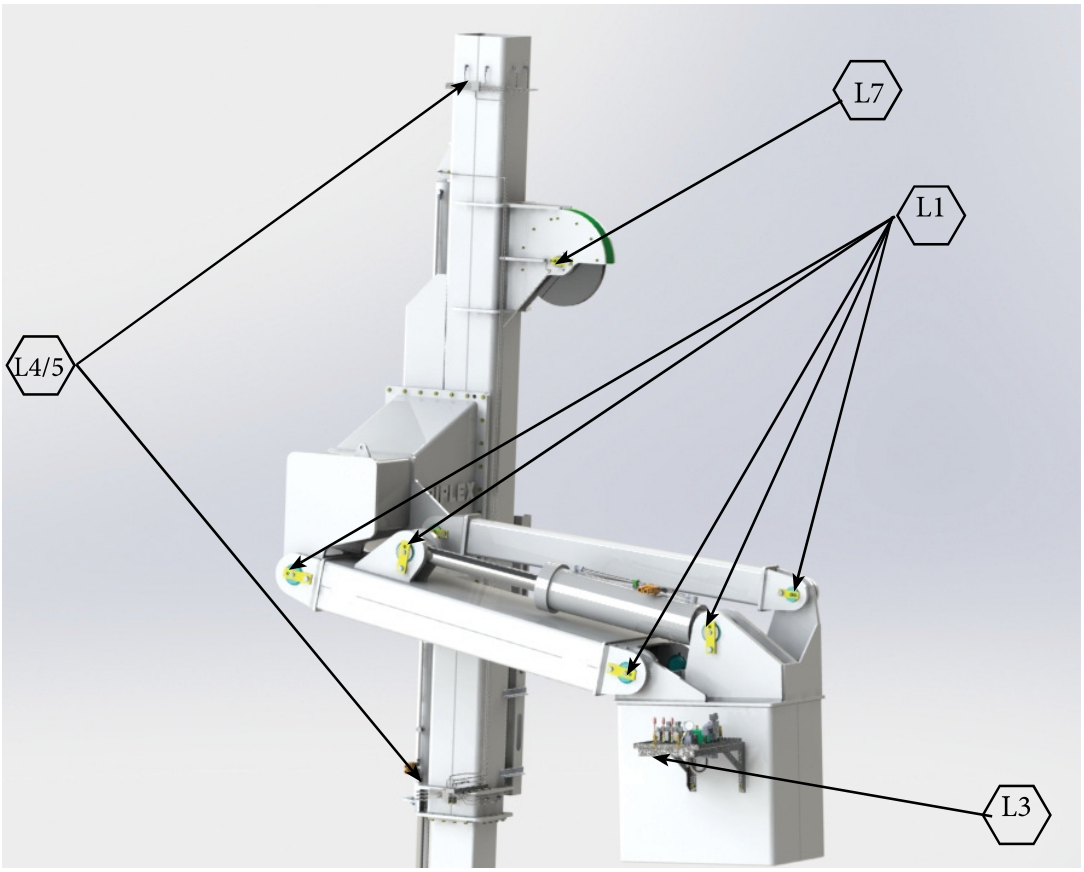
Lubrication





Lubrication





KN-75 LUBRICATION

Lubrication table

Standard lubricants

Lubricants Table

Pos.	Item	Oil Quality	Volume	Schedule
L1	Bolts	Shell Gadus S2 V220		Monthly lubrication. Daily control.
L2	Cross Bolts	Shell Gadus S2 V220		Monthly lubrication. Daily control.
L3	Hydraulic System	Recommended oil type 20-40°C Shell Tellus S2V T32 40-50°C Shell Tellus S2V T46 50-60°C Shell Tellus S2V T68 60-70°C Shell Tellus S2V T100 or equivalent dependent on system temp.		Weekly control. Yearly oil change.
L4	Lubrication divider SSV 8 (Inner Telescope)	Shell Gadus S3 A1300C	Apply a sufficient layer of grease on the load bearing surfaces.	Monthly lubrication. Daily control.
L5	Lubrication divider SSV 8 (Outer Telescope)	Shell Gadus S3 A1300C	Apply a sufficient layer of grease on the load bearing surfaces.	Monthly lubrication. Daily control.
L6	Bearing Pin for Telescope Cylinder	Shell Gadus S2 V220		Monthly lubrication. Daily control.
L7	Sheave Bolt	Shell Gadus S2 V220		Monthly lubrication. Daily control.
L8	Bearing Housing	Shell Gadus S2 V220		Monthly lubrication. Daily control.

Equivalent oils/lubricants from different manufacturers

MANUFAC-TURER:	MINERAL OILS:	GEAR OILS:	GREASE:	GEAR FAT: WIRE FAT:
EXXON MOBIL	Mobil DTE 10 Excel 15 Mobil DTE 10 Excel 32 Mobil DTE 10 Excel 46	Mobilgear 600 XP 68 Mobilgear 600 XP 150 Mobil SHC 630 (synth) Mobil SHC 220 (synth)	Mobilgrease XHP 222 Mobilith SHC 460 (synth) Mobilith SHC 100 (synth)	Mobiltac 375 NC
SHELL	Tellus S2 VX15 Tellus S2 VX32 Tellus S2 VX46	Omala S2 G 68 Omala S2 G 150	Gadus S2 V220AC 2 Gadus S2 OG 40 Gadus S5 V100 2	Gadus S2 A320 2 Gadus S2 OG 40
ESSO	Unvis N 15 Unvis N 32 Unvis N 46	Spartan EP 68 Spartan EP 150	Beacon EP 2 Unirex N3 unirex N2	Dynagear
FINA	Hydran HV 15 Hydran HV 32 Hydran HV 46	Giran 68 Giran 150	Marson EPL 2	
TOTAL	Equivis ZS 15 Equivis ZS 32 Hydroflo CT Equivis ZS 46	Carter EP 68 Carter EP 150 Carter SH 220	Multis Complex EP 2 Multiplex S 2 A	Ceran AD Plus
CASTROL	Hyspin AWH-M 15 Hyspin AWH-M 32 Hyspin AWH-M 46	Alpha SP 68 Alpha SP 150 Alpha SYN HG 220	Castrol High Temp. Grease Molub-Alby OG 936 SF havy	Molub-Alloy OG 936 SF Heavy
CHEVRON	Mechanism LPS 15 Mechanism LPS 32 Mechanism LPS 46	NL Gear Compound 68 NL Gear Compound 150	Dura-Lith Grease EP 2	Open Gear grease
TEXACO	Rando oil HD Z 15 Rando oil HD Z 32 Rando oil HD Z 46	Meropa 68 Meropa 150	Multifac EP 2	Texclad 2
EQUINOR	Hydraway HVXA 15 Hydraway HVXA 32 Hydraway HVXA 46	LoadWay Marine 68 LoadWay Marine 150	UniWay EP 2	GreaseWay OG
FAM	HIDO HV 15 HIDO HV 32 HIDO HV 46	Famredol Ultra 68 Famredol Ultra 150	FOR LPD Famredol Ultra 150	
Q8	Handel 15 Handel 32 Handel 46	Goya 68 Goya 150 El Greco 220 Schumann 220	Rubens WB	Giotto com-plex
KLÜBER	TBD	Klüberoil GEM1-68 N Klüberoil GEM1-150 N	Klüberplex AG 11-462 Klüberplex BEM 41-132	Klübeflex AG 11-462

Section 5

Periodic Maintenance

Annex C - Maintenance

DESCRIPTION	DOC/DRW #	REV #	PAG #
Maintenance Guidelines for RAPP Marine A/S Hydraulic Deck Machinery	Maintenance Guid.		2
Oil Selection Chart	6313		21

MAINTENANCE GUIDELINES

FOR

RAPP MARINE A/S

DECK MACHINERY



MACGREGOR

11.09.2020

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4 INTRODUCTION 3
5 PERIODIC MAINTENANCE / MAINTENANCE IN GENERAL 5
6 RECORD KEEPING – MAINTENANCE LOG 7
7 MAINTENANCE TIMETABLE 8
8 OIL AND LUBRICANT REQUIREMENTS 14
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8.1.2 Type 15
8.1.3 Condition 15
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2 REFERENCES

In Operation & Maintenance Manual for project; see section 8 for “Periodic Maintenance”, containing charts, drawings and documents indicating references to specific project documents related to maintenance schedules and logs.

These are critical documents in the ongoing working condition of Rapp Marine equipment.

3 GENERAL SAFETY

OPERATION AND MAINTENACE OF THE WINCH SYSTEM SHALL BE EXECUTED IN ACCORDANCE WITH REQUIREMENTS OF THIS INSTRUCTION AND WITH VESSEL SAFETY REGULATIONS.

THE DECK MACHINERY MUST BE OPERATED BY QUALIFIED PERSONNEL THAT HAVE STUDIED THE DOCUMENTATION, INSTRUCTIONS AND REQUIREMENTS.

NEGLIGENCE OF OPERATIONS AND LIMITATIONS SPECIFIED IN THIS INSTRUCTION CAN CAUSE FAILURE OF EQUIPMENT, DAMAGE OF PROPERTY OR INJURY OF PERSONNEL.

4 INTRODUCTION

The equipment is designed to provide maximum service with minimum maintenance. Nevertheless, certain checks and maintenance operations have to be carried out in order to keep the units serviceable and in good condition. This is for transport, storage and during operation to ensure safe and reliable operation through the lifetime of the equipment.

The maintenance schedules are designed to provide a basis for a preventative maintenance schedule and an equipment status reporting system. These schedules should be adjusted to account for local working practices and operational considerations.

The following manual is a general schedule which must be implemented for all Rapp Marine equipment. For specifics on lubrication amounts, detailed logs and drawings related to specific projects please refer to the “references” section of this document and view the related specific documents.

On a regular basis maintenance should be performed according the maintenance timetable.



WARNING Before doing any work on the unit, the operator must be aware of the dangers within the system, technicians and operators must take all necessary precautions as outlined in the personal safety section

MAINTENANCE GUIDELINES

The following manual is applicable for winch systems provided by Rapp Marine. The manual includes the following chapters and a brief outline of what they detail:

Maintenance timetable – This section details what parts of the system must be serviced and when. It shows the maximum lifetime on critical parts of the system. This timetable is critical in the lifetime of the overall equipment and should be adhered to strictly with a maintenance journal being regularly kept for the equipment for all operators & servicers use and knowledge.

Oil & Lubricant Requirements – This section details the specific lubricants required to be used on specific parts of the system. Typically for winch systems three types of lubricants are required these are: Hydraulic oil, gear and grease. Outlined in this section is the type required, the conditions in which to use the oil, storage, replacement and typical work conditions and lifecycle. It is also of critical importance that the oil be regularly cleaned and changed according to this chapter in order to ensure safe and reliable operation through the lifetime of the equipment.

5 PERIODIC MAINTENANCE / MAINTENANCE IN GENERAL

During operation, it is important that the operator records all findings and rectifies any malfunctioning components. In addition to the maintenance timetable plan for the equipment, the following periodic maintenance table shows typical things to be checked regularly to ensure safe operation of the winch system. Some of these items may be repeated within the maintenance timetable.

Item	Description	Before Every job	Daily	Weekly
1.	Check gear oil level	X		
2.	Check hydraulic system oil level	X		
3.	Check gear oil for water condensation			X
4.	Check Lubrication oil level	X		
5.	Check for leaks	X		
6.	Check electrical cables and components for damages		X	
7.	Check fuses working correctly		X	
8.	Check system structure for damage		X	
9.	Check for loose bolts, screws and connections			X
10.	Check winch wires and umbilicals for damage or fraying	X		

Item	Description	Before Every job	Daily	Weekly
11.	Check shackles, lifting slings, wire ropes, pad eyes and sheaves for damage or failure points			X
12.	Check cooling system is in working order and no overheating is occurring within the system	X		
13.	Check for any unusual sounds, observations or working movements. If so stop operation and report immediately to Rapp Marine			X



NOTE: Ensure no dirt enters the system during maintenance. Use recommended brush or clean rags.



NOTE: Never use cotton waste for cleaning.

6 RECORD KEEPING – MAINTENANCE LOG

Please keep records of maintenance activities and follow the Rapp Marine lubrication timetable. It is critical to the system that these activities be followed to ensure good working order and minimize problems and damage to the system. Making use of the experiences concerning maintenance is important for system knowledge hence systematic reporting and registration is required.
The records should be kept in the form of a manual or report to be on hand whenever it is required containing all necessary and previous information. In general Rapp Marine shall provide a template for a maintenance log which should be integrated to the operator's routine.

The maintenance log/manual should contain:

- A description of problems and impurities, and the date when they were discovered.
- A description of the initial inspection, and its results.
- A description of repairs made, the spare parts used, the date of the repairs and the length of time in which the system was shut down.
- Notes of when the oil is refilled or replaced, and when filter elements are replaced and strainers etc. are cleaned.
- A report of the data from oil analysis.
- Operational data print-out from auto-trawl computer (if any).

These reports and registrations will, when analyzed, often indicate areas with recurring problems which require special attention. This is done in order to be able to foresee future problems and take preventative actions, before damage or a complete shutdown of the system occurs.

Supplier's service technician.
Despite this, if service personnel have to be called up, performing the following could save time and expenses:

- Keep drawings, spare parts and clean rags available.
- Dismount covers and clean the machine thoroughly.
- Keep the report concerning maintenance at hand, and have an experienced person who knows the system at service man's disposal.

7 MAINTENANCE TIMETABLE

During operation, it is important that the operator records all findings and rectifies any malfunctioning components. In addition to the daily inspection during operation of the equipment, the following maintenance program is recommended to ensure safe operation of the winch system.

NOTE: Units are as follows; H = hours, D = days, W = weeks, M = monthly, Q = quarterly, Y = yearly

General Maintenance Timetable				
Equipment Group	Description	Period	Unit	Information and Notes
Drum unit	Lubricate spline shaft	1	M	See grease map for lubrication position. See lubrication chart for type of lubrication
	Lubricate drum bearing	1	M	See grease map for lubrication position. See lubrication chart for type of lubrication
Brake arrangement	Lubricate linings in brake band lugs	1	M	See grease map for lubrication position. See lubrication chart for type of lubrication
	Lubricate linings in brake cylinder	1	M	See grease map for lubrication position. See lubrication chart for type of lubrication
	Lubricate brake band adjustment nut	1	M	See grease map for lubrication position. See lubrication chart for type of lubrication
	Lubricate bolts at brake arrangement	1	M	See grease map for lubrication position. See lubrication chart for type of lubrication
	Check brake lining	3	M	Measure thickness of brake lining. If thickness is less than 70% of original thickness, replace brake band
	Check oil level on Hydraulic power pack (HPU) for the main brake	1	W	Visually check on HPU sight glass, level shall be on the top of the level glass
	Replace Accumulator on HPU's for the main brake	5	Y	Make sure to deactivate and lock (with brake) the system. Relieve pressure on HPU before disconnecting pipes/Accumulator. Make sure that the new accumulator is prefilled with nitrogen
	Replace hydraulic hoses	2	Y	Replace hydraulic hoses which are worn through use and time. It is important to identify hoses that are in exposed places. System pressure must be released before handling any pressurised hose.
	Check hydraulic hose integrity	1	M	Visual check of the hydraulic hoses within the system for damage, cracks, tears, nicks, hardness or colour changes.

General Maintenance Timetable				
Equipment Group	Description	Period	Unit	Information and Notes
	Replace brake cylinder(s)	5	Y	Replace brake cylinder(s) or replace/overhaul brake cylinder(s) by replacing brake plate springs
Level wind arrangement	Lubricate bearings on diamond screw	1	M	See grease map for lubrication position. See lubrication chart for type of lubrication
	Lubricate guide shaft	1	W	See grease map for lubrication position. See lubrication chart for type of lubrication
	Lubricate linings in level wind carriage	1	W	See grease map for lubrication position. See lubrication chart for type of lubrication
	Lubricate pilot tap	1	W	See grease map for lubrication position. See lubrication chart for type of lubrication
	Lubricate guide rollers	1	W	See grease map for lubrication position. See lubrication chart for type of lubrication
	Visually check oil level in level glass for level wind gearbox	1	D	Visually check sight glass on the level wind gearbox, shall be on the top of the level glass
	Visually check oil reservoir for water	1	W	Look for discolouration of oil. Change oil if discoloured
	Check pilot tap and diamond screw	3	M	Visually check the diamond shaft and pilot tap for damages on the surfaces and wearing
	Check guide rollers	3	M	Check guide rollers for rotating and no considerable wearing on surface
	Change oil on Level Wind Gearbox (1st time: 500H, 2nd time: 2500H)	5000/1	H/Y	See grease map for lubrication position. See lubrication chart for type of lubrication
	Clean and re-lubricate diamond screw	1	Y	Visually check the diamond shaft and pilot tap for damages on the surfaces as well as wear before re-lubricating
T90 level wind sheave	Lubricate bearings in sheave wheel	1	M	See grease map for lubrication position. See lubrication chart for type of lubrication
	Lubricate bush for sheave pivot shaft	1	M	See grease map for lubrication position. See lubrication chart for type of lubrication
	Lubricate bearings in sheave indicator	1	M	See grease map for lubrication position. See lubrication chart for type of lubrication
	Lubricate bearings in indicator rollers	1	M	See grease map for lubrication position. See lubrication chart for type of lubrication

General Maintenance Timetable				
Equipment Group	Description	Period	Unit	Information and Notes
Winch Drive Unit	Lubricate roller bearing	1	M	See grease map for lubrication position. See lubrication chart for type of lubrication
	Visually oil level in level glass	1	D	Visually check sight glass on the gearbox, shall be on the top of the level glass
	Visually check oil reservoir for water	1	W	Look for discolour of oil. Change oil if discoloured
	Change oil on Gearbox WDU (1st time: 500H, 2nd time: 2500H)	5000 / 1	H / Y	See grease map for lubrication position. See lubrication chart for type of lubrication
	The following applies to electric driven winches only:			
	Visually control of mechanical damages and conditions of connections.	1	W	Check structure, bolts, seals, paint etc.
	Keep the motor(s) clean an ensure free ventilation airflow	1	W	Clean with detergent for electric equipment
	Inspect electric motors	1	Y	Check conditions of shaft seals, connections, coils etc.
	Lubricate and re-grease of bearings	*	H	* See information from manufacturer regarding intervals, lubrication information etc.

General Maintenance Timetable				
Equipment Group	Description	Period	Unit	Information and Notes
Hydraulic system and units	Check for oil leaks	1	D	Check for hydraulic oil leaks, especially around couplings, hose and pipe connections, oil tanks and hydraulic power units
	Visual control of oil level and condition	1	D	Refill if low level. Change oil if discoloured
	Change HPU filter elements	1	Q	Make sure to shutdown system and relieve pressure before replacing filters with new ones
	Change hydraulic oil	1*	Y*	*Depending of working conditions (temperature, pressure etc.) hydraulic oil can be used from 5000 to 25000 hours. Use laboratory analysis for decision
	Hydraulic oil sample control	1	Q	Send a sample to laboratory for analysis
	Clean hydraulic oil tank	2	Y	Reservoir / oil tank must be emptied and cleaned a minimum of every 2-5 years
	Check accumulator on HPU (if present)	1	Y	
	Replace HPU accumulator (if present)	5	Y	Ensure to shutdown system and relieve pressure on HPU before disconnecting. Ensure that the new accumulator is prefilled with nitrogen gas
	Control of hydraulic control valves	1*	M*	*If not in regular use it is important to move the lever / hand wheels from time to time, lubricate around the entrance of the moving parts to prevent the lever / hand wheels from sticking
	Recalibrate Pressure Safety Valves	1	Y	As according to ship schedules to ensure safety of the system
	Recalibrate Pressure indicators and transmitters	1	Y	These should be re-calibrated yearly to ensure correct readings are given
	Electric Motors and Pumps	1	Y	Check that the pumps are functioning correctly and the current consumption of the motors. Ensure no overheating
	Replace hydraulic hoses	2	Y	Replace hydraulic hoses which are worn through use and time. It is important to identify hoses that are in exposed places. System pressure must be released before handling any pressurised hose.
	Check hydraulic hose integrity	1	M	Visual check of the hydraulic hoses within the system for damage, cracks, tears, nicks, hardness or colour changes.

General Maintenance Timetable				
Equipment Group	Description	Period	Unit	Information and Notes
Electric system units	Check electric cables and components for damages	1	D	
	Check fuses	1	D	"Blown" fuses can be an indicator of failures in the electrical system
	Clean control system computers and cabinets for dirt and dust	1	M	Use only dry air gun inside
	Open control panels for inspection	1	Y	Clean if necessary and check if heater (only present in deck panels) is working
	The following applies to electric driven winches with Frequency Drives only:			
	Replace air filters on inverter cabinets	1	Y	Shutdown system before performing maintenance. Replace the filters in the ventilating system
	Check inverter cooling fans	1	Y	**MUST BE DONE WITH POWER ON!** *When* activating the system the inverter will start up and the internal cooling fan shall start. See inverter user manual for fan information's. If abnormal noise or vibration is seen the fan needs to be replaced
	Check inverter and breakers cabinet door cooling fans	1	Y	**MUST BE DONE WITH POWER ON!** Open the inverter door and turn down the blue thermostat until the fan starts. If abnormal noise or vibration is seen the fan needs to be replaced. Adjust the thermostat back to start setting
	Power up spare inverters for extending lifetime on capacitors	1	Y	See user manual for inverters for details.
	Replace inverter cooling fans	2	Y	Shutdown system before performing maintenance**.** Replace the components according to inverter instructions
	Replace inverters DC bus and PCB capacitors (including spare)	5	Y	Shutdown system before performing maintenance**.** Replace the components according to inverter instructions

General Maintenance Timetable				
Equipment Group	Description	Period	Unit	Information and Notes
Fish Pump	Lubrication of bearings with grease	1*	W*	* Lubricate two strokes with the grease gun weekly or after every five time use of the fish pump. See applicable lubrication chart in the Service & Instruction manual for more info.
	Lubrication of bearings with grease, with the Set-Screws disassembled (Electric fish pump only)	1	M	Lubricate until all the air is out and clean grease are coming out of the "Set-Screw" hole. See applicable lubrication chart in the Service & Instruction manual for more info.
	Check that the pressure inside the fish pump is correct (Electric fish pump only)	1*	W*	*The pressure should be checked regularly and especially before operating the fish pump. Correct pressure: 0.3 BAR at 20 degrees Celsius / 0.5 BAR at 50 degrees Celsius See "Bleeding and pressurization procedure" in the Service & Instruction manual for more info.

8 OIL AND LUBRICANT REQUIREMENTS

The choice & use of oil and lubricants for the system is important for continued operation of the equipment and a full lifecycle. Rapp recommend using the approved oil and lubricants for the system as specified below. Use of any other oil and lubricants may be harmful to the system and cause unwanted effects, Rapp cannot be responsible for any problems should this be the case.
If there are any doubts about choosing oil or lubricant, contact Rapp Marine for written confirmation.



NOTE: It is prohibited to mix oil of different quality/brands.

8.1 Proper use of lubricants

This chapter covers the safe handling of lubricants. Improper handling of lubricants can create a health hazard or the danger of fatal injury. The following instructions must be complied with. Before handling lubricants, always check the corresponding safety data sheet.

Prolonged and repeated contact with the skin should be avoided as far as possible.

Areas of the skin splashed with lubricant should be cleaned with soap and water. Apply skin protection while working and a greasing skin cream after completing work. Where appropriate, wear oil-resistant protective clothing (e. g. gloves, apron).

Do not wash your hands with petroleum, solvents or cooling lubricants which can be or are already mixed with water.

Oil mist must be extracted at the point where it arises.

Protective goggles must be worn to prevent contact with the eyes. If lubricant should nevertheless get into the eyes, rinse the affected area with copious amounts of water. If irritation of the eyes persists, consult an ophthalmologist.

Under no circumstances should you induce vomiting if lubricant is accidentally swallowed. Seek medical help immediately.

As a rule, safety data sheets are available for lubricants, in accordance with 91/155/EEC. Here, you will find detailed information on health and environmental protection and accident prevention.

Most lubricants are hazardous to water. For this reason, they must never be allowed to get into the soil, water or sewage system.

8.1.1 **Hydraulic oil**

Oil for Rapp Marine's hydraulic system should correspond to the following specifications:

Kinematic viscosity cSt		
	at 40°C	**46**
	at 50°C	**30**
	at 100°C	**9,1**
	at -20°C	**5000**
Flash point, °C		**175**
Solidification temperature °C, not higher than		**-48**
In compliance with		**DIN-52524 (2) type: H-LP**
Anti wear quality	IP 281	**< 20 mg**
Gear test	FZG	**≥ 11**
Viscosity index		**> 175**

8.1.2 **Type**

Rapp Marine recommends using Shell Tellus Oil "T" as the hydraulic oil. Other brands may be used which are approved by Rapp Marine or are on the lubrication chart.

8.1.3 **Condition**

Daily visual checks of the condition of the oil must be performed by operator. The oil can be seen using the level glass typically on the tank and checking the oil colour. A gray color of hydraulic oil indicates that there has been an ingress of water. It is strictly prohibited to use hydraulic oil containing seawater.
The first oil sample analysis should be taken after initial system flushing then stored and recorded. After which oil samples shall be taken 3-4 times per year or every 20 operating hours, depending on the frequency of use where the following must be checked:

- Spectrometri;
- Water content;
- Particle count (ISO-norm, levels for automatic particle counters);
- Viscosity at common temperature;
- Total Acid Number (TAN).

8.1.4 **Cleanliness**

The cleanliness of the hydraulic oil is very important quality measurement and used as the quality control of hydraulic oil formulations. The hydraulic oil should always pass the following metrics, if it does not the equipment must be flushed until it meets these minimum criteria or changing of the oil may be required.

Particle level ISO-4406- 1999 "or"	max.: 18/16/13
Particle level SAE AS4059 Class 7B-F "or"	max.: 7
Particle level grade (SAE 749)	max.: 4
Optimal working viscosity (cSt) at +40°C	46
Water content	< 0,1%
Filter element rating (Absolute)	12 µm or better.

During the warranty period, a copy of results from all sample analyses must be sent to Rapp Marine A/S.

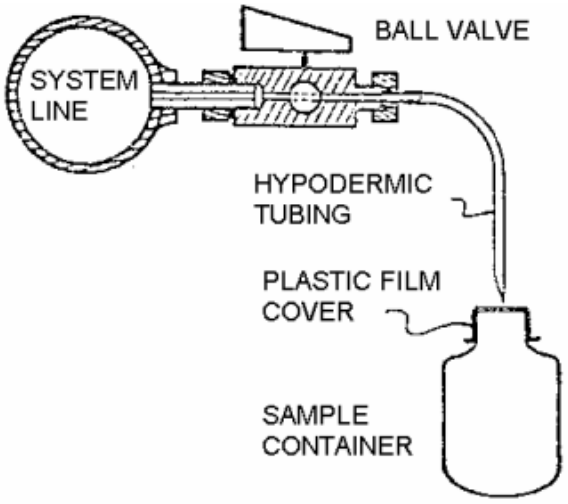
NOTE: If the specified viscosity level during use of the system drops more than 5%, heavier hydraulic oil must be added to the system to maintain the specified level.

"No system has ever failed from being too clean"

8.1.5 **Oil sampling for contamination control**

An accepted procedure for extracting samples from dynamic fluid lines is ISO standard 4021.

Details of procedure:



1. Before extracting or collecting the sample, a quantity of oil should be allowed to flush from the assembly equal to at least five times the volume between the port and the existing point.
2. Sufficient sample should be withdrawn from the line to yield enough oil to fill approximately 70% of the sample bottle volume. This leaves enough room to effectively shake the bottle before analysis.
3. Although the rate of sampling does not affect the quality of the sample, the sampling rate should in general not exceed 1% of the main line flow.
4. Oil is extracted through fully open ball valves from high pressure lines. To reduce the oil velocity in the sample line, the size and length of the hypodermic or capillary tubing can be varied.
5. Take at least two samples from each sampling place in the system
6. Mark the bottles clearly.

8.1.6 **Storage**

Always keep at least 20% of the tank volume as a spare amount of oil for hydraulic system.
Hydraulic oil shall be supplied in sealed drums. The oil must be stored indoors in dry, dust clean environment with a constant temperature with as little variance as possible.
If a special storage tank is used, the filling system to the main tank must be approved by Rapp Marine in writing.

NOTE: Long storage at low temperature causes deposit which, if introduced into the system, can clog and degrade the equipment.

8.1.7 **Working conditions**

Control of the oil temperature is crucial for equipment operation. Heat develops in the fluid as it is forced through the pumps, motor tubing, and relief valves. In conventional systems, excessive temperatures will oxidize the oil and can lead to varnish and sludge deposits in the system. Conversely, running the temperature too low will allow condensation in the reservoir and increase the likelihood of pump cavitation. The following table shows the ideal and limiting operating temperatures and viscosities for typical hydraulic systems employed by Rapp Marine.

Allowable Temperatures and viscosities:	
Nominal operating temperature	+40°C
Maximum operating temperature	+70°C
Maximum allowable system temperature not to be exceeded	+80°C
Minimum oil temperature before operating deck equipment/machinery	+15°C
Nominal operating viscosity	46 cSt @ +40°C
Operational viscosity range	30-100 cSt
Minimum allowable viscosity	10 cSt @ +75°C
Maximum allowable viscosity for pump start	2000 cSt @ -15°C



NOTE: Use pumps to work in idle mode to get minimum oil temperature of 15°C before operating deck machinery.

Keep cooling system in good working condition. High working temperatures reduces oil quality.

8.1.8 **Change of oil**

The time at which a change of hydraulic fluid is required is dependent on the operating conditions like temperature, pressure and contamination. The general guideline for oil change is between 5000 and 25000 operating hours. During this range it is up to the discretion of the operator to assess when it is necessary to completely change the oil. The decision should be made on data received from the oil analyses over time from first analysis to current analysis. When oil change is required the following procedure is to be followed.

Fluid Change-Out Recommendations — these are the proper steps to follow when changing the hydraulic fluid in a system.

1. Drain the system while the fluid is hot to keep contaminants in suspension.
2. Empty fluid from cylinders, accumulators and lines that might not drain properly.
3. Mop, siphon, or pump out oil left in the reservoir.
4. Wipe reservoir clean with lint free rags and remove rust and free paint.
5. Replace or clean filter elements and strainers and clean filter housings.
6. Refill the system with new fluid making sure to vent high points.
7. Restart and check system for proper operation.
8. For systems that exhibit high deposit, sludge and/or varnish formation: a petroleum based cleaner may be required. Follow manufacturer's recommendations.

8.2 Gear oil

Gear oil is used in gearboxes and chain drive housing boxed used in the level wind arrangement. The main parameter for selecting gear oil is the ***viscosity group***.

For ambient temperatures from ranging from -20°C to +35°C the recommended gear oil is of viscosity group **ISO VG 150**. For other working conditions contact Rapp Marine for written confirmation.

8.2.1 Type

Rapp Marine recommends using gear oil type Shell OMALA 150. Other brands may be used which are approved by Rapp Marine or are on the lubrication chart.

8.2.2 Conditions

There is a high risk that water may condense in the transmission housing and therefore the gear oil reservoir must be visually checked every week. A grey color of oil indicates that there has been ingress of oil. In case of black oil color check conditions of the gears. To drain out condensed water, at the bottom of housing there should be a ball valve installed, open this slowly to drain out all of the contaminated fluid and replace with clean fluid.

8.2.3 Change of oil

The first change of gear oil should be performed after 500 operating hours. Second change after 2500 operating hours. Thereafter the periodical changes should be every 5000 operating hours or at least every year. The guidelines below shall be followed for each oil change.

- The oil level in the transmission housing should be at the level indicated on the sight glass.
- Quantity of gear oil is specified on the lubrication chart for individual equipment.

The Following table shows the quantity of gear oil for main types of winch gear drives used by Rapp Marine.

8.3 Grease Lubricants

Lubricants used for the winch systems produced by Rapp Marine is typically grease. Grease is an integral part of the system ensuring tight seals between mechanical parts and preventing excessive part degradation. In Rapp Marines winches grease is typically used for greasing of working parts like the diamond screw, bearings and shafts etc. The amount of grease applied is also important because too little grease leads to metal-to-metal contact and premature failure and equipment degradation. Whereas excessive amounts of grease cause the operating temperature within the equipment to rise rapidly, particularly when running at high speeds.



NOTE: Grease and oils are not interchangeable

8.3.1 Type

The following table shows the recommended grease lubricants to be used for Rapp Marine equipment.

Part Description	Grease Type
General greasing	SHELL lubricants ALVANIA EP LF 2 or RETINAX-EP2
Roller bearings of electric motors	SKF-LGMT-2



NOTE: Other brands may be used which are approved by Rapp Marine or are on the lubrication chart.

8.3.2 Replenishment

The grease must be replenished at the correct frequency and in the proper amount so that there is always a sufficient amount of grease to maintain fluid films. Grease may be applied by hand-operated grease guns, screw-down or spring-loaded grease cups, or centralized grease systems.
Refer to the equipment lubrication charts, located in the engineering manuals, for application points for the grease

9 RAPP MARINE CONTACT INFORMATION

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Title:	Date:	Doc. Id:	Version:
FAR lubrication chart	22/12/2021	**6313**	17
Author:	Approver:		Page:
Hallvard Johanssen	Mads Bergdal		1 (3)
Doc. Applies to:	Department:		
MacGregor FAR	Engineering & Technology		

MACGREGOR

Revision history

5	Shell BIO oils added to lubrication chart	21/12/2021	HKJ	MB	MB
4	Grease for Fish Pump added, Mobilgrease FM221 & FM222	09/07/2020	HKJ	MB	MB
3	Oil for Fish Pump added, Mobil SHC Cibus 32 (Mineral)	27/01/2020	HKJ	BB	BB
2	More detailed text in Note 1 (both Mineral and Bio). Rapp Marine logo and web address replaced with MacGregor	22/05/2019	ST	BB	BB
1	Added lube index no.8: Fish pump	07/03/2019	GJK	BB	BB
0	Added lube indexes 1 - 7 for each kind of machinery	15/02/2019	GJK	BB	BB
Rev.	**Description**	**Date DD/MM/YY**	**Made by**	**Checked by**	**Approved by**

Title:	Date:	Doc. Id:	Version:	Page:
RAPP MARINE lubrication chart	09/07/2020	**6313**	16	2 (3)

LUBRICATION CHART, MINERAL OILS

RECOMMENDED OIL AND LUBRICATION FOR RAPP MARINE A/S SYSTEMS, GEAR AND WINCHES

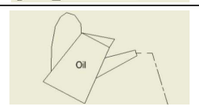
Important! Always check belonging lubrication plans for product

LUBE INDEX	APPLICATION	Updated Jan 2020	Updated Jun 2013	Updated Dec 2010	Updated Jun 2013	Updated Jan 2018	Updated Dec 2010	Updated Dec 2010	Updated Dec 2010	Updated Oct 2017	Updated Dec 2017	Updated Dec 2010	Updated Feb 2018	Updated Feb 2019
1	**HYDRAULIC MAIN SYSTEMS** **SERVO SYSTEMS**	Mobil DTE 10 Excel 46	Unvis N 46	Hydran HV 46	Equivis ZS 46	Hyspin AWH-M 46	Mechanism LPS 46	Rando Oil HD Z 46	HydraWay HVXA 46	Tellus S2 VX 46	HIDO HV 46	Handel 46	TBD	
2	**HYDRAULIC SERVO SYSTEMS**	Mobil DTE 10 Excel 32 Mobil DTE 10 Excel 46	Unvis N 32 Unvis N 46	Hydran HV 32 Hydran HV 46	Equivis ZS 32 Hydroflo CT Equivis ZS 46	Hyspin AWH-M 32 Hyspin AWH-M 46	Mechanism LPS 32 Mechanism LPS 46	Rando Oil HD Z 32 Rando Oil HD Z 46	HydraWay HVXA 32 HydraWay HVXA 46	Tellus S2 VX 32 Tellus S2 VX 46	HIDO HV 32 HIDO HV 46	Handel 32 Handel 46	TBD	
3	**RAPP FLUID COOLED ELECTRIC MOTORS**	Mobil DTE 10 Excel 15	Unvis N 15	Hydran HV 15	Equivis ZS 15	Hyspin AWH-M 15	Mechansim LPS 15	Rando Oil HD Z 15	HydraWay HVXA 15	Tellus S2 VX 15	HIDO HV 15	Handel 15	TBD	
4	**GEAR BOXES (NOTE 1)** **MAIN MULTIPLE MOTOR GEAR BOX (WDU)** **CHAIN BOX**	Mobilgear 600 XP 150 Mobil SHC 630 (synth) Mobilgear SHC 220	Spartan EP 150	Giran 150	Carter EP 150 Carter SH 220	Alpha SP 150 or Alpha SYN HG 220	NL Gear Compound 150	Meropa 150	LoadWay Marine 150	Omala S2 G 150	Famredol Ultra 150	Goya 150 El Greco 220 Schumann 220	Klüberoil GEM1-150 N	
5	**GEAR W/OIL CIRCULATION**	Mobilgear 600 XP 68	Spartan EP 68	Giran 68	Carter EP 68	Alpha SP 68	NL Gear Compound 68	Meropa 68	LoadWay Marine 68	Omala S2 G 68	Famredol Ultra 68	Goya 68	Klüberoil GEM1-68 N	
6	**GREASE LUBRICATED BEARINGS** **SLIDE BEARINGS** **GREASE FILLED WORM GEAR** **GREASE FOR SPOOLING SHAFT (DIAMOND SCREW)**	Mobilgrease XHP 222 Mobilith SHC 460 (synth)	Beacon EP 2 Unirex N 3	Marson EPL 2	Multis Complex EP 2	Castrol High Temperature Grease Molub-Alloy OG 936 SF heavy	Dura-Lith Grease EP 2	Multifak EP 2	UniWay LIX 62	Gadus S2 V220 2 Gadus SE OG 40	FOR LPD	Rubens WB	Klüberplex AG 11-462	
7	**OPEN GEAR WHEELS** **MAIN DRIVING GEAR**	Mobiltac 375 NC	Dynagear		Ceran AD Plus	Molub-Alloy OG 936 SF Heavy	Open Gear Grease	Texclad 2	GreaseWay OG	Gadus S2 A320 2 Gadus S2 OG 40		Giotto Complex	Klüberplex AG 11-462	
8	**OIL FISH PUMP** **GREASE LUBRICATED BEARINGS FISH PUMP**	Mobil SHC Cibus 32 Mobilgrease FM221 & FM222												Cassida Fluid HF 32
	NOTES	Year 2010 products for the marine section	Classic products for the industry								Used for winch testing and FAT procedures in fabric Gruza			

SYMBOLS USED IN DRAWINGS:



Illustration, Grease gun:
Grease (firm) to be used



Illustration, Oil can:
Oil (fluid) to be used

Matrix above displays the general recommended lubricants for Rapp Marine equipment, to be used for different parts of the winch system. The left hand columns describe the parts which need to be lubricated.
The top row with the company symbols describe the manufacturers of lubricants, with the type described below, and the recommended one to be used in the corresponding row for each part.
If operators wish to use lubricants not listed it will be on your own risk, and Rapp Marine can't be held responsible if problems occur due to this.
Please contact Rapp Marine (www.rappmarine.com) to check compatibility for any lubricant not listed.

NOTE 1: New spooling drive gearboxes are delivered with 220 oil viscosity. For refill or replacement of oil, please follow lubrication plan.

Title:	Date:	Doc. Id:	Version:	Page:
RAPP MARINE lubrication chart	09/07/2020	**6313**	16	3 (3)

MACGREGOR

LUBRICATION CHART, BIO OILS

RECOMMENDED OIL AND LUBRICATION FOR RAPP MARINE A/S SYSTEMS, GEAR AND WINCHES

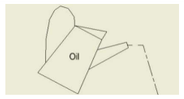
Important! Always check belonging lubrication plans for product

LUBE INDEX	APPLICATION	RSC Bio Solutions	EXXON Mobil	ESSO	FINA	TOTAL	Castrol	Chevron	TEXACO	STATOIL	Shell	FAM	Q8	KLÜBER LUBRICATION
		Updated Sep 2018					Updated Jan 2018							Updated Feb 2018
1	**HYDRAULIC MAIN SYSTEMS** **SERVO SYSTEMS**	Futerra 46					Biobar 46				Naturelle S2 HF 46			Klüberbio LR 9-46
2	**HYDRAULIC SERVO SYSTEMS**	Futerra 32 Futerra 46					Biobar 32 Biobar 46				Naturelle S2 HF 32 Naturelle S2 HF 46			Klüberbio LR 9-32 Klüberbio LR 9-46
3	**RAPP FLUID COOLED ELECTRIC MOTORS**	EnviroLogic HF 15									Naturelle S2 HF 15			
4	**GEAR BOXES (NOTE 1)** **MAIN MULTIPLE MOTOR GEAR BOX (WDU)** **CHAIN BOX**	EnviroLogic GO 150					Biostat 150				Naturelle S4 Gear Fluid 150			Klüberbio EG 2-150
5	**GEAR W/OIL CIRCULATION**	EnviroLogic GO 68					Biostat 68				Naturelle S4 Gear Fluid 68			Klüberbio EG 2-68
6	**GREASE LUBRICATED BEARINGS** **SLIDE BEARINGS** **GREASE FILLED WORM GEAR** **GREASE FOR SPOOLING SHAFT (DIAMOND SCREW)**	EnviroLogic Grease 2					BioTac MP				Naturelle S5 V120P 2			Klüberbio AG 39-602
7	**OPEN GEAR WHEELS** **MAIN DRIVING GEAR**	NA									Naturelle S2 Grease A600P 1.5 Naturelle S2 Grease A600P 1.5			Klüberbio AG 39-602
	NOTES													

SYMBOLS USED IN DRAWINGS:



Illustration, Grease gun:
Grease (firm) to be used



Illustration, Oil can:
Oil (fluid) to be used

Matrix above displays the general recommended lubricants for Rapp Marine equipment, to be used for different parts of the winch system. The left hand columns describe the parts which need to be lubricated.
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NOTE 1: New spooling drive gearboxes are delivered with 220 oil viscosity. For refill or replacement of oil, please follow lubrication plan.

Section 6

BOMs & Assembling Drawings

Parts List & Assembling Drawings

DESCRIPTION	DOC/DRW #	REV #	PAG #
B.O.M. & Assembly Guideline	-	A	3
400092447 BOM			6
	400092447	B	13
	400096381	A	14
	400096308	B	15
	RH504844/NVE – RH202569	C	16
	RH317214	A1	17
	RH318400	C	18
	RH328794	A	19
	RHHEBRGC-Q – RH411171	A	20
400092475 BOM			21
	400092475	B	26
	400096386	A	28
	400096390	A	29
	400095411	A	30
	400095410	A	31
	RH317083	C1	32
	RH329285	A	33
	RH321167	A	34
	RH321167	A	35
	400203203 – 2000011556	A	36
	RHHEBRGC-M1 – RH411181	C	37
400092566 BOM			38
	400092566 – 2000004320	C	46
	400180581 – 2000004088	B	48
	400180511 – 2000004040	A	49
	RH329298	B	50
	RH317245	B	51
	RH329308	A	52
	RH328834	A	53
	400181022 – 2000004252	A	54
	400181045 – 2000004277	A	55
	400177707 – 2000003665	A	56
	400181046 – 2000004281	A	57
	RH318591	A	58
	400182378	-	59
	RHHSWC-E – RH319631	F	65

Section 6

BOMs & Assembling Drawings

Parts List & Assembling Drawings

DESCRIPTION	DOC/DRW #	REV #	PAG #
4000092573 BOM			66
	400092573 - 2000005715	B	74
	400184715 - 2000005163	A	76
	400185445 – 2000005622	A	77
	400185138 – 2000005409	A	78
	RH328074	B	79
	400185288 – 2000005484	A	80
	400185290 – 2000005486	A	81
	RH318747	A	82
	RH318468	B	83
	RH318063	B	84
	RH317304	A	85
	400185508 – 2000005580	A	86
	400186258 – RH327524	B	87
	RH327556	A	88
	RH329338	A	89
	RH328792	A	90
	RH328382	A	91

B.O.M & Assembly Guideline

A	08/04/2022	Release for Approval	DASMV		
Rev.	**Date**	**Reason to issue**	**Prepared**	**Checked**	**Approved**
Title: BOM & Assembly Guideline				**Doc ID:** N/A	**Version:**
Doc. Applies to: MacGregor FAR - Bodø			**Department:** Project Management		

Prepared by Michael Van Epps
08/04/2022, Revision A

Purpose

This document specifies how MacGregor implements BOMs and assemblies collections. It should be used as a guideline to “navigate” through the delivered data.

Location of data

The generated documents will be made available together with this manual.
Direct Link: **BOM&ASSEMBLIES**

Prepared by Michael Van Epps
08/04/2022, Revision A

Guideline for OMM section 4

The first level to show, it presents the items as listed just like in the technical specification. The main rules of these BOMs are:

a) Part Name; MacGregor Part Number, and MacGregor Serial Number.
b) Blue items are assemblies.
c) All other items are single pieces, this could be purchased OEM parts to be delivered or integrated, ex: HPUs (of not MacGregor manufacturing).
d) Hyperlinks for easy navigation between sales order and specific item BOM assembly to view or retrieve a specific part number.
e) Hyperlinks to assembly BOMs, assembly drawings are at the end of each assembly BOM

To navigate through the BOMs list just click the hyperlink on the “Part ID” of an assembly (marked in blue). With this action, we can see the specific BOM of that assembly with all the associated parts.

If we want to see a specific BOM or assembly drawing the process is done in the same manner, just navigate through the BOM list and click on the “Part ID” of the chosen assembly.

NOTE: All BOMs and drawings are in PDF format.

Project Part List	SAP Project No.	
Rapp Marine Sales Order:		
Rapp Marine Project Name:		
Report Date:		
PART NAME	ITEM NUMBER	SERIAL NUMBER

Fig.: 1 - First Level of BOM List

Prepared by Michael Van Epps
08/04/2022, Revision A

Level	Pos	Qty	Unit	Aras ID	Name	Description
1				400092447	Storage Drum	STORAGE DRUM, RW-2372BS, OLN; 2Ton, PCD1525/Ø2050x2000, MOTOR ABB200 (RHMERW2372BS/OLN)
2	010	1	PCS	400092359	Gear	POSIPLAN, BPH425K/i=124,8 IEC200 (GETBI452-I200/00)
2	020	1	PCS	EMOAB200B35-EI/00	Electric Motor	M3BP200MLC4 B35, IP56/ENC ISOL; 47kW (EMOAB200B35-EI/00)
2	030	1	PCS	400096381	Winch Foundation	FRAME , RW-2372BS/OLN; ASSEMBLY
3	010	1	PCS	400096383	Winch Foundation	FRAME, RW-2372BS/OLN; MACHINING
3	020	1	PCS	400096384	Winch Foundation	REMOVABLE FRAME BAR, RW-2372BS/OLN; WELDING ASSEMBLY
3	030	4	PCS	RH318376	Bracket	GROUND BRACKET, 2xD50 / T=25, MACHINING; MACHINING, 320x120x25, 2xØ50
3	040	8	PCS	RH312860	Locking Plate	LOCKING WASHER, D80/d50/d22x44; MACHINING
3	050	8	PCS	FA0933G20075	Screw	HEX.HEAD SCREW A4-80, DIN 933 M20x75; FULLY THREADED (FA0933G20075)
3	060	8	PCS	FA0933G16040	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x40; FULLY THREADED (FA0933G16040)
3	070	8	PCS	FA0125G20	Washer	FLAT WASHER, A4, DIN 125 M20; Tykkelse h=3.0 d=21 (FA0125G20)
3	080	8	PCS	FA0125G16	Washer	FLAT WASHER, A4, DIN 125 M16; Tykkelse h=3.0 d=17 (FA0125G16)
2	040	1	PCS	400096308	Wire Rope Drum	DRUM WITH LEBUS, D2050xd1465xL2010 LEBUS; ASSEMBLY
3	001	1	PCS	400096310	Wire Rope Drum	DRUM - RW2372BS, PCD1525xD2050x2000; MACHINING
3	002	1	PCS	400092373	Split Drum Sleeve	LEBUS NO. 10029007 PCD1525x2000/ø20 (LERW2372-01)
3	003	7	PCS	400096378	Shim	SHIM PLATE, PLATE 1439x493,2/T5; MACHINING
3	004	1	PCS	400096379	Shim	SHIM PLATE, PLATE 1439x493,2/T5; MACHINING
3	005	1	PCS	400092590	Bracket	T6 / 420 x 456
3	006	4	PCS	RH31843401	Distance Ring	DRUM BOLT SPACER, D30/d15x60
3	007	4	PCS	RH318437	Wire Rope Clamp	WIRE CLAMP, 18x18x61 (R11), RW-2371BS; MACHINING
3	008	24	PCS	400096380	Wire Rope Clamp	CABLE CLAMP, PLATE 145x30/T3; BENDING
3	009	2	PCS	RH318439	Locking Plate	LOCKING PLATE, RW-2371BS, MACHINING; MACHINING, 100x20x5
3	011	4	PCS	FA0912G08040	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M8x40; THREAD LENGTH: 28mm (FA0912G08040)
3	012	56	PCS	FA0933G20030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M20x30; FULLY THREADED (FA0933G20030)
3	013	4	PCS	FA0933G10080	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x80; FULLY THREADED (FA0933G10080)
3	014	4	PCS	FA0933G10025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x25; FULLY THREADED (FA0933G10025)
3	015	52	PCS	FA0933G06016	Screw	HEX.HEAD SCREW A4-80, DIN 933 M6x16; FULLY THREADED (FA0933G06016)
3	016	78	PCS	FA7991G05012	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M5x12 (FA7991G05012)
3	017	4	PCS	FA0934G10	Nut	HEXAGON NUT, A4-80, DIN 934, M10 (FA0934G10)
3	018	12	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
3	019	52	PCS	FA0125G06	Washer	FLAT WASHER, A4, DIN 125 M6; Tykkelse h=1.6 d=6.4 (FA0125G06)
2	050	1	PCS	RH318355_NVE	Brake Unit	BRAKE ASSEMBLY TWS-3000 RW-2371BS; ASSEMBLY, D850
3	010	1	PCS	RH502491/NVE	Brake Band	BRAKE BAND ASSEMBLY, TWS-3000 NVE
4	010	1	PCS	RH604408/NVE	Brake Band	BRAKE BAND WELD&MACHINED TWS-3000 NVE; BRAKE BAND
5	060	8	PCS	FA0933G16030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x30; FULLY THREADED (FA0933G16030)
5	070	4	PCS	RH410451	Shear Pin	SHEAR PIN, D20h9x24 (M8)
5	080	4	PCS	RH410452	Locking Plate	LOCKING PLATE, 40x155x5
4	020	2.15	M	BLBCB100125	Brake Band	BRAKE LINING, 3/8" X5" (BLBCB100125)
4	030	58	PCS	BLRGB0822	Rivet	BRAKE LINING RIVET, Ø8X22mm, BRASS (BLRGB0822)
4	040	2	PCS	RH403166	Bearing Plain	LINING, D60/d50x30, TWS-820
4	050	4	PCS	FA0916G06010	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M6x10; CUP POINT (FA0916G06010)
4	060	1	PCS	GRRAX002S	Grease Nipple	GREASE NIPPLE, STRAIGHT, 1/4"R, A2 (GRRAX002S)

Level	Pos	Qty	Unit	Aras ID	Name	Description
4	070	2	PCS	400095607	Protective Sleeve	INNER RING d64/D74/12, ROUND BAR D100x17; MACHINING
2	030	1	PCS	RH504844/NVE	Cylinder Assembly	BRAKE CYLINDER BHS-110/50-S NVE, ASSY; 59BREMSESY
3	010	1	PCS	RH303520/NVE	Pipe	CYLINDER PIPE BHS-110/50-S NVE-QUALITY; BHS110/50-S, NVE-quality
3	020	1	PCS	RH303519	Piston Rod	PISTON ROD BHS-110/50-S, MACHINING; BHS-110/50-S
3	030	1	PCS	RH402907/NVE	Piston	PISTON, D109/d35x42,5, BHS-110/50 (NVE)
3	040	1	PCS	RH409526	Stuffing Box	STUFFING BOX, BHS-110/50-S (NVE)
3	050	1	PCS	RH402909/NVE	Stuffing Box	STUFFING BOX NUT, BHS-110/50 (NVE)
3	060	1	PCS	RH401487	Bearing Plain	LINING, D60/d50x125, BHS-110/50-S
3	070	1	PCS	RH303521	Stroke Limiter	STROKE LIMITER BHS-110/50-S MACHINING; BHS-110/50-S
3	080	1	PCS	SEPSA006	Hydraulic Seal piston	PISTON SEAL, 110-96-16/32, SIMRIT, 110x110x96 (SEPSA006)
3	090	1	PCS	SEPRA011	Hydraulic Seal rod	PISTON ROD SEAL AUN-50-106, SIMRIT, 60x60x10 (SEPRA011)
3	100	1	PCS	SEDWA010	Hydraulic Seal rod	DIRT-WIPER AS-50-65-7/10, 65x65x10 (SEDWA010)
3	110	1	PCS	SEORA175	O-Ring	O-RING, Ø99,30 x 5,70, 100x100x6 (SEORA175)
3	120	1	PCS	SEORA062	O-Ring	O-RING, Ø34,52 x 3,53 (R4137), 35x35x4 (SEORA062)
3	130	24	PCS	BSPXX016	Spring	PLATE SPRING, DIN 2093, 100x51x5 (BSPXX016)
3	140	1	PCS	BETBS039	Thrust Ball Bearing	THRUST BALL BEARING, SINGLE DIR, 51213; d65/D100x27 (BETBS039)
3	150	1	PCS	FA0985E30	Nut	NUT NYLOCK HEXAGON, 8 ELZN, DIN 985 M30 (FA0985E30)
3	160	1	PCS	GRRAX002S	Grease Nipple	GREASE NIPPLE, STRAIGHT, 1/4"R, A2 (GRRAX002S)
3	170	0.2	M	SEGRA077	Guide Ring	GUIDE STRIP, 15x2.0 (PTFE), 15x15x2 (SEGRA077)
3	180	1	PCS	FCPPF051	Plug	HEXAGON SOCKET PLUG, DIN 908, A4, G3/8"; DIN 908 (ISO 228) (FCPPF051)
3	030	1	PCS	RH319718	Brake Adjusting Device	NUT FOR BRAKE SCREW, D63,5x74, MACHINING
3	040	3	PCS	GRRAX002S	Grease Nipple	GREASE NIPPLE, STRAIGHT, 1/4"R, A2 (GRRAX002S)
3	050	2	PCS	RH408161	Locking Plate	LOCK DISC, D40/d11x6, TWS-
3	060	2	PCS	RH316996	Bearing Plain	LINING, D60/d50x25, MACHINING
3	070	1	PCS	RH318365	Bolt	BOLT, D50x202, MACHINING
3	080	4	PCS	RH318364	Bearing Plain	LINING, D60/d50x20, MACHINING
3	090	1	PCS	RH318372	Bolt	BOLT, D50x202, MACHINING
3	100	2	PCS	FA0933G10020	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x20; FULLY THREADED (FA0933G10020)
3	110	4	PCS	FA0916G06012	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M6x12; CUP POINT (FA0916G06012)
2	060	1	PCS	RH323401	Slipring Device Assembly	SLIPRING ARRANG.-FOCAL 176,RW2371,ASSE
3	010	1	PCS	RH313210	Bracket	SLIP RING TORQUIE BRACKET; WELDING ASSEMBLY, ROV4000, SLIP RING TORQUIE BRACKET
3	020	1	PCS	400092511	Slipring Device	FOCAL 176291 6xOPT,5xEL@4500V,4xEL@1000V (EACSL0471)
3	030	6	PCS	FA0912G08050	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M8x50; THREAD LENGTH: 28mm (FA0912G08050)
3	040	6	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)
3	050	2	PCS	FA0933G10030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x30; FULLY THREADED (FA0933G10030)
3	060	4	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
3	070	2	PCS	FA0934G10	Nut	HEXAGON NUT, A4-80, DIN 934, M10 (FA0934G10)
2	070	1	PCS	RH317214	Bearing Housing	BEARING HOUSING S3044; ASSEMBLY, S3044 - WELDED
3	010	1	PCS	RH317211	Bearing Housing	BEARING HOUSING S3044; WELDING & MACHINING, S3044-WELD
3	020	1	PCS	RH317213	Cover	BEARING COVER, D390/d205, MACHINING
3	030	1	PCS	RH317212	Cover	BEARING COVER, D390/205, MACHINING
3	040	0.17	M2	COSEX080	Gasket	GASKOID GASKET MATERIAL, 0,4X1000 MM (COSEX080)
3	050	1	PCS	BEASS025	Spherical Bearing Sleeve	ADAPTER SLEEVE, H3044X; d200x126/Nut HM3044 (BEASS025)

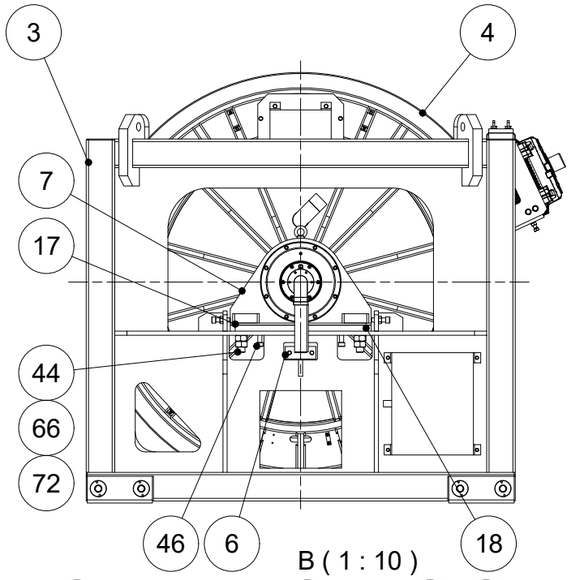
Level	Pos	Qty	Unit	Aras ID	Name	Description
3	060	1	PCS	BESRS1018	Spherical Roller Bearing	SPHERICAL ROLLER BEARING, 23044-E1-K; d220(taper 1:12)/D340x90 (BESRS1018)
3	070	8	PCS	FA0912G12030	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M12x30; FULLY THREADED (FA0912G12030)
3	080	1	PCS	FA0580G016	Eyebolt	LIFTING EYE BOLT, DIN 580, M16, A4; EYE SIZE Ø35 (FA0580G016)
3	090	8	PCS	FA0933G12030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x30; FULLY THREADED (FA0933G12030)
3	100	1	PCS	SESRA085	Rotary Shaft Lip Seal	SEAL, 200x230x15, 230x230x15 (SESRA085)
3	110	1	PCS	GRMFX004	Grease Nipple	GREASE NIPPLE, STRAIGHT, M10x1.0, A4 (GRMFX004)
3	120	1	PCS	SESRB085	Rotary Shaft Lip Seal	SEAL, 200x230x15, W/STAINLESS SPRING, 230x230x15 (SESRB085)
2	080	1	PCS	RH314192	Drive Shaft	DRUM SHAFT, RW-2326, MACHINING
2	090	1	PCS	RH317984	Support Shaft	DRUM SHAFT, BEARING D200/SLIPRING D140,2, BEARING SIDE, MACHINING
2	100	1	PCS	RH318400	Torque Arm	TORQUE ARM, RW2371BS, ASSEMBLY; ASSEMBLY, M39x3, MIN DIST. 405
3	010	1	PCS	BESPS100L	Radial Spherical Plain Bearing	ROD END, GAL-40-UK-2RS; d40x28 - M39x3 (Left hand thread) (BESPS100L)
3	020	1	PCS	BESPS100	Radial Spherical Plain Bearing	ROD END, GAR-40-UK-2RS; d40x28 - M39x3 (BESPS100)
3	030	1	PCS	RH318401	Bolt	TENSION BOLT, D60x200, M39x3(L&R); MACHINING
3	040	2	PCS	RH408161	Locking Plate	LOCK DISC, D40/d11x6, TWS-
3	050	4	PCS	RH31708301	Distance Ring	SPACER, D45/d40x6, MACHINING
3	060	2	PCS	RH317084	Shear Pin	SHEAR PIN, D40x101, MACHINING; GROOVE D28x6
3	070	1	PCS	FA0934E393	Nut	HEX.NUT, GRADE 8, ELZN, DIN 934, M39x3 (FA0934E393)
3	080	2	PCS	FA0933G10016	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x16; FULLY THREADED (FA0933G10016)
3	090	2	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
3	100	1	PCS	FA0934E393L	Nut	HEX.NUT, Gr.8, ELZN, DIN 934, M39x3 LEFT; LEFT HAND THREAD (FA0934E393L)
2	120	1	PCS	RH319115	Support Plate	MOTOR SUPPORT PLATE, RW2371BS_OLP
2	130	1	PCS	RH328794	Cover	GEARBOX COVER, BPH.25, ASSEMBLY
3	010	1	PCS	RH328795	Cover	GEARBOX COVER, BPH.25, WELDING ASSEMBLY
3	020	4	PCS	FA0933G08008	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x8; FULLY THREADED (FA0933G08008)
3	035	8	PCS	FA0933G10025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x25; FULLY THREADED (FA0933G10025)
3	040	4	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)
3	050	8	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
3	060	1	PCS	COGLX041	Sealing Compound	WURTH MS 40, POLYMER B SEALANT (COGLX041)
2	140	1	PCS	400095861	Cover	GEARBOX COVER_OPEN_BPH.25, (T30/D300xd145); MACHINING
2	150	1	PCS	RH314195	Cover	BEARING COVER, D260x32, RW-2326BS, MACH.
2	160	1	PCS	RH314194	Cover	BEARING COVER, D260x22, RW-2326BS, MACH.
2	170	1	PCS	RH312858	Shim	BEARING SHIM PLATE, 190x690x10 (2xD42); MACHINING, CENTER DISTANCE 580
2	180	1	PCS	COVVX019	Lifting Sling	EPOCAST 36 WITH HARDENER, 4 L; CHOCKING COMPOUND (COVVX019)
2	190	1	PCS	RH314201	Locking Plate	LOCKING DISC, BPH325, MACHINING; MACHINING, BPH325
2	200	1	PCS	RH314202	Locking Plate	LOCKING DISC, BPH325, MACHINING; MACHINING, BPH325
2	210	1	PCS	RH314196	Bearing Plain	LINING, D145/d132x23,5, MACHINING
2	220	1	PCS	400096385	Bushing	LINING, D140/d120/67,5; MACHINING
2	230	1	PCS	RH314197	Bearing Plain	LINING, D130/d121x20, MACHINING
2	240	1	PCS	RH318949	Bracket	BRACKET FOR RH203377PL & RH203378PL; WELDING & MACHINING, Ref. RH203377PL & RH203378PL
2	250	1	PCS	RH318968	Bracket	BRACKET FOR BULKHEAD UNION; BENDING, FOR BULKHEAD UNION, 2XØ34 / 90deg
2	260	1	PCS	RH321920	Shear Pin	SHEAR PIN, D35/M30, MACHINING
2	270	6	PCS	RH319054	Shim	SHIM - EL.MOTOR, D50/d17x6, MACHINING
2	280	1	PCS	RH314261	Key	KEY, 32x18, MACHINING

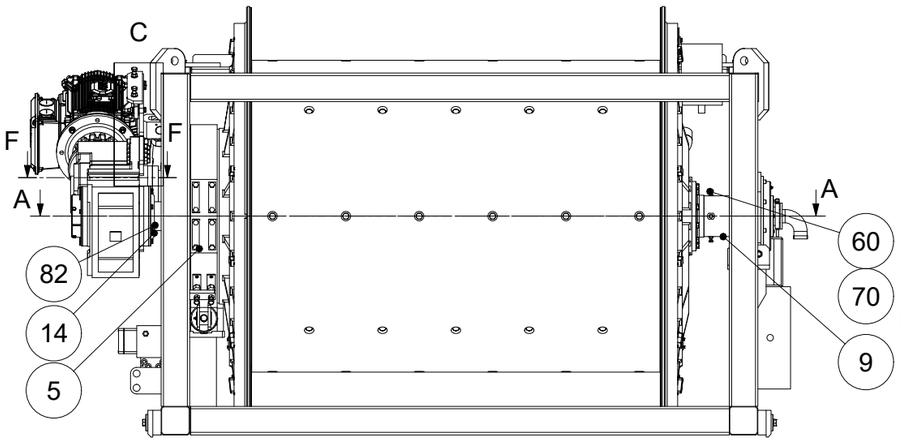
Level	Pos	Qty	Unit	Aras ID	Name	Description
2	290	1	PCS	RH410554	Fixed Support	BRAKE BAND SUPPORT, DSW- 4006E; L=185+20 2 x M16 (c-c = 70)
2	300	2	PCS	RH408797	Nut	SLIDE NUT WDU-4000/4500
2	310	2	PCS	RH408614	SLIDING PLATE, TWS-2000-10000	SLIDING PLATE, TWS-2000-10000
2	320	0.1568	M2	COSEX0821	Gasket	PREFLEX GASKET, 0,8x1000 MM; REPLACE GASKOID (COSEX0821)
2				RHHEBRGC-Q	Hydraulic Winch Assembly	HYDR. BRAKE CTRL. AND GEAR COOLING, (RHHEBRGC-Q)
3	010	1	PCS	RHHGMR15TRS	Hydraulic Fittings	TEST POINT SS. FOR TUBE Ø15PH STAINLESS (RHHGMR15TRS)
4	010	1	PCS	HGMAS002	Hydraulic Pressure Test Nipple	TEST POINT 2703-01-18-10(312-01-04R) SS; TESTNIPPEL (HGMAS002)
4	020	1	PCS	FTTFF002	Hydraulic Fittings	TRIP.LOK 10TT4X-SS 15/16 1/4" TEST P. F.; 10TT4MXSS (FTTFF002)
4	030	1	PCS	FTMSF005	Hydraulic Fittings	TRIP.LOK TX-SS 15 SLEEVE METRIC; TXSS15 (FTMSF005)
4	040	1	PCS	FTNUF004	Hydraulic Fittings	TRIP.LOK BTX-SS 15/16 NUT; 10 BTX-SS (FTNUF004)
4	050	1	PCS	FTUTF016	Hydraulic Fittings	TRIP.LOK R6X-SS 15/16 SWIVEL NUT RUN TEE; 10 R6X-SS (FTUTF016)
3	020	1	PCS	RHHGMR20TRS	Hydraulic Fittings	TEST POINT,SS.FOR TUBE Ø20PH SS (RHHGMR20TRS)
4	010	1	PCS	HGMAS002	Hydraulic Pressure Test Nipple	TEST POINT 2703-01-18-10(312-01-04R) SS; TESTNIPPEL (HGMAS002)
4	020	1	PCS	FTTFF003	Hydraulic Fittings	TRIP.LOK 12TT4X-SS 18/20 1/4" TEST P. F.; 12TT4MXSS (FTTFF003)
4	030	1	PCS	FTUTF017	Hydraulic Fittings	TRIP.LOK R6X-SS 18/20 SWIVEL NUT RUN TEE; 12 R6X-SS (FTUTF017)
4	040	1	PCS	FTNUF005	Hydraulic Fittings	TRIP.LOK BTX-SS 18/20 NUT; 12 BTX-SS (FTNUF005)
4	050	1	PCS	FTMSF008	Hydraulic Fittings	TRIP.LOK TX-SS 20 SLEEVE METRIC; TXSS20 (FTMSF008)
3	030	1	PCS	RHHGMR15TRS	Hydraulic Fittings	TEST POINT SS. FOR TUBE Ø15PH STAINLESS (RHHGMR15TRS)
4	010	1	PCS	HGMAS002	Hydraulic Pressure Test Nipple	TEST POINT 2703-01-18-10(312-01-04R) SS; TESTNIPPEL (HGMAS002)
4	020	1	PCS	FTTFF002	Hydraulic Fittings	TRIP.LOK 10TT4X-SS 15/16 1/4" TEST P. F.; 10TT4MXSS (FTTFF002)
4	030	1	PCS	FTMSF005	Hydraulic Fittings	TRIP.LOK TX-SS 15 SLEEVE METRIC; TXSS15 (FTMSF005)
4	040	1	PCS	FTNUF004	Hydraulic Fittings	TRIP.LOK BTX-SS 15/16 NUT; 10 BTX-SS (FTNUF004)
4	050	1	PCS	FTUTF016	Hydraulic Fittings	TRIP.LOK R6X-SS 15/16 SWIVEL NUT RUN TEE; 10 R6X-SS (FTUTF016)
3	040	1	PCS	RHHGMR15TRS	Hydraulic Fittings	TEST POINT SS. FOR TUBE Ø15PH STAINLESS (RHHGMR15TRS)
4	010	1	PCS	HGMAS002	Hydraulic Pressure Test Nipple	TEST POINT 2703-01-18-10(312-01-04R) SS; TESTNIPPEL (HGMAS002)
4	020	1	PCS	FTTFF002	Hydraulic Fittings	TRIP.LOK 10TT4X-SS 15/16 1/4" TEST P. F.; 10TT4MXSS (FTTFF002)
4	030	1	PCS	FTMSF005	Hydraulic Fittings	TRIP.LOK TX-SS 15 SLEEVE METRIC; TXSS15 (FTMSF005)
4	040	1	PCS	FTNUF004	Hydraulic Fittings	TRIP.LOK BTX-SS 15/16 NUT; 10 BTX-SS (FTNUF004)
4	050	1	PCS	FTUTF016	Hydraulic Fittings	TRIP.LOK R6X-SS 15/16 SWIVEL NUT RUN TEE; 10 R6X-SS (FTUTF016)
3	060	1	PCS	RHHHH123802S	Hydraulic Hose	BRAKE HOSE 3/8" 2 EA. INCL. SS FITT. PH; 2xslanger,2xF40,2xC6,2xB+T (RHHHH123802S)
4	010	2	PCS	HH2DK003	Hydraulic Hose	HP-HOSE 202206,S421,S425,L=0,5M,276BAR; 3/8" Bremseslange med syrefaste koblinger (HH2DK003)
4	020	2	PCS	FTCBF008	Hydraulic Fittings	TRIP.LOK F42X-SS 12-3/8" BSPP-CONNECTOR; 8F42EDMXSS (FTCBF008)
4	030	2	PCS	FTUEF011	Hydraulic Fittings	TRIP.LOK C6X-SS 12 SWIVEL NUT ELBOW; 8C6MXSS (FTUEF011)
4	040	2	PCS	FTNUF003	Hydraulic Fittings	TRIP.LOK BTX-SS 12 NUT; 8 BTX-SS (FTNUF003)
4	050	2	PCS	FTMSF003	Hydraulic Fittings	TRIP.LOK TX-SS 12 SLEEVE METRIC; TXSS12 (FTMSF003)
3	070	1	PCS	HH2CS0026	Hydraulic Hose	LOW PRESS. HOSE 1" (ø28) MAX 100 BAR; ø20 - Stain. S. Couplings (HH2CS0026)
3	080	1	PCS	FTCBF015	Hydraulic Fittings	TRIP.LOK F42X-SS 18/20-1/2" BSPP-CONN.; 12-8F42EDMXSS (FTCBF015)
3	090	1	PCS	FTUEF013	Hydraulic Fittings	TRIP.LOK C6X-SS 18/20 SWIVEL NUT ELBOW; 12C6MXSS (FTUEF013)
3	100	1	PCS	HH2CS0029	Hydraulic Hose	LOW PRESS. HOSE 1,2" (ø20MM) MAX 100 BAR; ø15 - Stain. S. Couplings (HH2CS0029)
3	110	1	PCS	FTCBF012	Hydraulic Fittings	TRIP.LOK F42X-SS 15/16-1/2" BSPP-CONN.; 10F42EDMXSS (FTCBF012)
3	120	1	PCS	FTUEF012	Hydraulic Fittings	TRIP.LOK C6X-SS 15/16 SWIVEL NUT ELBOW; 10C6MXSS (FTUEF012)
3	130	1	PCS	RH600314S	Check Valve	VU 12F-12F 0,35 BAR DIA 15 PH; CHECK VALVE 0,35 BAR DIAM 15 PH
4	010	1	PCS	400190567	Check Valve	SS Check valve, 1/2", 0,35bar, VU12F12F (FASTER) Stainless steel !!! (available on request)

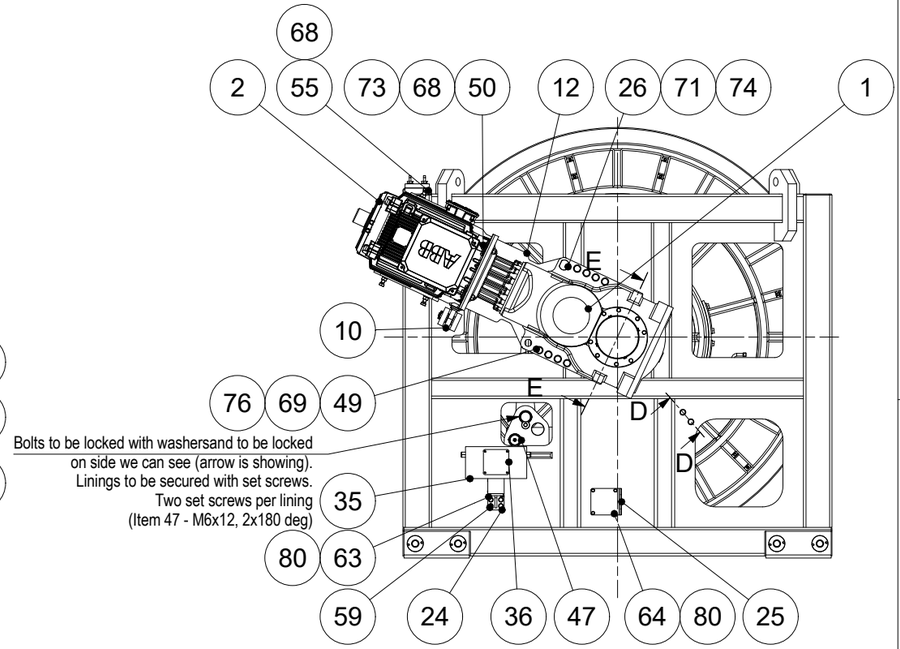
Level	Pos	Qty	Unit	Aras ID	Name	Description
4	020	2	PCS	FTMSF005	Hydraulic Fittings	TRIP.LOK TX-SS 15 SLEEVE METRIC; TXSS15 (FTMSF005)
4	030	2	PCS	FTNUF004	Hydraulic Fittings	TRIP.LOK BTX-SS 15/16 NUT; 10 BTX-SS (FTNUF004)
4	040	2	PCS	FTCBF012	Hydraulic Fittings	TRIP.LOK F42X-SS 15/16-1/2" BSPP-CONN.; 10F42EDMXSS (FTCBF012)
3	140	1	PCS	RHHRRNV0201201S	Pressure Reducing Valve	PRESS. RED.VALVE CH.VLV.20 LPM Ø12PH SS (RHHRRNV0201201S)
4	010	1	PCS	HRROC007	Pressure Reducing Valve	PRESS. RED.VALVE VRP-R-VU-05.90.19; VRPR059019 (HRROC007)
4	020	3	PCS	FTCBF008	Hydraulic Fittings	TRIP.LOK F42X-SS 12-3/8" BSPP-CONNECTOR; 8F42EDMXSS (FTCBF008)
4	030	3	PCS	FTNUF003	Hydraulic Fittings	TRIP.LOK BTX-SS 12 NUT; 8 BTX-SS (FTNUF003)
4	040	3	PCS	FTMSF003	Hydraulic Fittings	TRIP.LOK TX-SS 12 SLEEVE METRIC; TXSS12 (FTMSF003)
4	050	1	PCS	FTUTF015	Hydraulic Fittings	TRIP.LOK R6X-SS 12 SWIVEL NUT RUN TEE; 8 R6X-SS (FTUTF015)
4	060	1	PCS	FTTFF001	Hydraulic Fittings	TRIP.LOK 8TT4X-SS 12 1/4" TEST P. F.; 8TT4MXSS (FTTFF001)
4	070	1	PCS	HGMAS002	Hydraulic Pressure Test Nipple	TEST POINT 2703-01-18-10(312-01-04R) SS; TESTNIPPEL (HGMAS002)
3	150	1	PCS	RHHSE1-600485S1	Solenoid Valve Assembly	SINGLE BOX, 4D01, 2xø15PH+2xø12PH SS; Syrefast fittings etc. (RHHSE1-600485S1)
4	010	1	PCS	RHHBOX1MDPEM	Enclosure	SINGEL VALVE BOX IN MDPE ASSEMBLED; m/NG6 blindplate. (RHHBOX1MDPEM)
4	020	1	PCS	HSEDE030	Coil	DIRECTIONAL VALVE 4D01-3151-0101-C1-G0Q (HSEDE030)
4	030	2	PCS	FTMSF003	Hydraulic Fittings	TRIP.LOK TX-SS 12 SLEEVE METRIC; TXSS12 (FTMSF003)
4	040	2	PCS	FTNUF003	Hydraulic Fittings	TRIP.LOK BTX-SS 12 NUT; 8 BTX-SS (FTNUF003)
4	050	2	PCS	FTMSF005	Hydraulic Fittings	TRIP.LOK TX-SS 15 SLEEVE METRIC; TXSS15 (FTMSF005)
4	060	2	PCS	FTNUF004	Hydraulic Fittings	TRIP.LOK BTX-SS 15/16 NUT; 10 BTX-SS (FTNUF004)
4	070	2	PCS	FTCBF008	Hydraulic Fittings	TRIP.LOK F42X-SS 12-3/8" BSPP-CONNECTOR; 8F42EDMXSS (FTCBF008)
4	080	2	PCS	FTCBF012	Hydraulic Fittings	TRIP.LOK F42X-SS 15/16-1/2" BSPP-CONN.; 10F42EDMXSS (FTCBF012)
4	090	2	PCS	FCPPF015	Plug	HEXAGON HEAD PLUG, DIN 910, A4, G3/8"; DIN 910 (FCPPF015)
4	100	6	PCS	FCPPF010	Plug	HEXAGON HEAD PLUG, DIN 910, A4, G1/4"; DIN 910 (FCPPF010)
4	110	4	PCS	FA0912D05030	Screw	SOCKET HEAD SCREW 12.9 DIN 912 M5x30; THREAD LENGTH: 22mm (FA0912D05030)
4	120	2	PCS	SEBOB003	Bonded Seal	BONDED SEAL, PP 45-C, 3/8" R/BSP, A4, 24x24x4 (SEBOB003)
4	130	6	PCS	SEBOB002	Bonded Seal	BONDED SEAL, PP 45-B, 1/4" R/BSP, A4, 21x21x4 (SEBOB002)
3	160	1.5	M	TPPIF018	Pipe Clamp	HYDR. PIPE, Ø20X2.0 SEAML.AISI-316; Ø20X2.0 SEAMLESS ACID PROOF AISI-316 (TPPIF018)
3	170	3	M	TPPIF014	Pipe Clamp	HYDR. PIPE, Ø12X1.5 SEAML.AISI-316; Ø12X1.5 SEAMLESS ACID PROOF AISI-316 (TPPIF014)
3	180	6	PCS	TPCLFA1K012	Pipe Clamp	TUBE CLAMP COMPL. 12MM.AISI 316; TUBE CLAMP COMPL. SER.A.GR.1 12mm/AISI 316 (TPCLFA1K012)
3	190	3	PCS	TPCLFA2K015	Pipe Clamp	TUBE CLAMP COMPL. 15mm.AISI 316; TUBE CLAMP COMPL. SER.A.GR.2 15mm/AISI 316 (TPCLFA2K015)
3	200	3	PCS	TPCLFA3K020	Pipe Clamp	TUBE CLAMP COMPL. 20mm.AISI 316; TUBE CLAMP COMPL. SER.A.GR.3 20mm/AISI 316 (TPCLFA3K020)
3	210	1	M	TPPIF016	Pipe Clamp	HYDR. PIPE, Ø15X1.5 SEAML.AISI-316; Ø15X1.5 SEAMLESS ACID PROOF AISI-316 (TPPIF016)
3	220	1	PCS	FTUTF003	Hydraulic Fittings	TRIP.LOK JTX-SS 12 UNION TEE; 8JMTXSS (FTUTF003)
3	230	3	PCS	FTNUF003	Hydraulic Fittings	TRIP.LOK BTX-SS 12 NUT; 8 BTX-SS (FTNUF003)
3	240	3	PCS	FTMSF003	Hydraulic Fittings	TRIP.LOK TX-SS 12 SLEEVE METRIC; TXSS12 (FTMSF003)
3	250	1	PCS	FTUTF015	Hydraulic Fittings	TRIP.LOK R6X-SS 12 SWIVEL NUT RUN TEE; 8 R6X-SS (FTUTF015)
3	260	1	PCS	FTUTF024	Hydraulic Fittings	TRIP.LOK S6X-SS 12 SWIVEL NUT BRANCH TEE; 8 S6X-SS (FTUTF024)
3	270	2	PCS	FTUNF012	Hydraulic Fittings	TRIP.LOK HX6-SS 12-12 SWIVEL NUT UNION (FTUNF012)
3	280	2	PCS	FTREF007	Hydraulic Fittings	TRIP.LOK TRTX-SS 15/16-12 REDUCER; 10-8TRMTXSS (FTREF007)
3	290	1	PCS	FTUNF004	Hydraulic Fittings	TRIP.LOK HTX-SS 15/16 UNION; 10HMTXSS (FTUNF004)
3	300	5	PCS	FTNUF004	Hydraulic Fittings	TRIP.LOK BTX-SS 15/16 NUT; 10 BTX-SS (FTNUF004)
3	310	5	PCS	FTMSF005	Hydraulic Fittings	TRIP.LOK TX-SS 15 SLEEVE METRIC; TXSS15 (FTMSF005)
3	320	1	PCS	FTUNF005	Hydraulic Fittings	TRIP.LOK HTX-SS 18/20 UNION; 12HMTXSS (FTUNF005)
3	330	5	PCS	FTNUF005	Hydraulic Fittings	TRIP.LOK BTX-SS 18/20 NUT; 12 BTX-SS (FTNUF005)

