KONGSBERG

HiPAP 502P

502P/452P system

Instruction Manual

440337/B

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

Disclaimer

Kongsberg Discovery 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 Kongsberg Discovery's support organisation. You can also contact us at the following email address: support.hpr@kd.kongsberg.com. If you need information about our other products, visit https://www.kongsberg.com/discovery/.

Table of contents

ABOUT THIS MANUAL..... 7
KONGSBERG HIPAP 502P..... 8
System description..... 9
System diagram..... 9
System units..... 11
Computer..... 11
Transceiver..... 11
Responder Driver unit (optional)..... 12
APOS - the HiPAP operator system..... 12
HiPAP 500 Portable transducer..... 12
General supply conditions..... 12
Receipt, unpacking and storage..... 13
Equipment responsibility..... 13
Support information..... 14
INSTALLATION..... 15
Installing the computer in a 19" rack..... 16
Installing the computer with a KM1000 kit..... 16
Installing the transceiver..... 17
Installing the Responder Driver unit..... 18
CABLE LAYOUT AND INTERCONNECTIONS..... 20
Cable plan..... 21
List of cables..... 22
Yard/customer responsibilities for installation of HiPAP 502P computer..... 23
Installing the topside cables..... 23
Computer rear connectors..... 24
Connecting power and ground to the transceiver..... 25
Connecting the transducer to the transceiver..... 28
Connecting the Responder Driver unit to the transceiver..... 29
Connecting the Responder Driver unit to the responder..... 31
Converting from fibre optical to electrical signal..... 32
OPERATING PROCEDURES..... 33

TECHNICAL SPECIFICATIONS..... 34
Performance specifications..... 35
Weights and outline dimensions..... 36
Power specifications..... 37
Environmental requirements..... 38
MAINTENANCE..... 40
About Electrostatic Discharge (ESD)..... 41
Preventive maintenance schedule..... 43
Computer..... 43
Replacing the filter..... 43
Preventive maintenance intervals..... 45
Creating a backup..... 45
Transceiver unit..... 45
Replacing the Ethernet switch..... 45
Removing the LPT32 board..... 47
Replacing the LPT32 board..... 48
Removing a filter board..... 48
Replacing a filter board..... 49
Replacing the power module in the transceiver..... 50
Replacing the power module in the transceiver unit..... 53
Replacing the fan unit in the transceiver unit..... 53
Replacing the terminal block in the transceiver unit..... 54
Replacing a fuse in the transceiver unit..... 54
SPARE PARTS..... 56
Computer..... 57
HiPAP 500 transducer..... 57
Transceiver unit..... 58
LPT32 Transceiver board Spare part..... 58
LPT32 Filter board Spare part..... 58
Power supply Spare part..... 58
Ethernet switch Spare part..... 58
Fan unit Spare part..... 58
DRAWING FILE..... 60
Computer dimensions..... 61
Transceiver – dimensions..... 62

435248 Transceiver unit - Wiring diagram.....63
433851 Transducer – dimensions.....64
Transducer–minimum bending radius.....65
433953 Sensor reference point.....66
Responder Driver Unit dimensions.....67
Responder driver unit, wiring diagram.....68
Fibre to responder drive converter wiring.....69
EQUIPMENT HANDLING.....70
Inspection of units and transportation boxes after arrival.....71
Unpacking standard parts and units.....71
Specifications for storage after unpacking.....73
Transporting Kongsberg Discovery equipment.....74
INDEX.....76

About this manual

This manual contains all the necessary documentation for the safe installation, operation and maintenance of 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/discovery/

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Kongsberg HiPAP 502P

Topics

System description, page 9

System diagram, page 9

System units, page 11

General supply conditions, page 12

Support information, page 14

System description

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

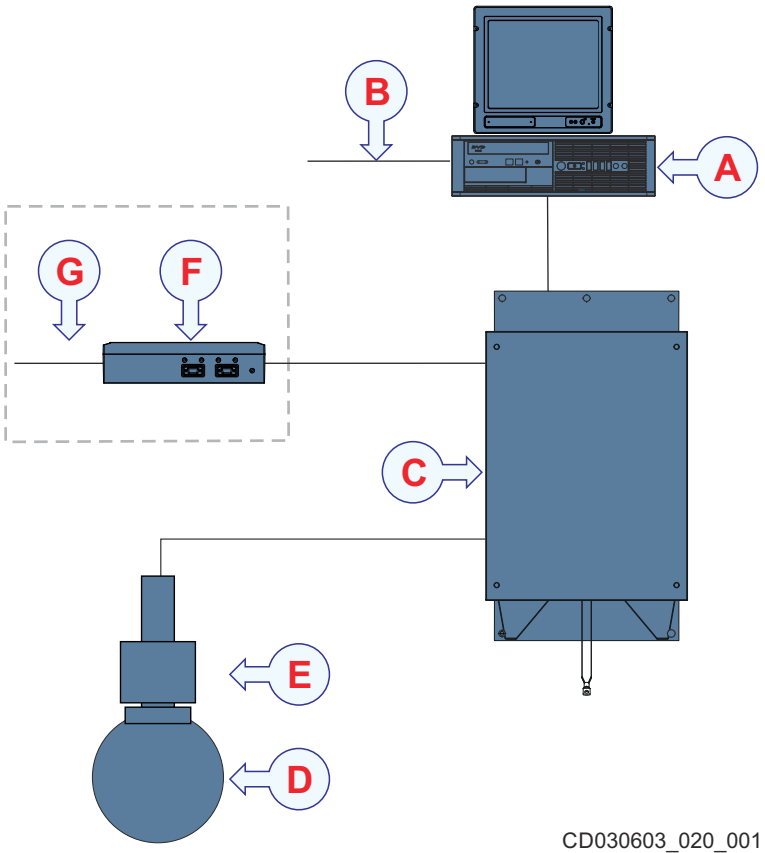
The HiPAP 502P system computes the precise position of underwater objects such as Remotely Operated Vehicles (ROVs), Autonomous Underwater Vehicles (AUVs), towed objects or fixed seabed transponders.

The system offers the user a wide range of transponder channels and cNODE transponder models.

HiPAP Portable is available in a range of models with different motion and heading sensors. Calibration of the roll and pitch alignments is not required on these models, but it may be necessary to calibrate for alignment with the ship's gyro compass. The transducers are designed to be mounted on a shaft for installation over the side or through a ship’s moon pool.

System diagram

The system diagram identifies the main components of a basic HiPAP 502P system. Only the main connections between the units are shown. Detailed interface capabilities and power cables are not shown.



A. *Computer*

B. *Interfaces*

- *Attitude (roll, pitch and heave)*
- *Heading*
- *Positioning systems*

C. *Transceiver*

D. *Transducer*

E. *Motion and heading sensor*

F. *Responder Driver unit (optional)*

G. *Responder*

System units

Computer

The HiPAP system is operated through either one or several operator stations or computers.

The computer consists of the following main units:

- Computer
- Display
- Keyboard and mouse

Computer

The computer is an 8 channel serial line model. It is built on a high performance CPU running a Microsoft Windows 7 operating system. The computer can be installed inside operator station consoles by using specific brackets or as a stand alone unit.

Display

Refer to the separate manual supplied with the display.

Keyboard and mouse

The keyboard is a USB QWERTY keyboard with US layout. The mouse is optical with cable and USB connection.

Transceiver

The transceiver transmits pulses of acoustic energy, or sound, through water and receives reflections, or echoes, of said pulses when they are reflected back from underwater objects. A pulse of acoustic energy is commonly referred to as a ping.

The transceiver is a stainless steel cabinet that contains racks holding the system electronic modules. It contains a number of circuit boards and modules. The transceiver is designed to be installed on a suitable bulkhead and are fitted with vibration/shock absorbers to reduce the effects of vessel vibrations.

Responder Driver unit (optional)

The Responder Driver unit sends responder trigger signals to responders.

The Responder Driver unit is a stand-alone unit. The unit is interfaced to the HiPAP system via the transceiver unit. APOS controls which drive is being active while the sync/timing is received from the transceiver.

APOS - the HiPAP operator system

The HiPAP system is operated from an acoustic positioning operator station (APOS). The operator station is a Windows based computer running dedicated acoustic positioning software.

The system can be operated from one single APOS station or from a wide number of APOS operator stations connected on a network.

HiPAP 500 Portable transducer

The transducer is portable and has an integrated motion sensor. Several models are available with different motion and heading sensors.

The HiPAP 500 Portable transducer has a full spherical body that includes 241 transducer elements. The HiPAP 450 has the same transducer with disabled elements. The sensors are inside the unit that is attached to the top of the transducer.

General supply conditions

General supply conditions apply to this HiPAP 502P delivery.

Related concepts

Specifications for storage after unpacking, page 73

Related tasks

Inspection of units and transportation boxes after arrival, page 71
Unpacking standard parts and units, page 71
Transporting Kongsberg Discovery equipment, page 74

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 Discovery so that Kongsberg Discovery 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 502P warranty period (as specified in the contract) begins when the acceptance documents have been signed.

Support information

Should you need technical support for your HiPAP 502P system you must contact a Kongsberg Discovery 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.

Company name	Kongsberg Discovery AS
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Support website	Product support A to Z
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Kongsberg Discovery support is also available in the KM-Support App. Our support application is available for free in the App Store and Google Play. Search for KM-Support. The use of our support application is free of charge. Your mobile phone provider may charge you the cost of the communication.

Installation

Topics

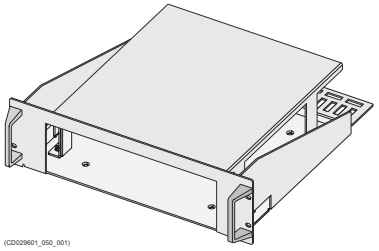
Installing the computer in a 19" rack, page 16
Installing the computer with a KM1000 kit, page 16
Installing the transceiver, page 17
Installing the Responder Driver unit, page 18

Installing the computer in a 19" rack

The computer can be installed inside a console, inside a suitable cabinet, in a 19" rack or on a desk. This procedure describes how to install the computer using rack kit 371931.

Context

Procedure



1. Remove the lid from the rack shelf.
2. Place the computer on the shelf with the front to the front of the shelf.
3. Mount the lid, and secure properly with the lock nuts and washers.
4. Mount the shelf to the rack with the cage nuts, washers and screws provided.

Further requirements

Connect the cables.

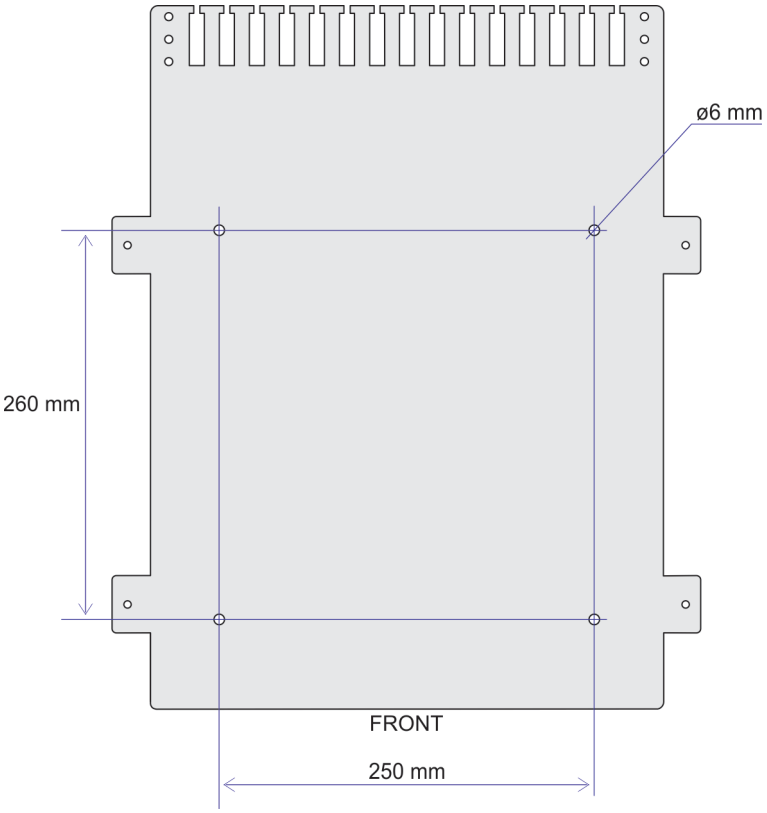
After electrical installation, secure all cables to cable fingers and holes.

Installing the computer with a KM1000 kit

The computer can be installed inside a console, inside a suitable cabinet, in a 19" rack or on a desk. This procedure describes how to install the computer using KM1000 kit (331385).

Prerequisites

Install the computer horizontal or vertical with the KM1000 kit.



Procedure

1. Prepare four holes, each for M6, following the illustration.
2. Mount the bottom plate using countersunk screws or bolts.
3. Place the computer on the bottom plate.
4. Mount the two brackets to the bottom plate using M5 locking nuts and washers.

Further requirements

Connect the cables.

After electrical installation, secure all cables to cable fingers and holes.

Installing the transceiver

The physical length of the cables limit the distance between the transducer and the transceiver.

Prerequisites

There must be a clear space of at least 500 mm in front of the unit for maintenance and 200 mm under the unit for the cables.

The transceiver unit must be mounted on a bulkhead. You do not need to remove the circuit boards or modules from the transceiver unit during the installation process. Keep the transceiver unit door on during the installation. Make sure that the unit is not exposed to dust, moisture, vibration or physical damage during the installation process.

