



MBARI “New Research Vessel”

TECHNICAL SPECIFICATION FOR ELECTRIC DRIVEN RESEARCH WINCH SYSTEM.

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REVISION HISTORY

Rev.	Date	Done by	Approved by	Comment/ Changes
00	07.01.2019	DHN		Issued for review
01	21.03.2019	DHN		ROV winch – alternative as TRW-system
02	08.04.2019	DHN		ROV Winch – alternative with direct pull winch removed. Dim. sketch number for TRW corrected.
03	07.06.2019	DHN		CTD winch redesigned – RH328323 Storage drum redesigned – RH328252 Level wind incl. slack wire compensator redesigned – RH328253
04	05.05.2020	WSB		Cable and slip rings included, HPU's included, misc. corrections. Issued as draft.
05	14.05.2020	WSB		Misc corrections /adjustments after review. Released for bid.
06	17.07.2021	DHN	WSB	Setup of traction winch system “mirrored” as per final winch room layout. • Traction Winch RH329031 replacing RH327920 • Level Wind w/Slack Wire Compensator RH330303 replacing RH328781
07	03.08.2021	RAJ	JFN	Main supply voltage changed to 480V 60Hz
08	31.08.2021	DHN/RAJ	WSB	Various updates as per client remarks. -
09	17.09.2021	WSB	WSB	Various updates as per discussions with Freire, as per B731-Techspec-MBARI-140041.07 10190007 dated 16.09.2021.
10	04.10.2021	WSB	WSB	Motor size Storage Reel corrected from IEC225 to IEC200. Technical Specification 15110.01-800-00 is referred to. Index / chapter numbering is corrected.
11	21.12.21	FFA	FFA	HPU dim. drawings updated. Performance and pull diagram updated for ROV & CTD system Dimensional drawing CTD updated RAL-code confirmed
12	21.01.2021	FFA	FFA	Dimensional drawing and weight CTD updated Dimensional drawing TRW Updated Dimensional drawing Level wind/SWC updated Dimensional drawing storage drum updated

1. GENERAL DESIGN CRITERIA FOR THE EQUIPMENT

- ✓ Ambient operating temperature for winches and handling equipment installed on deck -20°C to + 45°C with 100% relative humidity
- ✓ Operating temperature for equipment installed under deck/indoor 0°C to + 40°C with 50% relative humidity
- ✓ Survival temperature (not operating) - 30°C to + 60°C
- ✓ Operational limit: Winches are designed for operation at Sea State 5, but we cannot guaranty that all the scientific equipment will be possible to launch and recover at this sea state.
- ✓ Recovery limit: Winches are designed for recovery at Sea State 6, but we cannot guaranty that all the scientific equipment will be possible to recover at this sea state.
- ✓ Main Power supply 480V 60Hz
- ✓ Control System voltage AC230V60Hz
- ✓ All Electric motors are TEFC (total enclosed fan cooled) anti-condensation heaters, above 10kW. Insulation Class F and thermal rated with Class B temperature rise.
- ✓ Electric motors for the winch drives have internal PTC temperature sensor
- ✓ All electric winch drive motors have enclosed rating IP56
- ✓ All HPU electric motors have enclose rating IP54
- ✓ Enclosure rating for other electric equipment (installed on deck or under deck):
 - Encoders IP66
 - Proximity switches IP67
 - Load Cells IP66
 - Control Panels on deck/hangar IP66
- ✓ Enclosure rating for other electric equipment (installed under deck and in control rooms):
 - VFD Cabinets without AC IP54
 - Starters for HPU's IP54
 - Control Panels IP22
- ✓ Scientific winches are designed and produced in accordance with DNV Lifting Appliances for Offshore Crane No.2,22 -2013 and with Subpart 189.35 of 46 CFR Subchapter U Based on Dynamic Amplifying Factor (DAF) 1.8
- ✓ Certification of winches is not included.
- ✓ Equipment is delivered according to Technical Specification 18110.01-800-00 MNV Contract Spec_RevD_2021_04_08_FINAL, limited to section 070, 300, 301, 302, 303, 304, 305, 324, 556, 710 and 711
- ✓ All winches and sheaves have included foundations for installation to reinforced ship deck structure provided by the customer.
- ✓ Basis for our drag force/dynamic calculations:
 - Friction factor for cable/wire (C_{df}) 0,03
 - Drag factor for "tools" (C_{dz}) 2,5
 - Average hauling speed 1,0 – 1,7m/s
 - Vessel motion 1m/s
- ✓ All storage/take-up drums has 3 – 4mm wear plates of stainless steel installed inside the drum shield.
- ✓ All drum core's and sheave diameters in the total winch and handling system complies with the rope/cable/wire manufacture minimum bending requirement or better.
- ✓ On research winches, functionality for constant speed setting (compensate for change in diameter for different wire layers).
- ✓ MacGregor will fulfill DNV requirements of Class Notation Cyber Secure Essential (+) with OHS (Overboard Handling System) to a security level SP3; and collaborate with Shipyard's

consultant.

- ✓ MacGregor will collaborate with Shipyard's consultant (TSI) in respect of Noise & Vibration recommendations

