

Instruction Manual



KONGSBERG

HiPAP 102P





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HiPAP 102P
High Precision Acoustic Positioning
system
Instruction manual

423152/A

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Document information

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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

Kongsberg Maritime AS endeavours to ensure that all information in this document is correct and fairly stated, but does not accept liability for any errors or omissions.

Support information

If you require maintenance or repair, contact your local dealer. You can also contact us using the following address: km.support.hpr@kongsberg.com. If you need information about our other products, visit <http://www.kongsberg.com>. On this website you will also find a list of our dealers and distributors.

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About this manual

Observe this general information about the HiPAP 102P Instruction manual; its purpose and target audience.

Purpose of manual

The purpose of this instruction manual is to provide the descriptions and procedures required to install, operate and maintain the HiPAP 102P.

Target audience

The manual is intended for all users of HiPAP 102P.

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HiPAP® is a registered trademark of Kongsberg Maritime AS in Norway and other countries.

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HiPAP 102P

Topics

[System diagram, page 7](#)

[Main system units, page 8](#)

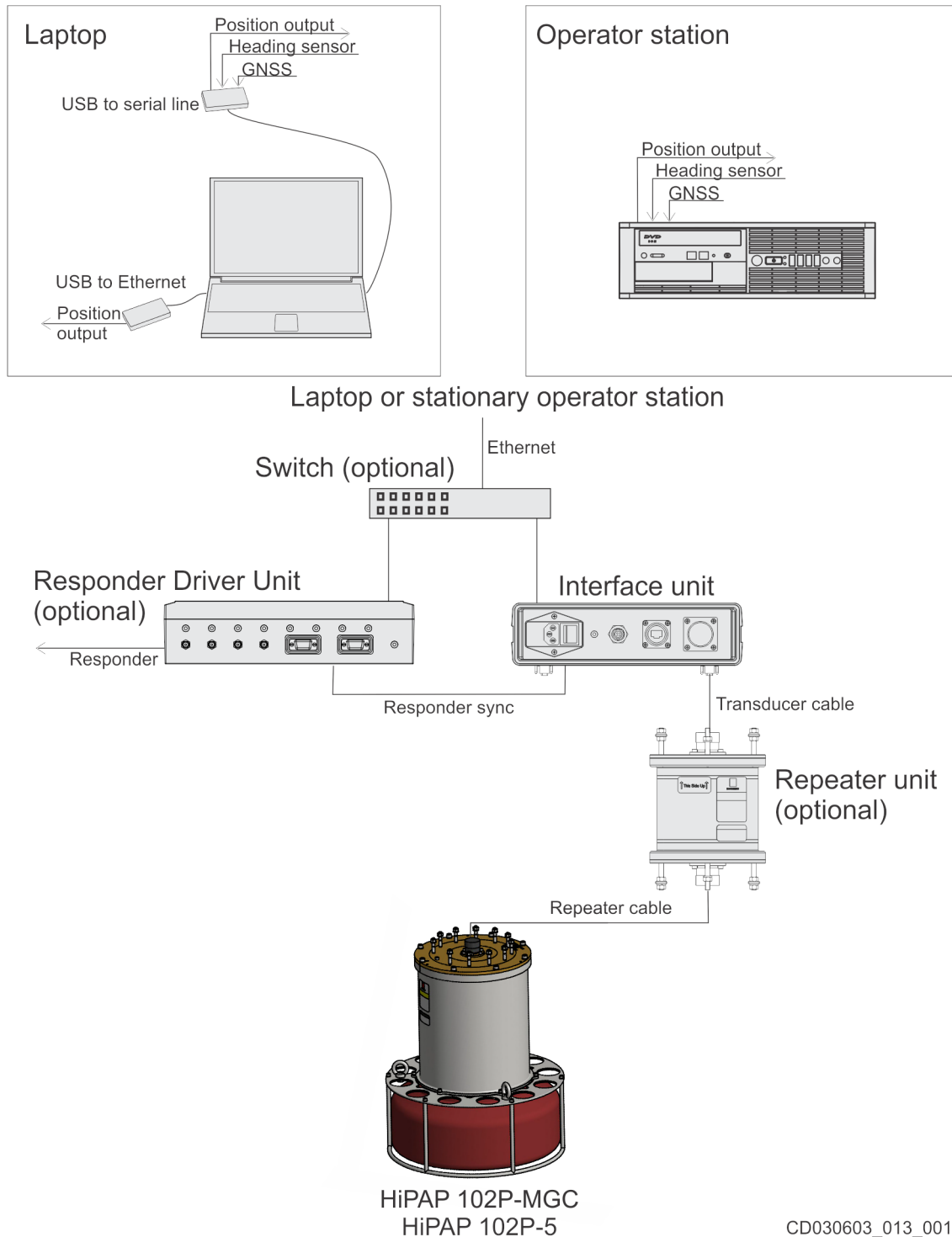
[Scope of supply, page 11](#)

[General supply conditions, page 11](#)

[Support information, page 12](#)

System diagram

The system diagram identifies the main components of a portable HiPAP 102P system. Only the basic connections between the units are shown.



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Main system units

Topics

- [HiPAP 102P transducer, page 8](#)
- [Operator Station, page 8](#)
- [Ethernet switch \(option\), page 9](#)
- [Interface unit, page 10](#)
- [Responder Driver Unit \(option\), page 10](#)
- [Fibre splice box, page 10](#)
- [Subsea repeater unit \(option\), page 10](#)

HiPAP 102P transducer

The HiPAP 102P transducer integrates transmitter/receiver acoustic elements and electronics in one unit. The unit also includes a motion sensor and optional heading sensor.

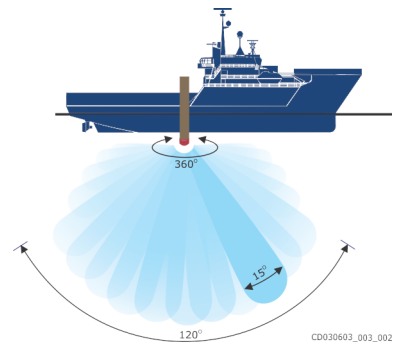
The transducer has an operational coverage of $\pm 90^\circ$ while the main coverage is $\pm 60^\circ$.

Caution

The transducer should NOT be left with power on for more than one hour in air.

It needs to be deployed in water for proper cooling.

It should also be protected against direct sunlight when placed on deck.



Operator Station

The HiPAP system is operated from one or several operator stations, depending on the actual system configuration. The operator station is identical for all HiPAP models. One station can operate several HiPAP transducers of various types.

The stationary operator station comprises:

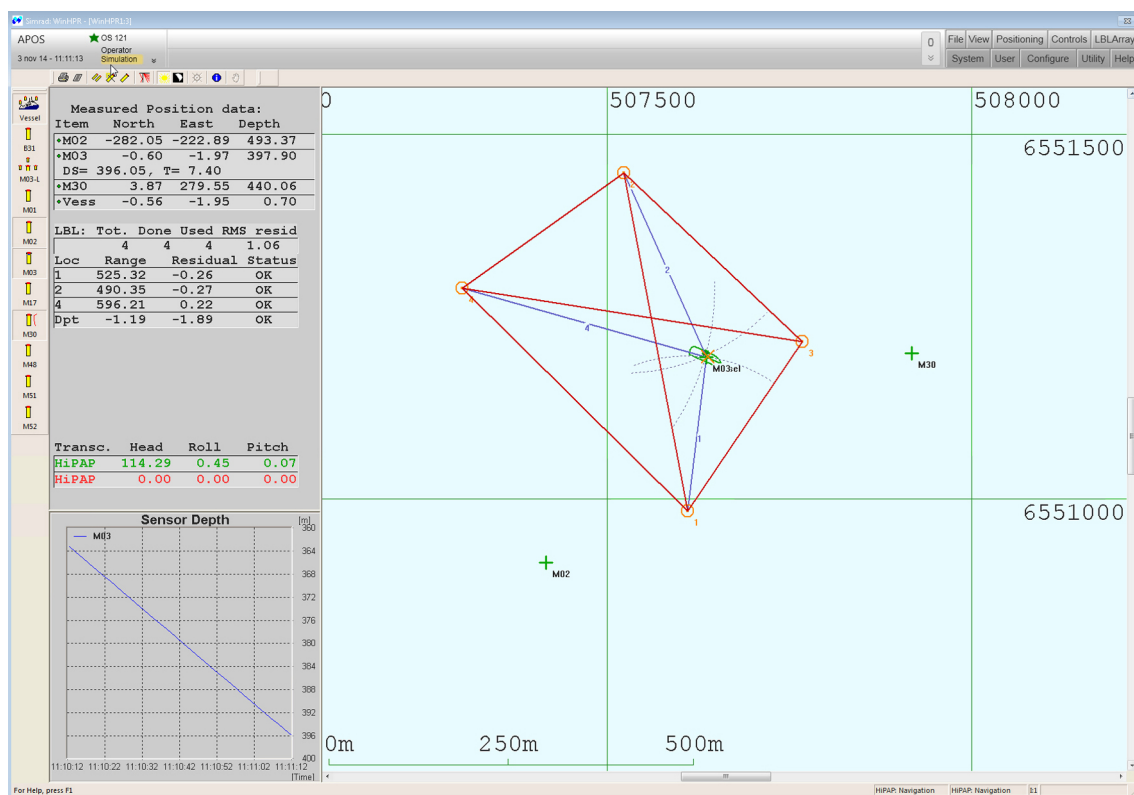
- Computer
- Keyboard
- Mouse
- Display

The portable operator station comprises:

- Laptop
- USB to serial unit
- USB to Ethernet unit

The computer runs on a Microsoft Windows operating system. The user interface is a graphical user interface, designed as a standard Windows application.

The screen is divided into 3 windows in which the operator can select several different views. Typical views are graphical position plot, numerical data, inclination and roll, pitch and heading. A normal display configuration is shown in the following figure.



Ethernet switch (option)

An Ethernet switch is a telecommunication device that receives a message from any device connected to it and then transmits the message only to the device for which the message was meant.



See the manual delivered with the system.

Interface unit

The interface unit connects the HiPAP and the operator station.

The interface unit includes a power supply, powering the transducer, and connects the transducer, the responder (optional) and the operator station.



Responder Driver Unit (option)

The Responder Driver Unit provides responder trigger signals to responders.

The Responder Driver Unit is a stand-alone unit and is connected to the interface unit and the switch.



Fibre splice box

A splice box is a housing in which fiber optic cables begin or end.

The Fibre Splice Box has eight ports. This box is used to splice the system fibre optic cables.

Subsea repeater unit (option)

Use a repeater unit to amplify the signals when the transducer cable has to be longer than 70 metres.

The subsea repeater unit amplifies the signals between the transducer and the interface unit.



Scope of supply

Please observe the standard and optional items provided with the HiPAP 102P delivery.

When you unpack the items provided with the HiPAP 102P system, verify that the following items are included.

- Transducer unit
- Operator station
- Interface unit
- Transducer cable
- Ethernet cable
- USB to Ethernet unit (for portable operator station)
- USB to serial line unit (for portable operator station)
- 2 USB cables (for portable operator station)
- Display cable (for stationary operator station)
- Keyboard cable (for stationary operator station)
- Mouse cable (for stationary operator station)
- Instruction manual

Optional items:

- Responder driver unit
- Ethernet cable
- Ethernet switch
- Repeater unit
- Repeater cable

General supply conditions

The following general supply conditions apply to this Kongsberg HiPAP 102P delivery.

Receipt, unpacking and storage

Upon accepting shipment of the equipment, the shipyard and/or the dealer must ensure that the delivery is complete and inspect each shipping container for evidence of physical damage.

If the inspection reveals any indication of crushing, dropping, immersion in water or any other form of damage, the recipient should request that a representative from the company used to transport the equipment be present during unpacking.

All equipment must be inspected for physical damage, i.e. broken controls and indicators, dents, scratches etc. during unpacking. If any damage to the equipment is discovered, the recipient must notify both the transportation company and Kongsberg Maritime so that Kongsberg Maritime can arrange for replacement or repair of the damaged equipment.

Once unpacked, the equipment must be stored in a controlled environment with an atmosphere free of corrosive agents, excessive humidity or temperature extremes.

The equipment must be covered to protect it from dust and other forms of contamination when stored.

Equipment responsibility

Unless otherwise stated in the contract, the shipyard doing the installation and/or equipment dealer becomes fully responsible for the equipment upon receipt.

The duration of responsibility cover:

- The period of time the equipment is stored locally before installation
- The entire installation process
- Commissioning
- The period of time between commissioning and the final acceptance of the equipment by the end user or owner

Unless other arrangements have been made in the contract, the Kongsberg HiPAP 102P warranty period (as specified in the contract) begins when the acceptance documents have been signed.

Support information

If you need support for your Kongsberg HiPAP 102P you must contact Kongsberg Maritime AS.

- **Company name:** Kongsberg Maritime AS
- **Address:** Strandpromenaden 50, 3190 Horten, Norway
- **Telephone, 24h support:** +47 33 03 24 07
- **Telefax:** +47 33 04 76 19
- **Website:** <http://www.km.kongsberg.com>
- **Support website:** http://www.km.kongsberg.com/support_hpr
- **E-mail address:** km.support.hpr@kongsberg.com

Installing the HiPAP 102P hardware units

Topics

[Installing the transducer, page 14](#)

[Installing the repeater unit, page 14](#)

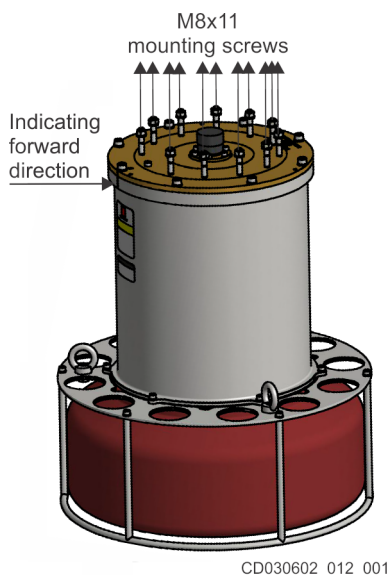
[Installing the responder driver unit \(option\), page 15](#)

[Converting from fibre optical to electrical signal, page 16](#)

Installing the transducer

The transducer cable must be connected before mounting the transducer.

Context



See the drawing in the drawing file chapter for where to install.

Mount the transducer unit on a transducer shaft "over the side" of the vessel or through a moon pool, in a location that provides the best conditions regarding propeller noise and aerated water. The stud bolts for mounting are at the top of the unit.

Procedure

- 1 Unscrew the nuts from the mounting screws.
- 2 Mount the unit so the direction indicator is in a forward direction, as illustrated in the previous figure.
- 3 Fasten all the nuts to the mounting screws once the transducer shaft is in place.

Related topics

[Installing the transducer to the ship's side pole, page 40](#)

Installing the repeater unit

The transducer cable must be connected before mounting the repeater unit.

Prerequisites

See the drawing in the drawing file chapter for details on the repeater unit.

Mount the repeater unit to make sure it is not hanging by the cable. There are stud bolts for mounting at the top and the bottom of the unit.

Procedure

- 1 Mount the unit with the arrow pointing upwards.
- 2 Fasten the twelve stud bolts on the top and the bottom of the unit.

Related topics

[Repeater unit, outline dimensions, page 44](#)

Installing the responder driver unit (option)

The Responder Driver Unit is a stand-alone unit and can be mounted horizontally or vertically.

Prerequisites

The unit should be located where it is most suitable for connecting the cables to the responders. This can be close to Remote Operating Vehicle (ROV) operation room. There is normally one cable connected to the Responder Driver Unit for each responder to be operated. The unit must be installed so it is easy accessible for operators to check the working condition of the responder trig status diodes.

Procedure



- 1 Open the unit by removing the four screws that secures the lid.
- 2 Lift off the lid and see the four mounting holes, one in each corner.
- 3 Mount the responder driver unit where suitable. The mounting screws with nuts and washers are delivered with the unit.
- 4 Close the unit.

Note

Keep the protecting caps on the fibre-optic connectors when not used.

Related topics

[Responder driver unit, outline dimensions, page 45](#)

Converting from fibre optical to electrical signal

The converter works both ways and can be used to create an optical isolation between high voltage equipment and a transceiver.

Context

You need one kit for each responder signal. The connectors are provided to make the cable as long as it needs to be.

Procedure

- 1 Produce the cable from the responder driver unit to the converter according to drawing 308850 in the drawing file chapter. The connectors are part of the converter kit.
- 2 Secure the cable and connect it.
- 3 For an optical isolation, produce the cable from the converter to the ROV according to drawing 308850 in the drawing file chapter. This connector is also provided.
- 4 Secure the cable and connect it.
- 5 Continue with fibre optical or electrical cables as needed.

