

CONSTRUCTOR™
Operators Manual



KYSTDESIGN AS

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Volume 1 – General Description

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System General

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1 Description of the ROV

CONSTRUCTOR™ is a general purpose hydraulic work class ROV. The system is characterised by a compact and integrated mechanical architecture, powerful and accessible hydraulic functions and a user friendly real time control system.

1.1 ROV Dimensions and Performance

Item	Sub-Item	Specification:
Constructor ROV	Standards	DNV Standard for Certification No.2.22, Lifting Appliances 2011. Electrical installations in compliance with the requirements of FEA-M standards and data sheets.
	Certifying authority	The ROV frame and lifting appliances are certified by DNV.
	Lift point / Emergency Lift Point	SWL = 7 TONNES All stress calculations are based on 4x 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 arrangement includes an additional lift point for Emergency Recovery, i.e. allows for lifting the ROV without use of the termination bullet.
	Depth Rating	- ROV: 3000msw - Buoyancy: 3000msw
	Classification	Ex Zone2
	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.
	Tare weight	~4600kg incl skid, manipulators & payload.
	Pay Load	~360Kg with Skid, Manipulators and standard sensors, cameras, lights and P&T installed.
	Through frame lift capacity	3000Kg



Mechanical interfaces	Four docking receptacles underneath for installation in two alternative locations: Alt.1: Spacing 670x795mm Alt.2: Spacing 428x795mm The receptacles suits Ø65mm docking pins with Ø34mm lock bolts.
Operating temperature	-20 to +45 °C
Auto holding capability	Heading +/- 1° Altitude +/- 100 mm Depth +/- 75 mm
Trim functions	Pitch +/- 10° Roll +/- 10°

1.2 ROV Hydraulic System

MAIN SYSTEM	Pump	Variable displacement load sensing pump (PV180R1K1T1NMFC)
	Filters	2x 3 micron high pressure filter, no bypass
		10 micron return filter, with built in bypass valve
	Thrusters	4 horizontal thrusters - SA 380
		3 vertical thrusters SA 380
	Thruster Control Unit	14 Proportional pressure reducing valves
		1 Pilot operated utility valve, 250l/min @200bar
		1 Pump soft start / Idle valve
		System Pressure Relief / Safety Valve
		Pressure sensor in supply line
		Pressure sensor in return line
		Termination board with light emitting diodes
		Transparent valve pack cover



	Reservoir	16L Hydraulic Compensator with analogue volume readout.
	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.
	Interfaces	Quick connectors for deck HPU
AUXILIARY SYSTEM	Pump	Variable displacement load sensing pump (PV092L1K1T1NMRC)
	Filters	3 micron 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.
	Valve-pack 1	10 Proportional Directional Valves Size NG3
		Termination board with light emitting diodes
		Transparent valve pack cover
	Valve-pack 2	10 Proportional Directional Valves Size NG3
		Termination board with light emitting diodes
		Transparent valve pack cover
	Valve-pack 3	4 of 80 l/min bi-directional output with proportional pressure and flow control. Separate pressure control for valve-pack 1 and 2.
		1 Proportional pump control valve
		System Pressure Relief / Safety Valve
		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
	Manifolds	Pressure and return manifolds mounted in the front of the ROV.
		1x Pilot Operated High Flow Valve 160 l/min in pressure manifold.



	Reservoir	16 L Hydraulic compensator with analogue volume readout.
	Piping & Fittings	All fittings will be made of stainless steel. Swagelok imperial fittings are used for pipe diameters up to 1". For sizes above, SAE flange fittings are used.
	Camera & Light Actuators	- One hydraulic tilt unit for docking camera w/light.
	Interfaces	Quick connectors for deck HPU
		Interface for 5F RigMaster and 7F Atlas on port side.
		Interface for 7F T4 manipulator on port and starboard side.

The ROV system is normally delivered with Shell S3M22 hydraulic oil. This oil is registered and categorized as BLACK in the HOCNF register.

With regard to the use of environmental friendly oils, there is nothing to indicate that our system is inferior to others in this area. The only special by a ROV hydraulic system compared to any other systems with similar pumps and valves, is that it operates under lower temperatures and with the risk of water ingress. What we therefore can promise is that our ROV system is equally compatible with green oils as other ROV systems. However, we cannot guarantee that green oils are as good as traditional mineral hydraulic oils.



1.3 ROV Electric System

	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 is optional, requires one separate fibre.
	Power Distribution	All power distributed to external users, such as lights, cameras and sensors can be switched on/off and isolated from the topside computer. All power lines are protected by individual fuses.
	Gyro Interface	Connector type : Seacon MinM-26#20
	Tool Skid Interface	Connector type : Seacon 5506-2008 Max power consumption allowable is 20A 115VAC.
	Camera interface	Interface for 10 cameras. Connector type : Seacon MinL 1 coax/6 electric. Transmission type (HD or Composit) are selected in the multiplexer. HD requires optional cards installed.
	Camera Actuators	Two off electrical pan & tilt units.
	Survey Sensor Interface	Survey Sensors, 10 off. Connector type : Seacon Min-K-10 The sensors are mainly wired for 24VDC. (Other voltages available)
		Survey Sensors, 4 off. Connector type : Seacon Min-K-8 The sensors are wired for 115VAC. (Other voltages available)
	Light Interface	Connector type : Seacon 5506-1503 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 reset through the control system. The 115V supply is protected by a 20A breaker.
	Electric Motor	Pressure compensated 220 HP (shaft) dual ended, 4 pole, 3 phase 4150V, 50 - 60 Hz



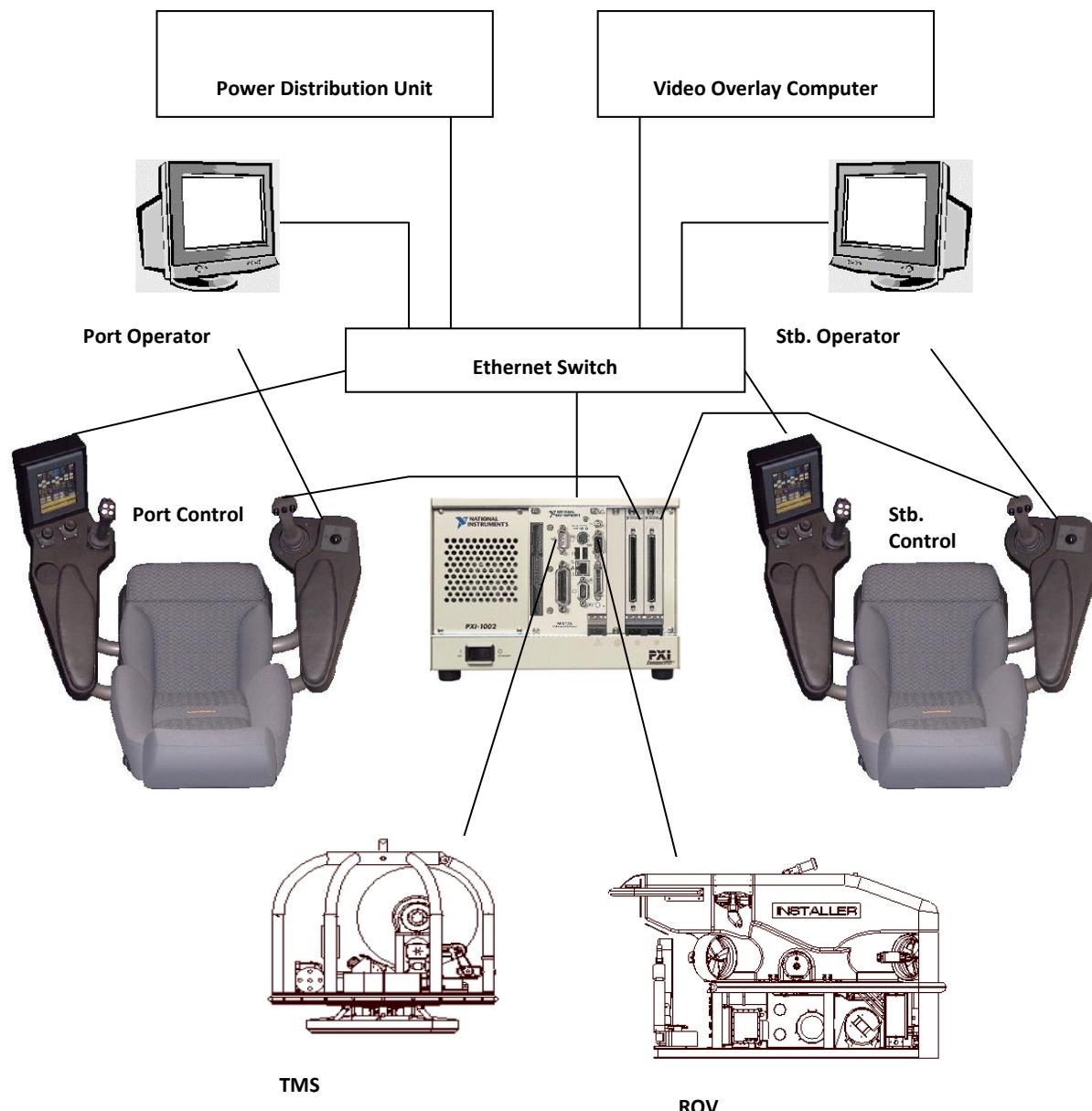
	Pressure vessel	Mounted with easy access to all penetrators. Opens in one end allowing access to all live electronics.
	Transformer & Termination	Combined oil filled unit placed at the rear port side of the ROV



1.4 ROV Control System

1.4.1 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).



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**.



1.4.2 Real Time Level:

A real time level gives reliability, deterministic loop speed, short boot time, and simplicity. This level is meant to be a “turn on and forget” level. It is made up of the following elements:

1. ROV control system
2. TMS Control system
3. PDU control system
4. Left Control joysticks and touch screen system
5. Right Control joysticks and touch screen system
6. Topside PXI real time controller:
 - Decode and control ROV serial links
 - TCU 20 times /sec at 57.6kbps
 - ACU, GFVPs, Light Box and KD Con 57,6kbps
 - Gyro 38,4 kbps (settable)
 - Depth Sensor 9,6 kbps
 - Altimeter 9,6 kbps
 - ROV auto / command functions
 - Decode and control TMS serial link 5 times/sec 57,6 kbps
 - Decode and control PDU Ethernet link
 - Communicate with Left Control 10 times /sec Ethernet link
 - Communicate with Right Control 10 times /sec Ethernet link
 - Generate video overlay data
 - Generate data to be displayed at the “Information Level”
 - Handle setup change requests.

The PXI system reads and calibrates all I/O, control alarms and map functions together. It takes about 20 sec from power on to the real time level is up and running.

1.4.3 Information Level:

The information level consists of:

1. Optional Video overlay system, e.g. “Options” SW.
2. Individual left and right pilot operator computers running ROV status programs.
3. Sonar, PC etc.

The PXI unit sends an Ethernet UDP telegram containing ROV motion system data.

A video overlay system may decode this telegram and display the data overlaid in the video display.

The two operator monitor computers may run several programs to supervise system data. One program controls the video matrix, one monitors the fibre optic system and so on.



The ROV Monitor program displays control system information like alarms, navigational information etc.

The ROV System Setup program gives access to the real time level calibration and configuration. This may be used to configure/reconfigure functions and settings in the ROV control system.

The Pro-face touch screen editor program gives access to the touch screens software. Operators can use this to label buttons on the touchscreen to reflect the current function or actuator the buttons are connected to.

None of these programs are vital for system to run and can be turned off if needed.

1.4.4 Control System and Navigation Sensors

A wide range of navigational sensors can be used with the ROV. Parameters can be adjusted and set in the configuration program.

Typical sensors are Depth sensor, Altimeter, Sonar, Gyro, Doppler Velocity Log, Responder and Transponder. The control system is able to utilize all sensors for optimal navigation.

The ROV control system provides auto functions as Auto heading, Auto depth and Auto altitude.

The control system is prepared for upgrade with INS to provide advanced auto modes like AutoPos and AutoTrack.

1.4.5 Telemetry

The KD-Con™ telemetry system includes the following basic I/O's:

1. Up to 32 controlled power relays
2. Up to 36 serial ports individual selectable RS232/485/TTL
3. 8 Ground fault detection channels (the valve packs have built-in GFD circuits)
4. 8 composite video channels
5. 4 HD-SDI video channels (max 720p/1080i) are optional.
6. Gb layer-1 Ethernet ports with additional 5 port Gb switch for expansion is optional.
7. Optional 2 ch. PECL for multi beams

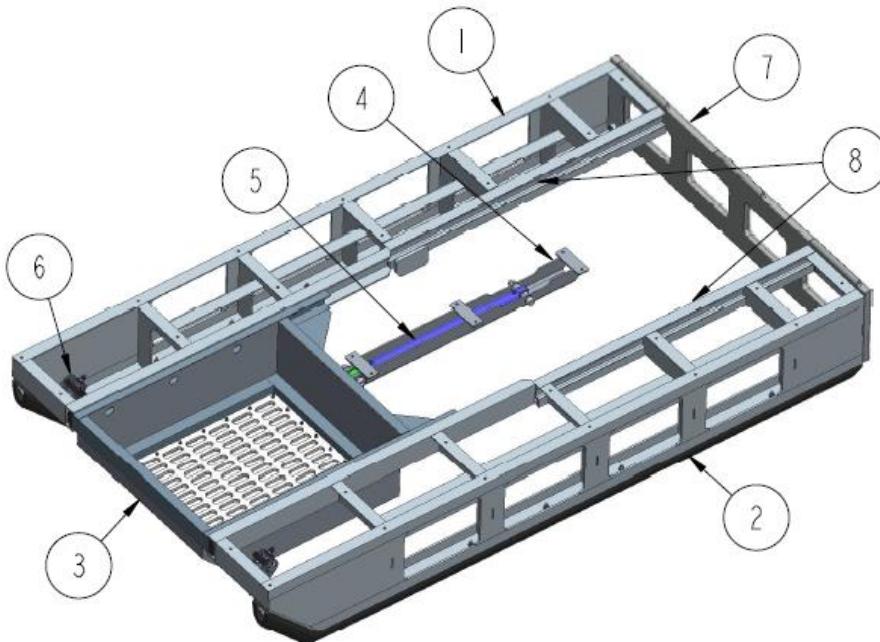
Diagnostics includes optical budget, I/O monitoring (traffic and activity). New cards and modules are developed to suit future needs.



2 Interface for project equipment / special requirements

2.1 Description of skid

The Constructor 05 & 06 is delivered with a hydraulic operated front drawer and a skid designed for carrying Isolated Hydraulic Pump Unit. Height of the skid is 430mm. (IHPU is not included in the delivery).



The skid contains the following features:

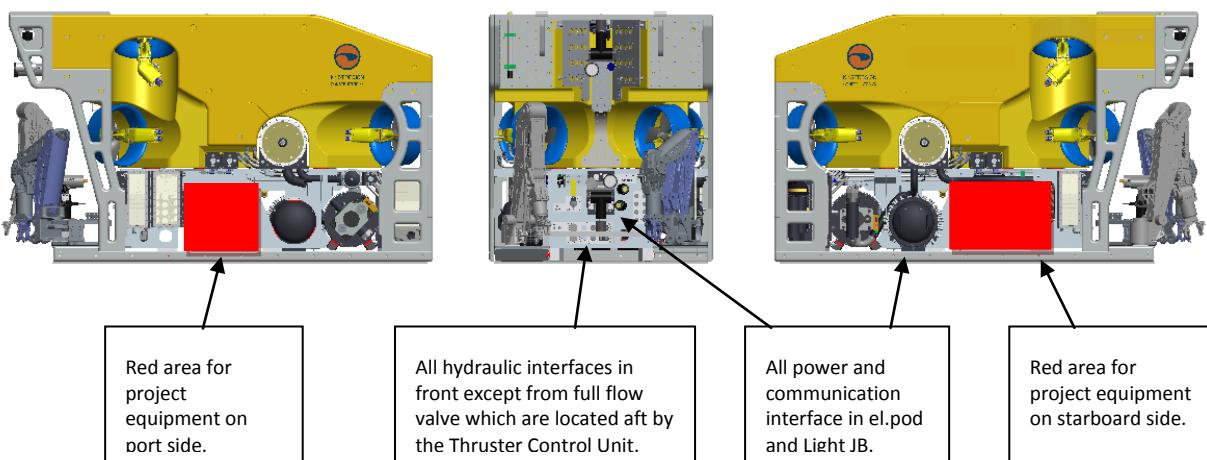
1. Starboard skid section
2. Port skid section
3. 1x Front drawer
4. 1x Cylinder support
5. 1x Hydraulic cylinder with 600mm stroke
6. 2x Light brackets
7. 1x aft cover
8. Interface for IHPU (ref. drawing AF41-2010M02)

Several other skid solutions have been developed for KD ROV's.



2.2 Interfaces inside the ROV

The ROV is delivered with approximately 360kg lead. In addition to the skid drawer as described above, there is a lot of open space in the ROV itself for storage of various project equipment. See red area on figures below. Hydraulic and electrical interfaces are also shown on the below figures.



For hydraulic connection of external project equipment, the following valves are available in addition to valves required to run Atlas manipulator, camera tilt and skid drawer:

- 11 off low flow valves (~8 l/min @ 200bar) proportional flow, pressure control on VP.
- 4 off high flow valves (80 l/min @ 200bar) proportional flow & pressure control.
- 1 off pilot operated high flow valve (160 l/min @ 200bar) in pressure manifold
- 1 off full flow valve (250 l/min @ 200bar)

Power and communication interface are available from the main pod or the light control box in front.

2.3 Power supply and telemetry solution for sensors and instruments

Sensors can be powered from different sources. By default the ROV provides 24Vdc, 48Vdc and 115Vac for external sensors. The built in telemetry system can provide interface for serial communication (RS232/485/TTL), Ethernet etc. Other interfaces can be provided if needed.

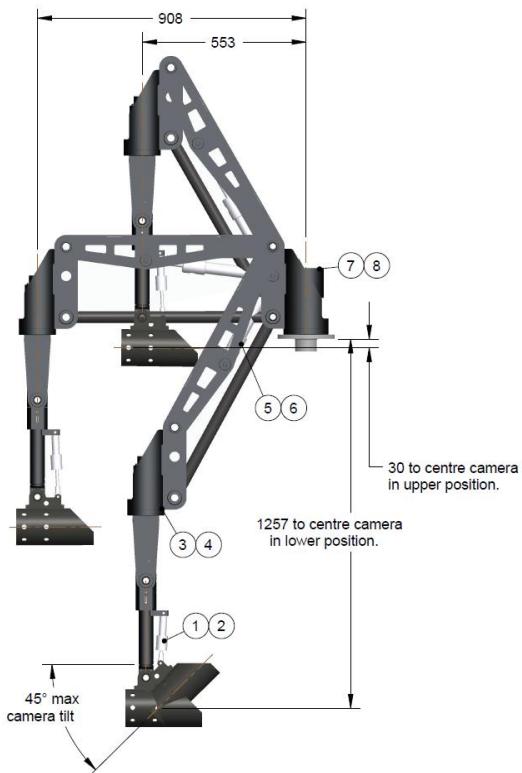
2.4 Manipulators

The ROV is equipped with manipulator interface plates on starboard and port front corner. The starboard plate has hole pattern for T4 manipulator. The port plate has hole pattern for T4, Rigmaster and Atlas manipulators.



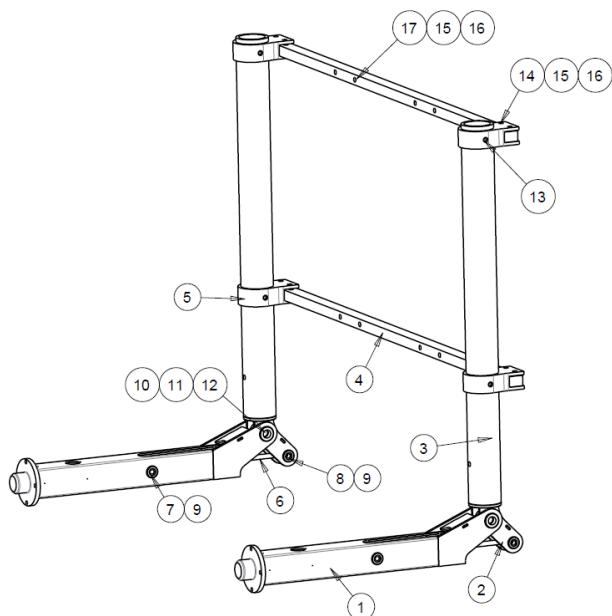
2.5 Camerabooms

Kystdesign has its own cameraboom design that easily can be installed by dedicated brackets on each side of the skid.



2.6 Pipe Tracker

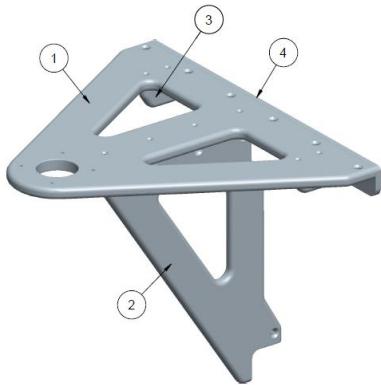
Kystdesign has its own Pipe Tracker Carrier design that easily can be installed by dedicated brackets on each side of the skid.





2.7 Doppler

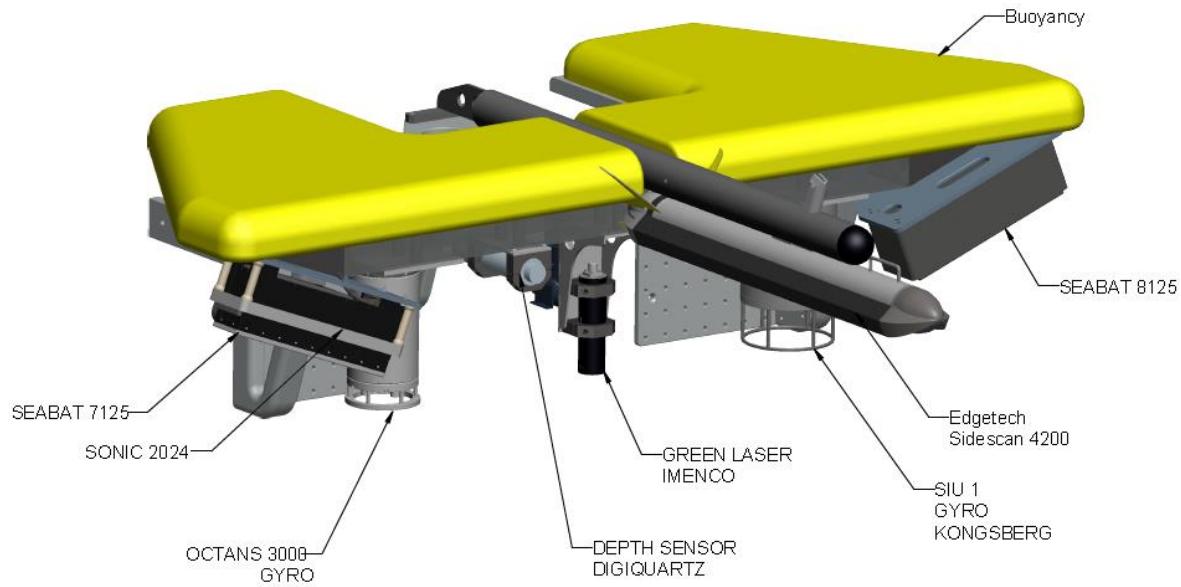
Kystdesign has its own design on Doppler Support Frame for installation aft on the ROV.



There are also possibilities for installing the Doppler underneath the ROV dependent on other equipment to be carried.

2.8 Seafloor mapping and imaging

KYSTDESIGN has delivered several support systems for seafloor mapping equipment. One example is our survey frame designed to suit directly onto the Supporter and Constructor front frame as shown on the below figure.

