cNODE Modem MiniS
Instruction Manual

Document information

- **Product**: Kongsberg cNODE Modem MiniS

- **Document**: Instruction Manual

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Warning

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

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

Disclaimer

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

Support information

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

Table of contents

About this manual

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

Target audience

This manual is intended for all users of the system.

Online information

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

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

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cNODE Modem MiniS

Topics

System description

cNODE Modem MiniS is designed for the Point 2 Point transfer of data between two cNODE's or to a surface vessel equipped with any HiPAP or μPAP systems.

The data telemetry operates on CYMBAL digital protocol, Kongsbergs field proven robust propriety link. Data rates of up to 6 kb/s are available. One cNODE Modem can address several other cNODE Modems during operation using the Kongsberg Link User Protocol. The modem is simple to configure with the TTC Light software.

Naming description

The modem name consists of the model name, the model number, the transducer beam width and any options included.

Model name

cNODE Modem MiniS

Model number

First digit = Frequency band

• 3 = 30 kHz

Second digit = Depth rating

• 4 = 4000 m

• 7 = 7000 m

Transducer beamwidth

• 180 = 180° beam width

• 40V = 40° vertical beam width

Optional modem modules

S: Split version for remote transducers

Modem identification

The modem have labels that identifies

• the modem name

• serial number

• default channels

System units

Modems

The modems have a depth rating of up to 7000 metres, and the housing is an anodised aluminium or titanium tube which is polyurethane coated to protect against corrosion and abrasion.

There are several models available with different beam widths. All modems have an internal tilt sensor ±90° and a rechargeable Li-Ion battery. The modem can be charged from an on deck battery charger or from an external 24 V source during operation.

Battery charger

Charging a battery is a process with an inherent risk so check applicable procedure(s) prior to charging in order to first assess the level of the inherent risk; and then, if necessary, apply suitable controls to mitigate the inherent risk before charging.

The battery charger charges the internal battery in approximately 1 hour. The LED charge status indicator shows when charging is complete.

Remote transducers

You need a modem with a dedicated end cap for the remote transducers.

There are different remote transducers available for many uses.

The transducer cable has two Subconn connectors; MCIL4F and MCIL4M. The cable connects the remote transducer to the modem.

TTC 30 (Transponder Test and Configuration unit)

The transponder test and configuration unit is designed for on deck testing and configuration of the transponders.

The TTC can test all Kongsberg modem high frequency channels, Cymbal and FSK. It can also test telemetry modems with internal and external sensors.

Support information

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

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

Company name	Kongsberg Maritime AS
Address	Strandpromenaden 50, 3183 Horten, Norway
Telephone	+47 33 03 41 00
Telephone 24h support	+47 33 03 24 07
Website	https://www.kongsberg.com/maritime/
Support website	Product support A to Z
Email address	km.support.hpr@kongsberg.com

General acoustic considerations

Take this information into consideration when deploying the modems.

Acoustic range

The term *depth rating* should not be confused with the term *acoustic range*. The acoustic range is dependent on many factors, and some of the factors are outside the control of the user.

Vessel system

The directivity and coverage area for the vessel system is different, depending on which system you are using. Some systems have high directivity and omnidirectional coverage, while other systems has reduced coverage and less directivity. The modem should always be within the coverage cone of the vessel system.

Transducer type

There are different types of transducers used with the modems depending on operational needs. An omnidirectional transducer, such as TD180, covers a large area, but has less acoustic power compared to a focused transducer, such as TD30V. A focused signal gives less footprint/coverage. The vessel should always be within the signal footprint of the modem.

Tx Power

The ability to detect signals depends on the signal strength. The transmission power can be adjusted, both for the vessel system and for the modem.

Acoustic noise

Acoustic noise is present at all vessels. At given conditions, the noise level can be excessive. A vessel's propellers and thrusters produce acoustic noise during manoeuvring, and in certain instances onboard machinery and pumps may also produce acoustic noise when in use. Heavy propeller/thruster use as well as waves can generate air bubbles, which can get in front of the vessel's transducer and block the acoustic signal.

Sound velocity and ray bending

Variations in water temperature affects the velocity of sound through the water column, and variations in the ocean's salinity level can bend the acoustic signal making it impossible for the signal to reach the vessel.

Getting started

Topics

425668/C

Turning on the modem

The modem is designed for operation in water only. The modem may be operated in air for test purposes over a short period of time.

Prerequisites

The modem must be charged before use.

Procedure

1   Grease the connector with Molykote 44 Medium or equivalent grease. Lubricating SEACON connectors, page 31

2   Connect the on/off plug to the end cap connector.

3   Tighten the locking sleeve to the end cap connector.

Result

A buzz can be heard within 25 seconds as a confirmation that the modem is activated.

Further requirements

It is recommended to test the modem with the Test and Configuration unit (TTC) to make sure it is working properly before operation.

Turning on the TTC

Use the Transponder Test and Configuration unit to check that the transponder is ready for use.

Procedure

1   Open the suitcase.

2   Turn on the main power switch to start the program.

    This takes approximately 1.5 minutes.

Acoustic test

Test the modem acoustics to make sure it is functioning.

Procedure

1   Set **TTC Power** by using the left/right arrows to select the power level and tap **Set** to confirm your selection.

2   Connect the test transducer cable to the upper right connector.

3   Place the test transducer face to face with the modem transducer.

4   Select the **Acoustic test** tab.

5   Type in the serial number, if necessary.

6   Type in the modem channel number, if necessary.

7   Tap **Interrogate**.

8   A green indicator will flash on the display if there is acoustic contact with the modem.

9   Tap **Interrogate** again to stop the acoustic test.

Pre-deployment checks

Before deploying the modem, it is important to do the following checks to make sure the operation goes smoothly.

Context

It is recommended to test the modem with the Test and Configuration unit (TTC) to make sure it is working properly before operation.

Procedure

1   Make sure the locking cord is in place.

2   If the unit has been altered from the factory pre-sets, check that the unit is configured according to your requirements.

3   Make sure the battery is fully charged.

4   Push the pressure relief valve in to confirm that it is flush with the end cap.

5   Switch the modem ON by inserting the on/off plug.

6   Perform an acoustic test using a Transponder Test and Configuration (TTC) unit: Acoustic test, page 16

    a   Interrogate the modem.

    b   Read battery status and confirm that it will last for the upcoming operation.

    c   Read the power setting and confirm it is correct for the upcoming operation.

Result

The modem is ready for use.

Deployment

The modem is designed for operation in water only. The modem may be operated in air for test purposes over a short period of time.

Prerequisites

The modem must be charged before use. It is recommended to test the modem with the Test and Configuration unit (TTC) to make sure it is working properly before operation.

Description

When you fit the modem onto a vehicle/structure, the unit must be positioned with the transducer upright and there must be a clear line of sight between the transducer on the modem and the vessel's transducer.Use a hose clamp with rubber protection to secure the modem.

The modem has an internal tilt sensor, where forward is towards the embossed logo, and upwards is toward the transducer.

Recovering the modem

It is important to perform these recovery checks after every operation.

Procedure

1   Wash the unit thoroughly in warm fresh water to dissolve any salt deposits and clean off any sand or silt.

2   As an extra precaution, it is recommended that the unit is left to soak in fresh water to allow salt to dissolve and diffuse from hard-to-reach areas, such as crevices between mating parts.

     Leave the unit to soak for 24 hours, or as long as practical conditions allow.

3   Dry off the unit and make sure that there is no water around the on/off plug or the external connector.

4   Turn the unit off by removing the on/off plug or disconnecting the external cable.

5   Recharge the unit.

Cymbal protocol

Cymbal is the acoustic protocol used both for positioning of subsea transponders in SSBL/LBL mod and data communication to and from transponders. It uses Direct Sequence Spread Spectrum (DSSS) signals.