2. CLARIFICATIONS

- ✓ The estimated noise level for airborne noise is stated under each winch in this specification. The noise level will vary from nominal to maximum speed of the winch.
Note: The noise data recorded during FAT might be different from the noise recorded after installation on the ship in a closed winch room – due to other background noise and structural vibrations.
It's important to categorize the maximum noise requirements between "unmanned" and "manned" in the different compartments like, Main Winch Room and "Working Deck". During "launch/recovery" operation, the winches are working at very slow speed and could comply with a "manned" requirement without ear protectors, in opposite to the operation when the scientific package is in water and the winches are working at full speed and maximum noise level – "unmanned" requirement.
- ✓ To make sure that the winches and handling system is designed and dimensioned to handle the related dynamic loads, we strongly suggest that all the scientific packages are identified and described with size and weight along with planned maximum cast depth.
- ✓ Winch system described is not EX certified
- ✓ Minimum cross section on power cable to be 1,5mm², signal cables may be below this
- ✓ Cable, cable glands, terminal pads etc internally on equipment are of IEC, DIN EN standard.
- ✓ Cable types and sizes prescribed on cable diagram are according to IEC, DIN EN standards.
- ✓ Cable glands related to external connections on equipment are considered Yard supply.
- ✓ Electric starters are furnished with disconnecting switch.
- ✓ Wire routing still to be agreed upon/confirmed.
- ✓ Type of slip rings still to be agreed upon/confirmed.
- ✓ Type of cable/rope/wire still to be confirmed/approved by CUSTOMER.
- ✓ CUSTOMER needs to confirm the speed and acceleration at the overboard sheave.
- ✓ To make sure that the winches and handling system is designed and dimensioned to handle the related dynamic loads, we strongly suggest that all the scientific packages are identified and described with size and weight along with planned maximum cast depth.

3. RESERVATIONS AND LIMITATIONS

General

Based on a cast depth, our presented dynamic studies of winch/cable loads need to be further discussions/considerations as to the related MBL/RWL and operational safety factors – see graphs under items

For this above reason, we cannot guarantee the service life of any of the EM/EOM/COAX cables included into this specification.

The wire routing for the required locations of deployment, involve several guide sheaves with 90°bending, reverse bending and bending in different planes.

For this reason, the service life of the cables/rope/wire will be reduced.

Integration towards third party's systems and such is not included, but may be subject to variations after necessary interface details of such is submitted to MacGregor. Variations may or may not be subject to additional cost.

Cable Loading During Operations

Cable Conditioning: "Spin Out" during the Initial Deployment All new cables/wires need to be relieved of the constructional stretch and cast that become stored within the armor package as a part of the normal manufacturing process. This initial "spin out" can be accomplished by deploying the cable/wire to full depth with either the payload attached or just a clump weight while allowing it to rotate freely. While one such deployment may not completely relieve the cable of all trapped energy, it has been shown to remove a significant portion of it. If a full-depth spin out can't be performed, going through this process to the depth of the project at hand will still aid in conditioning the cable. A record of all such cable/wires conditioning will help to ensure they are performed each time the cable is used on a project that exceeds the previous deepest deployment.

Further, over time the cable/wire might be subject to diametrical contraction due to elongation, compression and wear when loaded/used. Also, a large variation in linepull might result in diametrical variation of the cable/wire in respect to the underlaying layers spooled on the drum.

For the above reasons, we cannot guarantee any changes to occur in the quality of the spooling on the winches. It might be necessary to make a complete rewind to ensure quality of the spooling on the winches after some time in operation.

Cable spooling

MacGregor cannot take the full liability for the final result of the spooling of customer supplied cables unless any errors are directly caused by the winch not being in compliance to the agreed technical specifications. In such a case MacGregor liability shall be limited to rectifying the non-compliance on the winch.

The condition of a customer supplied cable and its conformity with respective data sheet is the customer's sole liability at and upon arrival at mutually agreed place of delivery.

Cable termination

It is the Customer responsibility to perform termination of winch end and mission equipment end. The Customer holds the liability of the integrity and conducting performance of the cable under and after the work of termination. It is also the Customer's responsibility to control the integrity / performance of cable before work of termination is initiated.

4. CTD WINCH

1.ea Research Winch HW515T90.

Drum winch with top inlet 90-degree spooling.

Spooling with 90deg swivel function.

Winch model HW-515-T90 acc. to drawing 2000004676

Wire capacity: 6650m of cable 8,18 mm in 25 layers.

Drum size: dia. 502/990 x 982mm

Singe motor drive – ABB electric motor, IEC 200 – High output motor.

Planetary/bevel/parallel gearbox – BPH323, ratio 35,67:1

SWL 4,0 tons

Electro hydraulic actuated band brake with capacity SWLx1,8

Electric driven and synchronized level wind for 8,18 mm cable.

Lebus sleeve for 8,18 mm cable.

Tension control.

Slip ring prepared for and included; 4 pass - 7A/1000V. Focal 180

Cable included, 6500m of Rochester A301592

Winding of 6500 m of cable A301592 under tension is included.

Type of electric system: Frequency controlled system.

Active Heave Compensation (AHC) included.

Est. weight 4250kg – ex. cable

Winch performance as described in table below is related to:

Power Requirement 46kW

Wire layer	Dia.(mm)	Nominal speed			Maximum speed		
		Motor speed	1336 RPM		Motor speed	2806 RPM	
First layer	510	4,0 t/	60 m/min.		1,9 t/	126 m/min.	
Half length	739	2,8 t/	87 m/min.		1,3 t/	183 m/min.	
Top layer	903	2,3 t/	106 m/min.		1,1 t/	223 m/min.	