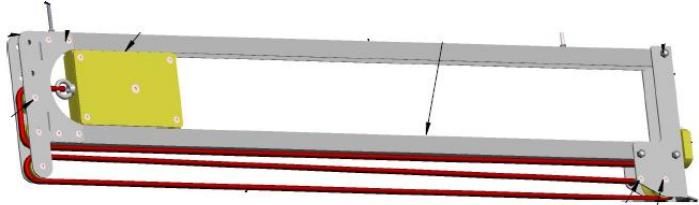


Regarding Sidescan Sonar and Sub Bottom profiler, there are strong points on the ROV sides and underneath for interfacing this type of equipment.



2.9 High Pressure Water Pump with Hose Retractor

If High Pressure Water Pump is of interest, this can be installed together with our Hose Retractor Unit. The Hose Retractor Unit allows the 3/8" water jetting hose to be pulled approx. 2.5m out with automatically retraction when not in use. The water jetting hose is not shown on the below figure.



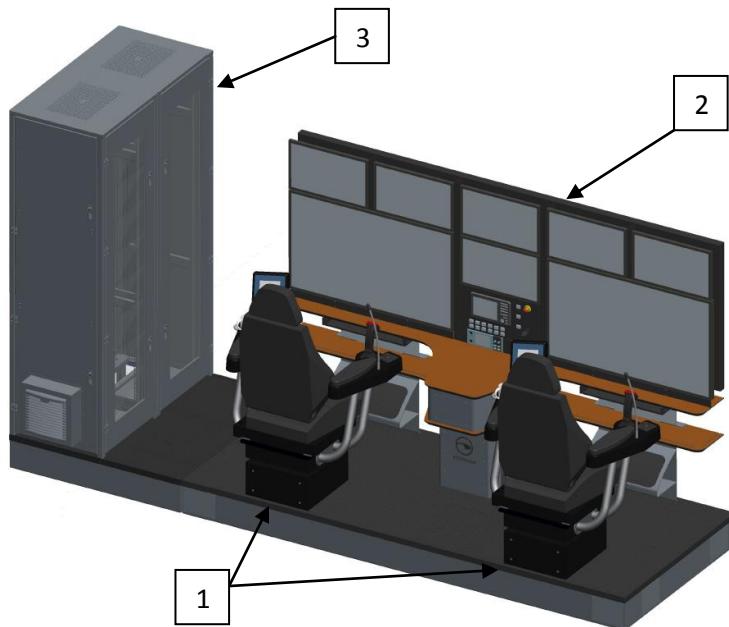


3 ROV Control Station

3.1 General

The Control Station Hardware can either be integrated into a ship control room, or installed into a 20' Control Container. The Control Station consists of the following main components:

1. 2 off identical Pilot Chairs
2. Monitor support section including desk, footrest and platform for easy cable routing.
3. 2 bay 19" Side rack with platform



3.2 Pilot Chair

The Pilot Chair contains the following components:

1. Chair Base with swivel and swivel lock.
2. El. Controlled Seat Position Adjustment Unit
3. Recaro leather seat
4. Left Armrest with:
 - 1x Touch Screen
 - 1x Grabber Joystick
 - 2x Joysticks that can easily be mapped according to customers need.
 - 2x Push buttons for ClearCom (2ch)
 - 2x Encoders for trimming of Auto Functions
 - 1x Joystick for winch control (pay in/out)



5. Right Armrest with:
 - Main Joystick
 - Trackball Mouse for PC interface
 - ClearCom Goose Neck Microphone

3.3 Monitor Support Section

The Monitor Support Section contains the following components:

1. 2x 46" Sony Monitors
2. 6x 22" NEC Monitors
3. ClearCom Unit
4. Desk / shelf Unit with cut-out in front panel for VHF/UHF and T4 Master storage
5. Footrests
6. Centre section with 19" rack interface for misc. equipment
7. Platform for easy cable routing

3.4 Side Rack

The Side Rack contains the following components:

1. 2 bay 19" rack, dimension 1200x600x2000mm (WxDxH)
2. 1x Miranda MultiView Video Controller (16 ch input HD/SD/Composite)
3. 2x UPS (for clean power supply to rack components)
4. System Computer and necessary interface boards
5. Operator computers for graphic display of control software
6. Telemetry System
7. Master Clearcom Unit
8. Video Matrix 16ch (Composite).

OPTION: Video Overlay System 3ch including Video Logger.



4 Power Distribution System (PDU)

PDU	Description	Two separate cabinets, one containing the necessary breakers, contactors, overload relays and signal transformers. The other serving as a termination and isolation point for all High Voltage Connections. An external cabinet provides soft start capability.
	Input	3 phase 400-420-440-460-480 VAC, 50-60 Hz
	Power outputs	ROV HPU Transformer
		TMS HPU Transformer
		ROV Instrumentation Transformer
		TMS Instrumentation Transformer
	Monitoring local	Voltage in
		Frequency in
		Phase detection in
		Contactors on/off status
TRANSFORMERS	ROV HPU Transformer	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)
		3 phase 400-420-440-460-480VAC, 50-60 Hz
		230 KVA
		SecondaryTappings : 4200-4350-4500 V



	ROV Inst. Transformer	3 phase 400-420-440-460-480VAC, 50-60 Hz 10 KVA SecondaryTappings : 3000-3150-3300V
	TMS HPU Transformer	3 phase 400-420-440-460-480VAC, 50-60 Hz 23 KVA SecondaryTappings : 3000-3150-3300V
	TMS Inst. Transformer	3 phase 400-420-440-460-480VAC, 50-60 Hz 10 KVA SecondaryTappings : 3000-3150-3300V



5 Certification

The CONSTRUCTOR ROV lifting arrangement consists of the following main items:

Item:	Name:	Drawing:
1	Main frame	AF25-1012M09
2	ROV Bullet Joint	AF64-1018M01
3	Emergency recovery lift point	AD16-1010M15
4	Work Module Interface	AD16-1013M20

Applicable certificates are found in the Fabrication Record Book.

Stresses and deflections have been verified for all items by applying Finite Element analysis and found acceptable with satisfactory margins according to DNV "Rules for Certification of Lifting Appliances". The design loads used in this analysis correspond to 4 times the SWL values given in the certificates. Furthermore, all components have been test loaded to minimum 2 times the SWL values given in the certificates.

Item 1 consists of the aluminium main frame, adjustable lifting plate and 2 tension bolts for connection to the main frame.

Item 2 consists of swiveled termination bullet.

Item 3 is connected directly to the adjustable lifting plate. This item shall primarily be used for emergency recovery of the ROV.

Item 4 consists of four receptacles for bottom mounted modules.



KYSTDESIGN
S U B - S E A T E C H N O L O G Y

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6 Spare Part List

Pos	Supplier	Category	Description	Part no	Qty	KD Part No.
1	SEACON europa Ltd	Cable	Power & Signal Cable 4m	AD16-1000E02 item 22	1	100371
2	SEACON europa Ltd	Cable	Power Cable	AD16-1000E02 item 23	1	100372
3	SEACON europa Ltd	Cable	Sensor Cable 3,0m	AD16-1000E02-item 21	1	100370
4	SEACON europa Ltd	Cable	Valve Pack Cable	AF25-1000E40	1	101125
5	SEACON europa Ltd	Conn	Panel Mount Connector	5506-1504-0004	1	100367
6	SEACON europa Ltd	Conn	Panel Mount Connector	5506-2008-0004	1	100368
7	SEACON europa Ltd	Conn	Panel Mount Connector	5506-2008-SP	1	100365
8	SEACON europa Ltd	Conn	Panel Mount Connector	MIN-K 4276-2-B	1	101128
9	SEACON europa Ltd	Conn	Panel Mount Connector	MIN-L 4119-4-B	1	101127
10	SEACON europa Ltd	Conn	Panel mount connector	5506-1503-0004	1	100366
11	SEACON europa Ltd	Conn	Panel mount connector	MIN-K 4276-1-B	1	101129
12	SEACON europa Ltd	Conn	Panel mount connector	MIN-M 4276-4-A	1	101130
13	Elprint	EI. Board	ACU Terminal & LED Card	AE99-1034B01	1	101201
14	Elprint	EI. Board	DC/DC Power Card Micro	AC28-1100E05	1	100797
15	Elprint	EI. Board	DC/DC Power Card Mini	AC28-1100E01	1	100678
16	Westcontrol	EI. Board	Dimmer 6A Phase	AF60-1000B03	1	101324
17	Hapro	EI. Board	Driver Card	AE99-1000B01	2	101143
18	Elprint	EI. Board	FARM Module Card Mini	AC28-1100E02	1	100677
19	Westcontrol	EI. Board	GFD Card	390014105	1	100248
20	Elprint	EI. Board	GFVP Terminal & LED Card	AE99-1035B01	1	101202
21	Westcontrol	EI. Board	Light Board	AF60-1000B01	1	101322
22	Westcontrol	EI. Board	Light Control	AF60-1000B02	1	101323
23	Hapro	EI. Board	Master Card	AE95-1050E91	1	101079
24	Hapro	EI. Board	Piggyback RS232 Card	AE95-1050E96	2	101084
25	Hapro	EI. Board	Piggyback RS485 Card	AE95-1050E97	2	101085
26	Hapro	EI. Board	Piggyback TTL Card	AE95-1050E98	1	101086
27	Hapro	EI. Board	Relay Card	AE95-1050E92	1	101080
28	Hapro	EI. Board	Serial Card	AE95-1050E95	1	101083
29	Westcontrol	EI. Board	Switch 20A	AF60-1000B03	1	101336
30	Elprint	EI. Board	TCU LED Card	AE99-1033B02	1	101200
31	Elprint	EI. Board	TCU Terminal Card	AE99-1033B01	1	101199
32	Hapro	EI. Board	Video Card	AE95-1050E93	1	101081
33	Ebm-papst	EI. Fan	80x80x15mm 24Vdc	AD0824HX-D71	1	100905
34	Farnell	EI. Fan	80x80x25mm 115Vac	SF11580AT/1082HBL.GN	1	101017
35	Fox Electronics	EI. Fiber	LC Dempe ledd SM 5dB		2	
36	Farnell	EI. Fuse	1.5A Very Fast 451 Series	045101.5MRL (-NRL)	15	505
37	Farnell	EI. Fuse	10A Medium 5x20mm Littelfuse 234 Series	0234010.MXP	5	505
38	Farnell	EI. Fuse	3.15A Fast TE5 Littelfuse 395 Series	39513150000	10	505
39	Farnell	EI. Fuse	5.0A Very Fast 451 Series	0451005.MRL (-NRL)	20	505
40	Fieberworks	EI. KDcon	Brown 2.5Gbps SFP CWDM 1611nm	SFP-MR80D-C61-U	1	101096
41	Kystdesign	EI. KDcon	Ethernet Mux Subsea	AF33-1000M01	1	101190

Pos	Supplier	Category	Description	Part no	Qty	KD Part No.
42	Fieberworks	EI. KDcon	Green 2.5Gbps SFP CWDM 1531nm	SFP-MR80D-C53-U	1	101092
43	Fieberworks	EI. KDcon	Orange 2.5Gbps SFP CWDM 1571nm	SFP-MR80D-C57-U	1	101094
44	Fieberworks	EI. KDcon	Purple 2.5Gbps SFP CWDM 1491nm	SFP-MR80D-C49-U	1	101090
45	Kystdesign	EI. KDcon	Video Multiplexer Subsea w 4ch HD-SDI	AF30-1000M01	1	101212
46	Kystdesign	EI. KDcon	Video Multiplexer Topside w 4ch HD-SDI	AF30-1000M03	1	101213
47	Farnell	EI. Pow	AC/DC 90-254/12V 8,3A Schroff	13100103	1	101207
48	Farnell	EI. Pow	Bridge Rectifier 35A/400V	GBPC3504	1	101206
49	Digi-Key	EI. Pow	Capacitor 350V 1800uF	ECE-T2VP182FA	1	101204
50	Farnell	EI. Pow	Capacitor 63V 15.000uF	ALT22A153DE063	1	101205
51	Craftec	EI. Pow	DC/DC 150/24V 250W Mini	V150B24C250BF	1	101186
52	Craftec	EI. Pow	DC/DC 300/12V 150W Micro	V300C12C150BF	1	100437
53	Craftec	EI. Pow	DC/DC 300/24V 250W Mini	V300B24C250BF	1	100436
54	Craftec	EI. Pow	DC/DC 300/48V 150W Mini	V300C48C150BF	1	101168
55	Craftec	EI. Pow	HoldUp Cap 1800uF	HUB1800-S	1	100440
56	Craftec	EI. Pow	Rectifier 750W - 1000W	FARM2C11	1	100434
57	Pyrocontrol	EI. Sensor	PT100 Element	ME20GK005006B1bab	1	100429
58	Kystdesign	EI. Trafo	Constructor trafo assembly	AF25-1060E01	1	
59	Innova	Hyd	Bearing kit for SA300 & 380 thruster	0286-MAS-BK	4	
60	Hyco	Hyd	Filterelement 10 mikron	932658Q	6	
61	Hyco	Hyd	FilterelementCardew	SDFC-1	6	
62	Hyco	Hyd	Filterelement 2 mikron high collapse	G01448Q	6	
63	Tools	Hyd	Hose, AF25 Aux pump regulator	JIC 7/16" 90° - JIC 7/16" - 3270mm	1	
64	Tools	Hyd	Hose, AF25 Aux water filter return	JIC 3/4" - JIC 3/4" - 3/8" - 1450mm	1	
65	Tools	Hyd	Hose, AF25 Aux water filter sensor	JIC 7/16" 90° - JIC 7/16" - 3960mm	1	
66	Tools	Hyd	Hose, AF25 Aux water filter supply	JIC 7/16" 90° - JIC 7/16" - 1700mm	1	
67	Tools	Hyd	Hose, AF25 Main pump regulator	JIC 7/16" - JIC 7/16" - 1/4" - 1250mm	1	
68	Tools	Hyd	Hose, AF25 Main water filter return	JIC 3/4" - JIC 3/4" - 3/8" - 970mm	1	
69	Tools	Hyd	Hose, AF25 Main water filter sensor	JIC 7/16" 90° - JIC 7/16" - 1030mm	1	
70	Tools	Hyd	Hose, AF25 Main water filter supply	JIC 7/16" - JIC 7/16" - 1/4" - 990mm	1	
71	Tools	Hyd	Hose, AF25 Manipulator C	JIC 7/16" 90° - JIC 7/16" - 1/4" - 1300mm	1	
72	Tools	Hyd	Hose, AF25 Manipulator P	JIC 7/16" 90° - JIC 7/16" - 1/4" - 1600mm	1	
73	Tools	Hyd	Hose, AF25 Manipulator R	JIC 9/16" 90° - JIC 9/16" - 3/8" - 1600mm	1	
74	Tools	Hyd	Hose, Aux pump supply	Hyd Hose AF25-Aux pump supply hose	1	
75	Tools	Hyd	Hose, Main pump supply	Hyd Hose AF25-Main pump supply hose	1	
76	Tools	Hyd	Hose, Thruster	Hyd hose AF25-T3A/T5A (straight-45deg-L940mm)	1	
77	Tools	Hyd	Hose, Thruster	Hyd hose AF25-T3B/T5B (straight-45deg-L1010mm)	1	
78	Tools	Hyd	Hose, Thruster	Hyd hose AF25-T4A/T4B (straight-45deg-L725mm)	1	
79	Tools	Hyd	Hose, Thruster	Hyd hose AF25-TA1/TA7 (straight-straight-L875mm)	1	
80	Tools	Hyd	Hose, Thruster	Hyd hose AF25-TA2/TB2/TA6/TB6 (straight-straight-L690mm)	1	
81	Tools	Hyd	Hose, Thruster	Hyd hose AF25-TB1/TB7 (straight-straight-L905mm)	1	
82	Svafas	Hyd	Hose,Push on, 1/2"	Hyd Hose PB-8	2	101165

Pos	Supplier	Category	Description	Part no	Qty	KD Part No.
83	Svafas	Hyd	Hose,Push on, 1/4"	Hyd Hose PB-4	2	101070
84	Svafas	Hyd	Hose,Push on, 3/4"	Hyd Hose PB-12	1	
85	Svafas	Hyd	Hose,Push on, 3/8"	Hyd Hose PB-6	2	101071
86	Danfoss	Hyd	Pressure sensor MBS 1200 20 BAR 4-20M M12x11/4 BSP		1	100426
87	Danfoss	Hyd	Pressure sensor MBS 1200 250 BAR 4-20M M12x11/4 BSP		1	100428
88	Hyco	Hyd	Pump Aux	PV092L1K1T1NMRC	1	101241
89	Hyco	Hyd	Pump Main	PV180R1K1T1NMFC	1	101105
90	Innova	Hyd	Seal kit for SA300 & 380 thruster	0286-MAS-SK	4	
91	Innova	Hyd	Thruster, SA 380		1	
92	Aratron	Hyd	Valve, NG3 Non return	BDERV3	1	100327
93	Aratron	Hyd	Valve, NG3 Proportional directional	WDPF A03 ADB V 5 G24 M35/55	1	100390
94	Aratron	Hyd	Valve, poppet	SDSPM18-BA-G24-M35/55	1	100391
95	Sun	Hyd	Valve, poppet logic element	LOHA-XDN/AP	1	101113
96	Aratron	Hyd	Valve, Pressure Relief	BVSPM22-350	2	100325
97	Hydronic	Hyd	Valve, Proportional Directional Normally Closed	PE16-S67C	1	100343
98	Hydronic	Hyd	Valve, Proportional Directional Normally Open	PE16-S67H	1	100344
99	Aratron	Hyd	Valve, Proportional Pressure reducing	MVPPM22-220-G24-M35/55	1	100328
100	Aratron	Hyd	Valve, Proportional pressure relief	BDPPM18 200 G24 M35/55	1	100392
101	Hydronic	Hyd	Valve, Proportional reducing / relieving	EHPR08-33-0-N-24-DL	1	100345
102	Hydronic	Hyd	Valve, Proportional reducing / relieving	TS12-36AS-0-N-24-DL	1	100346
103	Kystdesign	Mech	Diaphragm 1,2L compensator	Diaphragm BFA 100-90-100 Materiale 50 NBR 253	1	100119
104	Kystdesign	Mech	Diaphragm 16L reservoir	Diaphragm BFA 320-310-120 Materiale 50 NBR 253	1	100158
105	Kystdesign	Mech	Glide Ring for liftpoint		2	100534
106	Kystdesign	Mech	Lid 16L Comp	AB25-4000M21 rev.01 ROV-Version LID	1	101136
107	Kystdesign	Mech	Lid ACU	AF25-1034M21 rev.01 Auxilliary Control Unit Lid	1	101138
108	Kystdesign	Mech	Lid GFVP	AF25-1035M11 rev.01 General Function Valve Pack Lid	1	101139
109	Kystdesign	Mech	Lid TCU	AF25-1033M21 rev.01 Thruster Control Unit Lid	1	101137
110	Kystdesign	Mech	Lid termination & Trafo JB	AD16-1060M31 rev.01 LID Trafo Supporter	1	100314
111	Kystdesign	Mech	Linear sensor-LTS 0200 3AS 1949 (KD-type)	Linear sensor-LTS 0200 3AS 1949 (KD-type)	1	100157
112	Kystdesign	Mech	POD seal	Piston Seal 292x284x5,5, SJ-K1 H-PUR	2	100134
113		O-Ring	003,68 x 1,78 - 70NBR	Gland seal for electromotor - conductor 4,0sqmm	10	101169
114		O-Ring	004,48 x 1,78 - 70NBR	Gland seal for electromotor - conductor 6,0sqmm	10	101170
115		O-Ring	004,50 x 1,50 - 70NBR	NG3 ventil	10	101179
116		O-Ring	007,00 x 2,50 - 70NBR	TCU / HP Filter interface	4	101171
117		O-Ring	013,94 x 2,62 - 70 NBR	Vent Screw 16L reservoir	4	100195
118		O-Ring	018,72 x 2,62 - 70NBR	Seaconn Shellsize 15	4	100779
119		O-Ring	020,35 x 1,78 - 70NBR	Seaconn MINK-FCR (axial/flange)	4	101172
120		O-Ring	021,89 x 2,62 - 70NBR	Seaconn Shellsize 20	4	100780
121		O-Ring	022,22 x 2,62 - 90NBR	Linear Sensor	8	100775
122		O-Ring	026,70 x 1,78 - 70NBR	Seaconn MINM-FCR (axial/flange)	4	101173
123		O-Ring	031,47 x 1,78 - 90NBR	Linear Sensor	8	100776

Pos	Supplier	Category	Description	Part no	Qty	KD Part No.
124		O-Ring	032,92 x 3,53 - 90NBR	1" SAE J158 Flange	4	100690
125		O-Ring	034,52 x 3,53 - 90NBR	TCU / HP Filter interface	4	101174
126		O-Ring	037,69 x 3,53 - 90NBR	1 1/4" SAE J158 Flange	4	100688
127		O-Ring	047,22 x 3,53 - 90NBR	1 1/2" SAE J158 Flange	4	100691
128		O-Ring	056,75 x 3,53 - 90NBR	2" SAE J158 Flange	4	100646
129		O-Ring	058,00 x 3,00 - 70NBR	Kompensatorer	10	100159
130		O-Ring	059,99 x 2,62 - 70NBR	TCU / Sensor JB interface	4	101175
131		O-Ring	069,44 x 3,53 - 90NBR	2 1/2" SAE J158 Flange	4	100689
132		O-Ring	075,87 x 2,62 - 90NBR	Filter 30P - AF25-1038	8	101154
133		O-Ring	101,27 x 2,62 - 70NBR	TMS pump - 15kW HPU	4	100786
134		O-Ring	104,37 x 3,53 - 90NBR	Filter 80CN	5	101155
135		O-Ring	133,00 x 2,62 - 70NBR	Sensor JB Lid	4	101176
136		O-Ring	162,00 x 3,50 - 70NBR	Main Pump	4	100709
137		O-Ring	247,24 x 3,53 - 70 NBR	Flange 16L comp	4	100188
138		O-Ring	275,00 x 3,53 - 70NBR	Termination & Transformer JB	4	101177
139		O-Ring	280,00 x 3,00 - 70 NBR	16L Comp	4	100160
140		O-Ring	313,00 x 3,53 - 70NBR	POD ROV	10	100416
141		O-Ring	320,00 x 4,00 - 70NBR	16L Comp	4	100161