There are 10 wide band carrier frequencies with 56 unique codes. The bandwidth of each band is 4 kHz. There are 560 unique channels in total.

Channel names	Centre frequency
M8xx	24.0 kHz
M6xx	24.4 kHz
M4xx	24.8 kHz
M2xx	25.2 kHz
Mxx	25.6 kHz

Channel names	Centre frequency
M1xx	26.0 kHz
M3xx	26.4 kHz
M5xx	26.8 kHz
M7xx	27.2 kHz
M9xx	27.6 kHz

Cabling

Topics

425668/C

Configuration or power connector pinout

The external connector is for configuration, responder function, on/off function and charging.

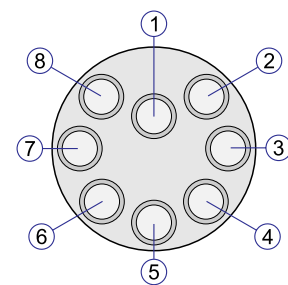This is the pin configuration for a male connector, as seen towards the connector (face view).

Pin 1, 2 and 3 is for configuration.

Pin 4 and 5 is for responder function.

Pin 6 and 8 is for on/off function.

Pin 7 and 8 is for external power.

| Pin number	Signal
1	
2	
3	
4	Responder trigger +
5	Responder trigger -
6	On/Off
7	External power (24 VDC)
8	Ground

Connecting the modem to external power and responder signals

The modem can be used with the internal battery or be connected to an external power source.

Prerequisites

This is the pin configuration for a male connector, as seen towards the connector (face view).

1

2

3

4   Responder trigger+

5   Responder trigger-

6   On/Off

7   External power(24 VDC)

8   Ground
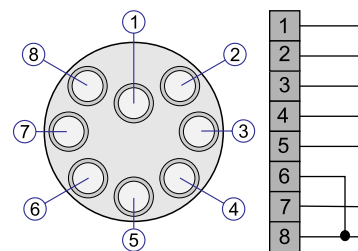
Procedure

1   Use the cable with part number 402462 from Kongsberg.

2   Connect wire 6 and 8 in the pigtail (the ON/OFF function).

    When 6-8 are linked, the modem is ON.

    With no connection between 6-8, the modem is OFF.

3   Make sure that the external power supply 24 VDC is between 20 and 28 VDC.

4   Check the responder trigger signal.

5   Switch ON the unit by inserting the external power/responder cable.

Further requirements

It is recommended to test the modem with the Test and Configuration unit (TTC) to make sure it is working properly before operation.

Modem connector pinout

This is the pin configuration for a female plug, as seen towards the plug (face view).
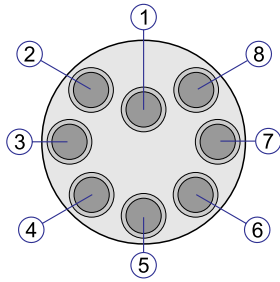
Pin number	Signal
1	RS-232 Tx
2	RS-232 Rx
3	Ground
4	RS-422 Tx +
5	RS-422 Tx −
6	RS-422 Rx +
7	RS-422 Rx −
8	Ground

RS-232

RS-232 connection

Modem side		User side
1 TX RS-232	→	RX
2 RX RS-232	←	TX
3 GND RS-232	—	GND RS-232

(CD030103_012_001)

RS-422

Modem side		User side
4 TX+ RS-422	→	RX+
5 TX- RS-422	→	RX-
6 RX+ RS-422	←	TX+
7 RX- RS-422	←	TX-
8 GND RS-422	—	GND RS-422

RS-422 connection

(CD030103_012_002)

RS-485

Modem side		User side
4 TX+ RS-422		TX+/RX+
5 TX- RS-422		TX-RX-
6 RX+ RS-422		
7 RX- RS-422		
8 GND RS-422	—	GND RS-485

RS-485 connection

(CD030103_012_003)
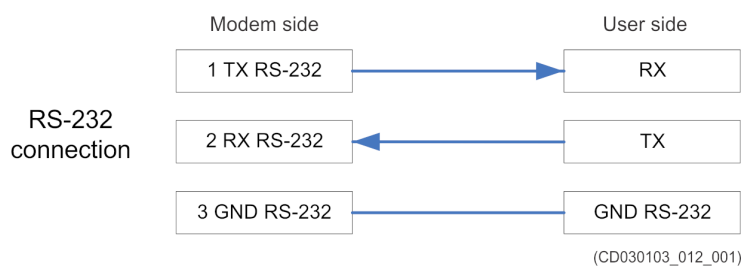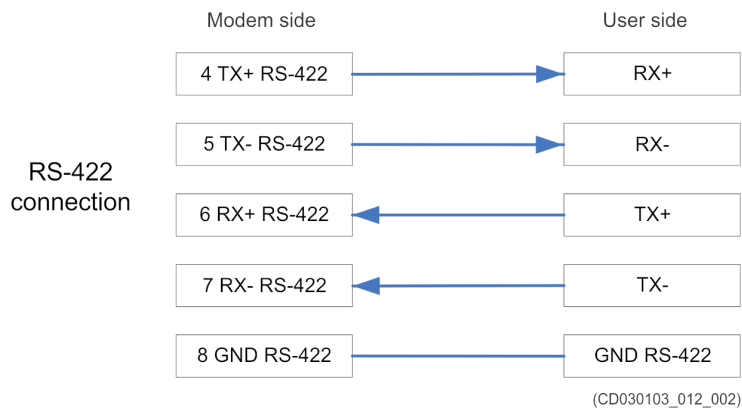
Connecting the modem to a RS-232 signal

The modem can be used with the internal battery or be connected to an external power source.

Context

This is the pin configuration for a female connector, as seen towards the connector (face view).

A   cNODE Modem MiniS

B   User connector

1   RS-232 Tx

2   RS-232 Rx

3   Ground

Procedure

1   Use the cable with part number 427240 from Kongsberg.

2   Connect wire 1 to the user RS-232 Rx.

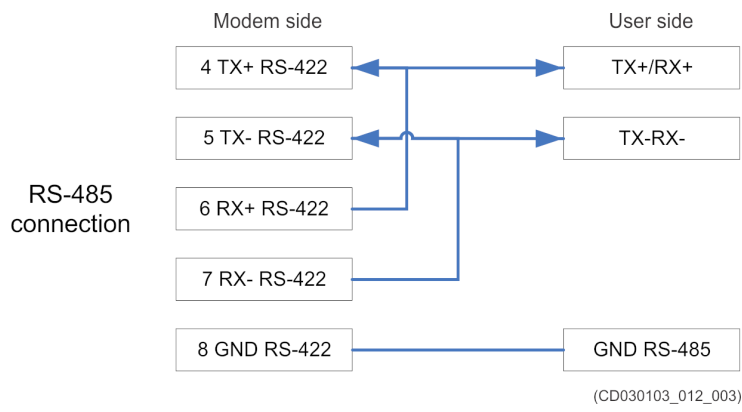3   Connect wire 2 to the user RS-232 Tx.

4   Connect wire 3 to the user RS-232 Ground.

Connecting the modem to a RS-422 signal

The modem can be used with the internal battery or be connected to an external power source.

Context

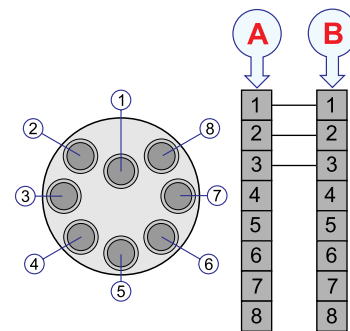This is the pin configuration for a female connector, as seen towards the connector (face view).

