

Training Program



Training Program

MacGregor Equipment

Schedule



R/V David Packard

Monterey Bay Aquarium Research Institute (MBARI)

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3.7.1 - Traction Winch

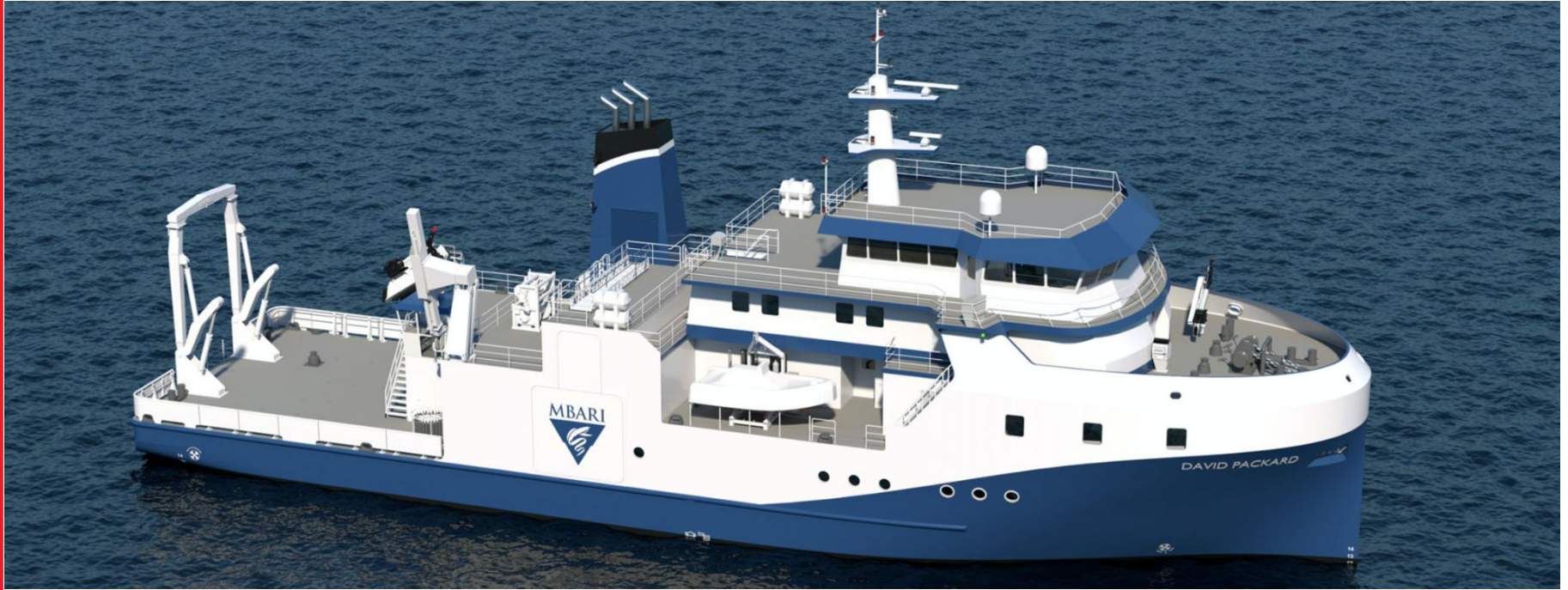
3.7.2 - Storage Drum

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3.8 - Brake and Cooling HPU



General Design Criteria



1 - General Design Criteria

1.1 - Temperature

1.2 - Operational Limits

1.3 - Electric/Power & IP ratings

1.4 - Surface Treatment



1.1 General Design Criteria - Temperature

HANDLING

TEMPERATURES		FROM	TO
Ambient operating temperature with 100% relative humidity	Equipment installed on deck	+ 40°C	-10 °C
Operating temperature with relative humidity up to 70 %	Equipment installed under deck/indoor	+ 40°C	0°C
Seawater temperature		+ 32°C	-2°C

WINCHES

TEMPERATURES		FROM	TO
Ambient operating temperature with 100% relative humidity	Equipment installed on deck	-20°C	+ 45°C
Operating temperature with 50% relative humidity.	Equipment installed under deck/indoor	0°C	+ 40°C
Survival temperature	Not operating	+ 60°C	- 30°C

1.2 - General Design Criteria - Operational Limits

HANDLING

OPERATIONAL LIMITS FOR HANDLING EQUIPMENT

Design of according to	USCG 46 CFR 189.35 – Weight Handling Gear requirements
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WINCHES

OPERATIONAL LIMITS FOR WINCHES

Operational limit	Winches are designed for operation at Sea State 5, but we cannot guarantee 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.

1.3 - General Design Criteria - Electric/Power & IP ratings

HANDLING

ELECTRIC / POWER			
Power supply Voltage (HPU)	480V, 60Hz - 3 phases		
Control system Voltage	AC 230V, 60Hz		
Floodlights	LED Type	Im	9000
IP RATINGS			
Enclosure rating for el equip. installed <u>on deck</u>	Encoders & Load Cells	IP	66
	Control Panels on deck/hangar	IP	66
	Proximity switches	IP	67
	Radio remote controls with Gore-Tex	IP	65
Enclosure rating for el. equip. installed <u>under deck</u>	Starters for HPU's	IP	55
	Control Panels	IP	65

1.3 - General Design Criteria - Electric/Power & IP ratings

WINCHES

ELECTRIC / POWER			
Power supply Voltage (HPU)	480V, 60Hz - 3 phases		
Control system Voltage	AC 230V, 60Hz		
Floodlights	LED Type	Im	9000
IP RATINGS			
<u>Enclosure rating for el equip. installed on deck or under the deck</u>	Encoders & Load Cells	IP	66
	Control Panels on deck/hangar	IP	66
	Proximity switches	IP	67
	HPU electric motors	IP	54
<u>Enclosure rating for el. equip. installed under deck and in control rooms</u>	Electric winch drive motors	IP	56
	VFD Cabinets without AC	IP	54
	Control Panels	IP	54
	Starters for HPU's	IP	54

NOTE: 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

1.4 - General Design Criteria - Surface Treatment

HANDLING

SURFACE PREPARATION

DESCRIPTION	QUALITY	STANDARD
All parts are grit blasted to standard:	Sa 2,5	ISO 8501-1 (2007)
Roughness	min. segment 2 (G 201) 50-70 µm (microns)	ISO 8503-1 (2012)

SURFACE TREATMENT / COLOR

Surface treatment: All products	Metallized
Color Item	RAL 9016 White (Gloss: High)
Color Macgregor letters	RAL 3000 Red

Macgregor has developed its own surface treatment procedures.

1.4 - General Design Criteria - Surface Treatment

HANDLING

Macgregor has developed its own surface treatment procedures.
Please see procedure and painting specification below.

COATING

DESCRIPTION	QUALITY	STANDARD
Metallized (thermally sprayed with sink, Zn)	75 µm	
All surfaces: Applied “tie-coat”	40 µm	Carboguard E 19
Welds, corners, angles & notches: “stripe-coat”		Carboxane 2000 WG
All surfaces: Applied full coat	125 µm	Carboxane 2000 WG
Topcoat applied, all surfaces:	75 µm	Carboxane 2000 TC
Total film thickness included thermally sprayed zinc: <u>315 microns</u>		
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 signing the contract. Ref: 5.1.0 SURFACE TREATMENT		

1.4 - General Design Criteria - Surface Treatment

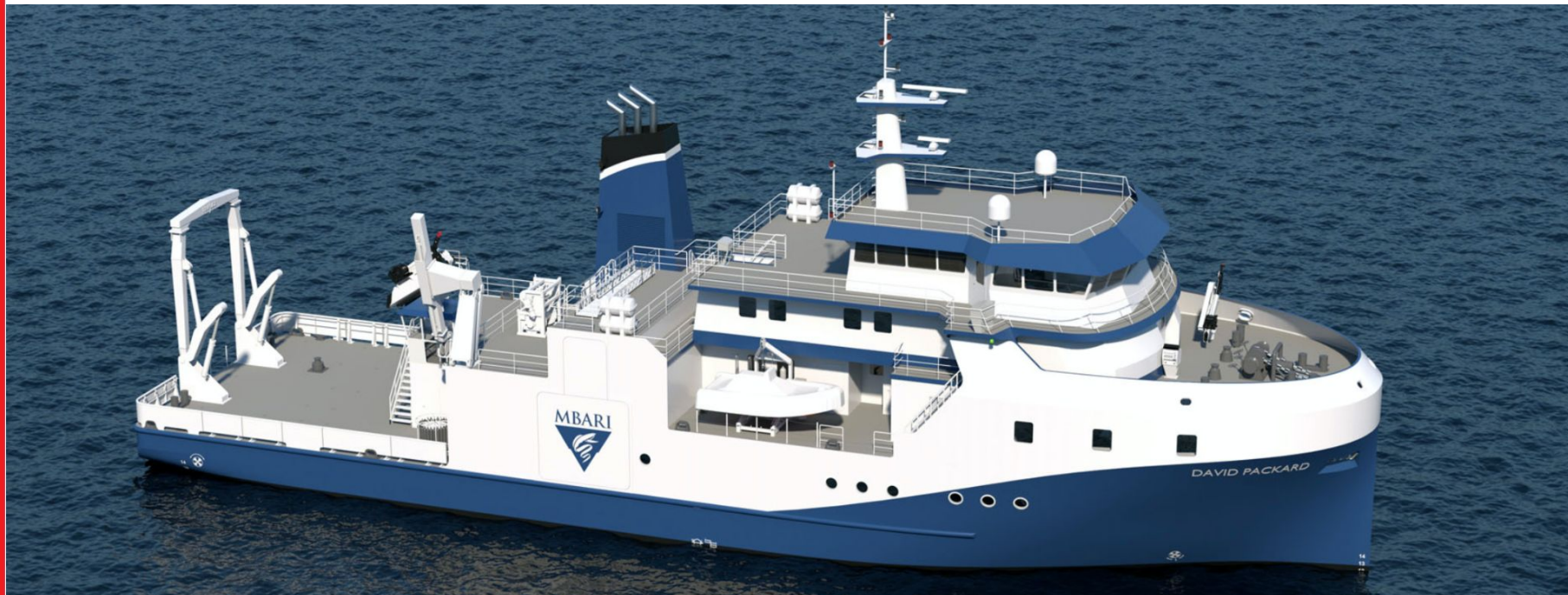
WINCHES

SURFACE TREATMENT		
DESCRIPTION		STANDARD
Shot blasting to	Grade SA	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
Color code	RAL - 9016 Confirmed	
<i>Total thickness paint is minimum 240μ but average will be above 315μ</i>		

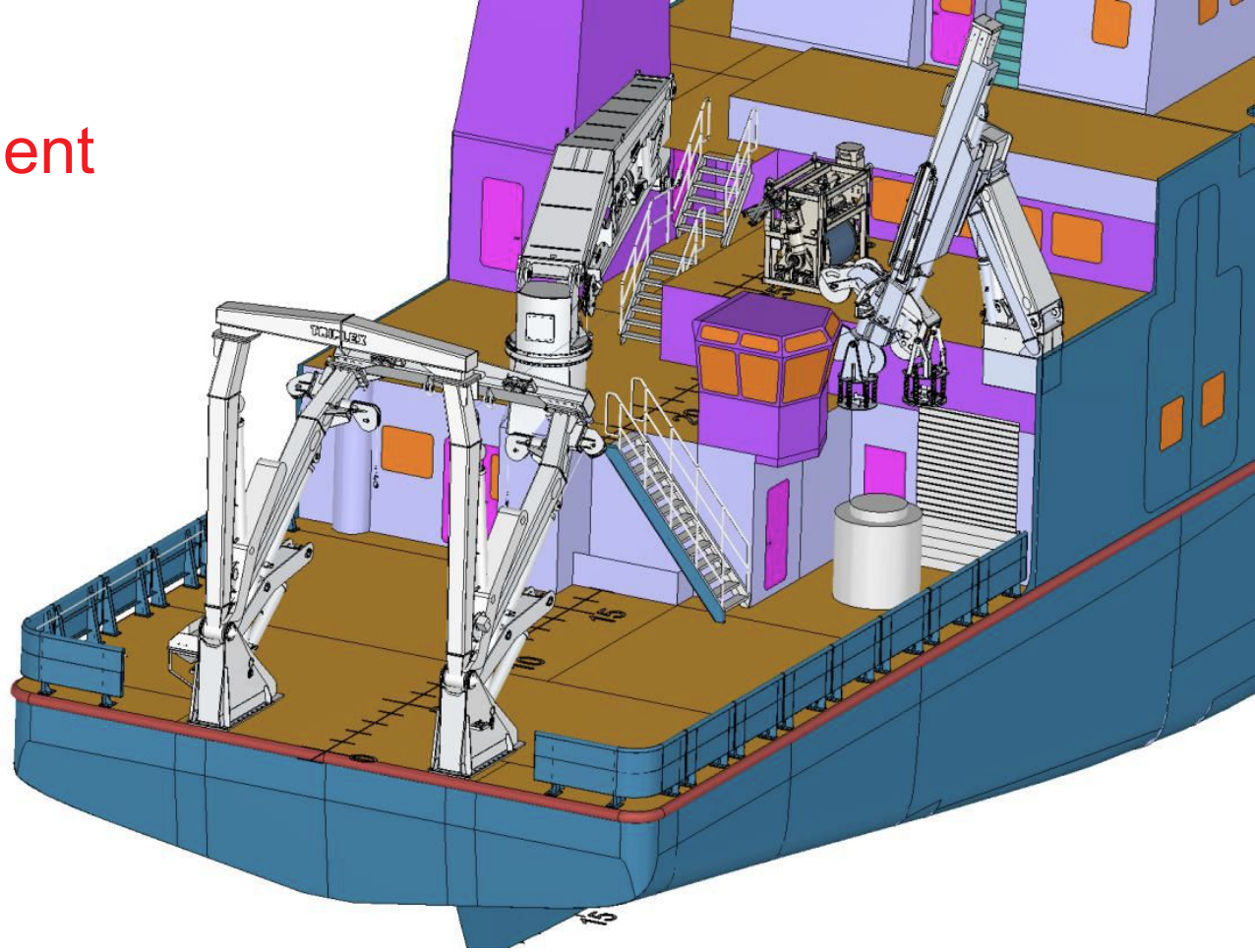
Note:

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.

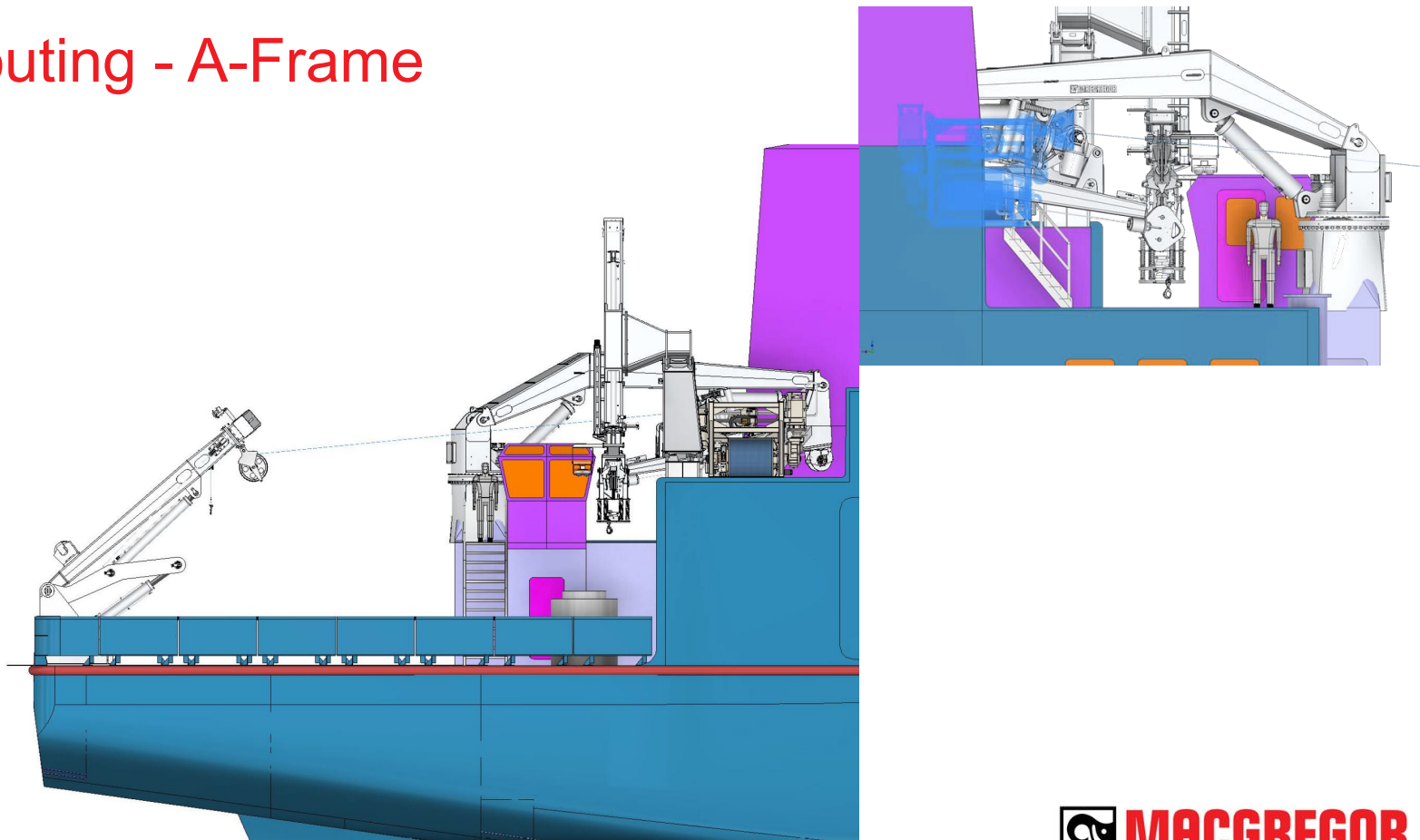
Deck Arrangement



Aft Deck Arrangement

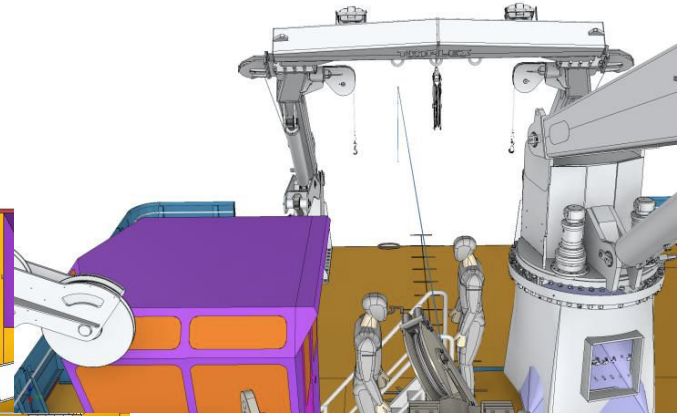
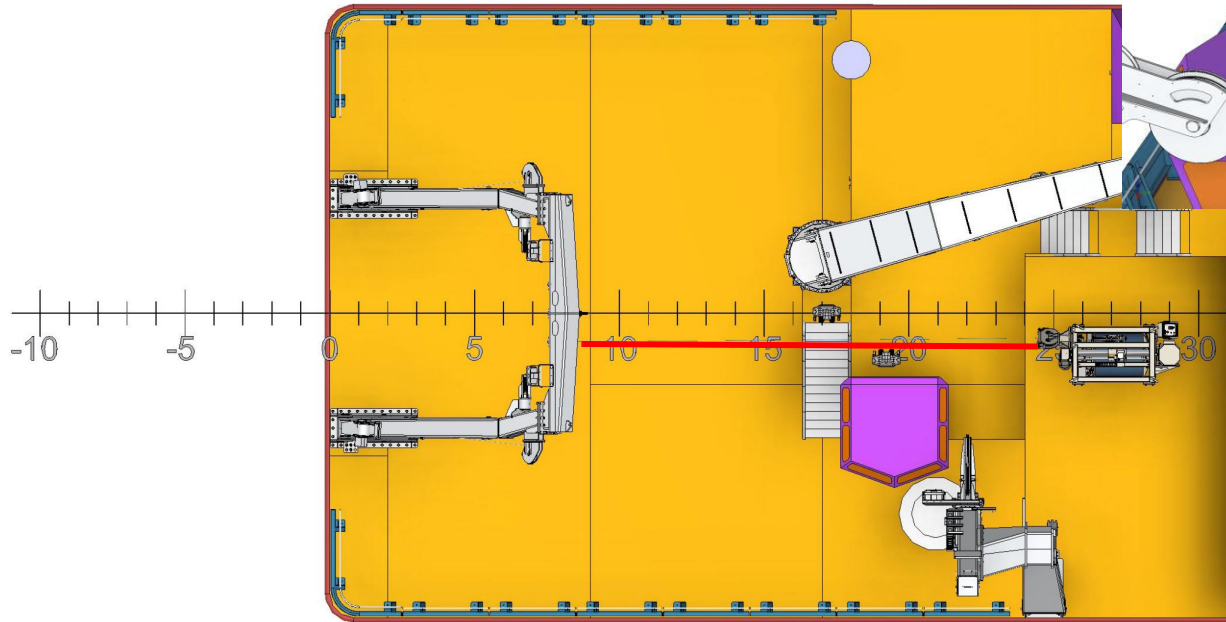


Wire Routing - A-Frame



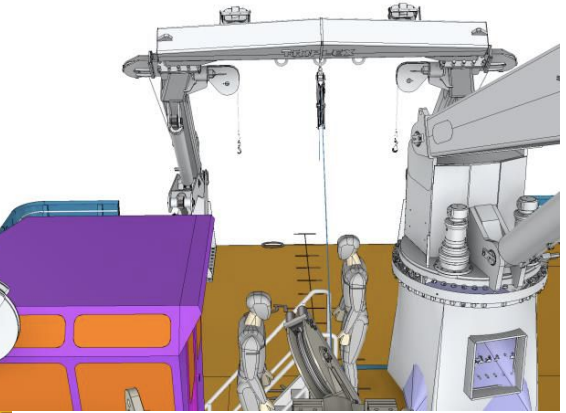
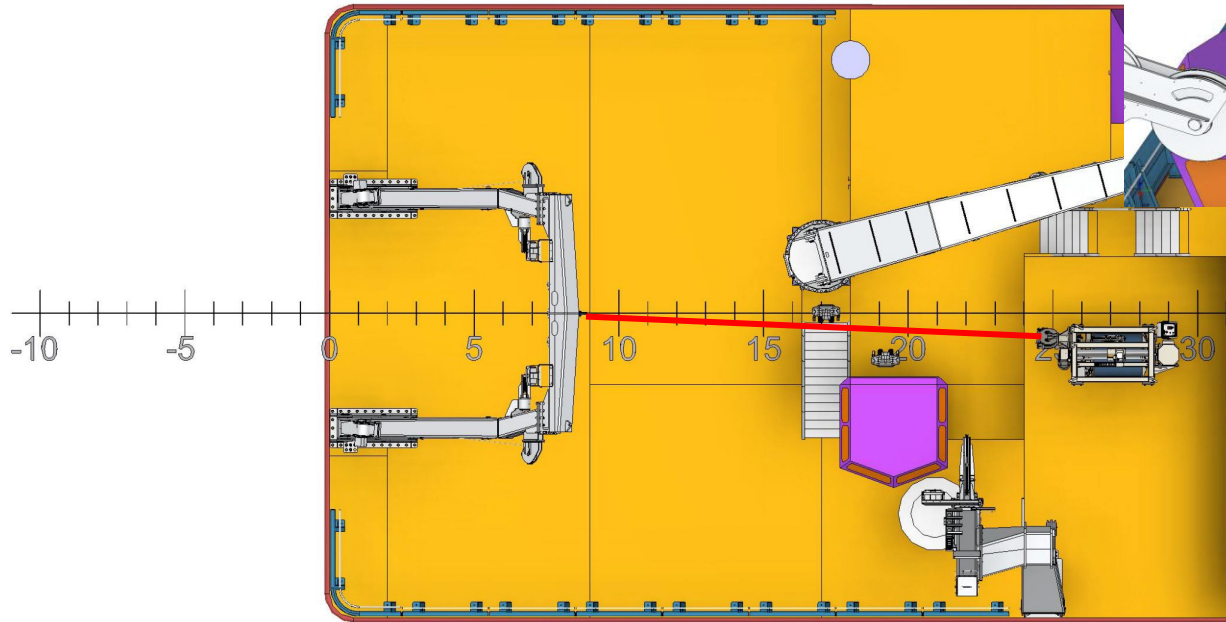
Wire Routing - A-Frame

From the CTD Winch to the Starboard Pad Eye



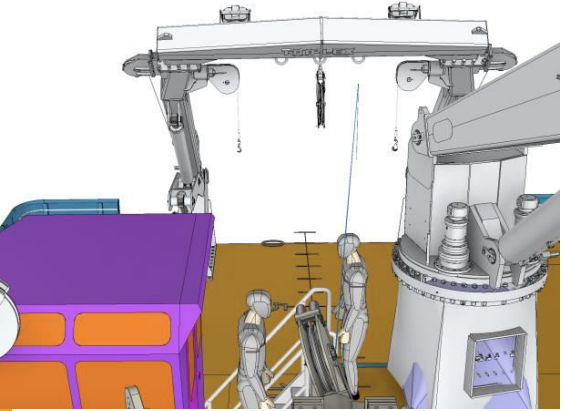
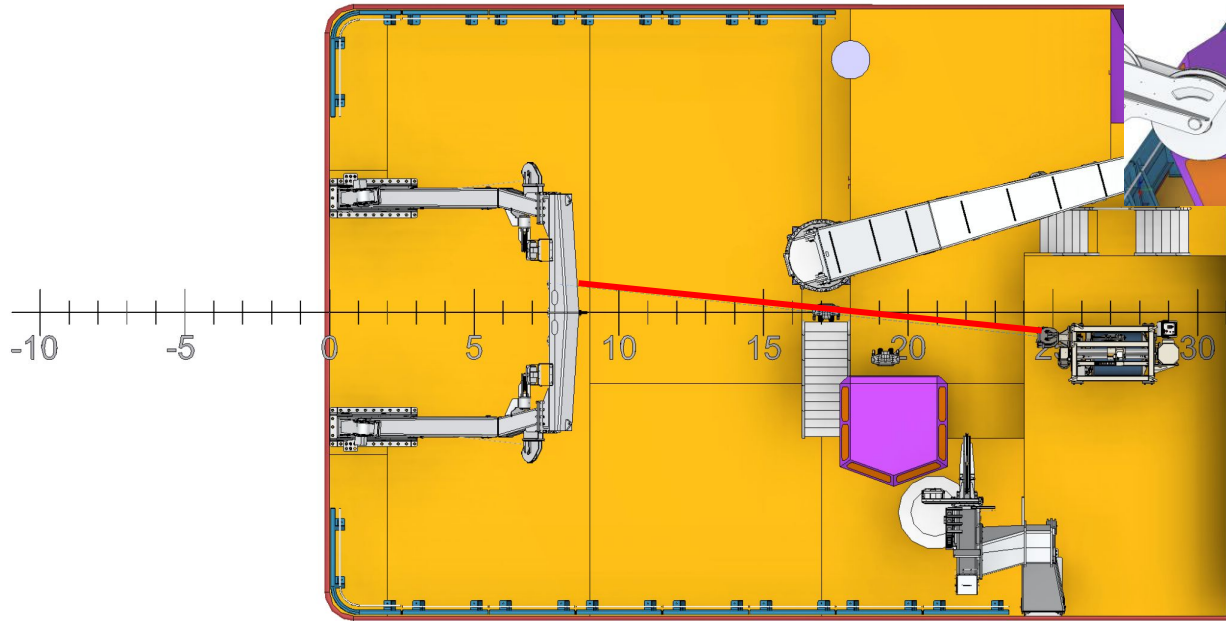
Wire Routing - A-Frame

From the CTD Winch to the Middle Pad Eye

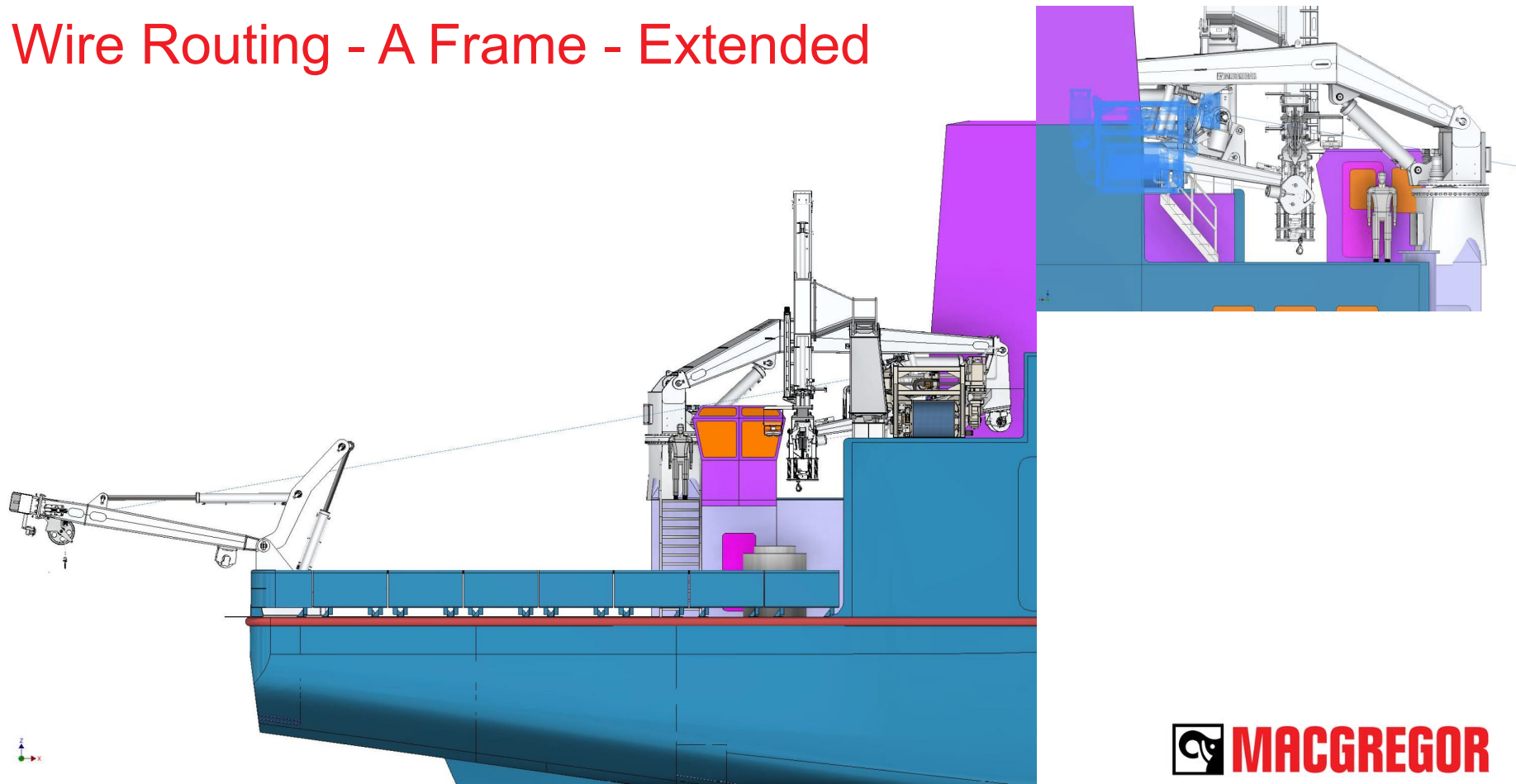


Wire Routing - A-Frame

From the CTD Winch to the Port Pad Eye

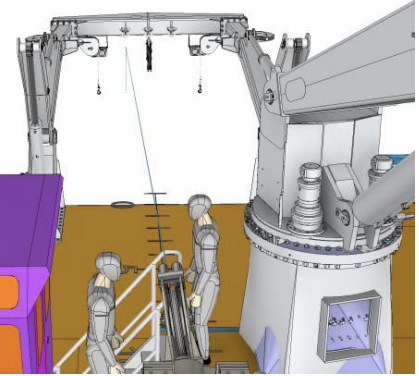
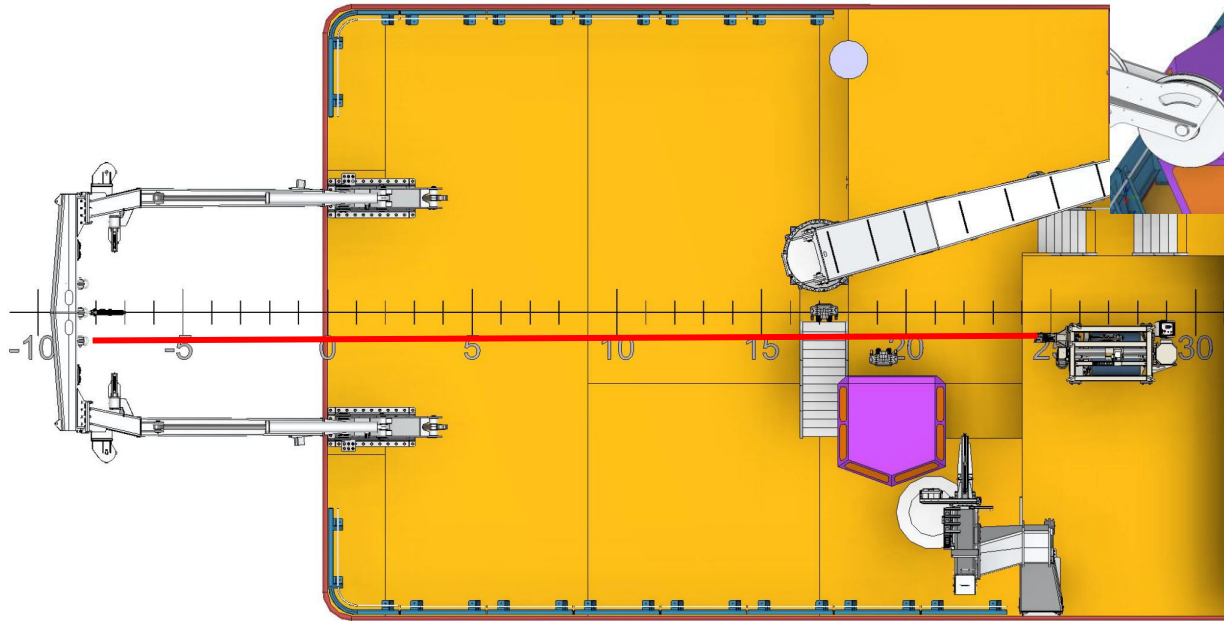


Wire Routing - A Frame - Extended



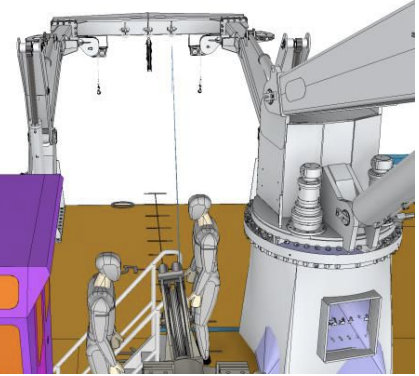
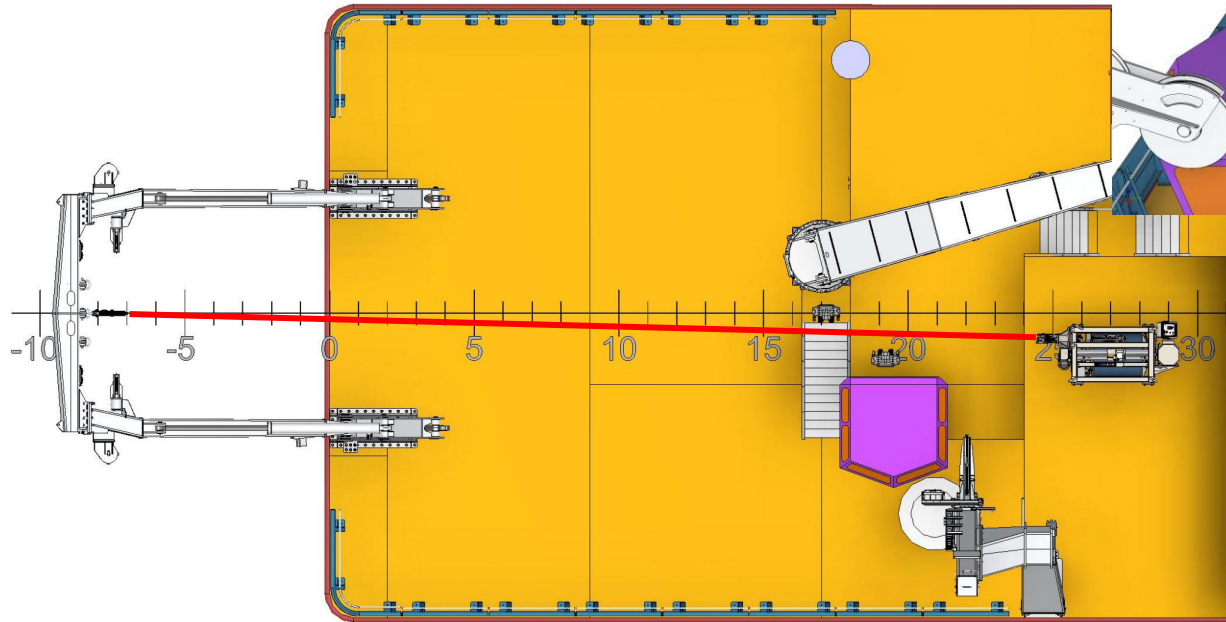
Wire Routing - A Frame - Extended

From the CTD Winch to the Starboard Pad Eye



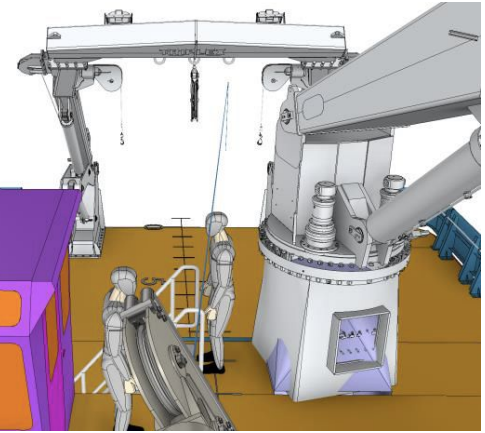
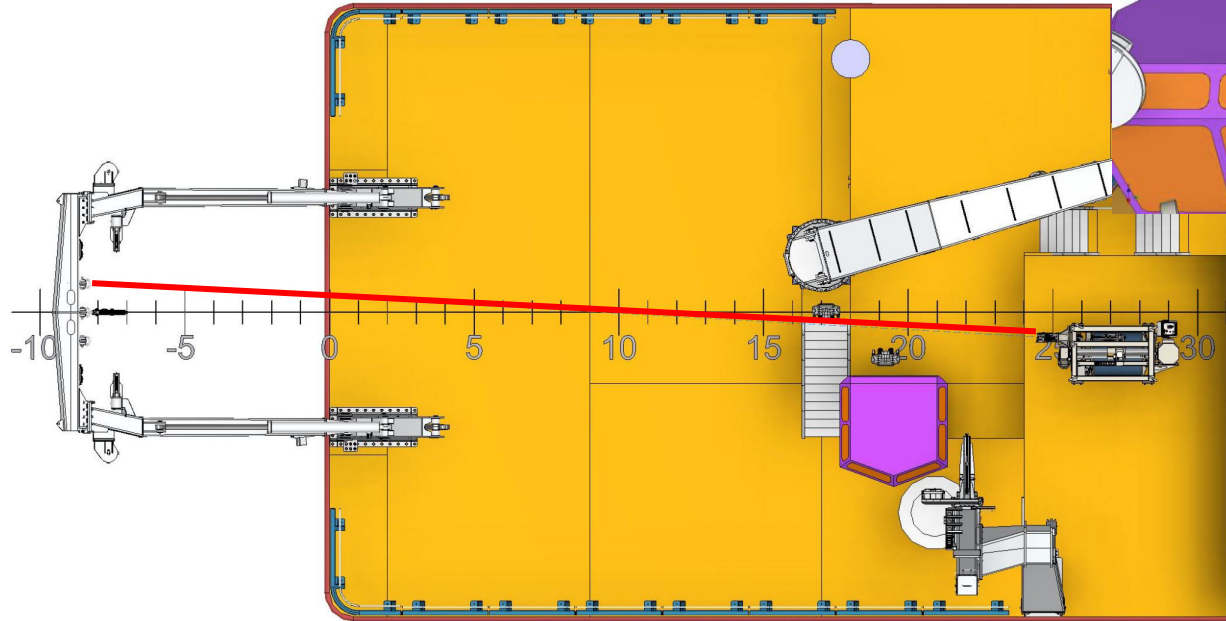
Wire Routing - A Frame - Extended