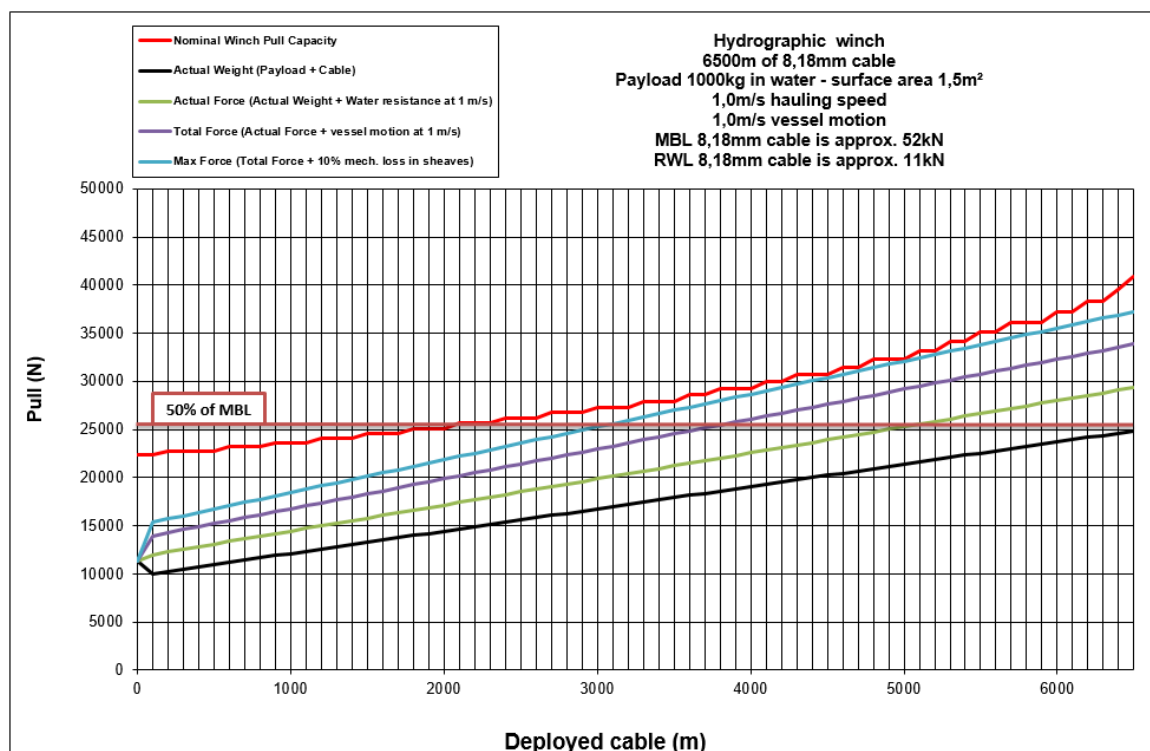
Table based upon 6500meter of 8,18mm cable

Control panel for local and emergency control installed close to the winch:

- ✓ Activate winch switch
- ✓ Control here
- ✓ Alarms
- ✓ Joystick for Pay-out and haul in
- ✓ Emergency stop switch
- ✓ Manual spooling
- ✓ "one button launch & recovery"

Performance and Pull diagram

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



Active Heave Compensation capabilities

Diagram for definition of required acceleration (dw/dt) and speed (m/s) based on pure Wave height H_{s5} and period T_{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.

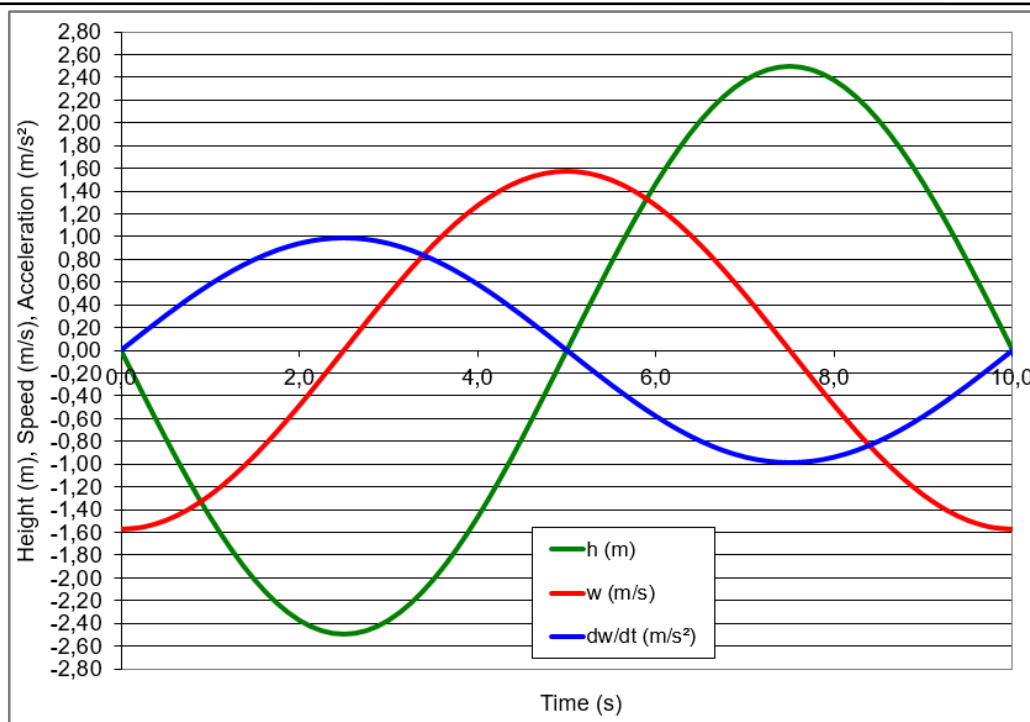


Image of winch (side operation)

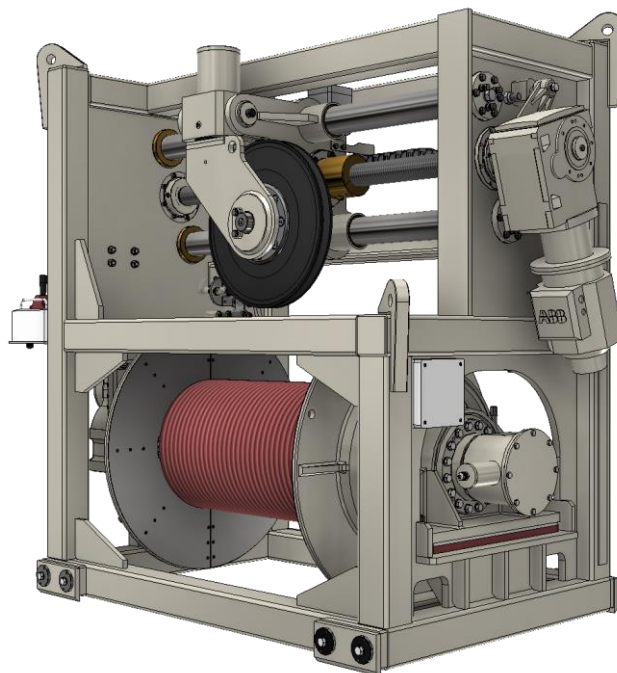


Image: Iso view of winch (image might deviate from actual product)