Constructor 5 - 6

Extended cable spares



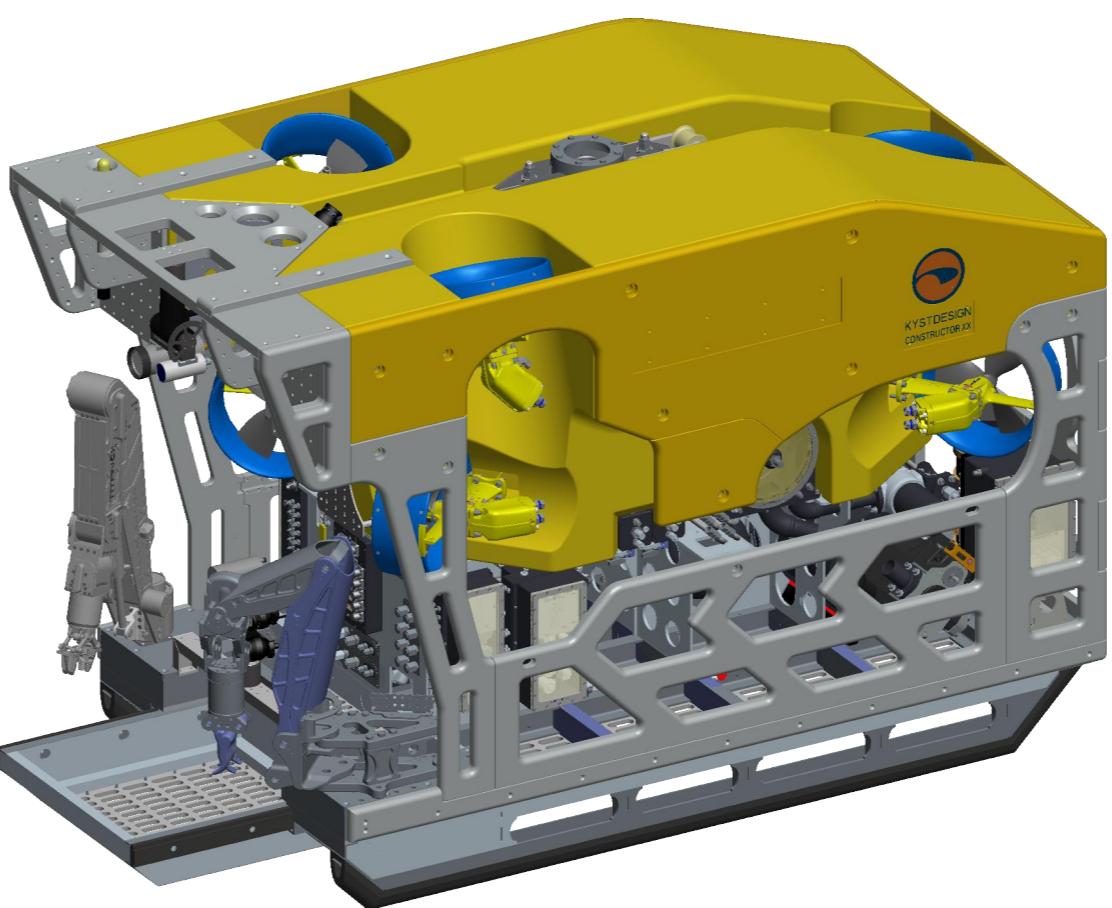
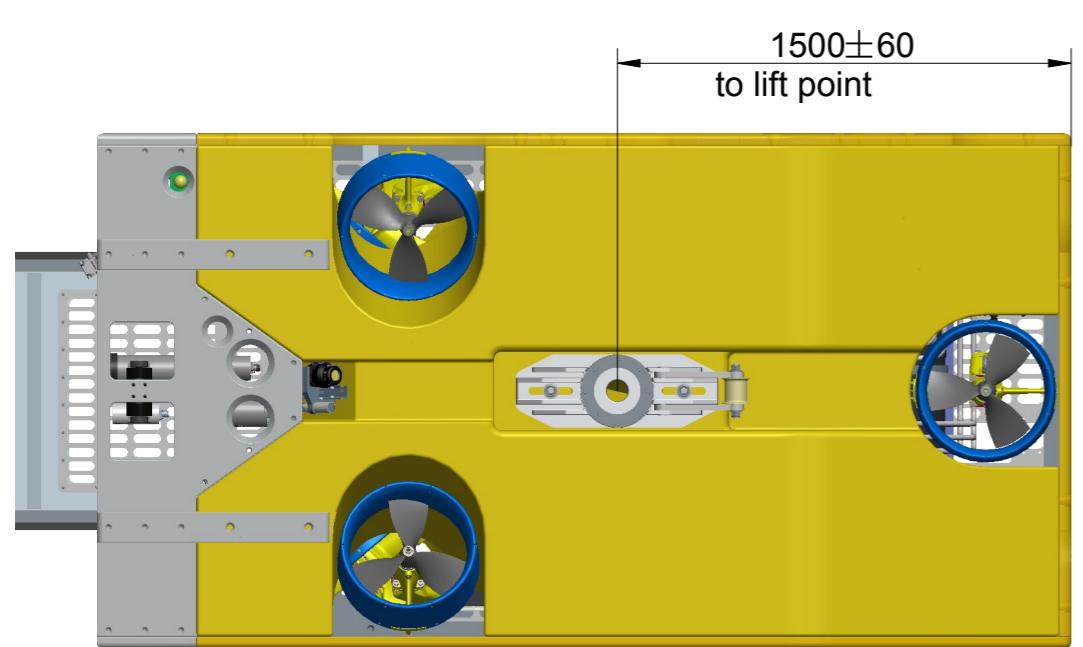
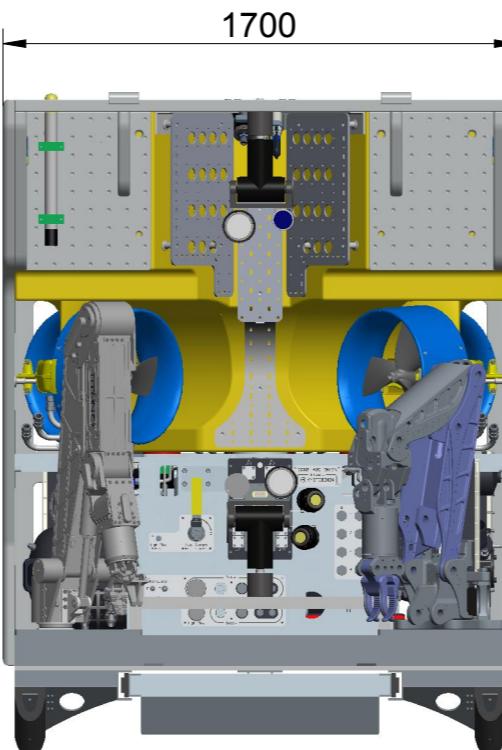
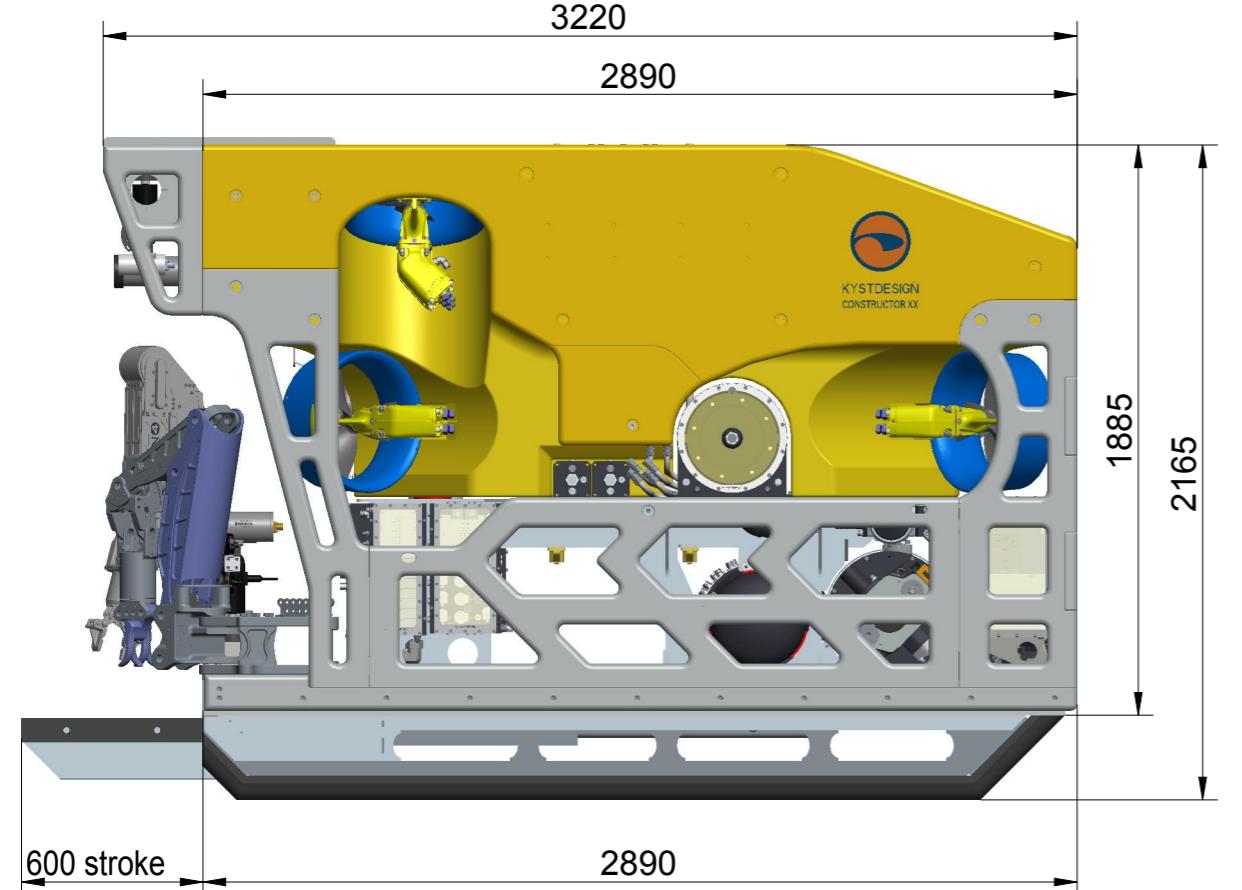
Pos	Category	Description	Drawing	DO-Ref	Qty	KD PrtNr
1	Cable	Altimeter Tritech	AF51-1000E48 3m	DO-02029	1	101 250
2	Cable	Camera	AF51-1000E45 6m	DO-02023	3	101 247
3	Cable	Camera digital	AF51-1000E44 6m	DO-02068	1	101 246
4	Cable	Depth,Saiv TD303	AF51-1000E47 3m	DO-02024	1	101 249
5	Cable	Gyro	AF51-1000E54 2m	DO-02104	1	101 256
6	Cable	Lamp ,DSP&L	AF51-1000E57 4m	DO-02063-S	3	101 260
7	Cable	Lamp ,DSP&L	AF51-1000E57 6m	DO-02063-S	1	101 261
8	Cable	Lamp, DSP&L Y split	AF51-1000E56 2m	DO-02063-Y	2	101 258
9	Cable	Manipulator T4	AF51-1000E46 3.5m	DO-02065	1	101 248
10	Cable	Pigtail 5501-1508-0012			1	101 350
11	Cable	Pigtail 5501-2008-0012			2	101 351
12	Cable	Pigtail 55R1-1503-0012			5	101 349
13	Cable	Pigtail MCIL3F 4 meter			1	101 352
14	Cable	Pigtail MINK-10 5 meter	AF51-1000E52 5m		5	101 254
15	Cable	Pigtail MINK-8 5 meter	AF51-1000E55 5m		2	101 257
16	Cable	Pigtail MINM-26 2 meter	AF51-1000E53 5m		1	101 255
17	Cable	Rov power	AF51-1000E23		1	100 372
18	Cable	Rov power & signal	AF51-1000E22		1	100 371
19	Cable	Rov sensor	AF51-1000E21		1	100 370
20	Cable	Rov valvepack	AF25-1000E40		1	101 125
21	Cable	Sonar Mesotech	AF51-1000E50 5m	DO-02047	1	101 252
22	Cable	Transponder MST324N	AF51-1000E51 5m	DO-02051	1	101 253
23	Conn	5507-1508-0004			1	101 026
24	Conn	5506-1503-004 18awg			1	100 366
25	Conn	5506-1504-0004 22awg			1	100 367
26	Conn	5506-1508-SP			1	100 364
27	Conn	5506-2008-0004			1	100 368
28	Conn	MIN-K 10 4276-2-B			3	101 128
29	Conn	MIN-K 8 4276-1-B			2	101 129
30	Conn	MIN-M 26 4276-3-B			1	101 130

Item	Tag no	Specification	Supplier	Type/model	Qty.
1	+A-d1-d8	SUPPORT RELAY	PHOENIX	PLC-BSC-24DC/21	1
2	+A-d10,d12	SUPORT RELAY, BREAKERS	PHOENIX	PLC-BSC-230VAC/21	1
3	+A-d11	MINIATYR RELE 4CO LED 230VAC	SCHNEIDER	RXM4AB2P7	1
4	+A-H7, H8	HOUR COUNTER	ELTECO	H57.44 10-30 VDC	1
5	+A-F16	PHASE SEQUENCE RELAY	CARLO GAVAZZI	DPA51CM44	1
6	+A-F3-F6	FUSE CONTROL CURRENT	PHOENIX	UKK 5-HESILED 24 (5x20)	1
7	+A-F7-F8	FUSE CONTROL CURRENT	PHOENIX	UKK 5- HESILED 250 (5x20)	1
8	+A-K1	CONTACTOR T1	SCHNEIDER	LC1-F330 230VAC COIL	1
9	+A-K2	CONTACTOR T2	SCHNEIDER	LC1-D32 230VAC COIL	1
10	+A-K3	CONTACTOR T3	SCHNEIDER	LC1-D38 230VAC COIL	1
11	+A-P4, P9	VOLTAGE TRANSMITTER T1/T3	CARLO GAVAZZI	CPTDINA63LA3AX	1
12	+A-P12, P17	VOLTAGE TRANSMITTER T2/T4	CARLO GAVAZZI	CPTDINA61LA1AX	1
13	+A-P16	WM3-96 GRUNNENHET	CARLO GAVAZZI	AD1016H	1
14	+A-P16	MÅLEINNGANG STRØM/SPG	CARLO GAVAZZI	AQ1018	1
15	+A-P16	STRØMFORS. 90-260 AC/DC	CARLO GAVAZZI	AQ1020	1
16	+A-P16	2X20mA UTGANG	CARLO GAVAZZI	AO1026	2
17	+A-P16	2X RELEUTGANG	CARLO GAVAZZI	AO1035	1
18	+A-P10,P13,P15	INSULATION RESISTANCE	MEGACON	KPM163 200-240V JORDF. 10VDC 3,6 KV	1
19	+A-P5	INSULATION RESISTANCE	MEGACON	KPM163 200-240V JORDF. 10VDC 5 KV	1
20	+A-F0, Q1	Breaker NSX400N [Main breaker]	SCHNEIDER	NSX400N	1
21	+A-Q2, Q4	BREAKER 32A	SIEMENS	3RV1431-4EA10	1
22	+A-Q3	BREAKER 40A	SIEMENS	3RV1431-4FA10	1
23	+A-Q6, Q10	BREAKER , 1.25A	SCHNEIDER	GV2ME063	1
24	+A-T10	24VDC SUPPLY 3A	SCHNEIDER	OPTIMO POWER SUPPLY 1 ~ 24V 3	1
25	+A-T6	CONTROL VOLTAGE TRANSF.	NORATEL	SU 120C 670-690-710 / 230VAC 500VA	1
26	+A-T18, T19, T20	CURRENT TRANSF. SUPPLY	CARLO GAVAZZI	CTD-3X.400.5A.XXX	1
27	+B-P1,2,3,6,7,8,11,14 / +A-P18,19,20	CURRENT TRANSMITTER	CARLO GAVAZZI	E83-2050	1
28	+B-CHK1, 2, 3, 4	CHOKE	MEGACON	CH163/3.6	1
29	+B-CHK1	CHOKE	MEGACON	CH163/5	1
30	+B-T11	VOLTAGE TRANSFORMER T1	LANNE TRAFO	3X4500V->3X110V 30VA	1
31	+B-T13	VOLTAGE TRANSFORMER T3	LANNE TRAFO	3X3300V->3X110V 30VA	1
32	+B-T12, T14	VOLTAGE TRANSFORMER T2, T4	KARSTEN MOHOLT	2X3300V->2X110V 30VA	1



7 Drawings

Drawing No.	Description
AF25-1000M01	ROV Assembly
AF64-1018M01	ROV Bullet Joint
AF25-1011M01	Buoyancy with attached components
AF25-1012M08	Frame with brackets
AF25-1012M09	Frame with lifting arrangements
AF25-1012M10	Frame, welded assembly
AD16-1013M20	Work module interface bracket
AF25-1014M01	Covers
AF25-1015M10	Front Frame
AF41-2012M02	Skid with Tool Basket, Assembly
AD16-1013M60	Tilt Unit, Docking Camera
AD16-1213M20	Light Tilt Unit



Weight in air:

ROV with Skid, Manipulators and Pay load: 4600 kg

SWL lift point: 7000 kg

Through frame lift: 3000 kg

Pay load: ~360 kg

Depth Rating: 3000 msw

Itm.	Qty.	Description	Drg. / Spec.	Material
02	25.06.14	Upgrade to 220HP	AHO	AHO EKB
01	26.04.13	AS BUILT	GVI	AHO EKB
A	24.03.13	ISSUED FOR COMMENTS	GVI	AHO EKB
Rev.	Date	Description	Prep	Chk App

CONSTRUCTOR

Drawing title
CONSTRUCTOR 220HP
With Skid
General Arrangement



Size

A3

K Y S T D E S I G N A S
Strandgaten 202, 5525 Haugesund, NORWAY
Tel: +47 52 70 62 50
Fax: +47 52 70 62 01
www.kystdesign.no

Scale
1:25
File name
AF25-1000M01

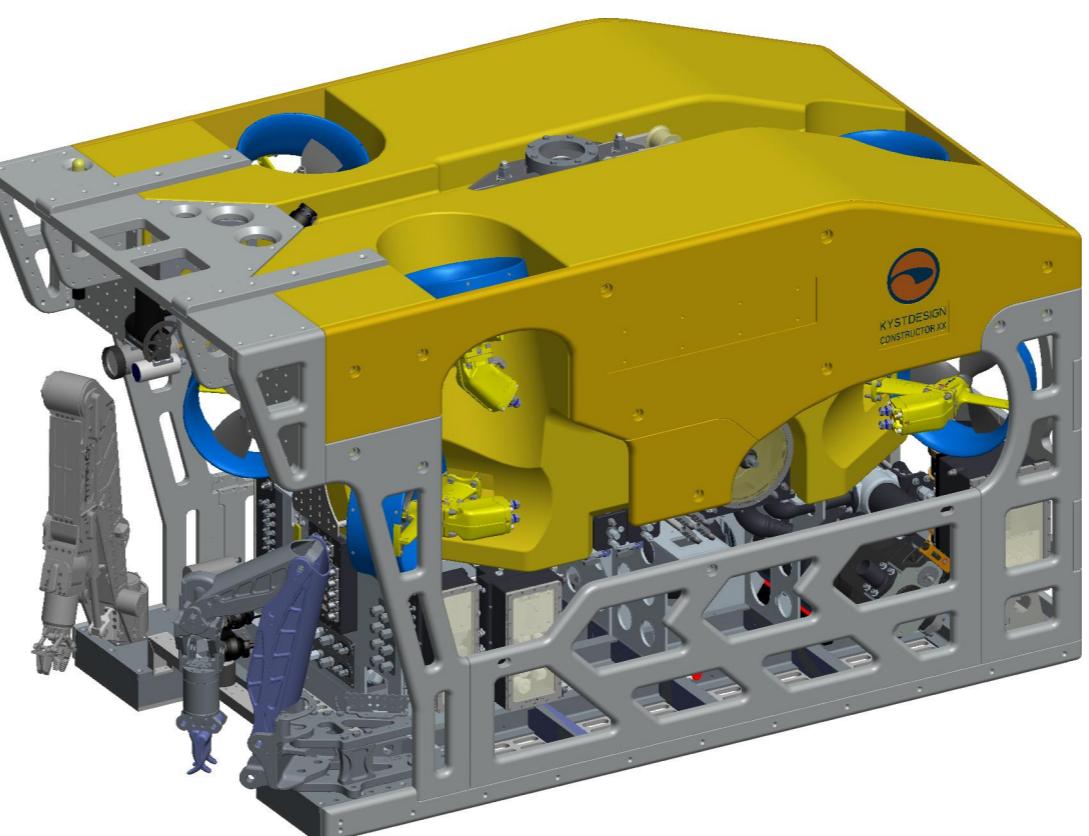
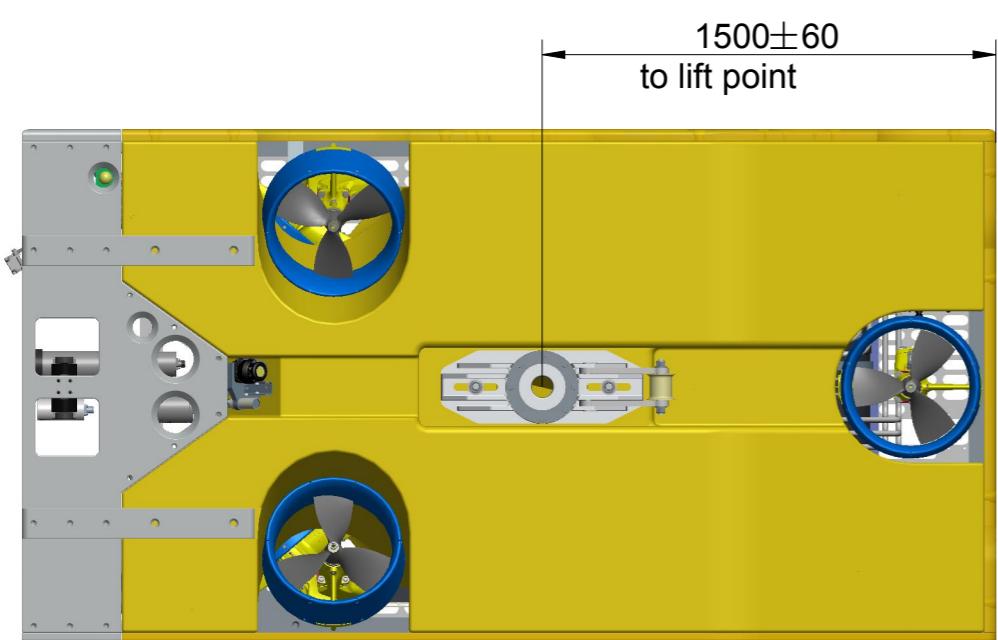
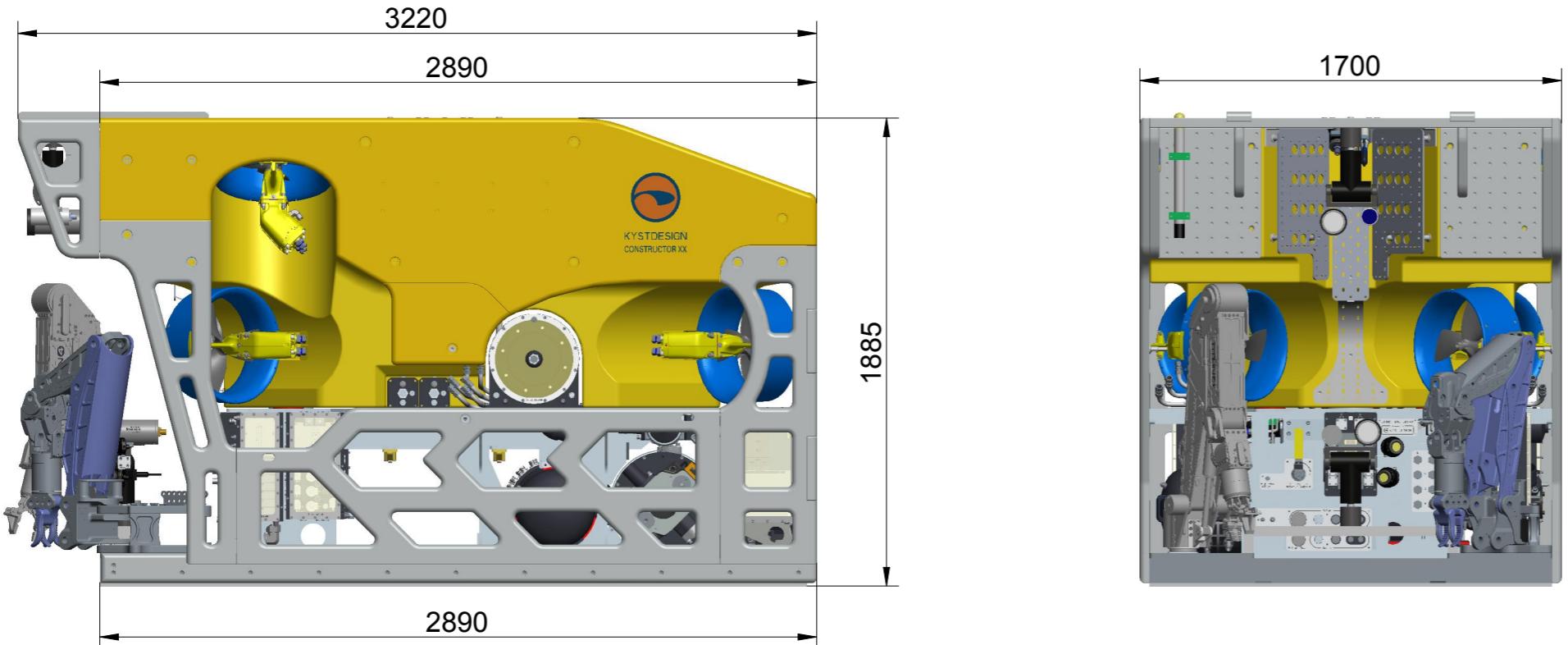
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Weight in air:

ROV with Manipulators and Pay load: 4600 kg

SWL lift point: 7000 kg

Through frame lift: 3000 kg

Pay load: ~500 kg

Depth Rating: 3000 msw

Itm.	Qty.	Description	Drg. / Spec.	Material
02	25.06.14	Upgrade to 220HP	AHO	AHO EKB
01	26.04.13	AS BUILT	GVI	AHO EKB
A	24.03.13	ISSUED FOR COMMENTS	GVI	AHO EKB
Rev.	Date	Description	Prep	Chk App

CONSTRUCTOR

Drawing title
CONSTRUCTOR 220HP
Without Skid
General Arrangement



Size

A3

K Y S T D E S I G N A S
Strandgaten 202, 5525 Haugesund, NORWAY
Tel: +47 52 70 62 50
Fax: +47 52 70 62 01
www.kystdesign.no

Scale
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File name
AF25-1000M01

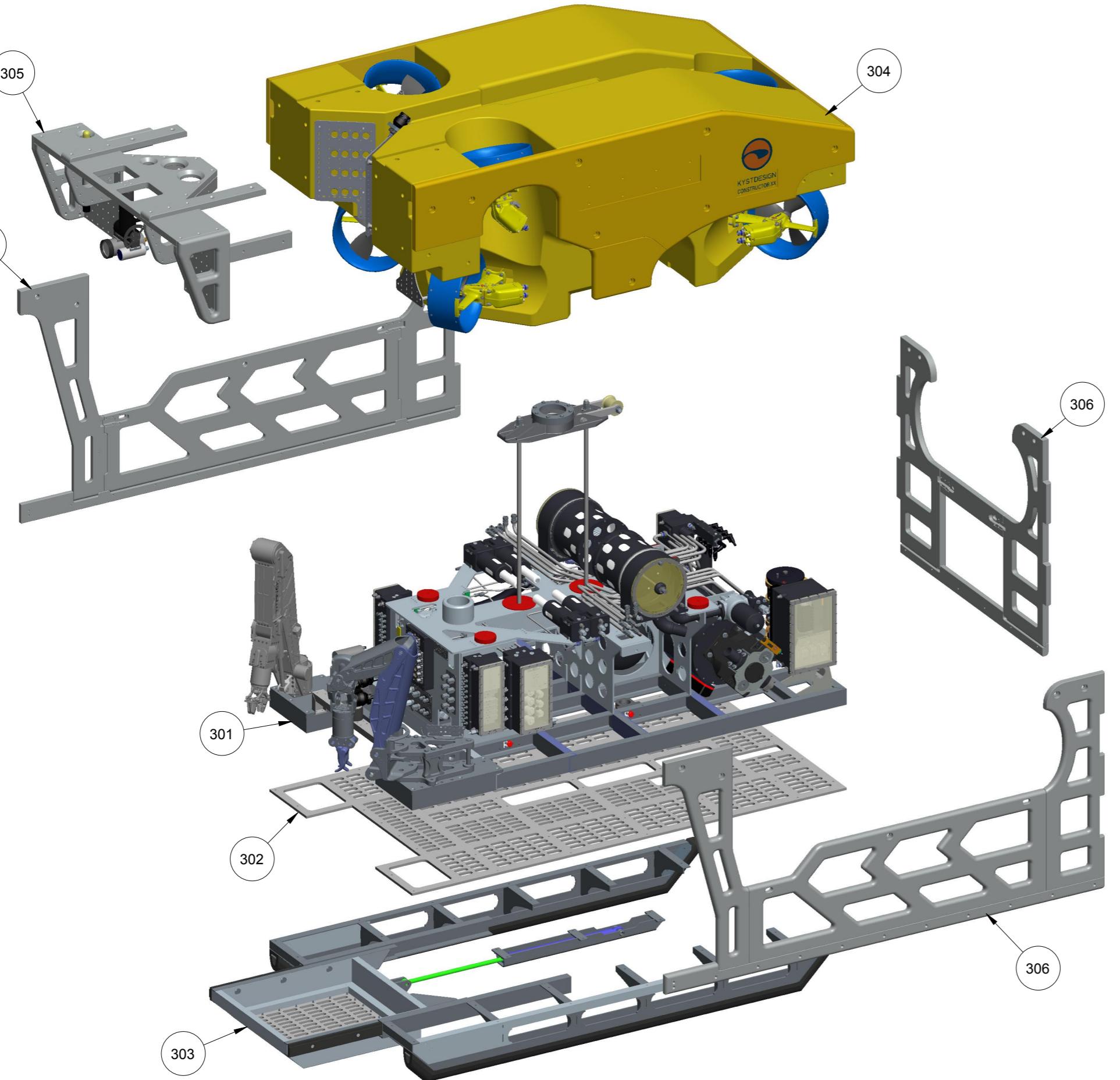
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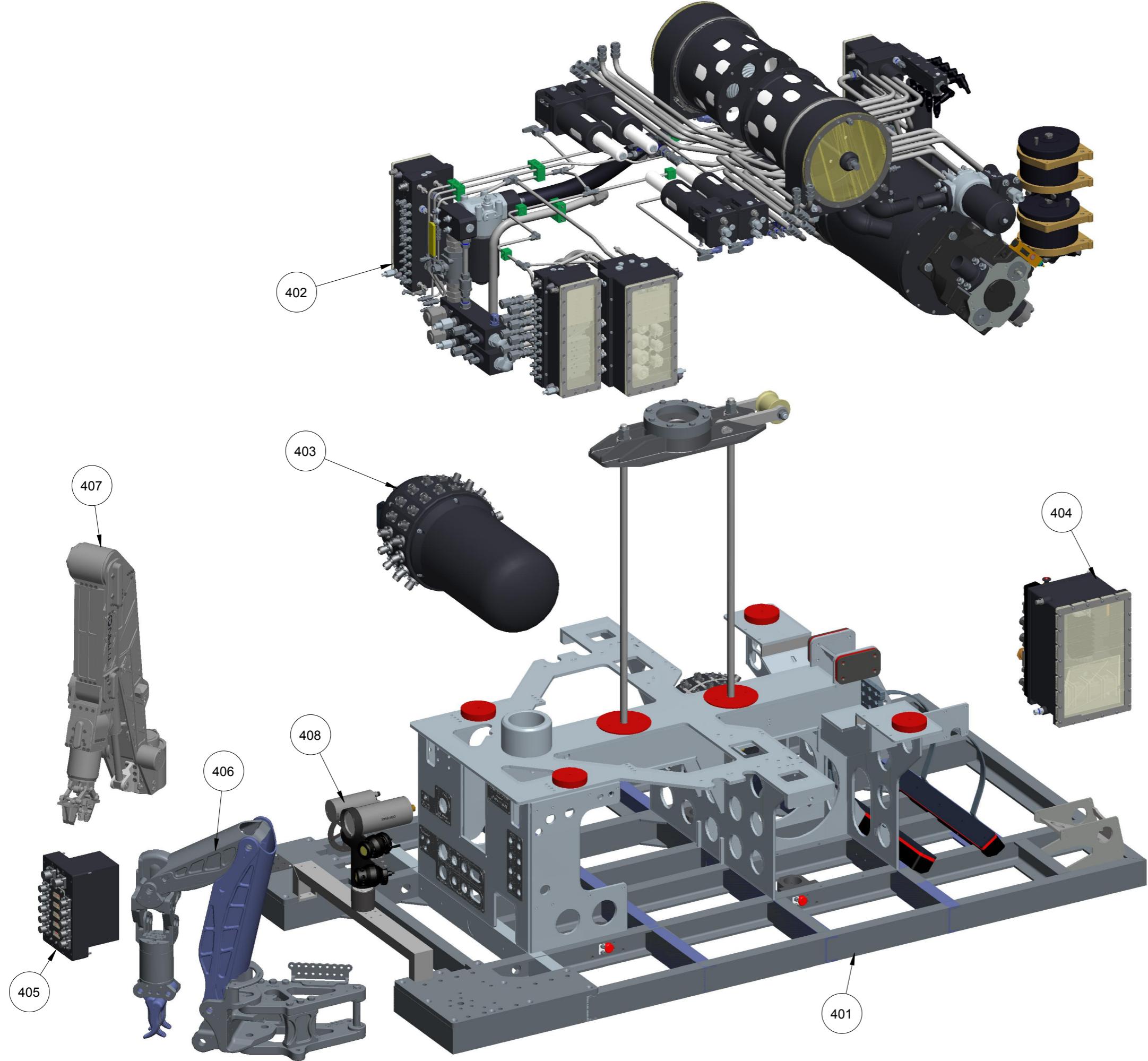
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01	26.04.13	AS BUILT	GVI	AHO
A	24.03.13	ISSUED FOR COMMENTS	GVI	AHO
Rev.	Date	Description	Prep	Chk

CONSTRUCTOR

Drawing title	CONSTRUCTOR 220HP General Arrangement	Size	
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Strandgaten 202, 5525 Haugesund, NORWAY			3
Tel: +47 52 70 62 50			of
Fax: +47 52 70 62 01			4
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Itm.	Qty.	Description	Drg. / Spec.	Material	
408	1	Pan & Tilt Unit			
407	1	Manipulator, TITAN 4	Schilling		
406	1	Manipulator, Atlas	Schilling		
405	1	Light JB	AF25-1062M01		
404	1	Termination & Transformer JB	AF25-1060M01		
403	1	Control Pod	AF25-1050M01		
402	1	Hydraulic System	AF25-1031M01		
401	1	Frame with brackets	AF25-1012M08		
Itm.	Qty.	Description	Drg. / Spec.	Material	
02	25.06.14	Upgrade to 220HP	AHO	AHO	EKB
01	26.04.13	AS BUILT	GVI	AHO	EKB
A	24.03.13	ISSUED FOR COMMENTS	GVI	AHO	EKB
Rev.	Date	Description	Prep	Chk	App

CONSTRUCTOR

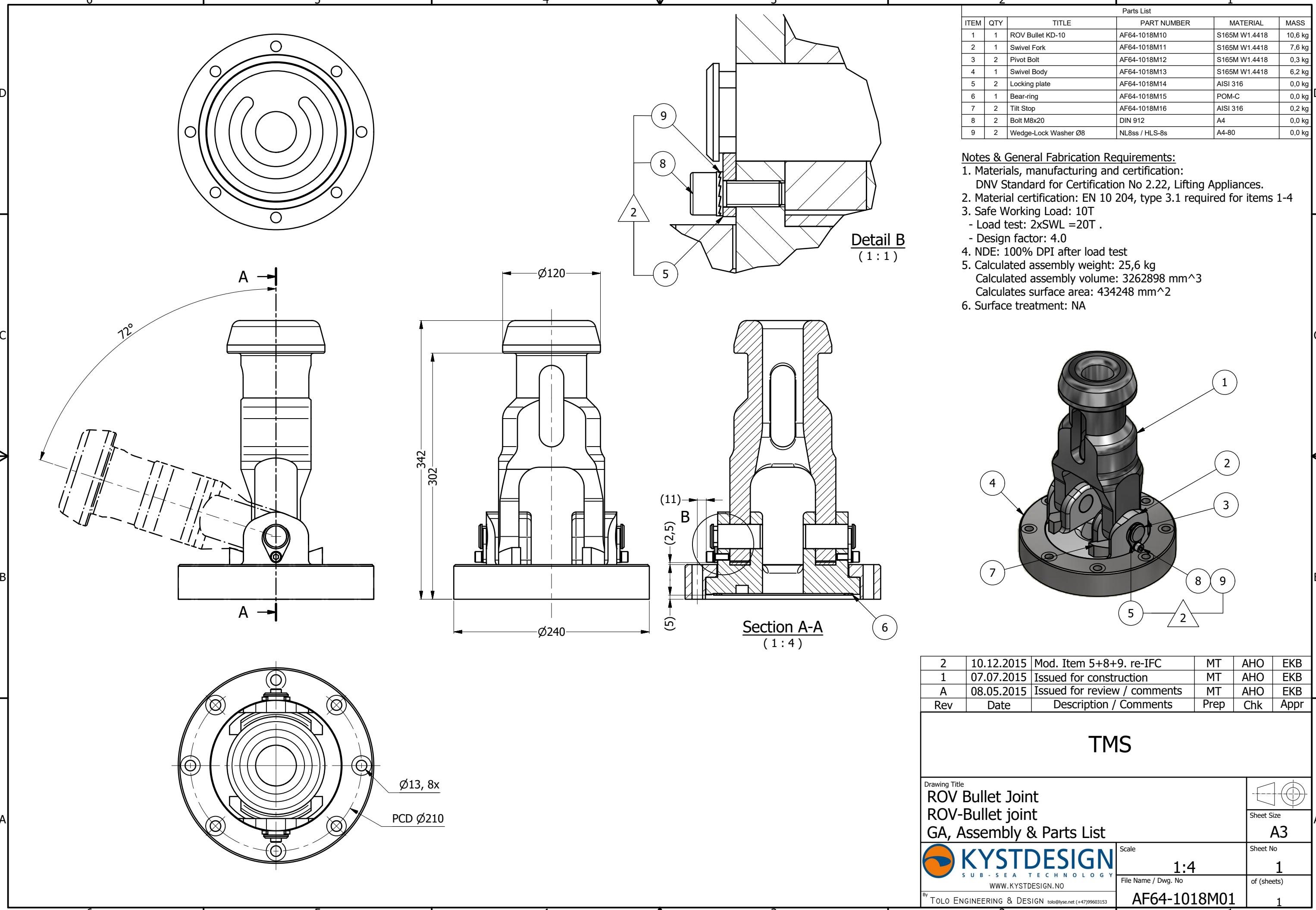
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CONSTRUCTOR 220HP
General Arrangement

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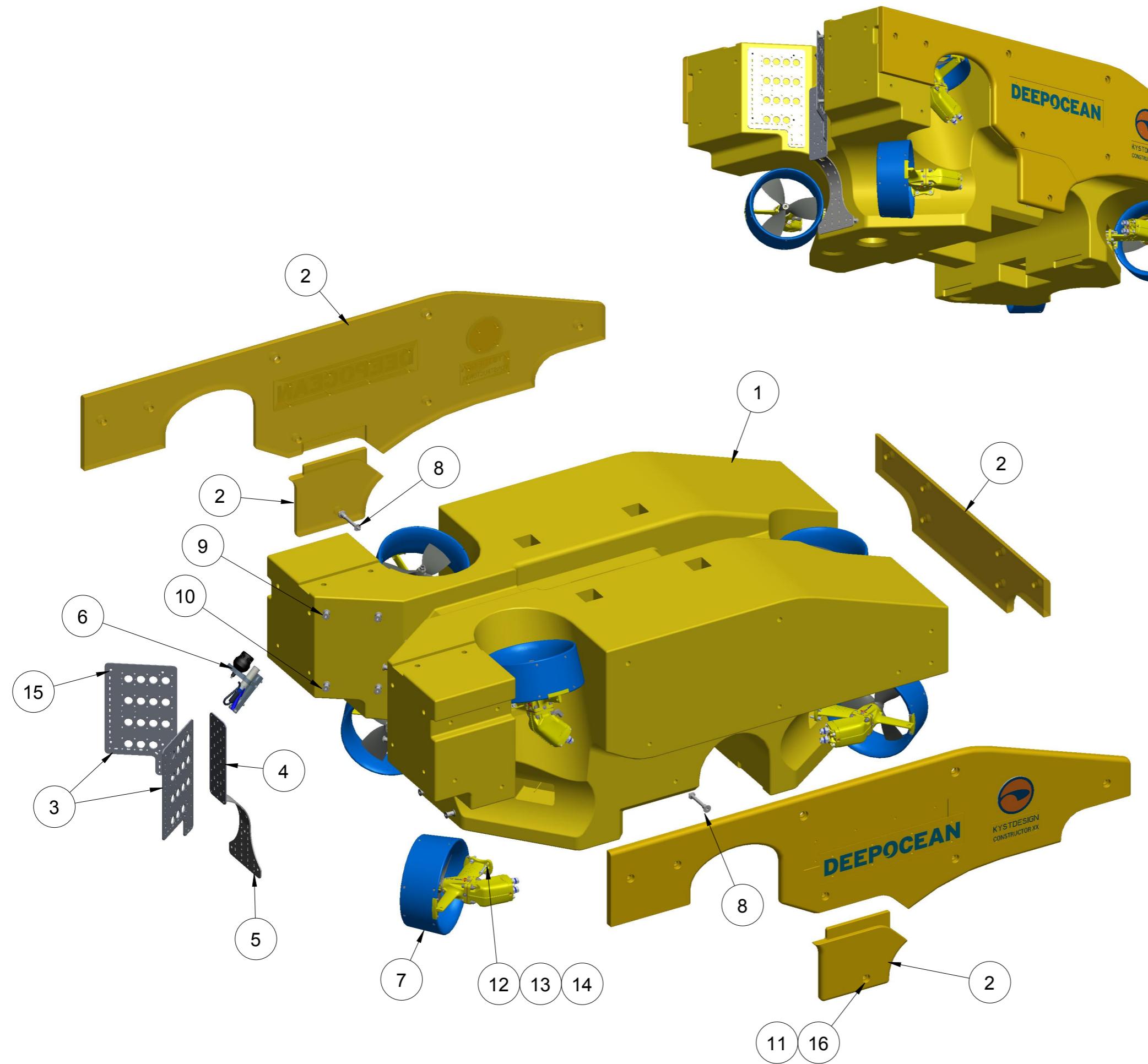
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KYSTDESIGN AS
Strandgaten 202, 5525 Haugesund, NORWAY
Tel: +47 52 70 62 50
Fax: +47 52 70 62 01
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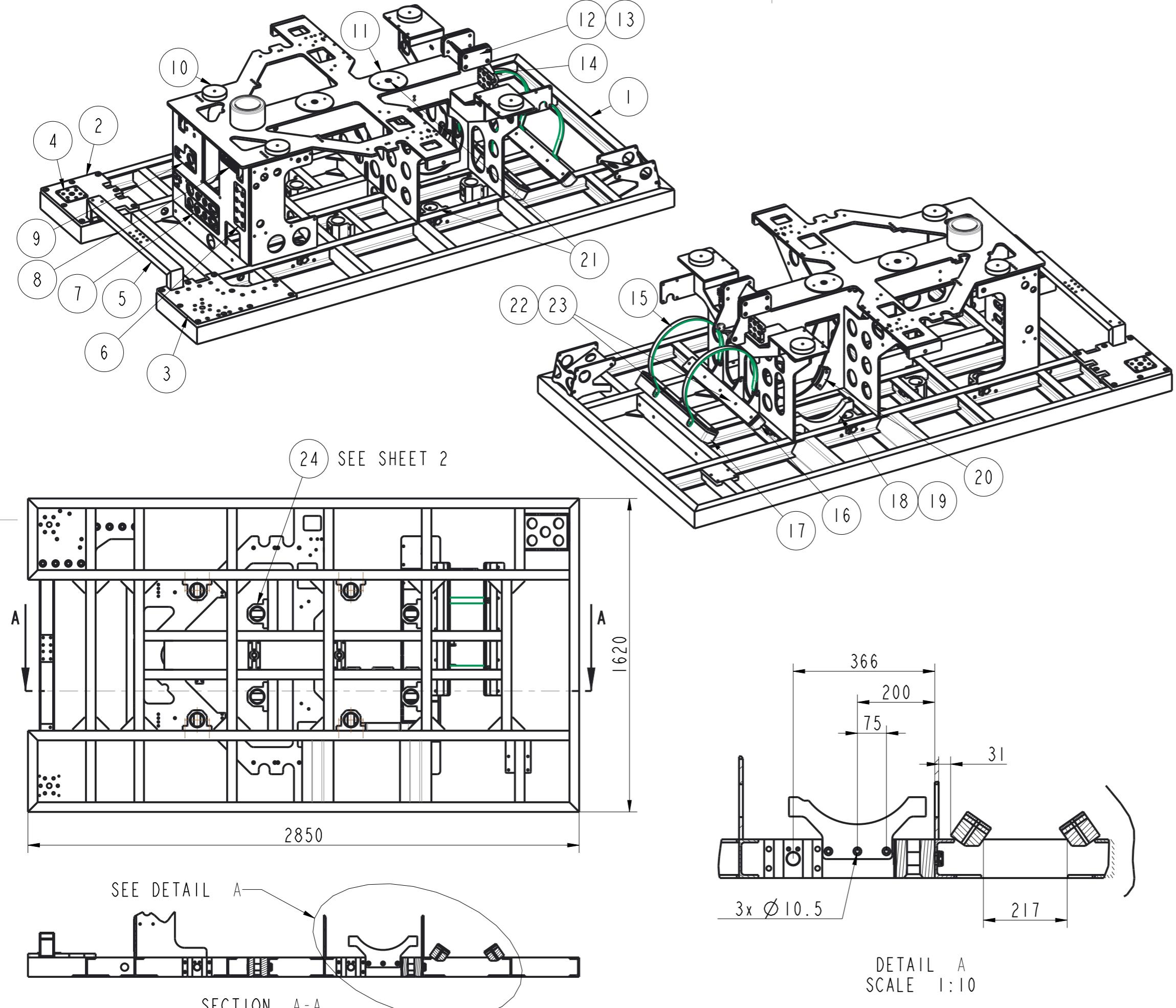


16	2	Screw M12x45	DIN 912	A4
15	15	Screw M12x25	DIN 7991	A4
14	28	Screw M12x45	DIN 912	A4
13	28	Washer M12	DIN 125	A4
12	28	Lock Washer M12	DIN 127B	A4
11	2	Eccentric Washer M12	AF25-1014M51	
10	9	Distance bolt	AD16-1113M62	AISI 316
9	4	Distance bolt	AD16-1113M61	AISI 316
8	2	Distance bolt	AF25-1014M72	AISI 316
7	7	Thruster	SA380	
6	1	Tilt Unit	AD16-1013M60	
5	1	Front Plate, Lower Centre	AF25-1013M43	
4	1	Front Plate, Top Centre	AF25-1013M42	
3	2	Front Plate, Port & Starboard	AF25-1013M41	
2	1	Covers	AF25-1014M01	
1	1	Buoyancy 3000msw	AF25-1011M11	
Itm.	Qty.	Description	Drg. / Spec.	Material
02	26.06.14	REISSUED FOR PRODUCTION	AHO	EKB
01	03.06.13	ISSUED FOR PRODUCTION	GVI	AHO
A	31.05.13	ISSUED FOR COMMENTS	GVI	EKB
Rev.	Date	Description	Prep	Chk

CONSTRUCTOR

Drawing title	Buoyancy with components General Arrangement	Size
		A3
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Strandgaten 202, 5525 Haugesund, NORWAY Tel: +47 52 70 62 50 Fax: +47 52 70 62 01 www.kystdesign.no		1 of 1