From the CTD Winch to the Middle Pad Eye



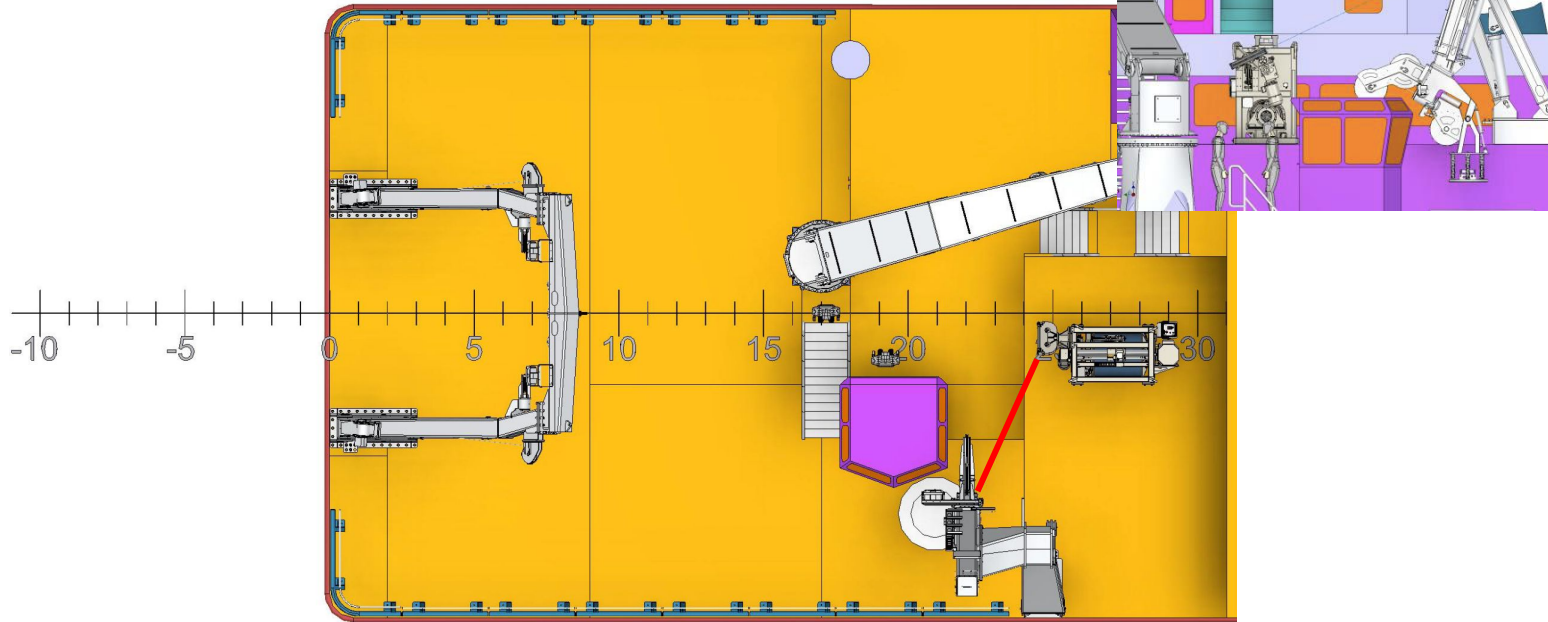
Wire Routing - A Frame - Extended

From the CTD Winch to the Port Pad Eye



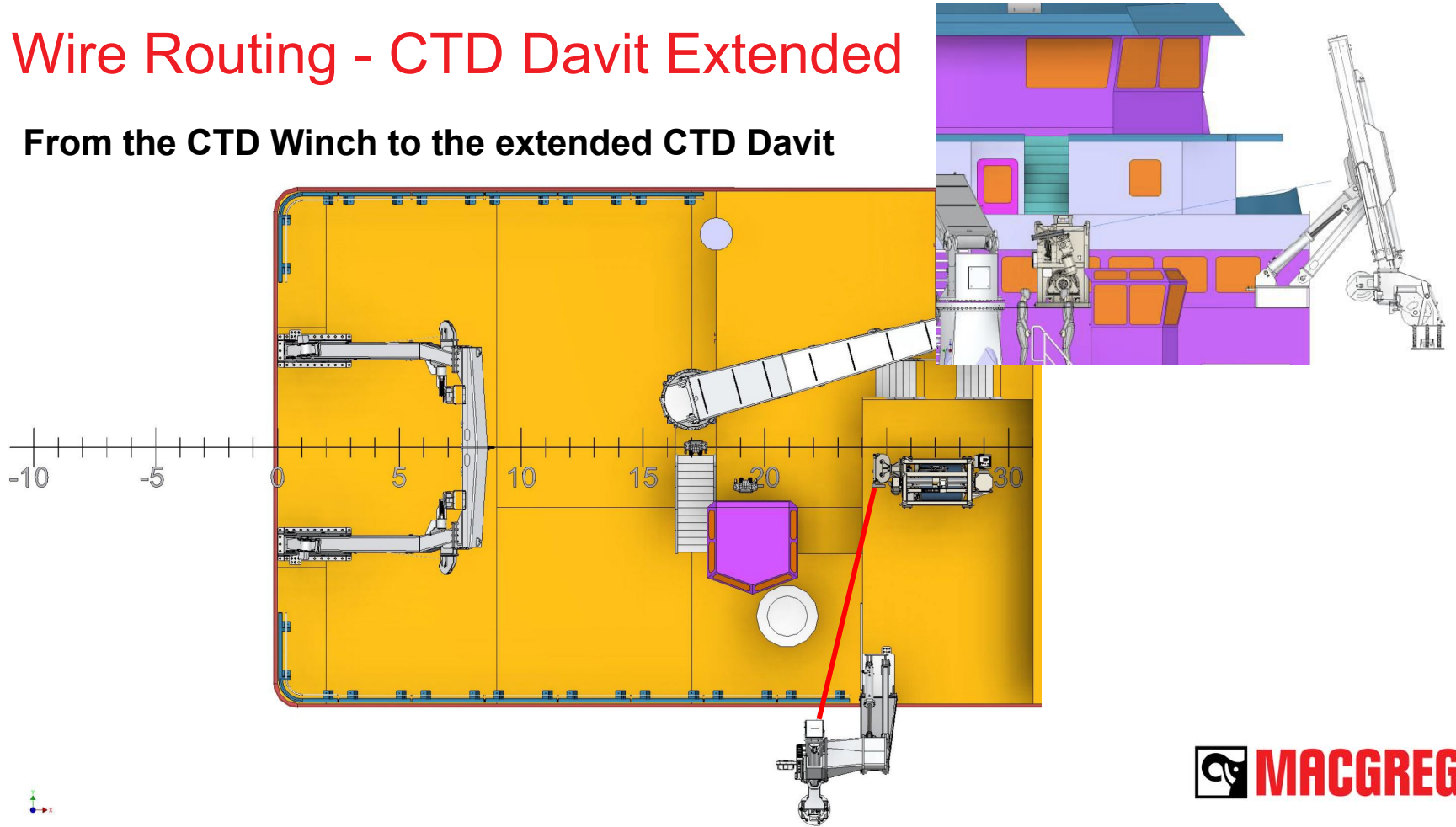
Wire Routing - CTD Davit

From the CTD Winch to the CTD Davit



Wire Routing - CTD Davit Extended

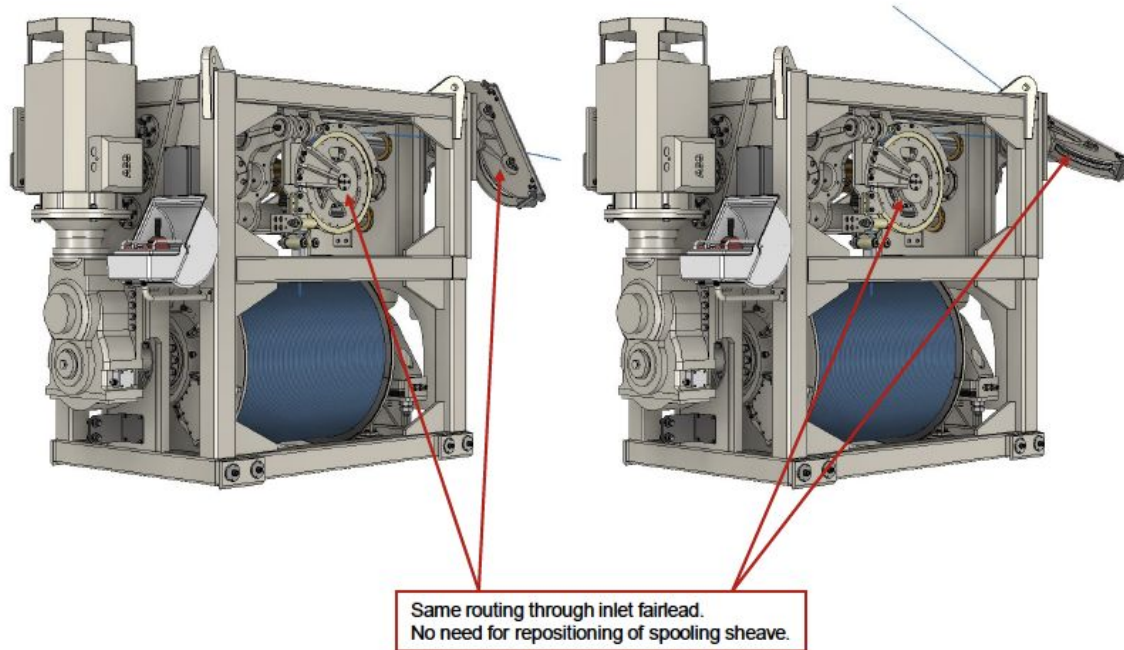
From the CTD Winch to the extended CTD Davit



Wire Routing - CTD Winch Operation

SIDE OPERATION

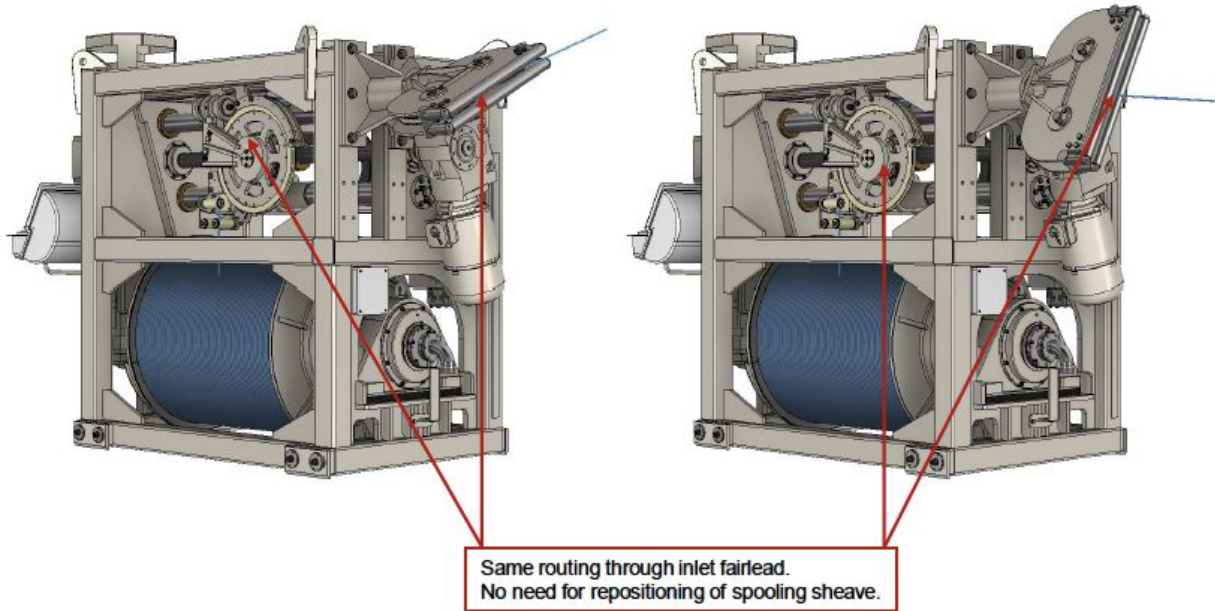
AFT OPERATION



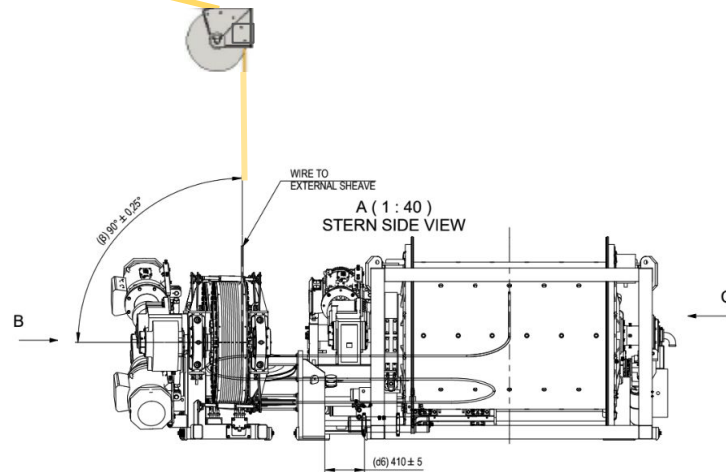
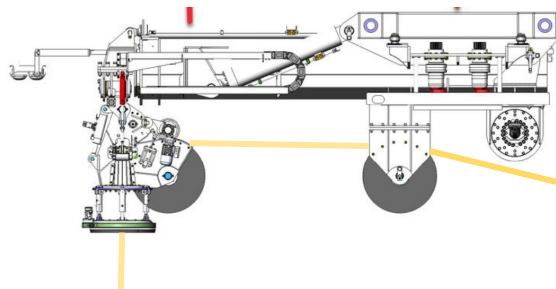
Wire Routing - CTD Winch Operation

SIDE OPERATION

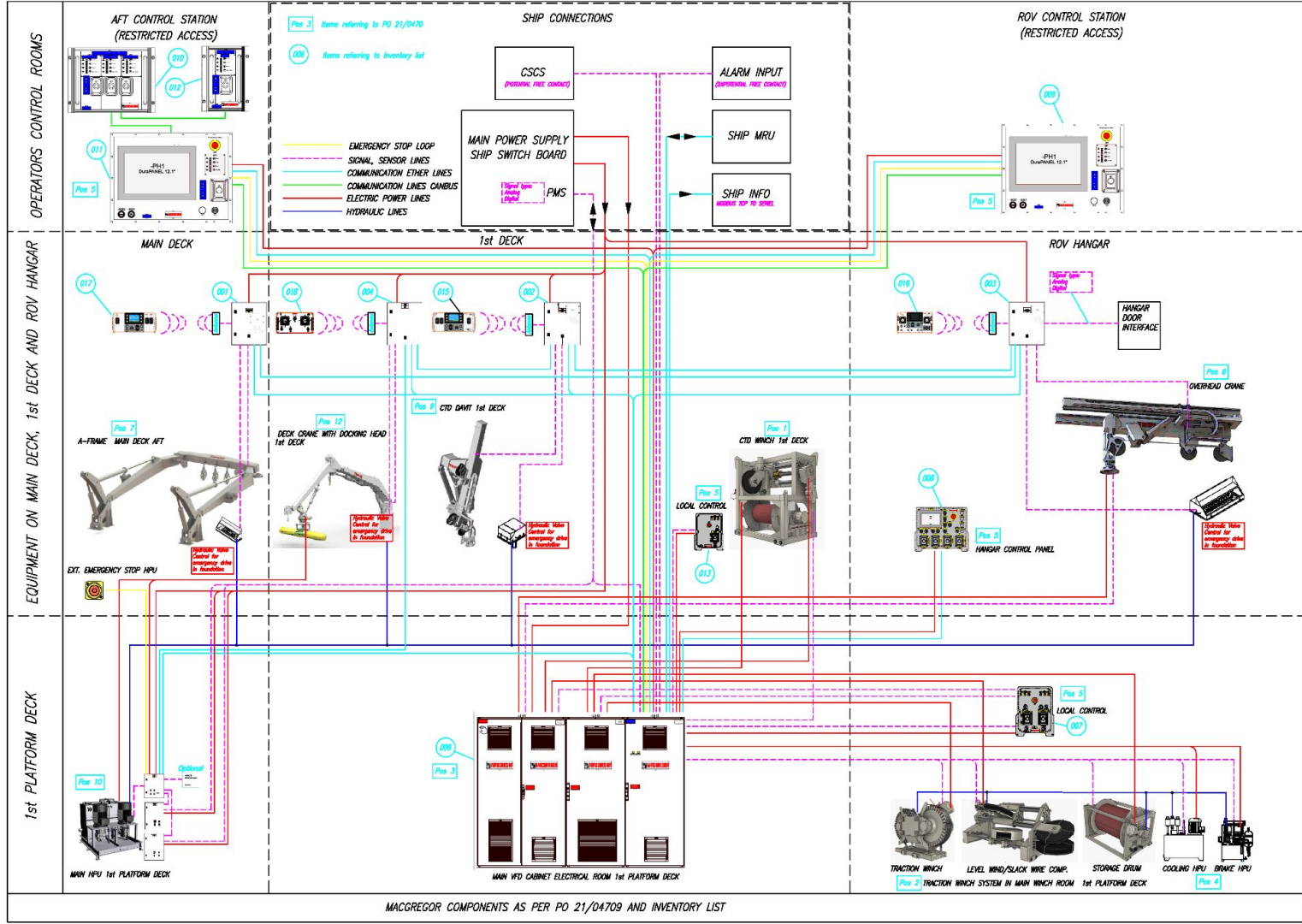
AFT OPERATION



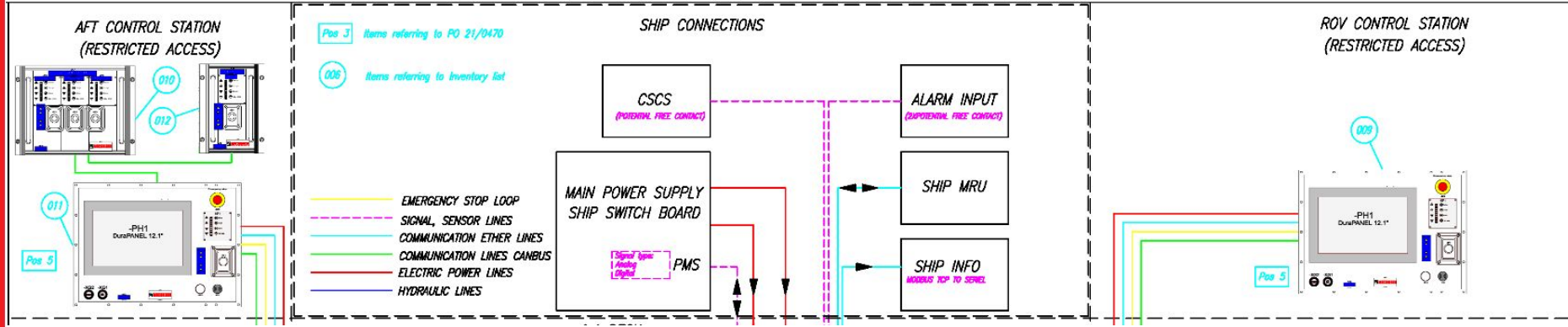
Wire Routing - ROV



Overview MacGregor System

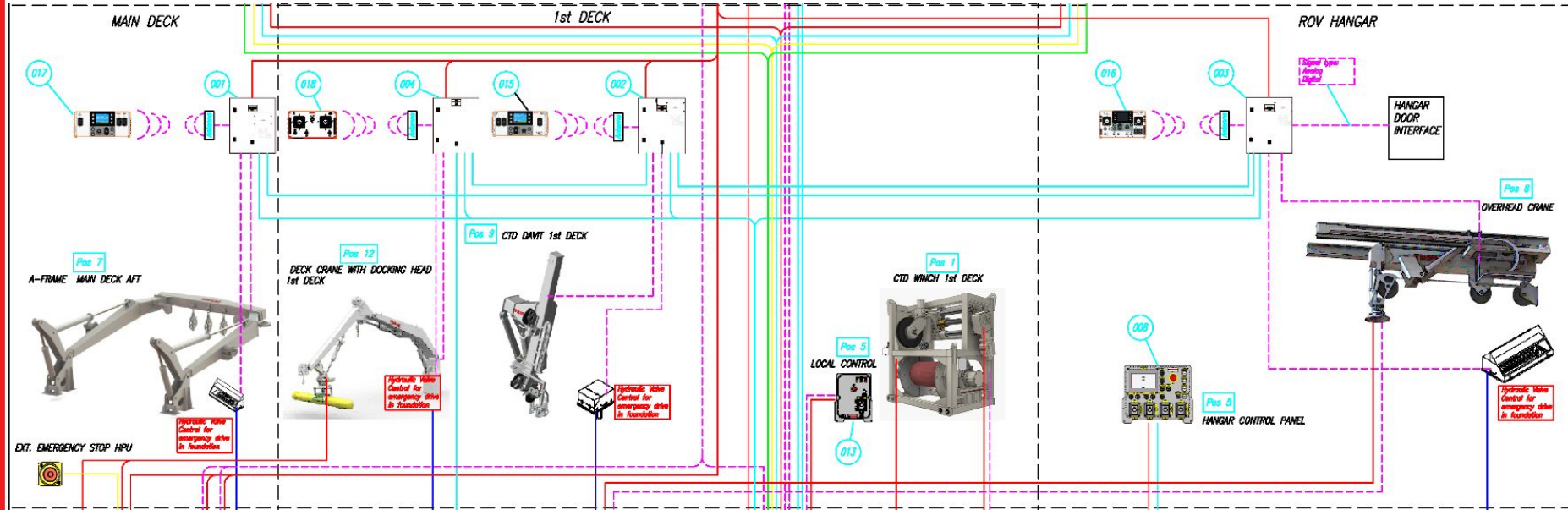


System Overview - Operators Control Rooms



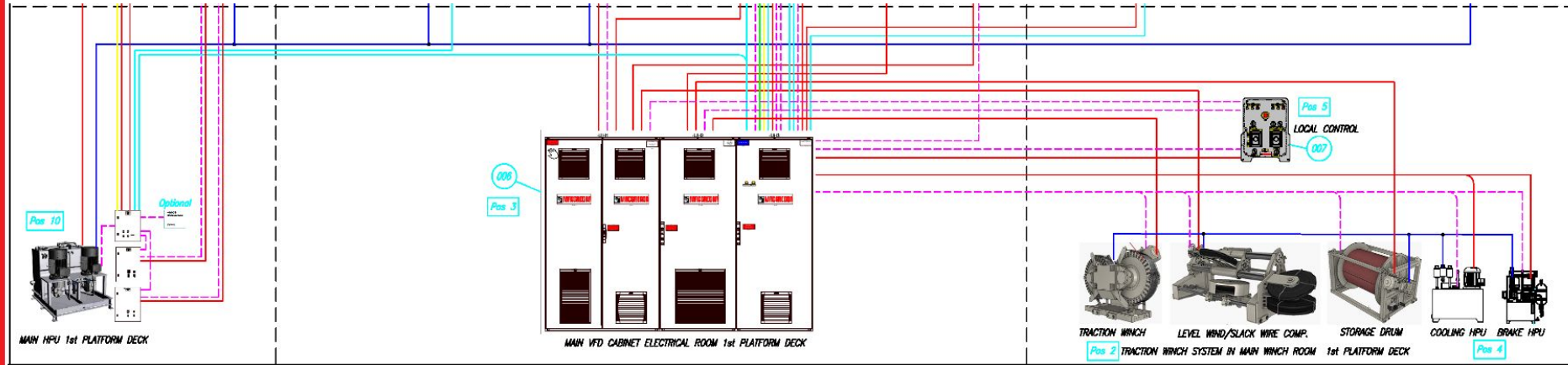
[link](#)

System Overview - Equipment on Main Deck + 1st Deck + ROV Hangar



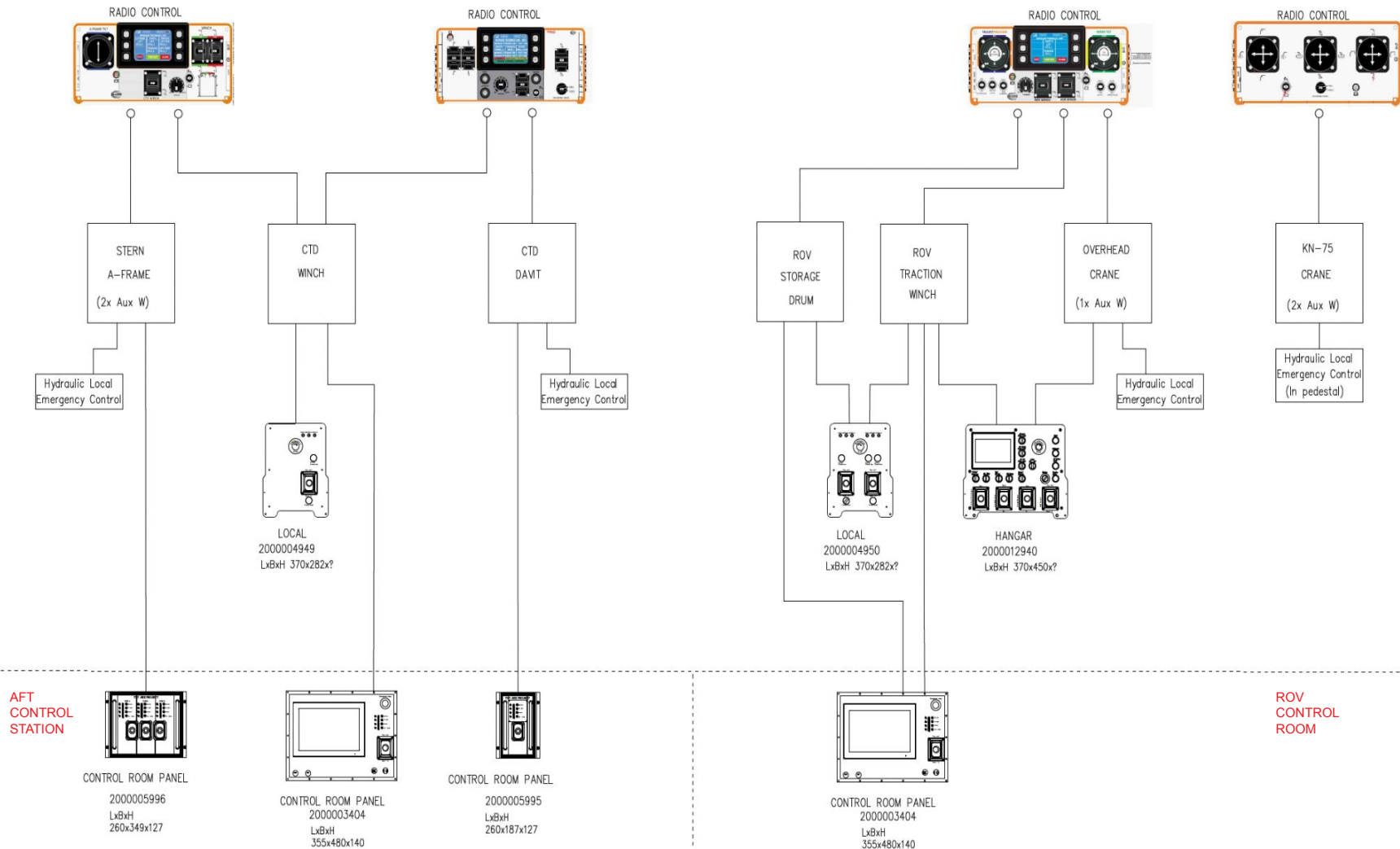
[link](#)

System Overview - 1st Platform Deck



[link](#)

Control System Overview



The diagram illustrates the network architecture of the AFT Control Station. It shows a central 'Main VFD Cabinet' connected to various control panels and modules. The diagram includes Ethernet, CanBus, and EtherCAT communication lines. Key components include CP01 (ROV Control Room), CP03 (AFT Control Station), CP04 (AFT Control Station), CP05 (AFT Control Station), WP01 (Local Panel CTD Winch), WP02 (Local Panel ROV Traction System), WP03 (Hangar Control Panel), and TRIP01 (Communication To/From Triplex System). Red circles indicate emergency stop buttons.

Main VFD Cabinet
 Pentagon
 Brake HPU
 Gear Cooling HPU

CP01
 ROV Control Room
 Panel PC
 w/Network Modules
 2000003404

CP03
 AFT Control Station
 Panel PC
 w/Network Modules
 2000003404

CP04
 AFT Control Station
 Control Panel
 A-Frame Stern
 3/S
 2000005996

CP05
 AFT Control Station
 Control Panel
 CTD Davit
 1/S
 2000005995

WP01
 Local Panel
 CTD Winch
 2000004949

WP02
 Local Panel
 ROV Traction System
 2000004950

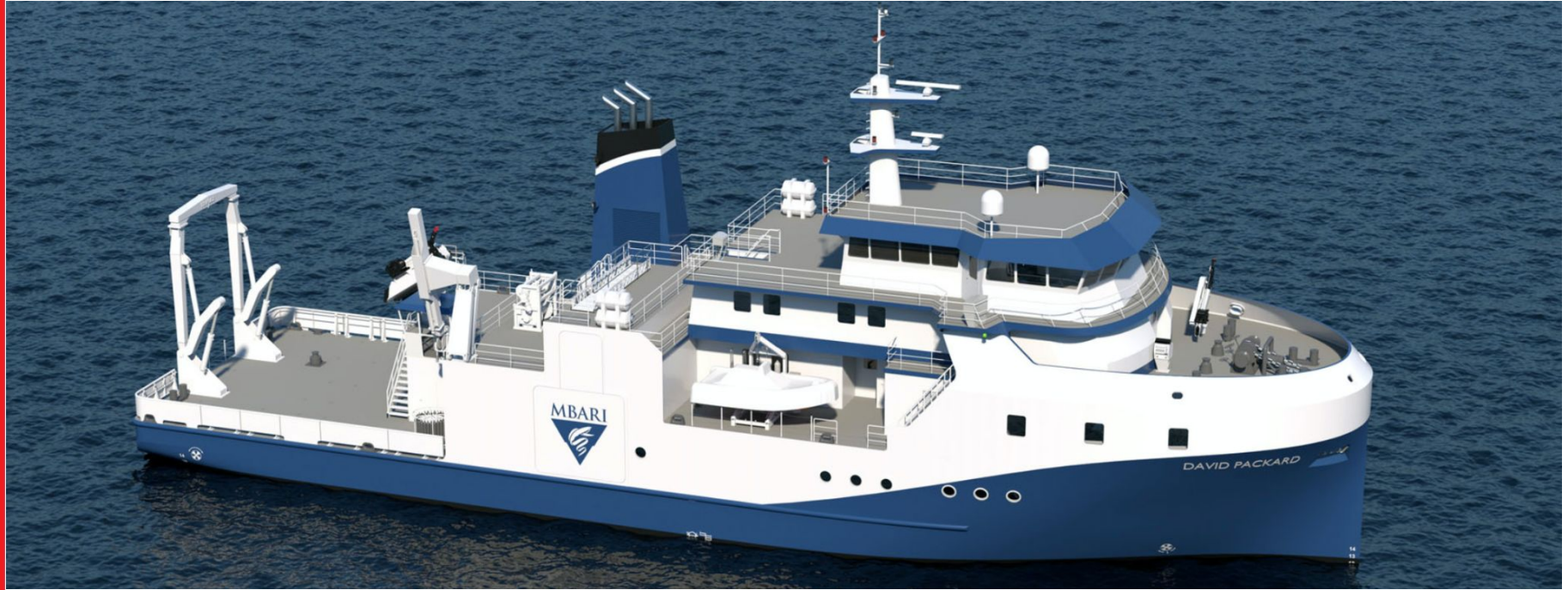
WP03
 Hangar Control Panel

TRIP01
 Communication
 To/From
 Triplex System

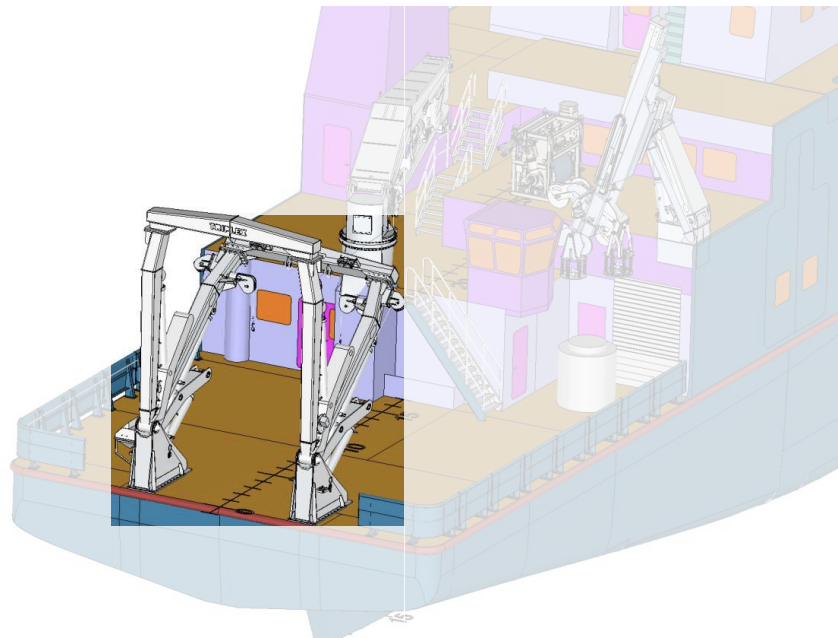
Emergency stop button



Equipment



Stern A-FRAME



3.1 - Stern A-FRAME

3.1.1 - Features

3.1.2 - Technical Data

3.1.3 - Dimensional Sketches

3.1.4 - Controls

3.1.4.1 - Radio Remote Control

3.1.4.2 - Control Station Panel

3.1.4.3 - Manual Control / Valve Center / Emergency Control

3.1.5 - Hydraulic Diagram

3.1.6 - Maintenance & Lubrication Charts



Features

DESCRIPTION

Complete stern a-frame with 170° stroke, 2 LED floodlights, 2 Aux winches, 3 pad eyes and 4 sheave block.

- 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

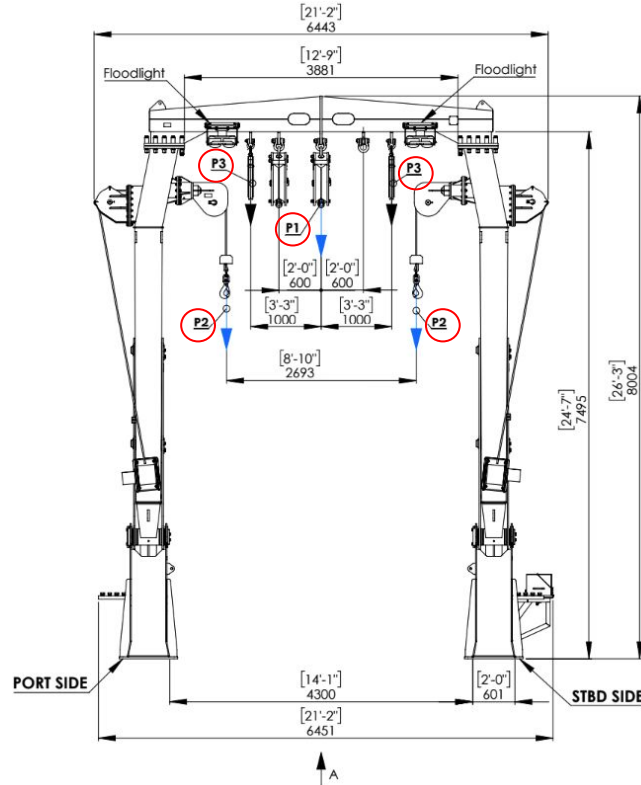
Technical Data

TECHNICAL DATA – A-FRAME		
P1 (Working area 40°-170°) – SDL	100	kN
P2 (Winch Working Area 10°-170°)	SWL 2x3	Ton*
P3 (Working area 40°-170°) SDL	50	kN
Luffing load (center sheave 40°-170°)	SWL 6	Ton*
Luffing load - Vertical hanging (center pad eye 40°-170°)	SWL 6	Ton*
Hydraulic pressure	200	Bar
Tilting time out/in	100/100	Seconds
Recommended oil flow	160	L/min
Weight of crane (moving parts) approx.	12 800	Kg
Weight of foundation approx.	2x1 900	Kg

* Metric Tons

[Information from Dimensional Sketches 20549](#)

Dimensional Sketch



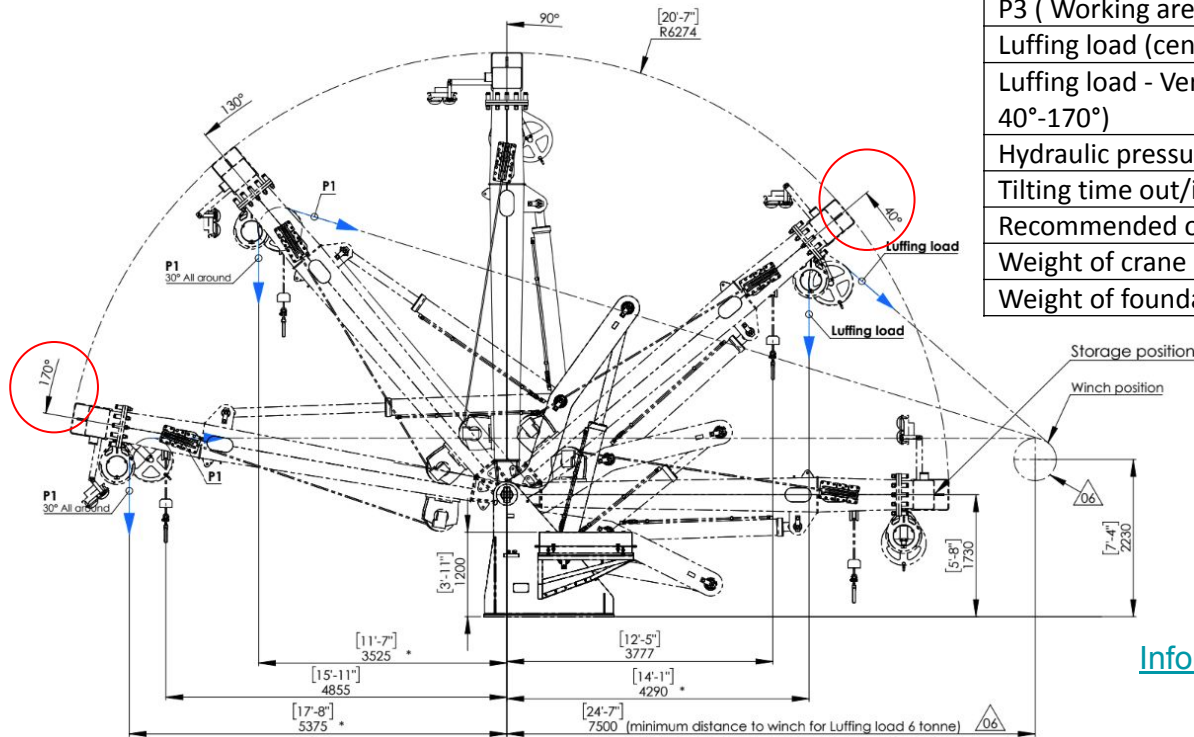
TECHNICAL DATA – A-FRAME

P1 (Working area 40°-170°) – SDL	100	kN
P2 (Winch Working Area 10°-170°)	SWL 2x3	Ton*
P3 (Working area 40°-170°) SDL	50	kN

* Metric Tons

[Information from Dimensional Sketches 20549](#)

Dimensional Sketch



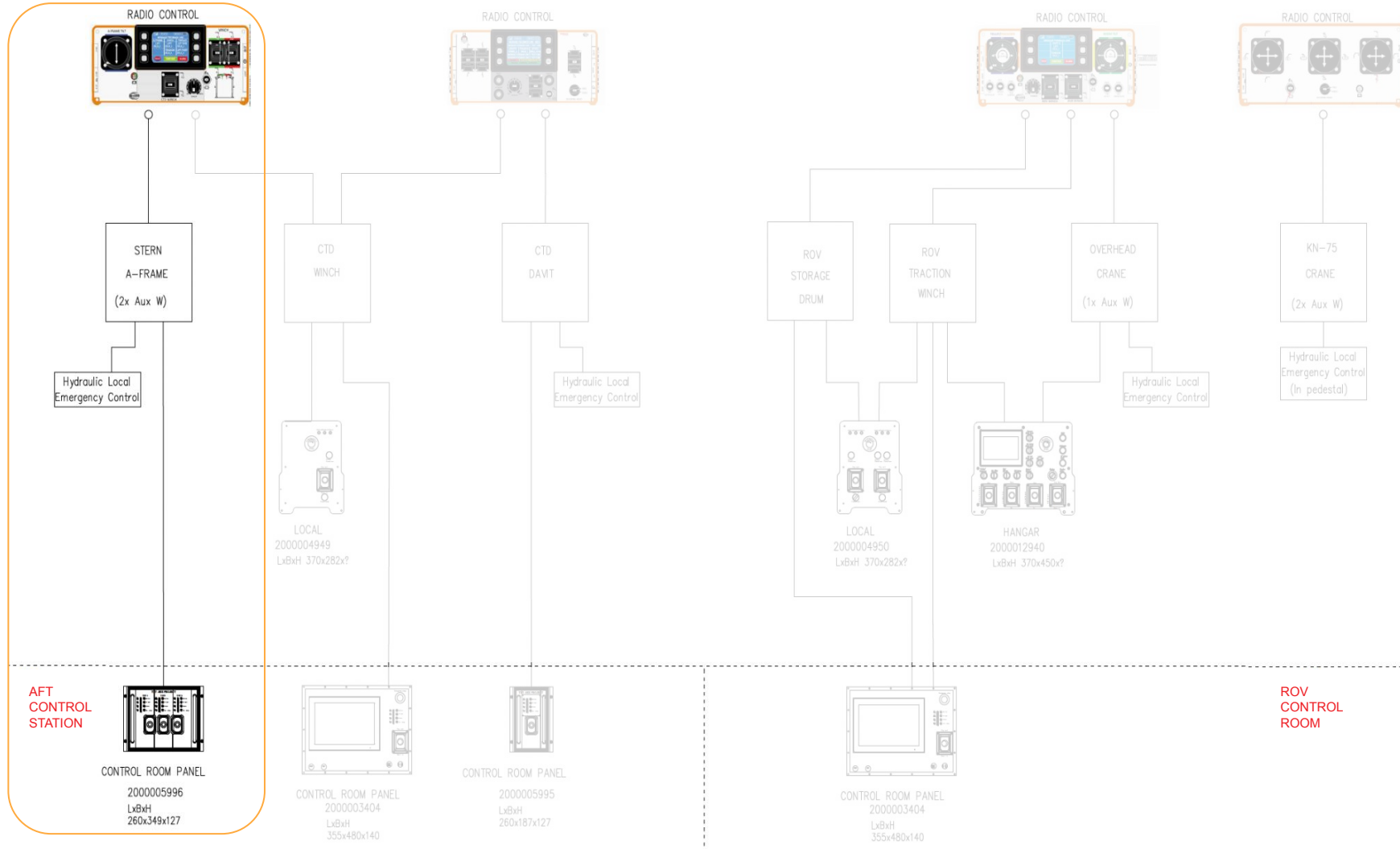
TECHNICAL DATA – A-FRAME

P1 (Working area 40°-170°) – SDL	100	kN
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Luffing load (center sheave 40°-170°)	SWL 6	Tons*
Luffing load - Vertical hanging (center pad eye 40°-170°)	SWL 6	Tons*
Hydraulic pressure	200	Bar
Tilting time out/in	100/100	Sec
Recommended oil flow	160	L/min
Weight of crane (moving parts) approx.	12 800	Kg
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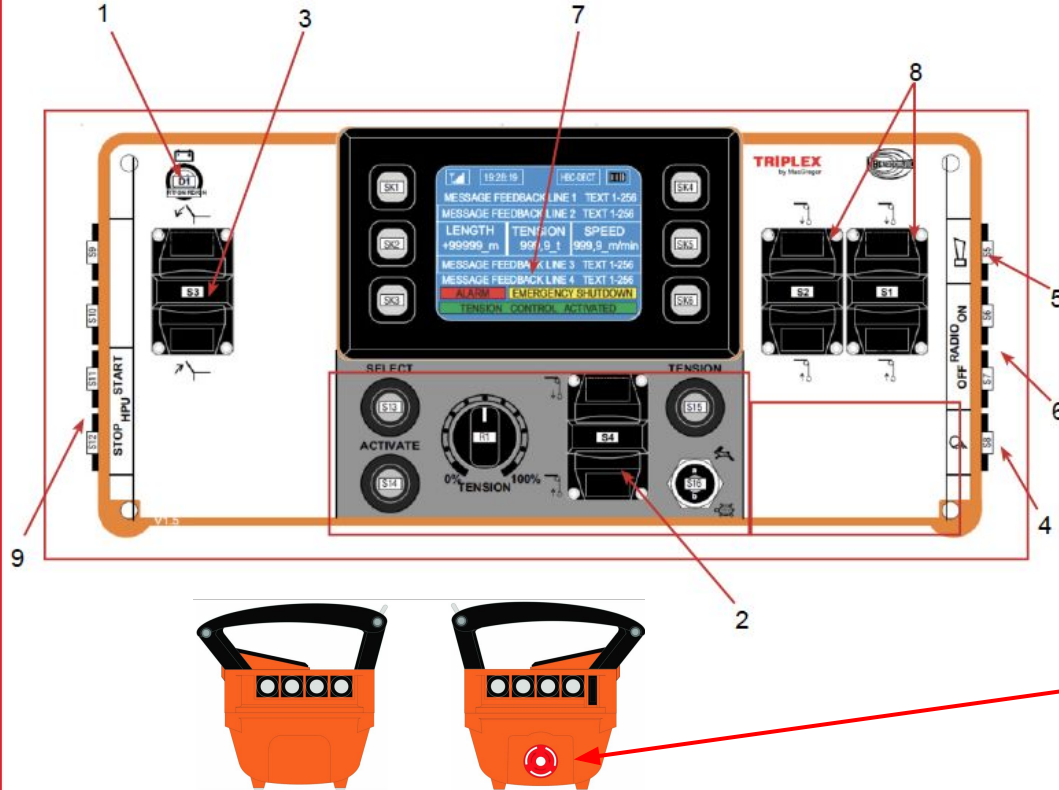
* Metric Tons

[Information from Dimensional Sketches 20549](#)

Control System - Stern A-FRAME



Controls - Radio Remote Control



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

Function STOP - prevent the main oil valve to open and stop the communication

NOTE: The remote will turn off when not active for 10 mins.

Controls - Radio Remote Control

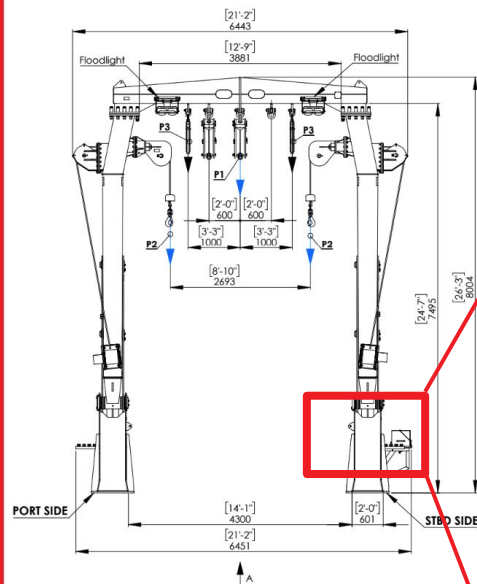
Additional information:

- All movement functions of the A-Frame takes place from this control panel.
- All movement functions of the aux winches takes place from this control panel.
- All motions can be controlled at step-less variable speed (infinite variable) from zero to full speed.
- Operating simultaneously different functions is fully possible. Each function will be clearly marked.
- HPU with necessary performance can be started from a starter switch on the radio remote console.

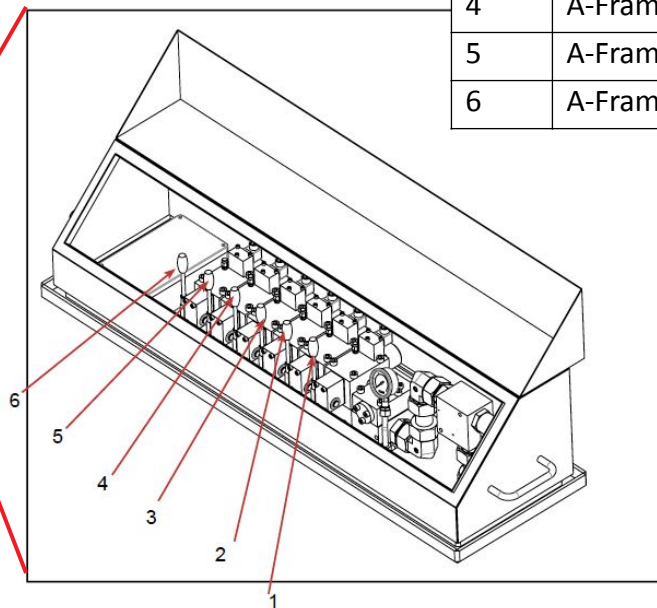
Controls - Manual Control / Valve Central

(Hydraulic Local Emergency Control)

Stern A-FRAME



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



NOTE: Operated from levers on directional valves mounted in stainless steel cabinet with access through hinged hatch. This control is used for emergency operation. Normal operation is from the radio control panel.

