Technical Data

Joren Marine
Marine Equipment

New 170 Ton capacity Winch from factory

For efficient operation and handling of wire or rope internal on vessel and external in the sea.

17 0 ton at first layer, speed 0 – 20 m/min
60 ton at last layer, speed 0 – 40 m/min
C apacity: 1800m 8" rope or 7000m 3"steel wire
W ater cooled brake resistors
W ire/Rope spooling device
Motor Control and local Control Panel (radio)
Remote Control Console
Low voltage VFD Single drive system
Recommended spare parts for five year operation
HPU Electric motors: 2 x ABB/Siemens/ Franz Wolfer/VEM
350KW per unit, heater build-in motor
IP56, S1 continuous duty, insulation class F
Electrical general: Ambient temp. 50 deg C
Voltage 440V/660V, frequency 60Hz
Winch Band Brake hydraulic set on drum flange with stainless steel (AISI 316L) lining
Brake Capacity: 200ton@first layer / 80ton@last layer.
Brake torque is set 50% by spring load and 50% by hydraulic
Emergency quick release and free wheeling
Piping: Hot dip galvanized, under 35 mm in stainless steel.
Comes sandblasted and painted for marine use.
Net weight: 108.5 ton

Content

Specification for AHTS Winch System

1. General

This specification describe a winch including all auxiliary for efficient operation and handling and of wire and rope internal on an AHTS vessel well as external in the sea to a max nominal load of 170t

2. Painting and Surface Preparation

a) Surface preparation / coating and color:

Abrasive-blasted to Swedish Standard SIS 055900 SA2.5

Steel part coating system:

Zinc-rich epoxy primer, 50um

Two Epoxy coat, thickness, 2 x 150µm

Polyurethane top coat, thickness, 50µm

Min. total dry film thickness, 400µm

Galvaniosed steel part coating system

Epoxy primer, 50um

Epoxy coat, thickness, 75µm

Polyurethane top coat, thickness, 75µm

Min. total dry film thickness, 200µm

Colures and Topcoat finish in accordance with Owner's standards

The complete winch to be finished in colures: Munsell:10R 3/8 or RAL:8012.

Painting appearance shall be free of holiday, sagging, brush print, pinhole, orange or cracking and dry spray etc. Topcoat finish shall comply with the required colour.

Difficult to spray areas as plate edges will be power tooled broken (without any sharp edges) and is strip coated before spray application in order to obtain an even film thickness on all places.

Steel work, welding slag, spatter, etc shall be removed; sharp edges, uneven welds are

to be rounded or smoothened with disc grinder or disc sander; undercuts and exceeding classification ruling and blowholes are to be welded and ground.

Standard Components (e.g. motors, brake lifting devices etc.):

Standard coat of the respective manufacturer to be used but according to the corrosion class "Maritime Milieu".

All welding of supports etc shall be completed before painting.

All steel to be delivered in accordance with SIS 055900 rust grade A

A guarante is included of a minimum paint life of five years according to the European Scale of Degree of Rusting for Anticorrosive Paints of:

RE1 for all surfaces

Scope of Delivery

Windlass System (for one windlass)

1 unit	170-ton @ (bare drum) Electric-VFD windlass (1800m of 8"synthetic or 7000m of 3"steel wire drum capacity).....drawing EMW170-00 .....drawing EMW170-wp-00（cooling & pneumatic control diagram）
2 units	Water cooled brake resistors
1 unit	Wire/Rope spooling device
1 unit	Motor Control Panel
1 unit	Local Control Panel (radio)
1 unit	Remote Control Console (Part1 and Part2)
2 units	Low voltage VFD Single drive system for windlass
1 lot	Recommended spare parts for five year operation

3. Design criteria

Ambient air temperature: 50°C(max) relative humidity 93%(max)

