KONGSBERG

cPAP MKII

Transceiver

Instruction Manual

447979/A

Document information

- **Product**: Kongsberg cPAP MKII
- **Document**: Instruction Manual
- **Document part number**: 447979
- **Revision**: A
- **Date of issue**: 4 November 2019

Copyright

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

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 cPAP MKII.

Target audience

This manual is intended for all users of the cPAP MKII.

Online information

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

https://www.kongsberg.com/maritime

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cPAP MKII

Topics

System description

The cPAP MKII transceiver is designed for LBL positioning of ROV and other umbilical cord connected vehicle or module.

The cPAP MKII Transceiver is compatible with both Cymbal acoustic protocol for positioning and data link, and FSK channels and telemetry.

It has an acoustic telemetry link for command and data transfer. The subsea transceiver unit is designed so that the transducer can be replaced individually to suit its purpose.

System units

Transceiver

The transceiver is provided to transmit acoustic energy through water. This transmission and reception are commonly referred to as a *ping*.

The subsea transceiver is a small aluminium tube that contains the system electronic modules and a battery. The transceiver is designed to be installed on a remotely operated vessel that is connected with an umbilical cord to a mothership. It has a connector for a remote transducer, a connector for APOS use and a connector for users without APOS.

Remote transducers

The remote transducer is connected to the top of the transceiver with a cable.

TDR180

The transducer has a 180° omnidirectional beam width. It is available in aluminium.

TDR40V

The transducer has a 40° vertical beam width. It is available in aluminium.

TDR30H

The transducer has a 30° horizontal beam width. It is available in aluminium.

Transducer cable

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

Scope of supply

The main units required are provided with the standard delivery.

- Transceiver
- Remote transducer
- Transducer cable
- Power and signal pigtail cable
- Quick Reference Guide

General supply conditions

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.

Detailed descriptions and procedures for the receipt, unpacking and storage of the equipment are found in the chapter for *Equipment handling*.

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 cPAP MKII warranty period (as specified in the contract) begins when the acceptance documents have been signed.

Support information

Should you need technical support for your cPAP MKII 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, 3183 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

Getting started

Topics

Installing the transducer

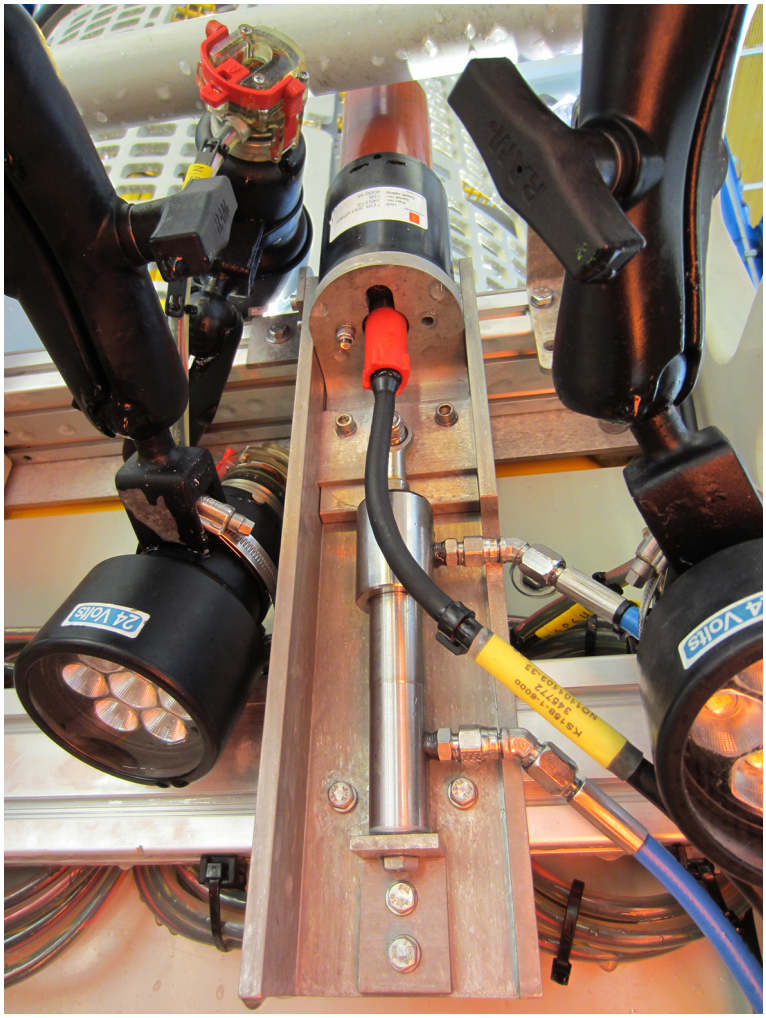
The transducer needs to be protected during launch and recovery of the ROV.