Controls - Control Room Panel

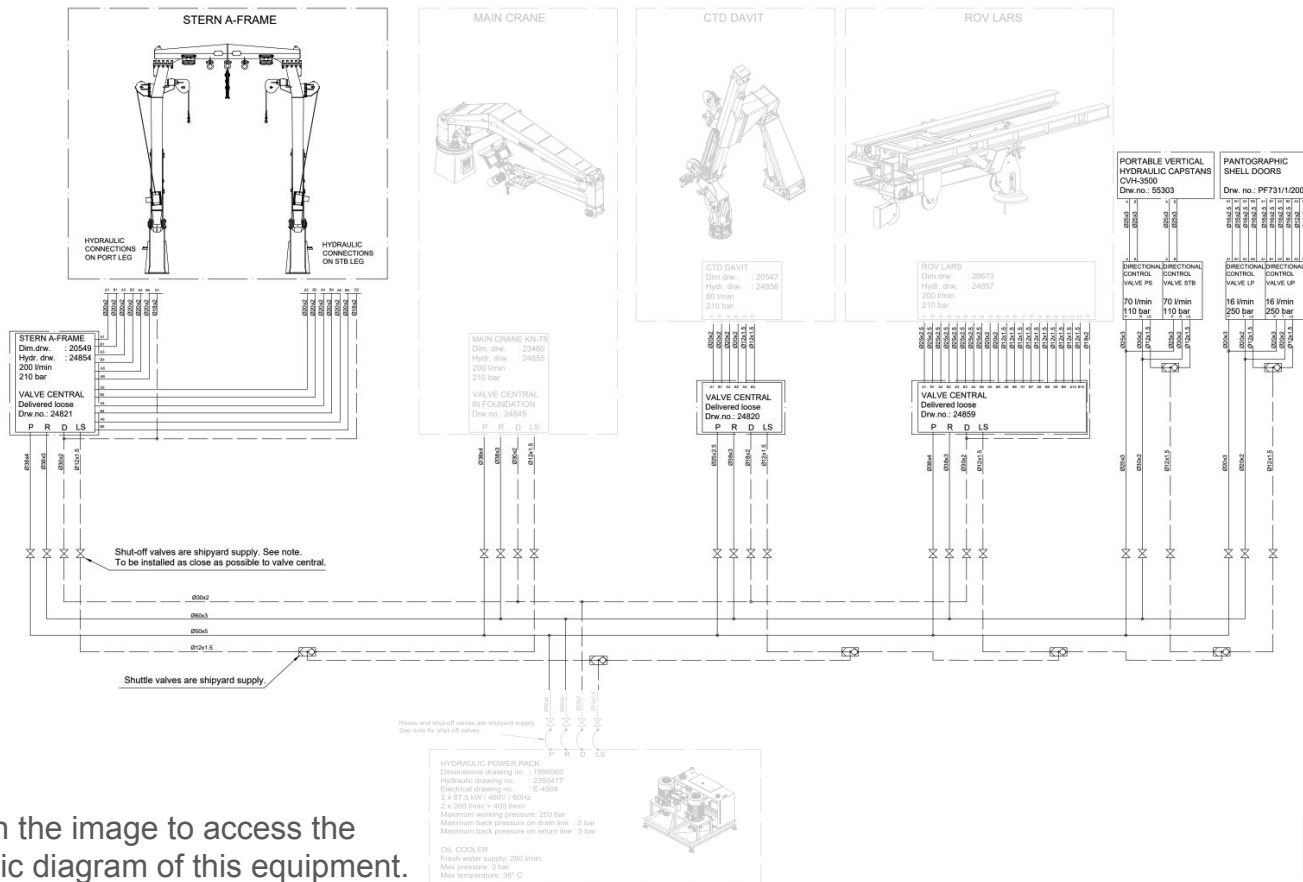
The control panel for AFT control station has the following functions:

- Tilt function controlled by a two-ways joystick
- Haul In and Pay Out functions for the Starboard Winch controlled by a two- way joystick
- Haul In and Pay Out functions for the Port Winch controlled by a two- way joystick



Hydraulic Diagram

Stern A-FRAME



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:

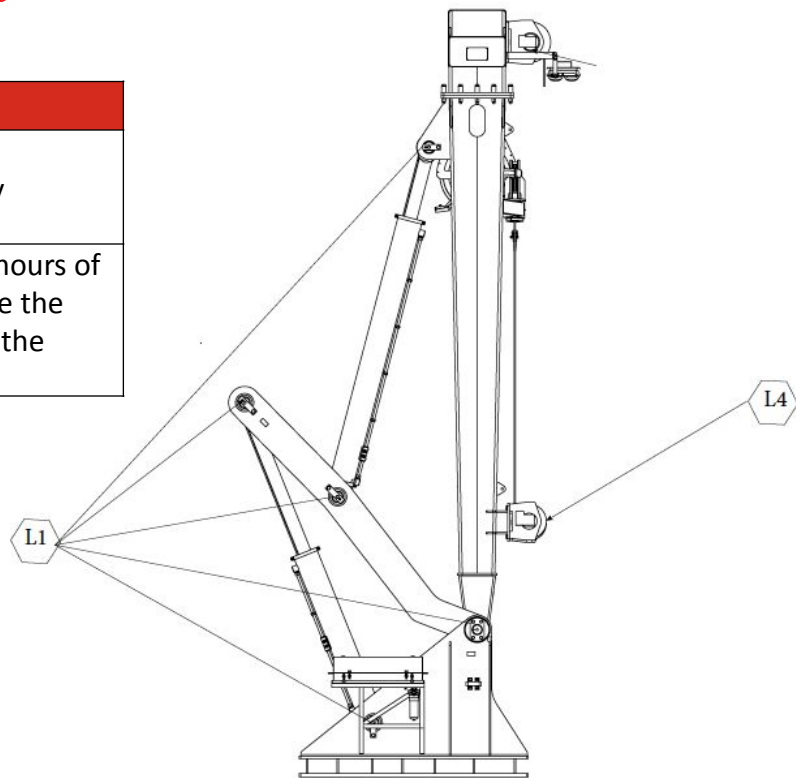
- Pressure Line 375 bar
- Return Line 135 bar
- Drain Line 135 bar
- LS Line 375 bar

Fluid Cleanliness: ISO Class 17-15-12

Click on the image to access the hydraulic diagram of this equipment.

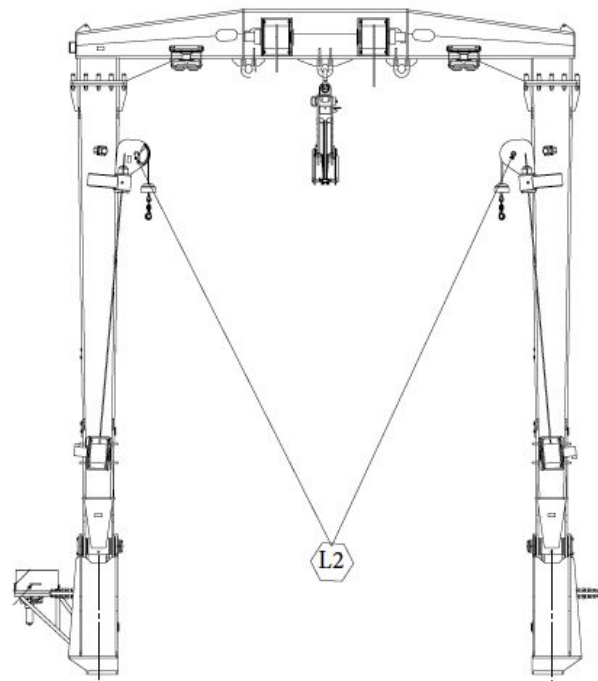
Maintenance & Lubrication Charts

POS	ITEM	OIL QUALITY	VOLUME	SCHEDULE
L1	Bolts	Shell Gadus S2 V220 2		Monthly lubrication. Daily control
L4	Winch SE-27	Hydraulic oil HLP ISO VG 150 (Shell Omala S2 G 150 normal) or equivalent	Fill the drum to it's horizontal axis. 3,5L	After every 250 hours of operation, grease the internal parts of the drum.

**MACGREGOR**

Maintenance & Lubrication Charts

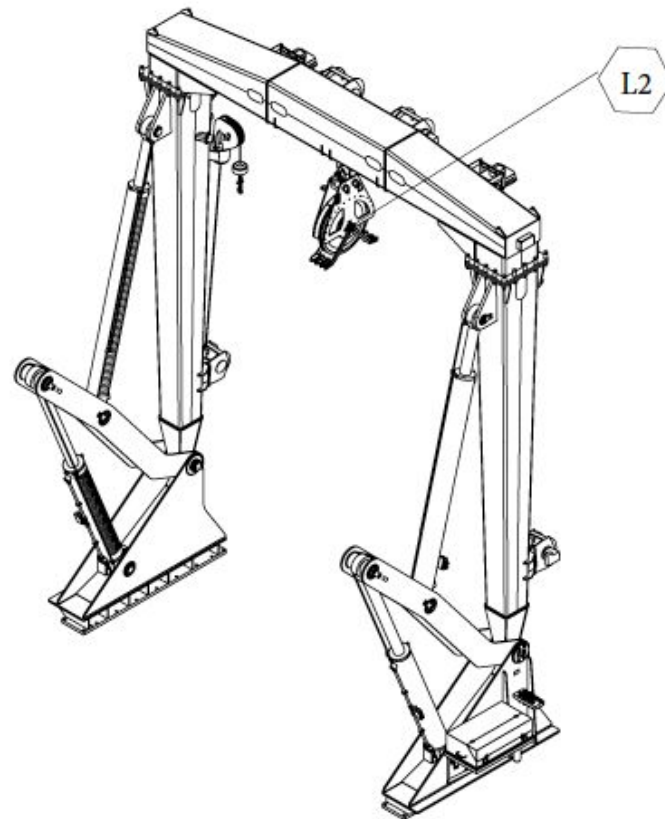
POS	ITEM	OIL QUALITY	SCHEDULE
L2	Wire block	Shell Gadus S2 V220 2	Every 48 hours at continuous use or at least once each 4th week.



Maintenance & Lubrication Charts

POS	ITEM	OIL QUALITY	SCHEDULE
L2	Wire block	Shell Gadus S2 V220 2	Every 48 hours at continuous use or at least once each 4th week.

Stern A-FRAME



Maintenance & Lubrication Charts

Standard lubricants				
POS	ITEM	OIL QUALITY	VOLUME	SCHEDULE
L1	Bolts	Shell Gadus S2 V220 2		Monthly lubrication. Daily control
L2	Wire block	Shell Gadus S2 V220 2		Every 48 hours at continuous use or at least once each 4th week.
L3	Hydraulic system	Recommended 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°C Shell Tellus S2 V 100 or equivalent dependent on system temp.		Weekly control. Yearly oil change.
L4	Winch SE-27	Hydraulic oil HLP ISO VG 150 (Shell Omala S2 G 150 normal) or equivalent	Fill the drum to it's horizontal axis. 3,5L	After every 250 hours of operation, grease the internal parts of the drum.

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 complex
KLÜBER	TBD	Klüberoil GEM1-68 N Klüberoil GEM1-150 N	Klüberplex AG 11-462 Klüberplex BEM 41-132	Klüberflex AG 11-462

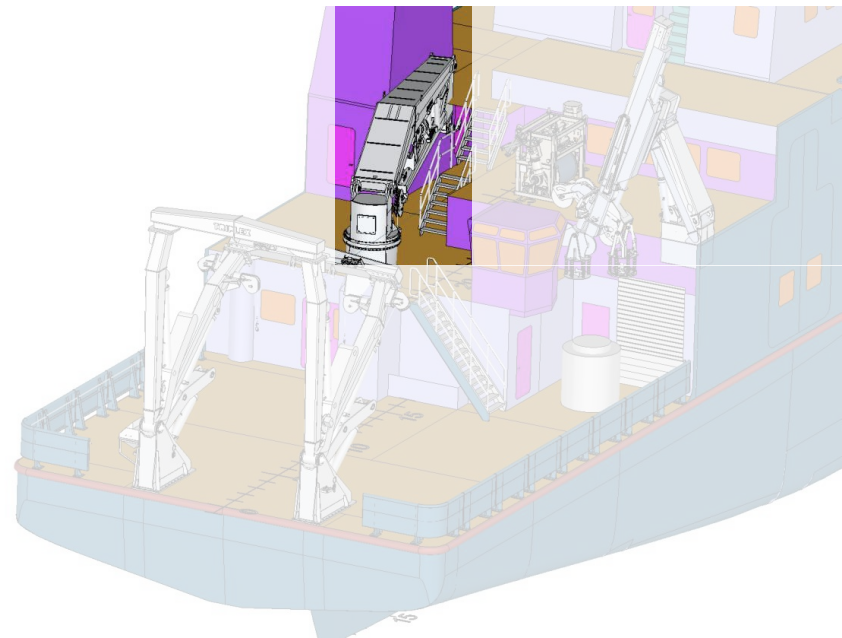
Stern A-FRAME

[Equivalent oils/lubricants from different manufacturers - link](#)



MACGREGOR

KN-75 Main Crane



3.2 - KN-75 Main Crane

3.2.1 - Features

3.2.2 - Technical Data

3.2.3 - Dimensional Sketches

3.2.4 - Docking Head

3.2.5 - Controls

3.2.5.1 - Radio Remote Control

3.2.5.2 - Control Station Panel

3.2.5.3 - Manual Control / Valve Center / Emergency Control

3.2.5.4 - Starting up

3.2.5 - Hydraulic Diagram

3.2.6 - Maintenance & Lubrication Charts



Features

DESCRIPTION

Complete knuckle boom. Crane with a winch 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.

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.

AUV Docking Head, the is equipped with all the necessary piping and cabling necessary for the AUV docking Head.

Technical Data

TECHNICAL DATA - CRANE		
Dimensioned lifting capacity	75	Tm
SWL-1 in port or at sea	2.5	Tons*
SWL-2 in port	8.2	Tons*
SWL-3 AUV Docking Head	2.0	Tons*
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°	°
Slewing speed	1.0	Rpm
Weight without foundation, approx.	11 560	Kg
Weight foundation, approx.	1 200	Kg

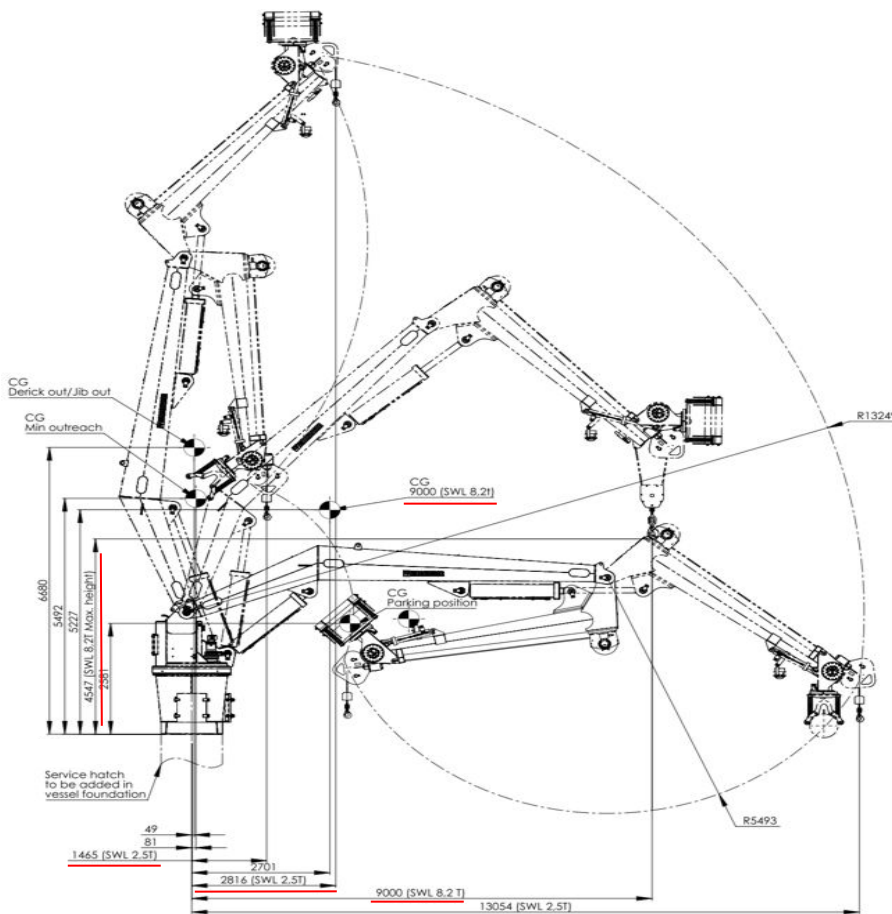
* Metric Tons

[Information from Dimensional Sketch 23460](#)

CAUTION: To avoid electrical cabling damage to the Docking Head, limit slewing to 3 revolutions (3x360°). Exceeding this limit may cause equipment damage.



Dimensional Sketch



KN-75 Main Crane

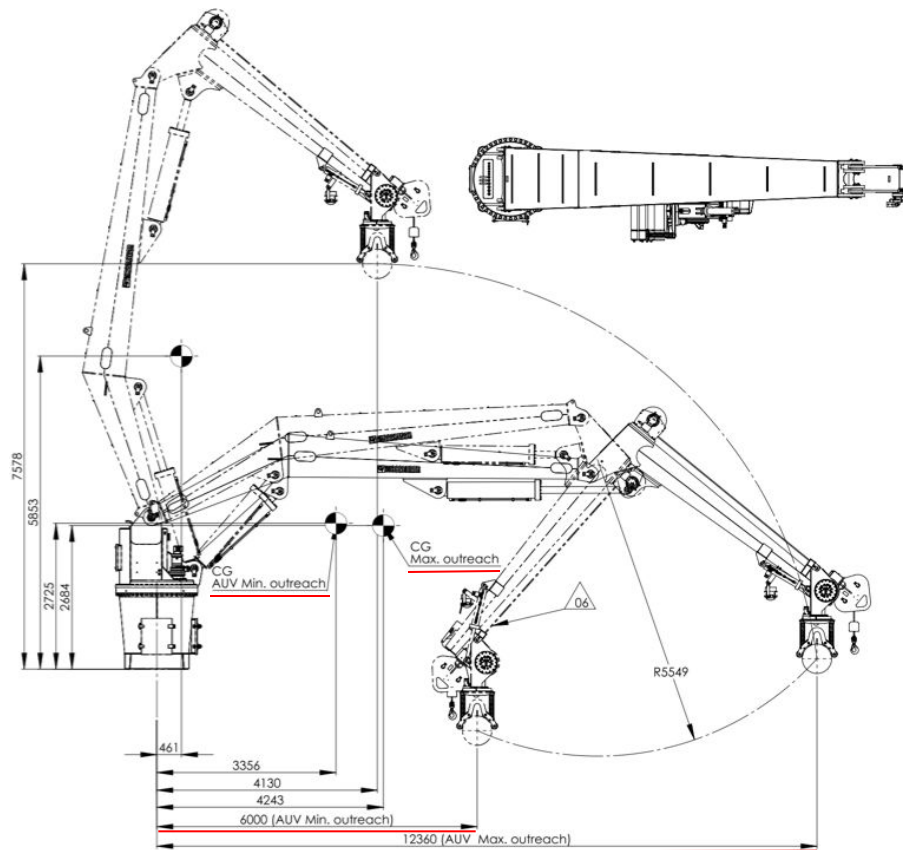
TECHNICAL DATA - CRANE

Dimensioned lifting capacity	75	Tm
SWL-1 in port or at sea	2.5	Tons*
SWL-2 in port	8.2	Tons*
SWL-3 AUV Docking Head	2.0	Tons*
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°	°
Slewing speed	1.0	Rpm
Weight without foundation, approx.	11 560	Kg
Weight foundation, approx.	1 200	Kg

[Information from Dimensional Sketch 23460](#)

Dimensional Sketch

KN-75 Main Crane



TECHNICAL DATA - CRANE

Dimensioned lifting capacity	75	Tm
SWL-1 in port or at sea	2.5	Tons*
SWL-2 in port	8.2	Tons*
SWL-3 AUV Docking Head	2.0	Tons*
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°	°
Slewing speed	1.0	Rpm
Weight without foundation, approx.	11 560	Kg
Weight foundation, approx.	1 200	Kg

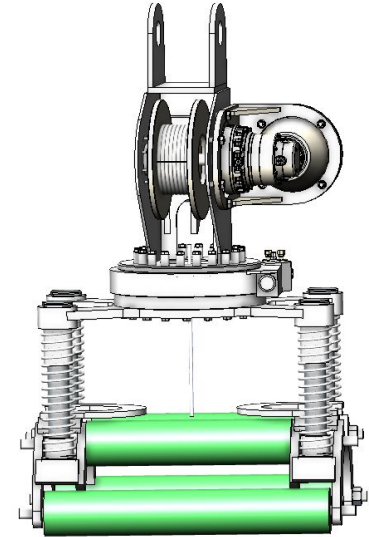
[Information from Dimensional Sketch 23460](#)

Technical Data (Docking Head)

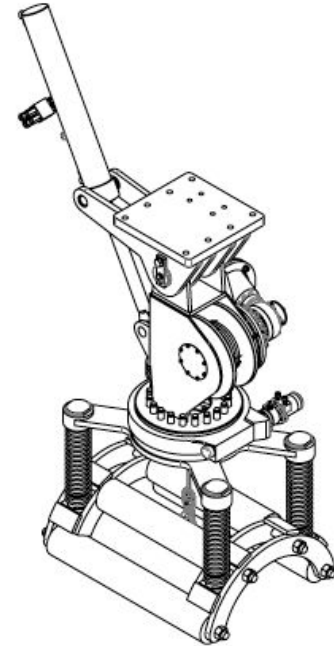
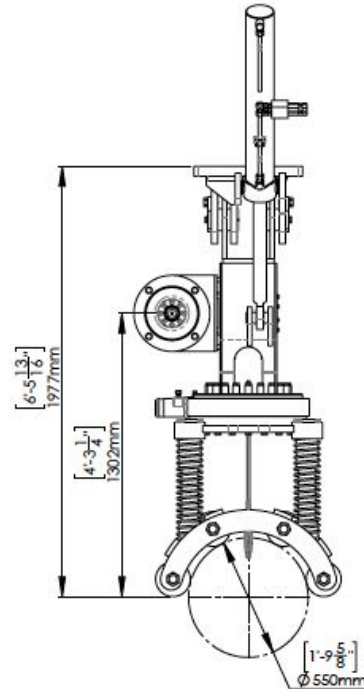
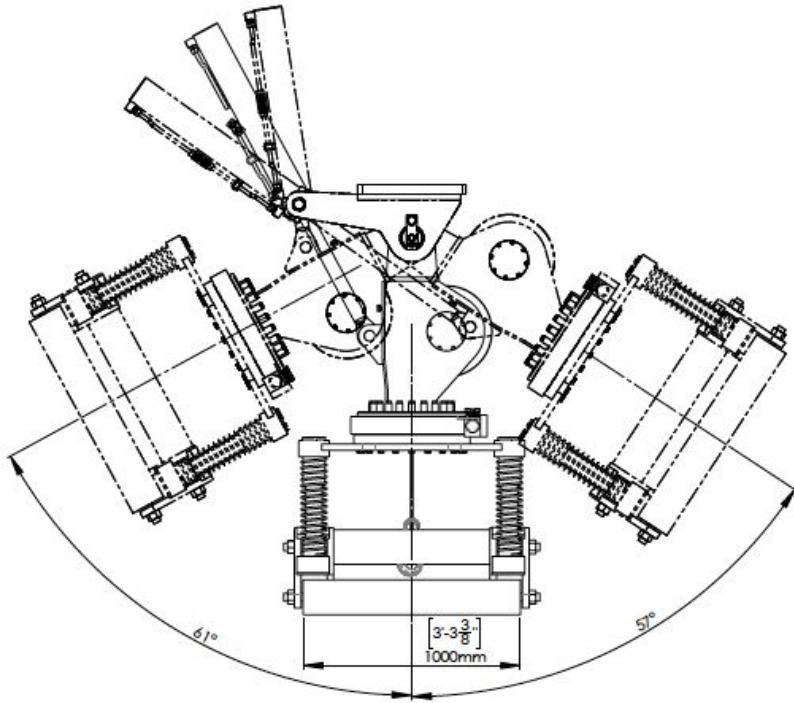
TECHNICAL DATA DOCKING HEAD

Working Pressure	230	Bar
AUV Max weight	1.0	Ton
DAF (inboard)	1.7	
DAF (outboard)	2.25	
Mass of Docking Head (approx.)	1400	Kg

[Information from Dimensional Sketch 23412](#)



Dimensional Sketch (Docking Head)



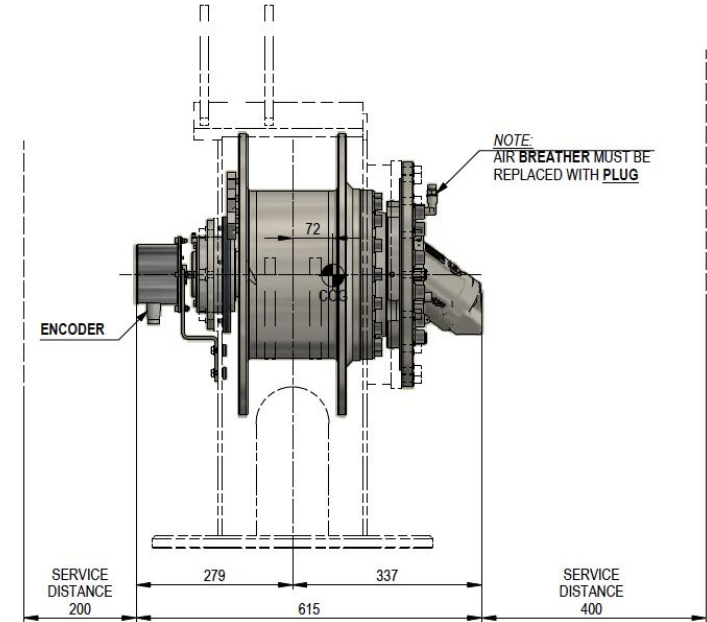
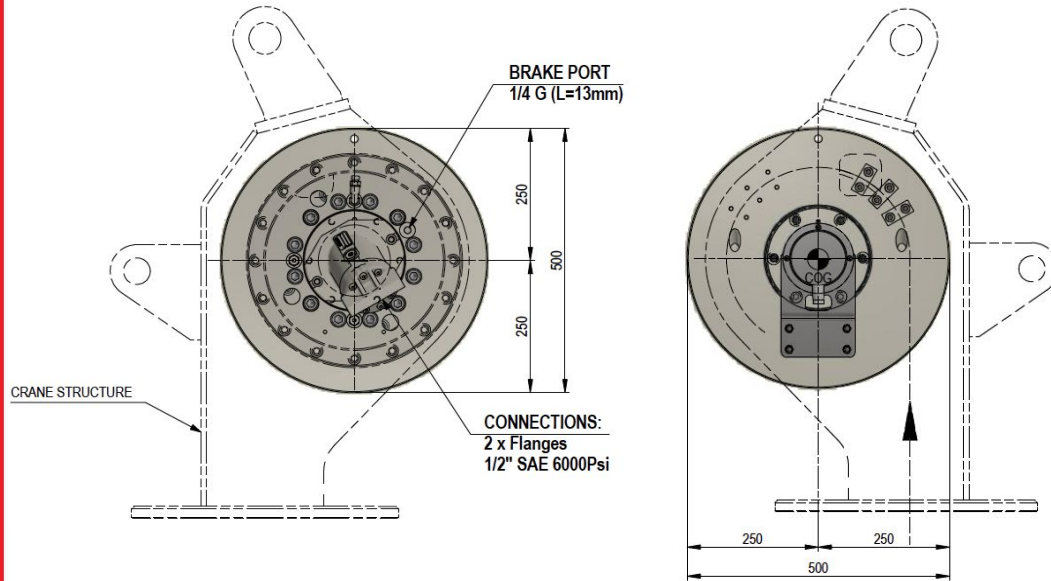
Features (Docking Head)

DESCRIPTION - KN-75 Main Crane - Docking Head

AUV Docking head mounted on the crane, and all function can be controlled by the cranes radio remote control. The docking head is equipped with one electrical winch for securing the AUV during Launch and Recovery. The winch has a hook which that is manually attached or detached to the lifting point of the AUV.

KN-75 Main Crane - Docking Head - Winch

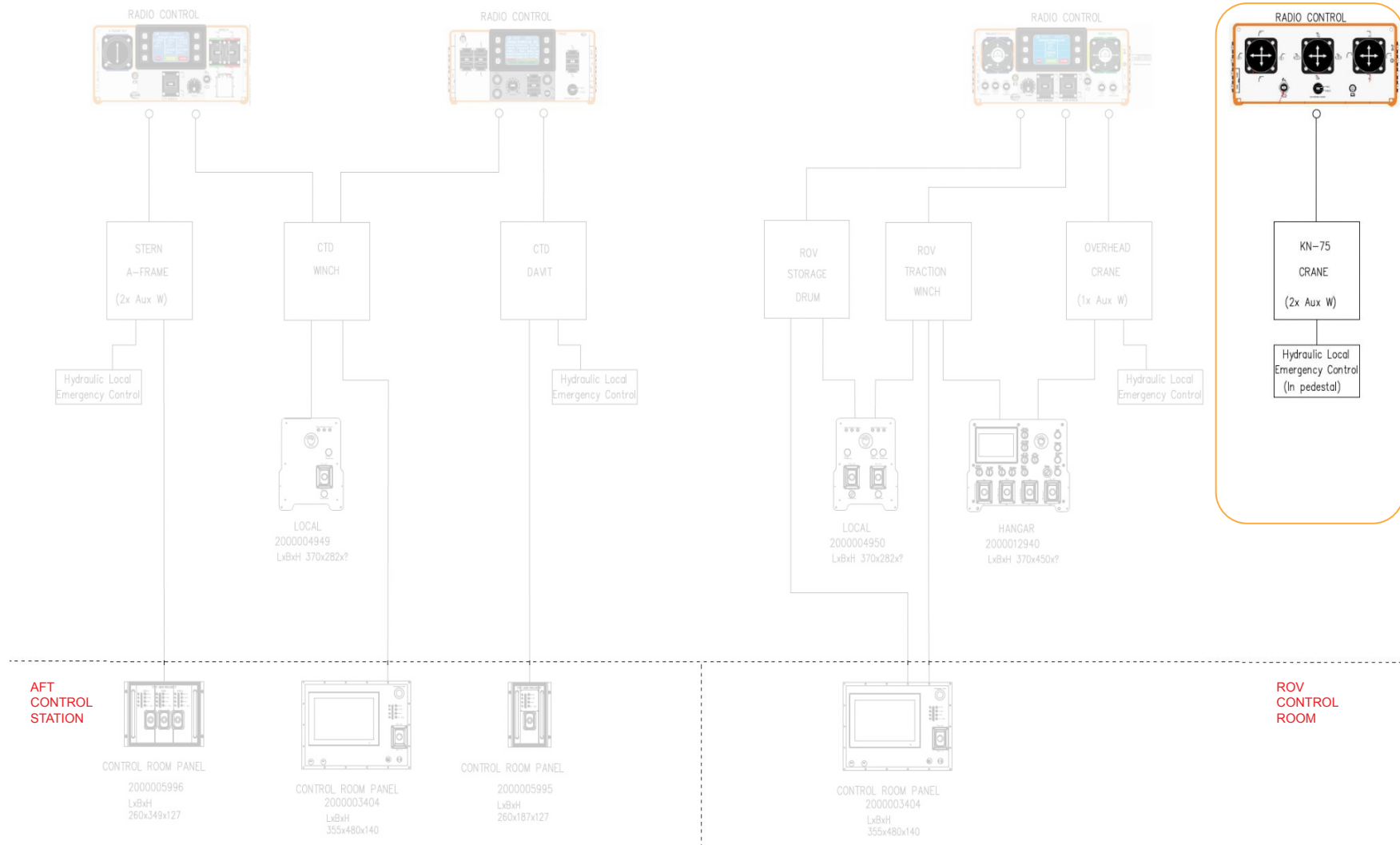
Dimensional Sketch (Docking Head - Winch)



CAUTION: Make sure that not less than 5 windings of rope is left on drum during operation. The use of less rope on the drum can cause damage to the equipment.

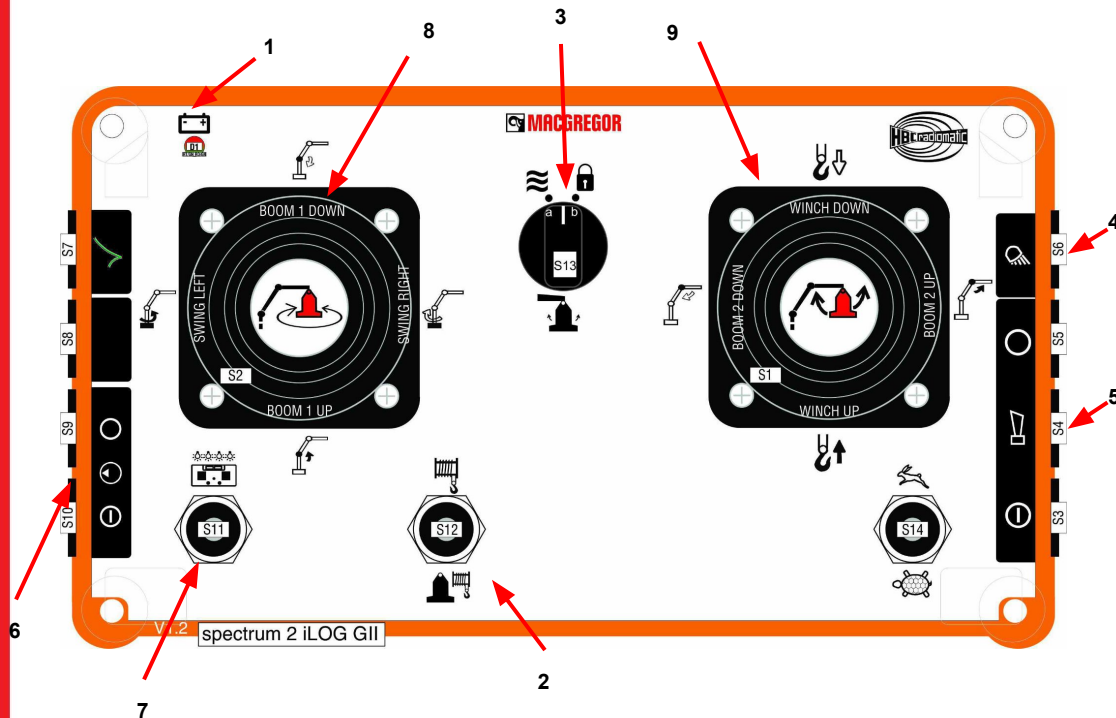
Information from Dimensional Sketch 2000004293

Control System - KN-75 Main Crane

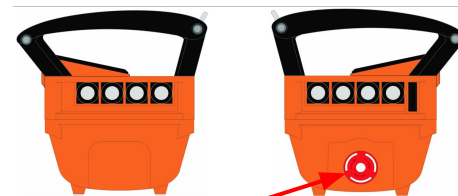


Controls - Radio Remote Control

KN-75 Main Crane



POS	DESCRIPTION
1	Battery indicator
2	Aux winch control turn on/off ?
3	Switch
4	Lights: on/off
5	Horn
6	Radio control: On/Off ?
7	Radio control lights
8	Joystick Boom 1 and Swing left/right
9	Joystick Winch up/down and Boom 2



Function STOP - prevent the main oil valve to open and stop the communication

NOTE: The remote will turn off when not active for 10 mins.

Controls - Radio Remote Control

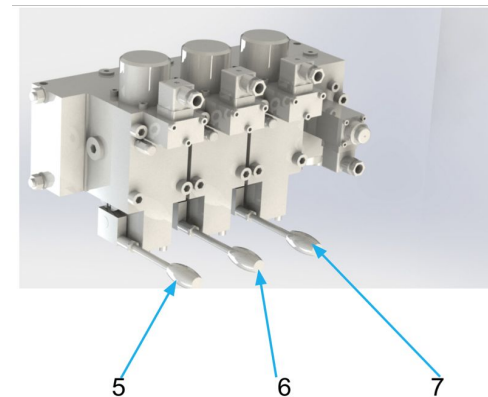
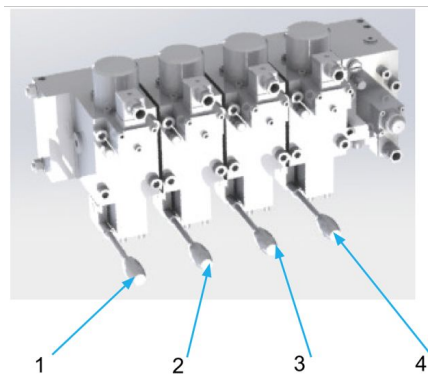
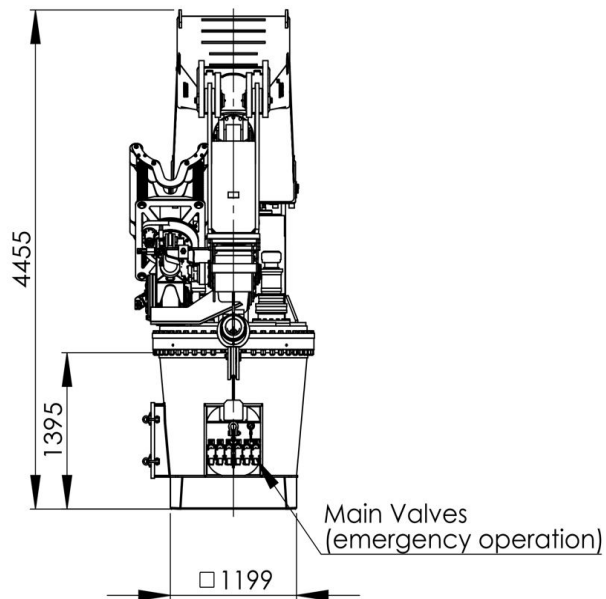
Additional information:

- All movement functions of the crane and both winches take place from this control panel.
- All functions of the Docking Head take place from this control panel.
- All motions can be controlled at step-less variable speed (infinite variable) from zero to full speed.
- Operating simultaneously different functions is fully possible. Each function will be clearly marked.
- HPU with necessary performance can be started from a starter switch on the radio remote console.

Controls - Manual Control / Valve Central

(Hydraulic Local Emergency Control)

KN-75 Main Crane



POS	DESCRIPTION	OPERATION
1	SWING	Clockwise / Counter Clockwise
2	MAIN DERRICK	Cyl. In /Cyl. Out
3	JIB	Cyl. Out / Cyl. In
4	WINCH	Lower / Lift
5	SLEWING DOCKING HEAD	Clockwise / Counter Clockwise
6	WINCH DOCKING HEAD	Lower / Lift
7	TILT DOCKING HEAD	Cyl. Out / Cyl. In

NOTE: Operated from levers on directional valves mounted in stainless steel cabinet with access through hinged hatch. This control is used for emergency operation. Normal operation is from the radio control panel.

Starting Up

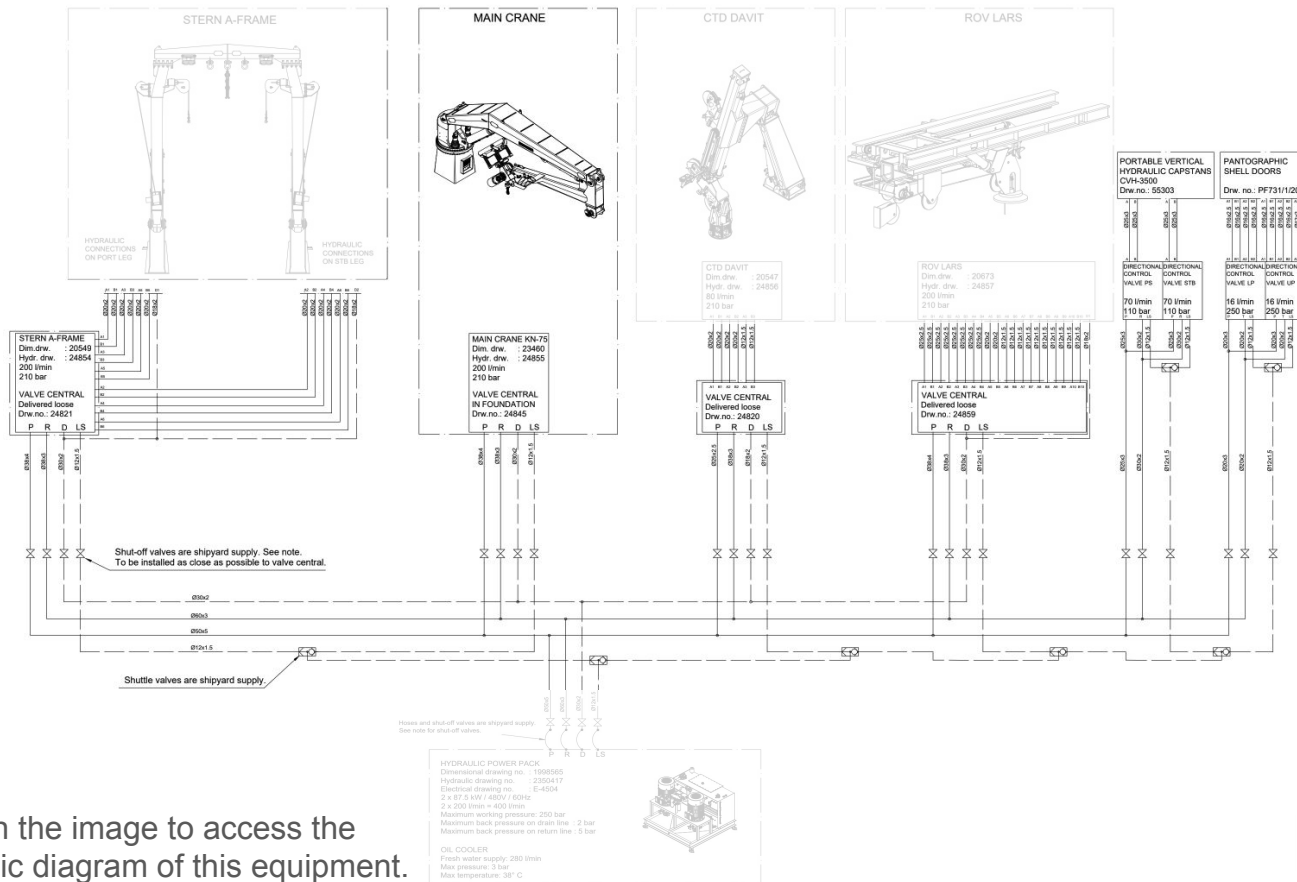
KN-75 Main Crane

Instructions for Starting Up

- 1** Run the pump for 15 mins before any maneuvering valves are operated. This allows the filtration of the oil in the pipe system.
- 2** Subsequently, move the hydraulic cylinders back and forth along their entire length to ensure proper oil filling. During this operation, use another crane to securely hold the crane in place.
- 3** When all functions have been thoroughly tested, replace the gaskets in the high-pressure filters. Also, ensure the main filter for each spool on the proportional valves is thoroughly cleaned.
- 4** To prevent cylinder dropping during loading and when the pump pressure is "off," adjust the overcenter valves on the cylinders inward until the crane securely holds the load.

Hydraulic Diagram

KN-75 Main Crane



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

Click on the image to access the hydraulic diagram of this equipment.