The brackets for hanging up the transceiver is delivered with the unit.

CAUTION:

Do not weld in the vicinity of the transceiver unit. First weld the brackets, then bring in the transceiver unit.

Procedure

1. Measure and mark the locations where to mount the brackets.

   Make sure the transceiver is at a suitable height for easy access.
2. Weld the brackets to the bulkhead.
3. Clean the welds and brackets, and paint them with an appropriate preservation medium.
4. Once the paint is dry, lift the unit into position and align the unit onto the brackets.
5. Start with the upper bracket, and bolt the shock absorbers to the brackets.

Further requirements

Connect the cables.

Related concepts

About Electrostatic Discharge (ESD), page 41

Installing the Responder Driver unit

The Responder Driver unit sends responder trigger signals to responders. The Responder Driver unit is a stand-alone unit that 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 the Remote Operating Vehicle (ROV) operation room. The unit must be installed so it is easily accessible for operators to check the working condition of the responder trigger status diodes.

Procedure

1. Loosen and remove the four screws securing the lid.
2. Remove the lid and locate 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.

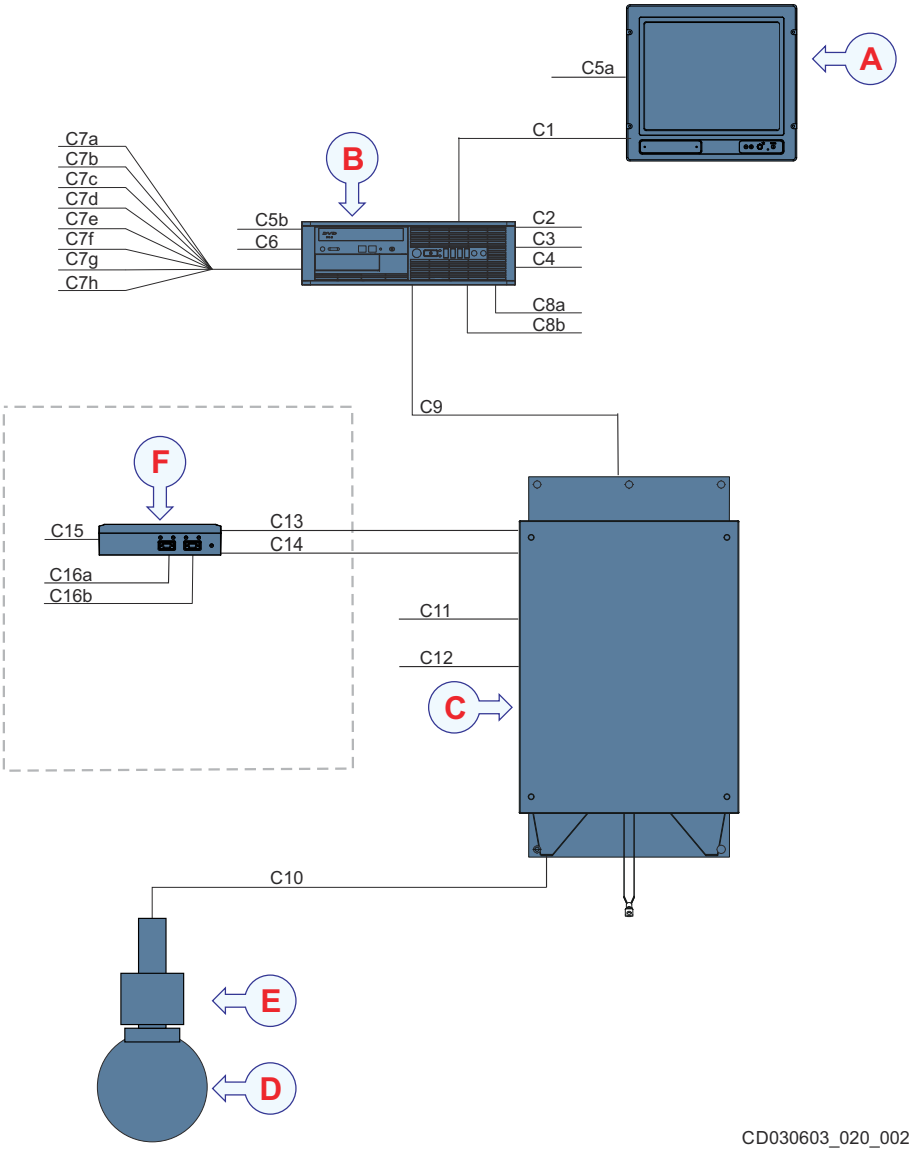
Cable layout and interconnections

Topics

Cable plan, page 21
List of cables, page 22
Yard/customer responsibilities for installation of HiPAP 502P computer, page 23
Installing the topside cables, page 23
Computer rear connectors, page 24
Connecting power and ground to the transceiver, page 25
Connecting the transducer to the transceiver, page 28
Connecting the Responder Driver unit to the transceiver, page 29
Connecting the Responder Driver unit to the responder, page 31
Converting from fibre optical to electrical signal, page 32

Cable plan

The cables are part of the delivery with the main units.



A. Display

B. Computer

C. Transceiver

D. Transducer

E. Inertial Measurement Unit

F. Responder Driver unit (optional)

List of cables

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

Cable	Type	From/To	Minimum requirements
C1	Video cable	From computer to display	
C2	Computer cable	From computer to keyboard	
C3	Computer cable	From computer to mouse (or other pointing device)	
C4	Serial cable	From computer to external device(s)	
C5 (a)	AC Power cable	From display to AC power outlet	
C5 (b)	AC Power cable	From computer to AC power outlet	
C6	Ground cable	From computer to vessel ground	
C7 (a)	Serial cable	From computer to external device(s)	Split cable 4x2x0.5 w/ screen
C7 (b)	Serial cable	From computer to external device(s)	Split cable 4x2x0.5 w/ screen
C7 (c)	Serial cable	From computer to external device(s)	Split cable 4x2x0.5 w/ screen
C7 (d)	Serial cable	From computer to external device(s)	Split cable 4x2x0.5 w/ screen
C7 (e)	Serial cable	From computer to external device(s)	Split cable 4x2x0.5 w/ screen
C7 (f)	Serial cable	From computer to external device(s)	Split cable 4x2x0.5 w/ screen
C7 (g)	Serial cable	From computer to external device(s)	Split cable 4x2x0.5 w/ screen
C7 (h)	Serial cable	From computer to external device(s)	Split cable 4x2x0.5 w/ screen
C8 (a)	Ethernet cable	From computer to local area network (LAN) A	Cat 7 * 100/ 1000 BaseTX port
C8 (b)	Ethernet cable	From computer to local area network (LAN) B	Cat 7 * 100/ 1000 BaseTX port
C9	Ethernet cable	From transceiver to computer	Cat 7 * 1000 BaseTX port
C10	Transducer cable	From transceiver to transducer	

C11	AC Power cable	From transceiver to AC power outlet	
C12	Ground cable	From transceiver to vessel ground	
C13	Ethernet cable	From transceiver to Responder Driver Unit	
C14	Serial cable	From transceiver to Responder Driver Unit	
C15	AC Power cable	From Responder Driver Unit to AC power outlet	
C16 (a)	Serial cable	From Responder Driver unit to external device(s)	
C16 (b)	Serial cable	From Responder Driver unit to external device(s)	

Yard/customer responsibilities for installation of HiPAP 502P computer

Yard/customer has to install one (1) double 115/230 VAC power sockets within 2 metres cabling distance from the computer. One (1) 115/230 VAC power cable of 2 metres length is delivered.

Yard has to install the patch panel for the system network (if delivered).

The serial number plate has to be mounted near by the computer (on the outside of the yard/customer supplied console/cabinet if the computer is mounted inside a console/cabinet).

Installing the topside cables

The topside/bridge cables include those used to connect the computer and the display to each other, to AC mains power, and to external devices. A high capacity Ethernet cable connects the computer to the transceiver.

Procedure

1. Connect the power cable from the display to the AC power outlet. (C5a)
2. Connect the power cable from the computer to the AC power outlet. (C5b)
3. Connect the cable from the computer to the keyboard. (C2)

4. Connect the cable from the computer to the mouse (or other pointing device). (C3)
5. Connect the video cable from the computer to the display. (C1)
6. Connect the ground cable from the computer to vessel ground. (C6)
   The cable must be provided by the installation shipyard.
7. Connect the Ethernet cable from the computer to the local area network (LAN). (C8 a, C8 b)
8. Connect the serial cables from the computer to the external devices. (C7)
9. Connect the Ethernet cable from the computer to the transceiver. (C9)

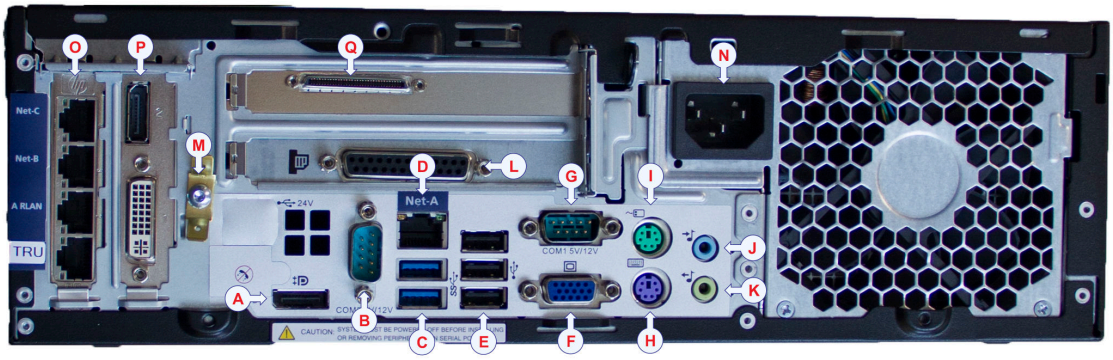
Note:

It is very important that a high-quality Ethernet cable is used.

10. Connect the ground cable from the transceiver to vessel ground. (C12)
11. Connect the power cable from the RDU to the AC power outlet. (C15)
12. Connect the cable from the transceiver to the Responder Driver Unit. (C13, C14)
13. Connect the cable from the RDU to the external device.

Computer rear connectors

The rear panel on the computer holds connectors for the various HiPAP 502P cables.



A. Display cable

B. Serial cable

C. USB cables

D. Ethernet cable

E. USB cables

F. Display cable

G. Serial cable

H. PS/2 keyboard cable

I. PS/2 mouse cable

J. Audio cable — Audio input

K. Audio cable — Audio output

L. Parallel cable

M. Ground cable

N. AC Power cable

O. Ethernet cables

P. Video cables

Q. Special cable

Connecting power and ground to the transceiver

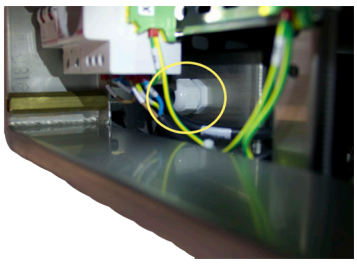
The transceiver is delivered with a power cable for test use only.

Prerequisites

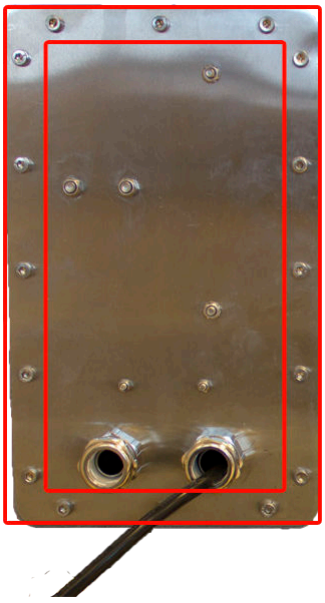
These cables must be provided by the installation shipyard.

Procedure

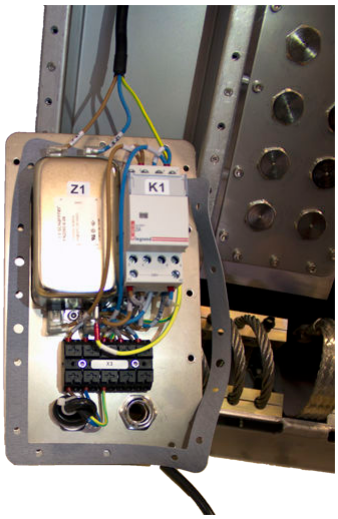
1. Manufacture the cable according to the minimum requirements provided.
2. Connect the power cable from the transceiver to the AC power outlet.
3. Loosen the cable gland on the cable to the filter. The top part needs to be loosened, not the nut.



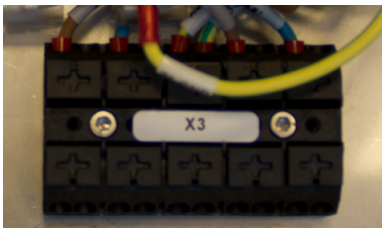
4. Remove the 16 screws on the power box underneath the transceiver cabinet.



Take care not to lose the gasket around the box.

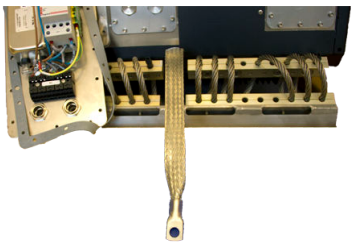


5. Remove the test cable.
6. Enter the cable through the gland, connecting it as shown in the wiring diagram and the cable description.



