



KONGSBERG

# Instruction Manual

## HiPAP 351P Ex







KONGSBERG

***HiPAP 351P Ex***  
***Instruction manual***

406733/A

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# About this manual

Observe this general information about the HiPAP 351P Ex 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 351P Ex.

## **Target audience**

The manual is intended for all users of HiPAP 351P Ex.

## **Registered trademarks**

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

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

# HiPAP 351P Ex

## Topics

[System description, page 7](#)

[System diagram, page 8](#)

[Main system units, page 9](#)

[Scope of supply, page 12](#)

[General supply conditions, page 12](#)

[Support information, page 14](#)



## System description

Kongsberg HiPAP 351P Ex system is designed for optimal positioning of subsea objects in both shallow and deep water.

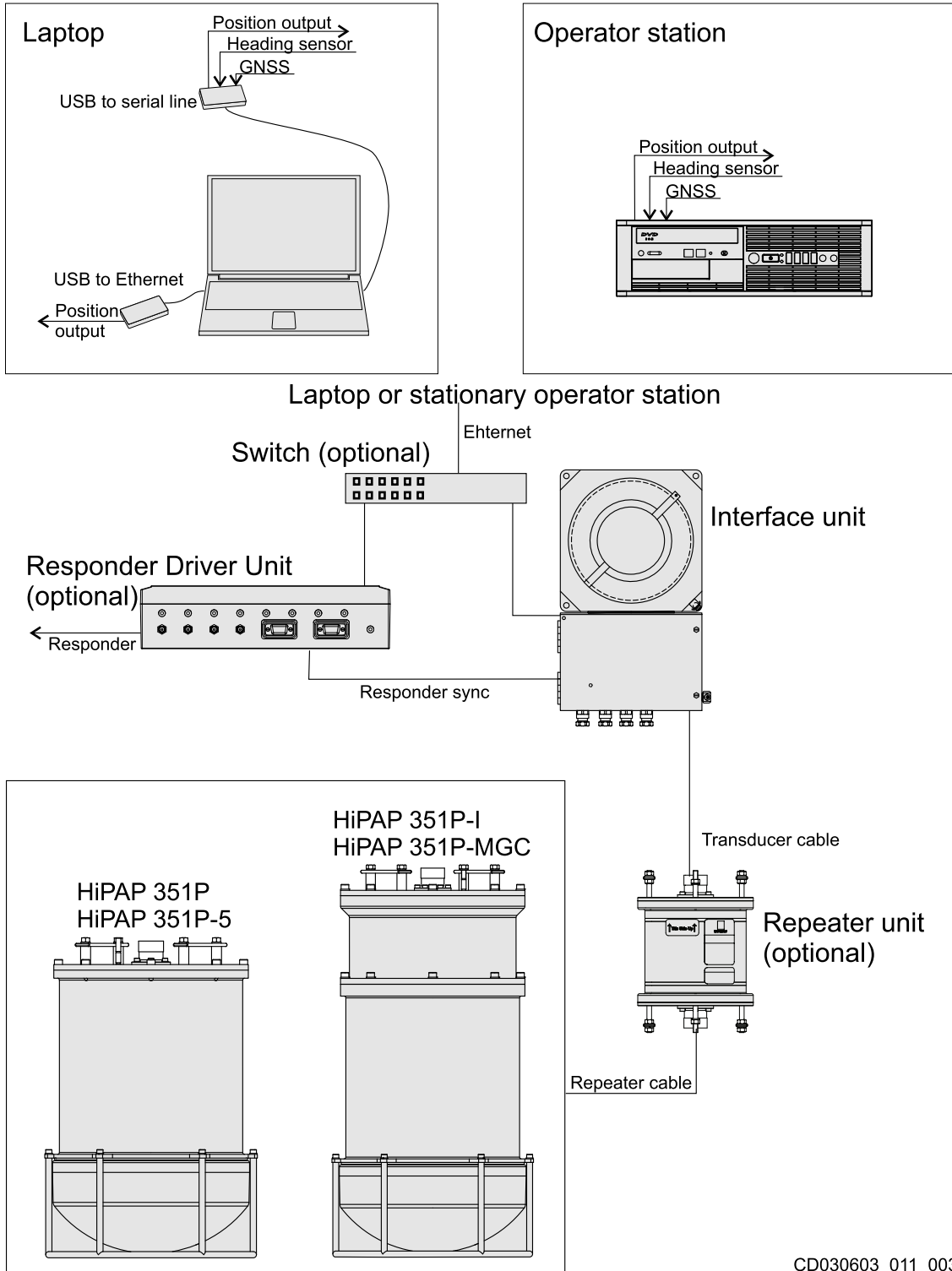
The HiPAP 351P series are the portable models of the HiPAP systems. With its unique and compact transducer containing receiver and transmitter electronics along with a variety of high quality motion sensors it will send underwater positioning data to the vessels. The HiPAP 351P series are the only systems available offering automatic beam steering from portable transducers.

The transducers are designed to be mounted on a shaft for installation over-the-side or through a moon-pool of a vessel.

The transducer can be tilted to utilize the 160° cone operating area in the sector of the required area. There will be no need for extra calibration, or mechanical fine adjustments, as the internal Motion Reference Unit will automatically compensate for the tilt.

## System diagram

The system diagram identifies the main components of a portable HiPAP 351P Ex system, as well as the connections between the units.



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## Main system units

### Topics

[HiPAP 351P transducer, page 10](#)

[Interface unit, page 10](#)

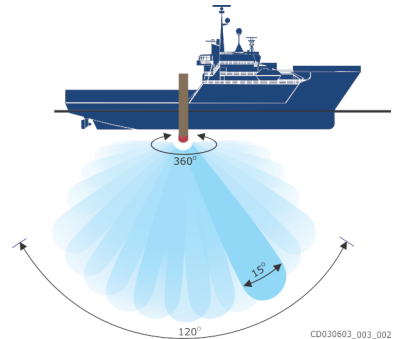
[Subsea repeater unit \(optional\), page 10](#)

[Operator Station, page 11](#)

## HiPAP 351P transducer

The HiPAP 351P transducer has all the electronics built in.

The HiPAP 351P transducer is spherical with a cylindrical body including 46 transducer elements. This model has good accuracy in the  $\pm 60^\circ$  coverage sector and is suited for operations where the major positioning targets are within this sector.



### 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.*

---

## Interface unit

The interface unit connects the HiPAP and the operator station.

This interface unit is explosion proof.

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



## Subsea repeater unit (optional)

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 351P Ex delivery.

When you unpack the items provided with the HiPAP 351P Ex 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
- Responder trigger cable
- Ethernet cable
- Ethernet switch
- Ethernet cable
- Repeater unit
- Repeater cable

## General supply conditions

The following general supply conditions apply to this Kongsberg HiPAP 351P Ex delivery.

## Receipt, unpacking and storage

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

The shipyard performing the installation and/or equipment dealer becomes fully responsible for the equipment upon receipt unless otherwise stated in the contract.

The duration of responsibility includes:

- The period of time the equipment is stored locally before installation
- During the entire installation process
- While commissioning the equipment
- The period of time between commissioning and the final acceptance of the equipment by the end user (normally the owner of the vessel which the equipment has been installed to)

Unless other arrangements have been made in the contract, the Kongsberg HiPAP 351P Ex guarantee period (as specified in the contract) begins when the acceptance documents have been signed.

## Support information

If you need support for your Kongsberg HiPAP 351P Ex 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](http://www.km.kongsberg.com/support_hpr)
- **E-mail address:** [km.support.hpr@kongsberg.com](mailto:km.support.hpr@kongsberg.com)



# Installing the HiPAP 351P Ex hardware units

## Topics

[Installing the transducer, page 16](#)

[Installing the repeater unit, page 17](#)

[Installing the interface unit, page 17](#)

[Installing the responder driver unit \(optional\), page 17](#)

[Converting from fibre optical to electrical signal, page 18](#)

## Installing the transducer

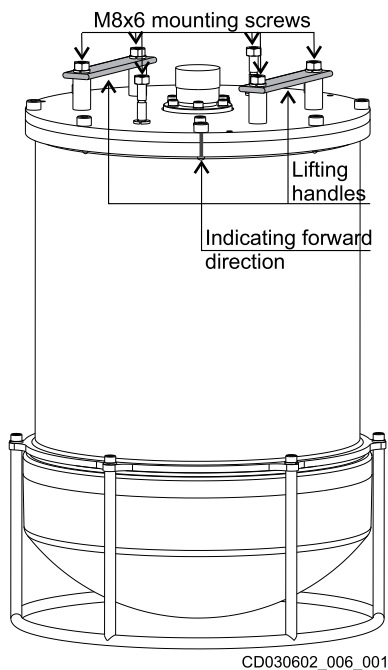
The transducer cable must be connected before mounting the transducer.

### Prerequisites

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 mounting holes are at the top of the unit.

The unit is supplied with mounting brackets. The unit has an underwater connector, two handles and six mounting screws for mounting to the pole/shaft. Four of the mounting screws are used for the handles.



### Procedure

- 1 Remove the carrying/lifting handles.
- 2 Mount the unit so the direction indicator is in a forward direction, as illustrated in the previous figure.
- 3 Fasten the six mounting screws.

### Related topics

[Installing the transducer, page 43](#)

[HiPAP 351P/351P-5, outline dimensions, page 49](#)

## 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 mounting holes at the top and the bottom of the unit.

### Procedure

- 1 Remove the carrying/lifting handles.
- 2 Mount the unit with the arrow pointing up.
- 3 Fasten the six mounting screws on the top and the bottom of the unit.

### Related topics

[Repeater unit, outline dimensions, page 58](#)

## Installing the interface unit

This is an explosion safe cabinet. Make special attention to the ex and safety aspects when mounting.

### Prerequisites

Due to the weight and nature of the enclosures precautions have to be taken to avoid damages to the equipment and the individual. The enclosures flame path must be securely protected to avoid damage, all openings that are not sealed is a flame path.

When mounting the enclosure make sure that the mounting support is able to take the full weight of the enclosure. If any twisting or bending is likely, use washers or packing plates as necessary before the screws or nuts are tightened.

Do not open the lid before the enclosure is securely fastened and in an upright position.

See the producer's home page [www.bartec.no](http://www.bartec.no)

### Procedure

- Follow the procedure that came with the interface unit.

## Installing the responder driver unit (optional)

The Responder Driver Unit is a stand-alone unit and can be mounted with 4 screws horizontally or vertically.

### Prerequisites

The unit should be located where it is suitable for connecting the cables to the responders. This can be close to the Remote Operating Vehicle (ROV) operation room.