Prerequisites

It is important to get a good line of sight to the LBL transponders while the ROV is navigating close to the seabed.

This can be solved by using a hydraulic ram to raise and lower the transducer as needed.

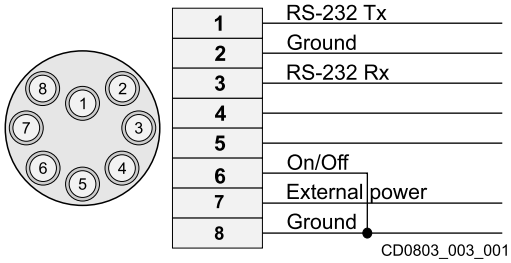
Example



Connecting power and ground to the transceiver

The transceiver must be connected to a suitable power source and must be properly grounded.

Context



External connector pinout, page 15

Procedure

1 Connect wire 6 and 8 in the pigtail.

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

2 Connect wire 7 to power.

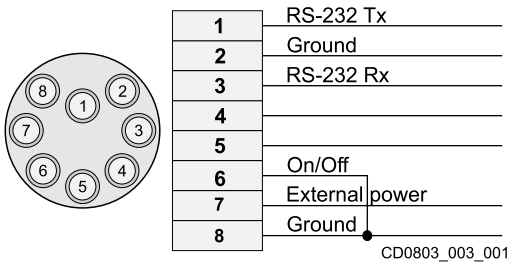
Make sure that the external power supply 24 VDC is between 20 and 28 VDC.

3 Connect wire 8 to ground.

Connecting to APOS

Systems without APOS must connect to the User connector.

Context



External connector pinout, page 15

Procedure

1 Connect the RS-232 Tx wire 1 from cPAP to the RS-232 Rx from APOS.

2 Connect the RS-232 Rx wire 3 from cPAP to the RS-232 Tx from APOS.

3 Connect the RS-232 ground wire 2 from cPAP to the RS-232 ground from APOS.

Pre-deployment checks

Context

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

Procedure

1 Make sure the interface cable is properly fastened and that a dummy plug is installed on the unused bulkhead connector.

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

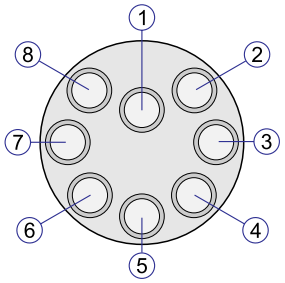
3 Perform a communication check with APOS before launching.

4 Make sure there will be a free line of sight between the transceiver’s transducer and the seabed transponders.

External connector pinout

The external connector is for power and connection to APOS.

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



Pin number	Signal
1	RS-232 Tx
2	Ground
3	RS-232 Rx
4	Not connected
5	Not connected
6	On/Off
7	External power(24 VDC)
8	Ground

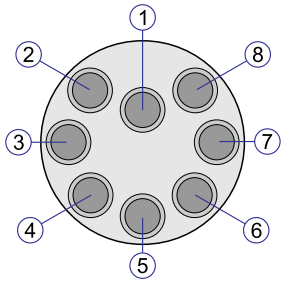
Connecting power and ground to the transceiver, page 13

Connecting to APOS, page 13

User connector pinout

The user connector is for systems without APOS. Use the external connector for power and ground.

