



KONGSBERG

HiPAP 602/502/452/352/102 Hull unit
High Precision Acoustic Positioning
system
Instruction manual

419427/C

February 2023 © Kongsberg Maritime AS

Document information

- **Product:** Kongsberg HiPAP Hull unit
- **Document:** Instruction manual
- **Document part number:** 419427
- **Revision:** C
- **Date of issue:** 16 February 2023

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Warning

The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment and/or injury to personnel. You must be familiar with the contents of the appropriate manuals before attempting to operate or work on the equipment.

Kongsberg Maritime disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.

Disclaimer

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Support information

If you require maintenance or repair, contact Kongsberg Maritime's support organisation. You can also contact us using the following address: km.support.hpr@kongsberg.com. If you need information about our other products, visit <https://www.kongsberg.com/maritime>.

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About Electrostatic Discharge (ESD) 95

About this manual

This manual includes all necessary documentation to safely install, operate and maintain the system.

Target audience

This manual is intended for all users of the system.

Online information

All end-user documentation can be downloaded from our website.

<https://www.kongsberg.com/maritime/>

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References

Document number 396013	HiPAP 602/502/452/352/102 System Instruction manual
Document number 325840	HiPAP Cable plan and interconnections
Document number 340211	Meson Instruction manual for DN350, DN500, DN700
Document number 404896	Meson Instruction manual for DN500, Soft seal

HiPAP Hull unit

Topics

[Important, page 9](#)

[System description, page 9](#)

[System diagram, page 10](#)

[System units, page 11](#)

[Scope of supply, page 12](#)

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Important

The HiPAP Hull unit is an advanced product. It is used with other advanced products. There is important information that you need to know.

Before you turn on the HiPAP Hull unit system

Before you operate the transducer, make sure that it is submerged in water.

Caution

You must never set the system to ping unless the transducer is submerged in water. The transducer can be damaged if it transmits in the open air.

Before you turn on the HiPAP Hull unit system, make sure that the water depth under the keel is sufficient for the transducer to be fully lowered.

If you need to turn on the HiPAP Hull unit system while the vessel is in dry dock, you must ALWAYS first check for necessary clearance between the hull and the dry dock floor.

To avoid personal injury or damage to the equipment, you MUST check the conditions in the sonar room.

Personnel, tools and other obstructions must be kept clear of the moving parts.

The transducer cable must be permitted to move freely.

Verify that the hand crank is not in use, but securely mounted on the side of the gantry.

System description

The system is used to position subsea objects in both shallow and deep water.

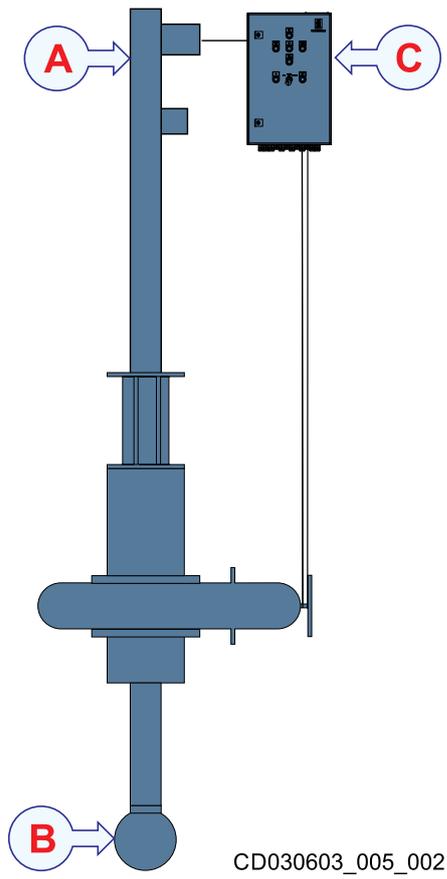
The HiPAP Hull unit systems calculates the accurate positions of subsea objects such as Remotely Operated Vehicles (ROVs), Autonomous Underwater Vehicles (AUV's), towed bodies or fixed seabed transponders.

The system offers the user a wide range of transponder channels and cNODE transponder models for depths rating down to 11000 metres.

The HiPAP Hull unit systems use a signal processing technique which enables narrow transmitter and receiver beams to be generated in all directions within the lower half of the transducer, using electronic beam control to achieve accuracy.

System diagram

The system diagram identifies the main components of a basic HiPAP Hull unit system. Only the main connections between the units are shown. Detailed interface capabilities and power cables are not shown..



- A** Hull unit
- B** Transducer
- C** Hull Unit Controller

System units

Hull unit description

The hull unit is a large mechanical construction designed to lower the transducer into the water when the HiPAP Hull unit system shall be used. When the system is turned off, the transducer must be hoisted for protection.

The hull unit lets the transducer be lowered through the vessel's hull deep enough to minimise the effects of noise and air layers below the vessel. The hull unit is installed on top of a gate valve, which can be closed when the transducer is not in use.

Gate valve

The gate valve closes the opening in the vessel's hull when the transducer is raised.

The gate valve can either be manually operated, or controlled by a hydraulic system. On the manual type, a hand operated wheel is used to open and close the valve. On the hydraulic version, a single button does the same job.

Transducer description

The transducer is bolted to the lower end of the transducer shaft.

When the transducer shaft is fully raised the transducer is stored in the transducer dock. The gate valve can be closed to protect the transducer and to access it for maintenance.



Hull Unit Controller description

The Hull Unit Controller provides power and direction to the hoisting motor, and thus controls the lowering and hoisting of the transducer. The unit also controls the gate valve. The gate valve must open before the transducer is lowered, and close after the transducer has been hoisted.

This unit holds the power supply and control logic for the hoist and lower operation of the transducer and opening and closing the gate valve. It also has a local control panel for local control of the hoist/lower open/close operations.

The unit has built in safety features to avoid lowering the transducer when the gate valve is closed and closing the gate valve when the transducer is lowered.



Scope of supply

To assemble a complete HiPAP Hull unit system you need all the system units. The main units you need are provided with the standard delivery. Some items are optional.

When you unpack the parts provided with the HiPAP Hull unit system delivery, make sure that the following items are included.

- Mounting flange
- Gate valve
- Hull unit with transducer
- Hull Unit Controller
- Cables

Optional items

- Hydraulic Power Pack
- Laser unit

Support information

Should you need technical support for your HiPAP Hull unit system you must contact a Kongsberg Maritime office. A list of all our offices is available on our website. You can also contact our main support office in Norway.

Manuals and technical information can be downloaded from our support website.

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Preparations

Topics

[About installation drawings, page 15](#)

[Tools, equipment and consumables required for installation, page 15](#)

[Torque, page 16](#)

[Hull unit location, page 16](#)

About installation drawings

The installation shipyard must provide all necessary design and installation drawings, as well as the relevant work standards and mounting procedures.

Note

If required, all documents provided by the shipyard for the physical installation of the HiPAP Hull unit system must be approved by the vessel's national registry and corresponding maritime authority and/or classification society. Such approval must be obtained before the installation can begin. The shipowner and shipyard doing the installation are responsible for obtaining and paying for such approval.

Kongsberg Maritime offers free advice for installation planning. Proposed arrangements may be sent for commentary or suggestions. The following drawings should be submitted should assistance be requested:

- General arrangement
- Body plan and drawings of the relevant compartment
- Lines plan

Tools, equipment and consumables required for installation

To install the HiPAP Hull unit system, all necessary tools and equipment for mechanical work, cabinet installation and electrical wiring must be available.

It is not practical to provide a detailed list of all necessary tools and equipment. You must be equipped with a standard set of tools. This tool set must comprise the normal tools for electronic and electromechanical tasks. This includes different screwdriver types, pliers, spanners, a cable stripper, a soldering iron, etc. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment. However, you must make sure that the following specialized tools are available.

- All necessary tools and consumables required for welding
- All necessary tools and consumables required for physical installation of units, cabinets and racks
- All necessary tools and consumables required for electrical installations
- A crane (or other lifting device) capable of lifting the individual units and cabinets
- A crane (or other lifting device) capable of lifting the entire hull unit

Note

If you need specific consumables, or if special tools and/or test instruments are required, these are identified in the relevant procedure(s).

Torque

All the nuts and bolts used in the system must be tightened to their recommended torques to prevent leaks or damage to the threads. Follow the recommended tightening torques for the various sizes.

These torques are for lubricated threads.

- M6 — 7 Nm
- M8 — 17 Nm
- M10 — 33 Nm
- M12 — 57 Nm
- M16 — 140 Nm
- M20 — 273 Nm
- M24 — 472 Nm
- M27 — 682 Nm
- M39 — 990 Nm

Hull unit location

All hydroacoustic instruments are subjected to noise. It is important that the location of the hull unit is chosen to minimize noise.

Important

Selecting the optimum location for the hull unit is of vital importance for the overall system performance.

All external noise sources (sea noise, machinery noise, air bubbles etc), and the individual performance of the ship, must be taken into consideration.

The hull unit location must be selected by a skilled engineer with experience in positioning system theory and hull unit installation. The supplier will assist if required.

The compartment, within which the hull unit is to be mounted, must be accessible under all conditions. Take into consideration the following:

- The access door / hatch should be large enough to allow installation and removal of the hull unit without the requirement to disassemble it.
- The hull unit will pass through a hole of 800 mm diameter, provided there are no obstructions either side of the hole.
- The compartment should also be connected to the ship's ventilation system. In tropical regions an air dehumidifier is recommended to reduce the likelihood of problems and corrosion due to condensation.
- The compartment should also be supported by a central or separate bilge pump.

The hull unit should be located within 1/6 to 1/3 of the ship's length between perpendiculars (LBP), measured from the fore perpendicular (FP). Deviations from this specification should not be made without consulting the supplier. In all cases, it is imperative that the transducer array has a free view under the keel when it is in its operational position.

The location must be as close to the keel as possible. The vertical distance from the lower edge of the keel to the top of the mounting flange must be discussed with the supplier.

- The assistance of a dockyard crane will be required to lower the hull unit into the vessel.
- Heater elements of approximately 1000 watts should be installed close to the bottom of the hull unit to prevent the unit icing up in cold weather.
- If there is any chance of damage caused by welding or other work during the installation or a maintenance period, the hull unit must be protected with heat resistant material.
- The installation must be approved by an appropriate classification society.
- When the vessel has been launched, the air must be released from the transducer dock through the air vent cock.

Installation

Topics

[Accuracy and tolerance requirements, page 19](#)

[Installing the mounting flange, page 19](#)

[Installing the gate valve, page 21](#)

[Installing the hull unit on the gate valve, page 22](#)

[Installing the hoisting motor, page 24](#)

[Installing the Hull Unit Controller, page 25](#)

[Installing the laser, page 25](#)

Accuracy and tolerance requirements

It is very important for the system accuracy that the angular orientation of the hull unit is as accurate as possible.

This implies that the welding of the mounting flange into the hull must be completed with the tolerances according to the following three offset angles:

- 1 **Roll angle:** The upper surface of the mounting flange must be horizontal in the athwart ships direction when the ship is floating at its normal trim.
Tolerance: $\pm 1^\circ$
- 2 **Pitch angle:** The upper surface of the mounting flange must be horizontal in the fore-and-aft direction when the ship is floating at its normal trim.
Tolerance: $\pm 1^\circ$
- 3 **Azimuth angle:** No angular requirements.

Installing the mounting flange

The mounting flange must be mounted so that it remains vertical during normal operating conditions.

Prerequisites

This task must take place in dry dock. The shipyard must provide all necessary tools and manpower.

The mounting flange is heavy. Always use appropriate lifting equipment to minimize risk of personnel injury or equipment damages. Only certified equipment must be used.

The top mating surface of the mounting flange must be protected with a wooden cover at all times until the gate valve is installed.

Note

The quality of the welding is critical to the safety of the vessel. Welding must only be done by a certified welder. Always wear the personal protective equipment. Observe and obey the relevant safety instructions.

The final installation work must be approved by the vessel's national registry, the corresponding maritime authority and/or classification society.

Procedure

- 1 Define the physical location of the mounting flange.
This location must be carefully selected. The decision must be based on the general principles outlined in chapter *Preparations* and all relevant knowledge about the vessel construction.

Note

All information related to practical and theoretical noise patterns along the hull must be taken into consideration.

- 2 Note the orientation of the centre line of the mounting flange with regards to the mounting bolts.
- 3 Cut out a hole in the vessel's hull with a diameter large enough to accommodate the mounting flange.
The exact size of the hole must be determined by the installation shipyard.
- 4 Orientate the mounting flange correctly, and weld it into position.

Important

To obtain optimal system performance, the total height of the mounting flange must be as close as possible to its stated minimum height.

The top flange must be parallel to the water line in both the fore-and-aft and athwartship directions.

- 5 Check the upper surface of the mounting flange to ensure that it is level, undamaged and clean.
- 6 Cover the upper surface of the mounting flange with a wooden plate to protect it
- 7 Brace the mounting flange to the hull plating and the surrounding hull frames by adding several strengthening plates.
The final dimensions of the doubling plate must be defined in the approved installation drawings supplied by the shipyard.
- 8 Make sure that the hull plating surrounding the mounting flange is even and smooth without protruding objects that can cause noise.
Objects protruding from the hull will generate turbulence and flow noise. This will reduce the overall performance of your system.
- 9 If necessary, grind and polish all surfaces.
- 10 As soon as all installation, welding and grinding has been done, prime or paint the mounting flange and the surrounding area using a high quality protective coating.

Installing the gate valve

A mounting flange is used to fit the gate valve to the hull plating.

Prerequisites

Note

This is a generic procedure. Observe the applicable documentation provided by the manufacturer.

This task must take place in dry dock. The shipyard must provide all necessary tools and manpower. The following specific items are required for this task:

- Silicone grease
- Anti-seize lubricant
- Torque wrench
- Lifting arrangement
- O-ring
- Mounting hardware

Note

The gate valve is heavy. Appropriate lifting equipment (lifting tackle, portable crane or ship's crane) is required. Always use appropriate lifting equipment to minimize risk of personnel injury or equipment damages. Only certified equipment must be used.

It is assumed that the mounting flange has been installed correctly.

Context

Only the basic steps of the task are offered. Additional procedures with more information and/or details must be provided by the installation shipyard to fit the vessel properties.

The top mating surface of the gate valve must be protected with a wooden cover at all times until the transducer dock is installed. It is very important that this surface is clean and undamaged, to ensure watertightness after the hull unit has been installed.

Caution

The sealing capability of the gate valve is dependent on clean and scratch free surfaces. It is important that the valve is protected against welding spatter, grit etc.

Procedure

- 1 Attach the necessary tackles to the gate valve, and make sure that the unit is lifted with the correct side up.
The gate valve will work in any position, but we recommend that it is mounted with its identification tags and classification markings facing up. You must also consider the access to the end switches, and (if relevant) the hydraulic hose connections.
- 2 Lower the gate valve down into the hull unit compartment, but stop when the unit is a few centimetres above the mounting flange.

Note

Do not damage the mating surfaces on the valve, the end switches, or (if relevant) the hydraulic actuator.

- 3 Verify that the mating surface on the valve is clean and undamaged.
- 4 Prepare the mounting flange.
 - a Remove the protective cover from the mating surface on the mounting flange.
 - b Verify that the mating surface on the mounting flange is clean and undamaged.
 - c Wipe a thin film of silicone grease on the O-ring and place it in the groove on the mounting flange.
- 5 Attach the nuts and washers while the gate valve is still suspended.
- 6 Lubricate the threads with a high grade commercial anti-seize lubricant.
- 7 Lower the valve carefully onto the mounting flange while tightening the nuts.
- 8 Verify that the valve is orientated and aligned correctly.
- 9 Disconnect and remove the tackles from the gate valve.
- 10 Tighten the nuts to the recommended torque.
[Torque, page 16](#)

Installing the hull unit on the gate valve

The upper parts of the hull unit include the mechanical gantry, the hoisting motor, the hoisting spindle and the junction box. The transducer shaft is supported by the gantry, and penetrates the mounting flange. The complete assembly is mounted on top of the mounting flange.

Prerequisites

The shipyard must provide all necessary tools and manpower. The following specific items are required for this task:

- Silicone grease

- Torque wrench
- A crane (or other lifting device) capable of lifting the entire hull unit

Note

The hull unit is heavy. Appropriate lifting equipment (lifting tackle, portable crane or ship's crane) is required. Always use appropriate lifting equipment to minimize risk of personnel injury or equipment damages. Only certified equipment must be used.

Context

Note

The transducer is covered with a thick red or black protective coating made of a special plastic type. The protective coating is a vital part of the transducer. It is very important that neither this coating nor the internal parts of the transducer are damaged during the handling, installation or cleaning. Any holes and/or scratches in the transducer surface will allow water to penetrate the transducer. If a leak occurs, the transducer must be replaced.

The top mating surface of the gate valve must be protected with a wooden cover at all times until the transducer dock is installed. It is very important that this surface is clean and undamaged, to ensure watertightness after the hull unit has been installed.

A dedicated O-ring is provided with the HiPAP Hull unit system delivery. This O-ring gives a watertight connection between the gate valve and the transducer dock. During the installation process, make sure that the O-ring is kept safe from damage, and that the top of the gate valve is kept clean, smooth and without physical damage such as scratches or dents. Proper O-ring lubrication must be applied before the hull unit is mounted on top of the gate valve.

Procedure

- 1 Manoeuvre the unit into the hull unit compartment, taking care not to damage the unit.
The mating surface of the transducer dock flange must be protected at all times during the operation.
- 2 Raise the unit using two cranes/tackles, one of them must be attached to the top of the unit.
- 3 Rotate the unit to the upright position without any part touching the deck.
- 4 Once the entire weight of the unit is supported by the crane attached to the top of the unit, release the crane attached to the lower end.
The unit is now hanging from one crane.
- 5 Manoeuvre the unit over the gate valve.
- 6 Stop lowering when the bottom flange of the transducer dock approaches the gate valve.