There is normally one cable connected to the Responder Driver Unit for each responder. Install the unit so operators have easy access for checking the responder trigger 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

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

---

### Related topics

[Responder driver unit, outline dimensions, page 59](#)

## 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.

# Cable layout and interconnections

## **Topics**

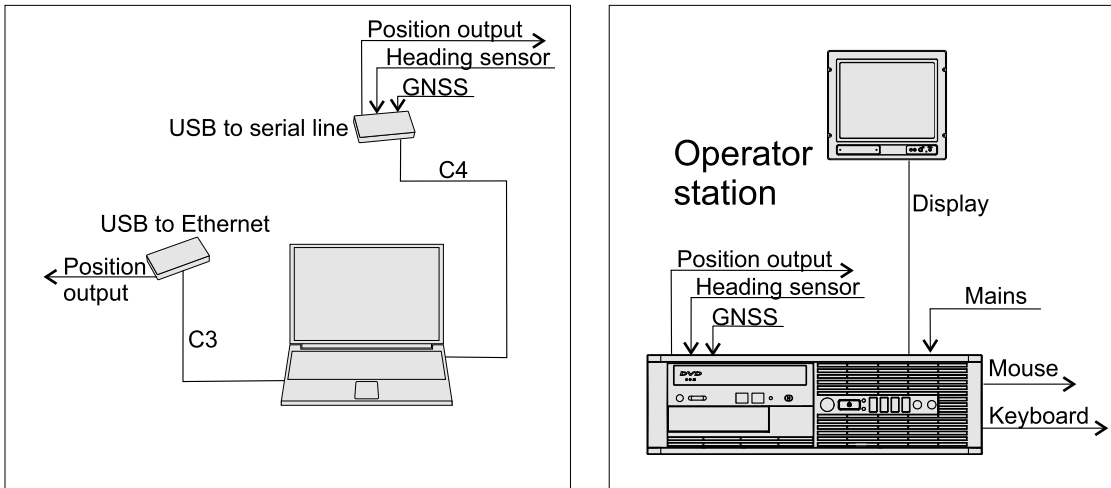
[Cable plan, page 21](#)

[List of cables, page 22](#)

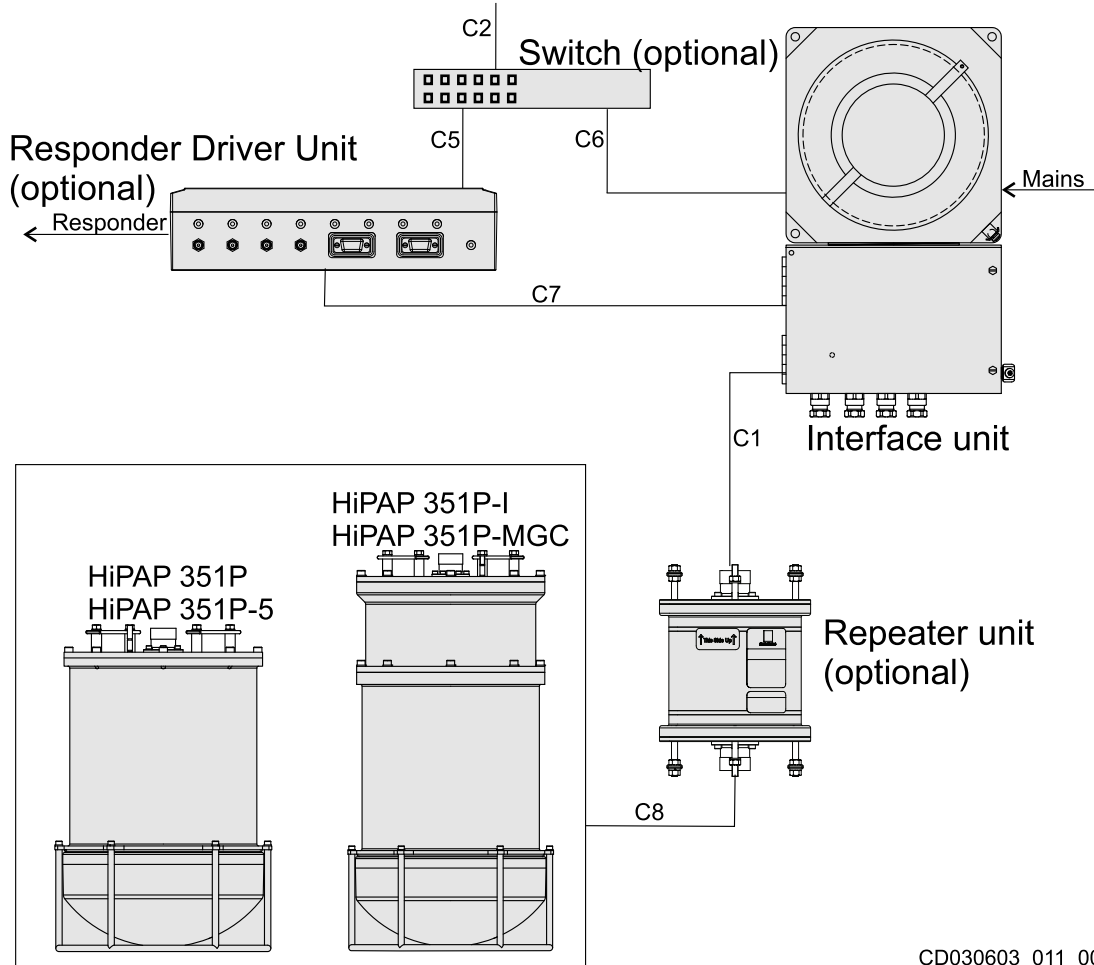
[Cable procedures, page 22](#)

## Cable plan

The cable plan shows the system setup and its connections.



Laptop or stationary operator station



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## List of cables

A set of cables is required to connect the HiPAP 351P Ex units to each other, to the relevant power source(s), and to peripheral devices.

- 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

## Cable procedures

### Topics

[Connecting the transducer cable, page 23](#)

[Connecting the repeater cable, page 23](#)

[Connecting the Ethernet cables, page 23](#)

[Connecting the USB cables, page 24](#)

[Connecting the responder sync cable \(optional\), page 24](#)

[Responder driver cables, page 24](#)



## 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 long, 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.

## 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

The diagram shows a front view of the RDU connector. It is a male 9-pin D-sub connector. The pins are arranged in two rows. The top row has pins 1, 5, and 9. The bottom row has pins 2, 6, and 8. Pin 3 is the ground pin. The diagram is enclosed in a dashed box and labeled 'RDU Front view' and '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.

# Alignment for integrated navigation

## **Topics**

[Horizontal and vertical offset, page 27](#)

[Motion and heading alignment, page 27](#)

## 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.
- 3 The offsets for the surface navigation system's antenna must be determined in the same way.

## 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 this to the surface navigation system.
- The surface navigation must be a good DGNS 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 30](#)

[Cleaning the transducer unit, page 30](#)

[Backup, page 31](#)

## Preventive maintenance schedule

In order to secure the HiPAP 351P Ex for long and trouble-free use, observe the following preventive maintenance tasks.

- After use
  - Clean the HiPAP transducer
  - Clean the repeater unit
  - Lubricate the connectors
- 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

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

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# Spare parts

## Topics

[Portable operator station spare part, page 33](#)

[Operator station spare part, page 33](#)

[Bluestorm serial interface card spare part, page 33](#)

[EX Interface unit spare part, page 34](#)

[Repeater unit spare part, page 34](#)

[Responder driver kit spare part, page 34](#)

[Transducer 351P spare part, page 35](#)

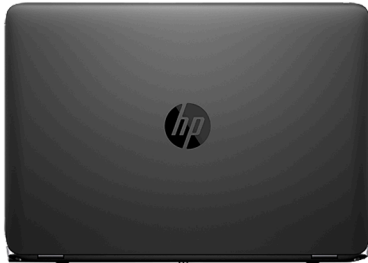
[Transducer 351P-5 spare part, page 35](#)

[Transducer 351P-I spare part, page 36](#)

[Transducer 351P-MGC spare part, page 36](#)

## Portable operator station spare part

Portable operator station for the portable HiPAP 351P system.



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

## Operator station spare part

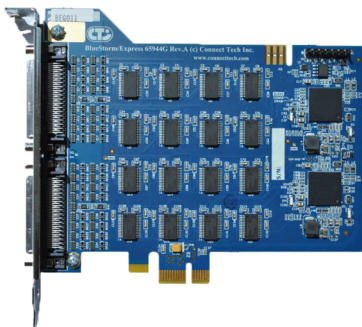
Operator station for the portable HiPAP 351P system.



- **Part name:** Operator station
- **Part number:** 397188

## Bluestorm serial interface card spare part

The serial interface card is delivered with an eight connectors split cable.



- **Part name:** Bluestorm serial interface card
- **Part number:** 381270

## EX Interface unit spare part



- **Part name:** HiPAP 351P Ex Interface unit
- **Part number:** 405835

## 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
- 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
- Power adapter

## Transducer 351P spare part



- **Part name:** Transducer HiPAP 351P
- **Part number:** 320756

## Transducer 351P-5 spare part



- **Part name:** Transducer HiPAP 351P-5
- **Part number:** 320757

## Transducer 351P-I spare part



- **Part name:** Transducer HiPAP 351P-I
- **Part number:** 320977

## Transducer 351P-MGC spare part



- **Part name:** Transducer HiPAP 351P-MGC
- **Part number:** 398078

# Technical specifications

## **Topics**

[Performance specifications, page 38](#)

[Weights and outline dimensions, page 38](#)

[Power specifications, page 39](#)

[Environmental specifications, page 40](#)

## Performance specifications

These performance specifications summarize the main functional and operational characteristics of the HiPAP 351P Ex.

### Transducer unit

Transducer	Roll	Pitch	Heading
351P-I	0.01@ > 1 h (1 $\sigma$ )	0.01@ > 1 h (1 $\sigma$ )	0.05@ > 1 h [° sec lat] (1 $\sigma$ )
351P-MGC	0.01@ > 1 h (1 $\sigma$ )	0.01@ > 1 h (1 $\sigma$ )	0.025@ > 1 h [° sec lat] (1 $\sigma$ )

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

For 351P – See Kongsberg MRU H specification.

For 351P-5 – See Kongsberg MRU 5 specification.

## Weights and outline dimensions

These weights and outline dimension characteristics summarize the physical properties of the HiPAP 351P Ex.

### Transducer unit

Transducer	Weight	Height	Diameter
351P and 351P-5	42 kg	513 mm	338 mm
351P-I and 351P-MGC	51 kg	663 mm	341 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



**Interface unit**

Weight	Height	Width	Depth
51 kg	476 mm	280 mm	300 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

## Power specifications

These power characteristics summarize the power specifications for the HiPAP 351P Ex.

**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:	80 W

**Portable operator station**

See the manual supplied with the computer.