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	Not connected
5	Not connected
6	Not connected
7	Not connected
8	Not connected

Maintenance

Topics

Cleaning

The transceiver and transducer must be cleaned after use.

Context

After retrieving the unit from salt water, it should be thoroughly rinsed with fresh water as usual with this kind of equipment.

Procedure

1 Rinse or soak thoroughly with fresh water, the longer the better.

   Lukewarm water is preferable if available.

   Pay particular attention to nooks and crannies (around bolt heads, connectors and so on).

2 If a connector has been disconnected for open face rinsing, leave it to dry properly before reconnecting.

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.

Technical specifications

Topics

Performance specifications

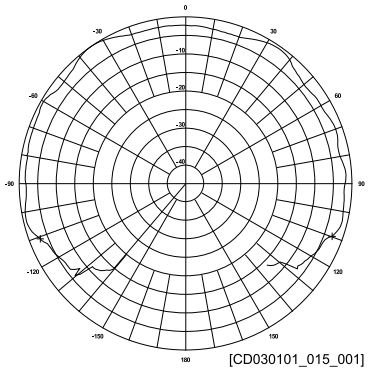
These performance specifications summarize the main functional and operational characteristics of the cPAP MKII Transceiver.

Transceiver

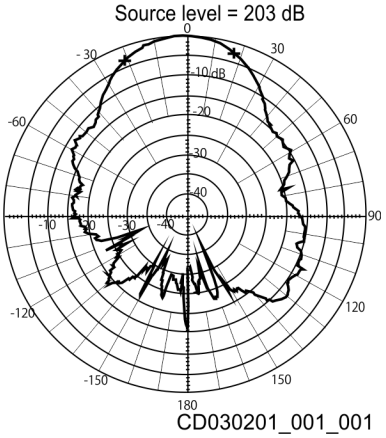
- **Maximum depth**: 4000 m
- **Operational frequency**: MF 21 – 31 kHz
- **External connector**:
  - Seacon MCBH8MDO
  - Seacon MCBH4FAS

Transducer

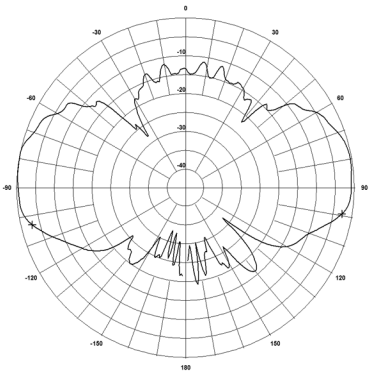
- **Transducer beam**: 180 degrees
- **Trigger level**: < 85 dB
- **Source level**: 188 dB



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



- **Transducer beam**: 30° Horizontal
- **Trigger level**: < 80 dB
- **Source level**: 194 dB



Weight and outline dimensions

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

Transceiver

- **Outline dimensions**:
  - **Height**: 277.5 mm
  - **Diameter**: 105 mm
- **Weight (In air)**: 4.2 kg
- **Weight (In water)**: 2.2 kg

TDR180

- **Outline dimensions**:
  - **Height**: 160 mm
  - **Diameter**: 88 mm
- **Weight (In air)**: 1.7 kg
- **Weight (In water)**: 1.0 kg

TDR40V

- **Outline dimensions**:
  - **Height**: 161 mm
  - **Diameter**: 100 mm
- **Weight (In air)**: 2.3 kg
- **Weight (In water)**: 1.3 kg

TDR30H

- **Outline dimensions**:
  - **Height**: 213 mm
  - **Diameter**: 77 mm
- **Weight (In air)**: 1.7 kg

Power requirements

These power characteristics summarize the supply power requirements for the cPAP MKII Transceiver.

- **Model**: cPAP MKII
- **Voltage requirement**: 24 V (20-28 VDC), 1 A/24 W

The transceiver contains an internal battery. This reduces the current draw from the external power supply. This is a Li-Ion (LiFe) battery.

Environmental requirements

These environmental specifications summarize the temperature and humidity requirements for the cPAP MKII Transceiver.