- 7 Remove the protective cover from transducer dock and gate valve flanges, and check that the mating surfaces are clean and undamaged.
- 8 Wipe a film of grease in its groove, and position the O-ring seal.
- 9 Carefully lower the hull unit down onto the gate valve.
Make sure that the studs mate correctly and easily with their corresponding holes in the transducer dock flange.
Make sure that the O-ring stays in place.
- 10 Place the nuts and washers onto all the bolts, making sure that the required washers are used.
- 11 Tighten all the nuts to finger tight, and then working alternately on opposite sides of the dock.
- 12 Tighten the nuts to the recommended torque.
[Torque, page 16](#)
- 13 The hull unit must be supported against the vessel's hull in two directions 90° apart, using steel braces of suitable dimensions. These braces must be **bolted** into position to allow later maintenance or possible removal of the hull unit. Refer to the typical arrangement drawing, to see where and how many are required for the different hull units.
[Hull unit HL 3770, page 79](#)
[Hull unit HL 2180, page 81](#)
[Hull unit HL 6120, page 83](#)
- 14 Make sure that no units or protrusions will obstruct the vertical movement of the hull unit or the transducer cables.
- 15 Support the transducer cable to make sure it doesn't get tangled when the vessel moves.

Installing the hoisting motor

The hull unit is delivered with the motor dismounted. It must therefore be fitted during the installation.

Prerequisites

It is recommended to fit the motor after the hull unit has been installed in the vessel.

Procedure

- 1 Remove the plate covering the motor shaft key-way on the gearbox.
- 2 Mount the motor onto the gearbox using all the bolts provided.

- 3 Remove the oil filler and level plugs from the gearbox, and fill the gearbox with oil if necessary.
The gear oil must follow DIN CLP PG and ISO VG 220. Use Mobilgear 600 XP 220 or similar gear oil.
- 4 Cut the plastic vent plug on the oil filler plug to allow the gearbox to breathe.

Installing the Hull Unit Controller

The unit is designed to be mounted on a bulkhead.

Prerequisites

The unit must be placed within direct line of sight from the hull unit.

Procedure

- 1 Determine the location of the unit.
- 2 Check on the other side of the bulkhead to ensure there will be no “surprises” when the holes are drilled or welding is performed.
- 3 Drill the holes to fit M8 bolts, or weld 4 x M8 studs to the appropriate positions on the bulkhead.
- 4 Lift the cabinet against the bulkhead and align the mounting holes/studs.
- 5 Locate the bolts/studs through the holes, place washers onto the threads, then screw nuts onto them.
- 6 Make sure the cabinet is positioned correctly, then tighten the nuts to the final torque.

[Torque, page 16](#)

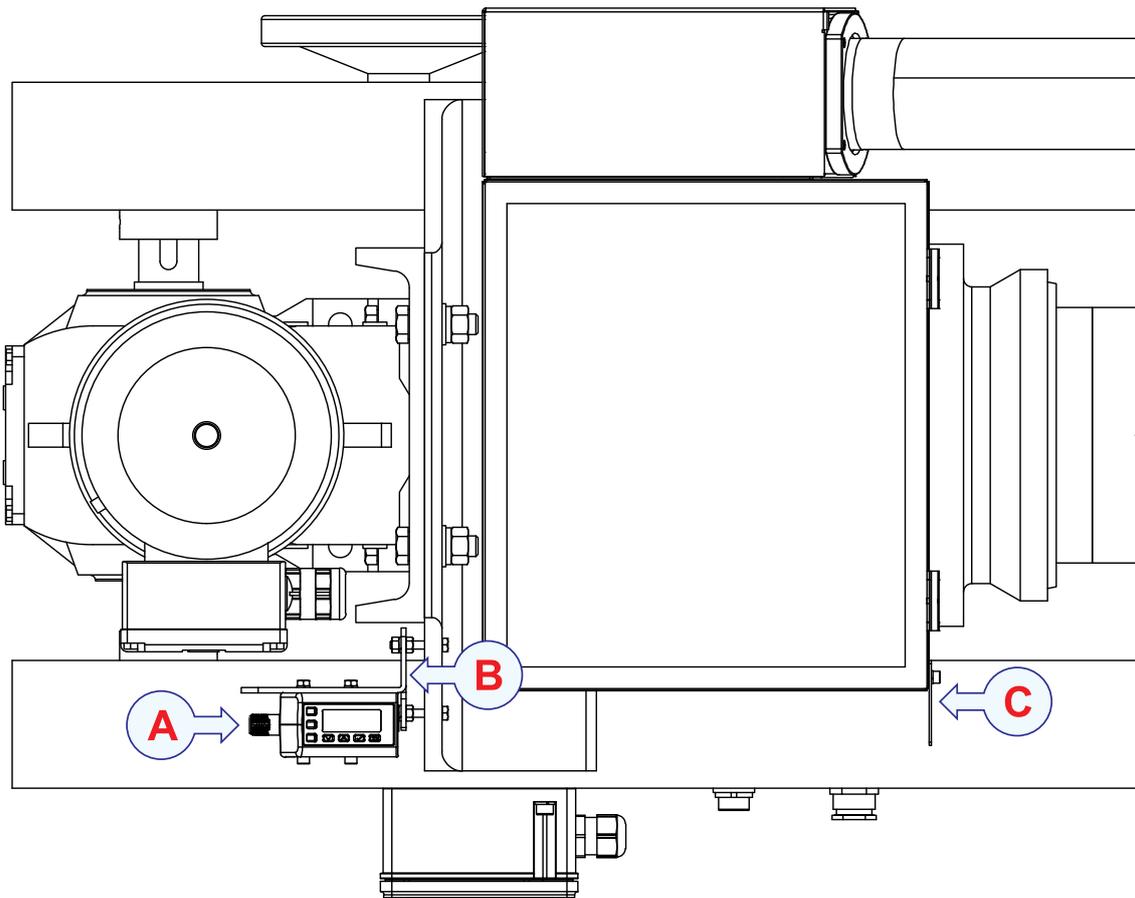
Further requirements

Connect the cables.

Installing the laser

The laser unit measures the distance from the top of the hull unit to the Hull Unit Controller and you get the depth of the transducer in APOS.

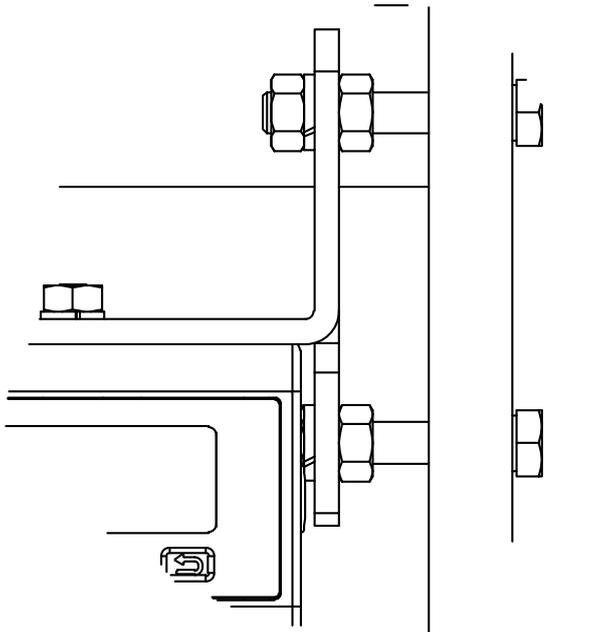
Context



- A** Laser unit
- B** Mounting bracket
- C** Reflector bracket

Procedure

- 1 Fasten the laser unit to the bracket.
Use the M4x45 bolts with spring washers and nuts that are included with the laser.
- 2 Drill holes in the gantry as shown in the cut-out drawing.
[Gantry cut-out \(Laser unit\), page 85](#)
Drill three 4.2 mm holes for M5 size.
- 3 Make M5 threads in the holes in the gantry.
- 4 Fasten the mounting bracket to the top of the hull unit.
Use the M5x30 bolts with spring washers and 2 nuts that are included with the laser.



- 5 Drill holes in the junction box as shown in the cut-out drawing.
[Junction box cut-out \(Laser unit\), page 86](#)
Drill two 4.3 mm holes for M4 size.
- 6 Fasten the reflector bracket to the junction box.
Use the M4x10 bolts, spring washers and self-clinching nuts that are included with the laser.

Cabling

Topics

[Sonar room cable plan \(Hull unit\), page 29](#)

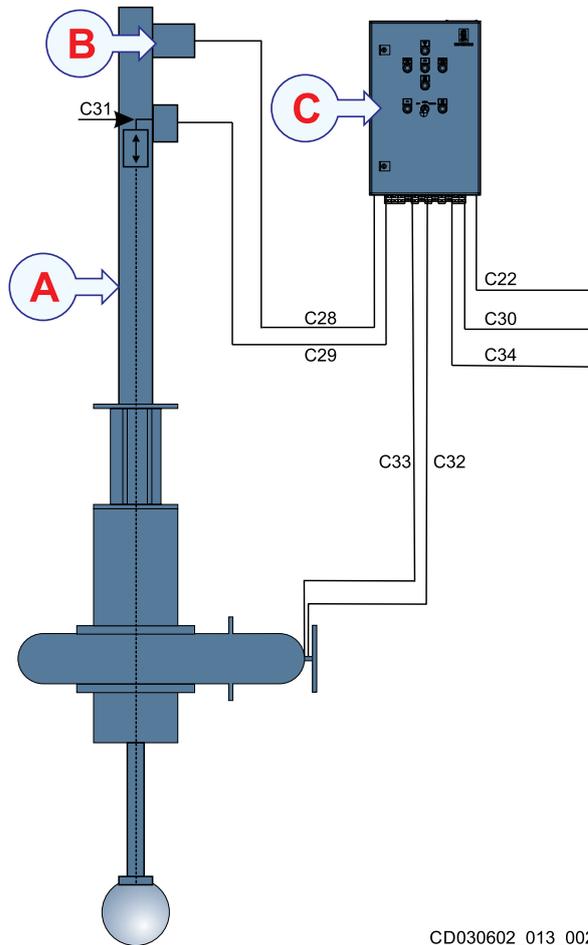
[Sonar room cable plan \(Hull unit with hydraulic power pack\), page 30](#)

[List of cables, page 31](#)

[Installing the HiPAP Hull unit cables, page 31](#)

Sonar room cable plan (Hull unit)

The sonar room cables include those used to connect the HiPAP Hull unit units to AC mains power, as well as the control cables between the units.

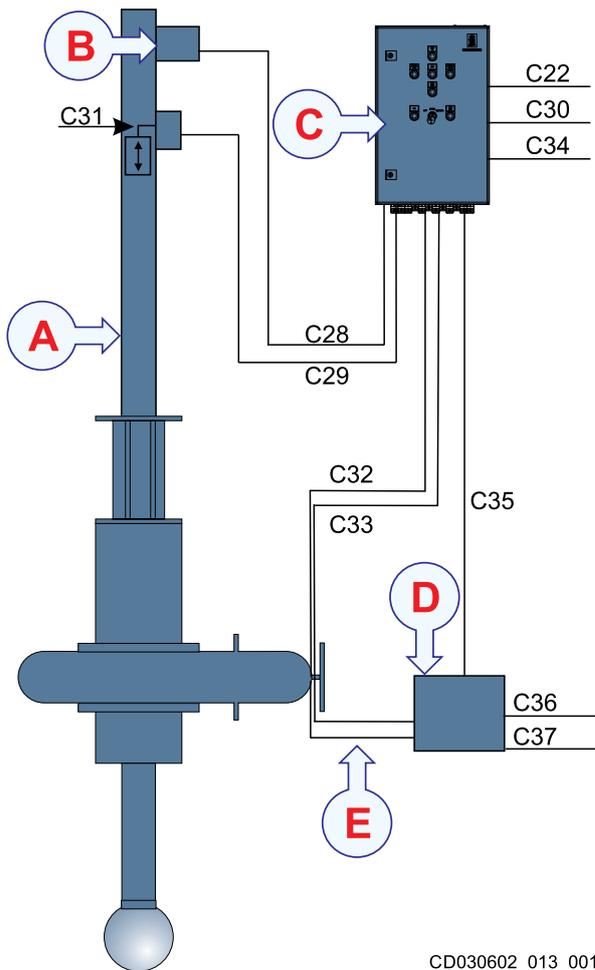


CD030602_013_002

- A Hull unit
- B Hoisting motor
- C Hull Unit Controller

Sonar room cable plan (Hull unit with hydraulic power pack)

The sonar room cables include those used to connect the HiPAP Hull unit units to AC mains power, as well as the control cables between the units.



CD030602_013_001

- A Hull unit
- B Hoisting motor
- C Hull Unit Controller
- D Hydraulic power pack
- E Hydraulic pipes

List of cables

A set of cables is required to connect the system units to each other, and to the relevant power source(s). Additional cables are required to connect the HiPAP Hull unit system to peripheral devices.

Cable	Type	From/To	Minimum requirements
C22	Ethernet cable	From Hull Unit Controller to transceiver	Cat7
C28	AC Power cable	From Hull Unit Controller to hoisting motor	4 x 1.5 mm ²
C29	Control cable	From Hull Unit Controller to hull unit junction box	6 x 0.75 mm ²
C30	Ground cable	From Hull Unit Controller to vessel ground	
C31	Transducer cable	From hull unit to hull unit junction box	Included with delivery
C32	Control cable	From Hull Unit Controller to gate valve	
C33	Control cable	From Hull Unit Controller to gate valve	
C34	AC Power cable	From Hull Unit Controller to AC power outlet	4 x 1.5 mm ²
C35	AC Power cable	From Hull Unit Controller to gate valve power pack, Optional	4 x 1.5 mm ²
C36	Control cable	From Hull Unit Controller to solenoid, Optional	2 x 0.75 mm ²
C37	Control cable	From Hull Unit Controller to solenoid, Optional	2 x 0.75 mm ²
	Control cable	From Hull Unit Controller to laser, Optional	Included with delivery

Installing the HiPAP Hull unit cables

Topics

[Installing the system cables, page 32](#)

[Connecting power to the hoisting motor, page 32](#)

[Connecting the laser, page 34](#)

Installing the system cables

The sonar room cables include those used to connect the HiPAP Hull unit units to AC mains power, as well as the control cables between the units.

Procedure

- 1 Connect the AC power cable to the Hull Unit Controller. (C34)
- 2 Connect the ground cable from the Hull Unit Controller to vessel ground. (C30)
- 3 Connect the power cable from the Hull Unit Controller to the hoisting motor. (C28)
[Connecting power to the hoisting motor, page 32](#)
- 4 Connect the control cable from the Hull Unit Controller to the hull unit junction box. (C29)
- 5 Connect the control cable from the Hull Unit Controller to the junction box. (C32, C33)
- 6 Connect the power cable from the Hull Unit Controller to the gate valve power pack. (C35)
- 7 Connect the cable from the Hull Unit Controller to the laser.
[Connecting the laser, page 34](#)
- 8 Connect the cable from the Hull Unit Controller to the solenoid. (C36)
- 9 Connect the cable from the Hull Unit Controller to the solenoid. (C37)

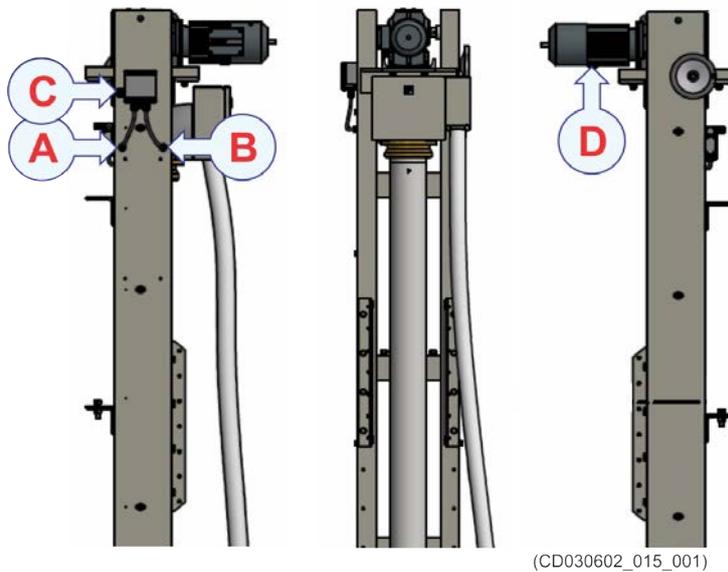
Connecting power to the hoisting motor

The Hull Unit Controller powers the hoisting motor.

Prerequisites

The cable must be provided by the installation shipyard.

Hull Unit Controller	Signal	Hoisting motor
U5/2 (U1)	L1	U1
U5/4 (V1)	L2	V1
U5/6 (W1)	L3	W1
PE Rail	Ground	Ground



Cable connection to:

- A** Lower limit switch
- B** Upper limit switch
- C** Junction box
- D** Power

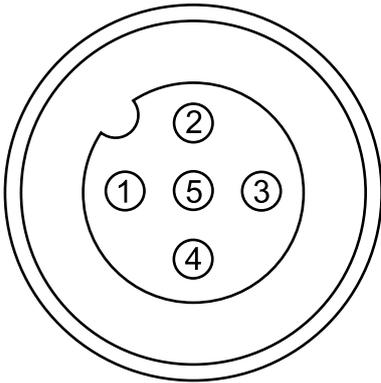
Procedure

- 1 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 2 Manufacture the cable according to the minimum requirements provided.
- 3 Insert the cable through one of the cable glands delivered with the unit.
Make sure you use the correct size cable gland according to the cable size.
- 4 Connect the cable shield to PE ground.
- 5 Connect the cable to the Hull Unit Controller (**C**) according to the wiring specification.
- 6 Run the cable to the hoisting motor (**D**).
- 7 Remove the 10 screws on the hoisting motor.
- 8 Lift off the cover.
- 9 Remove the blind plug at the bottom of the motor.
- 10 Insert the cable through one of the cable glands delivered with the unit.
- 11 Connect the cables according to the wiring diagram.
If it is a 440 V power supply then connect cable where it is labelled 440 V supply.
If it is a 220 V power supply then connect cable where it is labelled 220 V supply.

Connecting the laser

The optional laser unit is delivered with an open ended cable, to connect it to the Hull Unit Controller.

Context



Pin number	Signal	Wire colours	Hull Unit Controller
1	24 VDC	Brown	F3 1
2	Signal	White	U2 332
3	Ground	Blue	F3 3/U2 333
4	Not connected	Black	
5	Not connected	Grey	

Procedure

- 1 Connect the cable to the laser unit.
- 2 Connect the wires to the Hull Unit Controller according to the wiring diagram.