Maintenance & Lubrication Charts

LUBR. PLACE	OIL QUALITY	VOLUME	SCHEDULE
HYDR. SYSTEM	20-40 C Shell Tellus S2 V32 40-50 C Shell Tellus S2 V46 (normal) 50-60 C Shell Tellus S2 V68 60-70 C Shell Tellus S2 V100 (dependent on system temp.)		Weekly control. Yearly oil change
GEAR SWING (RE 1023)	Shell Omala S2 G 150 (220 from Triplex)	Level plugs 4,8L	Refill every 50 hour. Oil change after 2000 hours or annually.
BRAKE	Shell Tellus S2 V32		
SLEEWING BEARING			
BEARING RACES 4 ea. nipples	Shell Gadus S2 V220		Monthly lubrication. Daily control.
GEAR TEETH	Shell Gadus S2 OGH		Monthly lubrication. Daily control.
ROTARY COUPLING 1 ea. nipple	Shell Gadus S2 V220		Monthly lubrication.
BOLTS (8 stk. nipples KN-60) (4 stk. nipples KN-75)	Shell Gadus S2 V220		Monthly lubrication. Daily control.
WINCH SE45V	Shell Omala S2 G 150 (220 from Triplex)	9,5L	Oil change every 6 months or after 600 hours of use
Wire rope	Shell gadus S2 OG 40 (50)	Apply a sufficient layer of grease on the wire surfaces	Monthly lubrication. Daily control

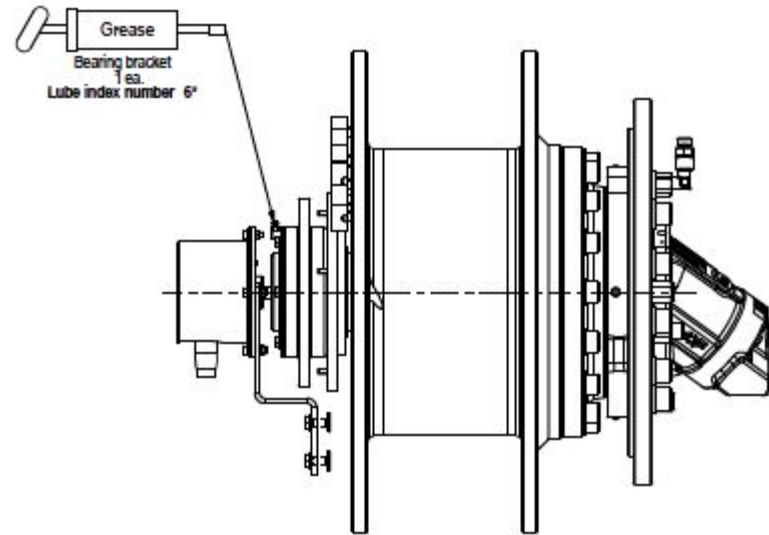
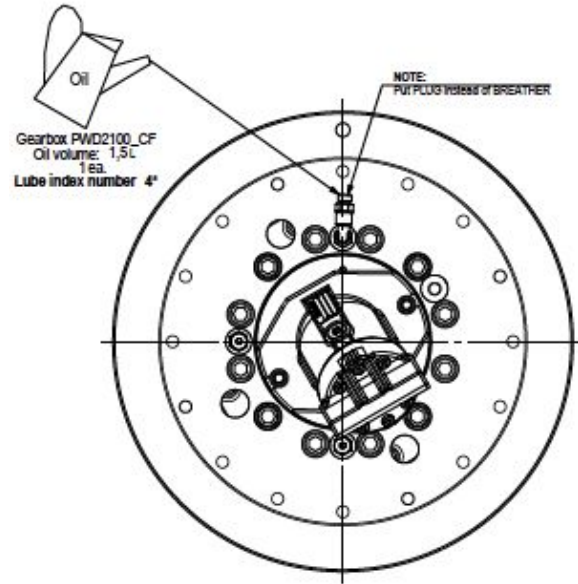
KN-75 Main Crane

NOTE: The bearing race on slewing bearing must be lubricated before use.
See lubrication chart.

[link](#)

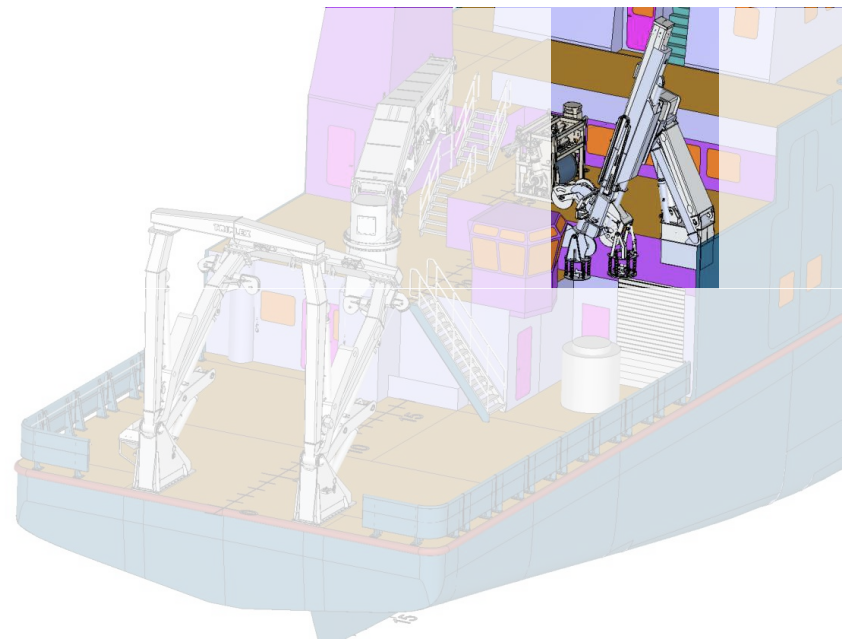
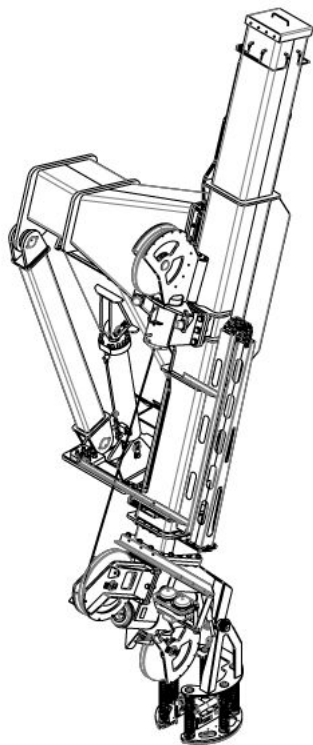


Maintenance & Lubrication Charts - Winch



More information regarding the oil selection at the general Maintenance section ([#6313 RAPP MARINE Lubrication Chart](#))

CTD Davit



3.3 - CTD Davit

3.3.1 - Features

3.3.2 - Technical Data

3.3.3 - Dimensional Sketches

3.3.4 - Controls

3.3.4.1 - Radio Remote Control

3.3.4.2 - Control Station Panel

3.3.4.3 - Manual Control / Valve Center / Emergency Control

3.3.5 - Hydraulic Diagram

3.3.6 - Maintenance & Lubrication Charts



Features

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.

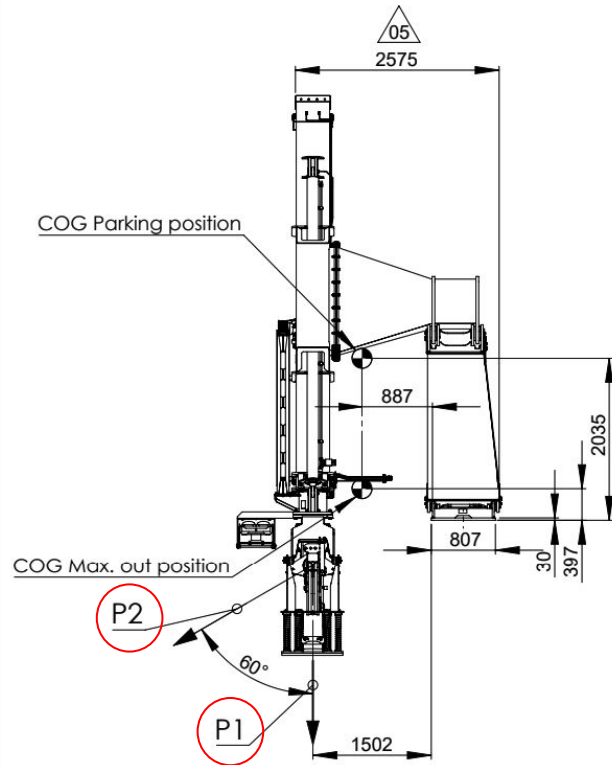
Technical Data

TECHNICAL DATA - CRANE	
P1 - (Cast position)	DLT = 73,5 kN
P2 - (Towing in Cast position)	SWL = 3,2 Tons*
P3 - Luffing load	12 kN
Working pressure at consumer	200 bar
Tilting time	18 s
Telescoping time	40 s
Recommended oil flow	80 l/min
Mass of moving parts (approx.)	7 110 kg
Mass of foundation (approx.)	550 Kg

* Metric Tons

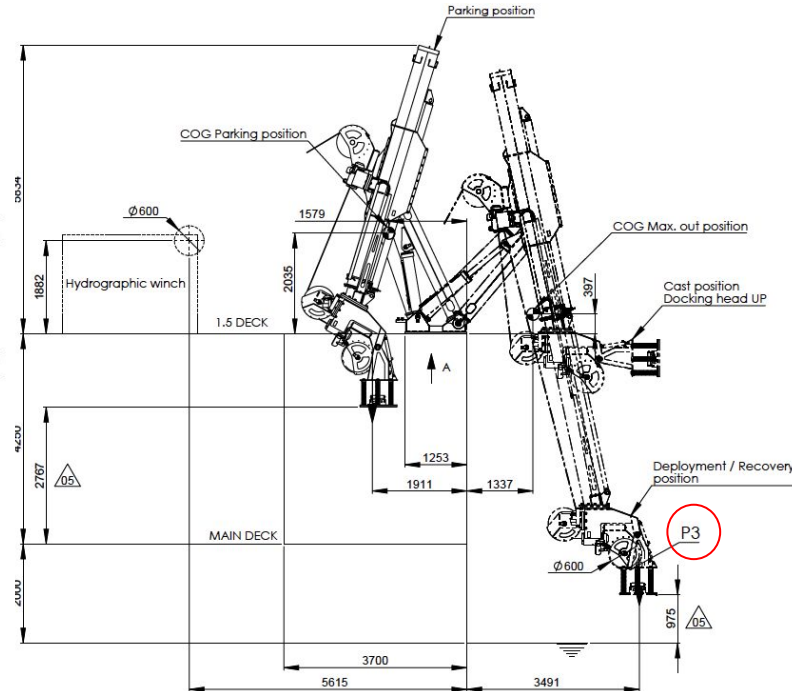
[Information from Dimensional Sketch 20547](#)

Dimensional Sketch



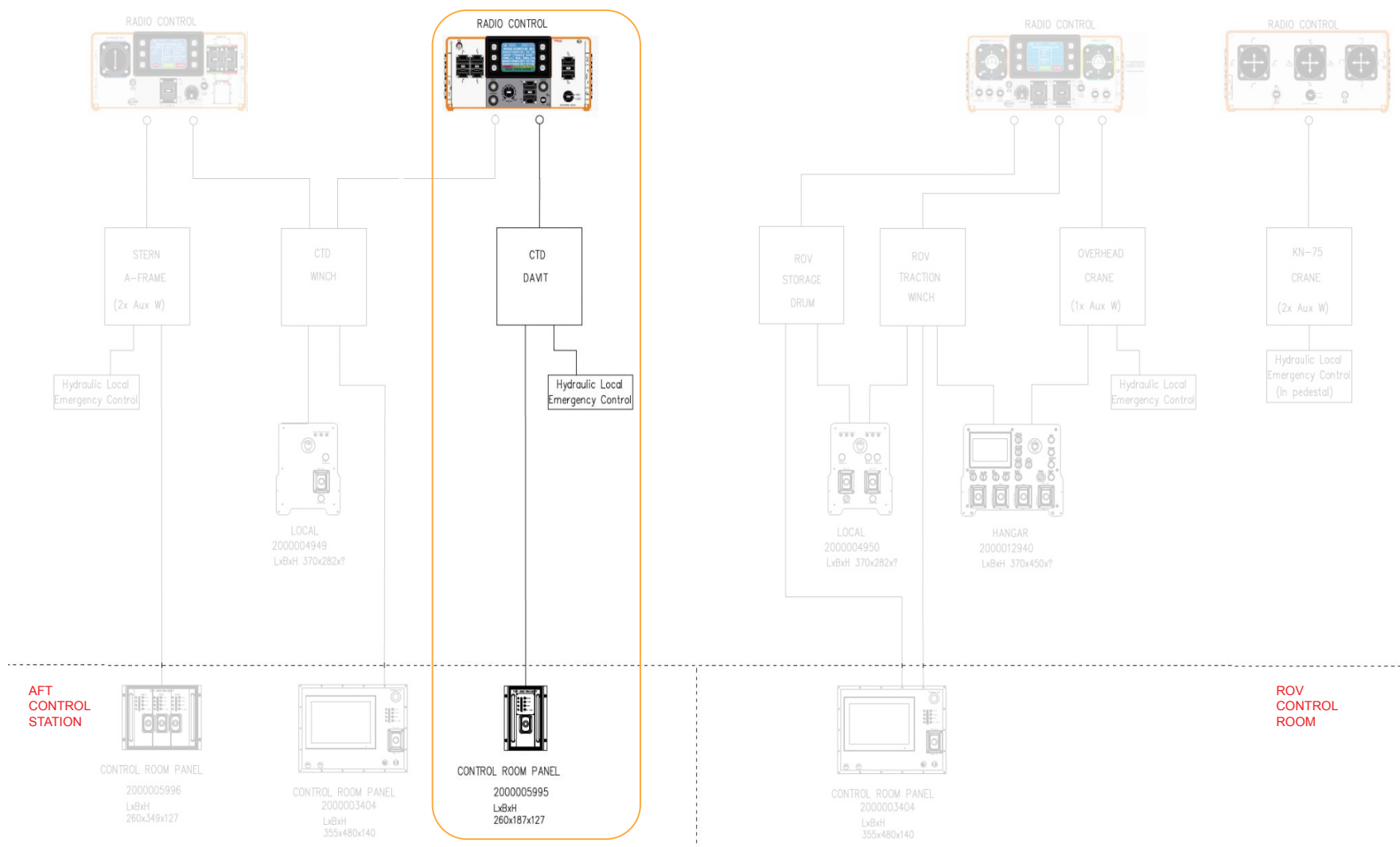
TECHNICAL DATA - CRANE

P1 - (Cast position)	DLT = 73,5 kN
P2 - (Towing in Cast position)	SWL = 3,2 Tons
P3 - Luffing load	12 kN

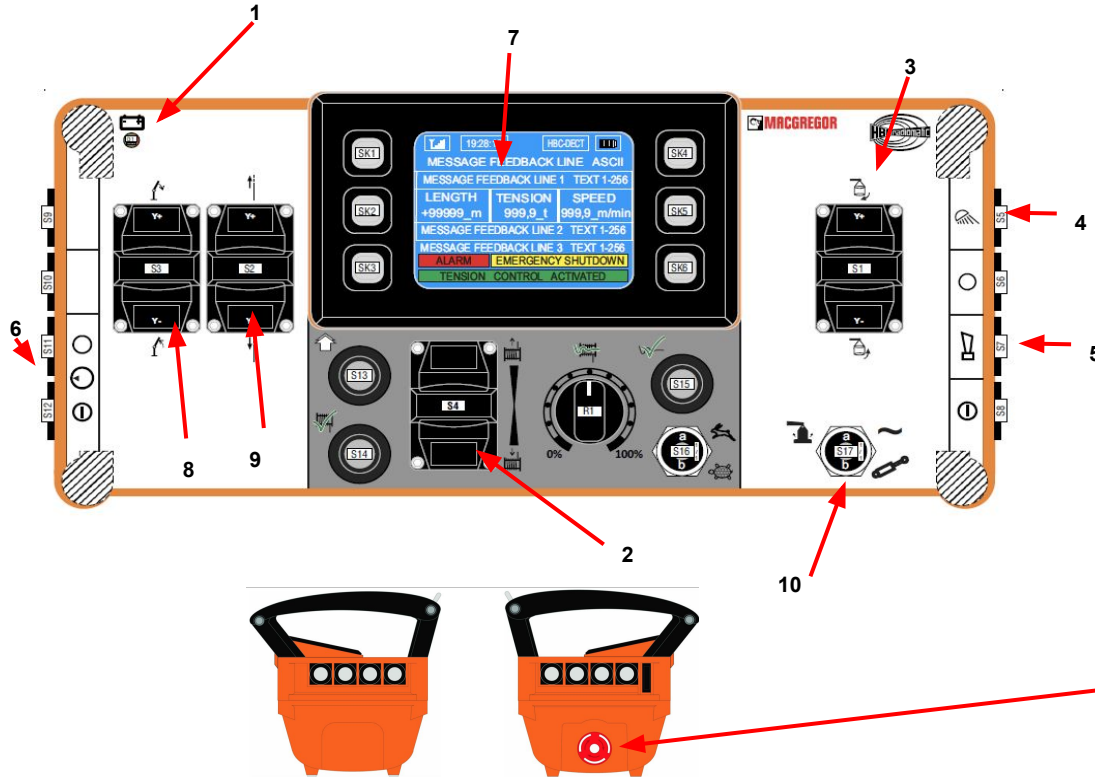


Information from
[Dimensional
 Sketch 20547](#)

Control System - A-FRAME



Controls - Radio Remote Control



POS	DESCRIPTION
1	Battery indicator
2	External winch control (ref: manual for RAPP winch)
3	
4	Lights: on/off
5	Horn
6	Radio control: On/Off
7	Display
8	?
9	?
10	?

Function STOP - prevent the main oil valve to open and stop the communication

NOTE: The remote will turn off when not active for 10 mins.

Controls - Radio Remote Control

Additional information:

- All movement functions of the CTD Davit will take place from this control panel.
- All motions can be controlled at step-less variable speed (infinite variable) from zero to full speed.
- Operating simultaneously different functions is fully possible. Each function will be clearly marked.
- HPU with necessary performance can be started from a starter switch on the radio remote console.

Controls - Control Room Panel

The control panel for CTD Davit control has the following functions:

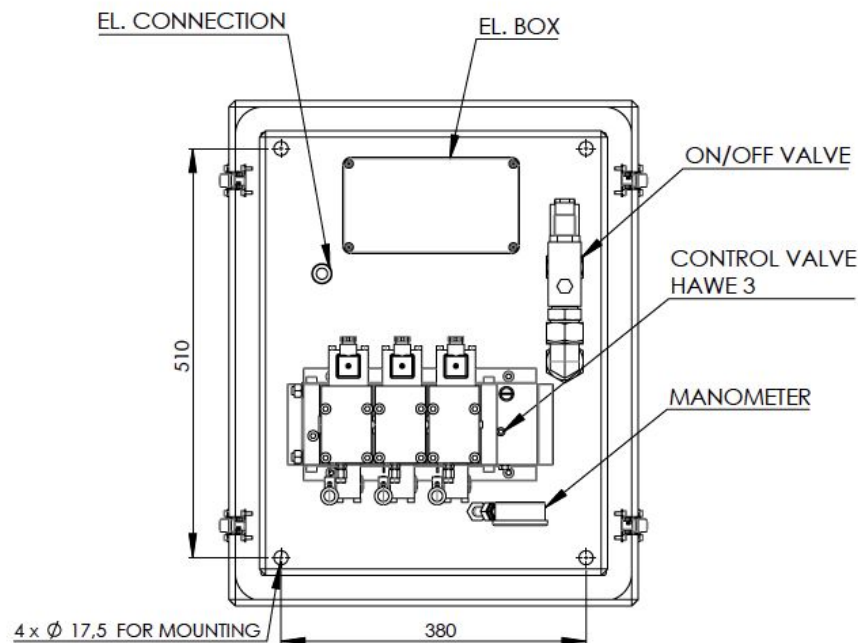
- Tilt function controlled by a two-way joystick



Controls - Manual Control / Valve Central

(Hydraulic Local Emergency Control)

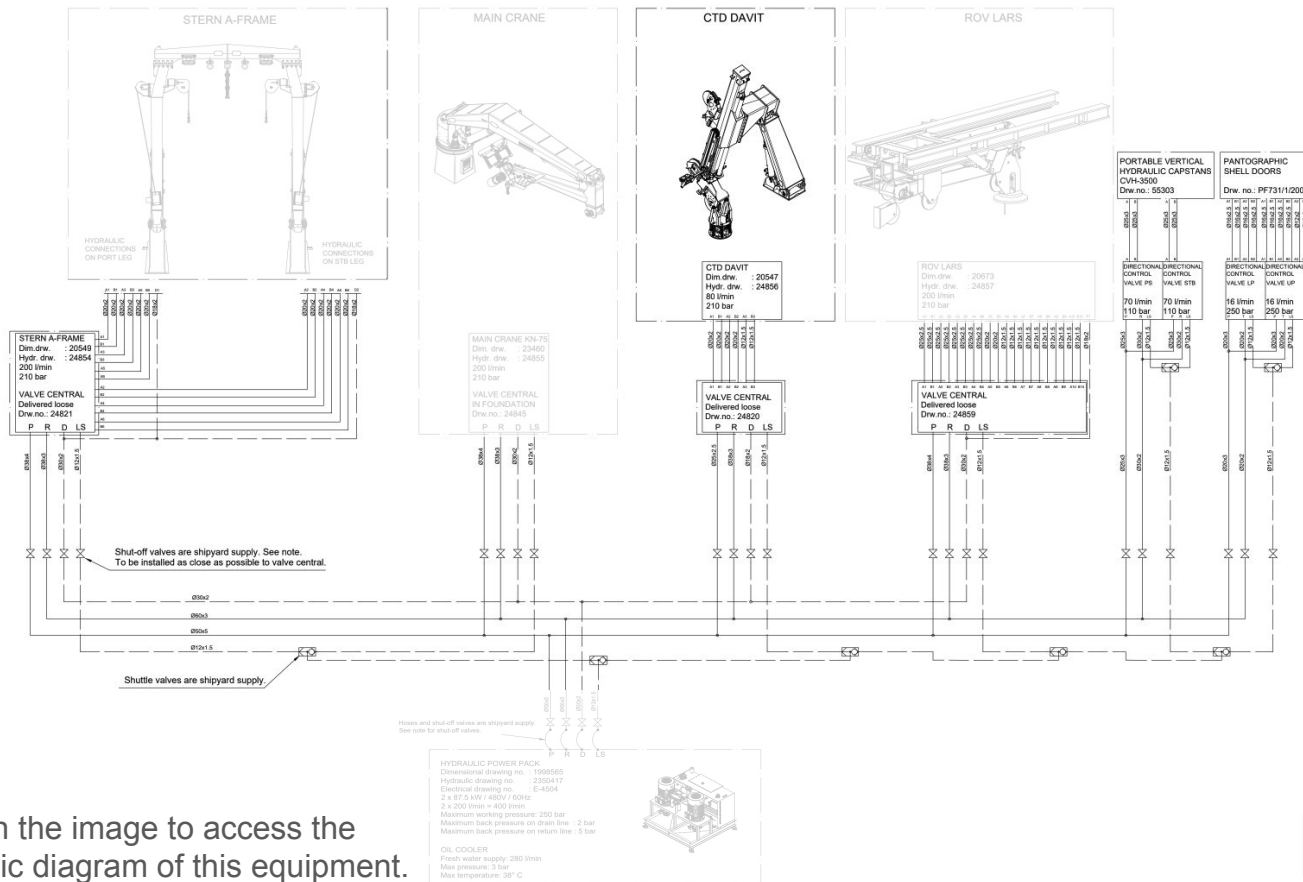
CTD Davit



NOTE: Operated from levers on directional valves mounted in stainless steel cabinet with access through hinged hatch. This control is used for emergency operation. Normal operation is from the radio control panel.

Hydraulic Diagram

CTD Davit



- Note:**
- FLARE FITTINGS acc. to SAE J 514 (ISO 8434-2)
 - Pipe Ø50x5: FLANGE 1 1/2" SAE 8000 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.

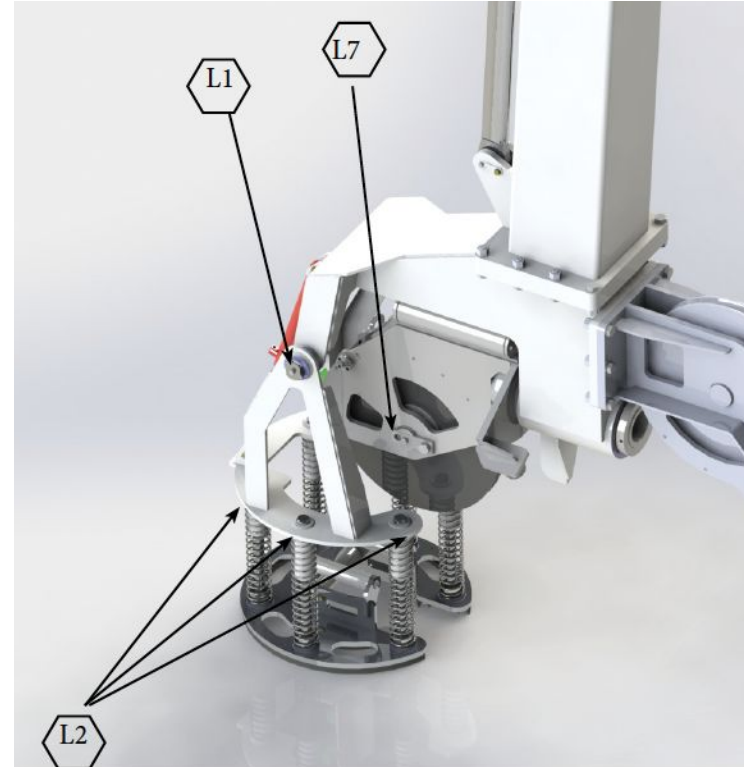
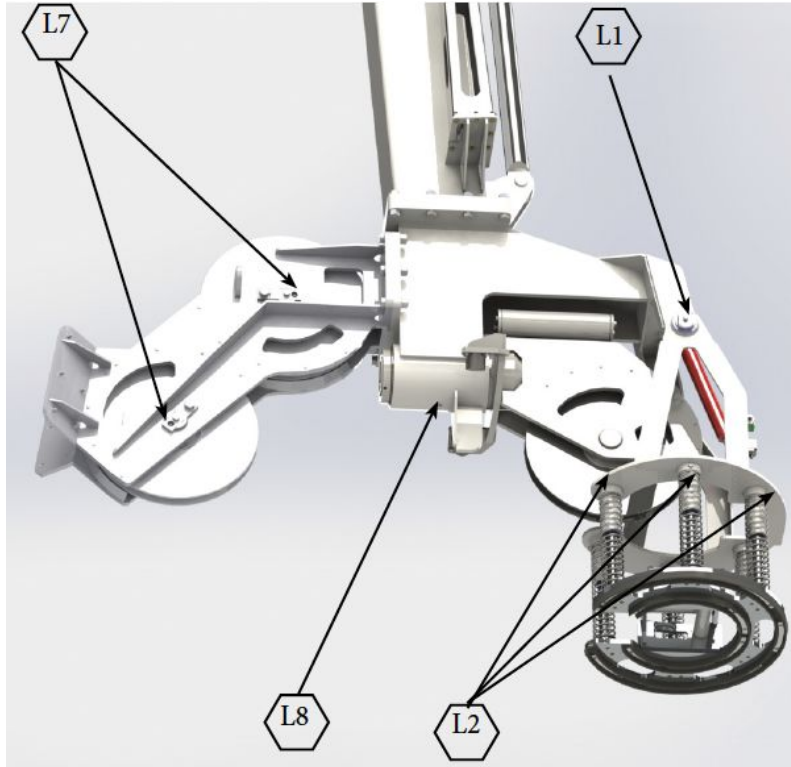
- Pressure testing:**
- Pressure Line 375 bar
 - Return Line 135 bar
 - Drain Line 135 bar
 - LS Line 375 bar

Fluid Cleanliness: ISO Class 17-15-12

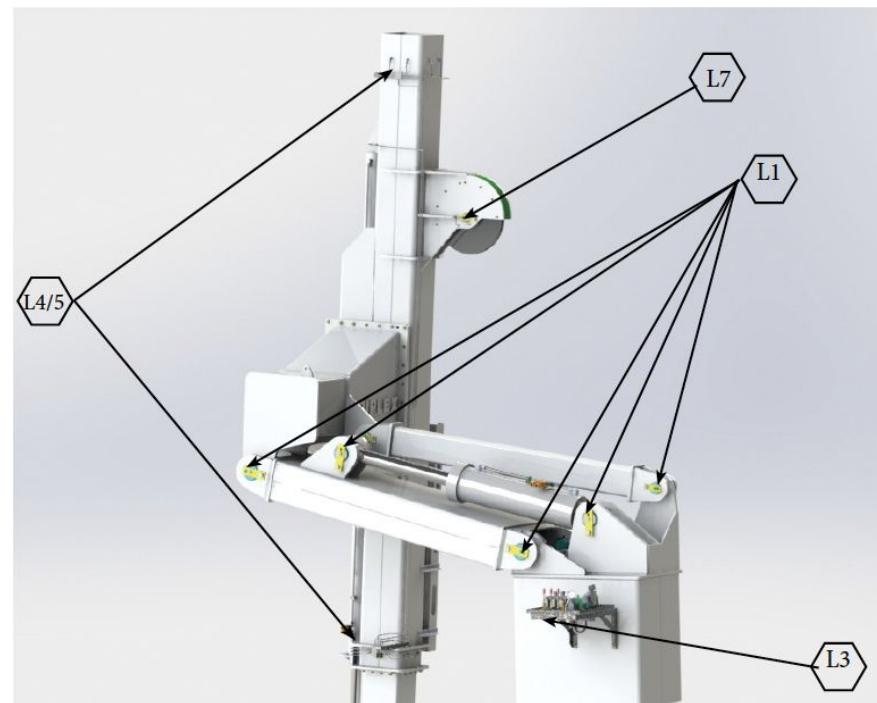
Click on the image to access the hydraulic diagram of this equipment.



Maintenance & Lubrication Charts



Maintenance & Lubrication Charts



Maintenance & Lubrication Charts

CTD Davit

Standard lubricants				
POS	ITEM	OIL QUALITY	VOLUME	SCHEDULE
L1	Bolts	Shell Gadus S2 V220		Monthly lubrication. Daily control
L2	Wire block	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

Maintenance & Lubrication Charts

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)	Mobilvac 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 complex
KLÜBER	TBD	Klüberoil GEM1-68 N Klüberoil GEM1-150 N	Klüberplex AG 11-462 Klüberplex BEM 41-132	Klüberflex AG 11-462

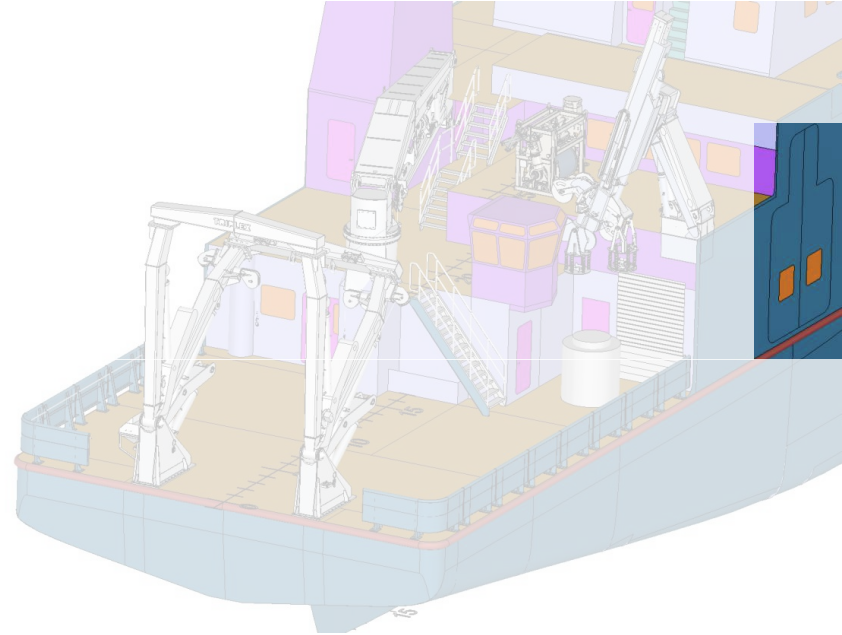
CTD Davit

[Equivalent oils/lubricants from different manufacturers - link](#)



MACGREGOR

ROV OverHead Crane



3.4 - ROV OverHead Crane

3.4.1 - Features

3.4.2 - Technical Data

3.4.3 - Dimensional Sketches

3.4.3.1 - ROV OverHead Crane

3.4.3.2 - Winch

3.4.3.3 - Docking Head

3.4.4 - Controls

3.4.4.1 - Radio Remote Control

3.4.4.2 - Control Station Panel Hangar

3.4.4.3 - Manual Control / Valve Center / Emergency Control

3.4.5 - Hydraulic Diagram

3.4.6 - Maintenance & Lubrication Charts



Features

DESCRIPTION

Complete OHC crane, including docking head

- For installation to the hangar ceiling.

The OHC is designed to launch and recover a ROV, with a dedicated lifting line winch mounted on the crane, routed through the Docking head.

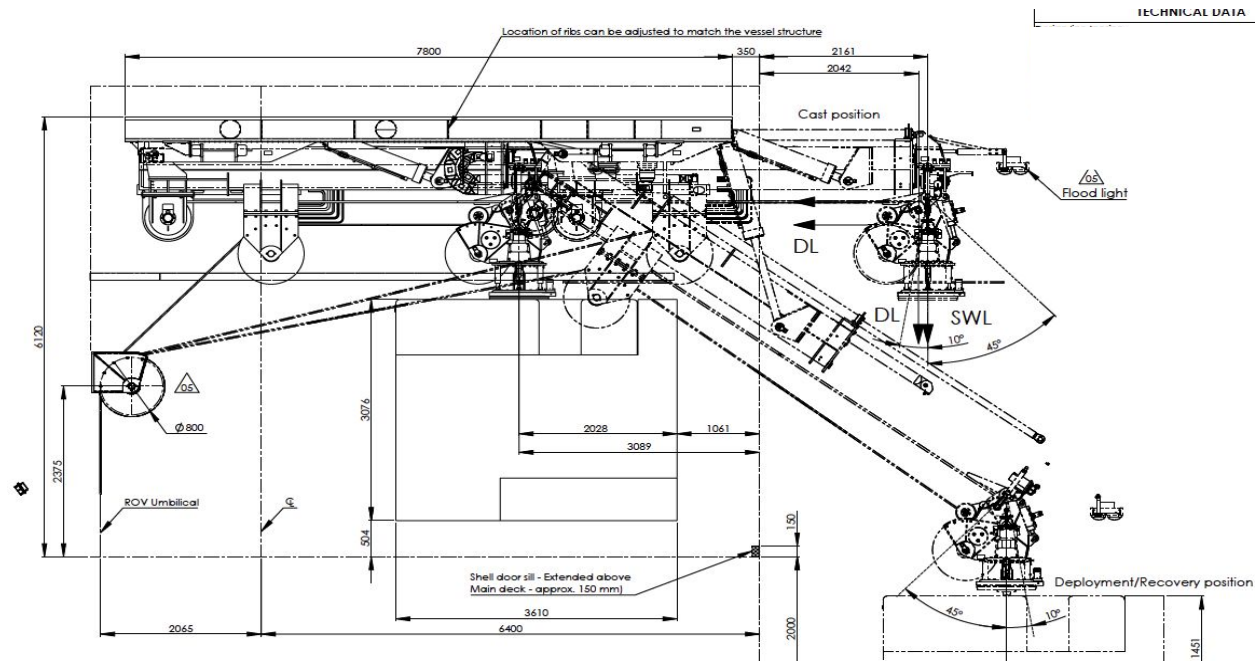
Technical Data

TECHNICAL DATA - OHC	
Design line tension	DL = 200 kN
Luffing 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

[Information from Dimensional Sketch 20673](#)

Dimensional Sketch

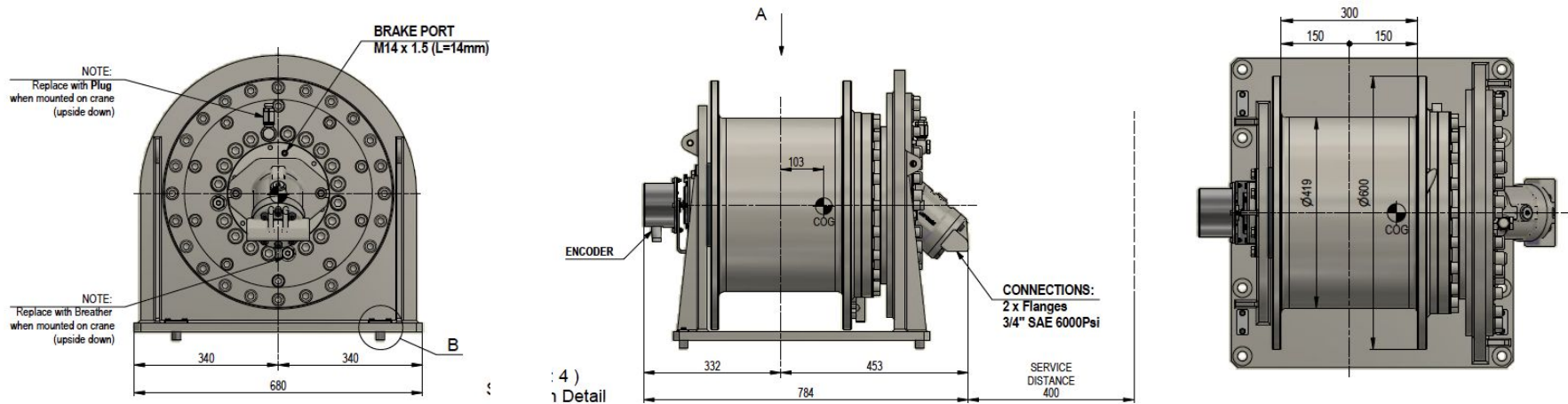
ROV OverHead Crane



[Information from Dimensional Sketch 20673](#)

Dimensional Sketch

ROV OverHead Crane - Winch



[Information from Dimensional Sketch 2000003571](#)

CAUTION: Make sure that not less than 5 windings of rope is left on drum during operation. The use of less rope on the drum can cause damage to the equipment.

Features

DESCRIPTION - Docking Head

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

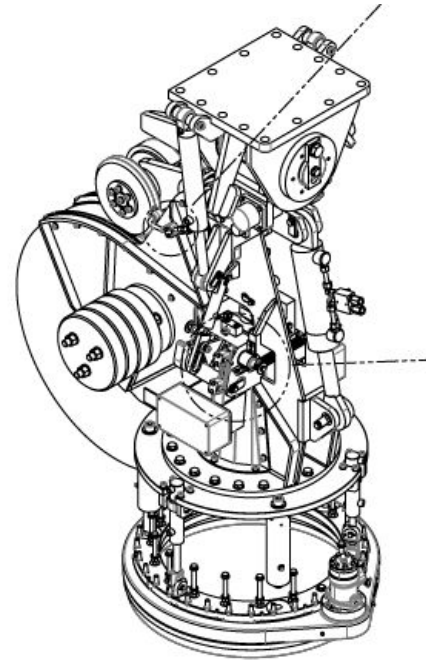
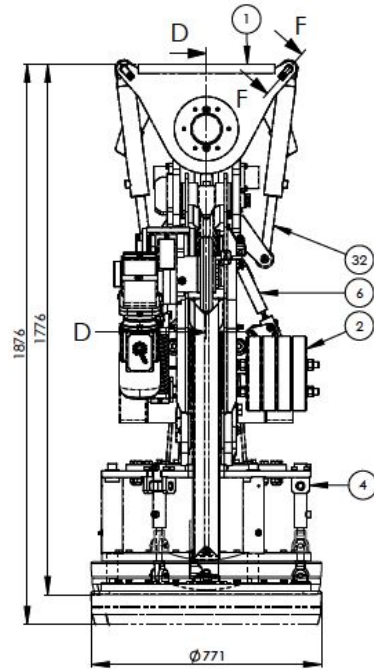
Functions:

- 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.

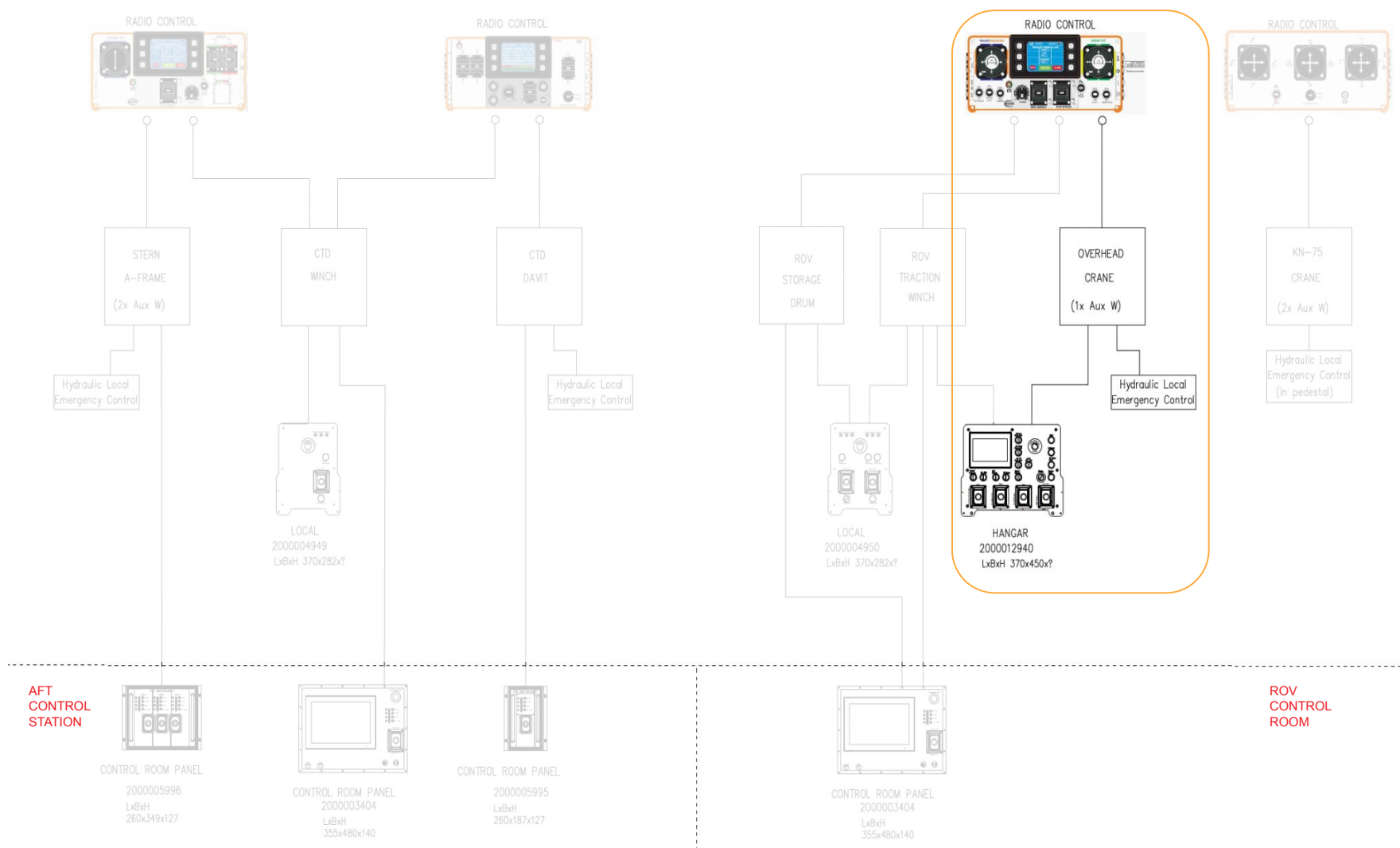
Dimensional Sketch

ROV OverHead Crane - Docking Head



[Information from Dimensional Sketch 25121](#)

Control System - ROV OverHead Crane



Controls - Control Station Panel Hangar

Remote control panel for hangar control room with the following functions:

- All movement functions of the OHC will take place from this control panel
- Emergency switch



Controls - Radio Control

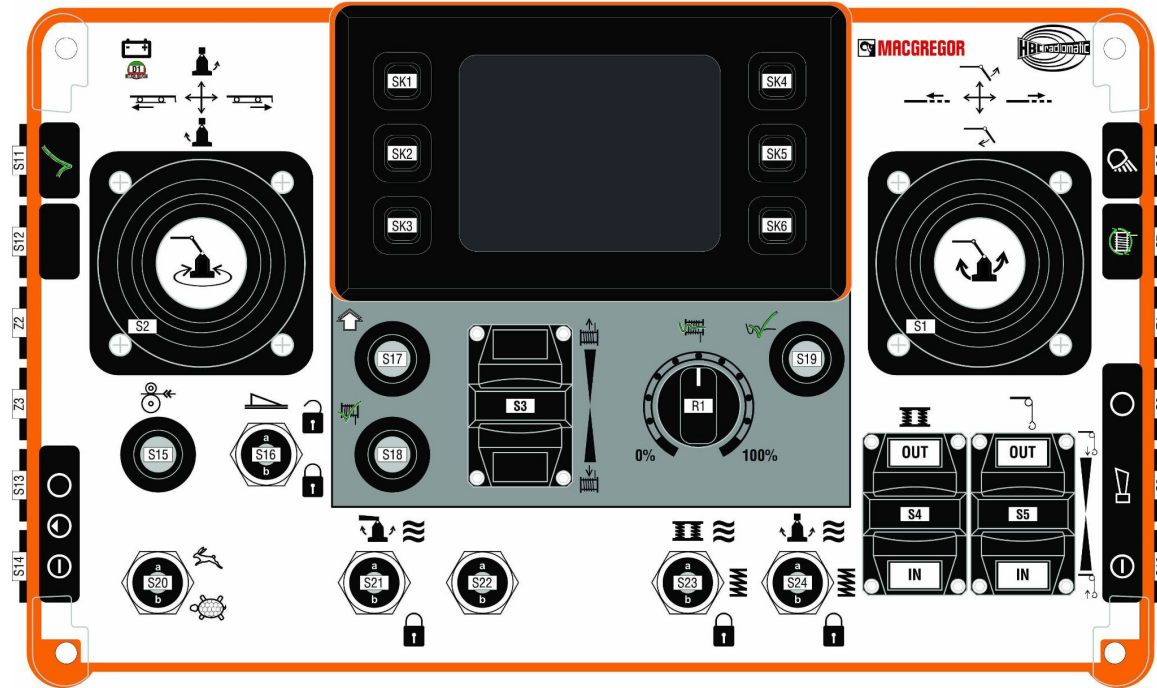
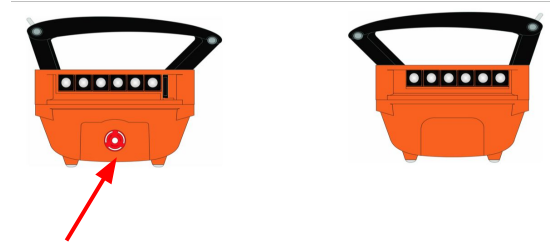


Image from SEOM Section 4 - Pag 255 of 371

NOTE: The remote will turn off when not active for 10 mins.