Transceiver

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

Spare parts

Topics

Transceiver spare part

- **Part name**: cPAP MKII transceiver
- **Part number**: 447900

TDR180 spare part

- **Part name**: cPAP TDR180
- **Part number**: 349742

TDR40V spare part

- **Part name**: cPAP TDR40V
- **Part number**: 349743

TDR30H spare part

- **Part name**: cPAP TDR30H
- **Part number**: 345773

Transducer cable spare part

- **Part name**: cPAP Transducer cable
- **Part number**: 345772

Power cable spare part

- **Part name**: cPAP Power cable
- **Part number**: 402462

User cable spare part

- **Part name**: cPAP User cable
- **Part number**: 427240

Drawing file

The following table lists the Kongsberg Maritime drawings that must be referred to when installing the cPAP MKII.

Description	Drawing
Transceiver Outline drawing	448001
Remote transducer TDR180	402065
Remote transducer TDR40V	386439
Remote transducer TDR30H	322391
cPAP connections	453273

Aluminium:
Weight in Water: 2.2Kg
Weight in Air: 4.2Kg

Rev.	Date	Reason for issue / Description of change	Designed by	Checked by	Approved by
B	2019-08-23	ECN-008778/A	fl	bodilu	eb
A	2019-02-20	First issue	fl	haa	eb

Material:	Surface: Ra 3,2 µm	Threads: 6g/6H	Broken edges: 0,1 - 0,5 x 45º
Surface treatment:	Tolerance unless otherwise stated: ISO 2768-mK		
Project No	Installation No / Item ID	Product Name: cPAP	