Operating procedures

Topics

[Maximum speed, page 36](#)

[Lowering the transducer, page 36](#)

[Raising the transducer, page 37](#)

[Manual operation of the hull unit, page 37](#)

Maximum speed

It is important to monitor the vessel speed and the water depth when the transducer is in the lowered position.

Note

When the transducer is lowered, the depth of water under the vessel must be monitored closely. Take note of the recommended vessel speed.

Important

The recommended vessel speed applies to verified systems.

Hull Unit	Maximum speed
HL 2180	10 knots
HL 3770	10 knots
HL 4570	8 knots
HL 6120	6 knots

Lowering the transducer

It is important to monitor the vessel speed and the water depth when the transducer is in the lowered position.

Prerequisites

Before you start moving the hull unit.

- Make sure that there is no maintenance work going on.
- Make sure that nothing is blocking the hull unit which could prevent it from moving or jam it while it is moving.

For operating the hull unit from the Hull Unit Controller, make sure the button on the unit points to **LOCAL**.

For operating the hull unit from the computer, make sure the button on the unit points to **REMOTE**.

Procedure

- 1 Open the gate valve.
Select **Gate valve open** on the hull unit controller or the computer.
- 2 Lower the transducer.
Select **TD down** on the hull unit controller or the computer.

Raising the transducer

It is important to monitor the vessel speed and the water depth when the transducer is in the lowered position.

Prerequisites

For operating the hull unit from the Hull Unit Controller, make sure the button on the unit points to **LOCAL**.

For operating the hull unit from the computer, make sure the button on the unit points to **REMOTE**.

Procedure

- 1 Hoist the transducer to its upper position.
Select **TD up** on the hull unit controller or the computer.
- 2 Close the gate valve.
Select **Gate valve close** on the hull unit controller or the computer.

Manual operation of the hull unit

It is important to monitor the vessel speed and the water depth when the transducer is in the lowered position.

Context

A hand crank is provided for manual operation and it is stored on the side of the gantry. Attach the hand crank to one end of the motor shaft and raise or lower the transducer manually in the event of a power failure or for maintenance purposes. The motor has an internal brake mechanism which must be released manually before using the hand crank.

Procedure

- 1 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 2 Loosen the hand crank from the gantry.



- 3 Move the hand crank to the hoist motor shaft.

- 4 Tighten the brake screw on top of the motor/gearbox until you are able to turn the motor shaft with the hand crank.



- 5 Loosen the brake screw when you are done moving the hull unit.
- 6 Move the hand crank to the side of the gantry for storage.

Note _____

It is important to remember to store the hand crank on the side of the gantry when you have finished the manual operation. Not storing it in the correct place might cause damage to people and the hull unit.

Testing the operating functionality of the system

Topics

[Verifying the quality of the hull unit installation, page 40](#)

[Making sure that all HiPAP Hull unit system cables are properly connected, page 42](#)

[Checking the hull unit lowering and hoisting functionality, page 45](#)

[Checking the Hull Unit Controller, page 46](#)

[Electrical check of hull unit and limit switches, page 47](#)

Verifying the quality of the hull unit installation

A quality inspection must take place after the hull unit has been installed, and while the vessel is still in dry dock. The inspection shall verify that the sonar room meets the requirements, and that the hull unit has been installed correctly.

Prerequisites

The vessel is in dry dock. Neither tools nor instruments are required.

Context

The *sonar room* is the compartment in which the Transceiver Unit and the Hull Unit are installed.

Procedure

- 1 Make sure that the sonar room requirements are met.
- 2 Make sure that the hull unit is installed in the correct location, and that it is suitably oriented for easy maintenance and replacement of parts.
- 3 Make sure that the unit is not physically damaged, and that the surfaces and paint-work are clean without dents or scratches.

The physical handling during the installation may have caused some minor scratches to the surfaces or paint-work. This can be accepted. However, if rough handling has caused serious damage, this must be recorded with a written statement and necessary photos, so that corrective actions can be made.

- 4 Make sure that the physical installation of the unit has been completed.
 - a Make sure that the welds and brackets used to support the hull unit are substantial enough to hold the unit securely under all operating conditions.
 - b Make sure that the compartment ("sonar room") in which the hull unit is mounted is clean and dry.
 - c Make sure that ample space is provided around the unit to allow for maintenance and replacement of parts.
 - d Make sure that the bolts, screws or studs that have been used are all of the correct size.
 - e Make sure that the correct flat and shake-proof washers have been used.
 - f Make sure that all the nuts have been tightened properly.
 - g Make sure that all welds and brackets have been painted with the correct preservation medium to prevent corrosion.
- 5 Make sure that cable installation has been completed.
 - a Make sure that all cables leading to and from the unit have been properly mounted and secured.

- b Make sure that the unit is securely connected to the ship's ground with an earthing strap.
- c Make sure that enough slack has been provided on each cable to allow for maintenance and replacement.
- d Make sure that the transducer cables can move freely when the transducer is lowered and hoisted.
- e Make sure that the cable is free to follow the transducer shaft as it is lowered, and is not liable to be caught on any obstructions.

The cable may swing some distance from the hull unit in rough seas, check the full radius of the cable.

- 6 Make sure that there are no corrosive attacks on the hull unit, mounting flange, support brackets or other parts of the installation.
- 7 Make sure that all relevant actions have been taken to reduce flow noise.
- 8 Make sure that the braces are **BOLTED** into position, **NOT WELDED**.
- 9 Make sure the guide rails, sprockets and drive chains within the gantry have sufficient grease.
Wipe off excess grease and clean up any drips.
- 10 Make sure that there is enough grease in the transducer shaft sleeve.
When sufficiently filled, a thin film of oil should be noticeable on the transducer shaft as it is raised.
- 11 Check that the filler and air vent screws are tight and not leaking.
Filler and air vent screws are located on the side of the shaft sleeve.
Wipe off excess grease and clean up any drips.
- 12 Make sure that the limit switches are properly secured into the gantry.
Limit switch operation will be checked during the "Setting to work" phase.
- 13 Make sure that the motor is correctly mounted and that all securing bolts are tight.
- 14 Make sure that the hand crank fits in position on the hoist motor shaft.
Find the hand crank stowed on top of the gantry.
- 15 Replace the hand crank to the top of the gantry.
- 16 Make sure that the motor's gearbox is filled with oil, and that there are no oil leaks.
- 17 Fill in the result table.

Result

Test results

Requirements	Results
The hull unit is correctly installed with easy access for maintenance and replacement of parts.	
The compartment in which the hull unit is installed ("sonar room") is clean and dry.	
The mounting flange is correctly installed and preserved.	
The gate valve is correctly installed and preserved.	
The guide rail, sprockets and drive chains are lubricated.	
The shaft sleeve is filled with grease and is not leaking.	
The limit switches are installed correctly.	
The motor and the hand crank is installed correctly.	
The gearbox is full and sealed.	
The installation of the hull unit has been checked according to the procedures defined in this manual. Comments concerning inaccuracies, faults and/or poor workmanship have been filed as a separate report.	
<i>Yard's quality assurance department</i>	
Date and signature	
<i>Installation team supervisor</i>	
Date and signature	

Making sure that all HiPAP Hull unit system cables are properly connected

The HiPAP Hull unit system relies on communication between each unit, and between the HiPAP Hull unit system and external devices. It is very important that all cables are correctly installed, that the proper cable types have been used, and that all cables are connected correctly.

Prerequisites

- The system units have all been installed according to the instructions provided.
- All system cables are connected.
- All cable connections are made.
- Correct operating power is available.
- Two people are required to do this task.
- You will need an ohmmeter to verify electrical connections and for continuity testing.
- To check the cable cores, you will need a suitable shorting strap.

Note

This test must be completed before any power is switched on.

Context

Visual inspection of the cabling

Look at the cable plans and check all power and inter-connection cables. Any locally fitted plugs and connectors must also be checked to see that the correct types have been used for the specific locations. (Sealed/spark-proof connectors in areas where flammable gasses may accumulate, and so on.)

- Make sure that all cable connections have been made according to the cable plan, and that all connections are tight and secure.
- Make sure that all cables are correctly laid in conduits, or are otherwise protected according to the regulations and recommendations laid down by the vessel's registering authority.
- Make sure that all protective covers are fastened correctly.

Cable connections and continuity

After the cable connections have been completed and the visual inspection has been carried out, all the cable wires must be checked for correct connection and continuity. Look at the cable plans and check all interconnection cables. Any locally fitted plugs and connectors must also be checked for shorts or open circuits.

- Make sure that all cable connections have been made according to the cable plan, and that all connections are tight and secure.

Note

The exact resistance values will depend on the type and lengths of the cables and the units to which the cables are connected. If you are in doubt, check with the manufacturers.

Procedure

- 1 The test engineers must position themselves one at each end of the cable to be checked.
- 2 Good communications must be established.
- 3 Make sure that the cable to be tested is not connected to any power source.

Note

If a cable terminates in a plug at the unit, the test will be more easily conducted if the plug is disconnected.

- 4 Select one pair of cable wires, and check that the wires are connected to the correct terminals in the unit.
- 5 The tester then connects his continuity tester to the two terminals in question and checks the continuity.

Note

If a low resistance (i.e. $<100 \Omega$ - $10 \text{ k}\Omega$) exists between the two wires, this may indicate that the cores are connected to circuits or units with low internal resistance. If this is the case, disconnect the wires from the terminal block and test again. The assistant then removes the shorting strap, and the resistance should go up to $\approx \infty \Omega$ again.

- 6 The assistant then shorts the two wires together, and the tester repeats the test. The resistance should be $\approx 0 \Omega$.
- 7 The assistant then removes the shorting strap, and the resistance should go up to $\approx \infty \Omega$ again.
- 8 The tester then checks each core's resistance to ground, (this should be $\approx \infty \Omega$), and each core's resistance to all the other wires in the cable, (this should be $\approx \infty \Omega$).
- 9 Assuming the test results are correct, the wires must be reconnected to the terminal block (if they had been removed), and the terminals checked to make sure they are correct and tight.
- 10 Move on to the next pair of wires and repeat the tests until all cables and wires has been checked.

Result

Test results

Requirements	Results
Connector type	
Cable continuity	
The installation of the hull unit has been checked according to the procedures defined in this manual. Comments concerning inaccuracies, faults and/or poor workmanship have been filed as a separate report.	
<i>Yard's quality assurance department</i>	
Date and signature	
<i>Installation team supervisor</i>	
Date and signature	

Checking the hull unit lowering and hoisting functionality

This is a mechanical test during which the hull unit is operated manually.

Prerequisites

Certain steps in this procedure are location specific. The steps marked [*Bridge*] are done on the bridge.

Note

Make sure that you have sufficient water depth below the keel before you lower the transducer.

If your vessel is in dry dock, make sure that you have sufficient height between the hull and the dry dock floor.

The HiPAP Hull unit system is turned on and operates normally. Neither tools nor instruments are required.

Procedure

- 1 [*Bridge*]: Make sure that you have sufficient water depth below the keel before you lower the transducer.
- 2 Make sure that the transducer can be lowered and hoisted without complications or obstacles.
- 3 If your vessel is in dry dock, make sure that you have sufficient height between the hull and the dry dock floor.
- 4 Loosen the hand crank from the gantry.



- 5 Move the hand crank to the hoist motor shaft.
- 6 Tighten the brake screw on top of the motor/gearbox until you are able to turn the motor shaft with the hand crank.



- 7 Lower the transducer approximately 30 cm.
- 8 Loosen the brake screw when you are done moving the hull unit.
- 9 Make sure that the cable is free to follow the transducer shaft as it is lowered, and is not liable to be caught on any obstructions.
The cable may swing some distance from the hull unit in rough seas, check the full radius of the cable.
- 10 Repeat steps 6 to 9 until the transducer is fully lowered.
- 11 Follow the same procedure to raise the transducer again, paying particular attention to the cable.
- 12 If the vessel is floating, release any air which may be trapped in the mounting flange by cracking open the air vent valve.

Result

Test results

Requirements	Results
The transducer can be lowered and hoisted	
The transducer cable is free to move	
<i>Yard's quality assurance department</i>	
Date and signature	
<i>Installation team supervisor</i>	
Date and signature	

Checking the Hull Unit Controller

The Hull Unit Controller provides power and direction to the hoisting motor, and thus controls the lowering and hoisting of the transducer. The unit also controls the gate valve. The gate valve must open before the transducer is lowered, and close after the transducer has been hoisted.

Procedure

- 1 Make sure that the unit is installed in the correct location, and that it is suitably oriented for easy maintenance and replacement of parts.

- 2 Make sure that the unit is not physically damaged, and that the surfaces and paint-work are clean without dents or scratches.
- 3 Make sure that the brackets are manufactured correctly and are bolted or welded securely to the bulkhead, if the unit is secured to mounting brackets.
- 4 Make sure the welds are satisfactory and strong enough to hold the brackets and unit, if the brackets are welded.
- 5 Make sure the bolts are of an appropriate size and number to ensure the brackets are secure, if bolts have been used.
- 6 Make sure that the correct flat and shake-proof washers have been used, and that all the bolts are tight.
- 7 Make sure that the braided ground conductor is correctly installed.
- 8 Make sure that all welds/brackets have been painted with the correct preservation medium to prevent corrosion.

Result

Test results

Requirements	Results
The unit is welded or bolted correctly.	
The bolts and the ground connector are correct.	
The paintwork is correct.	
The installation of the hull unit has been checked according to the procedures defined in this manual. Comments concerning inaccuracies, faults and/or poor workmanship have been filed as a separate report.	
<i>Yard's quality assurance department</i>	
Date and signature	
<i>Installation team supervisor</i>	
Date and signature	

Electrical check of hull unit and limit switches

This test checks the electrical operation of the hull unit and sets up the limit switches.

Prerequisites

The test must be performed after all inspections, cable connection checks and the manual operation check have been carried out, but before the hull unit is operated under power for the first time.

Procedure

- 1 Open the gate valve.
- 2 Lower the transducer manually, approximately 50 cm, by using the hand crank.
[Manual operation of the hull unit, page 37](#)
- 3 Move the hand crank to the side of the gantry for storage.
- 4 Switch on the power inside the Hull Unit Controller.
- 5 Set the Hull Unit Controller to LOCAL.
- 6 Press **TD up** and **STOP** quickly after each other several times.
The transducer shaft should move upwards. Check the hoist motor cabling, if the unit moves downwards.
- 7 Press **TD down**.
Verify that the **TD down** button starts to flash, and the transducer shaft starts moving downwards.
- 8 After a few seconds, operate the **lower limit switch** manually.
Verify that the switch functions. Lowering the transducer should stop when operating the limit switch.
- 9 Press **TD up**.
Verify that the **TD up** button starts to flash, and the transducer shaft starts moving upwards.
- 10 After a few seconds, operate the **upper limit switch** manually.
Verify that the switch functions. Hoisting the transducer should stop when operating the limit switch.
- 11 Press **TD up**.
Hoist the transducer to its upper position.
- 12 Use the air vent valve to release any air which may have accumulated in the transducer dock and shaft sleeve.
- 13 Press **LAMP TEST**.
Verify that all six buttons light up.
- 14 On the Hull Unit Controller:: Set the mode switch to position *REMOTE*.
When set to *REMOTE* you can test the operation from APOS.
APOS must be installed and running.
- 15 Select the hull unit icon on the top bar.
- 16 Verify that the Hull Unit Control dialog box opens.
- 17 Select the arrow down icon to lower the transducer.
- 18 Select the STOP icon in the hull unit section after a few seconds.
Verify that the STOP button on the Hull Unit Controller lights up.
- 19 Select the arrow up icon to hoist the transducer.
- 20 Select the STOP icon in the hull unit section after a few seconds.
Verify that the STOP button on the Hull Unit Controller lights up.

- 21 Set the Hull Unit Controller to LOCAL.
- 22 Press **Test** on relay U5 inside the Hull Unit Controller.
Verify that the **FAIL** button is blinking.
- 23 Press **Reset** on the same relay.
Verify that the **FAIL** button is not lit up.
- 24 Press **Test** on relay U7 inside the Hull Unit Controller.
Verify that the **FAIL** button is blinking.
- 25 Press **Reset** on the same relay.
Verify that the **FAIL** button is not lit up.

Result

Test results

Requirements	Results
The transducer can be hoisted and lowered locally.	
The transducer can be hoisted, lowered and stopped from APOS.	
The upper and lower limit switches functions as intended.	
The buttons on the Hull Unit Controller light up.	
<p>The installation of the hull unit has been checked according to the procedures defined in this manual. Comments concerning inaccuracies, faults and/or poor workmanship have been filed as a separate report.</p>	
<p><i>Yard's quality assurance department</i> Date and signature</p>	
<p><i>Installation team supervisor</i> Date and signature</p>	

Preventive maintenance

Topics

- [Preventive maintenance schedule, page 51](#)
- [Cleaning the hull unit, page 51](#)
- [Inspecting and cleaning the transducer, page 53](#)
- [Watertightness test, page 54](#)
- [Open/close gate valve, page 54](#)
- [Lubricating the drive chain, page 55](#)
- [Lubricating the transducer shaft sleeve, page 56](#)
- [Visual inspection of the hull unit, page 57](#)
- [Testing the drive chain tension, page 58](#)
- [Checking and filling gear oil, page 59](#)

Preventive maintenance schedule

The preventive maintenance intervals indicated in this section are recommended intervals. The maintenance needs are dependent on the use of the equipment.

- Actions to be taken every two weeks, (if possible)
 - Open/close gate valve
[Open/close gate valve, page 54](#)
- Actions to be taken regularly, depending on marine growth
 - Clean the transducer.
[Inspecting and cleaning the transducer, page 53](#)
- Actions to be taken every two months
 - Lubricating the drive chain
[Lubricating the drive chain, page 55](#)
 - Cleaning the transducer shaft
[Cleaning the hull unit, page 51](#)
- Actions to be taken every six months
 - Inspecting the Junction Box
- Actions to be taken every year
 - Visual inspection of the hull unit
[Visual inspection of the hull unit, page 57](#)
 - Checking and filling gear oil
[Checking and filling gear oil, page 59](#)
 - Lubricating the transducer shaft sleeve
[Lubricating the transducer shaft sleeve, page 56](#)

Cleaning the hull unit

The hull unit has normally been exposed to a salt atmosphere. Prior to storage and/or shipment, it must be thoroughly cleaned to prevent corrosion.