**Interface unit**

	Value
Voltage requirement:	85 to 264 VAC
Frequency:	47 to 63 Hz
Output power:	48 VDC
Frequency:	47 to 63 Hz
Maximum current drawn:	3.8 A at 115 VAC / 1.9 A at 230 VAC
Nominal power:	350 W (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 351P Ex.

### 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)
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 +60°C
Relative humidity:	10 to 90 % (non-condensing)

**Interface unit**

	Value
Operating temperature:	-20 to 40°C
Storage temperature:	-20 to +80°C
Storage/operating humidity:	5 to 95% relative (non condensing)
Degree of protection:	IP66

**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

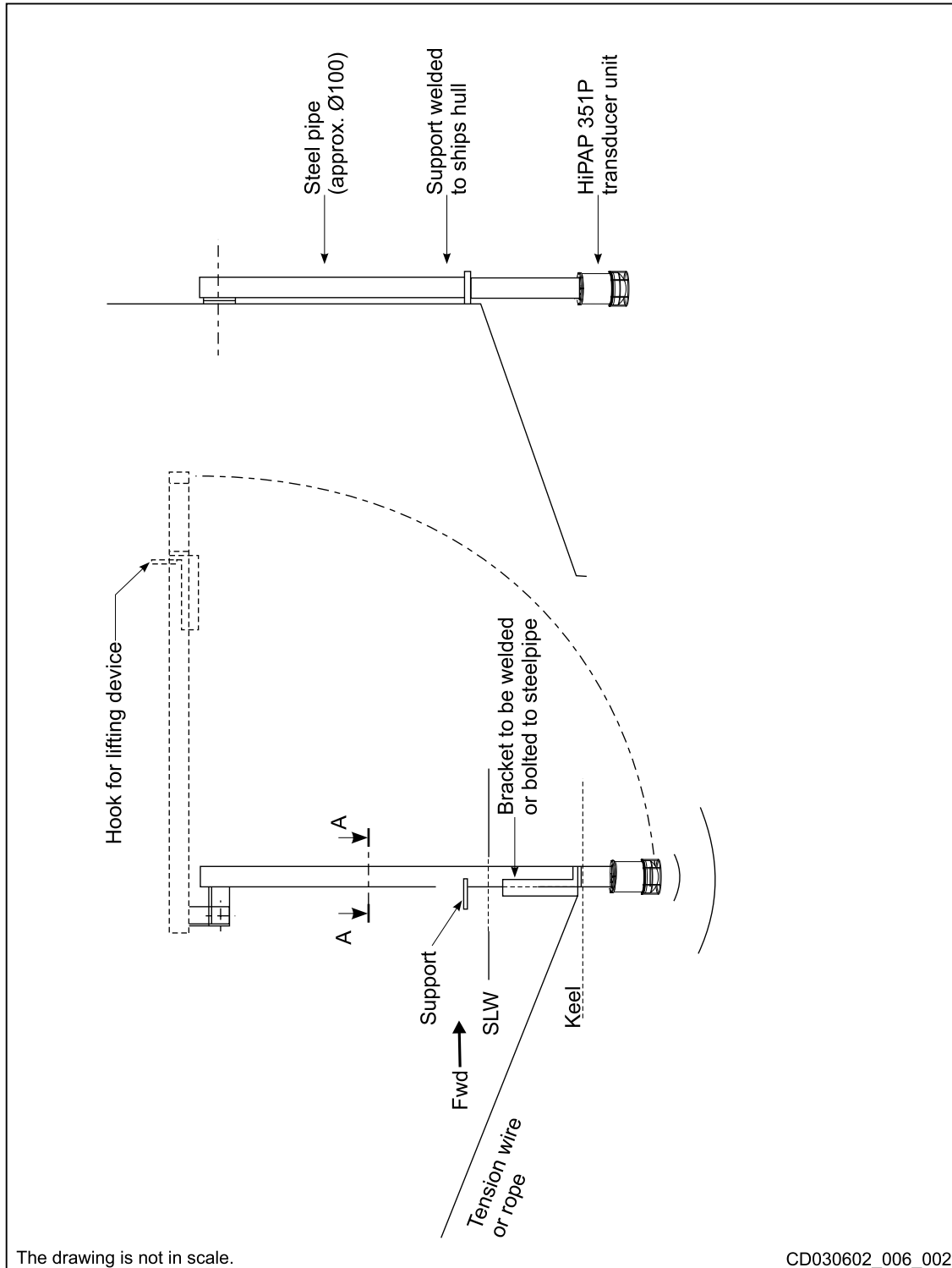
# Drawing file

## Topics

- [Installing the transducer, page 43](#)
- [Responder driver unit, wiring diagram, page 44](#)
- [Fibre to responder drive converter, wiring diagram, page 45](#)
- [Interface unit page 1, wiring diagram, page 46](#)
- [Interface unit page 2, wiring diagram, page 47](#)
- [Interface unit page 3, wiring diagram, page 48](#)
- [HiPAP 351P/351P-5, outline dimensions, page 49](#)
- [HiPAP 351P/351P-5, outline dimensions, page 50](#)
- [HiPAP 351P-I/MGC, outline dimensions, page 51](#)
- [HiPAP 351P-I/MGC, outline dimensions, page 52](#)
- [HiPAP 351P without cage, outline dimensions, page 53](#)
- [HiPAP 351P without cage, outline dimensions, page 54](#)
- [Interface unit page 1, outline dimensions, page 55](#)
- [Interface unit page 2, outline dimensions, page 56](#)
- [MP8300 outline dimensions, page 57](#)
- [Repeater unit, outline dimensions, page 58](#)
- [Responder driver unit, outline dimensions, page 59](#)

