

## cNODE®

Maxi and Midi Transponders

Medium Frequency, 4000 metres







KONGSBERG

***Kongsberg cNODE  
Maxi and Midi, Medium Frequency,  
4000 m  
Instruction Manual***

322217/G

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## Document information

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## Support information

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

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# Important — Battery safety

Read the lithium batteries safety procedure before handling batteries.

***WARNING***

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***The transponders are equipped with lithium batteries which can potentially be dangerous.***

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Read the lithium batteries safety procedure before handling batteries.

# About this manual

The purpose of this manual is to provide the descriptions, procedures and detailed parameter explanations required to allow for safe and efficient use of the cNODE.

## **Target audience**

This manual is intended for all users of the cNODE.

## **Online information**

All end-user manuals provided for operation and installation of your cNODE can be downloaded from our website.

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

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# Kongsberg cNODE

## **Topics**

[System description, page 10](#)

[Naming description, page 10](#)

[Scope of supply, page 11](#)

[General supply conditions, page 12](#)

[Support information, page 13](#)

## System description

cNODE is a family of transponders for underwater positioning and data links, and operates with HiPAP, HPR and cPAP transceivers. cNODE is designed to be a very versatile system with many interchangeable parts.

The transponders are operated from Acoustic Position Operator Station (APOS) with an acoustic telemetry link for command and data transfer. cNODE is compatible with both Cymbal protocol for positioning and data link and FSK channels and telemetry. They have responder and transponder functionality, SSBL and LBL positioning, and telemetry capabilities.



The transponders are rated to 4000 m with a housing made of coated anodised aluminium or stainless steel. The transponders are designed with a modular construction which means that the transducer, transponder electronics, battery pack and optional add-on's can be replaced individually to suit the operation.

The transponder may be secured to a subsea structure using mounting brackets, or fitted with an anchor weight and floating collar for operation on the open seabed.

## Naming description

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

### Model name

cNODE Maxi

cNODE Midi

### Model number

First digit = Frequency band	Second digit = Depth rating
3 = 30 kHz	4 = 4000 m

### **Transducer Beamwidth**

180 = 180° beam width

30V30H = 30° vertical and 30° horizontal beam width

30V = 30° vertical beam width

### **Optional transponder modules**

**R:** Release mechanism

**I:** Inclinometer sensor

**II:** Differential inclinometer sensor

**Si:** Sensor interface

**SiPI:** Sensor interface, Pressure and Inclinometer

**SvPI:** Sound velocity, Pressure and Inclinometer

**MGC:** Motion Gyro Compass

**Mi:** Modem

### **Transponder identification**

The transponders have labels that identifies

- the transponder name
- serial number
- default channels

## **Scope of supply**

The main units required are provided with the standard delivery.

- Transponder
- Battery
- Quick Reference Guide

## General supply conditions

General supply conditions apply to this cNODE delivery.

### Receipt, unpacking and storage

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

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

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

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

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

### Equipment responsibility

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

The duration of responsibility cover:

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

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

## Support information

Should you need technical support for your cNODE you must contact a Kongsberg Maritime office. A list of all our offices is provided 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, 3190 Horten, Norway
- **Telephone:** +47 33 03 41 00
- **Telephone 24h support:** +47 33 03 24 07
- **Telefax:** +47 33 04 76 19
- **Website:** <https://www.kongsberg.com/maritime/>
- **Support website:** [Product support A to Z](#)
- **E-mail address:** [km.support.hpr@kongsberg.com](mailto:km.support.hpr@kongsberg.com)

# System units

## Topics

[Transducers, page 15](#)

[Remote transducers, page 15](#)

[Modular top section \(MTS\), page 17](#)

[Modular end caps \(MEC\), page 17](#)

[cNODE batteries, page 19](#)

[External sensors, page 19](#)

[Accessories, page 19](#)



## Transducers

For more information about our transducers, see our website. <https://www.kongsberg.com/maritime>

### **TD180**

The transducer has a 180° omnidirectional beam width.



### **TD30V30H**

The transducer has a 30° vertical and a 30° horizontal beam width.



### **TD30V**

The transducer has a 30° vertical beam width.



## Remote transducers

The remote transducers are connected to the top of the transponder with a cable.

### **TDR180**

The transducer has a 180° omnidirectional beam width.



### **TDR40V**

The transducer has a 40° vertical beam width.



### **TDR30V**

The transducer has a 30° vertical beam width.



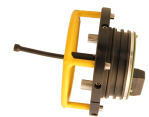
### **TDR30H**

The transducer has a 30° horizontal beam width.



### **Split for remote transducer**

The split is the connection between the transponder and the remote transducer.



### **Transducer cable**

The cable connects the transponder and the remote transducer.



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## Modular top section (MTS)

Several modules are available for different versions of the top sections.

### Sound velocity, Pressure and Inclinometer

The SvPI module provides a full suite of precision survey grade sensors for subsea positioning.

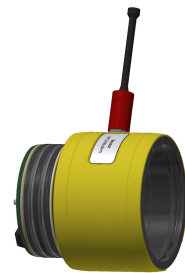
It is available in aluminium for different depths and accuracies.



### Modem

The modem lets you send data acoustically to and from sensors and other equipment.

The section is available in aluminium.



## Modular end caps (MEC)

Several end caps are available for different needs.

### Basic end cap

The basic end cap has a vent screw, safety valve, a standard external connector and is available in aluminium and stainless steel.



### Release end cap

The release mechanism can also be fitted on a basic end cap. It is available in aluminium and stainless steel.



### Sensor interface end cap

The sensor interface module interfaces with external sensors (RS-232/RS-485/RS-422) and is available in aluminium and stainless steel.



### Modem

The modem lets you send data acoustically to and from sensors and other equipment. The end cap is available in stainless steel.



### Inclinometer end cap

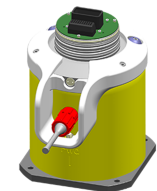
The Inclinometer end cap has one set of inclinometers set at 90° to each other (X and Y) and is available in stainless steel.

It is available as an end cap or in a combination with an external sensor.



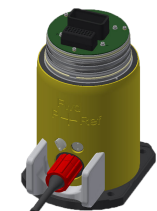
### MGC end cap

The Motion Gyro Compass end cap is fitted with a Kongsberg MCG gyro and is available in aluminium for various accuracies.



### Sensor interface, Pressure and Inclination end cap

The sensor interface, pressure and inclination end cap holds an internal pressure sensor and inclination sensor units and is available in aluminium.



## cNODE batteries

These are non-rechargeable lithium batteries.

### **cNODE Maxi battery**

The battery is made for cNODE Maxi and has a total energy content of 128 Ah.



### **cNODE Midi battery**

The battery is made for cNODE Midi and has a total energy content of 64 Ah.



## External sensors

Several sensors are available for different needs.

### **Inclinometer sensor**

The sensor has one set of inclinometers set at 90° to each other (X and Y).

It is available as an end cap or in a combination with an external sensor.



### **Current meter**

Aquadopp is a high accuracy sea current meter. The unit is connected to the sensor interface end cap with a subsea cable.



## Accessories

### **Floating collar**

The floating collars are available for several depths and for aluminium and stainless steel transponders.



### **TTC 30 (Transponder Test and Configuration unit)**

The TTC can test all Kongsberg transponder high frequency channels, Cymbal and FSK.



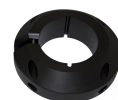
### **Transponder rack**

The rack can be used to fasten the transponder to a structure.



### **Funnel collar**

The funnel holds the transponder into place in a structure. It has an upper and a lower part.



### **Aquadopp mounting clamp**

The mounting clamp is made for the Aquadopp current meter. It keeps the sensor fastened to the transponder.



# Cable layout and interconnections

## **Topics**

[External signal connector pinout, page 22](#)

[Sensor interface connector pinout, page 23](#)

[Inclinometer connector pinout, page 24](#)

[Sensor interface, Pressure and Inclination connector pinout, page 25](#)

[Motion Gyro Compass connector pinout, page 25](#)

[Modem interface connector pinout, page 27](#)

[Modem interface connector pinout, page 28](#)

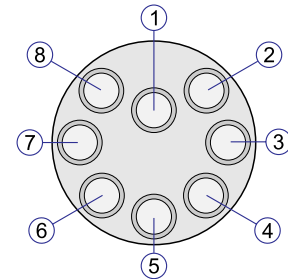
[Jumper settings Modem, page 28](#)

## External signal connector pinout

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

Pin 1, 2 and 3 is for configuration.

Pin 4 and 5 is for responder function.

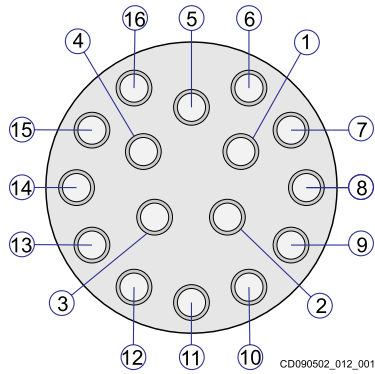


Pin number	Signal
1	RS-232 Tx Configuration
2	Ground
3	RS-232 Rx Configuration
4	Responder trigger+
5	Responder trigger-
6	On/Off
7	Not connected
8	Ground



## Sensor interface connector pinout

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

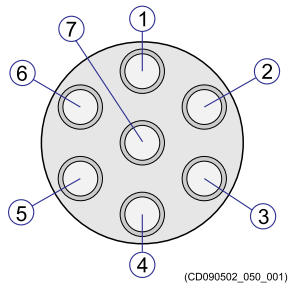


Pin number	Signal
1	RS-232 Tx Sensor interface 1
2	RS-232 Rx Sensor interface 1
3	Ground
4	RS-232 Tx Sensor interface 3
5	RS-232 Rx Sensor interface 3
6	Ground
7	RS-422 Tx +/RS-485 Data +
8	RS-422 Tx -/RS-485 Data -
9	RS-422 Rx +
10	RS-422 Rx -
11	Ground
12	VDC Out 1
13	VDC Out 2
14	Ground
15	On/Off External
16	On/Off Ground

## Inclinometer connector pinout

The external differential inclinometer module is connected to the inclinometer module via a cable. Both modules have the same connector and wiring specifications.

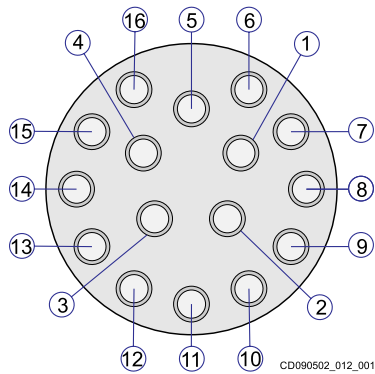
This is the pin configuration for a male plug, as seen towards the plug (face view).