Context

The hull unit comprises to separate areas; the “wet parts” and the “dry parts”.

- The “wet parts” include the lower part of the transducer shaft, the bottom of the mounting flange, the zinc anodes and the transducer. These parts are all exposed to the sea.
- The “dry parts” are the rest of the hull unit, all contained inside the hull. This includes the hoisting motor and the Hull Unit Controller.

A transducer must always be handled as a delicate instrument. Incorrect actions may damage the transducer beyond repair. A physical blow to the transducer face may easily damage one or more elements. Observe these transducer handling rules:

- **Do not** activate the transducer when it is out of the water.
- **Do not** handle the transducer roughly. Avoid impacts.
- **Do not** expose the transducer to direct sunlight or excessive heat.
- **Do not** damage the outer protective skin of the transducer.
- **Do not** use high-pressure water, sandblasting, metal tools or strong solvents to clean the transducer.
- **Do not** step on the transducer cables.
- **Do not** damage the transducer cables. Avoid exposure to sharp objects.

Procedure

- 1 Wash the “wet parts” of the hull unit using a high-pressure hose and copious amounts of fresh water.

Caution _____

Do not use direct the high pressure water directly towards the transducer.

- 2 Make sure that all traces of mud and marine growth are removed.
Use a wooden or plastic scraper to remove persistent growth, barnacles etc.
- 3 Wipe off the external surfaces of the “dry parts” of the hull unit using a damp lint free cloth and a mild detergent.

Note _____

Do not use excessive amounts of water. The “dry parts” of the hull unit includes parts that are not water tight.

- 4 Dry the unit thoroughly.
- 5 Inspect all surfaces for signs of corrosion, flaking, bubbling paint, stains etc.
- 6 Clean damaged or suspect areas, prepare and preserve these areas using the correct preservation mediums.
- 7 Wipe clean all exposed cables, and check for damage.
If a cable shows signs of wear or ageing, contact Kongsberg Maritime for advice.

- 8 Secure and protect loose parts.
- 9 If the hull unit is sent to storage or shipped, spray it externally using a corrosion inhibitor (for example a light oil) prior to packing.
- 10 If relevant, place a suitably sized bag of desiccant material (silica gel or similar) into the to storage/transport box to keep the components as dry as possible.

Inspecting and cleaning the transducer

To secure long life and accurate results, the transducer must be handled correctly.

Context

A transducer must always be handled as a delicate instrument. Incorrect actions may damage the transducer beyond repair.

Procedure

- 1 Hoist the transducer.
- 2 Close the gate valve.
- 3 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 4 Perform a watertightness test.
[Watertightness test, page 54](#)
- 5 For systems with hydraulics: Close the gate valve with the hand pump, if the watertightness test shows too much water leakage.
[Closing the gate valve by hand, page 62](#)
- 6 For systems without hydraulics: Close the gate valve with the hand wheel, if the watertightness test shows too much water leakage.
- 7 Drain the transducer dock.
- 8 Open the transducer dock.
- 9 Inspect for damages or growth.
- 10 Remove any growth and dirt with a stiff brush, or with a wooden scraper or with a plastic scraper.
Be careful not to damage the unit.
- 11 Clean the unit thoroughly with a lot of fresh water.

Caution

Do not use high-pressure water, sandblasting, metal tools or strong solvents to clean the transducer face.

Watertightness test

Every time maintenance is done that involves breaking the watertight integrity of the unit, the watertightness must be tested to make sure nothing will happen during the maintenance.

Procedure

- 1 Hoist the transducer to its upper position.
- 2 Close the gate valve.
- 3 Turn off all power to the system.
- 4 Make sure the gate valve is sealed, by opening the air-vent cock on the top of the transducer dock.
A small amount of water should flow out as the pressure within the transducer dock equalises with the ambient air pressure.
- 5 Open the gate valve slightly and close it again, when the water stops flowing. Water should start flowing out of the air-vent when the valve is cracked open, and should stop soon after it is closed again. This will prove that the lack of water flow is because the gate valve is sealed, and not because the air-vent cock is blocked.

Result

When the test has been performed satisfactorily, it is safe to continue with the required maintenance routines.

Leakage rate up to 3 litres per minute is no obstacle for performing transducer maintenance and repair.

Caution

If for any reason there is a delay between performing the watertightness test and starting the maintenance, stay safe - perform the test again.

Open/close gate valve

The gate valve needs to be moved, to stay watertight.

Context

The surfaces of the gate valve are subjected to biofouling and sediment build up. Biofouling that has been allowed to pass the initial attachment phase, can only be mechanically removed. To minimize this, the valve must be operated at regular intervals. For hydraulic operated valves, use the hand pump to make sure you have proper surface engagement.

Minor leaks are to be expected over time. Leakage rate up to 3 litres per minute is no obstacle for performing transducer maintenance and repair.

The gate valve should be moved every two weeks, but when in the middle of important operations the two weeks may be stretched.

Procedure

- 1 Hoist the transducer to its upper position.
- 2 Close the gate valve.
- 3 Perform a watertightness test.

[Watertightness test, page 54](#)

Lubricating the drive chain

The drive chains must be kept lubricated to ensure smooth operation and to prevent corrosion.

Prerequisites

The grease must follow NLGI grade 2 and ISO VG 150.

Use Mobilux EP 2 or similar grease.

Procedure

- 1 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 2 Inspect the drive chains looking for corrosion or dry areas.
If old grease has congealed or is badly contaminated with dirt etc, clean the effected areas using a scraper, solvents and cloths.
- 3 Inspect the sprockets for signs of wear and corrosion.
- 4 Check the entire hull unit assembly for signs of corrosion.
- 5 Check the drive chain tension.
[Testing the drive chain tension, page 58](#)
[Adjusting the drive chain tension, page 61](#)
- 6 Lubricate the chain and sprockets using grease type Mobilux EP 2 or similar.
Apply using a suitable brush.
- 7 Wipe off excess grease and clean up any drips.

Lubricating the transducer shaft sleeve

The transducer shaft sleeve is a vital part of the hull unit. It supports the transducer shaft, and allows the shaft to move down and up to lower and hoist the transducer. The transducer shaft sleeve is filled with grease. The grease ensures that the vertical movement of the transducer shaft is not limited by friction. The grease also ensures that the entire construction is waterproof.

Prerequisites

The grease must follow NLGI grade 2 and ISO VG 150.

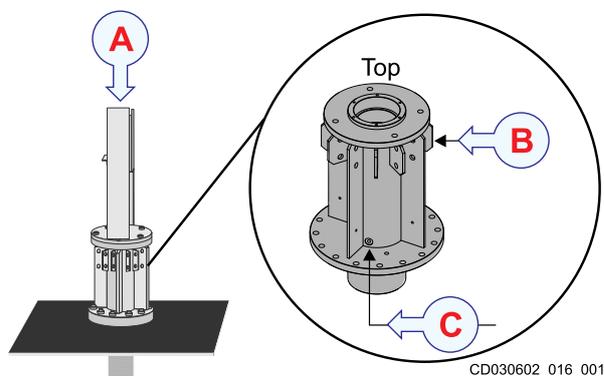
Use Mobilux EP 2 or similar grease.

Context

Adding grease to the transducer shaft sleeve is only required if the shaft is dry, or if water forces its way up along the shaft.

Note

Grease applied directly to the shaft will be removed the next time the transducer is lowered.



- A** Hull unit
- B** Air vent hole with screw
- C** Grease nipple

Procedure

- 1 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 2 Clean the shaft sleeve, the filler and level/air vent screws and the surrounding area, removing all dirt and loose debris (paint flakes etc).

- 3 Remove the air vent screw.

Note _____

If the air vent screw is not removed, the shaft seals can be damaged.

- 4 Fill the sleeve with grease, until the grease appears at the air vent hole.
- 5 Replace the air vent screw.
- 6 Wipe off excess grease with a soft cloth or paper wipe.
- 7 Switch on the power inside the Hull Unit Controller.

Visual inspection of the hull unit

Regular inspections of the hull unit is required to make sure that it operates properly.

Procedure

- 1 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 2 Check all cables for signs of damage or overheating.
- 3 Open all units and check all cable terminations.
- 4 Check all cable glands to make sure they seal correctly.
- 5 Inspect the hull unit for water intrusion.
If water is detected, find the leak. Tighten the bolts to close the leak, or replace the appropriate seals.
- 6 Check for signs of damage to the transducer shaft, such as scratches on the shaft surface, the twin-set gasket on the top of the shaft sleeve or sea growth.
If serious damage is detected, the shaft may need to be replaced. If in doubt, consult Kongsberg Maritime.
- 7 Check the hoist motor for signs of oil leaks.
- 8 Check the oil level in the gearbox and fill if it is necessary.
- 9 Check the transducer shaft to ensure that it is correctly lubricated.
The shaft should be covered with a thin film of grease when it is raised. Refill the shaft sleeve if it is necessary.
- 10 Check the entire hull unit assembly for signs of corrosion.
Clean any corroded areas and apply the appropriate preservation mediums.
- 11 Check the drive chain tension.
[Testing the drive chain tension, page 58](#)
[Adjusting the drive chain tension, page 61](#)

- 12 Check that the upper and lower limit switches are securely and correctly located, and operate correctly.
- 13 Switch on the power inside the Hull Unit Controller.
- 14 Hoist the transducer to its upper position.
- 15 Inspect the transducer.
[Inspecting and cleaning the transducer, page 53](#)

Testing the drive chain tension

To operate correctly without damaging the various shafts and bearings, the drive chains must be at the correct tension. The chains' tensioning devices are located on either side of the base of the hull unit gantry. There is one device for each drive chain. The devices raise or lower the lower sprocket bearings independently, so adjustment of one chain has no effect on the other.

Prerequisites

Make sure that you have sufficient water depth below the keel before you lower the transducer.

Procedure

- 1 Open the gate valve.
- 2 Lower the transducer to its bottom position.
- 3 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 4 Place a 12 mm block against the inside of the gantry frame, midway between the chain sprockets.
- 5 Pull the chain against the block with a spring-balance.
The tension must be adjusted so that a force of 9-10 kg is required to pull the chain against the block.
- 6 Grip the chain at the mid-point between the upper and lower chain sprockets. Using reasonable force, attempt to push and pull the chain horizontally in the directions in which the chain would normally bend.

It should be possible to move the chain between 1 and 2 cm.

Checking and filling gear oil

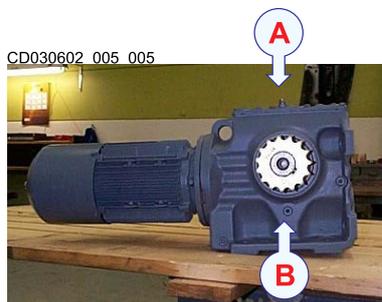
Check the level of the gear oil in the hoist motor's gear box every year.

Prerequisites

The gear oil must follow DIN CLP PG and ISO VG 220. Use Mobilgear 600 XP 220 or similar gear oil.

See the producer's home page for more information about the S67 motor:

<http://www.seweurodrive.com/>.



Procedure

- 1 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 2 Clean the gearbox and the surrounding area, removing all dirt and loose debris (paint flakes etc).
- 3 Unscrew the filler cap **A** and the level screw **B**.
- 4 Fill the gearbox with oil to the level hole, if necessary.
- 5 Replace the level screw and the filler cap.
- 6 Wipe off any excess oil.

Corrective maintenance

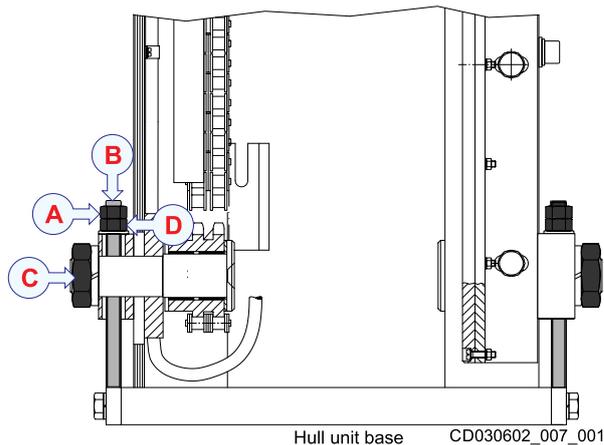
Topics

- [Adjusting the drive chain tension, page 61](#)
- [Replacing the drive chain, page 62](#)
- [Closing the gate valve by hand, page 62](#)
- [Replacing the gate valve, page 63](#)
- [Replacing the transducer cable, page 65](#)
- [Replacing the hoisting motor, page 67](#)
- [Replacing the hoisting motor's gear box, page 68](#)
- [Lifting the hull unit, page 69](#)
- [Replacing the transducer shaft sleeve, page 70](#)
- [Inspecting and replacing sacrificial anodes, page 73](#)
- [Adjusting the guide rails on the gantry, page 73](#)

Adjusting the drive chain tension

The drive chains transmit the force from the hoist motor to the transducer shaft, to raise or lower the shaft.

Context



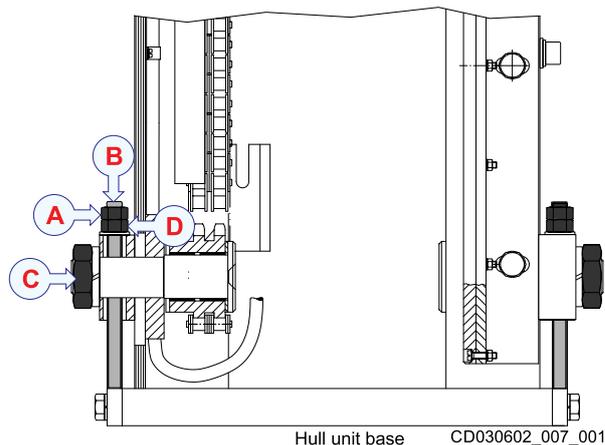
Procedure

- 1 Slacken lock-nut **A** on tension adjustment bolt **B**.
- 2 Remove the guard from nut **C**.
- 3 Slacken sprocket bearing nut **C** by a half turn.
- 4 Adjust tension adjustment nut **D** to achieve the correct tension in the chain.
- 5 Tighten the sprocket bearing nut and the lock-nut.
- 6 Check the drive chain tension.
[Testing the drive chain tension, page 58](#)
- 7 Enter the guard again on nut **C**.

Replacing the drive chain

Replace both drive chains at the same time.

Context



Procedure

- 1 Remove the guard from nut C.
- 2 Slacken the chains by loosening the lock-nut A and slackening the sprocket bearing nut C.
- 3 Find and remove the joints, and disconnect the chains from the transducer shaft.
- 4 Replace the chains.
- 5 Adjust the tension.

[Adjusting the drive chain tension, page 61](#)

- 6 Enter the guard again on nut C.

Closing the gate valve by hand

You may need to close the gate valve further than the Close button. The gate valve has a hand pump you can use, after the automatic system has stopped. This method can also be used as a safety measure to close the gate valve by hand.

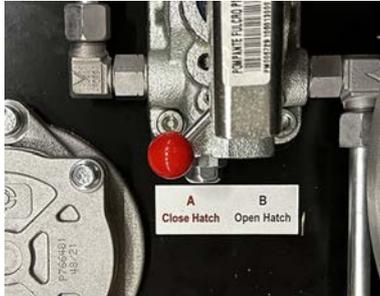
Prerequisites

This procedure is for systems with hydraulics.

Close the gate valve.

Procedure

- 1 Select **Close Hatch** on the hydraulic power pack.



- 2 Insert the hand lever to the pump.
- 3 Pump the gate valve completely closed.
In this position, the hydraulic system will not be able to open the gate valve automatically.
- 4 Carry out the necessary maintenance.

Further requirements

- 1 Select **Open Hatch** on the hydraulic power pack.
- 2 Pump until the gate valve is over the limit switch.
- 3 Store the hand lever for future use.
- 4 Position the lever on the hydraulic power pack to **Normal operation**, between Close and Open.
- 5 Use APOS or physical buttons to move the gate valve to the required position.

Replacing the gate valve

The gate valve closes the opening in the vessel's hull when the transducer is raised.

Prerequisites

Note _____

These units are heavy. Lifting apparatus will be required.

This task must take place in dry dock.

Note

Remove the hydraulic power pack (optional) before taking out the gate valve.

Context

The hull unit must be lifted to enable the old gate valve to be taken out and a new valve to be fitted. Make sure that all electrical cables to the hull unit have enough slack such that they will not be placed under tension as the hull unit is lifted.

Procedure

- 1 Hoist the transducer to its upper position.
- 2 Close the gate valve.
- 3 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 4 Make sure that you note or take pictures of all connections to the hull unit.
- 5 Use the lower vent valve to release the water that have accumulated in the transducer dock.
- 6 Secure a tackle capable of lifting the hull unit to the deckhead above the hull unit.
- 7 Attach the tackle to the hull unit with the lifting eyes.
When you start to lift the hull unit up from the mounting flange, the unit will take a slight slanting angle. This may cause the transducer to touch the flange wall. Prevent this by guiding and supporting the unit by hand during the lift.
- 8 Tighten the lifting tackle, taking the weight off the hull unit.
- 9 Mark the positions of the bracing beams and the transducer dock relative to the gate valve, to minimise changes in the hull unit alignment.
- 10 Remove the bracing beams supporting the hull unit.
- 11 Remove the bolts that attaches the transducer dock to the gate valve flange.
The water contents of the dock will leak out, but not under pressure. The dock must remain attached to the hull unit to protect the transducer.
- 12 Carefully hoist the hull unit off the gate valve.
The hull unit must be supported so it doesn't swing if the vessel moves.
- 13 Lift the hull unit completely out of the way.
- 14 Lift the old gate valve over the stud bolts and remove it.

Note

The gate valve is heavy. Lifting apparatus will be required.