Level	Pos	Qty	Unit	Aras ID	Name	Description
3	340	5	PCS	FTMSF008	Hydraulic Fittings	TRIP.LOK TX-SS 20 SLEEVE METRIC; TXSS20 (FTMSF008)
3	350	1	PCS	FTUBF005	Hydraulic Fittings	TRIP.LOK WTX-WLN-SS 18/20 BULKHEAD UNION (FTUBF005)
3	360	1	PCS	FTUBF004	Hydraulic Fittings	TRIP.LOK WTX-WLN-SS 15/16 BULKHEAD UNION (FTUBF004)
3	370	1	PCS	FTBNA005	Hydraulic Fittings	TRIP.LOK FNTX-S 18/20 BLIND NUT; 12FNMTXS (FTBNA005)
3	380	3	PCS	FTBNA004	Hydraulic Fittings	TRIP.LOK FNTX-S 15/16 BLIND NUT; 10FNMTXS (FTBNA004)
2	370	1	PCS	BESRS091	Spherical Roller Bearing	SPHERICAL ROLLER BEARING, 23026-E; d130/D200x52 (BESRS091)
2	380	1	PCS	SESRB0782	Rotary Shaft Lip Seal	SEAL, 145x170x13 A-TYPE, SSS, 170x170x13 (SESRB0782)
2	390	1	PCS	SESRB077	Rotary Shaft Lip Seal	SEAL, 140x170x15, W/STAINLESS SPRING, 15x170x170 (SESRB077)
2	400	1	PCS	SESRB073	Rotary Shaft Lip Seal	SEAL, 130x160x12, W/STAINLESS SPRING, (SESRB073)
2	410	1	PCS	FA0471U1300	Circlip	CIRCLIP RING EXTERNAL,STEEL DIN 471 A130; SPRING STEEL, PHOSPHATED, HRC 44-49 (FA0471U1300)
2	420	1	PCS	FA0472A1200	Circlip	CIRCLIP RING INTERNAL,STEEL DIN 472 I120; SPRING STEEL, PHOSPHATED, HRC 44-49 (FA0472A1200)
2	430	1	PCS	FA0988U13016035	Ring	SUPPORT WASHER, DIN 988, SS-130x160x3,5; SS13016035 DIN988 Steel St 2 K 60 (FA0988U13016035)
2	440	2	PCS	FA0912U36220	Screw	SOCKET HEAD SC 12.9 ZNFC DIN 912 M36x220 (FA0912U36220)
2	450	4	PCS	FA0912G20070	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M20x70; FULLY THREADED (FA0912G20070)
2	460	4	PCS	FA0912G20060	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M20x60; FULLY THREADED (FA0912G20060)
2	470	4	PCS	FA0916G06012	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M6x12; CUP POINT (FA0916G06012)
2	480	1	PCS	400091256	Screw	HEX.HEAD SCREW 8.8 VZN, DIN 931 M24x100; THREAD LENGTH:54mm (FA0931H24100)
2	490	8	PCS	FA0931G20100	Screw	HEX.HEAD SCREW A4-80, DIN 931 M20x100; THREAD LENGTH:46mm (FA0931G20100)
2	500	4	PCS	FA0931G16065	Screw	HEX.HEAD SCREW A4-80, DIN 931 M16x65; THREAD LENGTH:38mm (FA0931G16065)
2	510	10	PCS	FA0931G16060	Screw	HEX.HEAD SCREW A4-80, DIN 931 M16x60; THREAD LENGTH:38mm (FA0931G16060)
2	520	6	PCS	FA0931G14080	Screw	HEX.HEAD SCREW A4-80, DIN 931 M14x80; THREAD LENGTH:34mm (FA0931G14080)
2	530	20	PCS	FA0933G20055	Screw	HEX.HEAD SCREW A4-80, DIN 933 M20x55; FULLY THREADED (FA0933G20055)
2	540	2	PCS	FA0933G16090	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x90; FULLY THREADED (FA0933G16090)
2	550	4	PCS	FA0933G16060	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x60; FULLY THREADED (FA0933G16060)
2	560	2	PCS	FA0933G16050	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x50; FULLY THREADED (FA0933G16050)
2	570	7	PCS	FA0933G12055	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x55; FULLY THREADED (FA0933G12055)
2	580	16	PCS	FA0933G12030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x30; FULLY THREADED (FA0933G12030)
2	590	4	PCS	FA0933G12025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x25; FULLY THREADED (FA0933G12025)
2	600	4	PCS	FA0933G10050	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x50; FULLY THREADED (FA0933G10050)
2	620	4	PCS	FA0933G08030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x30; FULLY THREADED (FA0933G08030)
2	630	4	PCS	FA0933G08025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x25; FULLY THREADED (FA0933G08025)
2	640	4	PCS	FA0933G08020	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x20; FULLY THREADED (FA0933G08020)
2	650	4	PCS	FA7991G06016	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M6x16 (FA7991G06016)
2	660	4	PCS	FA0934U36	Nut	HEX.NUT, GRADE 12, Zn.F.C, DIN 934, M36; For 12.9 bolts (FA0934U36)
2	670	12	PCS	FA0934G20	Nut	HEXAGON NUT, A4-80, DIN 934, M20 (FA0934G20)
2	680	10	PCS	FA0934G16	Nut	HEXAGON NUT, A4-80, DIN 934, M16 (FA0934G16)
2	690	6	PCS	FA0934G14	Nut	HEXAGON NUT, A4-80, DIN 934, M14 (FA0934G14)
2	700	4	PCS	FA0934G10	Nut	HEXAGON NUT, A4-80, DIN 934, M10 (FA0934G10)
2	710	1	PCS	400091839	Nut	NUT NYLOCK HEXAGON, 8 VZN, DIN 985 M30 (FA0985H30)
2	720	2	PCS	FA6916H36	Washer	HARDENED WASHER, VZN, DIN 6916 M36; 300HV / FOR 10.9 BOLT (FA6916H36)
2	730	24	PCS	FA0125G16	Washer	FLAT WASHER, A4, DIN 125 M16; Tykkelse h=3.0 d=17 (FA0125G16)
2	740	1	PCS	FA0125H30	Washer	FLAT WASHER, VZN, DIN 125 M30; Tykkelse h=4.0 d=31 (FA0125H30)
2	750	1	PCS	400091197	Washer	FLAT WASHER, 8.8 VZN, DIN 125 M24; Tykkelse h=4.0 d=25 (FA0125H24)

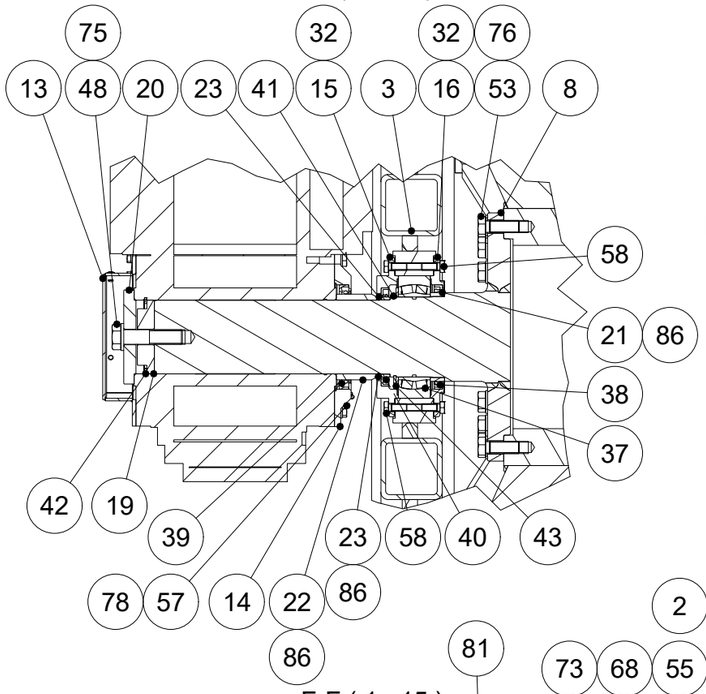
Level	Pos	Qty	Unit	Aras ID	Name	Description
2	760	36	PCS	FA0125G20	Washer	FLAT WASHER, A4, DIN 125 M20; Tykkelse h=3.0 d=21 (FA0125G20)
2	770	12	PCS	FA0125G14	Washer	FLAT WASHER, A4, DIN 125 M14; Tykkelse h=2.5 d=15 (FA0125G14)
2	780	11	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
2	800	12	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)
2	810	1	PCS	GRMAX001S	Grease Nipple	GREASE NIPPLE, STRAIGHT, M10x1.5, A2 (GRMAX001S)
2	820	1	PCS	GRMXX002	Grease Nipple	GREASE NIPPLE, M8x1,0 STRAIGHT, A4 (GRMXX002)
2	850	1	PCS	COGLX041	Sealing Compound	WURTH MS 40, POLYMER B SEALANT (COGLX041)
1				400182467	Electrical Winch Assembly	Electrical system ROW/Storage Drum Mbari S1V1
2	001	1	PCS	400091474	Cabinet Basic	KLIPPON POK 121209 EX
2	002	1	PCS	400091486	Mounting Rail	TS35X7.5 ST K41
2	003	1	PCS	EACCA096	Prefabricated Cable	V1-WV4A-10M-PUR-ABG0, 10M PUR M12 90* (EACCA096)
2	004	1	PCS	EACPG270	Cable Gland	SKINTOP MS-M 12X1,5 (ØF 3-7MM) (EACPG270)
2	005	1	PCS	EACPG271	Cable Gland	SKINTOP MS-M 16X1,5 (ØF 4,5-10MM) (EACPG271)
2	006	1	PCS	EACPG280	Cable Gland	SM-M 12X1,5 SKINDICHT BRASS (EACPG280)
2	007	1	PCS	EACPG281	Cable Gland	SM-M 16X1,5 SKINDICHT BRASS (EACPG281)
2	008	1	PCS	EACPL0011	Prefabricated Cable	EL.PLUG W/KABEL 5 METER, 3P+PE BELDEN (EACPL0011)
2	009	1	PCS	EACPL007	Electronic Card	DIODE-ADAPTER A07C4-2-24VDC; ADAPTER (EACPL007)
2	010	14	PCS	EACPL0202	Terminal	TERMINAL ENDSTOPPER WEW 35/2 (EACPL0202)
2	011	2	PCS	EACPL02025	Terminal	TERMINAL GROUNDING, ZPE 2,5 WEIDMULLER (EACPL02025)
2	012	7	PCS	EACPL021401	Terminal	TERMINAL ZDU 2,5 AN (2 HOLES) WEIDMULLER (EACPL021401)
2	013	2	PCS	EACPL02144	Terminal	TW1 (FOR ZDU 2,5) END COVER (EACPL02144)
2	014	1	PCS	EACTT007	Temperature Sensor	AUTEK-MFT1M12-R0375-0010XXB-1AAB-RAPP (EACTT007)



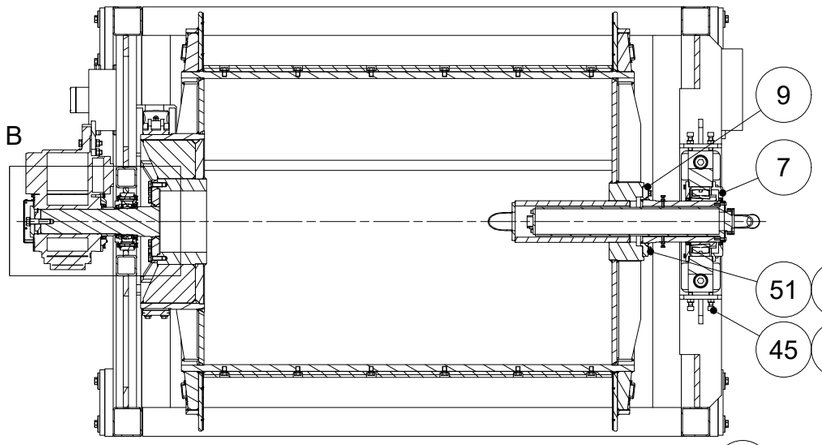




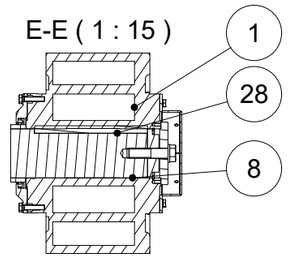
B (1 : 10)



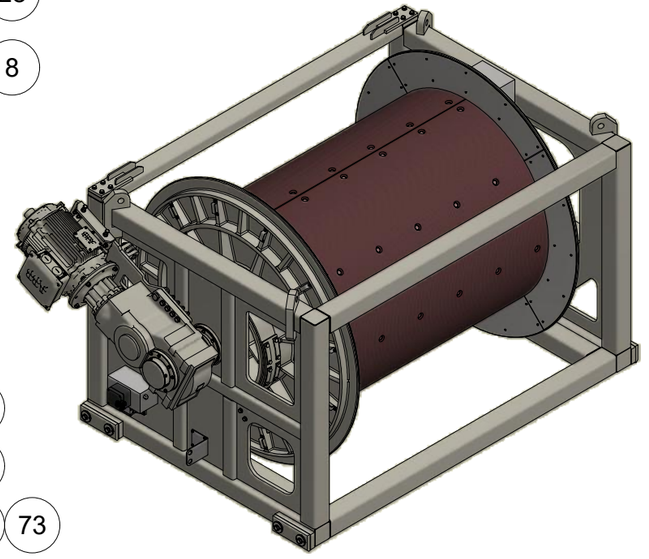
A-A (1 : 30)



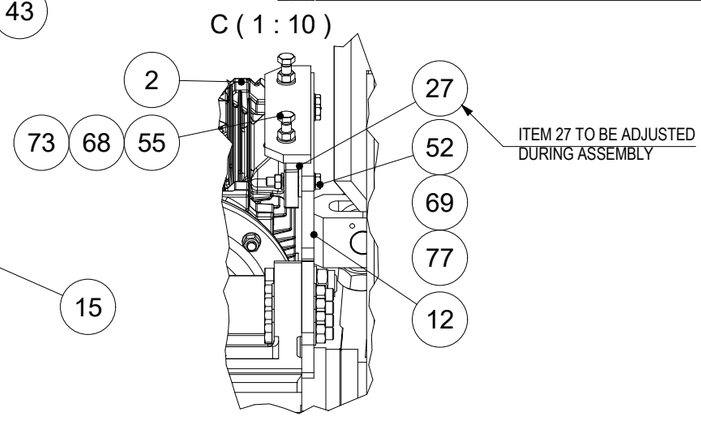
E-E (1 : 15)



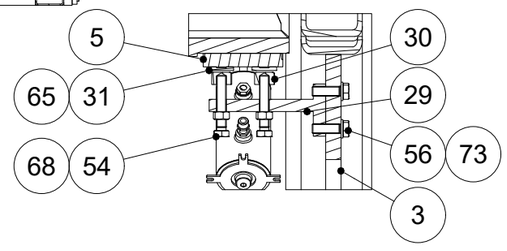
ISO VIEW (1 : 40)



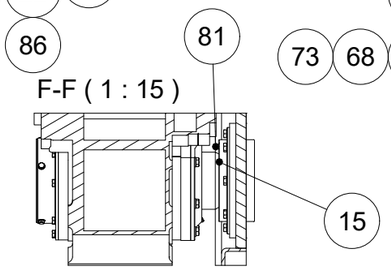
C (1 : 10)



D-D (1 : 10)



F-F (1 : 15)



TIGHTENING TORQUE - ACC. DOC. #6402

***MCG SIGNS (Not shown on Drawing)**
***POLYMER - ACC. DOC. #6482 MACHINED SURFACES AND SURFACE TREATMENT**
***LOCTITE 243 - ALL BOLT CONNECTIONS TO BE USED WITH**
***LOCTITE 638 - FOR BONDING OF CYLINDRICAL FITTING PARTS (GAP APPROX. 0,25 mm)**

83 84 85 86

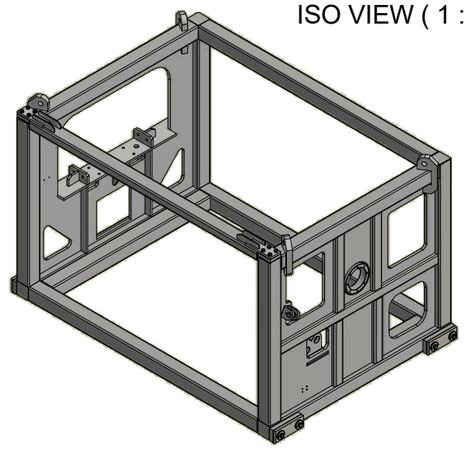
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PETRODO	20.10.2021.	P Pantovic	ECO-2056896			

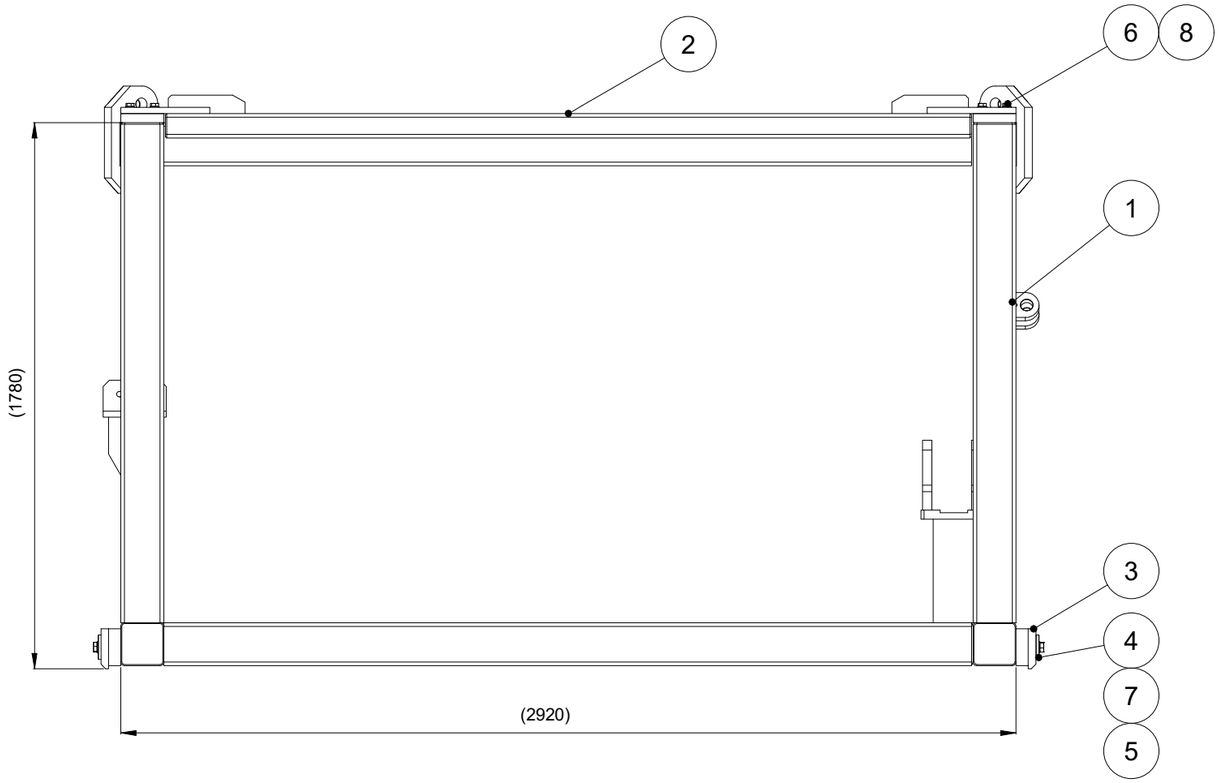
MACGREGOR

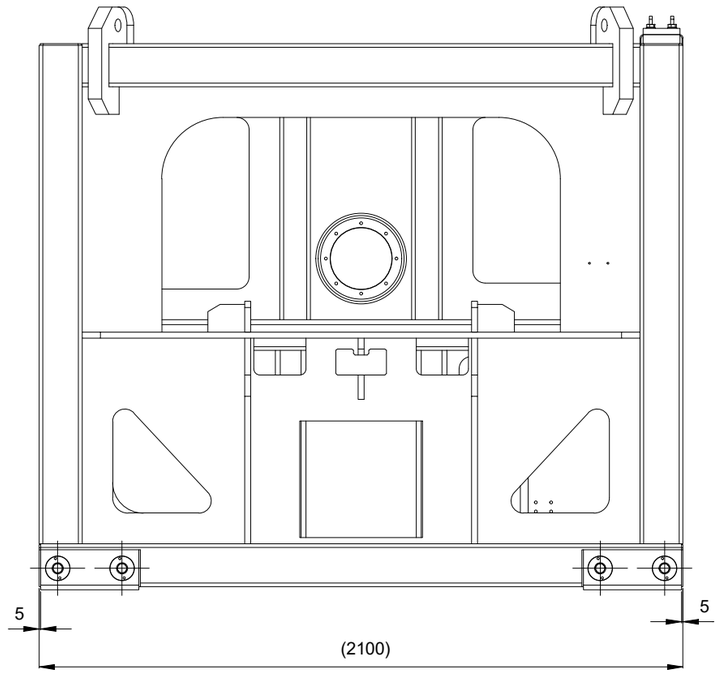
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Name	Weight (kg)
ASSEMBLY	9500
Description	Scale (A3)
RW-2372BS, OLN	1 : 30
Document ID: 400092447-ASSY	Revision: B / Sheet: 1 / 1

ISO VIEW (1 : 50)





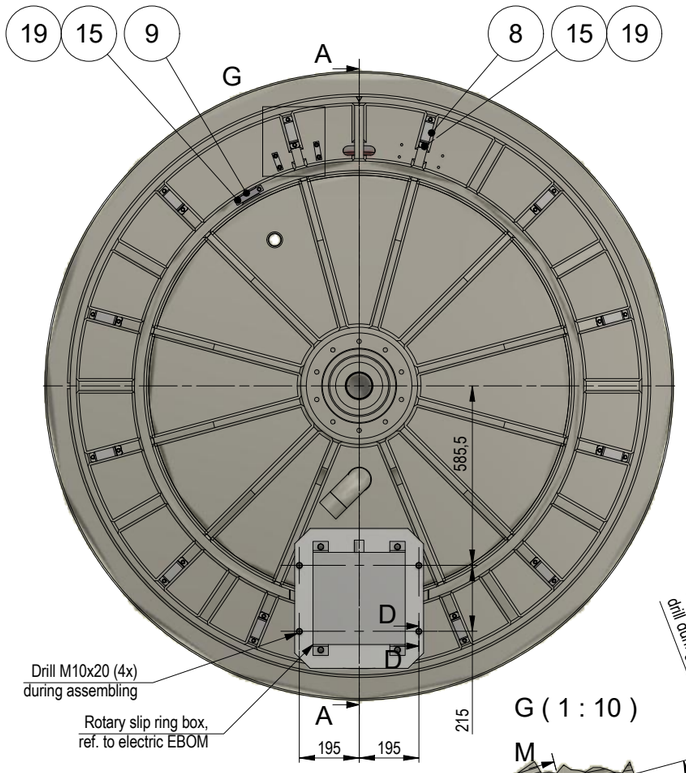


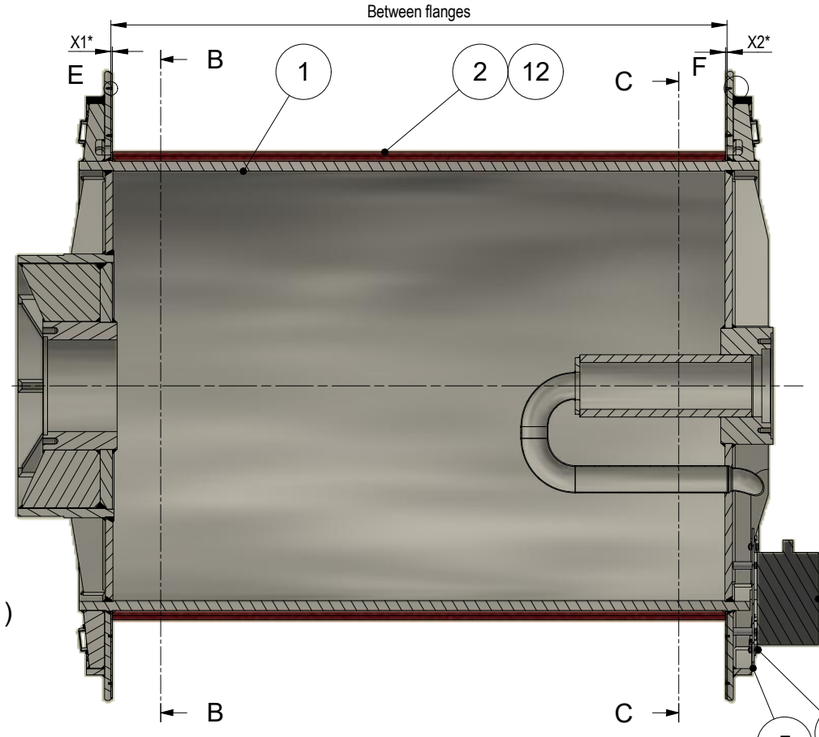
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A		Issued for production	19.10.2021.	RZPPA

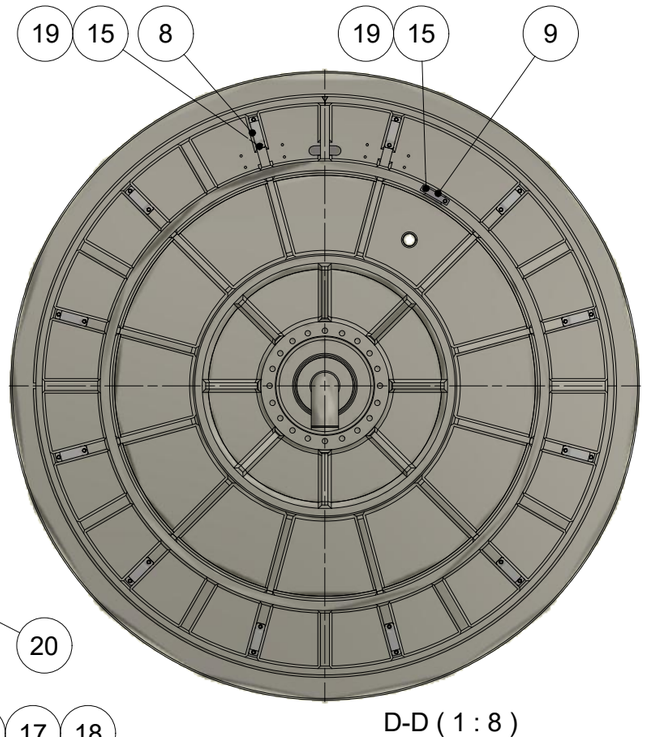
Weight 1790 kg	FRAME RW-2372BS/OLN ASSEMBLY				MACGREGOR
Unspecified Tolerances According to:	*Scale (A3)* 1:25	*Sheet* 1 / 1			*Drw number* 400096381
Standard NS-ISO 2768-1	*Tolerance Class* m Medium	*Material (for part)*	*Status* Production	*Drawn by / Date (dd/mm/yy)* PETRODO 19.10.2021.	*Checked by / Date (dd/mm/yy)* RZPPA 20.10.2021.	*Partlist* 400096381
NS-ISO 2768-2	K				

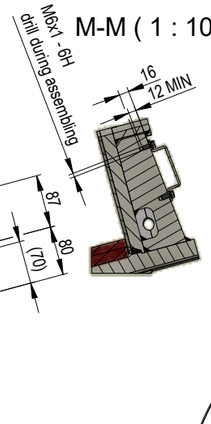
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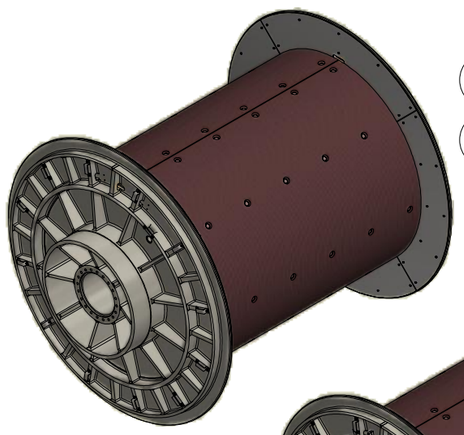




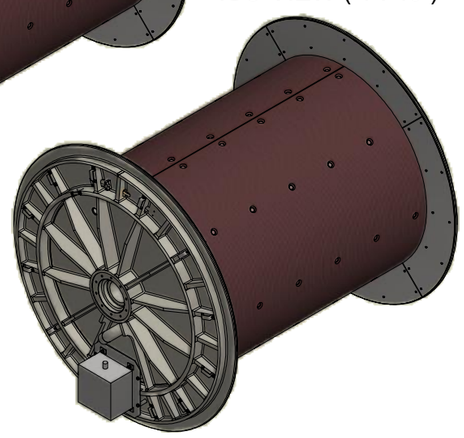


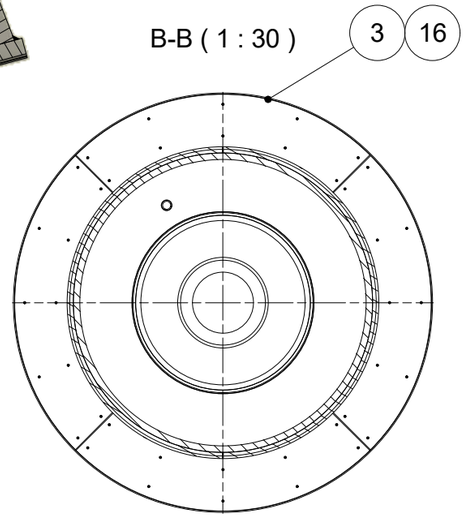


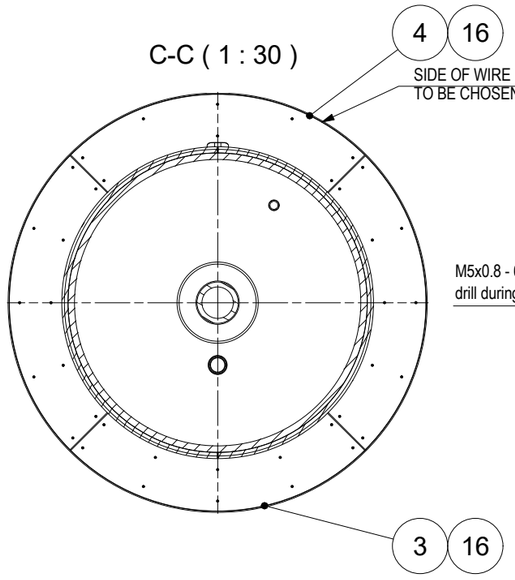
ISO VIEW (1 : 40)

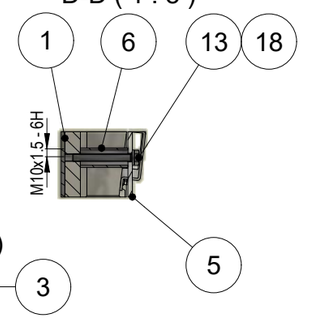


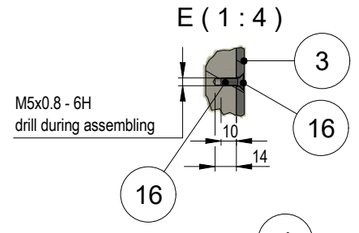
ISO VIEW (1 : 40)

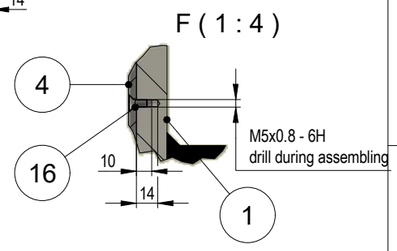












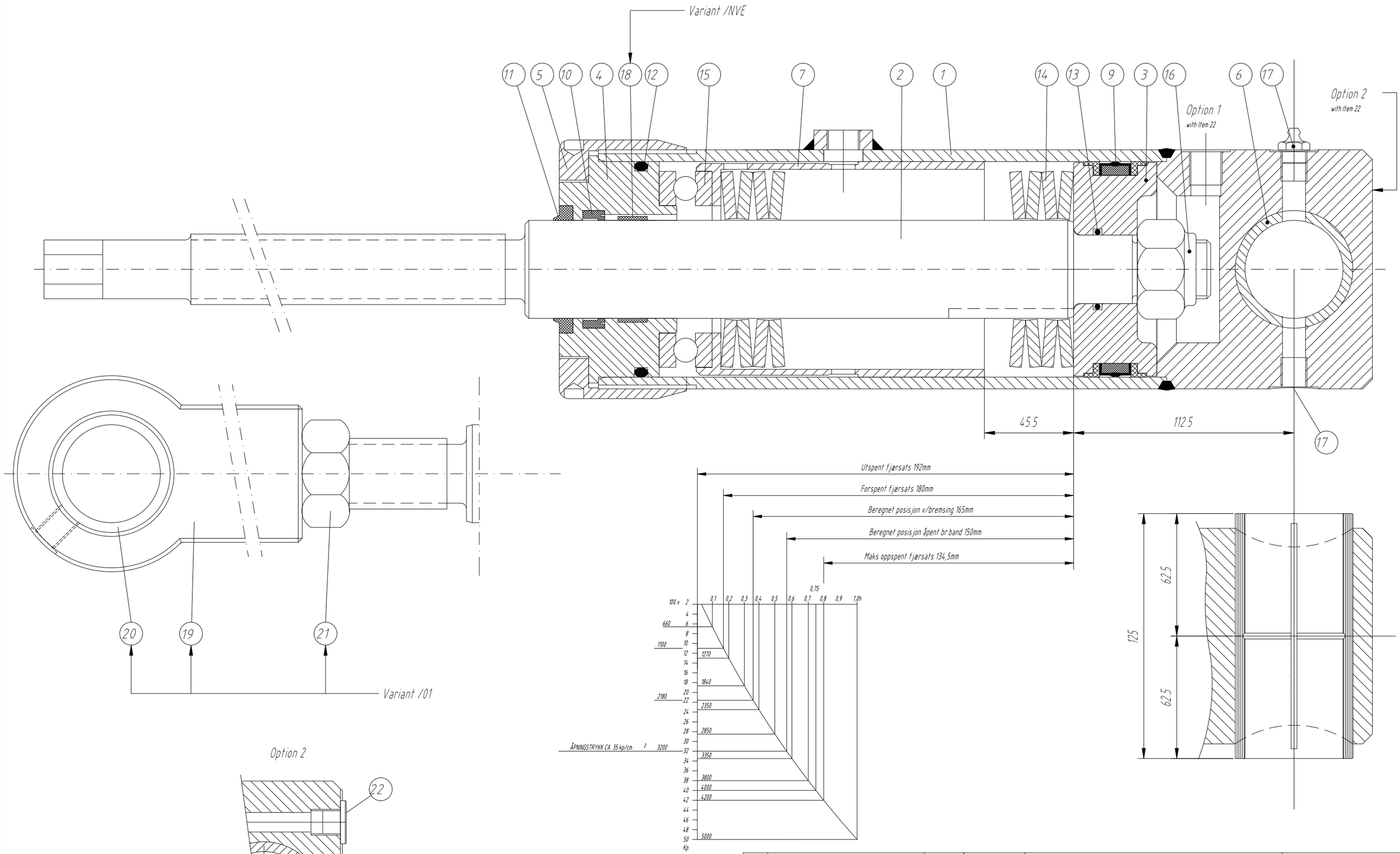
X1*, X2* - REFF. TO LEBUS DRAWING

Designed by	Date	Modified by	ECO / CO			
PETRODO	18.10.2021.	P Pantovic	ECO-2056896			

MACGREGOR

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Name		Weight (kg)
DRUM WITH LEBUS		6289
Description		Scale (A3)
D2050xd1465xL2010 LEBUS		1 : 20
Document ID	Revision	Sheet
400096308	B	1 / 1



PAKNINGSSETT: 5R 38/98

Rev.ID	Description of revision	Date/Sign
E		
D		
C	Item 22 added (option 1 and 2) IVITOD 16.03.17.	
B	Item 18 added. DHN 27.02.06	
A	Fjernet 1 muffe. EAB 19.03.90	

Tot.weight

RAPP HYDEMA
Phone: 75 55 01 00
Fax : 75 55 01 11
E-mail : office@rapphydema.com

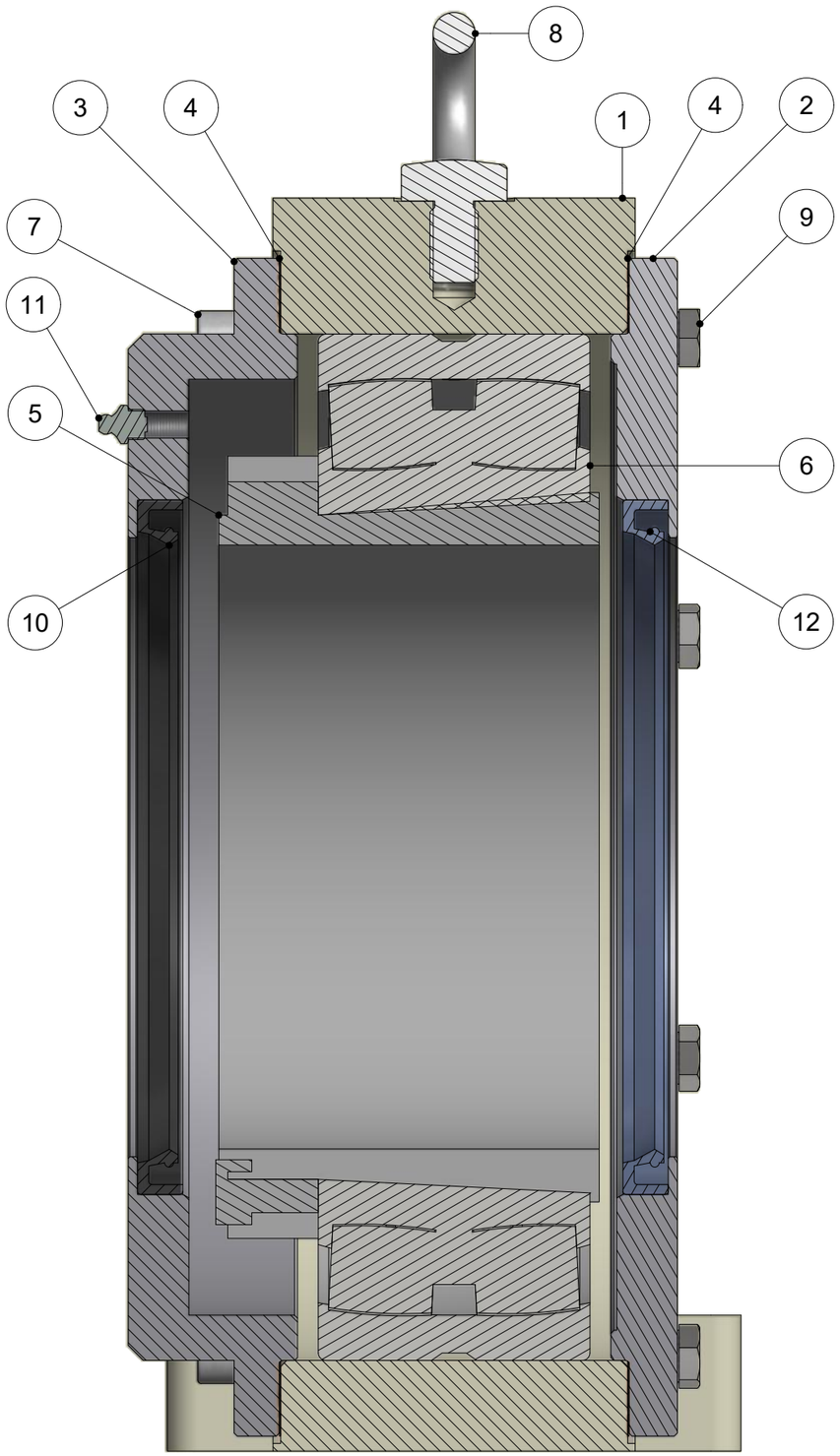
Drawn SS | Date 26.07.84 | Control RZNM | Approved RZNM

Scale 1:1

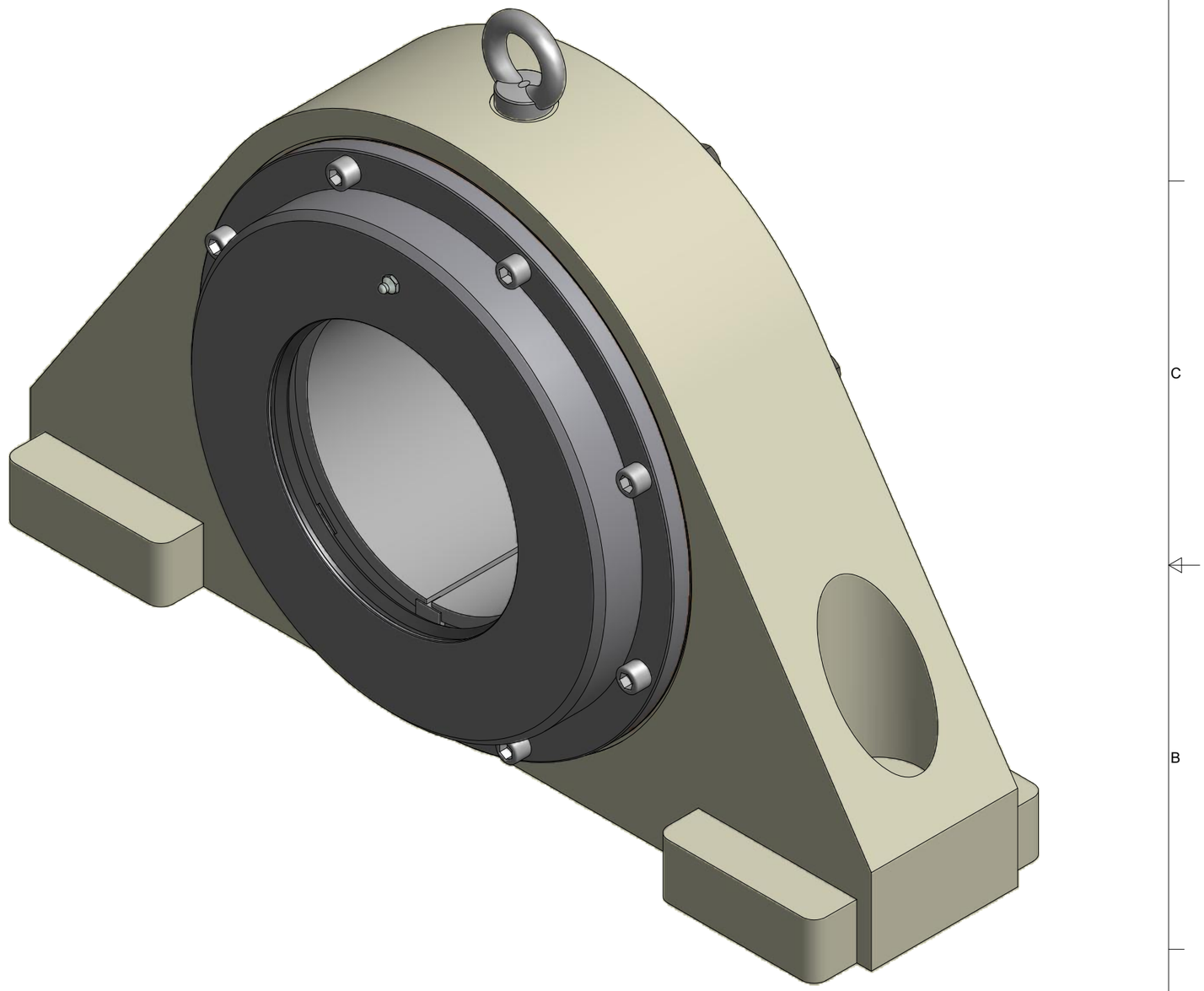
BRAKE CYLINDER BHS-110/50-S
BREMSESYLINDER

Part list RH504844/XXX
Subst.for: | Subst.by:
Drg.no. RH202569
Rev. ID. C | Approved DHN | Date 27.02.06

VIEW (1 : 2)



ISO VIEW (1 : 3)



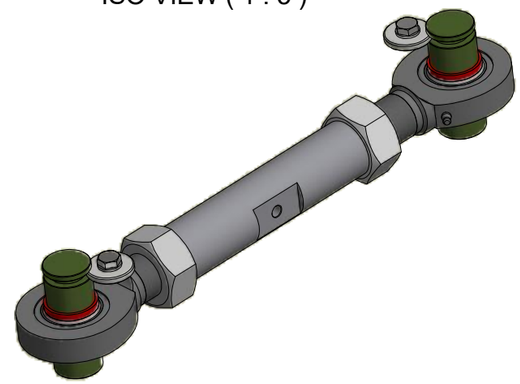
REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
A		Issued for production	02.09.2013	RHJJ
A1	-	Oneof seals (Item 10) replaced to Item 12 - seal with stainless steel spring	17.12.2014 / APA	RHDHN

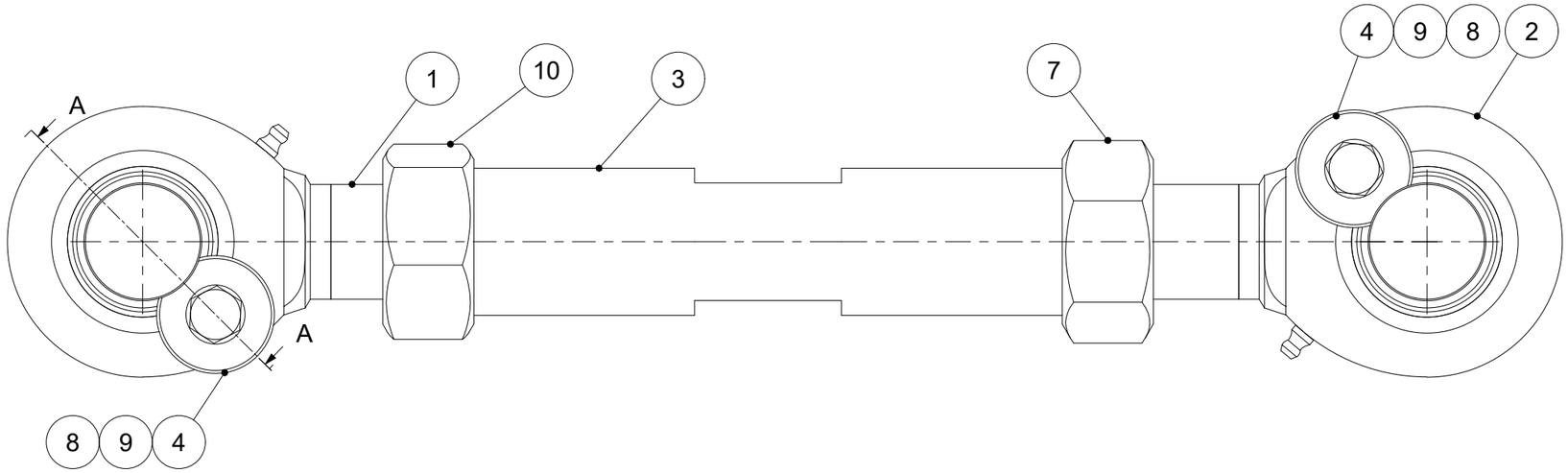
Weight 170 kg	BEARING HOUSING S3044 - WELDED ASSEMBLY			RAPP HYDEMA Phone: (+47) 75 55 01 00 Fax: (+47) 75 55 01 11 E-mail: office@rapphydema.com
Scale (A3) 1:2 *Sheet* 1 / 1				*Drw number* RH317214
	Material (for part)	*Status* Production	*Drawn by / Date (dd/mm/yy)* RHJJ 02.09.2013	*Checked by / Date (dd/mm/yy)* RHDHN 02.09.2013	*Partlist* RH317214

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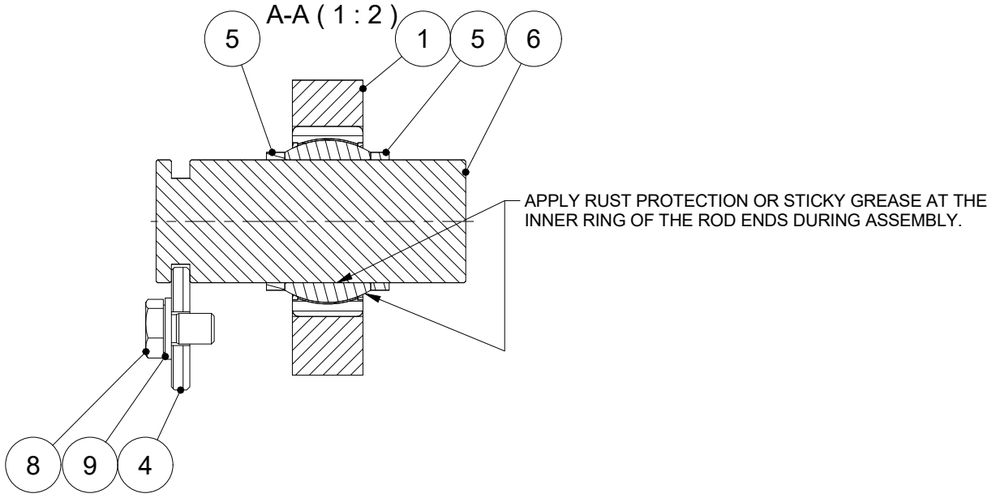
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ISO VIEW (1 : 5)





A-A (1 : 2)



REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
A		Issued for production	1.7.2014	RHDHN
B		Item 10 added and number of Item 7 reduced to 1.	24.11.2014/BSI	RHDHN
B1		Text note added	31.10.2016	RHJJ
C		Hex nuts replaced with M39x3	04.05.2018/MAKSTO	RZBSI

Weight 6 kg

TORQUE ARM
RW2371BS
ASSEMBLY

RAPP HYDEMA
Phone: (+47) 75 55 01 00
Fax: (+47) 75 55 01 11
E-mail: office@rapphydema.com

Unspecified Tolerances According to:

Standard	*Tolerance Class*
NS-ISO 2768-1	*m Medium*
NS-ISO 2768-2	*K*

Scale (A3) 1:2 *Sheet* 1 / 1

Material (for part)

Status Production

Drawn by / Date (dd/mm/yy) STMOM 01.07.2014

Checked by / Date (dd/mm/yy) STMOM 01.07.2014

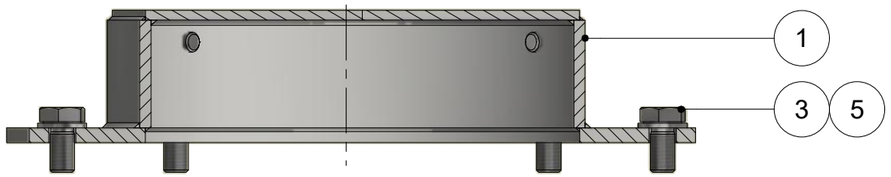
Drw number RH318400

Partlist RH318400

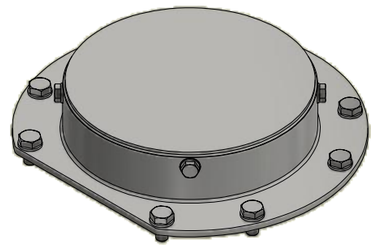
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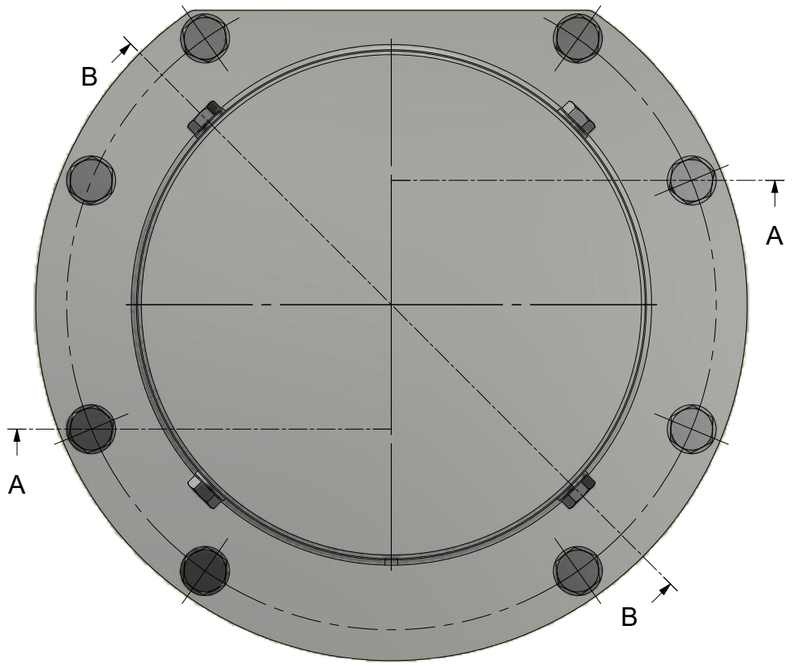
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A-A (1 : 2,5)

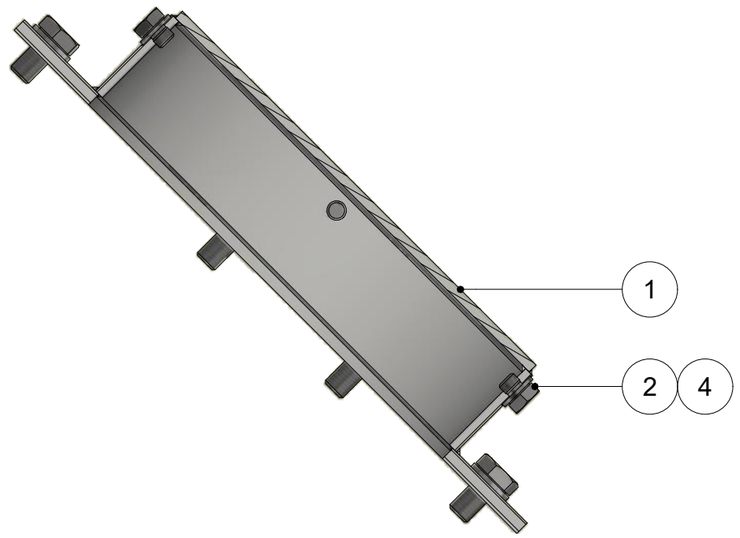


ISO VIEW (1 : 5)





B-B (1 : 2,5)



POLYMER - ACC. DOC. #6482 MACHINED SURFACES AND SURFACE TREATMENT

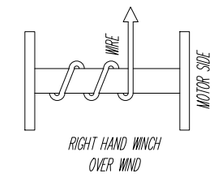
REV	ZONE	DESCRIPTION	DATE	APPROVED
A		Issued for production	07.08.2019.	RZBSI

Weight 3 kg	GEARBOX COVER BPH.25 ASSEMBLY	RAPP MARINE Phone: (+47) 75 55 01 00 E-mail: office@rappmarine.com	
Unspecified Tolerances According to:	*Scale (A3)* 1 : 2,5	*Sheet* 1 / 1	*Drw number* RH328794
Standard NS-ISO 2768-1	*Tolerance Class* m Medium	*Material (for part)*	*Status* Production
NS-ISO 2768-2	K	*Drawn by / Date (dd/mm/yy)* MAKSTO 07.08.2019.	*Checked by / Date (dd/mm/yy)* RZBSI 07.08.2019.
			Partlist RH328794

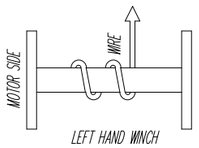
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PIPING/ TUBING ON USA - MOUNTED WINCHES:

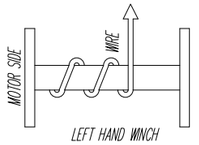
1/2" x .049 (ø 12 x 1.5)
3/4" x .049 (ø 15 x 1.5 / ø 20 x 2)
1" x .072 (ø 25 x 3)
1 1/4" x .095 (ø 30 x 3)
1 1/2"x .134 (ø 30 x 3)
1 1/2" sch 80 (ø 50 x 5)
2" sch 80 (ø 60 x 5)



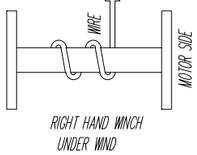
RIGHT HAND WINCH
OVER WIND



LEFT HAND WINCH
UNDER WIND



LEFT HAND WINCH
OVER WIND

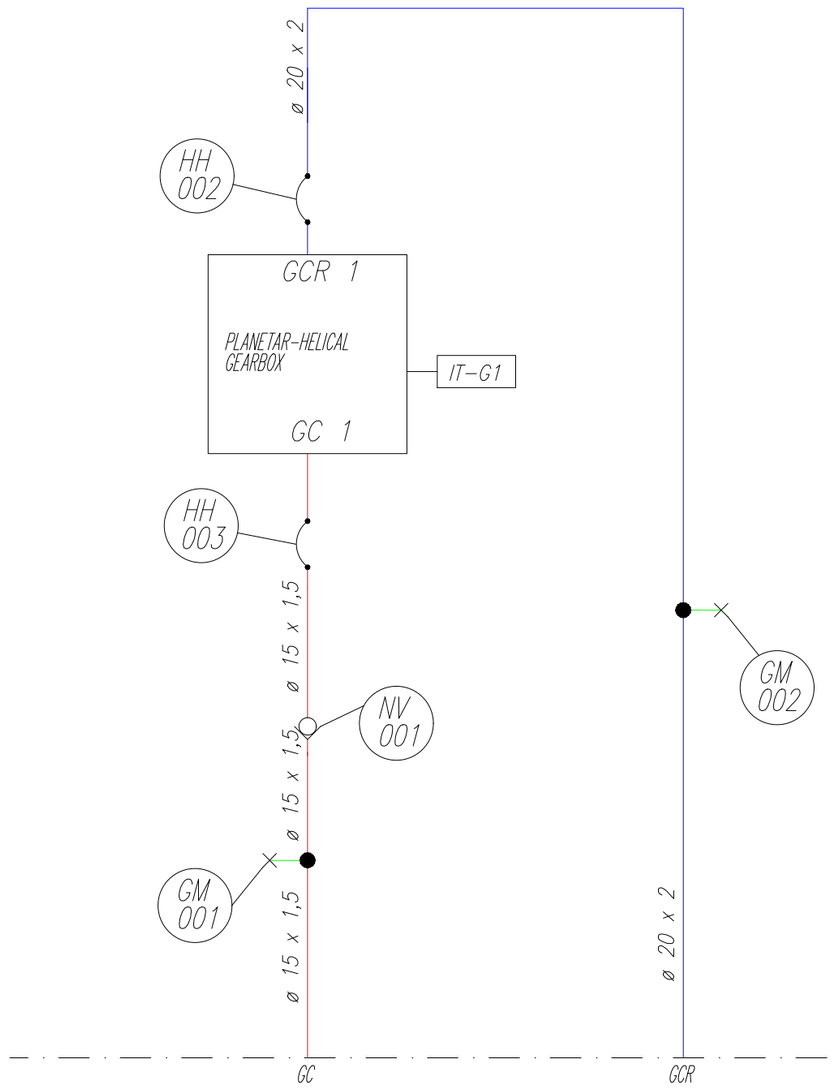


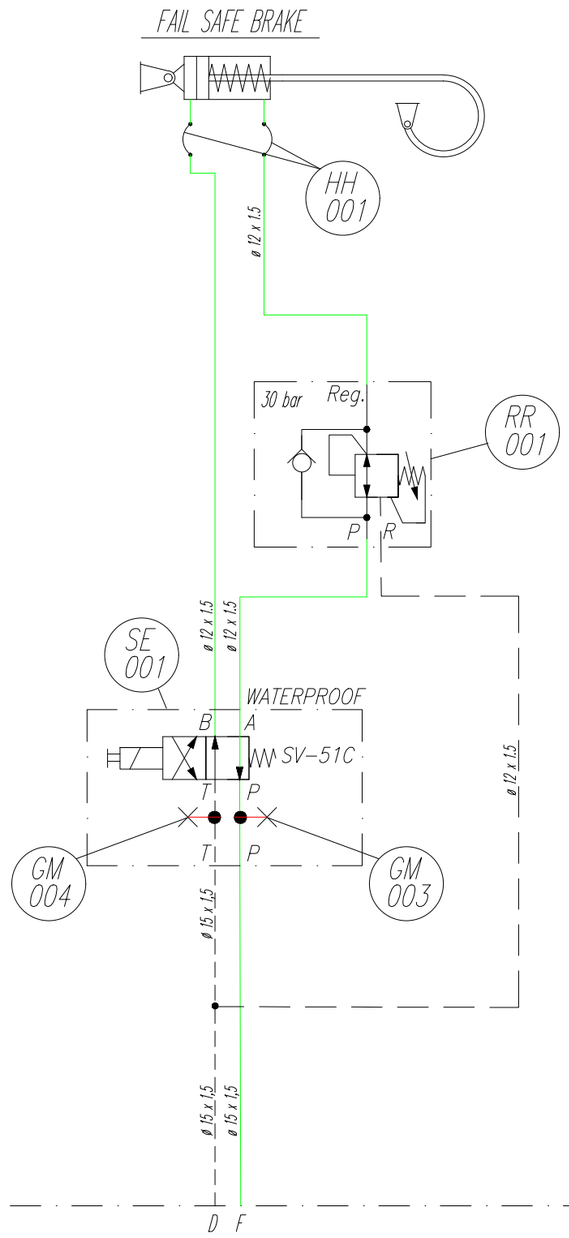
RIGHT HAND WINCH
UNDER WIND

DRAIN
SERVO
RETURN
PRESSURE

Note 1)
Gear cooling inlet to be in the center of the angle gearbox, and gear cooling outlet to be on the top of the angled part.
If plug on the outlet is located down, input part on the gear to be turned in position.

PIPE LENGTHS, FITTINGS AND BENDS ARE THUS TO BE CHOSEN WITH CARE. PLEASE CONSULT SYSTEM DEPARTMENT.





XQ 001 Extra mounting equipment.