Steel design tempearature:	-5°C(min) relative humidity 60%(min)
Atmosphere:	High salinity
Sea water temperature:	15°C ~33°C
The vibration level:	ISO 10816-3 level A (without the wire)
The noise level : equipment	< 85 dB(A) measured at 1 meters distance from the
Electrical equipment :	IEC. Standards as aplicable (incl. but not limited to IEC 60092, IEC 60533, IEC 60945, IEC 61800)
	EN 60439-1 Low-voltage switch gear and control gear assemblies
	EN ISO 13850 Safety of machinery. Emergency stop
	EN ISO 13849-1 and -2 Safety of machinery. Safety related parts of control system
	EN 60204-1 Safety of machinery. Electrical equipment of machines
	EN 62061 Safety of machinery. Functional safety of safety related electrical, electronic and programmable electronic control systems

Newer versions of above standards are acceptable

Protection degree:	IP56 for all external equipment
Duty:	S1
Dynamic application factor:	Min 1.4
Class:	Lloyds/DNV or ABS class requirements as applicable
Flag	Flags state requirements incl DMA
FEM Classification:	Class of utilization: T5 Spectrum class: L2 Mechanism group: M5

Danish maritime authority technical regulation no. x of 4 June 1985:

Technical regulation nr. R391 of 4. June 1985; Technical regulation on the construction, testing and inspection, etc. of towing winches and anchor handing winches with their associated equipment and arrangement.

If a conflict exists between the contents of mentioned documents, the order of precedence shall be: (1)The Project Summary, (2)Any list of negotiated deviations and clarifications to these specifications,(3) these Specifications, (4)the above standards, (5) The manufacturer's standards.

4. Price quoted includes the following

a) Manuals(4 hard copies and 4 soft copies)/Documentation in English

b) Functional and load testing at ; works + complete performance tests: speed/load,brake/load and FMEA test

c) First fill of greases and lubricants

d) Commissioning spares and special tools

e) Site commissioning up to 8 man-days and 2 man-trips.

f) Lloyds, ABS or DNV design approval to the choise of the Buyer. + Flag state approvals(DMA)

g) Seaworthy packing

h) Spare parts for five years operation

i) FMEA by class, any required or recommended modification by the FMEA is/are included

5. Price quoted excludes the following

a) All cables outside supplied cubicles and winches

b) All cables between VFD drives and motors

c) All cables between local and central control console

d) Installation(by shipyard)

e) Foundations/substructures/seats

f) Electrical incoming power cables and connection

g) Wire rope transpooling for windlass if rope is not supplied

h) Seawater cooling circuit if applicable; connection by ISO flanges (OD>35 mm)

i) All rigging/set-up for load testing outside factory

j) Main and auxiliary switchboard

k) External connecting diagrams

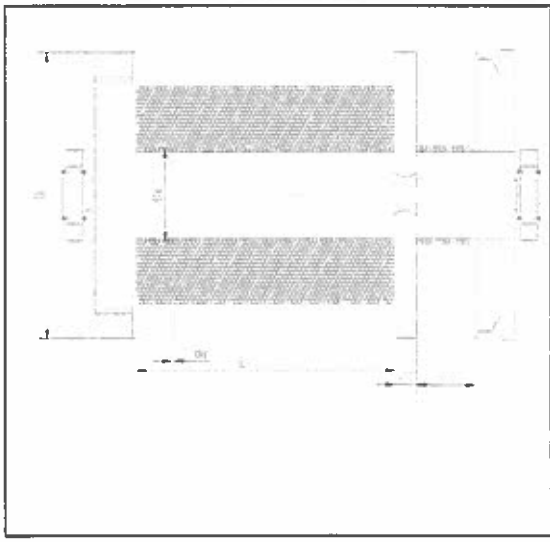
l) Board net calculations(short circuit, stability or harmonic calculations)