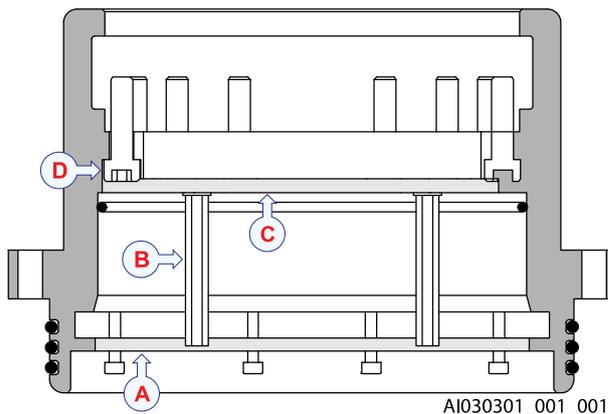
The sealing capability of the gate valve is dependent on clean and scratch free surfaces. Take great care to make sure the mating surfaces of the mounting flange and the transducer dock are not damaged.

- 15 Clean the mating surfaces and replace all O-rings.
- 16 Move the new gate valve into position and lower it carefully onto the mounting flange.
The gate valve will work in any position, but we recommend that it is mounted with its identification tags and classification markings facing up. You must also consider the access to the end switches, and (if relevant) the hydraulic hose connections.
- 17 Check that the gate valve is aligned correctly, and then secure it into position.
- 18 Carefully lower the hull unit down onto the gate valve.
Make sure that the studs mate correctly and easily with their corresponding holes in the transducer dock flange.
Make sure that the O-ring stays in place.
- 19 Tighten all the nuts to finger tight, and then working alternately on opposite sides of the dock.
- 20 Tighten the nuts to the recommended torque.
[Torque, page 16](#)
- 21 Replace all the gantry braces.
- 22 Check all electrical cables and connections.

Replacing the transducer cable

The transducer cable is connected to the transducer and the junction box.

Context



- A** Connector plate
- B** Spacer
- C** Support plate
- D** Mounting bolt

Procedure

- 1 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 2 Turn off the transceiver.
- 3 Open the transducer dock.
- 4 Remove the transducer.
- 5 Remove the four extended-head bolts securing the support plate.
Access is through the four holes in the plug plate.
- 6 Remove the eight screws located around the circumference of the connector plate.
The connector plate should now be free.
- 7 Use four spacer screws, located beside the access holes for the extended-head screws, to secure and support the connector plate.
- 8 Open the junction box at the top of the transducer shaft.
- 9 Disconnect the flat cables.
- 10 Remove the bolts from the nipple plate at the rear side of the junction box.
- 11 Remove the six socket-head screws that secure the two half-ring plates in position on the top of the transducer shaft.
- 12 Remove the two half-ring plates.
- 13 Pull up the upper gland block and remove the O-ring.
This will reduce the likelihood of the O-ring being damaged, and will reduce the force required to pull the block down the shaft. It should now be possible to pull and feed the transducer cable down the transducer shaft and out at the transducer dock.
- 14 Tie a suitable length of rope to the upper connector plate.
- 15 Remove the cable through the transducer dock.
- 16 Check the O-rings on the upper gland block on the new cable, replace as necessary.
Leave the O-rings on the cable above the gland block to reduce the pull required and reduce the likelihood of damage as they are pulled up the shaft.
- 17 Tie the rope to the transceiver connector on the new cable and carefully pull the cable up through the shaft.
- 18 Once the connector is accessible at the top of the shaft, remove the rope and continue to pull the cable up by hand.
- 19 At the appropriate time, feed the upper gland block into the bottom of the shaft.
- 20 Guide the seal plate correctly, locate it in the bottom of the shaft, and then secure it using the four extended-head screws.
- 21 Remove the four spacer screws, located beside the access holes for the extended-head screws.

- 22 Guide the connector plate correctly, locate it in the bottom of the shaft, and secure it using the eight screws.

Note

The connector plate must be "floating".

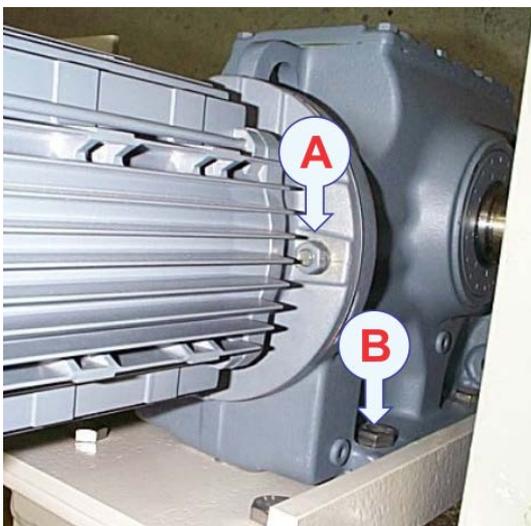
Do not use any washers or packing pieces here. If the screws must be replaced, ensure the new screws are the same length. The connector plate must be loose to allow some movement as the connectors on the cables and the transducer mate.

- 23 Remove any twists from the cable in the shaft.
- 24 Lift the upper gland block up out of the shaft, and fit and grease the O-rings.
- 25 Guide the upper gland block correctly.
- 26 Fit the gland block into the top of the shaft.
- 27 Replace the two half-rings to hold the block in position.
- 28 Replace the six socket-head screws to secure the half-rings in position.
- 29 Connect the cable in the junction box.
- 30 Close the junction box.
- 31 Remount the transducer.
- 32 Close the transducer dock.

Replacing the hoisting motor

The hoisting motor is located on the top of the hull unit.

Context



CD030602_005_004

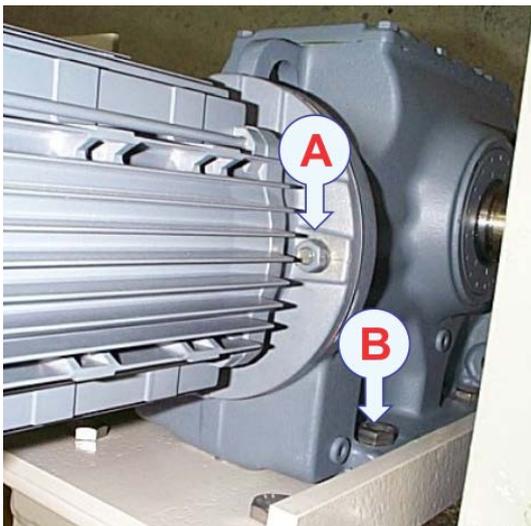
Procedure

- 1 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 2 Clamp the transducer shaft to prevent it from sinking when the motor is disconnected.
- 3 Open the junction box on the motor.
- 4 Label and disconnect all the cables.
- 5 Unscrew the four mounting nuts A.
- 6 Pull the motor straight off the gearbox.
If the motor is to be sent away for repair, close the gap in the motor brake by mounting the cover plate. This cover plate was supplied initially with the hull unit, and was used for this purpose prior to the motor installation.
- 7 Insert the new motor, and secure it in position with the four nuts.
- 8 Reconnect all cables.
- 9 Remove the transducer shaft clamp.
- 10 Check the oil level in the gearbox and fill if it is necessary.
The gear oil must follow DIN CLP PG and ISO VG 220. Use Mobilgear 600 XP 220 or similar gear oil.

Replacing the hoisting motor's gear box

The hoisting motor is located on the top of the hull unit.

Context



CD030602_005_004

Procedure

- 1 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 2 Clamp the transducer shaft to prevent it from sinking when the motor is disconnected.
- 3 Slacken the drive chains and lift them off the drive sprockets.
- 4 Support the motor and gearbox unit and remove the four mounting nuts/bolts/washers **B** which secure the gearbox to the motor platform on the hull unit gantry.
- 5 Lift the motor/gearbox off the top of the hull unit and place it on a clean, stable work bench.
- 6 Remove the sprocket wheels from the drive shaft using a wheel puller.
- 7 Fit the sprocket wheels onto the new gearbox.
- 8 Move the motor to the new gearbox if necessary.
- 9 Lift the motor and gearbox assembly onto the hull unit motor platform and secure it in position using the four mounting bolts with nuts and washers **B**.
- 10 Remove the oil filler and level plugs from the gearbox, and fill the gearbox with oil if necessary.

The gear oil must follow DIN CLP PG and ISO VG 220. Use Mobilgear 600 XP 220 or similar gear oil.

[Testing the drive chain tension, page 58](#)

- 11 Lift the drive chains onto the sprocket wheels
- 12 Check the drive chain tension.

[Testing the drive chain tension, page 58](#)

[Adjusting the drive chain tension, page 61](#)

- 13 Reconnect all cables.
- 14 Remove the transducer shaft clamp.

Lifting the hull unit

Occasionally maintenance must be done where the hull unit must be lifted.

Prerequisites

The tackle must be able to lift 1600 kg.

Procedure

- 1 Hoist the transducer to its upper position.
- 2 Close the gate valve.

- 3 Perform a watertightness test.
- 4 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 5 Make sure that you note or take pictures of all connections to the hull unit.
- 6 Remove all electrical cables to and from the hull unit.
- 7 Secure a tackle capable of lifting the hull unit to the deckhead above the hull unit.
- 8 Attach the tackle to the hull unit with the lifting eyes.
- 9 Tighten the lifting tackle, taking the weight off the hull unit.
- 10 Mark the positions of the bracing beams and the transducer dock relative to the gate valve, to minimise changes in the hull unit alignment.
- 11 Remove the bracing beams supporting the hull unit.
- 12 Remove the bolts that attaches the transducer dock to the gate valve flange.

The water contents of the dock will leak out, but not under pressure. The dock must remain attached to the hull unit to protect the transducer.
- 13 Carefully hoist the hull unit off the gate valve.

The hull unit must be supported so it doesn't swing if the vessel moves. Protect the gate valve with a cover to make sure the mating surface is not damaged.

Further requirements

Check that no rubbish, tools or similar have been left in the transducer dock before fastening the hull unit.

Follow the procedure in reverse to fasten the hull unit.

Replacing the transducer shaft sleeve

The shaft sleeve is located at the bottom of the hull unit gantry.

Context

You are strongly recommended to ask for assistance from Kongsberg Maritime if the shaft sleeve must be disassembled for any reason.

The shaft sleeve is fitted with A twin-set of packing seals at the upper end, and U-cup packing seals, bearings and a scraper at the lower end.

The space between the seals is filled with grease to lubricate the shaft and provide extra watertight security.

When the sleeve is sufficiently filled, there is a thin film of grease on the transducer shaft.

Note

It is important that the shaft sleeve is kept watertight, and that the transducer shaft raising and lowering actions are as smooth as possible. If the system is in frequent use, the shaft sleeve may be exposed to sea growth, dirt and pollution as the transducer shaft is raised. Frequent inspections, and greasing when necessary, are strongly recommended.

Procedure

- 1 Clean the transducer.
[Inspecting and cleaning the transducer, page 53](#)
- 2 Remove the transducer from the end of the shaft.
Make sure you have something to protect the transducer with, like rags.
- 3 Remove the bolts between the transducer dock and the shaft sleeve.
- 4 Hoist the hull unit from the transducer dock.
[Lifting the hull unit, page 69](#)
- 5 Lower the transducer manually.
[Manual operation of the hull unit, page 37](#)
- 6 Disconnect and remove the transducer cable.
- 7 Remove the transducer adapter from the end of the shaft.
- 8 Loosen the nuts and bolts holding the upper and lower clamping rings to decompress the seals, and remove the shaft sleeve from the hull unit.
- 9 Replace the upper shaft bearing and seals.
 - a Remove the six nuts holding the upper gland clamping ring onto the sleeve.
 - b Lift off the upper gland clamping ring.
 - c In preparation for replacement, unscrew the six spacing bolts till the ends of the threads are flush with the surface of the clamping ring.
 - d Extract the two parts of the upper sleeve seal and the upper sleeve bearing from the sleeve
 - e Clean the grease from the upper (internal) part of the shaft sleeve.
 - f Use the entering tool, and fit a new upper shaft bearing and seals into the top of the sleeve.
 - g Place the upper clamping ring in position and secure it loosely using the nuts.
- 10 Replace the lower shaft bearing and seals.
 - a Remove the six socket-head screws securing the lower clamping ring onto the bottom of the shaft sleeve, and then remove the ring.
 - b Use the tool and extract the lower sealing ring and the lower shaft bearing.
 - c Clean the grease from the lower (internal) part of the shaft sleeve.

- d Fit a new lower shaft bearing using the entering tool, and new lower shaft seal, ensuring they are correctly orientated.
- e Fit a new scraper ring into the lower clamping ring.
- f Locate the lower clamping ring on the bottom of the shaft sleeve, and hold it loosely in position with the six socket-head screws.

- 11 Mount the shaft sleeve onto the hull unit gantry.

Note _____

Make sure the shaft passes smoothly through the bearings and seals. The seals must be replaced if they are pinched or otherwise damaged.

- 12 Mount the transducer dock onto the shaft sleeve.

- 13 Place the transducer adapter onto the bottom of the shaft.

Make sure the holes and bolts are scrupulously clean and all traces of grease and old Loctite are removed.

Use new O-rings. Apply Loctite 577 to the bolts. Tighten the nuts to the recommended torque.

[Torque, page 16](#)

- 14 Remount the transducer with new O-rings and lock washers.

- 15 Install the Hull Unit on top of the gate valve.

- 16 Make sure that the gantry is replaced as exactly as possible in its original position, then bolt it firmly into position and refit the gantry braces.

- 17 Tighten all the mounting bolts for the dock, shaft sleeve and gantry to the appropriate torques.

- 18 Tighten the six socket-head screws holding the lower clamping ring onto the shaft sleeve to final torque.

- 19 Tighten the upper shaft seals against the shaft by tightening the six nuts around the upper clamping ring.

- 20 Tighten the six spacing bolts once the upper seals are tight, to fix the pressure on the seals.

- 21 Refill grease.

- 22 Check the drive chain tension.

[Testing the drive chain tension, page 58](#)

[Adjusting the drive chain tension, page 61](#)

Inspecting and replacing sacrificial anodes

The anodes are bolted to the underside of the shaft sleeve and at the bottom of the service dock.

Procedure

- 1 Hoist the transducer to its upper position.
- 2 Close the gate valve.
- 3 Set the Hull Unit Controller to OFF, and turn off the power inside the cabinet.
- 4 Open the transducer dock.
- 5 Clean the transducer.
[Inspecting and cleaning the transducer, page 53](#)
- 6 Inspect the physical conditions of the sacrificial anodes.
There are four anodes in total. Two are bolted to the underside of the shaft sleeve and two at the bottom of the service dock.
- 7 Replace the anodes if they are severely corroded.
- 8 Close the transducer dock.
- 9 Switch on the power inside the Hull Unit Controller.

Adjusting the guide rails on the gantry

The guide rails makes sure the transducer is aligned correctly.

Context

When the shaft is fully lowered there must be no space between the guide rails and the adjustable sliders.

Procedure

- 1 Lower the transducer.
- 2 Slacken the lock nuts and adjust the sliders until they are tight against the guide rails.
- 3 Tighten the lock nuts and re-check the clearance.
- 4 Raise the transducer and check the clearances at several places as it is raised.
If the clearances between the sliders and the rails changes (2/3) as the shaft is raised, the rails will need to be adjusted.

Note

These adjustments could affect the system alignment. Contact Kongsberg Maritime for assistance if you are in doubt.

Drawing file

Topics

[HiPAP General arrangement, page 75](#)

[Hull unit – Assembly drawing, page 77](#)

[Hull Unit Controller dimensions, page 78](#)

[Hull unit HL 3770, page 79](#)

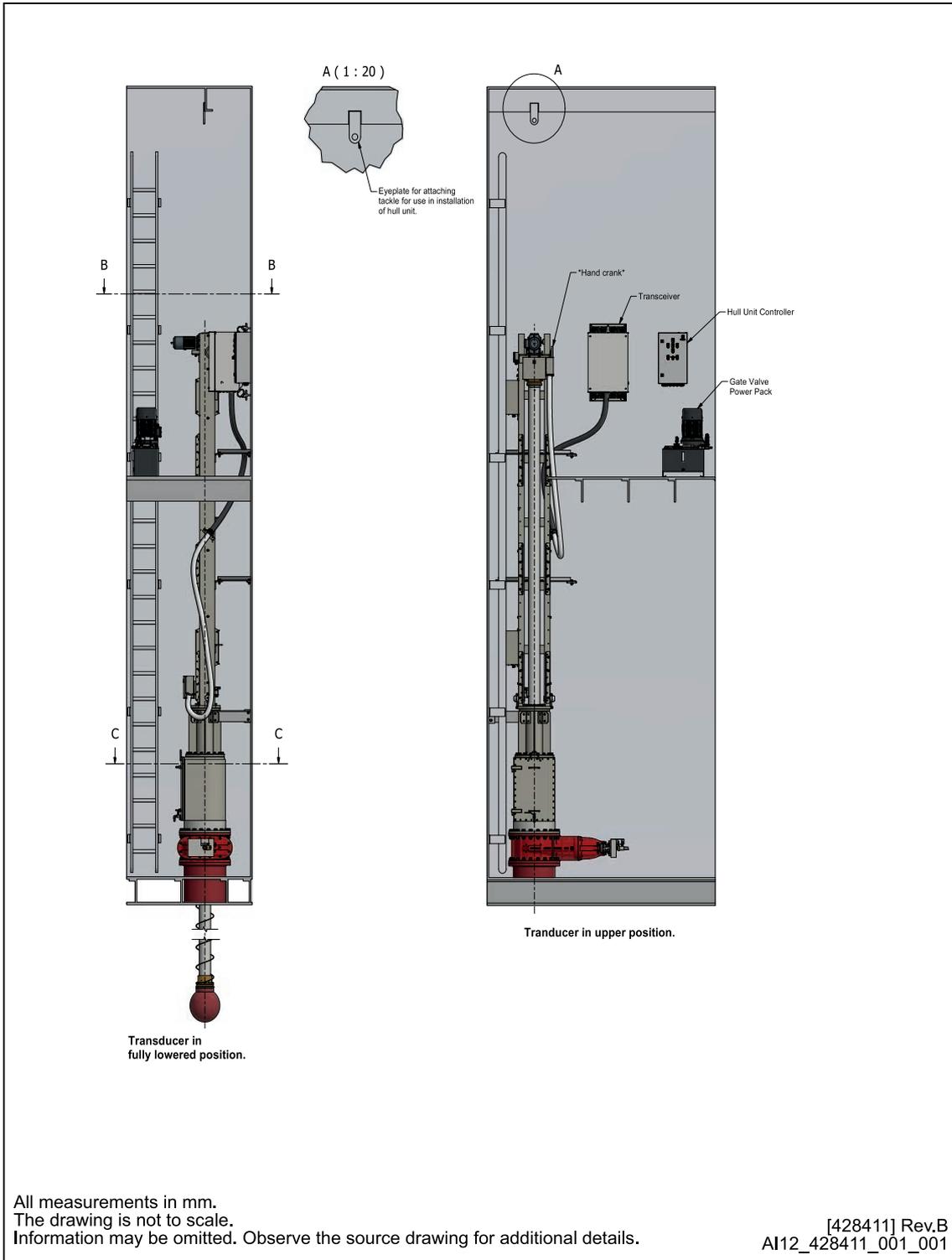
[Hull unit HL 2180, page 81](#)