Image of winch (aft operation)

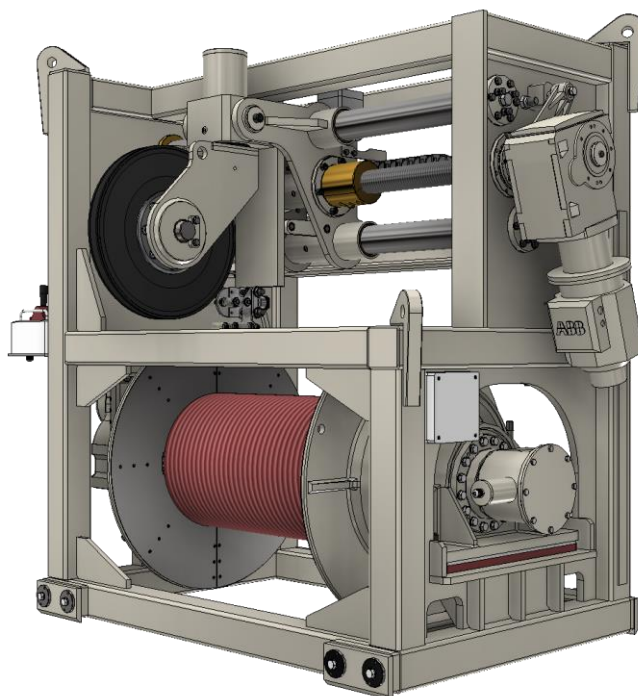


Image: Iso view of winch (image might deviate from actual product)

5. ROV WINCH – TRACTION WINCH

General Technical Requirement for the System:

Cable spec:

Umbilical wire, length = 5000 meters
Diameter = 20,0 +/-0,3mm (Fibron, ref dwg RM0058)
Weight = 1,26kg/m in air – 0,94kg/m in seawater.
Minimum bending diameter is 800mm (dynamic)

ROV/Cage.

Weight ROV/TMS/WP in air = 5760kg.
Weight ROV/TMS/WP in sea = 250kg. (ROV considered buoyant)

Wire + ROV/Cage in max water debt:

Max. dept = 5000meter, cable weight (5000m x 0,92kg/m) = 4600 kg
ROV/TMS/WP in sea water = 250 kg
Total weight in sea water (at 5000m depth) = 4850 kg

Drum parameters on winch:

1. Drum flange diameter = 2050mm
2. Drum length = 2000mm
3. Drum core min. = 1505mm
4. Wire dia = 20,0mm
5. Wire capacity: = 5000m
6. Wire turns = 99,5
7. wire layer = 11

1.ea ROV Winch – TRW SYSTEM

15T Traction Winch System for AHC comprising of

1ea. Traction Winch

Model: TRW-4004E-01R1.

Drawing: 400092475.

Traction heads with PCD 1238mm fitted with split sleeve for easy replacement/change.

Dual Electric Motor drive/ABB air cooled high output type/IEC225.

Sleeves for 20 mm. dia cable.

Traction head sleeves is of split type design.

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

Image of winch

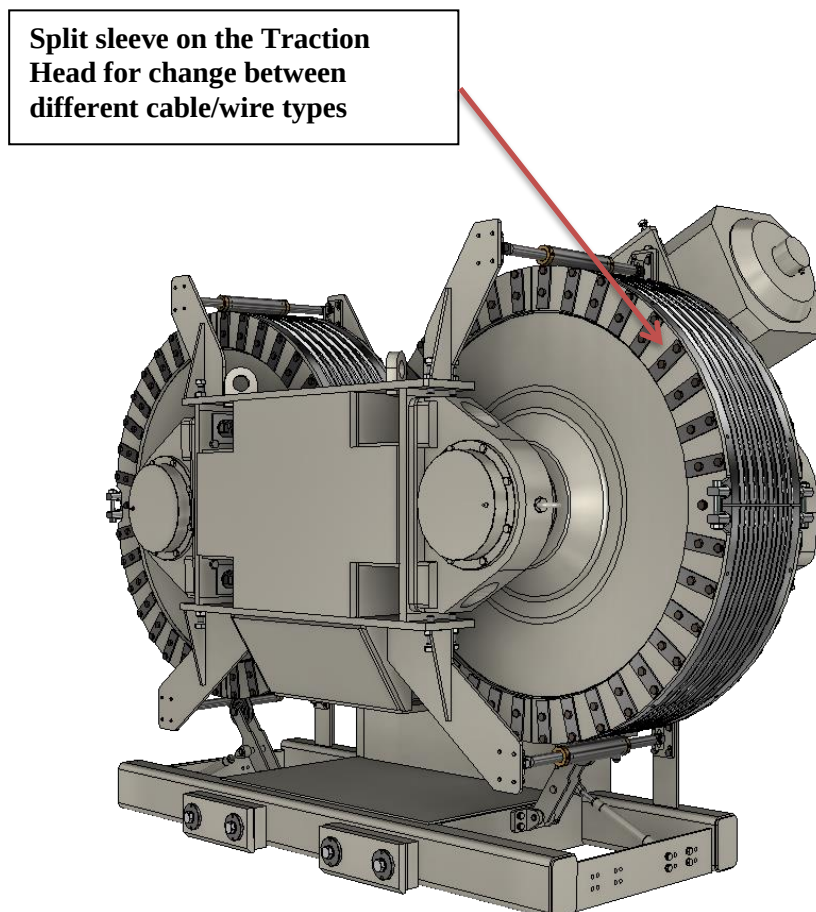


Image: Iso view of winch (image might deviate from actual product)

1ea. Combined Level Wind incl Slack Wire Compensator.**Model:** ELSWC5000-L2000.**Drawing:** 400092566Level Wind

Electric driven and electronic synchronized.