Related topics

[Fibre to responder drive converter, wiring diagram, page 47](#)

Cable layout and interconnections

Topics

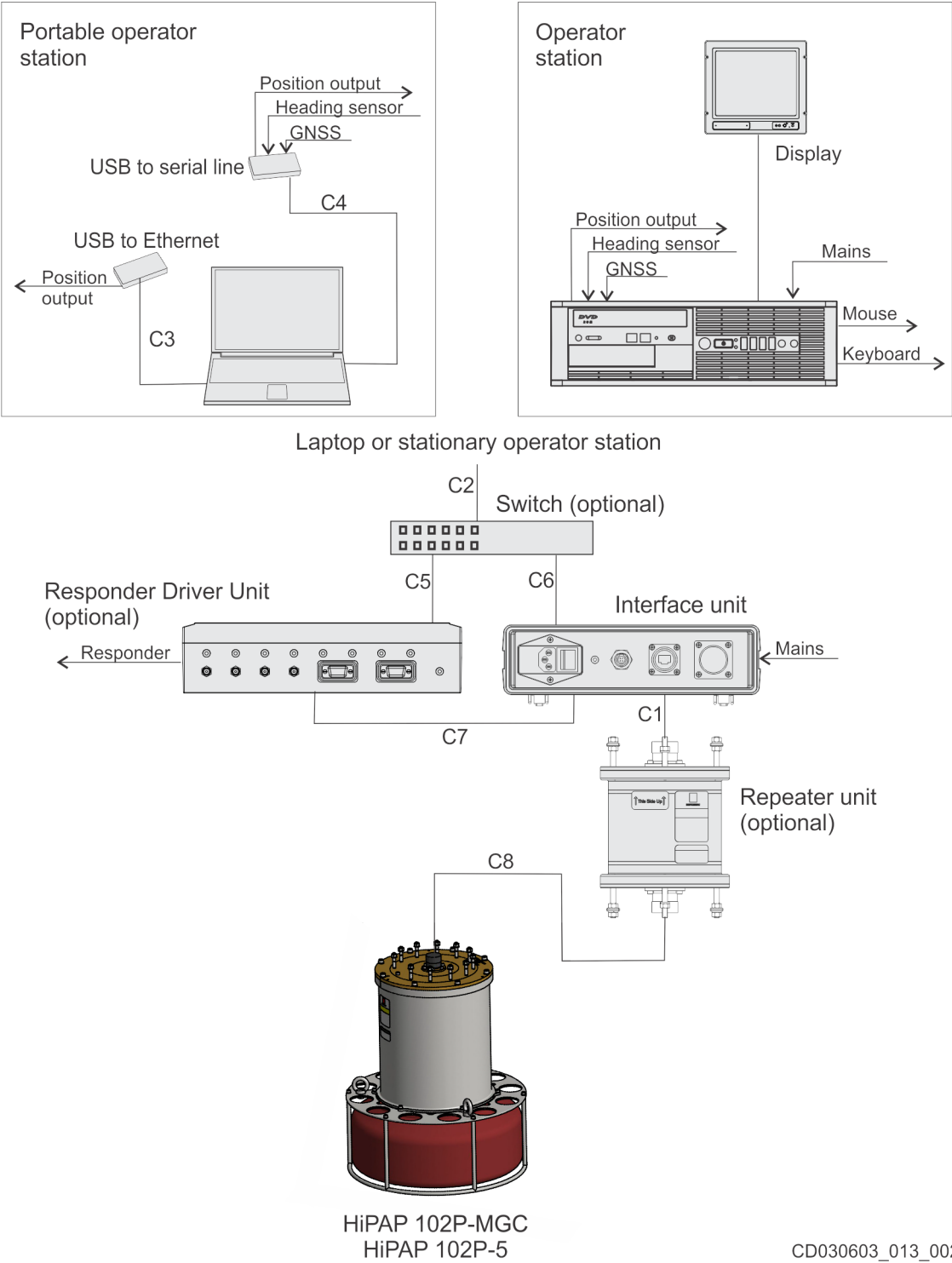
[Cable plan, page 18](#)

[List of cables, page 19](#)

[Installing the HiPAP 102P cables, page 19](#)

Cable plan

The cable plan shows the system setup and its connections.



List of cables

A set of cables is required to connect the HiPAP 102P units to each other, and to the relevant power source(s).

- C1 Transducer cable
- C2 Ethernet cable
- C3 USB cable
- C4 USB cable
- C5 Ethernet cable
- C6 Ethernet cable
- C7 Responder sync cable
- C8 Repeater cable

In addition:

- Standard mains cables for the interface unit, operator station and responder driver unit (optional).
- Display cable, delivered with the display
- Mouse cable, delivered with the mouse
- Keyboard cable, delivered with the keyboard
- Responder cables, optical or electrical, provided by the yard

Installing the HiPAP 102P cables

Topics

[Connecting the transducer cable, page 20](#)

[Connecting the repeater cable, page 20](#)

[Connecting the Ethernet cables, page 20](#)

[Connecting the USB cables, page 21](#)

[Connecting the responder sync cable \(optional\), page 21](#)

[Responder driver cables, page 21](#)

Connecting the transducer cable

This cable C1, connects the transducer to the interface unit.

Prerequisites

Determine if 70 meters is enough, or if you have to use a repeater unit. See the procedure for the repeater unit.

Procedure

- 1 Secure the transducer cable from the interface unit to the transducer, making sure the subsea connector ends by the transducer.
- 2 Connect the subsea connector to the transducer.
- 3 Connect the topside connector to the interface unit.

Connecting the repeater cable

This cable C8, connects the repeater unit to the transducer.

Procedure

- 1 Secure the transducer cable C1, from the interface unit to the repeater unit making sure the subsea connector is at the repeater end.
- 2 Secure the cable from the repeater unit to the transducer.
- 3 Connect the transducer cable's topside connector to the interface unit.
- 4 Connect the transducer cable's subsea connector to the repeater unit's upper connector.
- 5 Connect the repeater cable's connectors to the transducer and the lower end of the repeater unit.

Connecting the Ethernet cables

These cables C2, C5 and C6 connects the interface unit, the operator station and the responder driver unit (optional).

Prerequisites

Systems with a responder driver unit and the systems where the Ethernet cable needs to be > 100 m, need a switch.

Procedure

- 1 Secure the cable C2 between interface unit and operator station. For systems with a switch, secure the cable between the switch and the operator station.
- 2 Connect the Ethernet cable C2 to the Ethernet port on the operator station.

- 3 Connect the other end of the Ethernet cable C2 to the interface unit for systems without a switch, otherwise connect C2 to the switch.
- 4 For systems with a switch secure the cable C6 between the switch and the interface unit and connect.
- 5 For systems with a responder driver unit secure the cable C5 between the responder driver unit and the switch and connect.

Connecting the USB cables

These cables, C3 and C4 give the portable operator station Ethernet and serial lines.

Context

The USB to serial line and the USB to Ethernet units are commercial and may vary, depending on available models.

Procedure

- 1 Secure the cable C3 from the USB to Ethernet unit to the operator station.
- 2 Secure the cable C4 from the USB to serial line unit to the operator station.
- 3 Connect all cables.

Connecting the responder sync cable (optional)

This cable C7, synchronises the signals from the responders to the HiPAP system.

Procedure

- 1 Secure the cable C7 from the responder driver unit to the interface unit, making sure the D-sub connector ends by the responder driver.
- 2 Connect the cable.

Related topics

[Responder driver unit, wiring diagram, page 46](#)

Responder driver cables

These cables are provided by the yard.

Prerequisites

The signal cables to the responder consists of 2 dsub connectors for electrical signals, responder 1–4 and 4 fibre optical connectors for optical signals, responder 5–8.

Pinout Responder drive signal 1 to 4 for Responder Drive Unit

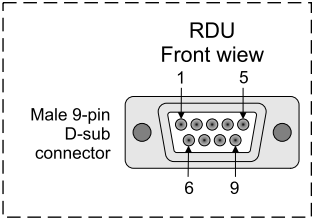
Responder 1	9p D-sub
Power 1 +24V	1
Drive signal 1	2
Ground	3

Responder 2	9p D-sub
Power 2 +24V	6
Drive signal 2	7
Ground	8

Responder 3	9p D-sub
Power 3 +24V	1
Drive signal 1	2
Ground	3

Responder 4	9p D-sub
Power 4 +24V	6
Drive signal 2	7
Ground	8

Male 9-pin D-sub connector



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Procedure

- 1 Secure the cable from the responder driver unit to the responder.
Use a fibre to electrical signal converter if necessary.
- 2 Connect the cable.