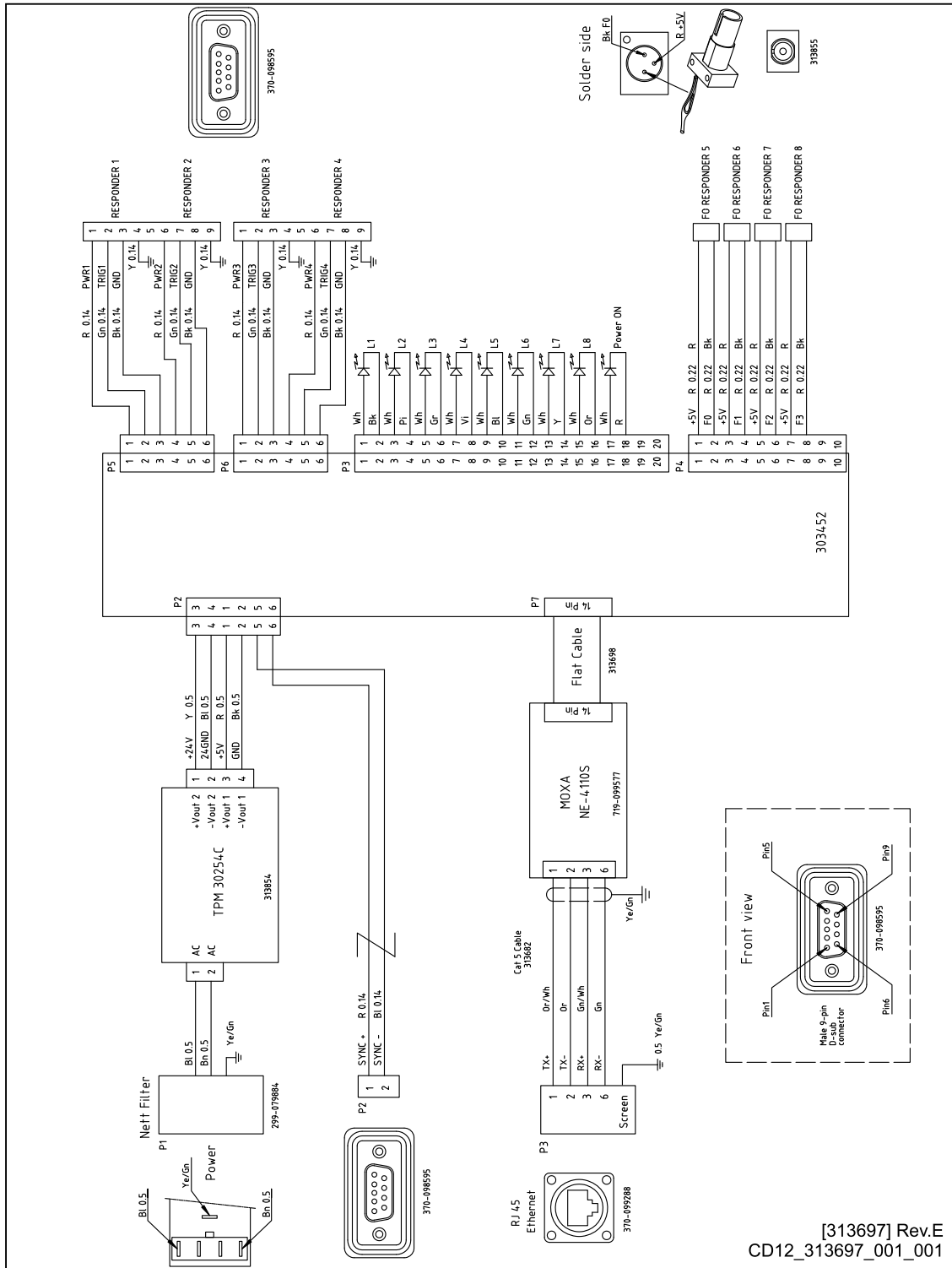
## Installing the transducer

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



# Responder driver unit, wiring diagram

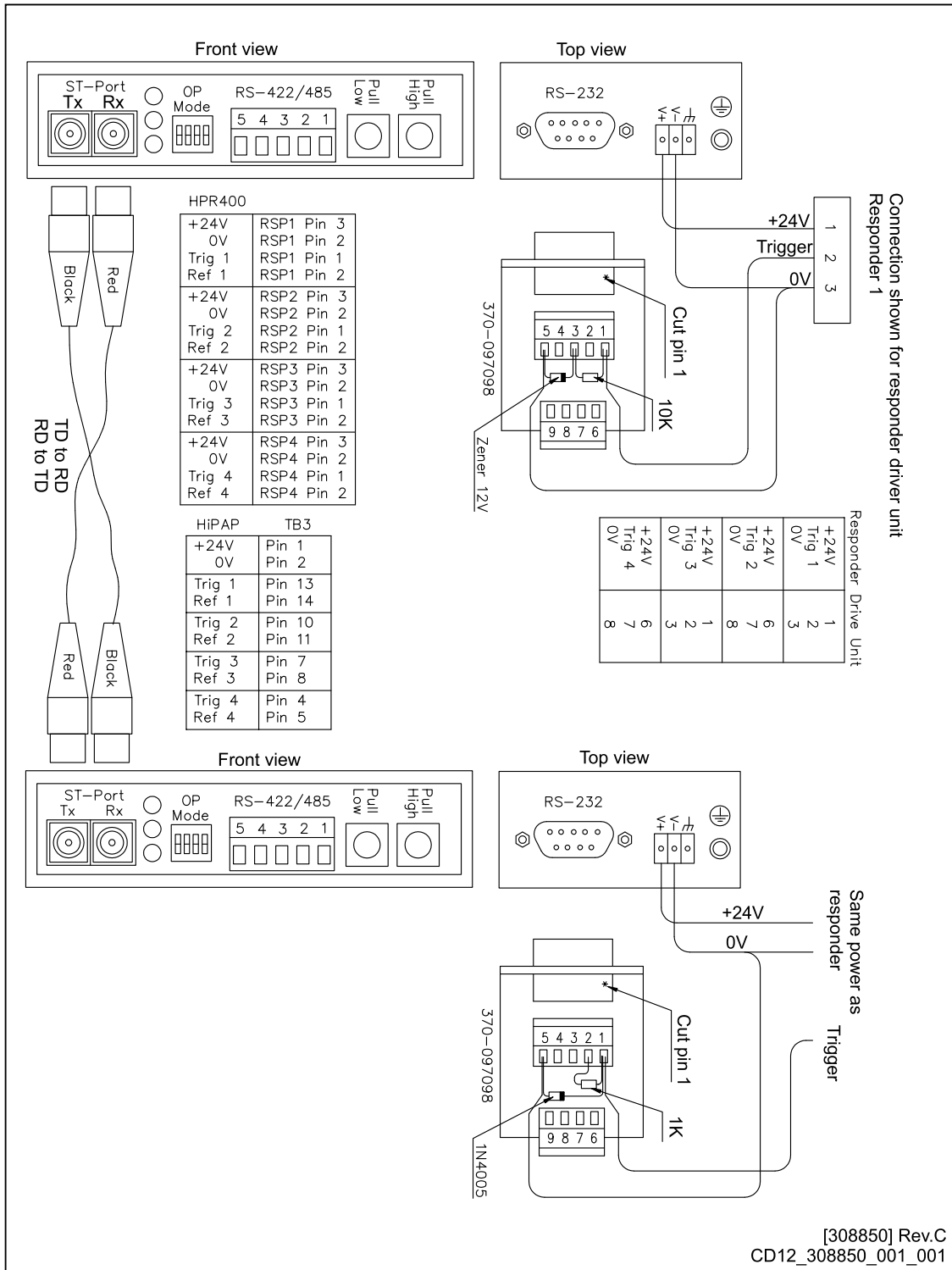
Drawing 313697



[313697] Rev.E  
CD12\_313697\_001\_001

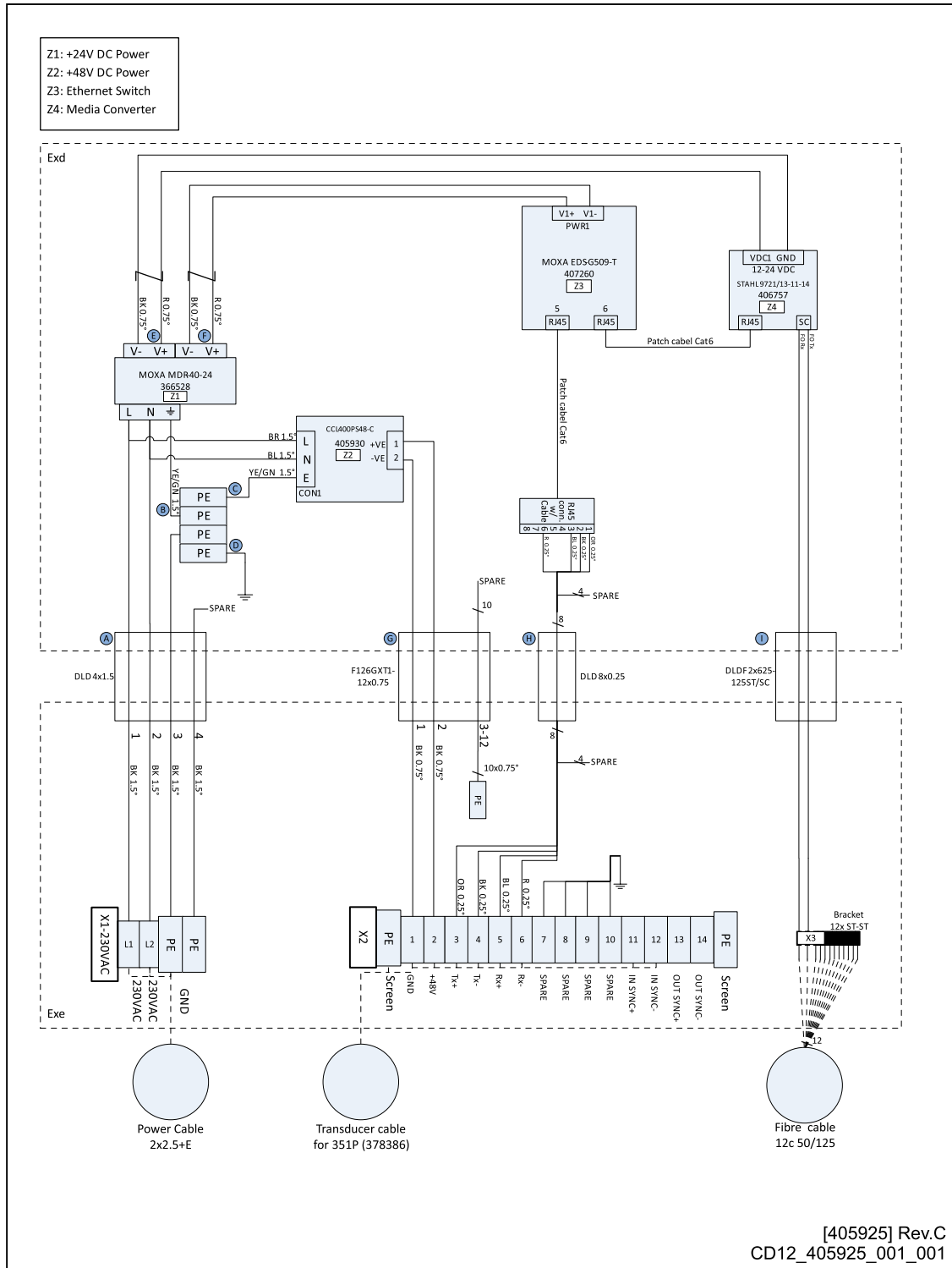
# Fibre to responder drive converter, wiring diagram