Sheave PCD diameter: 1ea. 900 mm.

Material in sheave: Composite.

Slack Wire Compensator

Sheave PCD diameter: 2ea. 900mm + 1ea. 900mm.

Material in sheave: Composite The Slack Wire Compensators position is logically positioned in relation to the operational sequence of the Traction Winch and the Storage drum.

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

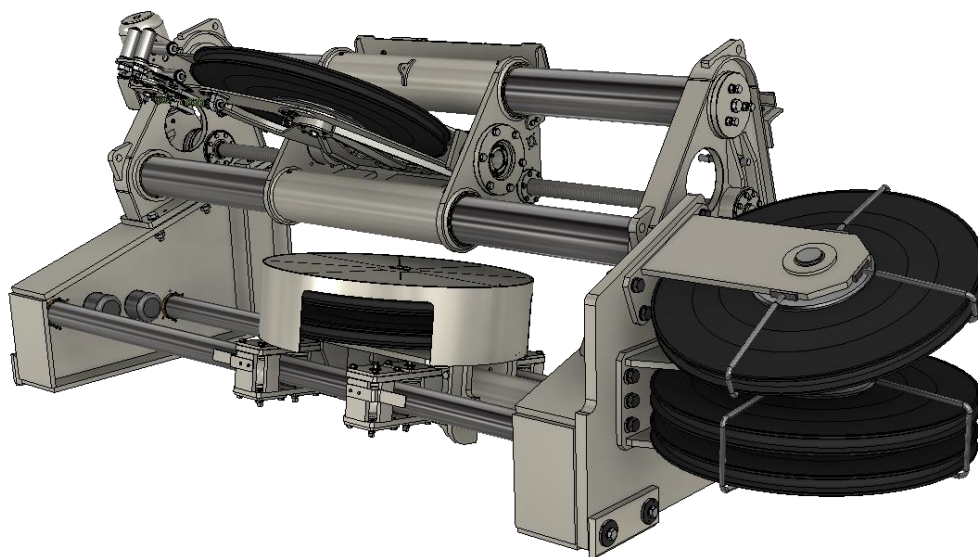
Image of level wind

Image: Iso view of winch (image might deviate from actual product)

1ea. Storage Drum.**Model:** RW-2372EB**Drawing:** 400092447

Storage Drum size: dia. 1470/2050 x 2000mm.

Lebus sleeve with PCD=1525mm. Mounted with wear plates on drum shields.

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

Maximum storage capacity is 5000m. of 20mm. dia. cable at 9 layers and OD=1950mm.

Single motor drive/ABB air cooled high output/M3BP200 frame.

Slipring included, type Focal 176/291, 5 pass 4500V/20A, 4 pass 1000V/7A, 6 SM fibre pass.

Cable is not included.

Winding of 5000 m of cable Fibron 20 mm umbilical, acc. to dwg. RM0058 under tension, is included. **Cable must be provided by customer to MacGregor facilities to conduct the winding. Required time of delivery for cable and cable sample will be advised by MacGregor.**

Maximum cast depth: 4050m (4700m. cable deployed).

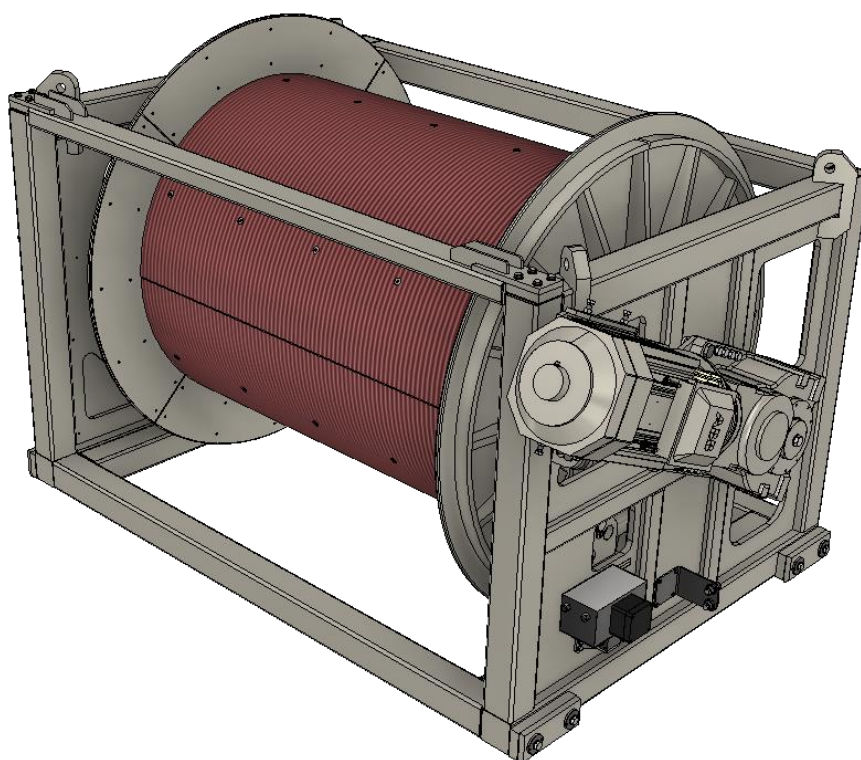
Image of winch

Image: Iso view of winch (image might deviate from actual product)

Control panel for local and emergency control installed close to the winch:

- ✓ Activate / select winch switch
- ✓ Control here
- ✓ Alarms
- ✓ Joystick for Pay-out and haul in
- ✓ Emergency stop switch
- ✓ Manual spooling

Total Combined winch system performance:

SWL 15,0 tons.

Hydraulic operated fail safe brake with capacity SWLx1,8

Constant Tension control.

Local and Remote control.