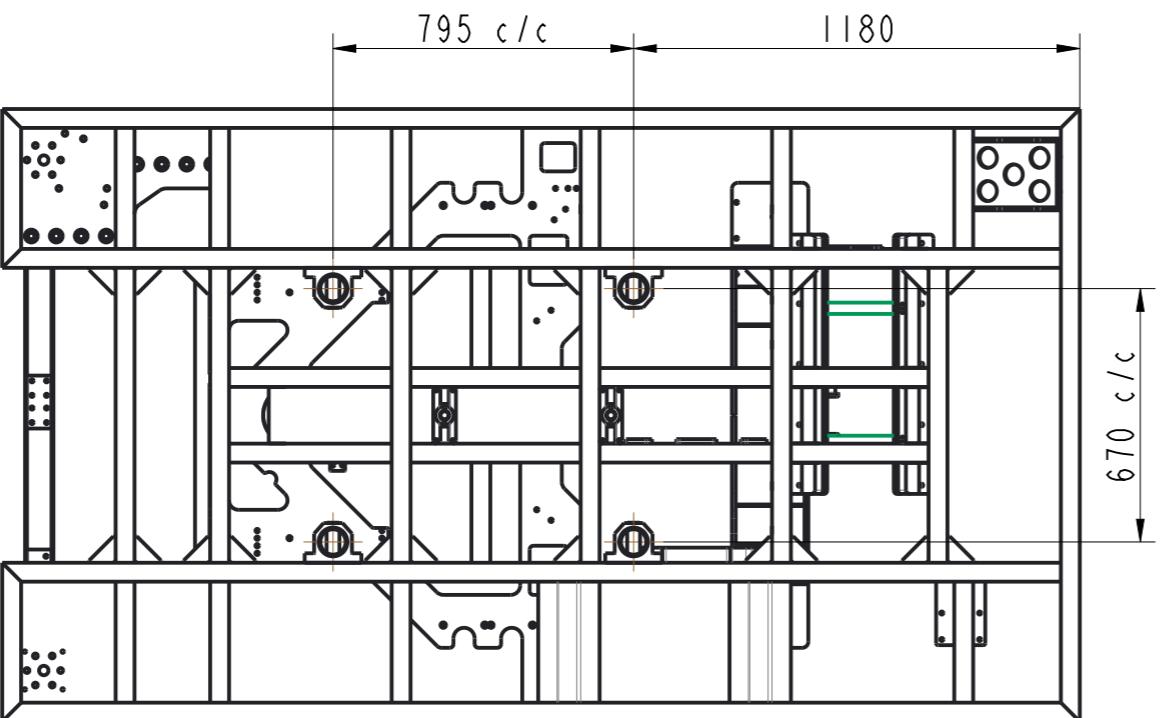
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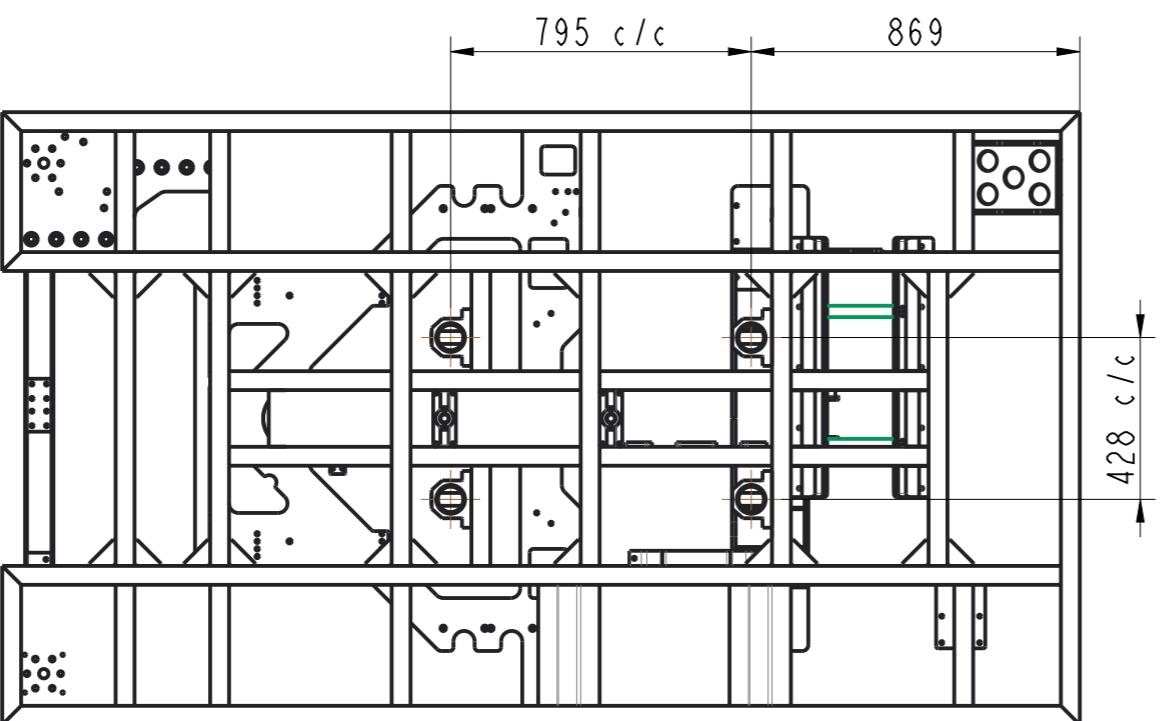
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23	2	HPU Support Pads, PEHD	AF25-1012M18, itm. 4	
22	2	HPU Support Pads, NEOPREN	AF25-1012M18, itm. 3	
21	1	Lifting Devices	AF25-1012M09	
20	3	Control Pod Brackets	AB89-1013M53	
19	1	Control Pod Strap	AD16-1013M54	
18	1	Control Pod Cradle	AF25-1013M54	
17	1	HPU Support AFT	AF25-1013M18, itm. 2	
16	1	HPU Support FWD	AF25-1013M18, itm. 1	
15	2	HPU Support Clamps	AF25-1013M53	
14	2	Pipe Clamps	AF25-1031M11	
13	2	Buoyancy Support Pad	AF25-1013M56, itm. 2	
12	2	Buoyancy Support Pad	AF25-1013M56, itm. 1	
11	2	Buoyancy Support Pad	AF25-1013M55, itm. 2	
10	4	Buoyancy Support Pad	AF25-1013M55, itm. 1	
9	1	Name Plate Return Valve	AF25-1013M34	
8	1	Name Plate ROV	AF25-1013M33	
7	1	Name Plate ACU	AF25-1013M31	
6	1	Name Plate Hyd	AF25-1013M32	
5	1	P&T Bracket	AD16-1013M66	
4	1	Manipulator Wear Plate	AD16-1013M93	
3	1	Manipulator Mounting Plate	AF25-1013M91	
2	1	Manipulator Mounting Plate	AF25-1013M90	
1	1	Welded Frame	AF25-1012M10	
itm.	Oty.	Description	Drg. / Spec.	Material
03	08.12.15	Work Module Interface 2	GVI	AHO EKB
02	31.10.13	Adjusted to suit 160kW motor	AHO	EKB EKB
01	11.02.13	ISSUED FOR PRODUCTION	AHO	EKB EKB
A	18.11.12	ISSUED FOR COMMENTS	AHO	EKB EKB
Rev.	Date	Description	Prep	Chk App

CONSTRUCTOR

Drawing title FRAME W/ BRACKETS	Size A3
-	
K Y S T D E S I G N A S Strandgaten 202, 5525 Haugesund, NORWAY Tel: +47 52 70 62 50 Fax: +47 52 70 62 01 www.kystdesign.no	Scale 1 of 2



Work Module Interface 1
SCALE 1:20

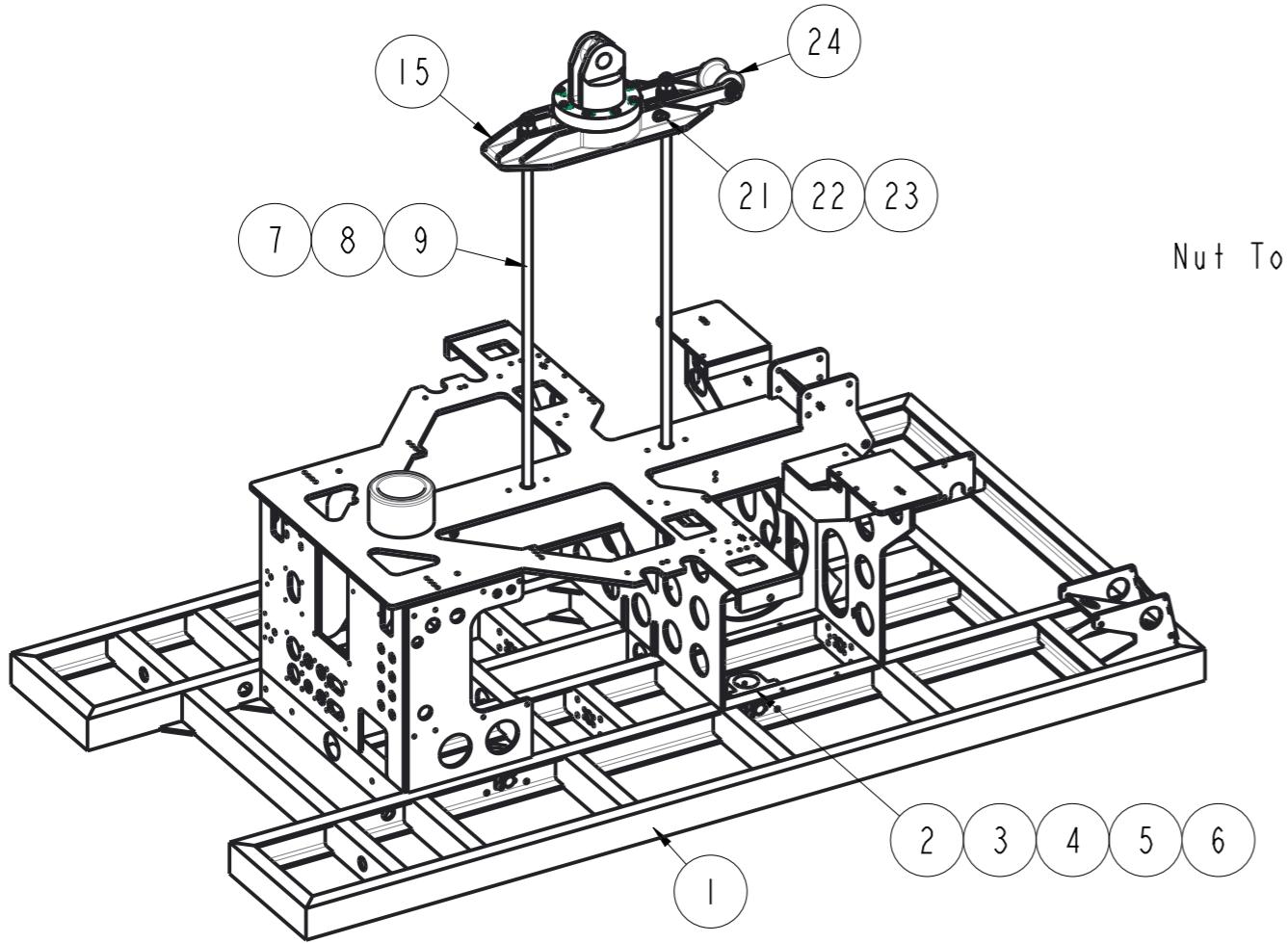


Work Module Interface 2
SCALE 1:20

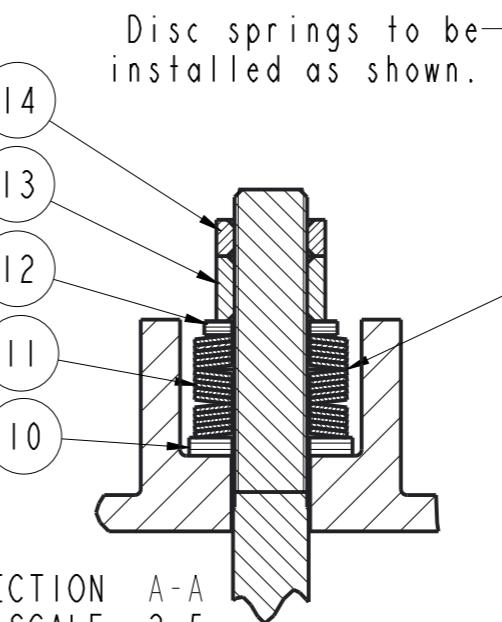
Item.	Oty.	Description	Drg. / Spec.	Material
03	08.12.15	Work Module Interface 2	GVI	AHO EKB
02	31.10.13	Adjusted to suit 160kW motor	AHO	EKB EKB
01	11.02.13	ISSUED FOR PRODUCTION	AHO	EKB EKB
A	18.11.12	ISSUED FOR COMMENTS	AHO	EKB EKB
Rev.	Date	Description	Prep	Chk App

CONSTRUCTOR

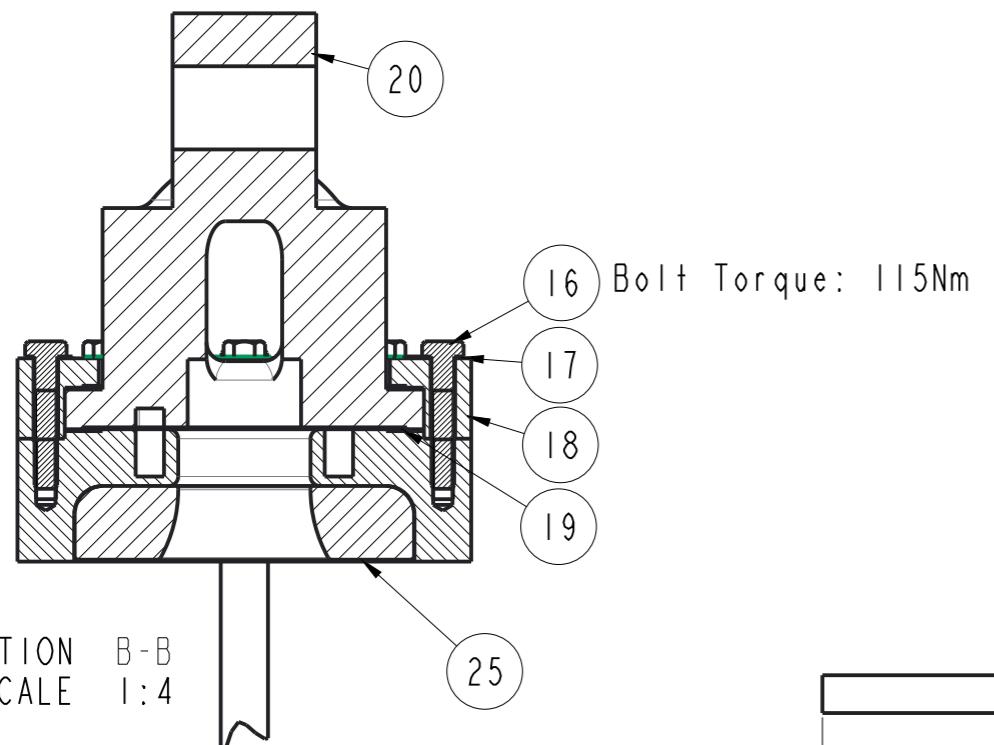
Drawing title FRAME W/ BRACKETS -	Size A3
K Y S T D E S I G N A S Strandgaten 202, 5525 Haugesund, NORWAY Tel: +47 52 70 62 50 Fax: +47 52 70 62 01 www.kystdesign.no	Scale 2 File name AF25-1012M08 of 2



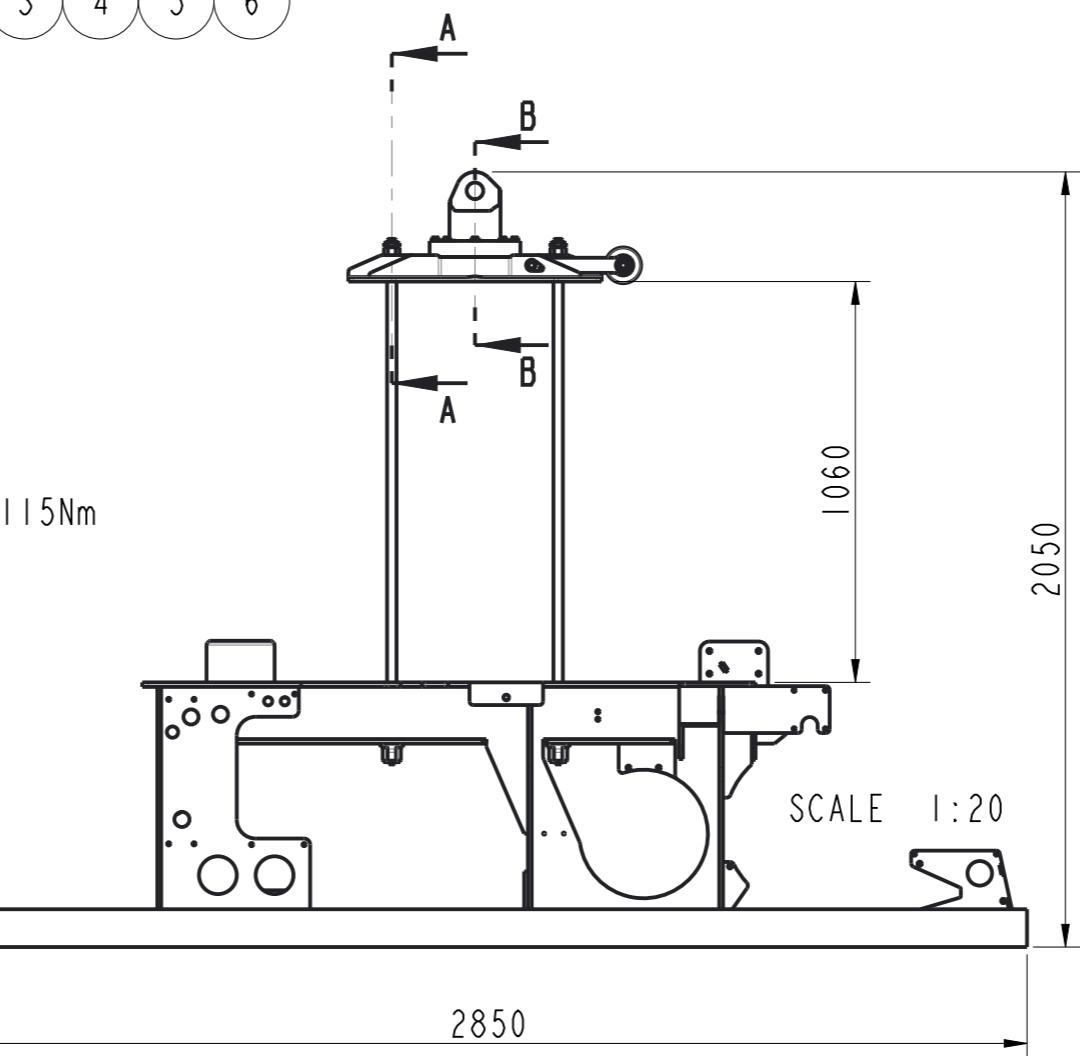
Nut Torque: 220Nm



SECTION SCALE
A-A
2:5



SECTION
SCALE
B-B
1:4



Notes & General Requirements:

1. Design & Certification:
DNV Standard for Certification No 2.22, Lifting Appliances.
2. Safe Working Loads:
- Frame Lift Point: SWL 7T
- Work Module Interface: SWL 3T
3. Load Testing: 2xSWL
Work Module Interface to be tested in both configurations.
Ref. Drawing AF25-1012M08 Sh.2

itm.	Oty.	Description	Drg. / Spec.	Material
03	25.11.15	Added Item 25	GVI	AHO EKB
02	31.10.13	Adjusted to suit 160kW motor	AHO	EKB EKB
01	17.12.12	ISSUED FOR PRODUCTION	AHO	EKB EKB
A	18.11.11	ISSUED FOR COMMENTS	AHO	EKB EKB
Rev.	Date	Description	Prep	Chk App

CONSTRUCTOR

Drawing title FRAME W/ LIFTING ARRANGEMENTS	Size A3	Sheet 1
		-
K Y S T D E S I G N A S Strandgaten 202, 5525 Haugesund, NORWAY Tel: +47 52 70 62 50 Fax: +47 52 70 62 01 www.kystdesign.no	Scale 1	Sheet 1
	File name AF25-1012M09	of 1

1

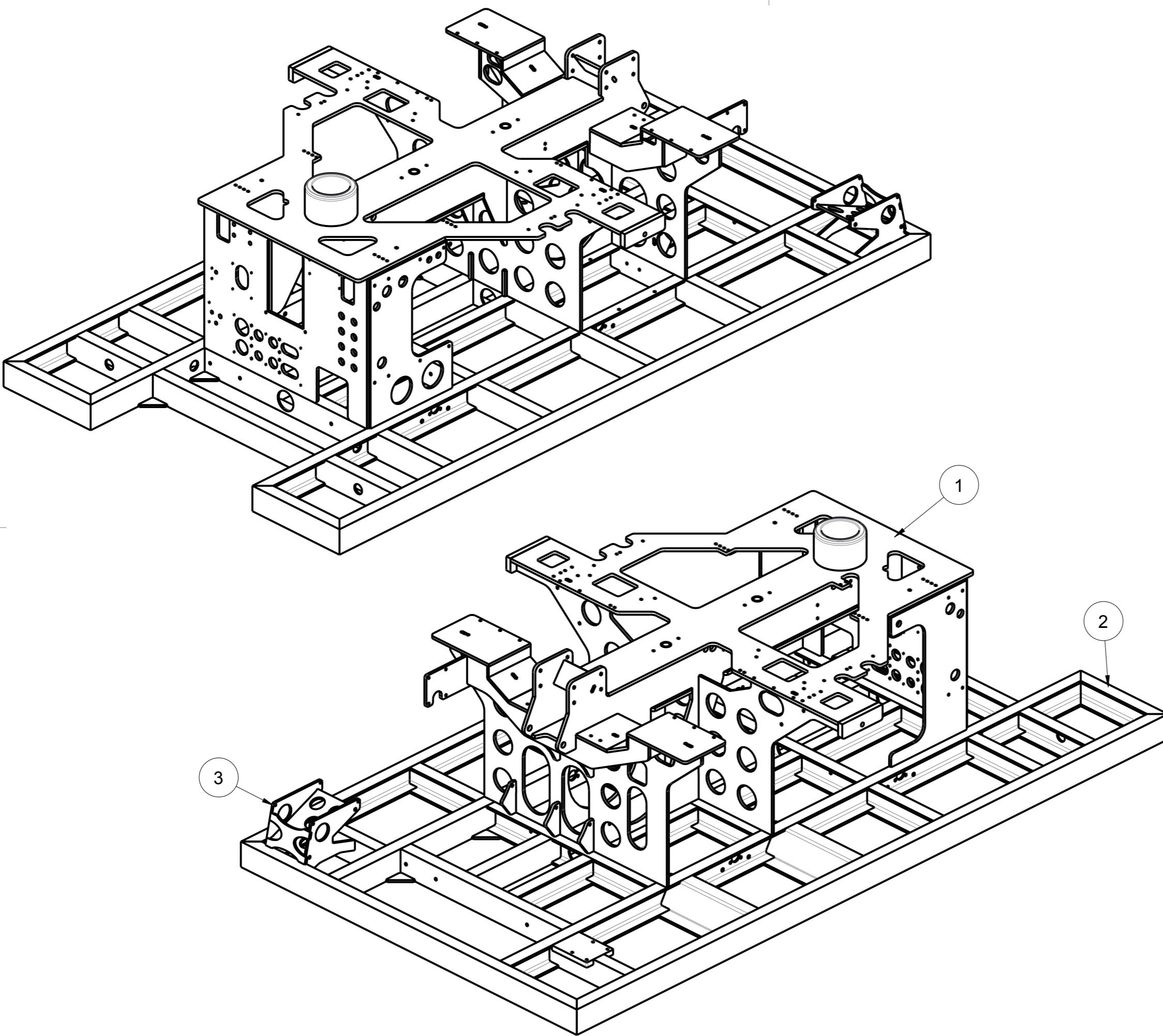
2

3

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6



Notes:

1. Material Certificate according to EN10204 3.1.B
2. General Tolerances:
Welding: NS1432-B
3. Welding procedures according to NS-EN-288 5.
4. Remove all burrs and sharp edges.