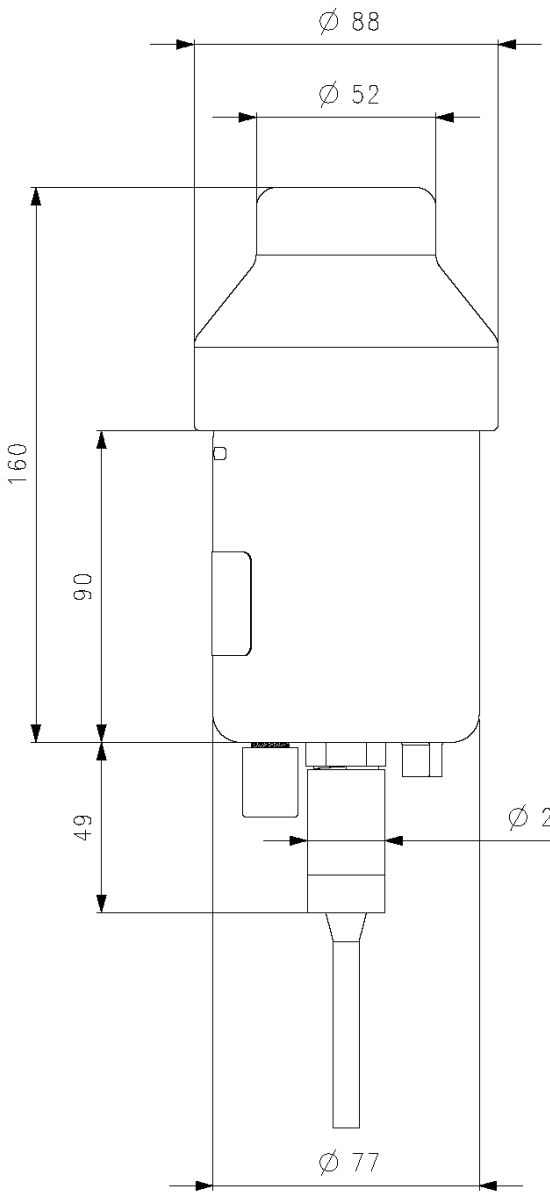
KONGSBERG
Kongsberg Maritime

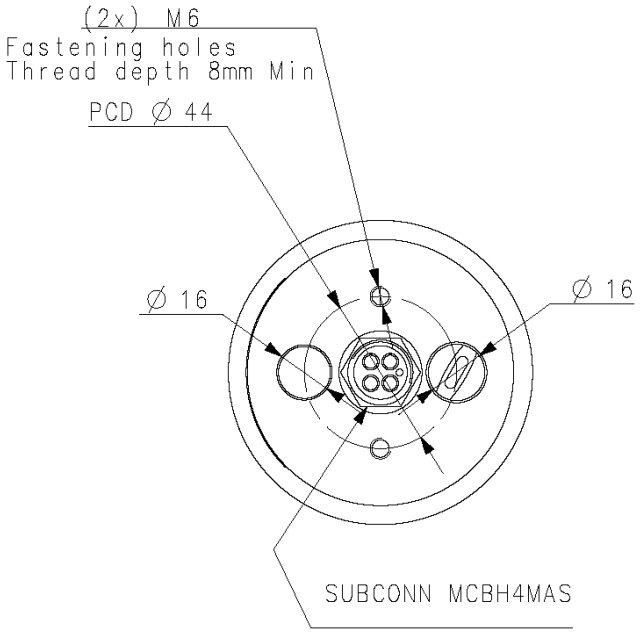
Title / Sub title / Drawing Type
Outline Dimensions cPAP MKII 34, Aluminium

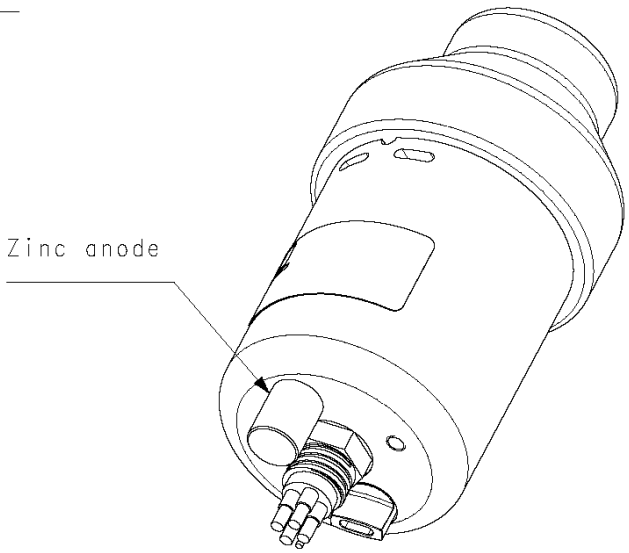
Outline Drawing

Scale 1 : 3
Size A4
Sheet 1 of 1

Information Classification	Document ID	Revision
Public	448001	B







Weight in air: 1.7 kg
Weight in water: 1.0 kg calculated

REV.	DATE	DESCRIPTION	Designed by	Checked by	Approved by
A	2018.01.15	First Issue	Rkov	HAA	EB

Material: Aluminium
Surface Treatment: –

Unless Otherwise Stated, Tolerances:
DIM.: ISO 2768-mK Threads: 6g/6H Surface: Ra 3.2

