DEEPOCEAN

TECHNICAL SPECIFICATIONS

POWER Kw/Hp
160/220

DEPTH RATING msw
3000

DIMENSIONS LxWxH (m)
3.22x1.7x1.87

WEIGHT Kg
4600

PAYLOAD Kg
400

THROUGH FRAME LIFT CAPACITY Kg
3000

CONSTRUCTOR 5 AND 6 ROV SPECIFICATIONS AND INTERFACE MANUAL

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DEEPOCEAN

DOCUMENT TITLE

Constructor 5 and 6 ROV Specifications and Interface Manual

ROV-AST-MAN-004

Revisions & Authorisations – Electronically Signed				
A	Issued for Construction/Use	2021-01-28	Orig.	Nils Sigurd Haugen
			Check	Greg Ronald Grindhaug
			Appr.	Arvid Horn
Rev	Description	Date	Signature	

Revision Record		
Rev	**Date**	**Reason For Issue**
0	2020-10-21	Draft
1	2012-01-20	Issued for Review
A		Issued for Construction/Use

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1. INTRODUCTION

1.1 SCOPE

The KD Con ™ work ROV control system is very compact, but still with high capacity in terms of interfaces and functions. It is based upon the latest technology available where a distributed philosophy is used through out to minimize size, weight, complexity, cables and number of items. Power and I/O are distributed into valve-packs, light-box and the main electronic pod and connected together through a RS485 bus network.

All functions are controlled through one single-mode fibre from surface by a multi-channel fibre optic system, capable of running a minimum of 14 survey sensors & 8 cameras in addition to ROV control. The control system is easy expandable in terms of I/O and interfaces.

More or less all interfaces can be turned off completely to isolate the systems in case of defects.

An integrated fault monitoring detects internal Comms & power failures, water leaks and power isolation faults, hydraulic pressures, temperatures, and compensator volumes.

1.2 OBJECTIVE

The purpose of this document is to ensure that the specification of the ROV system comply with the current status on the system.

1.3 DOCUMENT RESPONSIBILITIES

The Technical Manager ROV responsible to update document when changes made to the ROV system.

2. DEFINITIONS & ABBREVIATIONS

2.1 DEFINITIONS

Definitions	Description
DeepOcean	The company

Table 1 - Definitions Table

2.2 ABBREVIATIONS

Abbreviations	Description
DO	DeepOcean
HSEQS	Health, Safety, Environmental, Quality & Security
ROV	Remotely Operated Vehicle
TMS	Tether Management System
HPU	Hydraulic Power Unit
JB	Junction Box
GFVP	General Function Valve Pack
ACU	Auxiliary Control Unit
PDU	Power Distribution Unit
HP	Horse Power
LPM	Litres Per Minute
MSW	Meter of seawater

Table 2 - Abbreviations Table

3. VEHICLE – 220 HP ROV SYSTEM

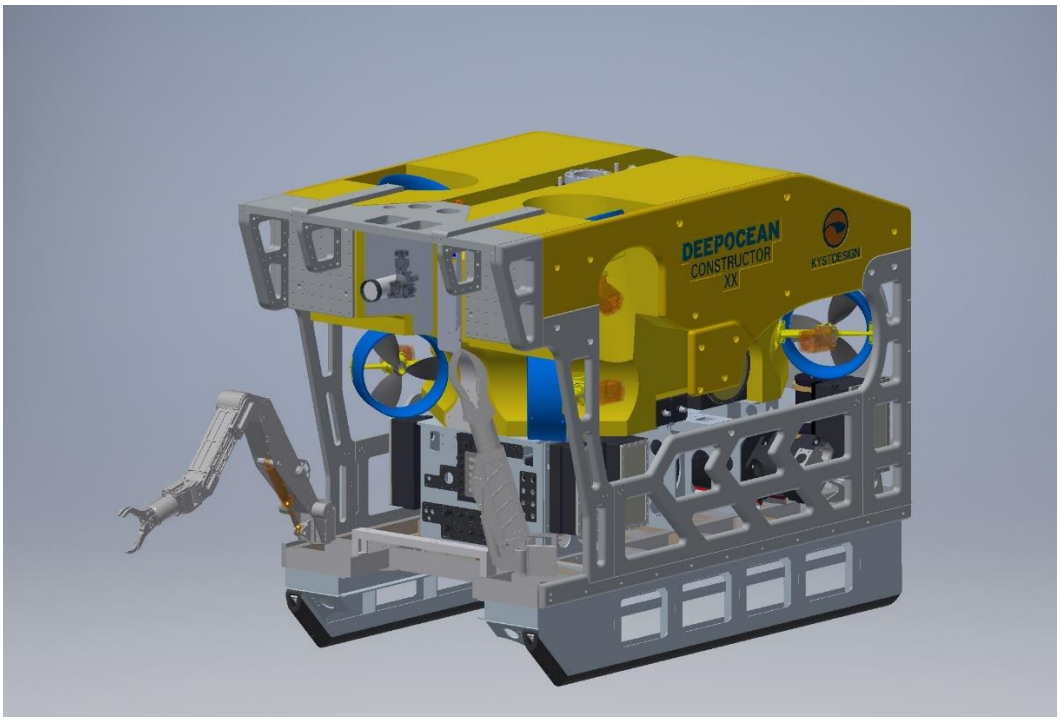


Figure 1 - Constructor with IHPU

3.1 ROV DIMENSIONS AND PERFORMANCE

Item	Sub-item	Specification
Constructor ROV	Standards	DnV Standard for Certification No.2.22, Lifting Appliances 2011. Electrical installation in compliance with the requirements of FEA-M standards and data sheets.
Constructor ROV	Certifying authority	The ROV frame and lifting appliances are certified by DnV.
Constructor ROV	Lift point / Emergency Lift Point	SWL = 7 TONNES All stress calculations are based on 4 x SWL load cases. All lifting appliances load tested to 16 tonnes. The lift-point is manual movable to accommodate for in-air trimming. The Lift Point arrangements included an additional lift point for Emergency Recovery, i.e. allows for lifting the ROV without use of the termination bullet.
Constructor ROV	Depth Rating	ROV : 3000msw Buoyancy 3000msw
Constructor ROV	Classification	Ex Zone2
Constructor ROV	Dimensions	3220 x 1700 x 1870 mm (LxWxH) + 430mm height of skid w/ hydraulic operated toolbox. The length includes Front Frame for installation of P&T, lights, cameras etc.
Constructor ROV	Tare weight	~4600kg incl skid, manipulators & payload.