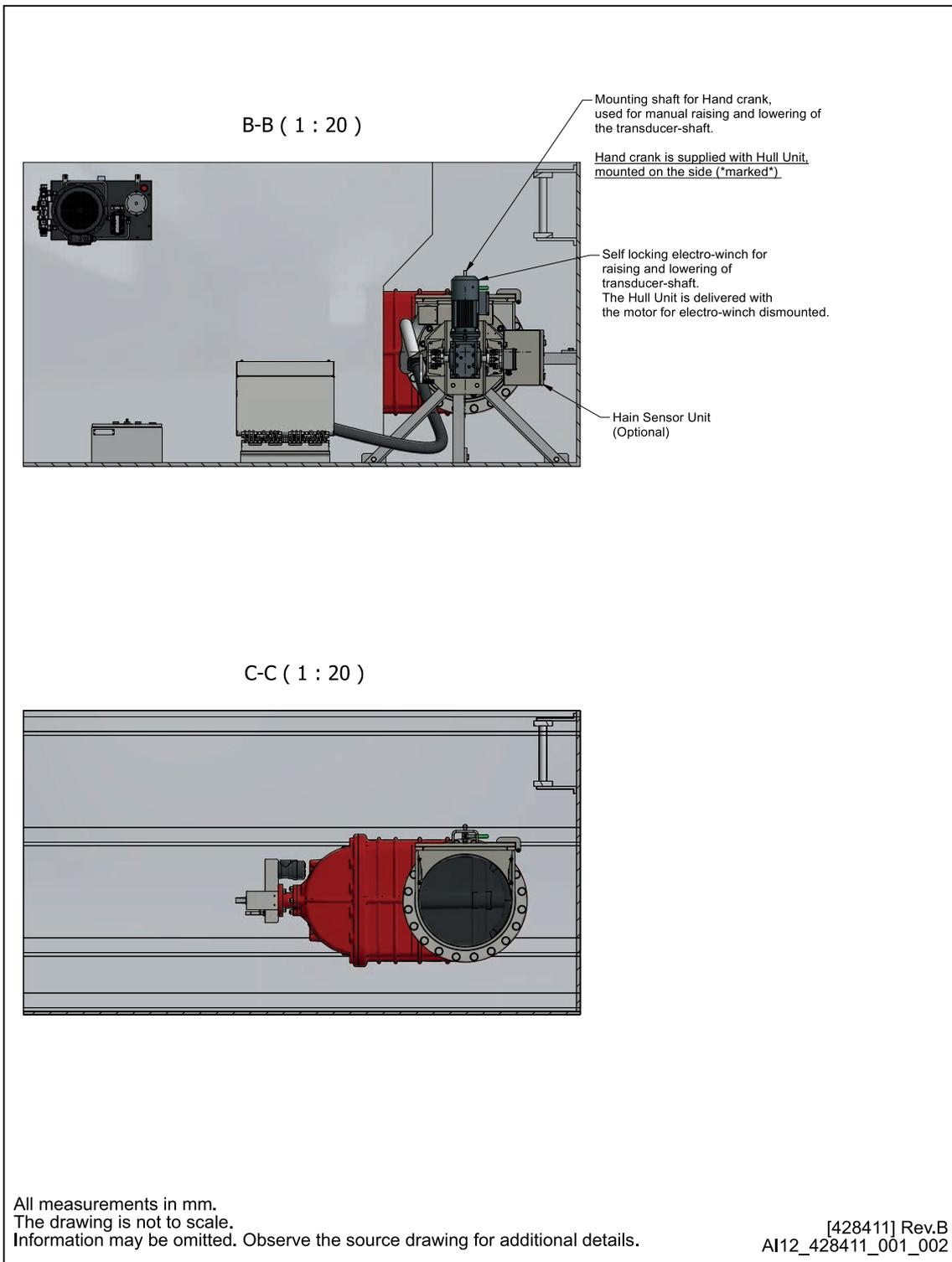
[Hull unit HL 6120, page 83](#)

[Gantry cut-out \(Laser unit\), page 85](#)

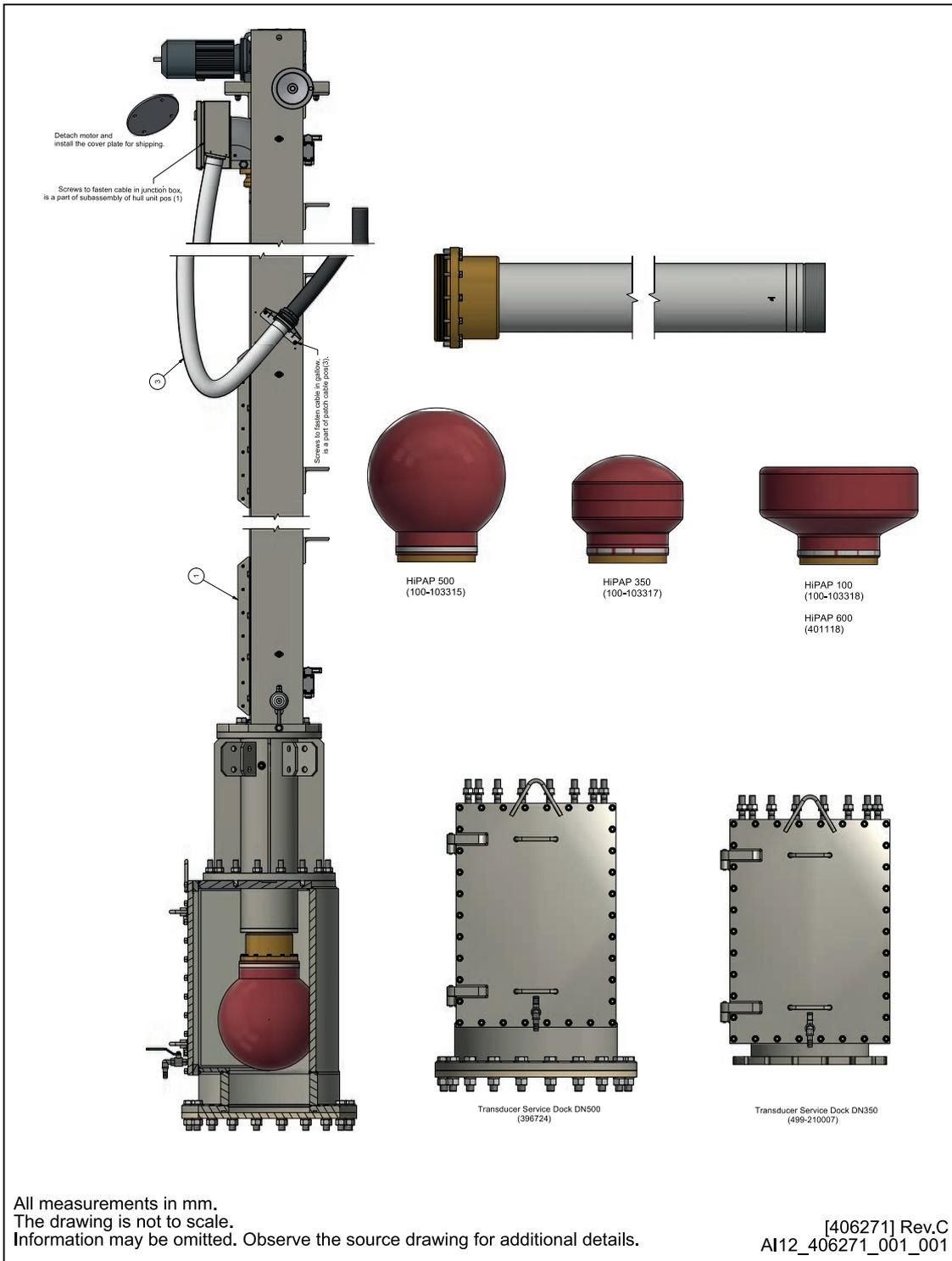
[Junction box cut-out \(Laser unit\), page 86](#)