ROV OverHead Crane



Function STOP - prevent the main oil valve to open and stop the communication

Controls - Radio Control

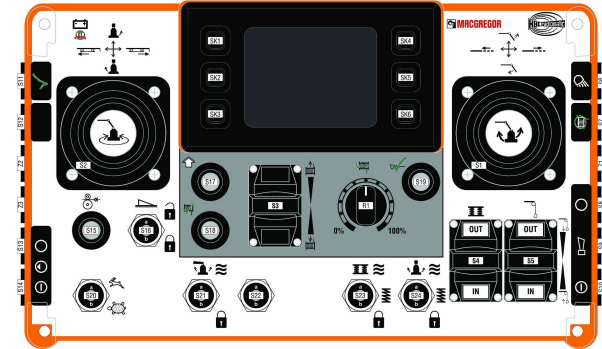
One Stick Launch function

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.



Controls - Radio Remote Control

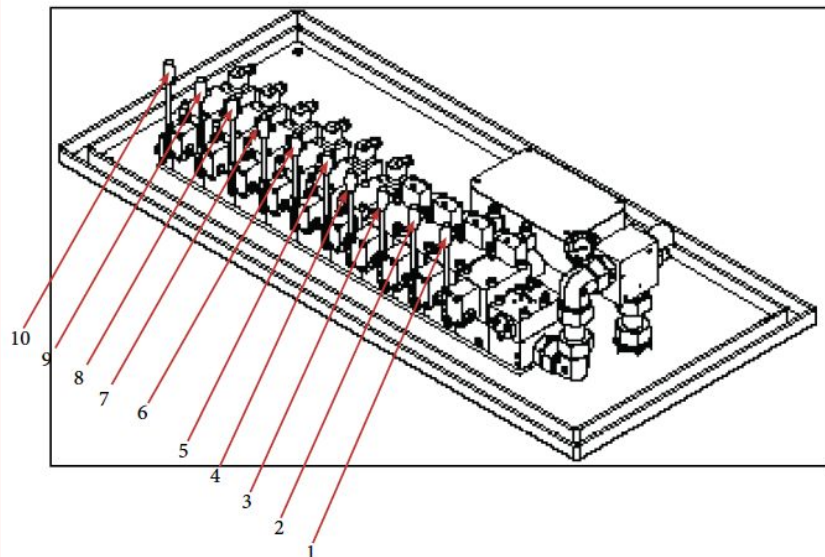
Additional information:

- All movement functions of the OHC will take place from this control panel.
- 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.
- Operating simultaneously different functions is fully possible. Each function will be clearly marked.
- HPU with necessary performance can be started from a starter switch on the radio remote console.

Controls - Manual Control / Valve Central

ROV OverHead Crane

(Hydraulic Local Emergency Control)



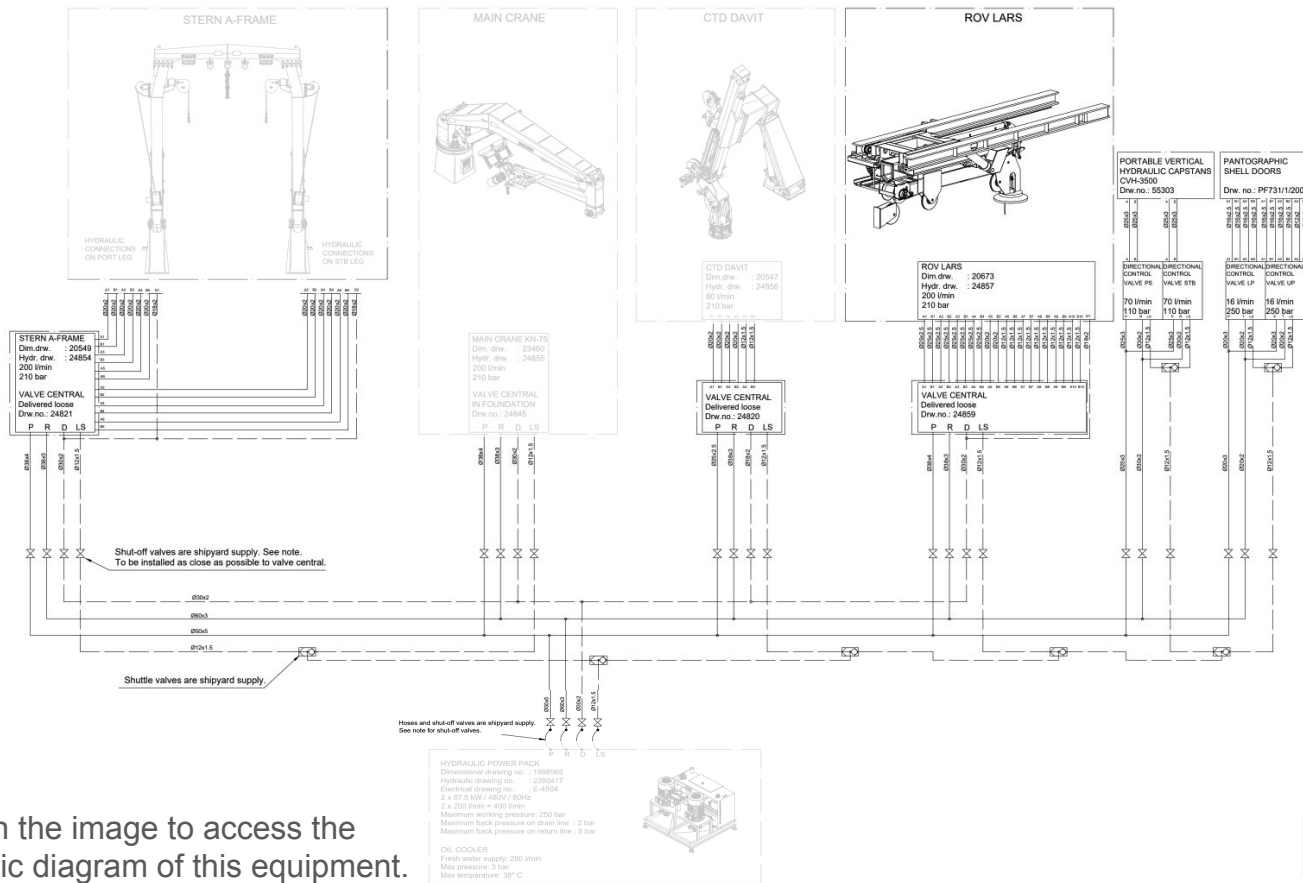
The Valve Central of the ROV OverHead Crane is located in the **Hangar Room**

POS	DESCRIPTION
1	Main boom : A: Cylinder out B: Cylinder in
2	Trolley motor: A: LARS stb: LARS port
3	Telescope boom: A: Cylinder out B: Cylinder in
4	Winch: A: Lower B: Lift
5	Along tilt cylinder: A: Cylinder out B: Cylinder in
6	Latch cylinder: A: Cylinder out B: Cylinder in
7	Docking head twist: A:Counter Clockwise B:Clockwise
8	Out hauler cylinder: A: Cylinder out B: Cylinder in
9	Research sheave across tilt: Aft/*forward
10	Spring plate cylinders: A: Cylinder out B: Cylinder in

NOTE: Operated from levers on directional valves mounted in stainless steel cabinet with access through hinged hatch. This control is used for emergency operation. Normal operation is from the radio control panel.

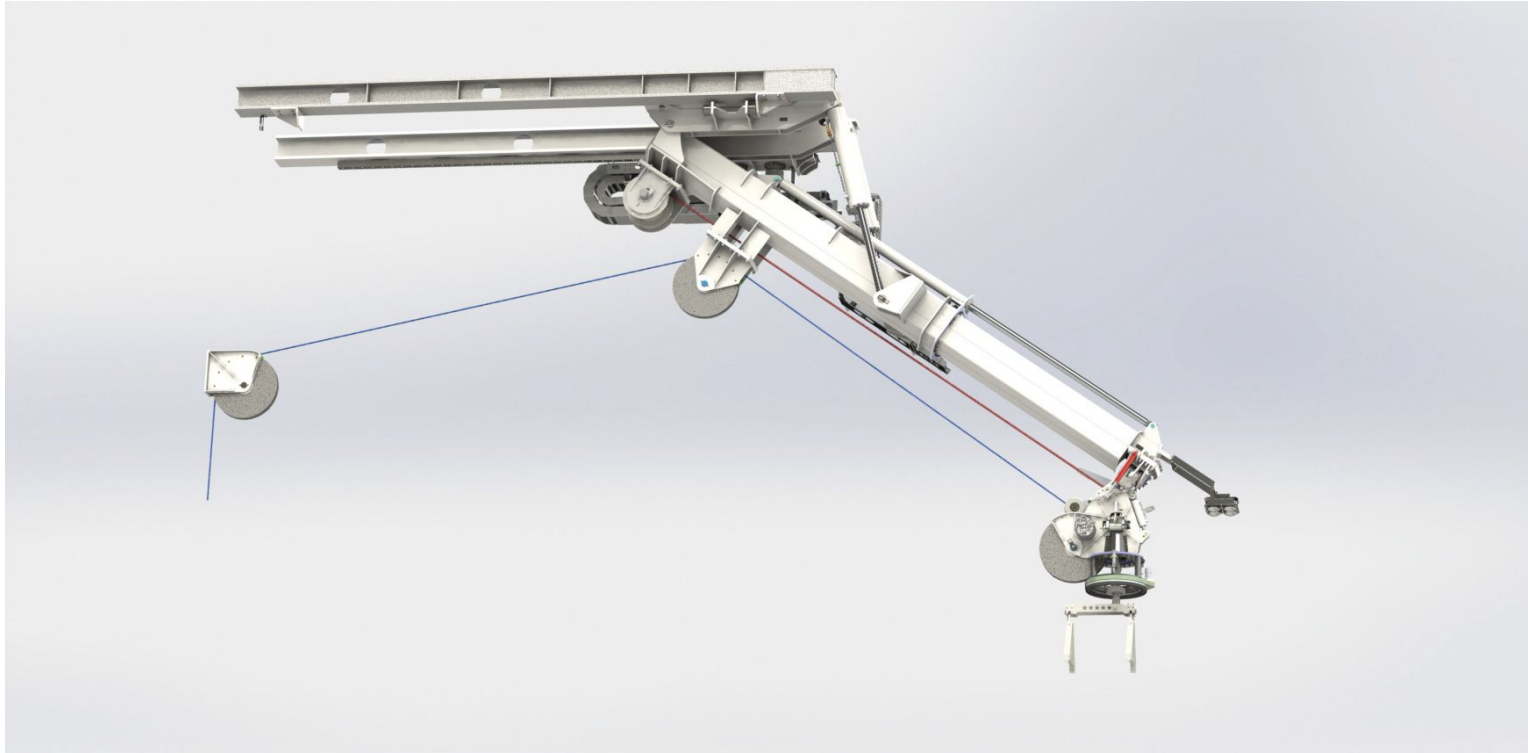
Hydraulic Diagram

ROV OverHead Crane

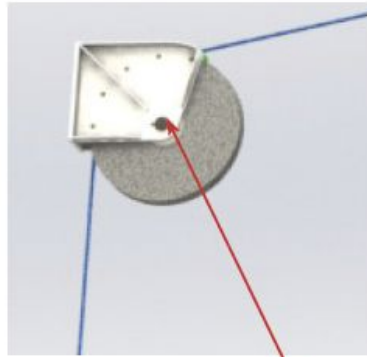


Click on the image to access the hydraulic diagram of this equipment.

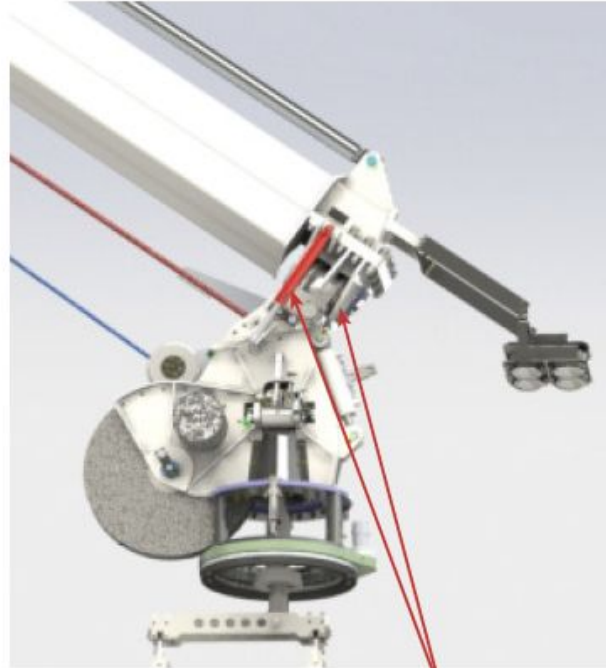
Maintenance & Lubrication Charts



Maintenance & Lubrication Charts

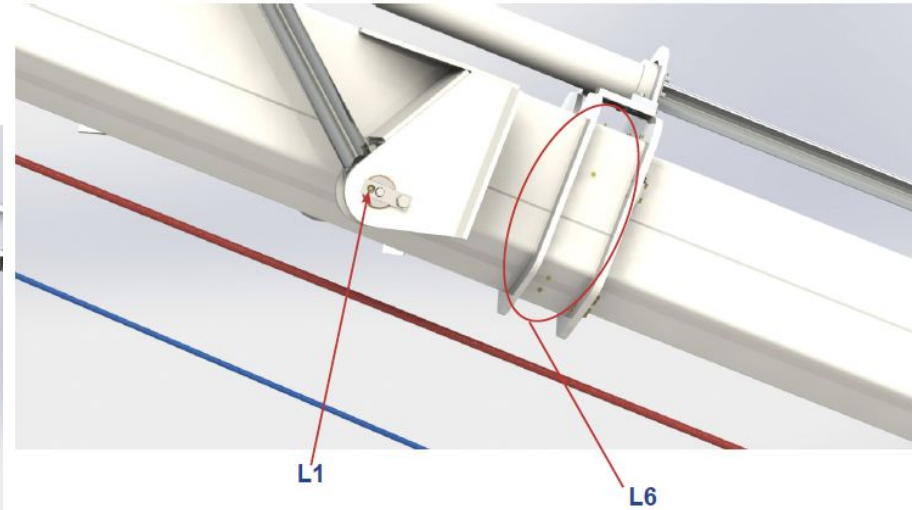
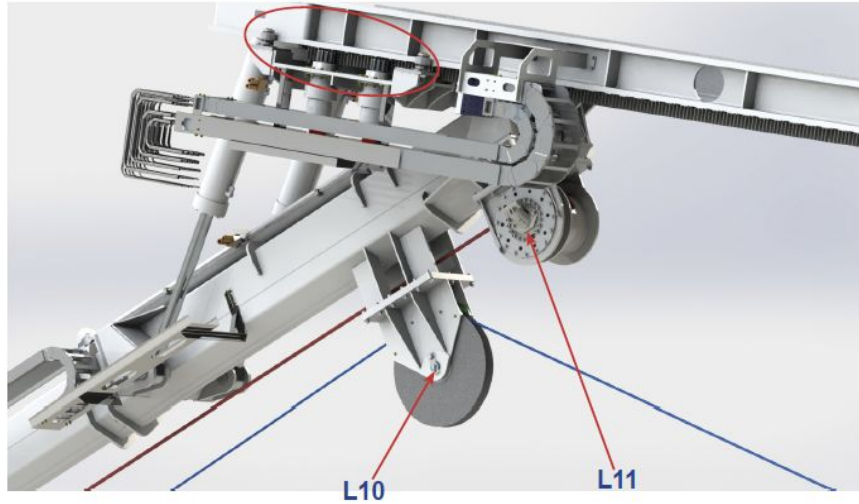


L10

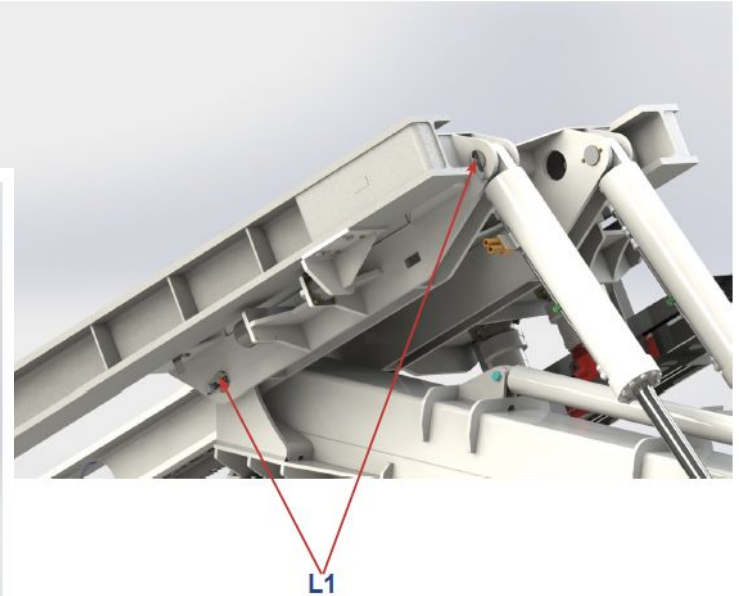
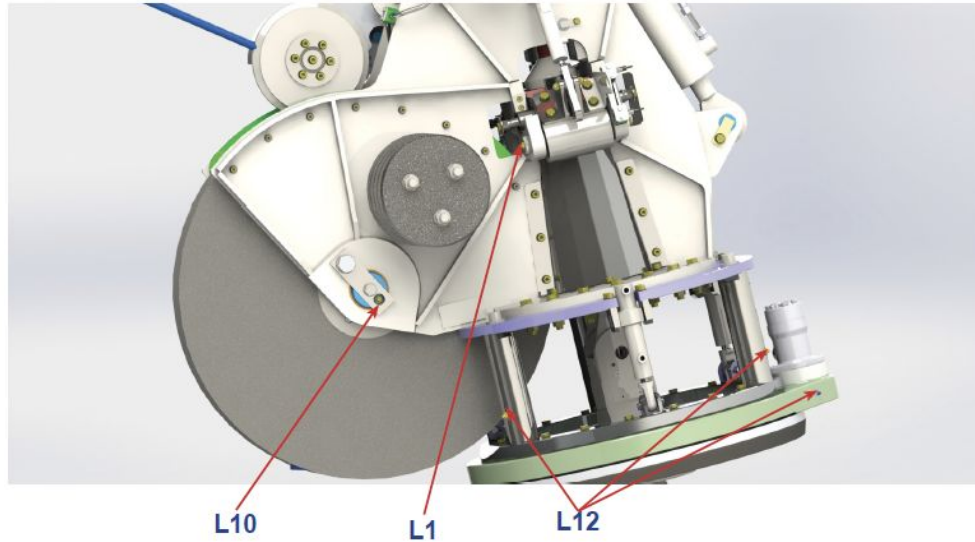


L1

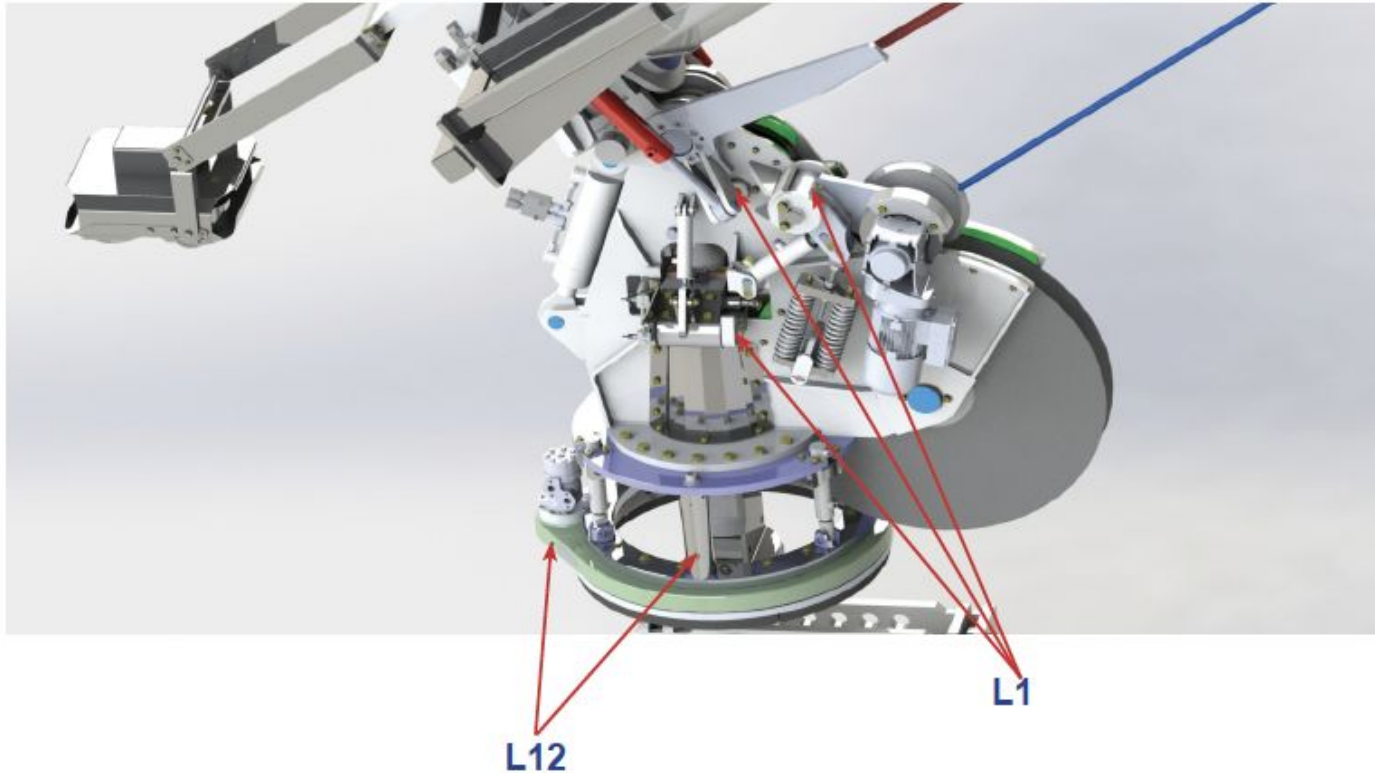
Maintenance & Lubrication Charts



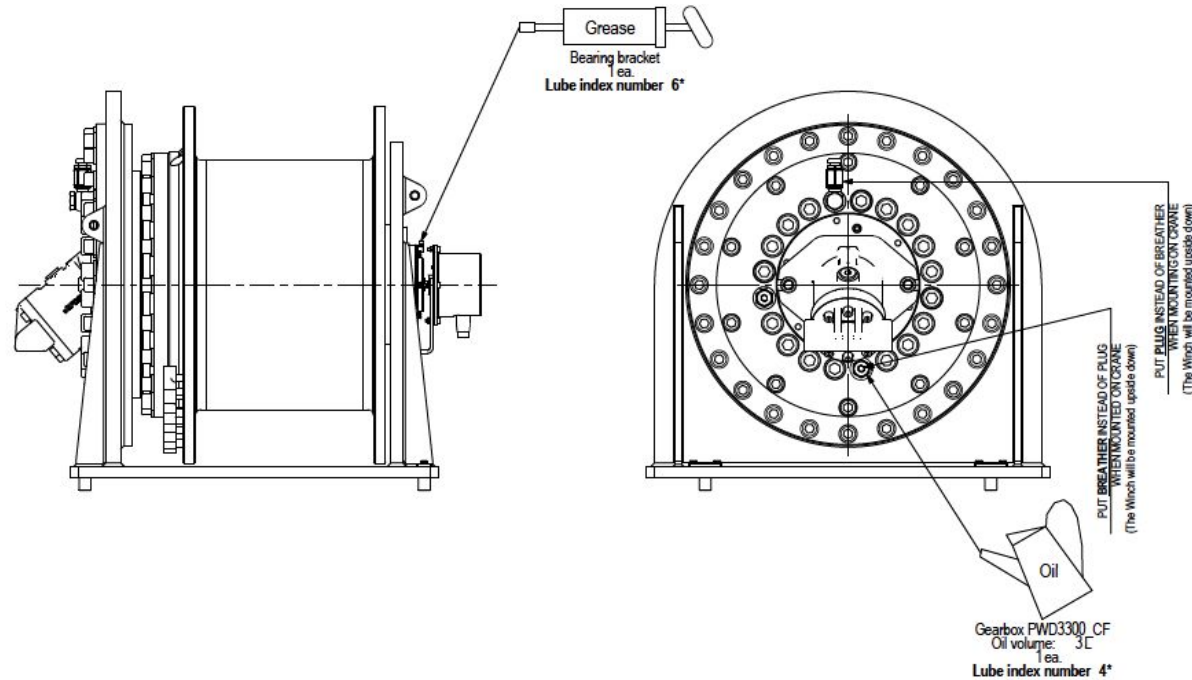
Maintenance & Lubrication Charts



Maintenance & Lubrication Charts



Maintenance & Lubrication Charts



[Information from Lubrication Chart 2000011851](#)

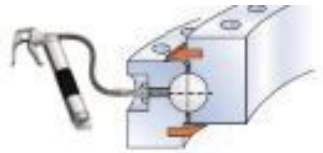
Maintenance & Lubrication Charts

POS	ITEM	OIL QUALITY	VOLUME	SCHEDULE
L1	Bolts	Shell Gadus S2 V220		Monthly lubrication. Daily control
L2	Hydraulic system	Recommended 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	2,6L	See: "RE-gearbox maintenance"
L4	Break	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 after 600 hours of use
L12	Docking head	Shell Gadus S2 V220		Monthly lubrication. Daily control

Maintenance & Lubrication Charts



NOTE: 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.



NOTE: Press grease into all grease nipples connected to the slewing ring while revolving the slewing ring, until a continuous grease collar forms under both of the seals.

Maintenance & Lubrication Charts

Lubricant specifications

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

Maintenance & Lubrication Charts

Lubricant specifications

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

Maintenance & Lubrication Charts

Lubricant specifications

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 @120°C R2F B				Pass
Water Washout		ASTM D1264		5%
Colour				Red
Temperature Range (temporarily)	°C			-25/+110 (120)

Maintenance & Lubrication Charts

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 complex
KLÜBER	TBD	Klüberoil GEM1-68 N Klüberoil GEM1-150 N	Klüberplex AG 11-462 Klüberplex BEM 41-132	Klüberflex AG 11-462

ROV OverHead Crane

[Equivalent oils/lubricants from different manufacturers - link](#)

Handling HPU



3.5 - Handling HPU

3.5.1 - Features

3.5.2 - Technical Data

3.5.3 - Dimensional Sketch

3.5.4 - Maintenance & Lubrication Charts



Features

Handling 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

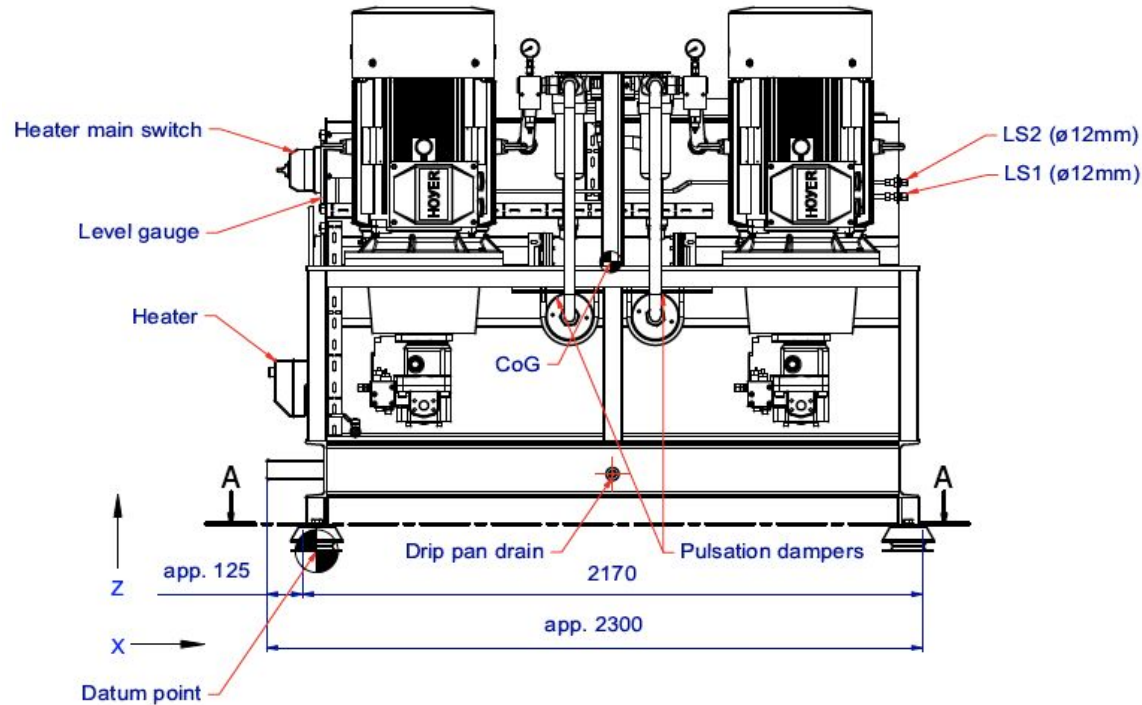
NOTE: The HPU will stop after 20 mins if there is no active consumers.

Technical Data

Connection Table						
Connection	Service	Dimension	Facing	Position (X)	Position (Y)	Position (Z)
P	Supply	2" SAE 6000 psi	Z	1035	755	1660
R	Return	2" SAE 3000 psi	-X	850	1075	1555
D	Drain	28L	Y	235	1520	1540
LS1	Load Sense	12S	X	2065	1175	1290
LS2	Load Sense	12S	X	2065	1175	1290
W1	Water IN	1 ½" BSPP	X	1305	1075	1030
W2	Water OUT	1 ½" BSPP	-X	765	1075	1030

NOTE: The HPU will stop after 20 mins if there is no active consumers.

Dimensional Sketch

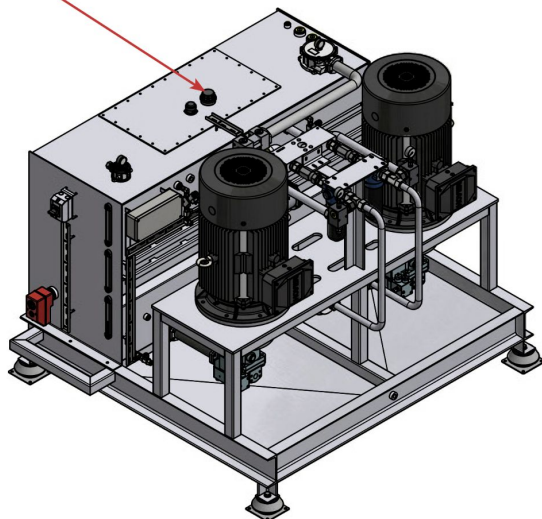


[Information from Dimensional Sketch 1998565](#)

Maintenance & Lubrication Charts

Oil for Hydraulic system

L2



POS	ITEM	OIL QUALITY	SCHEDULE
L2	Hydraulic system	Recommended 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

Maintenance & Lubrication Charts

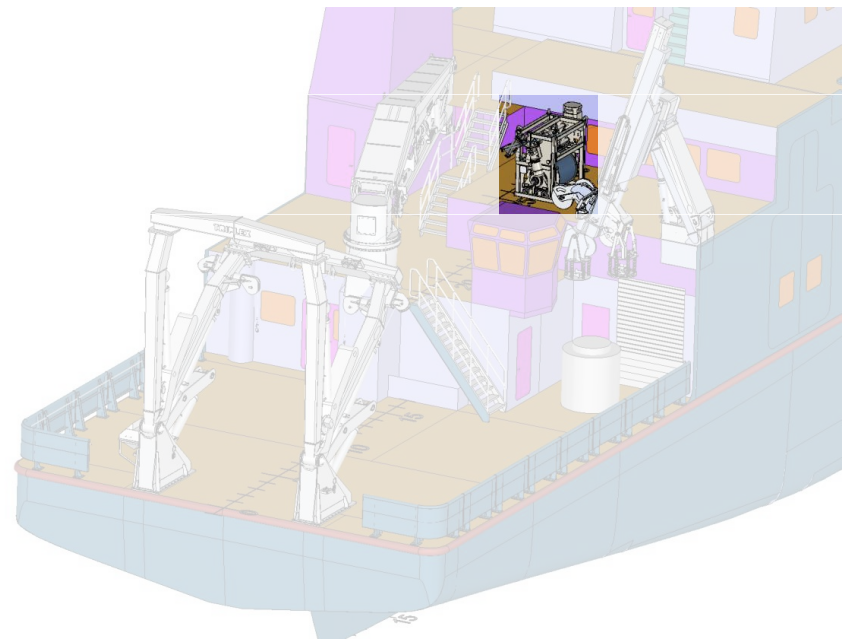
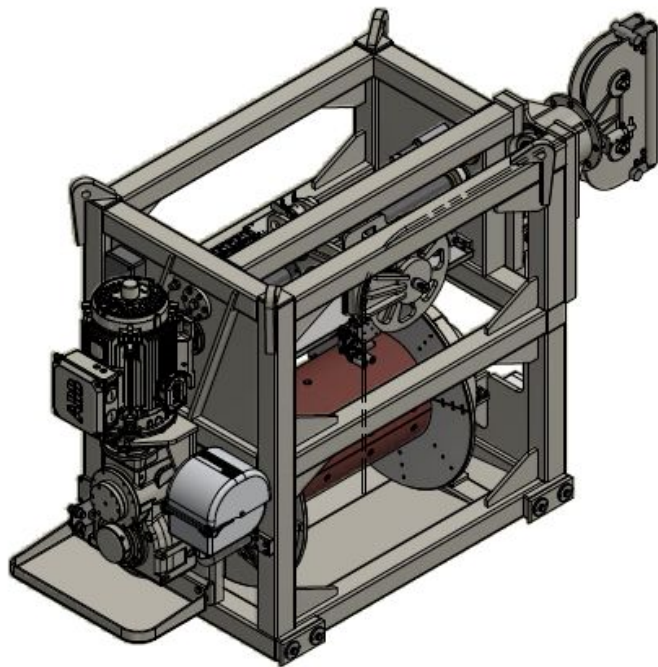
Inspection and Maintenance

The first time the system is operated it must be monitored constantly. Inspection and maintenance should be carried out in accordance with a maintenance plan determined by the type and conditions of operation.

The goal of regular inspection and maintenance is to maximize the operational security and ensure stable operation.

For more information see the inspection and maintenance document for HPU - [link](#)

CTD Winch



3.6 - CTD Winch

3.6.1 - Technical Data

3.6.2 - Dimensional Sketch

3.6.3 - Controls

3.6.3.1 - Local Panel

3.6.3.2 - Control Room Panel

3.6.4 - Hydraulic Diagram

3.6.5 - Maintenance & Lubrication Charts



Technical Data

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 982 mm

Single 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

Technical Data - Performance

CTD Winch

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

Technical Data - Performance

Performance and Pull diagram

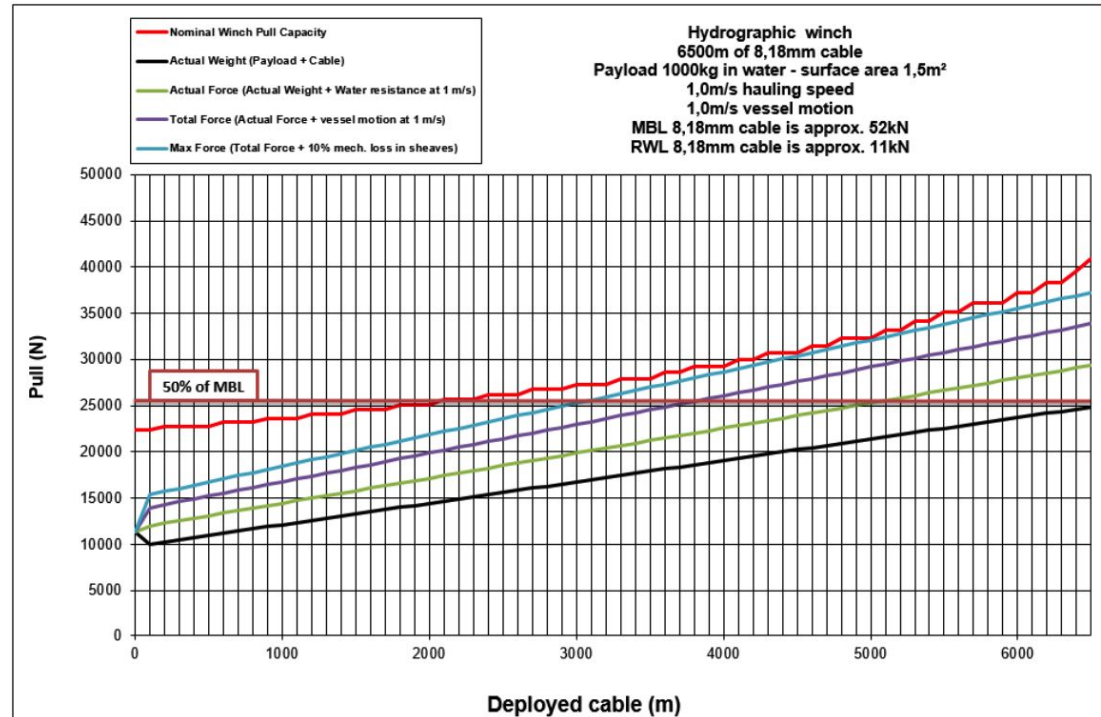


Diagram showing load case with deployed 6500m of cable at nominal load.

**MAGREGOR**

Technical Data - Performance

Active Heave Compensation capabilities

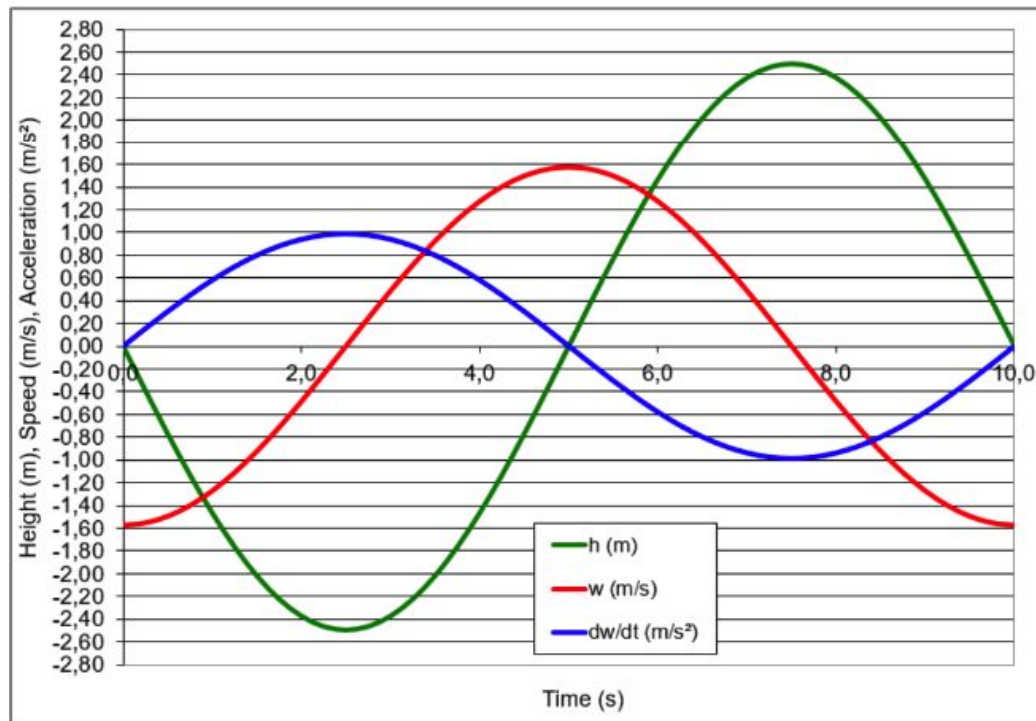
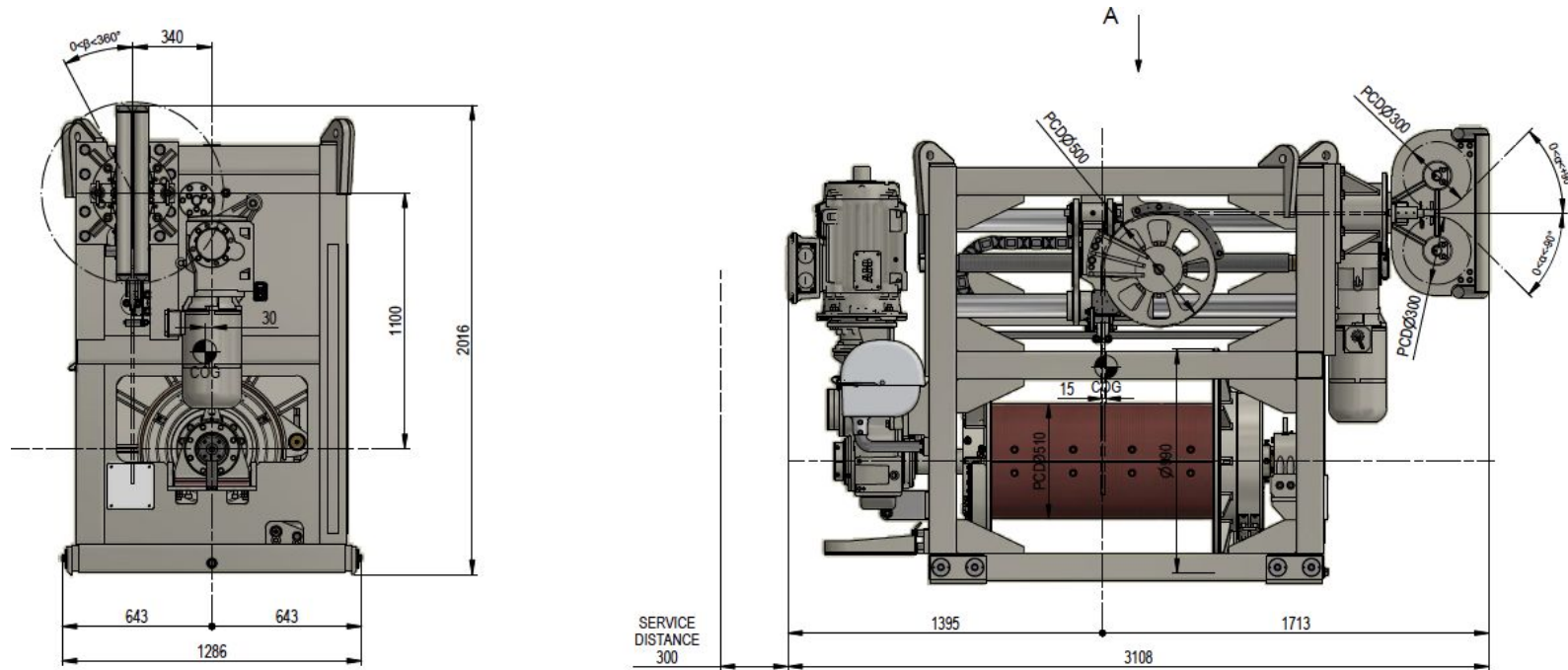


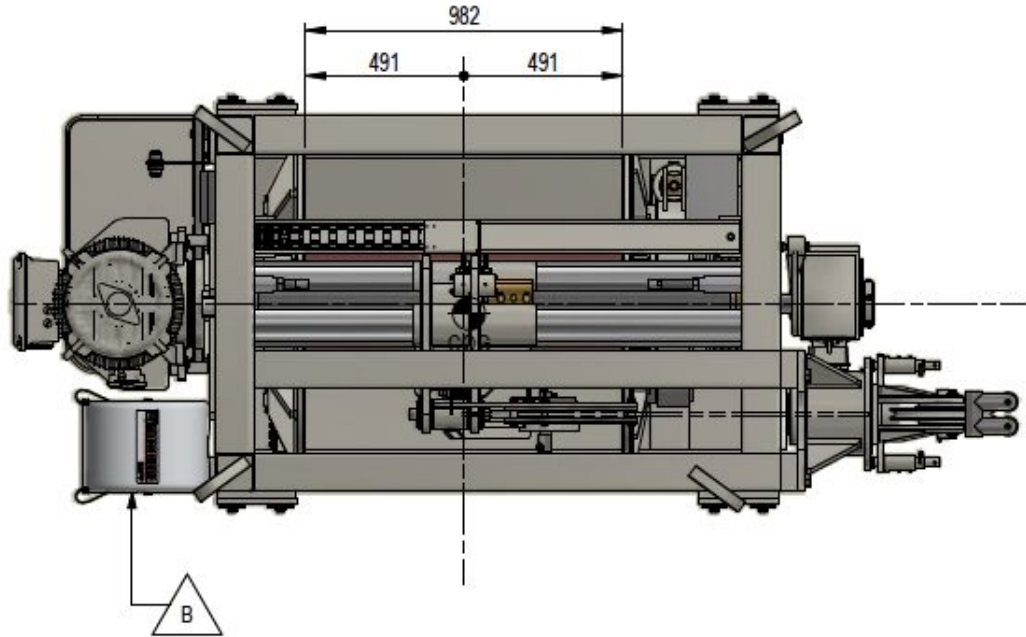
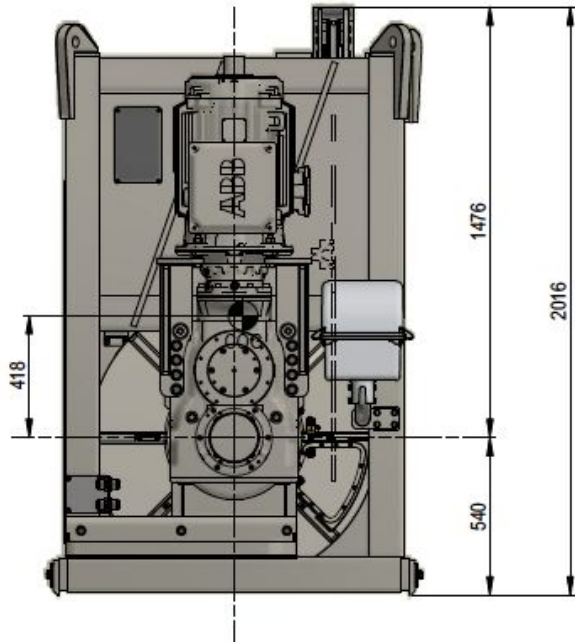
Diagram for definition of required acceleration (dw/dt) and speed (m/s) based on pure Wave height H_{s5} and period 10s. Vessel movement must be calculated by ship designer to verify that acceleration and speed at position of overboard sheave does not exceed these values. If so, power requirement of winch has to be recalculated and corrected.