Constructor ROV	Pay Load	~360Kg with Skid, Manipulators and standard sensors, cameras, lights and P&T installed.
Constructor ROV	Through frame lift capacity	3000Kg
Constructor ROV	Mechanical interfaces	Four docking receptacles underneath for installation in two alternative locations: Alt 1: Spacing 670 x 795mm Alt.2: Spacing 428 x 795mm The receptacles suits Ø65mm docking pins with Ø34mm lock bolts.
Constructor ROV	Operating temperature	-20 to +45°C
Constructor ROV	Auto holding capability	Heading +/- 1° Altitude +/- 100mm Depth +/- 75mm
Constructor ROV	Trim functions	Pitch +/- 10° Roll +/- 10°

3.2 ROV HYDRAULIC SYSTEM

Item	Sub-item	Specification
Main System	Pump	Variable displacement load sensing pump (PV180R1K1T1NMFC) Operation pressure : 220-230bar Flow : 315l/min @ 60 Hz
Main System	Filters	2 x 3 micron high pressure filter, no bypass 10 micron return filter, with built in bypass valve
Main System	Thrusters	4 horizontal thrusters – SA 380 3 vertical thrusters – SA 380
Main System	Thruster Control Unit	14 Proportional pressure reducing valves 1 Pilot operated utility valve, 250l/min @200bar Pressure sensor supply and return line
Main System	Reservoir	16L Hydraulic Compensator with analogue volume readout
Main System	Piping & Fittings	All fittings are made of stainless steel. Swagelock imperial fittings are used for pipe diameters up to 1”. For sizes above, SAE flange fittings is used.
Main System	Interfaces	Quick connectors for deck HPU
Auxiliary System	Pump	Variable displacement load sensing pump (PV092L1K1T1NMC) Operation pressure : 200 Bar Flow : 160 l/min @ 60 Hz
Auxiliary System	Filters	3 micon high pressure filter, no bypass 10 micron return filter, with built in bypass valve Water absorbing filter with pressure sensing line connected to the monitoring system

Auxiliary System	Valve pack 1	10 Proportional Directional Valve Size NG3 Termination board with light emitting diodes Transparent valve pack cover
Auxiliary System	Valve pack 2	10 Proportional Directional Valve Size NG3 Termination board with light emitting diodes Transparent valve pack cover
Auxiliary System	Valve pack 3	4 of 80 l/min bi-directional output with proportional pressure and flow control. Separate pressure control valve-pack 1 and 2 Pressure sensors in supply line, return line and on each of the six pressure controlled outlets Temperature sensor Termination board with light emitting diodes Transparent valve pack cover
Auxiliary System	Manifolds	Pressure and return manifolds mounted in the front of the ROV 1 x Pilot Operated High Flow Valve 160 l/min in pressure manifold
Auxiliary System	Reservoir	16 L Hydraulic compensator with analogue volume readout
Auxiliary System	Piping & Fittings	All fittings are made of stainless steel. Swagelok imperial fittings are used for pipe diameters up to 1”. For sizes above, SAE flange fittings is used.
Auxiliary System	Camera & Light Actuators	One hydraulic tilt unit for docking camera w/light.
Auxiliary System	Interfaces	Quick connectors for deck HPU
Auxiliary System	Interfaces	Interface for 5F RigMaster and 7F Atlas on port side
Main System	Interfaces	Interface for 7F T4 manipulator on port and starboard side

3.3 ROV ELECTRIC SYSTEM

Item	Sub-item	Specification
Constructor ROV	Telemetry Link	The ROV telemetry system communicates on single-mode fibres. The basic capacity of this system is 8 composite video channels (+4 optional HD-SDI channels) and 24 serial link channels (exp. To 36) simultaneously as standard. Requires one fibre. Ethernet module 4Gb + 5 port switch, requires one separate fibre.
Constructor ROV	Power Distribution	All power distributed to external users, lights, cameras and sensors can be switched on/off and isolated from the topside computer. All power lines are protected by individual fuses.
Constructor ROV	Gyro Interface	Connector type: Seacon MinM-26#20 Interface drawing: AF57-1-1050E21
Constructor ROV	Tool Skid Interface	Connector type: Seacon 5506-2008 Interface drawing: AF58-1062E01 Max power consumption allowable is 20A 115VAC.
Constructor ROV	Camera interface	Interface for 10 cameras. Connector type : Seacon MinL 1 coax / 6 electric Interface drawing: AF57-1-1050E27-28-29
Constructor ROV	Camera Actuators	Two off electrical pan & tilt units.
Constructor ROV	Survey Sensor Interface	Survey Sensors, 10 off. Connector type : Seacon Min-K-10 Interface drawing: A57-1-1050E23-24-25 The sensors are mainly wired for 24VDC. (Other voltages available)
Constructor ROV	Survey Sensor Interface	Survey Sensors, 4 off. Connector type : Seacon Min-K-8 Interface drawings: A57-1-1050E22 The sensors are wired for 115VAC. (Other voltage available)
Constructor ROV	Light interface	Connector type : Seacon 5506-1503 Interface drawing: AF58-1062E01 A 10 port light control box with easy access in the front of the ROV provides connection for lights or other el. Powered equipment. All outputs are dimmable, and individually fused. The fuses are featured with remote rest through the control system. The 115V supply is protected by a 20A breaker.
Constructor ROV	Electric Motor	Pressure compensated 220 HP (shaft) dual ended, 4 pole, 3 phase 4150V, 50-60 Hz
Constructor ROV	Pressure vessel	Mounted with easy access to all penetrators. Opens in one end allowing access to all live electronics.
Constructor ROV	Transformer & Termination	Combined oil filled unit placed at the rear port side of the ROV

4. TETHER MANAGEMENT SYSTEM

The KD10 TMS is an electro hydraulic Tether Management System (TMS) with tether capacity of 1000m Ø35mm tether.