HiPAP General arrangement

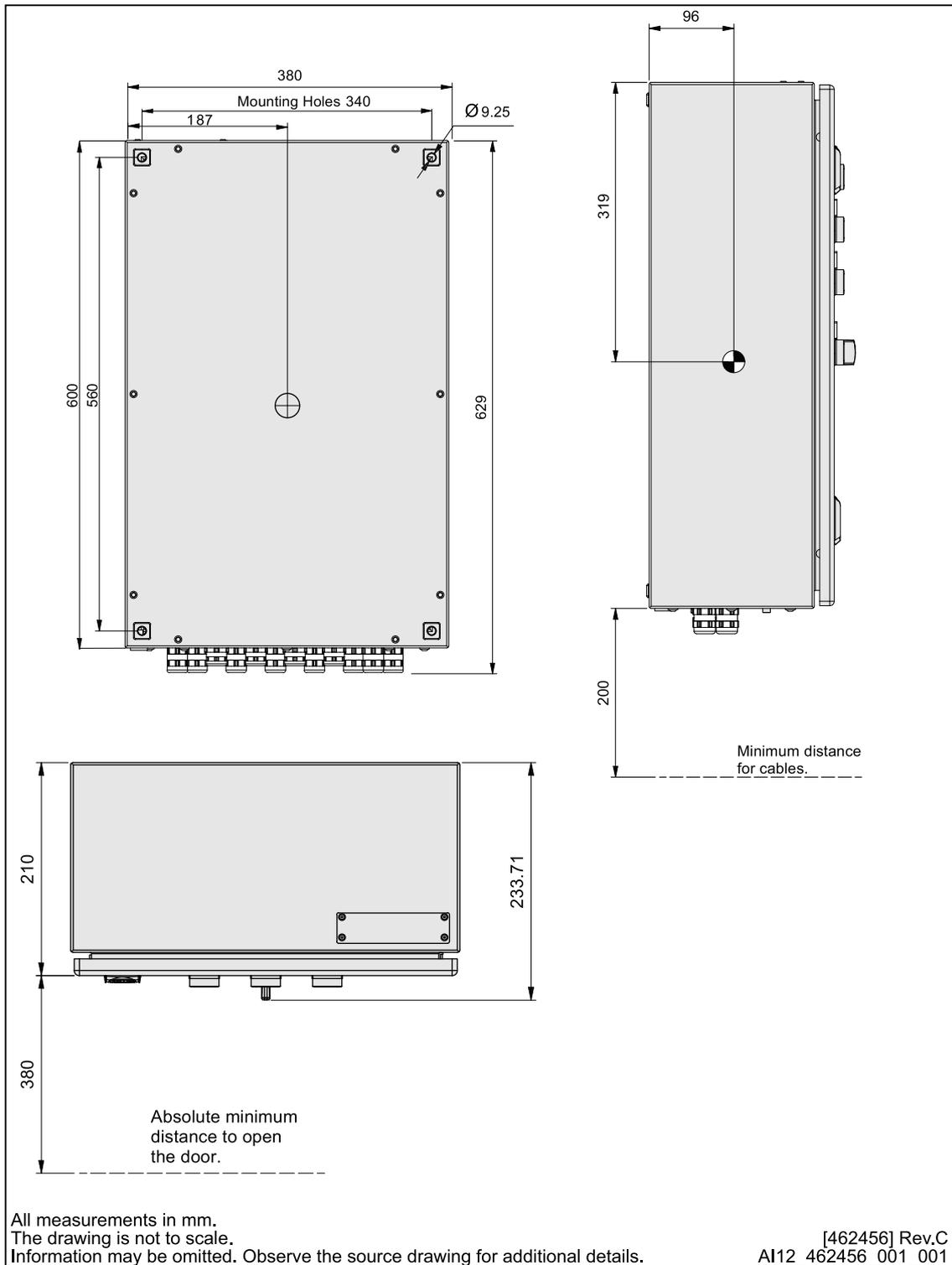




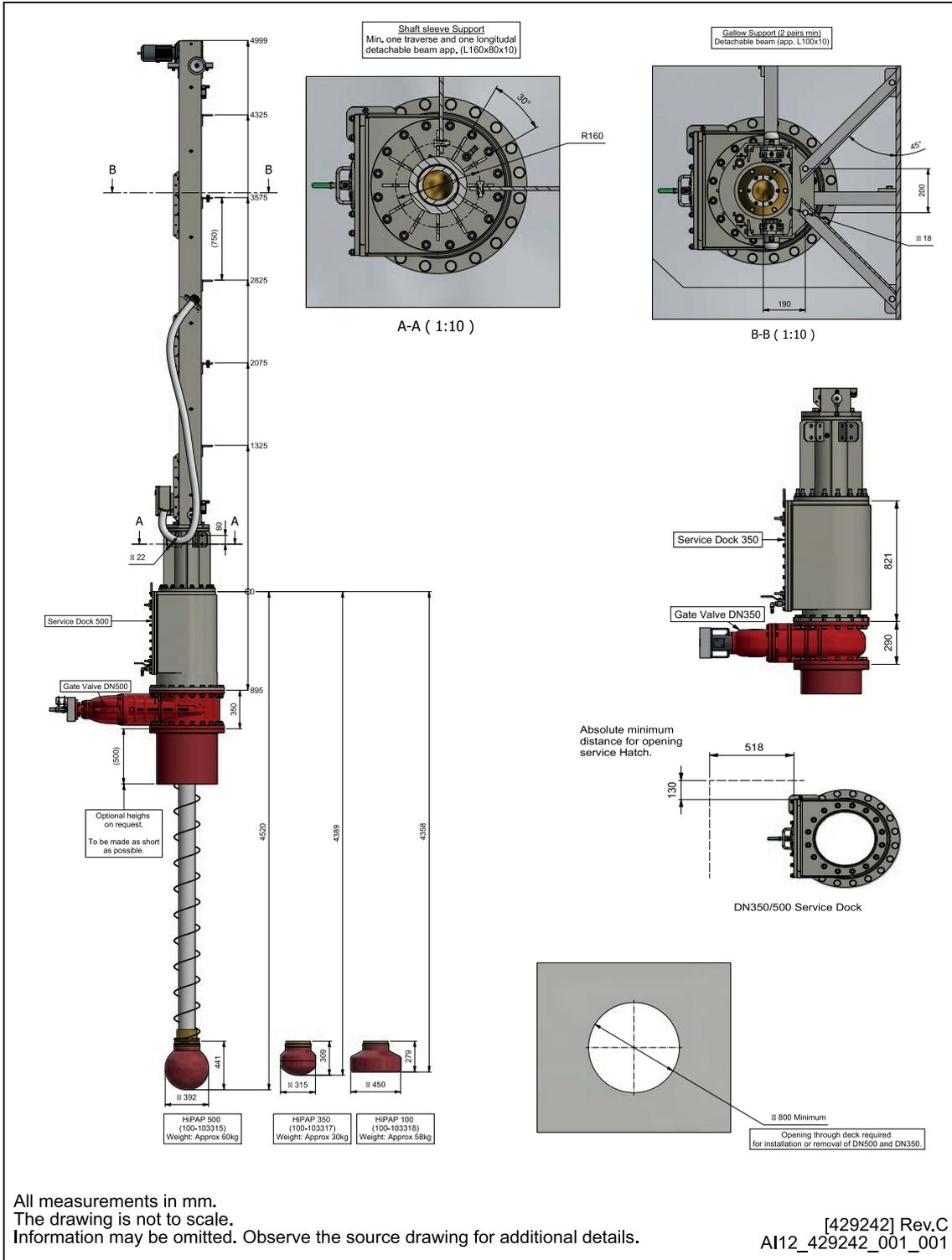
Hull unit – Assembly drawing



Hull Unit Controller dimensions

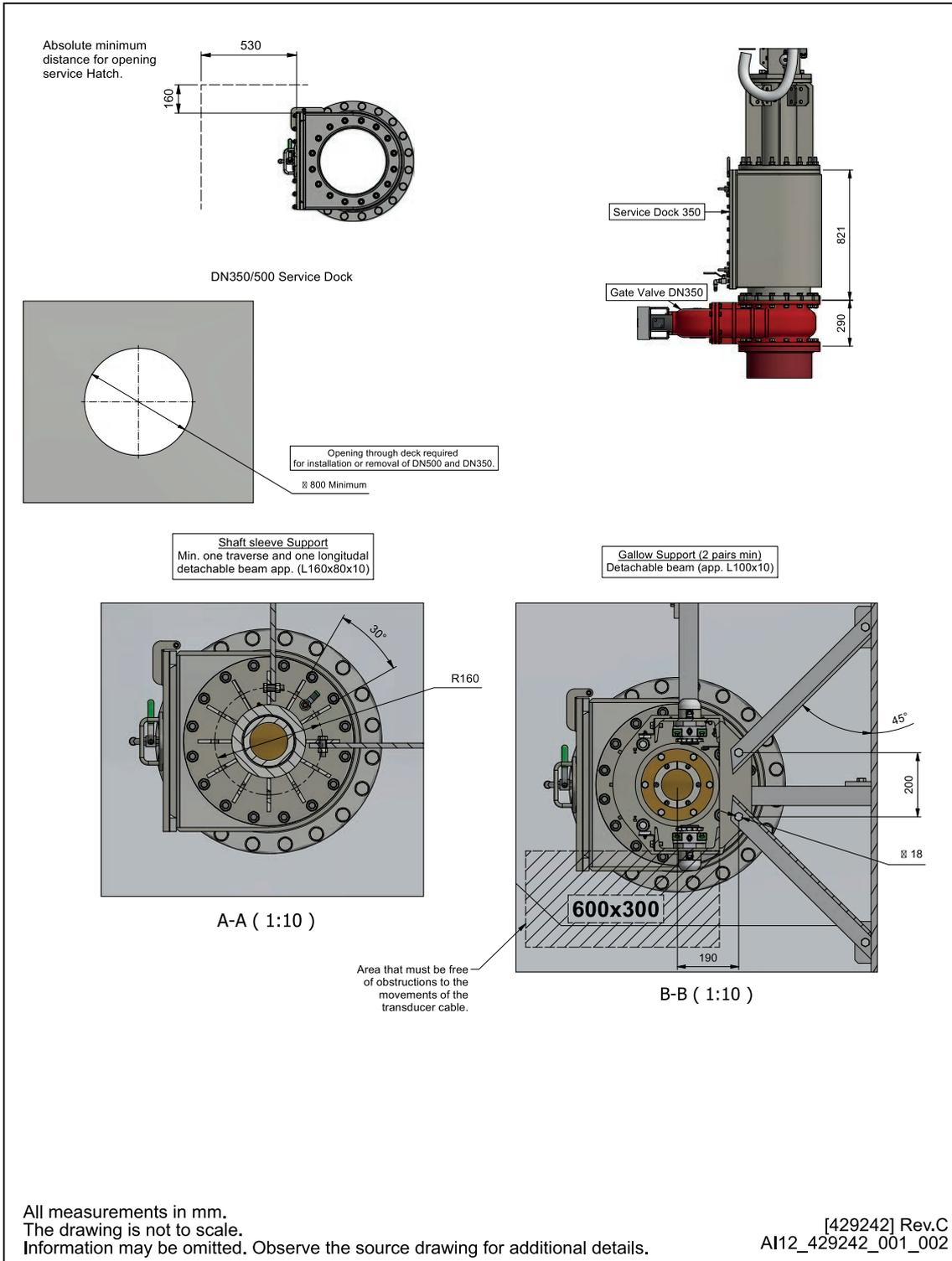


Hull unit HL 3770

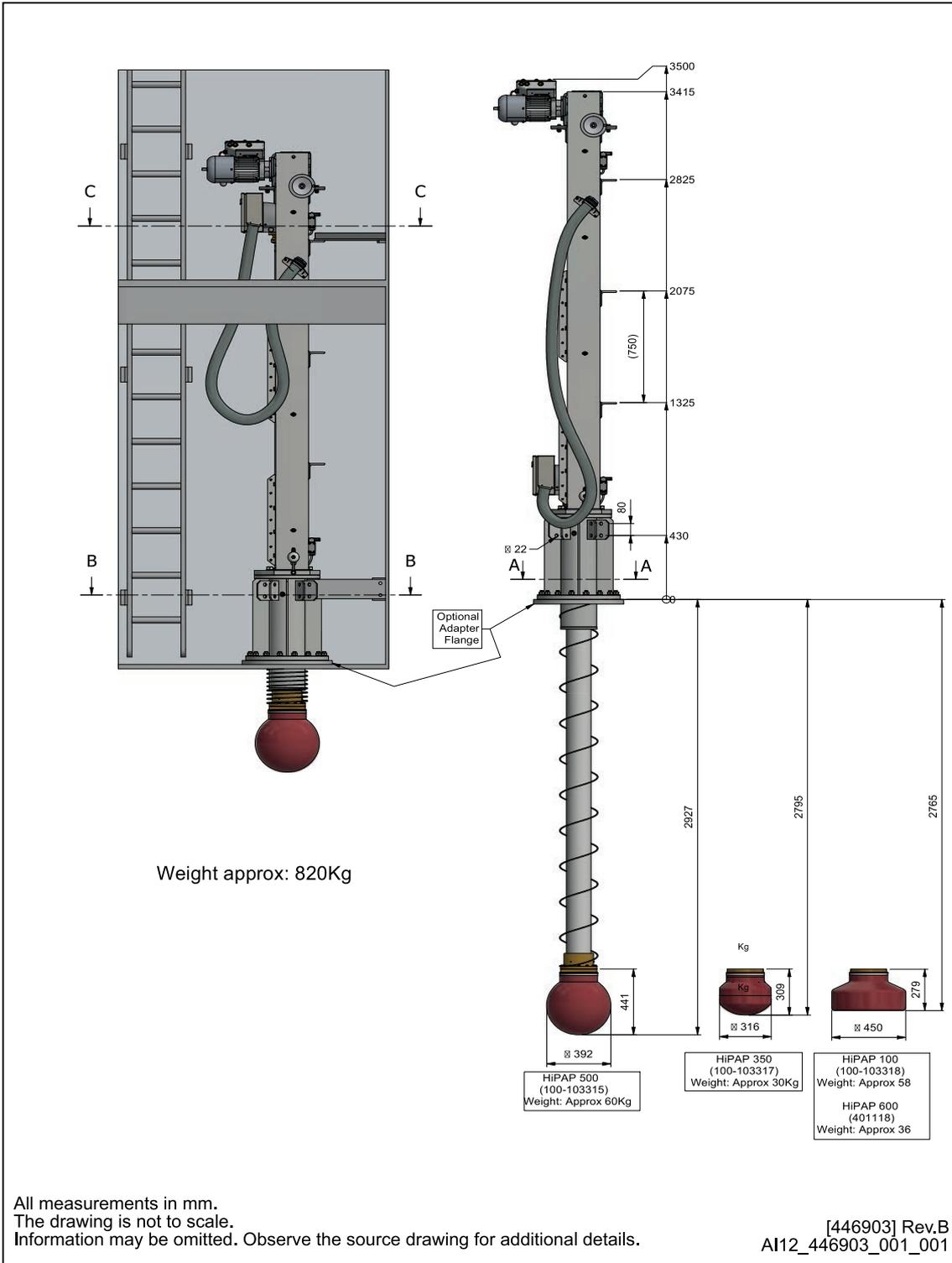


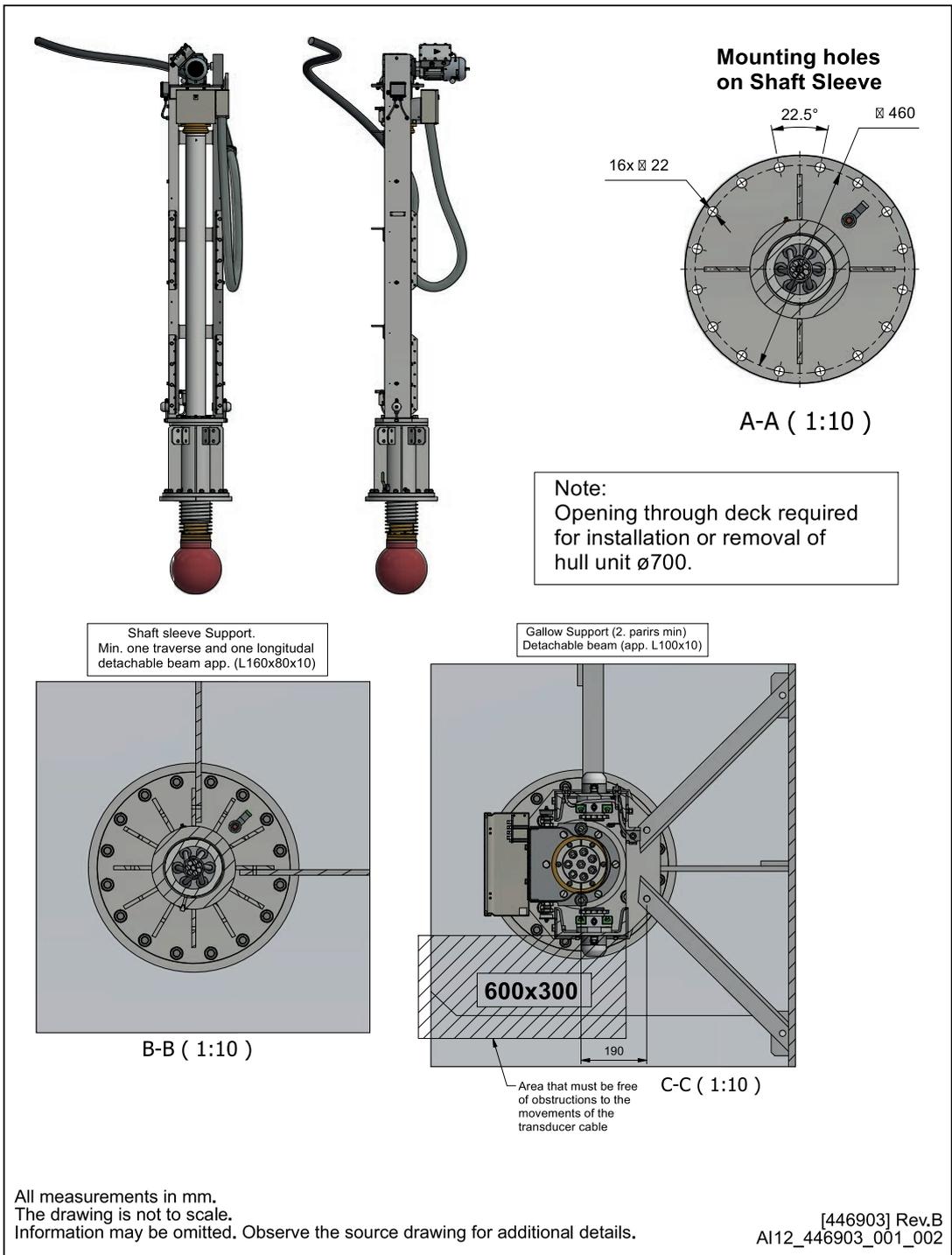
All measurements in mm.
 The drawing is not to scale.
 Information may be omitted. Observe the source drawing for additional details.

[429242] Rev.C
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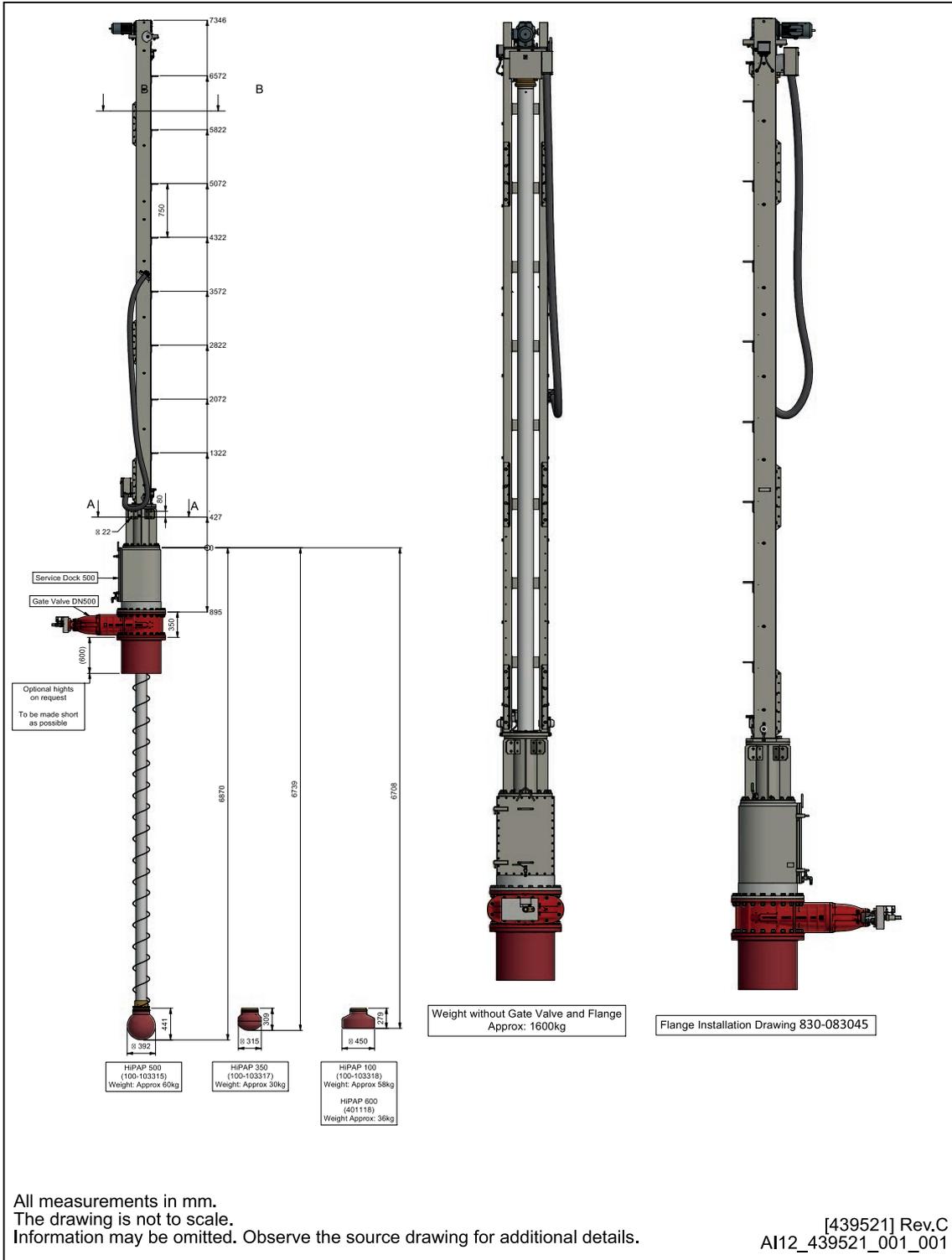