Designed by	Modified by	Date	ECO			
H Johansen		21-Feb-22	ECO-2056897			

MACGREGOR

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Name	Weight
HYDRAULIC BRAKE & COOLING SYSTEM,	0 kg
Description	Scale (A3)
Document ID: RH411171	Revision: A

400092475_BOM

Level	Pos	Qty	Unit	Aras ID	Name	Description
1				400092475	Traction Winch	TRACTION WINCH, TRW-4004E-01R1; 15Ton, PCD1238, Cantilever (RHMETRW0404B/01R1)
2	010	1	PCS	RH321453	Frame	WINCH FRAME, TRW-4004, WELDING
2	020	1	PCS	400096386	Traction Drum	DRUM #1, TRW4004 (SS SLEEVE DESIGN); ASSEMBLY
3	010	1	PCS	400096387	Traction Drum	DRUM, TRW4000 (STAINLESS SLEEVE DESIGN); MACHINING
3	020	1	PCS	RH317059	Drive Shaft	DRIVE SHAFT, TRW4003EB, MACHINING; MACHINING, DRIVE SHAFT
3	030	1	PCS	400096389	Traction Drum	PCD1238,PITCH 40, 3,5Ton, 20 mm
3	040	2	PCS	400096388	Plate	FRICTION PLATE, TRW4000 (SS SLEEVE); MACHINING
3	050	8	PCS	RH314001	Bracket	TIGHTENING BRACKET,SPLIT SLV, TRW-20000E; MACHINING, SPLIT SLEEVE, TRW-20000E
3	060	1	PCS	RH314011	Key	KEY, 36x20x360
3	070	20	PCS	FA0912U24070	Screw	SOCKET HEAD SC 12.9 ZNFC, DIN 912 M24x70 (FA0912U24070)
3	080	4	PCS	FA0912G16100	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M16x100 (FA0912G16100)
3	090	148	PCS	400092390	Screw	HEX.HEAD SCREW 10.9, HDG, DIN933 M16x40; FULLY THREADED (FA0933W16040)
3	100	4	PCS	FA0934G16	Nut	HEXAGON NUT, A4-80, DIN 934, M16 (FA0934G16)
3	110	20	PCS	FA6916H24	Washer	HARDENED WASHER, VZN, DIN 6916 M24; 300HV / FOR 10.9 BOLT (FA6916H24)
3	120	148	PCS	FA6916H16	Washer	HARDENED WASHER, VZN, DIN 6916 M16; 300HV / FOR 10.9 BOLT (FA6916H16)
2	030	1	PCS	400096390	Traction Drum	DRUM #2, TRW4004 (SS SLEEVE DESIGN); ASSEMBLY
3	010	1	PCS	400096387	Traction Drum	DRUM, TRW4000 (STAINLESS SLEEVE DESIGN); MACHINING
3	020	1	PCS	RH317059	Drive Shaft	DRIVE SHAFT, TRW4003EB, MACHINING; MACHINING, DRIVE SHAFT
3	030	1	PCS	400096391	Traction Drum	PCD1238,PITCH 40, 3,5Ton, 20 mm
3	040	2	PCS	400096388	Plate	FRICTION PLATE, TRW4000 (SS SLEEVE); MACHINING
3	050	8	PCS	RH314001	Bracket	TIGHTENING BRACKET,SPLIT SLV, TRW-20000E; MACHINING, SPLIT SLEEVE, TRW-20000E
3	060	1	PCS	RH314011	Key	KEY, 36x20x360
3	070	20	PCS	FA0912U24070	Screw	SOCKET HEAD SC 12.9 ZNFC, DIN 912 M24x70 (FA0912U24070)
3	080	4	PCS	FA0912G16100	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M16x100 (FA0912G16100)
3	090	148	PCS	400092390	Screw	HEX.HEAD SCREW 10.9, HDG, DIN933 M16x40; FULLY THREADED (FA0933W16040)
3	100	4	PCS	FA0934G16	Nut	HEXAGON NUT, A4-80, DIN 934, M16 (FA0934G16)
3	110	20	PCS	FA6916H24	Washer	HARDENED WASHER, VZN, DIN 6916 M24; 300HV / FOR 10.9 BOLT (FA6916H24)
3	120	148	PCS	FA6916H16	Washer	HARDENED WASHER, VZN, DIN 6916 M16; 300HV / FOR 10.9 BOLT (FA6916H16)
2	040	2	PCS	400095411	Bearing Housing	BEARING HOUSING, BLIND, TRW-4004; ASSEMBLY
3	010	1	PCS	400095405	Bearing Housing	BEARING HOUSING, TRW-4004; WELDING & MACHINING
3	020	1	PCS	400095407	Cover	BEARING COVER, OPEN, D330; MACHINING
3	030	1	PCS	400095408	Cover	BEARING COVER, D330; MACHINING
3	040	1	PCS	BESRS1017	Spherical Roller Bearing	SPHERICAL ROLLER BEARING, 23036-E1-K; d180(taper 1:12)/D280x74 (BESRS1017)
3	050	1	PCS	BEASS023	Spherical Bearing Sleeve	ADAPTER SLEEVE, H3036-HG; d160x109/Nut KML36 (BEASS023)
3	060	1	PCS	400091226	Rotary Shaft Lip Seal	SEAL, 170x200x15, SS ring (SESRB)
3	070	1	PCS	FA0580G016	Eyebolt	LIFTING EYE BOLT, DIN 580, M16, A4; EYE SIZE Ø35 (FA0580G016)
3	080	16	PCS	FA0933G12030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x30; FULLY THREADED (FA0933G12030)
3	090	16	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
3	100	1	PCS	GRMFX004	Grease Nipple	GREASE NIPPLE, STRAIGHT, M10x1.0, A4 (GRMFX004)
3	110	1	PCS	COGLX041	Sealing Compound	WURTH MS 40, POLYMER B SEALANT (COGLX041)
2	050	2	PCS	400095410	Bearing Housing	BEARING HOUSING, TRW-4004; ASSEMBLY
3	010	1	PCS	400095405	Bearing Housing	BEARING HOUSING, TRW-4004; WELDING & MACHINING
3	020	1	PCS	400095406	Cover	BEARING COVER, OPEN, D330; MACHINING
3	030	1	PCS	400095407	Cover	BEARING COVER, OPEN, D330; MACHINING
3	040	2	PCS	400095409	Distance Ring	SPACER, (D280xT13/L6); MACHINING
3	050	1	PCS	BESRS1017	Spherical Roller Bearing	SPHERICAL ROLLER BEARING, 23036-E1-K; d180(taper 1:12)/D280x74 (BESRS1017)
3	060	1	PCS	BEASS023	Spherical Bearing Sleeve	ADAPTER SLEEVE, H3036-HG; d160x109/Nut KML36 (BEASS023)
3	070	2	PCS	400091226	Rotary Shaft Lip Seal	SEAL, 170x200x15, SS ring (SESRB)
3	080	1	PCS	FA0580G016	Eyebolt	LIFTING EYE BOLT, DIN 580, M16, A4; EYE SIZE Ø35 (FA0580G016)
3	090	16	PCS	FA0933G12030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x30; FULLY THREADED (FA0933G12030)
3	100	16	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
3	110	1	PCS	GRMFX004	Grease Nipple	GREASE NIPPLE, STRAIGHT, M10x1.0, A4 (GRMFX004)
3	120	1	PCS	COGLX041	Sealing Compound	WURTH MS 40, POLYMER B SEALANT (COGLX041)
2	060	1	PCS	GETBI039-I225B/00	Gearbox	POSIPLAN, BPH328 i=100,64 IEC225 BR
2	070	2	PCS	EMOAB225B35-EI/00	Electric Motor	EL MOTOR ABB M3BP225SMD4 B35, IP56 ENC ISOL; 68kW
2	080	2	PCS	RH317069	Support Plate	MOTOR/GEARBOX SUPPORT PLATE TRW-4003E; MACHINING, MOTOR/GEARBOX SUPPORT BRACKET
2	090	2	PCS	RH317083	Torque Arm	TORQUE ARM, TRW-4003E, ASSEMBLY
3	010	1	PCS	RH317085	Bolt	TENSION BOLT, TORK ARM, PREMACHINING
3	020	2	PCS	RH317084	Shear Pin	SHEAR PIN, D40x101, MACHINING; GROOVE D28x6
3	030	1	PCS	BESPS100L	Radial Spherical Plain Bearing	ROD END, GAL-40-UK-2RS; d40x28 - M39x3 (Left hand thread) (BESPS100L)
3	040	1	PCS	BESPS100	Radial Spherical Plain Bearing	ROD END, GAR-40-UK-2RS; d40x28 - M39x3 (BESPS100)

400092475_BOM

Level	Pos	Qty	Unit	Aras ID	Name	Description
3	050	4	PCS	RH31708301	Distance Ring	SPACER, D45/d40x6, MACHINING
3	060	2	PCS	RH408161	Locking Plate	LOCK DISC, D40/d11x6, TWS-
3	070	1	PCS	FA0934E393	Nut	HEX.NUT, GRADE 8, ELZN, DIN 934, M39x3 (FA0934E393)
3	080	2	PCS	FA0933G10016	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x16; FULLY THREADED (FA0933G10016)
3	090	2	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
3	100	1	PCS	FA0934E393L	Nut	HEX.NUT, Gr.8, ELZN, DIN 934, M39x3 LEFT; LEFT HAND THREAD (FA0934E393L)
2	100	2	PCS	RH329285	TENSION ROLLER DEVICE, TRW-4004,ASSEMBLY	TENSION ROLLER DEVICE, TRW-4004,ASSEMBLY
3	010	1	PCS	RH329282	GUIDING BLOCK,(T48/160x100),MACH	GUIDING BLOCK,(T48/160x100),MACH
3	020	4	PCS	RH328077	Bearing Plain	LINING, (D30 X d20 / L25), MACHINING
3	030	1	PCS	RH328629	Nut	SPRING LOADING NUT,ROUND M35/L77,MACHINI
3	040	1	PCS	RH328631	Nut	CYLINDER ROD NUT,ROUND D20/L13,MACHINING
3	050	1	PCS	RH328632	CYLINDER ROD PLATE,120x45/T12,MACHINING	CYLINDER ROD PLATE,120x45/T12,MACHINING
3	060	1	PCS	RH317923	Wheel	TENSION WHEEL, TRW-4003E, PREMACHINING; MACHINING, PCD99, D23,4, TENSION WHEEL
3	070	1	PCS	RH328627	Pin	PIN, ROUND D15 / L100, MACHINING
3	080	2	PCS	RH328628	Distance Ring	DISTANCE RING,PIPE(D20xd15/L26),MACHININ
3	090	2	PCS	RH328630	Guide Shaft	GUIDE SHAFT, ROUND D20 / L188, MACHINING
3	100	1	PCS	RH329284	Bracket	BRACKET, TENSION ROLLER DEVICE, W+M
3	110	1	PCS	PCCDS054	Gas Cylinder	GAS CYL.DICT. DV4 10-23-40-0 SS (PCCDS054)
3	120	1	PCS	SEORA153	O-Ring	O-RING, Ø22,50 x 3,00 (RM-0225-30), (SEORA153)
3	130	1	PCS	FA0916G06008	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M6x8; CUP POINT (FA0916G06008)
3	140	2	PCS	BESPS210	Radial Spherical Plain Bearing	ROD END, GIR-15-UK-2RS (BESPS210)
3	150	1	PCS	BEABS0003	Angular Contact Ball Bearing	ANGULAR CONTACT BALL B, 3202-BD-2HRS-TVH; d15/D35x15,9 (BEABS0003)
3	160	2	PCS	FA0471F0150	Circlip	CIRCLIP RING EXTERNAL, A2 DIN 471 A15; STAINLESS (material x40Cr13) (FA0471F0150)
3	170	2	PCS	FA0471F0200	Circlip	CIRCLIP RING EXTERNAL, A2 DIN 471 A20; STAINLESS (material x40Cr13) (FA0471F0200)
3	180	1	PCS	FA0472F0350	Circlip	CIRCLIP RING INTERNAL, A2 DIN 472 I35; STAINLESS (material x40Cr13) (FA0472F0350)
3	190	4	PCS	FA0931G12070	Screw	HEX.HEAD SCREW A4-80, DIN 931 M12x70; THREAD LENGTH:30mm (FA0931G12070)
3	200	4	PCS	FA0933G12035	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x35; FULLY THREADED (FA0933G12035)
3	210	8	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
2	110	3	PCS	RH321167	Protection	CABLE PROTECTION, BAR (L635), ASSEMBLY
3	020	2	PCS	RH32116702	Bearing Plain	HUB (Ø54 / ø30 x 30), MACHINING
3	030	1	PCS	RH32116703	Protection	PROTECTION BAR, ROUND BAR (Ø30x603),MAC
3	040	2	PCS	RH321126	Bracket	BRACKET, CABLE PROTECTION, WELDING
3	050	2	PCS	FA0933G12040	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x40; FULLY THREADED (FA0933G12040)
3	060	2	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
3	070	2	PCS	FA0985G12	Nut	NUT NYLOCK HEXAGON A4-80, DIN 985 M12 (FA0985G12)
3	080	2	PCS	FA0916G10012	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M10x12; CUP POINT (FA0916G10012)
2	120	1	PCS	RH321167	Protection	CABLE PROTECTION, BAR (L635), ASSEMBLY
3	020	2	PCS	RH32116702	Bearing Plain	HUB (Ø54 / ø30 x 30), MACHINING
3	030	1	PCS	RH32116703	Protection	PROTECTION BAR, ROUND BAR (Ø30x603),MAC
3	040	2	PCS	RH321126	Bracket	BRACKET, CABLE PROTECTION, WELDING
3	050	2	PCS	FA0933G12040	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x40; FULLY THREADED (FA0933G12040)
3	060	2	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
3	070	2	PCS	FA0985G12	Nut	NUT NYLOCK HEXAGON A4-80, DIN 985 M12 (FA0985G12)
3	080	2	PCS	FA0916G10012	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M10x12; CUP POINT (FA0916G10012)
2	130	2	PCS	400203203	Cover	BPH.28 GEARBOX COVER - ASSEMBLY
3	001	1	PCS	400203202	Cover	BPH.28 GEARBOX COVER - WELDING
3	002	4	PCS	FA0933G10020	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x20; FULLY THREADED (FA0933G10020)
3	003	4	PCS	FA0933G08008	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x8; FULLY THREADED (FA0933G08008)
3	004	4	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
3	005	4	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)
3	006	1	PCS	COGLX041	Sealing Compound	WURTH MS 40, POLYMER B SEALANT (COGLX041)
2	140	2	PCS	400096431	Cover	GEARBOX COVER_OPEN_BPH.28, D300xD170/T35; MACHINING
2	150	1	PCS	RH323103	Locking Plate	LOCKING DISC, BPH428 - TRW400X,MACHINING
2	160	4	PCS	RH314458	Shear Pin	SHEAR PIN, D70/D45/M36x123, MACHINING
2	170	8	PCS	RH318253	Locking Bolt	LOCKING BOLT, D50/22, MACHINING; MACHINING, Ø80(10), GUIDING Ø50x54
2	180	4	PCS	RH318376	Bracket	GROUND BRACKET, 2xD50 / T=25, MACHINING; MACHINING, 320x120x25, 2xØ50
2	190	8	PCS	RH321988	Washer	WASHER PLATE, T6 x 90x90, MACHINING
2	200	4	PCS	RH317081	Shim	SHIM PLATE, 560x160x10, MACHINING
2	210	2	PCS	RH314010	Locking Plate	LOCKING WASHER, D170/D140/d31x23; MACHINING
2	220	4	PCS	RH317082	CHOCKFAST, T20, MOUNTING DURING ASSEMBLY	CHOCKFAST, T20, MOUNTING DURING ASSEMBLY; CHOCKFAST LAYER, T20, MOUNTING DURING ASSEMBLY
2	230	6	PCS	RH318188	Wear Ring	WEAR RING, D160/d170x35, MACHINING
2	240	2	PCS	400096432	Wear Ring	WEAR RING, D160xD140x20; MACHINING

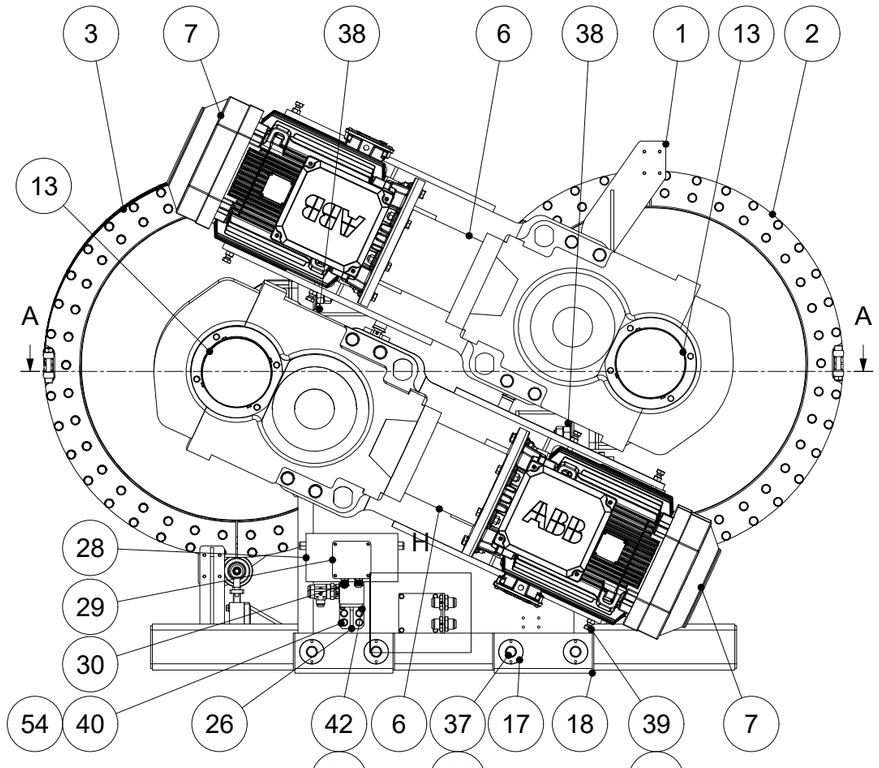
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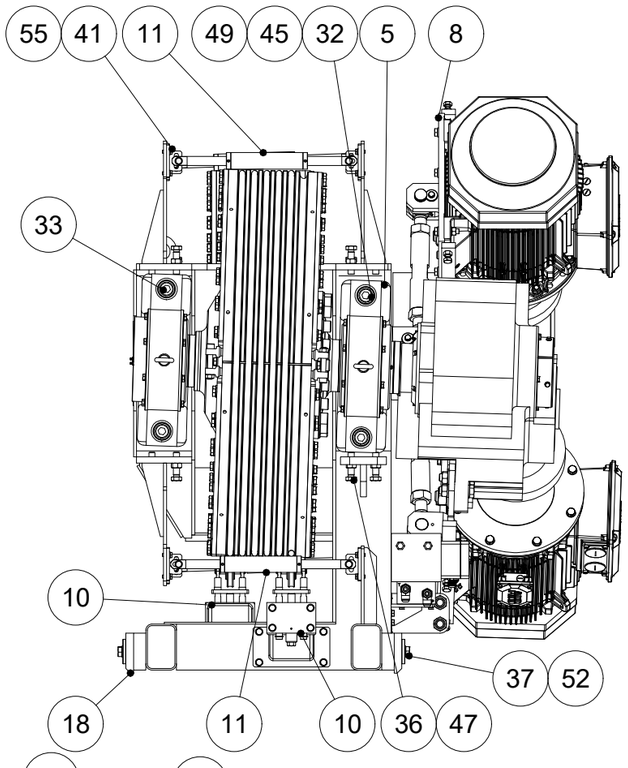
Level	Pos	Qty	Unit	Aras ID	Name	Description
2	250	3	PCS	RH318189	Distance Ring	DISTANCE RING, D160/d170x20, MACHINING
2	260	1	PCS	RH318949	Bracket	BRACKET FOR RH203377PL & RH203378PL; WELDING & MACHINING, Ref. RH203377PL & RH203378PL
2	270	1	PCS	RH318968	Bracket	BRACKET FOR BULKHEAD UNION; BENDING, FOR BULKHEAD UNION, 2XØ34 / 90deg
1				RHHEBRGC-M1	Hydraulic Winch Assembly	HYDR. BRAKE CTRL. AND GEAR COOLING; Traction winch (RHHEBRGC-M1)
2	010	1	PCS	RHHGMR20TRM	Hydraulic Fittings	TEST POINT (STAINLESS STEEL); syrefast mutter og støttering. (RHHGMR20TRM)
3	010	1	PCS	HGMAS002	Hydraulic Pressure Test Nipple	TEST POINT 2703-01-18-10(312-01-04R) SS; TESTNIPPEL (HGMAS002)
3	020	1	PCS	FTTFA003	Hydraulic Fittings	TRIP.LOK 12TT4X-S 18/20 1/4" TEST P. F.; 12TT4XS (FTTFA003)
3	030	1	PCS	FTUTA017	Hydraulic Fittings	TRIP.LOK R6X-S 18/20 SWIVEL NUT RUN TEE; 12R6MXS (FTUTA017)
3	040	1	PCS	FTNUF005	Hydraulic Fittings	TRIP.LOK BTX-SS 18/20 NUT; 12 BTX-SS (FTNUF005)
3	050	1	PCS	FTMSF008	Hydraulic Fittings	TRIP.LOK TX-SS 20 SLEEVE METRIC; TXSS20 (FTMSF008)
2	020	1	PCS	RHHGMR25TRS	Hydraulic Fittings	TEST POINT,SS. FOR PIPE Ø25 (PH) (RHHGMR25TRS)
3	010	1	PCS	HGMAS002	Hydraulic Pressure Test Nipple	TEST POINT 2703-01-18-10(312-01-04R) SS; TESTNIPPEL (HGMAS002)
3	020	1	PCS	FTTFF003	Hydraulic Fittings	TRIP.LOK 12TT4X-SS 18/20 1/4" TEST P. F.; 12TT4MXSS (FTTFF003)
3	030	1	PCS	FTUTF019	Hydraulic Fittings	TRIP.LOK R6X-SS 25 SWIVEL NUT RUN TEE; 16 R6X-SS (FTUTF019)
3	040	2	PCS	FTNUF006	Hydraulic Fittings	TRIP.LOK BTX-SS 25 NUT; 16 BTX-SS (FTNUF006)
3	050	1	PCS	FTMSF009	Hydraulic Fittings	TRIP.LOK TX-SS 25 SLEEVE METRIC; TXSS25 (FTMSF009)
3	060	1	PCS	FTREF019	Hydraulic Fittings	TRIP.LOK TRTX-SS 25-18/20 REDUCER; 16-12TRMTXSS (FTREF019)
2	030	1	PCS	RHHGMR12TRS	Hydraulic Fittings	TESTPOINT FOR TUBE Ø12 (STAINLESS PH); M/T-FITTING(M/R-SVIVEL) FOR MONT.PÅ RØR. (RHHGMR12TRS)
3	010	1	PCS	HGMAS002	Hydraulic Pressure Test Nipple	TEST POINT 2703-01-18-10(312-01-04R) SS; TESTNIPPEL (HGMAS002)
3	020	1	PCS	FTTFF001	Hydraulic Fittings	TRIP.LOK 8TT4X-SS 12 1/4" TEST P. F.; 8TT4MXSS (FTTFF001)
3	030	1	PCS	FTUTF015	Hydraulic Fittings	TRIP.LOK R6X-SS 12 SWIVEL NUT RUN TEE; 8 R6X-SS (FTUTF015)
3	040	1	PCS	FTNUF003	Hydraulic Fittings	TRIP.LOK BTX-SS 12 NUT; 8 BTX-SS (FTNUF003)
3	050	1	PCS	FTMSF003	Hydraulic Fittings	TRIP.LOK TX-SS 12 SLEEVE METRIC; TXSS12 (FTMSF003)
2	040	1	PCS	HGMAS002	Hydraulic Pressure Test Nipple	TEST POINT 2703-01-18-10(312-01-04R) SS; TESTNIPPEL (HGMAS002)
2	050	1	PCS	RHHGMR12TRS	Hydraulic Fittings	TESTPOINT FOR TUBE Ø12 (STAINLESS PH); M/T-FITTING(M/R-SVIVEL) FOR MONT.PÅ RØR. (RHHGMR12TRS)
3	010	1	PCS	HGMAS002	Hydraulic Pressure Test Nipple	TEST POINT 2703-01-18-10(312-01-04R) SS; TESTNIPPEL (HGMAS002)
3	020	1	PCS	FTTFF001	Hydraulic Fittings	TRIP.LOK 8TT4X-SS 12 1/4" TEST P. F.; 8TT4MXSS (FTTFF001)
3	030	1	PCS	FTUTF015	Hydraulic Fittings	TRIP.LOK R6X-SS 12 SWIVEL NUT RUN TEE; 8 R6X-SS (FTUTF015)
3	040	1	PCS	FTNUF003	Hydraulic Fittings	TRIP.LOK BTX-SS 12 NUT; 8 BTX-SS (FTNUF003)
3	050	1	PCS	FTMSF003	Hydraulic Fittings	TRIP.LOK TX-SS 12 SLEEVE METRIC; TXSS12 (FTMSF003)
2	080	1	PCS	RHHHH123801S	Hydraulic Hose	BRAKE HOSE 3/8" 2 EA. INCL. SS FITT. PH; 2xslanger,2xF40,2xB+T (RHHHH123801S)
3	010	2	PCS	HH2DK003	Hydraulic Hose	HP-HOSE 202206,S421,S425,L=0,5M,276BAR; 3/8" Bremseslange med syrefaste koblinger (HH2DK003)
3	020	2	PCS	FTCBF008	Hydraulic Fittings	TRIP.LOK F42X-SS 12-3/8" BSPP-CONNECTOR; 8F42EDMXSS (FTCBF008)
3	030	2	PCS	FTNUF003	Hydraulic Fittings	TRIP.LOK BTX-SS 12 NUT; 8 BTX-SS (FTNUF003)
3	040	2	PCS	FTMSF003	Hydraulic Fittings	TRIP.LOK TX-SS 12 SLEEVE METRIC; TXSS12 (FTMSF003)
2	090	2	PCS	FTSMF002	Hydraulic Fittings	TRIP.LOK F68x-SS 8 -M12x1.5 M.JIC.SWL (FTSMF002)
2	100	2	PCS	FTREF003	Hydraulic Fittings	TRIP.LOK TRTX-SS 12-8 REDUCER; 8-5TRMTXSS (FTREF003)
2	110	2	PCS	FTCBF016	Hydraulic Fittings	TRIP.LOK F42X-SS 18/20-3/4" BSPP-CONN.; 12F42EDMXSS (FTCBF016)
2	120	2	PCS	FTUEF013	Hydraulic Fittings	TRIP.LOK C6X-SS 18/20 SWIVEL NUT ELBOW; 12C6MXSS (FTUEF013)
2	130	2	PCS	HH2CS0027	Hydraulic Hose	LOW PRESS. HOSE 5,8" (ø24MM) MAX 100 BAR; ø20 - Stain. S. Couplings (HH2CS0027)
2	140	2	PCS	FTUEF013	Hydraulic Fittings	TRIP.LOK C6X-SS 18/20 SWIVEL NUT ELBOW; 12C6MXSS (FTUEF013)
2	150	2	PCS	FTCBF016	Hydraulic Fittings	TRIP.LOK F42X-SS 18/20-3/4" BSPP-CONN.; 12F42EDMXSS (FTCBF016)
2	160	2	PCS	HH2CS0027	Hydraulic Hose	LOW PRESS. HOSE 5,8" (ø24MM) MAX 100 BAR; ø20 - Stain. S. Couplings (HH2CS0027)
2	170	1	PCS	RH507944S	Check Valve	CHECK VALVE VU 38F-38F 0,35 BAR Ø12PH SS; Syrefast fittings.
3	010	1	PCS	400193497	Check Valve	SS Check valve, 3/8", 0,35bar, VU38F38F (FASTER) Stainless steel (available on request)
3	020	2	PCS	FTMSF003	Hydraulic Fittings	TRIP.LOK TX-SS 12 SLEEVE METRIC; TXSS12 (FTMSF003)
3	030	2	PCS	FTNUF003	Hydraulic Fittings	TRIP.LOK BTX-SS 12 NUT; 8 BTX-SS (FTNUF003)
3	040	2	PCS	FTCBF008	Hydraulic Fittings	TRIP.LOK F42X-SS 12-3/8" BSPP-CONNECTOR; 8F42EDMXSS (FTCBF008)
2	180	2	PCS	RH508541S	Check Valve	CHECK VALVE VU 1F-1F 0,35 BAR Ø20 SS PH; 58TILBVU1F
3	010	1	PCS	400193501	Check Valve	SS Check valve, 1", 0,35bar, VU1F1F (FASTER) Stainless steel (available on request)
3	020	2	PCS	FTMSF008	Hydraulic Fittings	TRIP.LOK TX-SS 20 SLEEVE METRIC; TXSS20 (FTMSF008)
3	030	2	PCS	FTNUF005	Hydraulic Fittings	TRIP.LOK BTX-SS 18/20 NUT; 12 BTX-SS (FTNUF005)
3	040	2	PCS	FTCBF017	Hydraulic Fittings	TRIP.LOK F42X-SS 18/20-1"BSPP-CONNECTOR; 12-16F42EDMXSS (FTCBF017)
2	190	1	PCS	RHHSE1-600485S	Solenoid Valve Assembly	SINGLE BOX, 4D01, 4xø12PH SS, INTERNAL; Syrefast fittings etc. (RHHSE1-600485S)
3	010	1	PCS	RHHBOX1MDPEM	Enclosure	SINGEL VALVE BOX IN MDPE ASSEMBLED; m/NG6 blindplate. (RHHBOX1MDPEM)
3	020	1	PCS	HSEDE030	Coil	DIRECTIONAL VALVE 4D01-3151-0101-C1-G0Q (HSEDE030)
3	030	4	PCS	FTMSF003	Hydraulic Fittings	TRIP.LOK TX-SS 12 SLEEVE METRIC; TXSS12 (FTMSF003)
3	040	4	PCS	FTNUF003	Hydraulic Fittings	TRIP.LOK BTX-SS 12 NUT; 8 BTX-SS (FTNUF003)
3	050	2	PCS	FTCBF008	Hydraulic Fittings	TRIP.LOK F42X-SS 12-3/8" BSPP-CONNECTOR; 8F42EDMXSS (FTCBF008)
3	060	2	PCS	FTCBF009	Hydraulic Fittings	TRIP.LOK F42X-SS 12-1/2" BSPP-CONNECTOR; 8-8F42EDMXSS (FTCBF009)
3	070	2	PCS	FCPPF015	Plug	HEXAGON HEAD PLUG, DIN 910, A4, G3/8"; DIN 910 (FCPPF015)
3	080	6	PCS	FCPPF010	Plug	HEXAGON HEAD PLUG, DIN 910, A4, G1/4"; DIN 910 (FCPPF010)

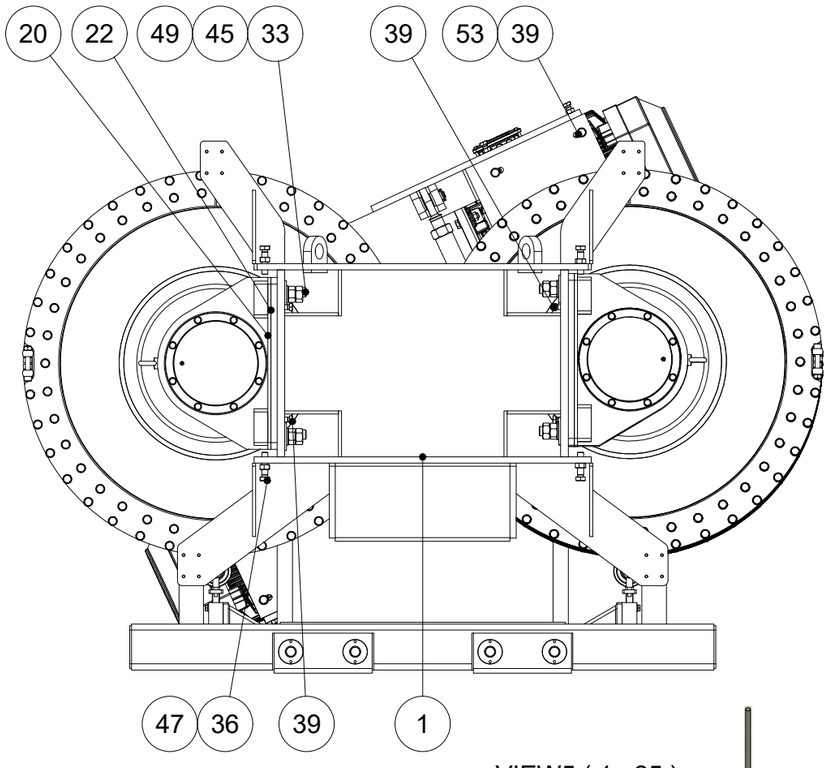
Level	Pos	Qty	Unit	Aras ID	Name	Description	
3	090	4	PCS	FA0912D05030	Screw	SOCKET HEAD SCREW 12.9 DIN 912 M5x30; THREAD LENGTH: 22mm (FA0912D05030)	
3	100	2	PCS	SEBOB003	Bonded Seal	BONDED SEAL, PP 45-C, 3/8" R/BSP, A4, 24x24x4 (SEBOB003)	
3	110	6	PCS	SEBOB002	Bonded Seal	BONDED SEAL, PP 45-B, 1/4" R/BSP, A4, 21x21x4 (SEBOB002)	
3	120	2	PCS	FTUBF006	Hydraulic Fittings	TRIP.LOK WTX-WLN-SS 25 BULKHEAD UNION; 16WMTXWLNMSS (FTUBF006)	
2	200	0.003	M	TPPIF020	Pipe Clamp	HYDR. PIPE, Ø25X2.5 SEAML. AISI-316; Ø25X2.5 SEAMLESS ACID PROOF AISI-316 (TPPIF020)	
2	210	0.006	M	TPPIF014	Pipe Clamp	HYDR. PIPE, Ø12X1.5 SEAML.AISI-316; Ø12X1.5 SEAMLESS ACID PROOF AISI-316 (TPPIF014)	
2	220	6	PCS	TPCLFA1K012	Pipe Clamp	TUBE CLAMP COMPL. 12MM.AISI 316; TUBE CLAMP COMPL. SER.A.GR.1 12mm/AISI 316 (TPCLFA1K012)	
2	230	3	PCS	TPCLFA3K025	Pipe Clamp	TUBE CLAMP COMPL. 25mm.AISI 316; TUBE CLAMP COMPL. SER.A.GR.3 25mm/AISI 316 (TPCLFA3K025)	
2	240	4	PCS	FTUTF003	Hydraulic Fittings	TRIP.LOK JTX-SS 12 UNION TEE; 8JMTXSS (FTUTF003)	
2	250	3	PCS	FTMSF003	Hydraulic Fittings	TRIP.LOK TX-SS 12 SLEEVE METRIC; TXSS12 (FTMSF003)	
2	260	3	PCS	FTNUF003	Hydraulic Fittings	TRIP.LOK BTX-SS 12 NUT; 8 BTX-SS (FTNUF003)	
2	270	1	PCS	FTUTF024	Hydraulic Fittings	TRIP.LOK S6X-SS 12 SWIVEL NUT BRANCH TEE; 8 S6X-SS (FTUTF024)	
2	280	2	PCS	FTUNF012	Hydraulic Fittings	TRIP.LOK HX6-SS 12-12 SWIVEL NUT UNION (FTUNF012)	
2	290	2	PCS	FTUTF017	Hydraulic Fittings	TRIP.LOK R6X-SS 18/20 SWIVEL NUT RUN TEE; 12 R6X-SS (FTUTF017)	
2	300	1	PCS	FTUTF005	Hydraulic Fittings	TRIP.LOK JTX-SS 18/20 UNION TEE; 12JMTXSS (FTUTF005)	
2	310	2	PCS	FTUNF010	Hydraulic Fittings	TRIP.LOK 12HMX6SS SWIVEL NUT UNIO (FTUNF010)	
2	320	1	PCS	FTUBF005	Hydraulic Fittings	TRIP.LOK WTX-WLN-SS 18/20 BULKHEAD UNION (FTUBF005)	
2	330	2	PCS	FTUTF005	Hydraulic Fittings	TRIP.LOK JTX-SS 18/20 UNION TEE; 12JMTXSS (FTUTF005)	
2	340	14	PCS	FTMSF008	Hydraulic Fittings	TRIP.LOK TX-SS 20 SLEEVE METRIC; TXSS20 (FTMSF008)	
2	350	14	PCS	FTNUF005	Hydraulic Fittings	TRIP.LOK BTX-SS 18/20 NUT; 12 BTX-SS (FTNUF005)	
2	360	4	PCS	FTREF010	Hydraulic Fittings	TRIP.LOK TRTX-SS 18/20-12 REDUCER; 12-8TRMTXSS (FTREF010)	
2	370	2	PCS	FTREF019	Hydraulic Fittings	TRIP.LOK TRTX-SS 25-18/20 REDUCER; 16-12TRMTXSS (FTREF019)	
2	380	1	PCS	FTUTF006	Hydraulic Fittings	TRIP.LOK JTX-SS 25 UNION TEE; 16JMTXSS (FTUTF006)	
2	390	5	PCS	FTNUF006	Hydraulic Fittings	TRIP.LOK BTX-SS 25 NUT; 16 BTX-SS (FTNUF006)	
2	400	5	PCS	FTMSF009	Hydraulic Fittings	TRIP.LOK TX-SS 25 SLEEVE METRIC; TXSS25 (FTMSF009)	
2	410	3	PCS	FTUTF007	Hydraulic Fittings	TRIP.LOK JTX-SS 30/32 UNION TEE; 20JMTXSS (FTUTF007)	
2	420	3	PCS	FTNUF007	Hydraulic Fittings	TRIP.LOK BTX-SS 30/32 NUT; 20 BTX-SS (FTNUF007)	
2	430	3	PCS	FTMSF010	Hydraulic Fittings	TRIP.LOK TX-SS 30 SLEEVE METRIC; TXSS30 (FTMSF010)	
2	440	3	PCS	FTREF024	Hydraulic Fittings	TRIP.LOK TRTX-SS 30/32-18/20 REDUCER; 20-12TRMTXSS (FTREF024)	
2	300	2	PCS	EACPG220	Cable Gland	M20 X1,5MM FOR CABLE SIZE 6-12MM; Nipple for el.motor (EACPG220)	
2	310	2	PCS	SESRB080	Rotary Shaft Lip Seal	SEAL, 160x190x15, W/STAINLESS SPRING, (SESRB080)	
2	320	4	PCS	FA0912U30200	Screw	SOCKET HEAD SC 12.9 ZNFC DIN 912 M30x200 (FA0912U30200)	
2	330	4	PCS	FA0912U30180	Screw	SOCKET HEAD SC 12.9 ZNFC DIN 912 M30x180 (FA0912U30180)	
2	340	2	PCS	FA0931G30110	Screw	HEX.HEAD SCREW A4-80, DIN 931 M30x110; THREAD LENGTH:66mm (FA0931G30110)	
2	350	8	PCS	FA0933G24100	Screw	HEX.HEAD SCREW A4-80, DIN 933 M24x100; FULLY THREADED (FA0933G24100)	
2	360	16	PCS	FA0933G20080	Screw	HEX.HEAD SCREW A4-80, DIN 933 M20x80; FULLY THREADED (FA0933G20080)	
2	370	8	PCS	FA0933G20075	Screw	HEX.HEAD SCREW A4-80, DIN 933 M20x75; FULLY THREADED (FA0933G20075)	
2	380	8	PCS	FA0933G16090	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x90; FULLY THREADED (FA0933G16090)	
2	390	40	PCS	FA0933G16070	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x70; FULLY THREADED (FA0933G16070)	
2	400	4	PCS	FA0933G12025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x25; FULLY THREADED (FA0933G12025)	
2	410	32	PCS	FA0933G10025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x25; FULLY THREADED (FA0933G10025)	
2	420	4	PCS	FA0933G08025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x25; FULLY THREADED (FA0933G08025)	
2	430	14	PCS	FA0933G08020	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x20; FULLY THREADED (FA0933G08020)	
2	440	4	PCS	FA0934G36	Nut	HEXAGON NUT, A4-80, DIN 934, M36 (FA0934G36)	
2	450	16	PCS	FA0934U30	Nut	HEX.NUT, GRADE 12, Zn.F.C, DIN 934, M30; For 12.9 bolts (FA0934U30)	
2	460	8	PCS	FA0934G24	Nut	HEXAGON NUT, A4-80, DIN 934, M24 (FA0934G24)	
2	470	16	PCS	FA0934G20	Nut	HEXAGON NUT, A4-80, DIN 934, M20 (FA0934G20)	
2	480	32	PCS	FA0934G16	Nut	HEXAGON NUT, A4-80, DIN 934, M16 (FA0934G16)	
2	490	18	PCS	FA6916H30	Washer	HARDENED WASHER, VZN, DIN 6916 M30; 300HV / FOR 10.9 BOLT (FA6916H30)	
2	500	4	PCS	FA0125G36	Washer	FLAT WASHER, A4, DIN 125 M36; Tykkelse h=5.0 d=37 (FA0125G36)	
2	510	16	PCS	FA0125G24	Washer	FLAT WASHER, A4, DIN 125 M24; Tykkelse h=4.0 d=25 (FA0125G24)	
2	520	8	PCS	FA0125G20	Washer	FLAT WASHER, A4, DIN 125 M20; Tykkelse h=3.0 d=21 (FA0125G20)	
2	530	48	PCS	FA0125G16	Washer	FLAT WASHER, A4, DIN 125 M16; Tykkelse h=3.0 d=17 (FA0125G16)	
2	540	4	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)	
2	550	32	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)	
2	560	18	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)	
2	570	2	PCS	FA0471U1600	Circlip	CIRCLIP RING EXTERNAL,STEEL DIN 471 A160; SPRING STEEL, PHOSPHATED, HRC 44-49 (FA0471U1600)	
2	580	2	PCS	FA0472A1400	Circlip	CIRCLIP RING INTERNAL,STEEL DIN 472 I140; SPRING STEEL, PHOSPHATED, HRC 44-49 (FA0472A1400)	
2	590	2	PCS	GRMXX002	Grease Nipple	GREASE NIPPLE, M8x1,0 STRAIGHT, A4 (GRMXX002)	
2	620	1	PCS	COGLX041	Sealing Compound	WURTH MS 40, POLYMER B SEALANT (COGLX041)	
2				400182377	Electrical Winch Assembly	MECHANICAL PART/WINCH/Electrical Winch Assembly	Electrical system ROW/Traction Winch Mbari S2V1
3	001	1	PCS	400091474	Cabinet Basic	ELECTRICAL PART/CABINET/Cabinet Basic	KLIPPON POK 121209 EX

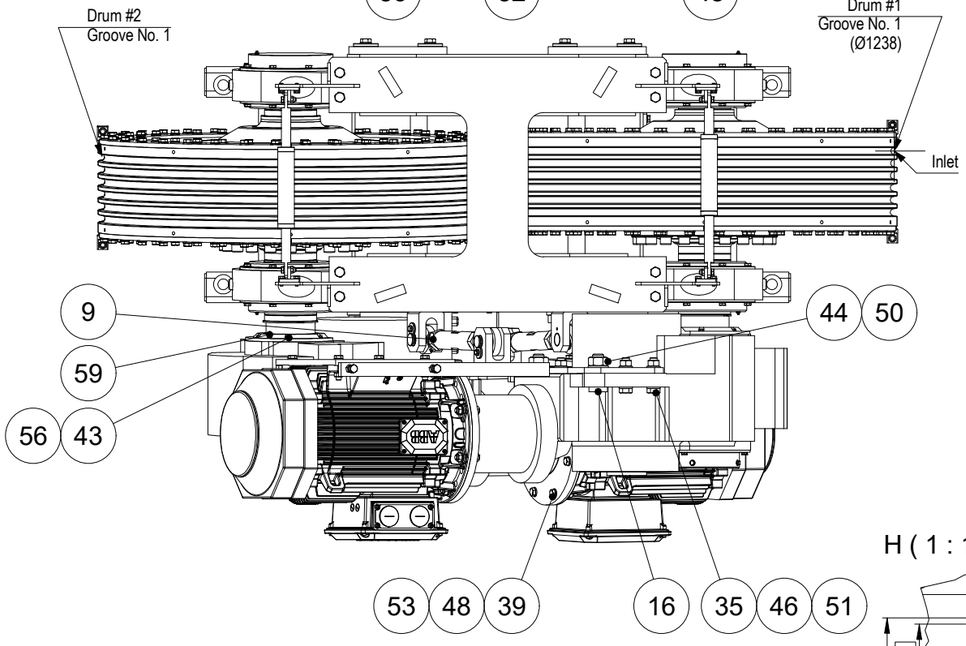
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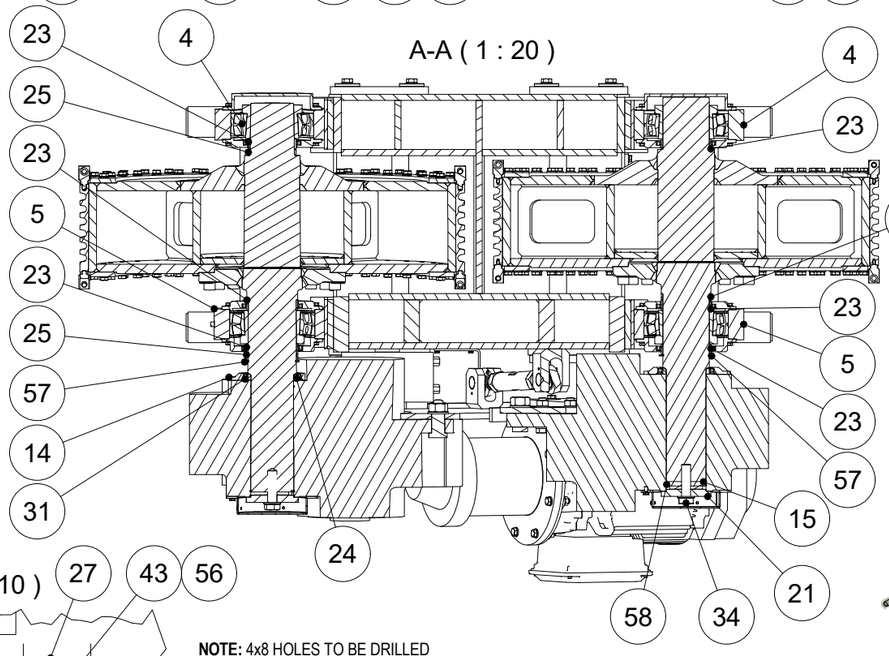
Level	Pos	Qty	Unit	Aras ID	Name	Description	
3	002	1	PCS	400091486	Mounting Rail	ELECTRICAL PART/FITTING/Mounting Rail	TS35X7.5 ST K41
3	003	2	PCS	400091997	Terminal	ELECTRICAL PART/Terminal	ZAP /TW (for ZDK 2,5) END COVER
3	004	2	PCS	EACCA096	Prefabricated Cable	ELECTRICAL PART/CABLE/Prefabricated Cable	V1-WV4A-10M-PUR-ABG0, 10M PUR M12 90* (EACCA096)
3	005	3	PCS	EACPG270	Cable Gland	ELECTRICAL PART/CABLE FITTING/Cable Gland	SKINTOP MS-M 12X1,5 (ØF 3-7MM) (EACPG270)
3	006	3	PCS	EACPG280	Cable Gland	ELECTRICAL PART/CABLE FITTING/Cable Gland	SM-M 12X1,5 SKINDICHT BRASS (EACPG280)
3	007	1	PCS	EACPL0011	Prefabricated Cable	ELECTRICAL PART/CABLE/Prefabricated Cable	EL.PLUG W/KABEL 5 METER, 3P+PE BELDEN (EACPL0011)
3	008	1	PCS	EACPL007	Electronic Card	ELECTRONIC PART/Electronic Card	DIODE-ADAPTER A07C4-2-24VDC; ADAPTER (EACPL007)
3	009	3	PCS	EACPL0202-2	Terminal	ELECTRICAL PART/Terminal	AEB 353SC/1 End Bracket (EACPL0202-2)
3	010	1	PCS	EACPL02025	Terminal	ELECTRICAL PART/Terminal	TERMINAL GROUNDING, ZPE 2,5 WEIDMULLER (EACPL02025)
3	011	4	PCS	EACPL02055	Terminal	ELECTRICAL PART/Terminal	TERMINAL DOUBLE, ZDK 2,5 WEIDMULLER (EACPL02055)
3	012	1	PCS	EACPL02056	Terminal	ELECTRICAL PART/Terminal	ZDK 2,5 PE Weidmuller (EACPL02056)
3	013	2	PCS	EACPL020T1-10	Terminal	ELECTRICAL PART/Terminal	TERMINAL NUMBERS (1-10); Dekafix 5-GW (1 to 10) (EACPL020T1-10)
3	014	3	PCS	EACPL021401	Terminal	ELECTRICAL PART/Terminal	TERMINAL ZDU 2,5 AN (2 HOLES) WEIDMULLER (EACPL021401)
3	015	1	PCS	EACPL02144	Terminal	ELECTRICAL PART/Terminal	TW1 (FOR ZDU 2,5) END COVER (EACPL02144)
3	016	2	PCS	EACPL02150	Terminal	ELECTRICAL PART/Terminal	TERMINAL END STOP MARKERS WAD 8 MC NE WS (EACPL02150)
3	017	2	PCS	EACTT007	Temperature Sensor	ELECTRICAL PART/SENSOR/Temperature Sensor	AUTEK-MFT1M12-R0375-0010XXB-1AAB-RAPP (EACTT007)

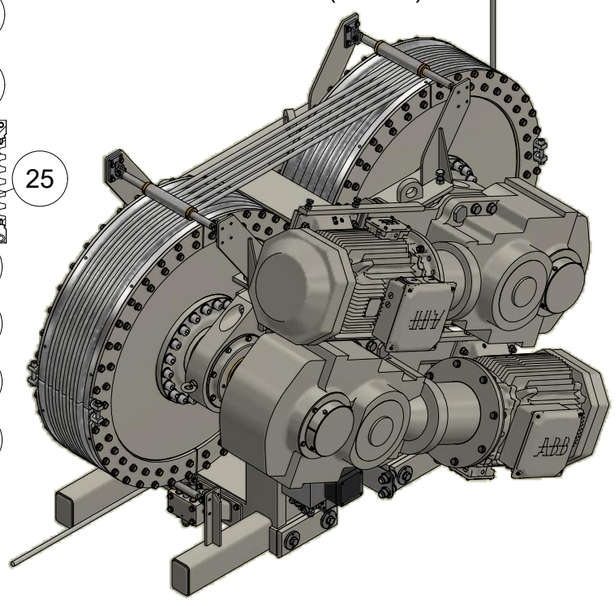


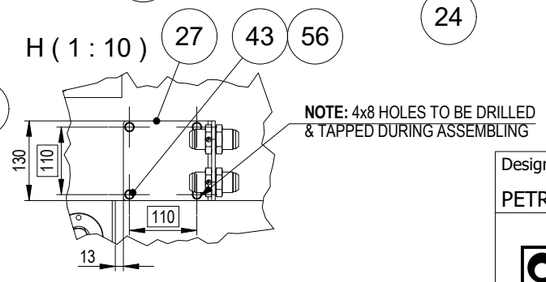












NOTE: 4x8 HOLES TO BE DRILLED & TAPPED DURING ASSEMBLING

TIGHTENING TORQUE - ACC. DOC. #6402

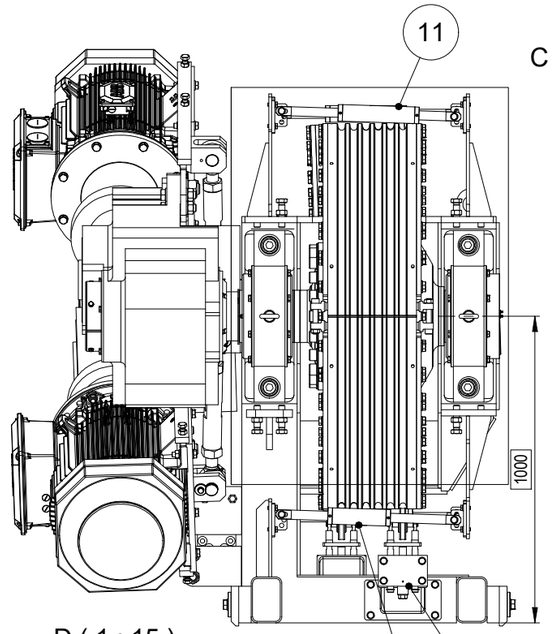
***MCG SIGNS (Not shown on Drawing)**
***POLYMER - ACC. DOC. #6482 MACHINED SURFACES AND SURFACE TREATMENT** — 60 61 62
***LOCTITE 243 - ALL BOLT CONNECTIONS TO BE USED WITH**

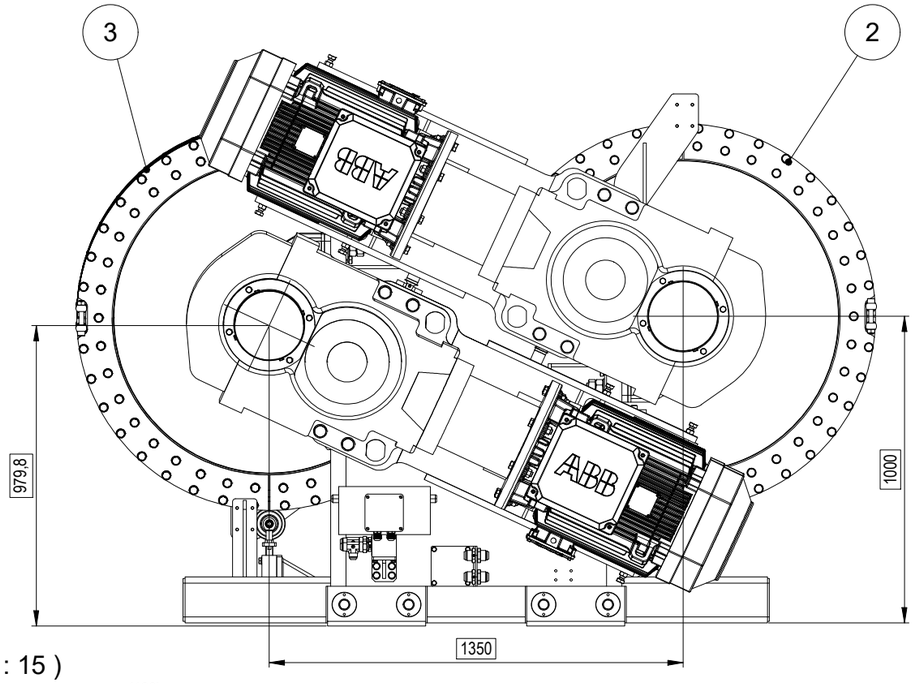
Designed by	Date	Modified by	ECO / CO			
PETRODO	26.10.2021.	P Pantovic	ECO-2057046			

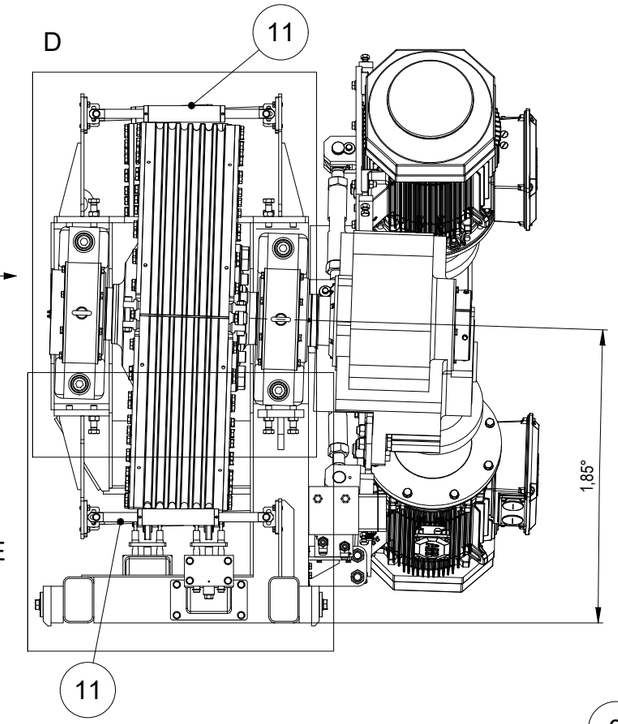
MACGREGOR

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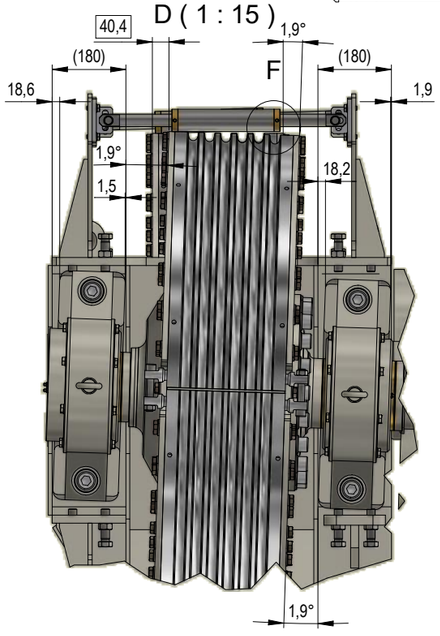
Name	Weight (kg)
TRACTION WINCH	7400
Description	Scale (A3)
TRW-4004E-01R1	1 : 20
Document ID	Revision / Sheet
400092475-ASSY	B / 1 / 2



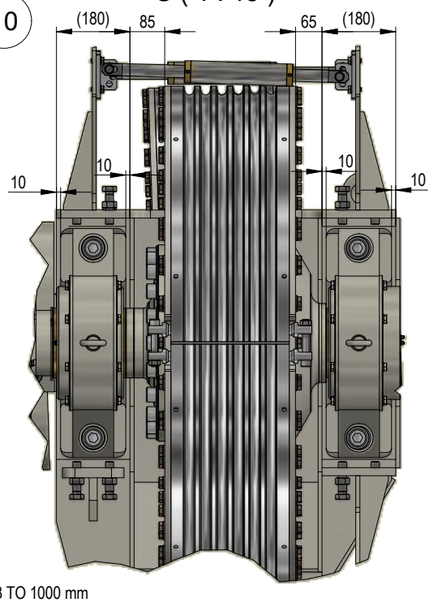




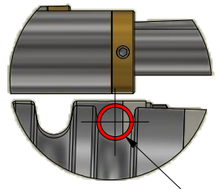
D (1 : 15)



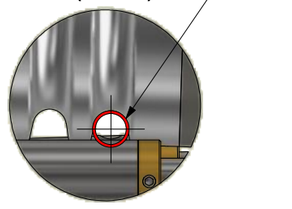
C (1 : 15)



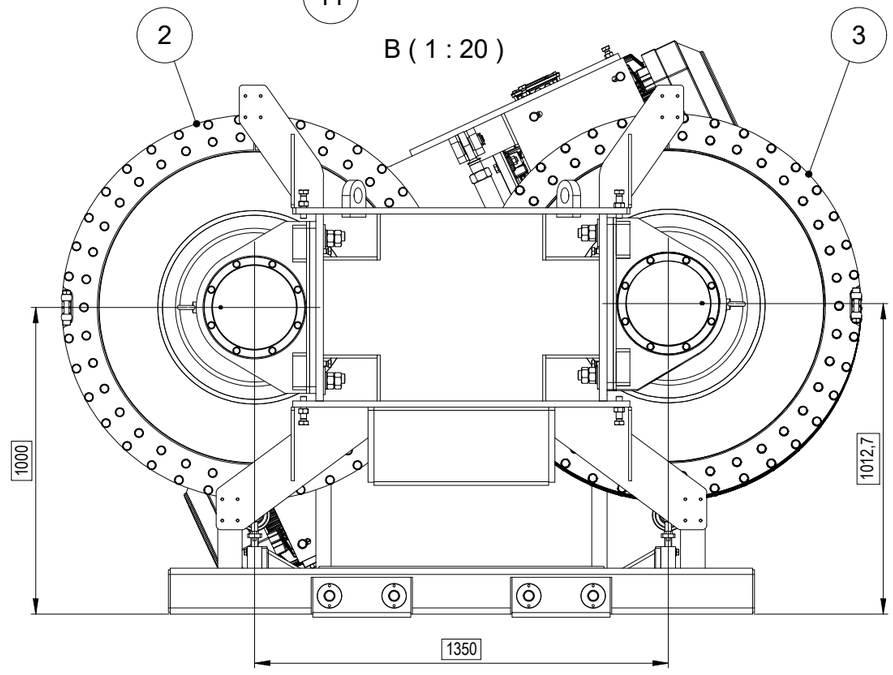
F (1 : 4)



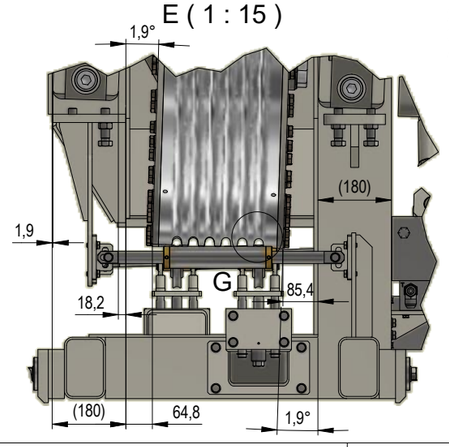
G (1 : 4)



B (1 : 20)

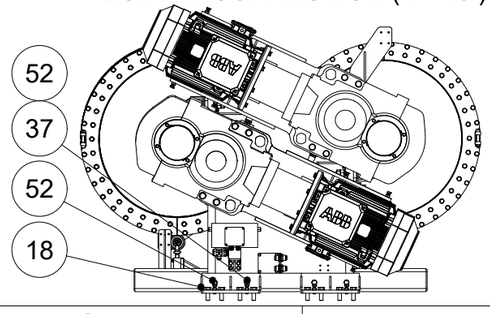


E (1 : 15)



1. ALIGN ITEM 3 TO 1000 mm
2. ALIGN ITEM 2 TO 980 mm / 1013 mm
3. FULFILLED ALIGNMENT OF 980 mm / 1013 mm GIVES 1,85° RELATIVE ANGLE BETWEEN WARPING HEADS
4. ALIGN TWO WARPING HEADS SO THE PIPE (Ø24) SMOOTHLY HIT FROM GROOVE 1 TO GROOVE 2 (DETAIL F) AS WELL AS THE PIPE SMOOTHLY HIT FROM GROOVE 1 TO GROOVE 1 (DETAIL G)

BOLTED CONNECTION (1 : 40)

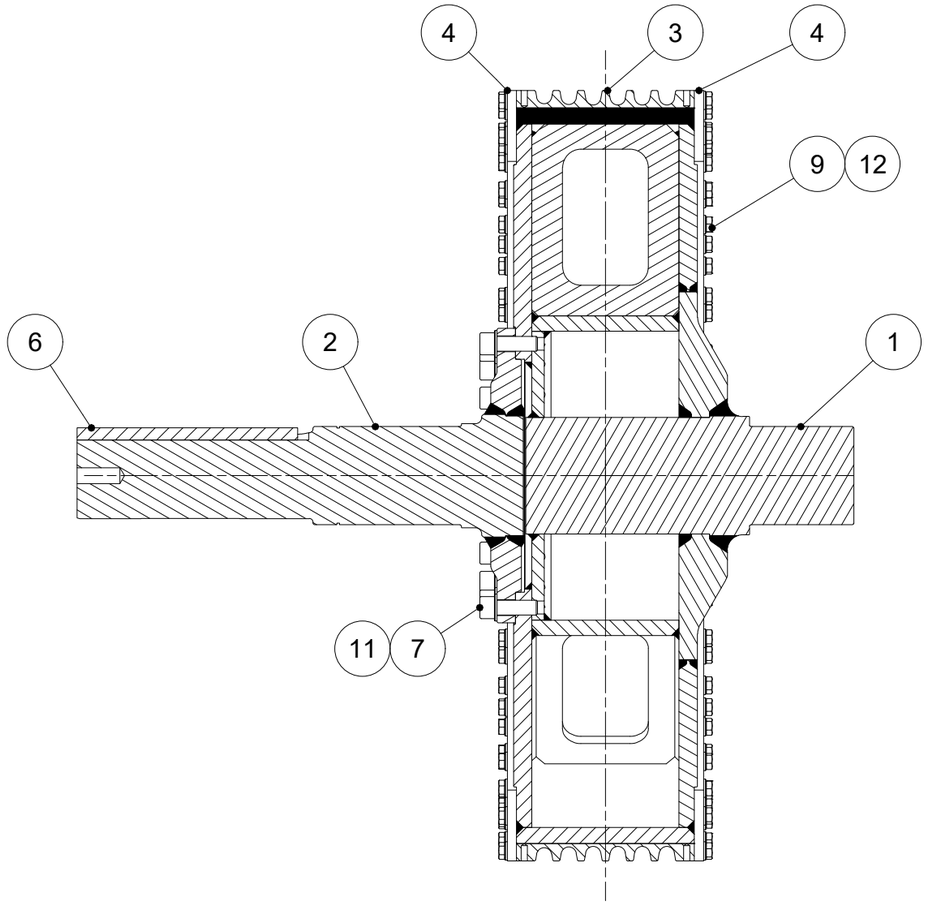


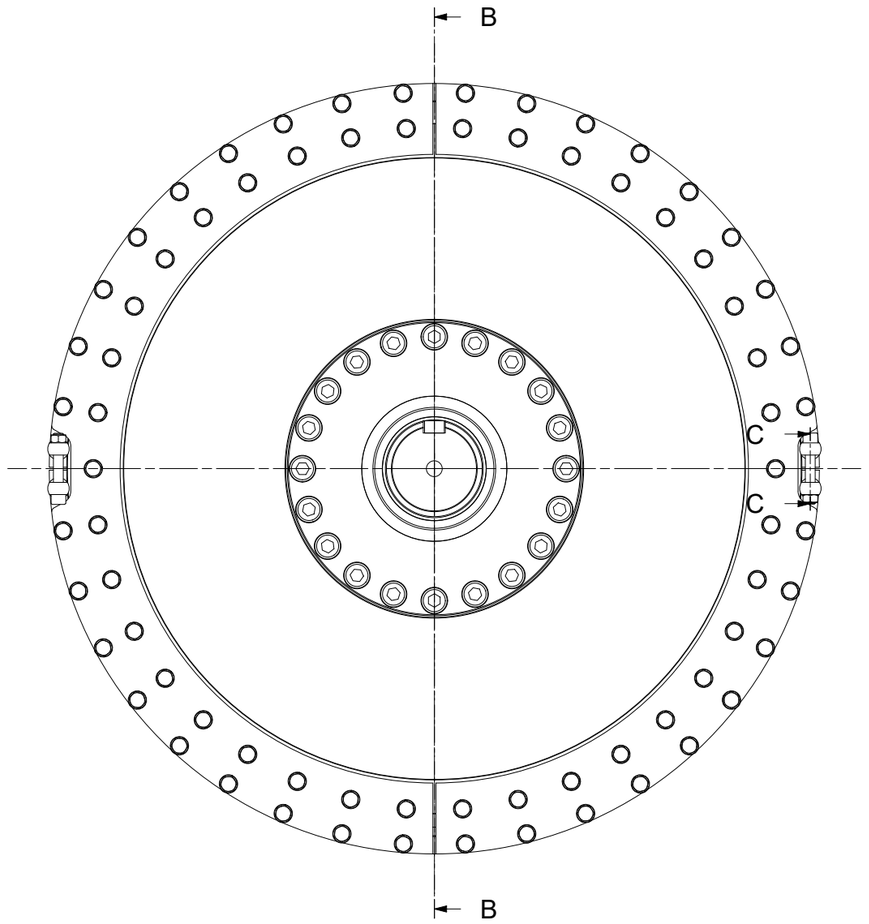
Designed by	Date	Modified by	ECO / CO			
PETRODO	26.10.2021.	P Pantovic	ECO-2057046			

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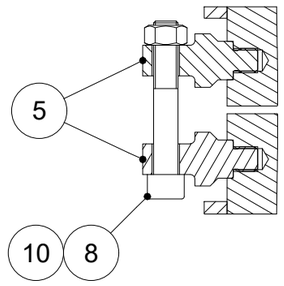
Name	Weight (kg)
TRACTION WINCH	7400
Description	Scale (A3)
TRW-4004E-01R1	1 : 20
Document ID: 400092475-ASSY	Revision: B / Sheet: 2 / 2

B-B (1 : 10)





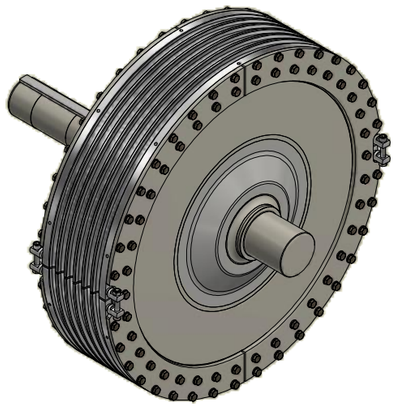
C-C (1 : 4)



ISO VIEW 1 (1 : 20)



ISO VIEW 2 (1 : 20)



NOTE # 1
Verify tightening torque of 40 Nm on the tightening brackets/device (RH314001)

LOCTITE 243 - ALL BOLT CONNECTIONS TO BE USED WITH 13

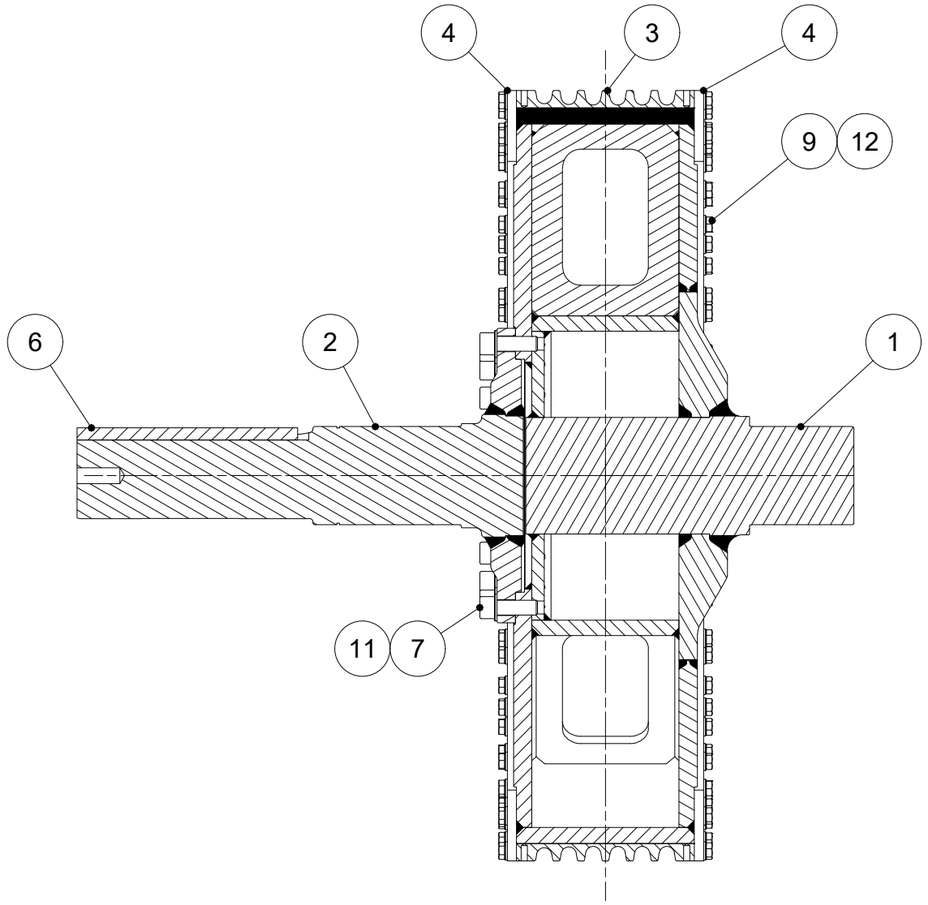
REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
A		Issued for production	23.10.2021.	RZPPA

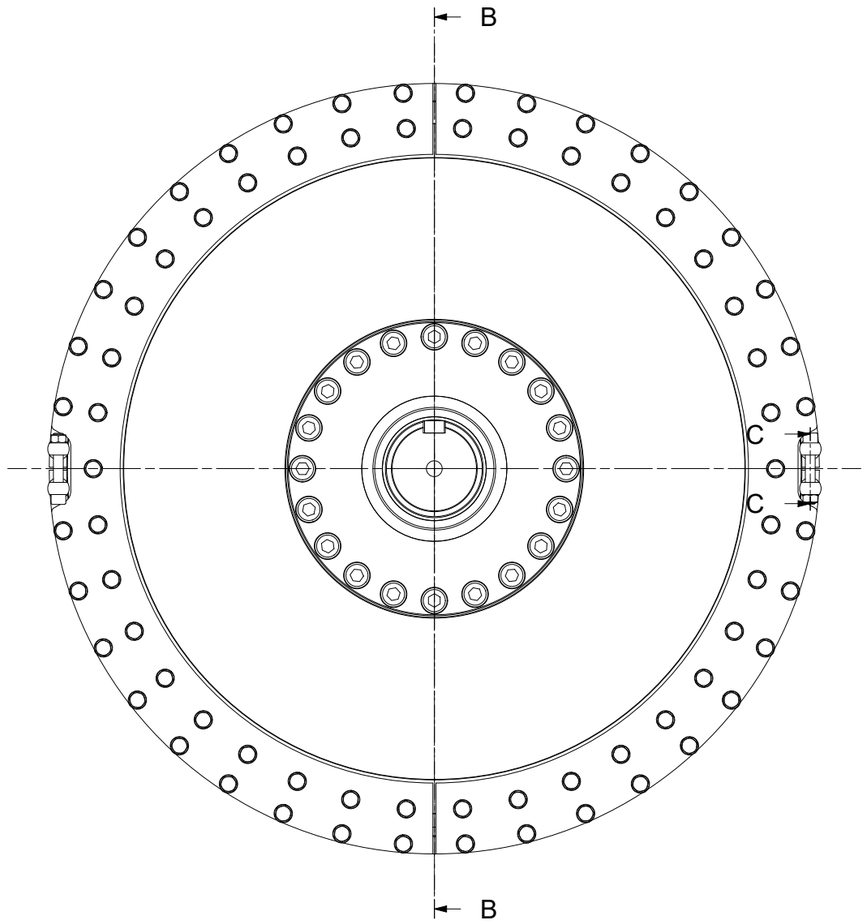
Unspecified Tolerances According to:		*Weight* 1353 kg	*Scale (A3 Sheet)* 1 : 10	1 / 1	DRUM #1 TRW4004 (SS SLEEVE DESIGN) ASSEMBLY
Standard	*Tolerance Class*				
NS-ISO 2768-1	*m Medium*				
NS-ISO 2768-2	*K*				

Material (for part)	*Status*	*Drawn by / Date (dd/mm/yy)*	*Checked by / Date (dd/mm/yy)*	*Drw number*	*Partlist*
	Production	PETRODO 23.10.2021.	RZPPA 25.10.2021.	400096386	400096386

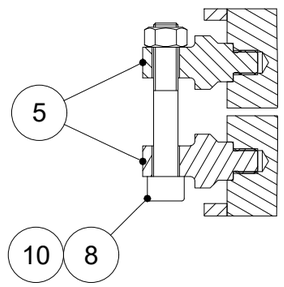
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B-B (1 : 10)





C-C (1 : 4)



ISO VIEW 1 (1 : 20)



ISO VIEW 2 (1 : 20)



NOTE # 1
Verify tightening torque of 40 Nm on the tightening brackets/device (RH314001)

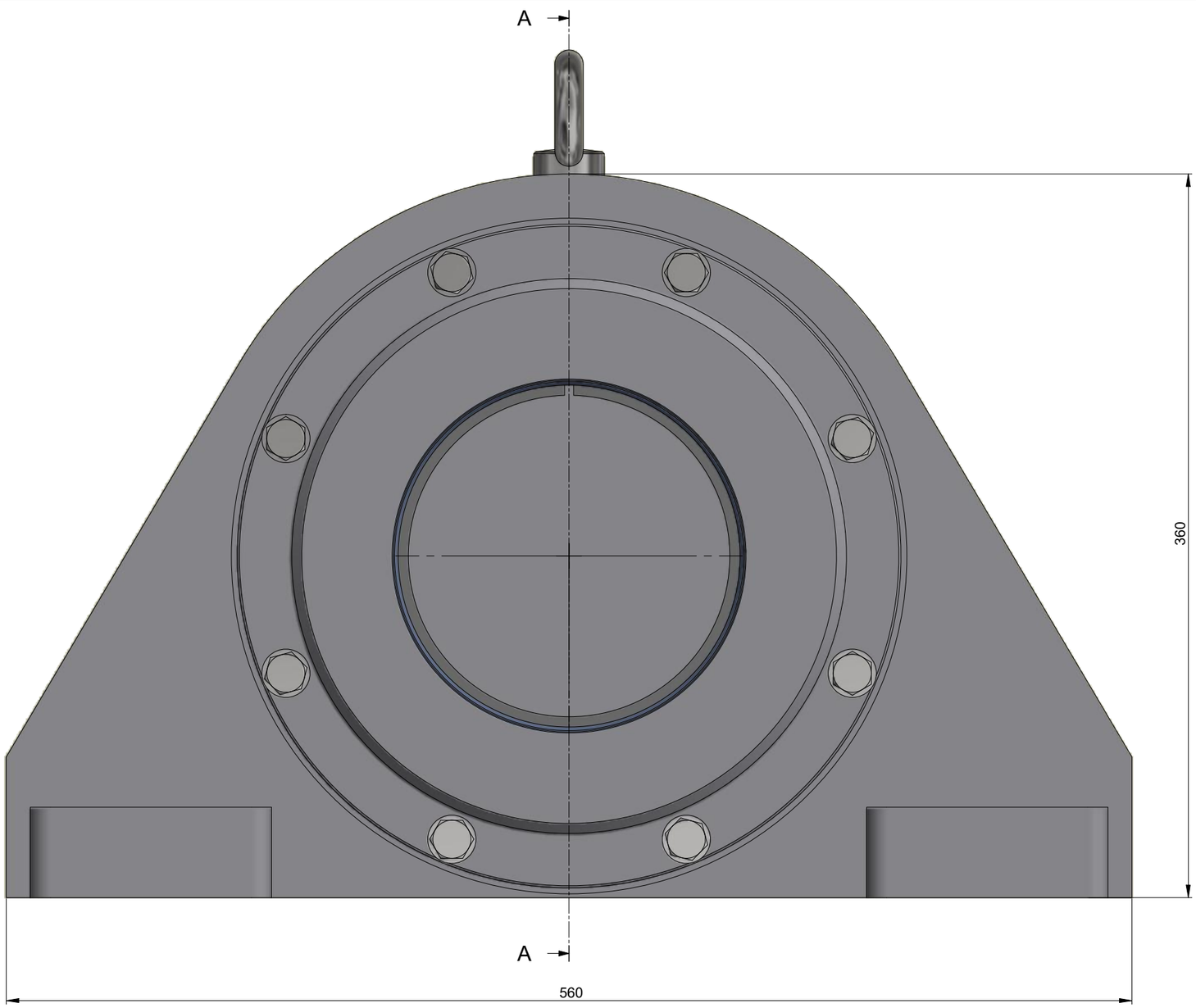
LOCTITE 243 - ALL BOLT CONNECTIONS TO BE USED WITH 13

REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
A		Issued for production	23.10.2021.	RZPPA

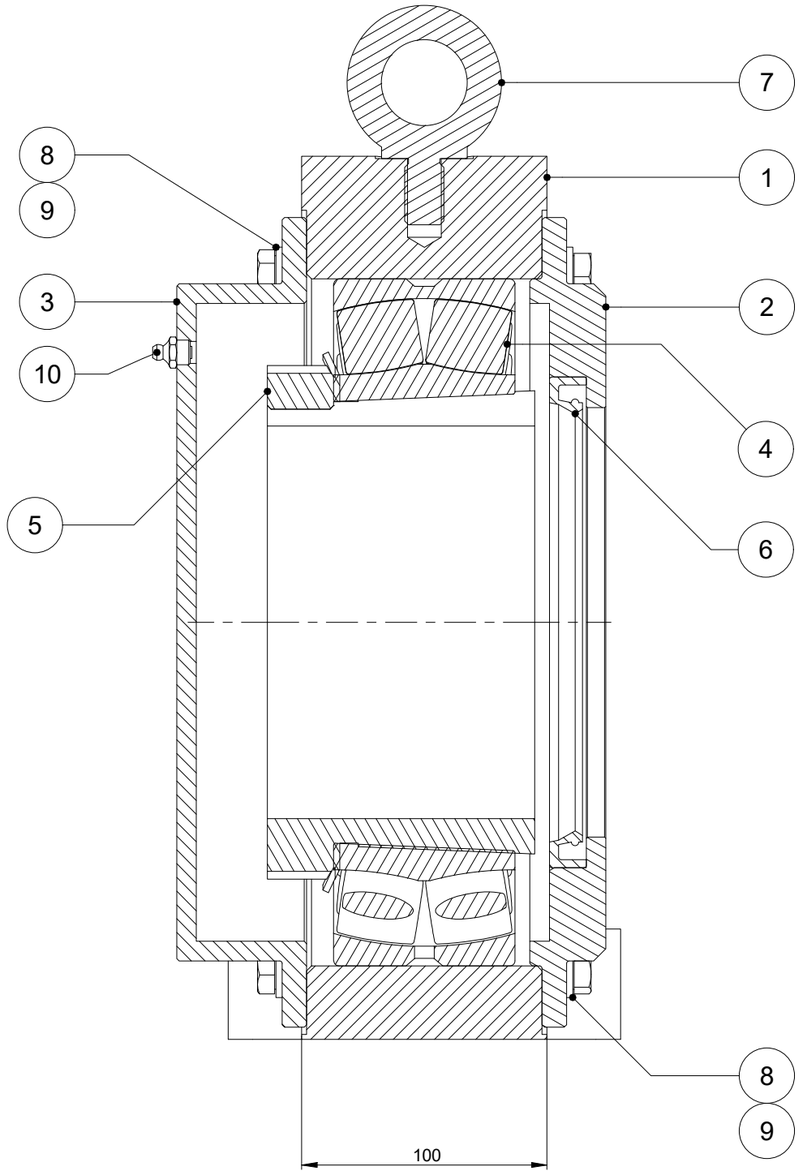
Weight 1390 kg		DRUM #2 TRW4004 (SS SLEEVE DESIGN) ASSEMBLY			MACGREGOR
Unspecified Tolerances According to:	*Scale (A3 Sheet)* 1 : 10 1 / 1				*Drw number* 400096390
Standard	*Tolerance Class*	*Material (for part)*	*Status*	*Drawn by / Date (dd/mm/yy)*	*Checked by / Date (dd/mm/yy)*
NS-ISO 2768-1	*m Medium*		Production	PETRODO 23.10.2021.	RZPPA 25.10.2021.
NS-ISO 2768-2	*K*				*Partlist* 400096390

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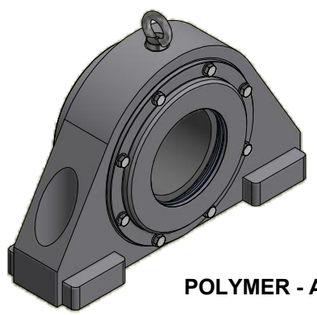
71SFED6EFDE497A05E5105E0D0E43



A-A (1 : 2,5)



ISO VIEW (1 : 10)



POLYMER - ACC. DOC. #6482 MACHINED SURFACES AND SURFACE TREATMENT

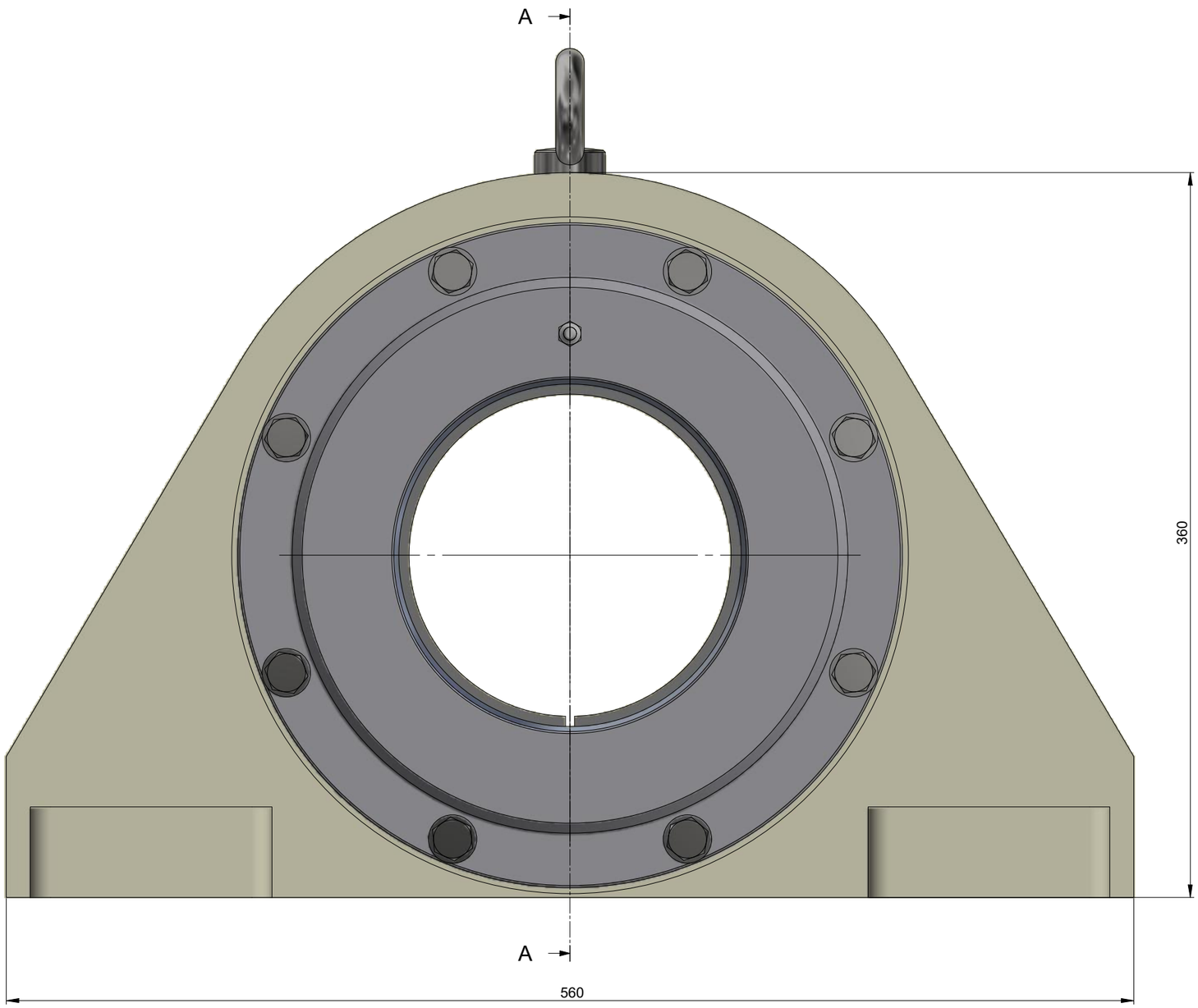
REV	ZONE	DESCRIPTION	DATE	APPROVED
A		Issued for production	28.10.2020	RZPPA

Weight 106 kg	BEARING HOUSING, BLIND TRW-4004 ASSEMBLY	RAPP MARINE Phone: (+47) 75 55 01 00 E-mail: office@rappmarine.com	
Scale (A3) 1 : 2,5	*Sheet* 1 / 1	*Drw number* 400095411	
Material (for part)	*Status* Production	*Drawn by / Date (dd/mm/yy)* MAKSTO 28.10.2020	*Checked by / Date (dd/mm/yy)* RZPPA 28.10.2020
		Partlist 400095411	