TMS KD-10

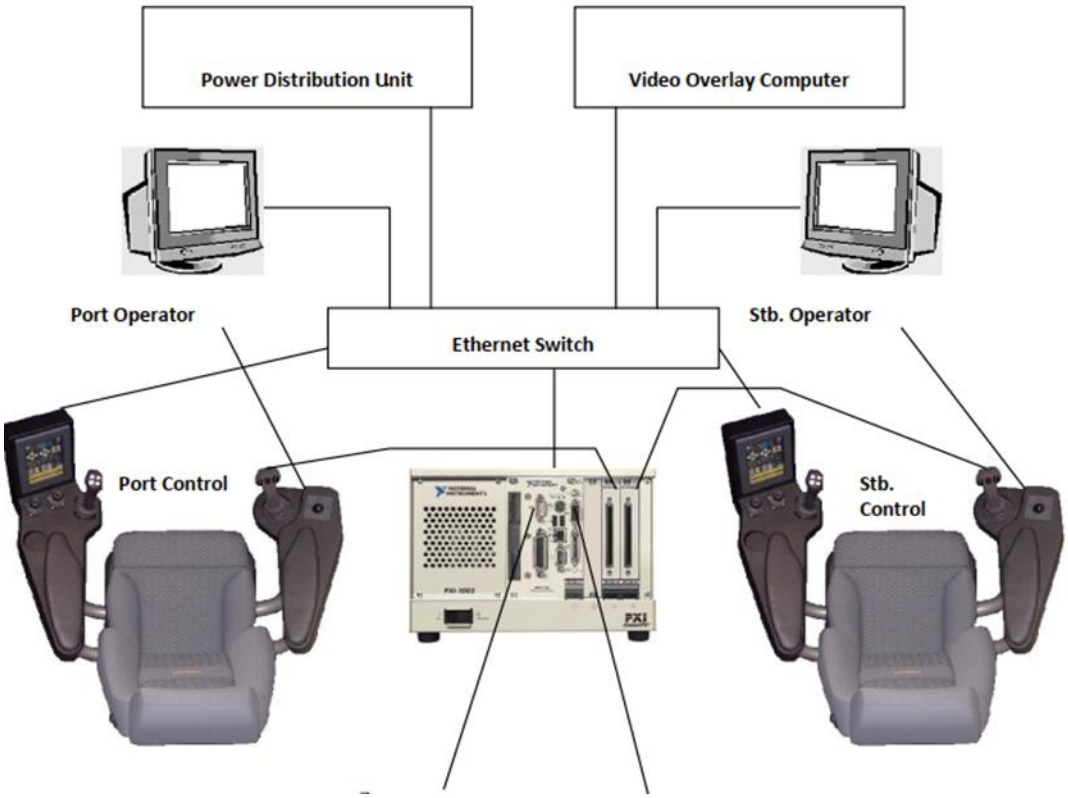
4.1 TMS TECHNICAL SPECIFICATION

Item	Sub-item	Specification
TMS	Max. Width	2590 mm
TMS	Min. Width	2380 mm
TMS	Height	2428 mm
TMS	Depth rating	3000 msw
TMS	SWL lift point	12000 kg (LARS interface)
TMS	SWL latch	10000 kg (ROV interface)
TMS	Tether diameter	Ø35 mm
TMS	Tether capacity	1000 m max capacity on drum. (Tether cable length to be checked)
TMS	Tether	Min.Tether Bending Diameter 900 mm
TMS	Weight in air	3450 Kg including 1000m tether
TMS	Weight in water	~1700 Kg including 1000m tether
TMS	Hydraulic Fluid	Tellus S3M22
TMS	Power Supply	3kV/3ph/60Hz
TMS	Total Power	15 kW
TMS	Slip Ring	Focal 176-8091-04
TMS	Tether	RT635-TD-01 Nexans

5. ROV CONTROL SYSTEM

5.1 GENERAL

The KYSTDESIGN control system is a real time CPU based system controlling the ROV, the Tether Management System (TMS) and the Power Distribution Unit (PDU).



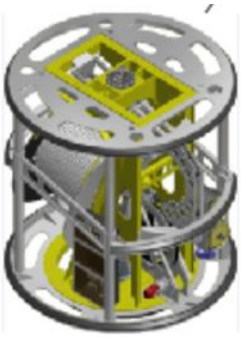


Figure 2 - TMS KD-10

Figure 3 - Constructor 220HP

The above illustration gives an overview of the control system main links. The PXI unit is the heart of the system being the main control. Operator computers, switching matrixes, the KD-Con fibre-optic system etc. are not shown.

The control system consists of 2 main levels, the **Real Time Level** and the **Information Level.**

5.2 POWER DISTRIBUTION UNIT

Item	Sub-item	Specification
PDU	Input	3 phase 670-690-710 VAC, 50-60 Hz
PDU	Power outputs	ROV HPU Transformer TMS HPU Transformer ROV Instrumentation Transformer TMS Instrumentation Transformer
PDU	Monitoring local	Voltage in Frequency in Phase detection in Contactors on/off status Insulation monitoring of all High voltage transformers secondary side
PDU	Monitoring Remote	Insulation monitoring of all High voltage transformers secondary side Supply voltage/current/Frequency/phase (440VAC) Breaker status (on/off/trip) Contactors on/off status Voltage and current for all ROV and TMS supply (high voltage side)
Transformer	ROV HPU Transformer	3 phase 670-690-710 VAC, 50-60 Hz 230 KVA Secondary Tappings : 4200-4350-4500 V
Transformer	ROV Inst. Transformer	1 phase 670-690-710 VAC, 50-60 Hz 10 KVA Secondary Tappings : 3000-3150-3300 V
Transformer	TMS HPU Transformer	3 phase 670-690-710 VAC, 50-60 Hz 23 KVA Secondary Tappings : 3000-3150-3300 V
Transformer	TMS Inst. Transformer	1 phase 670-690-710 VAC, 50-60 Hz 10 KVA Secondary Tappings : 3000-3150-3300 V