You can connect two power cables, for redundancy.

7. Block the cable gland not in use, if there is no redundancy in the power supply. Use a F/M20 cable gland blind plug.
8. Screw the power box back on, with the gasket fitted.
9. Fasten the cable glands, both the one loosened and the those for the power cables.
10. Connect the ground cable from the transceiver to vessel ground.



Connecting the transducer to the transceiver

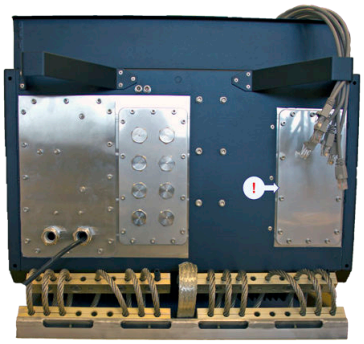
The cable is physically connected to the transducer.

Prerequisites

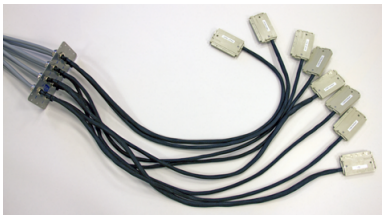
Make sure this cable moves as smooth as possible without any unnecessary wear.

Procedure

1. Remove the blind cover from underneath the transceiver on the right side, keeping the screws for the cover and EMC gasket.



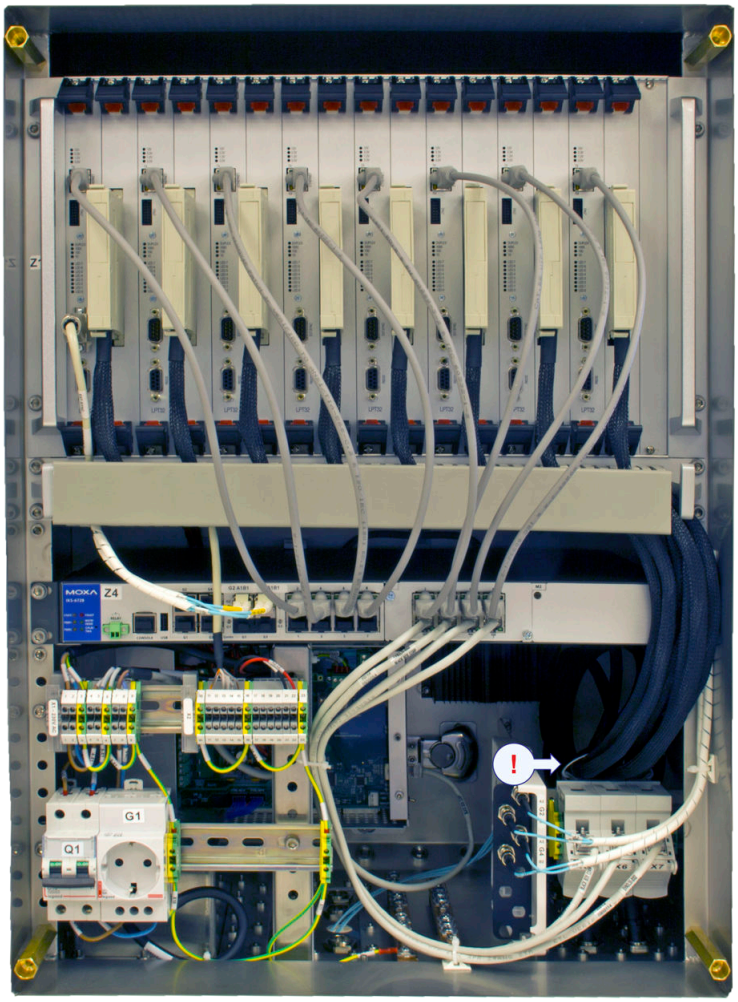
2. Insert the cable and connectors.



3. Fasten the cover.
4. Connect the individual transducer cables to the correct circuit board.

   The connectors are numbered. Circuit board 1 is to the left following in sequence to board number 8 to the far right.

5. Bundle the cables to the bracket inside the transceiver unit.



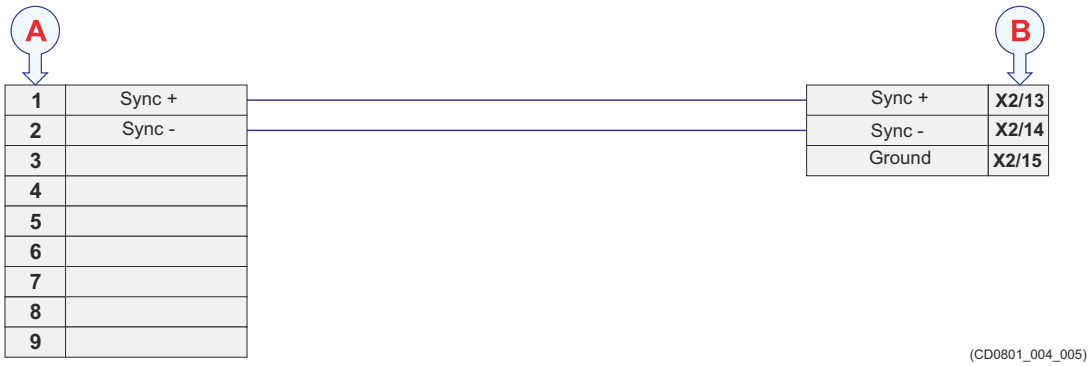
6. Connect the power cable to the X2 +48 V terminal block according to the wiring diagram.
7. Connect the Ethernet cable to the MOXA switch.
8. Close the door.

Connecting the Responder Driver unit to the transceiver

The synchronization cable for the Responder Driver unit is supplied by the yard.

Prerequisites

The 9-pin D-sub plug is delivered with the Responder Driver Unit.

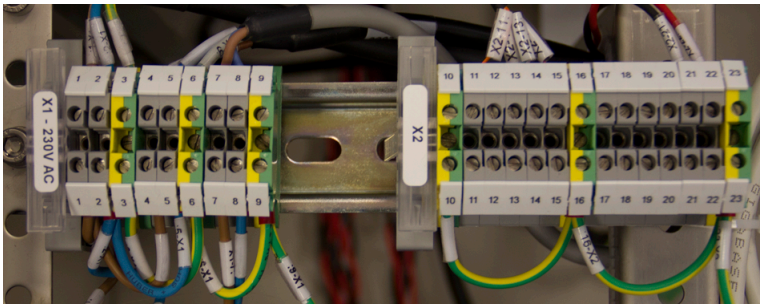


A. Responder Driver unit, **Input Responder Sync**

B. Transceiver Unit, X2

Procedure

1. Select the cable according to the specification and cut it to the needed length.
2. Install the 9-pin D-sub plug to the cable.
3. Support the cable between the transceiver and the Responder Driver Unit, making sure the D-sub connector ends at the Responder Driver Unit.
4. Remove one of the blind plugs in the bottom of the cabinet.
5. Insert the cable through one of the cable glands delivered with the transceiver cabinet.
6. Connect the wires to terminal block X2 according to the cable drawing or the wiring diagram.



7. Provide a service loop on the cable and fasten the cable gland.
8. Connect the 9-pin D-sub plug to the **Input Responder Sync** connector on the Responder Driver Unit.

Connecting the Responder Driver unit to the responder

The Responder Driver unit sends responder trigger signals to responders. Kongsberg does not supply the cables required to connect the units. The installing shipyard must supply the cables required to connect the units.

Prerequisites

The signal cables to the responder consists of 2 dsub connectors for electrical signals for responders 1–4 and four connectors for fibre optic connection to responders 5–8.

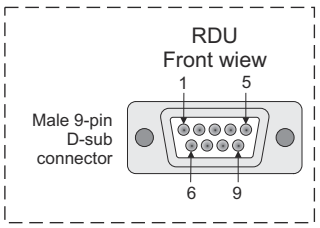
Pinout Responder drive signal 1 to 4 for Responder Drive Unit

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



CD0801_003_004

Procedure

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

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.

Operating procedures

See APOS online help.

Technical specifications

Topics

Performance specifications, page 35
Weights and outline dimensions, page 36
Power specifications, page 37
Environmental requirements, page 38

Performance specifications

These performance specifications summarize the main functional and operational characteristics of the HiPAP 502P 502P/452P system.

	S/N [dB rel. 1µPa]		
	20	10	0
Angular Accuracy (X & Y direction) [°]	0.06	0.1	0.3
Position Accuracy [°] (At 0° elevation)	0.08	0.14	0.42
Range Accuracy [m]	0.1	0.1	0.15
Cymbal Range Accuracy [m]	0.02	0.02	0.02
Receiver beam [°]	10		
Coverage [°]	±100		

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

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

Transceiver unit

The HiPAP transceiver accepts the following input formats:

Gyro

- NMEA $**HDT
- NMEA $**VHW
- Yokogawa $**HRC
- SKR
- STL

VRU/Attitude

- EM 3000
- $SPSXN,10
- $SPSXN,23

- IxSea Octans TAH ($PHOCT) R-P-H (UTC)
- IxSea Octans $PHTRO (roll and pitch)
- Ixsea Octans $PHLIN (Heave only)

For attitude data, the data rate should be at least 25 Hz, 100 Hz is recommended.

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 HiPAP 502P system.

Display

- **Model**: Hatteland Display JH19T14
- **Outline dimensions**:
  - **Depth**: 82 mm
  - **Width**: 483 mm
  - **Height**: 444 mm
- **Weight**: 11.5 kg

Computer

- **Model**: MP5810
- **Outline dimensions**:
  - **Depth**: 379 mm
  - **Width**: 338 mm
  - **Height**: 100 mm
- **Weight**: 7 kg

Transceiver Unit

- **Model**: x82
- **Outline dimensions**:
  - **Depth**: 525 mm

- **Width**: 909 mm
- **Height**: 548 mm

- **Weight**: 72 kg

Responder Driver unit

- **Outline dimensions**:
  - **Depth**: 200 mm
  - **Width**: 280 mm
  - **Height**: 73 mm
- **Weight**: 2.8 kg

Transducer

- **Model**: HiPAP 500 Portable transducer
- **Outline dimensions**:
  - **Diameter**: 392 mm
  - **Height**: 749 mm
- **Weight**: 93 kg + cables

Related references

Computer dimensions, page 61
Transceiver – dimensions, page 62
Responder Driver Unit dimensions, page 67

Power specifications

These power characteristics summarize the supply power requirements for the HiPAP 502P system.

Computer

- **Model**: MP5810
- **Voltage requirement**: 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

- **Power consumption**: 150 W

Transceiver Unit

- **Make and model**: x82
- **Voltage requirement**: 115/230 VAC — 50/60 Hz
- **Immunity**: Fast transient burst EN61000-4-4 (4kV)
- **Maximum voltage deviation**: 15 %
- **Maximum current draw**: 40 A
- **Normal current draw**: 0.8 A

Responder Driver unit

- **Voltage requirement**: 85 to 264 VAC — 40 to 440 Hz
- **Maximum inrush**: 5 A AC
- **Maximum current draw**: 0.4 A
- **Normal current draw**: 0.06 A
- **Power consumption**: 15 W

Environmental requirements

These environmental specifications summarize the temperature and humidity requirements for the HiPAP 502P 502P/452P system.

Computer

- **Model**: MP5810
- **Operating temperature**: 0 to +55 °C
- **Storage temperature**: -20 °C – 70 °C
- **Relative humidity**: 5 – 95% (relative non-condensing)

Transceiver Unit

- **Ingress protection (IP) code**: IP44
- **Vibration**: 5 to 100 Hz
- **Excitation level**: 5-13.2 Hz ± 1.5 mm, 13.2-100 Hz 1 g
- **Operating temperature**: 0 to +55 °C
- **Storage temperature**: -20 to 65 °C

- **Relative humidity**: 15 to 95% relative non-condensing

Responder Driver unit

- **Ingress protection (IP) code**: IP44
- **Vibration**: 5 to 100 Hz
- **Excitation level**: 5 to 13.2 Hz ±1.5 mm, 13.2 to 100 Hz 1 g
- **Operating temperature**: 0 to +55 °C
- **Storage temperature**: -40 to 75 °C
- **Relative humidity**: 15 to 95% relative non-condensing

Maintenance

Topics

About Electrostatic Discharge (ESD), page 41

Preventive maintenance schedule, page 43

Computer, page 43

Transceiver unit, page 45

About Electrostatic Discharge (ESD)

Electrostatic discharge (ESD) is the sudden flow of electricity between two electrically charged objects. Contact, an electrical short, or a dielectric breakdown can cause such a flow of electricity. 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 kΩ and 2 MΩ, 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 as 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 kΩ and 2 MΩ, 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.

Preventive maintenance schedule

Periodic preventive maintenance is essential to preserve reliability and ensure safe operation throughout the system's service life. The preventive maintenance activity is broken down into specific tasks and the tasks are organized periodically in a *preventive maintenance schedule*. The preventive maintenance schedule for the system is as follows:

- Whenever the system has been in use
  - Clean the transducer and remove marine growth.
  - Clean the repeater unit.
  - Lubricate the connectors.
  - Make sure that all the bolts are tightened.
  - Check that the equipment is intact, undamaged and in full working order.
- Every month
  - Dust the units.
  - Make a backup of the APOS configuration.
- Every six months
  - Check all cable connections.
  - Check that the equipment is intact, undamaged and in full working order.