Drawing 308850



# Interface unit page 1, wiring diagram

Drawing 405925

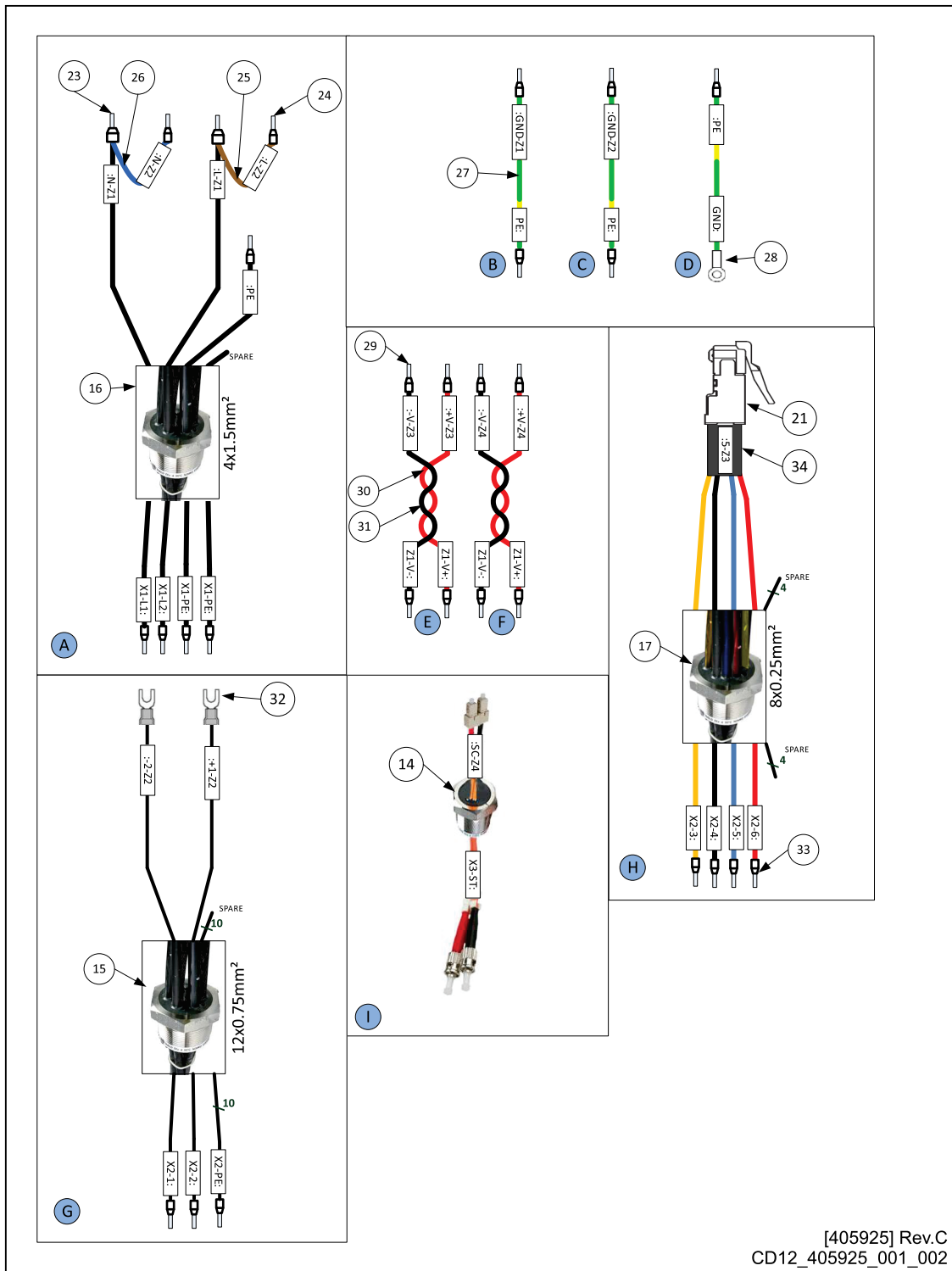


[405925] Rev.C  
CD12\_405925\_001\_001



# Interface unit page 2, wiring diagram

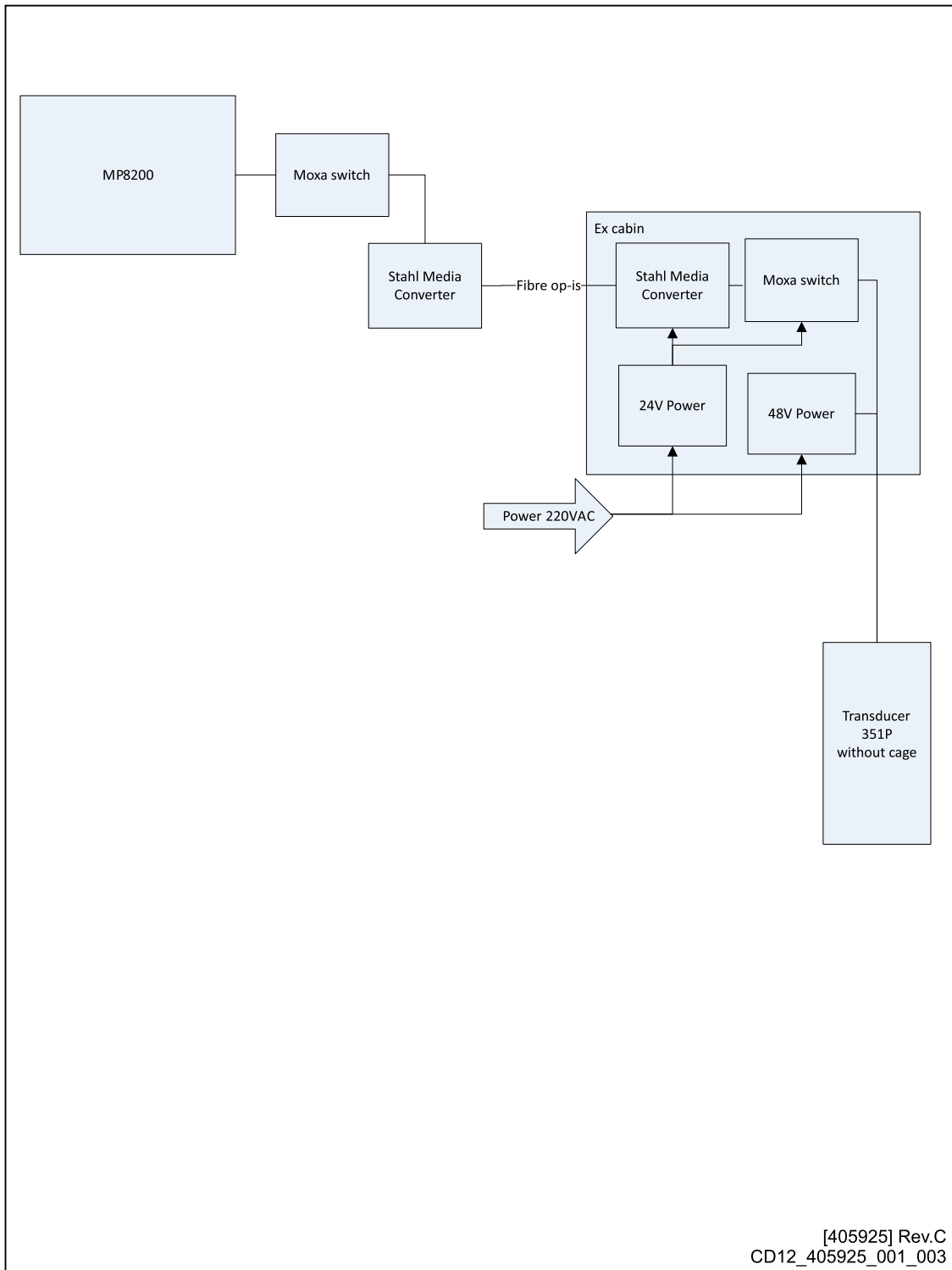
Drawing 405925



[405925] Rev.C  
CD12\_405925\_001\_002