m) Lifting slings

6. Specifications

170-ton Electric-VFD Rope reel (170-ton @bare drum) 【for 3" wire rope】

Nominal wire diameter: 76.2mm Wire tolerance factor: 3% Bare Drum diameter: 1500mm Drum flange diameter: 5200mm Main Drum length: 4200mm Socket drum length: 1000mm Ordered wire rope length: 7000m Drum capacity(full drum): 11500m Ratio d/dw: 20 No. of layers w/ordered length: 17 Turns on drum per layer: 53 Max no. of layers on drum: 23 *Unless otherwise noted[m/min],[ton]	Lay no	Line Pull (ton)	Line Speed (m/min)	Wire Rope on Drum(m)×Φ 76.2mm
	1	193.2	20.0	262.4
	2	178.4	21.6	546.6
	3	165.7	23.3	852.6
	4	154.7	24.9	1180.3
	5	145.1	26.6	1529.7
	6	136.6	28.2	1900.9
	7	129.0	29.9	2293.9
	8	122.3	31.5	2708.6
	9	116.2	33.2	3145.0
	10	110.7	34.9	3603.2
	11	105.7	36.5	4083.1
	12	101.1	38.2	4584.8
	13	96.9	39.8	5108.3
	14	93.0	41.5	5653.5

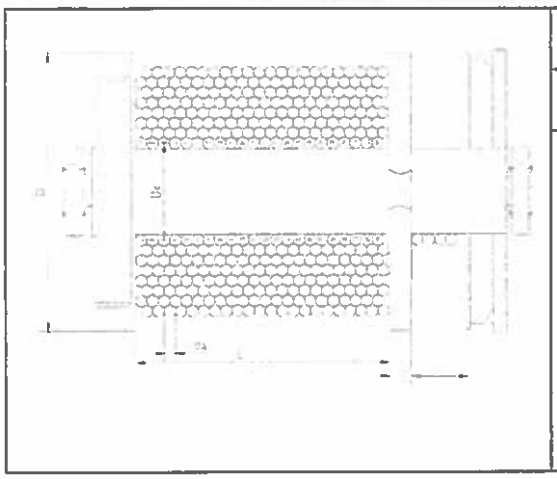


15	89.4	43.1	6220.4
16	86.1	44.8	6809.1
17	83.1	46.4	7419.6
18			
19			

170-ton Electric-VFD Rope reel (170-ton @bare drum) 【for 8" Synthetic rope】

Nominal wire diameter(dw):203.2mm
Wire tolerance factor: 7.3
Bare Drum diameter(d): 1500mm
Drum flange diameter(D): 5200mm
Main Drum length(L): 4200mm
Socket drum length: 1000mm
Ordered wire rope length: 1800m
Drum capacity(with 400 mm free space to drum flange): 1800m
Ratio d/dw: 7.37
No of layers w/ordered length: 9
Turns on drum per layer: 20.5
Max no. of layers on drum: 9
*Unless otherwise noted[m/min],[ton]

Lay no	Line Pull (ton)	Line Speed (m/min)	Synthetic Rope on Drum(m)× Φ203.2mm
1	178.8	21.6	109.7
2	148.1	26.1	242.2
3	126.3	30.5	397.4
4	110.2	35.0	575.5
5	97.7	39.5	776.3
6	87.7	44.0	999.9
7	79.6	48.5	1246.3
8	72.9	52.9	1515.5
9	67.2	57.4	1807.5



Type: Split drum, two units of spur gears driven by vector-duty electric motorswith gear reducer.

Classification: N/A

Design approvals: Design approvals by class.

Bearings: All roller and ball bearings for the complete winch to be make SKF or FAG with the outer ring locked against rotation in the housing by pin.

Drums:

Wire Rope Capacity (excluding socket compartment): 7000m×76.2 (3")mm wire rope or 1800m×203.2 (8")mm

Drum Type: Bare, split type, wire fastening for wire 60~154mm On main drum side and socket side. About support 15 t force by wire fastening and it will be remained at least 9 turns ropes on the drum.