Itm.	Qty.	Description	Drg. / Spec.	Material
02	31.10.13	Adjusted to suit 160kW motor	AHO	EKB
01	10.12.12	ISSUED FOR CONSTRUCTION	AHO	EKB
A	15.11.12	ISSUED FOR COMMENTS	AHO	EKB
Rev.	Date	Description	Prep	Chk

CONSTRUCTOR

Drawing title
FRAME
WELDED ASSEMBLY



Size

A3

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Fax: +47 52 70 62 01
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Scale
Sheet
1
of
3

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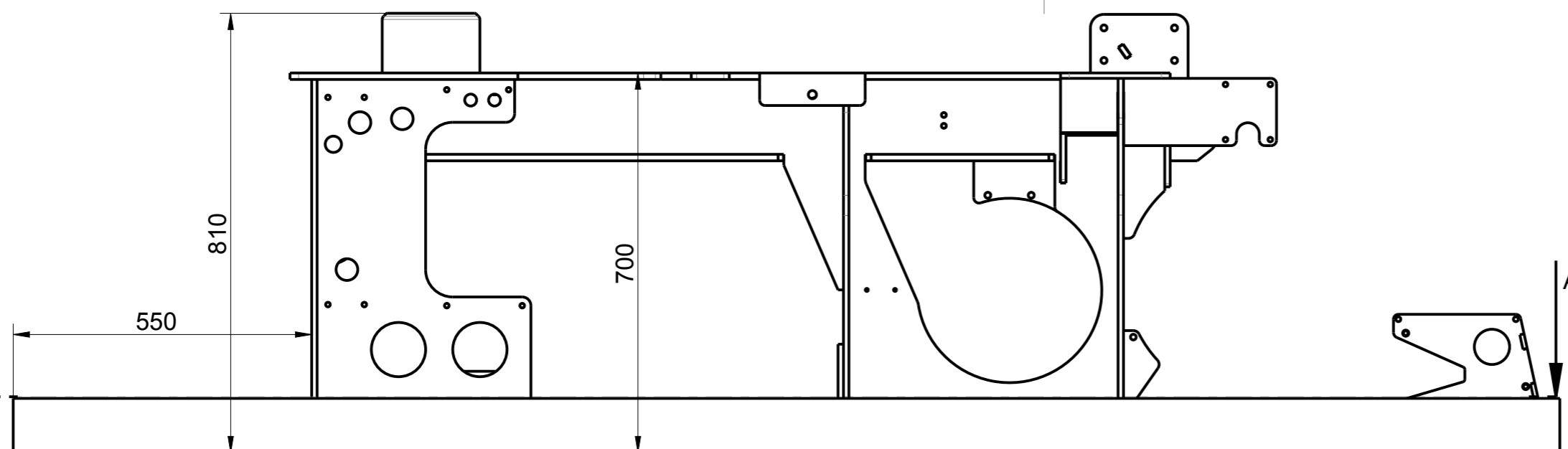
4

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A

A



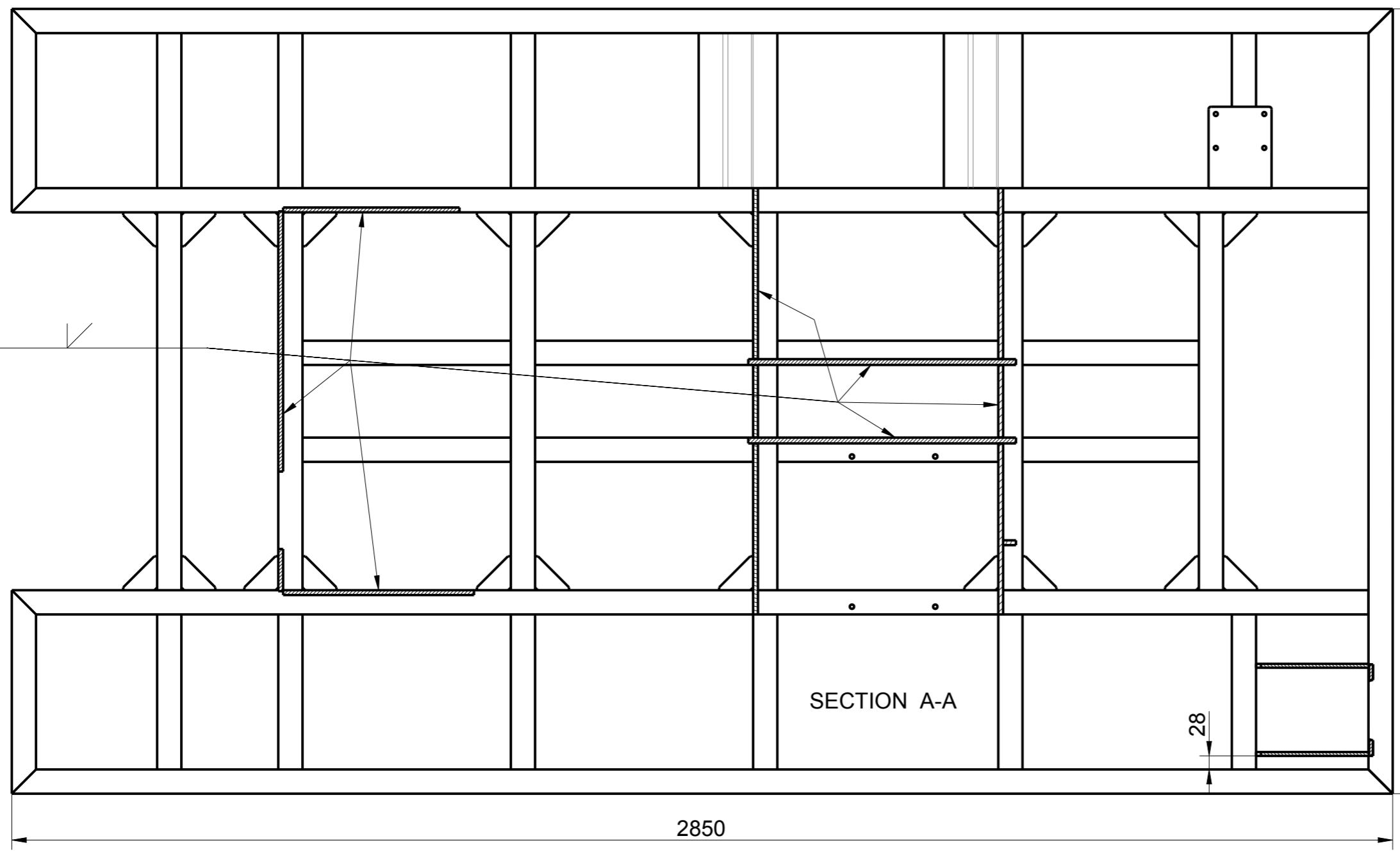
Notes:

1. Material Certificate according to EN10204 3.1.B
2. General Tolerances:
Welding: NS1432-B
3. Welding procedures according to NS-EN-288 5.
4. Remove all burrs and sharp edges.

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D

B



Itm.	Qty.	Description	Drg. / Spec.	Material
02	31.10.13	Adjusted to suit 160kW motor	AHO	EKB
01	10.12.12	ISSUED FOR CONSTRUCTION	AHO	EKB
A	15.11.12	ISSUED FOR COMMENTS	AHO	EKB
Rev.	Date	Description	Prep	Chk

CONSTRUCTOR

Drawing title
FRAME
WELDED ASSEMBLY

Size
A3

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Fax: +47 52 70 62 01
www.kystdesign.no

Scale
2
Sheet
2
File name
AF25-1012M10
of
3

C

D

E

F

G

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A

A

B

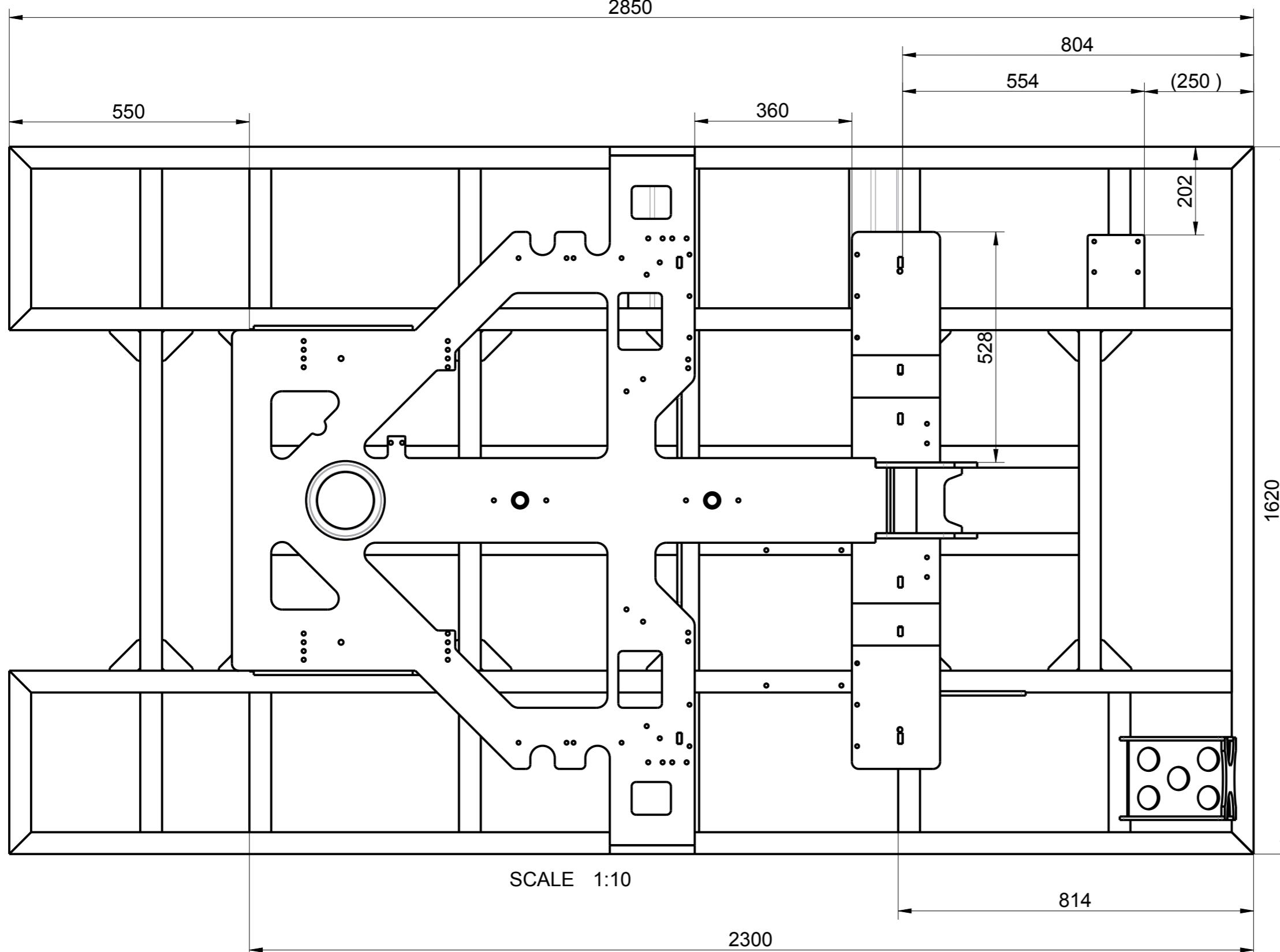
B

C

C

D

D



Itm.	Qty.	Description	Drg. / Spec.	Material
02	31.10.13	Adjusted to suit 160kW motor	AHO	EKB EKB
01	14.02.13	ISSUED FOR PRODUCTION	AHO	EKB EKB
A	15.11.12	ISSUED FOR COMMENTS	AHO	EKB EKB
Rev.	Date	Description	Prep	Chk App

CONSTRUCTOR

Drawing title FRAME WELDED ASSEMBLY		Size A3
-		
KYSTDESIGN AS Strandgaten 202, 5525 Haugesund, NORWAY Tel: +47 52 70 62 50 Fax: +47 52 70 62 01 www.kystdesign.no	Scale 3	Sheet 3 of 3
File name AF25-1012M10		

1

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5

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A

A

B

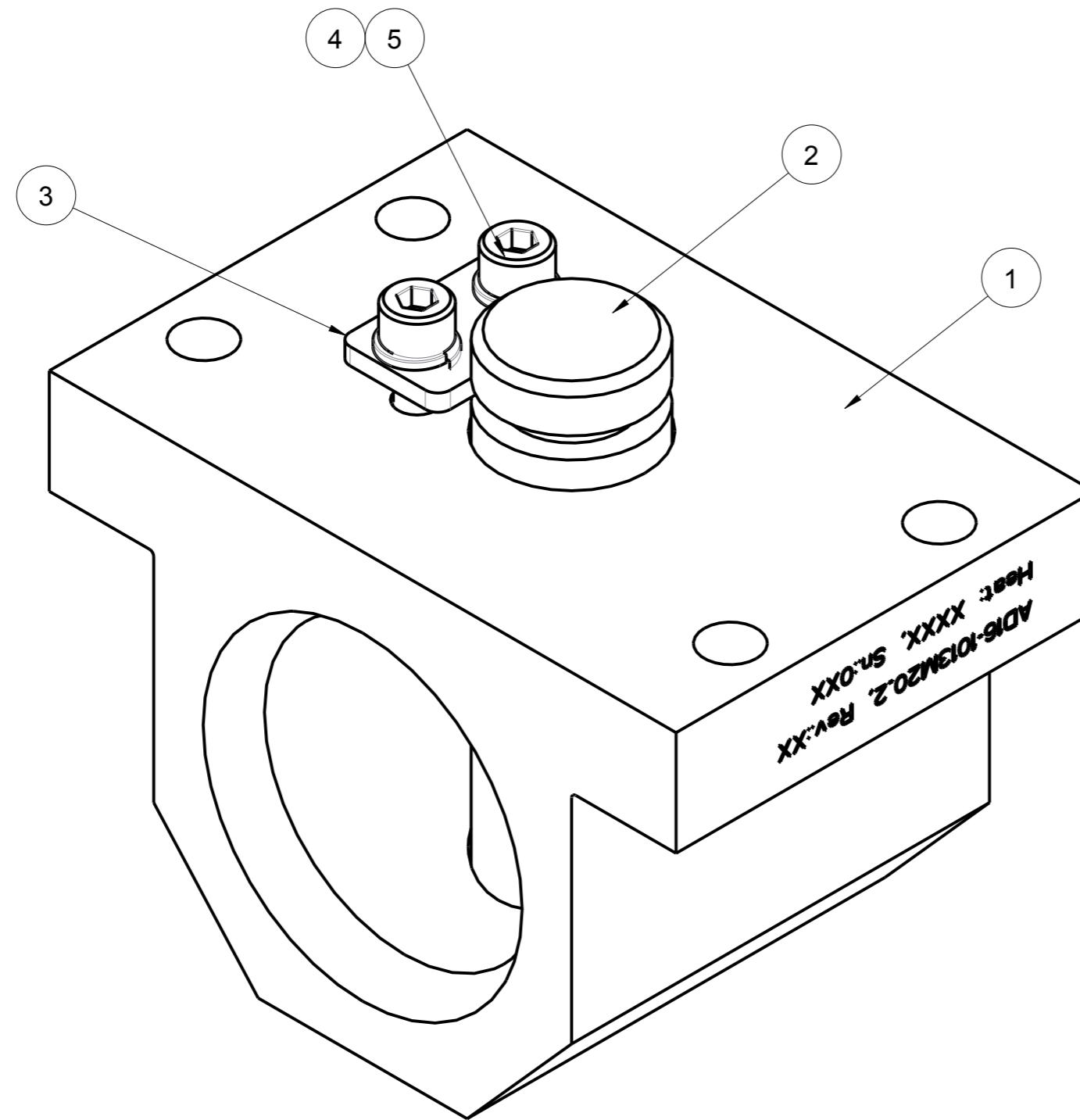
B

C

C

D

D



Dry weight: 6.30 kg

Submerged weight: 5.5 kg

Itm.	Qty.	Description	Drg. / Spec.	Material
02	01.07.13	Pos.3 moved to the other side	AHO	EKB
01	12.12.05	ISSUED FOR CONSTRUCTION	AHO	EKB
A	01.12.05	ISSUED FOR COMMENTS	AHO	PGE
Rev.	Date	Description	Prep	Chk

SUPPORTER

Drawing title BRACKETS WORK MODULE INTERFACE DETAILS	Size A3
KYSTDESIGN AS P.boks 2123, 5504 Haugesund, NORWAY Tel: +47 52 70 62 50 Fax: +47 52 70 62 01 web: www.kystdesign.no	Scale 67:100 Sheet 1 File name AD16-1013M20 of 4

1

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6

Notes:

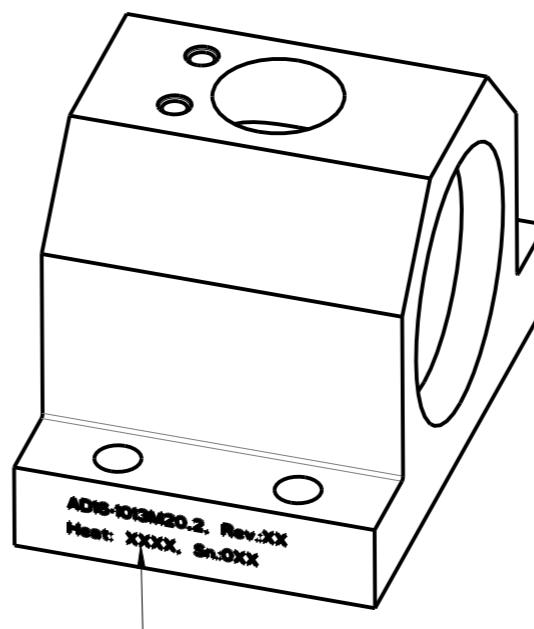
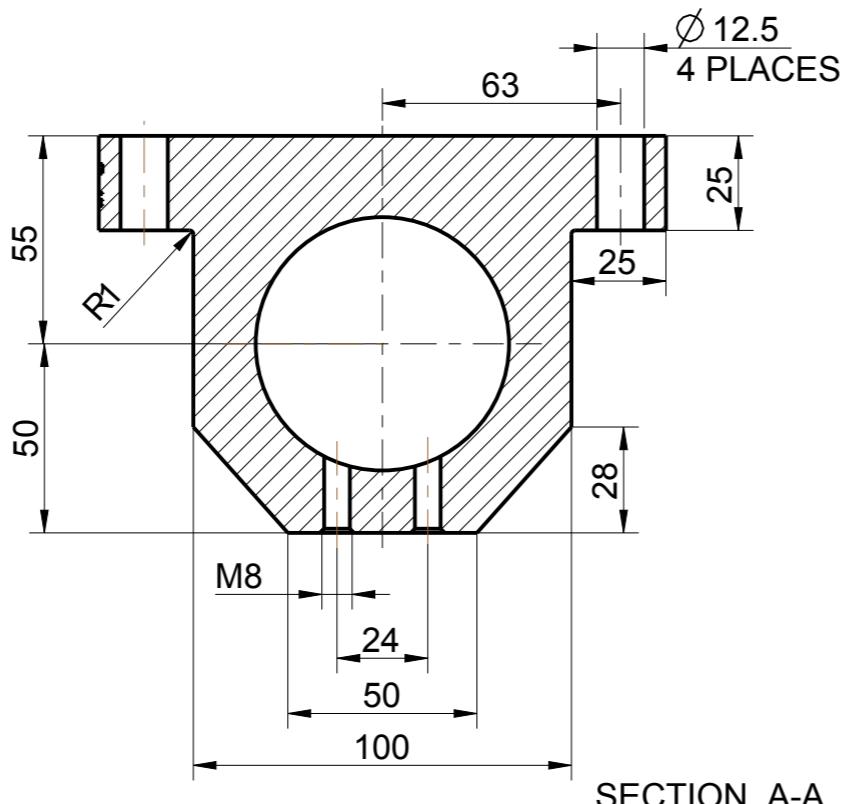
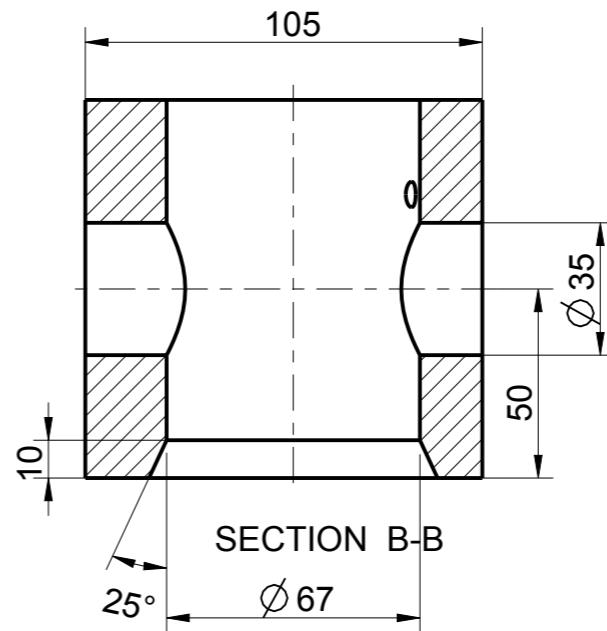
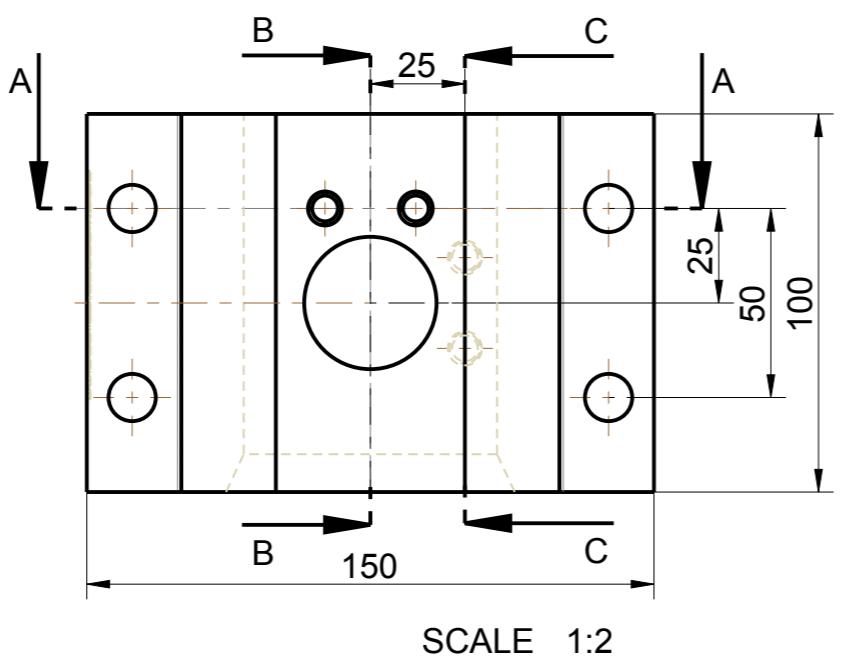
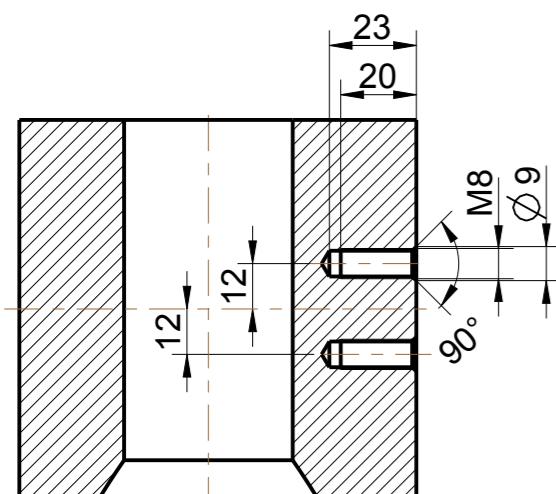
1. Material: AISI316L
2. General Tolerances:
Machining: NS-ISO 2768-1-M
- 3: Surface Finish:
General - Ra 3.2 uno.
4. Remove all burrs and sharp edges
5. Manufacturer to supply
Material Certificate
EN 10204 3.1.B
6. The following text to be
engraved with 3.5mm text
height where indicated:

AD16-1013M20_2, Rev.:XX
Heat: XXXX, Sn.:0XX

Itm.	Qty.	Description	Drg. / Spec.	Material
02	01.07.13	Two M8 holes added on sec.C.	AHO	EKB
01	12.12.05	ISSUED FOR CONSTRUCTION	AHO	EKB
A	01.12.05	ISSUED FOR COMMENTS	AHO	PGE
Rev.	Date	Description	Prep	Chk

SUPPORTER

Drawing title BRACKETS WORK MODULE INTERFACE DETAILS	Size A3
K Y S T D E S I G N A S P.boks 2123, 5504 Haugesund, NORWAY Tel: +47 52 70 62 50 Fax: +47 52 70 62 01 web: www.kystdesign.no	Scale 1:2 File name AD16-1013M20 of 4



Text location.
See P.O. for
serial number.