Related topics

[Responder driver unit, wiring diagram, page 46](#)

Alignment for integrated navigation

Topics

[Horizontal and vertical offset, page 24](#)

[Motion and heading alignment, page 24](#)

Horizontal and vertical offset

This procedure is done along the quay. The best way is to use a survey company is to measure the offsets.

Prerequisites

All measurements must be more accurate than 0.05 metres.

Context

Procedure

- 1 Measure the distance from the transducer to the vessel's reference point, either from the vessel's drawing or from real life measurements.
- 2 Measure the distance from the GNSS to the vessel's reference point, either from the vessel's drawing or from real life measurements.

Motion and heading alignment

This procedure is done at sea.

Prerequisites

Horizontal and vertical offset must be finished and entered into APOS.

Water depth of approximately 200 metres and a fixed transponder at the seabed is needed for the alignment.

The following equipment is required:

- The APOS computer that takes the HiPAP position and integrates with the surface navigation system.
- The surface navigation must be a good DGNSS or a system with equal accuracy.
- A sound velocity profile should be taken and entered to the system for increased accuracy.

Procedure

- The alignment correction is found by using four cardinal points. See APOS online help.

Operational procedures

See APOS online help.

Maintenance

Topics

[Preventive maintenance schedule, page 27](#)

[Cleaning the transducer unit, page 27](#)

[Backup, page 28](#)

Preventive maintenance schedule

In order to secure long and trouble-free operation of the HiPAP 102P, certain specific preventive maintenance tasks must be done. The tasks are organized in a preventive maintenance schedule.

- After use
 - Clean the transducer
 - Clean the repeater unit
 - Lubricate the connectors
 - Check that all fasteners are tightened
 - Check that there are no physical damage to the unit
- Every month
 - Dust the units
 - APOS backup
- Every sixth month
 - Check all cable connections
 - Check all units for damage

Cleaning the transducer unit

The transducer must be cleaned every time it's retrieved from the sea.

Procedure

- 1 Wash the transducer with lots of fresh water to reduce corrosion.

Caution

Do not use high-pressure washers, this will damage the transducer.

- 2 Inspect for damages or growth.
- 3 Remove any growth with a brush or a wooden scraper. Never use any metal, this will damage the transducer.
- 4 Lubricate the connector with silicone grease.

Backup

For backup procedures, refer to the Backup files document, doc no 859-216300. This is a separate manual supplied at system delivery.

You are advised to take back-up of all operator stations at regular intervals (1-3 months), and every time major changes have been performed in the configuration and /or user settings.

Important

A system backup must be performed when the software has been upgraded.

Spare parts

Topics

[Portable operator station spare part, page 30](#)

[Operator station spare part, page 30](#)

[HiPAP 102P-MGC spare part, page 30](#)

[HiPAP 102P-5 spare part, page 31](#)

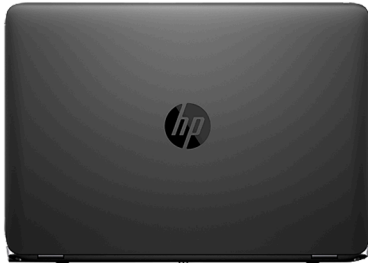
[Interface unit spare part, page 31](#)

[Repeater unit spare part, page 31](#)

[Responder driver kit spare part, page 32](#)

Portable operator station spare part

Portable operator station for the portable HiPAP system.



- **Part name:** Portable operator station
- **Part number:** 719-079874

Operator station spare part



- **Part name:** Operator station
- **Part number:** 413084

HiPAP 102P-MGC spare part



- **Part name:** Transducer HiPAP 102P-MGC
- **Part number:** 404499

HiPAP 102P-5 spare part



- **Part name:** Transducer HiPAP 102P-5
- **Part number:** 404448

Interface unit spare part



- **Part name:** HiPAP Interface unit
- **Part number:** 300134

Repeater unit spare part



- **Part name:** Repeater unit
- **Part number:** 399779

The repeater is delivered with cable.

Responder driver kit spare part



- **Part name:** HiPAP Responder driver kit
- **Part number:** 321990

The responder driver kit comes with:

- Responder driver unit
- Power adapter
- Trigger cable
- Parts for responder driver unit
 - 4 M4x25 bolts
 - 4 M4 spring washers
 - 4 M4 nuts
 - 3 D-SUB connector
 - 3 D-SUB connector cover
 - Power cable 3 m
 - Ethernet cable, cat. 6
- 2 Ethernet cables, cat. 6
- Ethernet switch

Technical specifications

Topics

[Performance specifications, page 34](#)

[Weights and outline dimensions, page 35](#)

[Power specifications, page 36](#)

[Environmental specifications, page 37](#)

Performance specifications

These performance specifications summarize the main functional and operational characteristics of the HiPAP 102P.

HiPAP 102P System

	HiPAP 102P-MGC	HiPAP 102P-5
S/N [dB rel. 1μPa]	20	20
Angular accuracy, (x and y direction) [°] (At 0° elevation)	0.14	0.14
Position accuracy [°] (At 0° elevation)	0.1	0.11
Cymbal, range accuracy, 1σ [m]	0.01	0.02
Range accuracy, 1σ [m]	0.1	0.1
Receiver beam [°]	15	15
Operational coverage[°]	±90	±90
Main coverage [°]	±60	±60

Angular accuracy (X & Y direction) [°] is the accuracy in each of the x and y axis.

Position accuracy [°] is the combined accuracy of both axis ($\sqrt{x^2 + y^2}$)

Operational coverage defines the sector where acoustic positioning and communications are operational.

Main Coverage is the sector where maximum range and angular accuracy can be achieved.

Outside the main coverage range and elevation angular accuracy are reduced, therefore a depth input for aiding is recommended. Whilst within the main coverage, range is up to 13.000 m, operational tests show ranges out to 3500 m at 86 degrees or near the horizontal.

Transducer unit

Transducer	Roll	Pitch	Heading
102P-MGC	0.01@ > 1 h (1 σ)	0.01@ > 1 h (1 σ)	0.025@ > 1 h [° sec lat] (1 σ)

@ > 1 h: obtained after one hour of operation.

For 102P-5 – See Kongsberg MRU 5 specification.

Weights and outline dimensions

These weights and outline dimension characteristics summarize the physical properties of the HiPAP 102P system.

Transducer unit

Transducer	Weight	Height	Diameter
102P-MGC	80 kg	556 mm	477 mm
102P-5	80 kg	556 mm	477 mm

Operator station

	Weight	Height	Width	Depth
Computer:	7.6 kg	103 mm	337 mm	384 mm
Display:		444 mm	483 mm	82 mm
Keyboard:	0.5 kg		298 mm	142 mm

Portable operator station

Weight	Height	Width	Depth
approximately 2 kg	21 mm	340 mm	240 mm

Transport case for transducer, notebook, interface unit and cables

Weight	Height	Width	Depth
approximately 15 kg	510 mm	650 mm	242 mm

Interface unit

Weight	Height	Width	Depth
3.7 kg	78 mm	258 mm	324 mm

Responder driver unit

Weight	Height	Width	Depth
2.8 kg	73 mm	280 mm	200 mm

Repeater unit

Weight	Height	Diameter
11.5 kg	279 mm	199 mm

Related topics[MP5810 Computer, page 42](#)[HiPAP 102P-MGC and 102P-5, outline dimensions, page 41](#)[Interface unit, outline dimensions, page 43](#)[Repeater unit, outline dimensions, page 44](#)[Responder driver unit, outline dimensions, page 45](#)

Power specifications

These power characteristics summarize the supply power requirements for the HiPAP 102P.

Operator station

	Value
Voltage:	110/220 VAC, 50/60 Hz autosensing, 240 W 85+ autosensing power
Maximum voltage deviation:	15%
Maximum current draw:	5 A
Normal current draw:	0.5 A
Nominal power:	150 W

Portable operator station

	Value
Voltage requirement:	100–240 VAC, 50/60 Hz, 1.7 A (AC Adapter)

Interface unit

	Value
Voltage requirement:	85 to 264 VAC
Frequency:	47 to 63 Hz
Output power:	48 VDC
Nominal power:	350 W
Maximum current drawn:	4 A at 115 VAC / 2 A at 230 VAC
Normal current drawn:	0.5 A (depending on current load)

Repeater unit

	Value
Voltage requirement:	48 VDC

Responder driver unit

	Value
Power:	85 to 264 VAC
Frequency:	40 to 440 Hz
Maximum inrush:	5 A AC
Maximum current drawn:	0.4 A
Normal current drawn:	0.06 A
Nominal power consumption:	15 W

Environmental specifications

These environmental specifications summarize the temperature and humidity requirements for the HiPAP 102P.