Dimensional Sketch



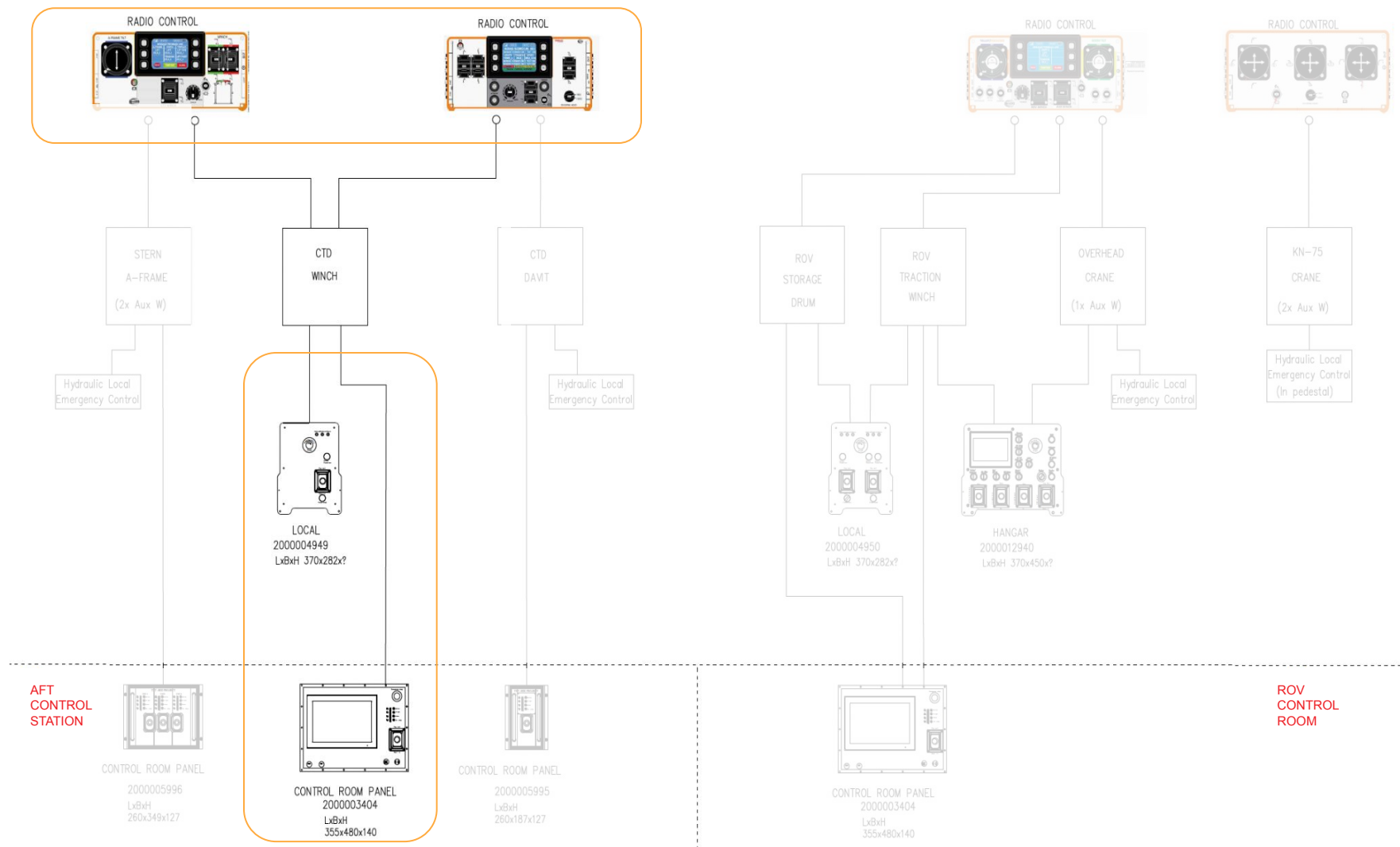
[Information from Dimensional Sketch 2000004676](#)

Dimensional Sketch

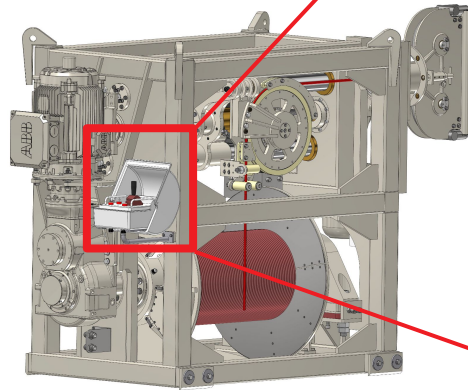


[Information from Dimensional Sketch 2000004676](#)

Control System - CTD Winch



Controls - Local Panel



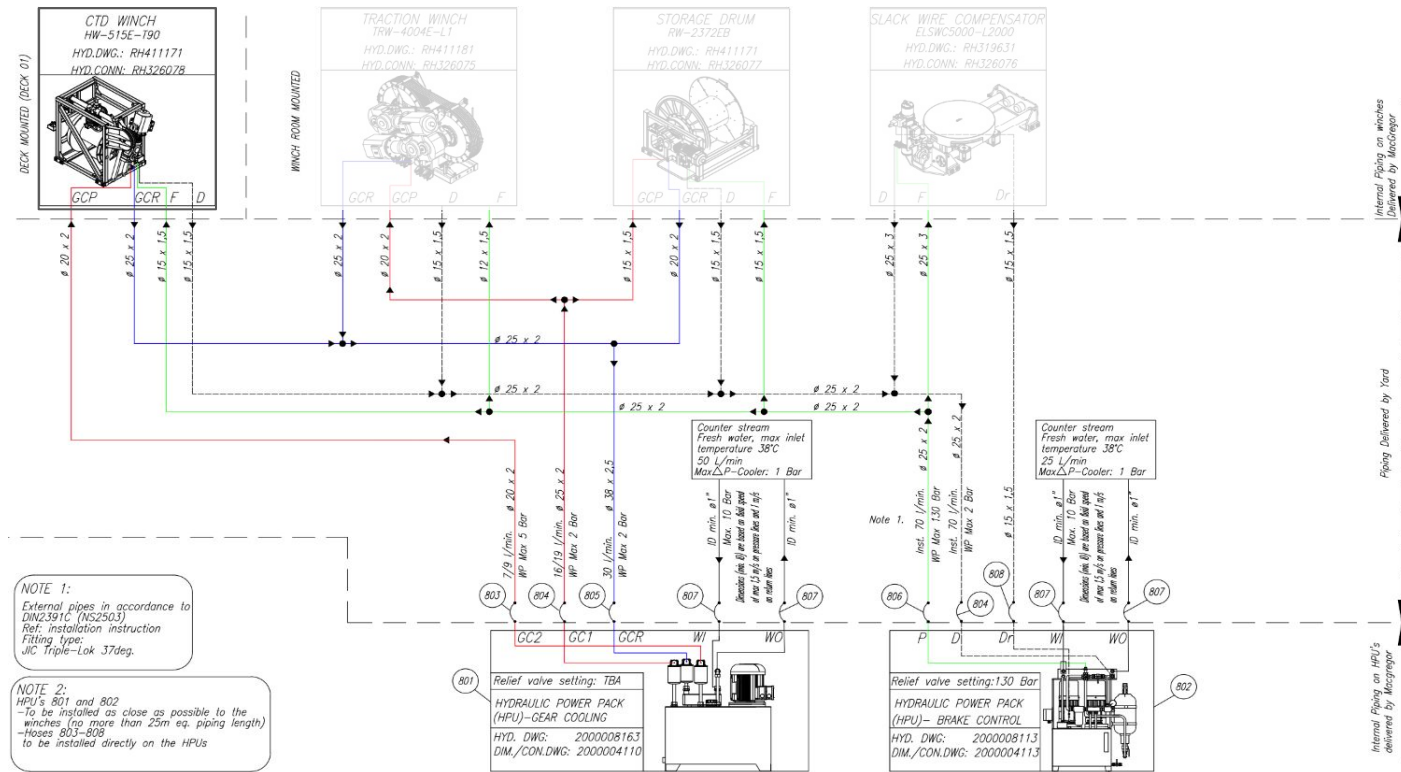
Controls - Control Room Panel



For Operational use of the Control Room Panel see the *Pentagon 7 Seas - Operator's Manual (Research version)*

Hydraulic System Winches

CTD Winch



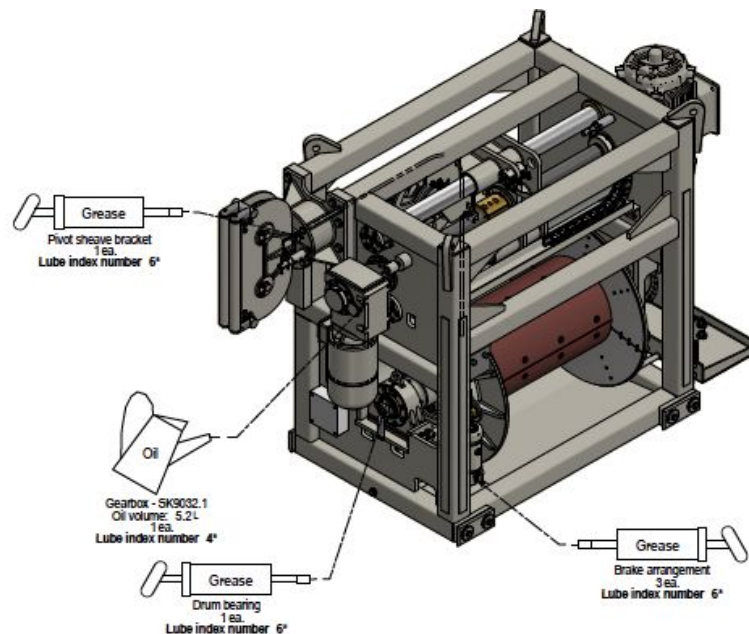
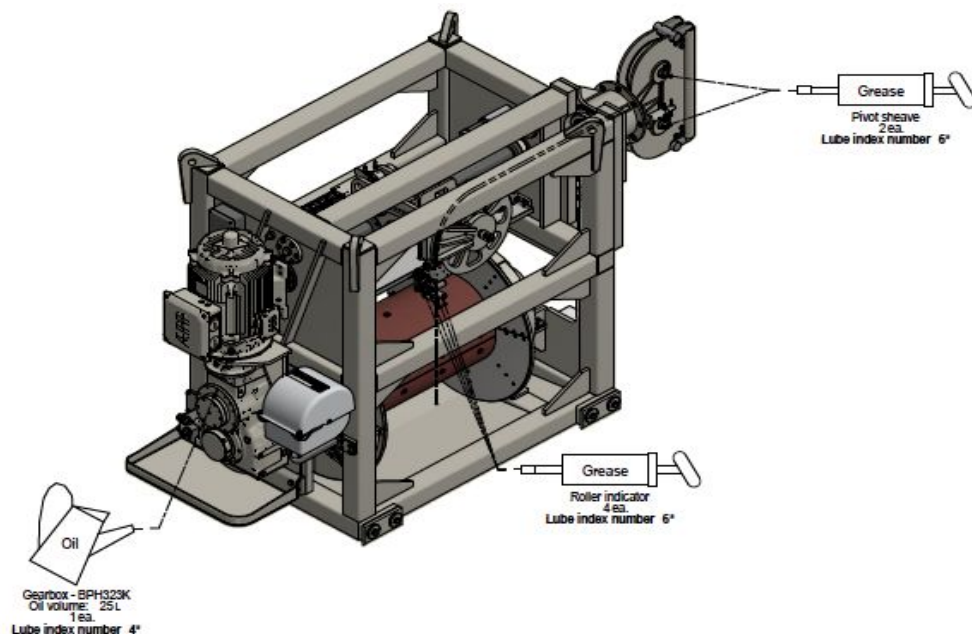
Designed by H. Johnsen	Modified by	Date 21-Dec-21	ECO	Name ECO-2056554
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Description MBARI 4/10070 HYDRAULIC SYSTEM BRAKE & GEAR COOL. (Old no. RH30398)				
Document ID 2000004171				
Revision A				
Weight % kg Scale (X3)				



Click on the image to access the hydraulic diagram of this equipment.

Maintenance & Lubrication Charts

CTD Winch

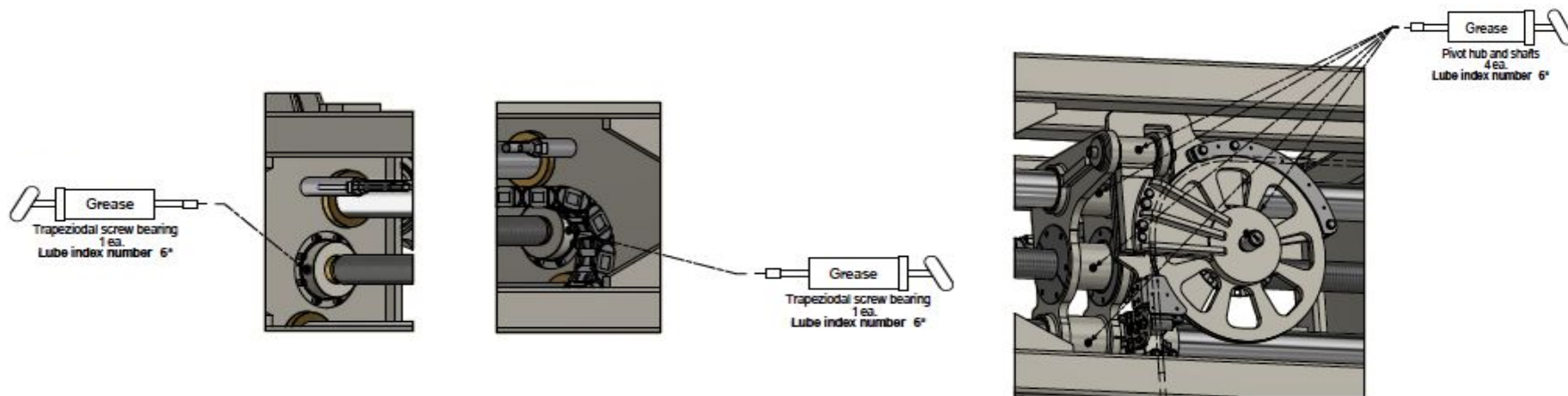


[Information from Lubrication Plan 2000005634](#)

More information regarding the oil selection at the general Maintenance section
([#6313 RAPP MARINE Lubrication Chart](#))

Maintenance & Lubrication Charts

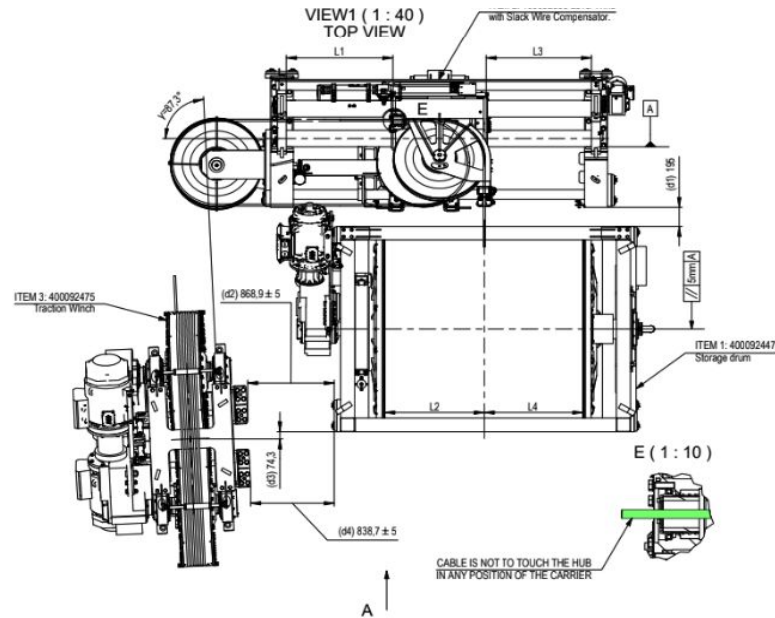
CTD Winch



[Information from Lubrication Plan 2000005634](#)

More information regarding the oil selection at the general maintenance section
([#6313 RAPP MARINE Lubrication Chart](#))

ROV Traction System



3.7 - ROV Traction System

3.7.1 - Features

3.7.2 - Technical Data

3.7.3 - Dimensional Sketch

3.7.1 - Traction Winch

3.7.2 - Storage Drum

3.7.3 - Level Wind/SWC

3.7.4 - Brake HPU

3.7.5 - Cooling HPU

3.7.4 - Controls

3.7.4.1 - Local Panel

3.7.4.2 - Control Room Panel

3.7.5 - Hydraulic Diagram

3.7.6 - Maintenance & Lubrication Charts



Features

DESCRIPTION - ROV Traction System

One (1) ROV Winch System (15T) composed by:

1ea. Traction Winch (Model: TRW-4004E-01R1)

1ea. Combined Level Wind incl Slack Wire Compensator (Model: ELSWC5000-L2000)

1ea. Storage Drum (Model: RW-2372EB)

- SWL 15,0 tons
- Hydraulic operated fail safe brake with capacity SWLx1,8
- Constant Tension control
- Local and Remote control
- Prepared for AHC (Active Heave Compensator) Operation

Technical Data - Performance

Winch performance at power requirement 190kW – including driving one Storage Drum and one Level Wind.

Peak power requirement for AHC operation (HS5 Period 10s) 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.

Technical Data - Performance

ROV Traction System

Performance and Load diagram

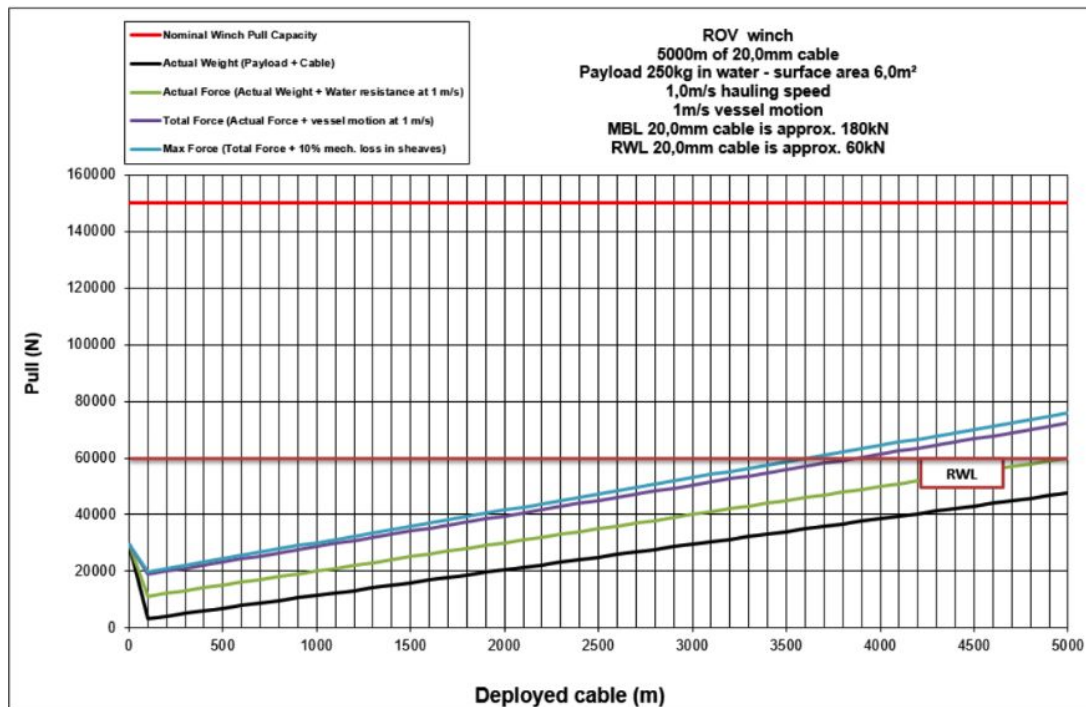


Diagram showing load cases with deployment of 5000m of cable

Technical Data - Performance

Active Heave Compensation capabilities

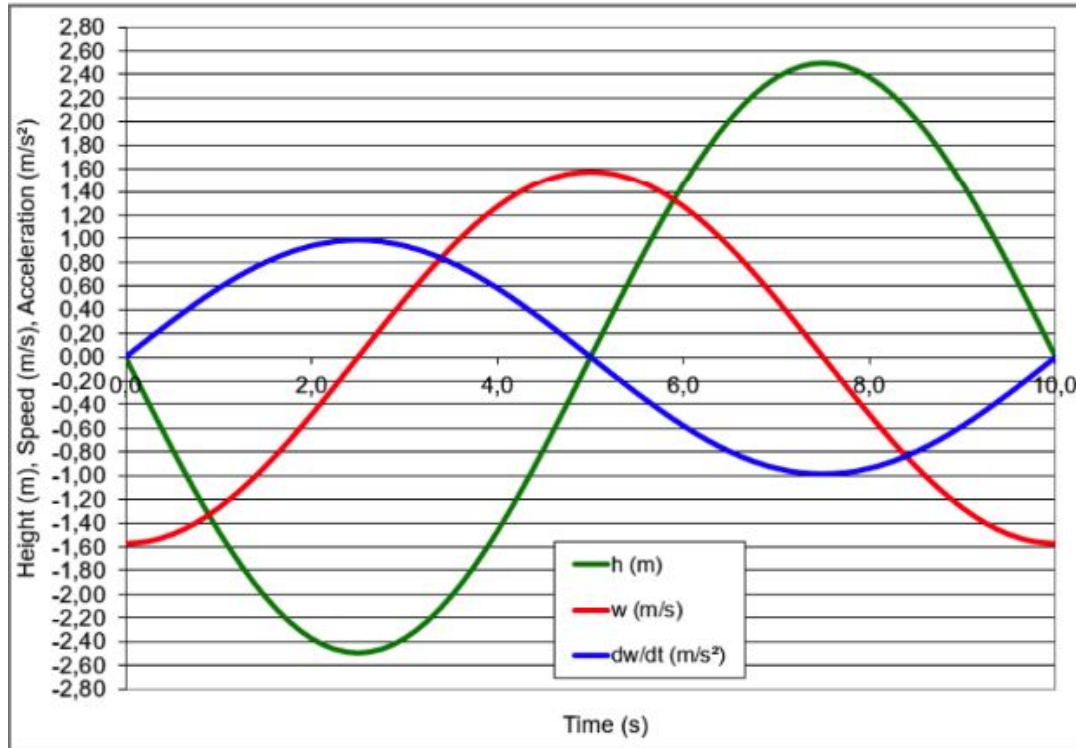


Diagram for definition of required acceleration (dw/dt) and speed (m/s) based on pure Wave height H_{s5} and period 10s. Vessel movement must be calculated by ship designer to verify that acceleration and speed at position of overboard sheave does not exceed these values. If so, power requirement of winch has to be recalculated and corrected.

Technical Data

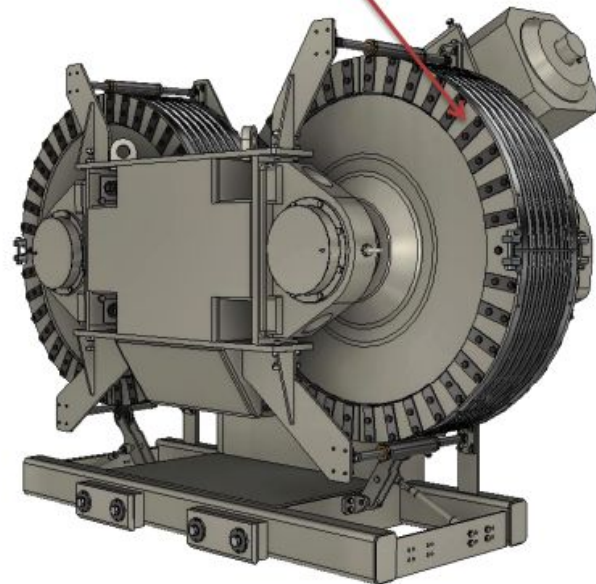
ROV Traction System - Traction Winch

Model: TRW-4004E-01R1.

Drawing: 400092475.

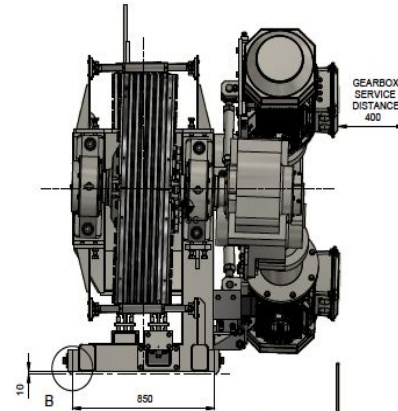
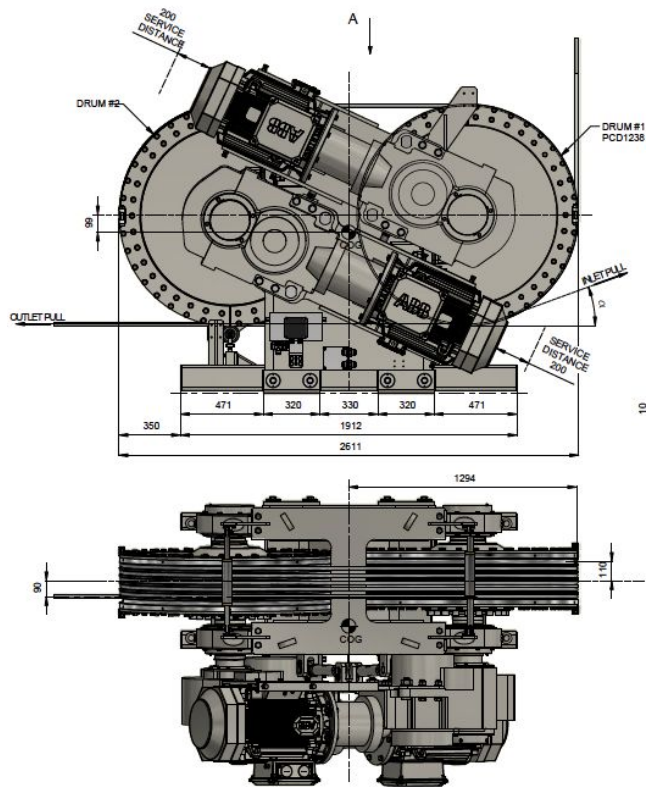
- Traction heads with PCD 1238mm fitted with split sleeve for easy replacement/change.
- Dual Electric Motor drive/ABB air cooled high output type/IEC225.
- Sleeves for 20 mm. dia cable.
- Traction head sleeves is of split type design.
- Deck interface: Winch equipped with brackets for welded connection to deck.

Split sleeve on the Traction Head for change between different cable/wire types

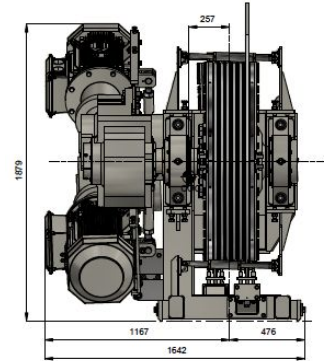
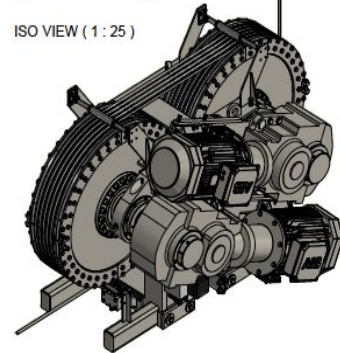


ROV Traction System - Traction Winch

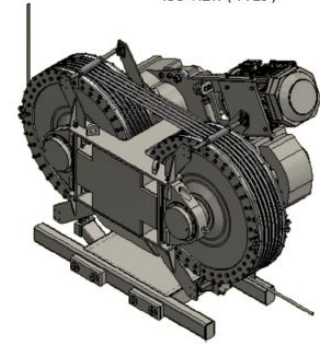
Dimensional Sketch



ISO VIEW (1 : 25)



ISO VIEW (1 : 25)



Technical Data

Model: ELSWC5000-L2000.

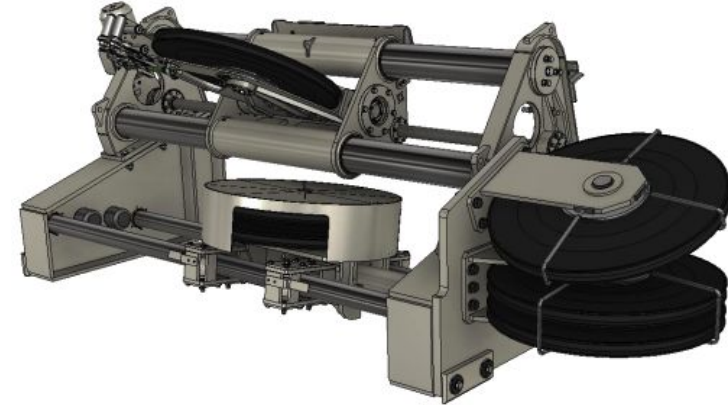
Drawing: 400092566

Level Wind

- Electric driven and electronic synchronized.
- Sheave PCD diameter: 1ea. 900 mm.
- Material in sheave: Composite.

Slack Wire Compensator

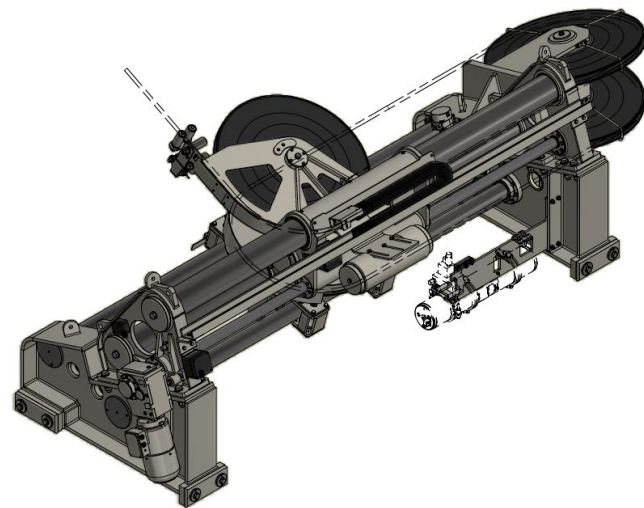
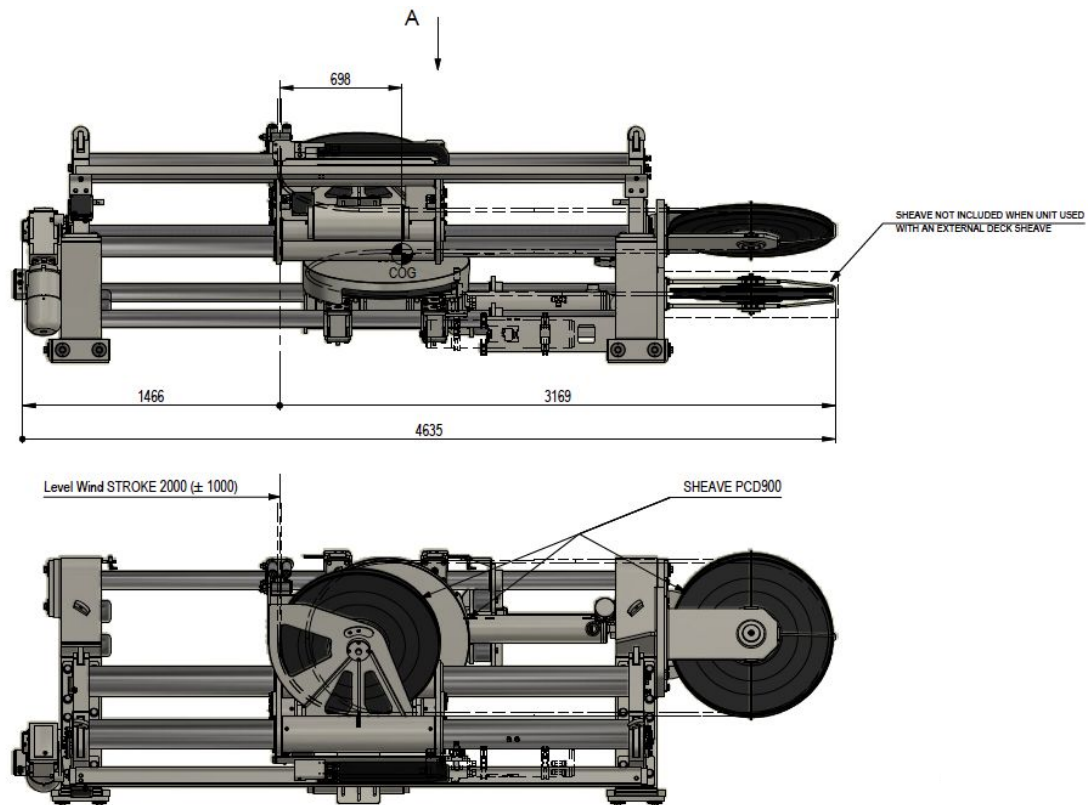
- Sheave PCD diameter: 2ea. 900mm + 1ea. 900mm.
- Material in sheave: Composite The Slack Wire Compensators position is logically positioned in relation to the operational sequence of the Traction Winch and the Storage drum.



Deck interface: Winch equipped with brackets for welded connection to deck.

ROV Traction System - Level Wind and Slack Wire Compensator

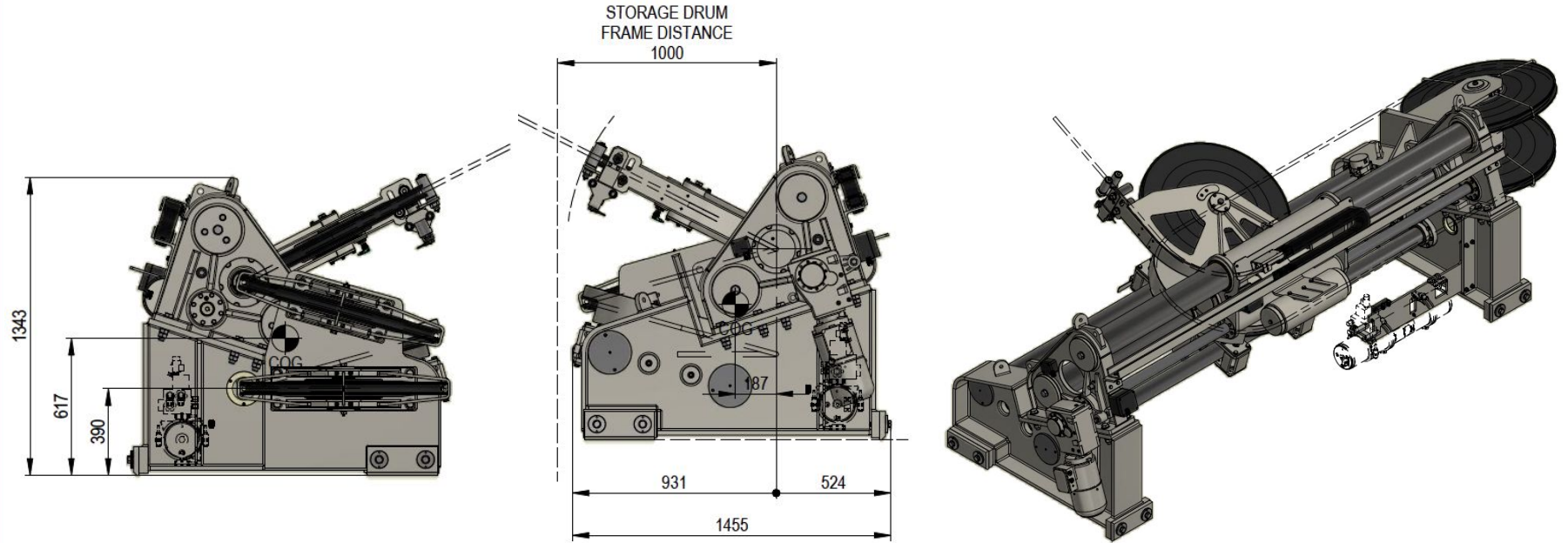
Dimensional Sketch



[Information from Dimensional Sketch 400092566](#)

ROV Traction System - Level Wind and Slack Wire Compensator

Dimensional Sketch



[Information from Dimensional Sketch 400092566](#)

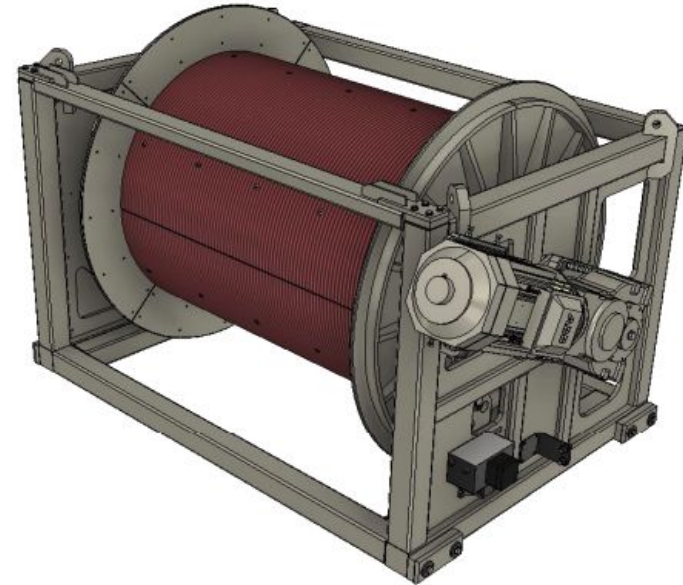
Technical Data

Storage Drum.

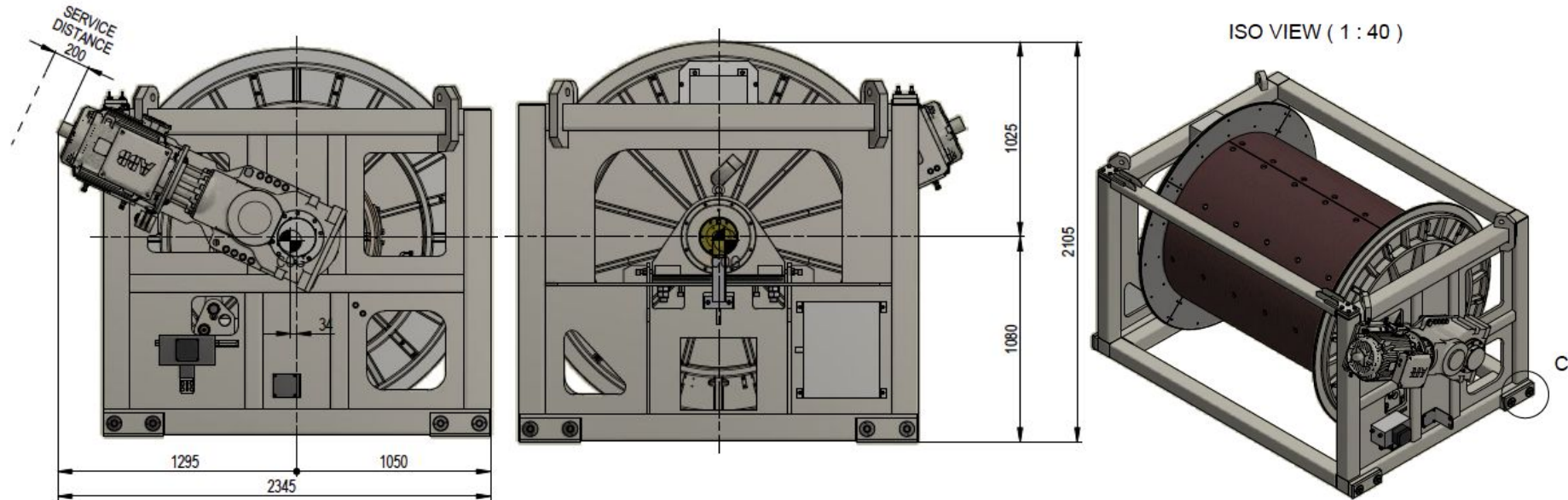
Model: RW-2372EB

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 type Focal 176/291, 5 pass 4500V/20A, 4 pass 1000V/7A, 6 SM fibre pass.
- Maximum cast depth: 4050m (4700m. cable deployed).