# Interface unit page 3, wiring diagram

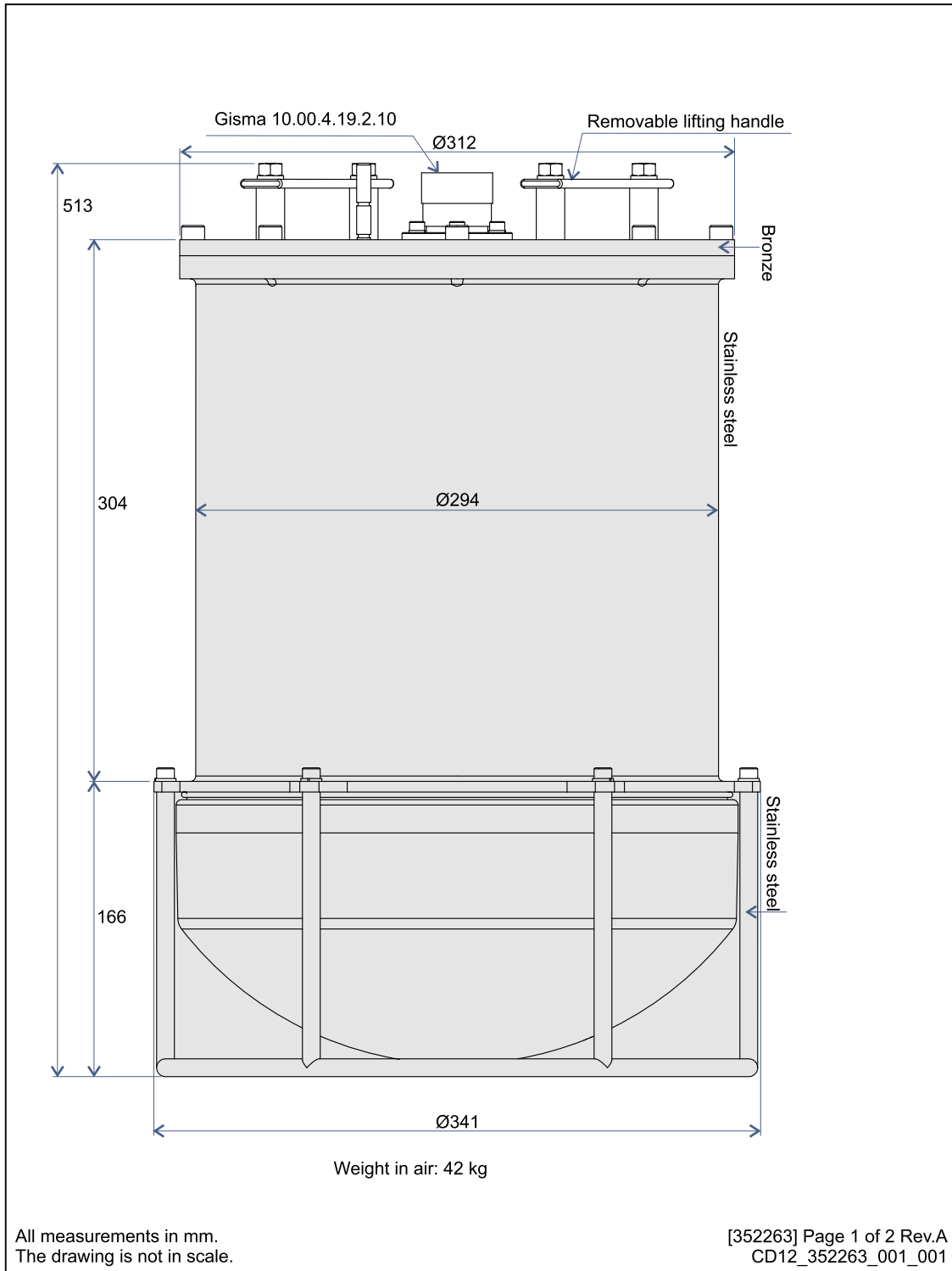
Drawing 405925



[405925] Rev.C  
CD12\_405925\_001\_003

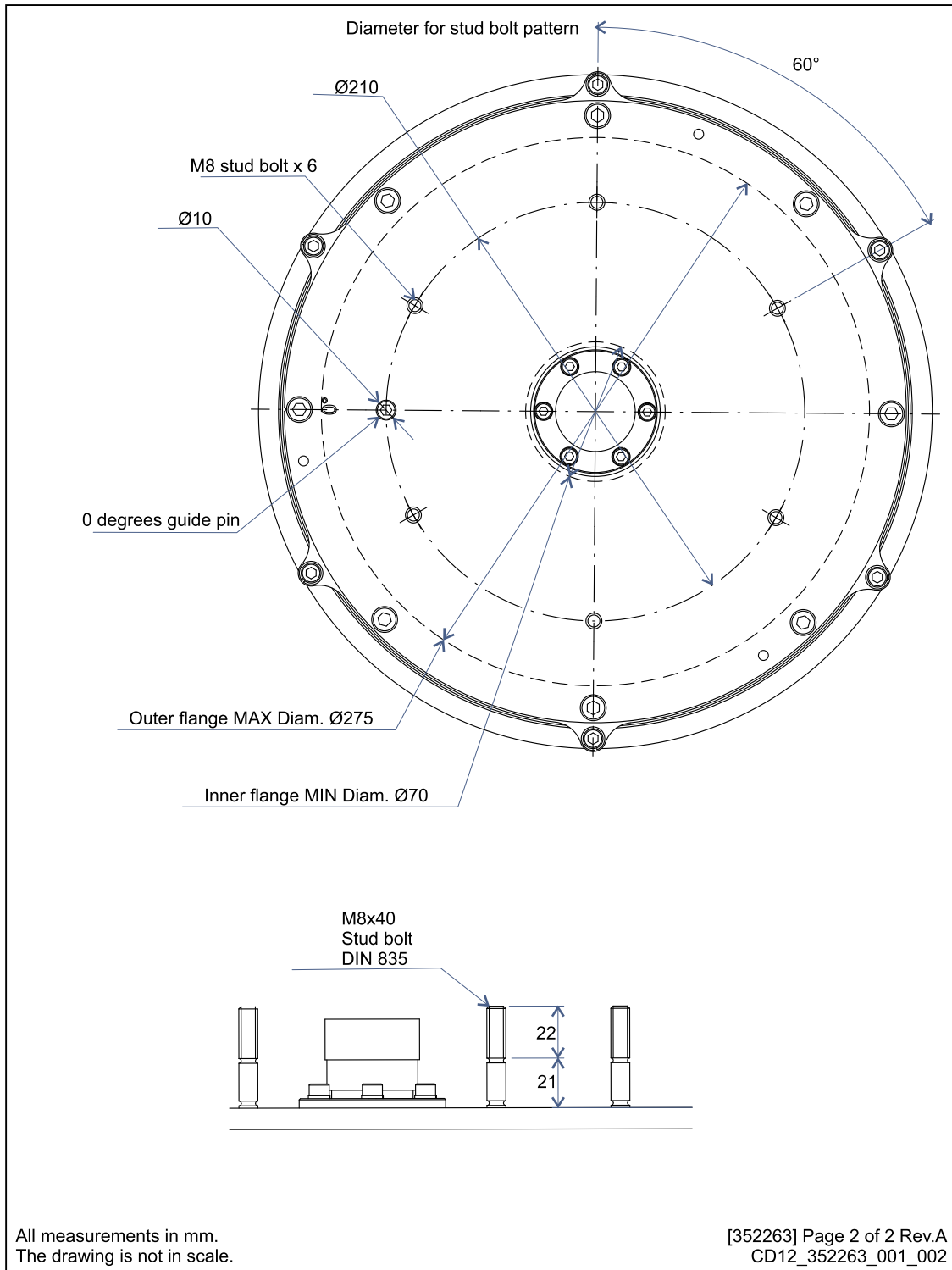
# HiPAP 351P/351P-5, outline dimensions

Drawing 352263 — page 1



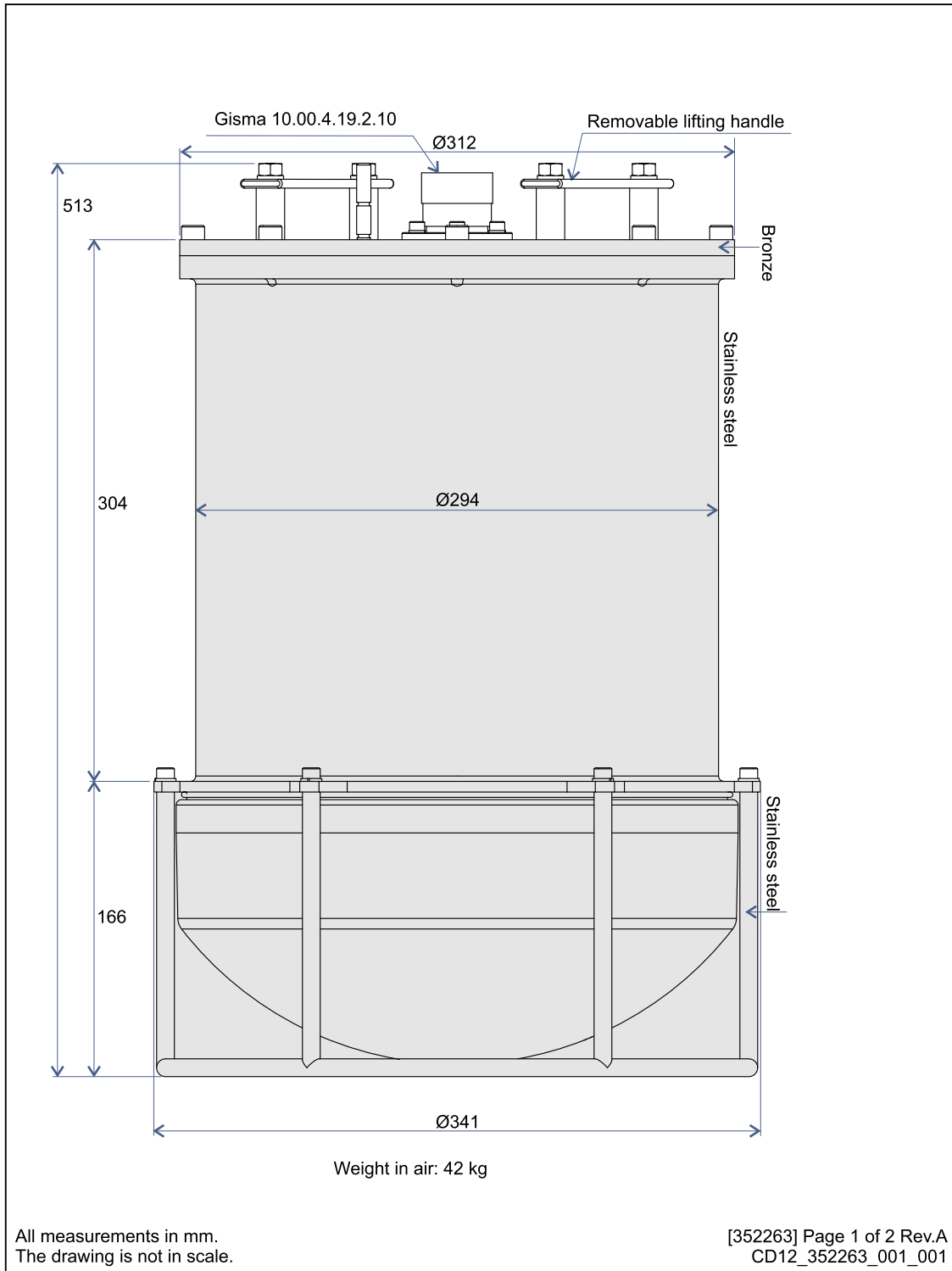
# HiPAP 351P/351P-5, outline dimensions

Drawing 352263 — page 2