Class. Code: 100

KONGSBERG

Kongsberg Maritime AS
Subsea Division
Horten – Norway

Title: Outline Dimesions
TDR 180 Alu

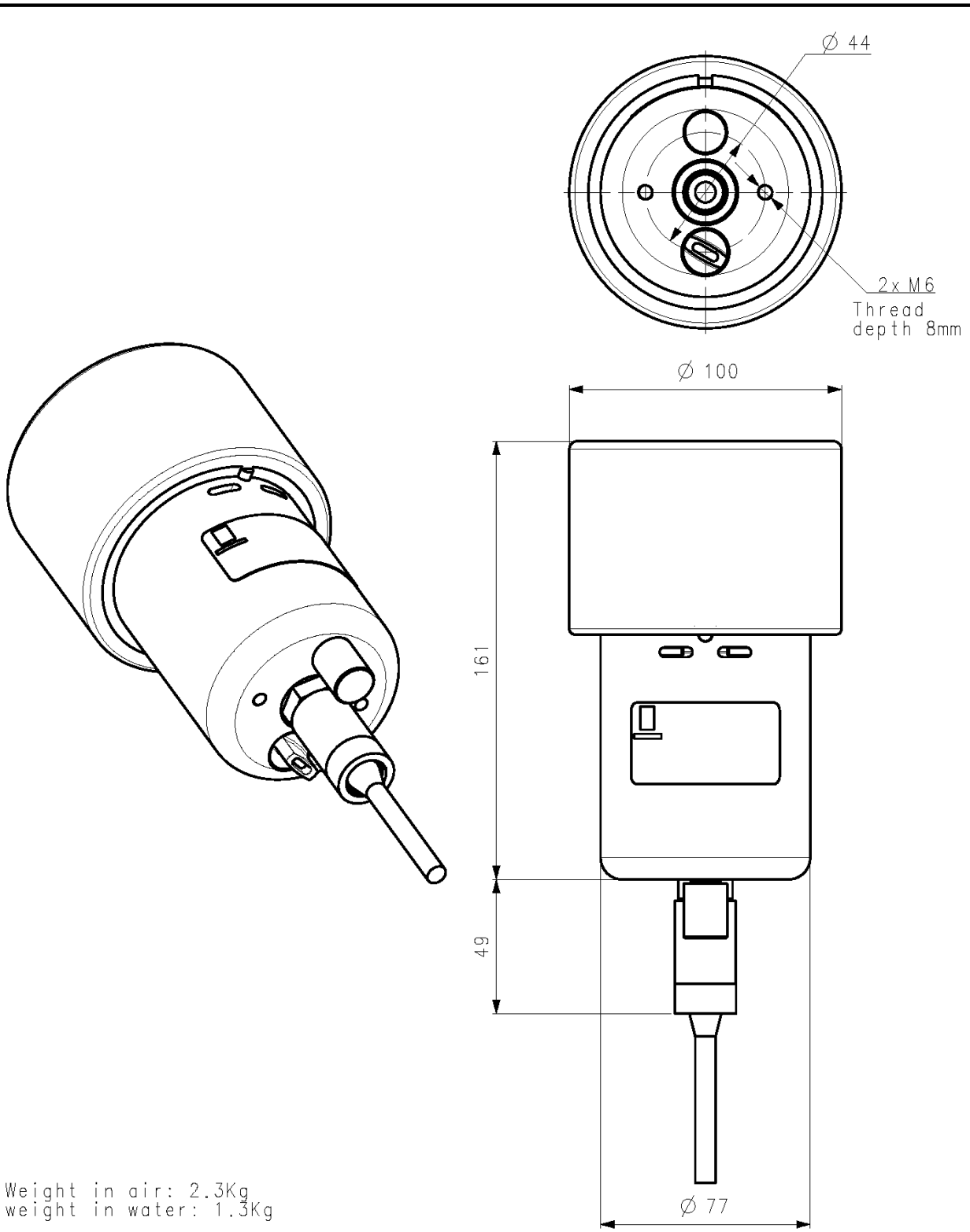
Sheet: 1/1
Size: A4
Scale: 1:1

Project / Product name: cNODE
Project number:

Drawing type: Information Drawing

Document ID: 402065

Revision/Version: A



REV.	DATE	DESCRIPTION	Designed by	Checked by	Approved by
A	2013.09.17	First Issue	FL	HAA	SER

Material: Aluminium
Surface Treatment: –

Unless Otherwise Stated, Tolerances:
DIM.: ISO 2768-mK Threads: 6g/6H Surface: Ra 3.2