Transducer unit

	Value
Maximum operating temperature in air:	35°C
Maximum operating temperature in water:	35°C
Storage temperature:	–40 to +70°C
Storage/operating humidity:	95% / 85% relative (non condensing)
Depth rating:	50 m
Vibration range	5–100 Hz
Vibration excitation level:	5-13.2 Hz ±1.5 mm, 13.2-100 Hz 1 g

Operator station

	Value
Operational temperature:	0 to 55°C
Storage temperature:	-20 to 70°C
Humidity:	5 to 95% (non-condensing)

Portable operator station

	Value
Operational temperature:	5 to 35°C
Storage temperature:	-20 to +70°C
Relative humidity:	10 to 90 % (non-condensing)

Interface unit

	Value
Operating temperature:	10 to 55°C
Storage temperature:	10 to +70°C
Storage/operating humidity:	5 to 95% relative (non condensing)
Vibration range	5–100 Hz
Vibration excitation level:	5-13.2 Hz ± 1.5 mm, 13.2-100 Hz 1 g

Responder driver unit

	Value
Protection:	IP44
Operation temperature:	0 to 55°C
Storage temperature:	-40 to 75°C
Humidity:	15% to 95% (non condensing)
Vibration range:	5 to 100 Hz
Vibration excitation level:	5 to 13.2 Hz ± 1.5 mm, 13.2 to 100 Hz 1 g

Repeater unit

	Value
Operating temperature:	-10 to 45°C
Storage temperature:	-20 to +70°C
Storage/operating humidity:	5 to 95% relative (non condensing)
Depth rating:	50 m

Drawing file

Topics

[Installing the transducer to the ship's side pole, page 40](#)

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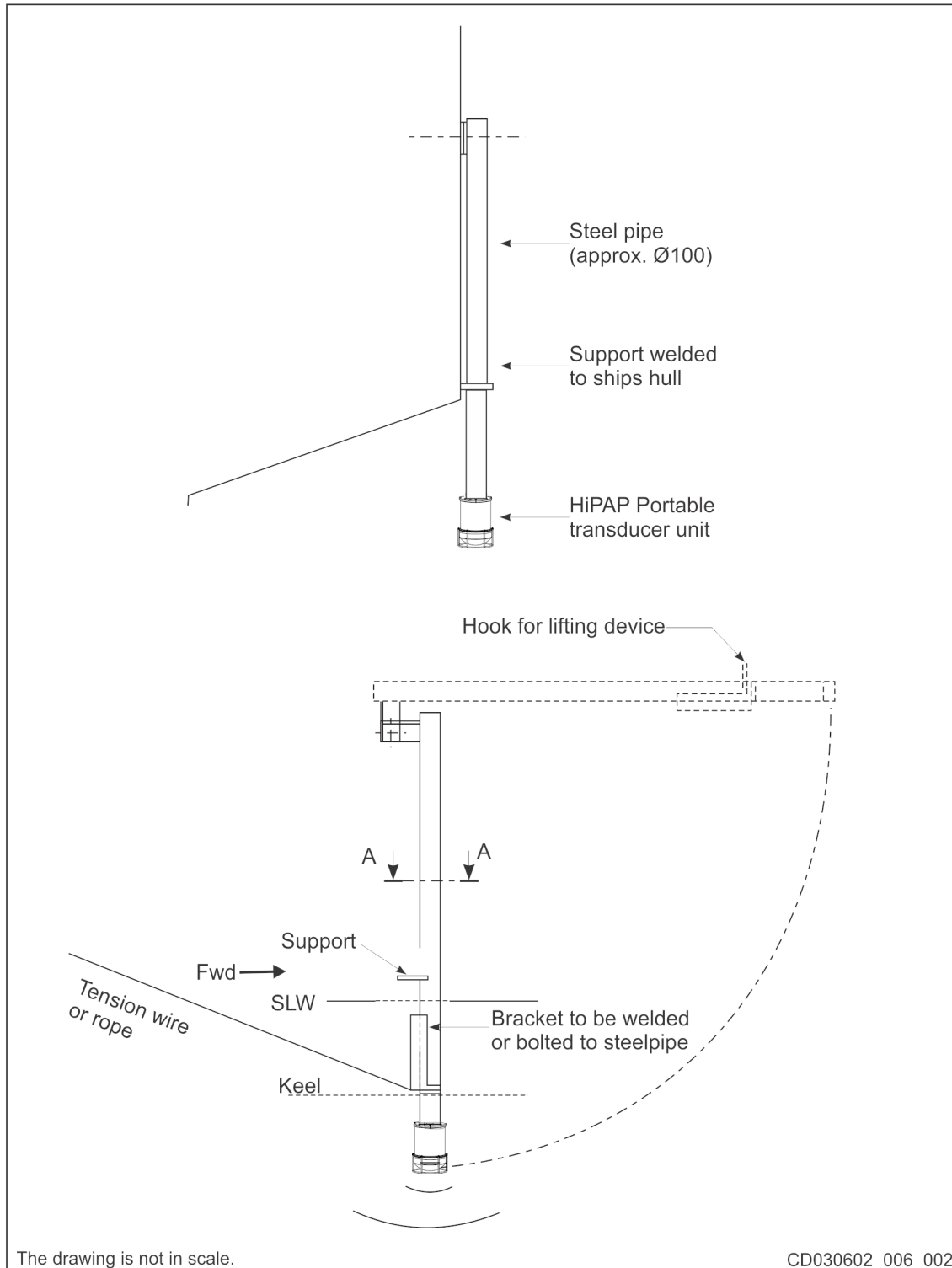
[Responder driver unit, outline dimensions, page 45](#)

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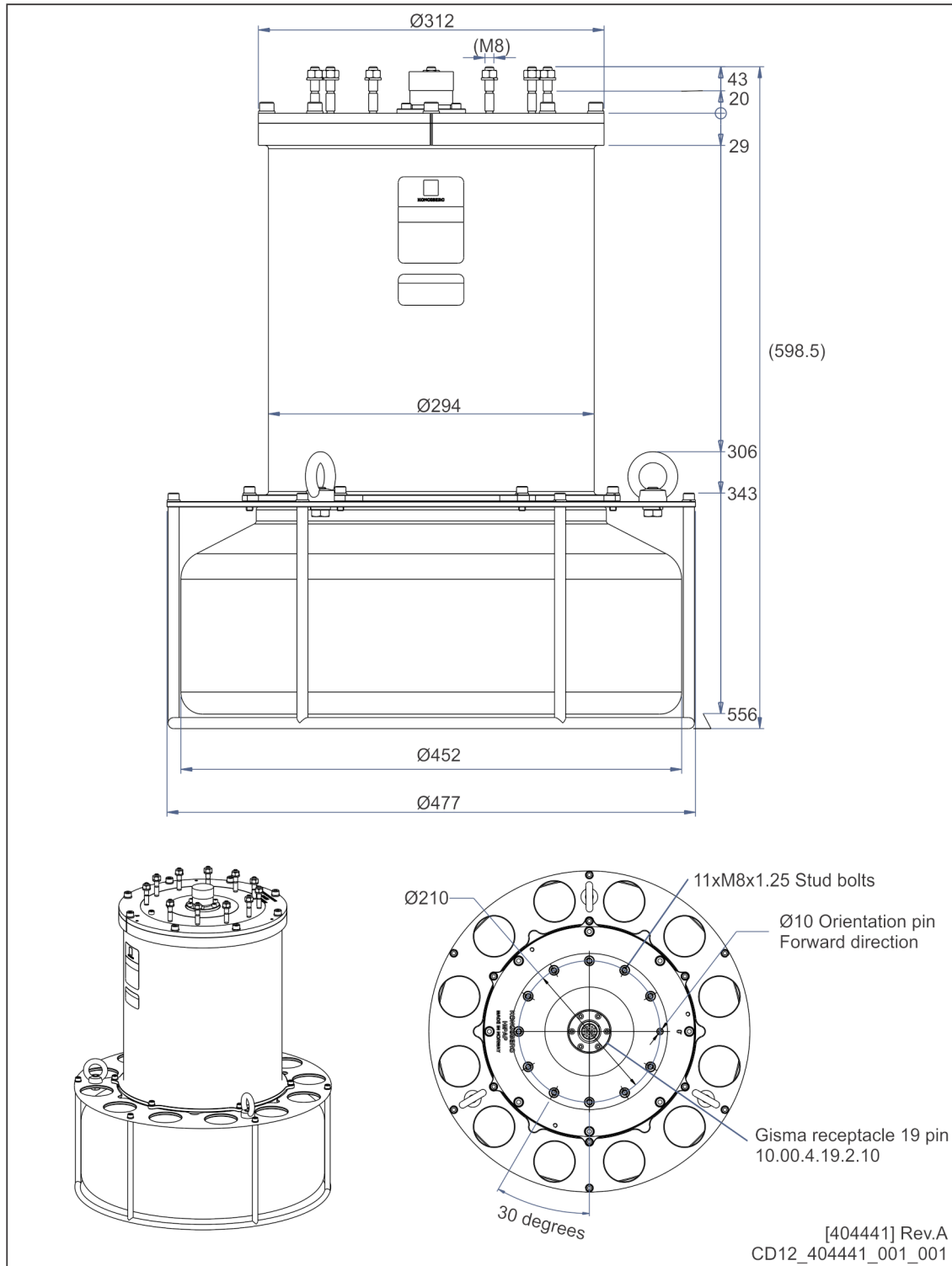
Installing the transducer to the ship's side pole