A   cNODE Modem MiniS

B   User connector

1

2

3
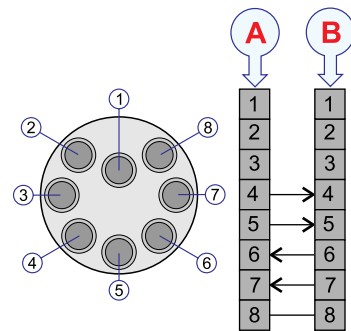
4   RS-422 Tx +

5   RS-422 Tx −

6   RS-422 Rx +

7   RS-422 Rx −

8   Ground

Procedure

1   Use the cable with part number 427240 from Kongsberg.

2   Connect wire 4 to the user RS-422 Rx+.

3   Connect wire 5 to the user RS-422 Rx-.

4   Connect wire 6 to the user RS-422 Tx+.

5   Connect wire 7 to the user RS-422 Tx-.

6   Connect wire 8 to the user RS-422 Ground.

Connecting the modem to a RS-485 signal

The modem can be used with the internal battery or be connected to an external power source.

Context

This is the pin configuration for a female connector, as seen towards the connector (face view).

A	cNODE Modem MiniS
B	User connector
1	
2	
3	
4	RS-422 Tx +
5	RS-422 Tx −
6	RS-422 Rx +
7	RS-422 Rx −
8	Ground
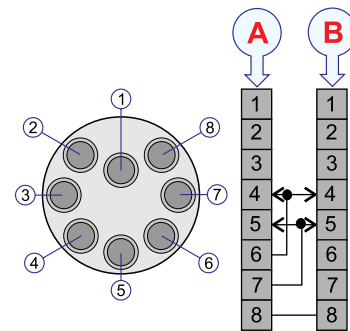
Procedure

1   Use the cable with part number 427240 from Kongsberg.

2   Connect wires 4 and 6.

3   Connect this wire to the user Tx+/Rx+.

4   Connect wires 5 and 7.

5   Connect this wire to the user Tx-/Rx-.

6   Connect wire 8 to the user RS-485 Ground.

Operating procedures

The modem is operated from the HiPAP operator station APOS.

• Refer to APOS online help for descriptions.

Maintenance

Topics

Safety features

The modem has a safety valve for releasing pressure that might build up inside.

Pressure relief valve

The transponder is fitted with a pressure relief valve at the bottom of the unit. The relief valve prevents overpressure. This valve will release the pressure if it exceeds approximately 1.0 bar.

The relief valve will normally pop out gently releasing the pressure. The valve is reset by firmly pushing the valve back in and is levelled with the surrounding surface.

Resetting the valve can in certain cases be obstructed due to production of acids and salts leaking from a damaged battery. In such cases the battery and circuits may have been damaged. Please contact Kongsberg Maritime for assistance.

Handling a transponder with an open relief valve or heated body

If the modem body is hot when recovered, place the modem fully submerged in a bucket of water for 24 hours or deploy into the sea permanently. If this method is impossible, the modem can be cooled with lots of cold water using a fire hose.

If the modem pressure relief valve emits gas or liquids when recovered, place the it fully submerged in a bucket of water for 24 hours or deploy into the sea permanently. If this method is impossible, the modem can be cooled with lots of cold water using a fire hose.

Charging the battery (on-deck)

Charging a battery is a process with an inherent risk so check applicable procedure(s) prior to charging in order to first assess the level of the inherent risk; and then, if necessary, apply suitable controls to mitigate the inherent risk before charging. Follow the charging procedure carefully.

Context

The battery must be fully charged before long term storage and it is recommended to recharge the battery every 6 months to make sure the battery does not discharge completely over time. A completely discharged battery will not charge, as all lithium ion batteries.

To comply with regulations for air transportation, the battery must have 30 % or less remaining capacity.

The battery charger will only start to charge if the battery capacity is lower than 96 %.

Caution

Equalize the temperature of the cNODE Modem MiniS to between 10 °C and 40 °C before charging it.

For on-deck charging, use the cNODE battery charger only.

Never charge the battery unattended.

Procedure

1   Switch off the cNODE Modem.

2   Let the unit warm up or cool down to an ambient temperature of 10 °C to 40 °C before charging.

3   Connect the battery charger plug to the connector on the modem marked CHARGE.

4   Connect the battery charger to mains (110 or 220 VAC).

5   Remove the power cord after charging, before removing the connector from the cNODE Modem MiniS.

Result

The LED indicator on the charger flashes green when charging. It normally takes about 30 seconds before the charging starts and the LED indicator starts flashing green after connecting the cNODE battery charger to the mains. The battery will be charged within 1 hour. The LED indicator will stay green when fully charged.

The modem is ready for use.

Lubricating SEACON connectors

SEACON connectors require very little maintenance. They are designed to be used in harsh environments and thus limited amounts of dirt and grit do not affect their performance.

Context

It is recommended that, upon disconnecting or retrieving the system, the connectors be cleaned, to storage (if possible, remate with dummy plugs). Prior to deployment the following maintenance procedure is recommended:

Procedure

1   Demate the connector set.

2   Flush connector interface with fresh water (deionized water if available), remove all dirt, grit and grease.

3   Inspect for damage in sealing areas, excessive corrosion, debonding of the cable and connector interface and cuts in the cable jacket.

4   Apply thin film of dilectric compound (DC) grease, silicon based, to sealing areas of male connector and across the face of the female connector. If the bulkhead connector (BC) is removed from it's housing then replace facial o-ring and make sure that o-rings are lubricated and in good condition. The use of some oil-based propellants in spray cans can cause conductivity problems in neoprene.

5   Mate the connector halves, wipe away any excess grease off the interface line of the mated set.

Battery charger status and troubleshooting

The battery charger has a LED indicator for easier troubleshooting.

LED indicator	What it means	How to fix this
Flashing green	The battery is charging	
Steady green	The battery is fully charged	
Flashing red	• The charger is not connected to the transponder • Failure in charger/transponder connection • Charger might be faulty	Disconnect all cables and wait 1 minute before reconnecting the cables and connect power supply to mains (110 or 220 Vac). If the LED indicator is still flashing red: Charger might be faulty Contact your local Kongsberg Maritime office.
Steady red	• The battery temperature might be outside the charging specification • Possible battery failure	• Let the unit warm up or cool down to an ambient temperature of 10 °C to 40 °C before charging. • Disconnect all cables and wait 1 minute before reconnecting the cables and connect power supply to mains (110 or 220 Vac). If the LED indicator is still flashing red:

LED indicator	What it means	How to fix this
		Possible battery failure Contact your local Kongsberg Maritime office.
No light	It normally takes about 30 seconds before the battery starts charging and the LED indicator starts flashing green after connecting the cNODE battery charger to the cNODE Modem MiniS and then to the mains (110 or 220 VAC).	Disconnect all cables and wait 1 minute before reconnecting the cables and connect power supply to mains (110 or 220 Vac). The charger or cNODE Modem MiniS might be faulty. Contact your local Kongsberg Maritime office.

Spare parts

Topics

Ordering spare parts

To make the order process as short and efficient as possible, you must provide accurate information about the product, the part you need, and yourself.

