Data Sheet

Ocean Master – AHC Winch
OM-4000-A6-6-384-222-RA-XXX
With Right Angle Level Wind

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Drawing no. OM-4000-A6-4-384-222-RA-006 – For info only

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Winch – Basic specification

Dimensions

Design factor (psi) : 2

Design temperature : T_D -20° to +45°C.

Overall dimensions (preliminary values) :

Depth (excl. sea fastening brackets)	3280	mm
Height (transport)	3445	mm
Height (operational)	4010	mm
Length (excl. sea fastening brackets)	5220	mm

Drum dimensions :

Core length	2545	mm
Core diameter	1500	mm
Flange diameter	2500	mm

Weight :

Winch *Excl. umbilical and slip ring.*	33 app.	ton

Cable capacity :

Cable length	Wire dim.	Layers	Comment
5450 meter	ø 35,0 mm	13 layers	Reduced SWL
4700 meter	ø 37,5 mm	12 layers	Reduced SWL
4000 meter	**ø 40,0 mm**	**11 layers**	**Standard SWL**
3450 meter	ø 42,5 mm	10 layers	Standard SWL
3250 meter	ø 45,0 mm	10 layers	Standard SWL

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Performance

SWL	:	Safe working load	222	kN
Pull/speed	:	Pull is at	690 50	V Hz Net
Continuous performance	:	Pull on top layer Speed on top layer	152 0-117	kN m/min
	:	Pull on first layer Speed on first layer	222 0-72	kN m/min
AHC Performance	:	AHC is operating from 0 Hz to a maximum of 80 Hz. With a TMS weight in water of 1,7 ton and an umbilical diameter of Ø 39 mm. with a weight in air of 5,74 kg/mtr. and 4,55 kg/mtr. in water. The expected max. Acceleration at a water depth of 1500m is, 2,4 m/s² and a speed up to 2,5 m/s. The AHC performance is improved on shallow water and reduced on deeper water.		
Power consumption	:		690 50 380 app.	V Hz Net Amp.

During AHC the current can be increased up to 130%.

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Construction

General : Self-contained all steel welded construction with drum, level wind and drive motors.

Bearings : Housed ferrous roller bearings.

Surface treatment :

Degreasing		
Sandblasting to ISO8501-1	SA	2,5
1 x Zinc primer	70	my
1 x Priming epoxy coat	130	my
2 x Top coat polyurethane à (total 80 my)	2 x 40	my
Total layer thickness	280	my

Colour RAL - TBA
Layer thickness regarded as minimum values

Level wind : Right angle level wind integrated, to be transported separately in a crate, and to be mounted on top of winch frame during mobilization.
Vertical exit angle -15 to +70 degree.
Horizontal +/- 0 degree.
Electrical driven spooling gear. A stainless steel encoder, make Pepperl+Fuchs 1024x1024; is placed on the level wind trapeze guiding spindle.
Spindle is driven by frequency controlled motor and gear. Together with the encoder placed on the winch drum a PLC controls the cable spooling.
Level wind equipped with ø1200 mm bottom of groove diameter sheave in PA6G material. Sheave carrying arm can be opened for installation of umbilical.

Motors : The winch is driven by six horizontal oriented electrical motors trough planetary gears driving a ring gear.

Brake : “Fail safe” disc-brake, make Pintsch Bubenzer, mounted on motor.
Electric OFF / spring ON.
Brake position feedback from micro switch.
Brake force according to DNV requirements for ROV handling.

Sea fastening clamps Sacrificial : 1 set of sea fastening clamps for welding to deck. Bolts for fastening brackets to tensioner foundation included.

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Electrical system, components and control system

Main switch board :
Separate item in stainless steel AISI316L, IP56 for installation on ship.
Cable for 10 m horizontal distance to winch included or alternative, cabinet mounted on back of winch – to be agreed.
Cabinet equipped with special ventilation system.
Three frequency converters, make Danfoss, for winch motor drives with encoder feedback card for closed loop vector control.
Frequency converters installed in separate part of the cabinet isolated from the PLC and rest of control system.
Frequency converter, make Danfoss, for level wind system.
One PLC, make Siemens S7-1200 for winch control, and AHC control.
Easy "on-site" recovery of PLC via provided SD card containing program backup. Backup is valid for the supplied winch, installation of the backup on other winches prohibited.
Level wind is controlled via PLC, programmed to suit actual cable diameter.
The PLC receives pulses from encoders placed on drum and level wind and thereby calculates the necessary movement of level wind to match the movement of the drum.