This is an example of how to install the portable HiPAP transducer to the pole.

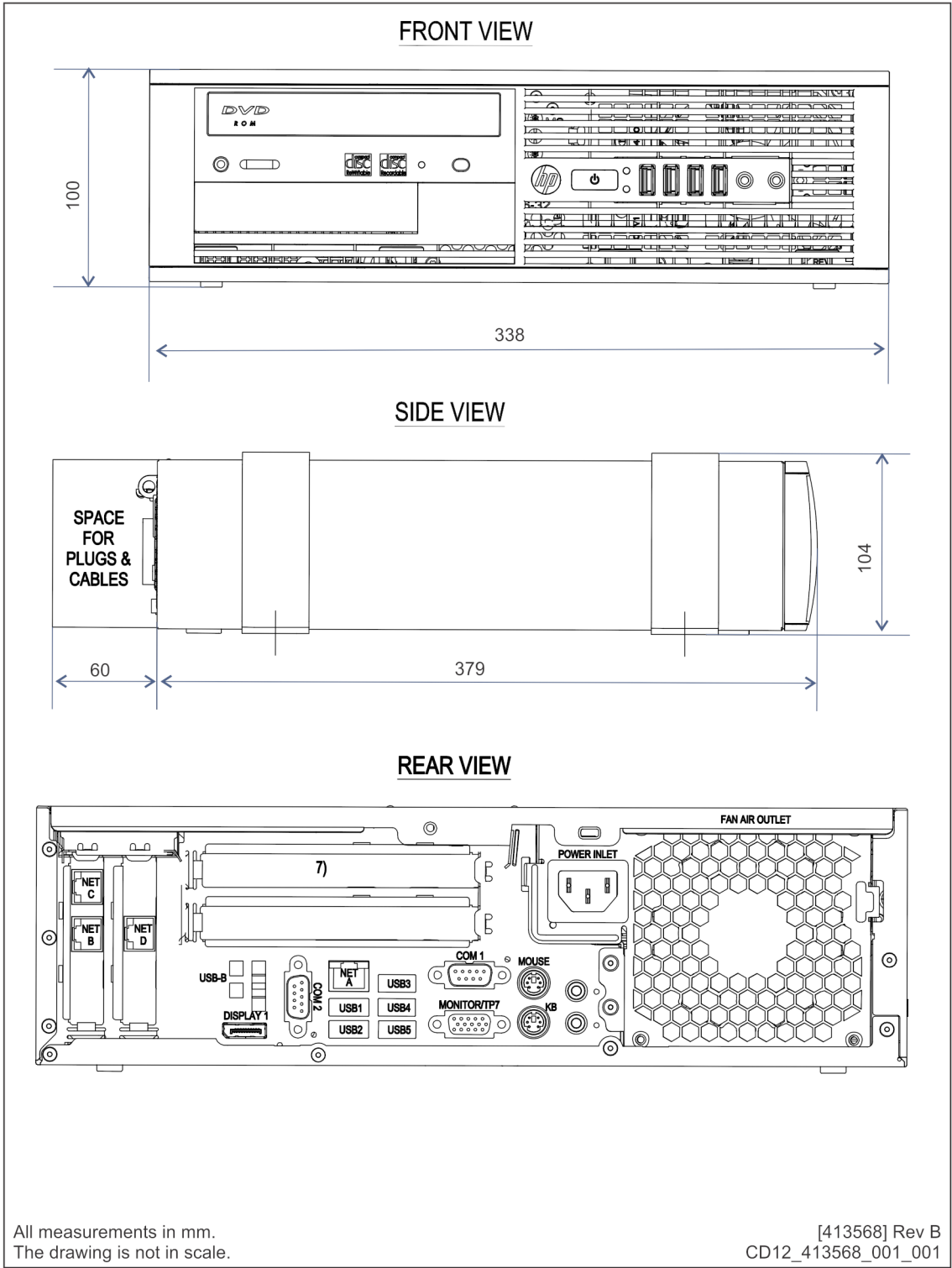


HiPAP 102P-MGC and 102P-5, outline dimensions

Drawing 404441

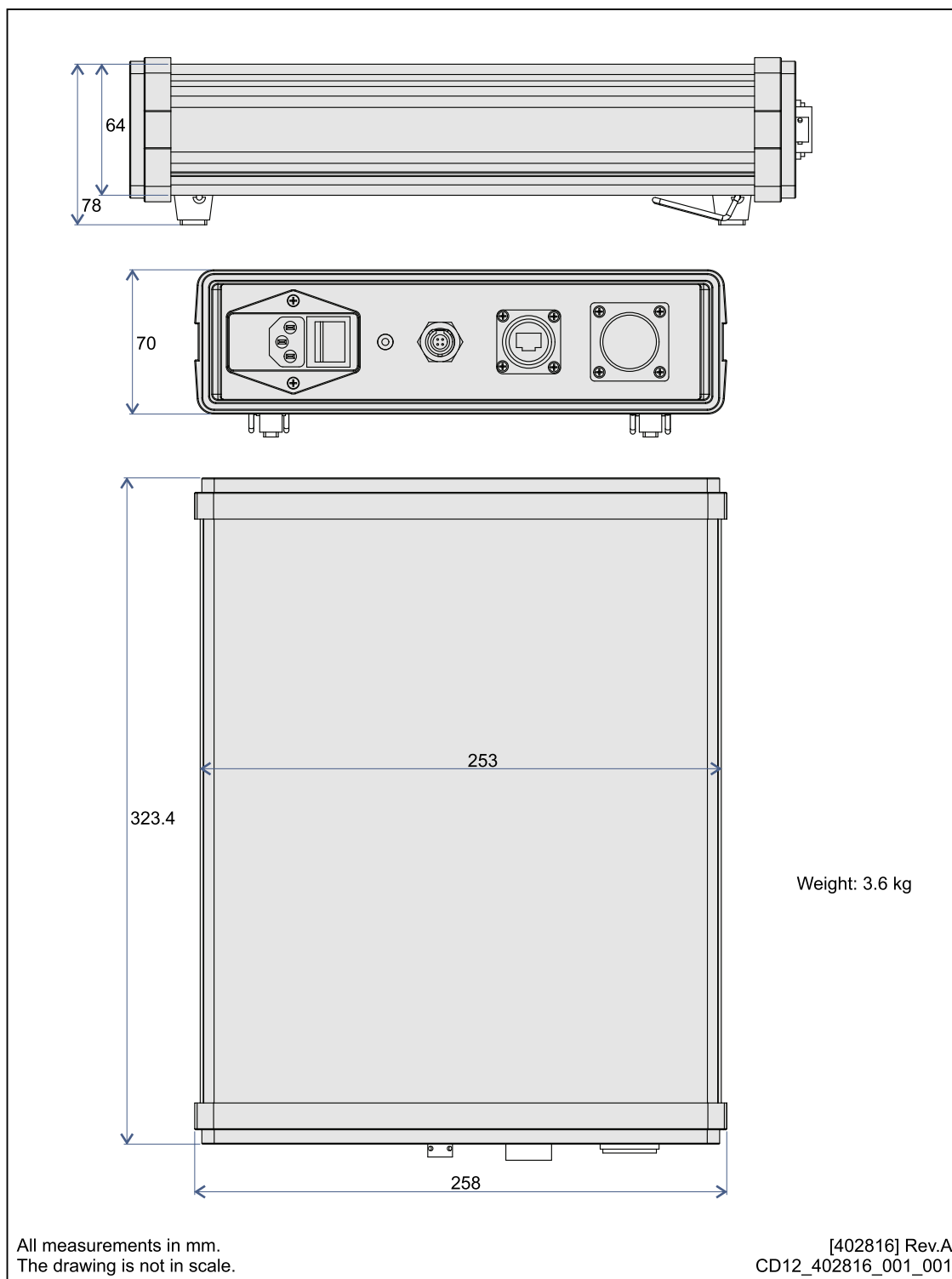


MP5810 Computer