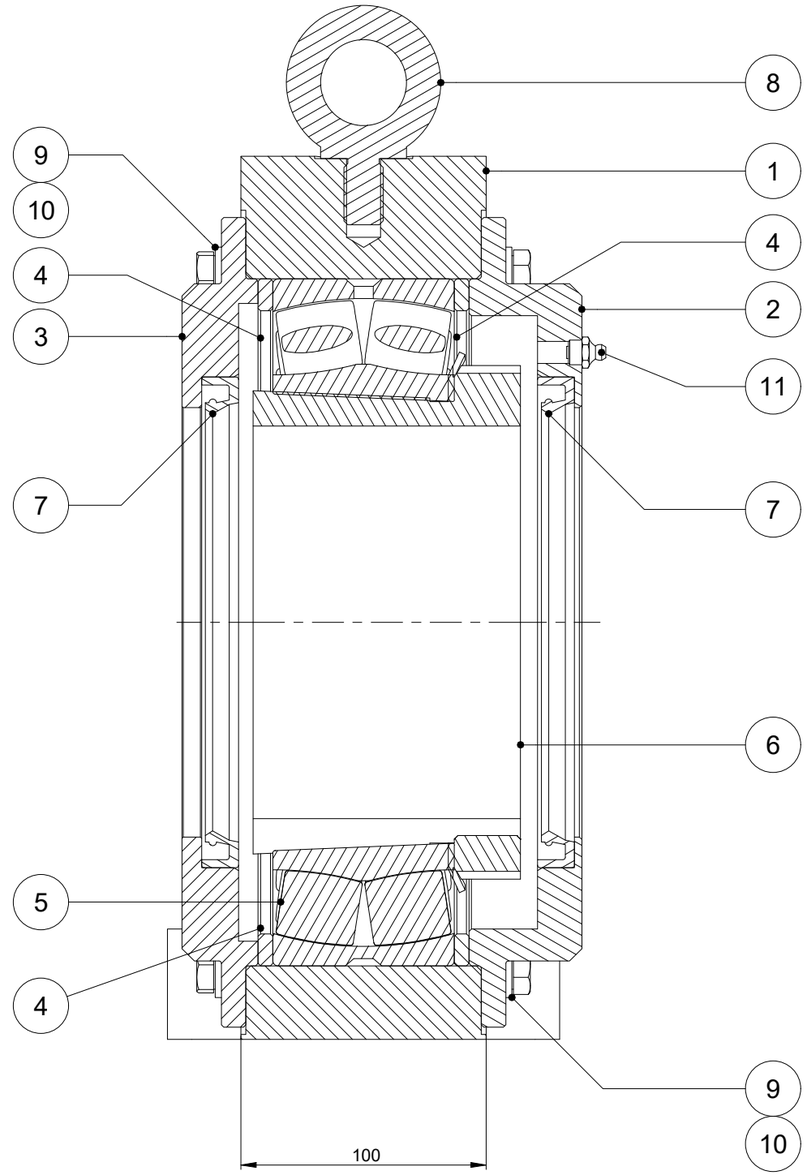
Unspecified Tolerances According to :
Standard | *Tolerance Class*
NS-ISO 2768-1 m Medium
NS-ISO 2768-2 K

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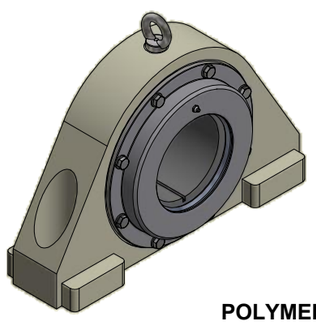
E440D9A5B19E404BBED181D3CD29CDEE



A-A (1 : 2,5)



ISO VIEW (1 : 10)



POLYMER - ACC. DOC. #6482 MACHINED SURFACES AND SURFACE TREATMENT

12

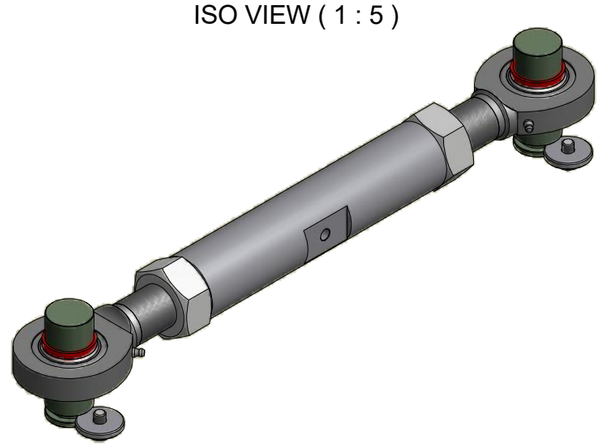
REV	ZONE	DESCRIPTION	DATE	APPROVED
A		Issued for production	28.10.2020	RZPPA

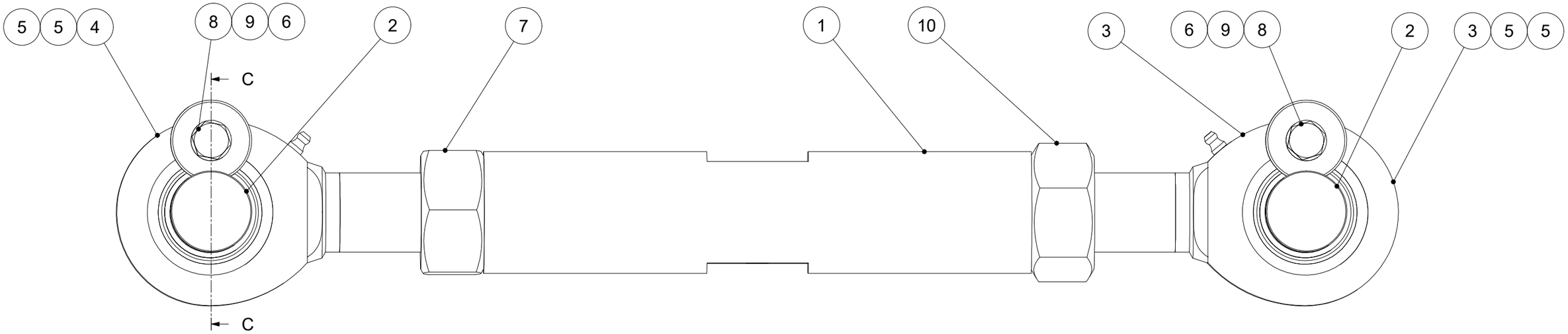
Weight 106 kg		BEARING HOUSING TRW-4004 ASSEMBLY	RAPP MARINE Phone: (+47) 75 55 01 00 E-mail: office@rappmarine.com		
Unspecified Tolerances According to:	*Scale (A3)* 1 : 2,5	*Sheet* 1 / 1		*Drw number* 400095410	
Standard	*Tolerance Class*				
NS-ISO 2768-1	*m Medium*	*Material (for part)*	*Status* Production	*Drawn by / Date (dd/mm/yy)* MAKSTO 28.10.2020	*Checked by / Date (dd/mm/yy)* RZPPA 28.10.2020	*Partlist* 400095410
NS-ISO 2768-2	*K*				

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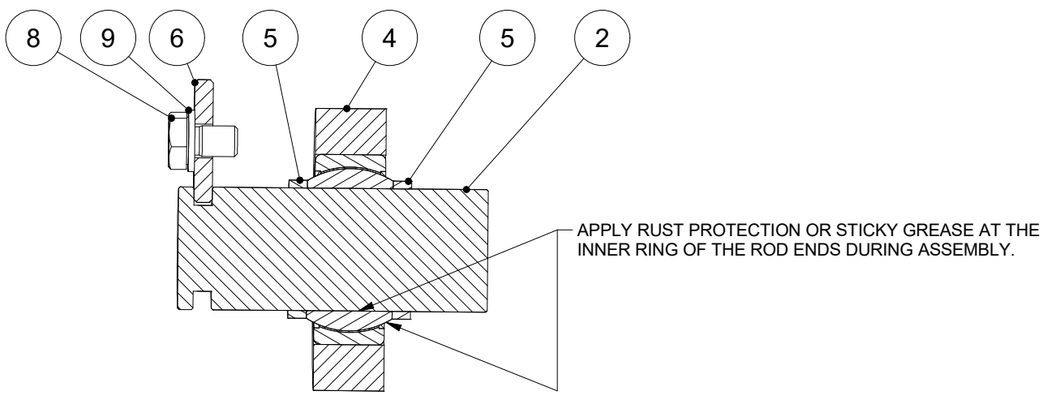
449C3330494A4C9FA0F203BB3ADF0E68

ISO VIEW (1 : 5)





C-C (1 : 2)



REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
A		Issued for production	21.5.2014	RHDHN
B		Position 1 modified, overall lenght 270, was 320	31.10.14/RZPPA	RHDHN
C		Item 10 added and number of Item 7 reduced to 1.	24.11.2014/BSI	RHDHN
C1		Text note added	31.10.2016	RHJJ

Weight 6 kg

TORQUE ARM
TRW-4003E
ASSEMBLY

RAPP HYDEMA
Phone: (+47) 75 55 01 00
Fax: (+47) 75 55 01 11
E-mail: office@rapphydema.com

Unspecified Tolerances According to:		*Scale (A3)*	*Sheet*
Standard	*Tolerance Class*	1:2	1 / 1
NS-ISO 2768-1	*m Medium*		
NS-ISO 2768-2	*K*		

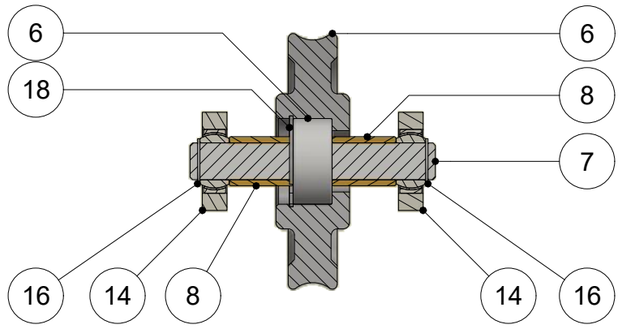
Material (for part)	*Status*	*Drawn by / Date (dd/mm/yy)*	*Checked by / Date (dd/mm/yy)*	*Drw number*
	Production	STNSI 21.05.2014	STNSI 21.05.2014	RH317083

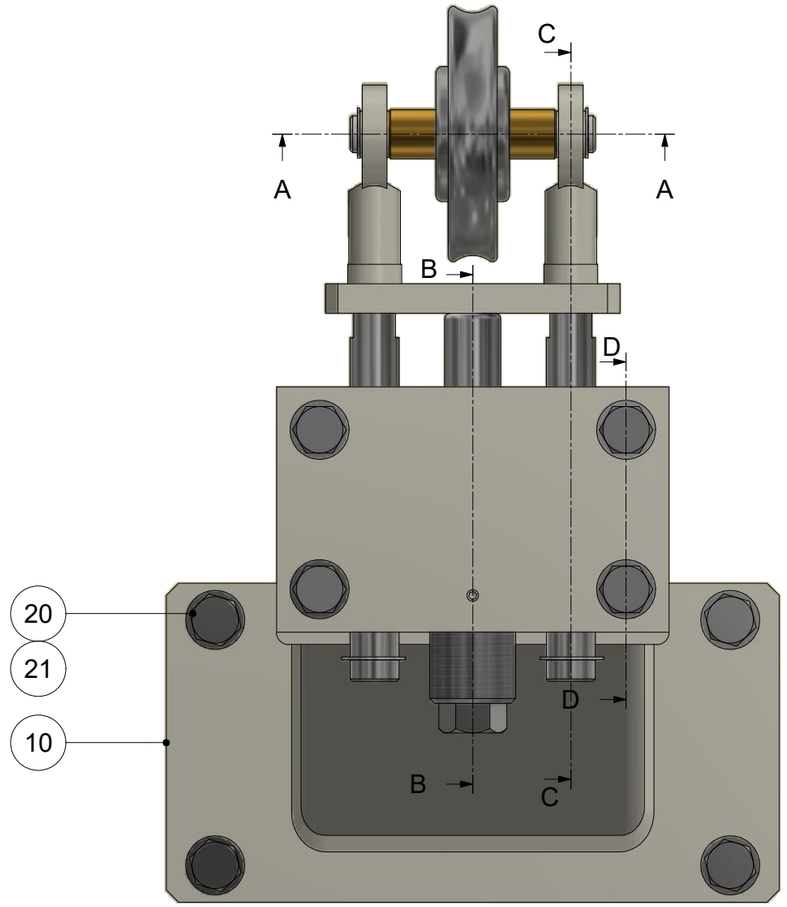
Partlist RH317083

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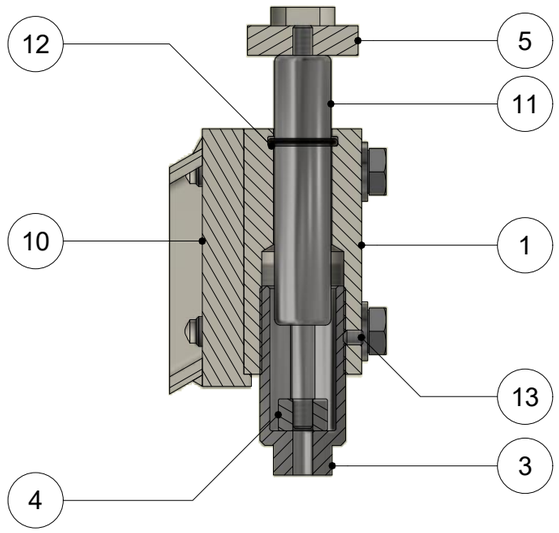
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A-A (1 : 2,5)

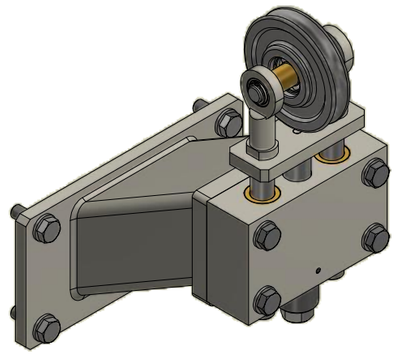




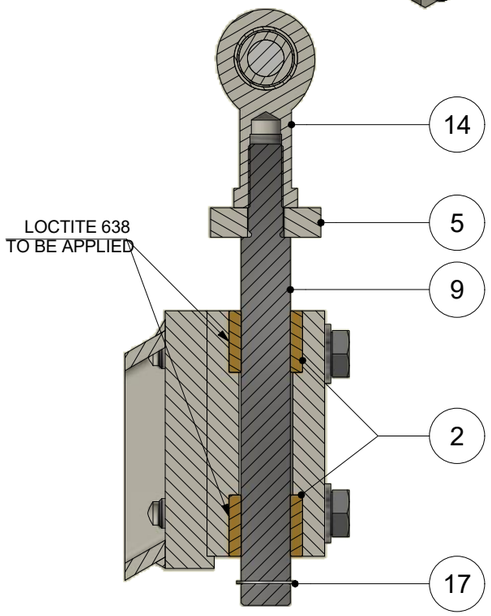
B-B (1 : 2,5)



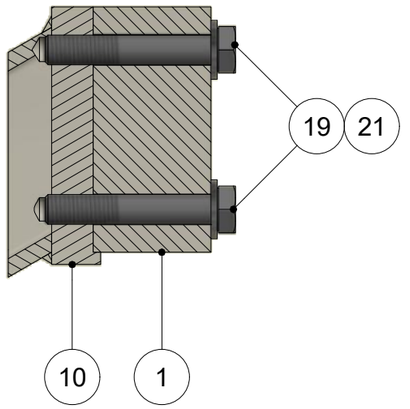
ISO VIEW (1 : 5)



C-C (1 : 2,5)



D-D (1 : 2,5)



TIGHTENING TORQUE:

M12 (A4-80): 75 Nm

LOCTITE 638 - TO BE USED FOR CYLINDRICAL PARTS FASTENING 22

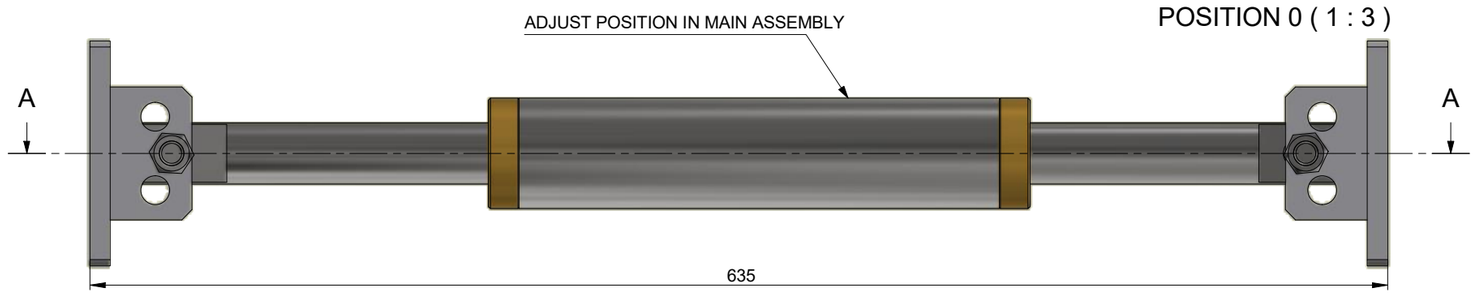
LOCTITE 243 - ALL BOLT CONNECTIONS TO BE USED WITH 23

REV	ZONE	DESCRIPTION	DATE	APPROVED
A		Issued for production	14.01.2020	RZPPA

Weight 17,5 kg	TENSION ROLLER DEVICE TRW-4004 ASSEMBLY			RAPP MARINE Phone: (+47) 75 55 01 00 E-mail: office@rappmarine.com	
Unspecified Tolerances According to:	*Scale (A3)* 1 : 2,5	*Sheet* 1 / 1		*Drw number* RH329285	
Standard	*Tolerance Class*	*Material (for part)*	*Status* Production	*Drawn by / Date (dd/mm/yy)* MAKSTO 14.01.2020	*Checked by / Date (dd/mm/yy)* RZPPA 14.01.2020	*Partlist* RH329285
NS-ISO 2768-1	*m Medium*				
NS-ISO 2768-2	*K*				

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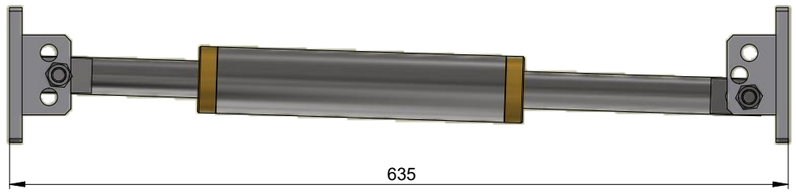
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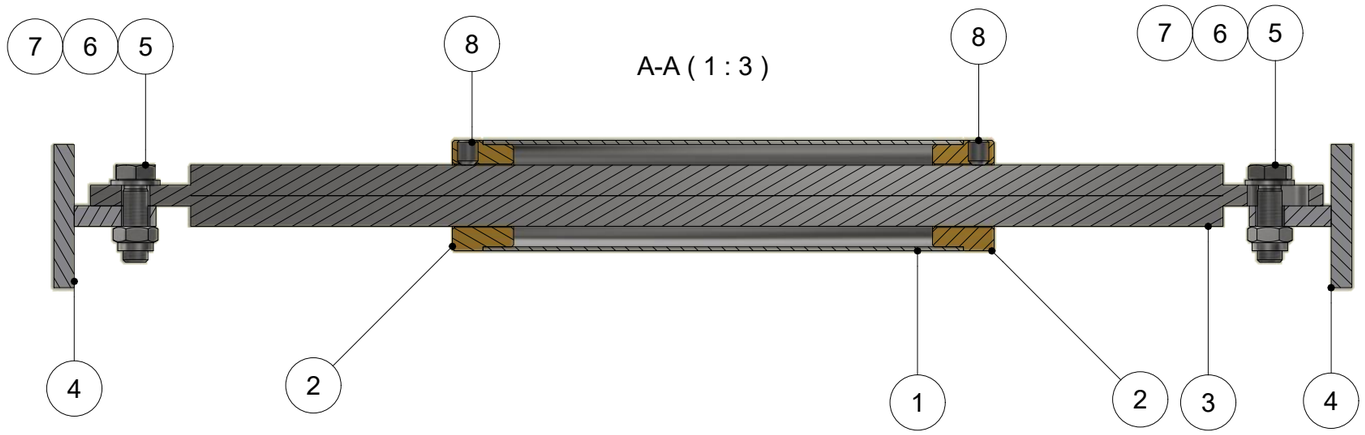
POSITION 0 (1 : 3)



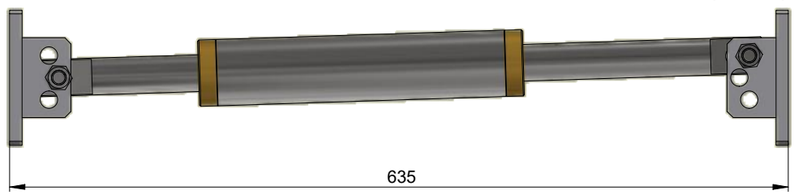
ISO VIEW (1 : 5)



POSITION 1 (1 : 5)



A-A (1 : 3)

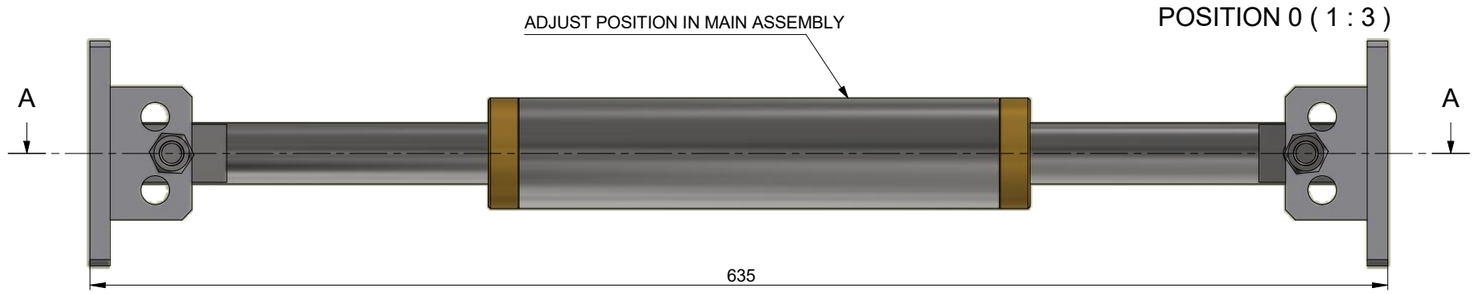


POSITION 2 (1 : 5)

REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
A		Issued for production	7.4.2016.	RHJJ

Weight 6,0 kg	CABLE PROTECTION BAR (L635) ASSEMBLY	RAPP HYDEMA Phone: (+47) 75 55 01 00 Fax: (+47) 75 55 01 11 E-mail: office@rapphydema.com	
Unspecified Tolerances According to : *Standard* / *Tolerance Class*: NS-ISO 2768-1 m Medium; NS-ISO 2768-2 K	*Scale (A3)* 1:3 *Sheet* 1 / 1	*Drw number* RH321167	
Material (for part)	*Status* Production	*Drawn by / Date (dd/mm/yy)* RZBMI 07.04.2016.	*Checked by / Date (dd/mm/yy)* RHJJ 07.04.2016.
		Partlist RH321167	

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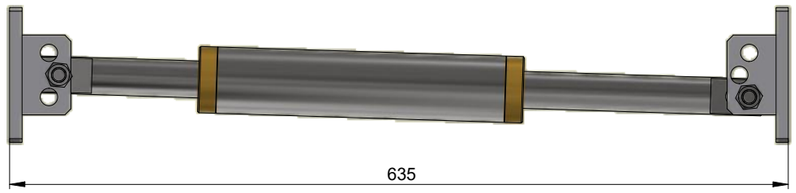


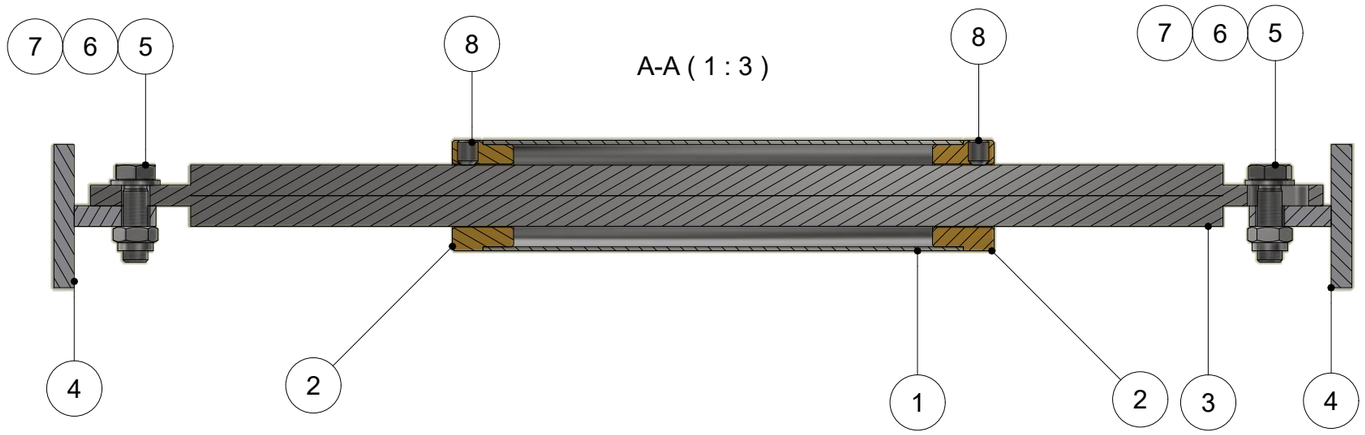
POSITION 0 (1 : 3)



ISO VIEW (1 : 5)

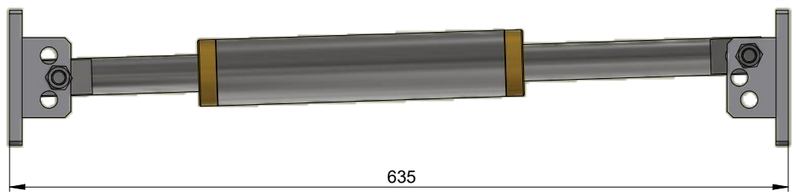
POSITION 1 (1 : 5)





A-A (1 : 3)

POSITION 2 (1 : 5)

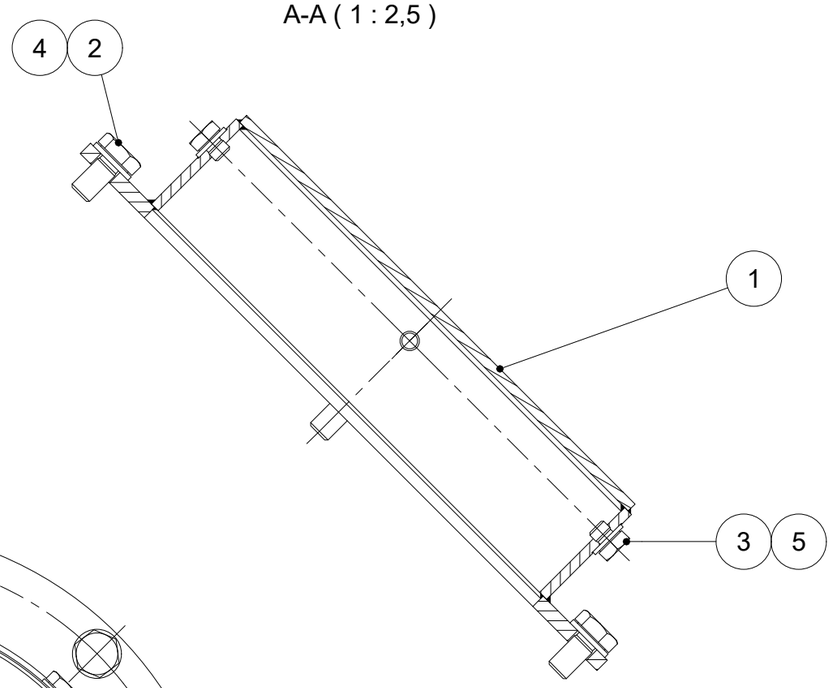


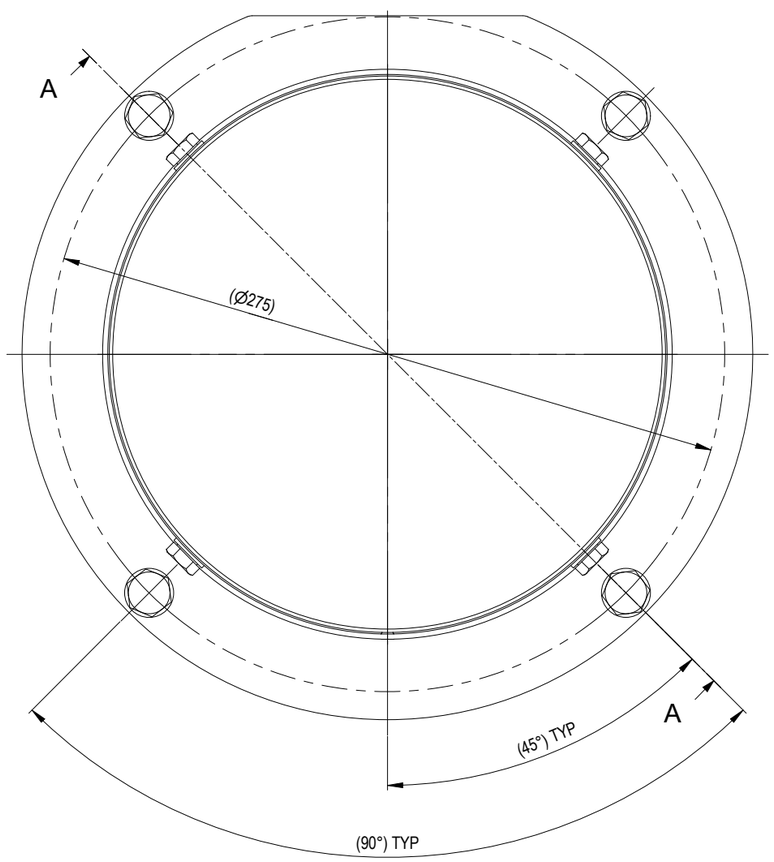
REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
A		Issued for production	7.4.2016.	RHJJ

Weight 6,0 kg	CABLE PROTECTION BAR (L635) ASSEMBLY	RAPP HYDEMA Phone: (+47) 75 55 01 00 Fax: (+47) 75 55 01 11 E-mail: office@rapphydema.com	
Unspecified Tolerances According to: *Standard* / *Tolerance Class*: NS-ISO 2768-1 m Medium; NS-ISO 2768-2 K	*Scale (A3)* 1:3 *Sheet* 1 / 1	*Drw number* RH321167	
Material (for part)	*Status* Production	*Drawn by / Date (dd/mm/yy)* RZBMI 07.04.2016.	*Checked by / Date (dd/mm/yy)* RHJJ 07.04.2016.
		Partlist RH321167	

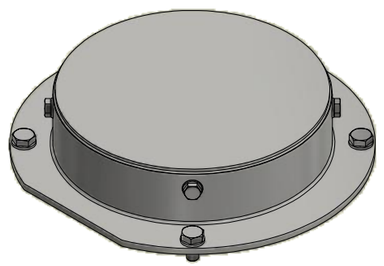
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A-A (1 : 2,5)





ISO VIEW (1 : 5)



6

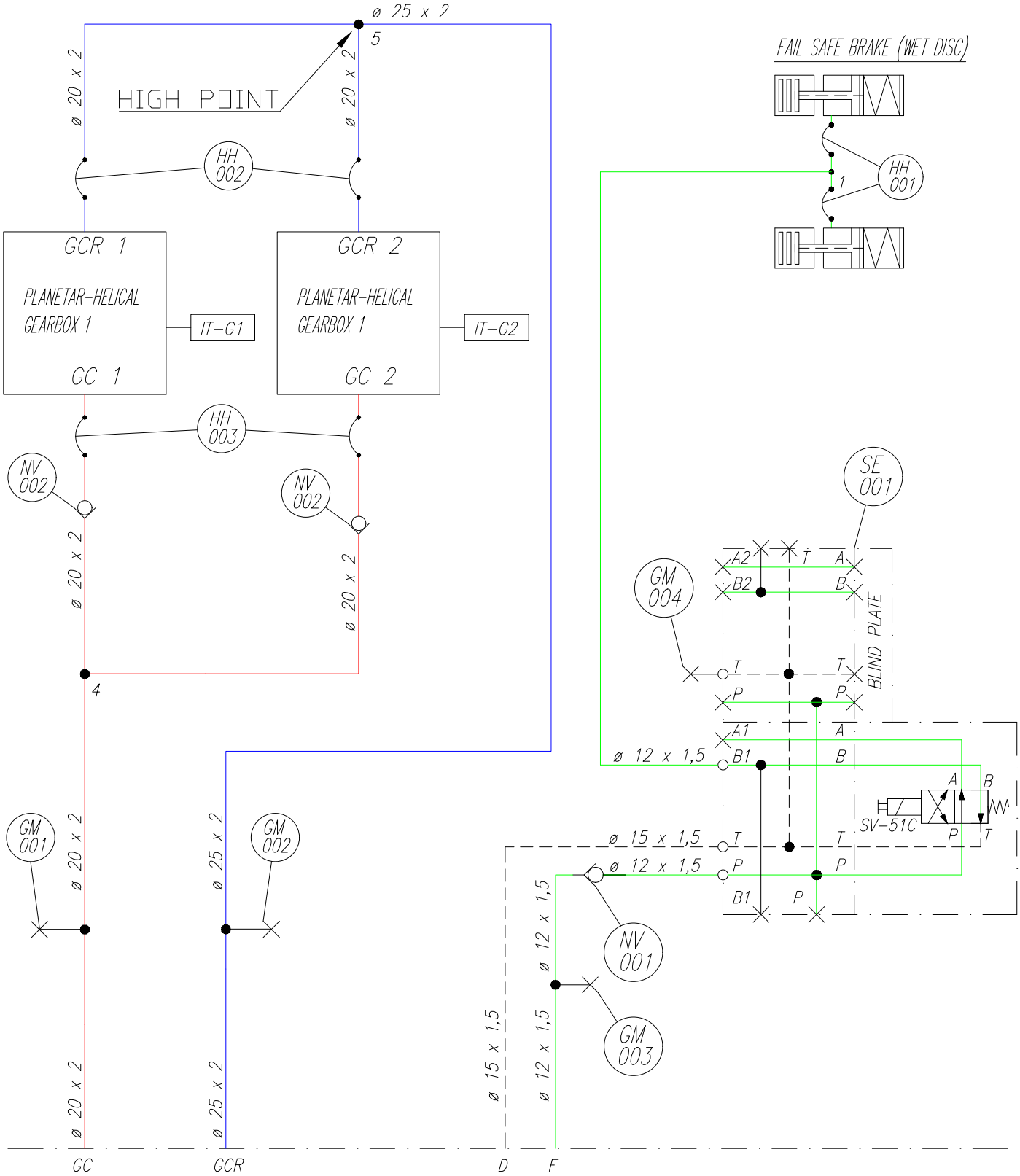
POLYMER - ACC. DOC. #6482 MACHINED SURFACES AND SURFACE TREATMENT

Designed by	Date	Modified by	ECO / CO			
MAKSTO	07.08.2019.	A Karaic				

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Name	Weight (kg)
Cover	3,9
Description	**Scale (A3)**
BPH.28 GEARBOX COVER - ASSEMBLY	1 : 2,5
Document ID	**Revision** / **Sheet**
2000011556	A / 1 / 1



Designed by	Modified by	Date	ECO			
H Johansen		21-Feb-22	ECO-2056897			

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Name	Weight
HYDRAULIC BRAKE & COOLING SYSTEM,	0 kg
Description	Scale (A4)
Document ID: RH411181	Revision: C

Level	Pos	Qty	Unit	Aras ID	Name	Description
1				400092566	Level Wind	LEV. WITH SLACK WIRE, LSWC5000/01L1 (RHMELSWC5000/01L1)
2	001	1	PCS	400180581	Level Wind	LEV-5000E/900-L2000, L
3	001	1	PCS	400180323	Bracket	LW B SIDE BRACKET LW EL 5000-L2000; MACHINING, LW B-SIDE (L), DIS BTW GUIDE SHAFTS APROX 522
3	002	1	PCS	400180415	Bracket	LW M SIDE BRACKET LW EL 5000-L2000; MACHINING, LW M-SIDE (L), DIS BTW GUIDE SHAFTS APROX 522
3	003	1	PCS	400180511	Sheave Assembly	SHEAVE, LEFT, PCD900, LW EL5000; ASSEMBLY
4	001	1	PCS	RH318415	Sheave House	SHEAVE FRAME PCD900 LW EL5000 (L&R); MACHINING, PCD900 (L&R)
4	002	1	PCS	RH329298	SHEAVE INDICATOR (L&R), LW EL5000	SHEAVE INDICATOR (L&R), LW EL5000; ASSEMBLY
5	010	2	PCS	RH317245	Wire Rope Roller	INDICATOR ROLLER ASSEMBLY LW INDICATOR; ASSEMBLY, INDICATOR ROLLER, LEVEL WIND INDICATOR
5	020	1	PCS	RH329299	Bracket	PIVOT ROLLER BRACKET, L.WIND INDICATOR; MACHINING
5	030	1	PCS	RH329301	Bracket	INDICATOR BRACKET, LEVEL WIND INDICATOR; WELDING & MACHINING
5	040	1	PCS	RH329302	Bracket	TENSION SPRING BRACKET, L.WIND INDICATOR; WELDING & MACHINING
5	050	1	PCS	RH329303	ENCODER CONNECTION PIPE, D60,3x6,3/L90	ENCODER CONNECTION PIPE, D60,3x6,3/L90; MACHINING
5	060	1	PCS	RH314346	Cover	COVER, M45x1.5xD58, MACHINING
5	070	1	PCS	RH329304	Distance Ring	SPACER, ROUND BAR, D40x11, MACHINING
5	080	1	PCS	RH329305	Bolt	BOLT, ROUND BAR D25 X 104, MACHINING
5	090	1	PCS	RH329306	ENCODER ROTATIONAL CONNECTION, D50x27	ENCODER ROTATIONAL CONNECTION, D50x27; MACHINING
5	100	4	PCS	RH326639	SPRING PIN, M20x55, MACHINING	SPRING PIN, M20x55, MACHINING
5	110	2	PCS	RH329307	COMPRESSION SPRING, d2,5/D16x107	COMPRESSION SPRING, d2,5/D16x107
5	120	1	PCS	RH325844AS_RFC4800	ROTARY SENSOR	ROTARY SENSOR
5	130	2	PCS	BEDBS027	Deep Groove Ball Bearing	DEEP GROOVE BALL BEARING, 6004 2RS; d20/D42x12 (BEDBS027)
5	140	1	PCS	SESRB0012	Rotary Shaft Lip Seal	SEAL, 20x35x7, W/STAINLESS SPRING, 35x35x7 (SESRB0012)
5	150	1	PCS	FA0472A0350	Circlip	CIRCLIP RING INTERNAL, STEEL DIN 472 I35; SPRING STEEL, PHOSPHATED, HRC 47-52 (FA0472A0350)
5	160	1	PCS	FA0471U0200	Circlip	CIRCLIP RING EXTERNAL, STEEL DIN 471 A20; SPRING STEEL, PHOSPHATED, HRC 47-52 (FA0471U0200)
5	170	2	PCS	FA0912G10020	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M10x20; FULLY THREADED (FA0912G10020)
5	180	2	PCS	FA0912G04020	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M4x20 (FA0912G04020)
5	190	1	PCS	FA0916G08008	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M8x8; CUP POINT (FA0916G08008)
5	200	2	PCS	FA0916G05010	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M5x10; CUP POINT (FA0916G05010)
5	210	2	PCS	FA0916G05006	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M5x6; CUP POINT (FA0916G05006)
5	220	2	PCS	FA0933G08020	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x20; FULLY THREADED (FA0933G08020)
5	230	2	PCS	400091318	Nut	HEXAGON NUT, GRADE 8, VZN, DIN 934, M24 (FA0934H24)
5	240	1	PCS	FA0934G16	Nut	HEXAGON NUT, A4-80, DIN 934, M16 (FA0934G16)
5	250	4	PCS	FA0439G2015	Nut	HEXAGON THIN NUT, A4, DIN 439, M20x1,5 (FA0439G2015)
5	260	2	PCS	400091197	Washer	FLAT WASHER, 8.8 VZN, DIN 125 M24; Tykkelse h=4.0 d=25 (FA0125H24)
5	270	4	PCS	FA0125G20	Washer	FLAT WASHER, A4, DIN 125 M20; Tykkelse h=3.0 d=21 (FA0125G20)
5	280	1	PCS	FA0125G16	Washer	FLAT WASHER, A4, DIN 125 M16; Tykkelse h=3.0 d=17 (FA0125G16)
5	290	2	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
5	300	2	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)
5	310	4	PCS	FA0988U02002820	Ring	SUPPORT WASHER, DIN 988, SS-20x28x2; SS20282 DIN988 Steel St 2 K 60 (FA0988U02002820)
5	320	1	PCS	GRMXX001	Grease Nipple	GREASE NIPPLE, STRAIGHT, M6x1.0, A4 (GRMXX001)
5	330	2	PCS	FA0916G05006	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M5x6; CUP POINT (FA0916G05006)
5	340	2	PCS	400095148	Pipe	PIPE, (D10 X T1,5 / L75); MACHINING
4	003	2	PCS	RH317245	Wire Rope Roller	INDICATOR ROLLER ASSEMBLY LW INDICATOR; ASSEMBLY, INDICATOR ROLLER, LEVEL WIND INDICATOR
5	010	1	PCS	RH317247	Level Wind Indicator	LEVEL WIND INDIACTOR ROLLER; MACHINING, D50x103, LEVEL WIND INDIACTOR ROLLER
5	020	1	PCS	RH317246	Roller Shaft	ROLLER SHAFT LEVEL WIND INDICATOR; MACHINING, D50x163,5, ROLLER SHAFT, LEVEL WIND INDICATOR
5	030	1	PCS	RH316935	Bearing Plain	LINING, D30/d20x12, MACHINING
5	040	1	PCS	RH316936	Distance Ring	DISTANCE RING, D42/d35x8, MACHINING
5	050	1	PCS	RH317248	Distance Ring	DISTANCE RING, D28/d24x37, MACHINING

Level	Pos	Qty	Unit	Aras ID	Name	Description
5	060	1	PCS	RH408161	Locking Plate	LOCK DISC, D40/d11x6, TWS-
5	070	1	PCS	BECRI2520	Cylindrical Roller Bearing	NEEDLE R BRG, W/INNER RING, NKI 25/20-TV; d25/D38x20 (BECRI2520)
5	080	1	PCS	BEDBS025	Deep Groove Ball Bearing	DEEP GROOVE BALL BEARING, 6004; d20/D42x12 (BEDBS025)
5	090	1	PCS	SESRA006	Rotary Shaft Lip Seal	SEAL, 30x42x7, 42x42x7 (SESRA006)
5	100	2	PCS	FA0472F0420	Circlip	CIRCLIP RING INTERNAL, A2 DIN 472 I42; STAINLESS (material x40Cr13) (FA0472F0420)
5	110	1	PCS	FA0933G10020	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x20; FULLY THREADED (FA0933G10020)
5	120	1	PCS	GRMFX004	Grease Nipple	GREASE NIPPLE, STRAIGHT, M10x1.0, A4 (GRMFX004)
5	130	1	PCS	SESRB0020	Rotary Shaft Lip Seal	SEAL, 30x42x7, W/STAINLESS SPRING, 42x42x7 (SESRB0020)
4	004	1	PCS	RH329308	COUNTER WEIGHT, LW EL5000 (L&R), ASSY	COUNTER WEIGHT, LW EL5000 (L&R), ASSY
5	010	1	PCS	RH31858401	COUNTER WEIGHT, D200x520, MACHINING	COUNTER WEIGHT, D200x520, MACHINING
5	020	1	PCS	RH329309	Bracket	COUNTER WEIGHT BRACKET, 534,3x240/T10; BENDING & PREMACHINING
5	030	2	PCS	RH32770303	COUNTER WEIGHT PLATE,(T30/D180),PREMACH	COUNTER WEIGHT PLATE,(T30/D180),PREMACH
5	040	2	PCS	FA0933G12050	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x50; FULLY THREADED (FA0933G12050)
5	050	3	PCS	FA0933G12025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x25; FULLY THREADED (FA0933G12025)
5	060	5	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
4	005	1	PCS	RH318565	Bearing Plain	LINING, D95/d75x37, MACHINING
4	006	1	PCS	RH318566	Sheave Shaft	SHEAVE SHAFT, D128(11)/d75(174)x185; MACHINING, Ø128(11)/Ø75(174)x185
4	007	1	PCS	RH318567	Bearing Plain	LINING, D95/d75x42, MACHINING
4	008	1	PCS	RH318568	Clamp	CLAMPING DISC, D128/D95/d21x12 (PCD=108); MACHINING
4	009	1	PCS	RH31856401	Plate	WIRE GUIDE, PLATE (T40 / 105x140); T40
4	010	1	PCS	RH31856403	Plate	WIRE GUIDE, PLATE (T30 / 105x140); T40
4	011	2	PCS	RH328978	Shaft Adapter	ADAPTER, M20x2,5 - Ø8, MACHINING
4	012	2	PCS	400092338	XXTEXTSENSOR_M8	Please refer to the Legacy BOM report
4	013	8	PCS	FA7981G080	Screw	WOOD SCREW, DIN 7981, A4, 6,3x25 (FA7981G080)
4	014	4	PCS	FA0916G05010	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M5x10; CUP POINT (FA0916G05010)
4	015	1	PCS	FA0933G20060	Screw	HEX.HEAD SCREW A4-80, DIN 933 M20x60; FULLY THREADED (FA0933G20060)
4	016	4	PCS	FA0933G12025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x25; FULLY THREADED (FA0933G12025)
4	017	8	PCS	FA0933G08020	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x20; FULLY THREADED (FA0933G08020)
4	018	2	PCS	FA0934G24	Nut	HEXAGON NUT, A4-80, DIN 934, M24 (FA0934G24)
4	019	2	PCS	FA0125G24	Washer	FLAT WASHER, A4, DIN 125 M24; Tykkelse h=4.0 d=25 (FA0125G24)
4	020	2	PCS	FA0125G20	Washer	FLAT WASHER, A4, DIN 125 M20; Tykkelse h=3.0 d=21 (FA0125G20)
4	021	4	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
4	022	8	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)
4	023	1	PCS	FA25201Q20	Washer	NORD-LOCK WASHER, ELZN DIN 25201 M20; 21,0x30,7x3,4 (FA25201Q20)
4	024	1	PCS	GRMAX001S	Grease Nipple	GREASE NIPPLE, STRAIGHT, M10x1.5, A2 (GRMAX001S)
3	004	1	PCS	400180510	Bracket	UNP 100 x 50 x 3225
3	005	2	PCS	400180579	Guide Shaft	D170 x 3216
3	006	1	PCS	400203401	Level Wind	LEVEL WIND CAR. LW EL5000 (L&R), AXIS DIST. APPR. 522mm; HIWIN Ball Nut
3	007	1	PCS	400092451	Ball Screw	BALL SCREW, D63x10, MACHINING
3	008	1	PCS	RH318419	Wear Ring	WEAR RING, D70/d50x79,5, MACHINING
3	009	1	PCS	RH318420	Cover	BEARING COVER, D176/d95x15, MACHINING; MACHINING, Ø176(5), Ø150(6) & Ø120(4)/Ø110x13, Ø95
3	010	1	PCS	RH318421	Wear Ring	WEAR RING, D70/d50x113, MACHINING
3	011	1	PCS	RH318422	Cover	BEARING HOUSING COVER, D156/d64x16; MACHINING, Ø156(8), Ø110x8/Ø75(14), Ø64
3	012	1	PCS	RH318423	Wear Ring	WEAR RING, D120/d80x23, MACHINING
3	013	1	PCS	RH318424	Distance Ring	THRUST RING, D145/d50x48,5, MACHINING
3	014	4	PCS	RH318425	Wear Ring	WEAR RING, D185/d170x68, MACHINING
3	015	2	PCS	RH318441	Cover	COVER, T=20, D=215/d26, MACHINING
3	016	2	PCS	400180580	Plate	T20 / D215 x d26

Level	Pos	Qty	Unit	Aras ID	Name	Description
3	017	4	PCS	RH318553	Bearing Plain	LINING, D190/d170x100, MACHINING
3	018	2	PCS	RH318554	Bearing Housing	SHEAVE FRAME, BEARING HOUSING, LW EL5000; MACHINING, Ø190/Ø170x100
3	019	1	PCS	RH318555	Bearing Plain	LINING, D100/d90x30, MACHINING
3	020	1	PCS	RH318556	Distance Ring	THRUST RING, D115/d37x10, MACHINING
3	021	1	PCS	RH318557	Cover	BEARING HOUSING COVER, D250x20; MACHINING, PCD220, Ø250x20
3	022	1	PCS	RH318558	Bearing Plain	LINING, D100xd90x26, MACHINING
3	023	1	PCS	RH318559	Bearing Plain	LINING, D100xd90x49, MACHINING
3	024	1	PCS	RH318570	Cover	COVER, D98/d63x6, MACHINING
3	025	1	PCS	RH31855701	Gasket	
3	026	1	PCS	RH31842001	Gasket	
3	027	1	PCS	400203461	Plate	T6 / D130 x d63; WIPE RING - SPLIT - HIWIN Ball Nut
3	028	2	PCS	RH312370	Protection	SENSOR HOLDER/PROTECTION, MACHINING; MACHINING, M18x1P
3	029	2	PCS	RH31253801	DETECTOR FOR PICK UP, D25 x L190 / M24	DETECTOR FOR PICK UP, D25 x L190 / M24; MACHINING
3	030	2	PCS	RH318112	Cover	BEARING HOUSING COVER RW-2340E-S90; MACHINING, D156/D74, BEARING HOUSING COVER
3	031	3	PCS	RH31811201	Gasket	
3	032	1	PCS	RH318114	Locking Nut	LOCKING NUT, M50x1,5 (T=45), MACHINING
3	033	1	PCS	RH314170	Key	KEY, 12x8x142
3	034	2	PCS	RH318783	Washer	LOCK WASHER, D55/d12x8, MACHINING
3	035	2	PCS	RH409939	Bracket	HOUSING FOR PICKUP
3	036	1	PCS	RH318119	Protection	CABLE CHAIN PROTECTION, T=6, BENDING
3	037	1	PCS	RH316978	Bracket	BRACKET FOR CABLE GUIDE RAIL ROVW-2021E; MACHINING, BRACKET FOR CABLE GUIDE RAIL
3	038	1	PCS	RH31722602	Bracket	BRACKET F CABLE GUIDE RAIL CTDW-520E-T90; MACHINING, BRACKET FOR CABLE GUIDE RAIL
3	039	2	PCS	RH31841103	Bracket	CABLE PROTECTION BRACKET, T=10; MACHINING
3	040	1	PCS	RH31841104	Bracket	CABLE PROTECTION BRACKET, T=5, MACHINING
3	041	2	PCS	RH319754	Plate	PLATE, T=8, MACHINING; PLATE
3	042	1	PCS	RH319119	Distance Ring	SPACER, D58/d40x16, MACHINING
3	043	1	PCS	400180582	Cable Chain	E4.32.05.063.0 - Series E4.32
3	044	1	PCS	GETGN1031	Gearbox	GEAR MTR 240NM/2,2KWI=16,3/EN/BR; GEAR MOTOR 240NM/2,2KW-100/SK9022/I=16,3/EN/BR (GETGN1031)
3	045	1	PCS	RH328834	Cover	GEARBOX COVER, SK9022, ASSEMBLY
4	010	1	PCS	RH328835	Cover	GEARBOX COVER, SK9022, WELDING ASSEMBLY
4	020	4	PCS	FA0933G08008	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x8; FULLY THREADED (FA0933G08008)
4	030	4	PCS	FA0912G08016	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M8x16; FULLY THREADED (FA0912G08016)
4	040	4	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)
4	050	1	PCS	COGLX041	Sealing Compound	WURTH MS 40, POLYMER B SEALANT (COGLX041)
3	046	2	PCS	FA0471U0600	Circlip	CIRCLIP RING EXTERNAL, STEEL DIN 471 A60; SPRING STEEL, PHOSPHATED, HRC 44-49 (FA0471U0600)
3	047	3	PCS	FA0472A1300	Circlip	CIRCLIP RING INTERNAL,STEEL DIN 472 I130; SPRING STEEL, PHOSPHATED, HRC 44-49 (FA0472A1300)
3	048	2	PCS	BESRS041	Spherical Roller Bearing	SPHERICAL ROLLER BEARING, 22212-E1; d60/D110x28 (BESRS041)
3	049	1	PCS	BECTF086	Axial Roller Bearing Cylindrical	AXIAL CYLINDRICAL ROLLER BRNG, 81122-TV; d110/D160x38 (BECTF086)
3	050	2	PCS	BECRF014918	Cylindrical Roller Bearing	CYLINDRICAL ROLLER BEARING SL014918; d90/D125x35 (BECRF014918)
3	051	1	PCS	BECTF079	Axial Roller Bearing Cylindrical	AXIAL CYLINDRICAL ROLLER BRNG, 81118-TV; d90/D135x35 (BECTF079)
3	053	1	PCS	400203506	Ball Nut	BALL NUT R63-10T6-FSIDIN BP 2 (HIWIN)
3	054	4	PCS	FA0912G06016	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M6x16; FULLY THREADED (FA0912G06016)
3	055	8	PCS	FA0912G05012	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M5x12 (FA0912G05012)
3	056	8	PCS	FA0916G08012	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M8x12; CUP POINT (FA0916G08012)
3	057	1	PCS	FA0931G16120	Screw	HEX.HEAD SCREW A4-80, DIN 931 M16x120; THREAD LENGTH: 38mm (FA0931G16120)
3	058	8	PCS	FA0931G08090	Screw	HEX.HEAD SCREW A4-80, DIN 931 M8x90; THREAD LENGTH: 22mm (FA0931G08090)
3	059	1	PCS	FA0933E36080	Screw	HEX.HEAD SCREW 8.8 ELZN, DIN 933 M36x80; FULLY THREADED (FA0933E36080)
3	060	4	PCS	FA0933G24060	Screw	HEX.HEAD SCREW A4-80, DIN 933 M24x60; FULLY THREADED (FA0933G24060)

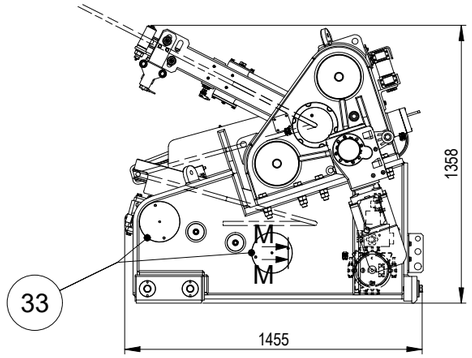
Level	Pos	Qty	Unit	Aras ID	Name	Description
3	061	18	PCS	FA0933G24110	Screw	HEX.HEAD SCREW A4-80, DIN 933 M24x110; FULLY THREADED (FA0933G24110)
3	062	6	PCS	FA0933G16050	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x50; FULLY THREADED (FA0933G16050)
3	063	12	PCS	FA0933G16055	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x55; FULLY THREADED (FA0933G16055)
3	064	28	PCS	FA0933G10020	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x20; FULLY THREADED (FA0933G10020)
3	065	14	PCS	FA0933G10025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x25; FULLY THREADED (FA0933G10025)
3	066	3	PCS	FA0933G10030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x30; FULLY THREADED (FA0933G10030)
3	067	10	PCS	FA0933G10035	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x35; FULLY THREADED (FA0933G10035)
3	068	10	PCS	FA0933G06016	Screw	HEX.HEAD SCREW A4-80, DIN 933 M6x16; FULLY THREADED (FA0933G06016)
3	069	40	PCS	FA0934G24	Nut	HEXAGON NUT, A4-80, DIN 934, M24 (FA0934G24)
3	070	7	PCS	FA0934G16	Nut	HEXAGON NUT, A4-80, DIN 934, M16 (FA0934G16)
3	071	5	PCS	FA0934G10	Nut	HEXAGON NUT, A4-80, DIN 934, M10 (FA0934G10)
3	072	8	PCS	FA0934G08	Nut	HEXAGON NUT, A4-80, DIN 934, M8 (FA0934G08)
3	073	1	PCS	FA25201Q36	Washer	NORD-LOCK WASHER, ELZN DIN 25201 M36; 36,6x58,5x4,6 (FA25201Q36)
3	074	44	PCS	FA0125G24	Washer	FLAT WASHER, A4, DIN 125 M24; Tykkelse h=4.0 d=25 (FA0125G24)
3	075	18	PCS	FA0125G16	Washer	FLAT WASHER, A4, DIN 125 M16; Tykkelse h=3.0 d=17 (FA0125G16)
3	076	42	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
3	077	16	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)
3	078	14	PCS	FA0125G06	Washer	FLAT WASHER, A4, DIN 125 M6; Tykkelse h=1.6 d=6.4 (FA0125G06)
3	079	2	PCS	SESRA118	Rotary Shaft Lip Seal	SEAL, BA-70-95-10, 95x95x10 (SESRA118)
3	080	3	PCS	SESRA061	Rotary Shaft Lip Seal	SEAL, 100x130x12, 130x130x12 (SESRA061)
3	081	1	PCS	SESRA053	Rotary Shaft Lip Seal	SEAL, 90x110x12, 110x110x12 (SESRA053)
3	082	1	PCS	SESRA026	Rotary Shaft Lip Seal	SEAL, 60x75x8, 75x75x8 (SESRA026)
3	083	1	PCS	SEORA092	O-Ring	O-RING, Ø82,14 x 3,53 (R4325), 82x82x4 (SEORA092)
3	084	8	PCS	GRMAX001S	Grease Nipple	GREASE NIPPLE, STRAIGHT, M10x1.5, A2 (GRMAX001S)
3	085	1	PCS	GRMAX003S	Grease Nipple	GREASE NIPPLE, 90°, M10x1.0, A2 (GRMAX003S)
3	086	1	PCS	GRMFX002	Grease Nipple	GREASE NIPPLE, STRAIGHT, M8x1.0, A2 (GRMFX002)
3	087	1	PCS	400092314	XXTEXTELECTRIC	Please refer to the Legacy BOM report
3	088	1	PCS	RH311907	CONNCTION BOX, L80 x B 75 x H55	CONNCTION BOX, L80 x B 75 x H55
3	089	1	PCS	RH409181	Shaft Coupling	CONNECTION BOX FOR LOAD CELL
3	091	1	PCS	COSEX084	Gasket	ANTI-CORR. TAPE, DENSO-50 MM x 10 M (COSEX084)
3	093	1	PCS	COGLX041	Sealing Compound	WURTH MS 40, POLYMER B SEALANT (COGLX041)
2	002	1	PCS	400180717	Bracket	WELDING/MACHINING
2	003	1	PCS	400180861	Bracket	WELDING/MACHINING
2	004	1	PCS	400181022	Frame	PCD900
3	001	1	PCS	400180946	Bracket	PCD900
3	002	3	PCS	400180969	Wire Rope Guide	PCD900
3	003	2	PCS	400180967	Wear Ring	D85 x 5 x 47.5
3	004	1	PCS	400180995	Bolt	D75 x 178
3	005	2	PCS	400181019	Plate	T10 / D100 x d18
3	006	4	PCS	FA0125G20	Washer	FLAT WASHER, A4, DIN 125 M20; Tykkelse h=3.0 d=21 (FA0125G20)
3	007	2	PCS	FA0125G16	Washer	FLAT WASHER, A4, DIN 125 M16; Tykkelse h=3.0 d=17 (FA0125G16)
3	008	4	PCS	FA0933G20045	Screw	HEX.HEAD SCREW A4-80, DIN 933 M20x45; FULLY THREADED (FA0933G20045)
3	009	2	PCS	FA0933G16035	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x35; FULLY THREADED (FA0933G16035)
3	010	12	PCS	FA7991G08020	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M8x20 (FA7991G08020)
3	011	1	PCS	GRMFX004	Grease Nipple	GREASE NIPPLE, STRAIGHT, M10x1.0, A4 (GRMFX004)
2	005	1	PCS	400181045	Frame	PCD900
3	001	1	PCS	400181036	Bracket	PCD900
3	002	3	PCS	400180969	Wire Rope Guide	PCD900

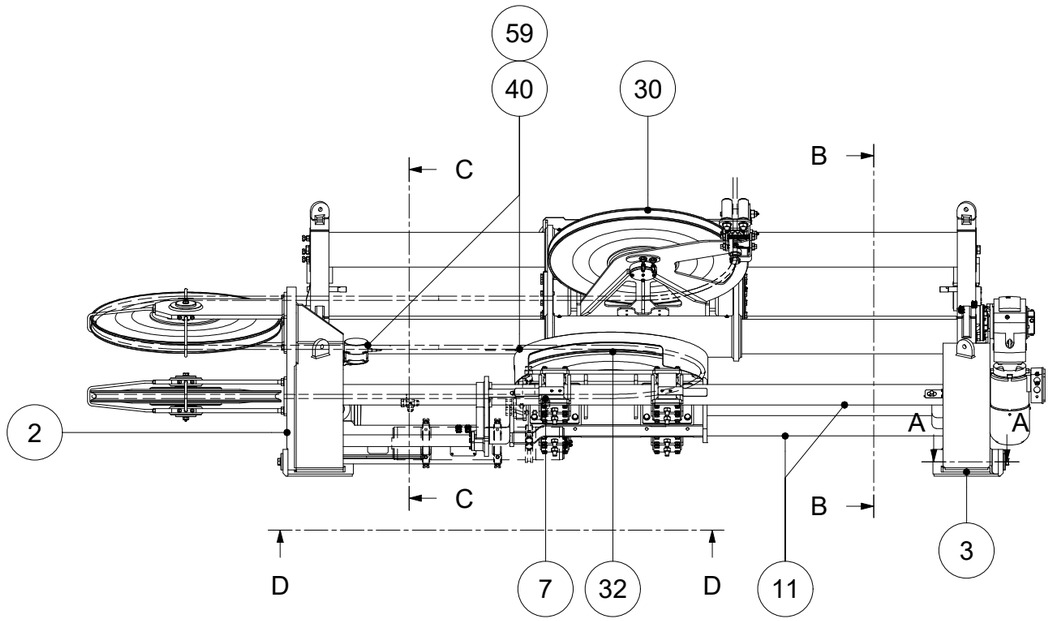
Level	Pos	Qty	Unit	Aras ID	Name	Description
3	003	2	PCS	400181019	Plate	T10 / D100 x d18
3	004	2	PCS	400180967	Wear Ring	D85 x 5 x 47.5
3	005	1	PCS	400180995	Bolt	D75 x 178
3	006	6	PCS	FA0125G16	Washer	FLAT WASHER, A4, DIN 125 M16; Tykkelse h=3.0 d=17 (FA0125G16)
3	007	2	PCS	FA0933G16035	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x35; FULLY THREADED (FA0933G16035)
3	008	4	PCS	FA0933G16040	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x40; FULLY THREADED (FA0933G16040)
3	009	12	PCS	FA7991G08020	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M8x20 (FA7991G08020)
3	010	1	PCS	GRMFX004	Grease Nipple	GREASE NIPPLE, STRAIGHT, M10x1.0, A4 (GRMFX004)
2	006	1	PCS	400177707	Cylinder Assembly	SWC HYDRAULIC CYLINDER, S=1150mm
3	001	1	PCS	400177698	Cylinder Assembly	M155 x 3 / d135
3	002	1	PCS	RH318657	Stuffing Box	STUFFING BOX FOR CYLINDER SWC-5000; MACHINING, Ø148x187
3	003	1	PCS	RH318602	Plate	ROD BLOCKER, D110/d32x25, MACHINING
3	004	1	PCS	400177706	Piston Rod	D90x1498
3	005	1	PCS	RH310970	Assembly Plate	TERMINALS CONECTION PLATE, ASSEMBLY; M155x3
3	006	1	PCS	BESPS002	Radial Spherical Plain Bearing	RADIAL SPHERICAL PLAIN BNG, GE 40 UK-2RS; d40/D62x28 (BESPS002)
3	007	1	PCS	BESPS100	Radial Spherical Plain Bearing	ROD END, GAR-40-UK-2RS; d40x28 - M39x3 (BESPS100)
3	008	1	PCS	FA0472E0620	Circlip	CIRCLIP RING INTERNAL, ELZN DIN 472 I62; SPRING STEEL, PHOSPHATED, HRC 44-49 (FA0472E0620)
3	009	1	PCS	FA0985E30	Nut	NUT NYLOCK HEXAGON, 8 ELZN, DIN 985 M30 (FA0985E30)
3	010	1	PCS	GRMXX002	Grease Nipple	GREASE NIPPLE, M8x1,0 STRAIGHT, A4 (GRMXX002)
3	011	1	PCS	SEDWA014	Hydraulic Seal rod	DIRT-WIPER AS-90-100-7/10, 100x100x10 (SEDWA014)
3	012	1	PCS	SEPRA015	Hydraulic Seal rod	PISTON ROD SEAL AUN-90-107, SIMRIT, 110x110x12 (SEPRA015)
3	013	1	PCS	SEORA1375	O-Ring	O-RING, Ø120,00 x 7,00 (R8475), 120x120x7 (SEORA1375)
3	014	1	PCS	FCPPF050	Plug	HEXAGON SOCKET PLUG, DIN 908, A4, G1/4"; DIN 908 (ISO 228) (FCPPF050)
2	007	1	PCS	400181046	Sheave Assembly	LEV-SWC
3	001	1	PCS	RH318610	Sheave House	SHEAVE FRAME, SWC-5000, MACHINING; MACHINING, SWC, SHAFT Ø120
3	002	4	PCS	RH318591	ROLLER UNIT (D100), SWC-5000, ASSEMBLY	ROLLER UNIT (D100), SWC-5000, ASSEMBLY
4	010	1	PCS	RH318593	Frame	ROLLER UNIT FRAME, D100, SWC-5000; MACHINING, Ø100
4	020	2	PCS	RH31859205	Locking Plate	LOCKING PLATE, T30, MACHINING; MACHINING, 130x130x25
4	030	2	PCS	RH31859206	Hub	BOSS, D40/d22, MACHINING
4	040	2	PCS	RH31859207	Locking Plate	LOCKING PLATE, T25, MACHINING; MACHINING, 130x130x22
4	050	2	PCS	RH31859208	Drive Shaft	SHAFT, D31xL225, MACHINING; MACHINING, Ø31/Ø225 (Ø25)
4	060	2	PCS	RH31859210	Wire Rope Roller	ROLLER, D108x120, MACHINING
4	070	4	PCS	RH31859211	Wear Ring	WEAR RING, D32/d25x10, MACHINING
4	080	4	PCS	RH31859212	Wear Ring	WEAR RING, D52/d48 x 4, MACHINING
4	090	4	PCS	BETRS003	Taper Roller Bearing	TAPERED ROLLER BEARING, 30205; d25/D52x16,25 (BETRS003)
4	100	4	PCS	SESRA0085	Rotary Shaft Lip Seal	SEAL, BA-32-52-7 W/DUST LIP, 52x52x7 (SESRA0085)
4	110	4	PCS	BELWS005	Washer	LOCKING WASHER, MB-5; MB-5 (BELWS005)
4	120	4	PCS	BELNS005	Locking Nut	LOCK NUT, KM-5; M25x1,5 (BELNS005)
4	130	4	PCS	FA0472F0520	Circlip	CIRCLIP RING INTERNAL, A2 DIN 472 I52; STAINLESS (material x40Cr13) (FA0472F0520)
4	140	16	PCS	FA0933G12025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x25; FULLY THREADED (FA0933G12025)
4	150	16	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
4	160	4	PCS	FA0933G16035	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x35; FULLY THREADED (FA0933G16035)
4	170	4	PCS	FA0125G16	Washer	FLAT WASHER, A4, DIN 125 M16; Tykkelse h=3.0 d=17 (FA0125G16)
4	180	2	PCS	GRMAX003S	Grease Nipple	GREASE NIPPLE, 90°, M10x1.0, A2 (GRMAX003S)
4	190	2	PCS	FA0934G20	Nut	HEXAGON NUT, A4-80, DIN 934, M20 (FA0934G20)
4	200	4	PCS	FA0916G06008	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M6x8; CUP POINT (FA0916G06008)
3	003	1	PCS	FA0471F1000	Circlip	CIRCLIP RING EXTERNAL, A2 DIN 471 A100; STAINLESS (material x40Cr13) (FA0471F1000)
3	004	1	PCS	GRMXX003	Grease Nipple	GREASE NIPPLE, M10x1,5 STRAIGHT, A4 (GRMXX003)

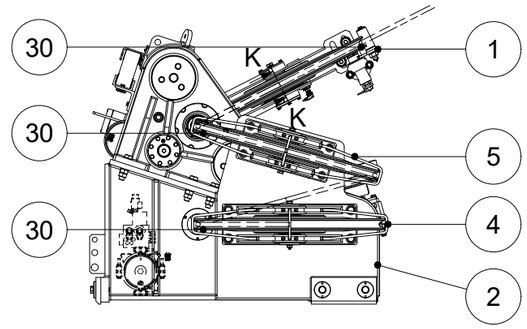
Level	Pos	Qty	Unit	Aras ID	Name	Description
2	008	1	PCS	400181047	Bracket	SWC Cylinder
2	009	1	PCS	400181050	Guide Support	LEV-SWC
2	010	1	PCS	400181060	Guide Support	80 x 40, L = 744
2	011	2	PCS	400181063	Guide Shaft	D100 x 3066
2	012	1	PCS	400197306	Bracket	SWC Cylinder
2	015	2	PCS	400181066	Wear Ring	D105 x 2.5 x 75
2	016	1	PCS	400181070	Bracket	M18 Sensor
2	017	1	PCS	400181069	Bracket	M18 Sensor
2	018	2	PCS	RH31860302	Bracket	INDICATOR BRACKET, T3/40x259, BENDING
2	019	1	PCS	RH318668	Cover	SHEAVE COVER, SWC-5000, MACHINING; MACHINING, SHEAVE, PCD900
2	020	8	PCS	RH312860	Locking Plate	LOCKING WASHER, D80/d50/d22x44; MACHINING
2	021	4	PCS	RH318171	Bracket	GROUND BRACKET, 2xD50 / T=25, MACHINING
2	022	4	PCS	RH318600	Bearing Plain	LINING, D115/d100x23, MACHINING
2	023	2	PCS	RH318666	Locking Bolt	LOCKING BOLT, D40, MACHINING
2	024	2	PCS	RH31450805	Locking Plate	LOCK DISC, D66/d22x=4, MACHINING
2	025	4	PCS	RH31860301	Bearing Plain	LINING, D55/d40x38, MACHINING
2	026	1	PCS	RH319297	FLAG, LEV05000, MACHINING	FLAG, LEV05000, MACHINING
2	027	1	PCS	RH31856404	FLAG SUPPORT, LEV05000, MACHINING	FLAG SUPPORT, LEV05000, MACHINING
2	028	1	PCS	RH411045	Bracket	Valve Bracket, WELDING
2				400182378	Electrical Winch Assembly	Electrical system SlackWire/Levelwind Mbari S9V1, Levelwind
3	001	1	PCS	400091476	Cabinet Basic	KLIPPON POK 162609 EX
3	002	1	PCS	400091488	Mounting Rail	TS35X7.5 ST POK 1626
3	003	2	PCS	400091997	Terminal	ZAP /TW (for ZDK 2,5) END COVER
3	004	8	PCS	EACCA096	Prefabricated Cable	V1-WV4A-10M-PUR-ABG0, 10M PUR M12 90* (EACCA096)
3	005	4	PCS	EACIN0203	Inductive Sensor	E2A-M18KS08-M1-B2, PNP/NC M12 PLUG; To be used with cable w/plug EACCA096 (EACIN0203)
3	006	2	PCS	EACIN022	Inductive Sensor	INDUCTIV PICK IMR-0802-BPSTC0S-PNP/NO (EACIN022)
3	007	10	PCS	EACPG270	Cable Gland	SKINTOP MS-M 12X1,5 (ØF 3-7MM) (EACPG270)
3	008	10	PCS	EACPG280	Cable Gland	SM-M 12X1,5 SKINDICHT BRASS (EACPG280)
3	009	2	PCS	EACPL0011	Prefabricated Cable	EL.PLUG W/KABEL 5 METER, 3P+PE BELDEN (EACPL0011)
3	010	1	PCS	EACPL007	Electronic Card	DIODE-ADAPTER A07C4-2-24VDC; ADAPTER (EACPL007)
3	011	4	PCS	EACPL0202-2	Terminal	AEB 353SC/1 End Bracket (EACPL0202-2)
3	012	1	PCS	EACPL02025	Terminal	TERMINAL GROUNDING, ZPE 2,5 WEIDMULLER (EACPL02025)
3	013	1	PCS	EACPL02026	Terminal	TERMINAL GROUNDING, ZPE 6 WEIDMULLER (EACPL02026)
3	014	19	PCS	EACPL02055	Terminal	TERMINAL DOUBLE, ZDK 2,5 WEIDMULLER (EACPL02055)
3	015	1	PCS	EACPL02056	Terminal	ZDK 2,5 PE Weidmuller (EACPL02056)
3	016	3	PCS	EACPL021401	Terminal	TERMINAL ZDU 2,5 AN (2 HOLES) WEIDMULLER (EACPL021401)
3	017	1	PCS	EACPL02144	Terminal	TW1 (FOR ZDU 2,5) END COVER (EACPL02144)
3	018	1	PCS	EACPL02152	Terminal	ZAP /TW 5 (FOR ZDU 6) END COVER (EACPL02152)
3	019	1	PCS	EACPO015	Wire Strain Gauge	STRING POT, SR1M-125 3175MM 4-20/20-4 MA; String potentiometer transducer (EACPO015)
3	031	1	PCS	400181473	Protection	T30 / D155 x d103
3	033	2	PCS	400181474	Protection Cover	SEALING COVER D200, ASSEMBLY
3	001	1	PCS	400181475	Protection Cover	SEALING COVER D200
3	002	2	PCS	FA0933G06020	Screw	HEX.HEAD SCREW A4-80, DIN 933 M6x20; FULLY THREADED (FA0933G06020)
3	003	1	PCS	FA0933G05006	Screw	HEX.HEAD SCREW A4-80, DIN 933 M5x6; FULLY THREADED (FA0933G05006)
3	004	1	PCS	COGLX041	Sealing Compound	WURTH MS 40, POLYMER B SEALANT (COGLX041)
2	034	4	PCS	FA0125G05	Washer	FLAT WASHER, A4, DIN 125 M5; Tykkelse h=1.0 d=5.3 (FA0125G05)
2	035	3	PCS	FA0125G06	Washer	FLAT WASHER, A4, DIN 125 M6; Tykkelse h=1.6 d=6.4 (FA0125G06)
2	036	15	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)