Computer

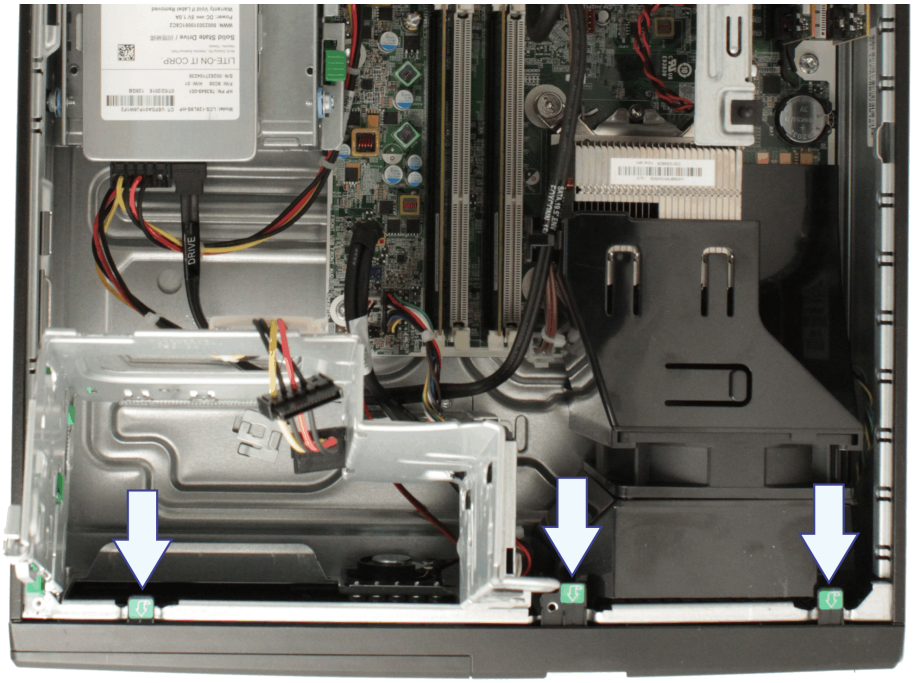
Replacing the filter

Prerequisites

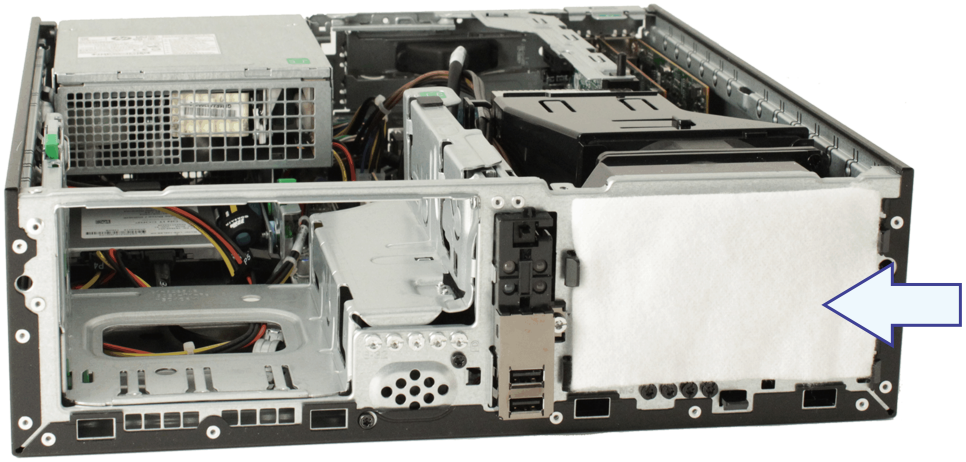
- Turn off the power to the computer.
- Make sure that the new filter is identical to the one listed in the recommended spare part list.
- Remove the computer from the damper kit
- Remove the cabinet lid from the computer.

Procedure

1. Press the three green handles to remove the front cover.



2. Carefully remove the old filter inside.



3. Install the new dust filter.
4. Put the front cover back in place.
5. Put the cabinet lid back in place.

Preventive maintenance intervals

Note:

These procedures should be performed on each HiPAP in the system. Local evaluations should be made to determine site-specific maintenance intervals.

ACTION	INTERVAL RECOMMENDED
Clean all filters for units equipped with fans.	Every week.
Clean cabinet surface.	Every month.
Check for loose connectors and wires.	Every six months.

Creating a backup

For backup procedures, refer to the backup files document, doc. no. 476331. This is a separate manual supplied with the system delivery.

Backup all operator stations regularly (1-3 months), and whenever the configuration and/or user settings of the operator stations are updated.

Important:

Always do a backup after a software update.

Transceiver unit

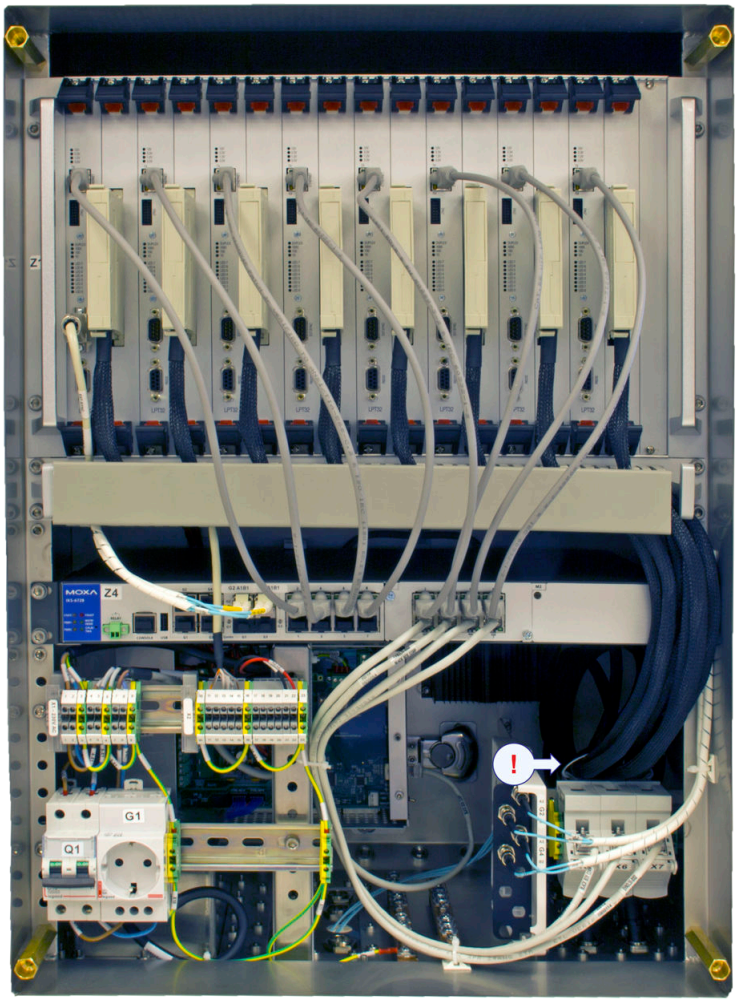
Replacing the Ethernet switch

This procedure is for the switch inside the transceiver.

Procedure

1. Turn off the transceiver.
2. Unplug the cables connected to the Ethernet switch.

3. Cut the strips to loosen the transducer cables.



4. Loosen the mounting screws and remove the unit.
5. Unplug the connectors at the back of the unit.
6. Replace the unit.
7. Reconnect all cables.
8. Bundle the cables to the bracket inside the transceiver unit.
9. Turn on the transceiver.

Removing the LPT32 board

The boards are located inside the unit.

Context

CAUTION:

Be careful not to touch the sides of the circuit boards and filter boards as the capacitors might still be charged.

Procedure

1. Turn off the transceiver.
2. Make sure the light on the power unit inside goes from **blue to red/off** before touching any of the boards.
3. Locate the faulty board.
4. Remove the cable connected to the front of the board.
5. Loosen the screws. (**A**)
6. Loosen the circuit board by pushing the two red locking devices on the handles.(**B**)
7. To loosen the board, push the top ejector up, and the bottom ejector down. (**C**)
8. Grab the handles and pull the circuit board straight out.
9. Place the circuit board inside an anti-static plastic bag. Place it on a clean and stable workbench.

Further requirements

To return the circuit board for repair or replacement, observe the relevant handling instructions.

Follow the procedure in reverse to install the new board.

Related concepts

About Electrostatic Discharge (ESD), page 41

Replacing the LPT32 board

The boards are located inside the unit.

Context

CAUTION:

Be careful not to touch the sides of the circuit boards and filter boards as the capacitors might still be charged.

Procedure

1. Grab the board ejectors with both hands, and push the board in while keeping it as straight as possible.
2. Lock the board in place by pulling the top locking handle down, and the bottom locking handle up.
3. Fasten the screws.
4. Insert the front mounted Ethernet cable and other front mounted cables.
5. Once all the boards are in position, re-apply power as required.
6. Close the transceiver unit front door.

Related concepts

About Electrostatic Discharge (ESD), page 41

Removing a filter board

The boards are located inside the unit.

Context

CAUTION:

Be careful not to touch the sides of the circuit boards and filter boards as the capacitors might still be charged.

Procedure

1. Turn off the transceiver.
2. Make sure the light on the power unit inside goes from **blue to red/off** before touching any of the boards.
3. Locate the faulty board.
4. Remove the cable connected to the front of the board.
5. Loosen the screws.
6. Loosen the circuit board by pushing the two red locking devices on the handles.
7. To loosen the board, push the top ejector up, and the bottom ejector down.
8. Grab the handles and pull the circuit board straight out.
9. Place the circuit board inside an anti-static plastic bag. Place it on a clean and stable workbench.

Further requirements

To return the circuit board for repair or replacement, observe the relevant handling instructions.

Follow the procedure in reverse to install the new board.

Related concepts

About Electrostatic Discharge (ESD), page 41

Replacing a filter board

The filter boards are located inside the transceiver unit.

Context

Note:

Be careful not to touch the sides of the circuit boards and filter boards as the capacitors might still be charged.

Procedure

1. Grab the board ejectors with both hands, and push the board in while keeping it as straight as possible.
2. Lock the board in place by pulling the top locking handle down, and the bottom locking handle up.
3. Fasten the screws.

4. Insert the front mounted Ethernet cable and other front mounted cables.
5. Once all the boards are in position, re-apply power as required.
6. Close the transceiver unit front door.

Related concepts

About Electrostatic Discharge (ESD), page 41

Replacing the power module in the transceiver

The power module is located in the back of the transceiver cabinet.

Prerequisites

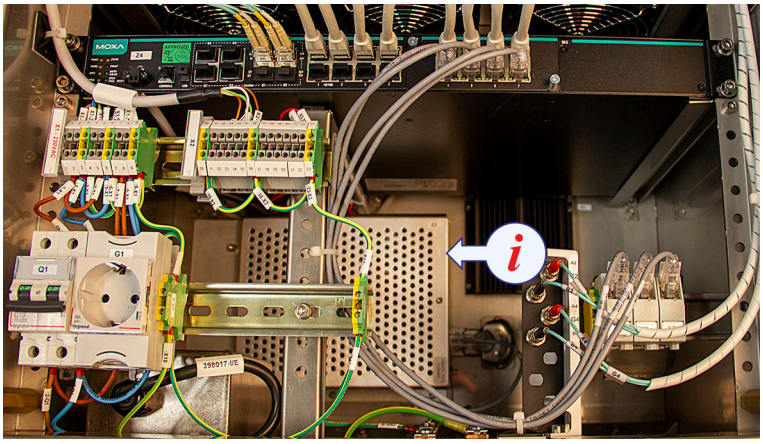
Older models of x82 have a smaller distance between the power module and the overlying modules. For these models you have to remove the fibre optic splice box to remove the power module.

Tip:

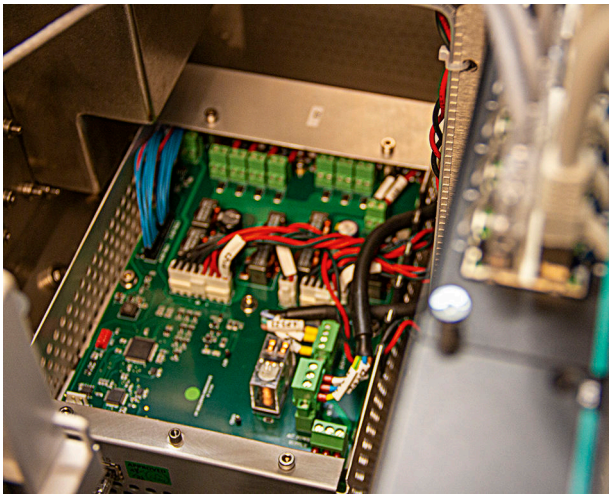
The fibre optic cables are fragile, handle them with care.

Procedure

1. Turn off the transceiver with the main switch.
2. Turn off the power supply to the transceiver.
3. Locate the power module in the back of the transceiver.