Pin number	Signal
1	Pulse width modulation out
2	Ground
3	X (1)
4	Y (1)
5	X (2)
6	Y (2)
7	VDC Out

## Sensor interface, Pressure and Inclination connector pinout

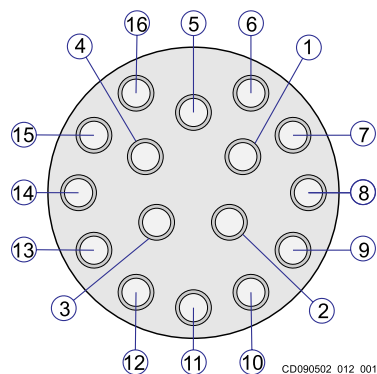
This is the pin configuration for a male plug, as seen towards the plug (face view).



Pin number	Signal
1	RS-422 Tx +
2	RS-422 Tx -
3	RS-422 Rx +
4	RS-422 Rx -
5	RS-232 Tx Sensor interface
6	RS-232 Rx Sensor interface
7	Ground
8	Not connected
9	Not connected
10	Not connected
11	Not connected
12	Not connected
13	VDC Out
14	Ground
15	RS-232 Tx Configuration
16	RS-232 Rx Configuration

## Motion Gyro Compass connector pinout

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



Pin number	Signal
1	TD +
2	TD –
3	RD +
4	RD –
5	RS-232 Tx Sensor interface 3
6	RS-232 Rx Sensor interface 3
7	Ground
8	COM2_OUT
9	COM3_IN_A
10	DC Out Ground
11	VDC Out 24V
12	VDC In
13	DC In Ground
14	Remote On/Off
15	RS-232 Tx Sensor interface 1
16	RS-232 Rx Sensor interface 1

## Setup

For deck calibration purposes or to use with a ROV display, the EM3000 telegram containing heading, pitch, roll and heave is communicated through the 16 pin Seacomm connector. The data is sent through the RS–232 port COM2\_OUT (pin 8 Tx, pin 7 GND). The communications parameters are 9600/8/n/1 with a 10 Hz update rate.

The ON/OFF signal (pin 14 ON/OFF, pin 13 Ext power GND) can be interfaced to a ROV switch to manually turn external power to the MGC on or off by a ROV. External power supply is also turned on by the cNODE transponder when enabling the MGC sensor, but the ROV switch and ROV display output is a backup solution if the transponder is not working.

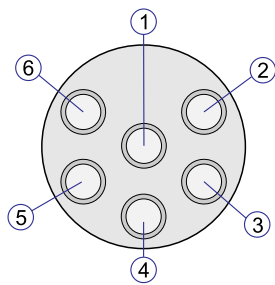
For deck test with internal battery only, the MGC sensor must be activated by using a TTC30 sending an enable sensor command.

For deck calibration without a TTC30 an external 24V supply must be connected to IN\_EXT\_POWER and the ON/OFF signal must be connected to GND.

## Modem interface connector pinout

This is the pinout for a 6-pin end cap.

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

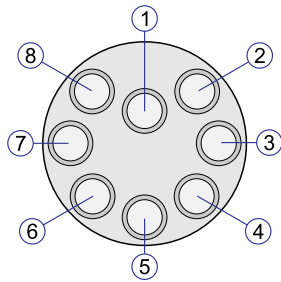


Pin number	Signal
1	RS-422 Tx +/RS-232 Tx
2	RS-422 Tx -
3	RS-422 Rx +/RS-232 Rx
4	RS-422 Rx -
5	Ground
6	Screen

## Modem interface connector pinout

This is the pinout for an 8-pin top section.

This is the pin configuration for a male 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 +/RS-485 Data +
5	RS-422 Tx -/RS-485 Data -
6	RS-422 Rx +
7	RS-422 Rx -
8	Ground

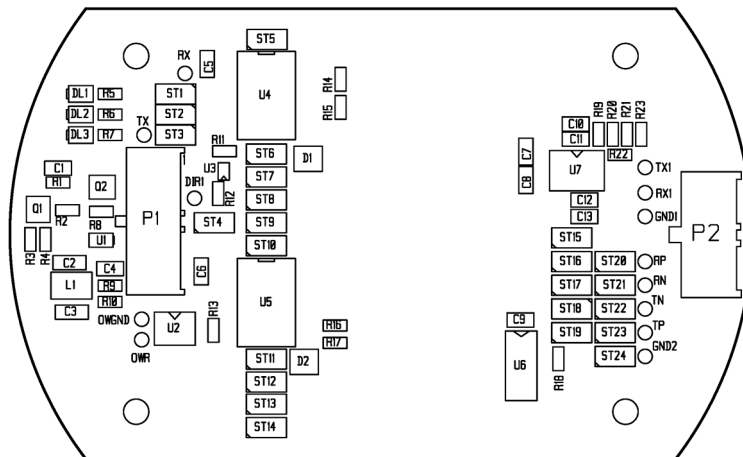
## Jumper settings Modem

Default jumper setting is for RS-232 and it is possible to change this to RS-422 or RS-485.

**ON** indicates that a jumper is inserted, all the others are open.

Jumper number	RS-232	RS-422	RS-485
ST1		<b>ON</b>	<b>ON</b>
ST2	<b>ON</b>		
ST3			
ST4		<b>ON</b>	<b>ON</b>
ST5	<b>ON</b>		
ST6	<b>ON</b>		
ST7	<b>ON</b>		
ST8	<b>ON</b>		
ST9			

Jumper number	RS-232	RS-422	RS-485
ST10		ON	ON
ST11		ON	ON
ST12		ON	ON
ST13		ON	ON
ST14		ON	ON
ST15	ON		
ST16			
ST17			
ST18			ON
ST19			ON
ST20		ON	ON
ST21		ON	ON
ST22		ON	ON
ST23		ON	ON
ST24		ON	ON



# General acoustic considerations

Take this information into consideration when deploying the transponders.

## **Acoustic range**

The depth rating should not be confused with acoustic range. The acoustic range is dependent on many factors, and some of the factors are outside 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 transponder should always be within the coverage cone of the vessel system.

## **Transducer type**

There are different types of transducers used on the transponders. A focused signal gives less footprint/coverage. The vessel should always be within the signal footprint of the transponder.

## **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 transponder.

## **Acoustic noise**

Acoustic noise is present at all vessels. At given conditions, the noise level can be excessive. Acoustic noise is caused by main propellers and thrusters, and in some instances also from machinery/pumps on board. Heavy propeller/thruster use or also waves can also generate air bubbles, which can get in front of the vessel transducer and block the acoustic signal.



**Sound velocity and ray bending**

Changes in sound velocity through the water column caused by changes in the water temperature and/or salinity can bend the acoustic signal and make it impossible to reach the vessel.

# Getting started

## Topics

- [Turning on the cNODE, page 33](#)
- [Turning off the cNODE, page 34](#)
- [Pre-deployment checks, page 34](#)
- [Changing between responder and transponder mode, page 35](#)
- [Installing a differential inclinometer, page 36](#)
- [Installing a sea current meter, page 36](#)
- [Installing a transponder with an MGC end cap, page 38](#)
- [Installing a floating collar, page 38](#)
- [Deploying a transponder with a floating collar, page 39](#)
- [Releasing the transponder manually, page 40](#)
- [Closing the release unit, page 40](#)
- [Adding weight to the release unit, page 41](#)
- [Default transmit power, page 42](#)
- [Extending the battery lifetime, page 42](#)

## Turning on the cNODE

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

### Context

For safety reasons, the transponder is delivered with the battery outside. The battery must be inserted and connected before the transponder is deployed.

### Procedure

- 1 Pull out the plastic locking cord that secures the transducer in place.
- 2 Remove the transducer.
- 3 Remove the transport plug.
- 4 Insert the new battery.

Inserting the battery at an angle makes this easier. Press firmly to make sure the battery is properly inserted.



- 5 Place a bag of dry silica-gel desiccant on the top of the battery.
- 6 Switch the on/off switch inside the top to on.



- 7 Replace the top.  
Make sure the alignment marks meet.
- 8 Insert the locking cord by pushing it sideways around the body.

## Turning off the cNODE

This will leave you with the transponder turned off and not using up the battery.

### Prerequisites

#### **WARNING**

---

***Remove the battery when storing the transponder for a longer period (months).***

---

### Procedure

- 1 Pull out the plastic locking cord that secures the transducer in place.
- 2 Remove the transducer.
- 3 Remove the battery.
- 4 Switch the on/off switch inside the top to off.



- 5 Replace the top.
- 6 Insert the locking cord by pushing it sideways around the body.

## Pre-deployment checks

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

### Prerequisites

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

### Procedure

- 1 Record the transponder serial number and channels.
- 2 Make sure the vent screw is closed.

- 3 Press the pressure relief valve in, to confirm it is flush with the end cap.
- 4 Check the following if a floating collar is used with the transponder:
  - a Make sure the transponder is properly attached to the floating collar.
  - b Make sure the weight is properly attached to the release.
- 5 Perform an acoustic test using a Transponder Test and Configuration (TTC) unit:
  - a Interrogate the transponder.
  - 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.

## Changing between responder and transponder mode

The transponder can also be used as a responder unit.

### **Prerequisites**

The transponder must be charged before use.

By default when the cNODE is turned on it is in transponder mode.

The signal input for the responder function must be between 2 and 6 ms with a positive pulse of 5 to 24 V.

### **Procedure**

- 1 When responder trigger signals are received, the mode is automatically changed to responder.
- 2 Once the responder trigger signals stop, it will take 1 minute before the cNODE changes automatically back to transponder mode.

## Installing a differential inclinometer

The transponder must have an inclinometer (I) end cap to be able to connect the external inclinometer sensor.

### Prerequisites

Turn on the transponder before installation.

The transponder must have an inclinometer (I) end cap to be able to connect the external inclinometer sensor.

### Procedure

- 1 Place the transponder and transponder rack on the floor.
- 2 Mount the transponder in the transponder rack by fastening the clamps around the transponder.
- 3 Secure the clamps with screws and tighten them properly.
- 4 Connect the interface cable to the transponder and the other end to the external inclinometer.