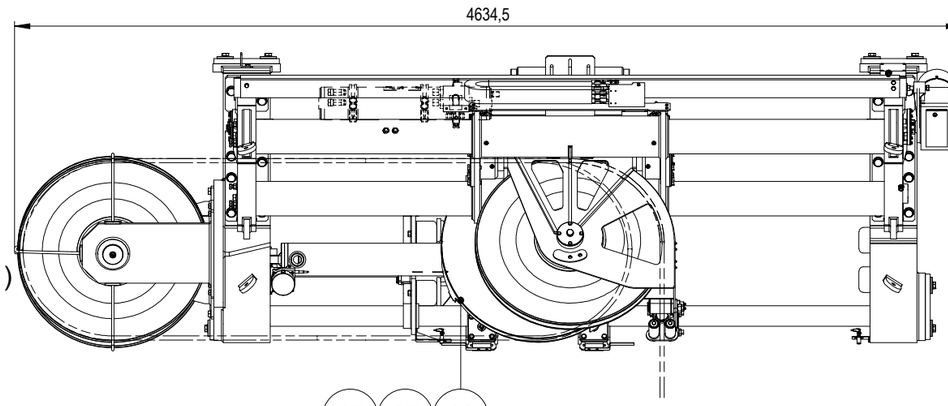
Level	Pos	Qty	Unit	Aras ID	Name	Description
2	037	58	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
2	038	8	PCS	FA0125G16	Washer	FLAT WASHER, A4, DIN 125 M16; Tykkelse h=3.0 d=17 (FA0125G16)
2	039	12	PCS	FA0125G20	Washer	FLAT WASHER, A4, DIN 125 M20; Tykkelse h=3.0 d=21 (FA0125G20)
2	040	1	PCS	FA0912G03010	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M3x10; FULLY THREADED (FA0912G03010)
2	041	4	PCS	FA0933G05010	Screw	HEX.HEAD SCREW A4-80, DIN 933 M5x10; FULLY THREADED (FA0933G05010)
2	042	6	PCS	FA0933G06010	Screw	HEX.HEAD SCREW A4-80, DIN 933 M6x10; FULLY THREADED (FA0933G06010)
2	043	3	PCS	FA0933G06016	Screw	HEX.HEAD SCREW A4-80, DIN 933 M6x16; FULLY THREADED (FA0933G06016)
2	044	1	PCS	FA0933G08016	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x16; FULLY THREADED (FA0933G08016)
2	045	4	PCS	FA0933G08025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x25; FULLY THREADED (FA0933G08025)
2	046	5	PCS	FA0933G08030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x30; FULLY THREADED (FA0933G08030)
2	047	4	PCS	FA0933G12025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x25; FULLY THREADED (FA0933G12025)
2	048	8	PCS	FA0933G12030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x30; FULLY THREADED (FA0933G12030)
2	049	6	PCS	FA0933G12045	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x45; FULLY THREADED (FA0933G12045)
2	050	36	PCS	FA0933G12055	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x55; FULLY THREADED (FA0933G12055)
2	051	4	PCS	FA0933G16045	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x45; FULLY THREADED (FA0933G16045)
2	052	4	PCS	FA0933G20050	Screw	HEX.HEAD SCREW A4-80, DIN 933 M20x50; FULLY THREADED (FA0933G20050)
2	053	8	PCS	FA0933G20080	Screw	HEX.HEAD SCREW A4-80, DIN 933 M20x80; FULLY THREADED (FA0933G20080)
2	054	5	PCS	FA0934G08	Nut	HEXAGON NUT, A4-80, DIN 934, M8 (FA0934G08)
2	055	10	PCS	FA0934G12	Nut	HEXAGON NUT, A4-80, DIN 934, M12 (FA0934G12)
2	056	4	PCS	FA0934G16	Nut	HEXAGON NUT, A4-80, DIN 934, M16 (FA0934G16)
2	057	2	PCS	FA0934G20	Nut	HEXAGON NUT, A4-80, DIN 934, M20 (FA0934G20)
2	058	8	PCS	FA7991G05020	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M5x20 (FA7991G05020)
2	059	1	PCS	EACPO015	Wire Strain Gauge	STRING POT, SR1M-125 3175MM 4-20/20-4 MA; String potentiometer transducer (EACPO015)
2	061	4	PCS	CPXXAND125	Buffer	RUBBER BUFFER STOP, TYPE AND, D125 1XM16; TYPE AND (CPXXAND125)
2	063	1	PCS	COGLX041	Sealing Compound	WURTH MS 40, POLYMER B SEALANT (COGLX041)
2	066	1	PCS	400197410	Plate	T6 / 125 x 190
2				RHHSWC-E	Load Control Valve Assembly	HYD. SYST. F. SLACKW. COMP. (RHHSWC-E)
3	010	1	PCS	HGMAS002	Hydraulic Pressure Test Nipple	TEST POINT 2703-01-18-10(312-01-04R) SS; TESTNIPPEL (HGMAS002)
3	020	1	PCS	HGMAS002	Hydraulic Pressure Test Nipple	TEST POINT 2703-01-18-10(312-01-04R) SS; TESTNIPPEL (HGMAS002)
3	030	1	PCS	HH4CS002	Hydraulic Hose	HP-HOSE 109516,S421x2 ,L=0,5M,350BAR (HH4CS002)
3	040	1	PCS	FTCBF022	Hydraulic Fittings	TRIP.LOK F42X-SS 25 -1 1/4" BSPP-CONN.; 16-20F42EDMXSS (FTCBF022)
3	050	1	PCS	FTUEF006	Hydraulic Fittings	TRIP.LOK ETX-SS 25 UNION ELBOW (FTUEF006)
3	060	1	PCS	FTUNF006	Hydraulic Fittings	TRIP.LOK HTX-SS 25 UNION; 16HMTXSS (FTUNF006)
3	070	2	PCS	FTNUF006	Hydraulic Fittings	TRIP.LOK BTX-SS 25 NUT; 16 BTX-SS (FTNUF006)
3	080	2	PCS	FTMSF009	Hydraulic Fittings	TRIP.LOK TX-SS 25 SLEEVE METRIC; TXSS25 (FTMSF009)
3	090	1	PCS	EACPT008	Pressure Sensor	MBS3050-3411-1GB04 0-250 Bar; Pressure Transmitter 250 bar (EACPT008)
3	100	1	PCS	RHHRRRV2002501S	Pressure Reducing Valve	PRESS. RED.VALVE RV. 200 LPM ø25PH SS (RHHRRRV2002501S)
4	010	1	PCS	RHHBSLO010	Valve Assembly	VALVEBL.PRESS.RED.W/REL.NG30 24V,0.8Amet (RHHBSLO010)
4	020	1	PCS	HGMAS002	Hydraulic Pressure Test Nipple	TEST POINT 2703-01-18-10(312-01-04R) SS; TESTNIPPEL (HGMAS002)
4	030	1	PCS	FTCBF031	Hydraulic Fittings	TRIP.LOK C40X-SS 12 -1/4" BSPP-ELB.C.; 8-4C4OMXSS (FTCBF031)
4	040	1	PCS	FTCBF007	Hydraulic Fittings	TRIP.LOK F42X-SS 12-1/4" BSPP-CONNECTOR; 8-4F42EDMXSS (FTCBF007)
4	050	4	PCS	SEBOB002	Bonded Seal	BONDED SEAL, PP 45-B, 1/4" R/BSP, A4, 21x21x4 (SEBOB002)
4	060	1	PCS	FTUEF011	Hydraulic Fittings	TRIP.LOK C6X-SS 12 SWIVEL NUT ELBOW; 8C6MXSS (FTUEF011)
4	070	1	PCS	FTCBF011	Hydraulic Fittings	TRIP.LOK F42X-SS 15/16-3/8" BSPP-CONN.; 10-6F42EDMXSS (FTCBF011)
4	080	1	PCS	SEBOB003	Bonded Seal	BONDED SEAL, PP 45-C, 3/8" R/BSP, A4, 24x24x4 (SEBOB003)
4	090	1	PCS	FTNUF004	Hydraulic Fittings	TRIP.LOK BTX-SS 15/16 NUT; 10 BTX-SS (FTNUF004)
4	100	1	PCS	FTMSF005	Hydraulic Fittings	TRIP.LOK TX-SS 15 SLEEVE METRIC; TXSS15 (FTMSF005)
4	110	3	PCS	FTCBF022	Hydraulic Fittings	TRIP.LOK F42X-SS 25 -1 1/4" BSPP-CONN.; 16-20F42EDMXSS (FTCBF022)

Level	Pos	Qty	Unit	Aras ID	Name	Description
4	120	3	PCS	SEBOB008	Bonded Seal	BONDED SEAL, PP 45-K, 1 1/4" R/BSP, A4, 52x52x3 (SEBOB008)
4	130	3	PCS	FTNUF006	Hydraulic Fittings	TRIP.LOK BTX-SS 25 NUT; 16 BTX-SS (FTNUF006)
4	140	3	PCS	FTMSF009	Hydraulic Fittings	TRIP.LOK TX-SS 25 SLEEVE METRIC; TXSS25 (FTMSF009)
3	110	1	PCS	RH411045	Bracket	Valve Bracket, WELDING
3	120	6	PCS	FA0933G08025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x25; FULLY THREADED (FA0933G08025)
3	130	1	PCS	RH606985	Hydraulic Accumulator	EHP2-C-0100-250-140-AKAFAAP00 W/CLAMPS
4	010	1	PCS	HVAOT060	Hydraulic Accumulator	ACCUMULATOR EHP2AKAFAAP00; Piston accumulator (HVAOT060)
4	020	2	PCS	HVAOT0704	Hydraulic Accumulator	FASTN.CLAMPS F.HVAOT060, 070,(ø168-172) (HVAOT0704)
3	140	1	PCS	FCSJF190	Hydraulic Adapter	ADAPTER, RI (1 1/2"-1")BSP AISI (FCSJF190)
3	150	1	PCS	FTCBF021	Hydraulic Fittings	TRIP.LOK F42X-SS 25 -1"BSPP-CONNECTOR; 16F42EDMXSS (FTCBF021)
3	160	1	PCS	RH411046	Bracket	ACCUMULATOR BRACKET, MACHINING
3	170	2	PCS	FA0933G10030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x30; FULLY THREADED (FA0933G10030)
3	180	3	PCS	RH606962S	Ball Valve	BALLVALVE BKH R 1 1123 W SWIVEL 25 PHSS
4	010	1	PCS	400192711	Ball Valve	Ball valve Stainless Steel ,1", BKH-DN25-G1 MHA Zentgraf (27673)
4	020	2	PCS	FTSBF011	Hydraulic Fittings	TRIP.LOK F64X-SS 25-1" BSPP.JIC.SWIVEL; 16F64OMXSS (FTSBF011)
4	030	2	PCS	SEBOB007	Bonded Seal	BONDED SEAL, PP 45-H, 1" R/BSP, A4, 43x43x3 (SEBOB007)
3	190	2	PCS	FTUTF006	Hydraulic Fittings	TRIP.LOK JTX-SS 25 UNION TEE; 16JMTXSS (FTUTF006)
3	200	3	PCS	FTUTF019	Hydraulic Fittings	TRIP.LOK R6X-SS 25 SWIVEL NUT RUN TEE; 16 R6X-SS (FTUTF019)
3	210	4	PCS	FTNUF006	Hydraulic Fittings	TRIP.LOK BTX-SS 25 NUT; 16 BTX-SS (FTNUF006)
3	220	4	PCS	FTMSF009	Hydraulic Fittings	TRIP.LOK TX-SS 25 SLEEVE METRIC; TXSS25 (FTMSF009)
3	230	4	PCS	FTUEF015	Hydraulic Fittings	TRIP.LOK C6X-SS 25 SWIVEL NUT ELBOW; 16C6MXSS (FTUEF015)
3	240	3	M	TPPIF020	Pipe Clamp	HYDR. PIPE, Ø25X2.5 SEAML. AISI-316; Ø25X2.5 SEAMLESS ACID PROOF AISI-316 (TPPIF020)
3	250	1	PCS	FTBNF004	Hydraulic Fittings	TRIP.LOK FNTX-SS 15/16 BLIND NUT (FTBNF004)
3	260	2	PCS	FTBNF006	Hydraulic Fittings	TRIP.LOK FNTX-SS 25 BLIND NUT (FTBNF006)

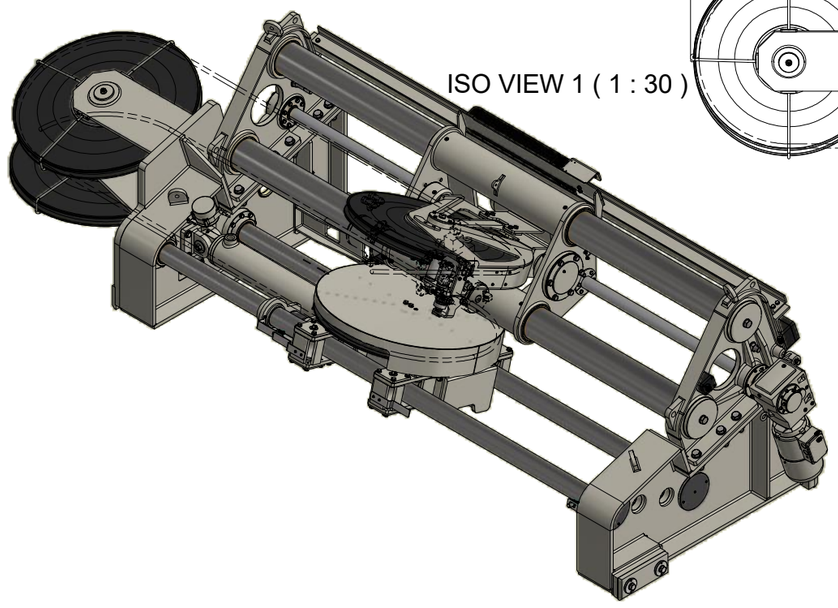




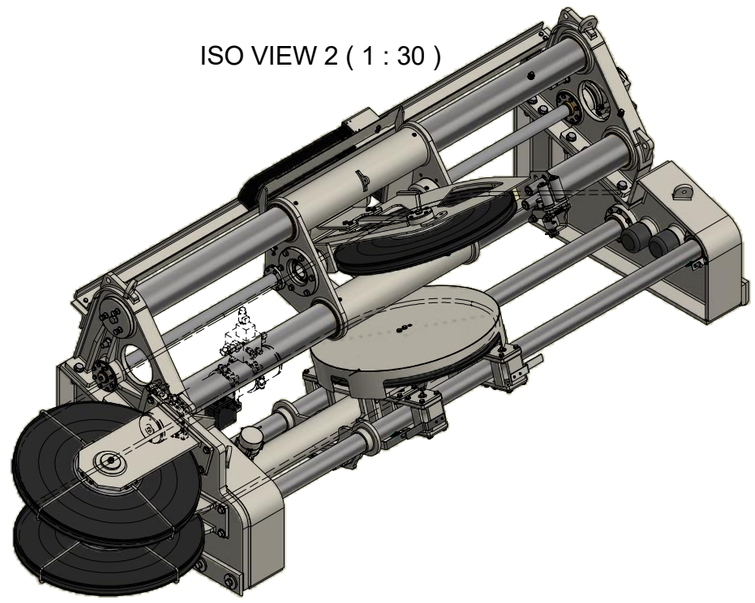




ISO VIEW 1 (1 : 30)



ISO VIEW 2 (1 : 30)



TIGHTENING TORQUE - ACC. DOC. #6402

***MCG SIGNS (Not shown on Drawing)**
***POLYMER - ACC. DOC. #6482 MACHINED SURFACES AND SURFACE TREATMENT**
***LOCTITE 243 - ALL BOLT CONNECTIONS TO BE USED WITH**
***LOCTITE 638 - FOR BONDING OF CYLINDRICAL FITTING PARTS (GAP APROX. 0,25mm)**

62 63 64 65

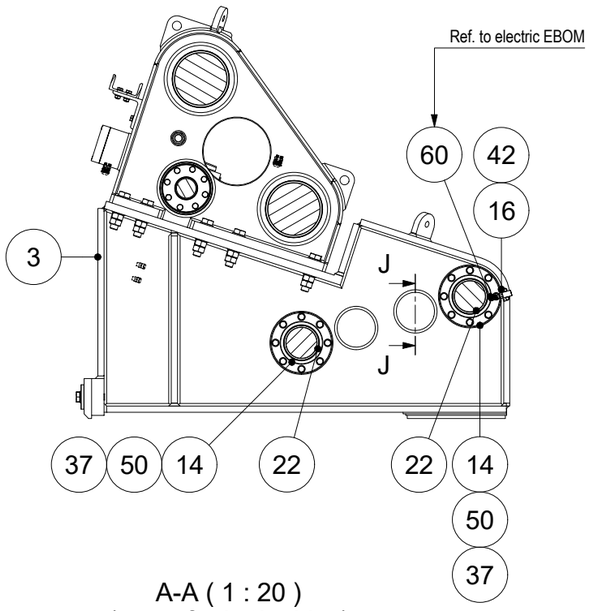
Designed by	Date	Modified by	ECO / CO			
P Pantovic	27.12.2021	M Stojkovic	ECO-2057498			

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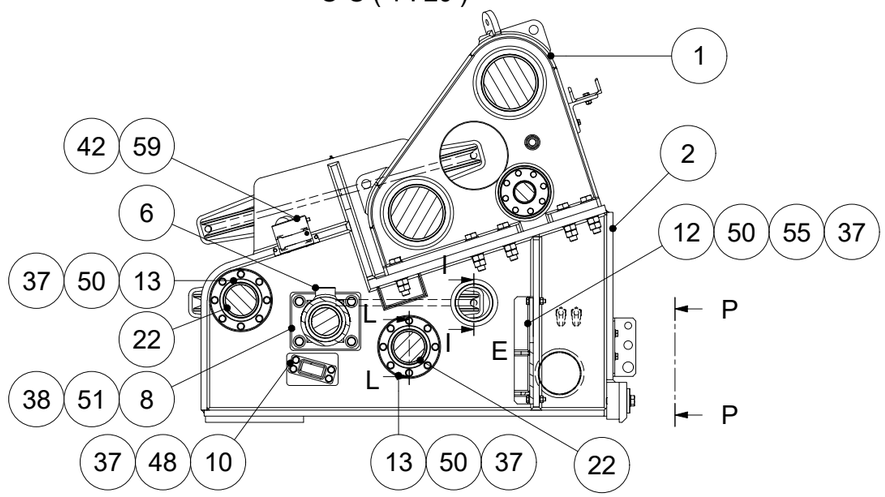
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ASSEMBLY	4544 kg
Description	Scale (A3)
LEV. WITH SLACK WIRE, LSWC5000/01L1	1 : 30
Document ID 2000004320	Revision C / Sheet 1 / 2

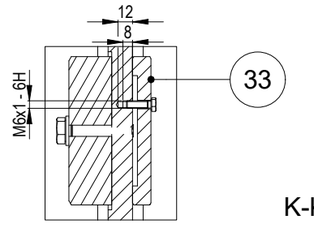
B-B (1 : 20)



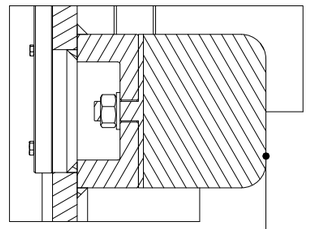
C-C (1 : 20)



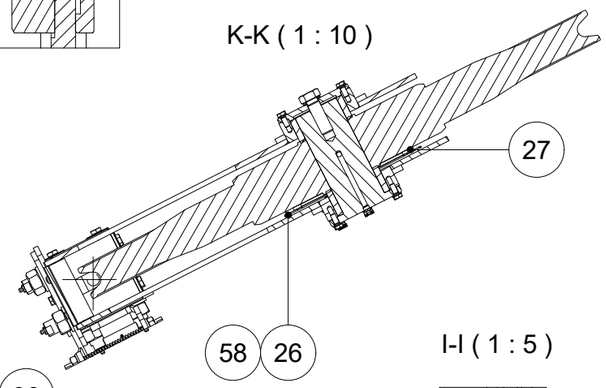
M-M (1 : 5)



J-J (1 : 5)



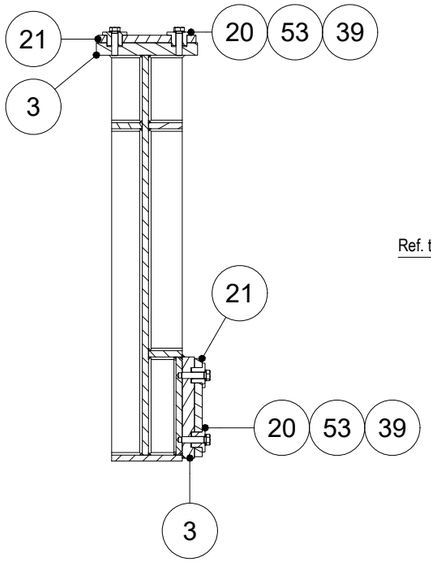
K-K (1 : 10)



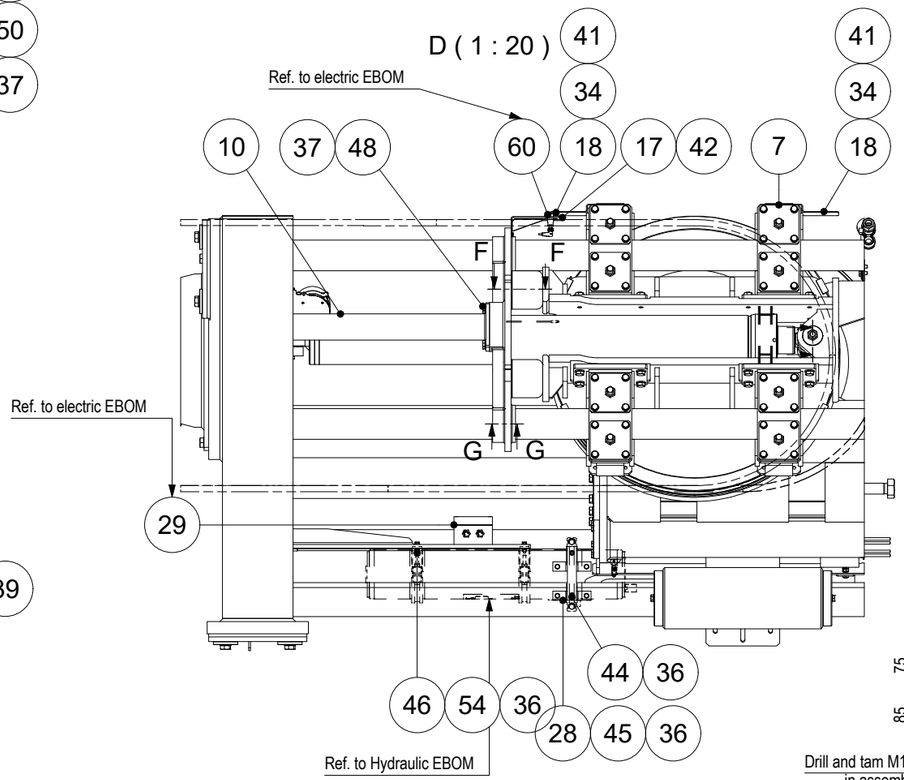
61 56 38

Same for both sheaves

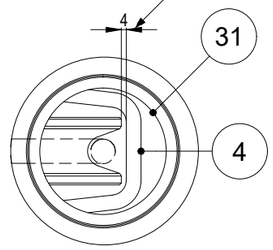
A-A (1 : 20)
(same for both sides)



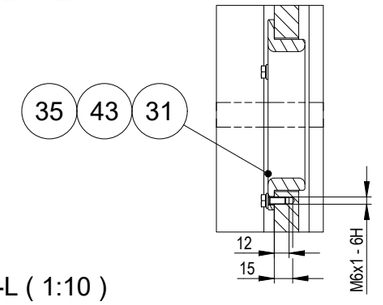
D (1 : 20)



E (1 : 5)

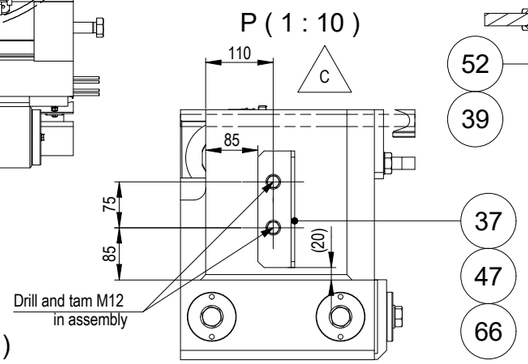


I-I (1 : 5)

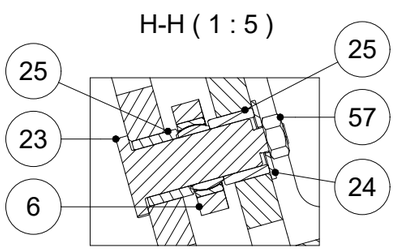


L-L (1:10)

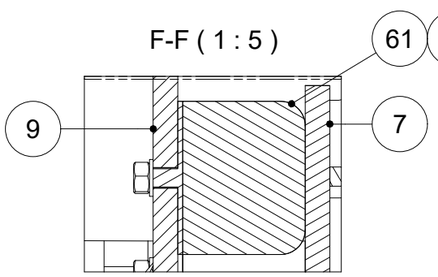
P (1 : 10)



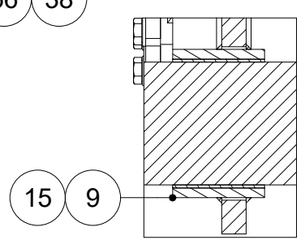
H-H (1 : 5)



F-F (1 : 5)



G-G (1 : 5)



Designed by	Date	Modified by	ECO / CO			
P Pantovic	12/27/2021	M Stojkovic	ECO-2057498			

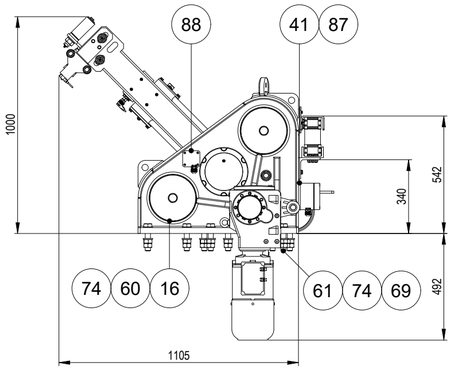
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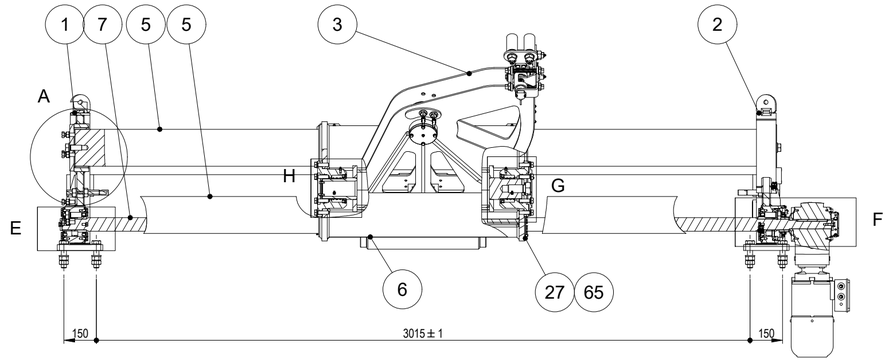
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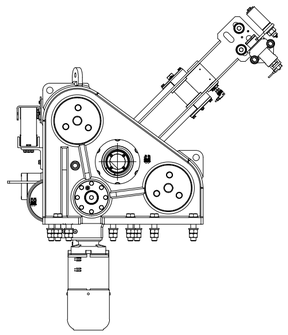
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ASSEMBLY	4544 kg
Description	Scale (A3)
LEV. WITH SLACK WIRE, LSWC5000/01L1	1 : 20
Document ID 2000004320	Revision C / Sheet 2 / 2

Sheet Purpose:

ASSEMBLY

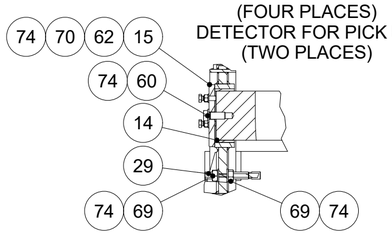


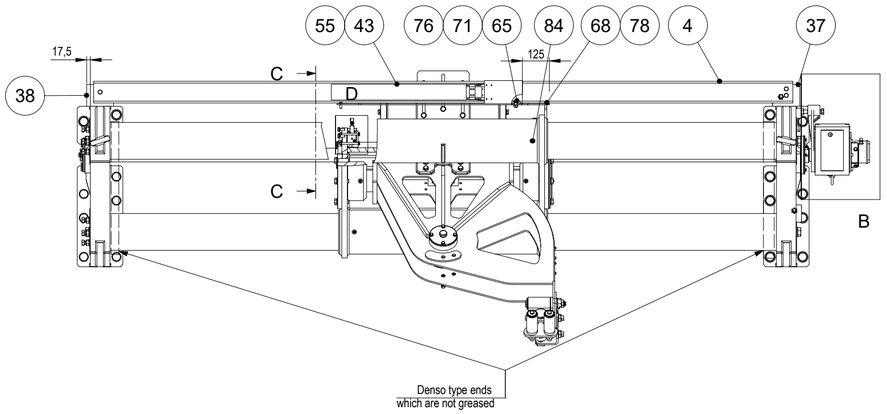


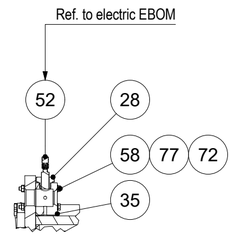


B (1 : 10)

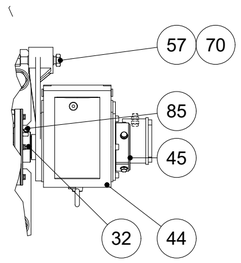
A (1 : 15)
END GUIDE SHAFT
(FOUR PLACES)
DETECTOR FOR PICK UP
(TWO PLACES)



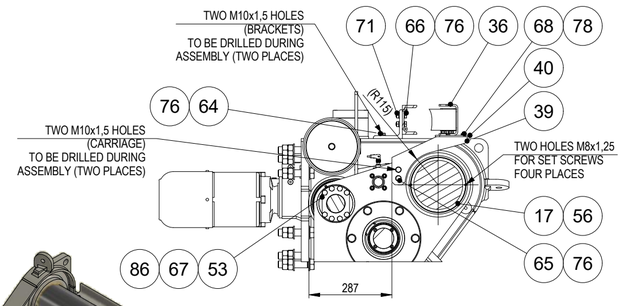




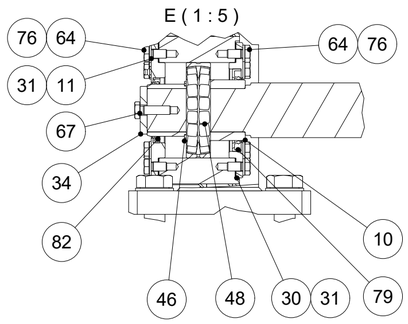
D (1 : 10)
TWO PLACES



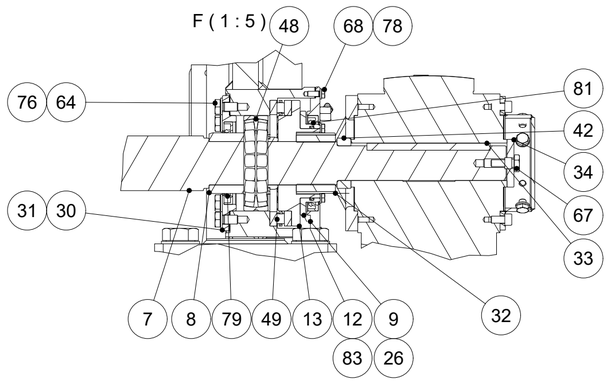
C-C (1 : 15)

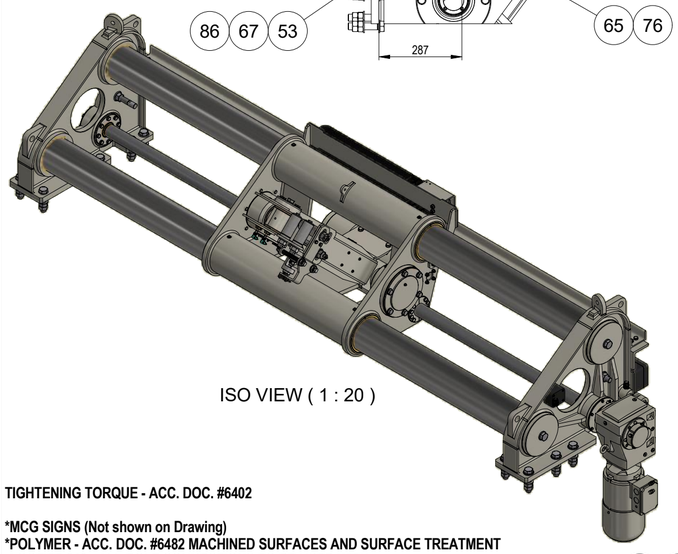


E (1 : 5)



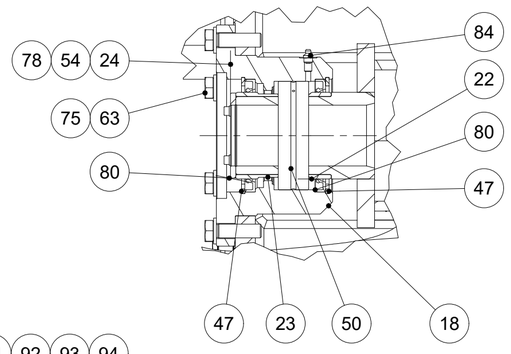
F (1 : 5)



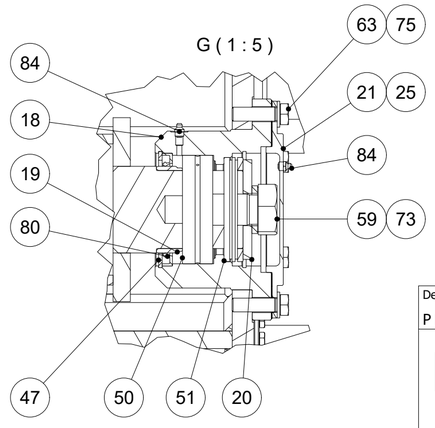


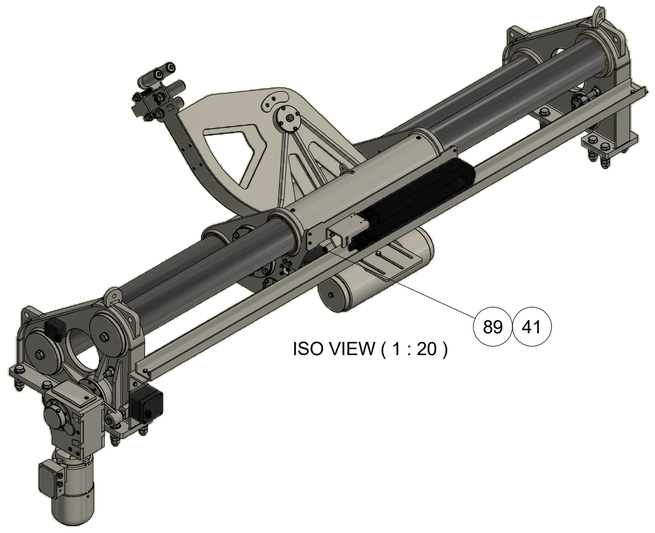
ISO VIEW (1 : 20)

H (1 : 5)



G (1 : 5)





ISO VIEW (1 : 20)

TIGHTENING TORQUE - ACC. DOC. #6402

***MCG SIGNS (Not shown on Drawing)**
***POLYMER - ACC. DOC. #6482 MACHINED SURFACES AND SURFACE TREATMENT**
***LOCTITE 243 - ALL BOLT CONNECTIONS TO BE USED WITH**
***LOCTITE 638 - FOR BONDING OF CYLINDRICAL FITTING PARTS (GAP APROX. 0,25mm)**
***DENSO TAPE - TO BE APPLIED AT NOT PAINTED SURFACES**

90 91 92 93 94

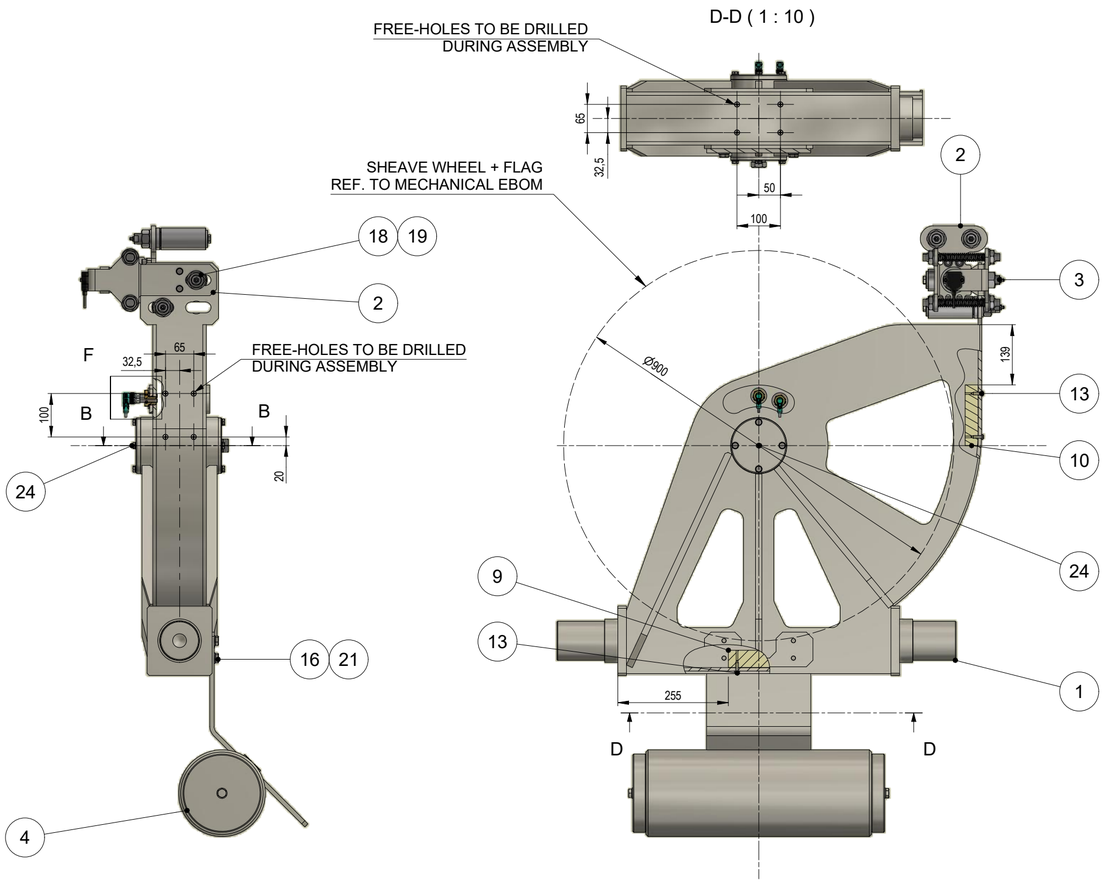
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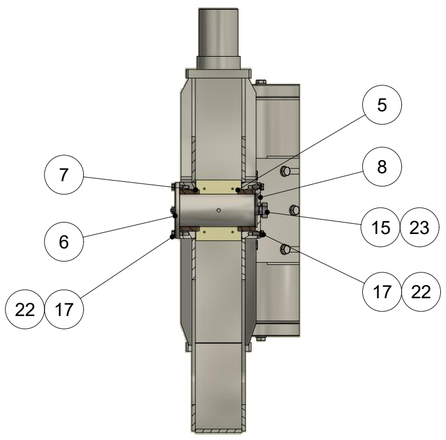
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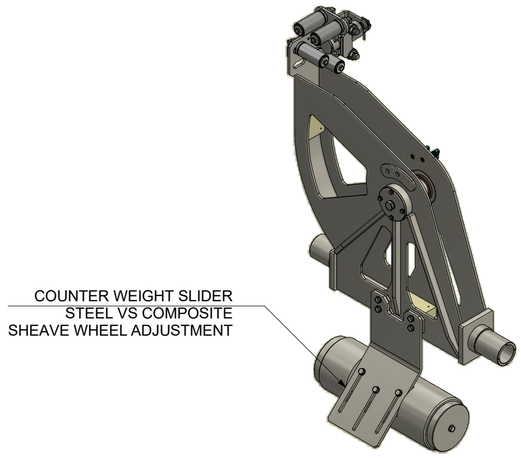
Name	Weight (kg)
Level Wind	2182
Description	Scale (A2)
LEV-5000E/900-L2000, L	1 : 20
Document ID	Revision / Sheet
2000004088	B / 1 / 1

LEFT



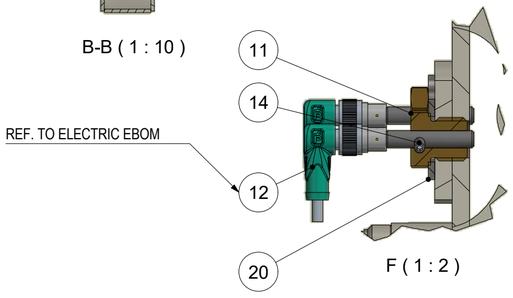


B-B (1 : 10)



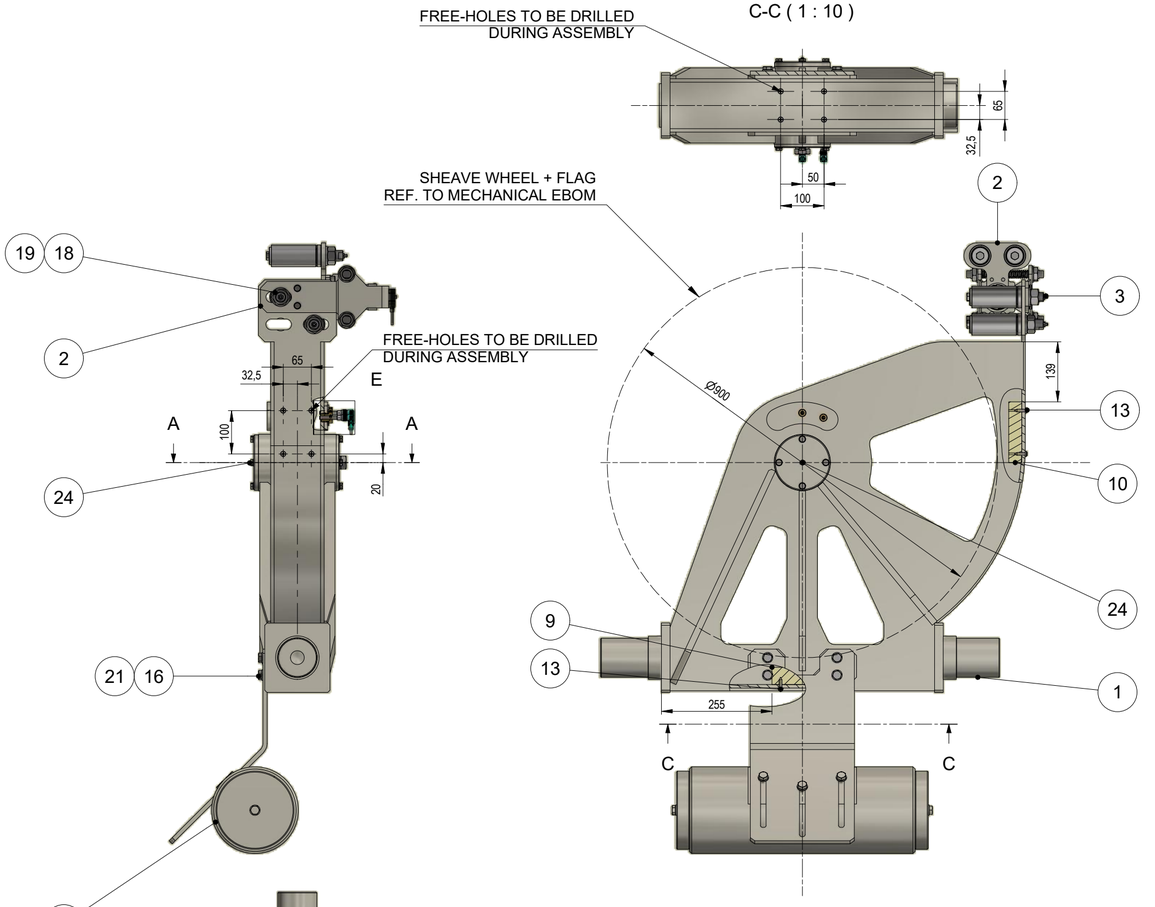
ISO VIEW
(1 : 15)

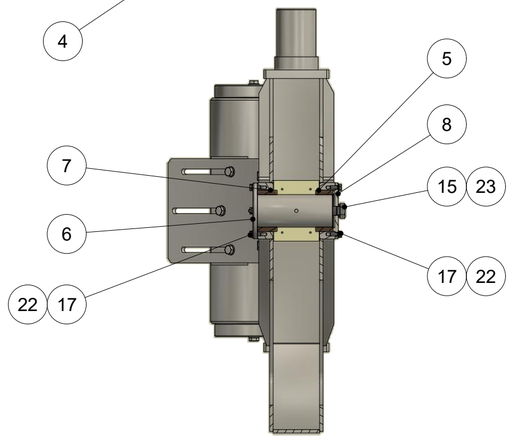
COUNTER WEIGHT SLIDER
STEEL VS COMPOSITE
SHEAVE WHEEL ADJUSTMENT



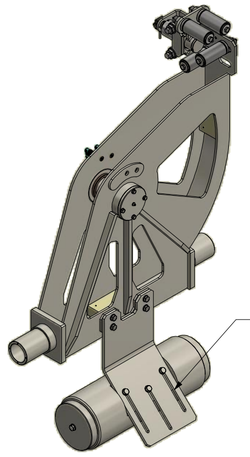
F (1 : 2)

RIGHT



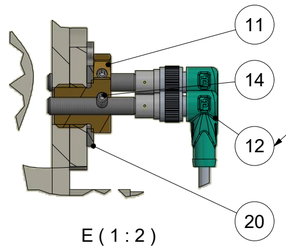


A-A (1 : 10)



ISO VIEW
(1 : 15)

COUNTER WEIGHT SLIDER
STEEL VS COMPOSITE
SHEAVE WHEEL ADJUSTMENT



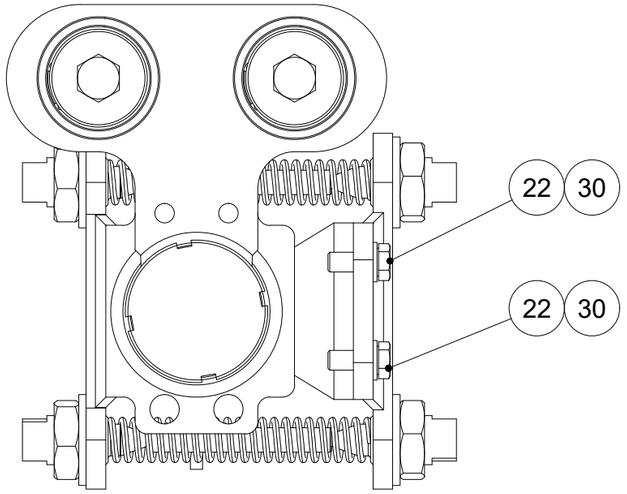
E (1 : 2)

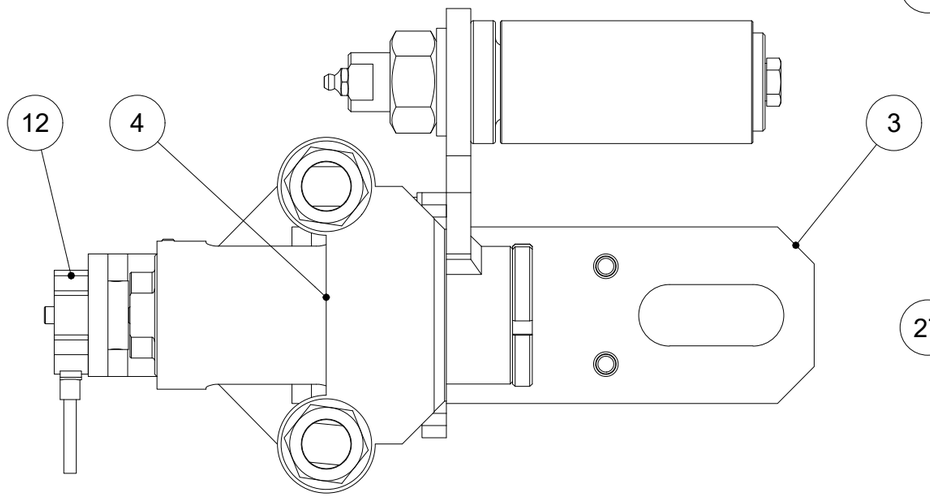
Designed by	Date	Modified by	ECO / CO			
P Pantovic	15.12.2021.	P Pantovic	ECO-2056483			

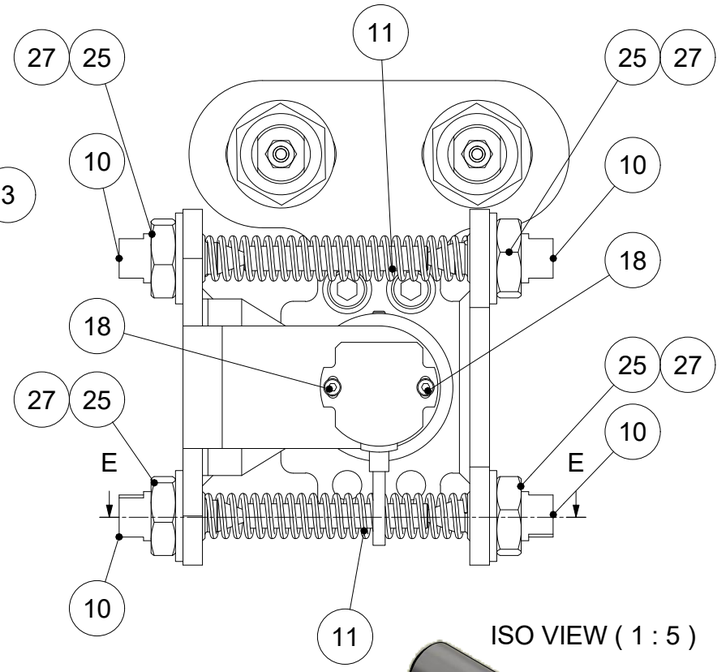
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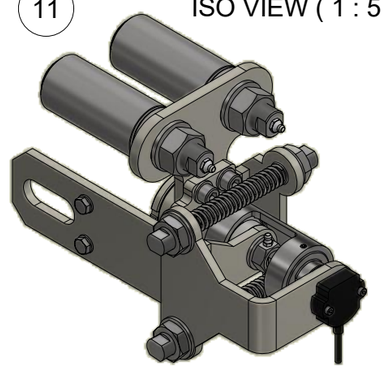
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Sheave Assembly	0 kg
Description	Scale (A2)
SHEAVE, LEFT & RIGHT, PCD900, ASSEMBLY	1 : 10
Document ID	Revision / Sheet
2000004040	A / 1 / 1



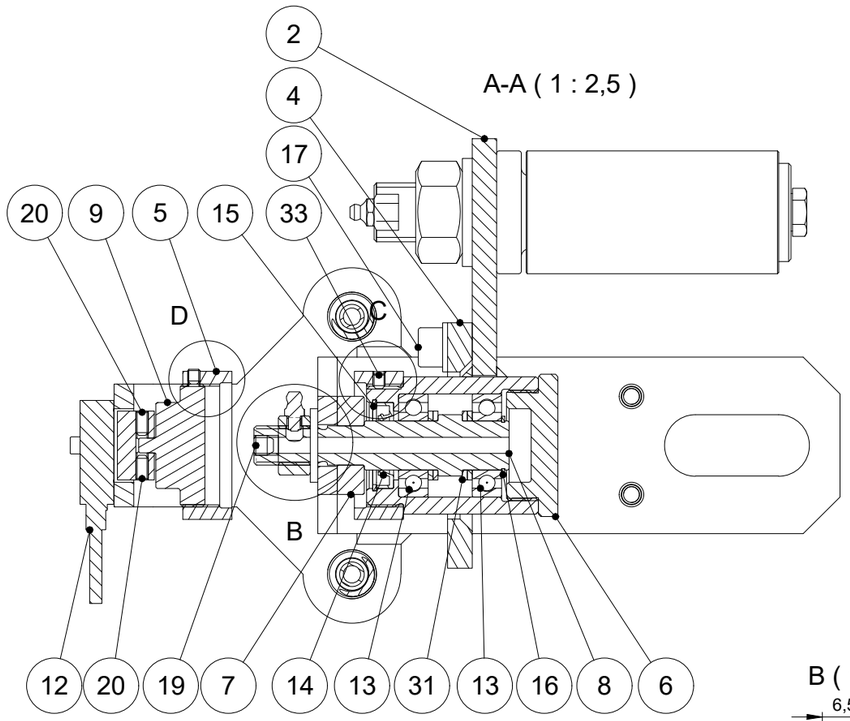


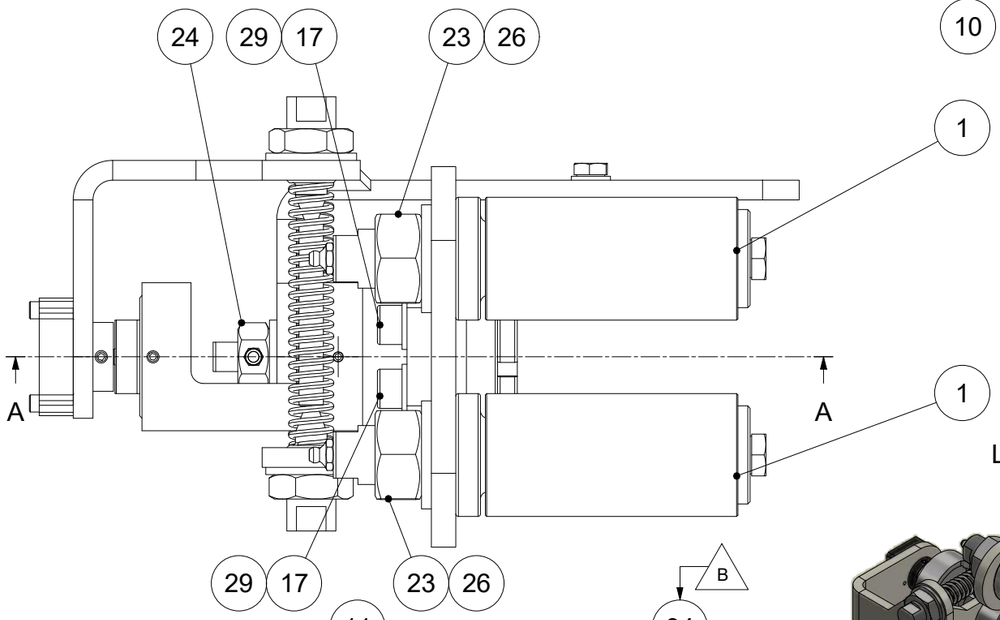


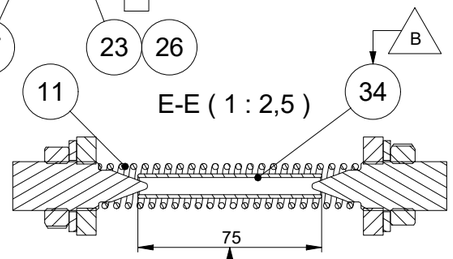
ISO VIEW (1 : 5)



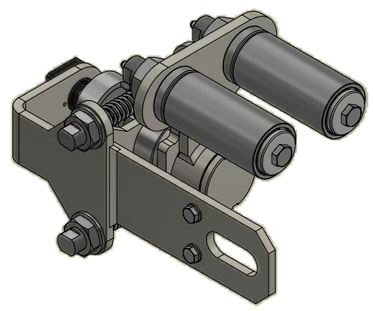
A-A (1 : 2,5)



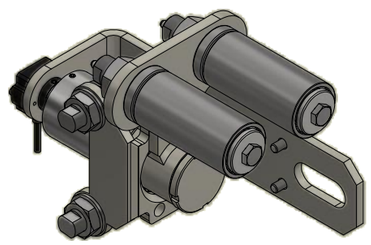




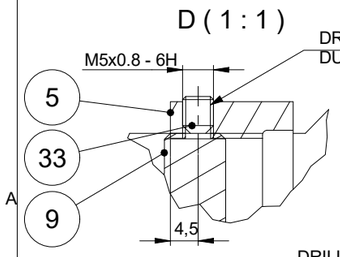
LEFT (1 : 5)



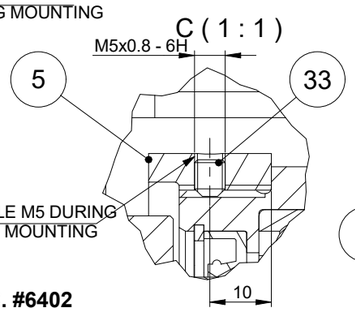
RIGHT (1 : 5)



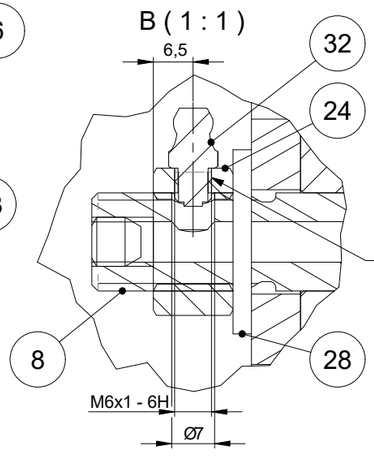
D (1 : 1)



C (1 : 1)



B (1 : 1)



DRILL HOLES M6x1 (NUT M16) AND
Ø7 (ITEM 8) DURING MOUNTING

TIGHTENING TORQUE - ACC. DOC. #6402

REV	ZONE	DESCRIPTION	DATE	APPROVED
A		Issued for production	30.01.2020.	RZPPA
B		Item 34 added	23.07.2020/RZPPA	RZPPA

Unspecified Tolerances According to:	Scale (A3) / Sheet
Standard / Tolerance Class	1 : 2,5 / 1 / 1
NS-ISO 2768-1 / m Medium	
NS-ISO 2768-2 / K	

Weight: 9,95 kg

SHEAVE INDICATOR FLAG & BRACKET (L&R)
LW EL5000
ASSEMBLY

Material (for part)	Status	Drawn by / Date (dd/mm/yy)	Checked by / Date (dd/mm/yy)
	Production	PETRODO 29.01.2020.	RZPPA 30.01.2020.

RAPP MARINE
Phone: (+47) 75 55 01 00
E-mail: office@rappmarine.com

Drw number: RH329298

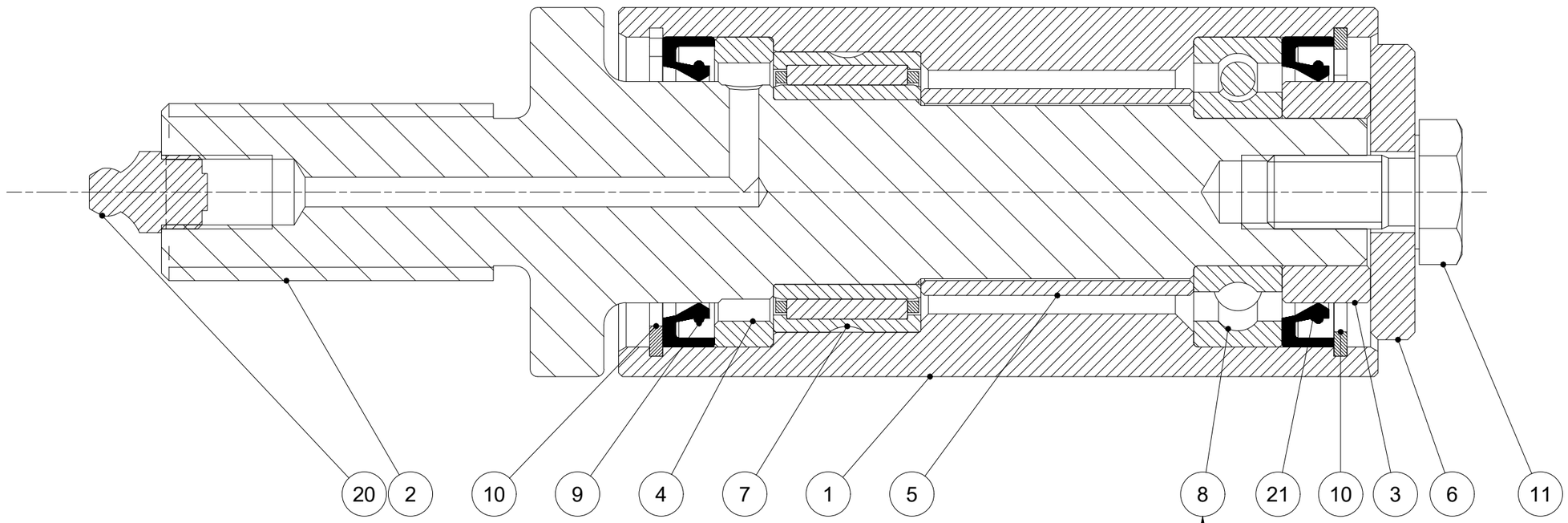
Partlist: RH329298

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F8AA4CB267DB4792B1F31A8DF074495E

ISOVIEW (1 : 2)





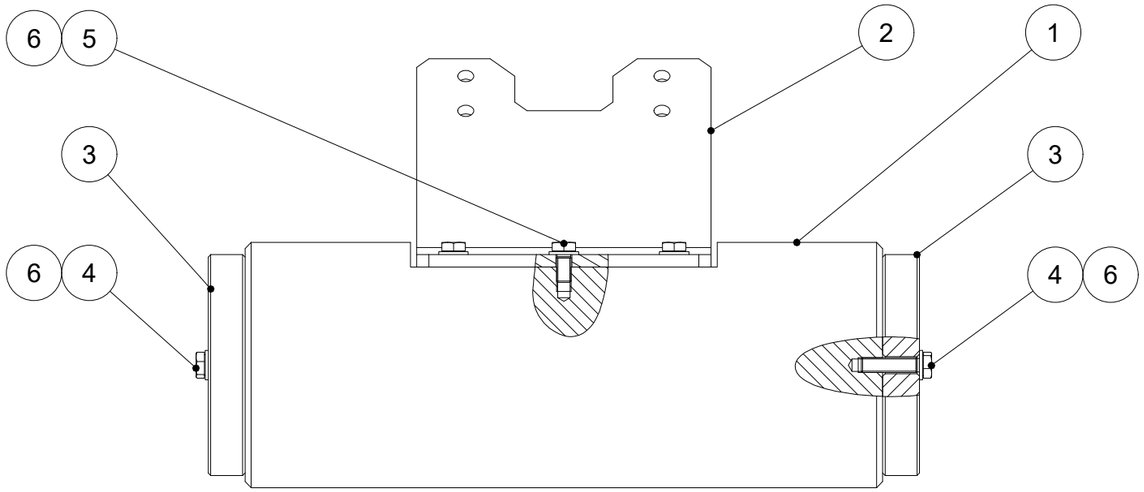
NOTE:
If sealed bearing (2RS) is used, remove sealings before assembly.

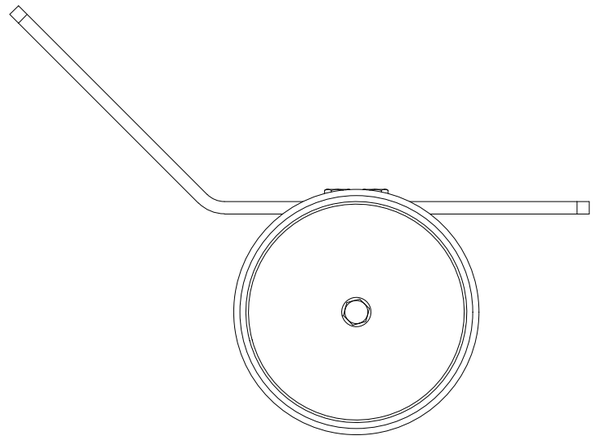
REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
A	-	Issued for production	10.09.2013	DHN
B	B2	Item 21 added. Text note added.	19.09.2013	RHJJ

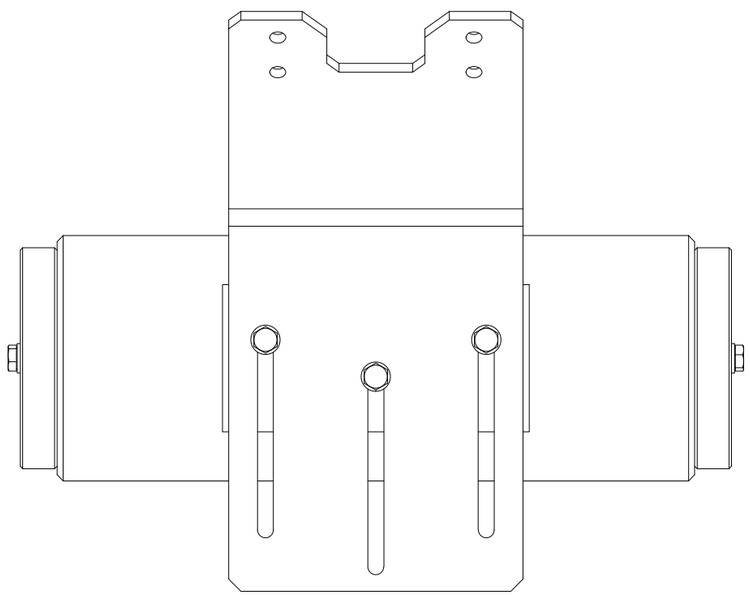
Weight 2 kg	INDICATOR ROLLER ASSEMBLY LEVEL WIND INDICATOR ASSEMBLY	RAPP HYDEMA Phone: (+47) 75 55 01 00 Fax: (+47) 75 55 01 11 E-mail: office@rapphydema.com			
Unspecified Tolerances According to:	*Scale (A3)* 1,5:1	*Sheet* 1 / 1	*Drw number* RH317245		
Standard / *Tolerance Class*					
NS-ISO 2768-1 m Medium	*Material (for part)*	*Status* Production	*Drawn by / Date (dd/mm/yy)* RZAVA 07.06.2013	*Checked by / Date (dd/mm/yy)* DHN 10.09.2013	*Partlist* RH317245
NS-ISO 2768-2 K					

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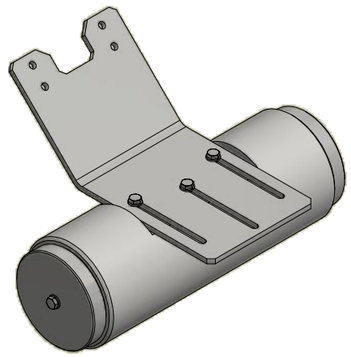
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ISO VIEW (1 : 10)

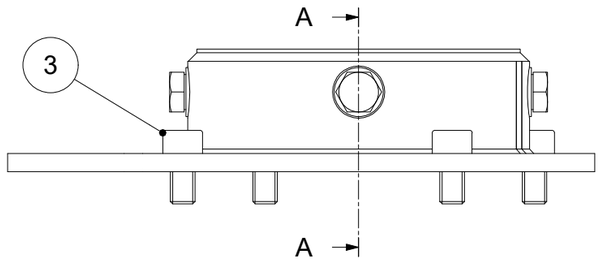


REV	ZONE	DESCRIPTION	DATE	APPROVED
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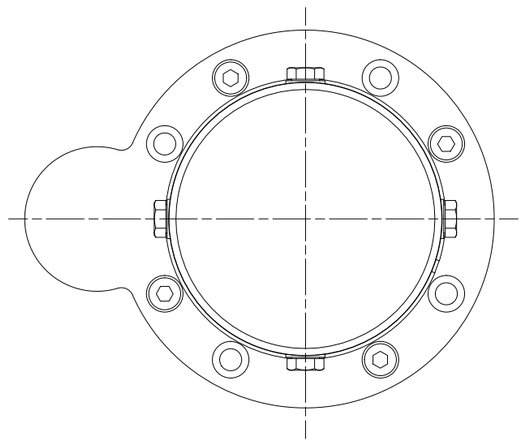
Weight 146 kg		COUNTER WEIGHT LW EL5000 (L&R) ASSEMBLY			RAPP MARINE Phone: (+47) 75 55 01 00 E-mail: office@rappmarine.com
Unspecified Tolerances According to :	*Scale (A3)*				*Drw number*
Standard / *Tolerance Class*	1 : 5				RH329308
NS-ISO 2768-1 m Medium	*Material (for part)*	*Status*	*Drawn by / Date (dd/mm/yy)*	*Checked by / Date (dd/mm/yy)*	*Partlist*
NS-ISO 2768-2 K		Production	PETRODC 30.01.2020.	RZPPA 30.01.2020.	RH329308

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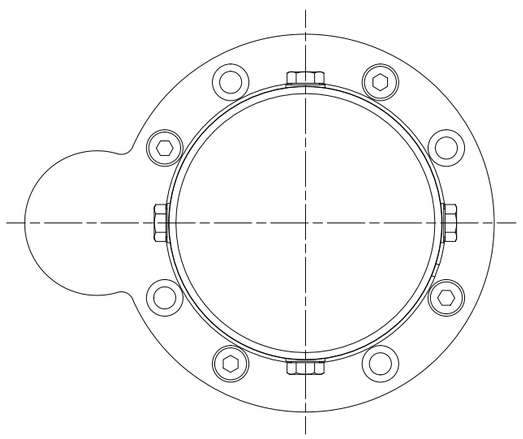
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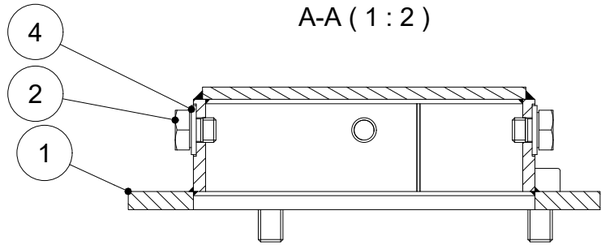
BOLTING AT B SIDE (1 : 2,5)



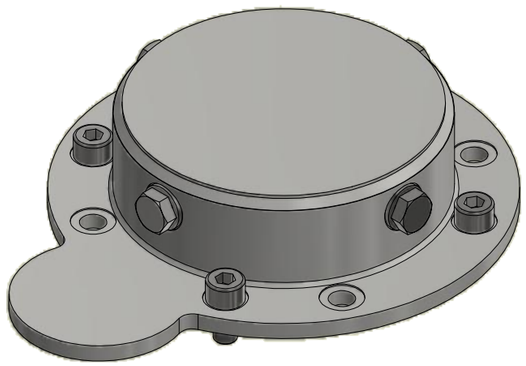
BOLTING AT A SIDE (1 : 2,5)



A-A (1 : 2)



ISO VIEW (1 : 2)



POLYMER - ACC. DOC. #6482 MACHINED SURFACES AND SURFACE TREATHMENT

5

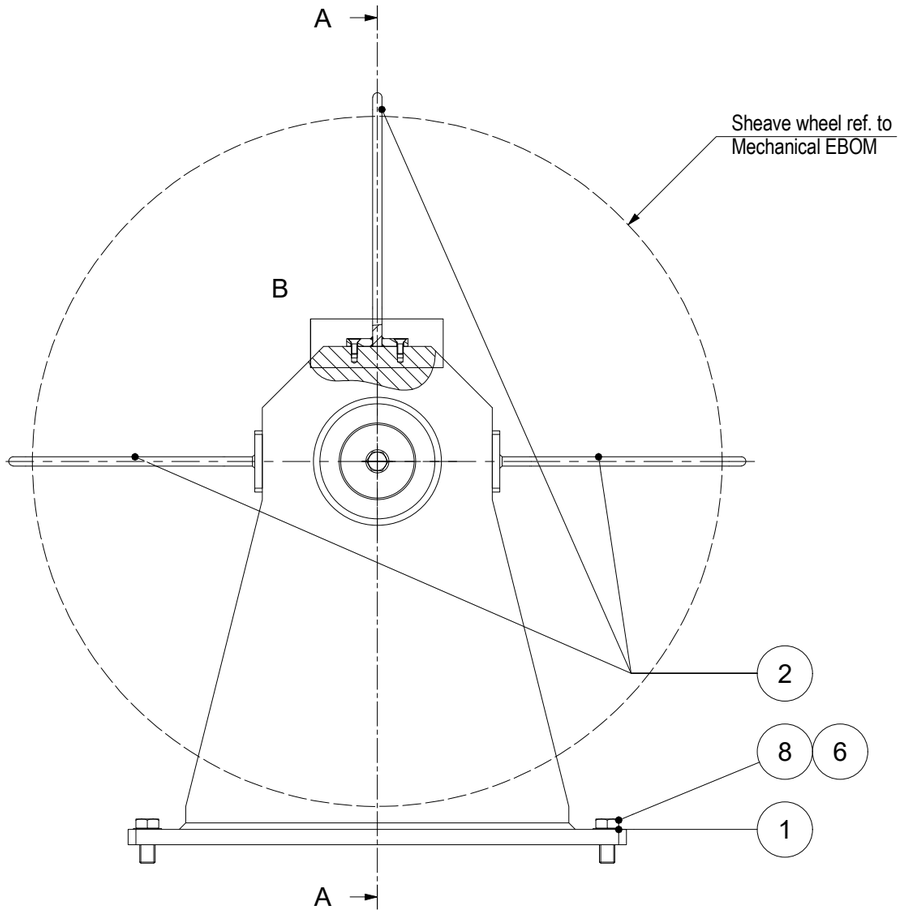
REV	ZONE	DESCRIPTION	DATE	APPROVED
A		Issued for production	09.08.2019.	RZBSI

Weight 1 kg	GEARBOX COVER SK9022 ASSEMBLY	RAPP MARINE Phone: (+47) 75 55 01 00 E-mail: office@rappmarine.com	
Unspecified Tolerances According to :	*Scale (A3)* 1 : 2	*Sheet* 1 / 1	*Drw number* RH328834
Standard / *Tolerance Class*	*Material (for part)*	*Status* Production	*Partlist* RH328834
NS-ISO 2768-1 m Medium	*Drawn by / Date (dd/mm/yy)* RZBSI 09.08.2019.	*Checked by / Date (dd/mm/yy)* RZBSI 09.08.2019.	
NS-ISO 2768-2 K			

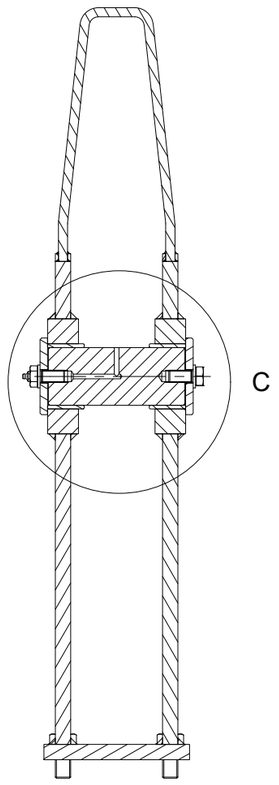
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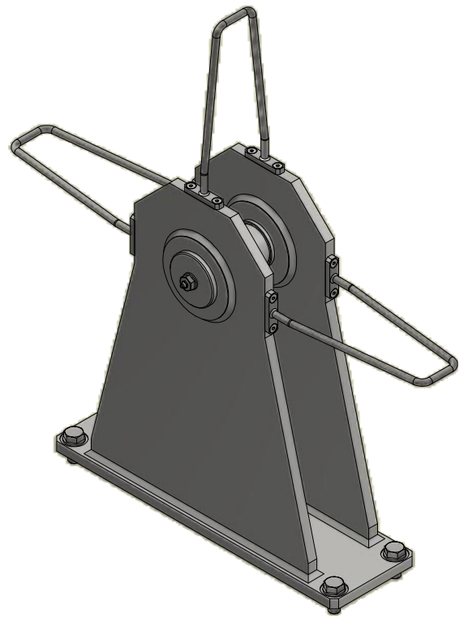
Sheet Purpose:	Sheet Purpose:	TOL. SYSTEM ACC. TO ISO	General tol. for dimensions
MACHINING	**ASSEMBLY**	Surface roughness R_a in µm	Machining ISO 2768 tol-class: mK Welding ISO 13920 tol-class: AE Therm. cut ISO 9013 tol-class: 441



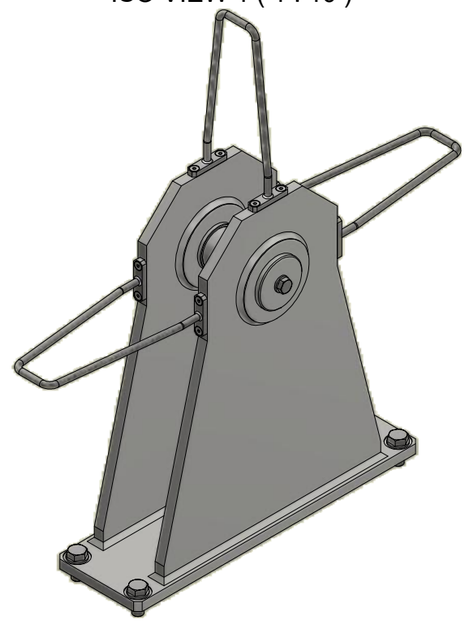
A-A (1 : 8)



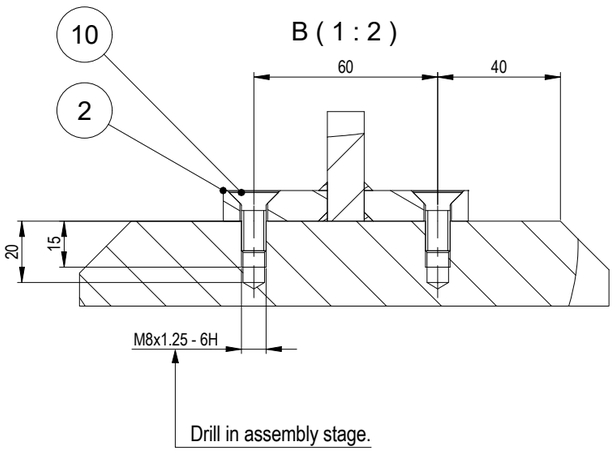
ISO VIEW 2 (1 : 10)



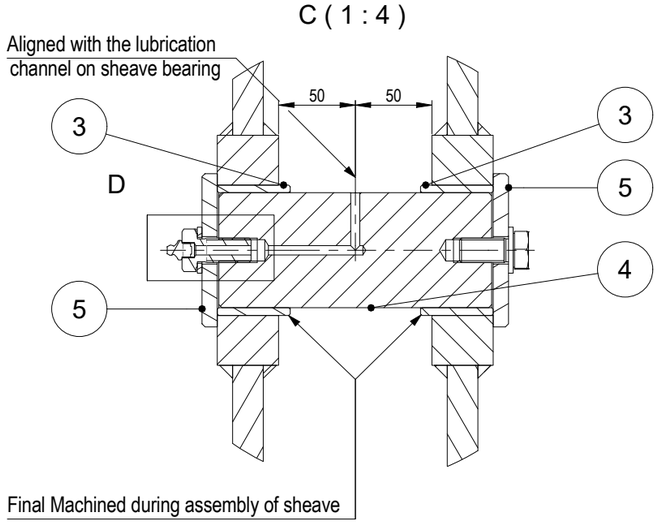
ISO VIEW 1 (1 : 10)



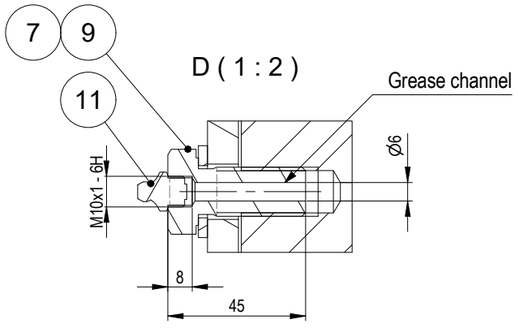
B (1 : 2)



C (1 : 4)



D (1 : 2)