Brake resistor :
Type BRA-002
Separate unit in stainless steel AISI 316L for installation on ship.
Cable for 10 m horizontal distance to winch included.
Brake resistor air cooled, temperature monitoring in brake resistor with PT100 sensor, connected to alarm in control system. Temperature displayed in HMI.
Brake resistor divided in sections. Each section supports one frequency converter. Each section can easily be replaced in case of malfunction without affecting the other sections.

Electrical drive motors :
Six electrical motors 4 poled, make Lønne (Siemens), with brakes.
Cast iron motor and junction box for 690V@50 HZ frequency controlled operation 0-80 Hz, 64 kW, each.
IP56.
Forced cooling for low speed operation 0 Hz.
Anti-condensation heating 230V.
3 x PTC in winding.
Encoder for closed loop frequency control.

Motor supervision :
Motor mounted with PT100 sensor connected to alarm in control system. The sensors also control the cooling fan on the motors. The start/stop temperature is adjustable. Read out of temperature in HMI.

AHC functionality :
Winch system can respond to a ± 0-10V analogue speed signal from an MRU.

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Anti-drifting during AHC	:	The TMS have a tendency to drift when deployed in AHC mode for periods longer than 15 minutes. AD mode will keep the deployed TMS at a fixed depth.
Launch & recov. During AHC	:	The launch & recovery mode makes it possible to adjust the position of the TMS while the winch is in AHC-Mode. The set point for the anti-drifting functionality is changed by 10 cm for each sec. the joystick is actuated.
Motor redundancy	:	Switches for emergency drive with fail on one of the main motors, electric brakes or frequency converters are placed inside the main electrical cabinet. It is possible to operate the winch with one motor / frequency drive out of operation. Or even 2 drives out of operation, but then at reduced torque.
Safety on winch	:	Protection around moving parts on winch. Flashing lamp indicating remote control of winch, incl. 5m cable and magnetic foundation.
Constant tension "latched" (low tension)	:	Torque control. – When the TMS/ROV is latched to the A-frame and the strain on the cable is relived, it is possible to switch to low constant tension, and the winch will follow the movement of the A-frame. If the TMS/ROV drops out of the latch, the control system will detect the failure and switch to full torque, thereby preventing dropping of the stack.
Joystick scale	:	To avoid the TMS to "tip over" because of too high launch speed, the launch speed can be adjusted from 50-100% via the HMI.
Ethernet	:	Ethernet port on PLC and frequency converters. Enable remote reading and programming online, access provided by customer.
Main controls	:	Stainless steel AISI316L, IP56 box for open deck location, including: - PLC operator panel in 9" color touch screen with: Winch status Set-up winch/level wind, Alarms - All operation of the winch is on the touch screen, including handshake function for transferring command to remote control. - Joystick - Emergency stop - Cable 15 mtr. - Pedestal in stainless steel for deck mounting of control box - HMI controlled feature at protected high user level for raising torque to 125%, intended for load testing of termination.
Heating	:	Main switch board, motors and junction boxes (if possible) are equipped with electrical heating. During storage, an external supply of 220-240VAC, 50/60HZ is needed to maintain the heat function.

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Slip ring installation

Slip ring	:	Prepared for Focal type 176 slip ring.
Inside junction box	:	Prepared for 2 pcs. Max. Height 160 mm.
Outside junction box	:	Prepared for 1 pc. Max. Height 160 mm.
Umbilical installation	:	Mechanical steel clamp machined to fit the umbilical armor. + cable clamps supporting the stripped umbilical at winch drum. Support for one extra round of umbilical to make sure re-termination is possible. Auto stop with 8 turns back on drum.

Documentation

FAT	:	SH Group A/S standard FAT according to DNV´s Rules for Certification of Lifting Appliances – Cert. Note 2.22, June 2013
Manuals	:	One Fabrication record book. One System documentation. One User manual. Two Electronic versions on USB stick. Delivered in English.

Electrical installation

Motor cable, control cable, earthing, marking etc.	:	According to DNV´s Electrical Installations, October 2013. Offshore Standard DNV –OS-D201.

Design

System design	:	The system is designed according to DNV Lifting Appliances 2.22, June 2013 and prepared to meet requirements for certification.
Lifting design	:	Lifting devices on winch frame are designed, tested and prepared to meet requirements for certification according to DNV 2.7.3 Type A Class R30. Lifting devices are frame, pad eyes and lifting sling. Lifting sling included in delivery.
Quality Assurance	:	SH Group A/S operates a DS/EN ISO 9001-2008 certified quality assurance system.