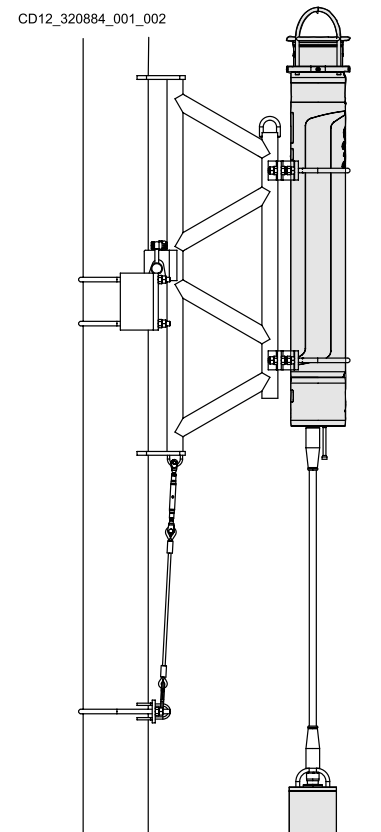
Always apply grease before mating connectors.

SubConn® connectors should not be exposed to extended periods of heat or direct sunlight. If a connector becomes very dry, it should be soaked in fresh water before use.

- 5 Make sure both units face the same direction.

FWD is moulded into the coating of the sensor module on the transponder and it is engraved into the top end cap of the sensor unit.

- 6 Mount the arrangement to the customer's structure.
- 7 Adjust the offset values in APOS to make sure the angles are correct.



## Installing a sea current meter

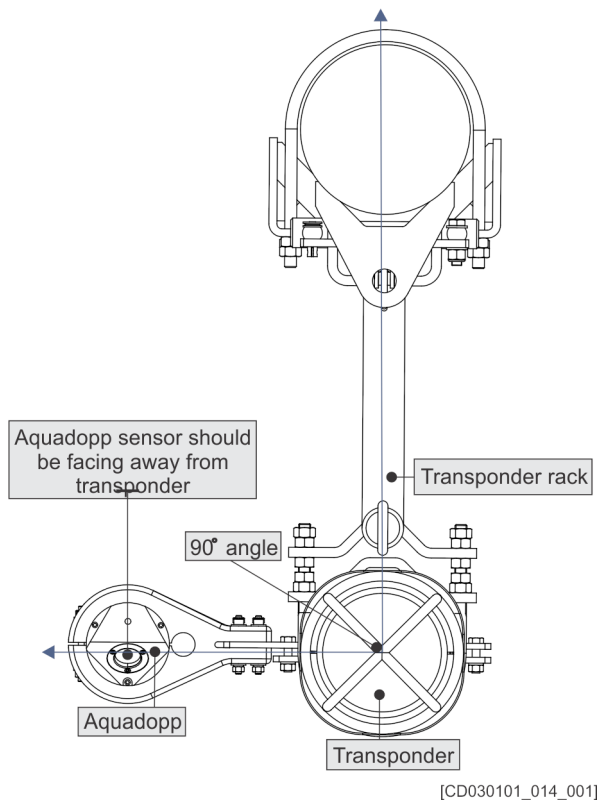
The transponder must have a sensor interface (Si) end cap to be able to connect the external sensor.

### Prerequisites

Turn on the transponder before installation.

The transponder must have a sensor interface (Si) end cap to be able to connect the external sensor.

## Context



## Note

*It is very important that the sea current meter's sensor eye faces the current for the best result possible.*

## Procedure

- 1 Mount the sea current meter sensor brackets on the sensor.  
Make sure the angle is correct in relation to the guiding tracks on the sensor.

## Note

*The sea current meter's sensor eye must be facing away from the transponder and other structures.*

- 2 Mount the sensor to the transponder with a mounting clamp.
- 3 Mount the transponder in the transponder rack by fastening the clamps around the transponder.
- 4 Connect the cable to the unit.  
Always apply grease before mating connectors.

SubConn® connectors should not be exposed to extended periods of heat or direct sunlight. If a connector becomes very dry, it should be soaked in fresh water before use.

- 5 Mount the arrangement to the customer's structure.

## Installing a transponder with an MGC end cap

Four insulation sleeves are delivered with the module.

### Prerequisites

For safety reasons, the transponder is delivered with the battery outside. The battery must be inserted and connected before the transponder is deployed.

You need 4 M8 bolts with a fitting length and strength to install the MGC.

### Procedure

- 1 Mount the transponder with the transducer having a free line of sight.
- 2 Enter the insulation sleeves into the bolt holes in the base of the unit.
- 3 Enter M8 bolts of fitting length and strength to the sleeves.
- 4 Fasten the bolts.

## Installing a floating collar

The transponder must have a release unit, or an adapter for a basic end cap, to install a floating collar.

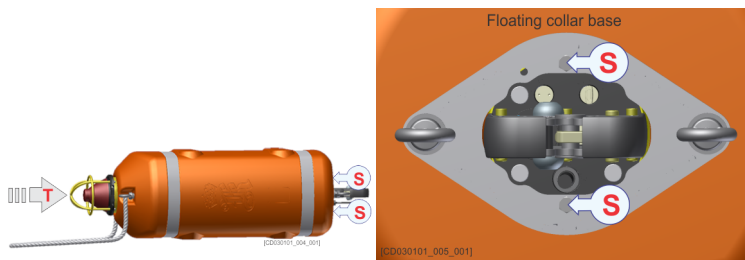
### Prerequisites

The transponder must have a release unit, or an adapter for a basic end cap, to install a floating collar.

### Procedure

- 1 Remove the two securing screws, **S** on the release unit.
- 2 Insert the transponder, **T** in the floating collar.





- 3 Fasten the two securing screws S on either side of the release unit.
- 4 Make sure the floating collar is fastened securely.

## Deploying a transponder with a floating collar

### Prerequisites

Install the floating collar before deploying the transponder.

Inspect the rope on the floating collar to make sure it is still intact.

Turn on the transponder before deployment.

### Note

*Do not lift the transponder by the transponder cage.*

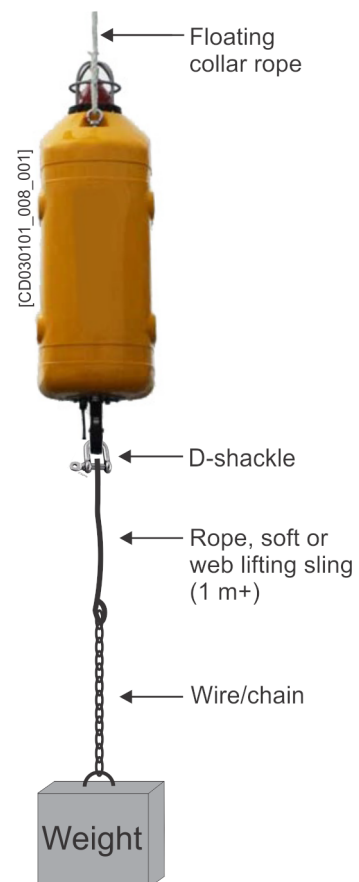
*The transponder must be positioned with the transducer upright.*

*Make sure there is a clear line of sight between the transponder's transducer and the ship's transducer.*

*The minimum length of the sling between the transponder and the weight should be 2 m to avoid the transponder from hitting the weight when it lands on the seabed.*

### Procedure

- 1 Connect the lifting device to the rope on the floating collar.
- 2 Lift the transponder with caution to avoid slamming into other solid objects.
- 3 Release the transponder into the water.



## Releasing the transponder manually

Normally the unit will be released acoustically from APOS, this procedure is for releasing manually on deck.

### Context

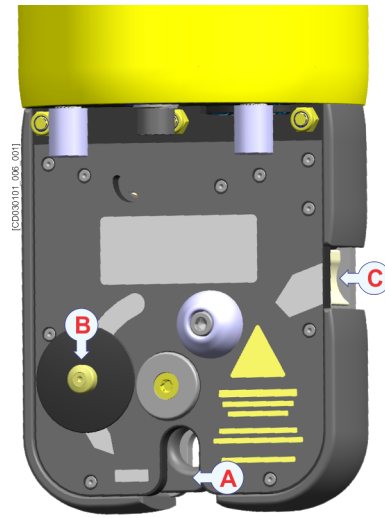
The release unit can be opened manually or acoustically.

### Procedure

- Push in the release button **C** on the side of the release unit.  
A sudden muted click and thud can be heard and felt.

### Result

The release unit is now fully opened **A**.



## Closing the release unit

This is how the anchor weight can be attached to the transponder before operation.

### Prerequisites

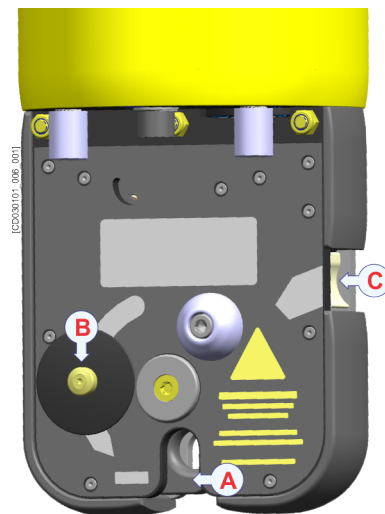
The release unit can be opened manually or acoustically.

### Procedure

- 1 Place a release link in the release hook **A**.
- 2 Pull the reset button **B** down until a firm click is heard and felt.

### Result

The release unit should now be in a fully closed position.



## Adding weight to the release unit

This is how the anchor weight can be attached to the transponder before operation.

### Steel shackle

Use a stainless steel D-shackle to connect the rope, soft or web lifting sling to the release mechanism.

### Note

*Maximum material thickness used in the D-shackle is 15 mm.*

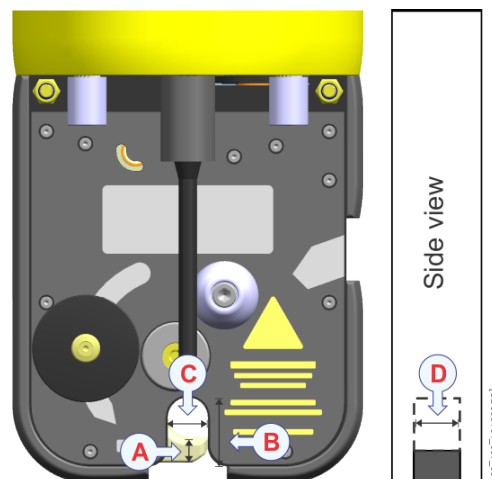
*Using rope, soft or web lifting sling directly to the release mechanism might jam the release hook, and the transponder could fail to release/open.*

*Always use a cable tie or safety wire to secure the pin at the shackle.*

- A** 10 mm
- B** 17 mm
- C** 16 mm
- D** 10 mm

It is recommended to use a minimum of 2 m of rope, soft or web lifting sling between the D-shackle attached to the release unit and the weight to avoid corrosion.