NO. of Wraps per Layer: 53 (for 3" wire rope) or 20.5 (for 8" synthetic rope)

Drum Dimensions: Φ1500mm(bare)×4200mm(wide)×Φ5500mm(flang), socket compartment width 1000 mm, opening in flange between socket compartment and main compartment is 600 mm, ensuring smooth transit of wire/rope between the compartments, opening rounding R=175 mm

Ratio of Drum Barrel to Wire Rope Diameter: 20 or 7.4

Windlass Motor: ABB/Siemens/ Franz Wolfer/VEM

Vector Duty Forced Air-cooled Electric Motor, 2 units

350KW per unit, heater build-in motor

IP56, S1 continuous duty, insulation class F

temperature rise B, 440/660V rate speed 900rpm

high speed 1800rpm, vertical mounting code: IMV1,

with SKF or FAG bearing,

with incremental 1024 pulses/rev encoder,

6×Pt100 temperature sensor connected with PLC and inverter,

overload 1.25x nominal load 1min

Electrical general: Ambient temp. 50 deg cel

Insulation class F

Temp rise B

Duty S1

Voltage 440V/660V

Frequency 60Hz

IP 56 for all external equipment IP 44 for remaining motors etc

Space heater for El-motors above 3kW, heaters to be reenergized then power is energized

All electric equipment including control system shall be able to operate with a fluctuation of +/- 10% in the main power supply.

Cable trays and cable ways to be of stainless steel AISI 316 external and for protected spaces galvanized

Cable penetratiins of stainless metal type penetrations

Winch Brake:

Band brake : Hydraulic set band type on drum flange (with stainless steel(AISI 316L) lining of min 5 mm thickness or alternative in solid stainless steel)

Brake Capacity: 200 ton @ bare drum and 80 ton @ full drum

The brake torque is set 50% by spring load and 50% by hydraulic load

High speed brake: Fail-safe spring-set. It will be set between the motor and gear box, with manual over-ride feature in case of malfunction. Capacity to be min 1.5 x rated motor torque or rated load torque. All material in stainless material, disc is complete enclosed

Water Brake: Two water brakes are included The AHTS vessels freshwater system will supply freshwater for cooling of the system, brake capacity min:

Bare drum: TBA t at 40 m/min

Outer layer: TBA t at 85 m/min

Electric motor braking: The electric motor braking system will dynamic brake the winch with the following capacity:

Bare drum: 200 t at 0 – 20 m/min

Bare drum: 85 t at 40 m/min

Outer layer: 70 t at 0 – 40 m/min

Outer layer: 40 t at 85 m/min

Total Dynamic brake torque (El-braking + Water braking)

Bare drum: 200 t at 0 – 40 m/min

Outer layer: 70 t at 0 – 85 mmin

Winch Emergency Release:

The winches to be provided with the following release functions:

a) A quick release function (with braking of app 10-20% of the nominal line pull, the braking will be performed by water cooling brake.), to ensure the functionality that UPS should be equipped.

b) A ultimate release function (without braking force (freewheeling)). The motor and the gear box will be followed to rotate with the drum.

The system to be independent of power supply from the vessel, and should be able to changed between the modes "a" and "b" above and all normal winch operation modes and vice versa.

Spooling device to open automatic with max speed at emergency and quick release.

The quick and ultimate release to be provided at the remote control panel in wheel house and further in the local control panel. Should not be provided direct on the winch.

Windlass Control: Local(radio portable control panel) and Remote(Part1 and Part2)

Spooling Device: Two units hydraulic motor driver, carriage with two vertical and horizontal rollers (hardened to min 40HRC and 2mm deep) with weak link for the roller support, so that a inpack by a socket or other will not damaged the roller and spooling gear

Opening: equal to the width of the drum plus additional 100mm each side, 120mm as minimum between rollers at all times;

Pull Capacity: 30t; The both rollers is parallel and each rollers individually, the distance and the speed can be adjusted:

Operating of the rollers:

1. Parallel of both rollers
2. Each rollers individually
3. Adjusting of the roller distance by parallel running mode
4. Spooling speed variable based on wire dia and winch speed

5. Guides crossing not to be possibly

Above function to be possibly to run in auto spooling mode (PID controlled) or manual

Gearboxes: Totally closed type, with expansion tank for thermal expansions, Gears be hardened and ground helical, has lubrication system with a off-line filter (make CJC). The gearbox has a Level alarm.