1

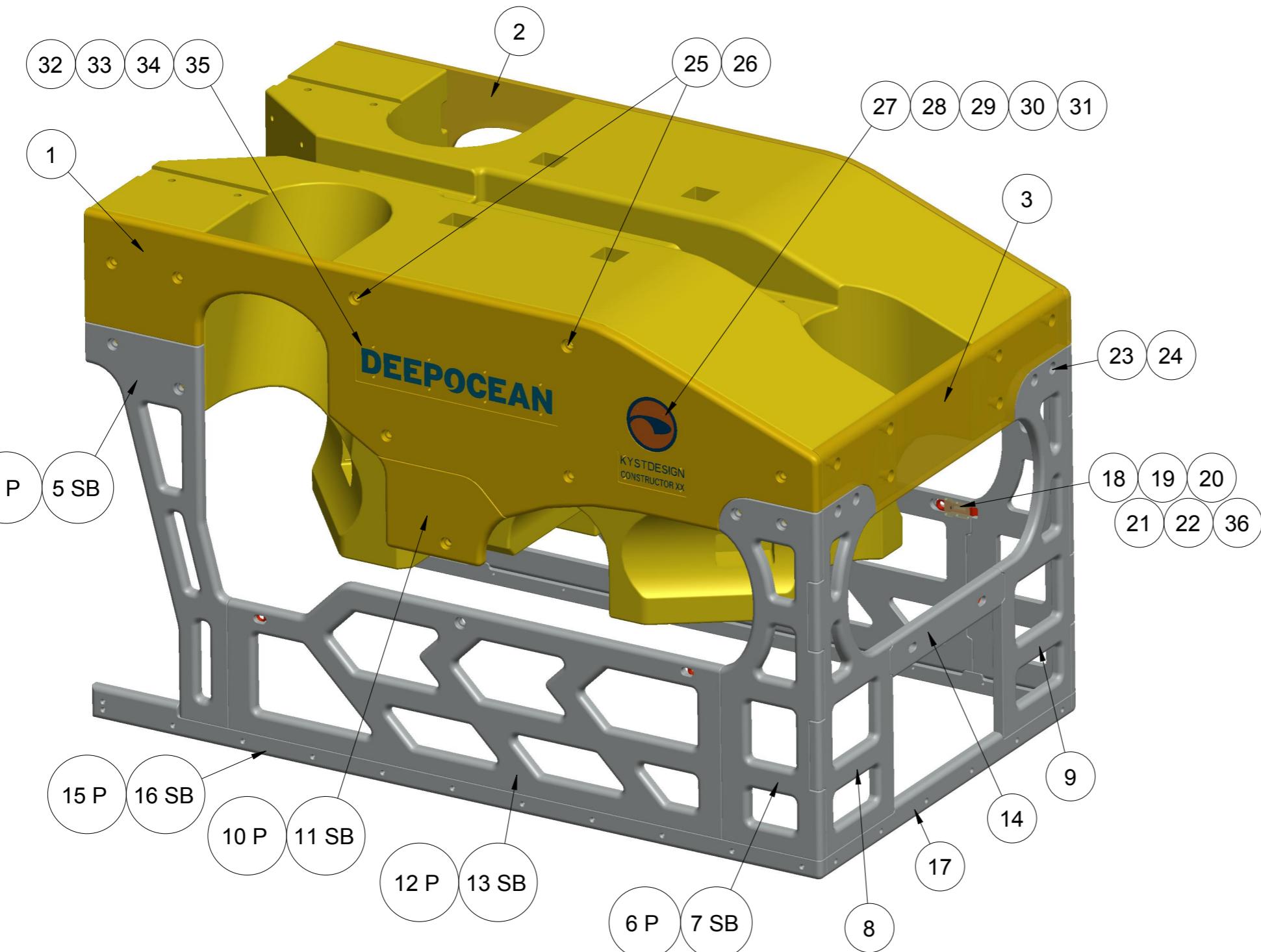
2

3

4

5

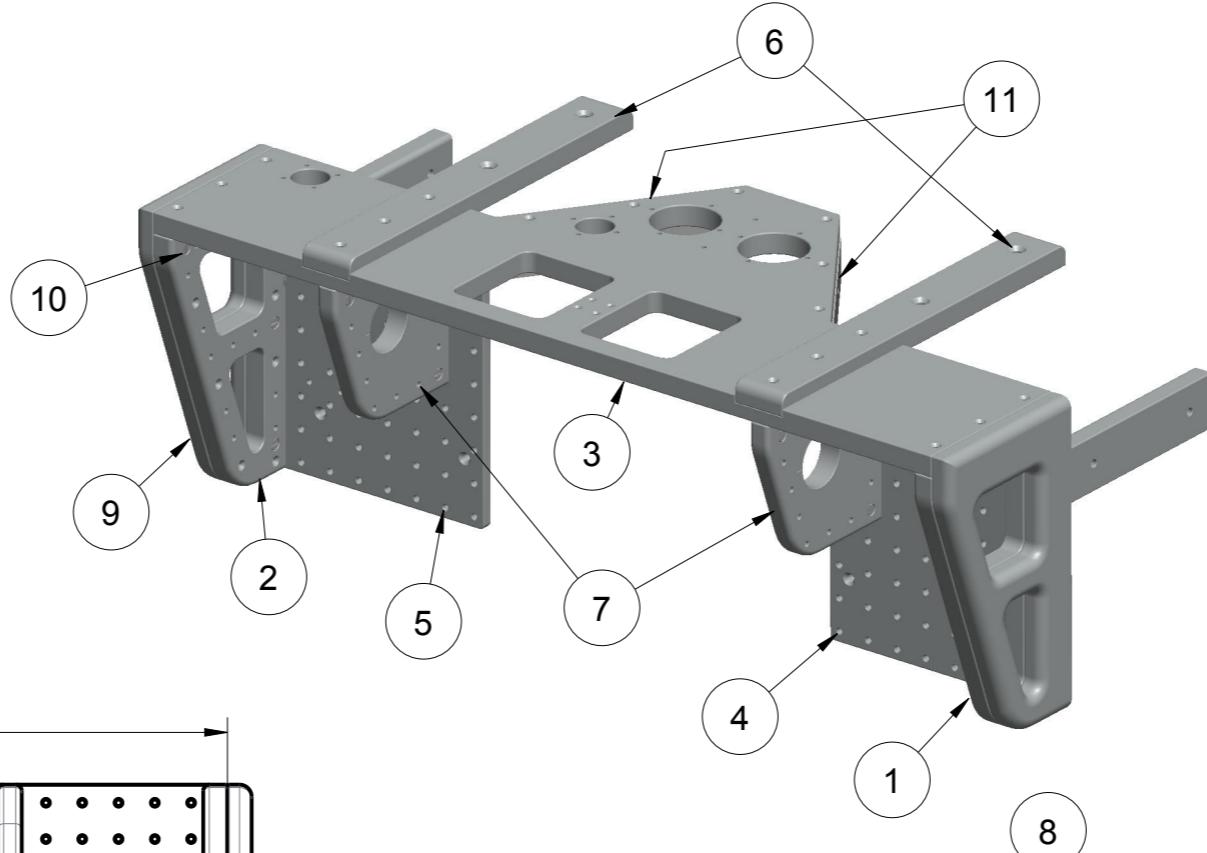
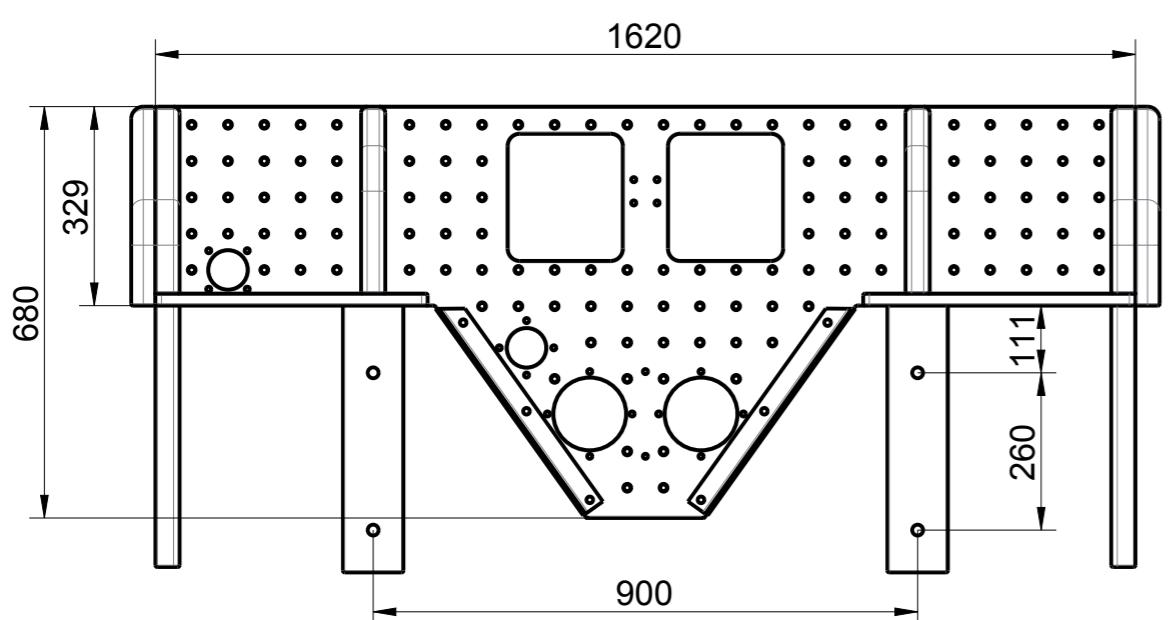
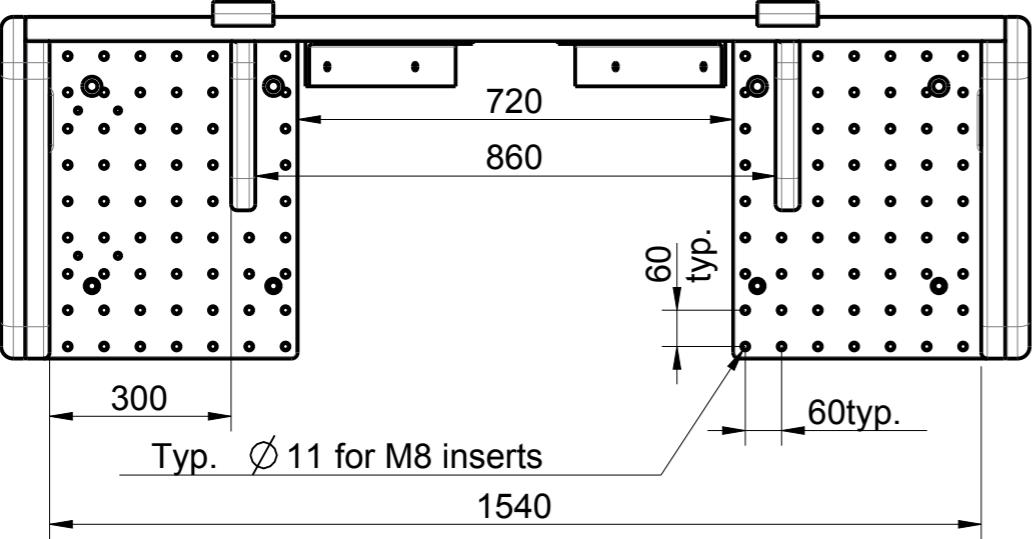
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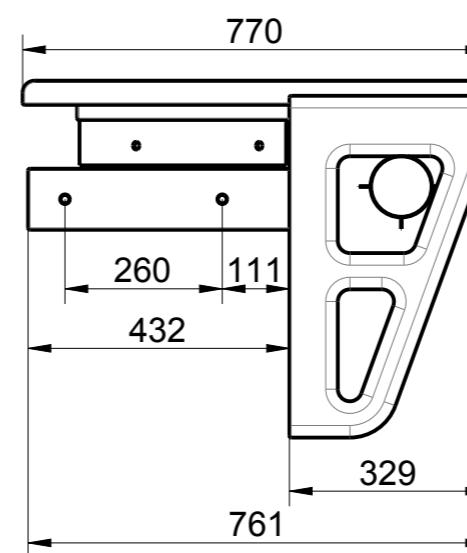
36	36	M6x16	DIN912	A4
35	16	M6x12, RAL1003	DIN7991	A4
34	16	M6x16	DIN7991	A4
33	16	Threaded insert	AF25-1014M53	
32	2	Client Logo	AF25-1014M63	
31	16	M6x12, RAL1003	DIN7991	A4
30	16	M6x16	DIN7991	A4
29	16	Threaded insert	AF25-1014M53	
28	2	KD Logo Circle	AF25-1014M62	
27	2	KD Logo Text	AF25-1014M61	
26	4	Eccentric washer M16	AF25-1014M52	
25	4	M16x45	DIN912	A4
24	35	Eccentric washer M12	AF25-1014M51	
23	35	M12x45	DIN912	A4
22	6	Spring	L-2518	SS
21	6	Spring Retainer Plate	AD16-1114M53	A4
20	36	Threaded insert	Ensat302 M6	A2
19	6	Latch	AD16-1114M52	Red
18	6	Latch plate	AD16-1114M51	Grey
17	1	Aft Bottom	AF25-1014M47	Grey
16	1	Starboard Side Bottom	AF25-1014M46	Grey
15	1	Port Side Bottom	AF25-1014M45	Grey
14	1	Aft Central	AF25-1014M44	Grey
13	1	Starboard Side Central	AF25-1014M43	Grey
12	1	Port Side Central	AF25-1014M42	Grey
11	1	Buoyancy Starboard Central	AF25-1014M41	Yellow
10	1	Buoyancy Port Central	AF25-1014M40	Yellow
9	1	Starboard Aft	AF25-1014M39	Grey
8	1	Port Aft	AF25-1014M38	Grey
7	1	Starboard Side Aft	AF25-1014M37	Grey
6	1	Port Side Aft	AF25-1014M36	Grey
5	1	Starboard Side Forward	AF25-1014M35	Grey
4	1	Port Side Forward	AF25-1014M34	Grey
3	1	Buoyancy Aft	AF25-1014M33	Yellow
2	1	Buoyancy Starboard Side	AF25-1014M32	Yellow
1	1	Buoyancy Port Side	AF25-1014M31	Yellow
Itm.	Qty.	Description	Drg. / Spec.	Material
02	17.01.14	REISSUED FOR PRODUCTION	AHO	EKB
01	21.01.13	ISSUED FOR PRODUCTION	AHO	EKB
A	19.01.13	ISSUED FOR COMMENTS	AHO	EKB
Rev.	Date	Description	Prep	Chk

CONSTRUCTOR

Drawing title COVERS -	Size A3
ASSEMBLY	
K Y S T D E S I G N A S Strandgaten 202, 5525 Haugesund, NORWAY Tel: +47 52 70 62 50 Fax: +47 52 70 62 01 www.kystdesign.no	Scale Sheet 1 File name AF25-1014M01 of 1



SCALE 2:25



11	2	Aluminium support angle	AF25-1015M13	ENAW 6082-T6
10	20	M10 KD NUT	AF25-1015M12	AISI 316L
9	1	Side Cover, Starboard. Sheet 2.	AF25-1015M11	PEHD 500
8	1	Side Cover, Port. Sheet 1.	AF25-1015M11	PEHD 500
7	2	Front Bracket, Itm.7,Sheet 6.	AD16-1215M10	PEHD 500
6	2		Sheet 7	PEHD 500
5	1		Sheet 6	PEHD 500
4	1		Sheet 5	PEHD 500
3	1		Sheet 4	PEHD 500
2	1		Sheet 3	PEHD 500
1	1		Sheet 2	PEHD 500
Itm.	Qty.	Description	Drg. / Spec.	Material
05	13.10.14	See item 1,2,4,5,7,8 and 9	GOS	GVI EKB
04	26.11.13	See Item 3	AHO	EKB EKB
03	19.03.13	REISSUED FOR PRODUCTION	AHO	EKB EKB
02	12.02.13	REISSUED FOR PRODUCTION	AHO	EKB EKB
01	06.02.13	ISSUED FOR PRODUCTION	AHO	EKB EKB
A	05.02.13	ISSUED FOR COMMENTS	AHO	EKB EKB
Rev.	Date	Description	Prep	Chk App

CONSTRUCTOR

Drawing title
Front Frame
Basic
Assembly & Details



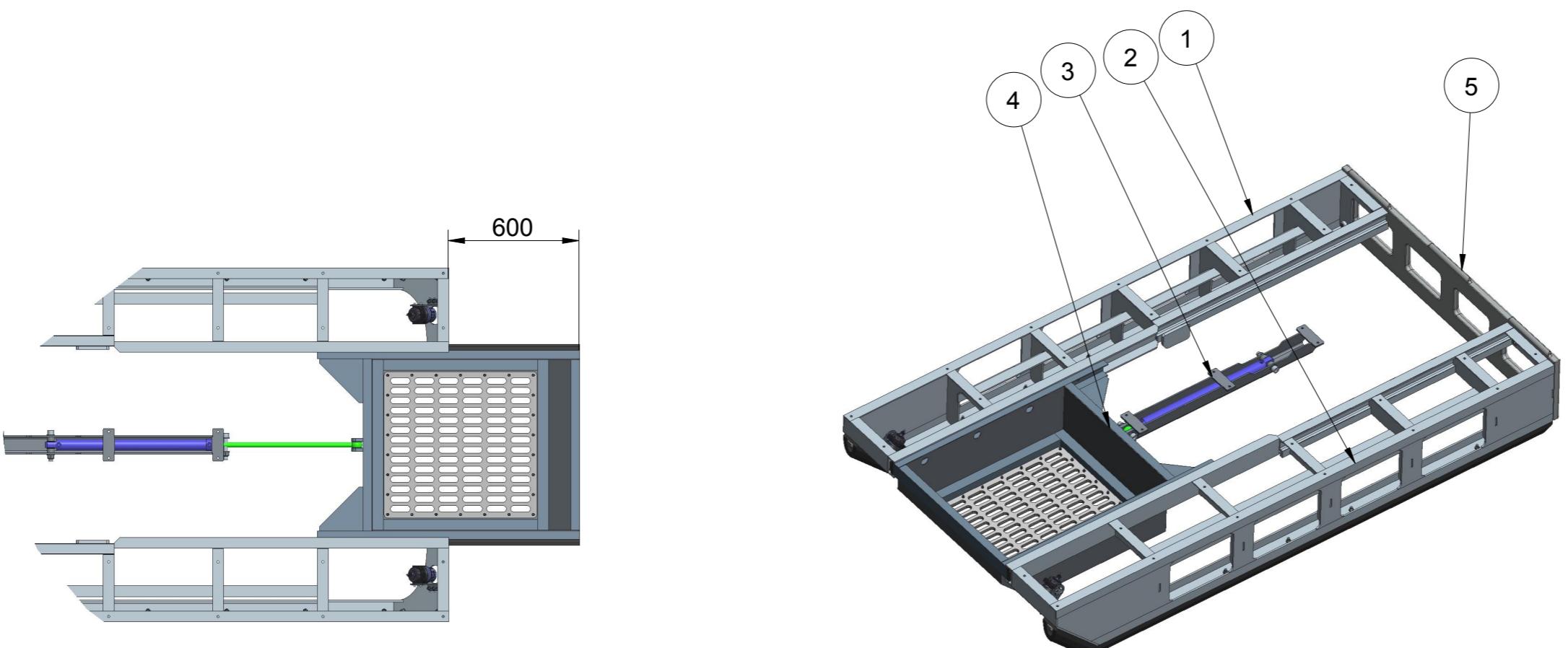
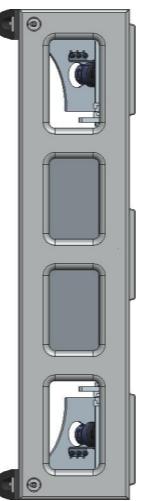
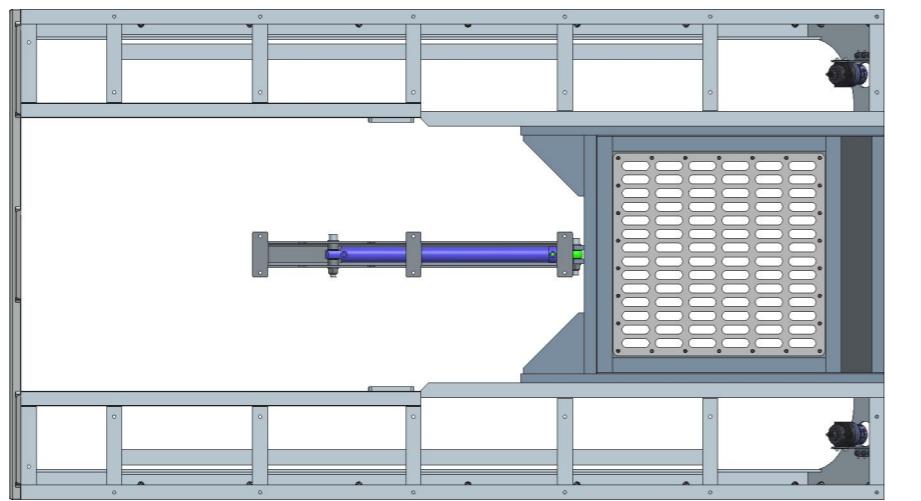
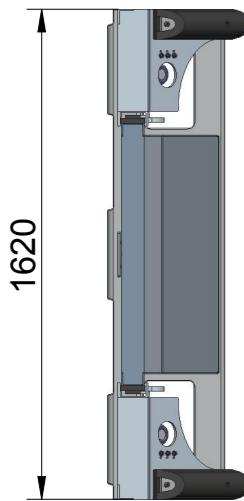
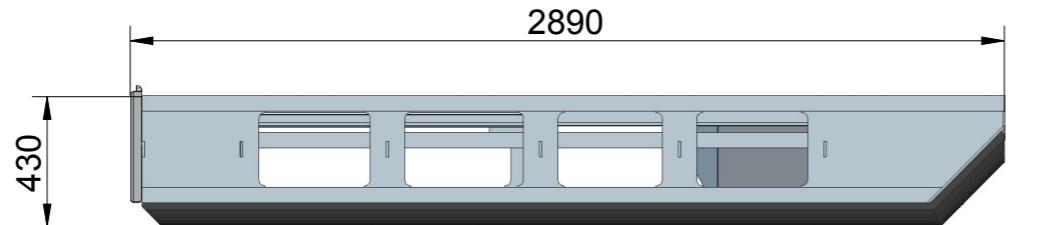
Size