Another option is to use a minimum of 1 m of rope, soft or web lifting sling between the D-shackle attached to the release unit and a minimum of 1 m of wire or chain attached to the weight.



## Default transmit power

- Cymbal: Low
- Phase Shift Keying: High

## Extending the battery lifetime

Consider how to save the transponder's battery life before deployment.

Reduce the transmit power level of the transponder, or increase the interrogation interval to extend the battery lifetime.

# Emergency procedures

Follow these procedures for transponders with lithium batteries with unknown or failing status. Always read these procedures before handling any lithium batteries.

## Topics

[Safety features, page 44](#)

[Recovering a failing transponder, page 44](#)

[Opening a transponder with defect/possibly defect battery, page 45](#)

[Handling a heated or self-heated transponder, page 45](#)

[Handling a transponder with an open relief valve, page 46](#)

[Handling heated or warm batteries, page 46](#)

[Handling transponder and separate transponder batteries in case of an external fire, page 47](#)

## Safety features

The cNODE has a safety valve for releasing pressure that might build up inside the transponder.

### 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.

### Vent screw

The vent screw is normally not operated and is for safety purposes only. The operator can release any excess pressure that may have built up inside the transponder. Make sure to dry off any water around the screw before opening it. The screw is normally opened and closed by hand.

## Recovering a failing transponder

Always read the emergency procedures before handling lithium batteries.

### Prerequisites

Handle a failing transponder as a possible water ingression.

### Procedure

- 1 Evacuate all unnecessary people.
- 2 Recover the transponder with great caution using a crane.  
No people should be near the transponder when it is lifted up on deck.
- 3 Place the transponder in a safe place out on deck, shielded from people and vital equipment.
- 4 Fasten the transponder in a crane, ready to lower it into the sea again.
- 5 Control the transponder for minimum two hours.
- 6 Check for damages that could involve a water leakage and check the housing temperature for a possible temperature increase in the lithium battery.

- 7 For batteries with normal temperature: Take out the battery, see the emergency procedure for opening a transponder with a possible defect battery.

[Opening a transponder with defect/possibly defect battery, page 45](#)

- 8 For batteries with increasing temperature: See the emergency procedure for handling a heated or self-heated transponder.

[Handling a heated or self-heated transponder, page 45](#)

## Opening a transponder with defect/possibly defect battery

Always read the emergency procedures before handling lithium batteries.

### Procedure

- 1 Evacuate all unnecessary people.
- 2 Use a full face mask with minimum BE-filter, and protective equipment made of rubber or plastic.

### **WARNING**

---

***You must never stand in front of, or at the back of the unit, when you open it.***

---

- 3 Open the transponder in a safe place out on the deck, shielded from people and vital equipment.
- 4 If there has been water ingress and the battery is still warm, disconnect the battery from the transponder electronics and study the procedure for handling a heated or warm separate battery.
- 5 Wash out the residues from the chemical reaction with water.

## Handling a heated or self-heated transponder

Always read the emergency procedures before handling lithium batteries.

### Procedure

- 1 Evacuate all unnecessary people.
- 2 Fasten the transponder to a rope or a crane and immerse in the sea for 24 hours or permanent. If this method is impossible, the unit can be cooled with copious amounts of cold water using a fire hose.
- 3 Recover the transponder and control the temperature.
- 4 Repeat this until the temperature is low and stable.

- 5 Take out the battery, see the emergency procedure for opening a transponder with a possible defect battery.

[Opening a transponder with defect/possibly defect battery, page 45](#)

## Handling a transponder with an open relief valve

Always read the emergency procedures before handling lithium batteries.

### Procedure

- 1 Evacuate all unnecessary people.
- 2 Use a full face mask with minimum BE-filter, and protective equipment made of rubber or plastic.
- 3 Fasten the transponder to a rope or a crane and immerse in the sea for 24 hours or permanent. If this method is impossible, the unit can be cooled with copious amounts of cold water using a fire hose.
- 4 Repeat this until no gases come out the relief valve and the temperature is low and stable.
- 5 Take out the battery, see the emergency procedure for opening a transponder with a possible defect battery.

[Opening a transponder with defect/possibly defect battery, page 45](#)

- 6 Wash out the residues from the chemical reaction with water.

## Handling heated or warm batteries

Always read the emergency procedures before handling lithium batteries.

### Procedure

- 1 Evacuate all unnecessary people.
- 2 Fasten the battery to a rope or a crane and immerse in the sea for 24 hours or permanent. If this method is impossible, the unit can be cooled with copious amounts of cold water using a fire hose.
- 3 Wash out the residues from the chemical reaction with water.



## Handling transponder and separate transponder batteries in case of an external fire

Always read the emergency procedures before handling lithium batteries.

### **Procedure**

- 1 If possible, move the battery and/or the transponder away from the fire.
- 2 Cool it down using lots of cold water.

Cooling down the battery with a large amount of cold water is the only way to reduce or stop the internal chemical reactions, or to limit the fire/explosions to as few battery cells as possible. The chemical reactions/fire will continue without additional supply of oxygen, so an extinguisher such as Lith-X will not work properly.

# Operating procedures

The transponder is operated from the HiPAP operator station APOS.

- Refer to APOS online help for descriptions.

# Maintenance

## Topics

- [Recovering the transponder, page 50](#)
- [Battery storage, page 50](#)
- [Cleaning the transponder, page 51](#)
- [Opening the transponder, page 51](#)
- [Inserting an O-ring, page 52](#)
- [Changing the battery, page 52](#)
- [Replacing the sacrificial anodes, page 54](#)
- [Resetting the pressure relief valve, page 54](#)
- [Lubricating SubConn® connectors, page 54](#)
- [Closing the release unit, page 55](#)
- [Releasing the transponder manually, page 55](#)

## Recovering the transponder

Always read the emergency procedures before handling lithium batteries.

### Context

Avoid slamming the transponder against solid objects as it is lifted out of the water.

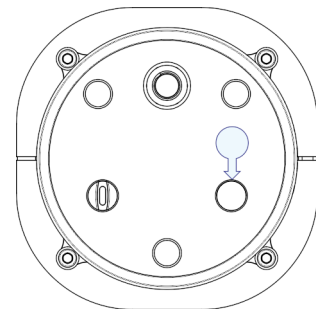
### Procedure

- 1 Send an acoustic command to the transponder to release it from the weight, for transponders with a release and a floating collar.
- 2 Grab hold of the rope attached to the floating collar and pull the transponder towards you.
- 3 Avoid slamming the transponder against solid objects as it is lifted out of the water.
- 4 Check the transponder's temperature  
If the transducer is overheated go directly to the emergency procedures.
- 5 Check the pressure relief valve to see if any chemical reaction has increased the pressure in the transponder to set it off.
- 6 Control the transponder for minimum two hours.

Check for damages that could involve a water leakage and check the housing temperature for a possible temperature increase in the lithium battery.

For batteries with possible damages, go to the emergency procedures chapter.

- 7 Wash the unit thoroughly in warm fresh water to dissolve any salt deposits and clean off any sand or silt.
- 8 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.
- 9 Dry off, so no water can come inside when opening.
- 10 Turn the transponder off and store the batteries outside the housing if the transponder is not used for some time.



## Battery storage

The batteries may be stored for up to 10 years with little loss of capacity, the losses being approximately according to these figures:

- **1st year:** 3 %

- **Next 9 years:** 1.5 % per year

The total capacity lost over 10 years will therefore be approximately 15%.

## Cleaning the transponder

The transponder must be cleaned after use.

### Procedure

- 1 Remove any growth and dirt with a stiff brush or a wooden or plastic scraper.  
Be careful not to damage the unit.
- 2 Clean the unit thoroughly with lots of fresh water.
- 3 Dry off, so no water can come inside when opening.

## Opening the transponder

Always read the emergency procedures before handling lithium batteries.

### Prerequisites

#### **WARNING**

---

***A battery malfunction may have caused high pressure to build up inside the transponder.***

***You must never stand in front of, or at the back of the unit, when you open it. Open the transponder in a safe place out on the deck, shielded from people and vital equipment.***

***Use a full face mask with minimum BE-filter, and protective equipment made of rubber or plastic.***

---

The transponder must be cleaned and dried before opening, so that no dirt or water seeps into the unit when it is opened.

### Procedure

- 1 Pull out the locking cord between the tube and either the top end cap, the transducer or the top section module.  
If the locking cord is hard to remove, carefully open the vent screw. Pressure may have built up inside the transponder.
- 2 Remove the top section.
- 3 Inspect all O-rings for damage.

- 4 Replace the O-rings that are damaged or used for more than a year.
- 5 Make sure the mating surfaces and the O-rings are completely clean.
- 6 Wipe a thin film of silicone grease over the rings and mating surfaces.

**Note**

---

*Do not lubricate the electromagnetic interference (EMI) shield (white or greyish ring).*

---

**Result**

Follow the procedure for opening the transponder in reverse order to close it.

## Inserting an O-ring

The O-rings must be inspected for damage as often as possible.

**Procedure**

**Note**

---

*Make sure to keep the O-rings and mating surfaces free of dust and debris.*

*Do not use a screwdriver or similar when removing the O-ring, use an O-ring tool.*

---

- 1 Open the transponder.
- 2 Remove the existing O-ring.
- 3 Clean the surface and cover it with a thin film of silicone grease.  
Use lint-free objects when cleaning the surfaces.
- 4 Insert the new O-ring.
- 5 Close the transponder.

## Changing the battery

Always read the emergency procedures before handling lithium batteries.

**Prerequisites**

The transponder must be open to change the battery.

---

**Note**

*Read the lithium batteries safety procedure before handling batteries.*

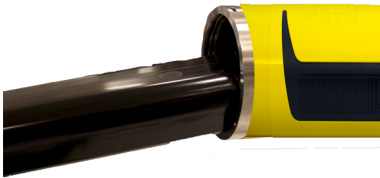
*Do not connect the + and – electrodes on the batteries with metal or wire..*

---

**Procedure**

- 1 Pull out the plastic locking cord that secures the transducer in place.
- 2 Remove the transducer.
- 3 Remove the spent battery.
- 4 Insert the new battery.

Inserting the battery at an angle makes this easier. Press firmly to make sure the battery is properly inserted.