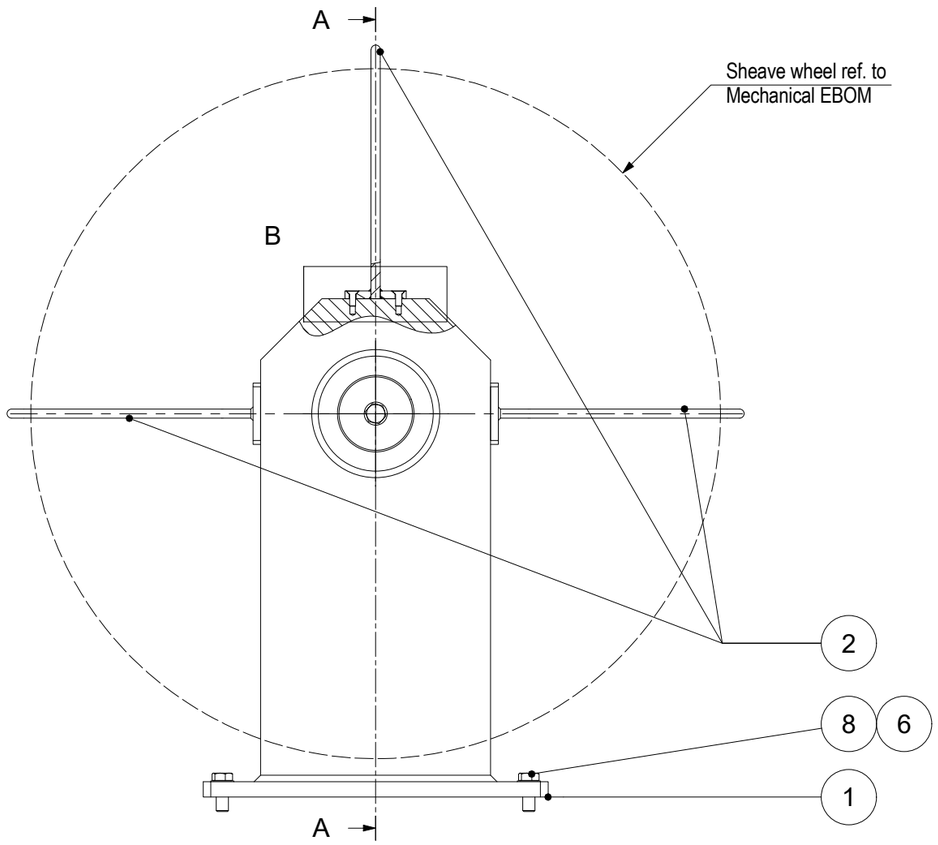
Designed by	Date	Modified by	ECO / CO			
P Pantovic	23.12.2021.	P Pantovic	ECO-2056483			

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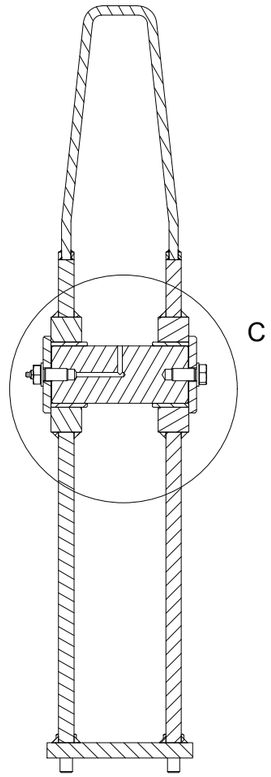
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Name		Weight
Frame		106 kg
Description		Scale (A3)
PCD900		1 : 8
Document ID	Revision	Sheet
2000004252	A	1 / 1

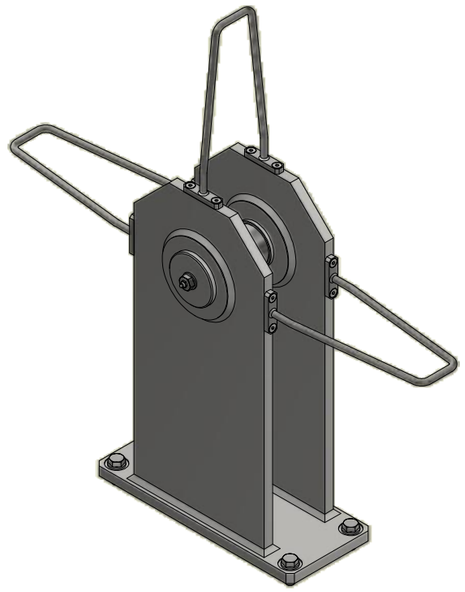
Sheet Purpose:	Sheet Purpose:	TOL. SYSTEM ACC. TO ISO	General tol. for dimensions
MACHINING	**ASSEMBLY**	Surface roughness R_a in µm	Machining ISO 2768 tol-class: mK Welding ISO 13920 tol-class: AE Therm. cut ISO 9013 tol-class: 441



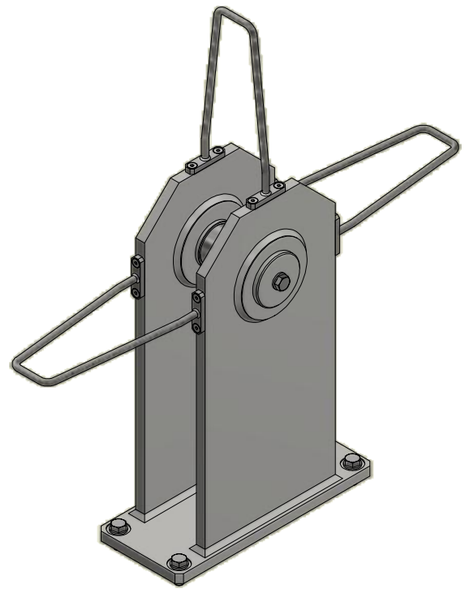
A-A (1 : 8)



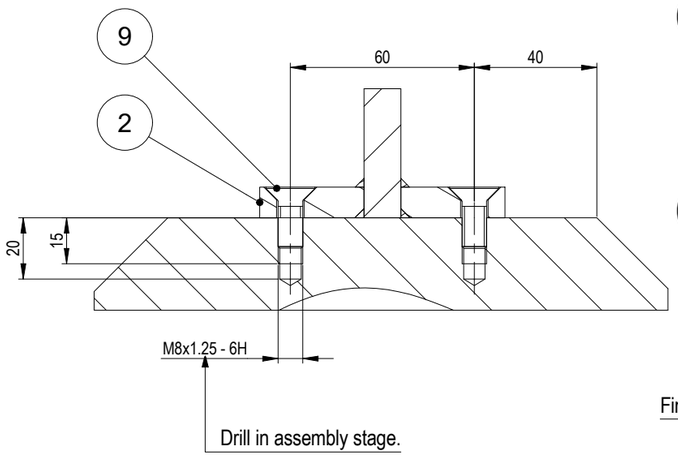
ISO VIEW 2 (1 : 10)



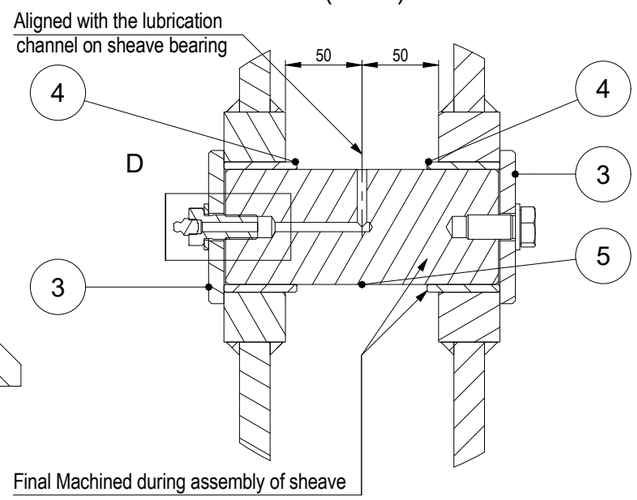
ISO VIEW 1 (1 : 10)



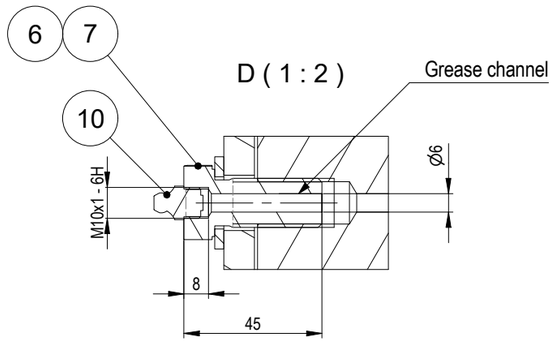
B (1 : 2)



C (1 : 4)



D (1 : 2)



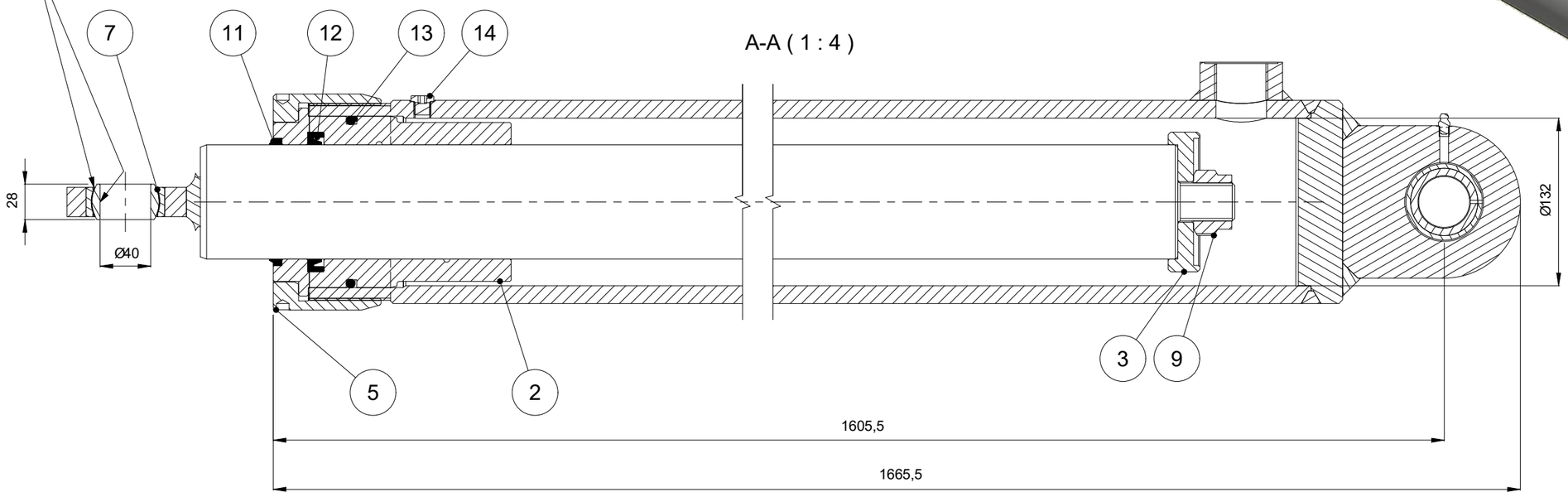
Designed by	Date	Modified by	ECO / CO			
P Pantovic	23.12.2021.	P Pantovic	ECO-2056483			

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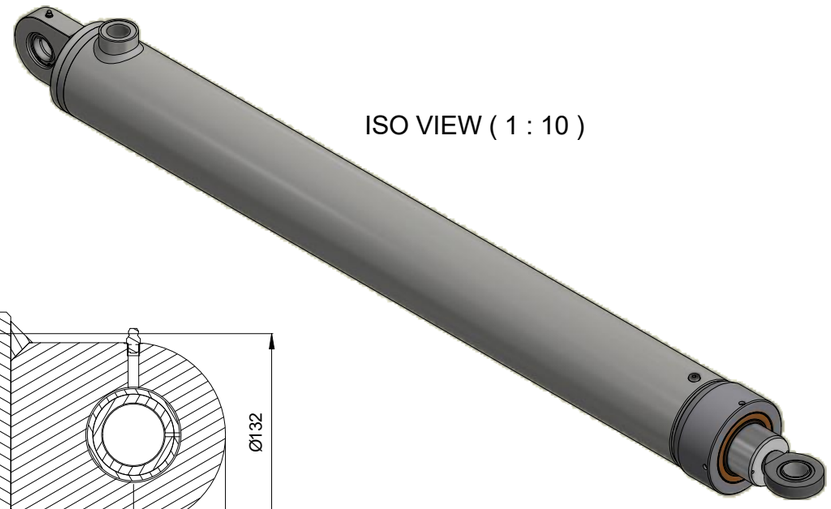
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Name		Weight
Frame		85 kg
Description		Scale (A3)
PCD900		1 : 8
Document ID	Revision	Sheet
2000004277	A	1 / 1

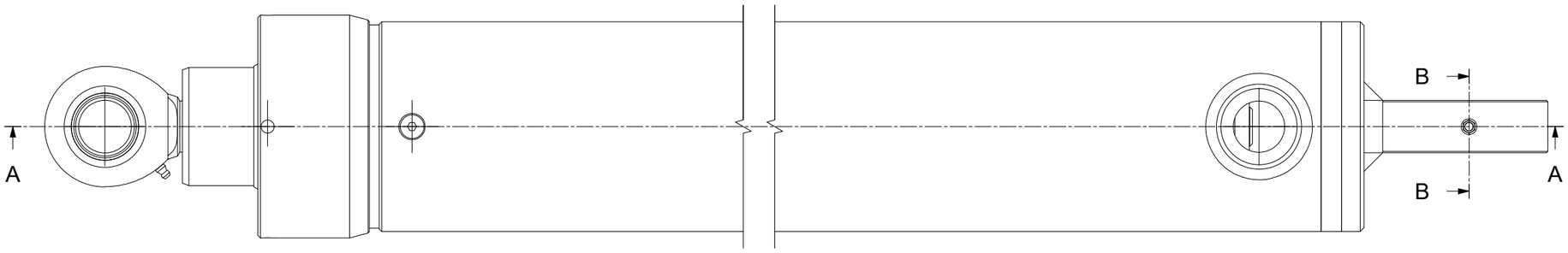
APPLY RUST PROTECTION OR STICKY GREASE AT THE INNER RING OF THE ROD ENDS DURING ASSEMBLY.

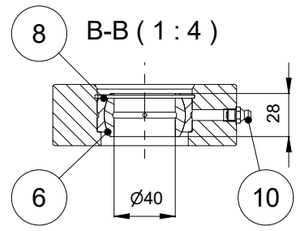


A-A (1 : 4)

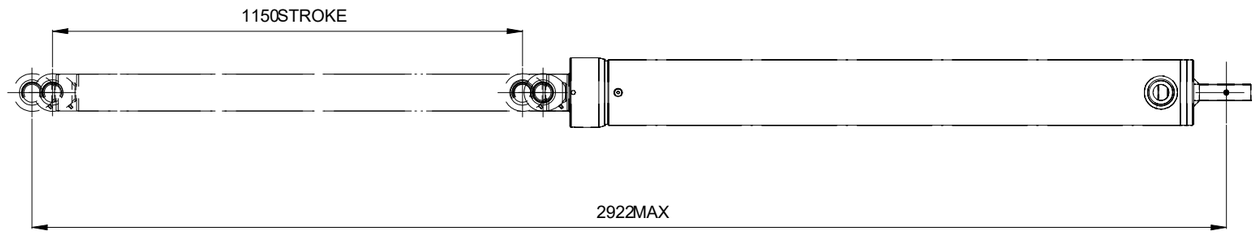


ISO VIEW (1 : 10)





B-B (1 : 4)



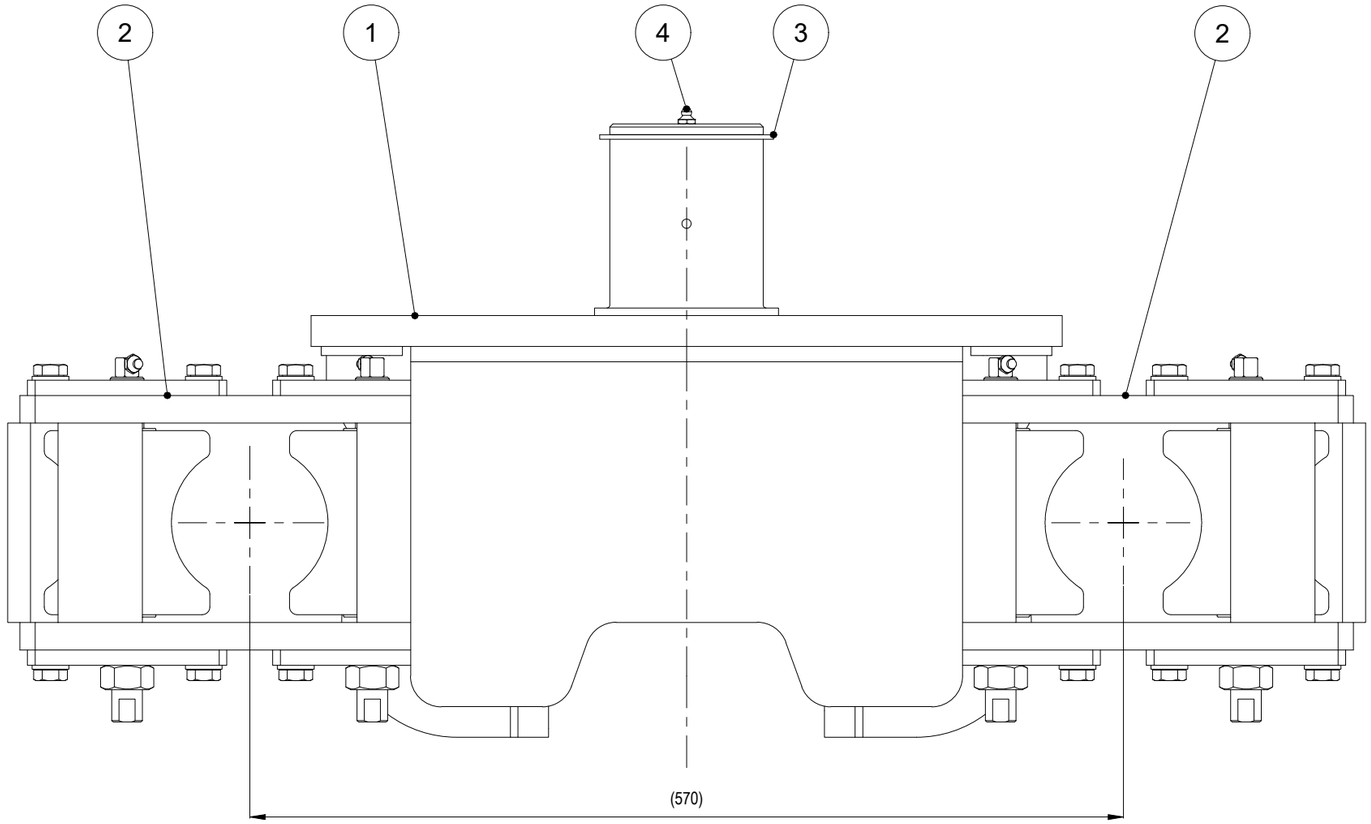
Designed by	Date	Modified by	ECO / CO			
P Pantovic	01.12.2021.		ECO-2056556			

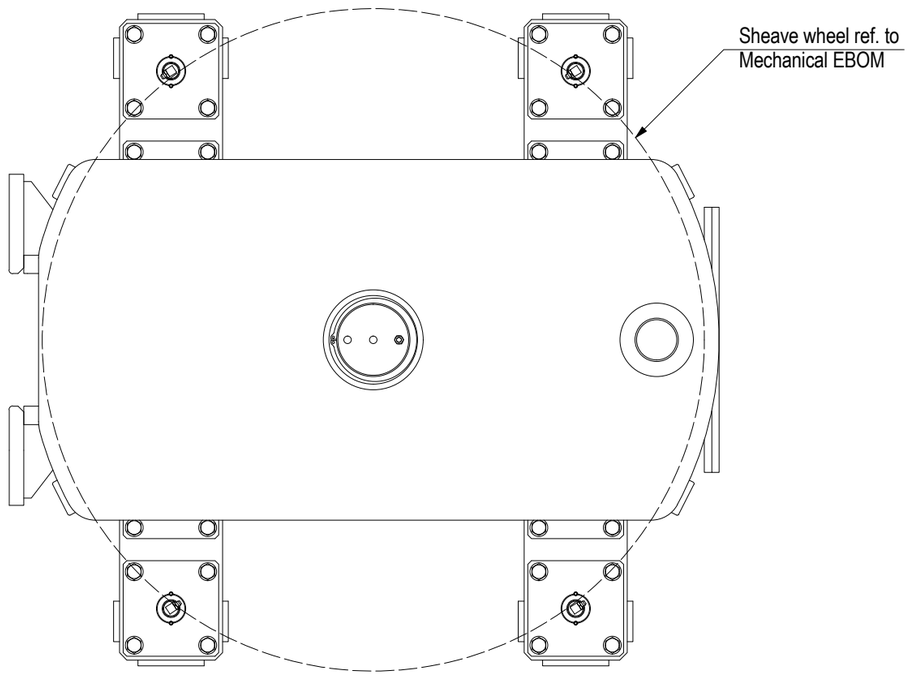
MACGREGOR

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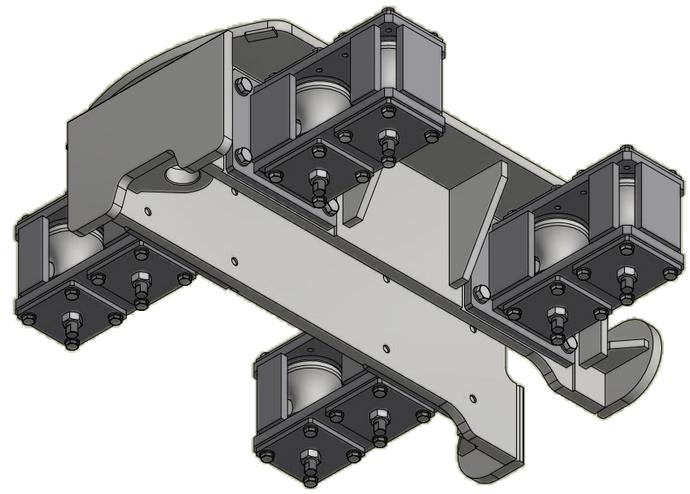
Name	Weight
Cylinder Assembly	173 kg
Description	**Scale (A3)**
SWC HYDRAULIC CYLINDER, S=1150mm	1 : 4
Document ID	**Revision** / **Sheet**
2000003665	A / 1 / 1

Sheet Purpose:	TOL. SYSTEM ACC. TO ISO	General tol. for dimensions
ASSEMBLY	Surface roughness R_a in µm	Machining ISO 2768 tol-class: mK Welding ISO 13920 tol-class: AE Therm. cut ISO 9013 tol-class: 441

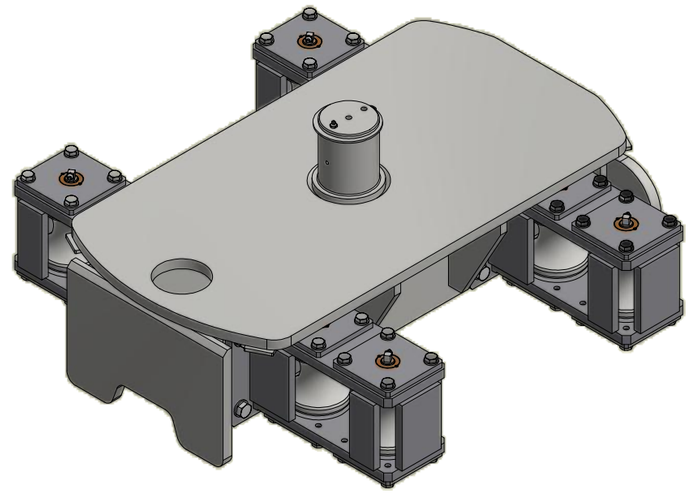




ISO VIEW 1 (1 : 10)



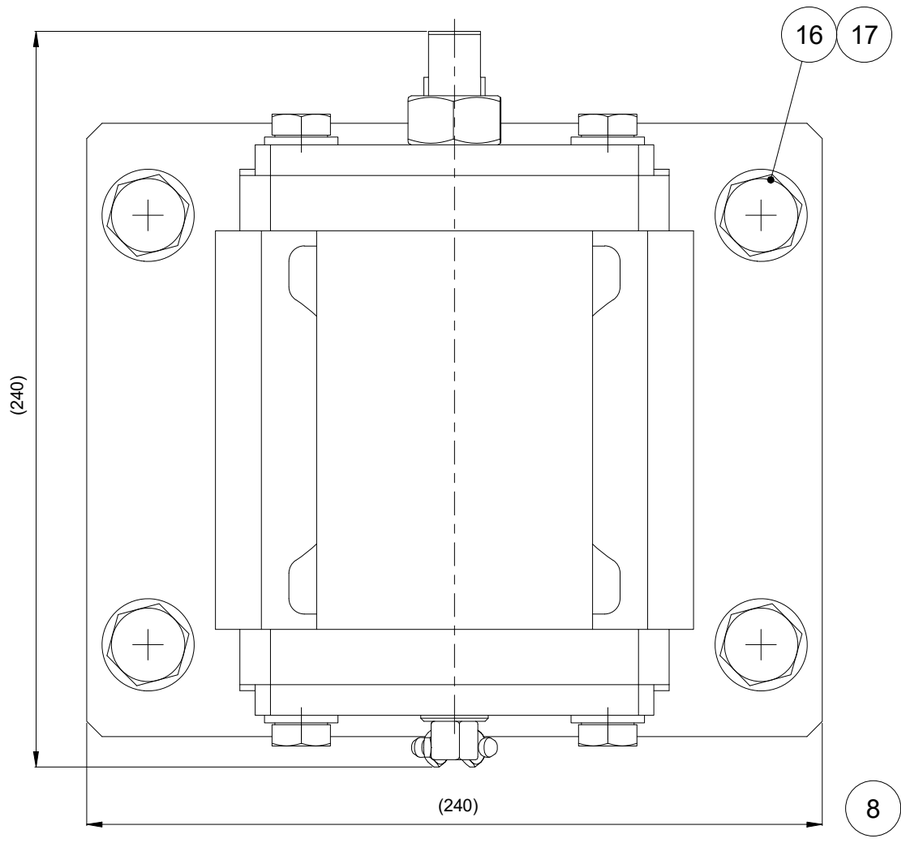
ISO VIEW 2 (1 : 10)

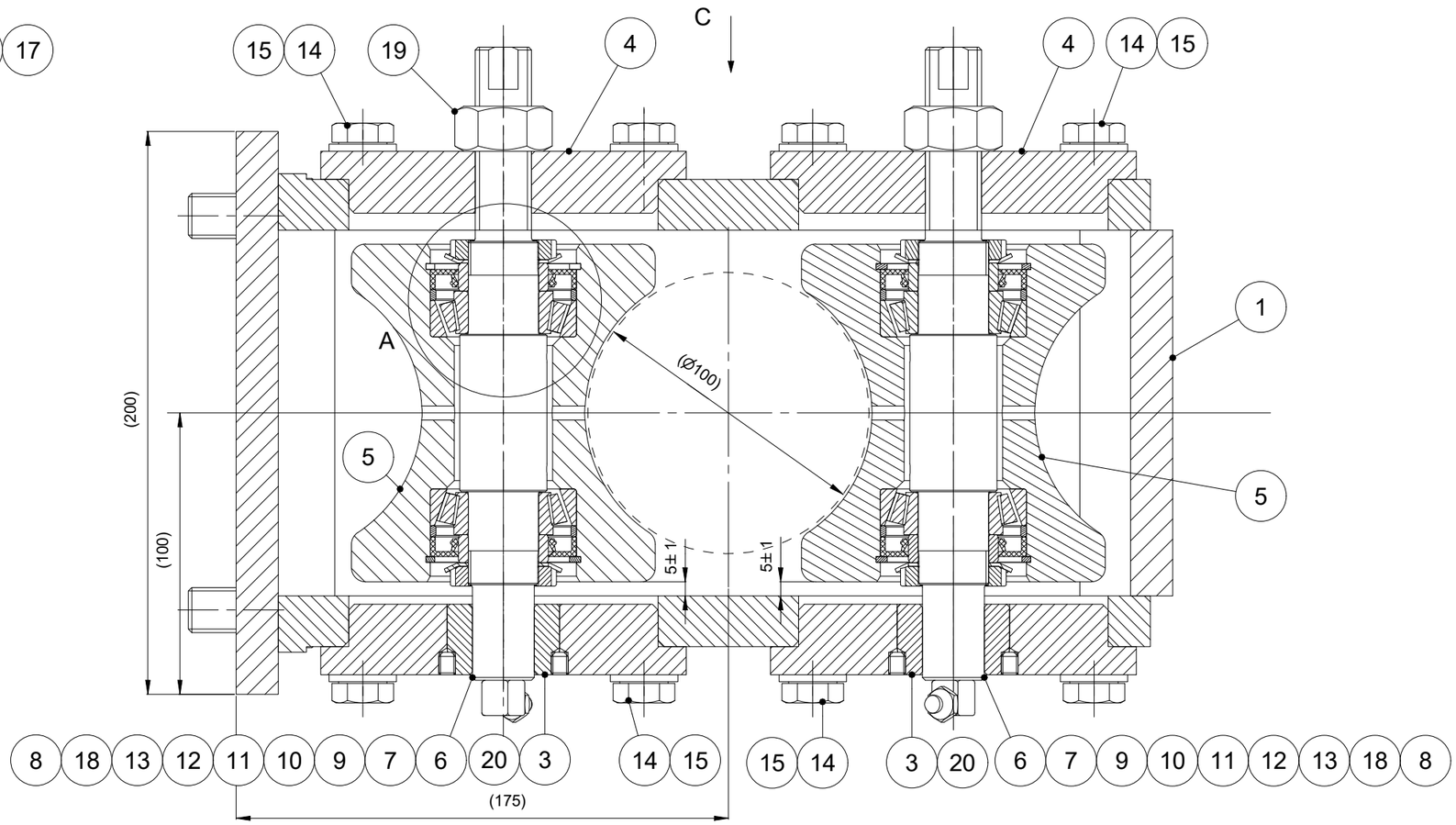


Designed by	Date	Modified by	ECO / CO			
P Pantovic	23.12.2021.	P Pantovic	ECO-2056483			

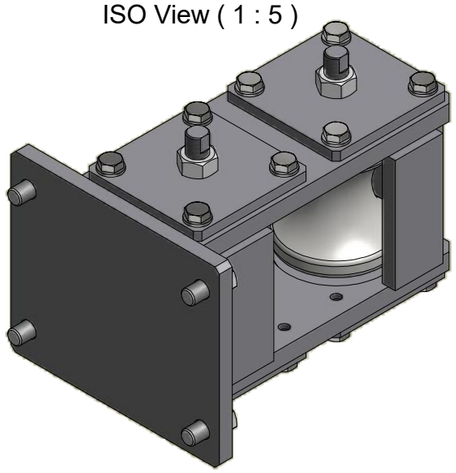
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Name	Weight
Sheave Assembly	338 kg
Description	**Scale (A3)**
LEV-SWC	1 : 4
Document ID	**Revision** / **Sheet**
2000004281	A / 1 / 1

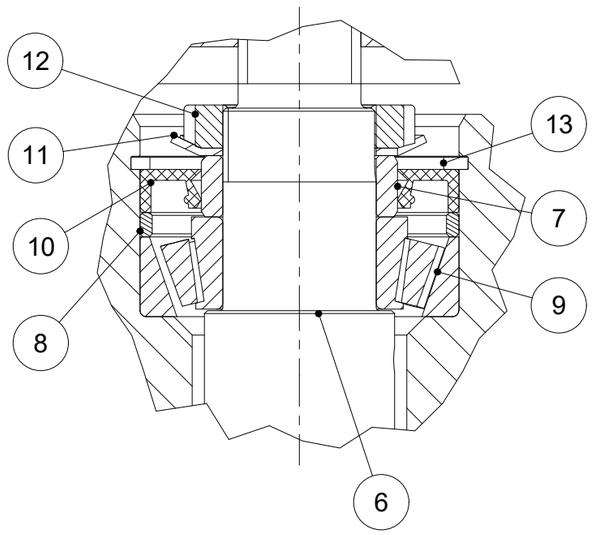




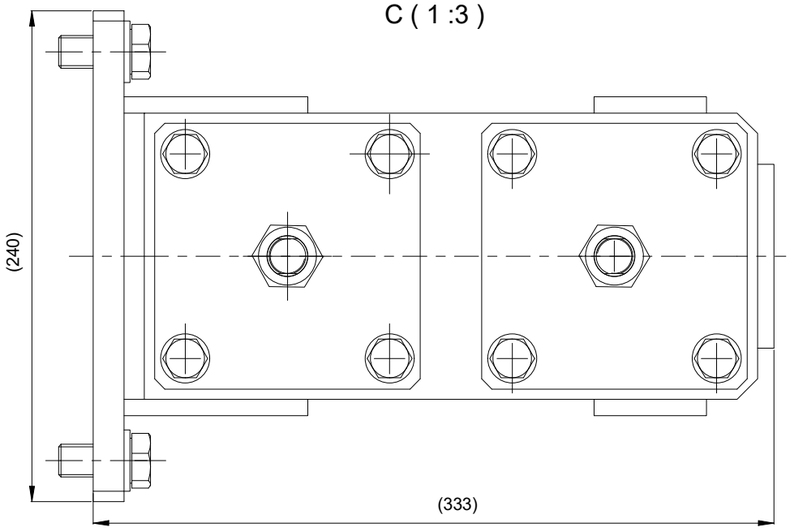
ISO View (1 : 5)



A (1 : 1)
4 places



C (1 :3)



REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
A		Issued for production	22.08.2014	RHDHN

Weight 38 kg		ROLLER UNIT SWC-5000 ASSEMBLY	RAPP HYDEMA Phone: (+47) 75 55 01 00 Fax: (+47) 75 55 01 11 E-mail: office@rapphydema.com		
Unspecified Tolerances According to :	*Scale (A3)*	*Sheet*		*Drw number*	
Standard / *Tolerance Class*	1:2	1 / 1		RH318591	
NS-ISO 2768-1 m Medium	*Material (for part)*	*Status*	*Drawn by / Date (dd/mm/yy)*	*Checked by / Date (dd/mm/yy)*	*Partlist*
NS-ISO 2768-2 K		Production	RZBSI 22.08.2014	RHDHN 22.08.2014	RH318591

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Yard Connections

Internal Connections

Levelwind/Slack Wire

=WCS01
+UH03

Main VFD Cabinet
Pentagon
Brake HPU
Gear Cooling HPU

+UC01

-UB6 -WG1 PUR 4x0.34mm2 Shld → -BG1 End Stop 1 /1.B1

-UB7 -WG2 PUR 4x0.34mm2 Shld → -BG2 End Stop 2 /1.B2

-UB8 -WG3 PUR 4x0.34mm2 Shld → -BG3 Follow Up Sensor 1 /1.B3

-UB9 -WG4 PUR 4x0.34mm2 Shld → -BG4 Block Count /1.B3

-UB10 -WG5 PUR 4x0.34mm2 Shld → -BG5 Block Count /1.B4

-UB1 -WG6 PUR 4x0.34mm2 Shld → -BG6 SWC Limit Sensor 1 Pos In /1.B5

-UB2 -WG7 PUR 4x0.34mm2 Shld → -BG7 SWC Limit Sensor 2 Pos Out /1.B5

-UB3 -WG8 PUR 4x0.34mm2 Shld → -BG8 String Sensor

-UB4 -WG9 Valve Cable 3x0.75+PE → -BP1 Pressure Transmitter

-UB5 -WG10 Valve Cable 3x0.75+PE → -QM1 SWC Valve

=WCS01
+UH01

Main VFD Cabinet
Power Input
Levelwinds

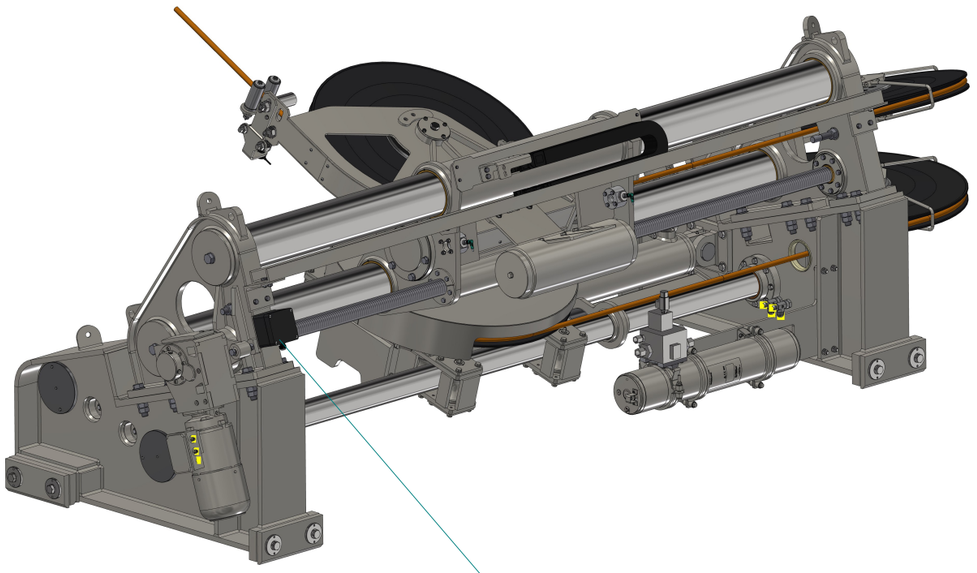
ENC
PWR
BRAKE
HEAT

M
3~

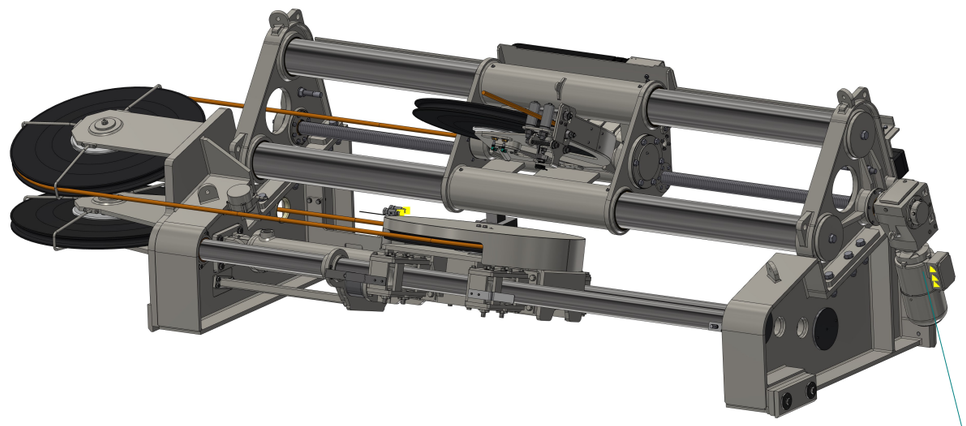
-MA1

2,2kW
5,22A
400V/50Hz
GETBI1031 2.2kW

				Date	17/11-2021	***CUSTOMER***	MACGREGOR	Levelwind & Slack Wire Compensator Levelwind & Slack Wire Compensator	400182378	=LEV01
				User	GSK	***PROJECTNAME***				
				Approved	RAJ				***PRONR*** -04 CD	Rev.
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 1 Next 2



=LEV01
+UC01



=LEV01
-MA1

Iso view of winch (image might deviate from actual product)

General Picture
Winch might be mirrored

				Date	17/11-2021	***CUSTOMER***	MACGREGOR	Levelwind & Slack Wire Compensator	400182378	=LEV01	
				User	GSK	***PROJECTNAME***		Connection Point Overview			
				Approved	RAJ				***PRONR*** -04 CD	Rev.	Sheet 2
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

End Stop Levelwind

Angle Sensor Levelwind

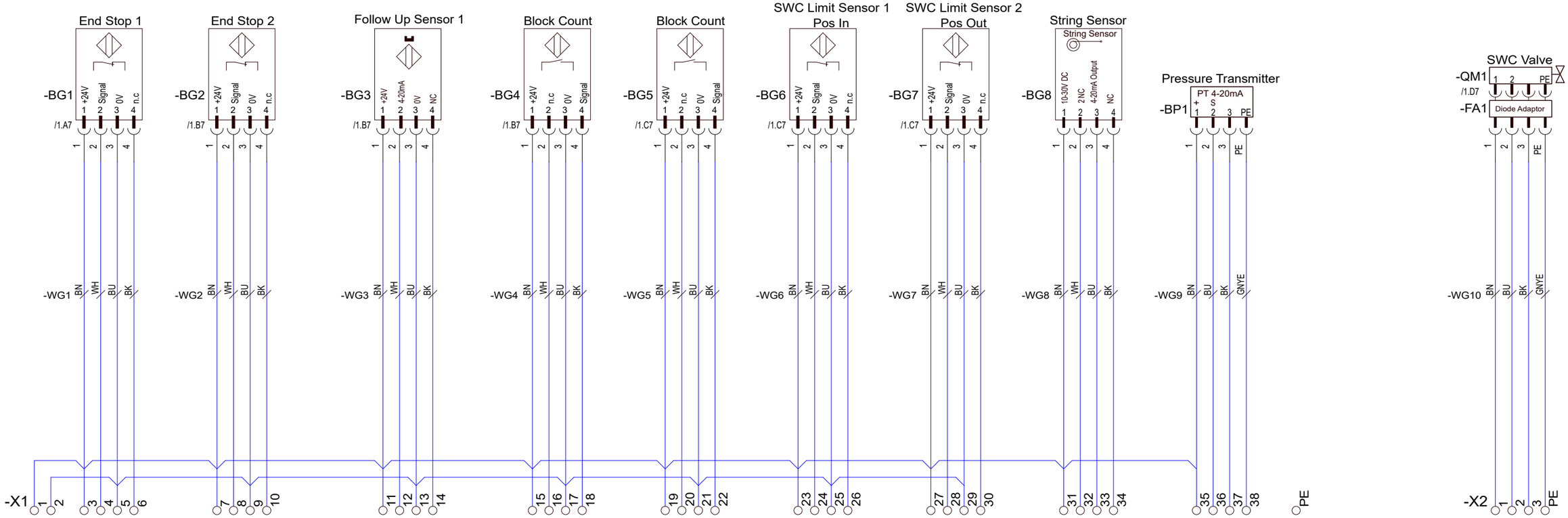
Block Count Levelwind

Limit Sensor Slack Wire

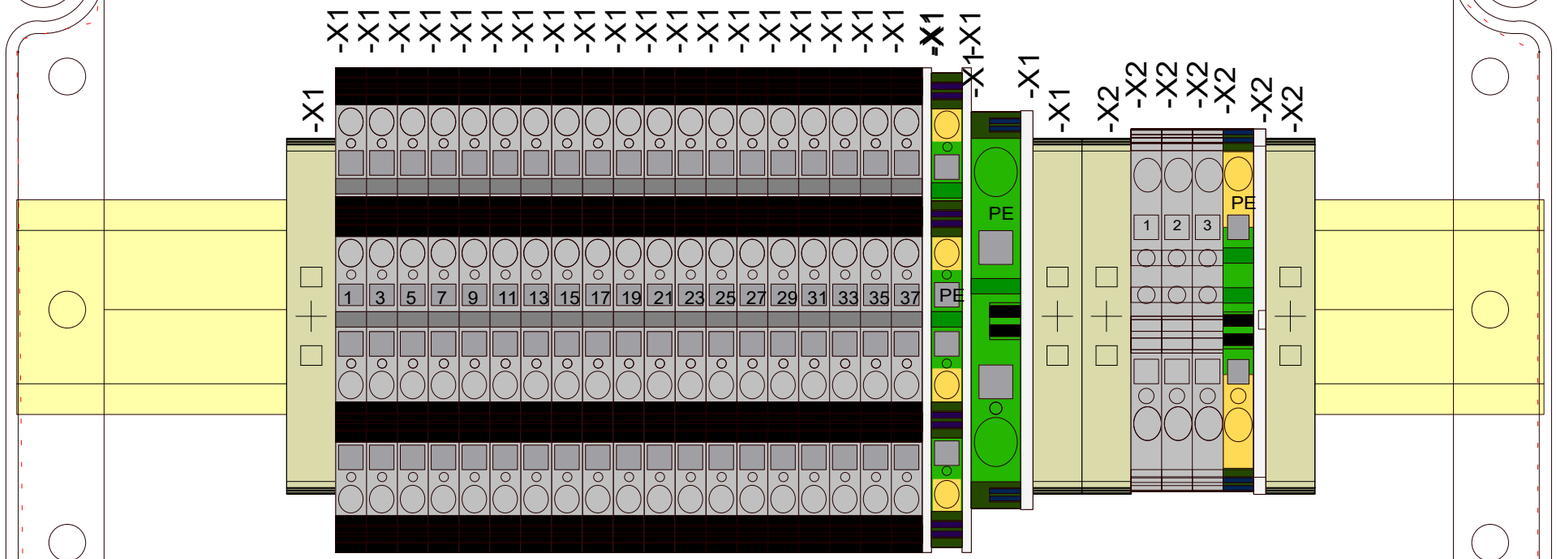
String Sensor Slack Wire

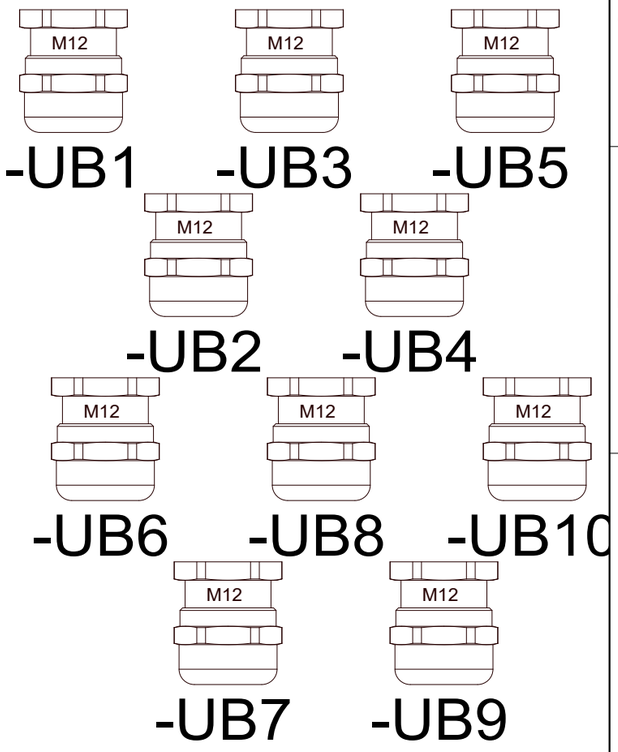
¨Pressure Transmitter

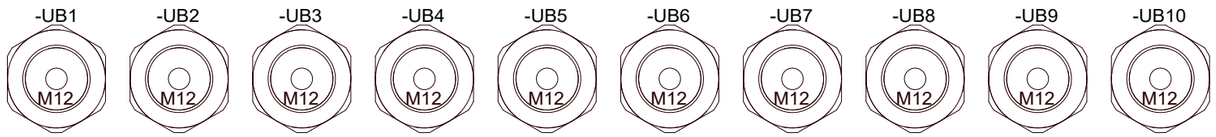
Brake Solenoid Valve



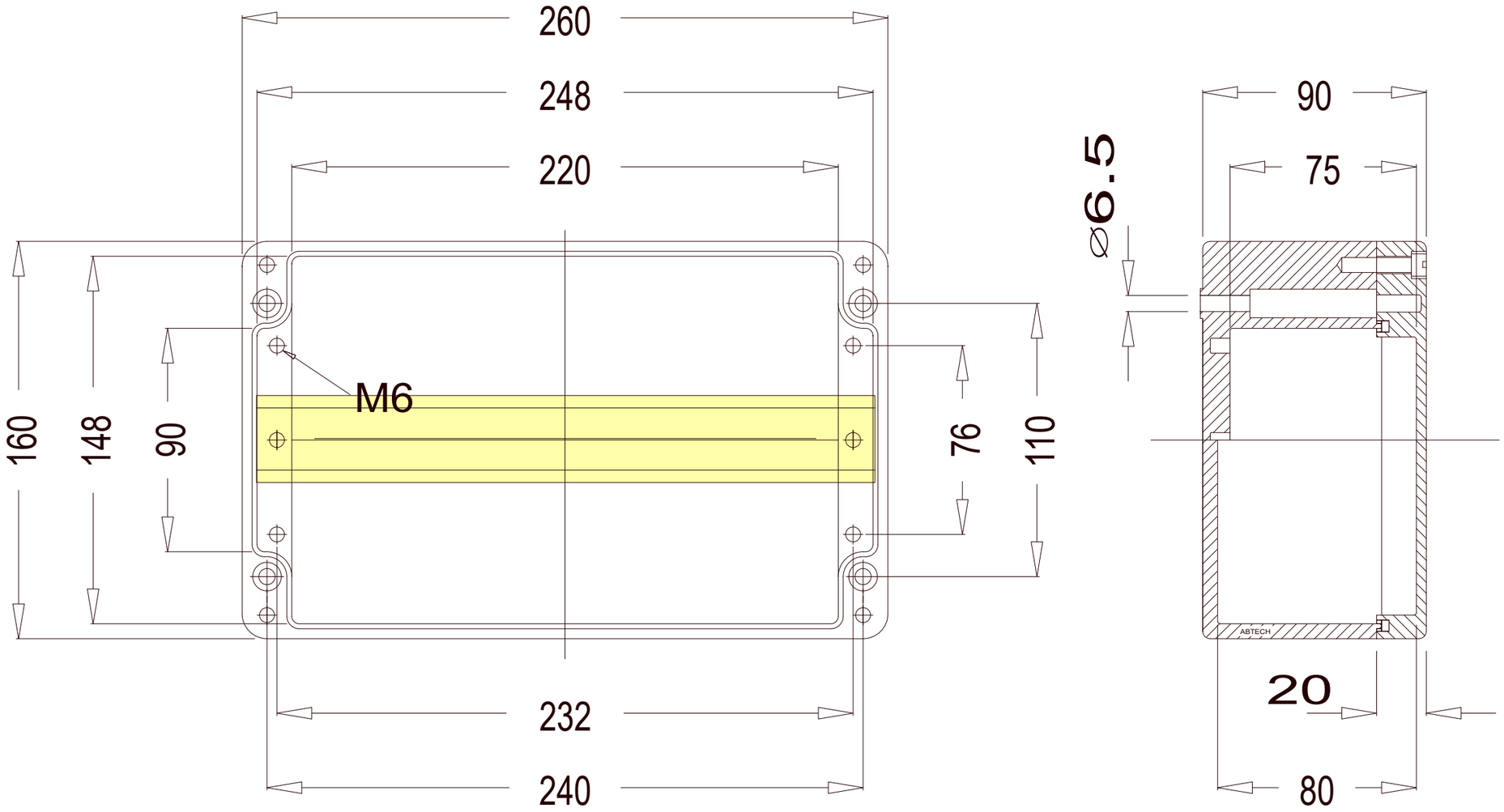
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				User	GSK	***PROJECTNAME***	MACGREGOR	Level Wind Connection Box			+UC01
				Approved	RAJ			Internal Connection	***PRONR*** -04 CC	Rev.	Sheet 1
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1







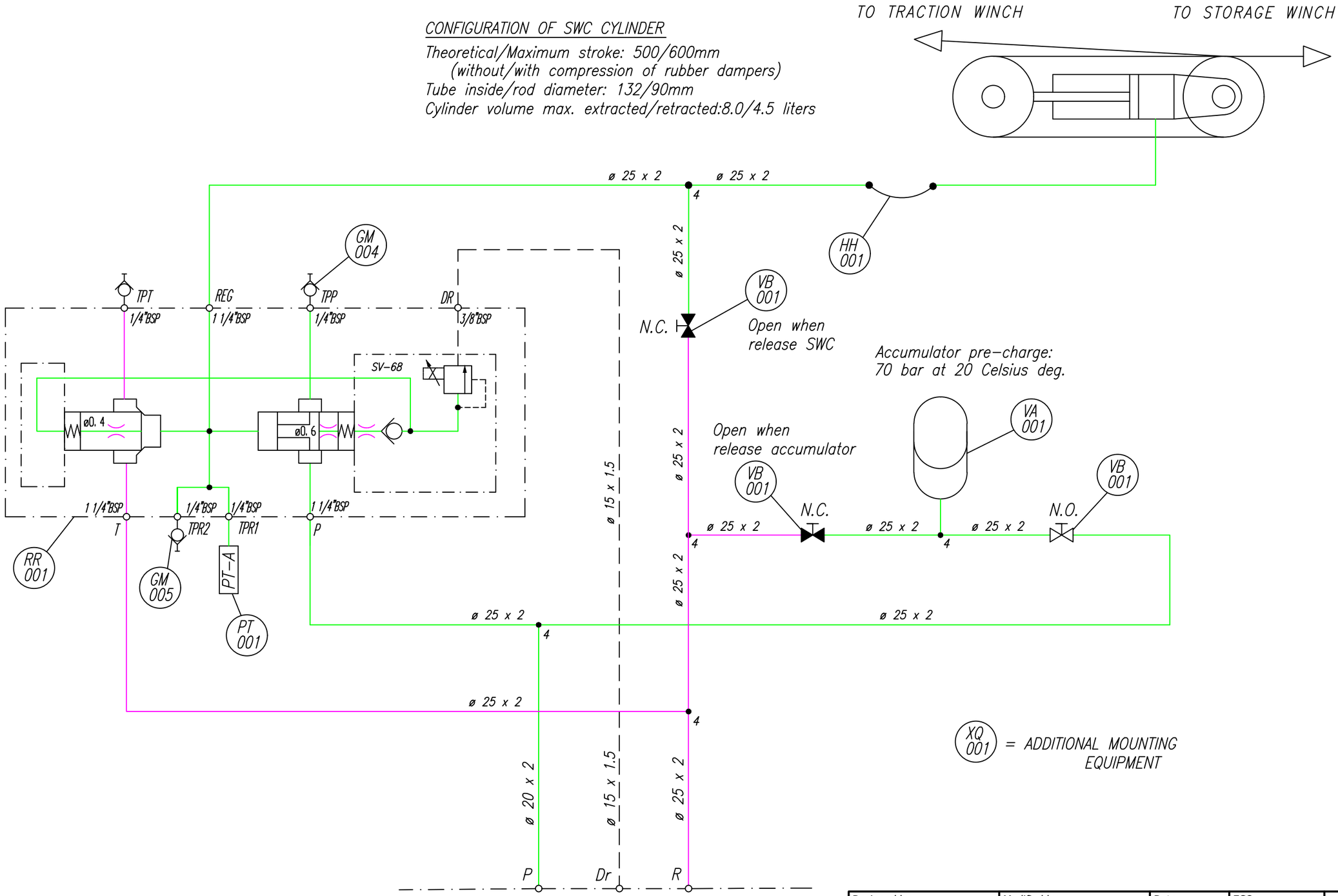
				Date	17/11-2021	***CUSTOMER***	MACGREGOR	Levelwind & Slack Wire Compensator	400182378	=LEV01
				User	GSK	***PROJECTNAME***		Level Wind Connection Box		+UC01
				Approved	RAJ			Internal Connection	***PRONR*** -04 GA	Rev.
Status	Change	Date	Name	Standard		Version	Index	Repl. by		Sheet 1 / Next 2



				Date	17/11-2021	***CUSTOMER***	MACGREGOR	Levelwind & Slack Wire Compensator	400182378	=LEV01	
				User	GSK	***PROJECTNAME***		Level Wind Connection Box		+UC01	
				Approved	RAJ			Internal Connection	***PRONR*** -04 GA	Rev.	Sheet 2
Status	Change	Date	Name	Standard		Version	Index	Repl. by			Next 1

Device ID	Device	Part Number	Qty	Unit	Description	Manufacturer	Datablad
-BG1..-BG2,-BG6..-BG7	E2A-M18KS08-M1-B2	EACIN0203	4	Pcs	Inductive Sensor M18, NC M12 Connector	Omron	D03E-EN-02+E2A+Datasheet[1].pdf
-BG3	Z RFC P08	EACPO051	1	Pcs	Position Marker Angle sensor	Novotechnik	RFC4800_analog_e_2010_04.pdf
-BG4,-BG5	IMR08-02BPSTCOS	EACIN022	2	Pcs	Inductive Sensor M8, NO M12 Connector	SICK	IMR08-02BPSTC0S.pdf
-BG8	String Sensor SR1M-125 4-20mA	EACPO015	1	Pcs	String Sensor SR1M-125 3175mm 4-20/ 20-4mA M12 Connector	Celesco	SR1M produktinfo.pdf
-FA1	Diode Adaptor for Solenoide Valve	EACPL007	1	Pcs	Diode Adaptor Plate	OEM Automatic AS	datasheet EACPL007. pdf
-UB1..-UB10	Lock Nut M12 Brass	EACPG280	10	Pcs	Nut Brass, Skindicht SM-M 12x1,5	Lapp Group	I
-UB1..-UB10	Skintop MS-M 12	EACPG270	10	Pcs	M12 Cable Gland Brass (3-7mm)	Lapp Group	LAPP MS-M.pdf
-UC1	KLIPPON POK 162609 EX	400091476	1	Pcs	90x260x160, GRP Connection box, EX Certified	Weidmüller	Datasheet
-UC1	TS35X7.5 ST POK 1626	400091488	1	Pcs	Rail, TS 35, TS 35 x 7.5, Length: 243 mm, without slot, Steel, galvanized, chromium-plated	Weidmüller	Datasheet
-WG1..-WG8	V1-WV4A-10M-PUR-ABG0 M12	EACCA096	8	Pcs	Cable With M12 Plugg, PUR 10M	Pepperl+Fuchs	V1-WV4A-10M-PUR-ABG0.pdf
-WG9,-WG10	Hirschmann plug with cable_A	EACPL0011	2	Pcs	Hirschmann plug with cable	Belden	EACPL0011 Rectangular_connectors.pdf
-X1	ZAP/TW 5	EACPL02152	1	Pcs	End Plate For ZDU/ZPE 6 Terminals)	Weidmüller	ZAP TW 5.pdf
-X1	ZAP/TW ZDK2.5	400091997	2	Pcs	End Plate For ZDK2.5 Terminal	Weidmüller	Weidmuller\ZAP TW ZDK2.5.pdf
-X1 (1,3,5,7,9,11,13,15,17,19, 21,23,25,27,29,31,33,35,37)	ZDK 2.5/1.5	EACPL02055	19	Pcs	Terminal 2 Levels	Weidmüller	ZDK 2.5.pdf
-X1 (PE)	ZDK 2.5 PE	EACPL02056	1	Pcs	PE Terminal 2 Levels	Weidmüller	ZDK 2.5PE.pdf
-X1 (PE)	ZPE 6	EACPL02026	1	Pcs	Terminal	Weidmüller	ZPE 6.pdf
-X1,-X2	AEB 35 SC/1	EACPL0202-2	4	Pcs	AEB 35 SC/1 End Bracket	Weidmüller	Datasheet
-X2	ZAP/TW 1	EACPL02144	1	Pcs	End Plate For ZDU/ZPE/ZTR 2.5 Terminals	Weidmüller	ZAP TW 1.pdf
-X2 (1-3)	ZDU 2.5 AN	EACPL021401	3	Pcs	Terminal	Weidmüller	ZDU 2.5.pdf
-X2 (PE)	ZPE 2.5	EACPL02025	1	Pcs	Terminal	Weidmüller	ZPE 2.5.pdf

				Date		***CUSTOMER***		Levelwind & Slack Wire Compensator	400182378		=LEV01		
				User		***PROJECTNAME***	MACGREGOR	Part list					
Status	Change	Date	Name	Approved					***PRONR*** -04 PL	Rev.	Sheet 1		
				Standard		Version	Index	Repl. by			Next		



Part list: RHHSWC-E

Designed by	Modified by	Date	ECO			
D Boc		03.06.2022	ECO-2057408			

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Name	Weight
Hydraulic Diagram	
Description	Scale (A3)
Slack Wire Compensator	
Document ID: RH319631	Revision: F

Level	Pos	Qty	Unit	Aras ID	Name	Description
1				400092573	Hydrographic Winch	CTD WINCH, HW515FST90/URP (RHMEHW515FST90/URP)
2	001	1	PCS	EMOAB200B35-EI/00	Electric Motor	M3BP200MLC4 B35, IP56/ENC ISOL; 47kW (EMOAB200B35-EI/00)
2	002	1	PCS	GETBI0411-I200/00	Gearbox	POSIPLAN, BPH323 i=35,67 IEC200; PIV POSIPLAN BPH323 1:35,67 IEC200 (GETBI0411-I200/00)
2	003	1	PCS	GETGN120	Gearbox	GEAR MTR; SK9032/5,5kW I=25,03 ENCODER (GETGN120)
2	004	1	PCS	400184715	Wire Rope Drum	D990 x PCD510 x L982
3	001	1	PCS	400184693	Wire Rope Drum	D990 x d468 x 992
3	002	1	PCS	400092377	Split Drum Sleeve	LEBUS NO. 10026235, PCD:ø510/468x982/ø8,18 RH, Right-hand grooving for left-hand lay wire
3	003	3	PCS	400184709	Shim	T5 / D980 x d490
3	004	1	PCS	400184711	Shim	T5 / D980 x d490 (wire inlet)
3	005	1	PCS	RH31940403	Plate	T6 / 289 x 222
3	006	2	PCS	RH31940404	Wire Rope Clamp	WIRE CLAMP, HW-507E-FR-T90, MACHINING
3	007	14	PCS	RH410576	Wire Rope Clamp	CABLE CLAMP, TBW-520E
3	008	2	PCS	RH316070	Shaft Adapter	ADAPTER PIN, M20x1,5, MACHINING
3	009	2	PCS	RH316071	Nut	ADAPTER NUT, M20x1,5, MACHINING
3	010	4	PCS	RH31607001	Gasket	T2 / D26 x d21
3	011	40	PCS	FA0125G06	Washer	FLAT WASHER, A4, DIN 125 M6; Tykkelse h=1.6 d=6.4 (FA0125G06)
3	012	4	PCS	FA0912G06020	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M6x20; FULLY THREADED (FA0912G06020)
3	013	40	PCS	FA0933G06016	Screw	HEX.HEAD SCREW A4-80, DIN 933 M6x16; FULLY THREADED (FA0933G06016)
3	014	22	PCS	FA0933G12030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x30; FULLY THREADED (FA0933G12030)
3	015	60	PCS	FA7991G05012	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M5x12 (FA7991G05012)
3	016	2	PCS	GRMAX003S	Grease Nipple	GREASE NIPPLE, 90°, M10x1.0, A2 (GRMAX003S)
3	017	5	PCS	EACPG220	Cable Gland	M20 X1,5MM FOR CABLE SIZE 6-12MM; Nipple for el.motor (EACPG220)
2	005	1	PCS	400184986	Frame	HW-500
2	006	1	PCS	400185445	Level Wind	L982
3	001	1	PCS	400185138	Wire Rope Sheave	PCD500
4	001	1	PCS	400185029	Sheave House	PCD510
4	002	1	PCS	RH314324	Bracket	SHEAVE WHEEL BRACKET CTD2330T90; MACHINING, CTD2330T90
4	003	1	PCS	400185070	Sheave Assembly	PCD500
4	004	1	PCS	RH314338	Bearing Plain	BUSH, D85/d60, MACHINING
4	005	1	PCS	400185108	Protection	T5 / D590 x d500
4	006	2	PCS	400185569	Protection	T12 / D590 x d520
4	007	3	PCS	RH314341	Distance Ring	SPACER, D15 x 1,5, MACHINING
4	008	3	PCS	RH314342	ROLLER, D20/d16, MACHINING	ROLLER, D20/d16, MACHINING; MACHINING, D20/D16
4	009	10	PCS	RH315280	Protection	PROTECTION PLATE, TBW-520E-T90; MACHINING, TBW-520E-T90
4	010	1	PCS	RH315279	FLAG, TBW-520E-T90, MACHINING	FLAG, TBW-520E-T90, MACHINING
4	011	2	PCS	RH315695	Shaft Adapter	ADAPTER, M20x1,5 - M8x1,0, MACHINING
4	012	1	PCS	400185097	Plate	T12 / 116 x 115
4	013	1	PCS	400185103	Protection	T6 / 105 x 182
4	014	1	PCS	400185118	Protection Cover	SEALING COVER D183, ASSEMBLY
4	015	1	PCS	RH328097	Plate	PLATE, 59.4X17 T=6, PART BLANK
4	016	1	PCS	RH328074	Level Wind Indicator	HW-2320E01-T90
5	001	1	PCS	RH326637	ROL. HOLDER (RH), ROL. INDIC.,WELD+MACH	ROL. HOLDER (RH), ROL. INDIC.,WELD+MACH
5	002	1	PCS	RH326638	INDIC. HOLDER, ROL. INDIC.,WELD+MACH	INDIC. HOLDER, ROL. INDIC.,WELD+MACH
5	003	4	PCS	RH318448	Wire Rope Roller	INDICATOR ROLLER ASSEMBLY, LW INDICATOR; ASSEMBLY, INDICATOR ROLLER, Ø30x62

Level	Pos	Qty	Unit	Aras ID	Name	Description
5	004	1	PCS	RH326641	SPINDLE, M8/D30/D20, MACHINING	SPINDLE, M8/D30/D20, MACHINING
5	005	4	PCS	RH326639	SPRING PIN, M20x55, MACHINING	SPRING PIN, M20x55, MACHINING
5	006	2	PCS	RH326640	COMPRESSION SPRING, d2,5/D16x81,PU PART	COMPRESSION SPRING, d2,5/D16x81,PU PART
5	007	4	PCS	FA0439G2015	Nut	HEXAGON THIN NUT, A4, DIN 439, M20x1,5 (FA0439G2015)
5	009	2	PCS	FA0912G04025	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M4x25 (FA0912G04025)
5	010	4	PCS	FA0934G14	Nut	HEXAGON NUT, A4-80, DIN 934, M14 (FA0934G14)
5	011	6	PCS	FA0125G14	Washer	FLAT WASHER, A4, DIN 125 M14; Tykkelse h=2.5 d=15 (FA0125G14)
5	012	2	PCS	BEDBS01262	Deep Groove Ball Bearing	DEEP GROOVE BALL BEARING, 61804-2RS1 (BEDBS01262)
5	013	1	PCS	FA0471U0200	Circlip	CIRCLIP RING EXTERNAL, STEEL DIN 471 A20; SPRING STEEL, PHOSPHATED, HRC 47-52 (FA0471U0200)
5	014	1	PCS	FA7991G08020	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M8x20 (FA7991G08020)
5	015	4	PCS	FA0125G20	Washer	FLAT WASHER, A4, DIN 125 M20; Tykkelse h=3.0 d=21 (FA0125G20)
5	016	1	PCS	SESRB0012	Rotary Shaft Lip Seal	SEAL, 20x35x7, W/STAINLESS SPRING, 35x35x7 (SESRB0012)
5	017	2	PCS	FA0916G05010	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M5x10; CUP POINT (FA0916G05010)
5	018	1	PCS	RH32664301	Gasket	CORK GASKET SHEET, 2 mm
4	017	2	PCS	RH316111	Distance Ring	DISTANCE RING, D48/d35, MACHINING
4	018	1	PCS	400185105	Plate	T12 / 105 X 93
4	019	1	PCS	400182482	Load Cell	0-62kN (max 100 kN)
4	020	5	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)
4	021	8	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
4	022	2	PCS	FA0125G16	Washer	FLAT WASHER, A4, DIN 125 M16; Tykkelse h=3.0 d=17 (FA0125G16)
4	023	3	PCS	FA0933G12080	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x80; FULLY THREADED (FA0933G12080)
4	024	2	PCS	FA0933G16040	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x40; FULLY THREADED (FA0933G16040)
4	025	5	PCS	FA0933G08016	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x16; FULLY THREADED (FA0933G08016)
4	026	5	PCS	FA0934G12	Nut	HEXAGON NUT, A4-80, DIN 934, M12 (FA0934G12)
4	027	30	PCS	FA7991G05020	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M5x20 (FA7991G05020)
4	028	4	PCS	FA7991G06012	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M6x12 (FA7991G06012)
4	029	1	PCS	GRMXX003	Grease Nipple	GREASE NIPPLE, M10x1,5 STRAIGHT, A4 (GRMXX003)
4	030	1	PCS	GRMXX002	Grease Nipple	GREASE NIPPLE, M8x1,0 STRAIGHT, A4 (GRMXX002)
4	031	2	PCS	RH329137	Bolt	HEX HEAD SHOULDER BOLT,M12 16H8 L70,MACH
3	002	1	PCS	400185288	Cable Guide	HW-500
4	001	1	PCS	400185234	Cable Guide	HW-500
4	002	1	PCS	RH312645	Shaft Nut	TRAPZIODAL NUT, MACHINING
4	003	1	PCS	400185286	Protection Cover	SEALING COVER D210, ASSEMBLY
4	004	1	PCS	RH315232	Flange Adapter	ADAPTER FLANGE, TR 80x10 NUT; MACHINING, TR 80x10 NUT
4	005	1	PCS	400185287	Protection Cover	T6 / D210 x d82
4	006	4	PCS	RH314300	Bearing Plain	LINING, D115/D100x80, MACHINING
4	007	2	PCS	RH314301	Bearing Plain	LINING W/FLANGE, D65/d45x45, MACHINING
4	008	14	PCS	FA0912G16040	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M16x40; FULLY THREADED (FA0912G16040)
4	009	12	PCS	FA0916G06016	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M6x16; CUP POINT (FA0916G06016)
4	010	6	PCS	FA7991G06012	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M6x12 (FA7991G06012)
4	011	3	PCS	GRMXX003	Grease Nipple	GREASE NIPPLE, M10x1,5 STRAIGHT, A4 (GRMXX003)
3	003	1	PCS	400185290	Bracket	L1578
4	001	1	PCS	400185289	Bracket	100 x 50 x 1497
4	002	1	PCS	RH31722602	Bracket	BRACKET F CABLE GUIDE RAIL CTDW-520E-T90; MACHINING, BRACKET FOR CABLE GUIDE RAIL
4	003	1	PCS	RH316978	Bracket	BRACKET FOR CABLE GUIDE RAIL ROVW-2021E; MACHINING, BRACKET FOR CABLE GUIDE RAIL

Level	Pos	Qty	Unit	Aras ID	Name	Description
4	004	4	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
4	005	2	PCS	FA0933G10030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x30; FULLY THREADED (FA0933G10030)
4	006	2	PCS	FA0934G10	Nut	HEXAGON NUT, A4-80, DIN 934, M10 (FA0934G10)
3	004	1	PCS	400185348	Screw	TR 80 x 10 x 2045,5
3	005	2	PCS	400185411	Guide Shaft	D100 x 1622,5
3	006	2	PCS	RH314288	Drive Shaft	SHAFT SUPPORT BUSHING, D150/d100x40; MACHINING
3	007	1	PCS	RH312728	Bearing Housing	BEARING HOUSING, D130; MACHINING
3	008	2	PCS	RH314289	Cover	COVER PLATE, D150, MACHINING
3	009	2	PCS	400185436	Cover	D150 x 25
3	010	1	PCS	RH312742	Bearing Plain	LINING, D70/d60x20, MACHINING
3	011	2	PCS	RH312748	Cover	COVER PLATE, D158/D125/d130/d100/d80x18; MACHINING
3	012	2	PCS	RH31274801	Gasket	T0.8 / D160 x d130
3	013	2	PCS	RH312727	Bearing Plain	LINING, D70/d60x50, MACHINING
3	014	1	PCS	RH313179	Washer	LOCK WASHER, D70/d12x8, MACHINING
3	015	1	PCS	RH313178	Key	KEY, 14x9x176
3	016	1	PCS	RH314358	Drive Shaft	SHAFT, D45, MACHINING
3	017	2	PCS	RH314359	Washer	TRUST WASHER, D80/d22x8, MACHINING
3	018	1	PCS	RH312538	DETECTOR FOR PICK UP, D25, MACHINING	DETECTOR FOR PICK UP, D25, MACHINING
3	019	1	PCS	RH314360	Bolt	STOP BOLT, D50 x L110 / M24, MACHINING
3	020	2	PCS	RH317269	Drive Shaft	SHAFT SUPPORT BUSHING, D150/d100x40
3	021	1	PCS	RH317270	Bearing Plain	LINING, D70/d60x20, MACHINING
3	022	2	PCS	RH312370	Protection	SENSOR HOLDER/PROTECTION, MACHINING; MACHINING, M18x1P
3	023	1	PCS	RH317271	Bearing Housing	BEARING HOUSING, D130; MACHINING
3	024	2	PCS	RH409939	Bracket	HOUSING FOR PICKUP
3	025	1	PCS	RH31253801	DETECTOR FOR PICK UP, D25 x L190 / M24	DETECTOR FOR PICK UP, D25 x L190 / M24; MACHINING
3	026	1	PCS	RH313187	Bolt	STOP BOLT, D50/M24x165, MACHINING
3	027	1	PCS	RH312859	Locking Nut	LOCKING NUT M60x2 T=45; MACHINING, M60x2 T=45
3	028	1	PCS	RH315260	Protection	CABLE CHAIN PROTECTION, B95xL175; BENDING
3	029	1	PCS	RH328136	Distance Ring	SPACER, D60/d50 L5, MACHINING
3	030	2	PCS	400185567	Protection Cover	T6 / D198 x d162
3	031	1	PCS	BETRF007	Taper Roller Bearing	TAPERED ROLLER BNG,31312-A-N11CA-A80-120; d60/D130x67 (BETRF007)
3	032	1	PCS	RHEACVA196-150_01	Cable Protection	ASSEMBLY CABLE PROTECTION (RHEACVA196-150_01)
3	033	1	PCS	BESRS012	Spherical Roller Bearing	SPHERICAL ROLLER BEARING, 21312-E1; d60/D130x31 (BESRS012)
3	034	1	PCS	BELWS012	Washer	LOCKING WASHER, MB-12; MB-12 (BELWS012)
3	035	8	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)
3	036	6	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
3	037	30	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
3	038	4	PCS	400091197	Washer	FLAT WASHER, 8.8 VZN, DIN 125 M24; Tykkelse h=4.0 d=25 (FA0125H24)
3	039	8	PCS	FA0912G05012	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M5x12 (FA0912G05012)
3	040	16	PCS	FA0912G08025	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M8x25; FULLY THREADED (FA0912G08025)
3	041	8	PCS	FA0912G12035	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M12x35; FULLY THREADED (FA0912G12035)
3	042	8	PCS	FA0912G12045	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M12x45; FULLY THREADED (FA0912G12045)
3	043	2	PCS	FA0912G20030	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M20x30 (FA0912G20030)
3	044	4	PCS	400185190	Screw	HEX.HEAD SCREW A4-80, DIN 931 M8x140; THREAD LENGTH: 28mm (FA0931G08140)
3	045	6	PCS	FA0933G10025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x25; FULLY THREADED (FA0933G10025)