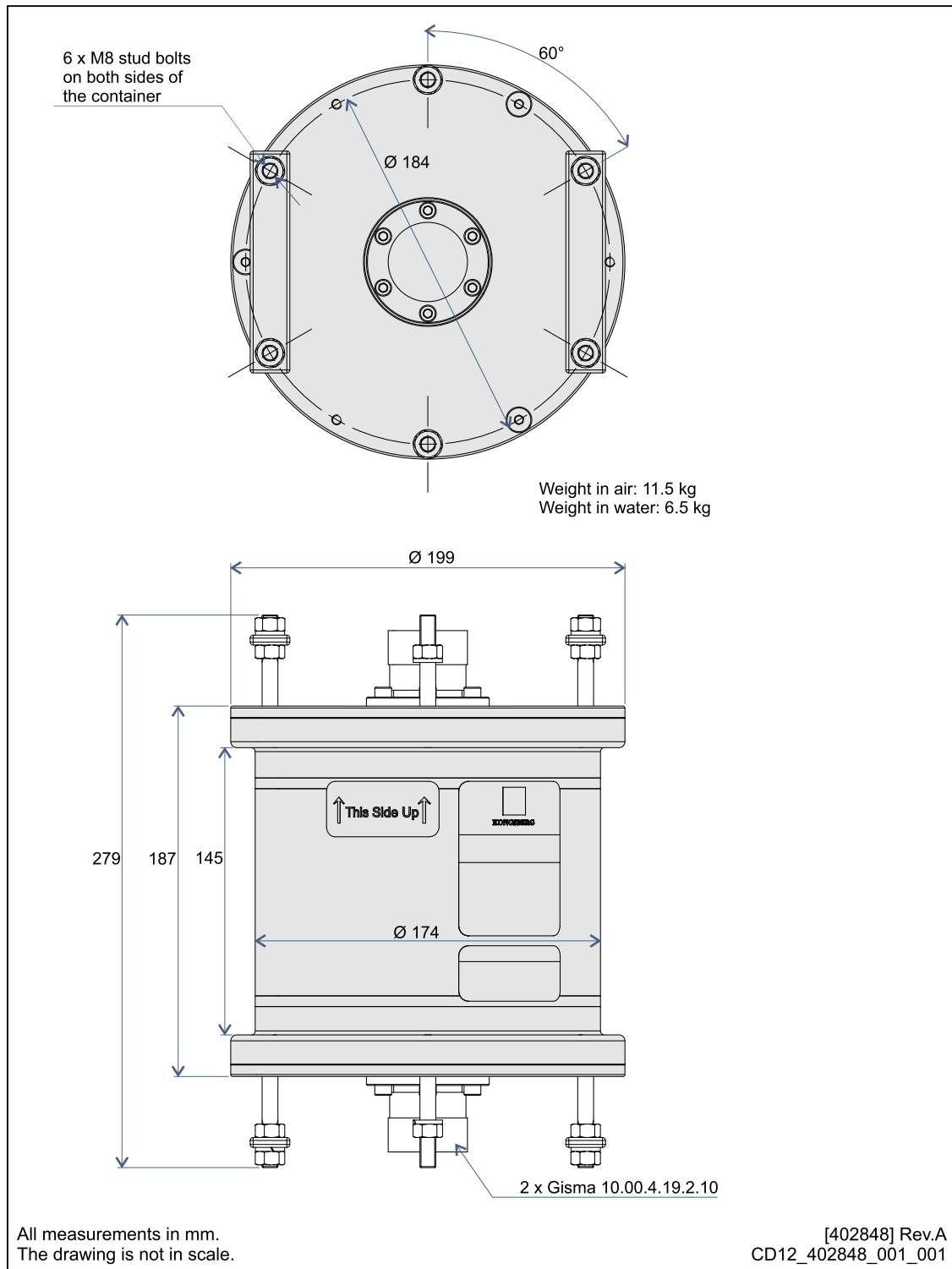
Interface unit, outline dimensions

Drawing 402816



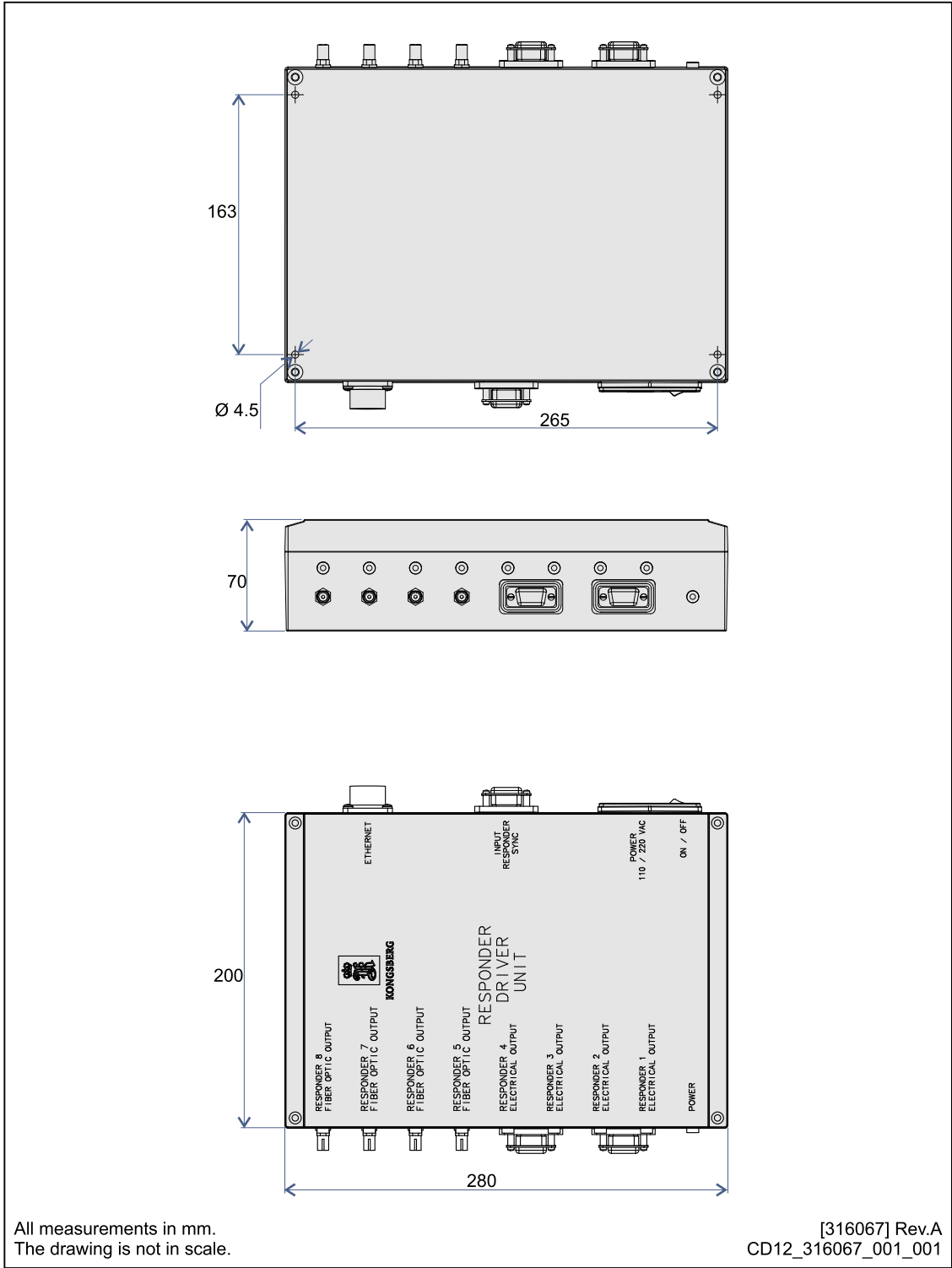
Repeater unit, outline dimensions

Drawing 402848



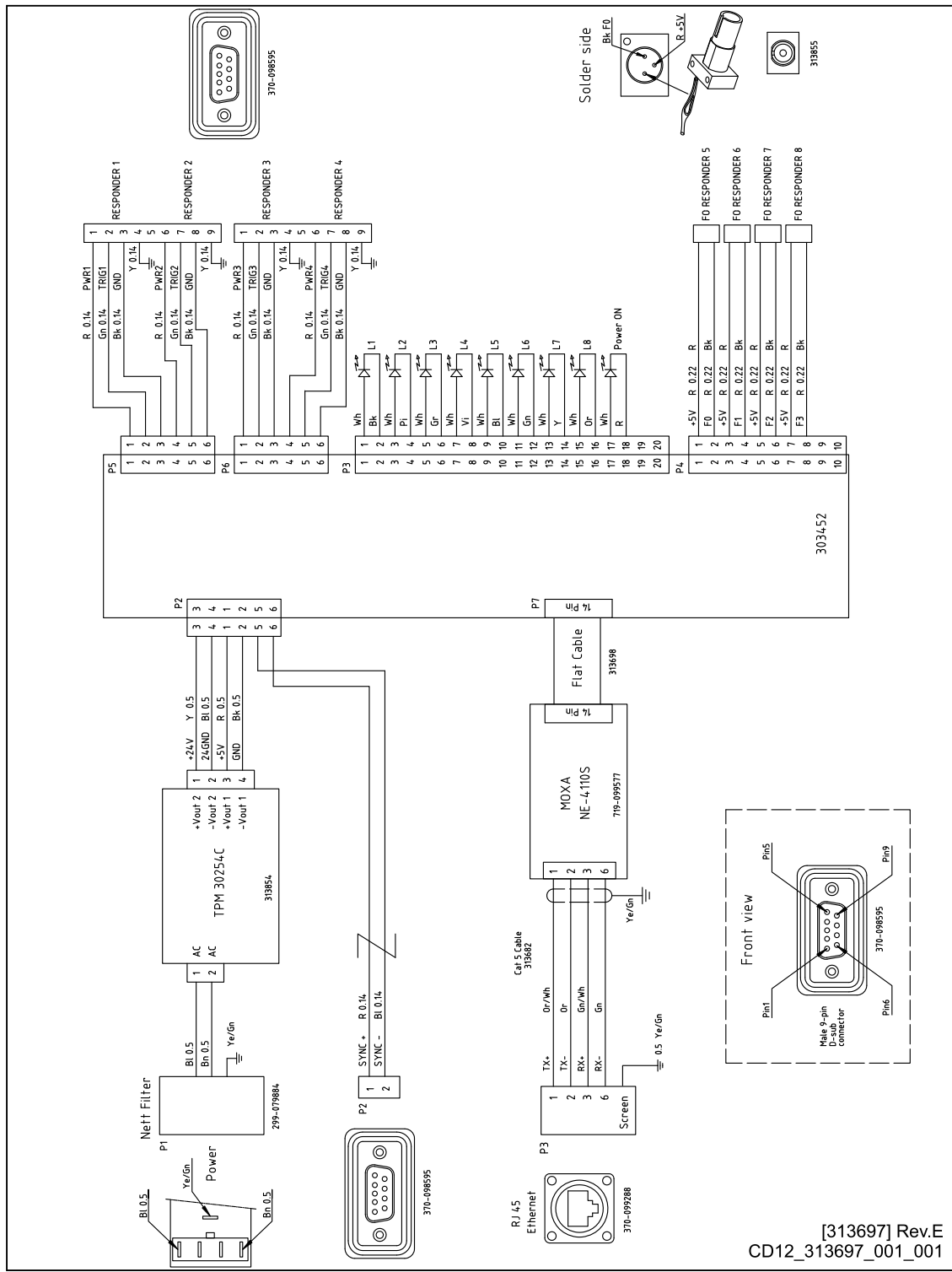
Responder driver unit, outline dimensions