The following information must be provided with your order:

• Part name and/or description

• Our part number

• Number of items required

• Your shipment address

• Preferred shipment method

• Required date of delivery from us

For certain spare parts (typically complete units, printed circuit boards and software) the vessel name is also useful, as this allows us to update our vessel database.

cNODE Modem MiniS 34-180 spare part

• **Part name**: Modem MiniS 34-180

• **Part number**: 425260

cNODE Modem MiniS 34-40V spare part

• **Part name**: Modem MiniS 34-40V

• **Part number**: 417930

cNODE Modem MiniS 37-40V spare part

• **Part name**: Modem MiniS 37-40V Ti

• **Part number**: 443254

cNODE Modem MiniS 34-S spare part

- **Part name**: Modem MiniS 34-S
- **Part number**: 475529

TDR180 spare part

Aluminium

- **Part name**: cNODE Modem MiniS TDR180
- **Part number**: 349742

Stainless steel

- **Part name**: cNODE Modem MiniS TDR180-St
- **Part number**: 375361

TDR30H spare part

Aluminium

- **Part name**: cNODE Modem MiniS TDR30H
- **Part number**: 345773

Stainless steel

- **Part name**: cNODE Modem MiniS TDR30H-St
- **Part number**: 375359

TDR40V spare part

Aluminium

- **Part name**: cNODE Modem MiniS TDR40V
- **Part number**: 349743

Stainless steel

- **Part name**: cNODE Modem MiniS TDR40V-St
- **Part number**: 375360

Battery charger spare part

- **Part name**: cNODE Modem MiniS battery charger
- **Part number**: 404199

ON/OFF plug spare part

- **Part name**: ON/OFF plug with locking sleeve
- **Part number**: 401633

Configuration or power cable spare part

- **Part name**: Pigtail cable with locking sleeve
- **Part number**: 408094

Modem cable spare part

- **Part name**: Pigtail cable with locking sleeve
- **Part number**: 427240

Transducer cable spare part

- **Part name**: cNODE Modem MiniS transducer cable
- **Part number**: 345772

Floating collar spare part

- **Part name**: Floating collar
- **Part number**: 442750

Transducer guard spare part

- **Part name**: Transducer guard
- **Part number**: 439442

TTC 30 spare part
- **Part name:** TTC 30 (Transponder Test and Configuration unit)
- **Part name:** 345775

Test and configuration cable (TTC to Modem MiniS) spare part

- Part name: Test and configuration cable (TTC to Modem MiniS) spare part
- Part number: 407647

Test and configuration cable (PC to Modem MiniS) spare part

- **Part name**: Test and configuration cable (PC to Modem MiniS) spare part
- **Part number**: 407648

Drawing file

Topics

Modem MiniS 3x-40V dimensions

Ø 104

321

238

Ø 105

MODEM
I / O

Serial No:

Channels:

CHARGE (24V)
RESPONDER
ON / OFF

SAFETY
VALVE

Aluminium:
Weight in water: 2.1Kg
Weight in air: 4.6Kg

Titanium:
Weight in water: 4.0Kg
Weight in air: 6.5Kg

All measurements in mm.
The drawing is not to scale.   [495068] Rev.A
Information may be omitted. Observe the source drawing for additional details.   AI12_495068_001_001
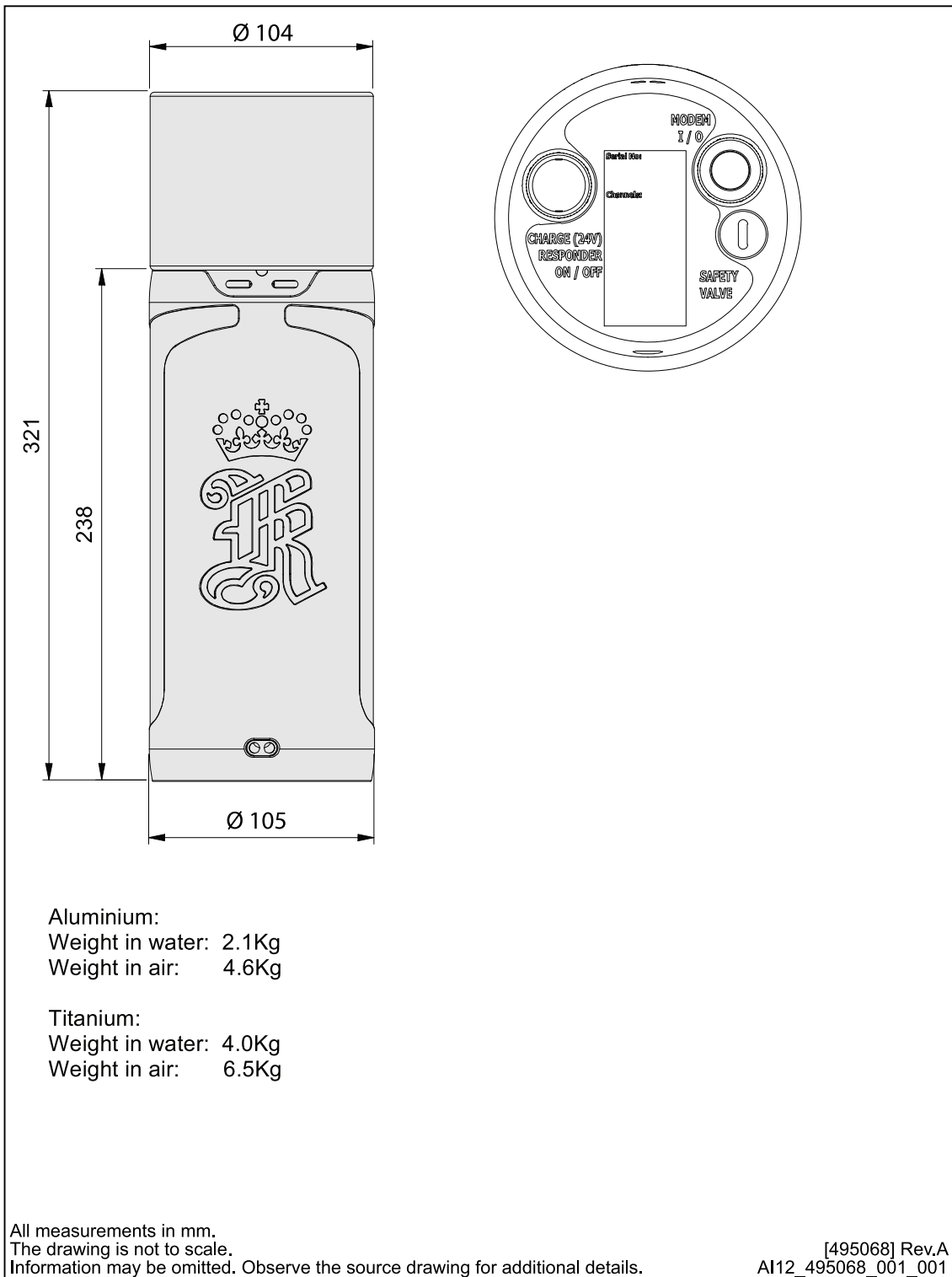
Modem MiniS 3x-180 dimensions

Ø 106

306

238

Ø 105

MODEM
I / O

Serial No:

Channels

CHARGE (24V)
RESPONDER
ON / OFF

SAFETY
VALVE

Aluminium:
Weight in water: 2.1Kg
Weight in air: 4.3Kg

Titanium:
Weight in water: 4.0Kg
Weight in air: 6.2Kg

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

[495069] Rev.A
AI12_495069_001_001
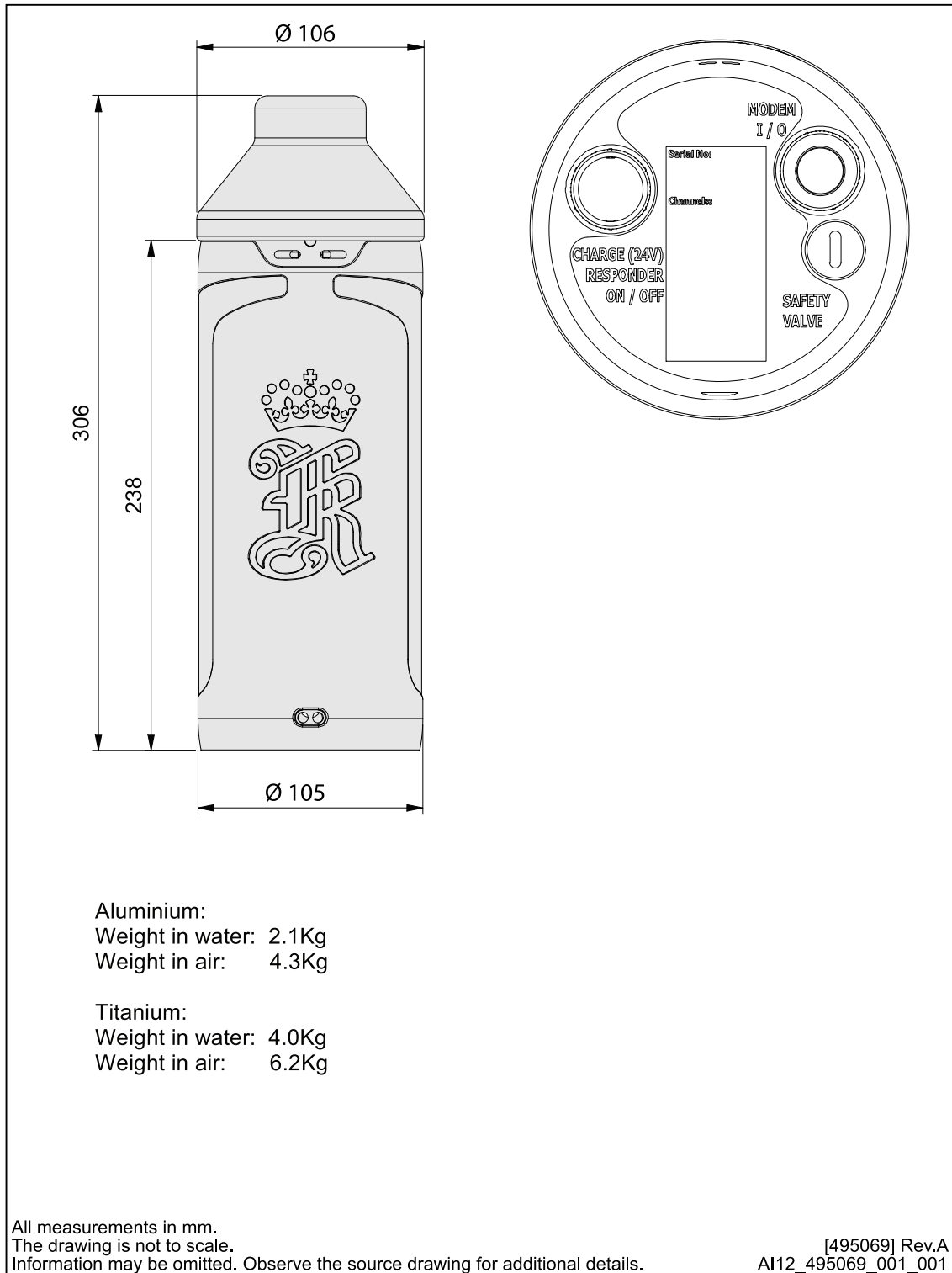
Modem MiniS 3x-S dimensions

278

238

Ø 105

MODEM
I/O

Serial No:

Channels:

CHARGE (24V)
RESPONDER
ON / OFF

SAFETY
VALVE

Aluminium:
Weight in water: 2.1Kg
Weight in air: 4.1Kg

Titanium:
Weight in water: 4.0Kg
Weight in air: 6.0Kg

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

[495070] Rev.A
AI12_495070_001_001
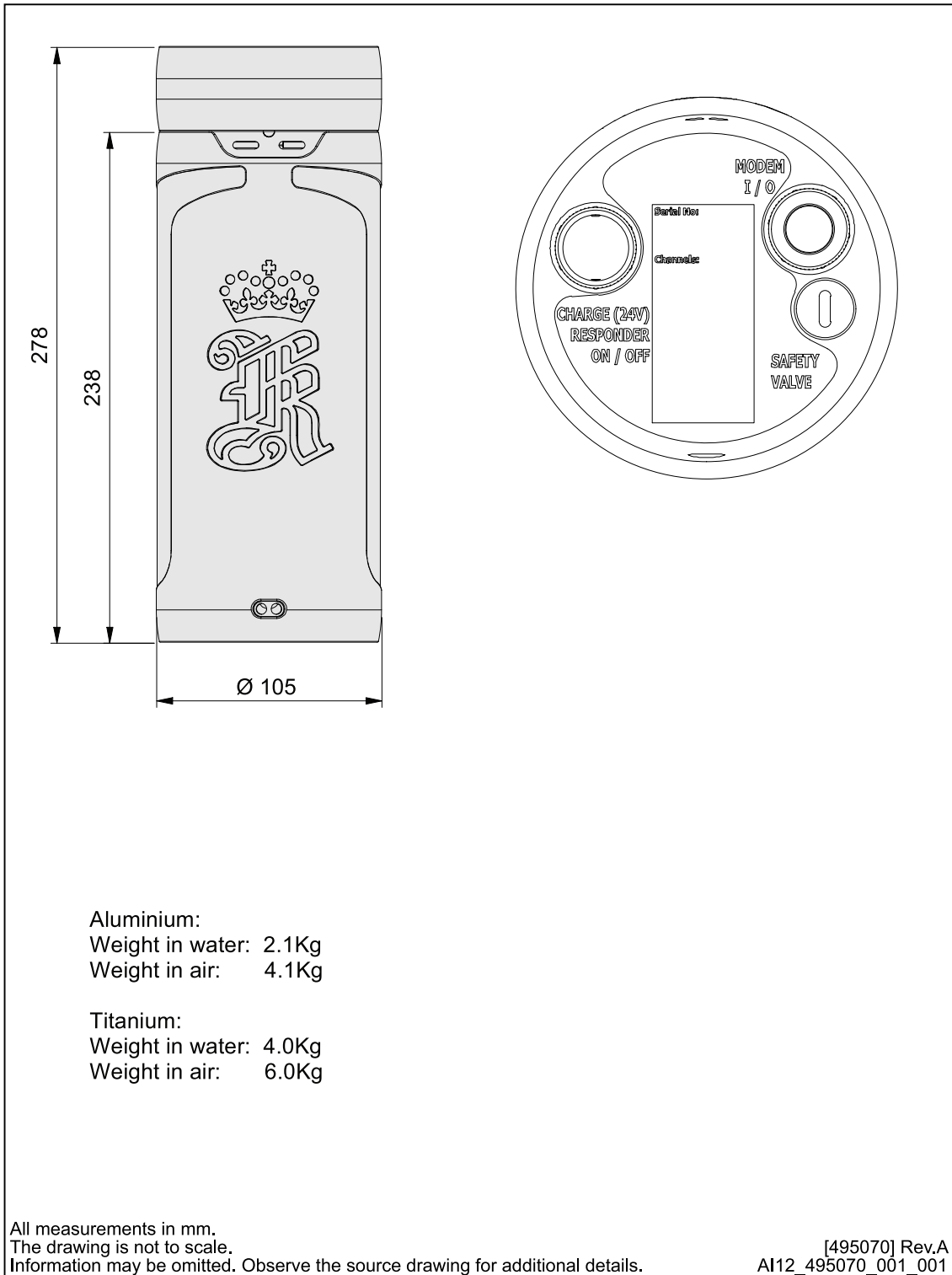
Transducer guard dimensions