The gearbox will be provided with a PLC controlled lubrication spray system to protect the gears against corrosion in standstill periods.

All gears with bearing on each side of the gear

Gears to ISO 17485 level 6. Standard: DIN3990. Safety factors for: Tooth root bending SF: min 1.55; Pitting SH: min 1.2; Scuffing min 1.5; Application factor to be min 1.5. Gear box gears teeth surface to Ra [µm] 0.6 or better and bevel gear teeth surface to be Ra [µm] 1.6 or better

Open gears &pinion : The gear bolted on drum flange has automatic greasing system, the plastic lubrication wheels on the whole width of the toothing. The electrical controls provide broad cycling flexibility as well as fault monitoring.

Gear rim and pinion will be hardened and grinded. Hardened to be Min. 55 HRC. Gears to ISO 17485 level 8 and level 7 for pinion. Standard: DIN3990. Application factor to be min 1.5; Safety factors for: Scuffing: min 1.5; Tooth root bending SF: min 1.55; Pitting SH: min 1.2. Open gear teeth surface to be Ra [µm] 1.6 or better

HPU: One separate HPU for one winch, provided for the band brake and spooling device. Power Pack arranged with two 100% motors and pumps with automatic standby functionality and alarms by failures

In-line filters with 10 micr filtration for each pump, ball valves to be fitted for ease of repair overhaul etc as required.

CJC filters provided for all hydraulic systems

Tanks to be in stainless steel AISI 316

Breather to be fitted with silica gel type or alternative systems fully enclosed with compensator for thermal expansion

Piping etc: Surface hot dip galvanised, less then 35mm in stainless steel AISI 316 including valves and fittings etc

Hoses only to be used by short length of app max 800 mm, in general pipes to be used.

Grease nipples of DIN 71412 type in stainless steel

Hydraulic and lubricant oil systems flushed to ISO 4406 with separate pumps and with min 60 deg hot oil at high velocity:

Hydraulic systems: 17/15/12

Lubricant systems: 18/16/13

Cetralised greasing system to be arranged

Coolers to be in stainless material in bronze or Stainless steel AISI 316 or higher grade depending on the aplication

Bolts/Nuts:

grade diameter	< 10.9	Other grades
< 16 mm	stainless steel	stainless steel
≥ 16 mm	hot dip galvanized	Delta Magni or equivalent

Motor Cooling: Air-cooled (rated for ambient temperature up to 50 ℃)

Dimensions LBH: Approx. 8.6m×TBAm×5.5m

Weight: Approx. 105 ton:

Item	unit weight	qty	total

Durm	35	1	45
Pinion&gear	9.5	1	11.5
spooling device	6.5	1	6.5
frame& joint base	15	1	15
Motor	1.3	2	2.6
Reducer	2.5	2	7
band brake	3.5	1	3.5
water brake	2	1	2
HPU	2	1	2

Max Deflection of the winch: TBA

7. Low Voltage Windlass Drive System

System feature: Heavy Duty electric motor especially for marine application and frequency control

Zero speed @ full torque

One-drive to one-motor for better performance

Applicable Standard: IEC

Quantity: 2 drive units

Control mode: When two converters is in service, mode is 100 % negative slip compensation;

When one converter is in service, mode is normal slip compensation

In one motor/ frequency mode (failure on one drive) the motor will be clutched out, so that the water brake for that drive is still active