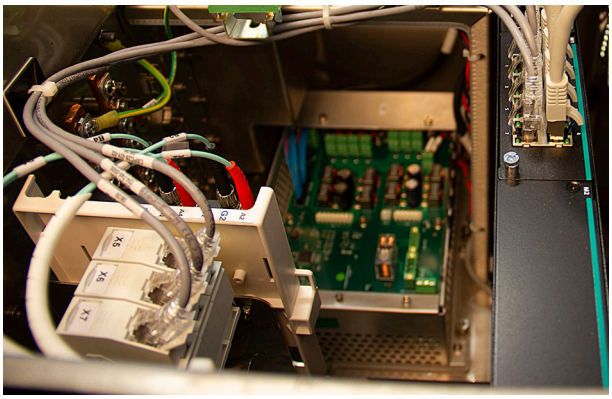


4. Remove the cover.



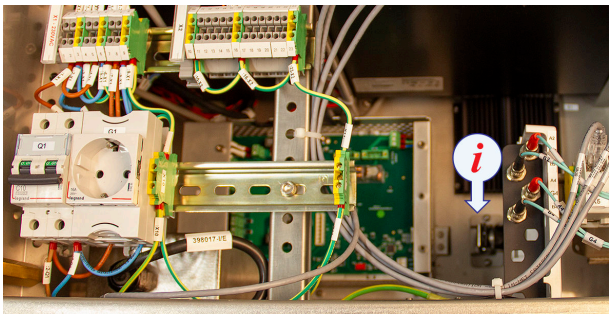
Notice where the cables are, to make it easy to connect the new unit.

5. Disconnect the cables to the power module.

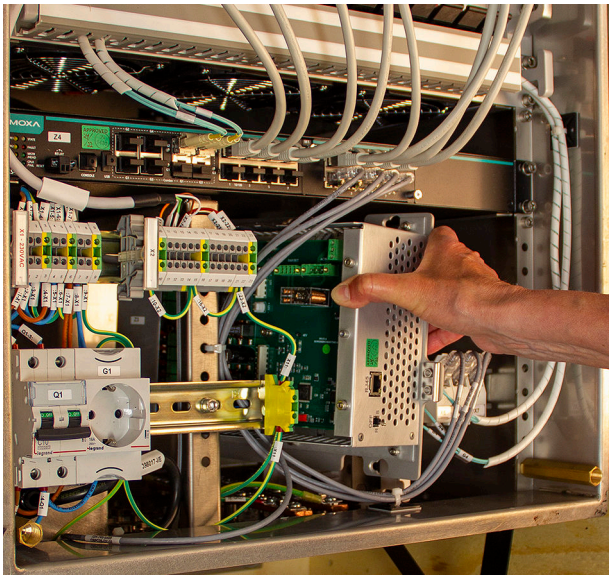


Make sure the cables are tucked in at the sides, so they won't be damaged when the module is removed.

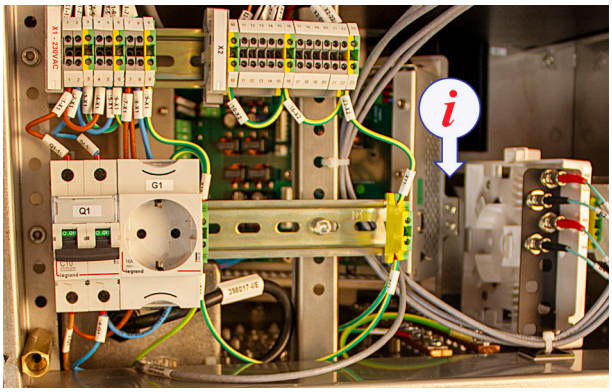
6. Open the lock on the right hand side of the power unit and turn it 180° counter-clockwise to release the power unit.



7. Slide the power unit to the left and pull out the power module.



8. Older models of the x82 transceiver will not get past the fibre optic splice box.



For these models you have to remove the fibre optic splice box to remove the power module.

CAUTION:

The fibre optic cables are fragile, handle them with care.

9. Insert the new power module the same way.

Related concepts

About Electrostatic Discharge (ESD), page 41

Replacing the power module in the transceiver unit

The power module is located in back of the transceiver unit.

Prerequisites

Removing the Moxa switch makes the job of replacing the power unit easier.

Procedure

1. Insert the new power unit through the same gap in the Transceiver unit.
2. Place the power unit on the six nuts on the back wall of the Transceiver unit.
3. Slide the power unit to the right and secure the power unit by turning the flap on the right side 180° and close the flap.
4. Reconnect all cable to the power unit.
5. Reattach the cover and secure with the screw.

Replacing the fan unit in the transceiver unit

The fan unit is located below the circuit boards inside the transceiver unit.

Prerequisites

Removing some of the circuit boards at the left side makes the job of replacing the fan unit easier.

Procedure

1. Switch off the transceiver unit using the Main switch.
2. Remove the four screws in the front.
3. Unplug the power cable by pressing the IEC lock on the connector at the back of the fan unit.
4. Remove the fan unit.
5. Replace the old fan unit with the new one.
6. Plug the power cable back in at the back of the fan unit.
7. Screw in the four screws in the front.
8. Switch on the transceiver unit using the Main switch.

Replacing the terminal block in the transceiver unit

The Ethernet switch/Converter is located below the PCB rack in the transceiver unit.

Procedure

1. Switch off the transceiver unit using the Main switch.
2. Remove the power cables in to the cabinet.
3. Disconnect the terminal block module.
4. The module is snapped on. To remove it, pull down the lock-tab in the lower end, and pull it directly out from the support rail.
5. Align the new module on the support rail.
6. Press the module and pull down the lock-tab until it snaps into place.

Replacing a fuse in the transceiver unit

The transceiver unit is powered via a Main switch mounted on the support rail at the bottom of the transceiver unit.

Context

The fuse is a circuit breaker, and it trips at 25 A.

Note:

Always use the correct size and type of fuse. Irreparable damage may be caused to the transceiver unit if the wrong fuse (or anything else) is used.

Procedure

1. Switch off all external units and systems connected to the HiPAP system.
2. Remove the transceiver unit front door.
3. Switch off power to the unit using the Main switch.
4. Replace the blown fuse(s) with a fuse with correct size and type.
5. If the Main switch has tripped, reset the switch.

   Note:

   Release the switch immediately. It is made so it can trip again if necessary.

6. Turn on the power to the HiPAP system and then to the other external units.

Note:

If, when a fuse is replaced, it blows or trips again when power is switched on to the system, a more serious fault exists. Do not replace the fuse(s) a second time until the fault has been found and corrected.

7. Close the transceiver unit front door.

Spare parts

Topics

Computer, page 57
HiPAP 500 transducer, page 57
Transceiver unit, page 58
LPT32 Transceiver board Spare part, page 58
LPT32 Filter board Spare part, page 58
Power supply Spare part, page 58
Ethernet switch Spare part, page 58
Fan unit Spare part, page 58

Computer

Computer

- **Part name:** MP5810
- **Part number:** 413084

HiPAP 500 transducer

- **Part name:** Transducer HiPAP 500
- **Part number:** TDH-089996

The transducer comes with:

- 3 O-rings 180x4 mm
- 2 O-rings 99.1x5.7 mm
- 4 M8x20 bolts
- 12 M8x35 bolts
- 12 M8 lock washers

Transceiver unit

- **Part name:** Transceiver unit x82–M8P
- **Part number:** 435243

LPT32 Transceiver board Spare part

- **Part name:** LPT32 Transceiver board

  Part number: 367861

LPT32 Filter board Spare part

- **Part name:** LPT32 Filter board

  Part number: 394739

Power supply Spare part

- **Part name:** Power supply transceiver

  Part number: 427030

Ethernet switch Spare part

- **Part name:** Ethernet switch transceiver

  Part number: 391184

Fan unit Spare part

- **Part name:** Fan unit transceiver

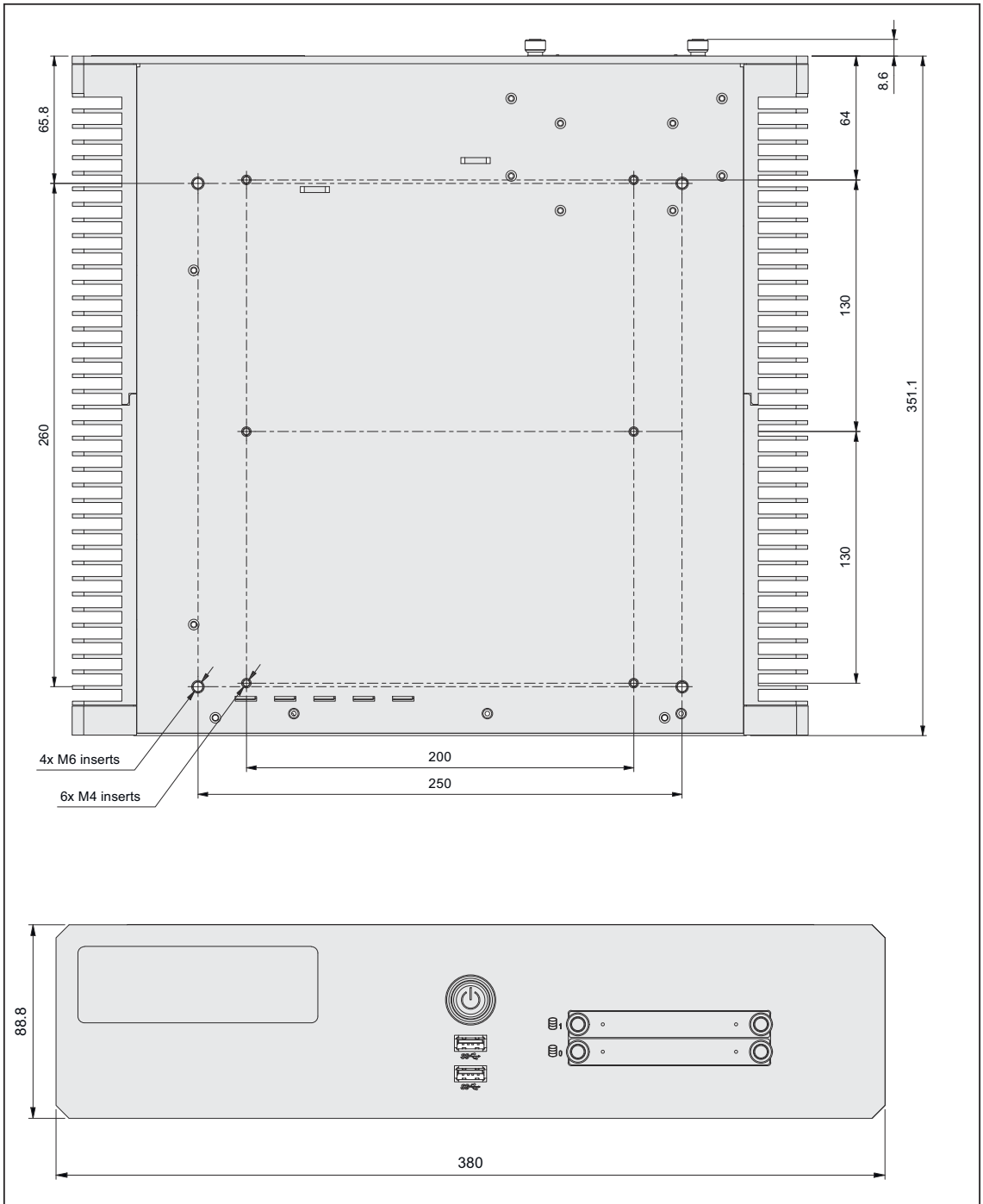
Part number: 397740

Drawing file

Topics

Computer dimensions, page 61
Transceiver – dimensions, page 62
435248 Transceiver unit - Wiring diagram, page 63
433851 Transducer – dimensions, page 64
Transducer–minimum bending radius, page 65
433953 Sensor reference point, page 66
Responder Driver Unit dimensions, page 67
Responder driver unit, wiring diagram, page 68
Fibre to responder drive converter wiring, page 69

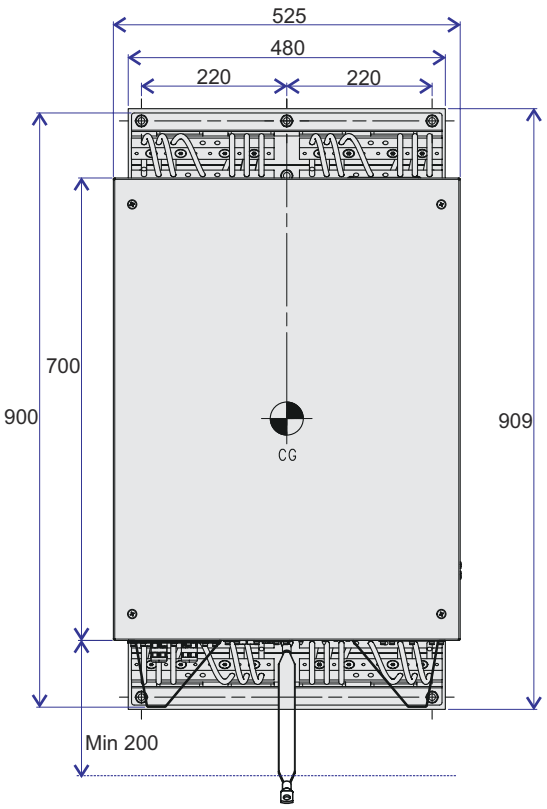
Computer dimensions

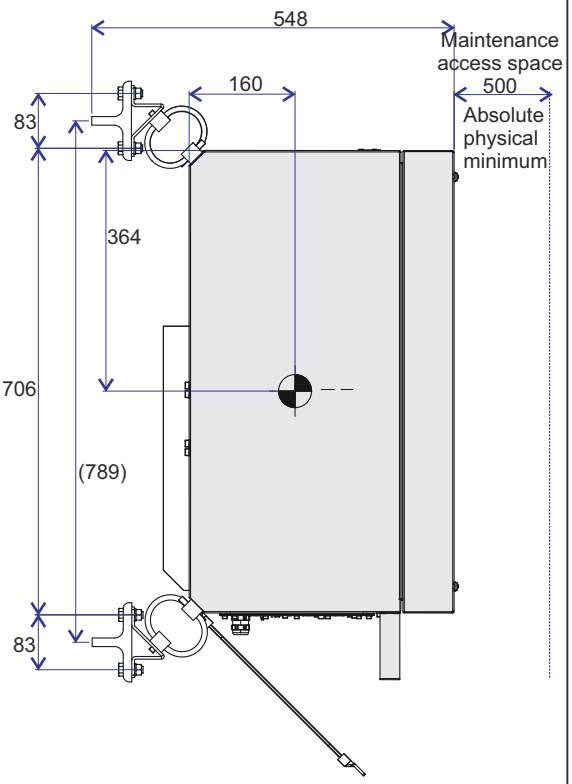


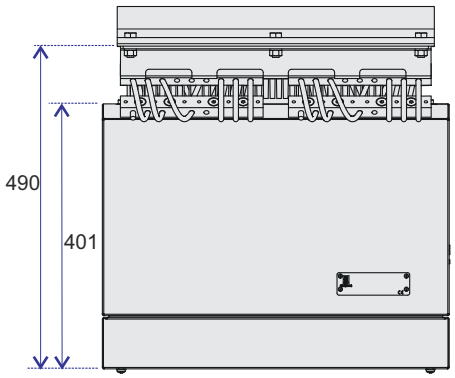
All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