135

Ø129

72.5

Weight: 0.44Kg

All measurements in mm.
The drawing is not to scale.   [439442] Rev.A
Information may be omitted. Observe the source drawing for additional details.   AI12_439442_001_001
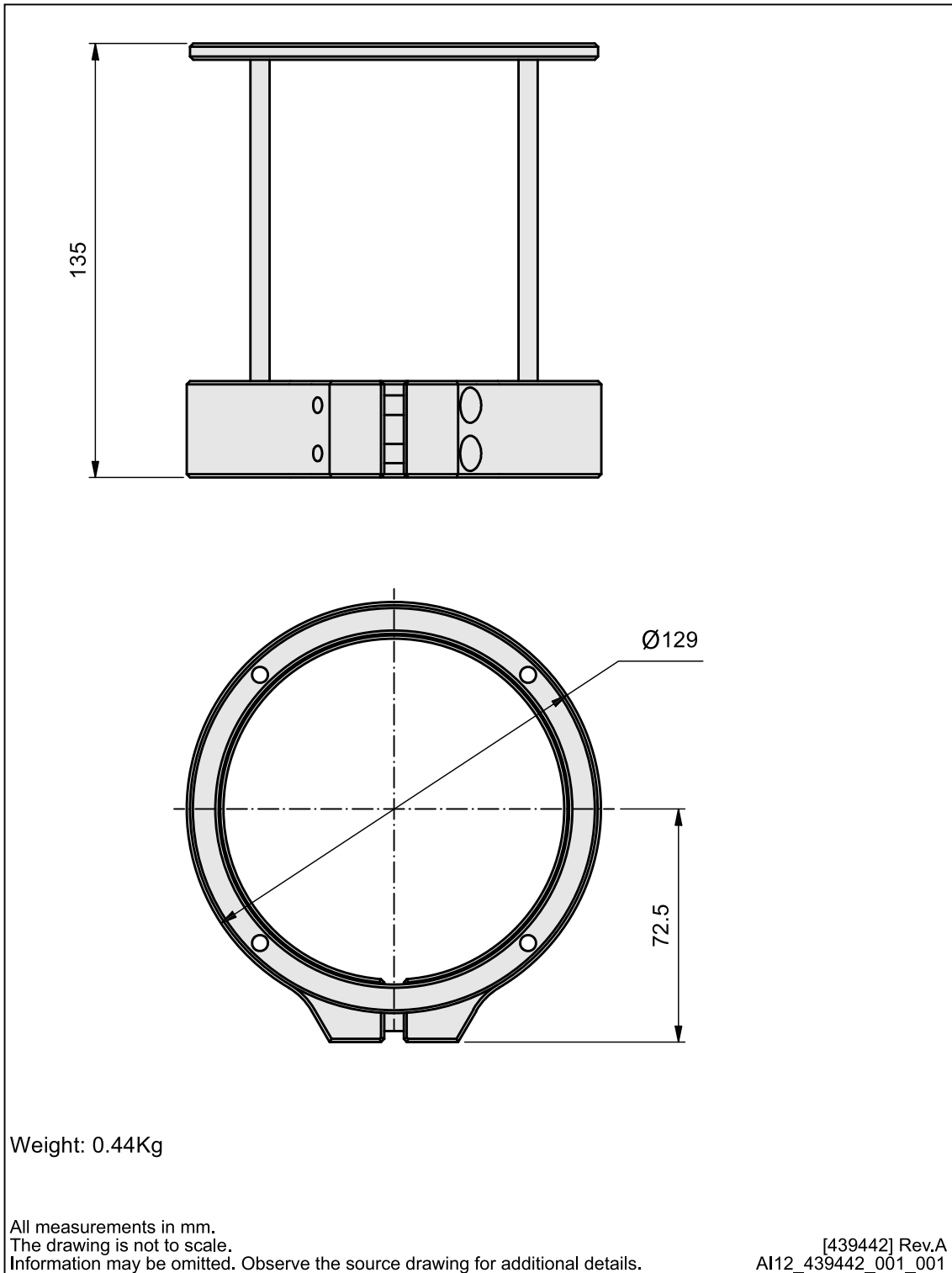
Floating collar dimensions

Ø 105

350

Ø 10

45°

308

198

564

250

M10 fasteners

Weight in air: 16.7 kg
Net buoyancy: 6.3 kg
Protection bow and fasteners in AISI 316L

All measurements in mm.
The drawing is not to scale.   [442757] Rev.A
Information may be omitted. Observe the source drawing for additional details.   AI12_442757_001_001

TDR180 dimensions

Ø 88

Ø 52

160

90

49

Ø 22

Ø 77

(x2) M6

Fastening holes
Thread depth 8 mm

PDC Ø 44

Ø 16

Ø 16

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

[402065] Rev.A
AI12_402065_001_001

TDR40V dimensions

Ø 100

161

49

Ø 77

Ø 44

M6 x2
Thread depth 8 mm

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

[386439] Rev.A
AI12_386439_001_001

TDR30H dimensions

Ø 77

Ø 62

213

96.5

49.3

M6 x2
Thread depth 8 mm

PDC Ø 44

Ø 16

Ø 16.3

Hex head 23.1

Ø 22.5

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

[322391] Rev.A
AI12_322391_001_001

Technical specifications

Topics

Performance specifications

These performance specifications summarize the main functional and operational characteristics of the system.

- **Operating frequency**: 21 – 31 kHz

- **Responder trigger signal**: 5 - 25 V positive logic pulse (2 - 6 ms)

- **Configuration or power connector**: Seacon MCBH8MDO

- **Configuration or power cable**: Seacon MCIL8F, 0.60 m

- **Modem connector**: Seacon MCBH8FDO

- **Modem cable**: Seacon MCIL8M, 0.60 m

- **Internal tilt sensor**: ±90°

CYMBAL acoustic data communication protocol overview

Profile name	Acoustic data speed (bit/s)	Reply size, user data (bytes)	Transmit duration (s)	Input buffer size (bytes)	Data output delay (s)	Typical applications	Supported product	
							Uplink (Rx Data)	Downlink (Tx Data)
P-170	170	42	2.1	3936	<0.1	Control	All	All
P-450	450	112	2.1	12796	<0.1	Control and data	All	All
P-1100	1100	144	1.1	32000	<3.1	Control and data	All	All
P-1800	1800	454	2.0	31740	<7.4	Control and data	All	All
P-2400	2400	168	0.6	32000	<3.0	Data	A, B, C	A, B, C
P-2500	2500	608	2.0	32000	<7.5	Control and data	A, B, C	A, B, C
P-4500	4500	1099	2.0	32000	<10.3	Data	A, B, C	A, B, C
P-6000	6000	1345	1.9	32000	<11.5	Data	A, C	A, C
P-9000	9000	2206	2.0	32000	TBD	Data	A	A, C
P-12000	12000	2821	2.0	32000	TBD	Data	A	A, C

A HiPAP xx2, μPAP

B   cNODE Maxi/Midi/Mini, cPAP

C   cNODE MiniS/Modem MiniS

D   HiPAP xx1

Modem MiniS 34-180

- **Depth rating**: 4000 m
- **Operating range**: 1000 m (depending on conditions)
- **Operating battery lifetime**:
  - **Quiescent battery lifetime**: 30 days
- **Cymbal (Low power, 1 second update rate)**: > 2.5 days
- **Cymbal (Low power, 3 second update rate-power saver mode)**: > 7 days
- **FSK (High power, 3 second update rate)**: > 4.5 days
- **Battery capacity with external power**: 75 to 80 %