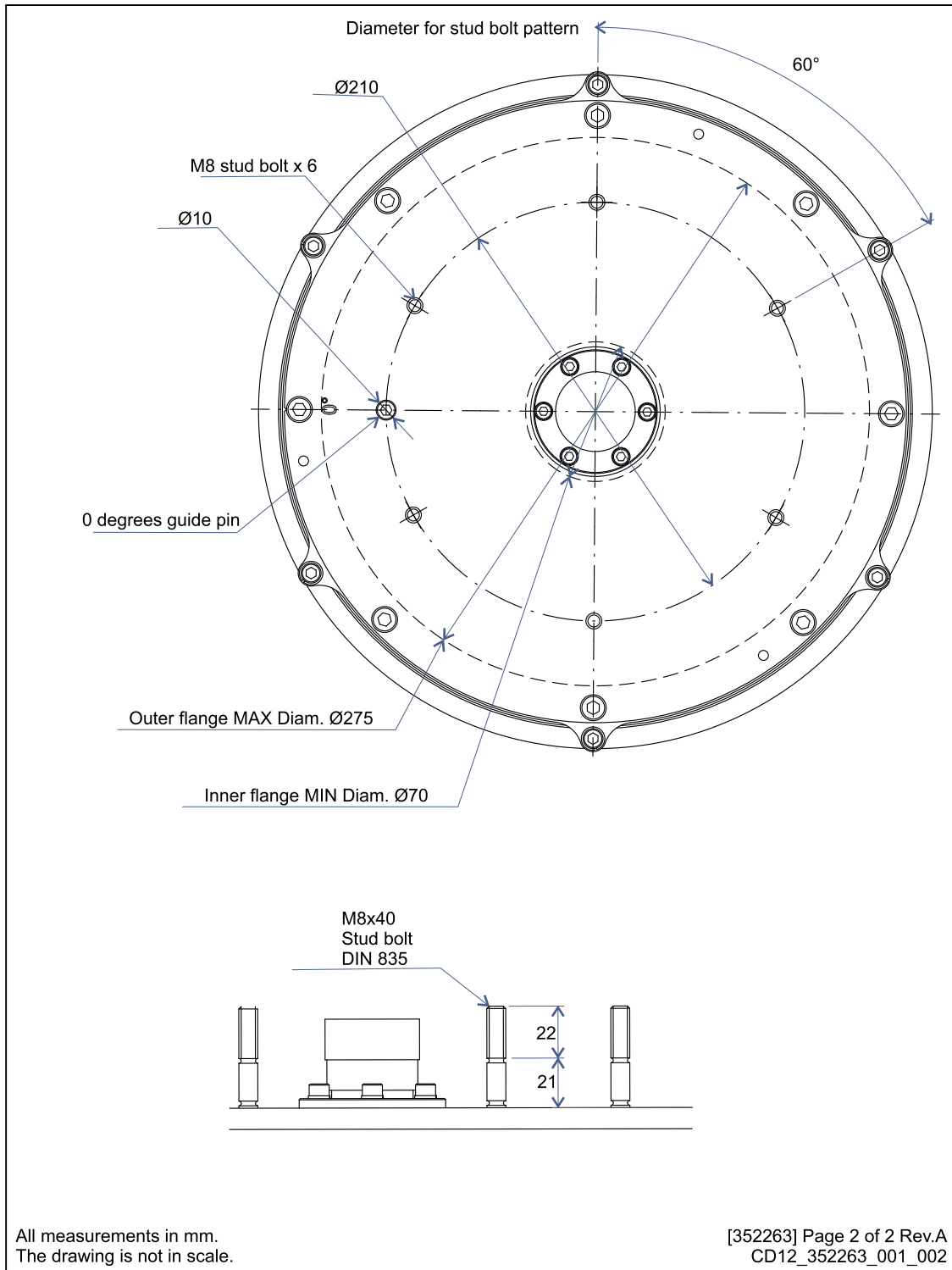
# HiPAP 351P-I/MGC, outline dimensions

Drawing 320935 - page 1



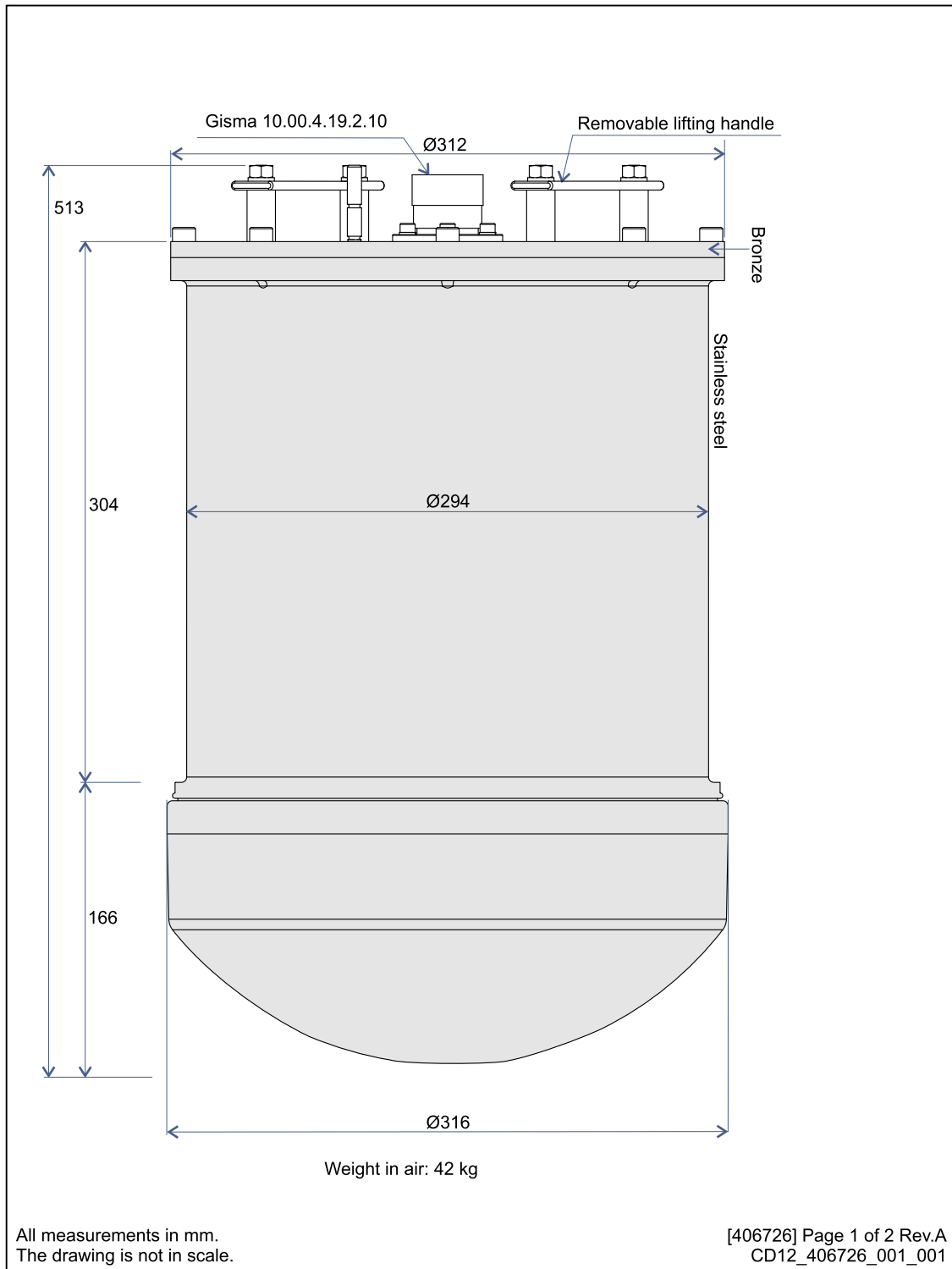
# HiPAP 351P-I/MGC, outline dimensions

Drawing 320935 — page 2



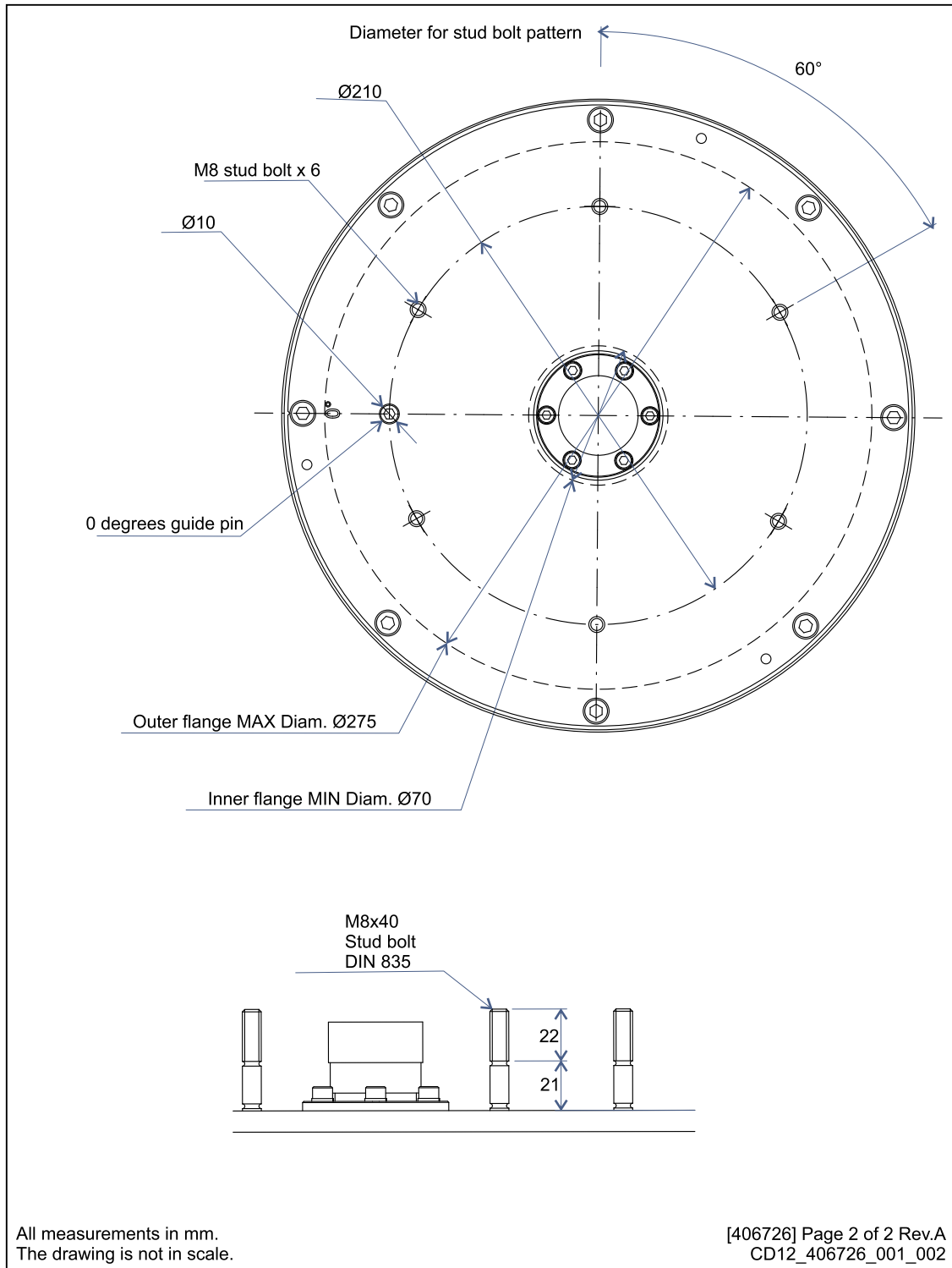
# HiPAP 351P without cage, outline dimensions