[472992] Rev.A
AI_12_472992_001_001

Transceiver – dimensions







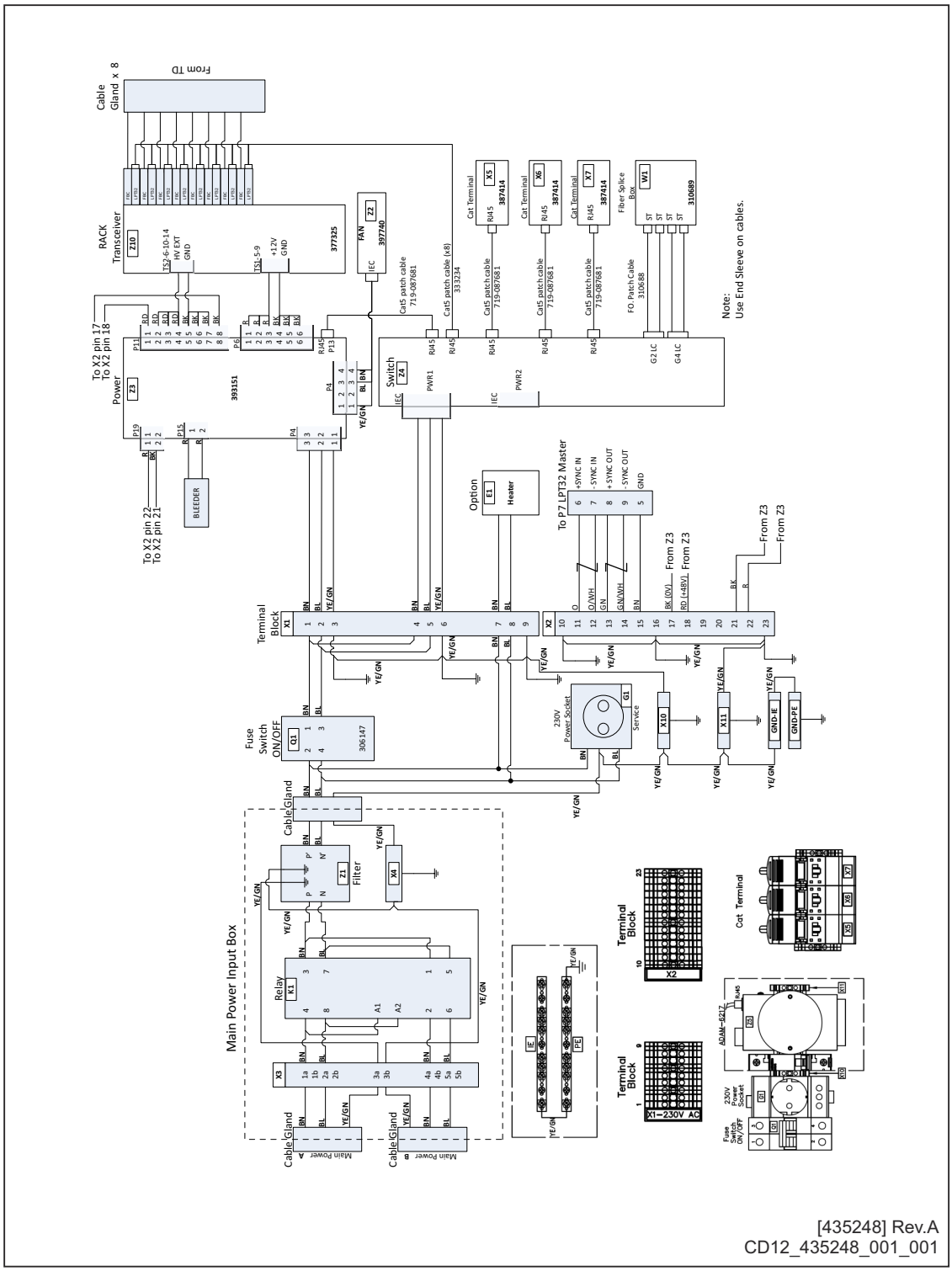
Weight 72 kg

Note:
The centre of gravity may vary slightly according to different configurations within the cabinet.

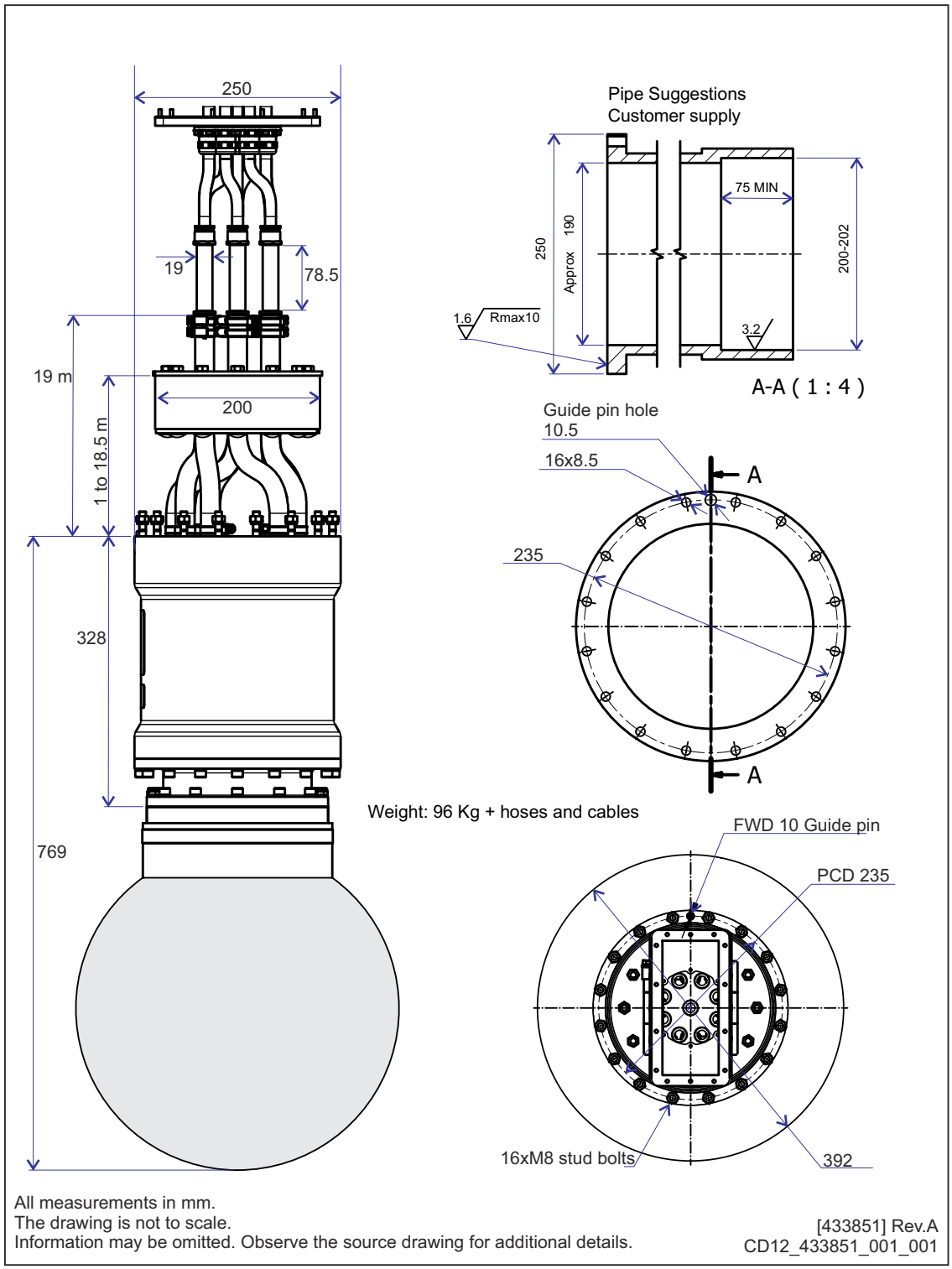
All measurements in mm.
The drawing is not in scale.