5.3 SENSORS AND EQUIPMENT ON ROV

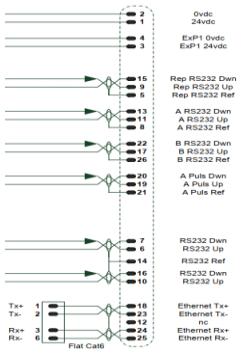
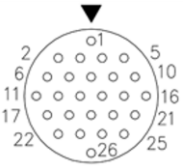
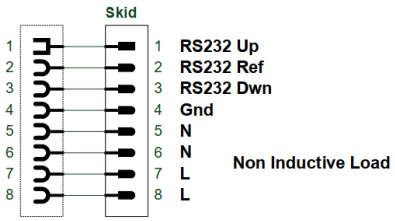
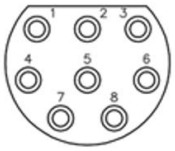
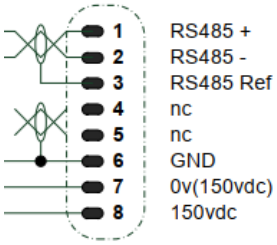
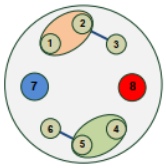
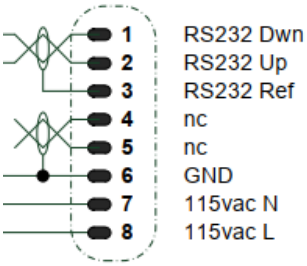
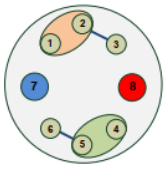
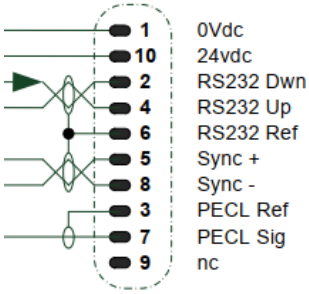
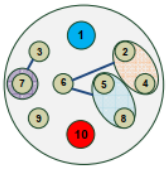
Sensor Equipment type	Equipment	No
ROV Gyro / Motions sensor	RTS Nemo Subsea Navigator	1
Depth Sensor	SAIV – TD303A (1 x spare sensor)	2
Obstacle Avoidance Sonar	Kongsberg MS1171	1
7 functions Manipulator starboard side	Schilling Titan 4	1
7 function Manipulator port side	Schilling Atlas	1
Altimeter	PA 500	1
Camera	Colour Cameras -Zoom- Imenco(Hammerhead)	3
Tool Camera	Mini – Colour Mini- Imenco	4
Camera – low light	Black & White Camera-low light- Imenco	2
Super Wide SeaCam	SWSC-4060-Colour	2
Transponder	USBL Mini Transponder	3
Light on ROV	ROS MV4000 / Led Sea Light / Sea Light Sphere	10
Light on ROV	Luxar 3000 Gas Discharge Light	2
Light on TMS	ROS MV4000 / Led Sea Light / Sea Light Sphere	2
Spare Light	ROS MV4000 / Led Sea Light / Sea Light Sphere	4
Camera TMS	Tool Mini Camera Colour - Imenco	2
Wire Rope Cutter	WebTool Cutter 38mm – RCO40LP	1
Wire Rope Cutter	WebTool Cutter 75mm – RCV75HD	1
High Pressure Water jet	Dynaset HPW	1

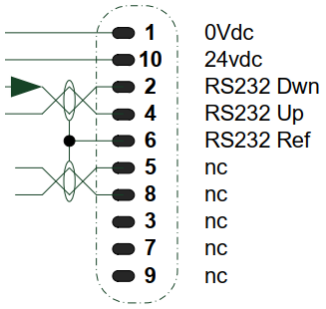
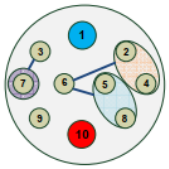
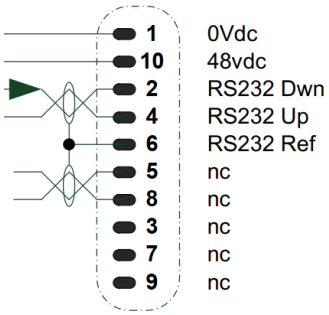
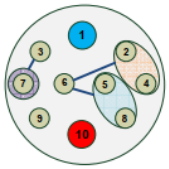
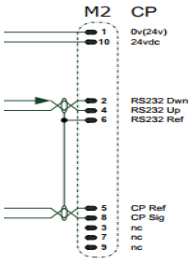
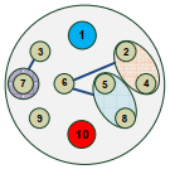
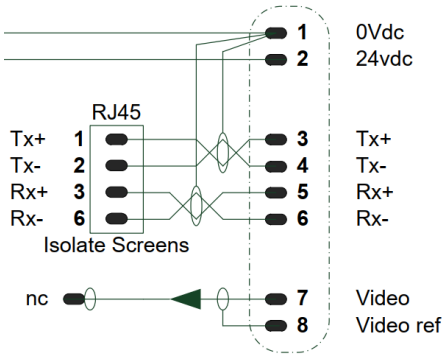
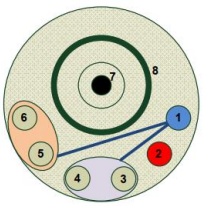
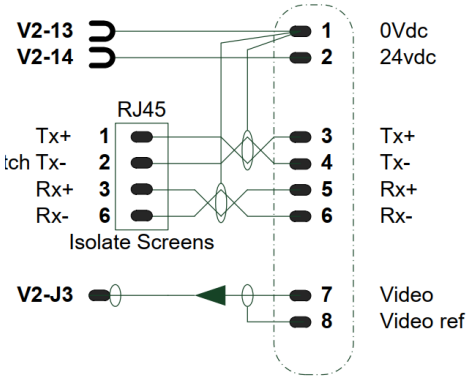
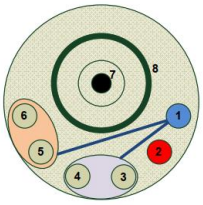
6. ELECTRIC AND HYDRAULIC INTERFACE