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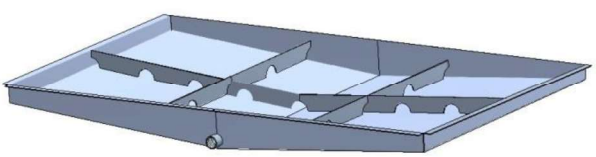
Winch – Options

The guide will lead you through the available winch options. Options are additional and not included in the winch basic price. Options are listed according to levels. Level 1 will be invoiced together with the winch basic price. Level 2,3… will be invoiced separately upon completion of each job.

Level 1 - Certification options		
Level 1 options installed on winch prior to FAT		
1.1	**DNV lifting appliances: 2.22 June 2013**	
1.2	**DNV 2.7-1 for max gross mass < 25 T**	
1.3	**DNV 2.7-3 for max gross mass > 25 T**	
1.4	**Custom specified certification**	
Level 1 - Additional design features and equipment		
1.5	**Umbilical cooling - external** Spray beam over drum for umbilical cooling.	
1.6	**Umbilical cooling - internal** The drum is fitted with internal plumbing and a water slip ring for dynamic water cooling of umbilical. Equipped with 3 x 5-7 spray nozzles.	
1.7	**Water-catch tray** V-shaped AISI 304 stainless steel tray with 2" outlet placed under drum.	

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1.8 Lebus shell

For optimal spooling lebus shell is always recommendable. Drum machined for tight fit. Bolt on design.

1.9 Central lubrication

By leading all grease points from level wind, pin bolts on band brake and drive wheels for gear drive to 2 pcs. Central placed “easy to reach” manifolds. Servicing is made easy and no hard to reach spots are “forgotten”. High pressure grease hoses are used and lead to the level wind trolley in an energy chain. Fittings are mild steel but wrapped with Densyl tape.

1.10 Emergency recovery panel (separate)

Emergency recovery function controlled from separate panel.
In case of failure in the control system (PLC) it is possible to recover the load.
Switch for pay in/out, level wind left/right and emergency stop.
Switches are hardwired directly to the frequency converters.

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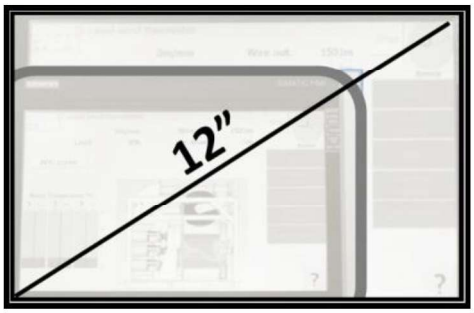
1.11 Remote control for bridge, 9" screen

19" rack remote control for indoor use. The control consists of a 9" colour touch screen, a joystick and an emergency stop.
All operations of the winch are controllable from the panel, like all alarms and status are visible.
Additional info:
- Control cable 50 mtr.
- Panel in RAL colour 9005

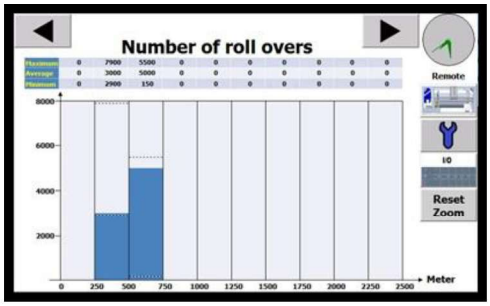
1.12 Touch screen size upgrade from 9 to 12"

Additional for option 1.11.
Touch screen on main control cabinet and remote control gets upgraded from 9 to 12".



1.13 Umbilical lifetime monitoring

Deploying TMS at same depth increases wear of the umbilical. This feature enables the user to identify the mostly used area on the umbilical and thereby take that into account, when the next deploying is being done. By clicking on a column the view will be zoomed in, giving the operator a more detailed view.



1.14 Radio remote control

For wireless control. Can be able to handle both winch and A-frame at same time. See appendix for more info.

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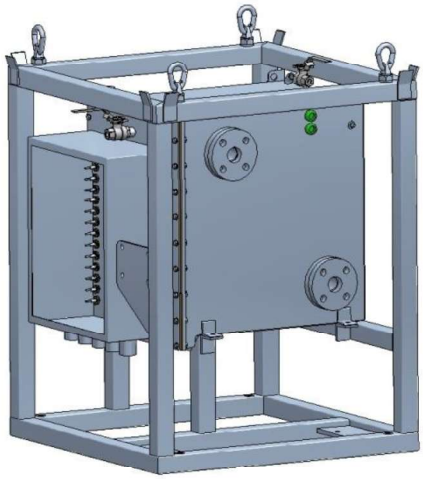
1.15 Water separation filter

Mounted on cooling HPU or brake HPU one filter pr. Unit. Filter keeps oil clean and avoids water in the oil coming from condensation.