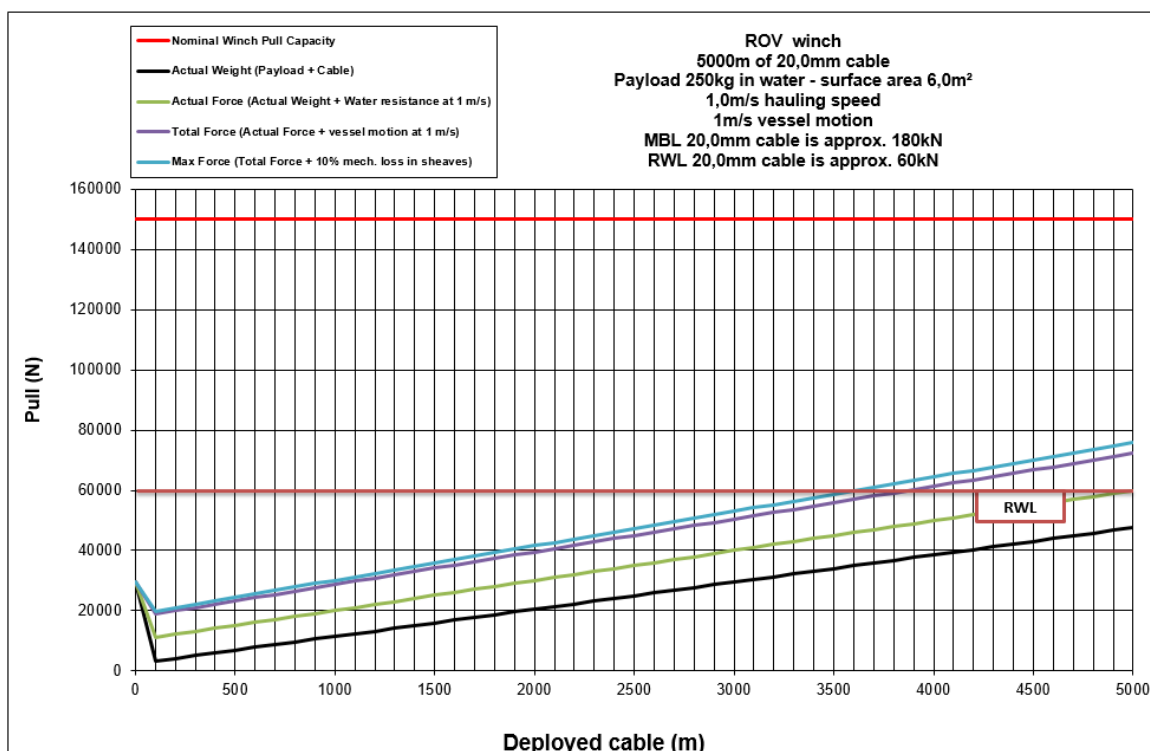
Winch performance at power requirement 190kW – including driving one Storage Drum and one Level Wind.

Peak power requirement for AHC operation (HS5 Period10) is 225kW - including driving one Storage Drum and one Level Wind.

Wire layer	Dia.(mm)	Electric motor at 1500 RPM		Electric motor at 2500 RPM	
Traction head	1238	15,0 t/	60.0 m/min.	9,0 t/	100.0 m/min.

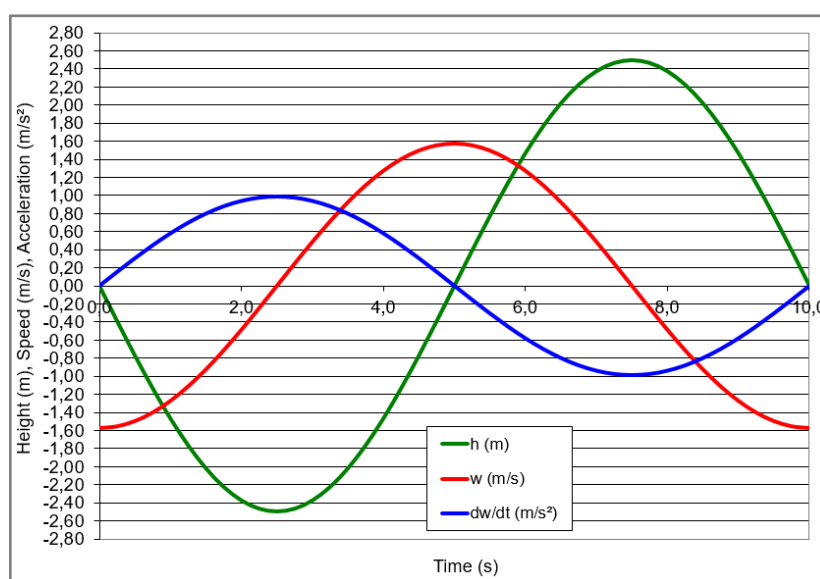
Performance and Load diagram

Diagram showing load cases with deployment of 5000m of cable:



Active Heave Compensation capabilities

Diagram for definition of required acceleration (dw/dt) and speed (m/s) based on pure Wave height H_{s5} and period T_{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.



6. MAIN DRIVE SYSTEM FOR THE WINCHES

Electric main drive system

Main power 480V/60Hz

Power requirement: 190kW (peak power 225kW)

Dimensional sketch: RH330319

Single line diagram: RH330320

CTD Winch

- 2 ea. Frequency converter low noise regenerating for the drive of:
1 off for main drive CTD Winch (5).
1 of level wind CTD Winch (5)

ROV TRACTION WINCH SYSTEM

- 2 ea. Frequency converter low noise regenerating for the drive of:
1 off for Traction Winch (6).
- 1 ea. Frequency converter low noise regenerating for the drive of:
1 off for Storage winch (6).
- 1 ea. Frequency converter low noise regenerating for the drive of:
1 off for Level wind (6).

NOTE!! The Frequency Drives are AFE type meaning that the vessels main Switch Board and electric system need to have the facility to receive all the regenerated power from the winches. PMS integration with floating limits.