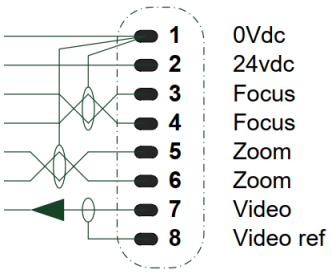
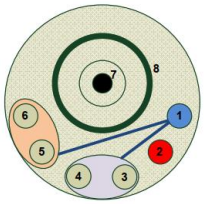
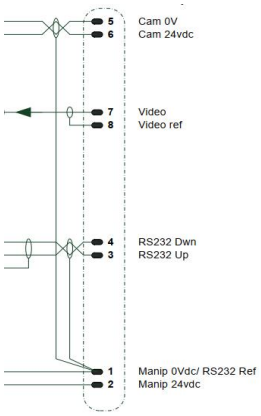
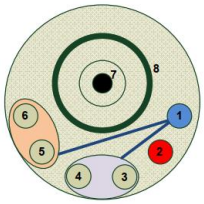
6.1 ELECTRIC INTEFACE VOLTAGE AND SIGNAL

Item	Connector Specification	Signal	Voltage	Power	Quantity
Gyro	Seacon MINI-CON MINM-26#20	RS232/485/TTL Ethernet(100Mb)	2x24VDC	ROV 24VDC Total 500W	2
Skid Interface	Seacon 55 Series 5506-2008	115VAC RS232/RS485	115VAC	2kW/20A	1
IHPU	Seacon MINI-CON MINK-2#14/6#22	RS485	150VDC	ROV DC Total 750W	1
Sensor Input 115VAC	Seacon MINI-CON MINK-2#14/6#22	RS232/RS485	115VAC	ROV Total 10A Inc. all DC power	3
MBE	Seacon MINI-CON MINK-2#14/8#20	RS232/485/PECL	24VDC	ROV 24VDC Total 500W	2
Sensor Input 24VDC	Seacon MINI-CON MINK-2#14/8#20	RS232/RS485 (1 analog CP)	24VDC	ROV 24VDC Total 500W	6
Sensor Input 48VDC	Seacon MINI-CON MINK-2#14/8#20	RS232/RS485/TTL 1xEthernet(100Mb)	48VDC	ROV Total 250W	2
Camera Input IP	Seacon MINI-CON 55Serie MINL FCRL 1Coax/6 Electric	1xCoax(NC) + 100Mb Ethernet	24VDC	ROV Total 200W	4
Camera Input Digital Stills/IP camera	Seacon MINI-CON 55Serie MINL FCRL 1Coax/6 Electric	1xCoax PAL + 100Mb Ethernet	24VDC	ROV Total 200W	1
Camera Input PAL	Seacon MINI-CON 55Serie MINL FCRL 1Coax/6 Electric	1xCoax + Bipolar Focus/Zoom	24VDC	ROV Total 200W	4
Schilling T4 Input	Seacon MINI-CON 55Serie MINL FCRL 1Coax/6 Electric	1xCoax 2x24VDC 1xRS232	24VDC		1

6.2 ELECTRIC INTEFACE CONNECTOR PIN OUT

Item	Connector Pin out	POD Connector	Connector location
GYRO **In use 1 of 2** ROV Gyro		Seacon MINI-CON MINM-26#20 	Pod Starboard side E1, E2 Drawing Ref: AF57-1-1050E21
SKID Connector		Seacon 55 Series 5506-2008 	Front Light box J11 Drawing Ref: AF58-1062E01
IHPU		Seacon MINI-CON MINK-2#14/6#22 	Pod Starboard side F1 Drawing Ref: AF57-1-1050E22
Sensor Input 115VAC		Seacon MINI-CON MINK-2#14/6#22 	Pod Starboard side F2, G1, G2 Drawing Ref: AF57-1-1050E22
MBE		Seacon MINI-CON MINK-2#14/8#20 	Pod Starboard side H1, H2 Drawing Ref: AF57-1-1050E23

Sensor Input 24VDC **In use 4 of 6** Depth Sensor Altimeter Sonar Responder		Seacon MINI-CON MINK-2#14/8#20 	Pod Starboard side J1, J2, K1, K2 L1, M2 Drawing Ref: AF57-1-1050E24 AF57-1-1050E25
Sensor Input 48VDC		Seacon MINI-CON MINK-2#14/8#20 	Pod Starboard side L2, M1 Drawing Ref: AF57-1-1050E25
CP Input		Seacon MINI-CON MINK-2#14/8#20 	Pod Starboard side M2 Drawing Ref: AF57-1-1050E25
Camera Input IP **In use 2 of 4** Center P/T IP Cam LowerP/T IP Cam.		Seacon MINI-CON 55 Series MINL-FCRL-1Coax/6Electric 	Pod Starboard side N1, N2, O1, O2 Drawing Ref: AF57-1-1050E27
Camera Input Digital Stills/IP Camera		Seacon MINI-CON 55 Series MINL-FCRL-1Coax/6Electric 	Pod Starboard side R1 Drawing Ref: AF57-1-1050E29

Camera Input PAL **In use 4 of 4** Low Light Camera Docking Camera Skid Camera Aft Camera		Seacon MINI-CON 55 Series MINL-FCRL-1Coax/6Electric 	Pod Starboard side P1, P2, Q1, Q2 Drawing Ref: AF57-1-1050E28 AF57-1-1050E29
Schilling T4 Input **In use 1 of 1** T4 Manip		Seacon MINI-CON 55 Series MINL-FCRL-1Coax/6Electric 	Pod Starboard side R2 Drawing Ref: AF57-1-1050E29