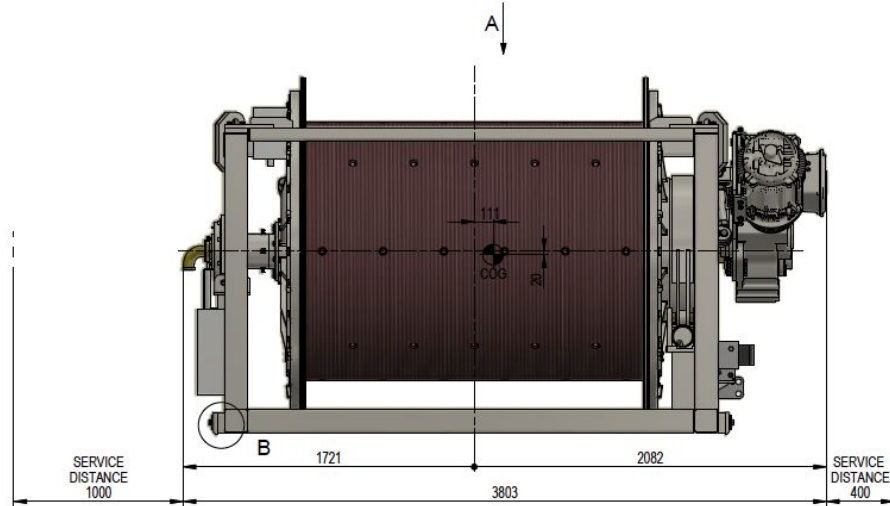


Dimensional Sketch

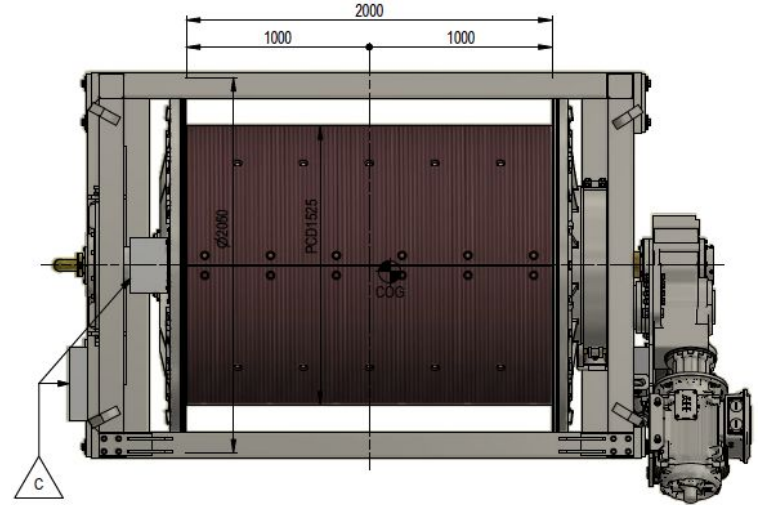


[Information from Dimensional Sketch 400092447](#)

Dimensional Sketch

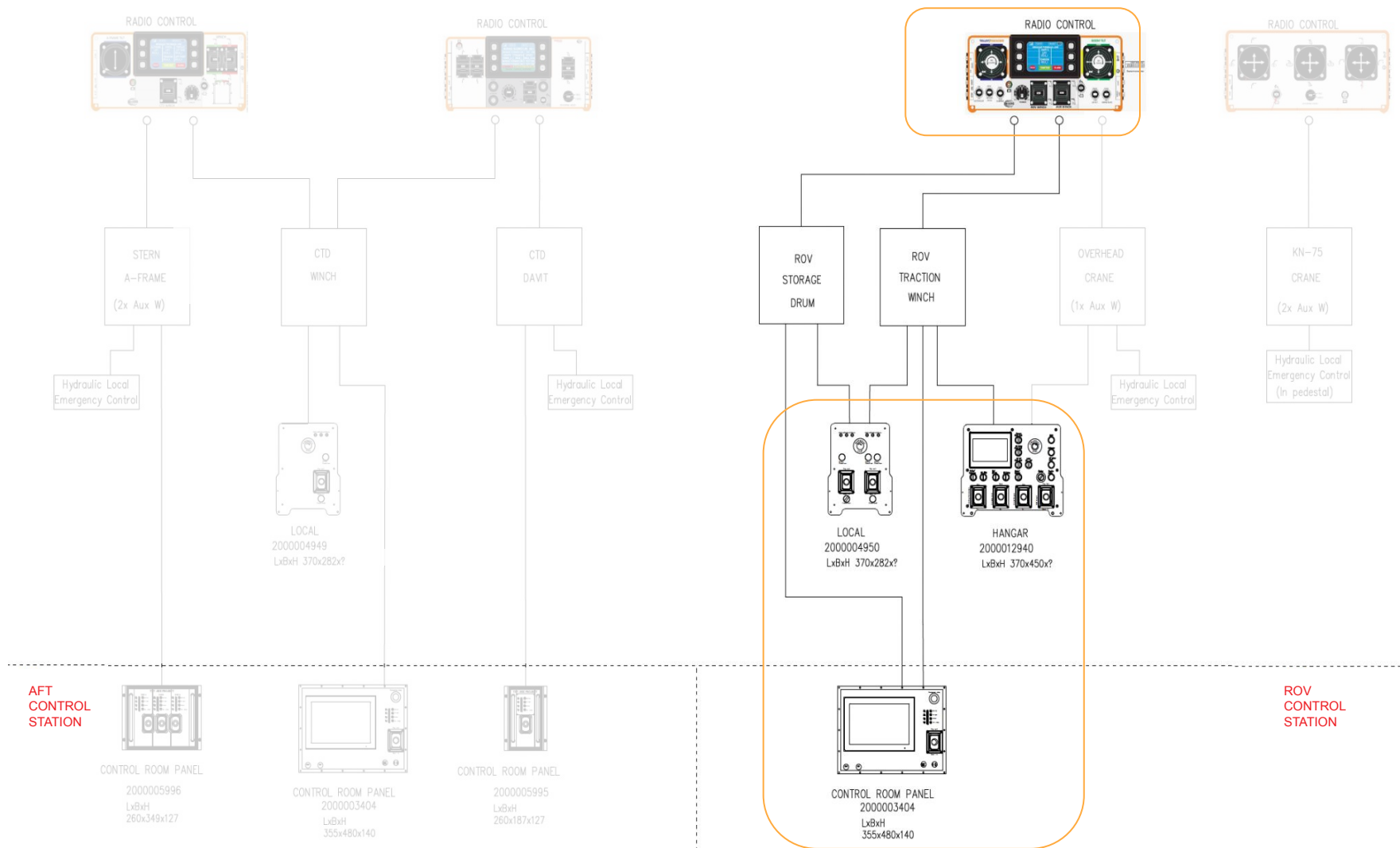


ROV Traction System - Storage Drum



[Information from Dimensional Sketch 400092447](#)

Control System - ROV Winch



Controls - Radio Control

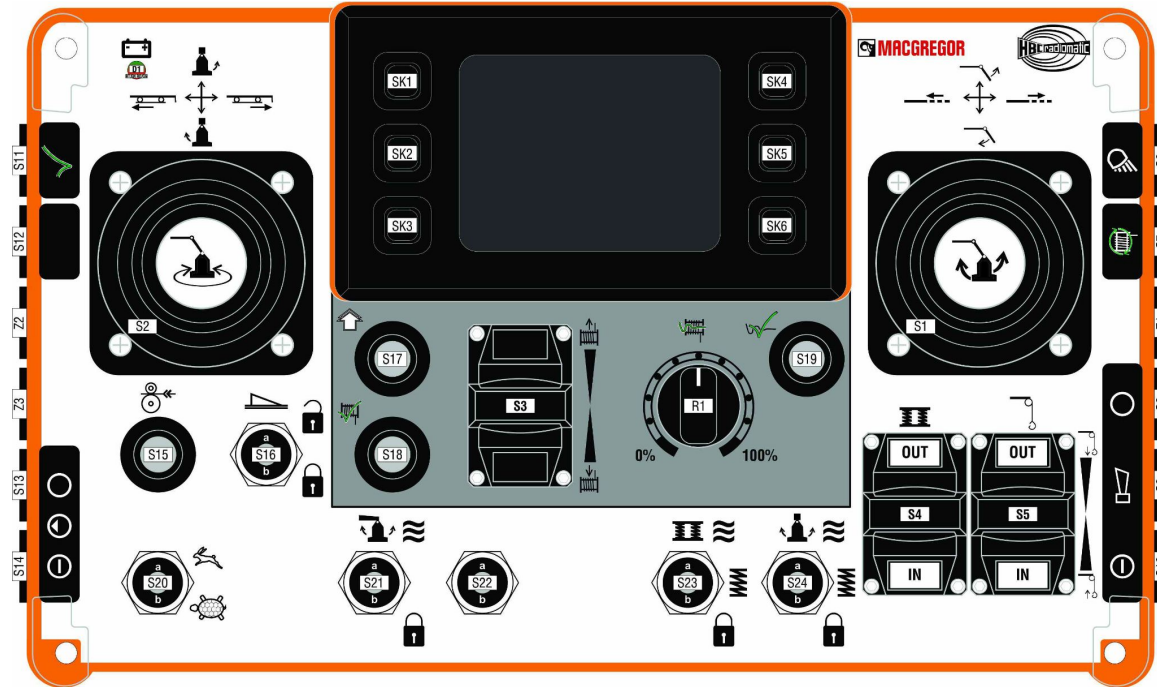
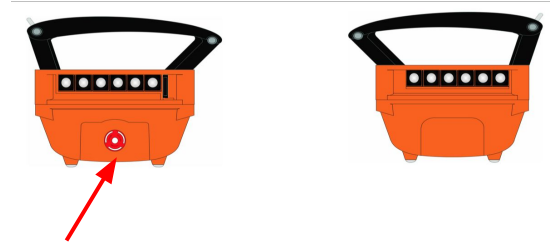


Image from SEOM Section 4 - Pag 255 of 371

NOTE: The remote will turn off when not active for 10 mins.



Function STOP - prevent the main oil valve to open and stop the communication

Controls - Radio Control

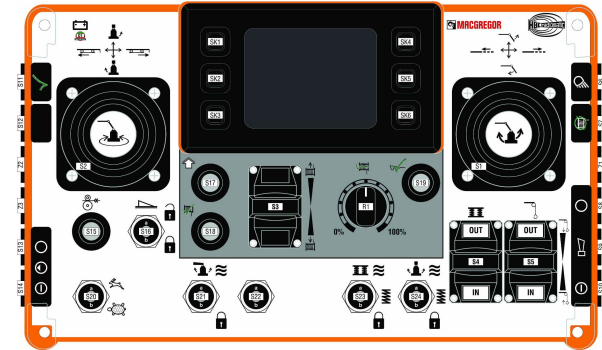
One Stick Launch function

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.

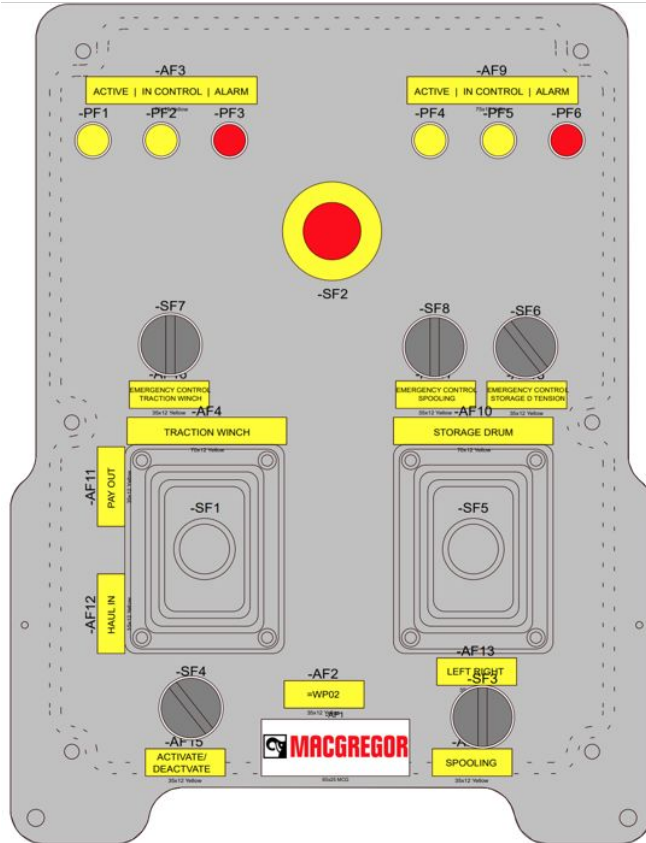
Sequences are: manually latch the ROV to the docking head by hoisting the lifting winch. Automatic movements: trolley out – tilt down - extension out. After the sequence is completed, the operator shall manually activate the lifting winch, lift the ROV in order to release the fail-safe latching mechanism 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.

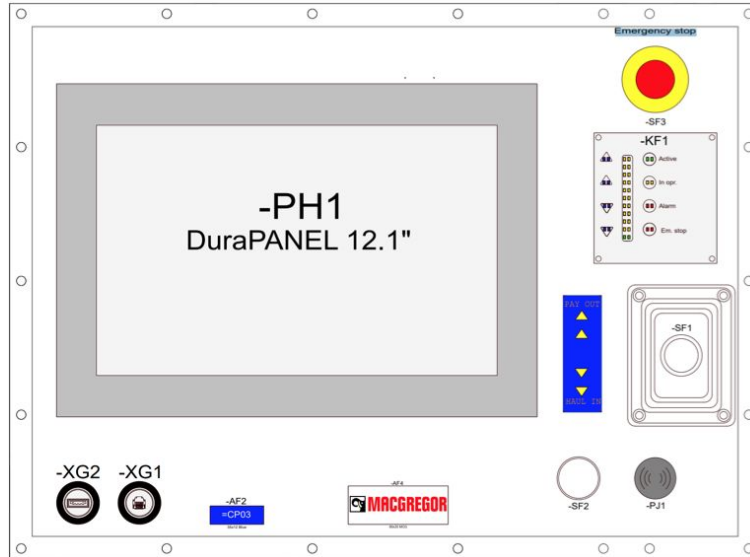


Controls - Local Panel





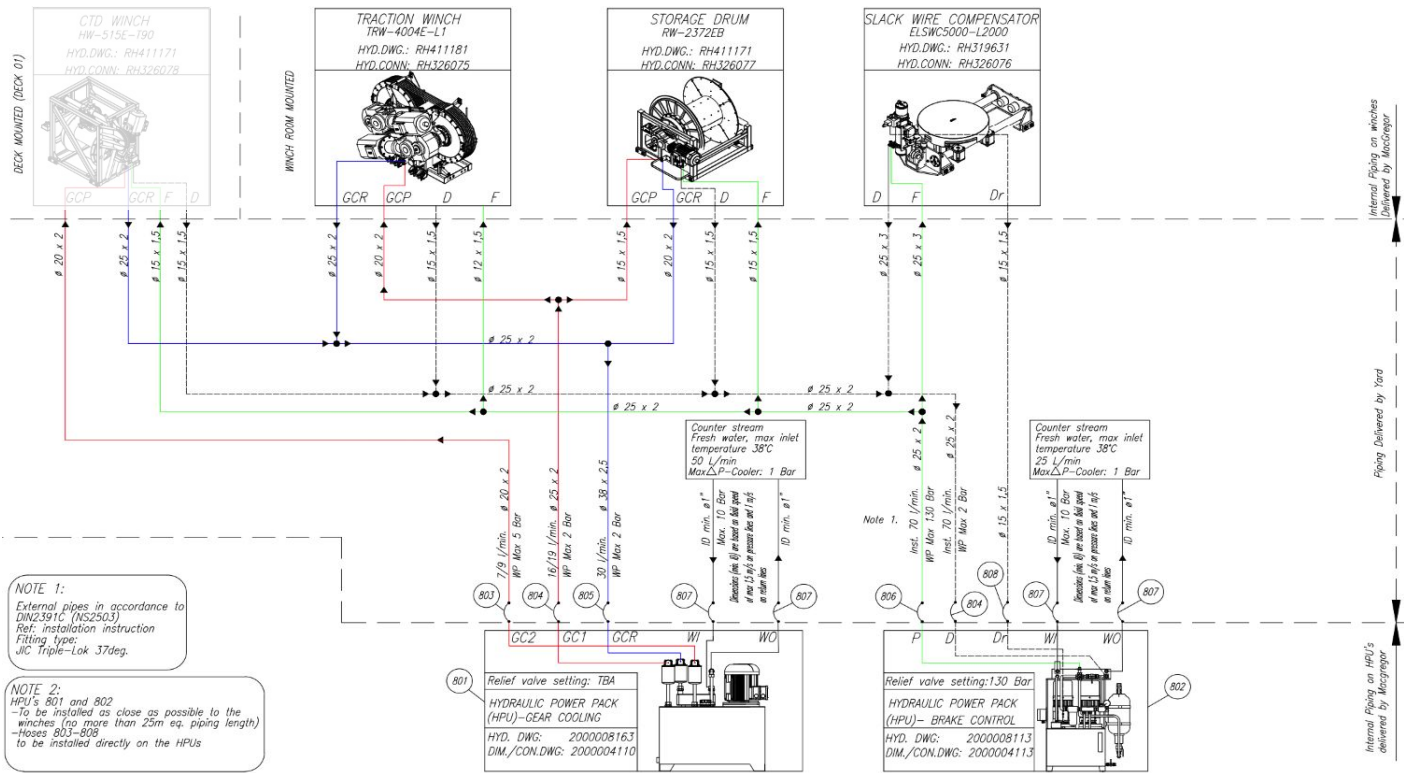
Controls - Control Room Panel



For Operational use of the
Control Room Panel see the
Pentagon 7 Seas - Operator's Manual (Research version)

Hydraulic System

ROV Winch



Designed by H. Johnsen	Modified by	Date 21-Dec-21	ECO ECO-2056554	Revision A
Name MBARI 4/10070 HYDRAULIC SYSTEM				
Description BRAKE & GEAR COOL (Old no. RH30398)				
Document ID 2000004171				
Scale (A3) 2x				



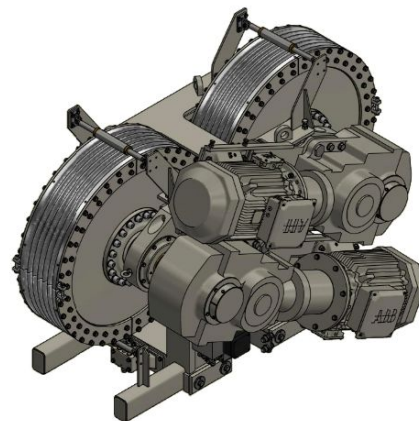
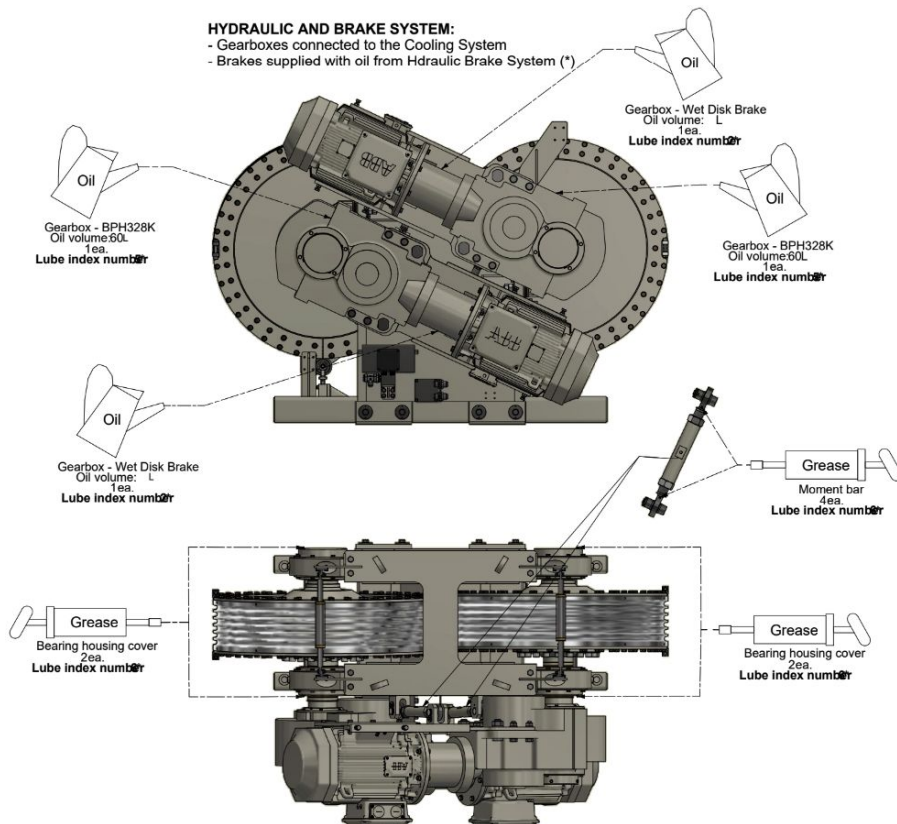
Click on the image to access the hydraulic diagram of this equipment.

Maintenance & Lubrication Charts

ROV Winch - Traction Winch

HYDRAULIC AND BRAKE SYSTEM:

- Gearboxes connected to the Cooling System
- Brakes supplied with oil from Hydraulic Brake System (*)

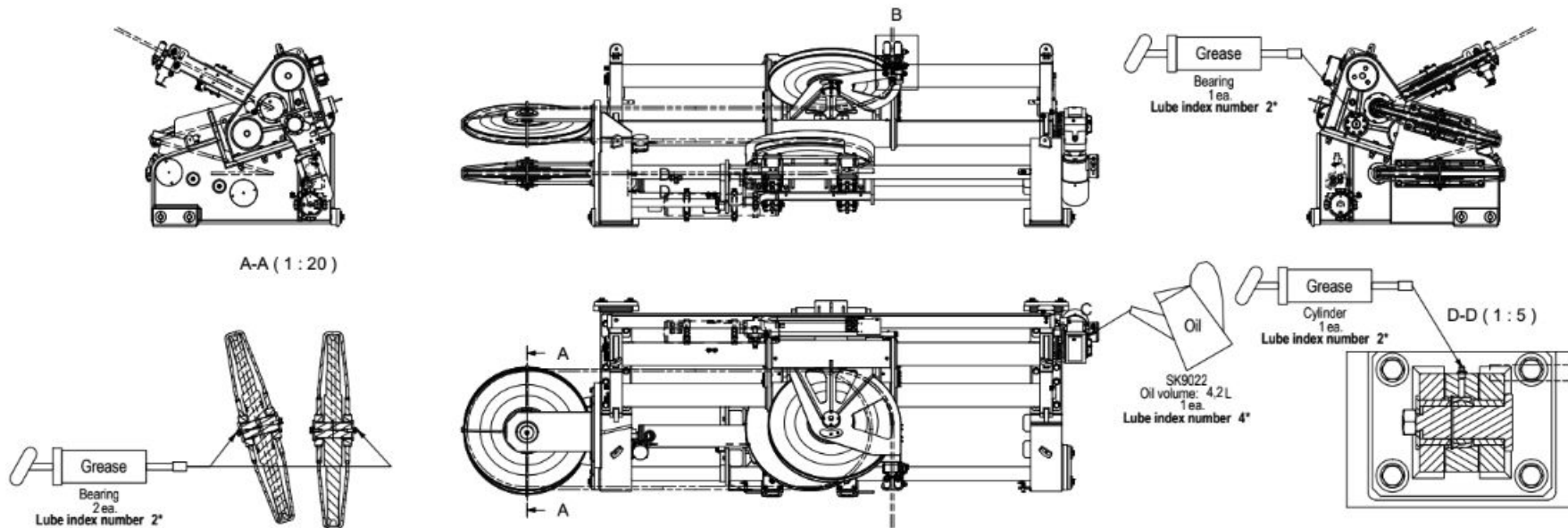


[Information from Lubrication Plan 400092475](#)

More information regarding the oil selection at the general maintenance section ([#6313 RAPP MARINE Lubrication Chart](#))

Maintenance & Lubrication Charts

ROV Winch - Level Wind and Slack Wire Compensator

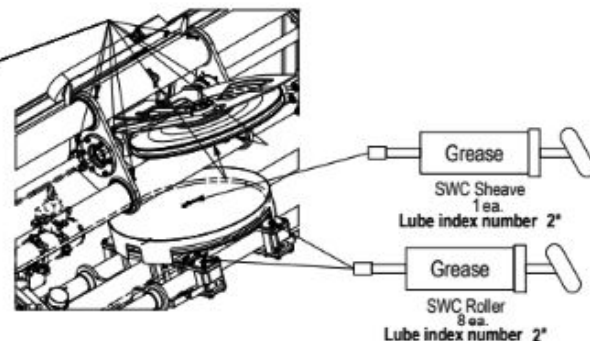
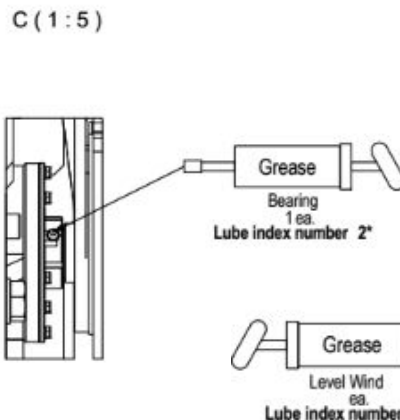
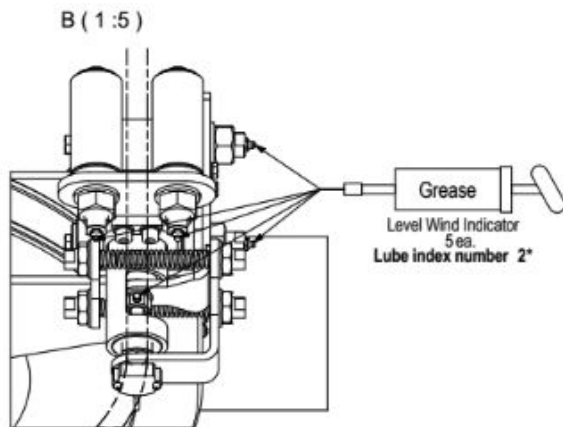


[Information from Lubrication Plan 2000004322](#)

More information regarding the oil selection at the general maintenance section ([#6313 RAPP MARINE Lubrication Chart](#))

Maintenance & Lubrication Charts

ROV Winch - Level Wind and Slack Wire Compensator

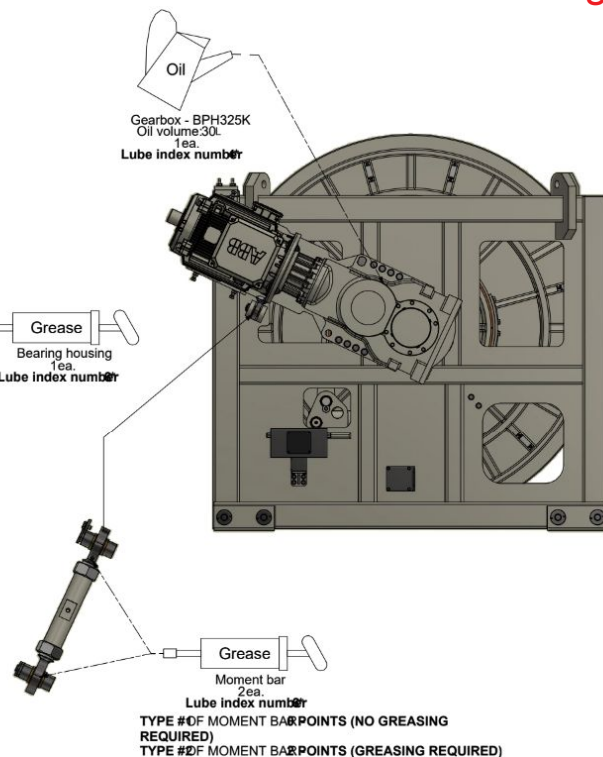
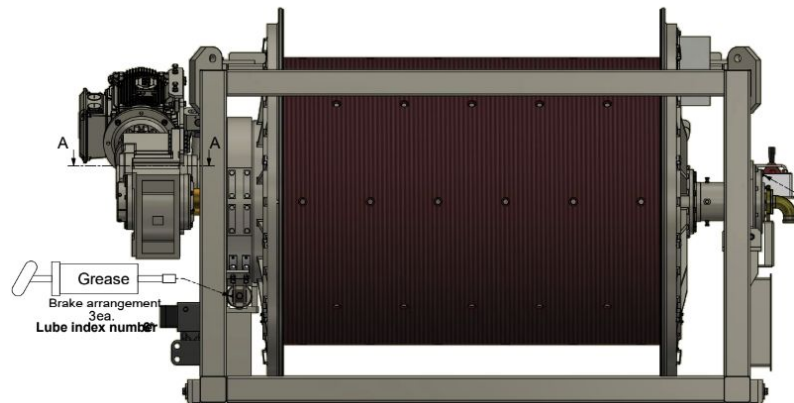


[Information from Lubrication Plan 2000004322](#)

More information regarding the oil selection at the general maintenance section ([#6313 RAPP MARINE Lubrication Chart](#))

Maintenance & Lubrication Charts

ROV Winch - Storage Drum

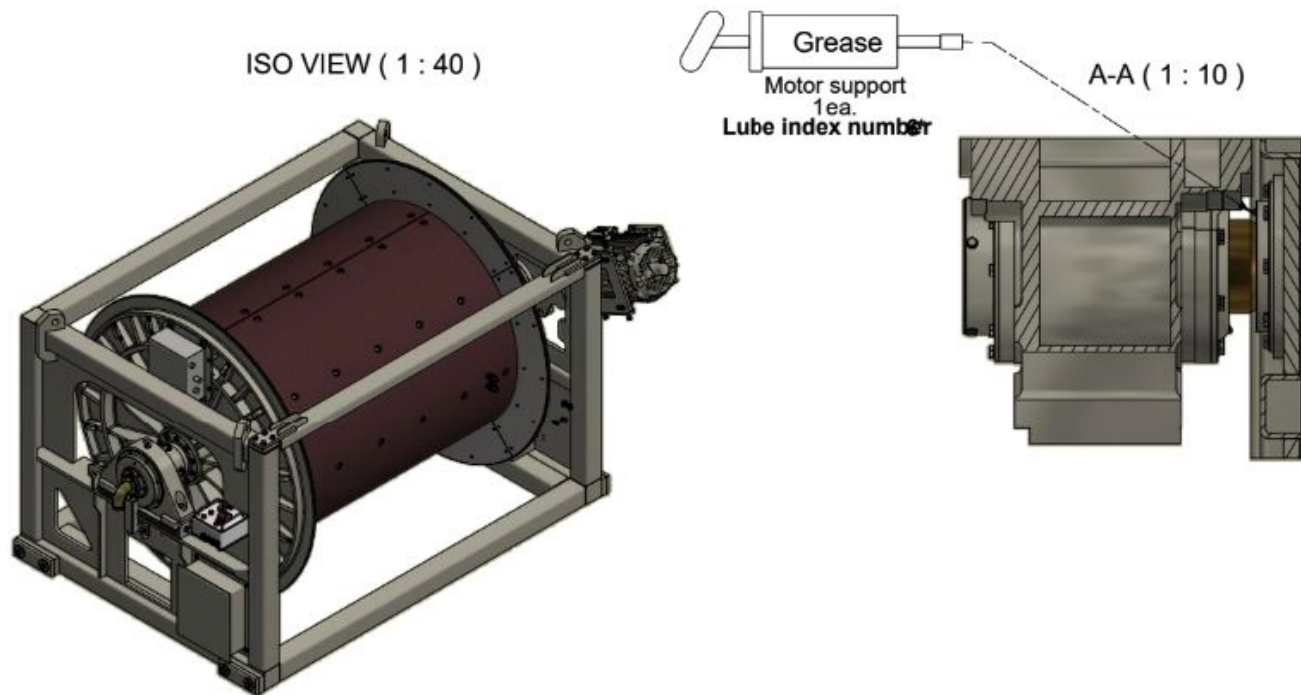


[Information from Lubrication Chart 400092447](#)

More information regarding the oil selection at the general maintenance section ([#6313 RAPP MARINE Lubrication Chart](#))

Maintenance & Lubrication Charts

ROV Winch - Storage Drum



[Information from Lubrication Chart 400092447](#)

More information regarding the oil selection at the general maintenance section ([#6313 RAPP MARINE Lubrication Chart](#))

3.8 - HPU Brake and Cooling

3.8.1 - Hydraulic Diagram

3.8.2 - Technical Data

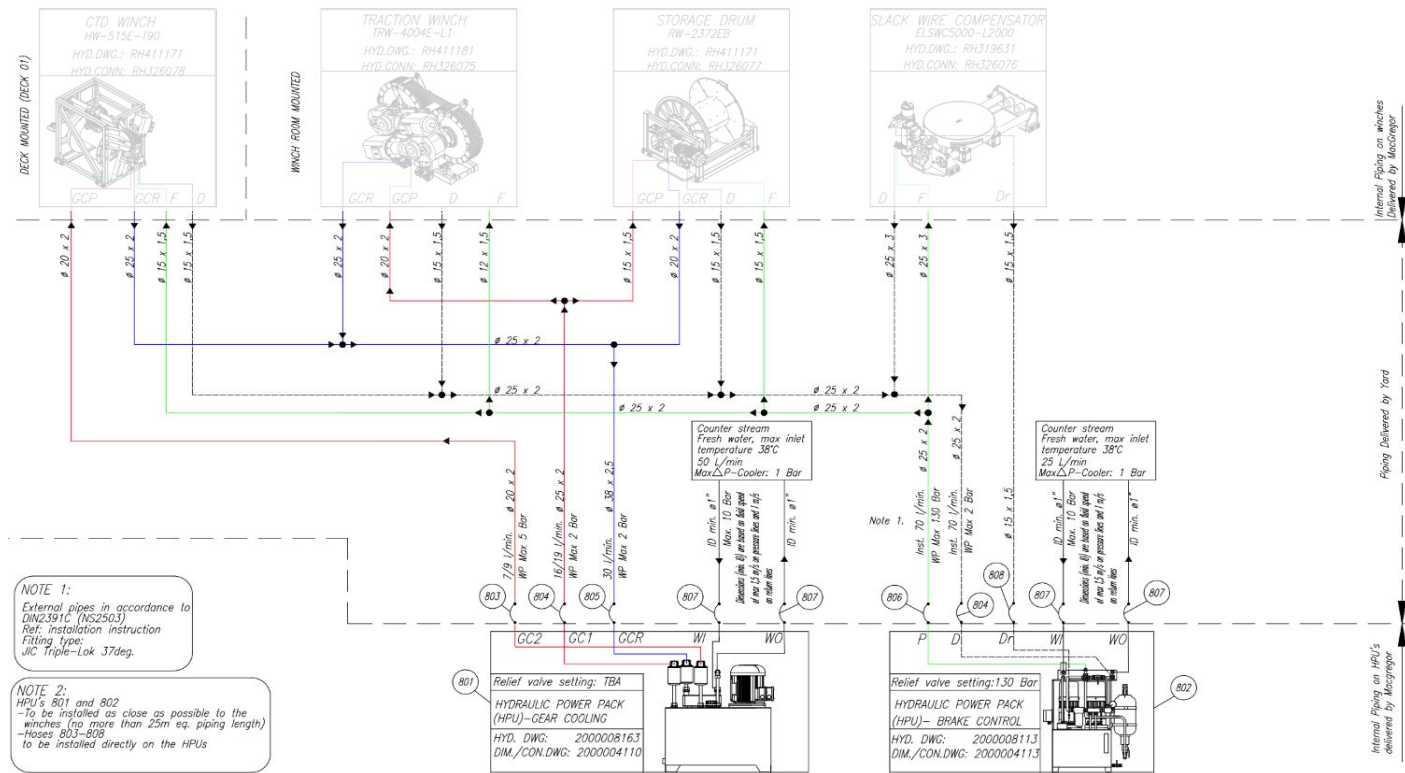
3.8.3 - Dimensional Sketch

3.8.4 - Maintenance & Lubrication Charts



Hydraulic System

HPU Brake and Cooling



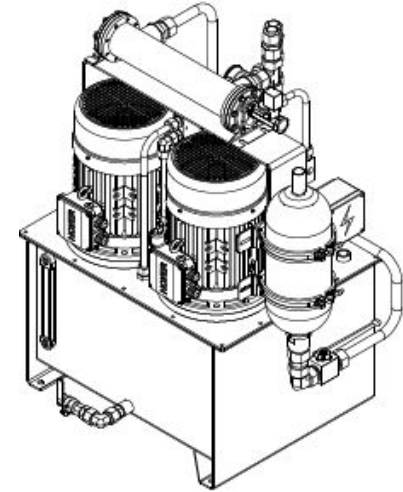
Designed by H. Johansen	Modified by	Date 21-Dec-21	ECO ECO-2056554	Revision A
Name MBARI 4/10070 HYDRAULIC SYSTEM				
Description BRAKE & GEAR COOL. (Old no. RH30398)				
Document ID 2000004171				
Scale (A3) 2x				

Technical Data

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.

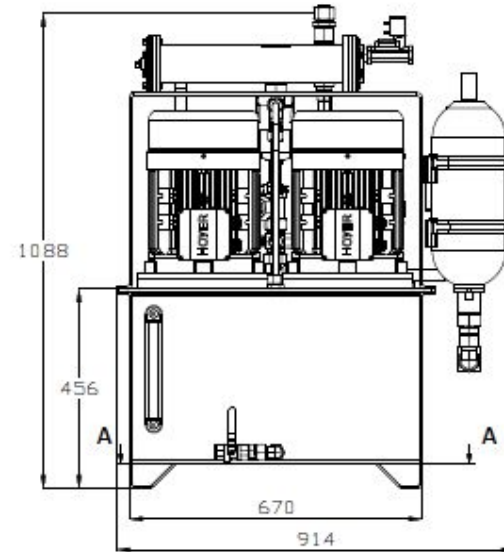
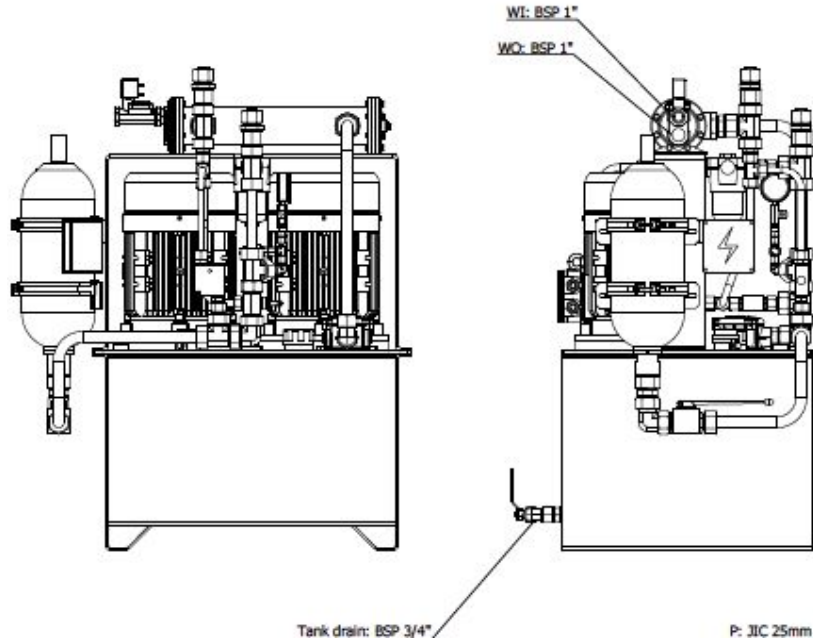


Required fresh water cooling supply@ maximum 38°C is 8a = 25l/min & 8b = 50l/min.

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.

Dimensional Sketch

Brake and Slack Wire Compensator HPU

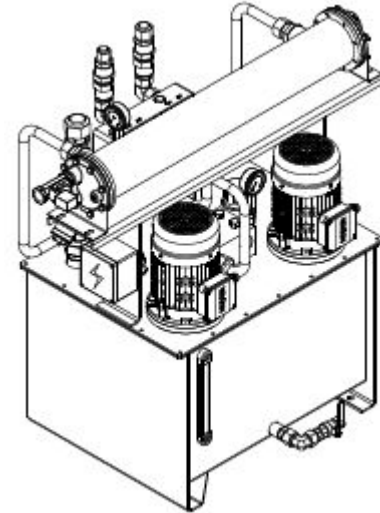


[Information from Dimensional Sketch 2000004113](#)

Technical Data

Hydraulic cooling system for the winch drive gearboxes.

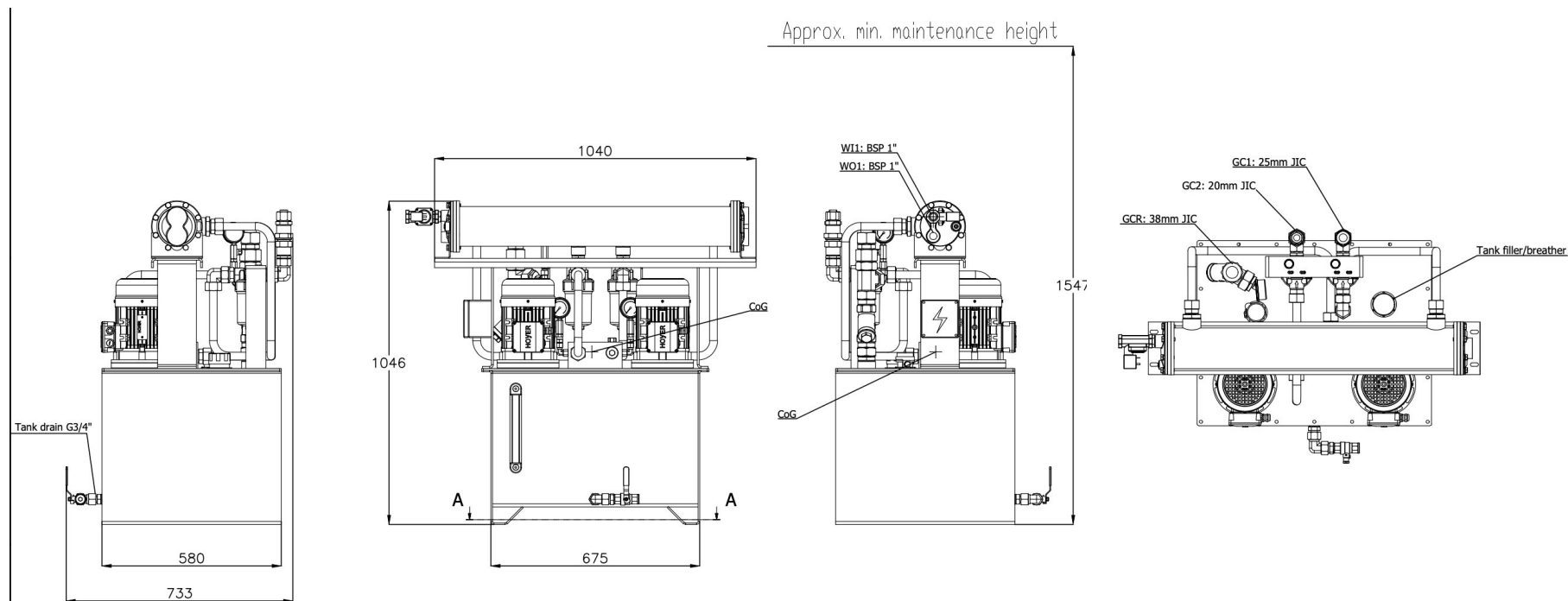
- 1 ea. Hydraulic Power Unit (HPU), mainly comprising of:
 - 2ea. Elec. hydraulic power pack 1,5 kW/3x480V/60Hz/IP55. S1-100% load rating, including fixed displacement hydraulic pumps, oil reservoir as well as filters, necessary valves, thermal switch, check valves and hoses.
 - Oil cooler approx. 30kW cooling capacity at 38°C water temperature installed on HPU
 - 2 ea. Starters as part of the complete control system.



Required fresh water cooling supply@ maximum 38°C is 8a = 25l/min & 8b = 50l/min.

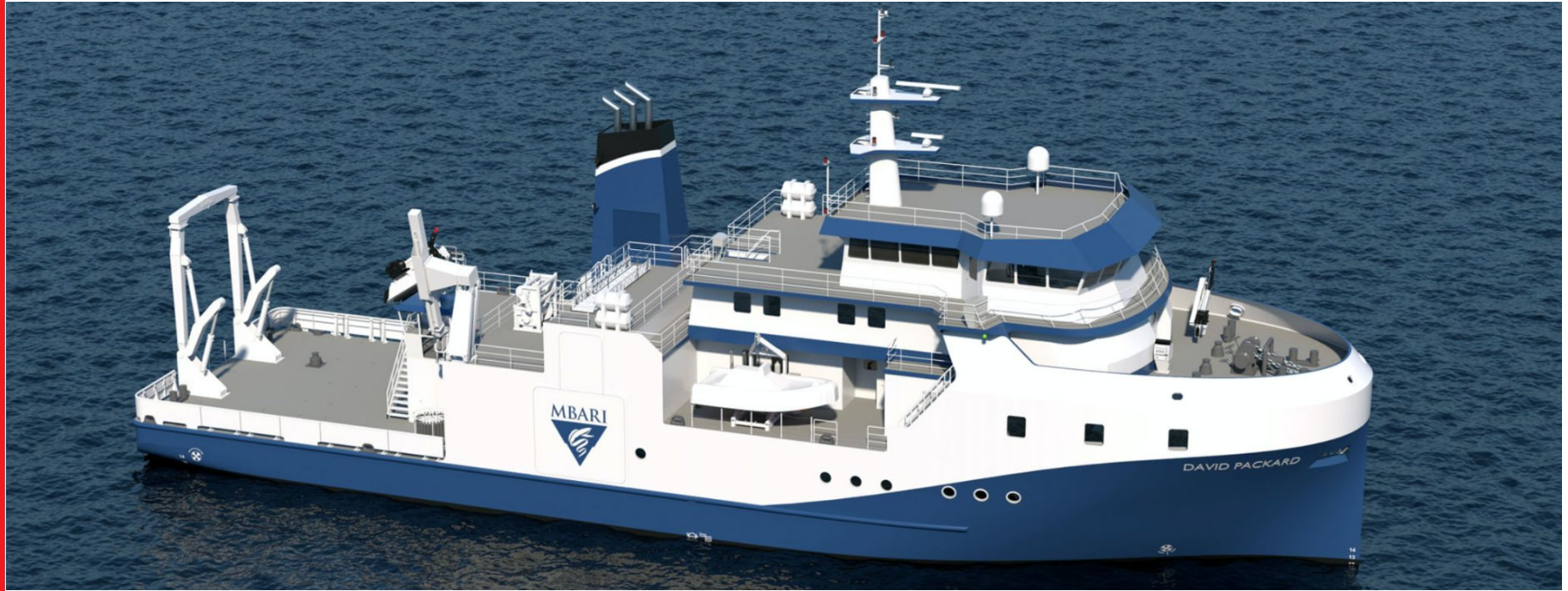
Note: The water supply on/off solenoid valves for water inlet are yard supply, but controlled from the MacGregor control system. Water pressure shall be sufficient to overcome cooler cross port pressure at max. 2 bar.