7. HYDRAULIC BRAKE AND COOLING SYSTEM

Hydraulic one line diagram TBC

Item 7a Hydraulic system for brake and slack wire compensator.

- 1 ea. Hydraulic Power Unit (HPU), mainly comprising of:
 - 2ea. Elec. hydraulic power pack 3,0 kW/3x480V/60Hz/IP55 S6-40% load rating, fixed displacement hydraulic pumps, included Oil tank, oil cooler and Accumulator.
 - 2 ea. Starters as part of the complete control system.
- Prepared for bio degradable oil, type and brand to be sent to Macgregor for approval.
According to dim sketch 2000004113

Item 7b Hydraulic cooling system for the winch drive gearboxes.

- 1 ea. Hydraulic Power Unit (HPU), mainly comprising of:
 - 2ea. Elec. hydraulic power pack 1,5 kW/3x480V/60Hz/IP55 S1-100% load rating, including fixed displacement hydraulic pumps, oil reservoir as well as filters, necessary valves, thermal switch, check valves and hoses.
 - Oil cooler approx. 30kW cooling capacity at 38°C water temperature installed on HPU
 - 2 ea. Starters as part of the complete control system.
- Prepared for bio degradable oil, type and brand to be sent to Macgregor for approval.
According to dim sketch 2000004110.

Required fresh water cooling supply@ maximum 38°C is

8a = 25l/min & 8b = 50l/min.

Note: The water supply on/off solenoid valves for water inlet are yard supply, but controlled from the MacGregor control system.

Water pressure shall be sufficient to overcome cooler cross port pressure at max. 2 bar.

8. COMMON CONTROL SYSTEM

8.1 Integration:

The Pentagon provide a wide range of opportunities to integrate third party equipment/suppliers, here under.:

- ✓ Power Management System (PMS)
- ✓ Integration true OPC/UA, winch data and alarms.

8.2 Motion Reference Unit:

Required available signal from Kongsberg MRU-H, generation 5 unit or similar.
MRU is optional, not included in this quote.

8.3 Over stern/over the side operation

System is integrated with radio control for handling, ref specification 101900007.09

The radio control has following functions for the winches:

- ✓ Activate winch switch
- ✓ Control here
- ✓ Alarms
- ✓ Joystick for Pay-out and haul in (switching between the three winches)
- ✓ Tension control
- ✓ Display for speed, length and tension monitoring
- ✓ Emergency stop switch

9.4 Common Control in Control Room

Pentagon™, Computerized Winch Control System

Pentagon Control/monitoring panel for remote control and automatic control of winches under item 5 & 6 – dwg.RH311505 with the following functions:

Pentagon Research system with touch screen for:

- ✓ Automatic pay-out and haul back at pre-set lengths, speed and tension.
- ✓ AHC – active heave compensation control for the winches
- ✓ Alarms
- ✓ Joystick for Pay-out and haul in for one winch at the time.
- ✓ Length, speed and tension monitoring
- ✓ Switching between winches
- ✓ Split screen when operating two winches simultaneously.
- ✓ Emergency switch
- ✓ Settings of display and system
- ✓ Setting control priority
- ✓ Logging facility of relevant winch data.



9. CONTROL FEATURES

Speed control accuracy on the electric driven winches

Down to 0,1m/s in normal mode and down to 0,02m/s in “creep mode”

In the Rapp control system, we have two modes of manual control. When the operator wants to have a very fine and accurate control he switches over to “creep control” which will give **continuous variable speed in increments of down to 0.02m/s**

Monitoring systems for cable/wire/rope tension, length and speed

Standard System # 1 for research winches: Calculated values

- ✓ Using the encoders on the electric motors for calculation of length and speed.
- ✓ Using the torque loading (from the VFD) on the electric motors for calculation of tension.

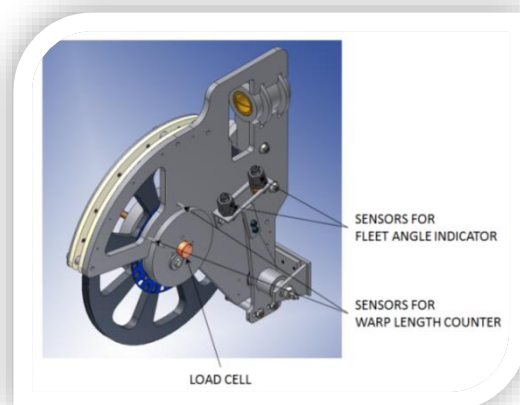
System # 2 for research winches: Measured values

- ✓ Load cell in the spooling sheave or in deck sheave for measurement of tension.
- ✓ Encoder in the spooling sheave or in deck sheave for counting of revolution with corresponding calculation of length and speed.

The monitoring system to be used is chosen by the operator from the control system.

System #1 and system #2 is back up to each other

– means we have 100% redundancy.



Electric driven and synchronized level wind system

- ✓ Synchronized based on a fixed adjustable pitch (ratio between the winch drum and the movement of the level wind carrier)
- ✓ Fleet angle sensor spooling (sensing the fleet angle on the wire between the layer on the drum and the level wind carrier)
- ✓ Combination of synchronized spooling and fleet angle sensor (fleet angle sensor will “reset” position of the level wind carrier if the synchronized spooling is lacking behind or is ahead). This is a feature used when spooling long cables – 5000m or more.

Tension control/auto rendering and heave compensation

- ✓ All winches has tension control and “auto rendering” features – means that that the winch will stop/or give out at the pre-set tension.
- ✓ Active Heave Compensation (AHC) is included for the winches.