6.3 ELECTRIC INTEFACE CABLE NUMBER AND PIGTAIL

Cable number / Pigtail	Description	No
DO-02024	SAIV TD303 Cable	2
DO-02029	Tritech Altimeter Cable	2
DO-02039	Octans 3000 Gen 3 Gyro Cable	2
DO-02104	Octans Gen 4 Gyro Cable	1
DO-02047	Mesotech Sonar Cable	2
DO-02125	Transponder Cable	3
DO-02063 or DO-00063	Light Cable depending on the light onboard	16
DO-02023	Composite Camera Cable	12
DO-00043	Sensor Cable 6 m	2
DO-00044	Power & Signal Cable	3
DO-00045	Power Cable	2
DO-02065	Schilling T4 Cable	2
5501-2008-0012	Seacon 55 Series SS20 8pin Pigtail 12 foot	2
5501-1508-0012	Seacon 55 Series SS15 8pin Pigtail 12 foot	1
5501-1503-0012	Seacon 55 Series SS15 3pin Pigtail 12 foot	1
5501-1504-0012	Seacon 55 Series SS15 4pin Pigtail 12 foot	2
MCIL-3-F	Seacon MCIL 3pin female Pigtail 60cm	2
MINK-8-Pigtail	Seacon Mini-Con 8pin Pigtail 5 meter	2
MINK-10-Pigtail	Seacon Mini-Con 10pin Pigtail 5 meter	3
MINK-10-Ethernet	Seacon Mini-Con 10pin Pigtail, Ethernet configuration, 5 meter	1
MINL-L-1Coax/6Electric	Seacon MINI-CON 55 Series Hybrid Flange Connector Receptacle	2
Min-K 2#14/8#20	Seacon Mini-Con Flange Connector Receptacle 10pin	2
Min-K 2#14/6#20	Seacon Min-Con Flange Connector Receptacle 8pin	3
Min-M 26#20	Seacon Min-Con Flange Connector Receptacle 26pin	1

6.4 HYDRAULIC INTEFACE PRESSURE AND FLOW

Item	Specification	Pressure	Flow	Open center	Quantity
GFVP 1	JIC 7/16”-20 Male (JIC-04 Male)	10-207 Bar*	0-8 L/Min	2	10
GFVP 2	JIC 7/16”-20 Male (JIC-04 Male)	10-207 Bar*	0-8 L/Min	2	10
ACU	JIC 1-1/16”-12 Male (JIC-12 male)	20-207r	0-80 L/min	2	4
High flow valve	JIC 1-1/16”-12 Male (JIC-12 male)	200bar	160 L/min		1
Full flow valve - Main system *	JIC 1-1/16”-12 Male (JIC-12 male)	200bar	250 L/min		1
Return manifold	JIC 1-1/16”-12 Male (JIC-12 male)	N/A			
Reservoir/ Compensator	Main System: 16L Auxiliary system : 16L	1bar static			2
Atlas 7f	Port side	207bar Aux system			1
Schilling T4	Stb side	207bar Main system			1
Thrusters-Sub Atlantic SA-300	4 horizontal 3 vertical	207bar Main system			7

- The valve pilot operated on/off on the main hydraulic system. Dirty Oil Pack(DOP) might be required to run tooling.