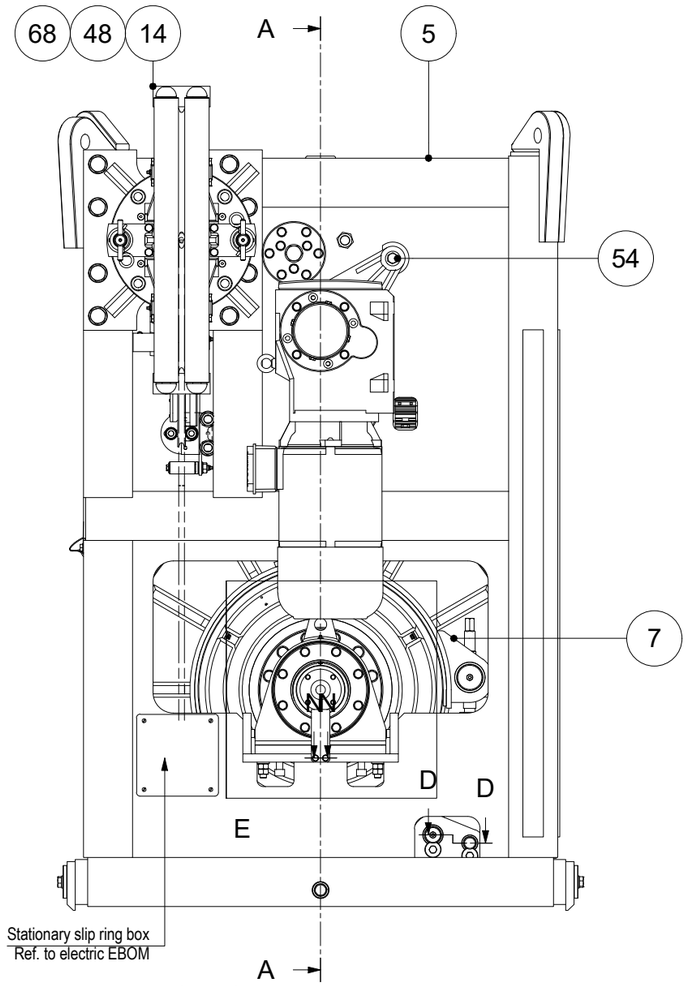
Level	Pos	Qty	Unit	Aras ID	Name	Description
3	046	1	PCS	FA0933G10035	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x35; FULLY THREADED (FA0933G10035)
3	047	24	PCS	FA0933G12045	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x45; FULLY THREADED (FA0933G12045)
3	048	6	PCS	FA0933G12050	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x50; FULLY THREADED (FA0933G12050)
3	049	4	PCS	400091267	Screw	HEX.HEAD SCREW 8.8 VZN, DIN 933 M24x70; FULLY THREADED (FA0933H24070)
3	050	4	PCS	FA0934G08	Nut	HEXAGON NUT, A4-80, DIN 934, M8 (FA0934G08)
3	051	6	PCS	FA0934G12	Nut	HEXAGON NUT, A4-80, DIN 934, M12 (FA0934G12)
3	052	2	PCS	400091318	Nut	HEXAGON NUT, GRADE 8, VZN, DIN 934, M24 (FA0934H24)
3	053	2	PCS	FA0985G24	Nut	NUT NYLOCK HEXAGON A4, DIN 985 M24 (FA0985G24)
3	054	4	PCS	SESRB041	Rotary Shaft Lip Seal	SEAL, 70x100x10, W/STAINLESS SPRING, 100x100x10 (SESRB041)
3	055	2	PCS	GRMAX002	Grease Nipple	GREASE NIPPLE, STRAIGHT, M10X1.0, ELZN (GRMAX002)
3	056	1	PCS	FA0471F0600	Circlip	CIRCLIP RING EXTERNAL, A2 DIN 471 A60; STAINLESS (material x40Cr13) (FA0471F0600)
3	057	12	PCS	FA7991G06012	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M6x12 (FA7991G06012)
3	059	1	PCS	COSEX084	Gasket	ANTI-CORR. TAPE, DENSO-50 MM x 10 M (COSEX084)
2	007	1	PCS	RH318747	Brake Unit	BRAKE ARRANGMENT HW 500, D600, 22,5 kNm; ASSEMBLY, D850, TQ 22,5 KNm
3	010	1	PCS	RH101550	Brake Band	BRAKE BAND, D600, TWS-500
4	060	12	PCS	400207260	Screw	HEX.HEAD SCREW 8.8 VZN, DIN 933 M16x25; FULLY THREADED (FA0933H16025)
4	070	1.54	M	BLBCB080100	Brake Band	BRAKE LINING, 5/16" X4" (BLBCB080100)
4	080	45	PCS	BLRGB0619	Rivet	BRAKE LINING RIVET, Ø6,35X19mm, BRASS (BLRGB0619)
4	090	5	PCS	FA0964G06012	Screw	SLOTTED RAISED COUNTERS A4 DIN 964 M6x12; COUNTERSINK (FA0964G06012)
4	100	2	PCS	400095607	Protective Sleeve	INNER RING d64/D74/12, ROUND BAR D100x17; MACHINING
3	020	1	PCS	RH318468	Cylinder Assembly	BRAKE CYLINDER SOW-500 / HW-500; ASSEMBLY, MAX STROKE 25,5
4	010	1	PCS	RH318464	Cylinder Assembly	BRAKE CYLINDER,D125/d110,WELD/MACHINING
4	020	1	PCS	RH318465	Piston Rod	PISTON ROD, D50, MACHINING
4	030	1	PCS	RH318467	Piston	PISTON, D109x42,5, BHS-110/50
4	040	1	PCS	RH409526	Stuffing Box	STUFFING BOX, BHS-110/50-S (NVE)
4	050	1	PCS	RH402909/NVE	Stuffing Box	STUFFING BOX NUT, BHS-110/50 (NVE)
4	060	1	PCS	RH403177	Bearing Plain	LINING, D40/d30x95, TWS-820
4	070	1	PCS	RH318466	Stroke Limiter	STROKE LIMITER, D110, MACHINING; MACHINING, Ø110x110
4	080	1	PCS	SEPSA006	Hydraulic Seal piston	PISTON SEAL, 110-96-16/32, SIMRIT, 110x110x96 (SEPSA006)
4	090	1	PCS	SEPRA011	Hydraulic Seal rod	PISTON ROD SEAL AUN-50-106, SIMRIT, 60x60x10 (SEPRA011)
4	100	1	PCS	SEDWA010	Hydraulic Seal rod	DIRT-WIPER AS-50-65-7/10, 65x65x10 (SEDWA010)
4	110	1	PCS	SEORA175	O-Ring	O-RING, Ø99,30 x 5,70, 100x100x6 (SEORA175)
4	120	1	PCS	SEORA062	O-Ring	O-RING, Ø34,52 x 3,53 (R4137), 35x35x4 (SEORA062)
4	130	16	PCS	BSPXX016	Spring	PLATE SPRING, DIN 2093, 100x51x5 (BSPXX016)
4	140	1	PCS	BETBS014	Thrust Ball Bearing	THRUST BALL BEARING, SINGLE DIR, 51113; d65/D90x18 (BETBS014)
4	150	1	PCS	FA0985E30	Nut	NUT NYLOCK HEXAGON, 8 ELZN, DIN 985 M30 (FA0985E30)
4	160	1	PCS	FA0125E30	Washer	FLAT WASHER, ELZN, DIN 125 M30; Tykkelse h=4.0 d=31 (FA0125E30)
4	170	1	PCS	GRRAX002S	Grease Nipple	GREASE NIPPLE, STRAIGHT, 1/4"R, A2 (GRRAX002S)
4	180	1	M	SEGRA077	Guide Ring	GUIDE STRIP, 15x2.0 (PTFE), 15x15x2 (SEGRA077)
4	190	1	PCS	FA0913G08010	Threaded Insert	HEX.SCKT SET SCR, FLAT,A4, DIN913 M8x10; FLAT POINT (FA0913G08010)
4	200	1	PCS	400092374	Plug	THREADED PLUG, A2, BSPT 1/4", DIN 906; THREADED PLUG, A2, BSPT 1/4", DIN 906
3	030	1	PCS	RH403248	Brake Adjusting Device	BRAKE ADJUSTMENT NUT, D63.5/M30x74; AWW-1800
3	040	2	PCS	RH314558	Bearing Plain	LINING, D50/d40x25, MACHINING
3	050	1	PCS	RH314541	Bolt	BOLT, D40, MACHINING
3	060	1	PCS	RH314542	Bolt	BOLT, D30, MACHINING

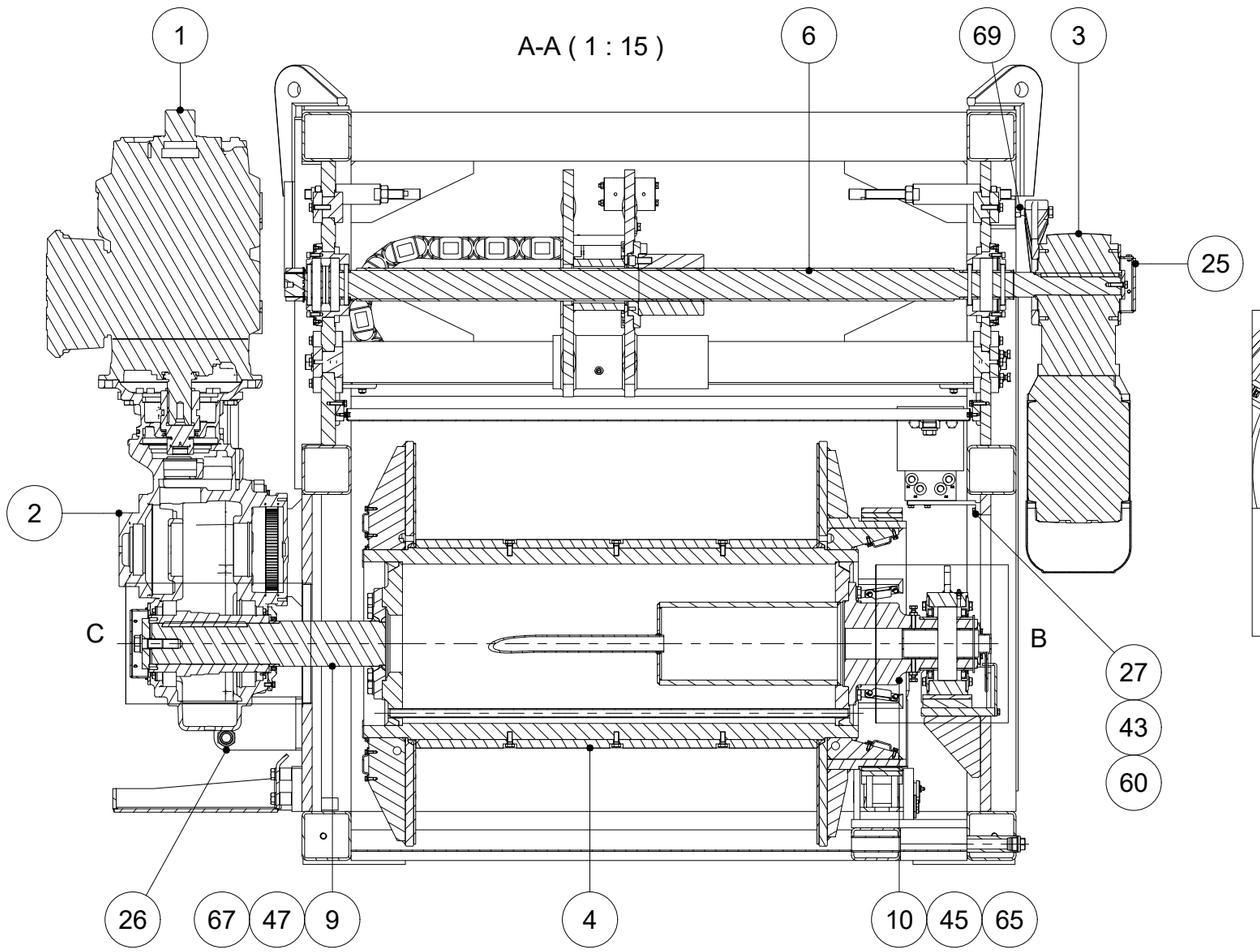
Level	Pos	Qty	Unit	Aras ID	Name	Description
3	070	2	PCS	RH408161	Locking Plate	LOCK DISC, D40/d11x6, TWS-
3	080	2	PCS	FA0933G10025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x25; FULLY THREADED (FA0933G10025)
3	090	4	PCS	FA0916G06010	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M6x10; CUP POINT (FA0916G06010)
3	100	3	PCS	GRRAX002S	Grease Nipple	GREASE NIPPLE, STRAIGHT, 1/4"R, A2 (GRRAX002S)
2	008	1	PCS	RH318063	Bearing Housing	BEARING HOUSING, D180x100, ASSEMBLY; ASSEMBLY, D120/H125, 100x320
3	001	1	PCS	RH318058	Bearing Housing	BEARING HOUSING, D180x90, MACHINING; MACHINING, D180/H125, 320x100
3	002	2	PCS	RH318059	Cover	BEARING HOUSING COVER, SEAL COVER; MACHINING, D230x145x17, DH=180, SEAL COVER
3	003	2	PCS	RH31805901	Gasket	D233 x d183 x 0,8
3	004	1	PCS	BESRS089	Spherical Roller Bearing	SPHERICAL ROLLER BEARING, 23024-E1; d120/D180x46 (BESRS089)
3	005	2	PCS	SESRB0732	Rotary Shaft Lip Seal	SEAL, 130x170x12, NBR, SSS, (SESRB0732)
3	006	16	PCS	FA0933G12020	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x20; FULLY THREADED (FA0933G12020)
3	007	16	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
3	008	1	PCS	GRMAX001S	Grease Nipple	GREASE NIPPLE, STRAIGHT, M10x1.5, A2 (GRMAX001S)
2	009	1	PCS	400185476	Drive Shaft	HW-515-FS-T90/URP
2	010	1	PCS	400185485	Support Shaft	SLIP RING, PCD260x326 / d75
2	011	1	PCS	RH317304	Fixed Support	BRAKE BAND SUPPORT HW-520E-F-T90; ASSEMBLY
3	010	1	PCS	RH317303	Fixed Support	BRAKE BAND SUPPORT HW-520E-F-T90; MACHINING
3	020	2	PCS	RH408614	SLIDING PLATE, TWS-2000-10000	SLIDING PLATE, TWS-2000-10000
3	030	2	PCS	RH408797	Nut	SLIDE NUT WDU-4000/4500
3	040	2	PCS	FA0934G16	Nut	HEXAGON NUT, A4-80, DIN 934, M16 (FA0934G16)
3	050	4	PCS	FA7991G06025	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M6x25 (FA7991G06025)
3	060	4	PCS	FA0933G16030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x30; FULLY THREADED (FA0933G16030)
3	070	4	PCS	FA0125G16	Washer	FLAT WASHER, A4, DIN 125 M16; Tykkelse h=3.0 d=17 (FA0125G16)
3	080	2	PCS	FA0933G16080	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x80; FULLY THREADED (FA0933G16080)
2	012	1	PCS	RH313890	Key	KEY, 28x16, MACHINING
2	013	1	PCS	400185508	Protection	DRIP TRAY - HW515-FS-T90/URP
3	001	1	PCS	400185539	Plate	T8 / 790 x 400
3	002	1	PCS	400185541	Plate	T8 / 1517,5 x 75
3	003	1	PCS	400185543	Plate	T8 / 796 x 140,8
3	004	1	PCS	RH32750002	DRIP TRAY PIPE,PIPE Ø30/24-L151,PBLANK	DRIP TRAY PIPE,PIPE Ø30/24-L151,PBLANK
2	014	1	PCS	400186258	Sheave Assembly	2 x PCD300 Swivel
3	001	1	PCS	RH327527	Bracket	PIVOT SHEAVE BRACKET,HW-2320E-T90,MACH
3	002	2	PCS	RH327556	INDICATOR ROLLER ASSE,HW-515E-T90,ASSE	INDICATOR ROLLER ASSE,HW-515E-T90,ASSE
4	020	1	PCS	RH32755602	Bearing Plain	ROLLING BUSH,PIPE D60/d40 L696,MACH
4	030	1	PCS	RH317016	Bearing Plain	LINING, D40,30/20x20, MACHINING
4	040	1	PCS	RH316935	Bearing Plain	LINING, D30/d20x12, MACHINING
4	050	1	PCS	RH316936	Distance Ring	DISTANCE RING, D42/d35x8, MACHINING
4	060	2	PCS	BEDBS027	Deep Groove Ball Bearing	DEEP GROOVE BALL BEARING, 6004 2RS; d20/D42x12 (BEDBS027)
4	070	2	PCS	FA0472F0420	Circlip	CIRCLIP RING INTERNAL, A2 DIN 472 I42; STAINLESS (material x40Cr13) (FA0472F0420)
4	080	2	PCS	SESRA006	Rotary Shaft Lip Seal	SEAL, 30x42x7, 42x42x7 (SESRA006)
3	003	2	PCS	RH327529	Bracket	PIVOT SHEAVE GUIDE ROLLER BRACKET, MACH
3	004	1	PCS	RH327533	Frame	PIVOT SHEAVE FRAME,HW-515E-T90,MACH
3	005	2	PCS	WIBLX080300-015-ST	Sheave Assembly	GUIDE SHEAVE PCD300,WØ8.18,D125 kN,ST (WIBLX080300-015-ST)
3	006	1	PCS	RH32752401	Bushing	BUSHING, PIPE D140/d120 L25, MACHINING
3	007	1	PCS	RH32752402	Bushing	BUSHING, PIPE D125/110 L25, MACHINING

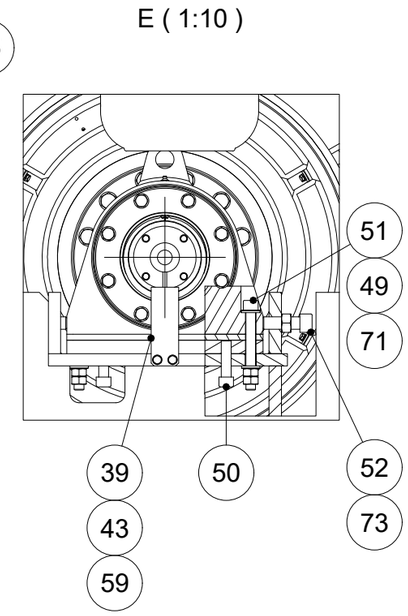
Level	Pos	Qty	Unit	Aras ID	Name	Description
3	008	1	PCS	RH32752403	Wire Rope Sheave	PIV. SHEAVE COV.,PL. D230/d67.5/T40,MACH
3	009	4	PCS	RH319473	Bearing Plain	LINING, D50/d40x21, MACHINING
3	010	2	PCS	RH32752405	Bolt	BOLT, D40x150, MACHINING
3	011	4	PCS	RH312592	Locking Plate	LOCKING PLATE, 35x75x8, MACHINING; MACHINING, T=8
3	012	1	PCS	RH329317	Cover	PIVOT SHEAVE COVER, D350/d147/T25, MACH
3	013	1	PCS	BELNS024	Locking Nut	LOCK NUT, KM-24; M120x2 (BELNS024)
3	014	1	PCS	BELWS024	Washer	LOCKING WASHER, MB-22; MB-24 (BELWS024)
3	015	2	PCS	GRMXX003	Grease Nipple	GREASE NIPPLE, M10x1,5 STRAIGHT, A4 (GRMXX003)
3	016	1	PCS	SESRB077	Rotary Shaft Lip Seal	SEAL, 140x170x15, W/STAINLESS SPRING, 15x170x170 (SESRB077)
3	017	2	PCS	BETRS0373	Taper Roller Bearing	TAPERED ROLLER BEARING, 33024 (BETRS0373)
3	018	1	PCS	SESRA070	Rotary Shaft Lip Seal	SEAL, 125x150x12, (SESRA070)
3	019	1	PCS	GRMXX002	Grease Nipple	GREASE NIPPLE, M8x1,0 STRAIGHT, A4 (GRMXX002)
3	020	12	PCS	FA0933G12030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x30; FULLY THREADED (FA0933G12030)
3	021	4	PCS	FA7991G08030	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M8x30 (FA7991G08030)
3	022	8	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
3	023	8	PCS	FA0933G10020	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x20; FULLY THREADED (FA0933G10020)
3	024	12	PCS	FA0125G12	Washer	FLAT WASHER, A4, DIN 125 M12; Tykkelse h=2.5 d=13 (FA0125G12)
3	025	6	PCS	FA7991G08025	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M8x25 (FA7991G08025)
3	026	6	PCS	FA7991G08020	Screw	SOCKET HEAD CAP SCREW,A4, DIN 7991 M8x20 (FA7991G08020)
3	027	2	PCS	RH329338	Sheave Assembly	SHEAVE PIVOT LOCK, HW-515E-T90, ASSEMBLY
4	010	1	PCS	RH329318	GUIDE PINE SUPPORT, HW-515E-T90	GUIDE PINE SUPPORT, HW-515E-T90; WELDING & MACHINING
4	020	1	PCS	RH329319	Pipe	PIPE, HOLLOW BAR D35x3/L130, MACHINING
4	030	1	PCS	RH329320	Pin	GUIDE PIN, ROUND BAR D35xL232, MACHINING
4	040	1	PCS	RH32841303	Handle	HANDLE PIN, D12, MACHINING
4	050	4	PCS	FA0916G08010	Threaded Insert	HEX.SOCKET SET S, CUP. A4, DIN916 M8x10; CUP POINT (FA0916G08010)
4	060	2	PCS	FA0933G10030	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x30; FULLY THREADED (FA0933G10030)
4	070	2	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
4	080	1	PCS	FAXXXXX1774	Spring Pin	SPRING COTTER PIN, Ø6,3 DOUBLE, A4 (FAXXXXX1774)
3	028	8	PCS	RH329339	Bearing Plain	GUIDE BUSHING, D30/d21, MACHINING
2	015	2	PCS	400185557	Shear Pin	D35x65 / M12
2	016	1	PCS	RH410231	Clamp	CLAMPING DISC, BREVINI BPH323; MACHINING, Ø123/ø100/ø25x19, Brevini BPH323
2	017	1	PCS	RH328792	Cover	GEARBOX COVER, BPH.23, ASSEMBLY
3	010	1	PCS	RH328793	Cover	GEARBOX COVER, BPH.23, WELDING ASSEMBLY
3	020	4	PCS	FA0933G08008	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x8; FULLY THREADED (FA0933G08008)
3	030	4	PCS	FA0933G05012	Screw	HEX.HEAD SCREW A4-80, DIN 933 M5x12; FULLY THREADED (FA0933G05012)
3	040	4	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)
3	050	4	PCS	FA0125G05	Washer	FLAT WASHER, A4, DIN 125 M5; Tykkelse h=1.0 d=5.3 (FA0125G05)
3	060	1	PCS	COGLX041	Sealing Compound	WURTH MS 40, POLYMER B SEALANT (COGLX041)
2	018	1	PCS	RH325991	Motor Bracket	MOTOR SUPPORT RH, BPH323K IEC200, W+M
2	019	1	PCS	RH325993	Motor Bracket	MOTOR SUPPORT LH, BPH323K IEC200, W+M
2	020	1	PCS	400185484	Protection	GREASE CONTAINER - HW515-FS-T90/URP
2	021	4	PCS	400185482	Washer	D45/d14 x 5
2	022	1	PCS	400185477	Protective Sleeve	INNER RING d40/D50/25
2	023	4	PCS	RH319511	Bracket	GROUND BRACKET, 250x120, T=20, MACHINING
2	024	8	PCS	RH317276	Locking Plate	LOCKING WASHER, D80/D50/d18x38; MACHINING

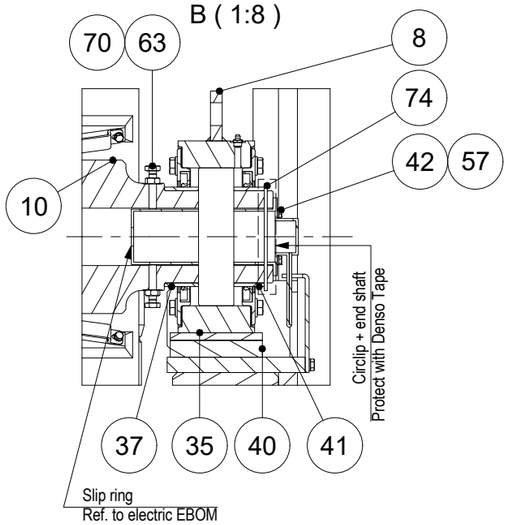
Level	Pos	Qty	Unit	Aras ID	Name	Description
2	025	1	PCS	RH328382	Cover	GEARBOX COVER, SK9032, ASSEMBLY
3	010	1	PCS	RH328383	Cover	GEARBOX COVER, SK9032, WELDING ASSEMBLY
3	020	4	PCS	FA0933G08008	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x8; FULLY THREADED (FA0933G08008)
3	030	4	PCS	FA0933G10025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x25; FULLY THREADED (FA0933G10025)
3	040	4	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)
3	050	4	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
3	060	1	PCS	COGLX041	Sealing Compound	WURTH MS 40, POLYMER B SEALANT (COGLX041)
2	026	1	PCS	RH318968	Bracket	BRACKET FOR BULKHEAD UNION; BENDING, FOR BULKHEAD UNION, 2XØ34 / 90deg
2	027	1	PCS	RH319356	SOLENOID BOX HOLDER	SOLENOID BOX HOLDER
2	028	2	PCS	400095677	Plate	CONTAINER SUPPORT, PLATE 200x50/T20; MACHINING
2	029	1	PCS	400096323	Bushing	LINING, (D110xd100/L25); MACHINING
2	030	1	PCS	400095286	Cover	SHAFT SEAL COVER, (T25/D230xd120); MACHINING
2	031	1	PCS	400095754	Protective Sleeve	INNER RING d30/D40/15, ROUND BAR D50x20; MACHINING
2	032	1	PCS	400185480	Protective Sleeve	INNER RING d30/D40/25
2	033	1	PCS	400185481	Protective Sleeve	INNER RING d40/D50/35
2	034	4	PCS	RH325992	Distance Ring	SPACER, ROUND D32 / L10, MACHINING
2	035	1	PCS	RH318060	Shim	SHIM PLATE, BEARING SUPPORT, 120x320x10
2	036	6	PCS	RH329575	Distance Ring	SPACER, ROUND BAR (D45/L30), MACHINING
2	037	1	PCS	RH318067	Bearing Plain	LINING, D130/d120x45, MACHINING
2	038	1	PCS	400185733	Bracket	Control panel bracket
2	039	1	PCS	400185684	Plate	T5 / 156.5 x 45
2	040	1	PCS	COVVX019	Lifting Sling	EPOCAST 36 WITH HARDENER, 4 L; CHOCKING COMPOUND (COVVX019)
2	041	1	PCS	RH318070	Bearing Plain	LINING, D130/d120x39,5, MACHINING
2	042	31	PCS	FA0125G06	Washer	FLAT WASHER, A4, DIN 125 M6; Tykkelse h=1.6 d=6.4 (FA0125G06)
2	043	21	PCS	FA0125G08	Washer	FLAT WASHER, A4, DIN 125 M8; Tykkelse h=1.6 d=8.4 (FA0125G08)
2	044	8	PCS	FA0125G10	Washer	FLAT WASHER, A4, DIN 125 M10; Tykkelse h=2.0 d=10.5 (FA0125G10)
2	045	26	PCS	FA0125G16	Washer	FLAT WASHER, A4, DIN 125 M16; Tykkelse h=3.0 d=17 (FA0125G16)
2	046	16	PCS	FA0125G18	Washer	FLAT WASHER, A4, DIN 125 M18; Tykkelse h=3.0 d=19 (FA0125G18)
2	047	12	PCS	FA0125G20	Washer	FLAT WASHER, A4, DIN 125 M20; Tykkelse h=3.0 d=21 (FA0125G20)
2	048	9	PCS	400091197	Washer	FLAT WASHER, 8.8 VZN, DIN 125 M24; Tykkelse h=4.0 d=25 (FA0125H24)
2	049	8	PCS	FA6916H16	Washer	HARDENED WASHER, VZN, DIN 6916 M16; 300HV / FOR 10.9 BOLT (FA6916H16)
2	050	4	PCS	FA0912G16060	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M16x60; FULLY THREADED (FA0912G16060)
2	051	4	PCS	400186256	Screw	SOCKET HEAD SCREW 12.9 ZFC, DIN 912 M16x130 (FA0912U16130)
2	052	4	PCS	FA0912G20060	Screw	SOCKET HEAD SCREW A4-80, DIN 912 M20x60; FULLY THREADED (FA0912G20060)
2	053	2	PCS	FA0931G10090	Screw	HEX.HEAD SCREW A4-80, DIN 931 M10x90; THREAD LENGTH:26mm (FA0931G10090)
2	054	1	PCS	FA0931G16110	Screw	HEX.HEAD SCREW A4-80, DIN 931 M16x110; THREAD LENGTH: 38mm (FA0931G16110)
2	055	8	PCS	FA0931G18090-70	Screw	HEX.HEAD SCREW A4-70, DIN 931 M18x90; THREAD LENGTH: 42mm / A4-70 (FA0931G18090-70)
2	056	4	PCS	FA0931G18100-70	Screw	HEX.HEAD SCREW A4-70, DIN 931 M18x100; THREAD LENGTH: 42mm / A4-70 (FA0931G18100-70)
2	057	4	PCS	FA0933G06016	Screw	HEX.HEAD SCREW A4-80, DIN 933 M6x16; FULLY THREADED (FA0933G06016)
2	058	6	PCS	FA0933G06020	Screw	HEX.HEAD SCREW A4-80, DIN 933 M6x20; FULLY THREADED (FA0933G06020)
2	059	13	PCS	FA0933G08020	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x20; FULLY THREADED (FA0933G08020)
2	060	2	PCS	FA0933G08025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x25; FULLY THREADED (FA0933G08025)
2	061	6	PCS	FA0933G08035	Screw	HEX.HEAD SCREW A4-80, DIN 933 M8x35; FULLY THREADED (FA0933G08035)
2	062	4	PCS	FA0933G10025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x25; FULLY THREADED (FA0933G10025)
2	063	4	PCS	FA0933G10050	Screw	HEX.HEAD SCREW A4-80, DIN 933 M10x50; FULLY THREADED (FA0933G10050)

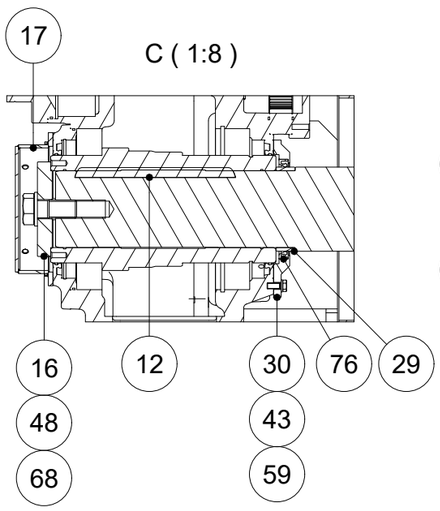
Level	Pos	Qty	Unit	Aras ID	Name	Description
2	064	4	PCS	FA0933G12025	Screw	HEX.HEAD SCREW A4-80, DIN 933 M12x25; FULLY THREADED (FA0933G12025)
2	065	12	PCS	FA0933G16040	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x40; FULLY THREADED (FA0933G16040)
2	066	14	PCS	FA0933G16060	Screw	HEX.HEAD SCREW A4-80, DIN 933 M16x60; FULLY THREADED (FA0933G16060)
2	067	12	PCS	FA0933G20050	Screw	HEX.HEAD SCREW A4-80, DIN 933 M20x50; FULLY THREADED (FA0933G20050)
2	068	9	PCS	400186159	Screw	HEX.HEAD SCREW 8.8 VZN, DIN 933 M24x55; FULLY THREADED (FA0933H24055)
2	069	1	PCS	FA0934G16	Nut	HEXAGON NUT, A4-80, DIN 934, M16 (FA0934G16)
2	070	6	PCS	FA0934G10	Nut	HEXAGON NUT, A4-80, DIN 934, M10 (FA0934G10)
2	071	8	PCS	400090942	Nut	HEXAGON NUT DIN934, GRADE 12.9ZFC, M16 (FA0934Z16)
2	072	4	PCS	FA0934G18	Nut	HEXAGON NUT, A4-80, DIN 934, M18 (FA0934G18)
2	073	4	PCS	FA0934G20	Nut	HEXAGON NUT, A4-80, DIN 934, M20 (FA0934G20)
2	074	1	PCS	FA0471F1200	Circlip	CIRCLIP RING EXTERNAL, A4 DIN 471 A120 (FA0471F1200)
2	075	2	PCS	FCPPF030	Plug	HEXAGON HEAD PLUG, DIN 910, A4, G1"; DIN 910 (FCPPF030)
2	076	1	PCS	SESRB063	Rotary Shaft Lip Seal	SEAL, 110x130x12, W/STAINLESS SPRING, 130x130x12 (SESRB063)
2	079	1	PCS	COSEX084	Gasket	ANTI-CORR. TAPE, DENSO-50 MM x 10 M (COSEX084)
2	080	1	PCS	COGLX041	Sealing Compound	WURTH MS 40, POLYMER B SEALANT (COGLX041)

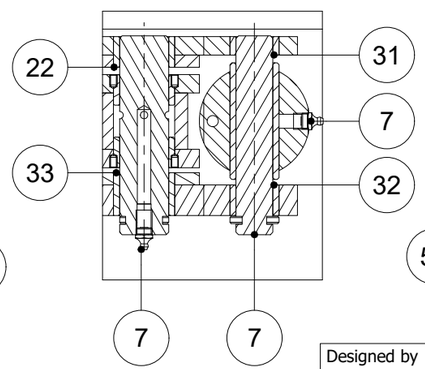


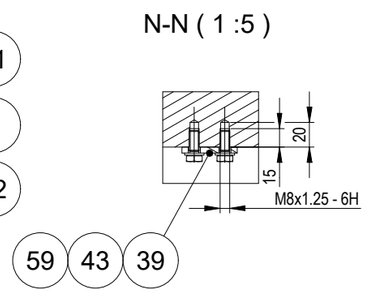












TIGHTENING TORQUE - ACC. DOC. #6402

***MCG SIGNS (Not shown on Drawing)**
***POLYMER - ACC. DOC. #6482 MACHINED SURFACES AND SURFACE TREATMENT**
***LOCTITE 243 - ALL BOLT CONNECTIONS TO BE USED WITH**
***DENSO TAPE - TO BE APPLIED AT NOT PAINTED SURFACES**

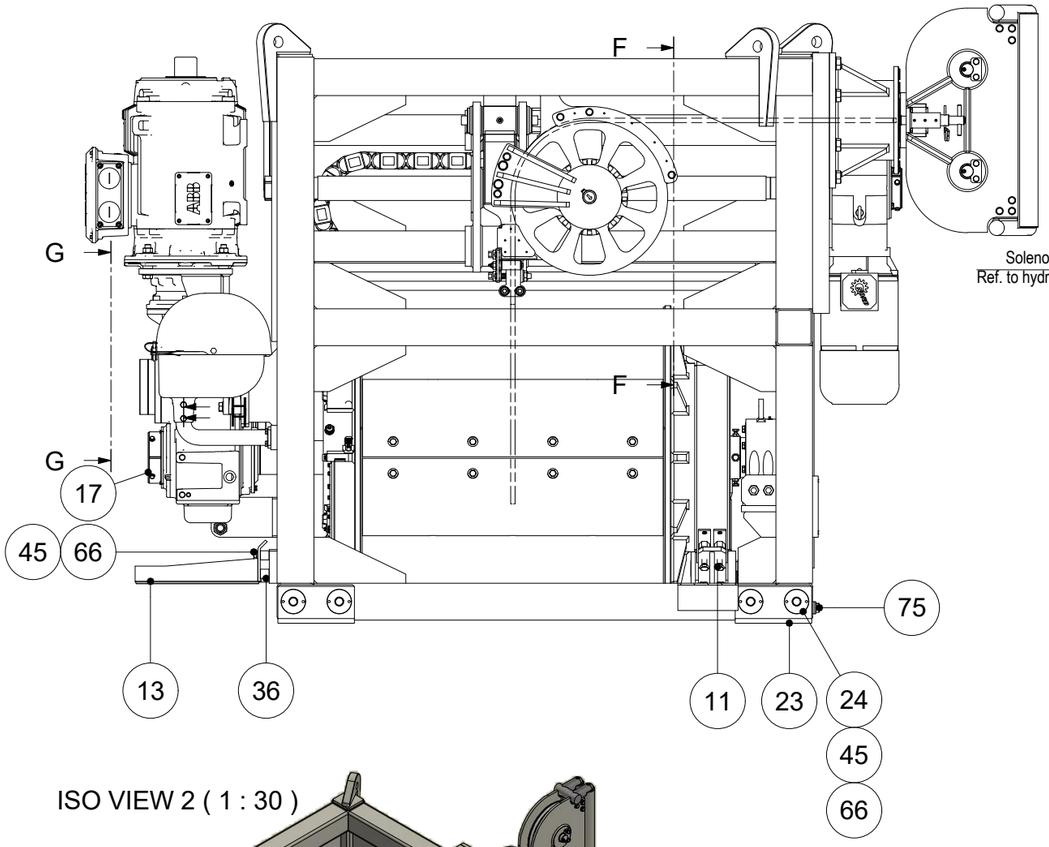
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Designed by	Date	Modified by	ECO / CO			
P Pantovic	09.02.2022.	D Petrovic	ECO-2058181			

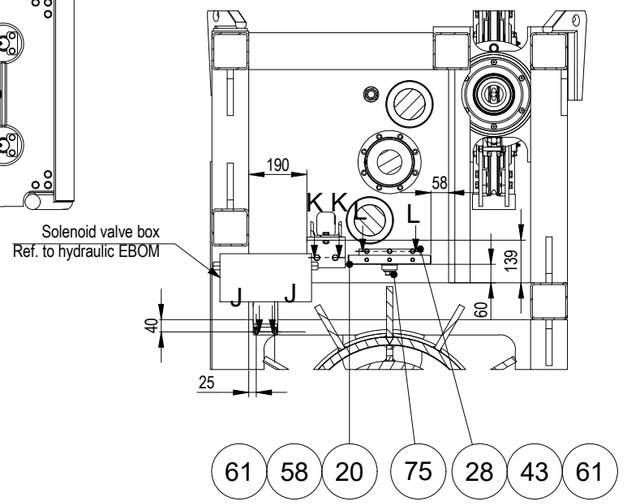
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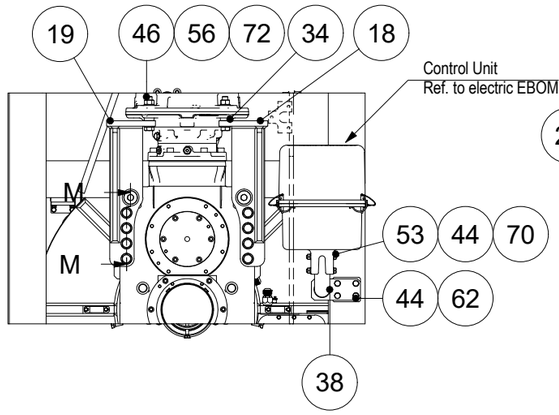
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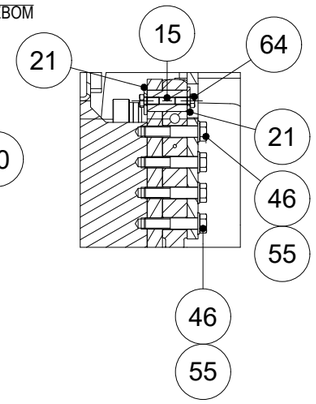
F-F (1 : 20)



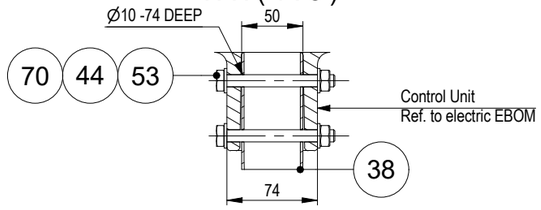
G-G (1 : 20)



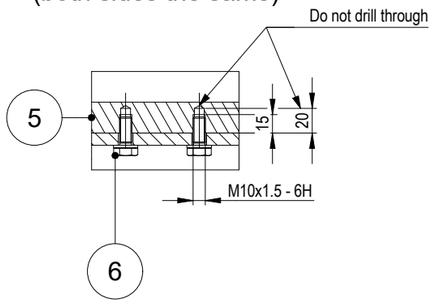
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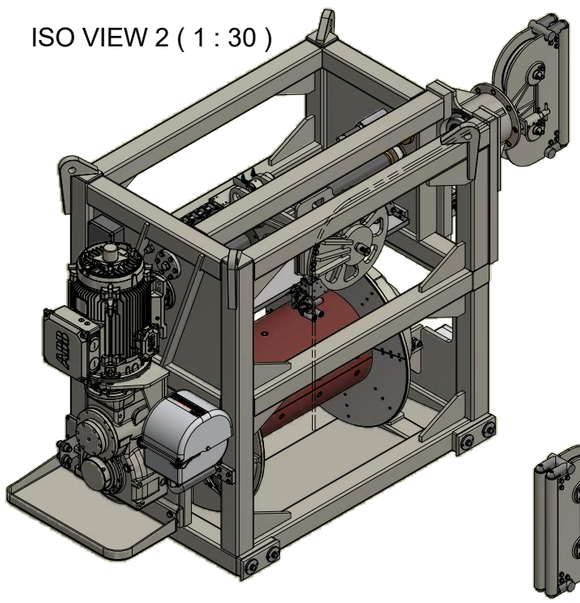
H-H (1 : 5)



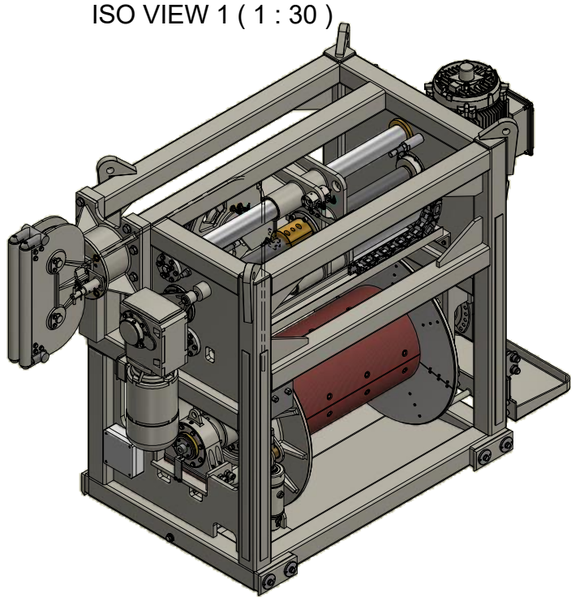
K-K (1 : 5)
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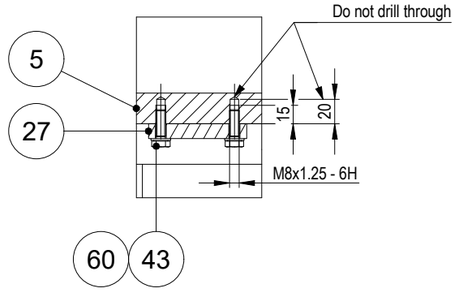
ISO VIEW 2 (1 : 30)



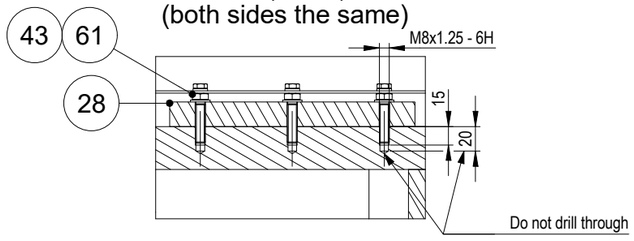
ISO VIEW 1 (1 : 30)



J-J (1 : 5)



L-L (1 : 5)
(both sides the same)



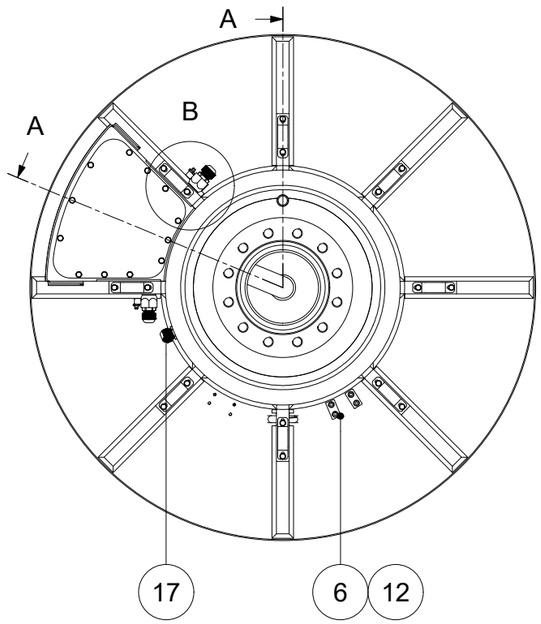
Designed by	Date	Modified by	ECO / CO			
P Pantovic	2/9/2022	D Petrovic	ECO-2058181			

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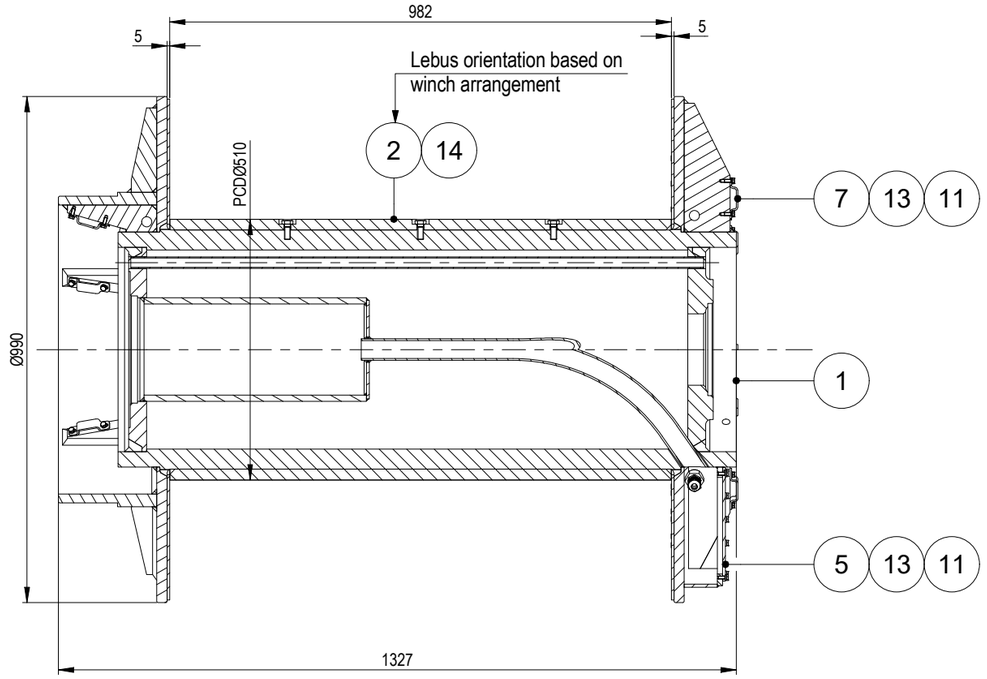
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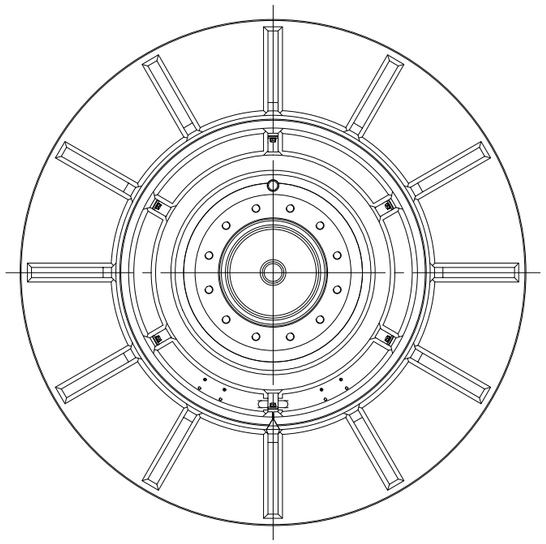
Name	Weight (kg)
ASSEMBLY	4215
Description	Scale (A3)
CTD WINCH, HW515FST90/URP	1 : 20
Document ID	Revision / Sheet
2000005715	B / 2 / 2

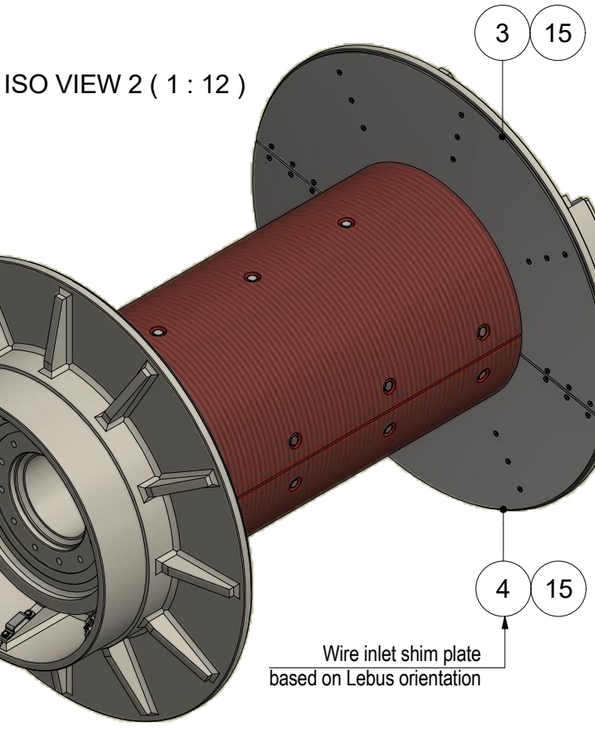
TOL. SYSTEM ACC. TO ISO	General tol. for dimensions
Surface roughness R_a in µm	Machining ISO 2768 tol-class: mK Welding ISO 13920 tol-class: AE Therm. cut ISO 9013 tol-class: 441



A-A (1 : 12)

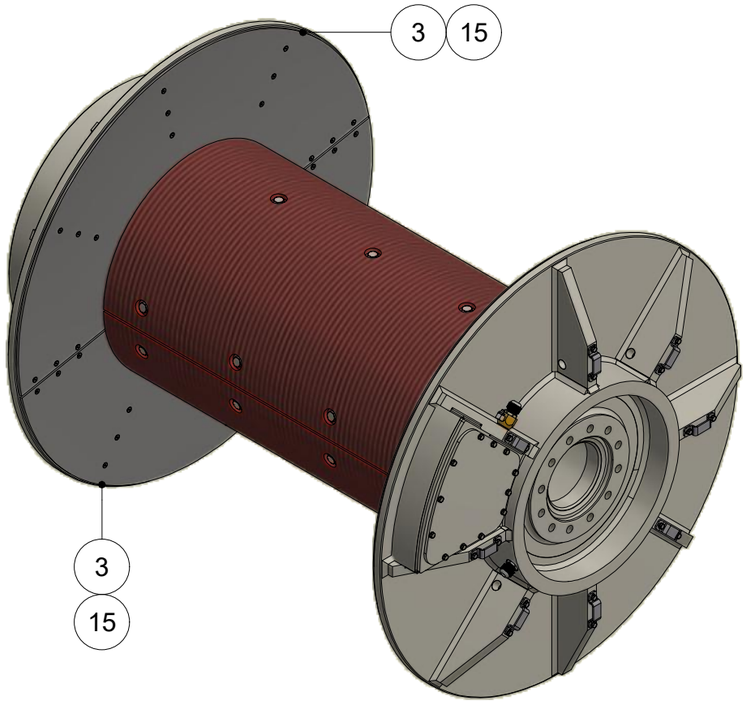




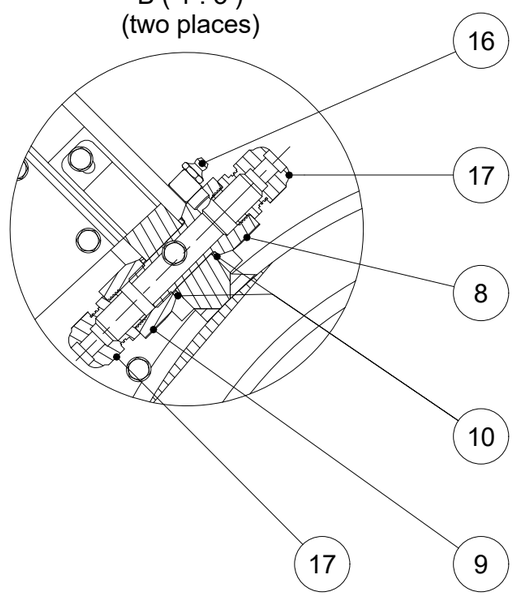


ISO VIEW 2 (1 : 12)

ISO VIEW 1 (1 : 12)



B (1 : 3)
(two places)



Designed by	Date	Modified by	ECO / CO			
P Pantovic	27.01.2022.	P Pantovic	ECO-2056698			

MACGREGOR

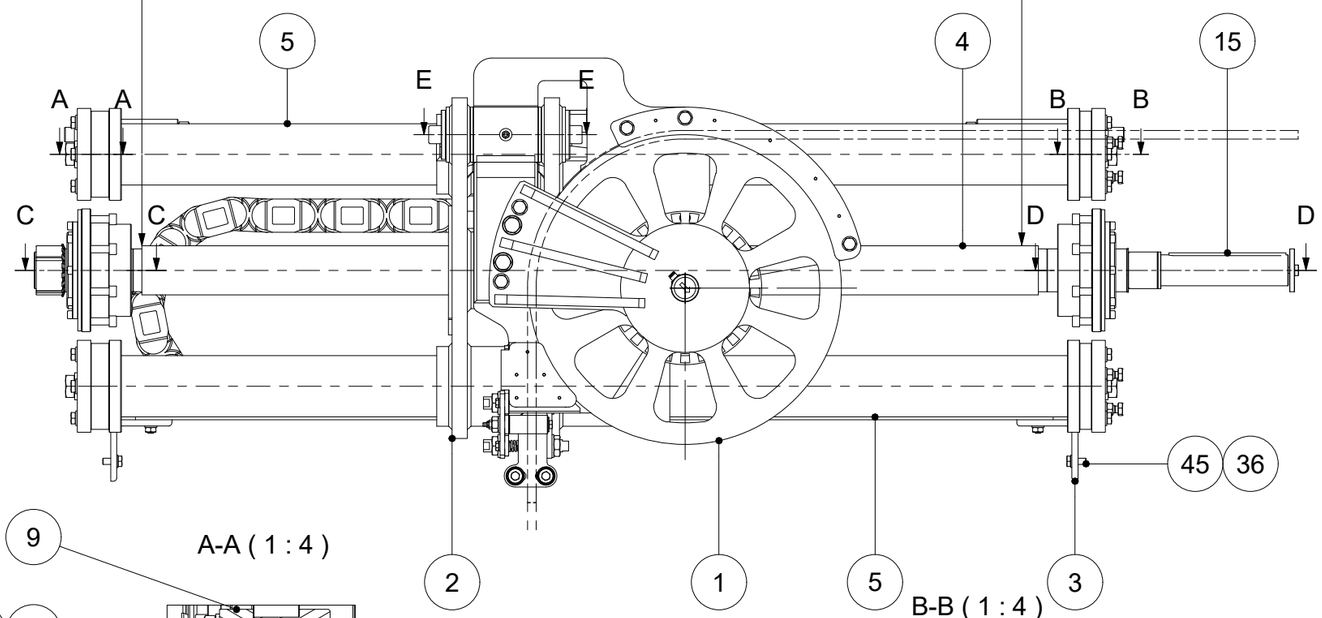
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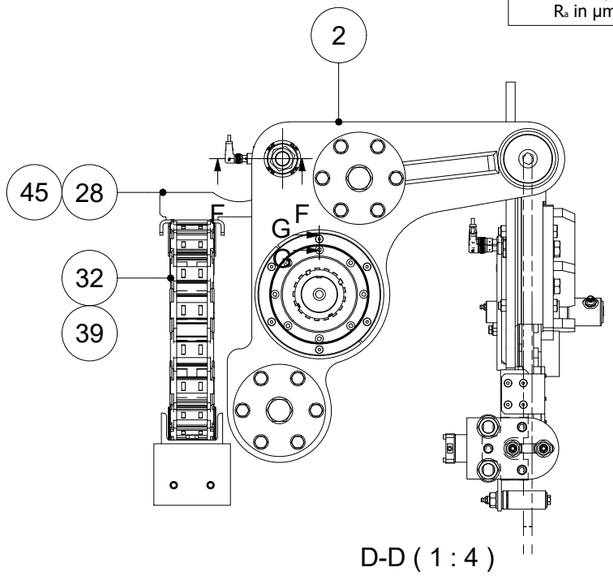
Name		Weight
Wire Rope Drum		1124 kg
Description		Scale (A3)
D990 x PCD510 x L982		1 : 12
Document ID	Revision	Sheet
2000005163	A	1 / 1

TOL. SYSTEM ACC. TO ISO	General tol. for dimensions
Surface roughness R_a in µm	Machining ISO 2768 tol-class: mK Welding ISO 13920 tol-class: AE Therm. cut ISO 9013 tol-class: 441

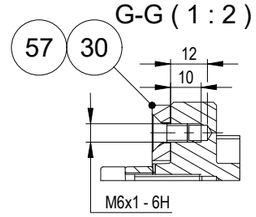
Ends which are not in contact with the nut, Protect with Denso tape

Ends which are not in contact with the nut, Protect with Denso tape

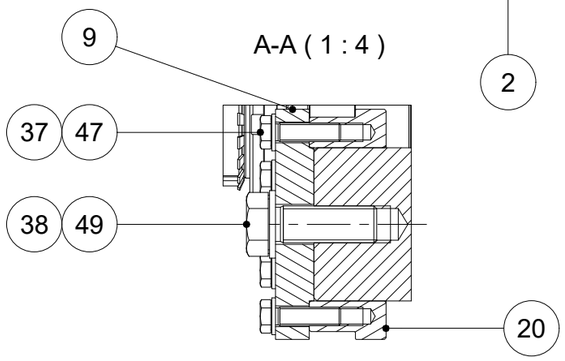




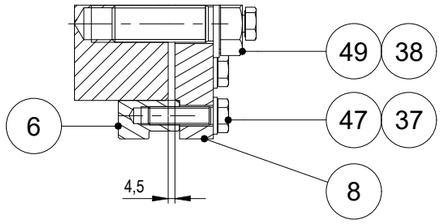
G-G (1 : 2)



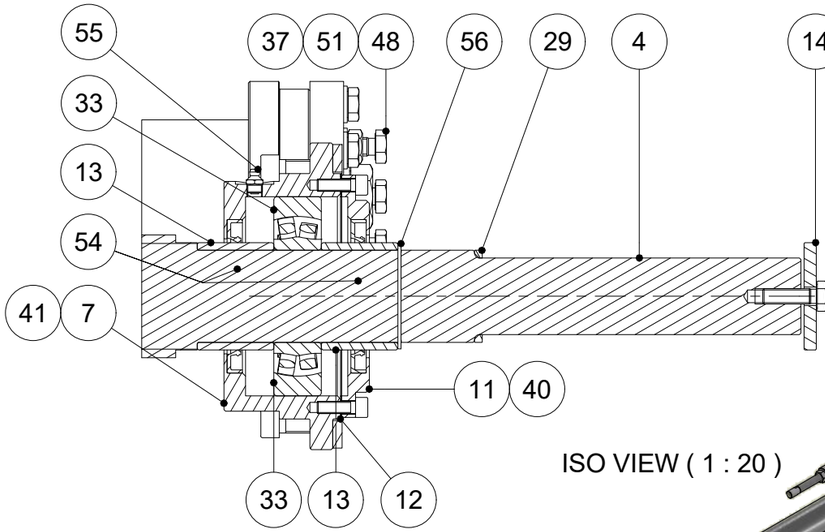
A-A (1 : 4)



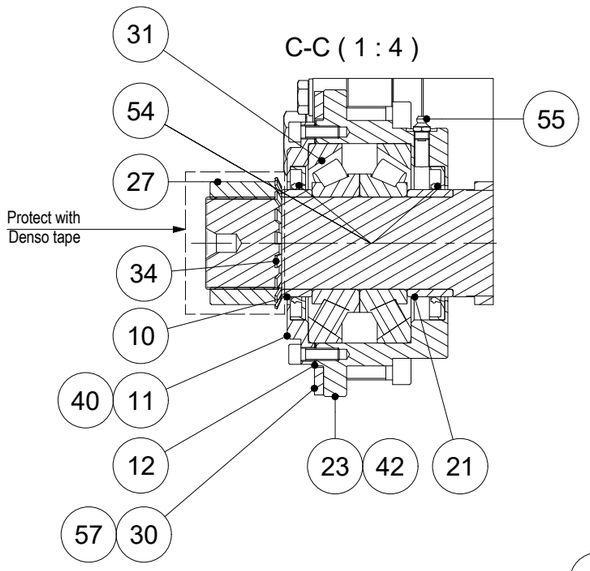
B-B (1 : 4)



D-D (1 : 4)

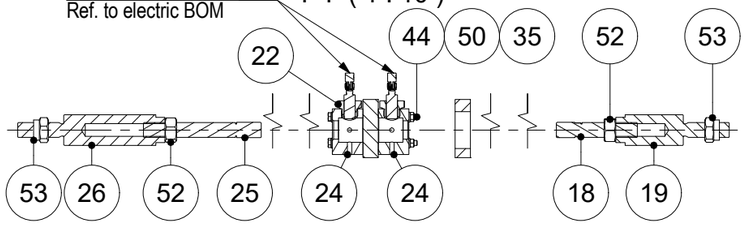


C-C (1 : 4)

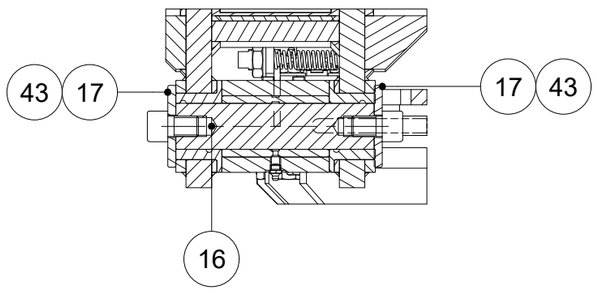


Proximity switch Ref. to electric BOM

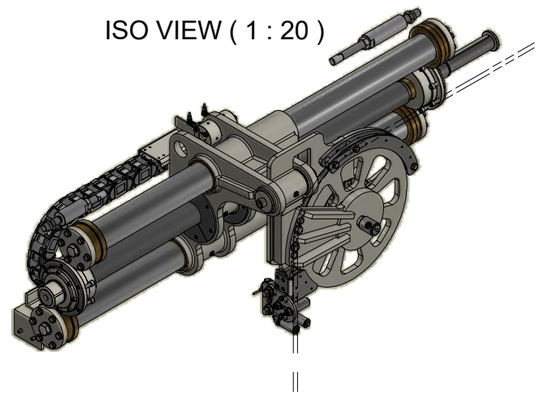
F-F (1 : 10)



E-E (1 : 6)



ISO VIEW (1 : 20)



58 59

TIGHTENING TORQUE - ACC. DOC. #6402

***LOCTITE 243 - ALL BOLT CONNECTIONS TO BE USED WITH**
***DENSO TAPE - TO BE APPLIED AT NOT PAINTED SURFACES**

Designed by	Date	Modified by	ECO / CO			
P Pantovic	07.02.2022.	P Pantovic	ECO-2056698			

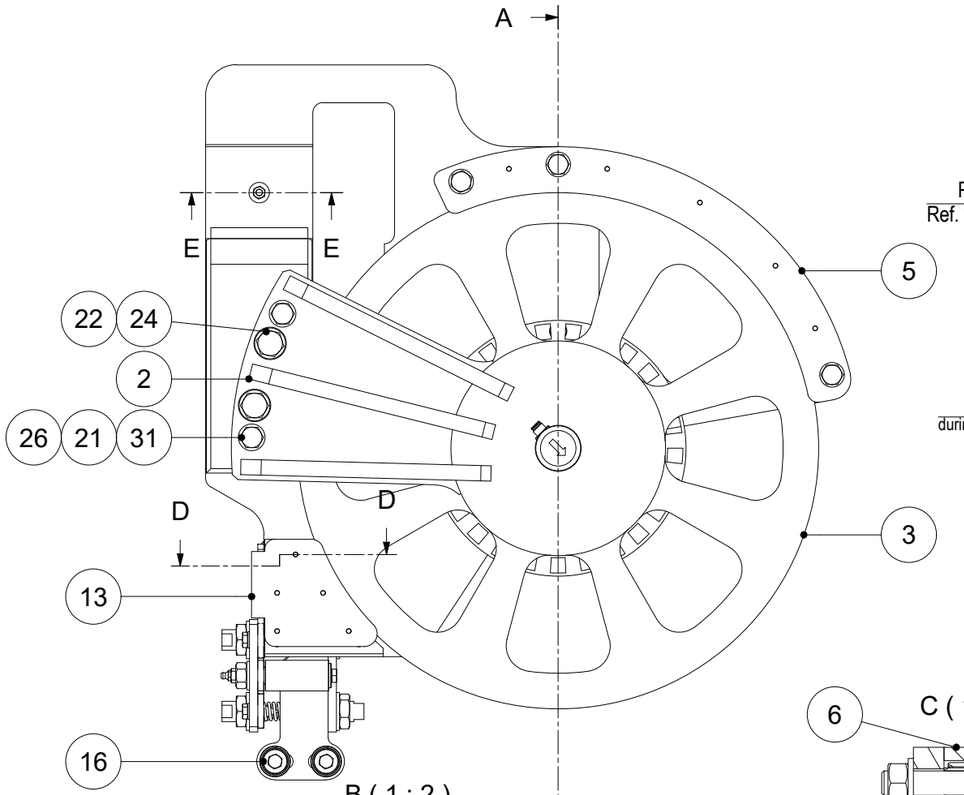
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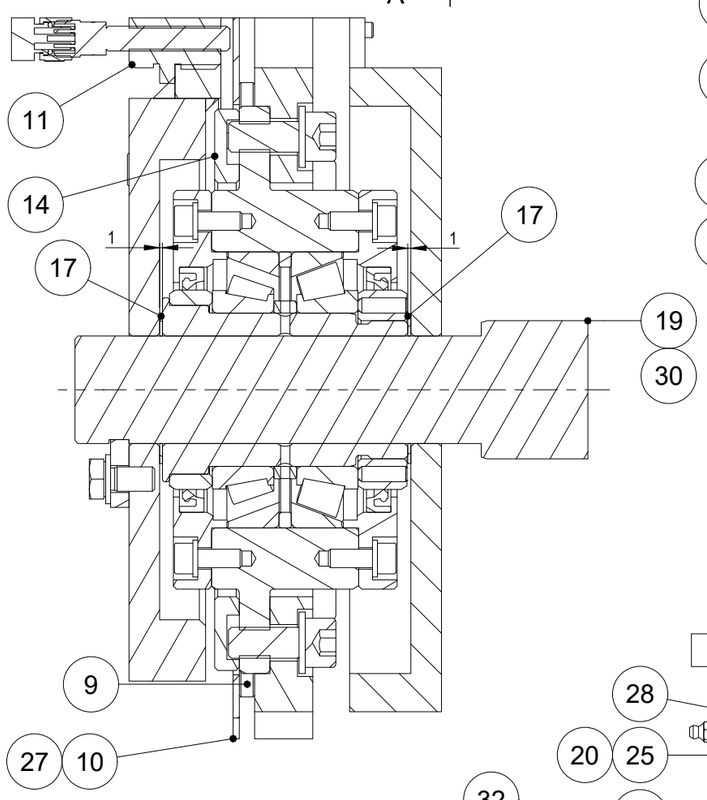
Name		Weight (kg)
Level Wind		543
Description		Scale (A3)
L982		1 : 10
Document ID	Revision	Sheet
2000005622	A	1 / 1

Sheet Purpose:	Sheet Purpose:	TOL. SYSTEM ACC. TO ISO	General tol. for dimensions
MACHINING	**ASSEMBLY**	Surface roughness R_a in µm	Machining ISO 2768 tol-class: mK Welding ISO 13920 tol-class: AE Therm. cut ISO 9013 tol-class: 441

12.5

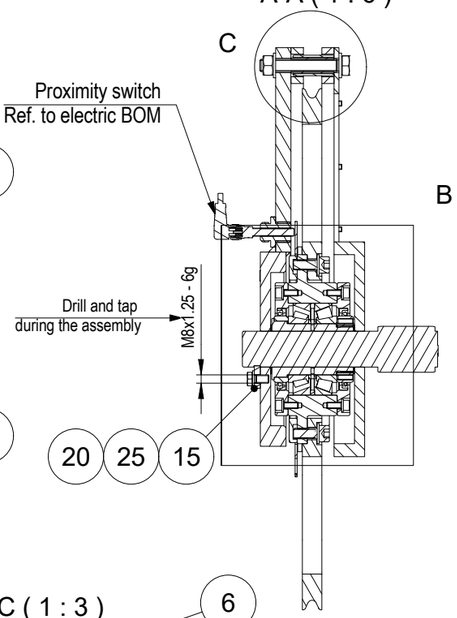


B (1 : 2)

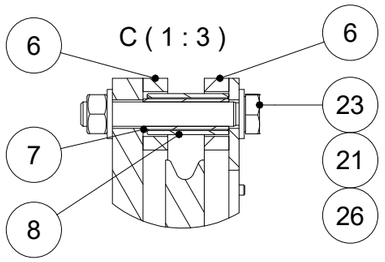


*LOCTITE 243 - ALL BOLT CONNECTIONS TO BE USED WITH

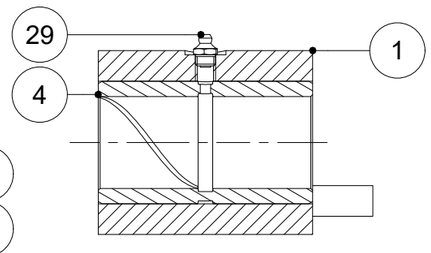
A-A (1 : 6)



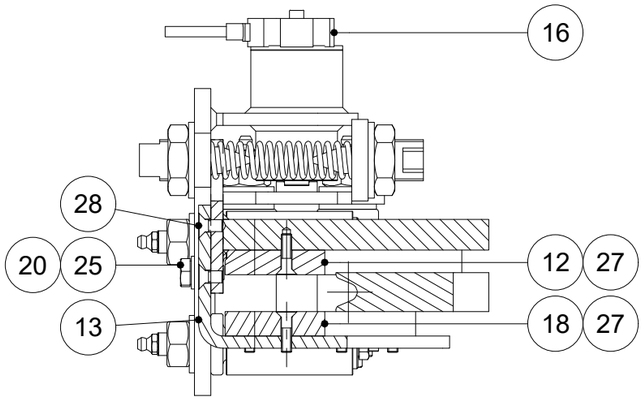
C (1 : 3)



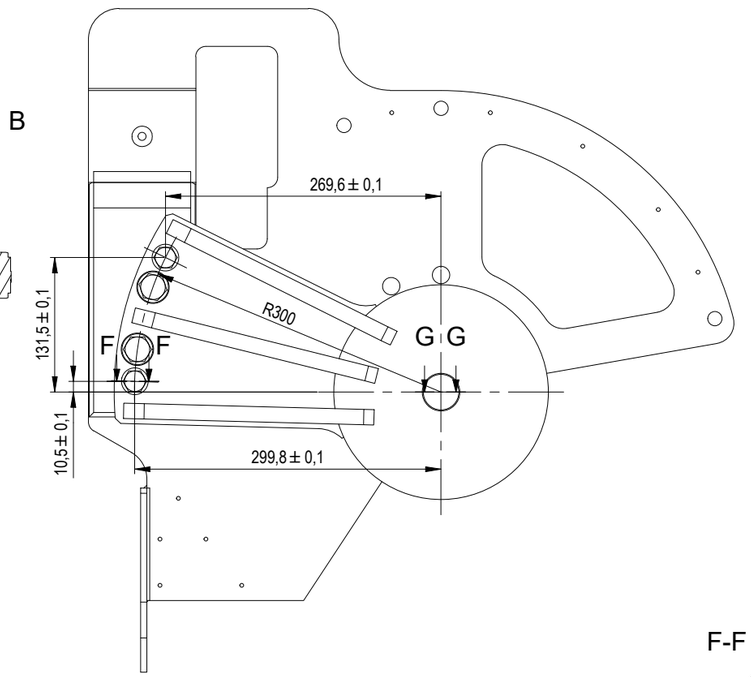
E-E (1 : 3)



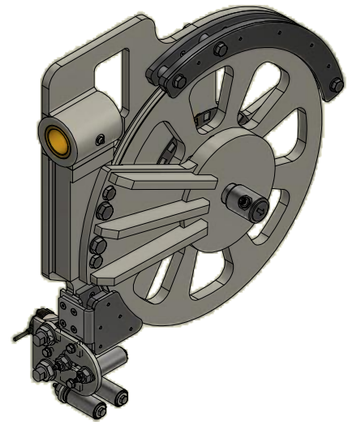
D-D (1 : 3)



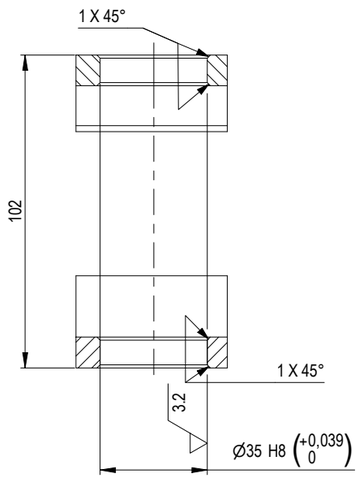
MACHINING VIEW (1 : 6)



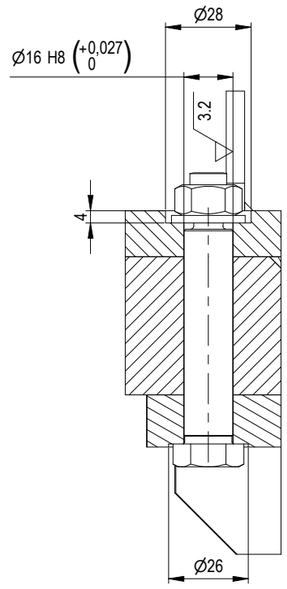
ISO VIEW (1 : 10)



G-G (1 : 2)



F-F (1 : 2)



Designed by	Date	Modified by	ECO / CO			
P Pantovic	02.02.2022.	P Pantovic	ECO-2056698			

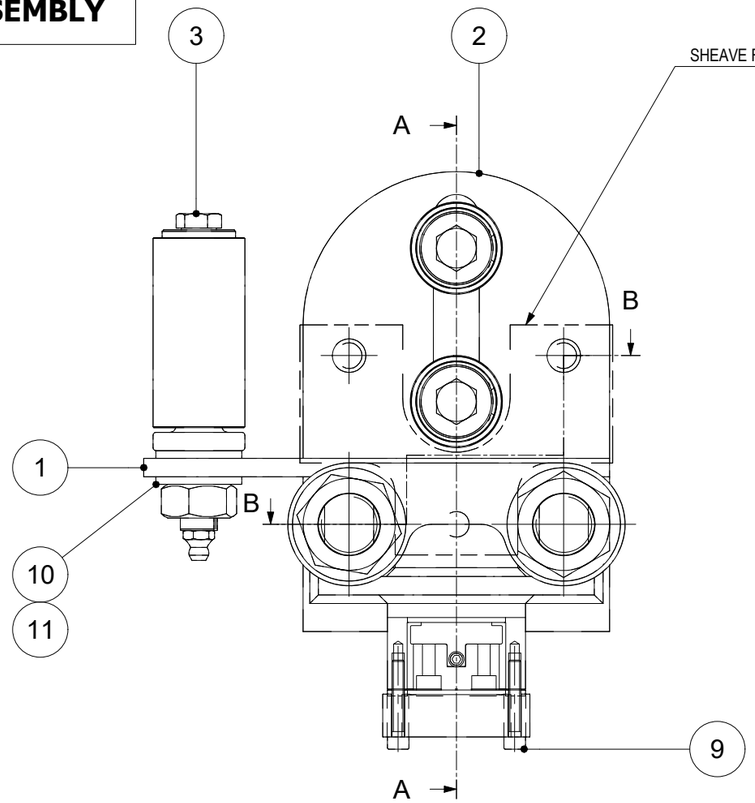
MACGREGOR

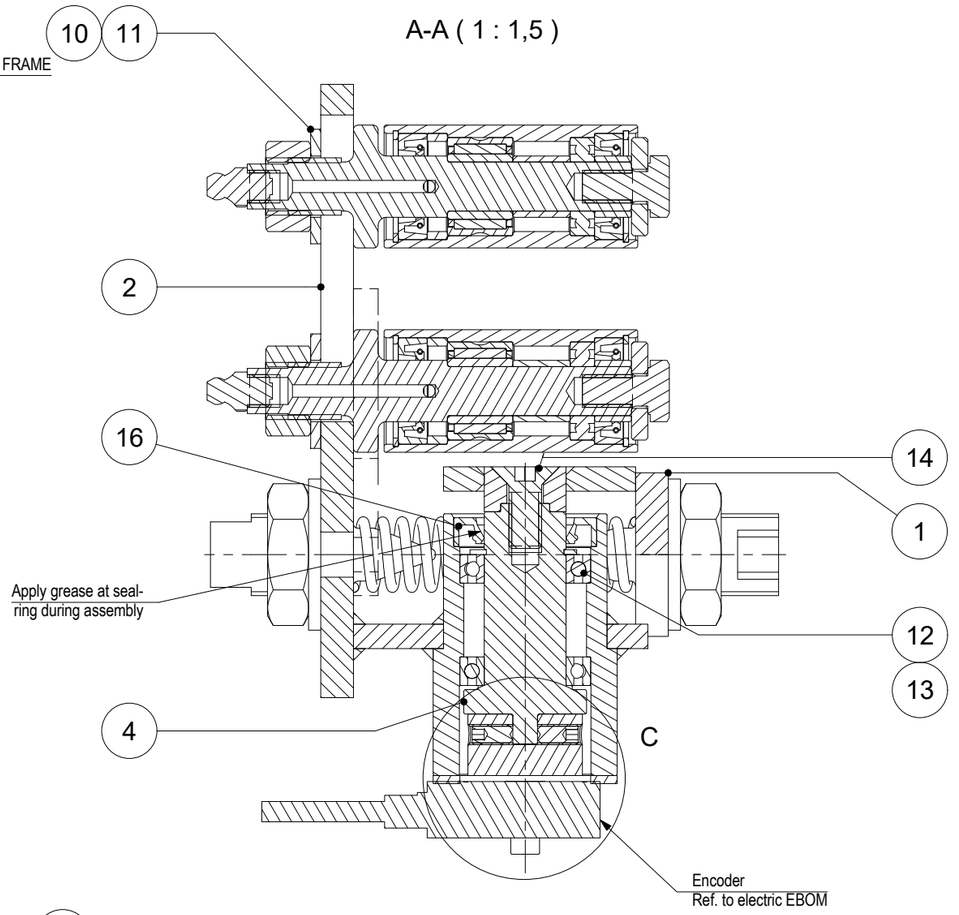
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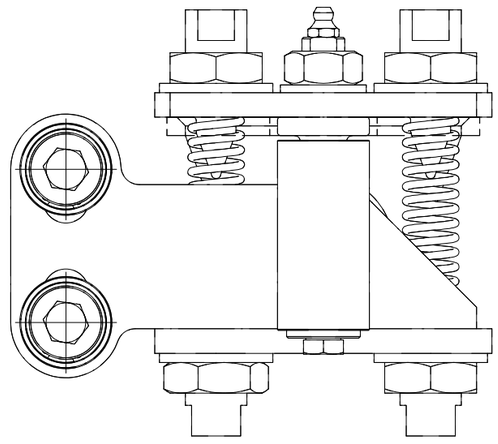
Name	Weight
Wire Rope Sheave	80 kg
Description	**Scale (A3)**
PCD500	1 : 6
Document ID	**Revision** / **Sheet**
2000005409	A / 1 / 1