Drawing 406726 — Page 1



# HiPAP 351P without cage, outline dimensions

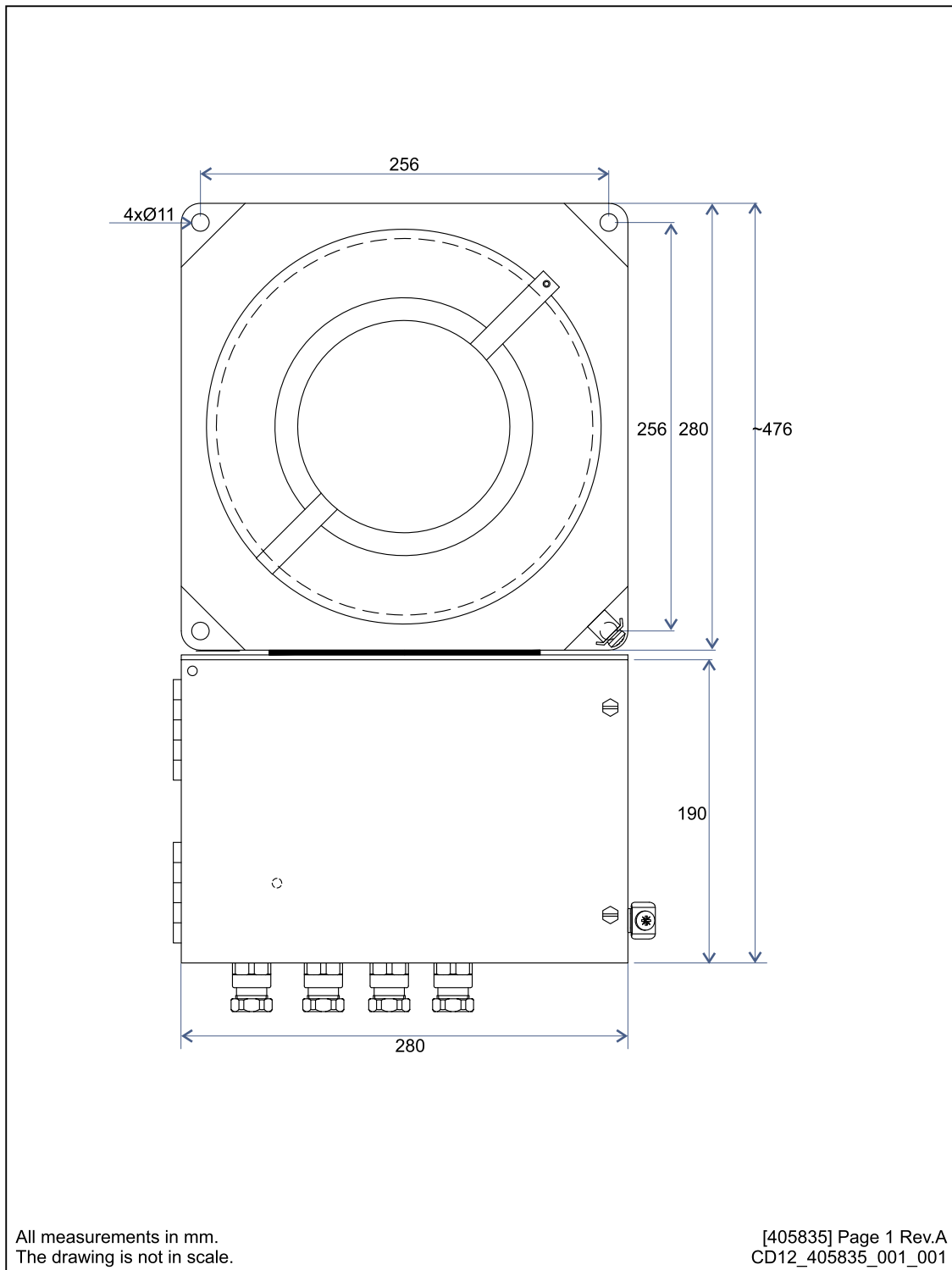
Drawing 406726 — Page 2





# Interface unit page 1, outline dimensions

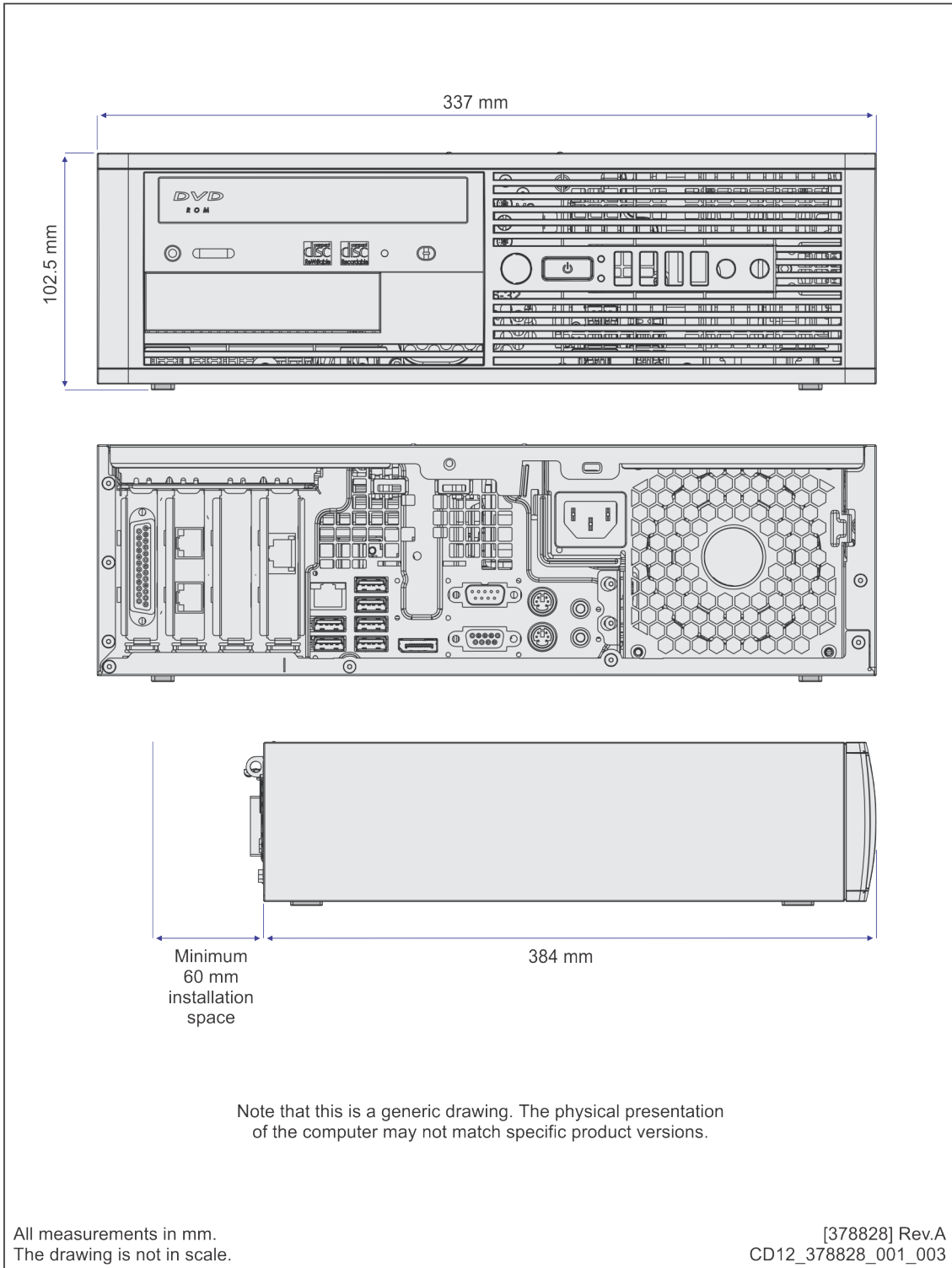
Drawing 405835





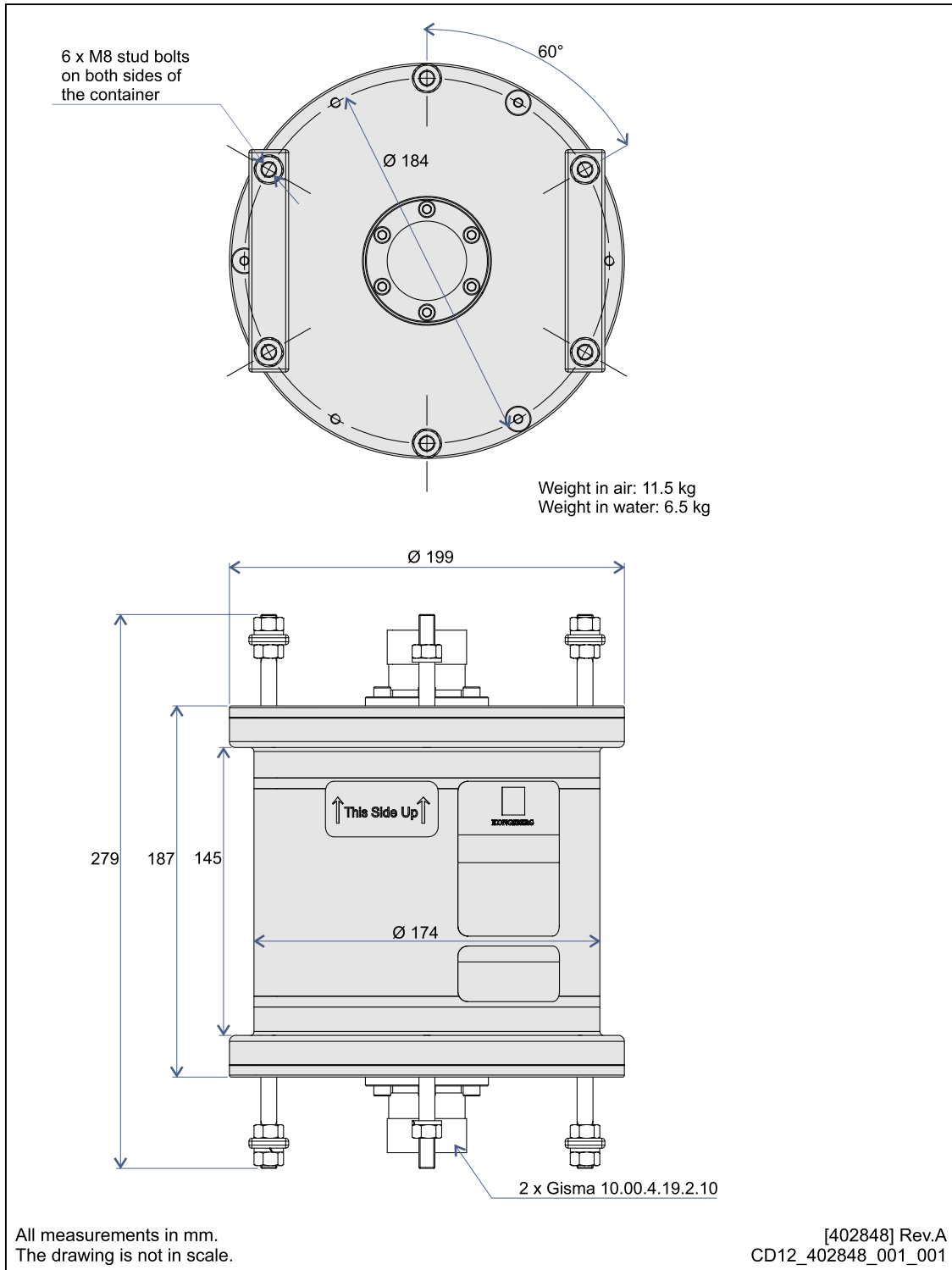
# MP8300 outline dimensions

Drawing 378828



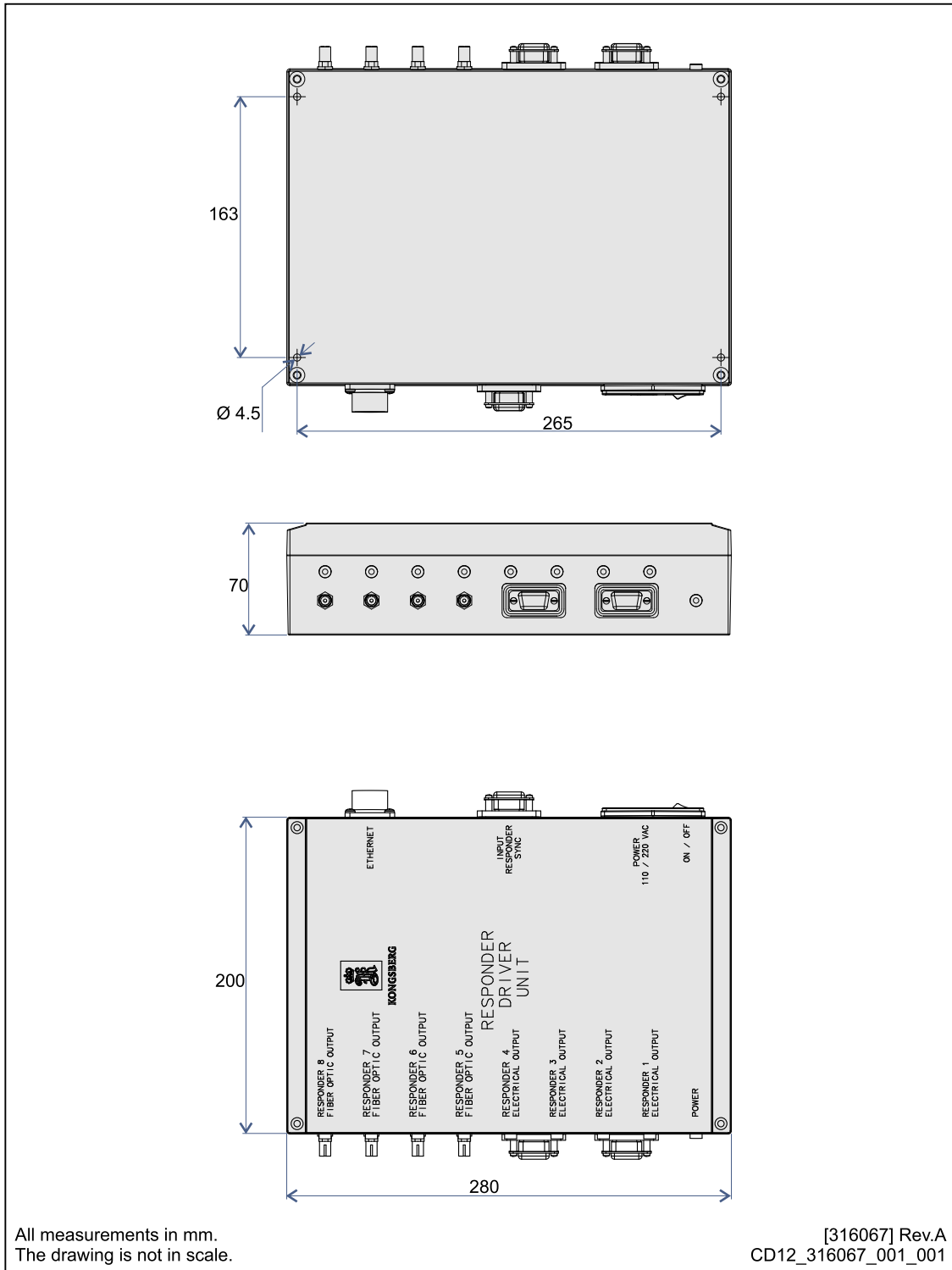
# Repeater unit, outline dimensions

Drawing 402848



# Responder driver unit, outline dimensions

Drawing 316067



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