Converter power :	380Kw per unit during 0- 50℃ environments
Brake chopper:	350Kw(S1)
Input:	6 pulse rectifier for converter
Input Voltage:	440V/660V
Output Voltage:	440V/660V
Line Frequency:	60Hz
Cooling Type:	Air-cooled
Ambient max. temp.:	50℃
Heat dissipation:	9Kw per drive unit
Protection degree:	not less than IP44, installed in cabin necessarily
Cable Inlet:	Bottom side
Dimensions:	LBH Approx.0.6×0.6×2.0 meters per unit Top ventilation space should be more than 225mm
Weight:	400Kg
Brake resistor:	2 units, 350Kw per unit, freshwater cooled. Material complete in AISI 316 stainless steel for all parts in contact with water, remaining part in AISI304. Maximum inlet temperature 38℃, Maximum outlet temperature 66℃, Maximum continuous working water pressure 6 bar, Test water pressure 9bar, minimum water flow 12 m^3 /h per unit

8. Motor control panel

Function:	Control motor fans, lubrication pump, hydraulic pump, sensor input, valve output control etc. Communication with remote control console by Profibus-DP, and installed with Ethernet Hub, installed with space heater and lighter, and radio transmitter.
Manufacture:	

Applicable Standard:	IEC
Main power:	35Kw(Ref 440V/60HZ)
AUX heater power:	5Kw(Ref 220V/60HZ)
Line Frequency:	60Hz
Cooling Type:	Air-cooled
Ambient Temperature:	50℃
Heat dissipation:	0.5kW(total)
Protection degree:	IP44, installed in cabin necessarily
Cable Inlet:	Bottom side
Dimensions:	LBH Approx.0.8×0.45×2.0 meters (Ref)
Weight:	200Kg

Operation function on MCP panel:

Hydraulic pump selector 1/auto/2

Clutch enable switch with key

Clutch 1 on pushbutton with green lamp

Clutch 1 off pushbutton with red lamp

Clutch 2 on pushbutton with green lamp

Clutch 2 off pushbutton with red lamp

Bypass switch with key

Drumzero position enable switch with key

Motor selector 1/both/2 switch with key

9. General Controls, Monitoring and Alarms

Controls

Control monitoring and indications to be included to provide efficient operations of the winch and it's auxiliaries, and minimum the below requirements to be fulfilled

The operator to be able to change all motions infinitely from full speed through zero to full speed in opposite direction or visa versa with no dead band of all motions, and alter the direction of all motions by moving the joy

stick in the proper direction.
The ramping to be with parabolic characteristic with fine adjustments at low speed.
The acceleration and deceleration of all motions to be under the control of the operator, however, if the operator moves the master switch too rapidly, acceleration or deceleration to be limited to a predetermined value.
Screened cables to be used for control, monitoring and bus cables and to routed separate.

Following functions to be included as minimum:

- Haul in and pay out of wire infinitive from 0 to max speed
- Spooling with roller guides functions as described above in page 5
- Tension/Torque setting and adjustment
- Wire payout if wire load exceed tension setting
- Rope guide speed adjustment
- Control selection (main / local)
- *Auto shooting (paying out progr. Length)
- Length alarm setting
- Tension alarm

Dynamic braking mode will only be enabled if torque setting is higher than the wire load torque
It should not be possibly to set the torque setting at a lower value than the actual load on the wire in a situation then you are paying out or release the brake with a load on the wire.

*System not to allow to pay more wire/rope out than installed

Following indications to be included:

- Tension (scale from 0 to app 250 t)
- Wire length (out)
- Rope speed
- Drum rotating indication
- Hydr pump running duty/standby
- Lub oil pump running duty/standby
- Mode selection indication
- Guide mode selection

Above functions and indications to be included in a GUI

Alarms & Shut downs

All alarm to be implemented and fitted to fully monitor and protect the winch and auxiliaries, Minimum the following alarms to be included with clear text on the opr. panel:

Winch:

- Alarm for 12 turns left on drum
- Stop for 9 turns left on drum (override function incl.)