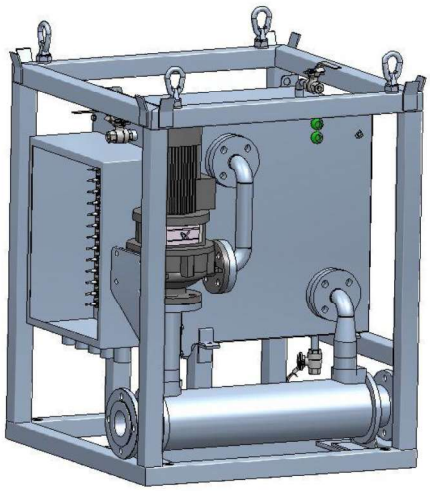
1.16 Brake resistor – fresh water

Liquid cooled, for fresh water use.
Requires 200 l/min. at a max temperature of 30°C.
Water supply to be provided by ship. Max water pressure 0,5 bar.



1.17 Brake resistor – sea water

Liquid cooled, for sea water use. The resistor is connected to a heat exchanger in a closed loop. Sea water does not get in contact with resistor elements. Requires 200 l/min. at a max temperature of 30°C.
Water supply to be provided by ship.



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1.18 Hydraulic band brake and brake HPU

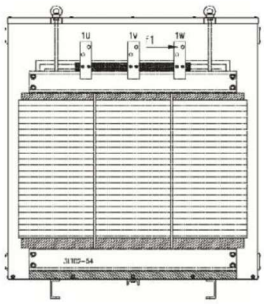
"Fail safe" model mounted on winch drum. Providing redundancy in the brake system. (Not mandatory feature for ROV handling according to DnV). Band brake is powered by included small HPU.
Brake system upgraded to meet DNV rules for offshore cranes when this option is selected.

1.19 MRU

Only for AHC winch.
Kongsberg MRU new type H-V including junction box, for client to mount on a suitable and stable location. Cabling between junction box and winch to be provided by client. Can handle 2 launch points.

1.20 Step Down Transformer for AHC winch

An independently housed transformer sized to handle a 690VAC input. IP 23 for indoor mounting.



1.21 Active THD filter

Recommended for generator <1500kW
Active filter Danfoss AHF 005.THID reduced from app. 20% to less than 5%
THD can be assessed upon receipt of filled out questionnaire covering Generator and power grid data.
Filter is delivered as loose item and must be placed in a sheltered area.

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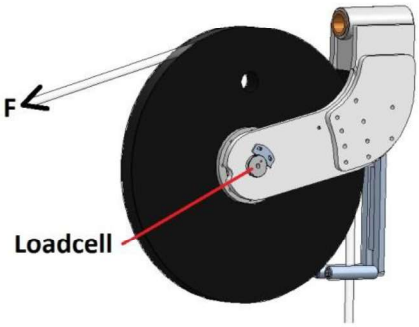
1.22 Load cell in RA level wind

Load sensing able by integrated load cell in cable sheave. Adjustment of load cell according to umbilical outlet angle.



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Level 2- Umbilical options

Options installed on winch after FAT

2.1 **Delivery of slip ring**
Standard Focal 176.
Interface to be agreed with client.

2.2 **Delivery of umbilical**
Interface to be agreed with client.

2.3 **Slip ring installation**
Termination and installation of free issued slip ring including Sepro delivery of junction boxes.

Power box (rotating)
325x465x150mm (wxhxd)
Material 1,5 plate 316L
IP56
With drain plug and space heater 230V
High voltage terminals UT10 with spacers max. 4,5kV
Barrier in front of terminals

Signal box (rotating)
325x375x150mm (wxhxd)
Material 1,5 plate 316L
IP56
With drain plug and space heater 230V
Terminals UT2,5 max. 250V
Fiber Optical splice cassette for 7 fibers
Pigtail connectors for 7 fibers.

Stationary box
525x600x150mm (wxhxd)
Material 1,5 plate 316L
IP56
With drain plug and space heater 230V
High voltage terminals UT10 with spacers max. 4,5kV
Barrier in front of terminals

Terminals UT2,5 max. 250V
Fiber Optical splice cassette for 7 fibers
Pigtail connectors for 7 fibers.