[400538] Rev.A
CD12_400538_001_001

435248 Transceiver unit - Wiring diagram



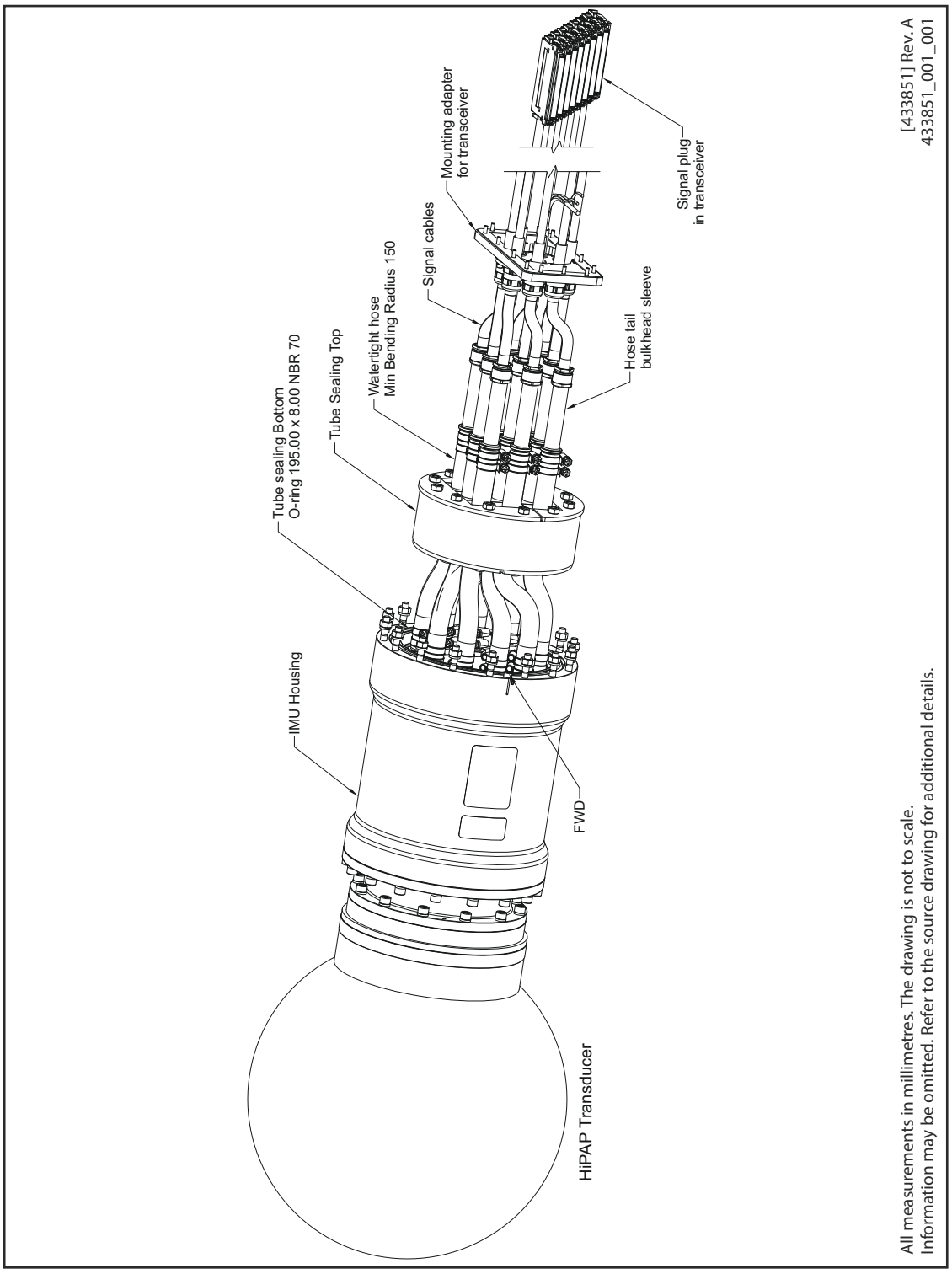
433851 Transducer – dimensions



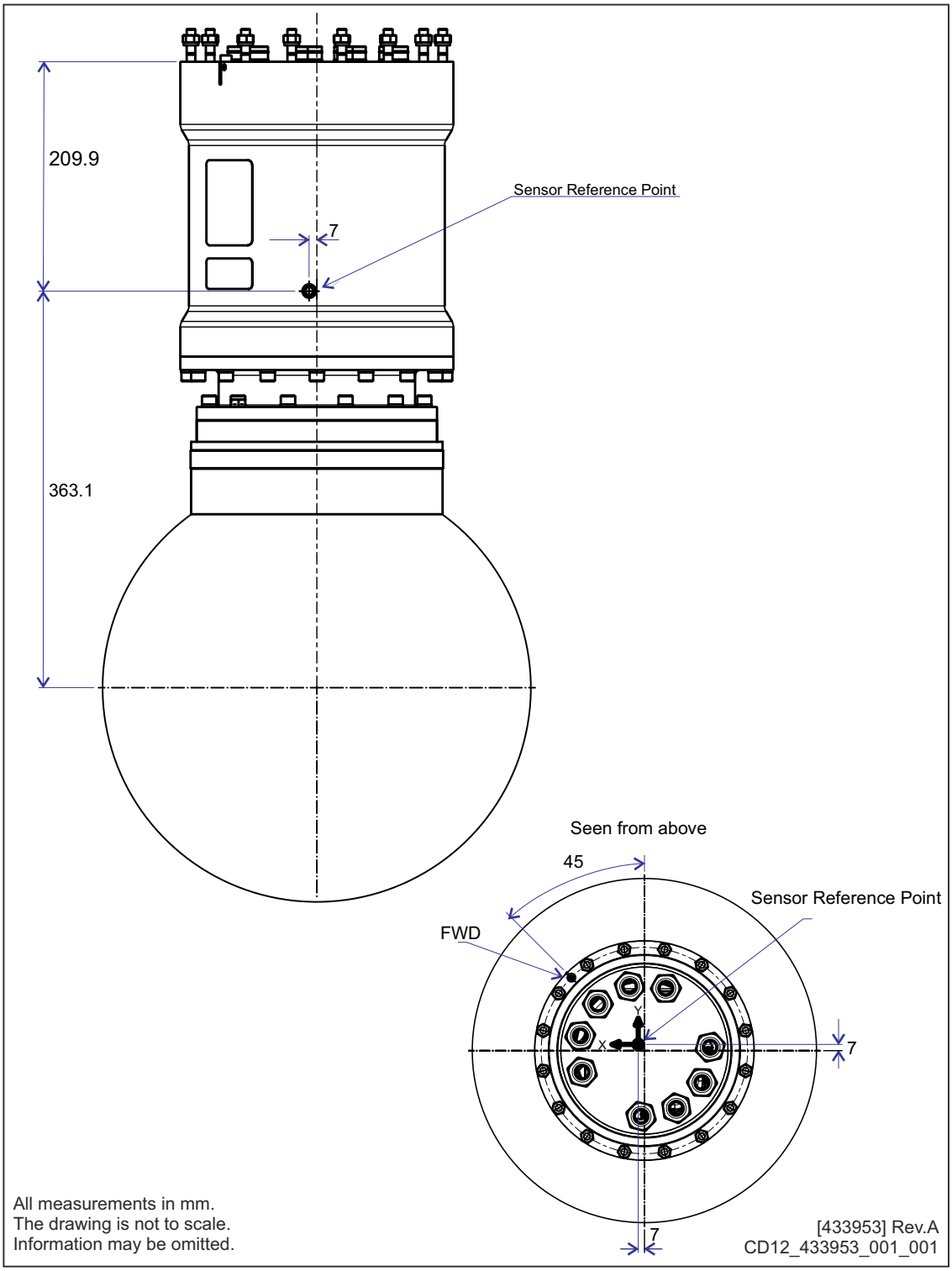
All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