- 5 Place a bag of dry silica-gel desiccant on the top of the battery.
- 6 Switch the on/off switch inside the top to on.



- 7 Replace the top.  
Make sure the alignment marks meet.
- 8 Insert the locking cord by pushing it sideways around the body.

**Result**

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

## Replacing the sacrificial anodes

Since these anodes are slowly disintegrating during normal wear and tear, they must be replaced when spent.

### Context

Inspect the anodes regularly, and replace them if needed.

### Procedure

- 1 Unscrew the corroded anodes using pliers.  
Make sure the centre stud bolt comes out.
- 2 Replace the anode and the serrated washer for better contact.

## Resetting the pressure relief valve

The Pressure relief valve can be found on the transponder bottom end cap.

### Procedure

- 1 Clean the unit thoroughly with lots of fresh water.
- 2 Push the valve back in until it sits flush with the surrounding surface.
- 3 Contact Kongsberg Maritime for assistance if the valve will not reset properly.

## Lubricating SubConn® connectors

Underwater connectors must be kept clean and lubricated and should be inspected regularly for damages and corrosion.

### Context

SubConn® connectors should not be exposed to extended periods of heat or direct sunlight. If a connector becomes very dry, it should be soaked in fresh water before use.

### Procedure

- 1 Grease the connector with Molykote 44 Medium or equivalent grease.  
A layer of grease corresponding to minimum 1/10 of the socket depth should be applied to the female connector.
- 2 Check that the inner edge of all sockets is completely covered, and a thin transparent layer of grease is visible on the face of the connector.



- 3 Fully mate the male and female connector in order to secure optimal distribution of grease on pins and in sockets.
- 4 Open and check for grease on every male pin, to confirm that enough grease is applied.  
Add more if necessary.
- 5 Connect and tighten the locking sleeve.

## Closing the release unit

This is how the anchor weight can be attached to the transponder before operation.

### Prerequisites

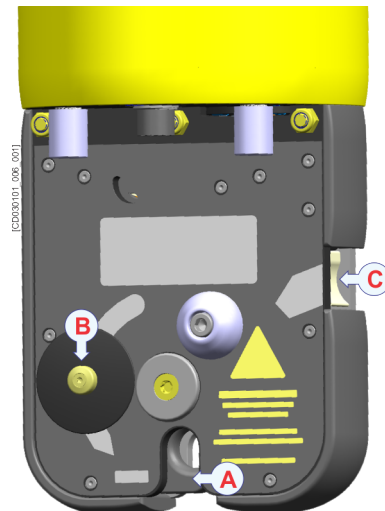
The release unit can be opened manually or acoustically.

### Procedure

- 1 Place a release link in the release hook **A**.
- 2 Pull the reset button **B** down until a firm click is heard and felt.

### Result

The release unit should now be in a fully closed position.



## Releasing the transponder manually

Normally the unit will be released acoustically from APOS, this procedure is for releasing manually on deck.

### Context

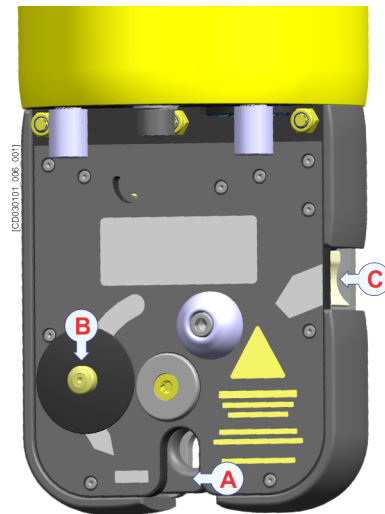
The release unit can be opened manually or acoustically.

**Procedure**

- Push in the release button C on the side of the release unit.  
A sudden muted click and thud can be heard and felt.

**Result**

The release unit is now fully opened A.



# Spare parts

## Topics

- [Maintenance kit, page 59](#)
- [TD180 Spare part, page 59](#)
- [TD30V30H Spare part, page 59](#)
- [TD30V Spare part, page 60](#)
- [Split for remote transducer Spare part, page 60](#)
- [TDR180 Spare part, page 60](#)
- [TDR30H Spare part, page 60](#)
- [TDR30V Spare part, page 60](#)
- [TDR40V Spare part, page 61](#)
- [Transducer cable Spare part, page 61](#)
- [Sound velocity, Pressure and Inclinometer Spare part, page 61](#)
- [Basic end cap Spare part, page 61](#)
- [Release end cap Spare part, page 61](#)
- [Sensor interface end cap Spare part, page 62](#)
- [MGC end cap Spare part, page 62](#)
- [Inclinometer end cap Spare part, page 62](#)
- [cNODE Maxi Battery Spare part, page 62](#)
- [cNODE Midi Battery Spare part, page 62](#)
- [Inclinometer sensor Spare part, page 63](#)
- [Inclinometer sensor Interface cable Spare part, page 63](#)
- [Adapter for floating collar Spare part, page 63](#)
- [Floating collar Spare part, page 63](#)
- [Transport plug Spare part, page 64](#)

[TTC 30 \(Transponder Test and Configuration unit\) Spare part, page 64](#)

[Current meter Aquadopp Spare part, page 64](#)

[Aquadopp mounting clamp Spare part, page 64](#)

[Transponder rack Spare part, page 65](#)

[Funnel collar Spare part, page 65](#)

## Maintenance kit

- **Part name:** cNODE Maxi and Midi maintenance kit, Aluminium
- **Part number:** 345595

This kit contains:

- 1 EMI shield
- 1 O-ring, 12 x 2 mm
- 3 Zink anodes 207–5000
- 3 locking cords
- 1 UV plug, dummy
- 6 O-rings, 107 x 5 mm
- 1 O-rings, 10 x 2 mm
- 1 Vent screw
- 1 Locking sleeve
- 1 Transport plug
- 6 Serrated lock washers

## TD180 Spare part

- **Part name:** TD180 Aluminium
- **Part number:** 319750
- **Part name:** TD180 Steel
- **Part number:** 320877



## TD30V30H Spare part

- **Part name:** TD30V30H Aluminium
- **Part number:** 313455
- **Part name:** TD30V30H Steel
- **Part number:** 359429



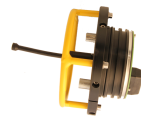
## TD30V Spare part

- **Part name:** TD180 Aluminium
- **Part number:** 320662
- **Part name:** TD180 Steel
- **Part number:** 320077



## Split for remote transducer Spare part

- **Part name:** Split for remote transducer Aluminium
- **Part number:** 320949
- **Part name:** Split for remote transducer Steel
- **Part number:** 322375



## TDR180 Spare part

- **Part name:** TDR180 Aluminium
- **Part number:** 349742
- **Part name:** TDR180 Steel
- **Part number:** 375361



## TDR30H Spare part

- **Part name:** TDR30H Aluminium
- **Part number:** 345773
- **Part name:** TDR30H Steel
- **Part number:** 375359



## TDR30V Spare part

- **Part name:** TDR30V Aluminium
- **Part number:** 333445
- **Part name:** TDR30V Steel
- **Part number:** 370447



## TDR40V Spare part

- **Part name:** TDR40V Aluminium
- **Part number:** 349743
- **Part name:** TDR40V Steel
- **Part number:** 375360



## Transducer cable Spare part

- **Part name:** Transducer cable 6 m
- **Part number:** 345772



## Sound velocity, Pressure and Inclinometer Spare part

- **Part name:** SvPI Sensor Aluminium
- **Part number:** 388700



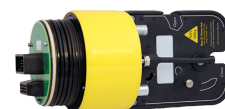
## Basic end cap Spare part

- **Part name:** Basic end cap Aluminium
- **Part number:** 330498
- **Part name:** Basic end cap Steel
- **Part number:** 330805



## Release end cap Spare part

- **Part name:** Release end cap Aluminium
- **Part number:** 325026
- **Part name:** Release end cap Steel
- **Part number:** 356511



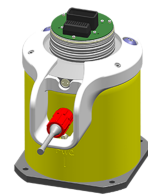
## Sensor interface end cap Spare part

- **Part name:** Sensor interface end cap Aluminium
- **Part number:** 347652
- **Part name:** Sensor interface end cap Steel
- **Part number:** 361410



## MGC end cap Spare part

- **Part name:** MGC end cap R2
- **Part number:** 397960
- **Part name:** MGC end cap R3
- **Part number:** 435220



## Inclinometer end cap Spare part

- **Part name:** Inclinometer end cap Steel
- **Part number:** 320818



## cNODE Maxi Battery Spare part

- **Part name:** cNODE Maxi Battery
- **Part number:** 319554



## cNODE Midi Battery Spare part

- **Part name:** cNODE Midi Battery
- **Part number:** 347563





## Inclinometer sensor Spare part

- Inclinometer sensor Spare part
- 441115



## Inclinometer sensor Interface cable Spare part

- **Part name:** Inclinometer sensor Interface cable
- **Part number:** 322407

## Adapter for floating collar Spare part

Adapter for transponder models without a release mechanism. For use on a basic end cap with a floating collar.

- **Part name:** Adapter for floating collar Aluminium
- **Part number:** 369045
- **Part name:** Adapter for floating collar Steel
- **Part number:** 372953



## Floating collar Spare part

- **Part name:** Floating collar Aluminium 4000 m
- **Part number:** 319301
- **Part name:** Floating collar Aluminium 2000 m
- **Part number:** 320772
- **Part name:** Floating collar Steel 4000 m
- **Part number:** 331151



## Transport plug Spare part

- **Part name:** Transport plug
- **Part number:** 346211



## TTC 30 (Transponder Test and Configuration unit) Spare part

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



## Current meter Aquadopp Spare part

- **Part name:** Aquadopp Current meter
- **Part number:** 349229



## Aquadopp mounting clamp Spare part

- **Part name:** Aquadopp mounting clamp
- **Part number:** 351070

## Transponder rack Spare part

- **Part name:** Transponder rack
- **Part number:** 320808



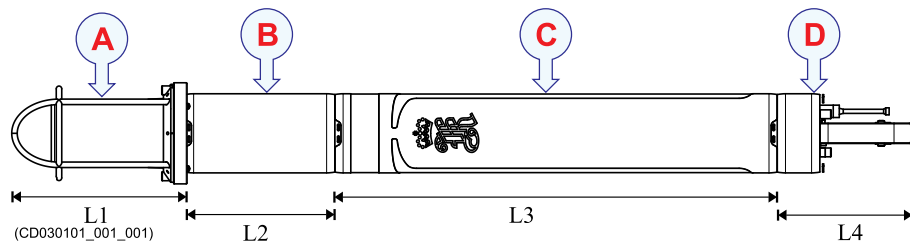
## Funnel collar Spare part

- **Part name:** Funnel collar Upper part
- **Part number:** 383679
  
- **Part name:** Funnel collar Lower part
- **Part number:** 383683



# About drawings

The cNODE transponders come in so many different configurations it is not practical to show an outline drawing of all of them.