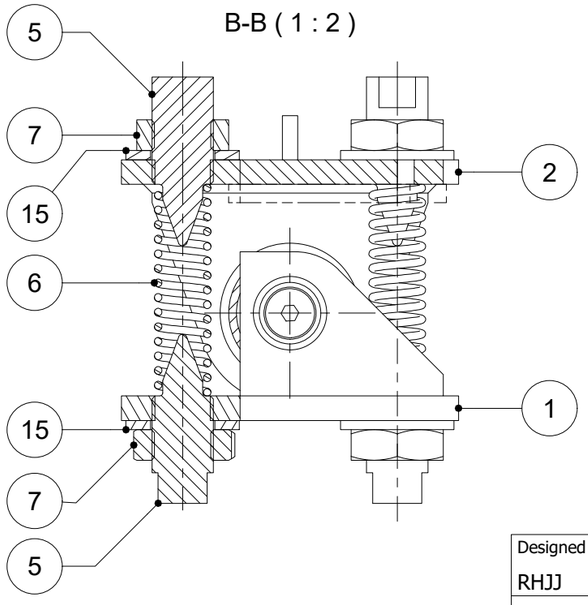
Sheet Purpose:

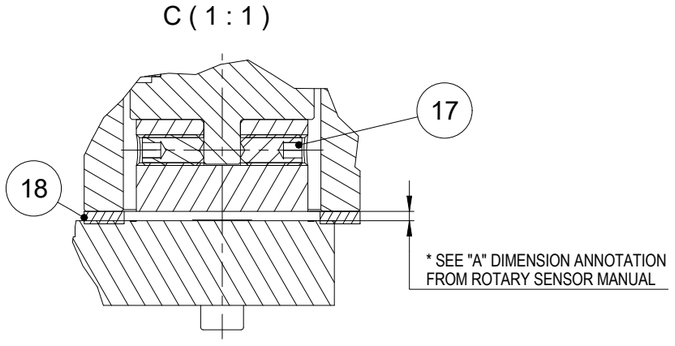
ASSEMBLY



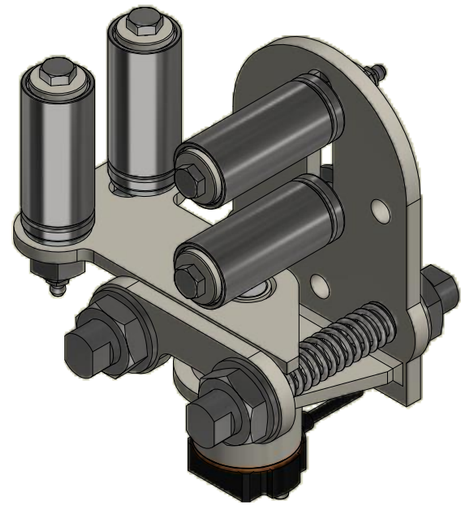




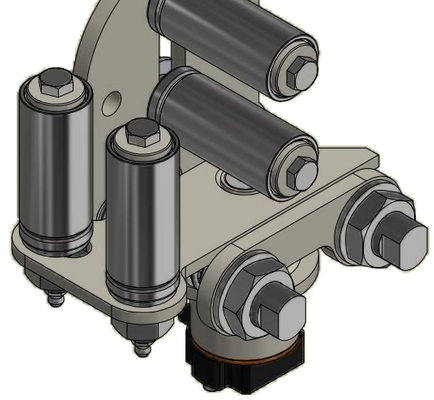




ISO VIEW (1 : 2,5)



ISO VIEW (1 : 2,5)



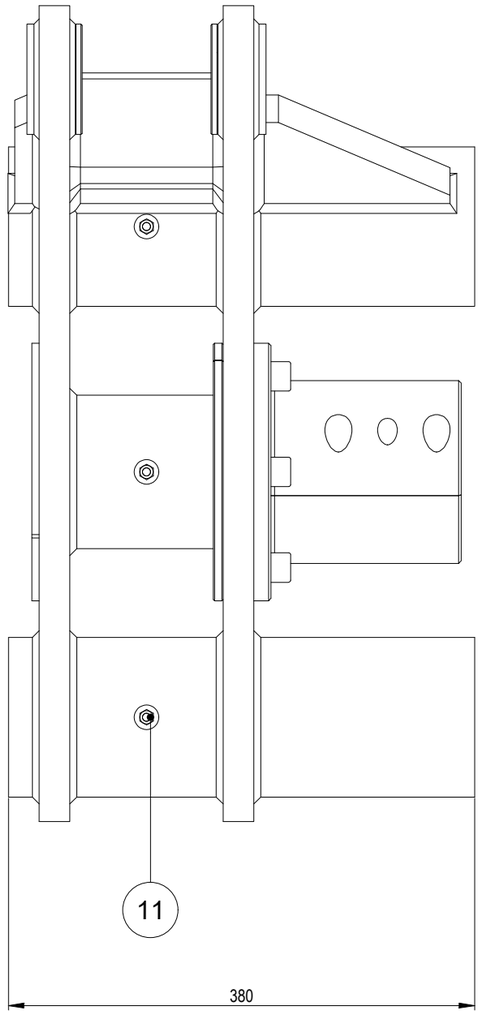
Designed by	Date	Modified by	ECO / CO			
RHJJ	26.04.2019.	D Petrovic	ECO-2057722			

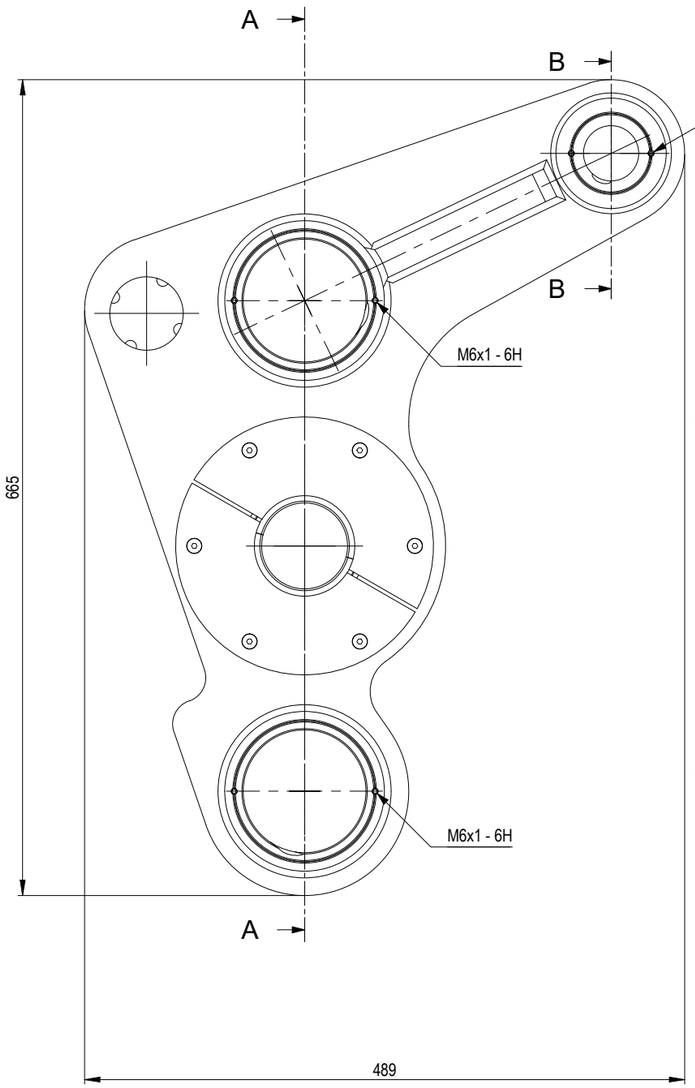
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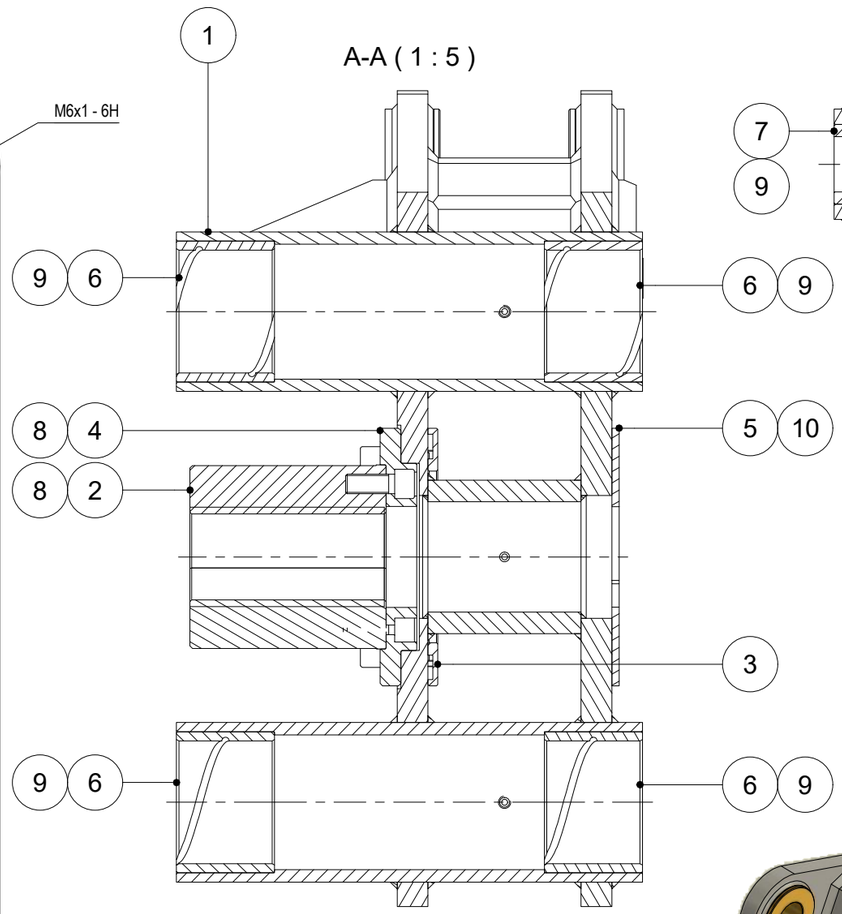
Name	Weight (kg)
LEVEL WIND INDICATOR	4,3
Description	**Scale (A3)**
HW-2320E01-T90	1 : 2
Document ID	**Revision** / **Sheet**
RH328074	B / 1 / 1

TOL. SYSTEM ACC. TO ISO	General tol. for dimensions	
Surface roughness R_a in µm	Machining ISO 2768	tol-class: mK
	Welding ISO 13920	tol-class: AE
	Therm. cut ISO 9013	tol-class: 441

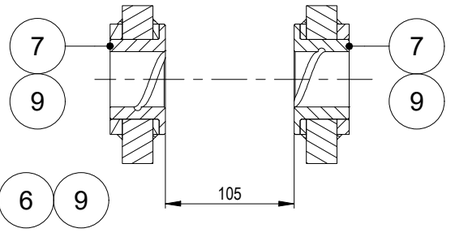




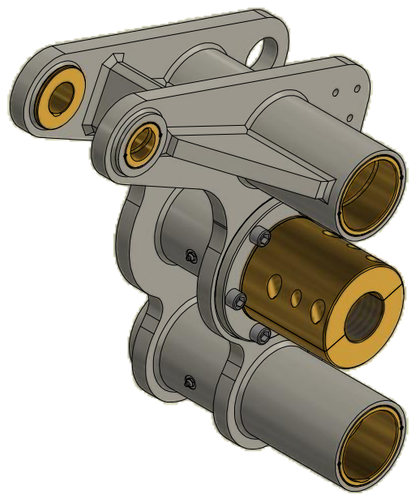
A-A (1 : 5)



B-B (1 : 5)



ISO VIEW (1 : 8)



TIGHTENING TORQUE - ACC. DOC. #6402

***POLYMER - ACC. DOC. #6482 MACHINED SURFACES AND SURFACE TREATMENT**
***LOCTITE 243 - ALL BOLT CONNECTIONS TO BE USED WITH**

Designed by	Date	Modified by	ECO / CO			
P Pantovic	04.02.2022.	P Pantovic	ECO-2056698			

MACGREGOR

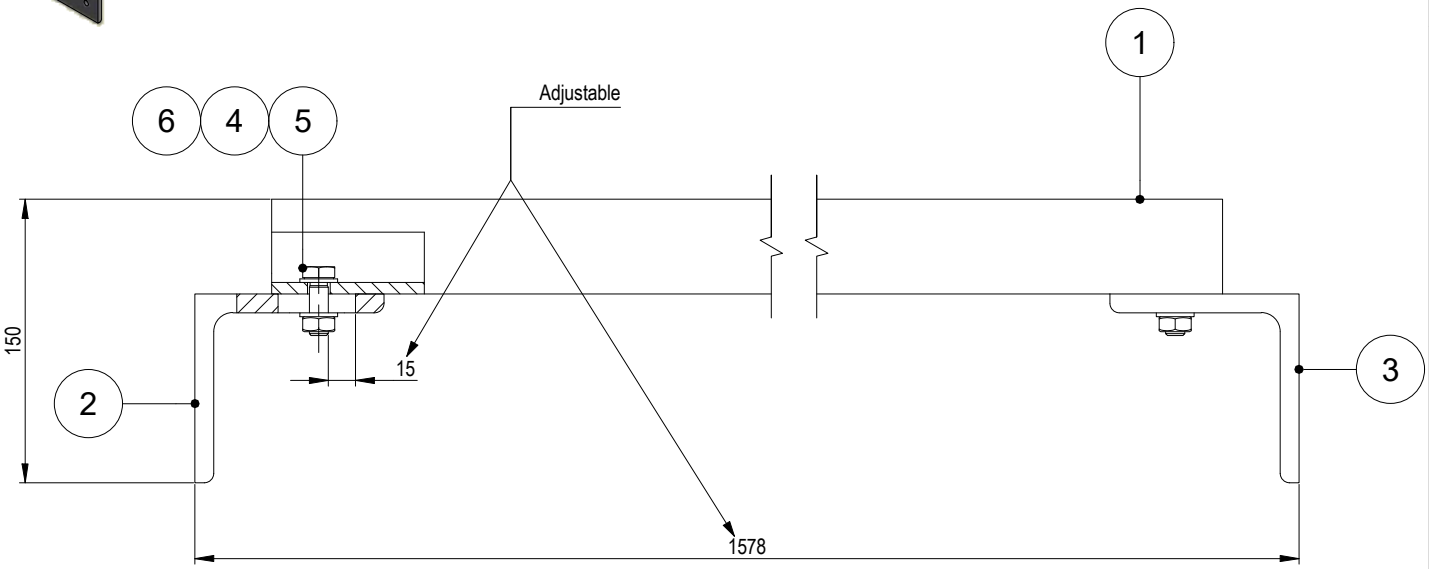
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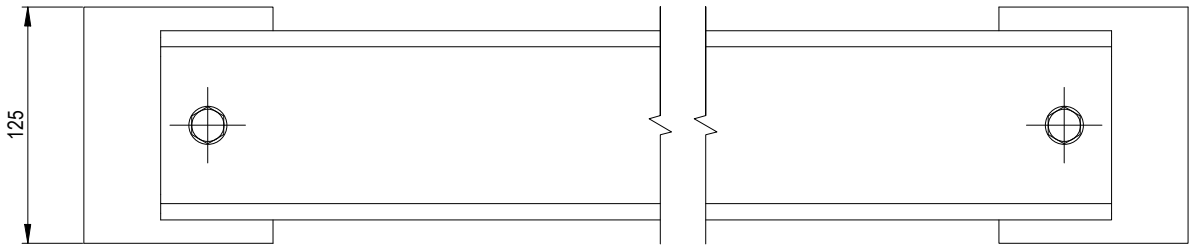
Name		Weight
Cable Guide		110 kg
Description		Scale (A3)
HW-500		1 : 5
Document ID	Revision	Sheet
2000005484	A	1 / 1

TOL. SYSTEM ACC. TO ISO	General tol. for dimensions	
Surface roughness R_a in µm	Machining ISO 2768	tol-class: mK
	Welding ISO 13920	tol-class: AE
	Therm. cut ISO 9013	tol-class: 441

ISO VIEW (1 : 15)





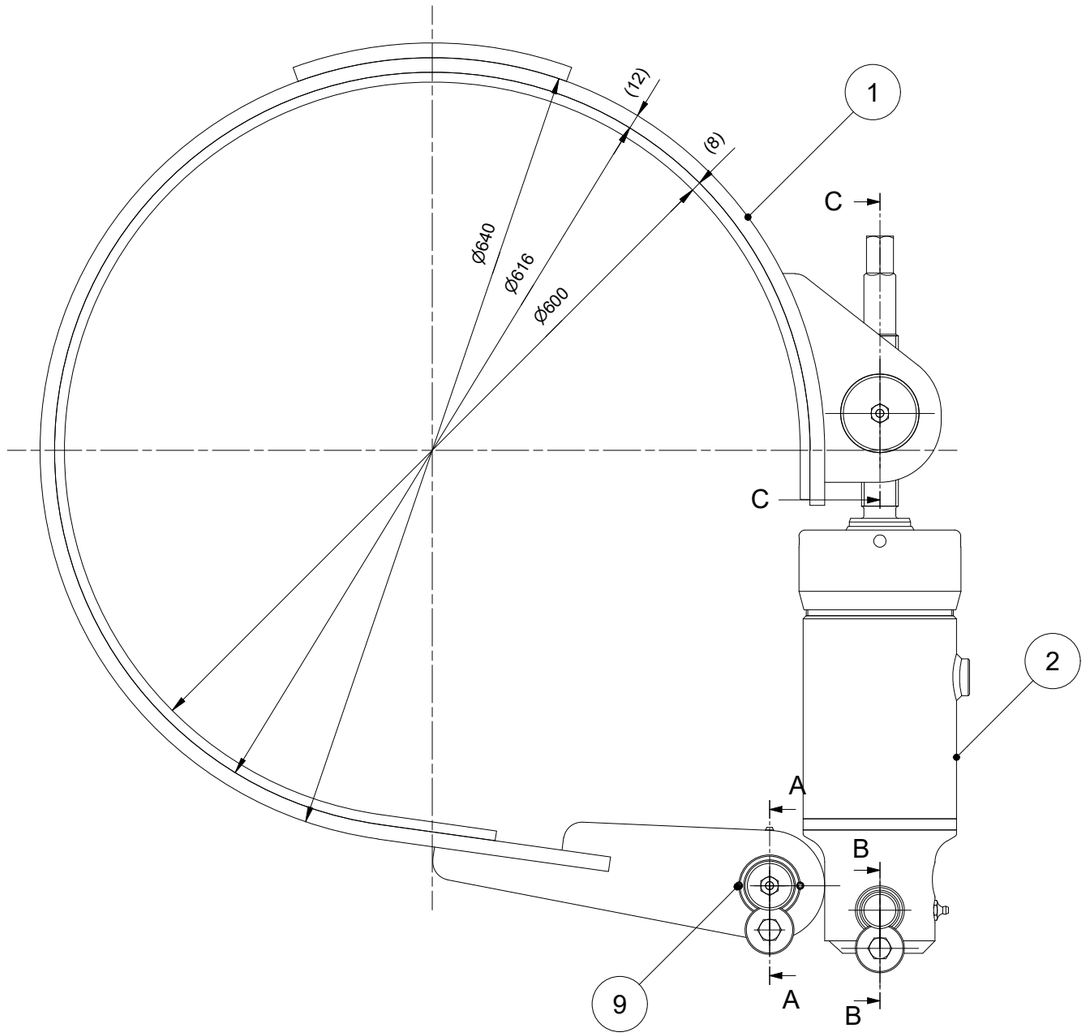


Designed by	Date	Modified by	ECO / CO			
P Pantovic	04.02.2022.	P Pantovic	ECO-2056698			

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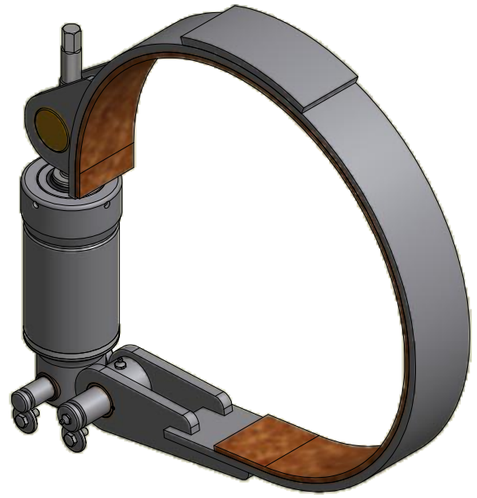
Name			Weight
Bracket			20 kg
Description			Scale (A4)
L1578			1 : 4
Document ID	2000005486	Revision A	Sheet 1 / 1



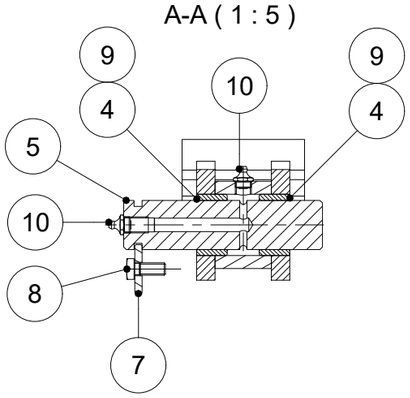
ISO VIEW - RIGHT HAND WINCH (1 : 8)
BOLTS POSITION



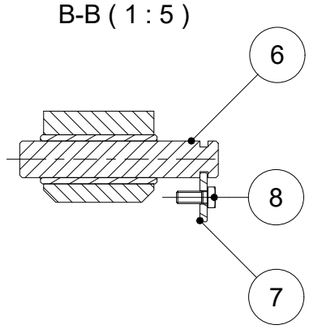
ISO VIEW - LEFT HAND WINCH (1 : 8)
BOLTS POSITION



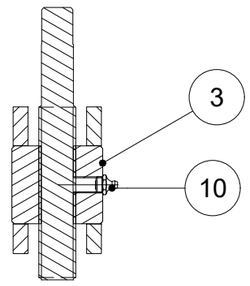
A-A (1 : 5)



B-B (1 : 5)



C-C (1 : 5)



REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
A	-	Issued for production.	04.09.2014	RHDHN

Weight 64 kg	BRAKE ARRANGMENT HW 500 D600, Tq 22,5 kNm ASSEMBLY	RAPP HYDEMA Phone: (+47) 75 55 01 00 Fax: (+47) 75 55 01 11 E-mail: office@rapphydema.com			
Scale (A3) 1:5 *Sheet* 1 / 1		*Drw number* RH318747			
	Material (for part)	*Status* Production	*Drawn by / Date (dd/mm/yy)* RZBMI 04.09.2014	*Checked by / Date (dd/mm/yy)* RHDHN 04.09.2014	*Partlist* RH318747

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79A718E3F AAB40089BAC6CDC75EE2514

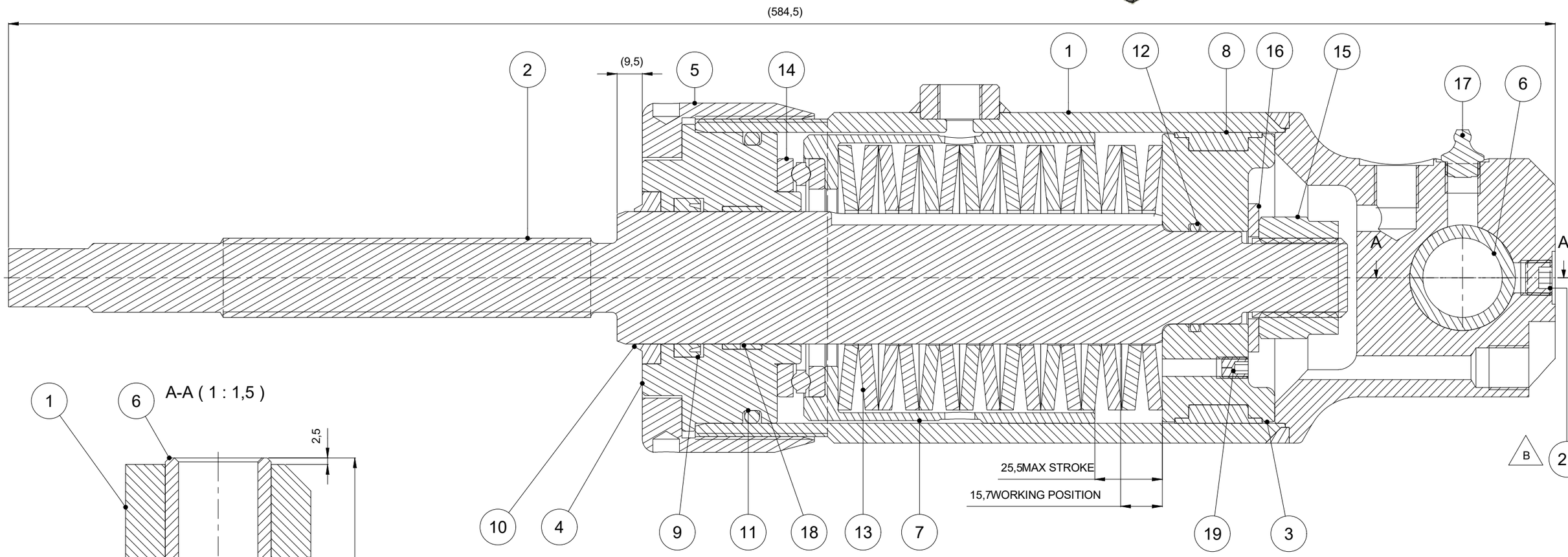
CYLINDER PRESSURE:

PRELOADED:	4 BAR
WORKING POSITION:	22,4 BAR
MAX COMPRESSION:	34,3 BAR

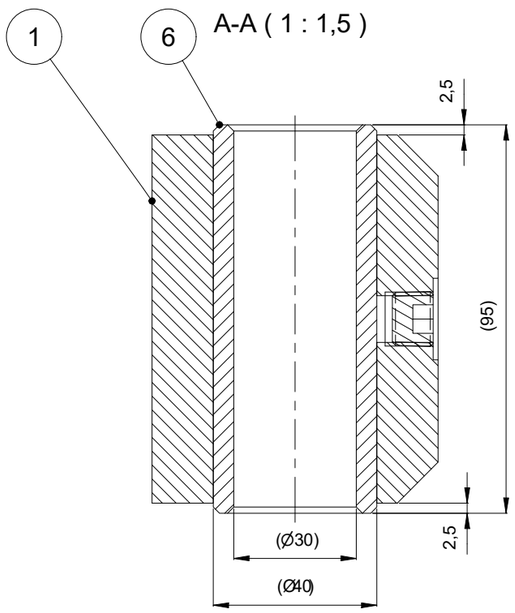
ISO VIEW (1 : 4)



VIEW1 (1 : 1,5)



A-A (1 : 1,5)



REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
A		Issued for production	10.07.2014	RHJJ
B		Threaded plug added, pos. 21	29.09.2021/MAKS	TORZBSI

Weight 26 kg	BRAKE CYLINDER SOW-500 / HW-500 ASSEMBLY	RAPP HYDEMA Phone: (+47) 75 55 01 00 Fax: (+47) 75 55 01 11 E-mail: office@rapphydema.com	
Unspecified Tolerances According to:	*Scale (A3)* 1:1,5	*Sheet* 1 / 1	*Drw number* RH318468
Standard NS-ISO 2768-1	*Tolerance Class* m Medium	*Material (for part)*	*Status* Production
NS-ISO 2768-2	K	*Drawn by / Date (dd/mm/yy)* RHJJ 10.07.2014	*Checked by / Date (dd/mm/yy)* RHJJ 10.07.2014
			Partlist RH318468

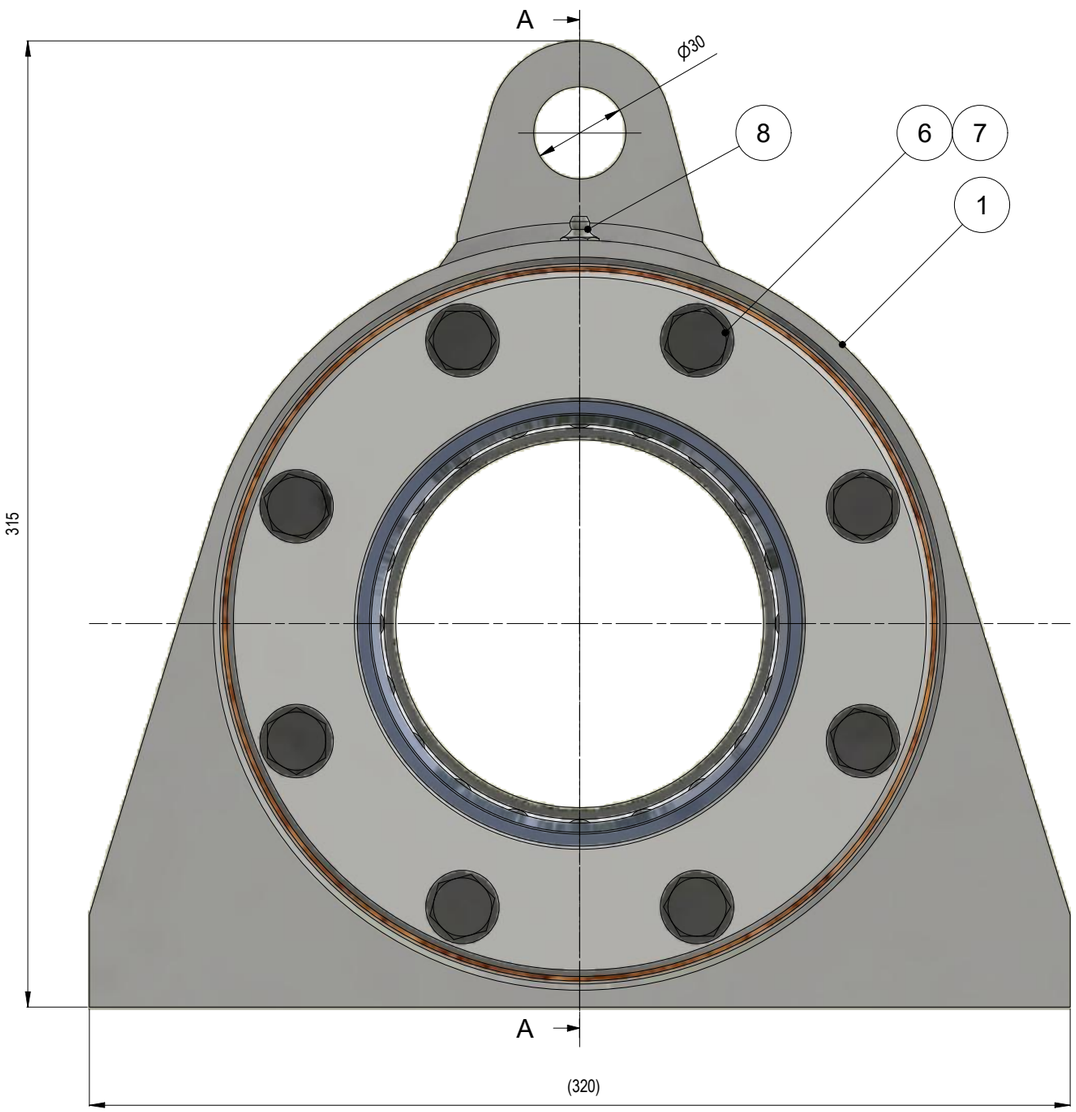
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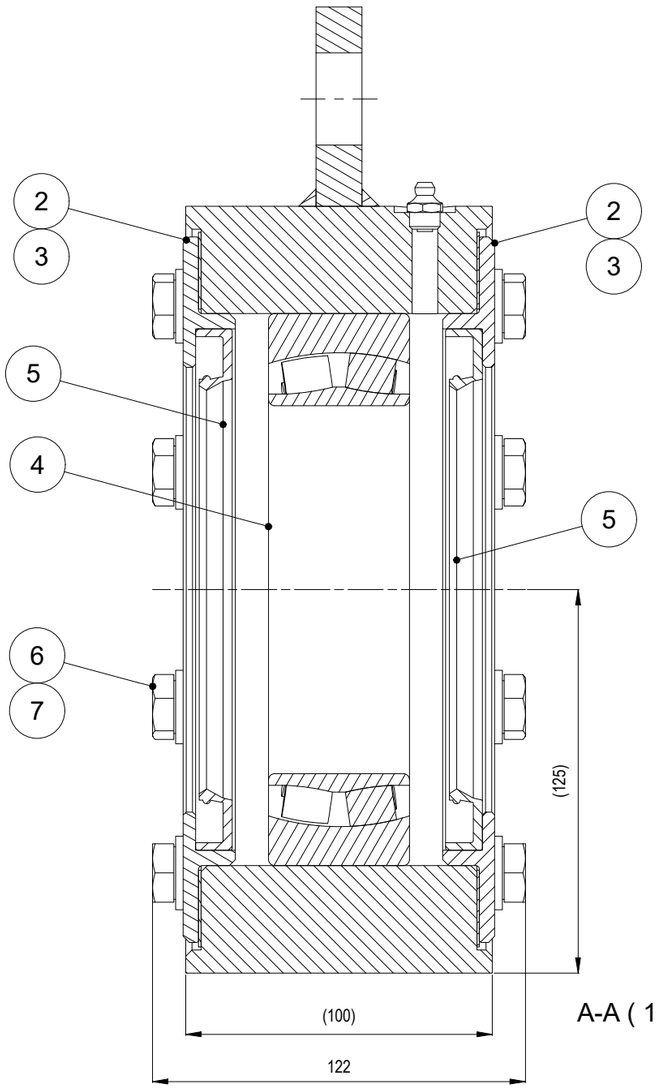
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Sheet Purpose:

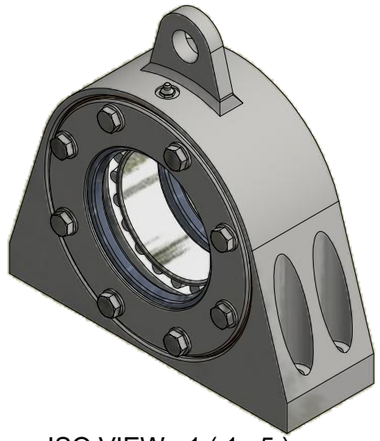
ASSEMBLY

TOL. SYSTEM ACC. TO ISO	General tol. for dimensions	
Surface roughness R_a in µm	Machining ISO 2768	tol-class: mK
	Welding ISO 13920	tol-class: AE
	Therm. cut ISO 9013	tol-class: 441





A-A (1 : 2)



ISO VIEW - 1 (1 : 5)



ISO VIEW - 2 (1 : 5)

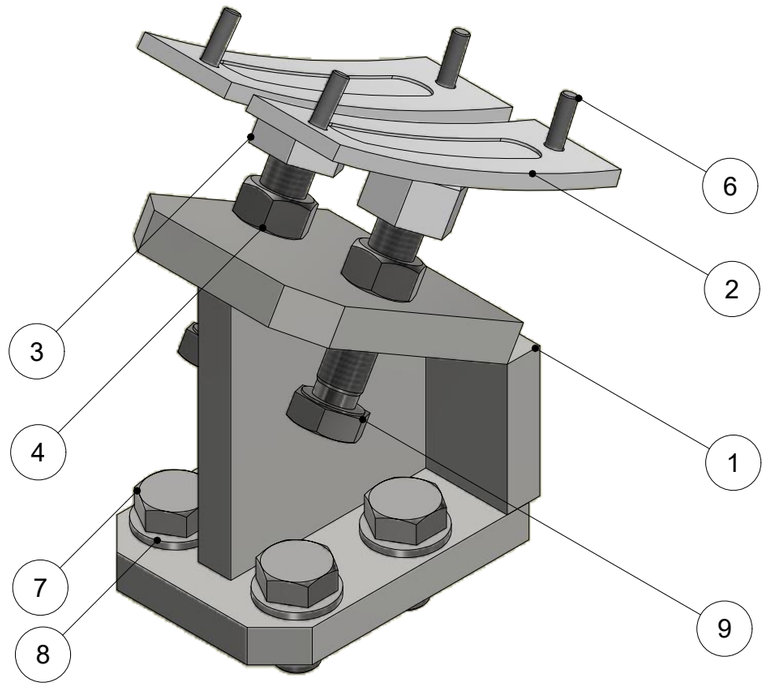
Designed by	Date	Modified by	ECO / CO			
RZBMI	27.05.2014.	A Karaic	ECO-2057200			

MACGREGOR

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Name	Weight (kg)
BEARING HOUSING	
Description	Scale (A3)
BEARING HOUSING, D180x100, ASSEMBLY	1 : 5
Document ID	Revision / Sheet
RH318063	B / 1 / 1

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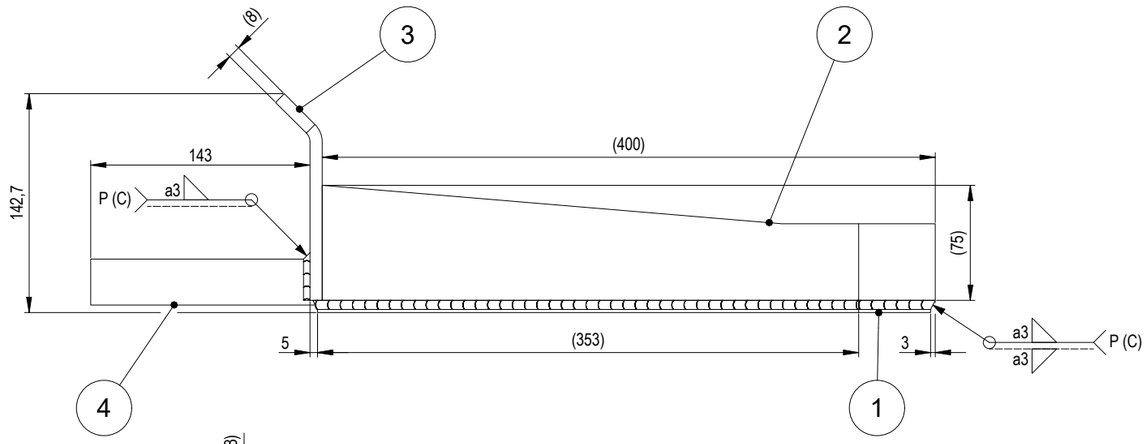
REV	ZONE	DESCRIPTION	DATE (dd/mm/yy)	APPROVED
A	-	Issued for production	13.09.2013	DHN

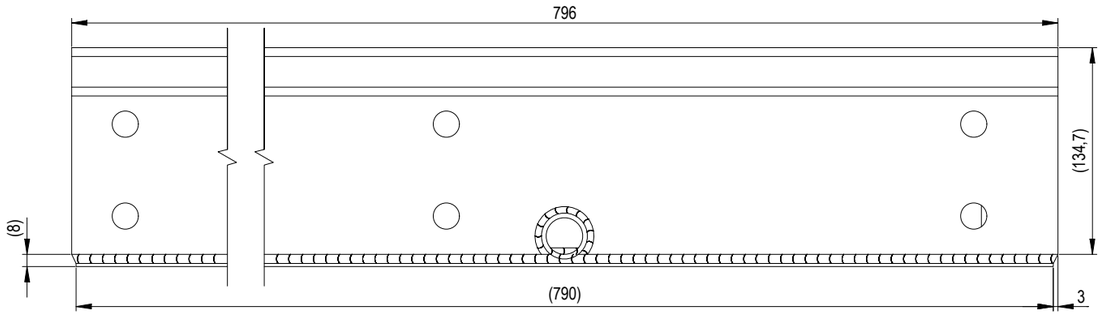
Weight 5 kg	BRAKE BAND SUPPORT HW-520E-F-T90 ASSEMBLY	RAPP HYDEMA Phone: (+47) 75 55 01 00 Fax: (+47) 75 55 01 11 E-mail: office@rapphydema.com	*Drw number* RH317304
Unspecified Tolerances According to: / *Scale (A3)* 1:2 / *Sheet* 1 / 1			
Standard / *Tolerance Class* *NS-ISO 2768-1* m Medium *NS-ISO 2768-2* K			
Material (for part)	*Status* Production	*Drawn by / Date (dd/mm/yy)* RZBMI 13.09.2013. / *Checked by / Date (dd/mm/yy)* DHN 13.09.2013.	*Partlist* RH317304

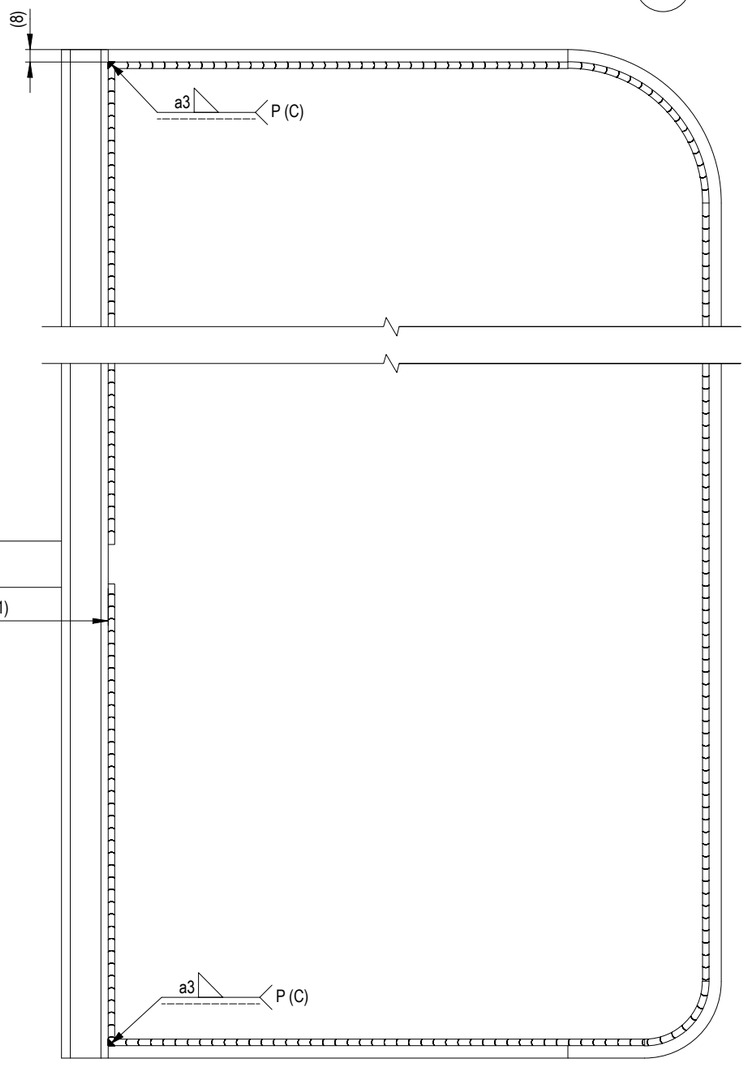
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EA0254ED73B442F2AA180DECC773F99F

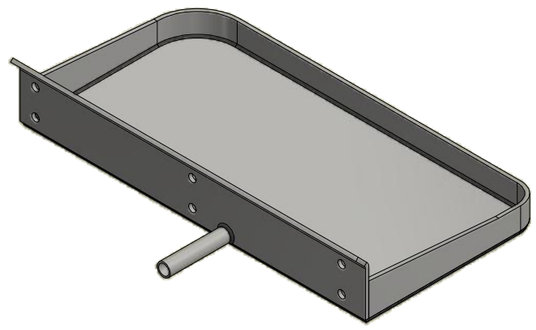
TOL. SYSTEM ACC. TO ISO	General tol. for dimensions
Surface roughness R_a in µm	Machining ISO 2768 tol-class: mK Welding ISO 13920 tol-class: AE Therm. cut ISO 9013 tol-class: 441







ISO VIEW (1 : 10)



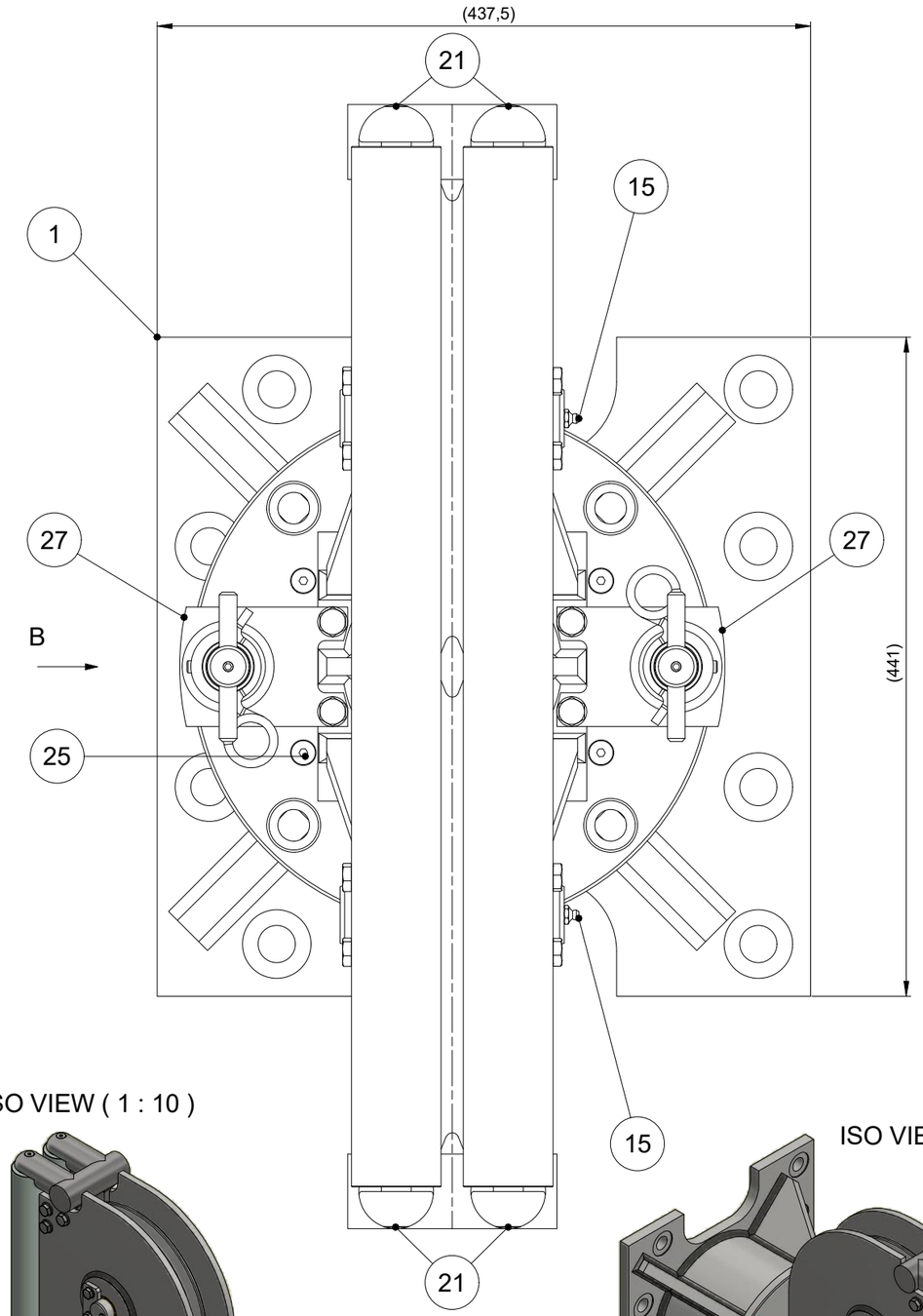
WELD LOGS DESCRIPITION:
P = PRIMARY WELD;
S = SECONDARY WELD;
P , S (CATEGORY OF WELD) ACC. TO DNV 2.22
C , B (NDT ACCEPTANCE LEVEL) ACC. TO ISO 5817.

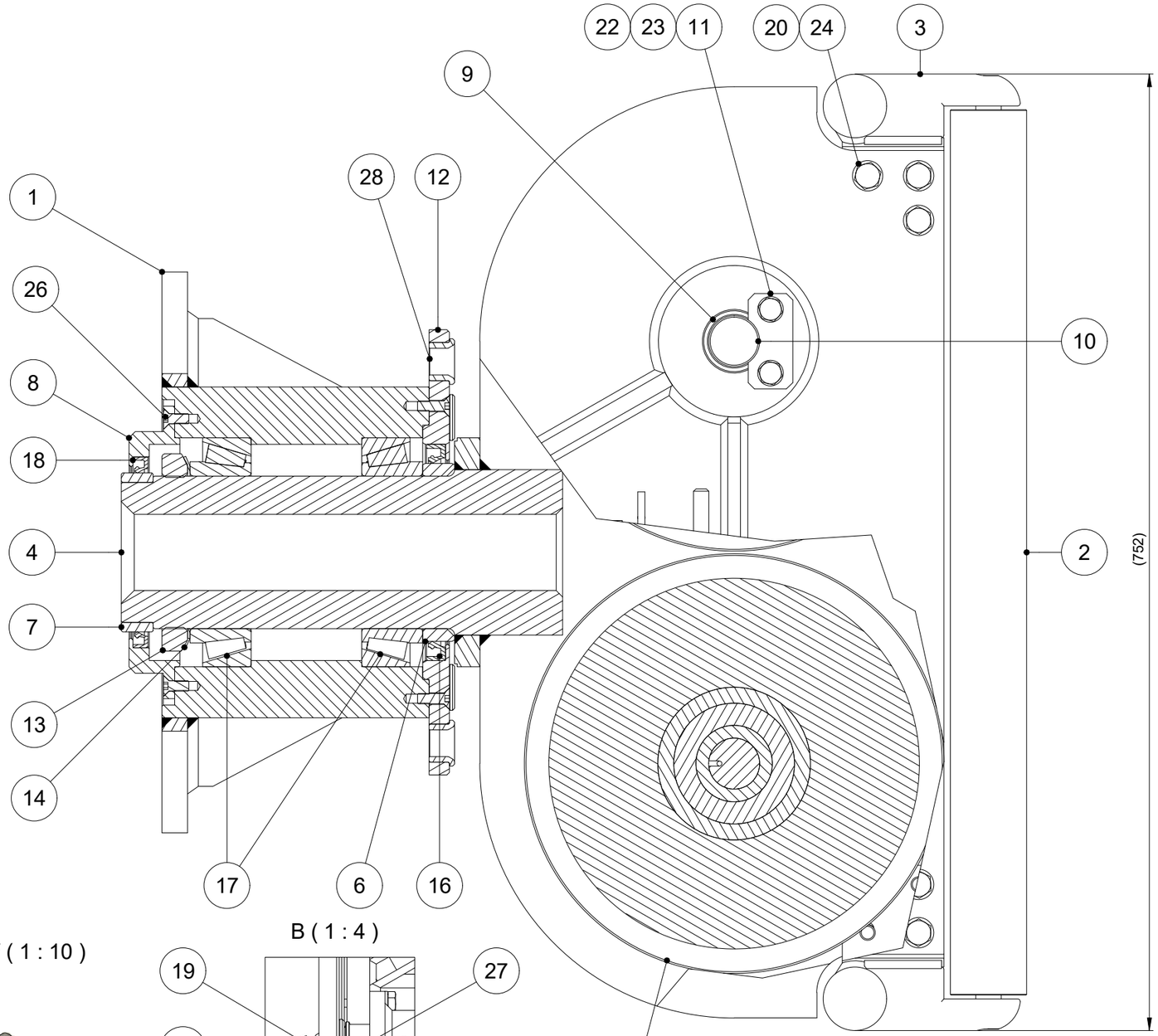
Designed by	Date	Modified by	ECO / CO			
D Petrovic	08.02.2022.	D Petrovic	ECO-2056698			

MACGREGOR

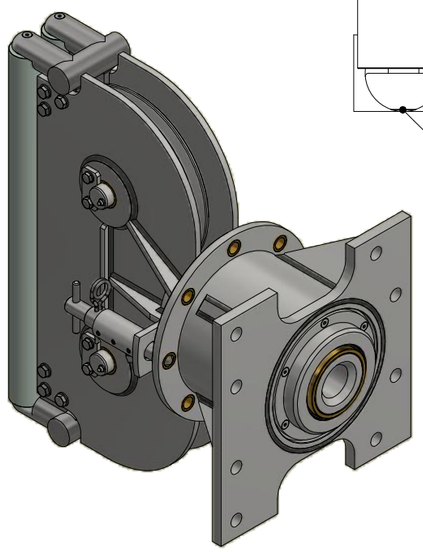
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Name	Weight (kg)
Protection	32
Description	Scale (A3)
DRIP TRAY - HW515-FS-T90/URP	1 : 4
Document ID 2000005580	Revision A / Sheet 1 / 1

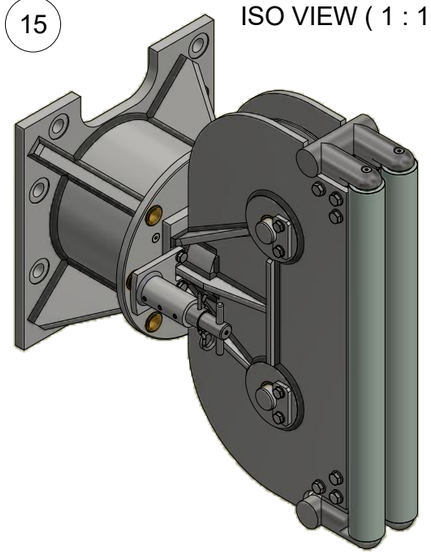




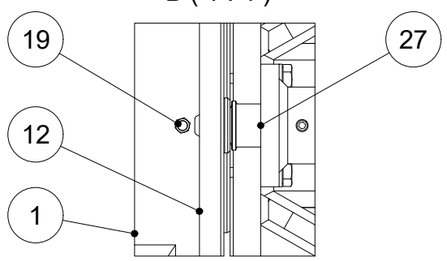
ISO VIEW (1 : 10)



ISO VIEW (1 : 10)



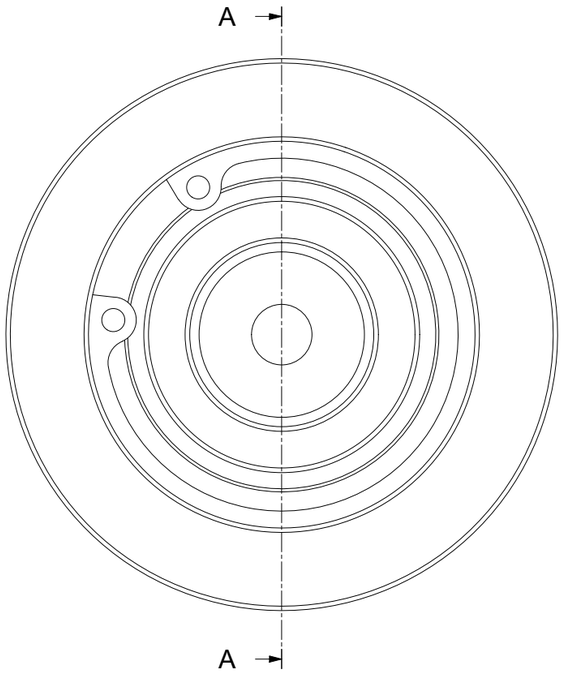
B (1 : 4)



REV	ZONE	DESCRIPTION	DATE	APPROVED
A		Issued for production	25.03.2019	RHJJ
B		Item 12 replaced with new one. Item 27 & 28 added. Weight corrected (was 255 kg)	06.02.2020./PETRODO	RZPPA

Weight 266 kg	PIVOT SHEAVE HW-515E-T90 ASSEMBLY	RAPP MARINE Phone: (+47) 75 55 01 00 E-mail: office@rappmarine.com			
Unspecified Tolerances According to:	*Scale (A3 Sheet)*		*Drw number*		
Standard / *Tolerance Class*	1 : 4 1 / 1		RH327524		
NS-ISO 2768-1 m Medium	*Material (for part)*	*Status*	*Drawn by / Date (dd/mm/yy)*	*Checked by / Date (dd/mm/yy)*	*Partlist*
NS-ISO 2768-2 K		Production	RMJP 25.03.2019.	RHJJ 25.03.2019.	RH327524

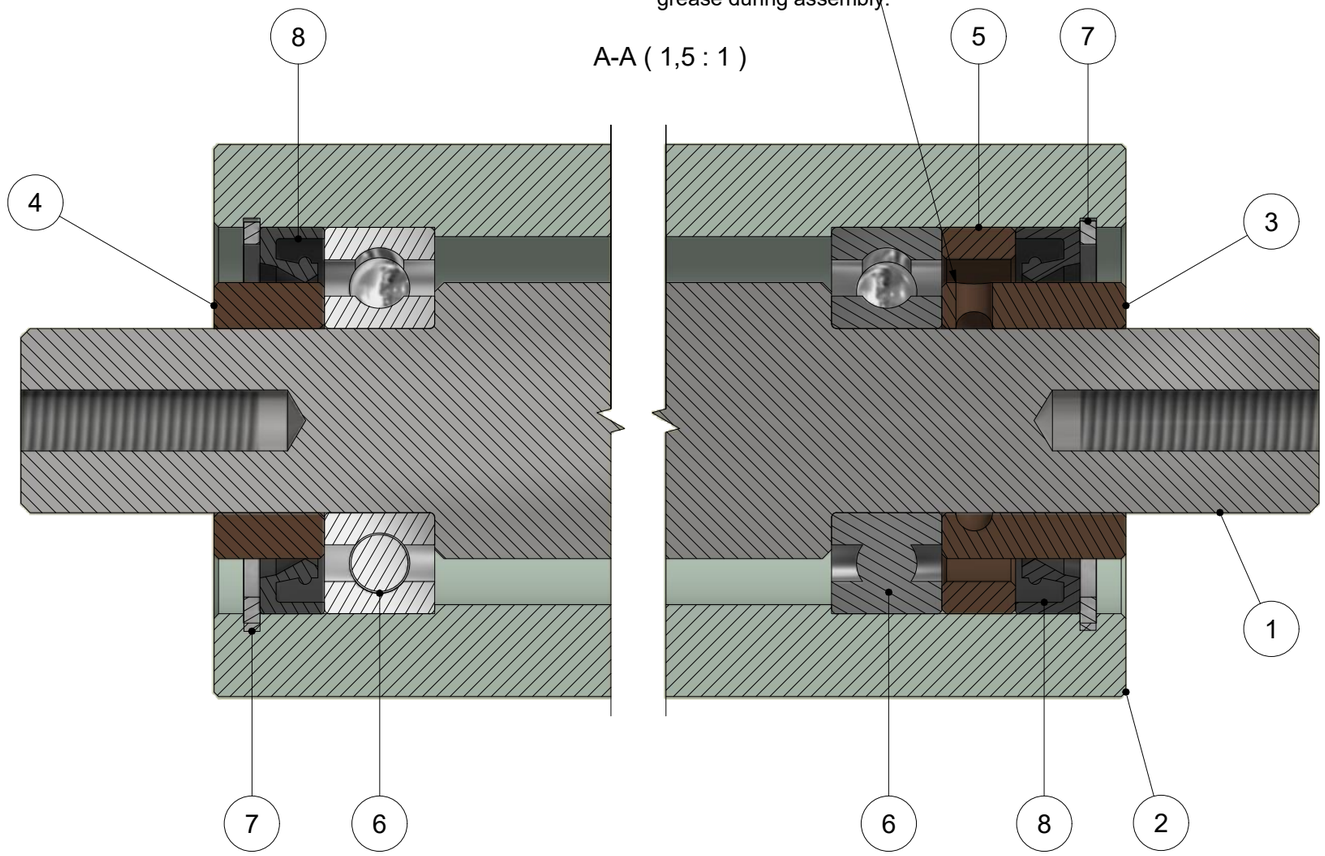
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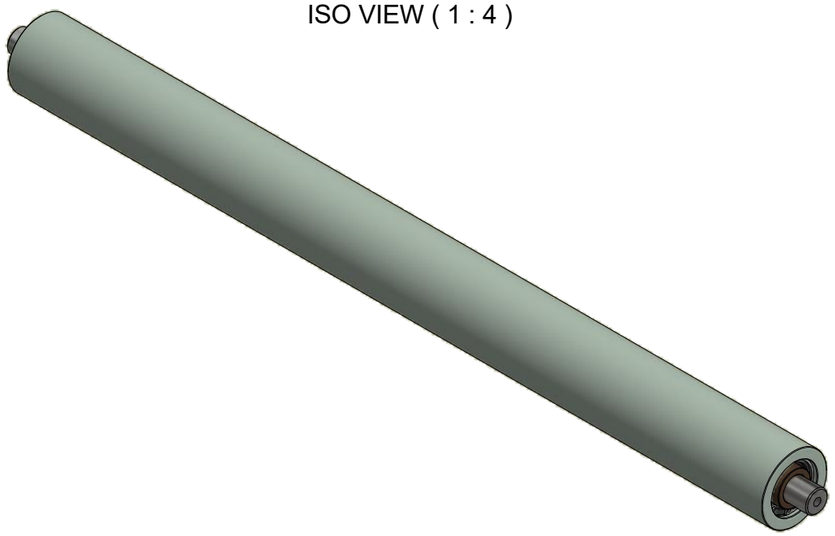
NOTE:

Lubrication seal with grease during assembly.

A-A (1,5 : 1)



ISO VIEW (1 : 4)

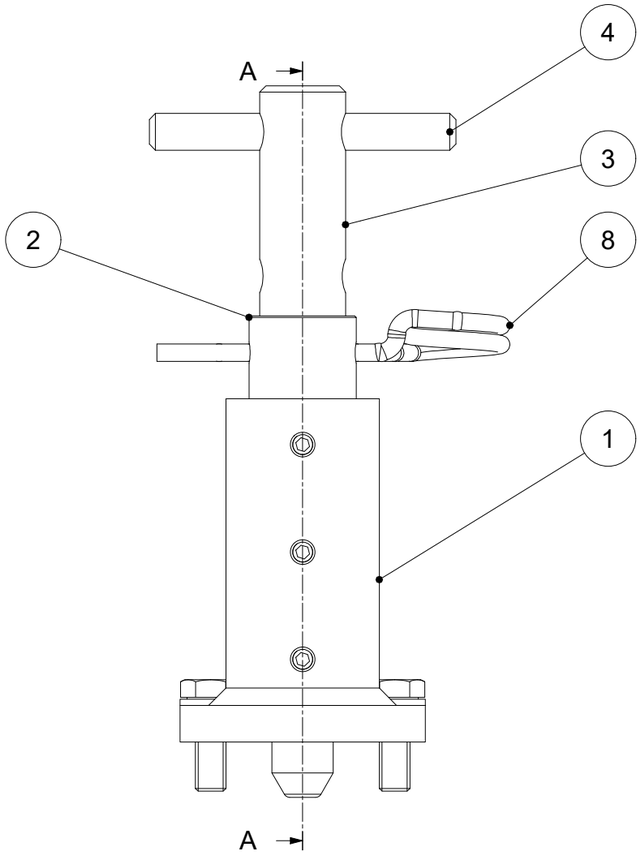


REV	ZONE	DESCRIPTION	DATE	APPROVED
A		Issued for production	22.03.2019	RHJJ

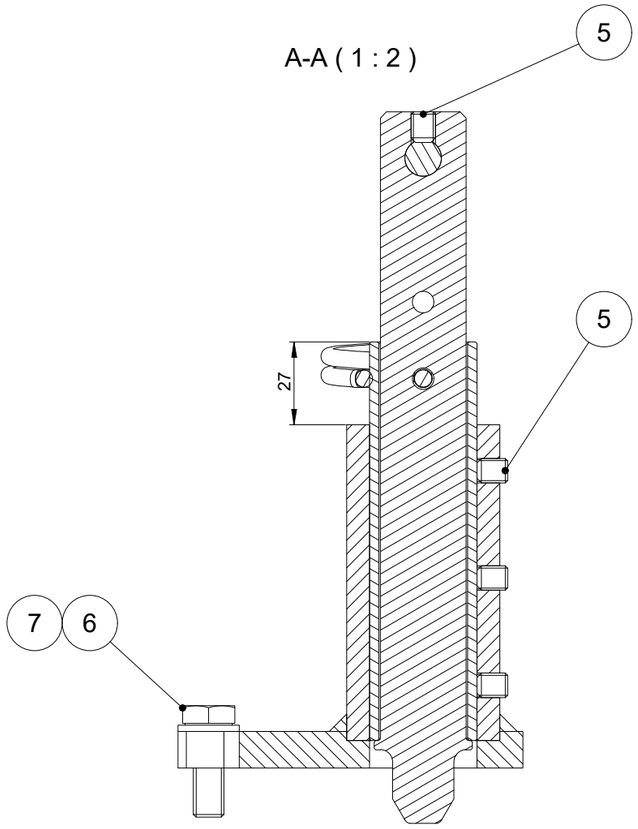
Weight 5,4 kg		INDICATOR ROLLER ASSEMBLY HW-515E-T90 ASSEMBLY		RAPP MARINE Phone: (+47) 75 55 01 00 E-mail: office@rappmarine.com	
Unspecified Tolerances According to:	*Scale (A3)* 1,5:1	*Sheet* 1 / 1		*Drw number*	RH327556
Standard	*Tolerance Class*	*Material (for part)*	*Status*	*Partlist*	RH327556
NS-ISO 2768-1	*m Medium*		Production		
NS-ISO 2768-2	*K*		RMJP 22.03.2019	RHJJ 22.03.2019	

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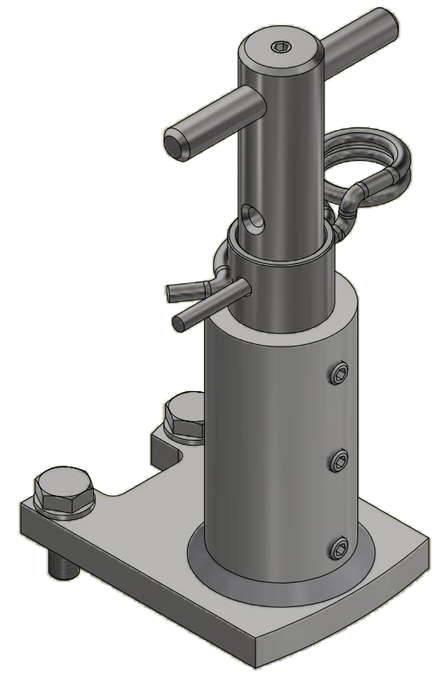
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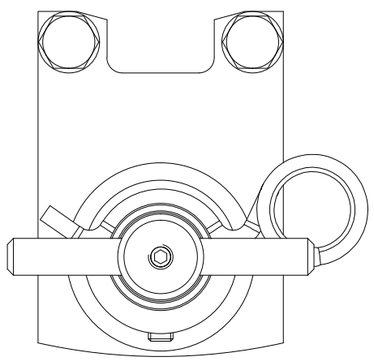


A-A (1 : 2)



ISO VIEW (1 : 2)





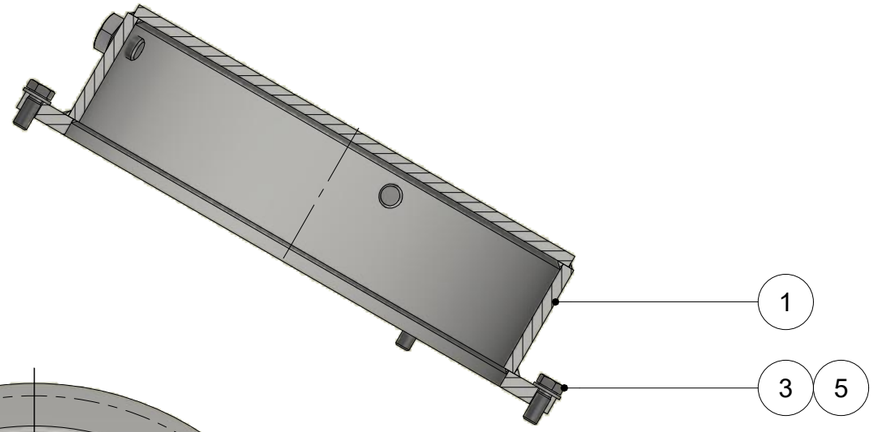
REV	ZONE	DESCRIPTION	DATE	APPROVED
A		Issued for production	06.02.2020.	RZPPA

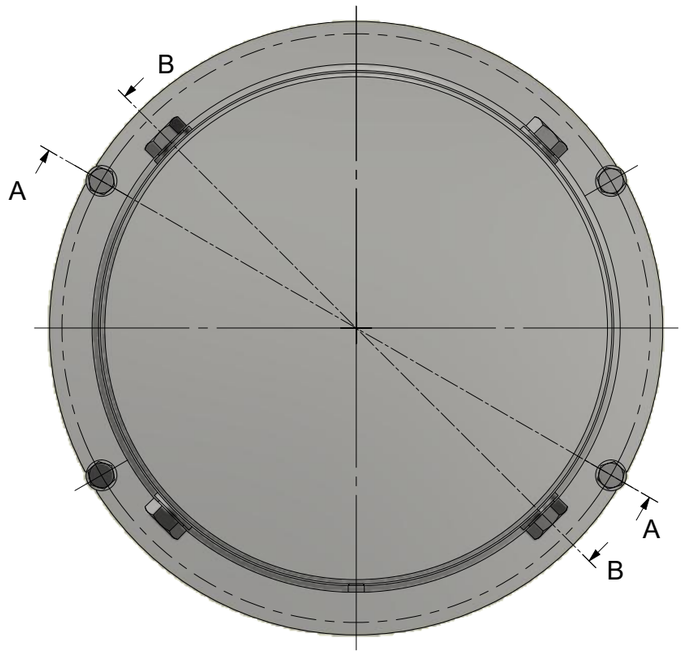
Weight 3,06 kg		SHEAVE PIVOT LOCK HW-515E-T90 ASSEMBLY			RAPP MARINE Phone: (+47) 75 55 01 00 E-mail: office@rappmarine.com
Unspecified Tolerances According to:	*Scale (A3)* 1 : 2	*Sheet* 1 / 1			*Drw number* RH329338
Standard *Tolerance Class*		*Material (for part)*	*Status*	*Drawn by / Date (dd/mm/yy)*	*Checked by / Date (dd/mm/yy)*	*Partlist* RH329338
NS-ISO 2768-1 *m Medium*			Production	PETRODO 06.02.2020.	RZPPA 06.02.2020.	
NS-ISO 2768-2 *K*						

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40C300BAF2904989903217C3AA7330CA

A-A (1 : 2)

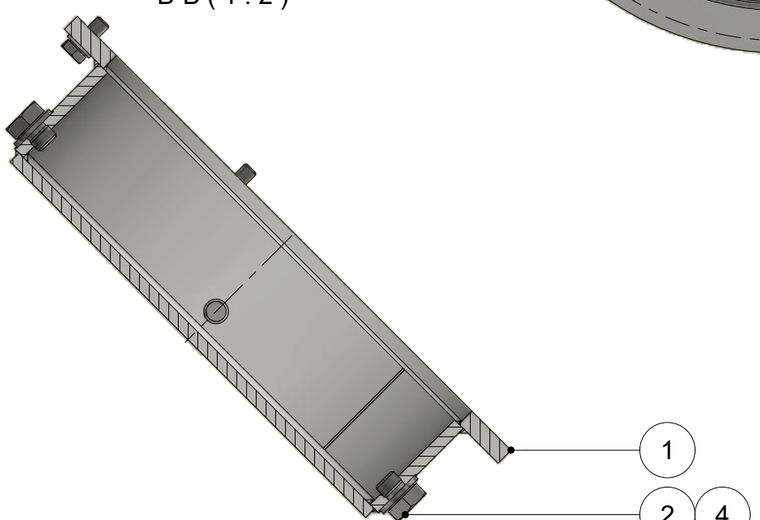




ISO VIEW (1 : 2,5)



B-B (1 : 2)



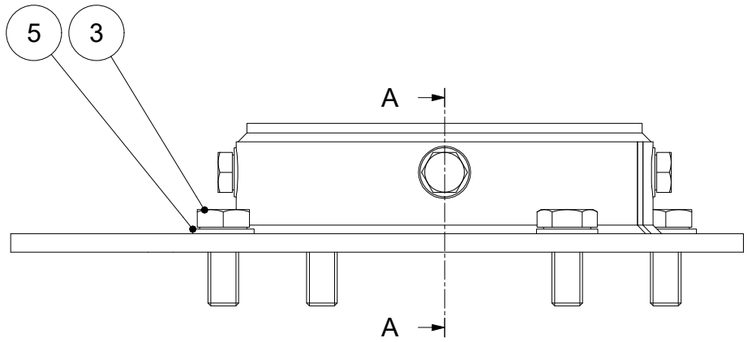
POLYMER - ACC. DOC. #6482 MACHINED SURFACES AND SURFACE TREATMENT

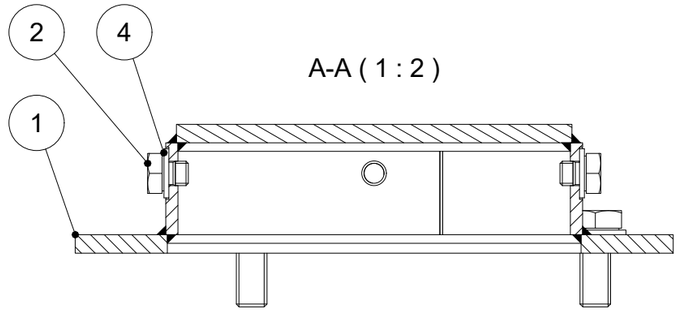
REV	ZONE	DESCRIPTION	DATE	APPROVED
A		Issued for production	07.08.2019.	RZBSI

Weight 2 kg	GEARBOX COVER BPH.23 ASSEMBLY			RAPP MARINE Phone: (+47) 75 55 01 00 E-mail: office@rappmarine.com	
Unspecified Tolerances According to:	*Scale (A3)*	*Sheet*		*Drw number*	
Standard / *Tolerance Class*	1 : 2	1 / 1		RH328792	
NS-ISO 2768-1 m Medium	*Material (for part)*	*Status*	*Drawn by / Date (dd/mm/yy)*	*Checked by / Date (dd/mm/yy)*	*Partlist*
NS-ISO 2768-2 K		Production	MAKSTO 07.08.2019.	RZBSI 07.08.2019.	RH328792

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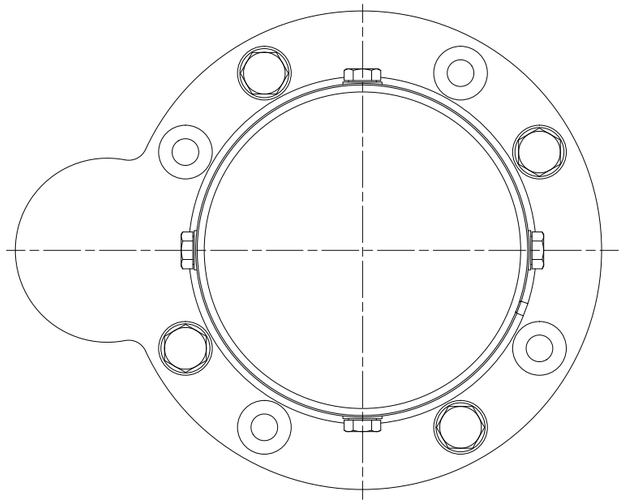
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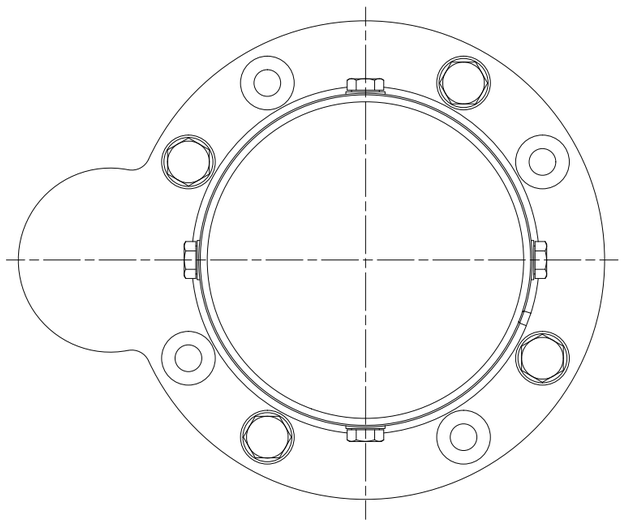


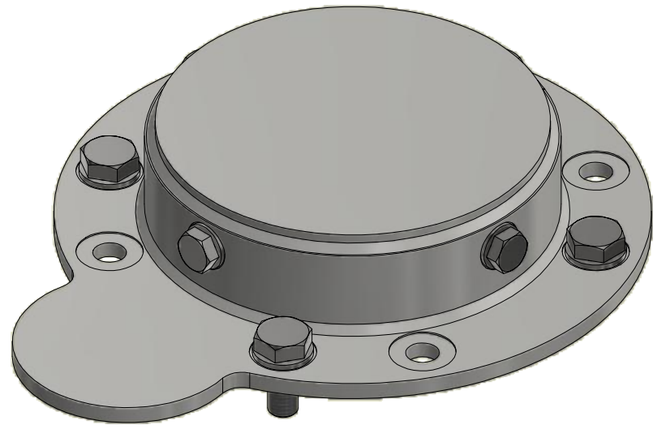
A-A (1 : 2)

BOLTING AT B SIDE (1 : 2,5)



BOLTING AT A SIDE (1 : 2,5)





POLYMER - ACC. DOC. #6482 MACHINED SURFACES AND SURFACE TREATHMENT 6

REV	ZONE	DESCRIPTION	DATE	APPROVED
A		Issued for production	25.06.2019.	RZBSI

Weight 2 kg	GEARBOX COVER SK9032 ASSEMBLY				RAPP MARINE Phone: (+47) 75 55 01 00 E-mail: office@rappmarine.com	
Unspecified Tolerances According to:	*Scale (A3)* 1 : 2	*Sheet* 1 / 1			*Drw number* RH328382	
Standard / *Tolerance Class*						
NS-ISO 2768-1 m Medium	*Material (for part)*	*Status* Production	*Drawn by / Date (dd/mm/yy)* PETRODO 24.06.2019.	*Checked by / Date (dd/mm/yy)* RZBSI 25.06.2019.	*Partlist* RH328382	
NS-ISO 2768-2 K						

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