[433851] Rev.A
CD12_433851_001_001

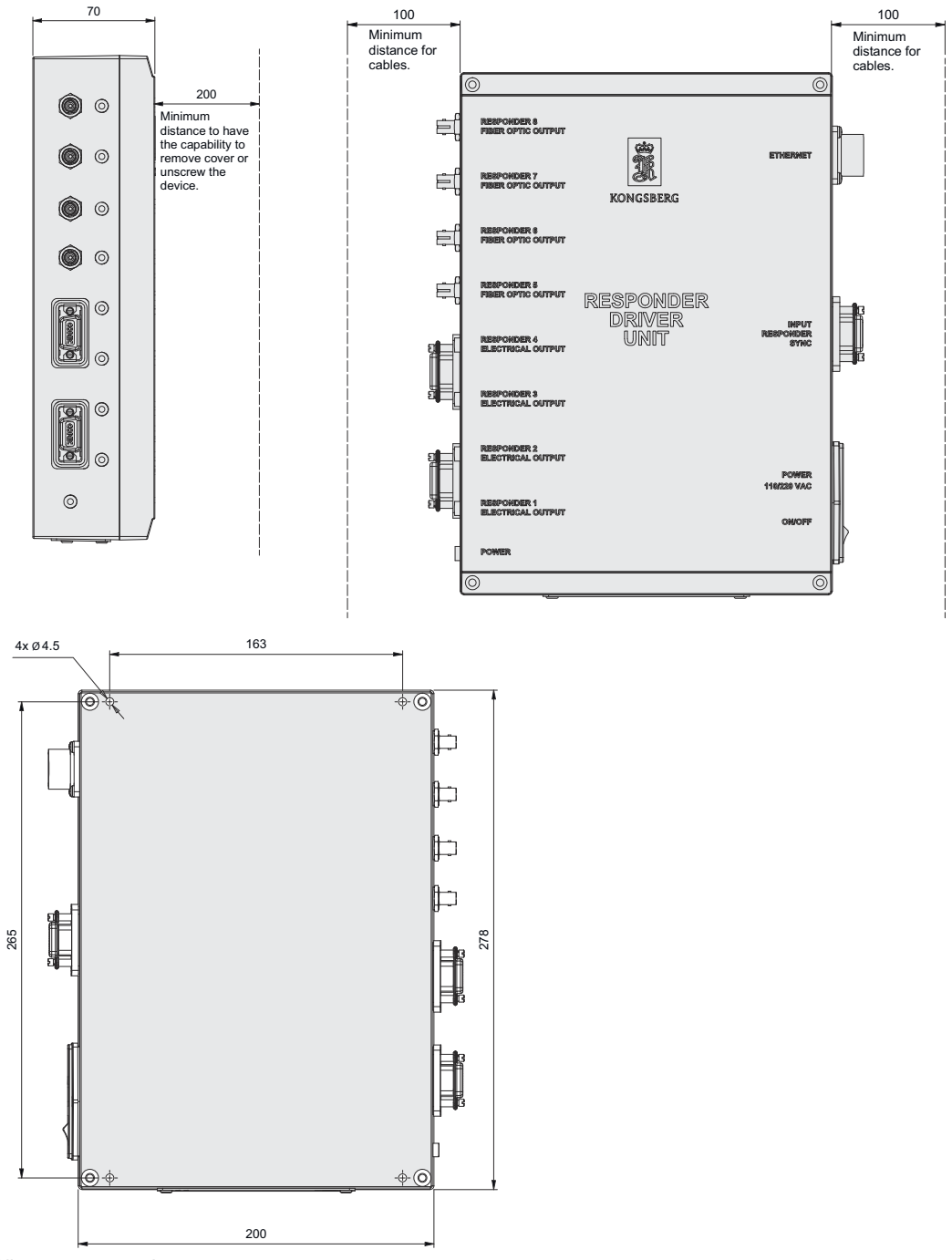
Transducer–minimum bending radius



433953 Sensor reference point



Responder Driver Unit dimensions

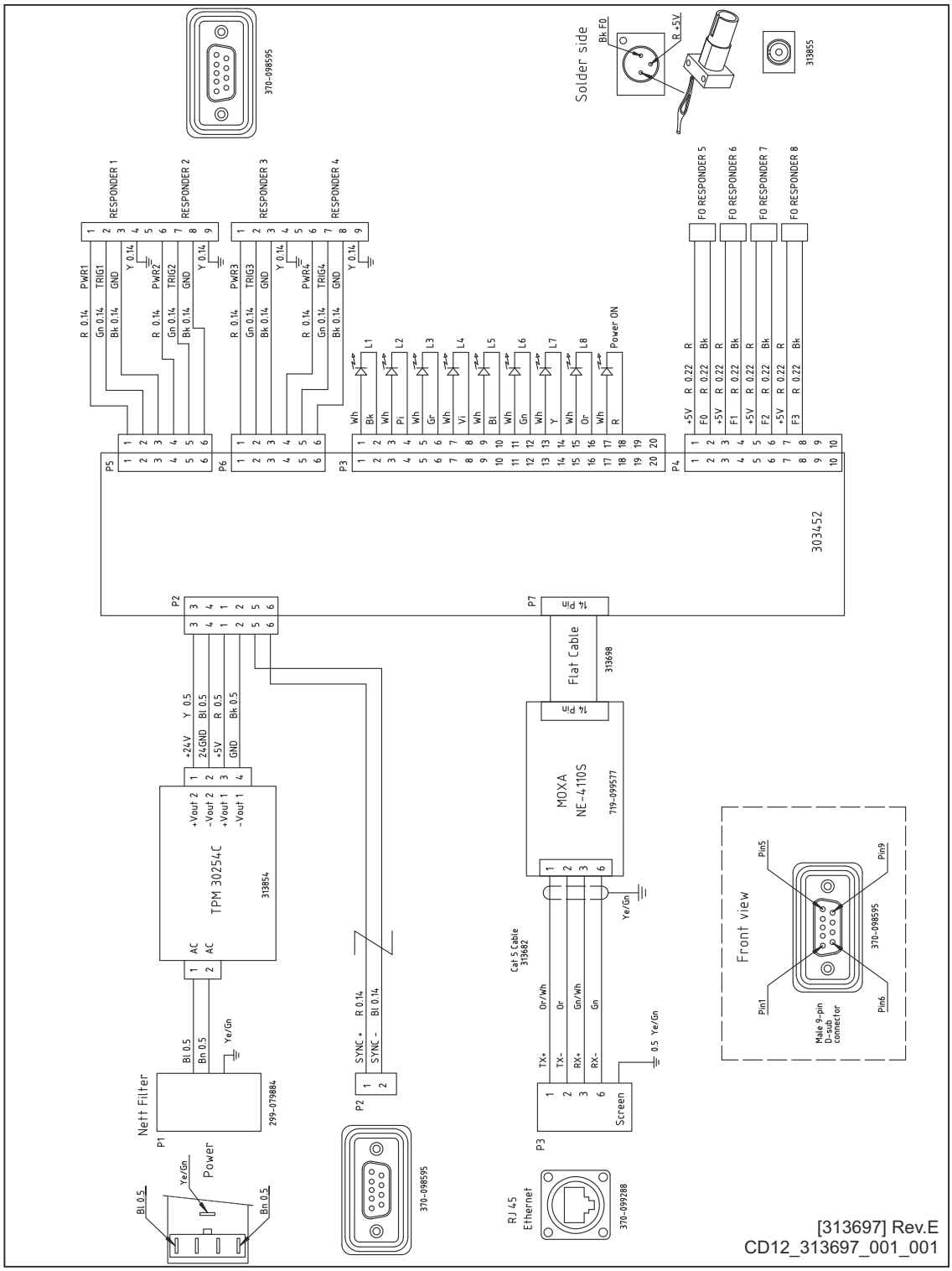


All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

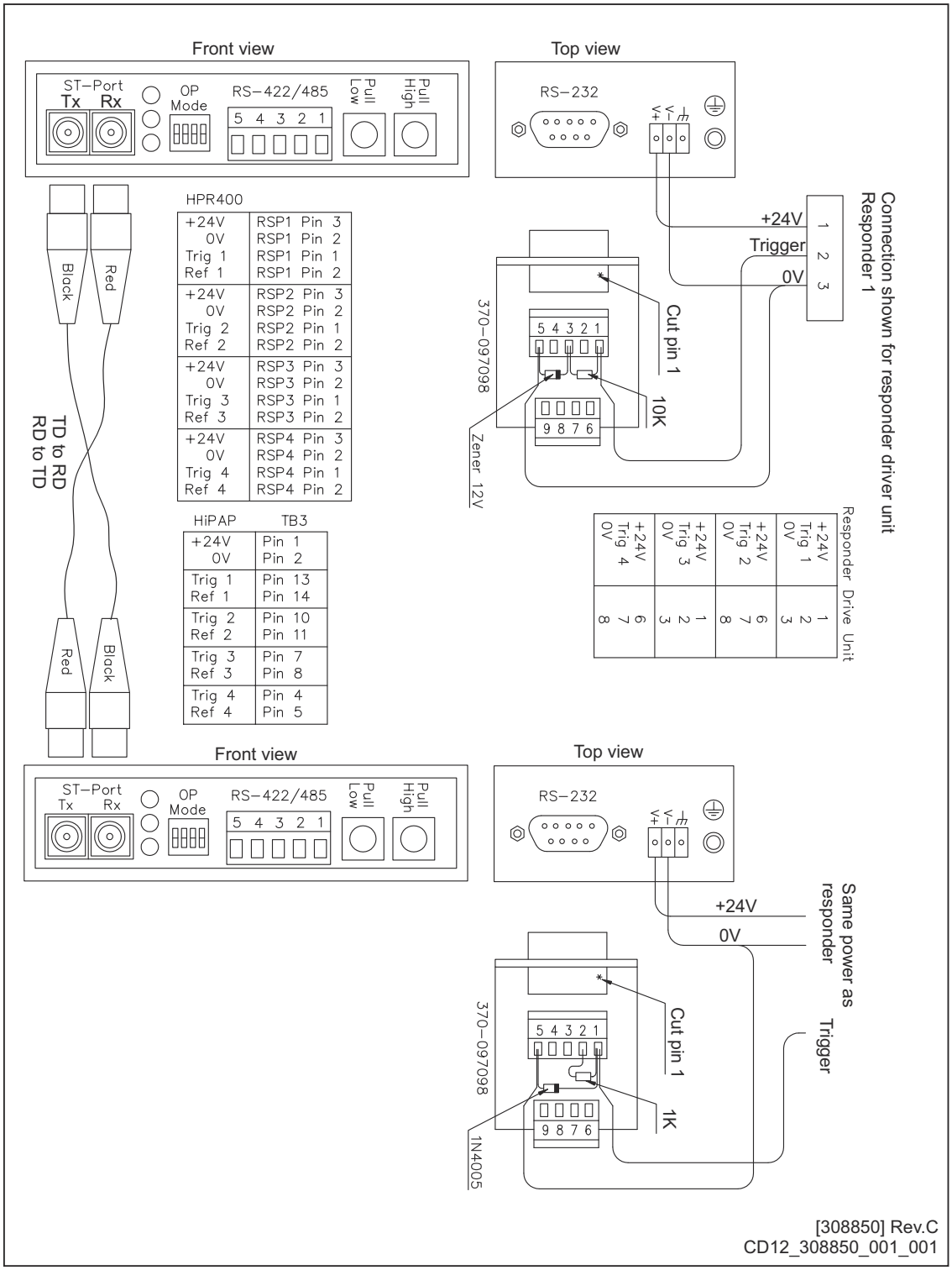
[316067] Rev.D
AI12_316067_001_001

Responder driver unit, wiring diagram

Drawing 313697



Fibre to responder drive converter wiring



Equipment handling

Topics

Inspection of units and transportation boxes after arrival, page 71

Unpacking standard parts and units, page 71

Specifications for storage after unpacking, page 73

Transporting Kongsberg Discovery equipment, page 74

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 Discovery 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.

Unpacking standard parts and units

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

Context

This procedure provides the basic tasks of unpacking units (main unit, spare parts etc) from boxes shipped from Kongsberg Discovery.

Note:

If the unit in question is not unpacked for immediate use, you may consider storing it unopened in its original box. However, it may be useful to open the box to check its contents for damage and retrieve any accompanying documentation.

Do not use a knife to open cardboard boxes - the contents may be located close to the surface, and can then be damaged by the blade.

Procedure

1. Check the carton before opening it to ensure it shows no signs of dropping, immersion in water or other mishandling.
   a. If external damage is detected, open the box to check its contents.
   b. Request that a representative of the carrier to be present while the box is opened, so any transportation damage can be identified and documented.
   c. 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 Discovery as soon as possible.
2. Place the box on a stable work bench or on the floor with the top of the box facing upwards.
3. In the absence of other instructions, always open the top of the carton first.

   The contents of the box will normally have been lowered into the carton from above, so this will usually be the easiest route to follow. Be careful when you open the box, and make sure that the contents are not damaged. Do not use a knife to open cardboard boxes.
4. If the box has been closed using staples, remove the staples from the carton as you open it.

   This will reduce the possibilities of scratch injury to yourself and damage to the contents.
5. If a wooden box has been closed using screws, always remove them using a screwdriver.

   Do not attempt to force the lid open with a crowbar or similar tool.
6. Once the carton is open, carefully remove all loose packing and insulation material.
7. Check for user manuals and other documents that may have been added to the carton during packing.
8. Check also for special tools, door keys etc.

Specifications for storage after unpacking

The unit must whenever possible be stored in its original transportation crate until ready for installation.

General specifications

During storage, each box must not be used for any purpose for which it was not intended (work platform, table, steps etc.).

Once unpacked, all equipment must be kept in a dry, non-condensing atmosphere, free from corrosive agents and isolated from sources of vibration.

Note:

Do not break the seal to open a circuit board package before the board is to be used. If the board package is returned to Kongsberg Discovery with the seal broken, we will assume that the unit has been used and you will be billed accordingly.

Each unit must be installed in its intended operating position as soon as possible after unpacking. If the unit contains normal batteries, these may have been disconnected/ isolated before the unit was packed. These must then be reconnected during the installation procedure. 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° 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°C.

Transporting Kongsberg Discovery equipment

Unless otherwise stated in the accompanying documentation, electronic, electromechanical and mechanical units supplied by Kongsberg Discovery 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 Discovery's products, and the extensive use of delicate electronic parts, all units and boxes must be regarded and handled as fragile equipment.

Index

Numerics

367861
  LPT32 spare part 58
391184
  switch spare part 58
394739
  LPT32 filter board spare part 58
397740
  fan spare part 58
413084
  computer 57
427030
  power supply spare part 58
435243
  transceiver spare part 58

A

about
  document downloads 7
  electrostatic discharge (ESD) 41
  online information 7
  registered trademarks 7
  target audience 7
  this publication 7
  transducer 12
AC mains
  connecting to the transceiver 25

B

backup
  software 45

C

cable plan 21
cables
  list 22
cabling
  connecting RDU & responder 31
commercial cables
  list 22
computer
  413084 57
  connectors 24
  environmental requirements 38
  filter 43
  installation 16
  maintenance 45
  outline dimensions 36
  power requirements 37
  rear panel 24
  spare part 57
  weight 36
connecting AC mains
  to the transceiver 25
connecting ground
  to the transceiver 25
connecting transducer
  to the transceiver 28
connection
  diagram 21
connections
  list 22
connectors
  computer 24

D

description
  operator station 11
  system 9
  Transceiver Unit 11
diagram
  connections 21
  system 9
  wiring 21
dimensions
  computer 36
  display 36
  technical specifications 36
  transceiver 36
  transceiver outline dimensions drawing 62
  transducer 37, 64
display
  dimensions 36
  outline dimensions 36
  weight 36
drawing
  display outline dimensions 36
  transceiver outline dimensions 62
  transducer 64
drawing file 60
  desktop computer 61
  fibre to responder drive converter wiring 69
  responder driver unit 67
drawings 60

E

electrical to fibre optical converter
  installation 32
electrostatic discharge (ESD)
  about 41
environmental
  requirements 38
environmental requirements
  computer 38
  transceiver 38

environmental requirements *(continued)*
Transceiver Unit 38
equipment .....
responsibility 13
equipment handling 70
inspection 71
storage after unpacking 73
transportation 74
unpacking 71
visual inspection 71
ESD
electrostatic discharge (ESD), about 41
ethernet switch .....
spare part 58

F

fan unit .....
spare part 58
fibre optical to electrical converter
installation 32
filter board .....
removing 48
replacement 48

G

general supply conditions
equipment responsibility 13
receipt 13
storage 13
unpacking 13
ground
connecting to the transceiver 25

H

help
technical support 14
HiPAP 502P
system diagram 9
how to
connect AC mains to the transceiver 25
connect ground to the transceiver 25
connect transducer to the transceiver 28
remove the filter board 48
remove the LPT32 Transceiver board 47
replace the filter board 48
replace the LPT32 Transceiver board 47, 48
transport Kongsberg Discovery equipment 74
unpack standard parts and units 71
visual inspection of units and transportation boxes after arrival 71
how to
create a backup 45
Installing the computer 16
Installing the transceiver 18
humidity .....
requirements 38

I

information .....
technical support 14
inspection .....
transportation boxes 71
units 71
installation .....
computer 16
converter 32
transceiver 18
installation procedures
installing the responder driver unit 18
installation requirements
environmental 38
humidity 38
temperature 38
Installing the transceiver 18
interconnection cables .....
list 22
interfaces
computer 24
introduction .....
operator station 11
Transceiver Unit 11

K

kits
transducer 57

L

list .....
cables 22
commercial cables 22
connections 22
interconnection cables 22
shipyard cables 22
system cables 22
LPT32 .....
maintenance 49
replacing a filter board 49
LPT32 filter board .....
spare part 58
LPT32 transceiver board .....
spare part 58
LPT32 Transceiver board .....
removing 47
replacement 47, 48

M

maintenance .....
computer 45
LPT32 49
MP5810 45
preventive maintenance 43
preventive maintenance schedule 43
replacing a filter board 49
replacing a fuse in the transceiver unit 54
replacing the fan unit in the transceiver unit 53

maintenance *(continued)*
replacing the power module in the transceiver unit 53
replacing the terminal block in the transceiver unit 54
minimum bending radius .....
transducer 65
MP5810 .....
filter 43
maintenance 45

O

offices .....
technical support 14
online information .....
website 7
operating voltage
computer 37
transceiver 38
Transceiver Unit 38
operator station .....
description 11
introduction 11
overview 11
purpose 11
order number
computer 57
ethernet switch 58
fan unit 58
filter board 58
transceiver 58
transceiver board 58
outline dimensions .....
computer 36
display 36
technical specifications 36
transceiver 36
transceiver outline dimensions drawing 62
transducer 37, 64
overview .....
operator station 11
Transceiver Unit 11

P

part number .....
computer 57
ethernet switch 58
fan unit 58
filter board 58
power supply 58
transceiver 58
transceiver board 58
performance .....
specifications 35
physical dimensions .....
transducer 37
plan
cable 21
power .....
requirements 37
specifications 37
power consumption .....
computer 37
transceiver 38
Transceiver Unit 38
power requirements .....
computer 37
transceiver 38
Transceiver Unit 38
power supply .....
part number 58
spare part 58
procedure
connecting AC mains to the transceiver 25
connecting ground to the transceiver 25
connecting transducer to the transceiver 28
creating a backup 45
Installing the computer 16
Installing the transceiver 18
removing the filter board 48
removing the LPT32 Transceiver board 47
replacing the filter board 48
replacing the LPT32 Transceiver board 47, 48
transporting Kongsberg Discovery equipment 74
unpacking standard parts and units 71
visual inspection of units and transportation boxes after arrival 71
purpose .....
operator station 11
this publication 7
Transceiver Unit 11

R

rear panel .....
computer 24
registered trademarks 7
removing .....
filter board 48
LPT32 Transceiver board 47
replacement .....
filter board 48
LPT32 Transceiver board 47, 48
replacing a filter board .....
LPT32 49
maintenance 49
replacing a fuse .....
transceiver unit 54
replacing a fuse in the transceiver unit .....
maintenance 54
replacing the fan unit .....
transceiver unit x82 53
replacing the fan unit in the transceiver unit .....
maintenance 53
replacing the filter 43
replacing the power module .....
transceiver unit x82 53
replacing the power module in the transceiver unit ....

replacing the power module in the transceiver unit *(continued)*
maintenance 53
replacing the terminal block .....
transceiver unit x82 54
replacing the terminal block in the transceiver unit .....
maintenance 54
requirements .....
environmental 38
humidity 38
power 37
temperature 38
responder driver unit .....
wiring diagram 68
responsibility .....
equipment 13

S

shipyard cables .....
list 22
size
computer 36
display 36
technical specifications 36
transceiver 36
transceiver outline dimensions drawing 62
transducer 64
sockets
computer 24
software .....
backup 45
spare part .....
computer 57
ethernet switch 58
fan unit 58
LPT32 filter board 58
LPT32 transceiver board 58
power supply 58
transceiver 58
spare part fan
397740 58
spare part LPT32
367861 58
spare part LPT32 filter board
394739 58
spare part power supply
427030 58
spare part switch
391184 58
spare parts .....
transducer 57
specifications .....
outline dimensions 36
performance 35
power 37
storage after unpacking 73
storage .....
after unpacking 73
supply conditions
equipment responsibility 13
supply conditions *(continued)*
receipt 13
supply voltage
computer 37
transceiver 38
Transceiver Unit 38
support information 14
system .....
description 9
diagram 9
system cables .....
list 22

T

target audience .....
this publication 7
technical requirements
power 37
technical specifications .....
outline dimensions 36
performance 35
technical support .....
information 14
offices 14
temperature .....
requirements 38
this publication .....
about 7
purpose 7
this user manual
about 7
purpose 7
transceiver .....
435243 58
connecting AC mains 25
connecting ground 25
connecting transducer 28
environmental requirements 38
installation 18
outline dimensions 36
outline dimensions drawing 62
power consumption 38
power requirements 38
spare part 58
weight 36
transceiver unit .....
replacing a fuse 54
Transceiver Unit .....
description 11
environmental requirements 38
introduction 11
overview 11
power consumption 38
power requirements 38
purpose 11
transceiver unit x82 .....
replacing the fan unit 53
replacing the power module 53
replacing the terminal block 54

transducer .....
about 12
connecting to the transceiver 28
dimensions 37, 64
minimum bending radius 65
outline dimensions 37, 64
physical dimensions 37
spare parts 57
weight 37
transportation .....
of delicate and fragile equipment 74

U

unpacking .....
standard parts and units 71

V

visual inspection .....
transportation boxes 71
units 71

W

website .....
document downloads 7
weight .....
computer 36
display 36
transceiver 36
transducer 37
wiring .....
diagram 21
wiring diagram .....
responder driver unit 68

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