Drawing 316067



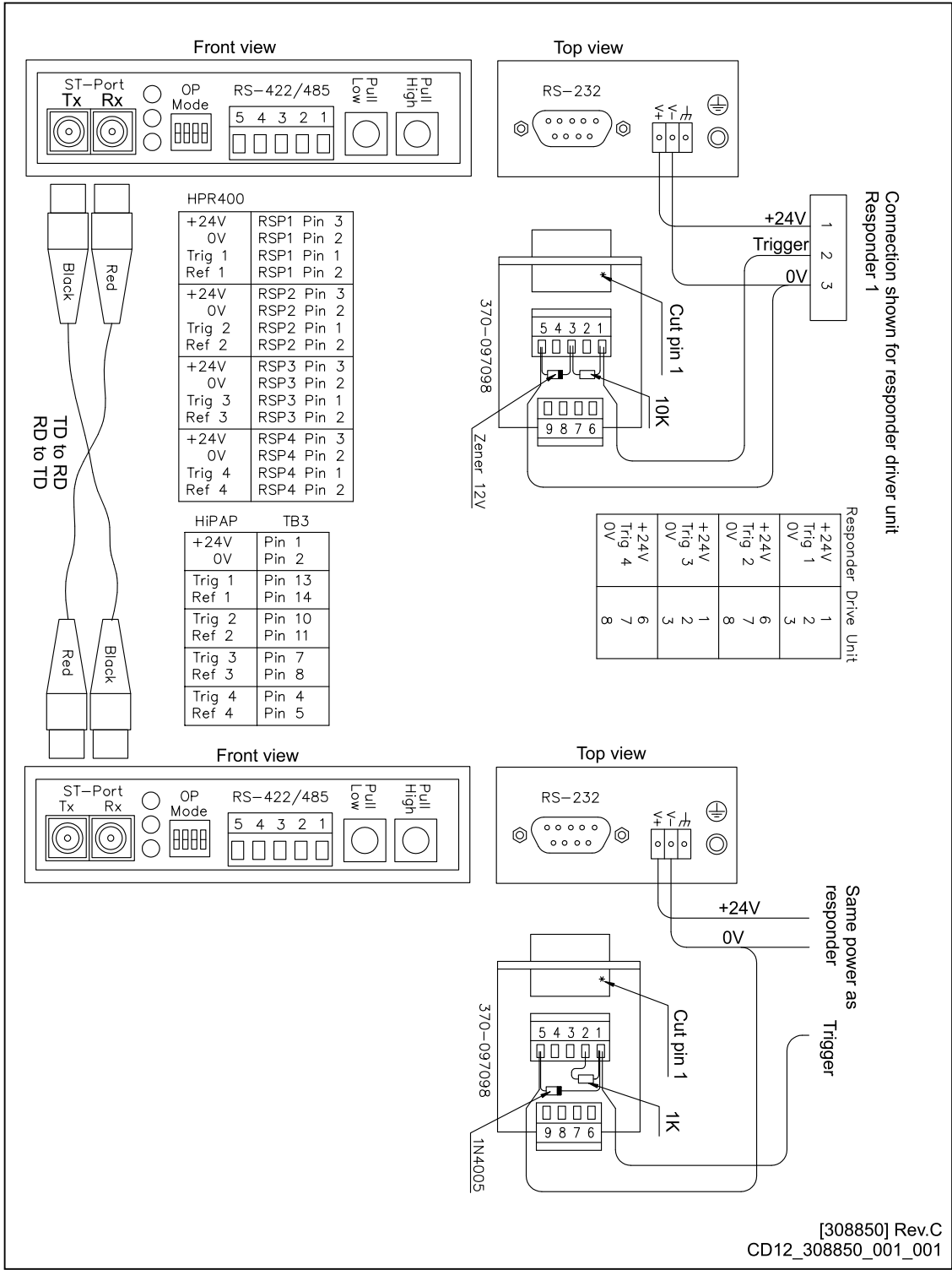
Responder driver unit, wiring diagram

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Fibre to responder drive converter, wiring diagram

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