A3

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Fax: +47 52 70 62 01
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Scale
Sheet
1
File name
AF25-1015M10
of
7

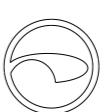
1 2 3 4 5 6



Dry weight:

Submerged Weight:

Itm.	Qty.	Description	Drg. / Spec.	Material
5	1	Cover	Sheet 2	See Drawing
4	1	Tool Basket Assembly	AF41-2012M06	See Drawing
3	1	Cylinder	Sheet 2	See Drawing
2	1	Port Sode Skid Frame	Sheet 3	See Drawing
1	1	Stb. Side Skid Frame	Sheet 3	See Drawing
Itm.	Qty.	Description	Drg. / Spec.	Material
01	25.08.15	ISSUED FOR PRODUCTION	GOS	GVI EKB
A	24.08.15	ISSUED FOR COMMENTS	GOS	GVI EKB
Rev.	Date	Description	Prep	Chk App

 KYSTDESIGN
SUB-SEA TECHNOLOGY

Drawing title:
IHPU SKID CONSTRUCTOR
Skid with Tool Basket.
Assembly & Detailing



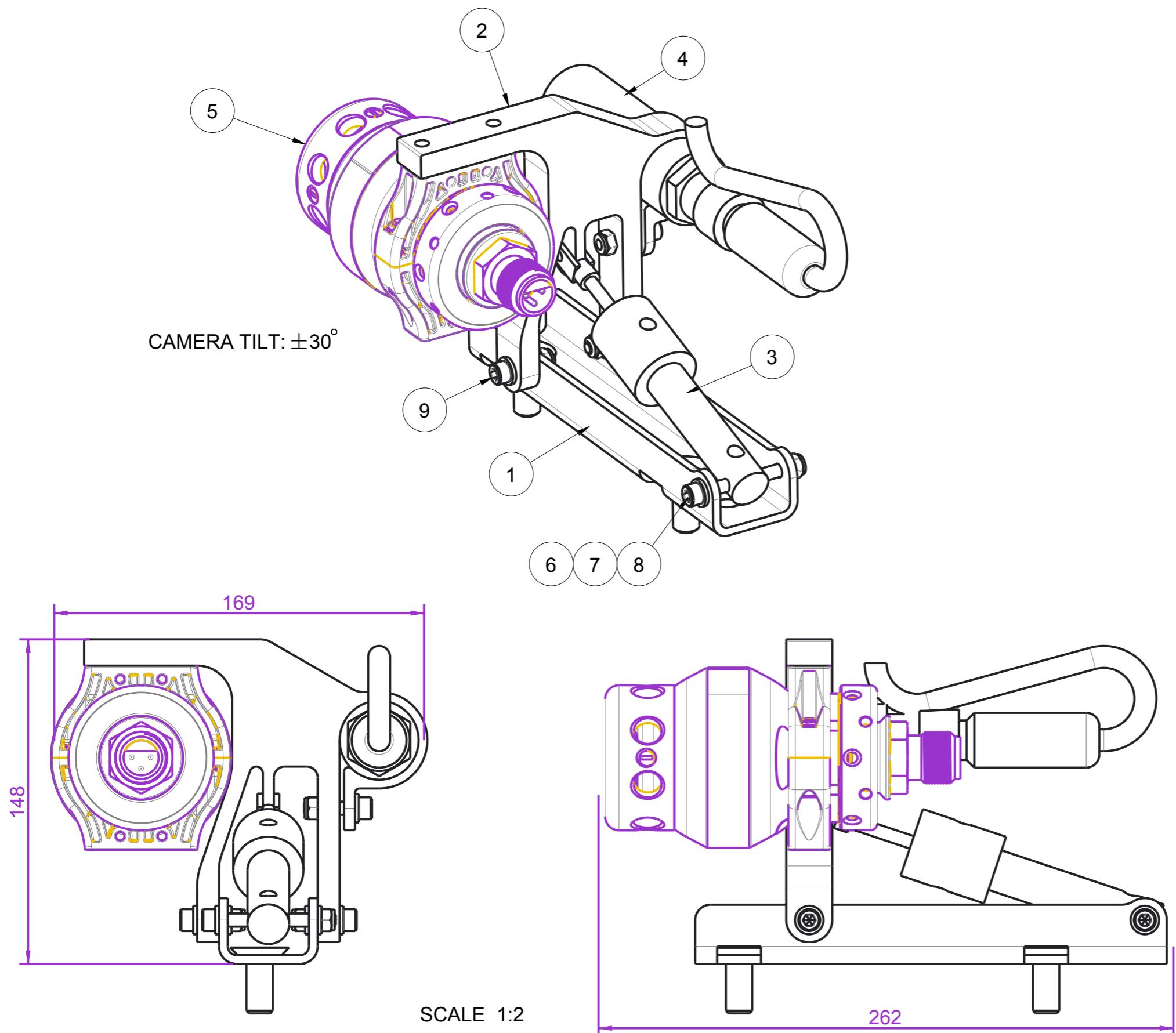
Size
A3

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Scale
1:25
Sheet
1
File name
AF41-2012M02
of
6

1 2 3 4 5 6

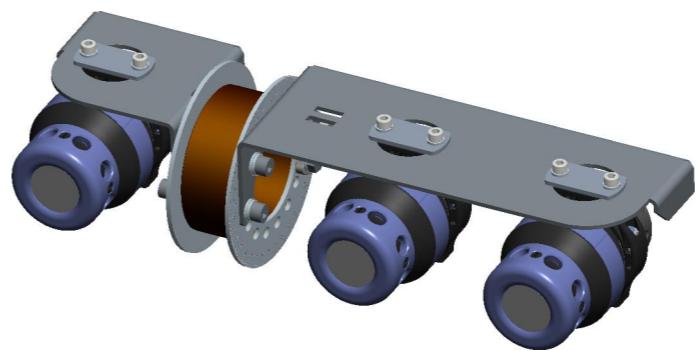
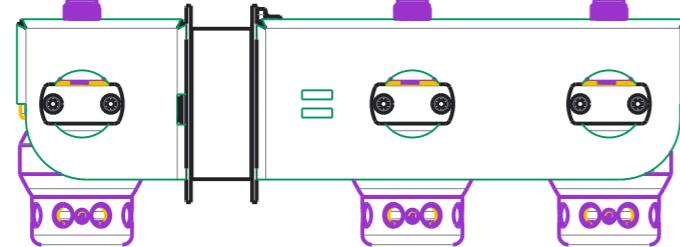
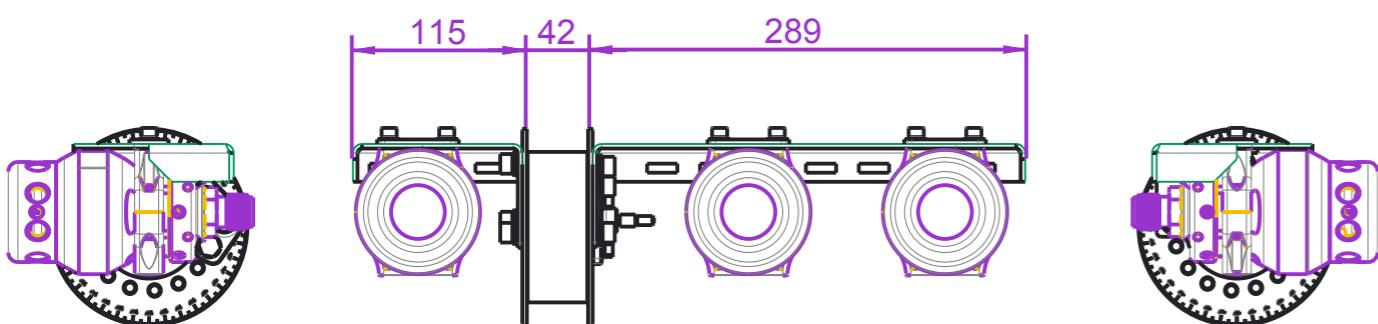
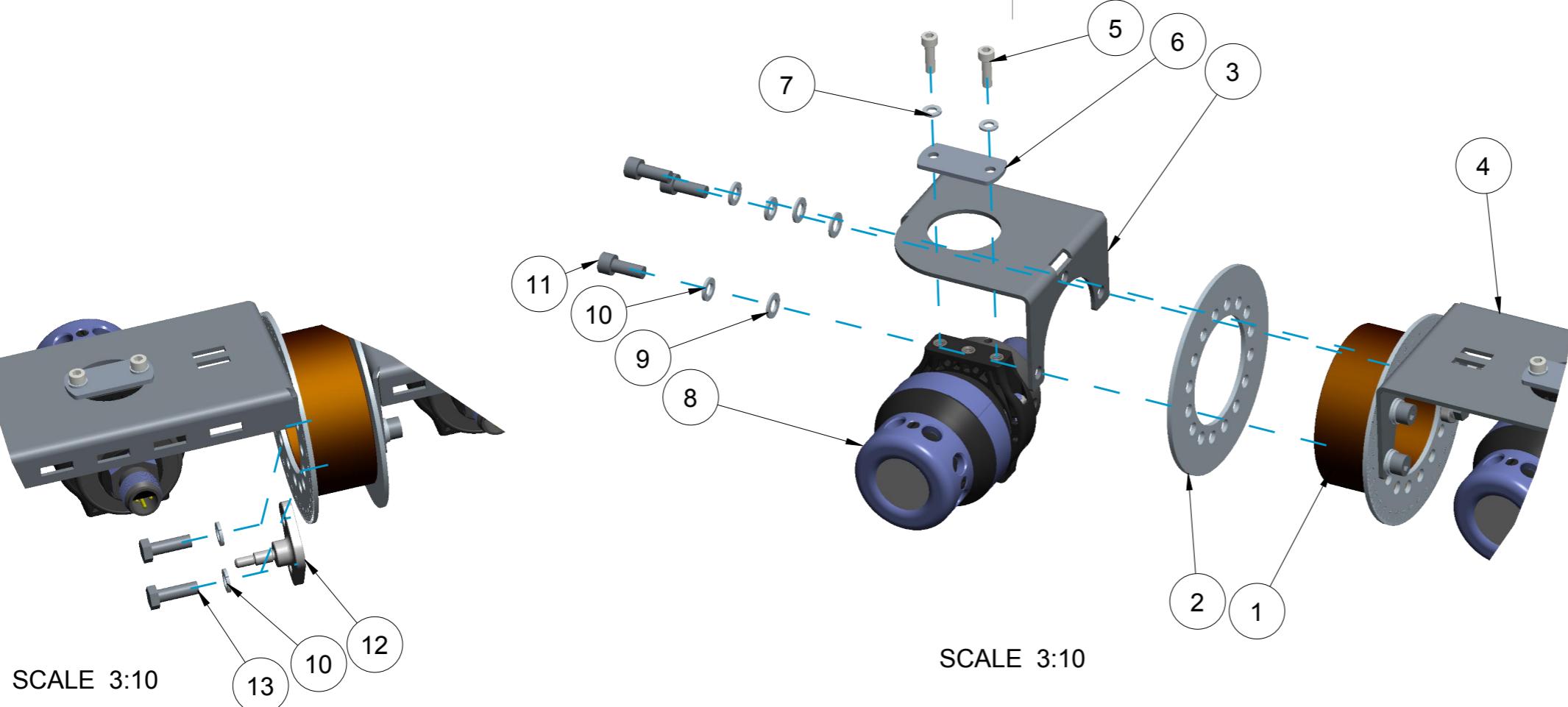
1 2 3 4 5 6



Itm.	Qty.	Description	Drg. / Spec.	Material
04	24.02.15	Adjusted for SLS-6100 light	LBR	AHO EKB
03	24.02.15	ISSUED FOR PRODUCTION	LBR	AHO EKB
02	12.03.13	ISSUED FOR CONSTRUCTION	AHO	EKB EKB
01	20.12.05	ISSUED FOR CONSTRUCTION	LBR	AHO PGE
A	24.02.15	ISSUED FOR COMMENTS	LBR	AHO PGE
Rev.	Date	Description	Prep	Chk App

SUPPORTER

Drawing title BRACKETS TILT UNIT ASSEMBLY & DETAILS	Size A3
K Y S T D E S I G N A S P.boks 2123, 5504 Haugesund, NORWAY Tel: +47 52 70 62 50 Fax: +47 52 70 62 01 web: www.kystdesign.no	Scale 1:2 Sheet 1 File name AD16-1013M60 of 3



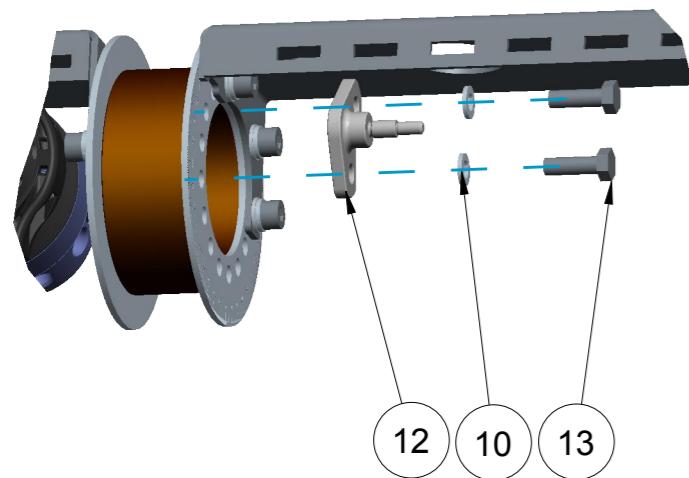
Port Side Shown

13	2	M8 x 25 Hex Cap Screw	DIN 931	A4
12	1	Hydraulic cylinder shaft	AE95-1017M24	AISI 316L
11	6	M8 x 20 Socket Cap Screw	DIN 912	A4
10	8	M8 Split Washer	DIN 127B	A4
9	6	M8 Flat Washer	DIN 125A	A4
8	3	SEALITE-SPHERE-MCBH3MP	DeepSea	Datasheet
7	6	M6 Split Washer	DIN 127B	A4
6	3	Item 2	AF25-1013M15	AISI 316L
5	6	M6 x 20 Socket Cap Screw	DIN 912	A4
4	1	Port Side Double Ligh Beam	AD16-1213M21	AISI 316L
3	1	Port Side Ligh Beam	AD16-1213M22	AISI 316L
2	2	Flange	AE95-1017M22	AISI 316L
1	1	Born Bearing	AD16-1113M16	AISI 316L
Itm.	Qty.	Description	Drg. / Spec.	Material
01	04.10.17	ISSUED FOR PRODUCTION	GOS	GVI
A	02.10.14	ISSUED FOR COMMENTS	GOS	EKB
Rev.	Date	Description	Prep	Chk

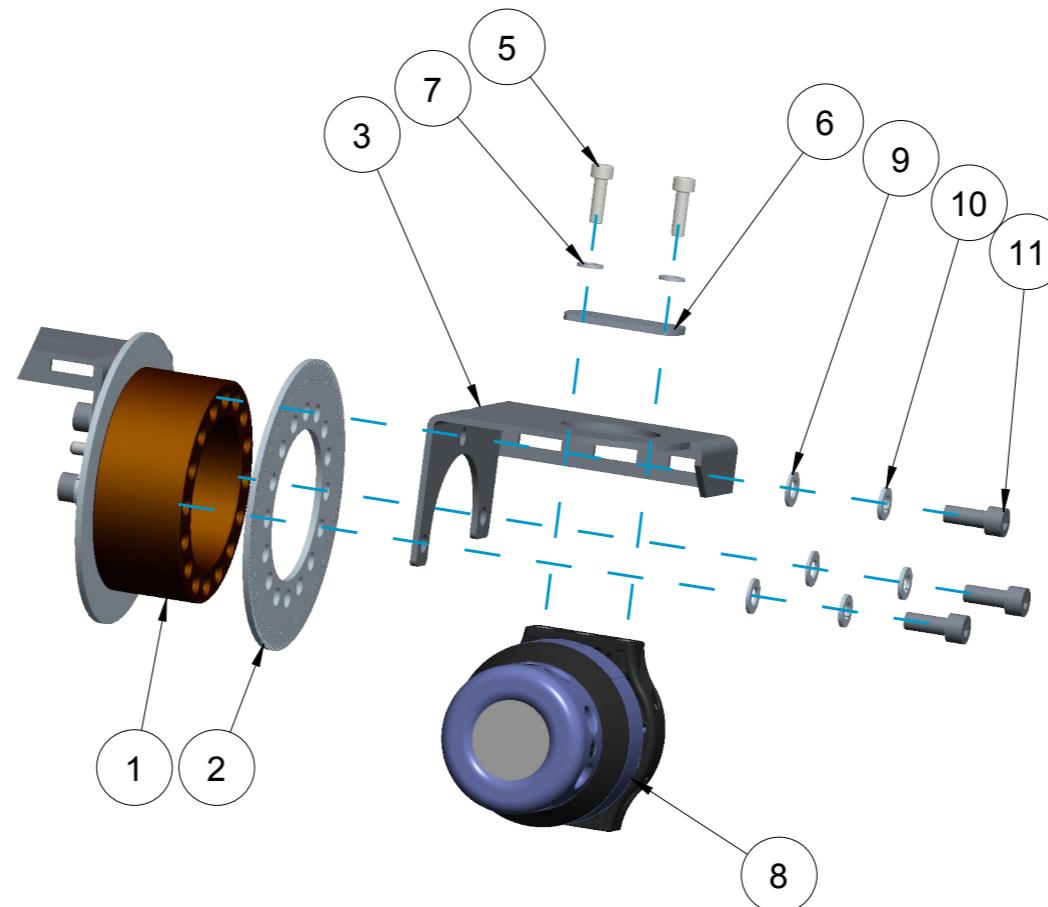
SUPPORTER Mk2

Drawing title Brackets LighTilt Unit Assembly & Detailing	Size A3	Sheet 1
		of 2
KYSTDESIGN AS Strandgaten 202, 5525 Haugesund, NORWAY Tel: +47 52 70 62 50 Fax: +47 52 70 62 01 www.kystdesign.no	Scale 1:5	
	File name AD16-1213M20	

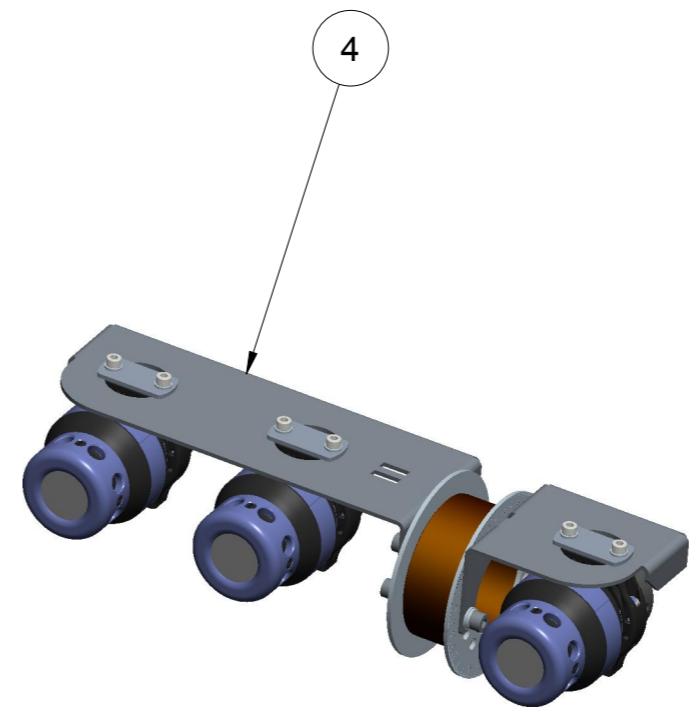
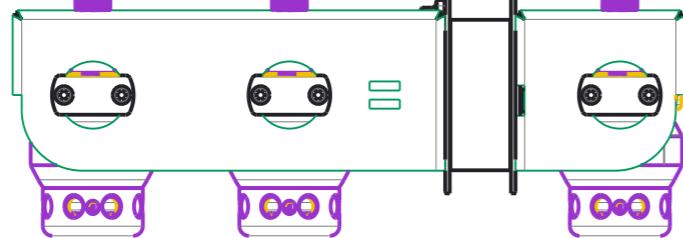
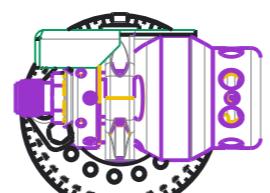
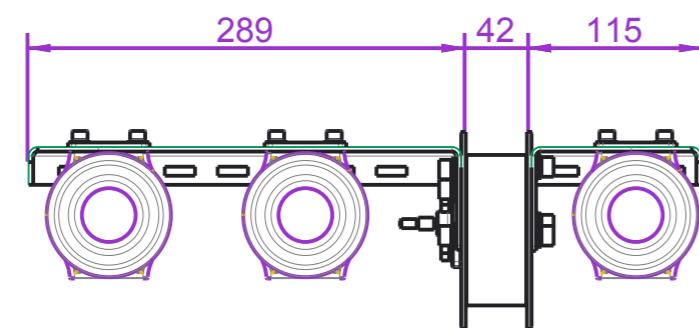
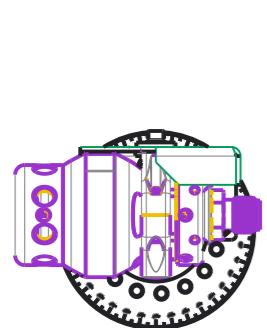
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SCALE 3:10



SCALE 3:10



Starboard Side Shown

13	2	M8 x 25 Hex Cap Screw	DIN 931	A4
12	1	Hydraulic cylinder shaft	AE95-1017M24	AISI 316L
11	6	M8 x 20 Socket Cap Screw	DIN 912	A4
10	8	M8 Split Washer	DIN 127B	A4
9	6	M8 Flat Washer	DIN 125A	A4
8	3	SEALITE-SPHERE-MCBH3MP	DeepSea	Datasheet
7	6	M6 Split Washer	DIN 127B	A4
6	3	Item 2	AF25-1013M15	AISI 316L
5	6	M6 x 20 Socket Cap Screw	DIN 912	A4
4	1	Starboard Side Double Light Beam	AD16-1213M25	AISI 316L
3	1	Starboard Side Light Beam	AD16-1213M24	AISI 316L
2	2	Flange	AE95-1017M22	AISI 316L
1	1	Bearing	AD16-1113M16	AISI 316L
Itm.	Qty.	Description	Drg. / Spec.	Material
01	04.10.17	ISSUED FOR PRODUCTION	GOS	GVI
A	02.10.14	ISSUED FOR COMMENTS	GOS	EKB
Rev.	Date	Description	Prep	Chk

SUPPORTER Mk2

Drawing title Brackets Light Tilt Unit Assembly & Detailing	Size A3	Sheet 2
KYSTDESIGN AS Strandgaten 202, 5525 Haugesund, NORWAY Tel: +47 52 70 62 50 Fax: +47 52 70 62 01 www.kystdesign.no	Scale 1:5	of 2
	File name AD16-1213M20	