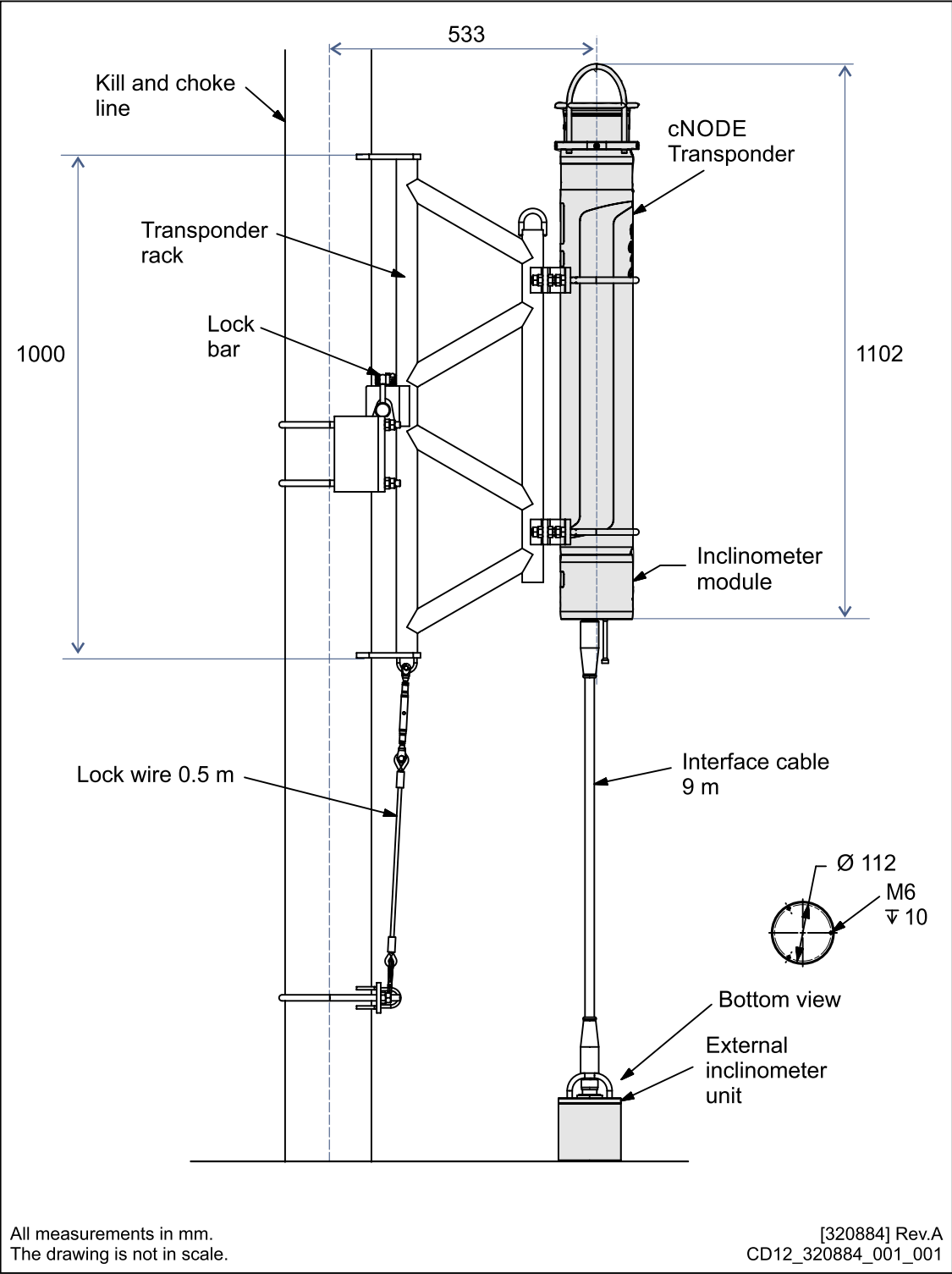
- A** Transducer/Split
- B** Optional transponder modules
- C** Body
- D** End caps

Use the dimensions of the different components in the transponder in the technical specification to find the total dimension of your cNODE transponder.

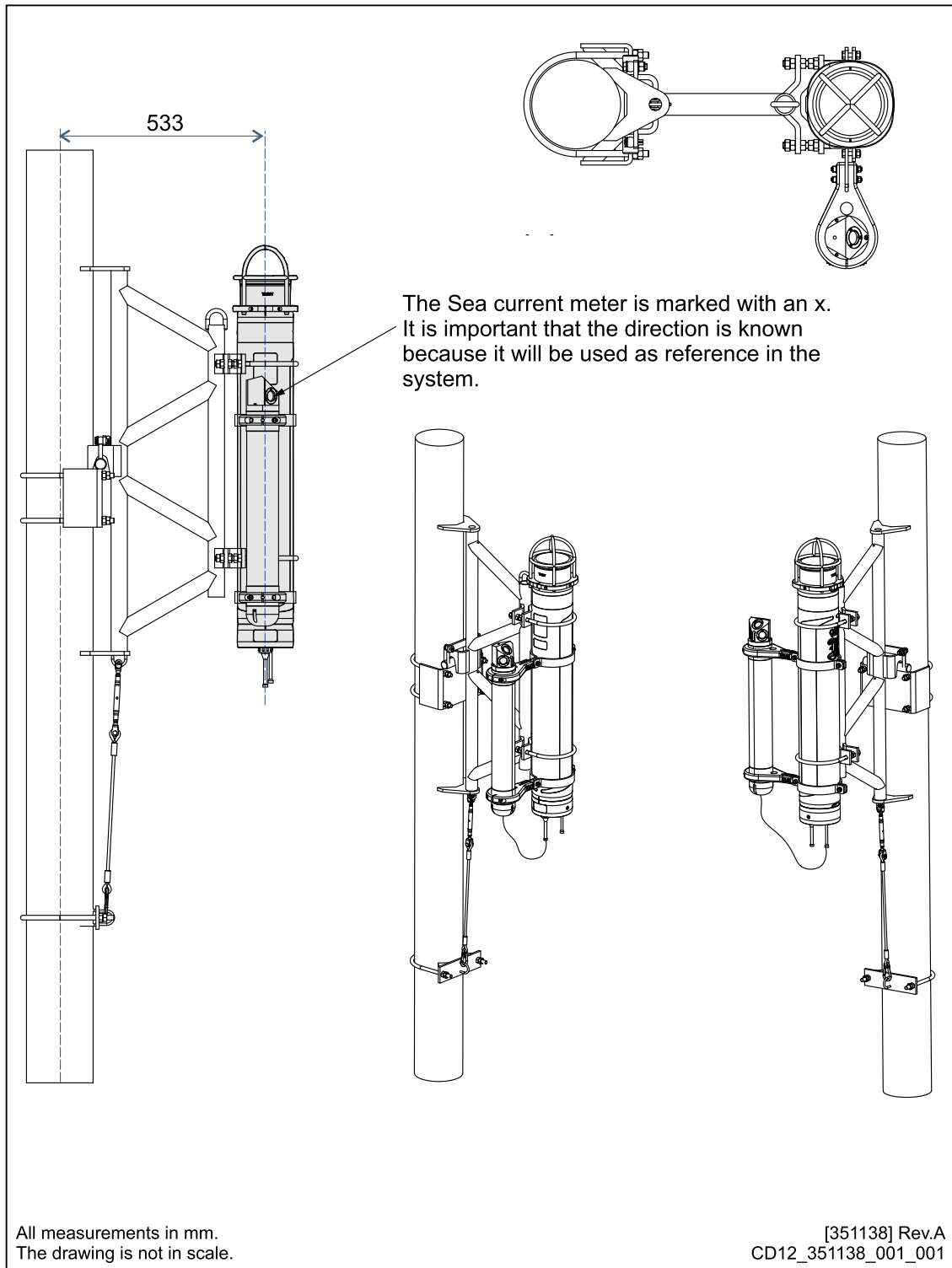
[Weight and outline dimensions, page 73](#)

Contact Kongsberg Maritime if you need an outline drawing of your specific transponder.

# Differential inclinometer arrangement drawing



## Current meter arrangement drawing



# Technical specifications

## **Topics**

[Performance specifications, page 70](#)

[Weight and outline dimensions, page 73](#)

[Power requirements, page 77](#)

[Environmental requirements, page 80](#)

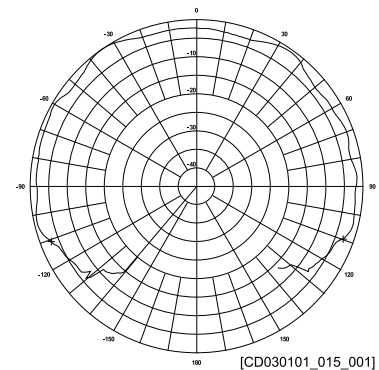
## Performance specifications

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

- **Depth range:** 4000 m
- **Operational frequency:** Medium frequency 21 – 31 kHz

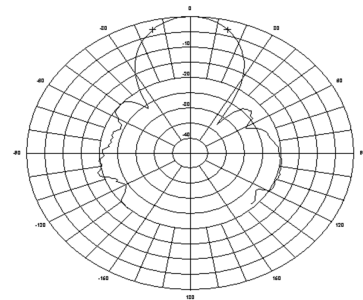
### TD180

- **Transducer beam:** 180 degrees
- **Maximum source level:** 190 dB
- **Receiver sensitivity:** 100 dB



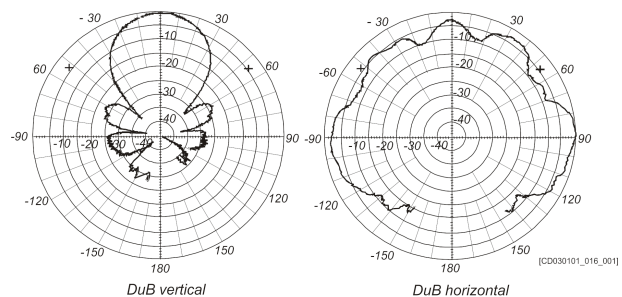
### TD30V

- **Transducer beam:** 30° Vertical
- **Maximum source level:** 206 dB
- **Receiver sensitivity:** 85 dB