Connection between signal box and power box is done by SILVYN cable conduit system from LAPP.

2.4 Spooling

Spooling of free issued umbilical onto winch with tension. The job is done with a tension machine as pictured. Tension speed and length is logged and a spooling certificate issued.
Note: Test certificate for the umbilical must be provided prior to spooling!
Interface to be agreed with client.

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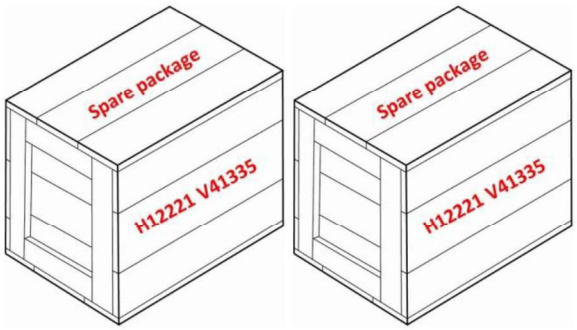
Level 3- Spare part options

Options delivered after FAT

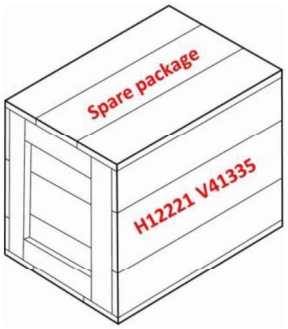
3.1 Full spare package

The full spare package contains spares for replacement offshore as well as onshore. An offshore spare applies to the maintenance, able to be carried out at sea. Onshore parts are those who require heavy lifting gear and will normally be used in service of the equipment.



3.2 Reduced spare package

The reduced spare package is basically containing spares for the maintenance to be carried out at sea.



Level 4 - Preservation and storage option

Option delivered after FAT

4.1 Preservation and storage

Preservation and storage of winch up to 6 months from FAT. Insurance not included.
- Emitters are placed in all electrical cabins and small junction boxes.
- All outer surfaces are protected with surface protection.
- Moisture absorbing units is placed evenly distributed inside the unit.
- The entre unit is carefully wrapped with UV resistant shrinking film.
- The outer protection film is inspected every third month for damage or cracks, if any then repaired.

4.2 Tarpaulin

Covering both RA level wind and winch when the complete winch is installed on the vessel during transit.
Covering winch with control panels mounted on winch.
Can be opened in all four corners allowing easy inspection. The locking mechanism will be suitable for marine environment and weather conditions.

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Level 5 - Shipping options

Options delivered after FAT

5.1 **Loading**
Loading of equipment.
FCA - according to incoterms 2010.

5.2 **Delivery**
Loading and delivery of equipment.
Location to be agreed, delivery according to DAP – Incoterms 2010.

Level 6 - Commissioning and installation

Option delivered after FAT

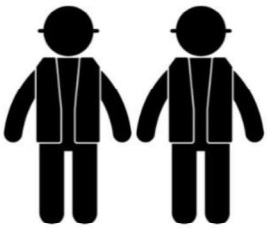
6.1 **Support**
Support during installation and/or commissioning by 2 service engineers for 5 days.
The price is excluding travel and accommodation cost:
Travel and accommodation costs will be invoiced as cost price +10%.
Additional installation support will be invoiced according to Sepro Service rates. Travel time will be invoiced according to Sepro Service rates

Level 7 - SAT support

Option delivered after FAT

7.1 SAT support

Participation in Sea Acceptance Test by 2 service engineers for 5 days
The price is excluding travel and accommodation cost:
Travel and accommodation costs will be invoiced as cost price +10%.
Additional SAT support will be invoiced according to Sepro Service rates. Travel time will be invoiced according to Sepro Service rates.



Level 8 – Training options

Options delivered after FAT

8.1 Training course – 1 day

Training course with Operator for 6 persons for 1 day.
Training course will be held at our facilities located in Svendborg.

8.2 Training course – 3 days

Training course with Supervisor for 6 persons for 3 days.
Training course will be held at our facilities located in Svendborg.

Level 9 – Extended guarantee period	
Option delivered after FAT	
9.1	**Two years additional guarantee period** Two years additional guarantee period, in addition the one year included from FAT date at premises in Svendborg. The extended guarantee is requiring a yearly inspection from Sepro Service of the equipment. Travel time, travel cost and accommodation costs for this yearly inspection will be invoiced additionally, as according to Sepro Service Rates.

List of deviations and exceptions

As a minimum we have the following deviations.

Item	Description
1	Source code is not part of delivery.

Date	Alteration of conditions or requirements	Initials