Modem MiniS 34-40V

- **Depth rating**: 4000 m
- **Operating range**: 5000 m (depending on conditions)
- **Operating battery lifetime**:
  - **Quiescent battery lifetime**: 30 days
  - **Cymbal (Low power, 1 second update rate)**: > 2.5 days
  - **Cymbal (Low power, 3 second update rate-power saver mode)**: > 7 days
  - **FSK (High power, 3 second update rate)**: > 4.5 days
- **Battery capacity with external power**: 85 to 95 %

Modem MiniS 37-40V Ti

- **Depth rating**: 7000 m
- **Operating range**: 5000 m (depending on conditions)
- **Operating battery lifetime**:
  - **Quiescent battery lifetime**: 30 days
  - **Cymbal (Low power, 1 second update rate)**: > 2.5 days
  - **Cymbal (Low power, 3 second update rate-power saver mode)**: > 7 days
  - **FSK (High power, 3 second update rate)**: > 4.5 days
  - **Battery capacity with external power**: 85-95 %

Common for all 180° transducers

- **Transducer beam**: 180°
- **Trigger level**: <85 dB
- **Source level**: 188 dB

[CD030101_015_001]
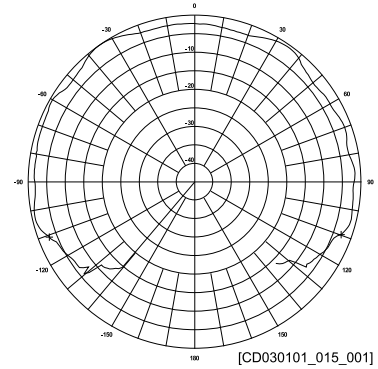
Common for all 40° transducers

- **Transducer beam**: 40° Vertical
- **Trigger level**: <80 dB
- **Source level**: 203 dB

Source level = 203 dB

CD030201_001_001
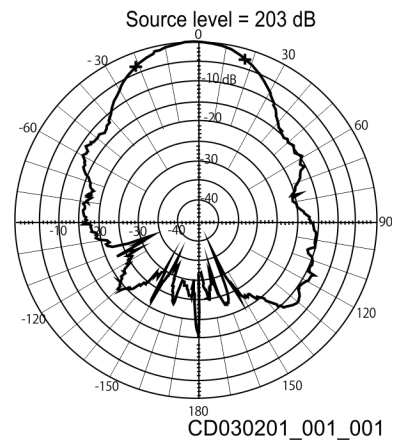
TDR30H

- **Transducer beam**: 30° Horizontal
- **Trigger level**: <80 dB
- **Source level**: 194 dB
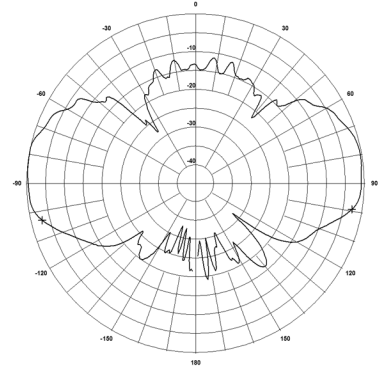
Weights and outline dimensions

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

Model	Height	Diameter	Weight in air	Weight in water
Modem MiniS 34-40V	321 mm	104 mm	4.6 kg	2.1 kg
Modem MiniS 34-180	305.5 mm	106 mm	4 kg	2.1 kg
Modem MiniS 37-40V Ti	321 mm	105 mm	6.5 kg	4.0 kg
Modem MiniS 34-S	277 mm	105 mm	4.3 kg	2.1 kg
TDR180	160 mm	88 mm	1.7 kg	1.0 kg
TDR40V	161 mm	100 mm	2.3 kg	1.3 kg
TDR30H	213 mm	77 mm	1.7 kg	0.9 kg

Model	Depth	Width	Height	Weight
Battery charger	80.7 mm	157.7 mm	47.3 mm	0.6 kg
Floating collar	350 mm	350 mm	564 mm	16.7 kg
Transducer guard	129 mm	137 mm	135 mm	0.44 kg

Power requirements

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

Battery
- **Battery type**: Li-Ion (LiFePO$_4$)
- **Nominal capacity**: 58 Wh

Battery charger
- **Input voltage**: 115/230 VAC 50–60 Hz maximum 1.4 A
- **Output voltage**: 24 VDC, 4 A

External power
- **Input voltage**: 24 VDC (20-28 VDC), 1 A/24 W

Environmental requirements

These environmental specifications summarize the temperature and humidity specifications for the system.

- **Operating temperature**: -5 to 55 °C
- **Storage temperature**: -30 to 70 °C
- **Vibration range**: 2 - 100 Hz
- **Excitation level**: 2-13.2 Hz ± 1.4 mm, 13.2-100 Hz 1 g

Battery safety

Topics

SECTION 1: Identification

The specification describes the technical parameters for the battery.

The cNODE Modem MiniS contains a custom made 58 Wh Li-Ion battery.

- **Product name**: cNODE MiniS Battery
- **Part number**: 396782
- **Manufacturer**: Kongsberg Maritime AS
- **Address**: Strandpromenaden 50, 3190 Horten, Norway
- **Telephone**: +47 33 03 24 07 (24 h)
- **Email address**: km.support.hpr@kongsberg.com
- **Website** : https://www.kongsberg.com/maritime

Note

The battery is a solid and sealed unit. The battery cannot be opened to reveal the individual cells.

For additional information about the cells inside the sealed battery pack, see the safety data sheet provided by the cell manufacturer. https://lithiumwerks.com/

SECTION 2: Hazards identification

The battery is not labelled with a hazmat label. It is not classified as dangerous or hazardous when undamaged and used as intended, and as such it is exempted from GHS (Globally Harmonized System of Classification and Labelling of Chemicals) classification and labelling.

Do not open, disassemble, crush or burn the battery. The battery contains dangerous ingredients. Exposure to the ingredients contained within the battery cells could be harmful. The battery cells include a barrier, preventing exposure to the user and environment. The battery cells are not classified as hazardous according to Regulation (EC) No. 1272/2008.

The chemicals in the battery cells are contained in a sealed enclosure. Risk of exposure occurs only if the cell is mechanically, thermally or electrically abused to the point of compromising the enclosure. If this occurs, exposure to the electrolyte solution contained within can occur by inhalation, ingestion, eye contact and skin contact. The electrolyte solution can be corrosive and may cause irritation and burns.

Other hazards

- Overcharge: If the cells that form the battery block are overcharged, the results may be a thermal runaway.

- External fire: Internal pressure and thermal runaway may be the consequences if the cells inside the battery are exposed to temperatures above 85 °C.

- Internal short circuit: Internal short circuit in a cell. Destruction of the separator can cause a short circuit between the anode and cathode. Thermal runaway and fire is possible.

- Water ingress: Internal pressure, thermal runway and chemical reactions may be the consequence.

The transponder is fitted with a pressure relief valve at the bottom of the unit. The relief valve prevents overpressure. Noxious gases and ingredients will then leak out of the transponder until the chemical reactions have stopped. Products generated by the chemical reactions during an emergency may however clog this pressure release valve.

SECTION 3: Composition

The battery is solid with a hard surface.

The lithium metal cells have the following chemical formula:

Li-Ion (LiFePO$_4$)

- **Negative electrode**: Lithium
- **Positive electrode**: Carbon
- **Nominal capacity**: 58 Wh
- **Lithium weight**: 5.3 g

Note _____

For additional information about the cells inside the sealed battery pack, see the safety data sheet provided by the cell manufacturer.