Safety system in winch room

- ✓ Flashing lights when winches are in operation

10. DOCUMENTATION AND ASSISTANCE INCLUDED

Service and assistance included:

- A) 3 ea hard copy and electronic (pdf) Engineering manuals in English language including:**
- Hydraulic system schematics
 - Electric wiring diagrams.
 - General installation instruction.
 - Dimension sketches of winches.
 - Dimension sketches of control panels and cabinets.
 - Flushing and cleaning procedures for hydraulic pipes.
- B) 3 ea hard copy and electronic (pdf) Operational manuals and spare part catalogues in English language including:**
- All relevant drawings with part lists and specifications.
 - Operational instruction for the Pentagon control system and winches.
 - Manufacturer's test certificates of winches.
 - Lubrication chart
 - Manufacturer's test certificates of winches.
 - On board Repair Part List as recommended by MacGregor, based on:
 - Cruise duration of 21 days in remote areas
 - Frequency semi –annual or greater (daily, weekly, monthly etc)
 - Hourly maintenance of under 2000 hrs frequency
 - The list shall contain prices of the parts.
 - Vendor Recommended Spares List as recommended by MacGregor:
 - Items required for preventive maintenance cycles greater than semi – annual, and greater than 2000 hrs.
 - The list shall contain items not readily stocked by vendor, with a greater than 90 day lead time. Frequency semi –annual or greater (daily, weekly, monthly etc)
 - The list shall contain prices and weights of the parts.
- C) Project and production QA will be provide as following:**
- Project schedule plan with progress reporting
- D) Start-up assistance/training:**
- Technical supervision and inspection of installation, start up assistance and dock trials will be carried out by one of our service engineers. According to mutually agreed and approved protocols. Included are travel expenses, lodging and labour hours for inspection and guidance.
A total stay of 10 days (one trip) at the yard is included. Each working day shall not exceed 10 hours and shall be executed mainly during normal working hours and normal working week. We require a notice from the yard 20 days before such assistance is to be performed.
 - Assistance during full scale trials out at sea, according to mutually agreed and approved protocols, including training of crew in operation and maintenance from one of our

engineers is included with a stay of maximum 10 days out at sea. This activity is to take place after dock testing and will be executed by personnel departing from Norway. Customer is responsible for covering cost of travel and other related expenses arising from travels to and from the place of execution.

- If the allocated number of work hours for supervision and trials are exceeded due to reasons and delays at the yard which are beyond MacGregor's control and/or responsibility, MacGregor will charge EURO. 1890,- per additional working day (Monday – Friday) at the yard, plus expenses.

- The hydraulic- and electric installation, winch foundations and alignments must be completed before the trials can start at shipyard. MacGregor's representative's involvement during start-up and final testing/sea trials is limited to ensuring that pipes are properly sealed and do not show any leakage under working conditions i.e. full system pressure and that all equipment supplied by MacGregor is operating as specified.
- MacGregor is not responsible for installation that has been carried out differently from submitted specifications.
MacGregor is not responsible for starting prime movers or supervision of same during start-up or trials.
The yard and/or the owner are responsible for allocating their own personnel to carry out any supervision or remedial work required at their own expense.

11. ALIGNMENT AND FOUNDATION OF WINCHES ON BOARD THE VESSEL

All winches mounted on board the vessel shall by Ship Yard be aligned in accordance with normal practice for this kind of machinery and as per instructions from MacGregor found in engineering manual.

Design, engineering and production of deck foundations for specific winches are the buyer's (shipyard or vessel owner) responsibility. Such foundations must comply with:

- Common practice and well-known engineering principals for marine rotating appliances for installation on deck.
- Class society requirements for marine rotating appliances for installation on deck (e.g. DNVGL Rules for Ship, section – Foundations for deck machinery, towing equipment and lifting appliances).

For the main winches, deck foundation must have sufficient stiffness to avoid excessive deflections, in respect to the above, under winch load. If not otherwise specified, such winch load is to be taken as rated line pull for the winch at half/mid wire layer (ref. performance table for actual winch). Deflection values, as result of structure analysis, can be submitted to MacGregor for information and comments/ evaluation.

12. SURFACE TREATMENT

Products manufactured by MacGregor, in this case all items in this technical specification are surface treated according to our standard specification:

- Shot blasting to Grade SA 2,5-3,0/ISO standard 8501-1.
- Zinc metallizing Minimum Thickness 60μ but average 80μ
- Tie coat (primer) Thickness Intercure 202, 50% diluted
- Hi-build Thickness Intercure 202
- Top coat Thickness Interfine 691

Total thickness paint is minimum 240μ but average will be above 315μ

- Color code RAL-9016 Confirmed

Note:

Sand blasting and zinc metallizing does not apply for Electric motors with aluminum housing, Delicate hydraulic components, Stainless steel components, Aluminum components, and if there are used Allen bolts with strength class 12,9.

13. SPARE PARTS FOR WINCHES

Standard package of spare parts and special tools **not included – To Be Considered**

14. LICENCE PRODUCTION/COUNTRY OF ORIGIN

MacGregor has an international production and service organization where components, complete products and services listed in the technical specification could have a different country of origin than Norway. Shipyard and the owners accept accordingly this information as a general and final notification that some of the specified products (or services) may have been manufactured at different locations and consequently have another country of origin than Norway.

15. ALIGNMENT AND FOUNDATION OF WINCHES

All winches mounted on board the vessel shall by Ship Yard be aligned in accordance with normal practice for this kind of machinery and as per instructions from MacGregor found in engineering manual.

Design, engineering and production of deck foundations for specific winches are the buyer's (shipyard or vessel owner) responsibility. Such foundations must comply with:

- Common practice and well-known engineering principals for marine rotating appliances for installation on deck.
- Class society requirements for marine rotating appliances for installation on deck (e.g. DNVGL Rules for Ship, section – Foundations for deck machinery, towing equipment and lifting appliances).

For the main winches, deck foundation must have sufficient stiffness to avoid excessive deflections, in respect to the above, under winch load. If not otherwise specified, such winch load is to be taken as rated line pull for the winch at half/mid wire layer (ref. performance table for actual winch). Deflection values, as result of structure analysis, can be submitted to MacGregor for information and comments/ evaluation.

November 4th, 2021

MacGregor

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