- Overspeed alarm
- Overspeed shut down (brake)

Hydraulic:

- Oil level low (alarm)
- Oil level low low (shut down)
- Oil temp high (alarm)
- Oil temp high high (shut down)
- Filter clogged (alarm) for all pumps (filters)
- Return filter clogged (alarm)

Lubrication:

- Lub oil pressure gearbox low (alarm)
- Lub oil pressure gearbox low low (shut down)

Frequency converter El-motors:

- Failures VFD
- Temperature El-motors high
- Overload (current)

Water brake:

- Pressure low (standby pump start)
- Pressure low low (winch brake)

Spooling gear

- Position sensor (end /auto calibration)

Load Measuring

The winch is equipped with a load measuring devices of make KELI
Tolerance are max 0.5%
2 load cells are provided one in each gear box and 1 load cell is provided for the band brake

Load measuring at braking: By load cell in the band brake

Load measuring at winching TBA (2 x load cell, one in each gear box)
Load measuring at paying out (2 x load cell gears box)

Safety Device

Visible and audible alarm to be given to the driver in an overload situation.

Emergency stops

Emergency functions to be hardwired and not to be performed by software functions:

- Emergency stops
- Operation from local panel
- Quick/ultimate release functions

10. Local Control Panel

(Get reference from attached drawing drawing no.: TBA)

It is a radio portable control panel for the winch and spooling gear.

Instrumentation includes:

1×Control on pushbutton

1×Control off pushbutton

1×Fault reset / lamp test pushbutton

1×Emergency stop switch

1×Spooling left/both/right in service on 3-ways selector

1×Spooling on left/off/right 3-ways selector

1×Drum zero position setting pushbutton

1×Beltbrake on/off switch with auto return

1×Hoist/lower joystick with potentiometer

1×Motor torque controller with potentiometer

1×Spooling speed controller with potentiometer

Braking function to be controlled by the joystick function

(no separate dynamic brake control)

1 x Quick release pull unlock switch

1 x Ultimate release pull unlock switch

1 x Quick release activated yellow lamp

1 x Ultimate release activated yellow lamp

1 x Release power OK green lamp

1 x Release fuse blown red lamp

1 x Overspeed warning red lamp

Dimensions:	LBH Approx. 0.3×0.2×0.2 meters (Ref)
Protection class:	IP65
Weight:	Approx 3Kg

11. Remote Control Console

(Get reference from attached drawing)

Part1

Part1 to be placed in the aft console, one plate for installing instrumentation.

Instrumentation includes:

1×Control on pushbutton with green lamp

1×Control off pushbutton with red lamp

1×Fault reset pushbutton

1×Lamp test pushbutton

1×Alarm acknowledge pushbutton

1×Emergency stop switch with red lamp

1×Ready for operation green lamp

1×Winch fault lamp

1×Buzzer

1×Autoshooting on pushbutton with green lamp

1×Autoshooting off pushbutton with red lamp

1×Spooling auto pushbutton with green lamp

1×Spooling manual pushbutton with yellow lamp

1×Spooling left in service pushbutton with yellow lamp

1×Spooling parallel in service pushbutton with green lamp

1×Spooling right in service pushbutton with yellow lamp

1×Drum zero position setting pushbutton with green lamp

1×Beltbrake on/off switch with auto return

1×Control stations 2-ways selector remote/local

1×Hyd. Pump service green lamp

2×Lub. oil pump on indication with green lamp

1 x Quick release pushbutton

1 x Ultimate release pushbutton

1 x Quick release activated yellow lamp

1 x Ultimate release activated yellow lamp

1 x Release power OK green lamp

/ lamp test pushbutton

1 x Release fuse blown red lamp

Features: Operation with Siemens S7-300 PLC

Dimension: LWD Approx. 0.45×0.4×0.2 meters (Ref)

Protection class: IP22

Weight: 5Kg (Ref)

Part2

Part2 to be placed on a swing arm at the winch operator.