6.5 HYDRAULIC INTEFACE DRAWINGS

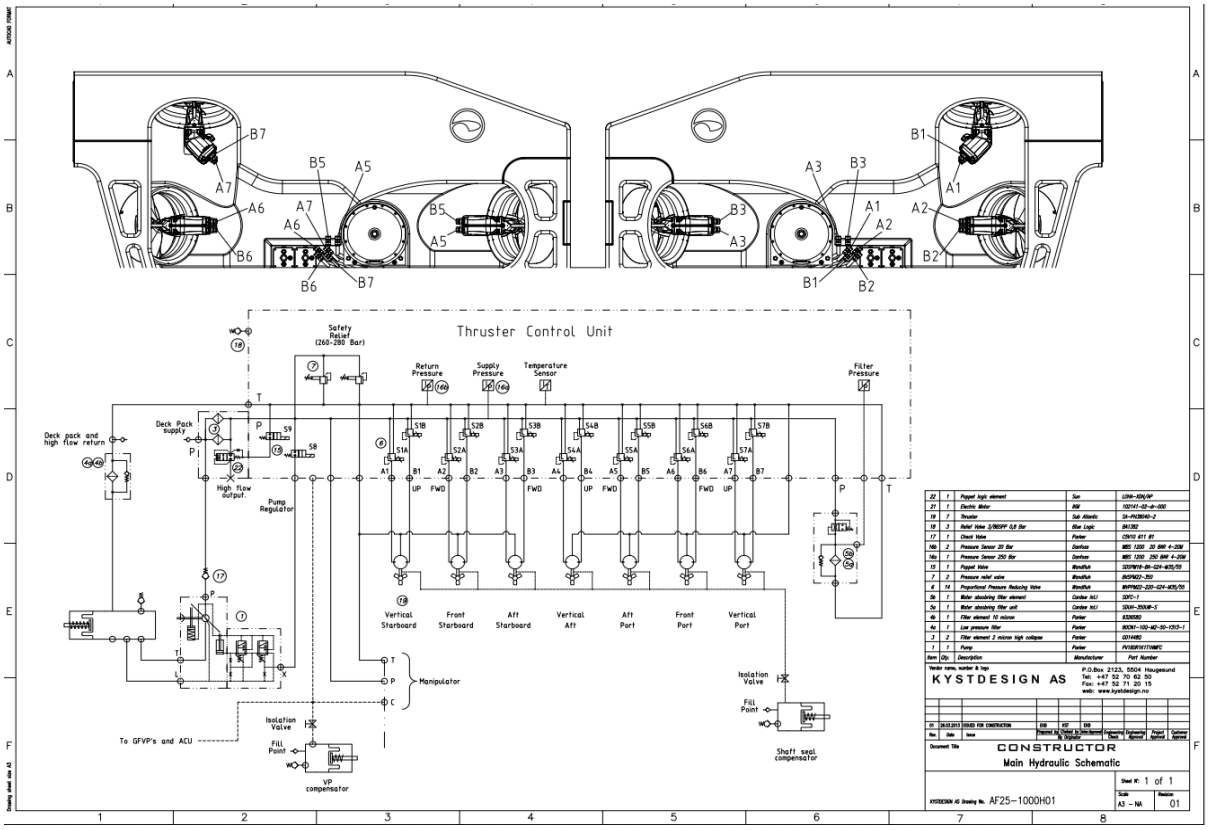


Figure 4 - Constructor main hydraulic drawing

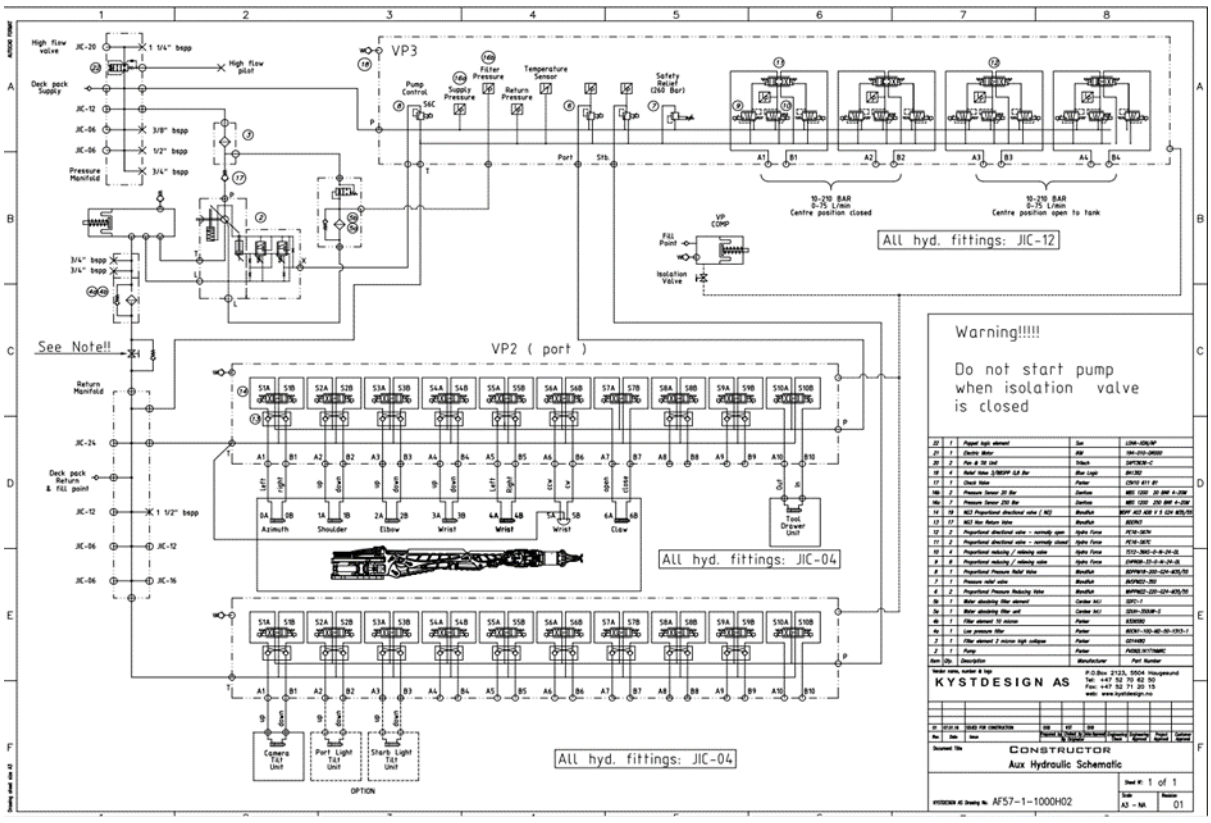


Figure 5 - Constructor aux hydraulic drawing

6.6 DRAWINGS ROV AND TMS

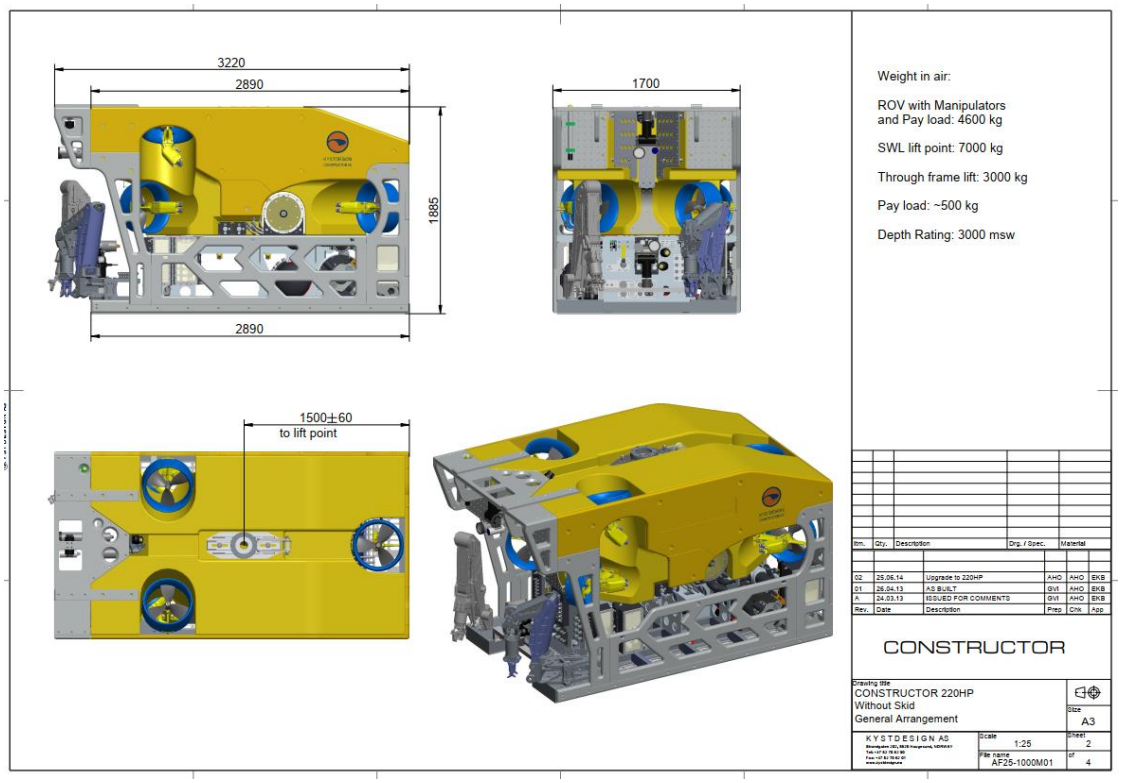


Figure 6 - Constructor drawing without skid

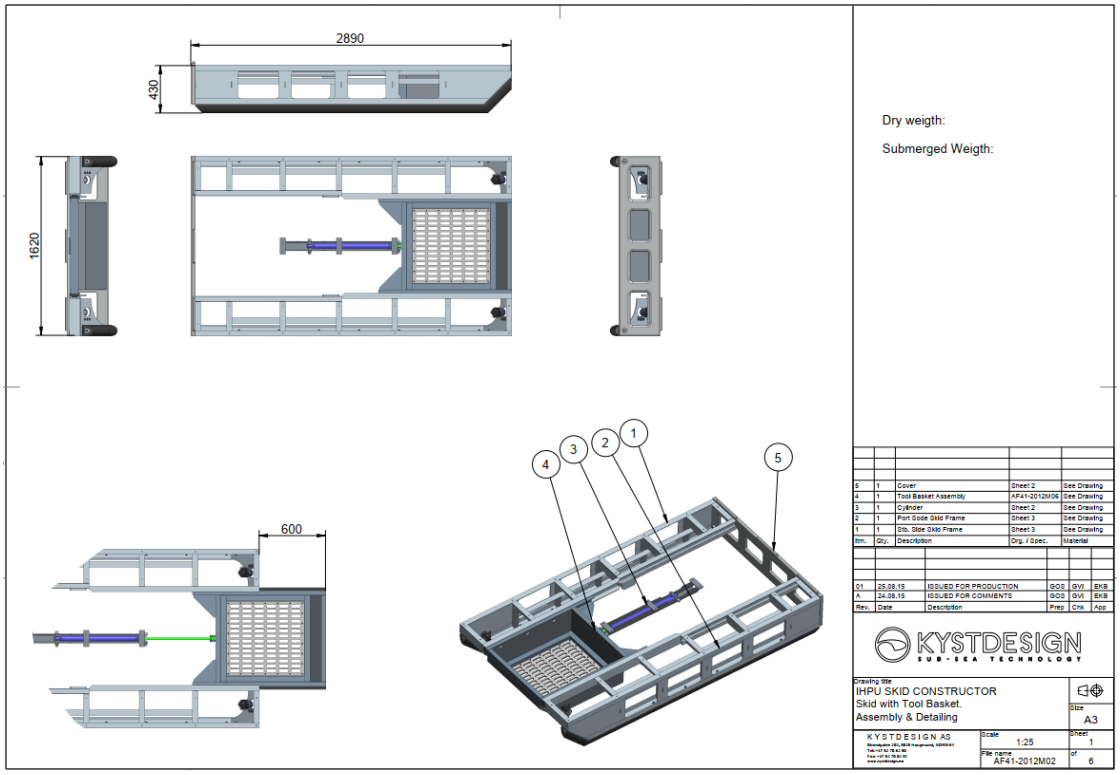


Figure 7 - Constructor IHPU Skid

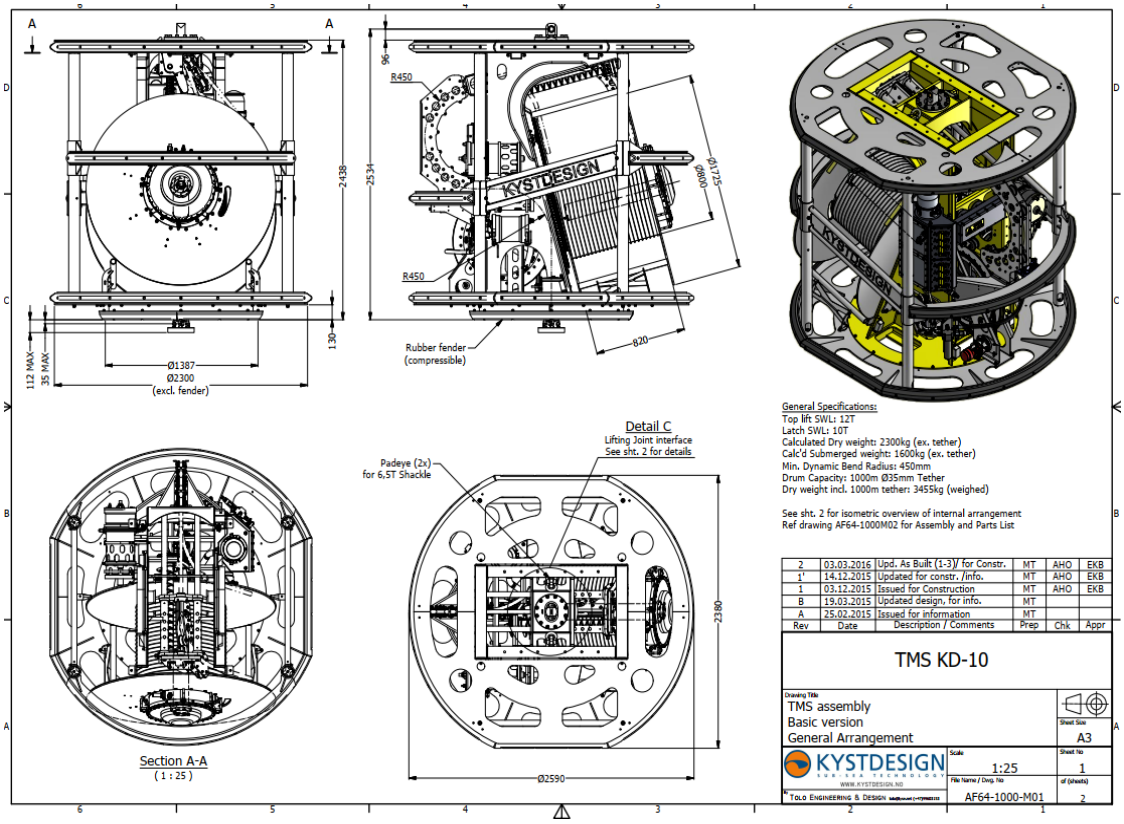


Figure 8 - TMS KD-10 drawing

6.7 DRAWINGS ROV AND TMS

Spare parts	Description
C5-C6 ROV spare parts	ROV according to recommended spare parts list from Kystdesign
TMS KD-10 S/N002-003	TMS according to recommended spare parts list from Kystdesign
Schilling T4	According to Schilling recommended spare parts list 008-0323
Schilling Rigmaster 5F	According to Schilling recommended spare parts list 008-0104
Schilling Atlas	According to Schilling recommended spare parts list 008-0506