_____

- **Manufacturer**: Lithium Werks
- **Cell type**: APR18650
- **Manufacturer's website**: https://lithiumwerks.com

SECTION 4: First aid measures

The battery will release toxic fumes if burned or exposed to fire.

If subjected to gas from a burning battery, remove the source of contamination or move yourself and any victims to fresh air. Seek medical advice.

- **Inhalation**: The chemicals are lung irritant. Avoid inhaling any vented gases. Remove the victim and yourself from exposure. Rest and keep warm. If breathing is difficult, seek emergency medical attention.

- **Skin contact**: The chemicals are skin irritant. Rinse immediately with a lot of water and soap for at least 15 minutes. Wipe immediately away excess material with waterless hand cleaner. Remove contaminated clothing and wash it thoroughly before reuse.

- **Eye contact**: The chemicals are eye irritant. Flush immediately with a lot of clear tepid water for at least 15 minutes.

- **Ingestion**: Exposure to the chemicals may cause tissue damage to throat and gastro/respiratory tract if swallowed. If ingested, rinse mouth and surrounding area with tepid water. Dilute by drinking plenty of water. Seek medical advice.

SECTION 5: Firefighting measures

The transponder is designed to withstand damage to the internal battery pack. Non-flammable material is used. In case of fire, move the battery away from the fire area if you can do it without compromising your own safety. Extreme mechanical abuse to the battery may result in a ruptured seal and exposure.

The individual cells in the battery pack contain a flammable liquid electrolyte that may vent, ignite and produce sparks when subjected to high temperatures (> 150 °C/302 °F), when damaged or abused. A burning battery can ignite other batteries in close proximity.

Suitable extinguishing media are dry chemical, CO2, water spray or regular foam. Cool down the battery/transponder with copious amounts of cold water.

The interaction with water or water vapour and exposed lithium hexafluorophosphate (Li PF6) may result in the generation of hydrogen and hydrogen fluoride (HF) gas. Contact with battery electrolyte may be irritating to skin, eyes and mucous membranes. Fire will produce irritating, corrosive and/or toxic gases. Fumes may cause dizziness or suffocation. Don a self-contained breathing apparatus (SCBA).

Note

In case of an external fire, always remove transceiver units and lithium batteries.

SECTION 6: Accidental release measures

During normal operation, accidental release measures are not applicable. Extreme mechanical abuse to the battery may result in a ruptured seal and exposure.

As an immediate precautionary measure, isolate the spill or leak area at least 25 metres (75 feet) in all directions. Keep unauthorized personnel away. Stay upwind, and keep out of low areas. Ventilate closed areas before entering. Wear adequate personal protective equipment.

Prevent material from contaminating soil and from entering sewers or waterways. Stop the leak if safe to do so. Contain the spilled liquid with dry sand or earth. Clean up the spills immediately.

Absorb spilled material with an inert absorbent (dry sand or earth). Scoop contaminated absorbent into an acceptable waste container. Collect all contaminated absorbent and dispose of it according to relevant regulations. Scrub the area with detergent and water; collect all contaminated water for proper disposal.

SECTION 7: Handling and storage

Do not open, disassemble, crush or burn the battery.

1   Do not expose the battery to water, sea water or other high-conductivity liquids.

2   Avoid mechanical or electrical abuse.

3   Do not expose the battery to temperatures outside the range of -30 °C to +70 °C.

4   Store in a dry location.

To minimize any adverse affects on the battery performance it is recommended that it is kept at room temperature (25 °C ± 5 °C). A storage temperature outside the recommended temperature range may foreshorten the service life.

To avoid complete discharge of the battery during long term storage, the battery should be fully charged and recharged every 6 months. A completely discharged battery will not charge, as all lithium ion batteries.

SECTION 8: Exposure control and personal protection

Airborne exposures to hazardous substances are not expected when the battery is undamaged and used as intended. Personal protective equipment (PPE) is not required when the battery is undamaged and used as intended. Don personal protective equipment if the battery is damaged and you are at risk for exposure to the chemicals inside.

In the event of fire or physical damage to the battery, follow the mandatory rules for personal protection.

• **Fire or explosion**: Don a self-contained breathing apparatus (SCBA).

• **Exposure to noxious gas**: Chemical-resistant gloves and safety glasses.

SECTION 9: Physical and chemical properties

The battery is solid with a hard surface. There is no risk for exposure to the chemicals inside an undamaged battery during normal operation and transportation.

The battery is a solid and sealed unit. The battery cannot be opened to reveal the individual cells.

For additional information about the cells inside the sealed battery pack, see the safety data sheet provided by the cell manufacturer.

Cell manufacturer

- **Manufacturer**: Lithium Werks
- **Manufacturer's website**: https://lithiumwerks.com/

SECTION 10: Stability and reactivity

The battery is stable. No specific handling requirements apply.

Avoid exposing the battery to fire or temperatures above 80 °C. Do not disassemble, crush, short or install the battery with incorrect polarity. Avoid mechanical or electrical abuse. Do not immerse in seawater or other high conductivity liquids.

The battery will release toxic fumes if burned or exposed to fire. Breaching of the individual cell enclosure may lead to generation of hazardous fumes which again may include extremely hazardous hydrofluoric acid (HF).

SECTION 11: Toxicological information

Acute oral, dermal and inhalation toxicity data are not available for this battery.

Risk of irritation occurs only if the battery is abused to the point of breaking the container and opening it to reveal the individual cells. If this occurs, irritation to the skin, eyes and respiratory tract may occur.

SECTION 12: Ecological information

Provided that the battery pack is disposed of according to local regulations and/or law, it will not have any environmental impact.

SECTION 13: Disposal considerations

Adhere to applicable laws, regulations and guidelines when disposing of the batteries.

A lithium thionyl chloride battery does not contain any heavy metals, and is therefore not regarded as special waste (it contains only biodegradable parts).

A used lithium battery can contain a significant amount of residual energy. It is the danger of explosion that presents a problem when disposing of a battery. Used batteries must therefore be handled with the same care as new ones.

Note

For safe disposal, contact the nearest local company that has been approved to collect and dispose of lithium batteries.

SECTION 14: Transport information

Transportation of the cNODE Modem MiniS must take place with adherence to applicable laws, regulations and guidelines; including those who address the transportation of dangerous goods in all modes of transport. To comply with regulations for air transportation, the battery must have 30 % or less remaining capacity.

The battery is certified according to UN 38.3.

- **Shipment of transponder**

  Each cNODE Modem MiniS transponder is transported as a closed and sealed unit, and must not be opened by unauthorized personnel.

  The cNODE Modem MiniS transponder must be shipped in accordance with the prevailing national regulations; **UN 3481 PI 967 Section II**, *Miscellaneous (Lithium Ion batteries included in equipment)*.

- **Shipment of separate battery**

  If the battery is shipped separately, the prevailing national regulations that apply are: **UN 3480 PI 965 Section IB**, *Miscellaneous (Lithium Ion battery)*.

For all shipments – cNODE Modem MiniS and separate batteries –, use lithium battery handling label as specified in the additional requirement of Section II of packing instructions 965, 966 and 967.

Transport identification codes:

- **Aircraft**: IATA DGR

- **Sea transport**: IMDG

- **Railway**: RID

- **Road transport**: ADR

Note

Damaged transponders that are returned to the manufacturer for repair must be transported without batteries. Damaged or spent batteries that have been recalled by the manufacturer for safety reasons must not be transported by air.

SECTION 15: Regulatory information

Not applicable.

SECTION 16: Other information

The battery manufacturers' safety data sheets are available on their websites.

• Lithium Werks: https://lithiumwerks.com

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