Instrumentation includes:

1×Hoist/lower joystick with potentiometer

1×Motor torque controller with potentiometer

1×Spooling speed controller with potentiometer

1×Spooling on left/off/right 3-ways selector

Braking function to be controlled by the joystick function

(no separate dynamic brake control)

HMI indicated with :

Individual windlass drive alarm

Individual windlass drive trip

Belt brake released

Line tension (ton) calculate from 2 load cells on gearbox

Line speed (m/min)

	Paid out rope/wire length with reset pushbutton (m)
	Static brake force (ton)
	Dynamic actual load (motor torque per motor)
	Motor current meter per motor(Amper)
	Drag brake actual water pressure(Kpa)
	Spooling auto or manual status
	Spooling left/both/right in service status
	Spooling position status each spooling
	Rope/wire odd or even status
	Rope/wire on drum position and lays status
	Rope/wire diameter
	All alarms and trips
HMI input with:	
	Rope/wire diameter
	Adjust of the roller distance by parallel running mode
	Auto shooting position setting
	Length alarm setting
Features:	Operation with Siemens S7-300 PLC CPU and I/O modules, and equipped with HMI touch panel, operator could set rope diameter by HMI touch panel. Visible and audible alarm to be given to the driver in an overload situation.
Dimension:	LWD Approx.0.4×0.35×0.1 meters (Ref)
Protection class:	IP22
Weight:	8Kg (Ref)

12. Testing

Shop test:

Shop testing according to in accordance with agreed FAT procedure, classification Rules and Flag state. include load test and load test in workshop.
Onboard test:
Construction tests or onboard tests of machinery, apparatus, equipment and fittings will be carried out as per requirement of the specified classification society and other regulatory bodies concerned as well as with the shipyard's standard and the agreed CAT.

13.Documents and Drawings

a) Drawings for approval (DFA)

one (1) set of drawings for approval (DFA) by mail in PDF format to the Buyer 15 days after signing the contract. The Buyer shall give written comments to the Supplier within 20 working days after receiving DFA, it will be regarded as the approval if no comments return overdue, however any deviation to the specification to be agreed by both parties in writting. Documents include:

- General Arrangement + Components specifications and calculations(brake, gear, drum include flanges, frequency drives, coolers, instrumentation and controls etc) after 15 days
- Base diagram after 15 days
- Hydraulic Flow Diagram after 15 days
- Electric Principle Diagram after 15 days
- Electric Wiring Diagram after 25 days
- Test Program after 30 days
- Spare Parts and Tools List after 30 days
-Control panels incl layouts of same after 30 days
-Motor control panels after 30 days
-Drive control panels after 30 days

b) Working Drawings

three sets of working drawings + one CD in PDF format to the Buyer.

Documents include:

- General Arrangement
- Base diagram
- Hydraulic Flow Diagram

- Hydraulic Flow Diagram
- Electric Principle Diagram
- Electric Wiring Diagram
- Test Program
- Spare Parts and Tools List

c) Delivered Documents

three (3) sets of delivered documents + three (3) CD in PDF format to the Buyer. Documents include:

- General Arrangement
- Base diagram
- Hydraulic Flow Diagram
- Electric Principle Diagram
- Electric Wiring Diagram
- Service Manual
- Supply List
- Spare Parts and Tools List
- Manufacturer's Certificate of Quality（1 original + 3 copies）
- Class design approvals （1 original + 3 copies）

-FMEA test

14. Quality pledge

a) In the case of any defects which are due to design, construction, or defective materials and/or the defects are discovered within a period of 24 months after the date of the successfully CAT, it shall be undertakes to remedy and exchange free of charge.

b) World wide service will to be provided

15. Main supplier

a. Electric motor: ABB/Siemens/VEM/Franz Wolfer

b. VFD driver: ABB/Siemens/Danfoss

c. Electric control cabinet, connection box, lightings, cable, etc.:

Maker to be specified

d. Open gear,Gearbox、brake、coupling:

e. Water Brake: Parmac/Eaton

f. Roller and ball bearings: SKF/FAG

g. Hydraulic motors and pumps: European or North American make and fabrication

h. PLC: Siemens

i. Pipe fittings: Walterscheid type: "WALPRO-X" or "WALFORM-X" or "Flare tube fittings 37°"

j. Paint SIGMA