### TD30V30H

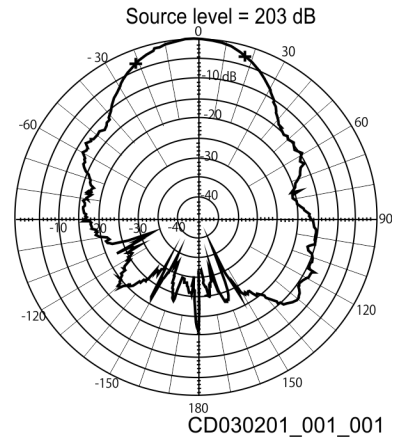
- **Transducer beam:** 30° Vertical/30° Horizontal
- **Maximum source level:** 206 dB/190 dB
- **Receiver sensitivity:** 85 dB





**TDR40V**

- **Transducer beam:** 40° Vertical
- **Maximum source level:** 203 dB
- **Receiver sensitivity:** 90 dB



Source level	Maximum	High	Low	Minimum
34–180 series	190 dB	184 dB	178 dB	173 dB
34–30V30H series Vertical	206 dB	200 dB	194 dB	186 dB
34–30V30H series Horizontal	190 dB	184 dB	178 dB	173 dB
34–30V series	206 dB	200 dB	194 dB	186 dB
34–40V series	203 dB	197 dB	191 dB	185 dB
34–30H series	194 dB	188 dB	182 dB	176 dB

**Release end cap**

- **Safe working load:** 500 kg
- **Minimum anchor weight:** 60 kg
- **Connector:** 8–pin female Subconn MCBH8F

**Inclinometer end cap**

- **Maximum detectable angles:** ±60 degrees  
**Accuracy:** 0.25 degrees  
**Resolution:** 0.1 degrees
- **Connector:** 8–pin female Subconn MCBH8F
- **Connector:** 7–pin Gisma plug 10.00.2.07.1.10

### **MEC Inclinometer sensor**

- **Maximum detectable angles:**  $\pm 60$  degrees  
**Accuracy:** 0.25 degrees  
**Resolution:** 0.1 degrees
- **Connector:** 8-pin female Subconn MCBH8F
- **Connector:** 7-pin Gisma plug 10.00.2.07.1.10
- **Cable:** Maximum 9 m

### **Sensor interface end cap**

- **Connector:** 8-pin female Subconn MCBH8F
- **Connector:** 16-pin Subconn MCBH16M

### **Sound velocity, Pressure and Inclinometer**

#### **Digiquartz pressure sensor**

- **1400 m:**  $\pm 0.01$  % of full scale range
- **2000 m:**  $\pm 0.01$  % of full scale range
- **4000 m:**  $\pm 0.01$  % of full scale range

#### **MTS Inclinometer**

- **Accuracy:**  $\pm 0.05$  degrees
- **Range:**  $\pm 90$  degrees

#### **Sound Velocity**

- **Accuracy:**  $\pm 0.02$  m/s

#### **Floating collar**

- **Depth range Aluminium:** 2000 m, 4000 m
- **Depth range Steel:** 4000 m

## Weight and outline dimensions

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

### **TD180**

- **Outline dimensions:**
  - **Height:** 169.5 mm
  - **Diameter:** 166 mm
- **Weight (In air) Aluminium:** 4.1 kg
- **Weight (In air) Steel:** 8.2 kg

### **TD30V30H**

- **Outline dimensions:**
  - **Height:** 316 mm
  - **Diameter:** 184 mm
- **Weight (In air) Aluminium:** 8.3 kg
- **Weight (In air) Steel:** 12.9 kg

### **TD30V**

- **Outline dimensions:**
  - **Height:** 169.5 mm
  - **Diameter:** 166 mm
- **Weight (In air) Steel:** 9.1 kg

### **Split for remote transducer**

- **Outline dimensions:**
  - **Height:** 62 mm
  - **Diameter:** 166 mm

### **TDR180**

- **Outline dimensions**
  - **Height:** 209.8 mm
  - **Diameter:** 88 mm

### **TDR30H**

- **Outline dimensions**
  - **Height:** 262.4 mm
  - **Diameter:** 77 mm

### **TDR40V**

- **Outline dimensions**
  - **Height:** 218.6 mm
  - **Diameter:** 100 mm

### **TDR30V**

- **Outline dimensions**
  - **Height:** 279.5 mm
  - **Diameter:** 166 mm

### **Transducer cable**

- **Length:** 6 m

### **Sound velocity, Pressure and Inclinator**

- **Outline dimensions:**
  - **Height:** 184 mm
  - **Diameter:** 144 mm
- **Weight (In air) :** 4.6 kg
- **Weight(In water):** 2 kg

### **cNODE Maxi body**

- **Outline dimensions:**
  - **Height:** 805 mm
  - **Diameter:** 144 mm

### **cNODE Midi body**

- **Outline dimensions:**
  - **Height:** 495 mm
  - **Diameter:** 144 mm

### **Sound velocity, Pressure and Inclinometer**

- **Outline dimensions:**
  - **Height:** 184 mm
  - **Diameter:** 144 mm
- **Weight (In air) Aluminium:** 2.4 kg

### **Basic end cap**

- **Outline dimensions:**
  - **Height:** 40 mm
  - **Diameter:** 144 mm
- **Weight (In air) Aluminium:** 2.2 kg
- **Weight (In air) Steel:** 5 kg

### **Release end cap**

- **Outline dimensions:**
  - **Height:** 243 mm
  - **Diameter:** 144 mm
- **Weight (In air) Aluminium:** 4.9 kg
- **Weight (In air) Steel:** 11.3 kg

### **Sensor interface end cap**

- **Outline dimensions:**
  - **Height:** 72.8 mm
  - **Diameter:** 144 mm
- **Weight (In air) Aluminium:** 2.4 kg

### **Inclinometer end cap**

- **Outline dimensions:**
  - **Height:** 128 mm
  - **Diameter:** 144 mm

### **MGC end cap**

- **Outline dimensions:**
  - **Height:** 237 mm
  - **Diameter:** 212 mm
- **Weight (In air) Aluminium:** 45 kg
- **Weight(In water) Aluminium:** 22 kg

**cNODE Maxi Battery**

- **Length:** 704 mm
- **Weight (In air) :** 6.5 kg

**cNODE Midi Battery**

- **Length:** 325.5 mm
- **Weight (In air) :** 3.5 kg

**External inclinometer**

- **Outline dimensions:**
  - **Height:** 175 mm
  - **Diameter:** 124 mm

**cNODE Maxi Floating collar 2000 m , Aluminium transponder**

- **Outline dimensions:**
  - **Height:** 949 mm
  - **Width:** 358 mm
  - **Depth:** 300 mm
- **Weight (In air) :** 43 kg

**cNODE Maxi Floating collar 4000 m , Aluminium transponder**

- **Outline dimensions:**
  - **Height:** 948 mm
  - **Width:** 350 mm
  - **Depth:** 455 mm
- **Weight (In air) :** 69.6 kg

**cNODE Maxi Floating collar 4000 m , Steel transponder**

- **Outline dimensions:**
  - **Height:** 845.5 mm
  - **Width:** 528 mm
  - **Depth:** 595 mm
- **Weight (In air) :** 110 kg

## Power requirements

These power characteristics summarize the supply power requirements for the cNODE transponder.

### cNODE Maxi

- **Battery type:** Non-rechargeable lithium battery Li/SOCl<sub>2</sub>
- **Operating range:** 10 — 14.4 VDC
- **Battery voltage:** 14.4 VDC
- **Battery capacity:** 128 Ah
- **Cells per battery:** 48

### Battery lifetime

The lifetime ranges should be treated as approximations only. Calculations made should allow for standard deviation in battery manufacture.

- **Quiescent battery lifetime:** 913 days

### cNODE Maxi 34–180 series — Cymbal

Update rate	1 second	2 s	3 s	4 s	5 s	10 s
TX power level						
Minimum	95 days	101 days	102 days	103 days	104 days	105 days
Low	71 days	85 days	91 days	95 days	97 days	101 days
High	36 days	54 days	65 days	72 days	77 days	89 days
Maximum	10 days	18 days	25 days	32 days	37 days	55 days

### cNODE Maxi 34–180 series — FSK

Update rate	1 second	2 s	3 s	4 s	5 s	10 s
TX power level						
Minimum	167 days	172 days	174 days	175 days	175 days	176 days
Low	141 days	157 days	163 days	167 days	169 days	173 days
High	88 days	118 days	133 days	142 days	148 days	161 days
Maximum	30 days	51 days	67 days	80 days	90 days	119 days

**cNODE Maxi 34-30V30H and other series — Cymbal**

Update rate	1 second	2 s	3 s	4 s	5 s	10 s
TX power level						
Minimum	95 days	101 days	102 days	103 days	104 days	105 days
Low	59 days	76 days	91 days	84 days	92 days	99 days
High	23 days	38 days	65 days	48 days	62 days	78 days
Maximum	6 days	11 days	25 days	16 days	25 days	40 days

**cNODE Maxi 34-30V30H and other series — FSK**

Update rate	1 second	2 s	3 s	4 s	5 s	10 s
TX power level						
Minimum	167 days	172 days	174 days	175 days	175 days	176 days
Low	125 days	147 days	156 days	161 days	164 days	170 days
High	61 days	91 days	109 days	121 days	129 days	149 days
Maximum	18 days	34 days	46 days	57 days	66 days	96 days

**cNODE Midi**

- **Battery type:** Non-rechargeable lithium battery Li/SOCl<sub>2</sub>
- **Operating range:** 10 — 14.4 VDC
- **Battery voltage:** 14.4 VDC
- **Battery capacity:** 64 Ah
- **Cells per battery:** 24

**Battery lifetime**

The lifetime ranges should be treated as approximations only. Calculations made should allow for standard deviation in battery manufacture.