Dimensional Sketch



[Information from Dimensional Sketch 2000004110](#)

Maintenance



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		

Periodic Maintenance / Maintenance in General

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.

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.

Maintenance Timetable

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

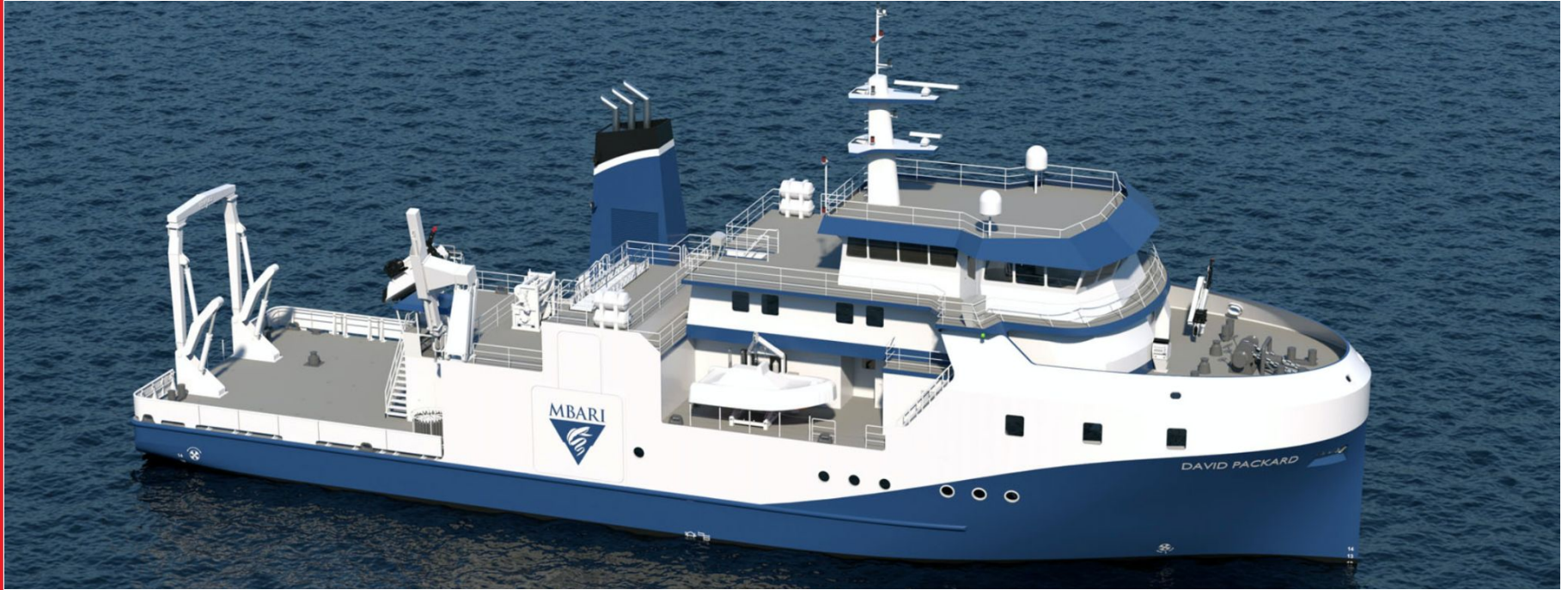
Maintenance Timetable

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 and 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.

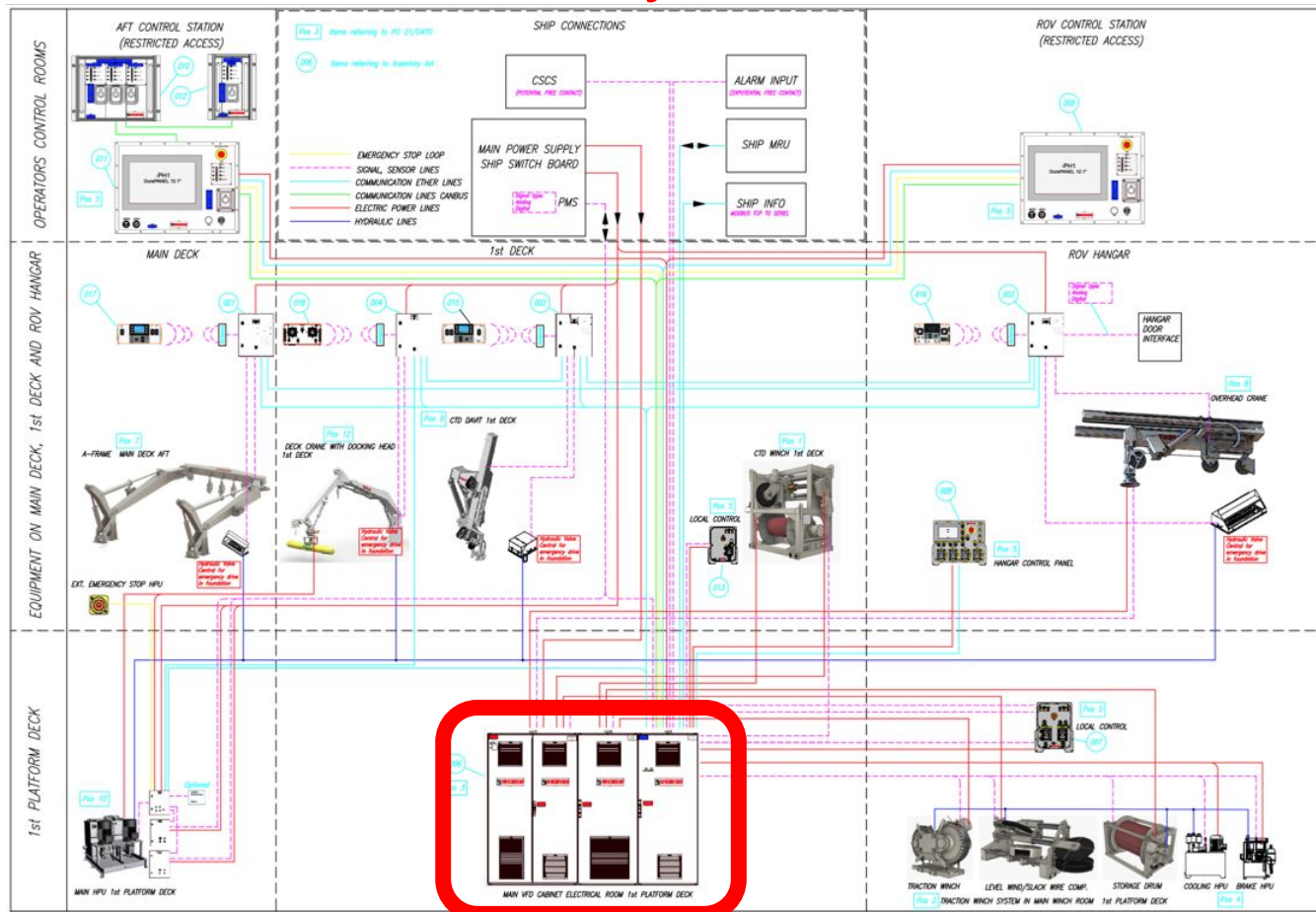
Maintenance Timetable

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.

Winches Main Drive System

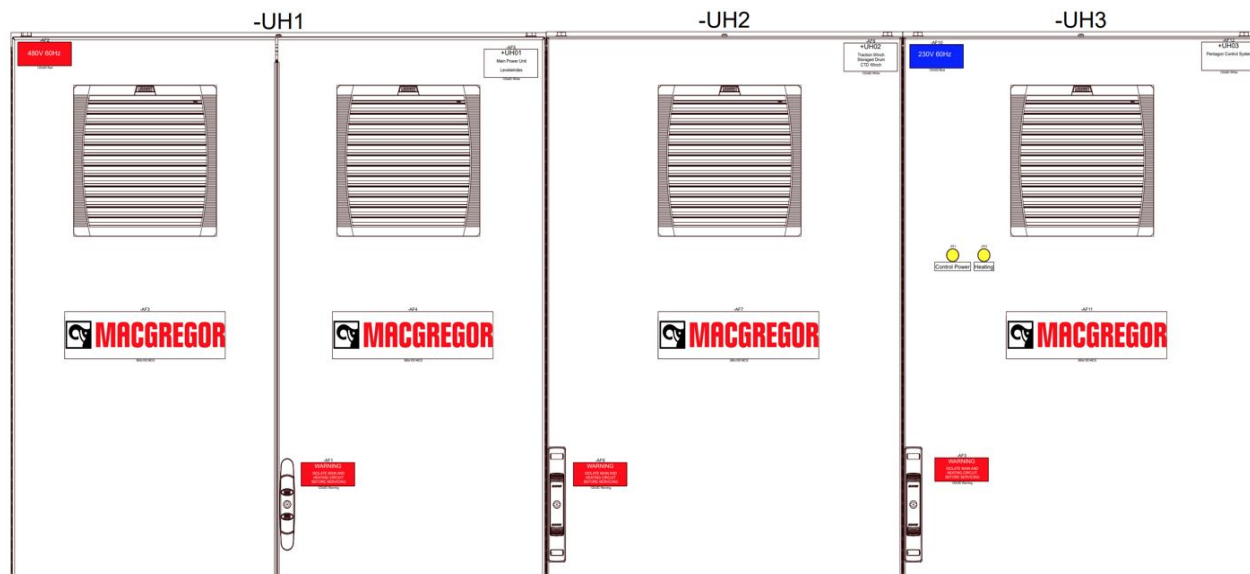


Winches Main Drive System



Winches Main Drive System

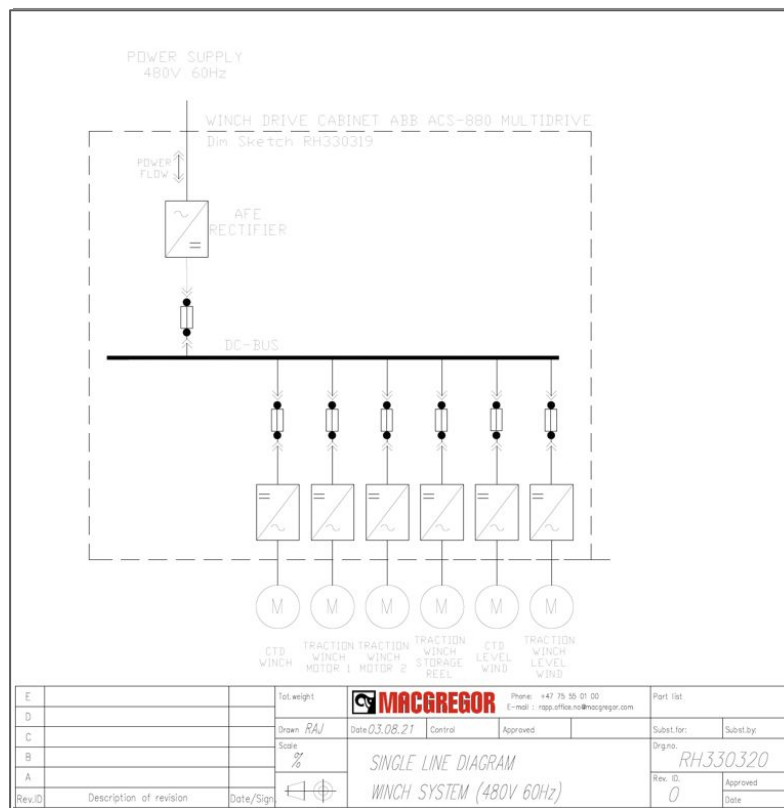
Electric main drive system
Main power 480V/60Hz
Power requirement: 190kW (peak
power 225kW)
Dimensional sketch: [RH330319](#)
Single line diagram: [RH330320](#)



Single line diagram

Dimensional sketch: [RH330319](#)

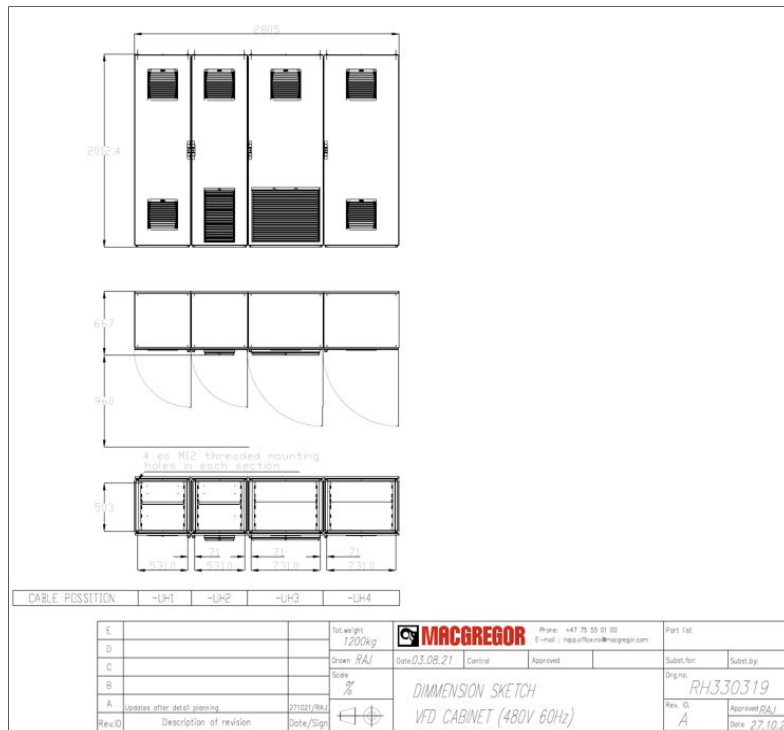
Single line diagram: [RH330320](#)



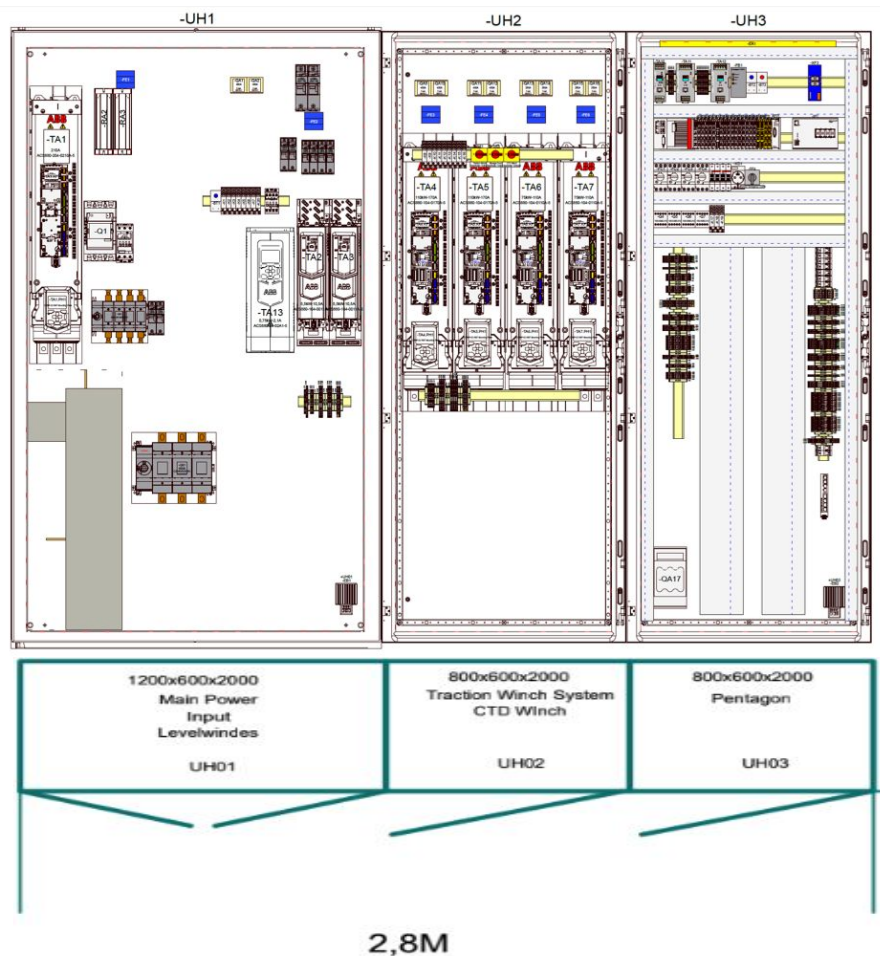
Dimensional sketch

Dimensional sketch: [RH330319](#)

Single line diagram: [RH330320](#)



Cabinet Overview



Main power 480V/60Hz

Power requirement: 190kW (peak power 225kW)

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 WINCH

- 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).

Maintenance

Main drive system for the winches

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

Maintenance

Vendor Recommended Spare (VRS) Parts List

Example of a table with a list of spare parts for the traction winch:

Part Indenture Level	Part Number (OEM)	Part Description	Unit of Issue (UI)	Weight	Recommended Quantity	Lead Time (PLT) (WEEKS)	Part Type/Indication
Traction Winch							
Mechanical parts							
Accessories	GRMXX003	GREASE NIPPLE M10 X 1,5 mm STAINLESS A4	EA	0,01lb	4	1-1	OBRP
Accessories	COSEX080	GASKOID GASKET MATERIAL, 0,4X1000 MM	M	0,01lb	1	1-1	OBRP
Hydraulic Parts							
RH411181, HH001	HH2DK003	Brake Hose 3/8", L=0.5m	EA	2lb	2	1-1	OBRP
RH411181, HH001/HH002	HH2SC0027	L/P Hose 5/8"	EA	2lb	2	1-1	OBRP
RH411181, SE001	HSEDE030	Solenoid Valve	EA	2lb	1	31-12	OBRP
Electric Parts							
4001812377	EACTT007	Gear Temp Sensor 4-20mA	EA	2lb	1	1-1	OBRP
4001812377	EACPL007	Diode Adaptor for Solenoide Valve	EA	2lb	1	1-1	OBRP

Information from Overboard Handling Systems (OHS) Vendor Recommended Spares (VRS) document

Maintenance

Recommended Spare Parts List (RSPL)

All equipments

Part Indenture Level	Part Number (OEM)	Part Description	Unit of Issue (UI)	Weight	Recommended Quantity	Lead Time (PLT) (WEEKS)	Part Type/Indication
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Part Indenture Level - Refers to a hierarchical structure that defines the relationship between components and subcomponents within a product assembly. Identifies the system name, type of part, and reference by partial writing level.

Part Number - Original equipment manufacturer (OEM) part identification number. The part number is a unique identifier assigned to a specific component or part within a product or system

Part Description - Describes and identifies characteristics of the spare part. Provides detailed information about a specific component or part within a product part or system

Unit of Issue (UI) - Emission unit (UI) related to supply. Refers to the standard unit in which a particular item or part is issued, stored, or sold

Weight - The weight of spare parts, depends on several factors, including the type of equipment or machinery they belong to, the material composition of the parts, their size, and their intended function. Here are some considerations regarding spare part weight (lbs, oz, etc.)

Recommended Quantity - Vendor-recommended spare parts, suggested by the manufacturer or supplier of the equipment or machinery. Quantities may vary based on the context and industry

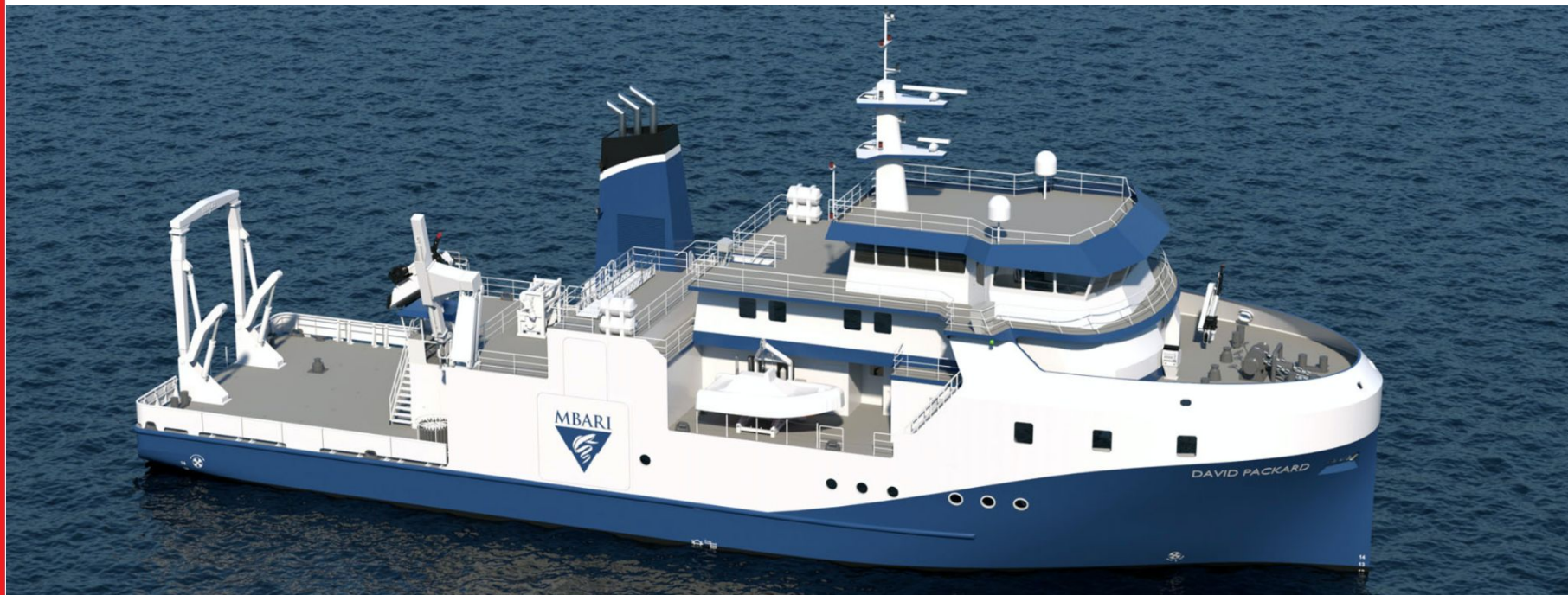
Lead Time (PLT) - The Production Lead Time (PLT), refers to the amount of time it takes for a product or component to be delivered after an order has been placed

Part Type/Indication - Choose One for each recommended part. If various, list the applicable identifiers:

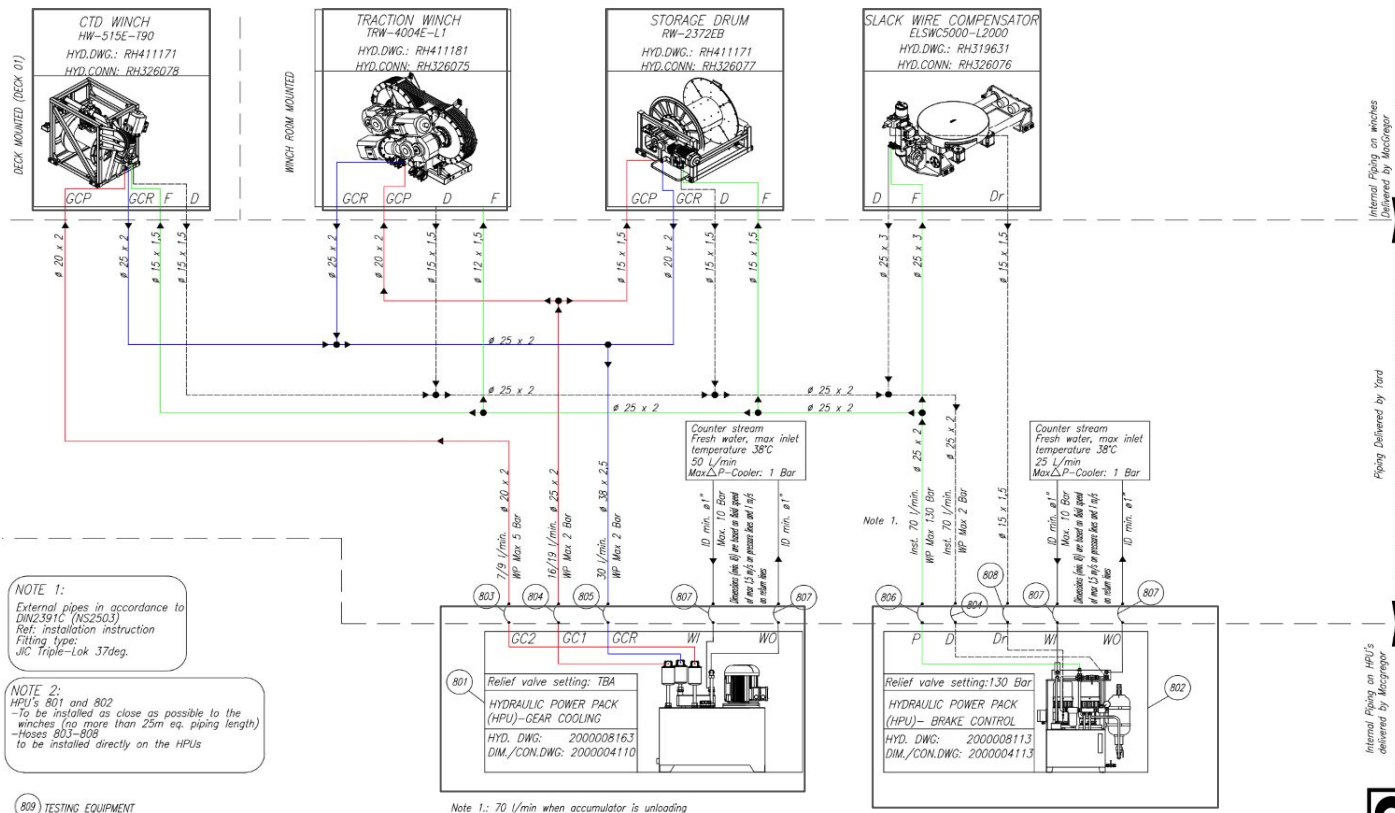
- On Board Repair Parts (**OBRP**)
- Vendor Recommended Spare (**VRS**)
- Safety Shut-off Valve (SSV) Insurance Spare (**SSV Ins**)



Hydraulic System

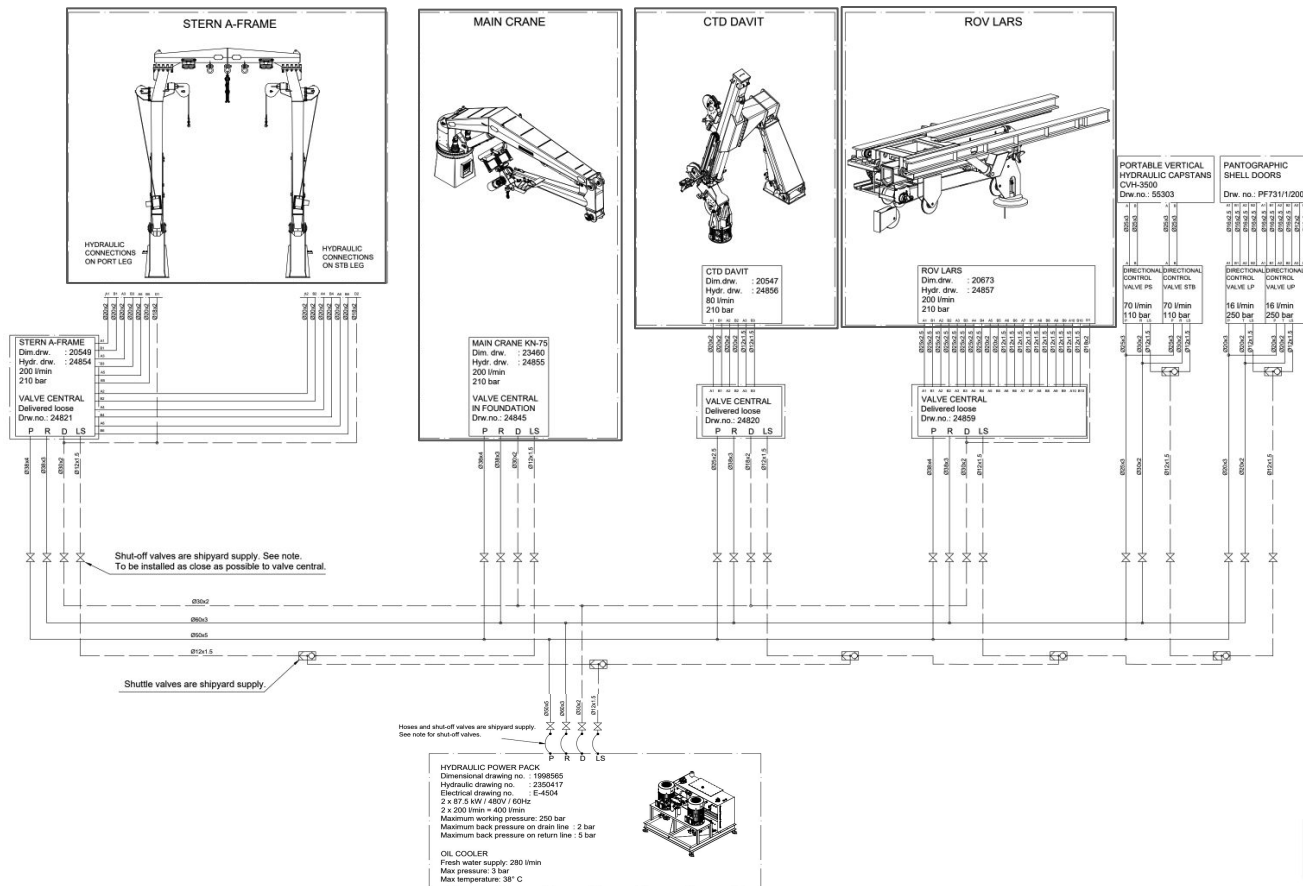


Hydraulic System - Winches



Designed by H. Johnsen	Modified by	Date 21-Dec-21	ECO ECO-2056554	Revision A
MACGREGOR Name: MBARI 4/10070 HYDRAULIC SYSTEM Description: BRAKE & GEAR COOL. (Old no. RH30398) Document ID: 2000004171				
This document and any technical data are subject to change without notice and are intended for use only by the customer. No part of this document may be reproduced or transmitted in any form or by any means electronic or mechanical, including photocopying and recording, or by any information storage or retrieval system, without permission in writing from Macgregor.				

Hydraulic System - Handling Equipment



Note:

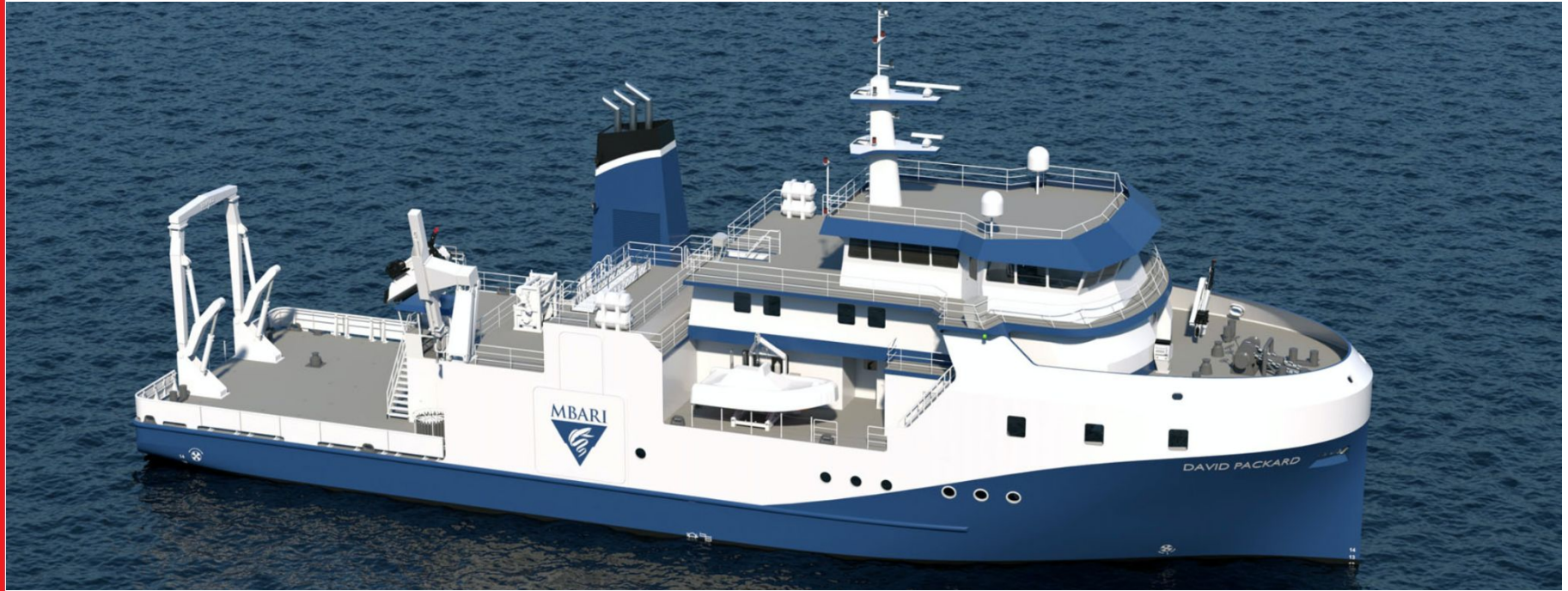
- FLARE FITTINGS acc. to SAE J 514 (ISO 8434-2)
- Pipe Ø50x5: FLANGE 1 1/2" SAE 8000 psi on HPU
- Pipe Ø60x3: FLANGE 2" SAE 3000 psi on HPU
- HOSE FITTING CONNECTION acc. to ISO 12151-5
- All exposed hydraulic hoses to be abrasion and UV protected
- Shut-off valves for pressure, return and drain lines 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

Safety

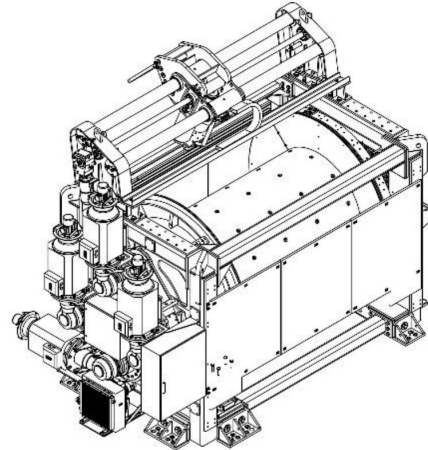


Safety

Personal Safety Precautions WINCHES

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.



Safety

Personal Safety Precautions

General

OPERATION AND MAINTENANCE 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.

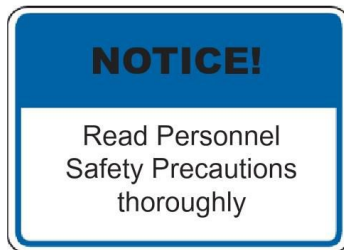
NEGLIGENCE OF OPERATIONS AND LIMITATIONS SPECIFIED IN THIS INSTRUCTION CAN CAUSE FAILURE OF EQUIPMENT, DAMAGE OF PROPERTY OR INJURY OF PERSONNEL.

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.

More 

Working with winches and rotating machinery

- 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.

More 

Working with wire ropes

- 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:
 - 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.

More 

Working with hydraulic systems

- 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.

More 

Working with hydraulic systems

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.



Personal Safety Precautions

CRANES

General

OPERATION AND MAINTENANCE OF THE CRANE 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.

Introduction

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

More 

Introduction

- 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.

Personnel Safety Precautions



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 vessel's heel + trim is higher than maximum designed value.
(Ref: dimension sketch)

Do not operate the crane when wind speed makes it indefensible.

Personnel Safety Precautions



SAFETY FOR USE OF CRANE

Operating of the cranes requires skill, ability and experience. Therefore only entrust persons with the operation of the cranes:

1. Who are physically and mentally suitable for this (not red, and not under influence of alcohol, drugs or medication).
2. Who handle the crane responsibly and reliably.
3. Who have the right qualifications (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.

Personnel Safety Precautions



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: The operator is directly responsible for every action he takes within the above mentioned duties.

Personnel Safety Precautions



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.

Personnel Safety Precautions



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.

Personnel Safety Precautions



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.

Personnel Safety Precautions



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:

Body	Leg	Foot	Arm	Hand	Finger
500 mm	180 mm	120 mm		100 mm	25 mm

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

Personnel Safety Precautions



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.

More 

Personnel Safety Precautions



- 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.

Personnel Safety Precautions



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.

Personnel Safety Precautions

Safe distances from electric power lines



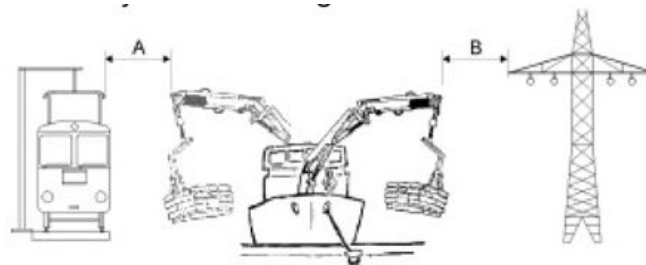
For overhead power lines and contact lines of electric railways the following minimum distances apply:

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



Personnel Safety Precautions



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.

Personnel Safety Precautions

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.

Personnel Safety Precautions



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.

More 

Personnel Safety Precautions



- 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 Lockout/Tag-out procedure.

Personnel Safety Precautions

Working with hydraulic systems



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.

Personnel Safety Precautions



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.

Personnel Safety Precautions

- 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.

Working with electric systems

Example of Lockout procedure.

SAFETY INSTRUCTIONS

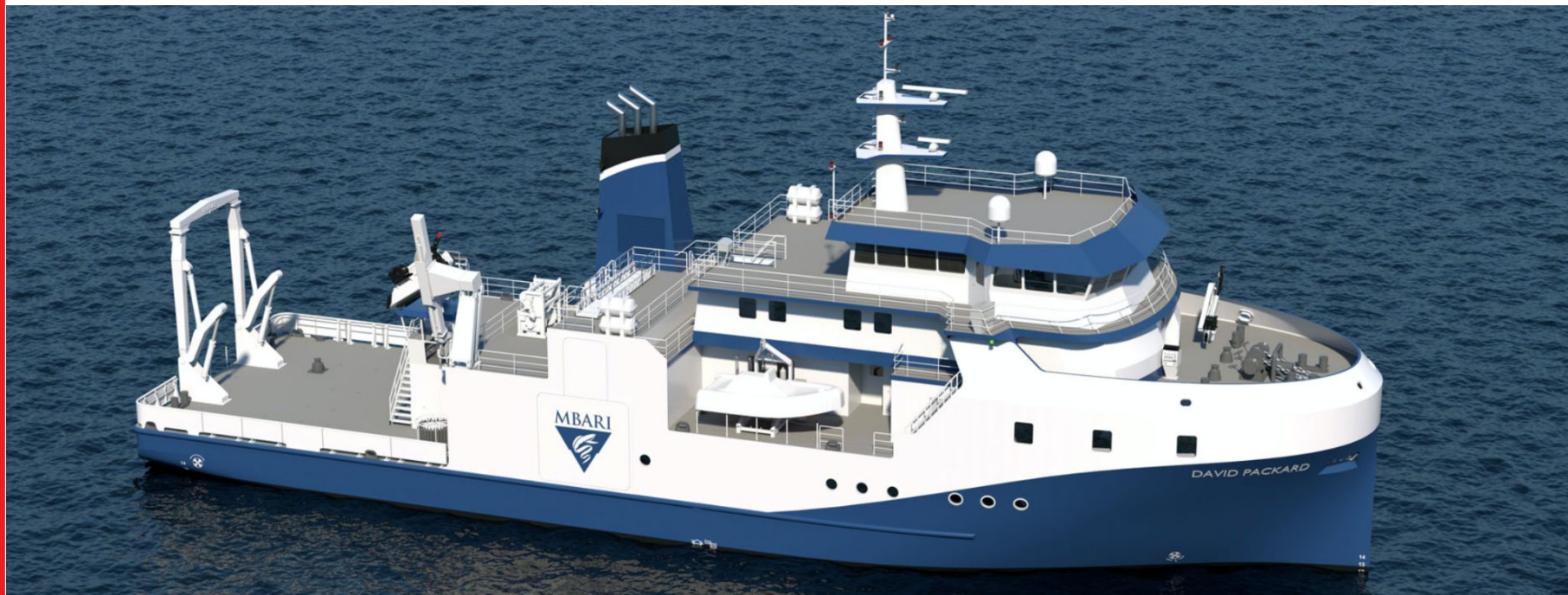
LOCKOUT PROCEDURE

1. Announce lockout to other personnel.
2. Turn power OFF at main panel.
3. Lockout power in OFF position.
4. Put key in pocket.
5. Clear machine of all personnel.
6. Test lockout by hitting RUN button.
7. Block, chain or release stored energy sources.
8. Clear machine of personnel before restarting machine.
9. Take key from pocket.
10. Unlock the lockout device.
11. Turn power on at main panel.
12. Announce machine is ON to other personnel.

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.



Troubleshooting



Troubleshooting - Hydraulic System

There are three types of hydraulic system in the system:

- Hydraulic brake system
- Hydraulic motor cooling system
- Hydraulic gear cooling system

For hydraulic troubleshooting the first challenge is to decide how to start trouble shooting, sometimes this is obvious, but on other occasions a detective work will be necessary. After some experience there is easier to attack the problem and find reason for this. Cleanliness cannot be stressed to highly, keep the work area and all items clean when working with hydraulics

The following principles will help to start correct troubleshooting

- In almost all situations, there is an alarm in the control system gives you an indication for the problem, but the reason for the alarm in the system is the challenge to find. All active alarm in the system is stated in the alarm list. This list shall be empty when the system operates normally
- Check the alarm up in the operation manual and evaluate around this.
- Use the tables below as checkpoints; keep attention to blocked filter and solenoid valves.

Brake System

PROBLEM	CAUSE	SOLUTION
No hydraulic pressure	Pump not running	Check if any alarms on level, temperature etc. Check electric system for pump
	Pressure switch set too low	Check pressure, set the pressure switch on the pressure indicated in the hydraulic drawing
	Pump is not delivering enough pressure	Check connection on pump for leakage inside tank, check relief valve and check connection between motor and pump
Brake is not lifting by activating the winch	Pressure not high enough	See above point
	Hydraulic valve is not sending pressure to the brake	Check pressure on the brake itself, check if the valve energies
	Pressure feedback doesn't work	Check the pressure transmitter, measure pressure.

Motor Cooling

PROBLEM	CAUSE	SOLUTION
No hydraulic cooling pressure	Pump not running when gear temperature is high	Check if any alarms on level, temperature etc. Check temperature sensor on the gearbox, check electric system for pump
	Filter is blocked	Check pump pressure, Change filter element
	Pump is not delivering enough cooling flow	Check bypass valve on the HPU
Operating winch do not get cooling flow	Cooling valve doesn't open	Check valve function, check electrical connection for valve
	Motor inlet/outlet blocked	Measure the pressure and check the inlet/outlet

Gearbox Cooling

PROBLEM	CAUSE	SOLUTION
No hydraulic cooling pressure	Pump not running when gear temperature is high	Check if any alarms on level, temperature etc. Check temperature sensor on the gearbox, check electric system for pump
	Filter is blocked	Check pump pressure, Change filter element
	Pump is not delivering enough cooling flow	Check bypass valve on the HPU
Operating winch do not get cooling flow	Cooling valve doesn't open	Check valve function, check electrical connection for valve
	Gearbox inlet/outlet blocked	Measure the pressure and check the inlet/outlet

Hydraulic System

For mechanical troubleshooting the first challenge is to decide how to start trouble shooting, sometimes this is obvious, but on other occasions a detective work will be necessary. After some experience there is easier to attack the problem and find reason for this.

Check constantly around oil leaks and loose bolts, cracks etc.

The following principles will help to start correct troubleshooting

- Check for abnormal heat or noise and try to identify where this come from
- Check drawings for the unit which have problems and try to eliminate
- Use the table below as checkpoints;

PROBLEM	CAUSE	SOLUTION
Oil leak from gearbox	Broken shaft seal	Check bearing and change seal as soon as possible
	Broken seal or O-ring	Check if there have been high pressure in the gearbox, and change the seal as soon as possible
Noise or heat from gearbox	Lack of lubrication	Check lubrication and refill if needed.
	Disc brake overheat	Check lubrication and refill if needed.
	Problem with gearbox bearing etc.	Gearbox to be overhauled.
Parking brake does not hold the load	Brake out of adjusting	Adjust the brake after instruction on mechanical drawings
	Brake function failing	Brake to be overhauled
Operating winch do not get cooling flow	Cooling valve doesn't open	Check valve function, check electrical connection for valve
	Gearbox inlet/outlet blocked	Measure the pressure and check the inlet/outlet
Resistance in spooling shaft	Problem with bearing.	Check lubrication, bearing to be changed
	Problem with shaft/nut connection	Check lubrication, Nut to be dismantled and overhauled
Noise, heat or slack i sheave bearing	Lack of lubrication	Check lubrication and refill if needed. Change bearing
	Mechanical malfunction	Change bearing

Training Program





MACGREGOR

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