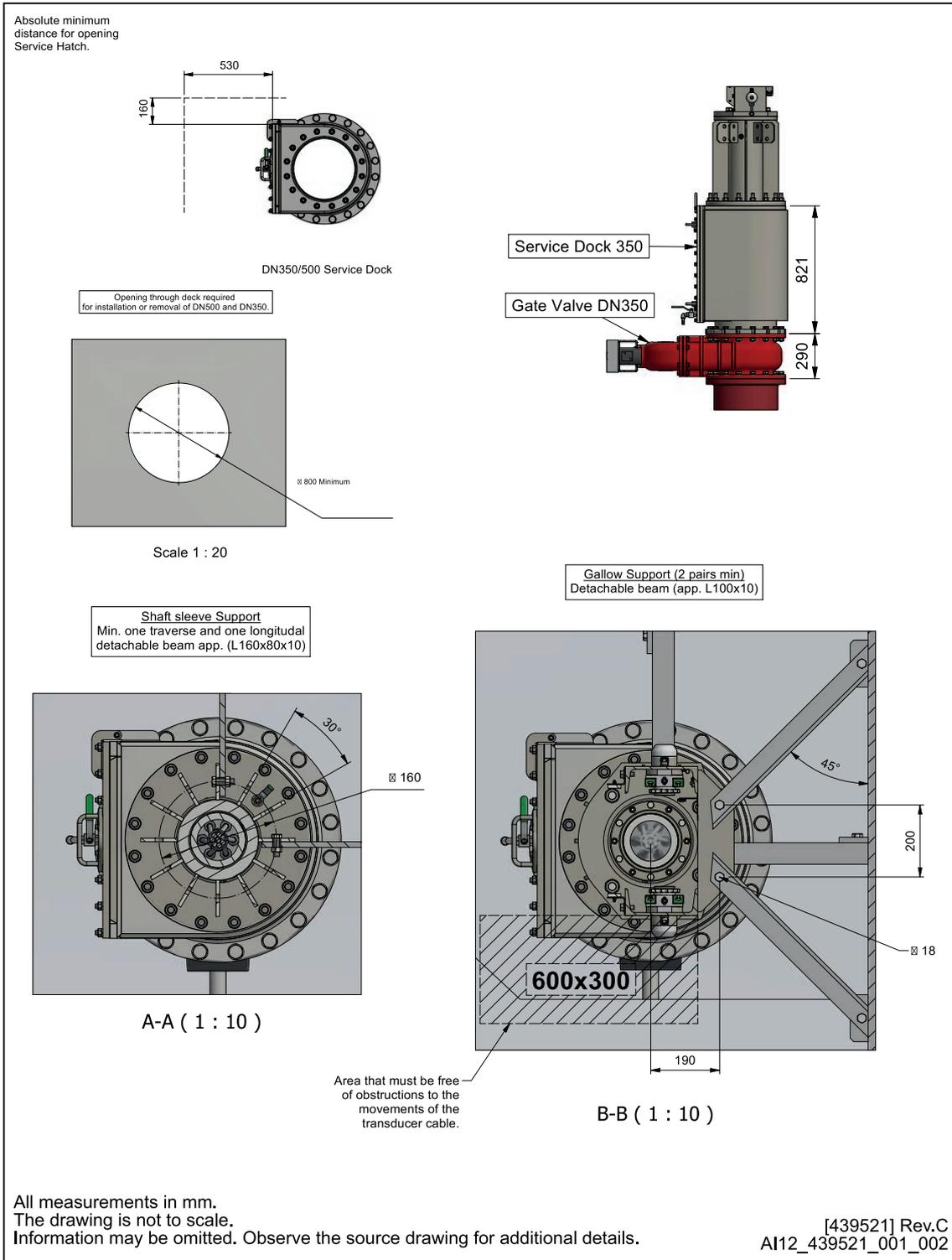
Hull unit HL 2180



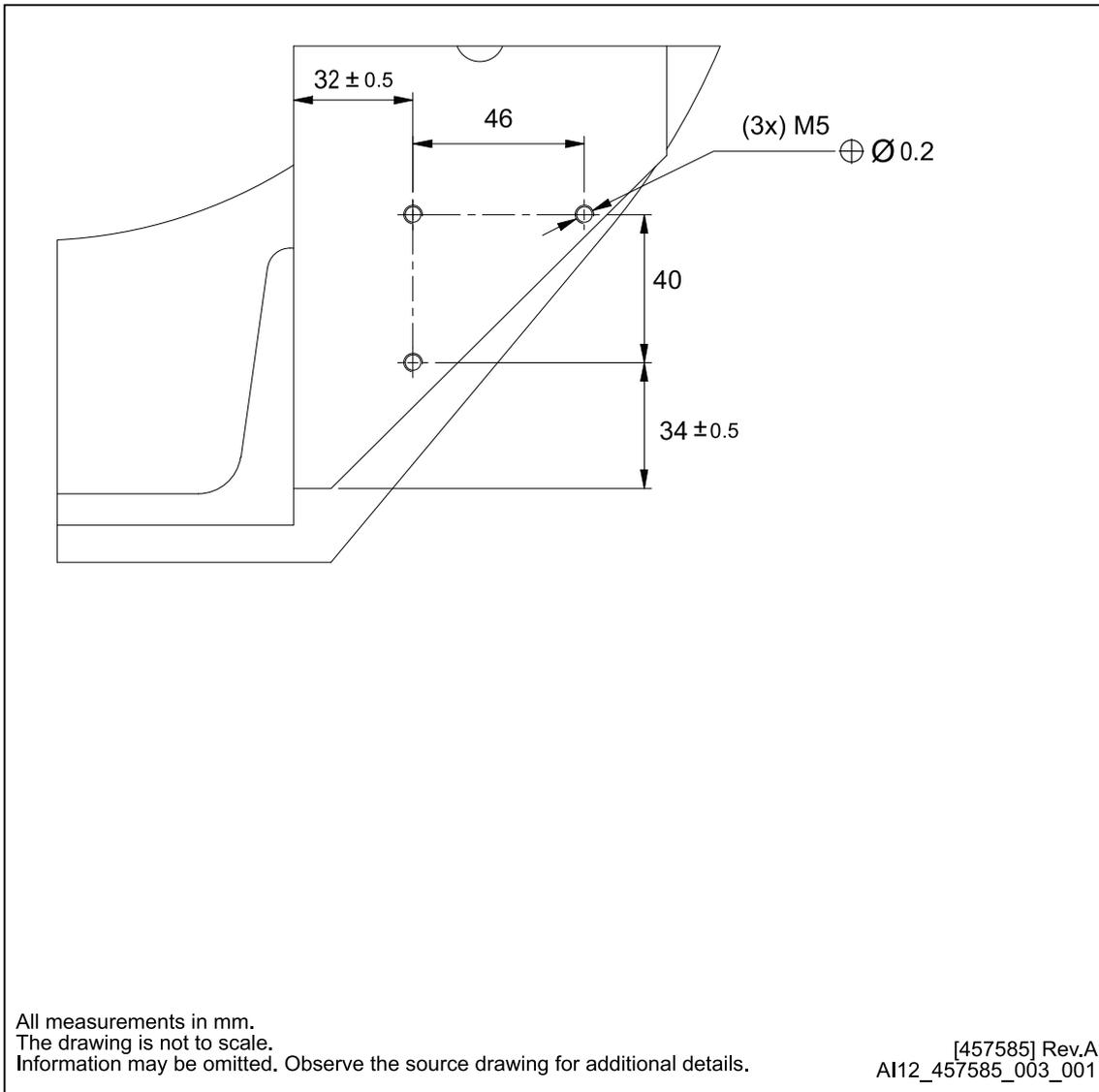


Hull unit HL 6120

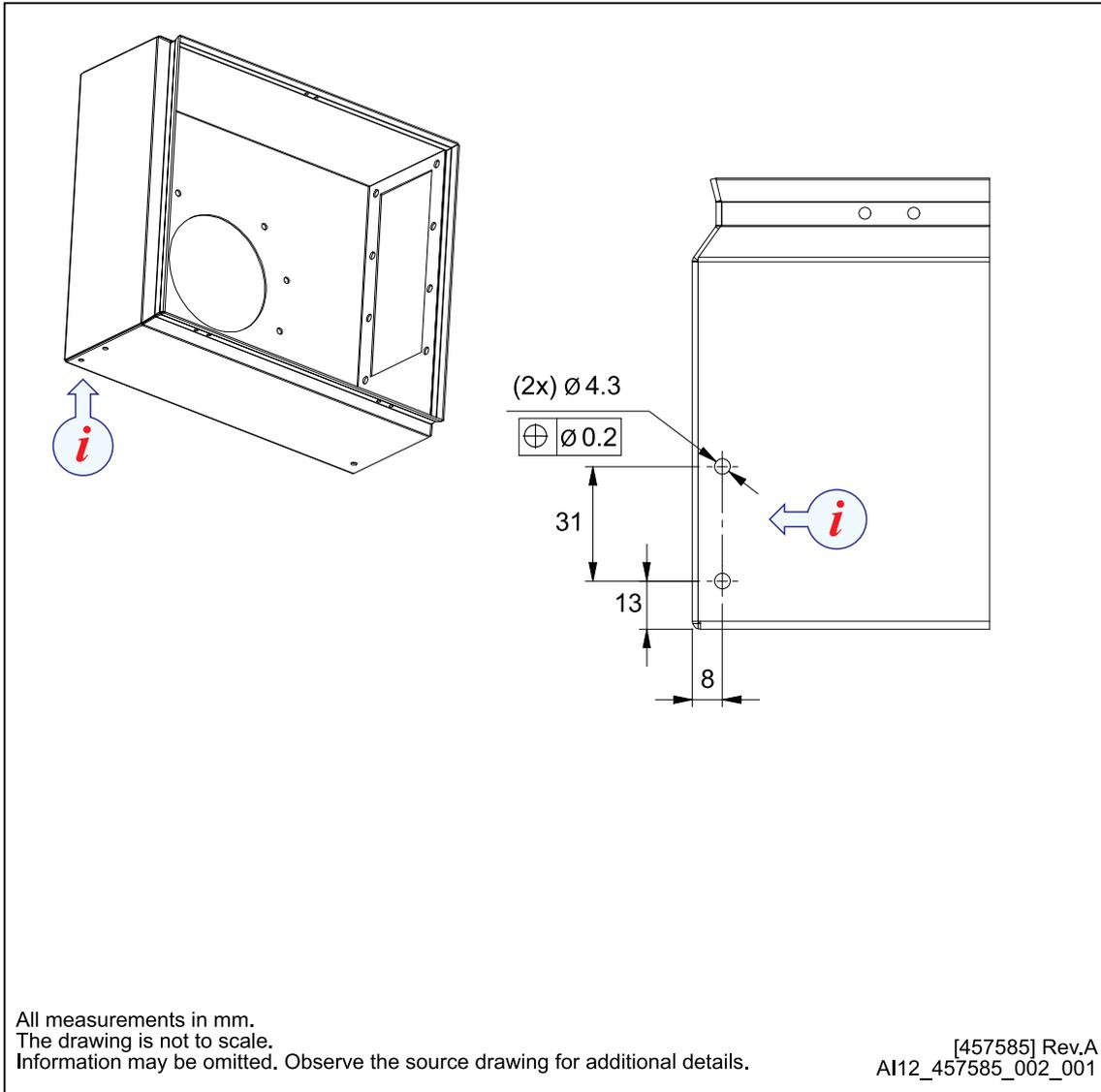




Gantry cut-out (Laser unit)



Junction box cut-out (Laser unit)



Technical specifications

Topics

[Interface specifications, page 88](#)

[Weights and outline dimensions, page 88](#)

[Power specifications, page 89](#)

[Environmental requirements, page 89](#)

Interface specifications

The HiPAP Hull unit system will interface with peripheral systems and sensors using standard and/or proprietary datagram formats.

Supported datagram formats for motion information

- NMEA \$**HDT
- NMEA \$**VHW
- Yokogawa \$**HRC
- SKR
- STL
- EM 3000
- \$SPSXN,10
- \$SPSXN,23
- IxSea Octans TAH (\$PHOCT) R-P-H (UTC)
- IxSea Octans \$PHTRO
- Ixsea Octans \$PHLIN

The data rate should be at least 25 Hz, 100 Hz is recommended for attitude data.

Data input can be either serial line RS-232,RS-422 or Ethernet UDP.

Serial line speeds can be from 1200 baud up to 115200 baud, 1 or 2 stop bits, 7/8 bit data and parity none, even or odd.

Weights and outline dimensions

These weights and outline dimension characteristics summarize the physical properties of the system.

Hull Unit Controller

Model	Depth	Width	Height	Weight
HiPAP Hull Unit Controller	236 mm	380 mm	629 mm	25 kg

Gantry

Model	Height	Diameter	Weight (including transducer and transducer dock)	Raise/lower travel
HL 2180	3.4 m	670 mm	1150 kg	2.2 m
HL 3770	5 m	670 mm	1330 kg	3.8 m
HL 4570	5.8 m	670 mm	1430 kg	4.6 m
HL 6120	7.35 m	670 mm	1600 kg	6.1 m

Power specifications

These power characteristics summarize the supply power requirements for the system.

Hull Unit Controller

- **Make and model:** HiPAP Hull Unit Controller
- **Voltage requirement:** 230/440 VAC, 50 to 60 Hz 3-phase
- **Nominal power consumption:** 750 - 1100 W, Depending on use

Gate valve

The gate valve is not manufactured by Kongsberg Maritime. Refer to the relevant end-user documentation provided by the manufacturer.

Environmental requirements

These technical specifications summarize the physical and environmental specifications.

Hull Unit Controller

- **Make and model:** HiPAP Hull Unit Controller
- **Operating temperature:** 0 to +55 °C
- **Storage temperature:** -20 to 60 °C
- **Degree of protection:** IP54
- **Operating humidity:** 80 % relative
- **Storage humidity:** 90 % relative

Equipment handling

Topics

[Transporting Kongsberg Maritime equipment, page 91](#)

[Unpacking mechanical units, page 92](#)

[Inspection of units and transportation boxes after arrival, page 92](#)

[Specifications for storage prior to installation or use, page 93](#)

[About Electrostatic Discharge \(ESD\), page 95](#)

Transporting Kongsberg Maritime equipment

Unless otherwise stated in the accompanying documentation, electronic, electromechanical and mechanical units supplied by Kongsberg Maritime can be only transported using methods approved for delicate and fragile equipment.

Prerequisites

Transportation methods approved for delicate equipment includes transportation by road, rail, air or sea.

Context

The units are to be transported in accordance with general or specific instructions for the appropriate unit(s), using pallets, transport cases, wooden boxes, or carton boxes as appropriate.

Observe the packing instructions.

Note

Special local restrictions concerning air transportation may be applied to units containing certain types of batteries. These units must be checked properly, and the regulations must be investigated by the packer/shipper before the unit is dispatched.

Procedure

- 1 Ensure that all local transportation is done according to the same specifications as for the initial delivery.
- 2 Make sure that the box containing the unit is kept dry at all times, and sheltered from the weather.

It must not be subjected to shocks, excessive vibration or other rough handling. The box will normally be marked with text or symbols indicating which way it is to be placed. Follow the instructions provided, and make sure that the box is always placed with its “top” facing upwards.

- 3 Make sure that the box is not used for any purpose for which it was not intended (step, table, etc.).

In the absence of other information, no other boxes must be stacked on top of it.

- 4 Handle all boxes and units with care.

Note

Due to the nature of Kongsberg Maritime’s products, and the extensive use of delicate electronic parts, all units and boxes must be regarded and handled as fragile equipment.

Unpacking mechanical units

Prior to installation or use, mechanical units must be unpacked from their transport boxes. It is important that this unpacking is done without inflicting damage to the equipment.

Prerequisites

Observe the procedure for unpacking of standard parts and units.

Context

Mechanical and electromechanical units may be heavy.

Hull units provided for acoustic positioning systems are provided with the transducer already mounted.

Note

The transducer is a delicate item. Make sure that it is not exposed to physical damage during the storage, unpacking, lifting and installation of the hull unit. The transducer is protected with a box shaped foam. Do not remove this protection until the final stages of the hull unit installation.

Procedure

- 1 Obtain the necessary lifting equipment, and make sure that the equipment is certified for the weight.
- 2 Lift the unit out of the transportation box.
- 3 Place it in a stable position on the floor/work bench.
- 4 Inspect the unit for visual damage.
- 5 Remove any packing material that may be inside the unit.
- 6 Collect and keep the relevant user manuals and/or documents provided with the unit.

Inspection of units and transportation boxes after arrival

A visual inspection must be done immediately after the box(es) have arrived at their destination.

Prerequisites

If you suspect that the equipment has been damaged during the transport, request that a representative of the carrier is present during the inspection.

Procedure

- 1 Check all boxes (wooden or cardboard boxes, plastic bags and/or pallets) for physical damage.
Look for signs of dropping, immersion in water or other mishandling.
- 2 If external damage is detected, open the box to check its contents.
Request that a representative of the carrier to be present while the box is opened, so any transportation damage can be identified and documented.
- 3 If a unit has been damaged, prepare an inspection report stating the condition of the unit and actions taken.
Describe the damage, and collect photographic evidence if possible. Return the inspection report to Kongsberg Maritime as soon as possible.
- 4 If units are not damaged, check the humidity absorbing material.
If required, dry or replace the bags, then re-pack the unit(s) according to the packing instructions.

Specifications for storage prior to installation or use

When a system, a unit or a spare part has been delivered to the customer, it may be subject to long time storage prior to installation and use.

General specifications

During this storage period, certain specifications must be met. The equipment must be preserved and stored in such a way that it does not constitute any danger to health, environment or personal injury.

- 1 The equipment must be stored in its original transportation box.
- 2 Ensure that the units are clearly separated in the shelves and that each unit is easily identifiable.
- 3 The box must not be used for any purpose for which it was not intended (work platform, steps, table etc.).
- 4 Boxes must not be placed on top of each other, unless specific markings permit this.
- 5 Boxes must not be placed directly on a dirt floor.
- 6 Do not open a box for inspection unless special circumstances permit so.
“Special circumstances” may be suspected damage to the box and its content, or inspections by civil authorities.
 - a If a unit is damaged, prepare an inspection report stating the condition of the unit and the actions taken. Describe the damage and collect photographic evidence if possible. Re-preserve the equipment.

- b If the unit is not damaged, check the humidity absorbing material. If required, dry or replace the bags, then re-pack the unit according to the packing instructions.
- 7 If a box has been opened, make sure that it is closed and sealed after the inspection. Use the original packing material as far as possible.
- 8 The storage room/area must be dry with a non-condensing atmosphere. It must be free from corrosive agents.
- 9 The storage room/area's mean temperature must not be lower than -10°C , and not warmer than $+50^{\circ}\text{C}$. If other limitations apply, the crates will be marked accordingly.
- 10 Boxes must not be exposed to moisture from fluid leakages.
- 11 Boxes must not be exposed to direct sunlight or excessive warmth from heaters.
- 12 Boxes must not be subjected to excessive shock and vibration.
- 13 If the unit contained in a box holds normal batteries, these may have been disconnected/isolated before the unit was packed. These must only be reconnected before the installation starts. Units containing batteries are marked.

Caution

Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them, or dispose of them by incineration.

Refer to the applicable product data sheets or battery handling procedures for further details.

Temperature protection

Any units that requires protection against extreme temperatures are identified as such in the applicable documentation. The box used to transport and store such units are clearly marked, for example:

Must not be transported or stored in temperatures below -5°C .

Other temperature limits may be used if applicable.

If a unit needs temperature protection, the box to be used for storage and transportation must be lined on all walls, base and lid, using minimum 5 cm thick polyurethane or polystyrene foam.

Most system units can normally be stored in temperatures between -30°C and $+70^{\circ}\text{C}$. Refer to the relevant technical specifications for details.

Note

Unless otherwise specified, transducers and hydrophones must not be stored in temperatures below -10°C and above $+50^{\circ}\text{C}$.

About Electrostatic Discharge (ESD)

Electrostatic discharge (ESD) is the sudden flow of electricity between two electrically charged objects. Such flow can be caused by contact, an electrical short, or dielectric breakdown. Electrostatic discharge (ESD) can cause serious damage to printed circuit boards and electronic modules.

Beware of Electrostatic Discharge (ESD)!

Note

When you handle electronic circuit boards and modules, you must beware of the dangers of electrostatic discharge (ESD), both to yourself and to the equipment. In order to ensure safe transport and storage, circuit boards and other electronic units will always be wrapped in a clear plastic protective bag, and the bag will be sealed.

For correct and safe handling of printed circuit boards and electronic modules, you need a suitable working area. The working area must be covered by an approved conductive service mat that has a resistance of between 50 k Ω and 2 M Ω , and is connected directly to a reliable earth point via its earthing cord. You - and all other service personnel involved - must wear a wristband in direct contact with the skin. The wristband must be electrically connected to the service mat.

What is Electrostatic Discharge (ESD)?

Electrostatic Discharge (ESD) is the transfer of an electrostatic charge between two bodies at different electrostatic levels, caused either by direct contact or induction by an electrostatic field. The passing of a charge through an electronic device can cause local overheating, and it can also "puncture" insulating layers within the structure of the device. This may deposit a conductive residue of the vaporized metal on the device, and thus create a short circuit. Electrostatic Discharge (ESD) may result in a failures or degraded performance of the device.

ESD can create spectacular electric sparks (thunder and lightning is a large-scale ESD event), but also less dramatic forms which may be neither seen nor heard, yet still be large enough to cause damage to sensitive electronic devices. Electric sparks require a field strength above approximately 4 kV/cm in air, as notably occurs in lightning strikes. Other forms of ESD include corona discharge from sharp electrodes and brush discharge from blunt electrodes.

ESD can cause a range of harmful effects of importance in industry, including gas, fuel vapour and coal dust explosions, as well as failure of solid state electronics components such as integrated circuits. These can suffer permanent damage when subjected to high voltages. Electronics manufacturers therefore establish electrostatic protective areas free of static, using measures to prevent charging, such as avoiding highly charging materials and measures to remove static such as grounding human workers, providing antistatic devices, and controlling humidity.

http://en.wikipedia.org/wiki/Electrostatic_discharge (January 2014)

Precautions to prevent Electrostatic Discharge (ESD)

Sensitive printed circuit boards and electronic modules must always be transported and stored in protective antistatic packing bags. It is also important that they are not transported or stored close to strong electrostatic, electromagnetic or radioactive fields. If it is necessary to open and touch the printed circuit board or module inside the protective bag, the following precautions must be taken.

- 1 For correct and safe handling of printed circuit boards and electronic modules, you need a suitable working area. The working area must be covered by an approved conductive service mat that has a resistance of between 50 k Ω and 2 M Ω , and is connected directly to a reliable earth point via its earthing cord.
- 2 You - and all other service personnel involved - must wear a wristband in direct contact with the skin. The wristband must be electrically connected to the service mat.
- 3 Printed circuit boards and electronic modules must be placed on the conductive service mat during installation and maintenance operations.
- 4 If, for any reason, it is necessary to move the circuit board from the conductive service mat, it must be placed in an approved antistatic transportation container (for example a static shielding bag) before transportation.
- 5 During installation and servicing, all electrical equipment (for example soldering irons and test equipment) must be earthed.

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