- **Quiescent battery lifetime:** 456.5 days



**cNODE Midi 34–180 series — Cymbal**

<b>Update rate</b>	<b>1 second</b>	<b>2 s</b>	<b>3 s</b>	<b>4 s</b>	<b>5 s</b>	<b>10 s</b>
<b>TX power level</b>						
Minimum	47.5 days	50.5 days	51 days	51.5 days	52 days	52.5 days
Low	35.5 days	42.5 days	45.5 days	47.5 days	48.5 days	50.5 days
High	18 days	27 days	32.5 days	36 days	38.5 days	44.5 days
Maximum	5 days	9 days	12.5 days	16 days	18.5 days	27.5 days

**cNODE Midi 34–180 series — FSK**

<b>Update rate</b>	<b>1 second</b>	<b>2 s</b>	<b>3 s</b>	<b>4 s</b>	<b>5 s</b>	<b>10 s</b>
<b>TX power level</b>						
Minimum	83.5 days	86 days	87 days	87.5 days	87.5 days	88 days
Low	70.5 days	78.5 days	81.5 days	83.5 days	84.5 days	86.5 days
High	44 days	59 days	66.5 days	71 days	74 days	80.5 days
Maximum	15 days	25.5 days	33.5 days	40 days	45 days	59.5 days

**cNODE Midi 34-30V30H and other series — Cymbal**

<b>Update rate</b>	<b>1 second</b>	<b>2 s</b>	<b>3 s</b>	<b>4 s</b>	<b>5 s</b>	<b>10 s</b>
<b>TX power level</b>						
Minimum	47.5 days	50.5 days	51 days	51.5 days	52 days	52.5 days
Low	29.5 days	38 days	42 days	44.5 days	46 days	49.5 days
High	11.5 days	19 days	24 days	28 days	31 days	39 days
Maximum	3 days	5.5 days	8 days	10.5 days	12.5 days	20 days

**cNODE Midi 34-30V30H and other series — FSK**

<b>Update rate</b>	<b>1 second</b>	<b>2 s</b>	<b>3 s</b>	<b>4 s</b>	<b>5 s</b>	<b>10 s</b>
<b>TX power level</b>						
Minimum	83.5 days	86 days	87 days	87.5 days	87.5 days	88 days
Low	62.5 days	73.5 days	78 days	80.5 days	82 days	85 days
High	30.5 days	45.5 days	54.5 days	60.5 days	64.5 days	74.5 days
Maximum	9 days	17 days	23 days	28.5 days	33 days	48 days

**MGC end cap**

- **External power:** 9 – 36 VDC
- **Power consumption:**
  - Maximum 20 W
  - Typical 12 W
- **cNODE Maxi:** 72 hours
- **cNODE Midi:** 36 hours

## Environmental requirements

These specifications summarize the temperature requirements and other environmental standards for the cNODE system.

**Transponder**

- **Operating temperature:** -5 to 55 °C
- **Storage temperature:** -30 to 70 °C

# Battery safety

## Topics

- SECTION 1: Identification, page 82
- SECTION 2: Hazards identification, page 82
- SECTION 3: Composition, page 83
- SECTION 4: First aid measures, page 84
- SECTION 5: Firefighting measures, page 84
- SECTION 6: Accidental release measures, page 85
- SECTION 7: Handling and storage, page 85
- SECTION 8: Exposure control and personal protection, page 86
- SECTION 9: Physical and chemical properties, page 86
- SECTION 10: Stability and reactivity, page 87
- SECTION 11: Toxicological information, page 87
- SECTION 12: Ecological information, page 88
- SECTION 13: Disposal considerations, page 88
- SECTION 14: Transport information, page 88
- SECTION 15: Regulatory information, page 89
- SECTION 16: Other information, page 89

## SECTION 1: Identification

The specification describes the technical parameters for the battery.

The cNODE contains a custom made Li-Ion battery.

- **Battery name:** L14.4 (48) Maxi
- **Part number:** 319554
- **Battery name:** L14.4 (48) Maxi Exd
- **Part number:** 355324
- **Battery name:** L14.4 (24) Midi
- **Part number:** 347563
- **Manufacturer:** Kongsberg Maritime AS
- **Address:** Strandpromenaden 50, 3190 Horten, Norway
- **Telephone:** +47 33 03 24 07 (24 h)
- **Telefax:** +47 33 04 29 87
- **E-mail address:** [km.support.hpr@kongsberg.com](mailto:km.support.hpr@kongsberg.com)
- **Website:** <https://www.kongsberg.com/maritime>

Note

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*The battery is provided as a solid and sealed unit. It cannot be opened to reveal individual cells.*

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## SECTION 2: Hazards identification

The battery is not provided with any hazards identification. It is not classified as dangerous or hazardous with normal use.

The battery must not be opened or burned. 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 runaway 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 a solid, manufactured article.

A lithium battery pack consists of several individual cells that are electrical connected, both in series and parallel.

The battery packs have different number of cells and power capacity. All transponder batteries include protection against short circuits (circuit breakers) and reverse current (diodes).

The lithium metal cells have the following chemical formula:

Lithium thionyl chloride — Li/SOCl<sub>2</sub>

- **Negative electrode:** Lithium
- **Positive electrode:** Carbon
- **Electrolyte:** A solution of lithium tetrachloroaluminate (LiAlCl<sub>4</sub>) in thionyl chloride

### **Battery identification:**

#### **cNODE Maxi**

- **Battery name:** L14.4 (48) Maxi
- **Part number:** 319554
- **Battery weight:** 6.5 kg
- **Lithium weight:** 183 g

#### **cNODE Midi**

- **Battery name:** L14.4 (24) Midi
- **Part number:** 347563
- **Battery weight:** 3.0 kg
- **Lithium weight:** 92 g

In case of hazardous events, the noxious gases are:

- Thionyl chloride (SOCl<sub>2</sub>)
- Sulphur dioxide (SO<sub>2</sub>)
- Hydrogen sulphide (H<sub>2</sub>S)
- Hydrogen chloride (HCl)
- Chlorine (Cl<sub>2</sub>)

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

- **Manufacturer:** Saft
- **Cell type:** LSH 20
- **Manufacturer's website:** <https://www.saftbatteries.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 copious amount 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 copious amount 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 materials are used. In case of fire, move the battery away from 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.

- 1 If possible, move the battery and/or the transponder away from the fire.

- 2 Cool it down using lots of cold water.
  - a Immerse the battery and/or the transponder in the sea for minimum 24 hours.
  - b If this method is impossible, it can be cooled down with a fire hose.

Cooling down the battery with a large amount of cold water is the only way to reduce or stop the internal chemical reactions, or to limit the fire/explosions to as few battery cells as possible. The chemical reactions/fire will continue without additional supply of oxygen, so an extinguisher such as Lith-X will not work properly.

Applying water directly onto a battery may develop hydrogen gas, due to the possible electrolysis if the battery terminals are exposed to water. Mixed with air, this gas is very inflammable/explosive. However, if the water cooling takes place on deck or in a storage room with good ventilation, there will never be enough hydrogen gas to exceed the lower explosive limit of hydrogen in air (about 4 %).

#### Note

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

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## 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 -40 °C to +80 °C.

4 Store in a dry location.

Recommended relative air humidity is 40 to 70 %. To minimize any adverse affects on the battery performance it is recommended that it is kept at room temperature (25 °C +/- 5 °C). Elevated temperatures can result in shortened life.

5 Do not store the battery in direct sunlight.

6 Keep the battery out of reach of children.

The storage room must be properly ventilated. It must be provided with sturdy racks with dedicated cradles for the batteries, and allow for easy removal of batteries in case of fire. The room must be designated and clearly identified as a storage area, and entrance should be restricted. The room must not be used as a general rest or work area.

Note

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*The storage room must have a sprinkler system or a fire station. A suitable fire hose (with water) must be placed outside or in the proximity of the room.*

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## SECTION 8: Exposure control and personal protection

Airborne exposures to hazardous substances are not expected when the battery is used for its intended purpose. No protection (respiratory, skin and/or eye) is then required. If the battery is damaged, and you are exposed to the chemicals inside, proper personal protection is required.

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

- **Fire or explosion:** Use a self-contained breathing apparatus.
- **Exposure to noxious gas:** Use a full-face mask with minimum BE filter and protective equipment of rubber or plastic. (*B* refers to protection against inorganic gases and *E* refers to protection against sulphur dioxide.)

## SECTION 9: Physical and chemical properties

The battery is solid with a firm and hard surface. No chemicals are exposed during normal use and transportation.

The battery pack is provided as a solid and sealed unit. The battery pack 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:** Saft
- **Manufacturer's website:** <https://www.saftbatteries.com/>

## SECTION 10: Stability and reactivity

The battery is stable. No specific handling requirements apply.

In normal use, the battery pack is placed inside the sealed transponder.

Water ingress into the transponder can cause dangerous situations.

Short-circuiting, overheating, mechanical damage and exposure to water can start chemical reactions and cause high currents inside the lithium battery. This can generate noxious gases and/or cause danger of explosion. The chemical reactions will continue without additional supply of oxygen, as the battery cells contain the necessary ingredients for maintaining the chemical reactions.

- 1 Do not open, disassemble, crush or burn the battery.
- 2 Do not expose the battery to water, sea water or other high-conductivity liquids.
- 3 Avoid mechanical or electrical abuse.
- 4 Do not expose the battery to temperatures outside the range of -40 °C to +80 °C.
- 5 Store in a dry location.

Recommended relative air humidity is 40 to 70 %. To minimize any adverse effects on the battery performance it is recommended that it is kept at room temperature (25 °C +/- 5 °C). Elevated temperatures can result in shortened life.

- 6 Do not store the battery in direct sunlight.
- 7 Keep the battery out of reach of children.

## 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

The battery is not biodegradable.

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

Dispose of the batteries in accordance with local, state and federal laws and regulations for batteries.

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

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

### Note

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

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## SECTION 14: Transport information

Transportation of the cNODE must be performed in accordance with rules and regulations stated for transportation of dangerous goods in the applicable countries.

**Certification:** UN 38.3

Transport identification codes:

- **Aircraft:** IATA DGR
- **Sea transport:** IMDG
- **Railway:** RID
- **Road transport:** ADR

Original shipping boxes must be used for all transport.

Air transport of all transponders with new lithium battery, and new separate transponder lithium batteries, is only permitted on board cargo aircraft. The goods must be clearly labelled: CARGO AIRCRAFT ONLY.

The transponders with batteries or batteries must be shipped must be shipped in accordance with the prevailing national regulations.

- Separate lithium batteries

- UN no. 3090, Class 9 Miscellaneous (Lithium batteries)
- Lithium batteries contained in equipment
  - UN no. 3091, Class 9 Miscellaneous (Lithium batteries)

Note

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*During transport a lithium battery must always be disconnected from the electronics.*

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## SECTION 15: Regulatory information

Not applicable.

## SECTION 16: Other information

The battery manufacturers' safety data sheet is available on their website.

Saft: <http://www.saftbatteries.com/>

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