Class. Code: 100416

KONGSBERG

Kongsberg Maritime AS
Subsea Division
Horten – Norway

Title: **Outline Dimensions**
Remote Transducer TDR40V cPAP

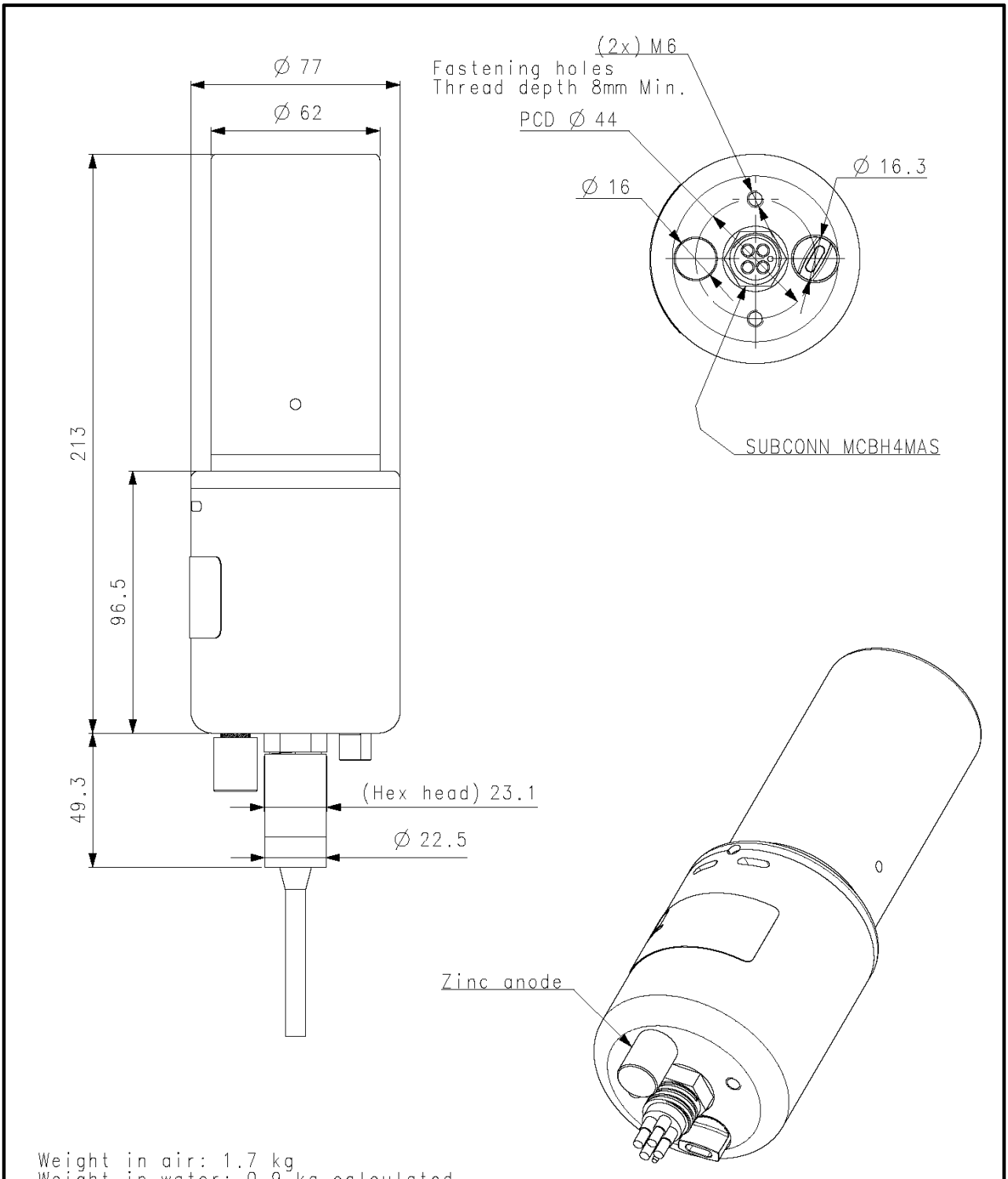
Sheet: 1/1
Size: A4
Scale: 1:2

Project / Product name: cNODE
Project number:

Drawing type: Information Drawing

Document ID: 386439

Revision/Version: A



REV.	DATE	DESCRIPTION	Designed by	Checked by	Approved by
A	2019.07.25	First Issue	Rkov	HAA	EB

Material: no data
Surface Treatment: -

Unless Otherwise Stated, Tolerances:
DIM.: ISO 2768-mK Threads: 6g/6H Surface: Ra 3.2

Class. Code

KONGSBERG

Kongsberg Maritime AS
Subsea Division
Horten - Norway

Title
Outline Dimensions
TDR30H cPAP, Alu

Sheet 1/1
Size A4
Scale 1:1

Project / Product name

Project number

Drawing type
Information Drawing

Document ID
322391

Revision/Version
A

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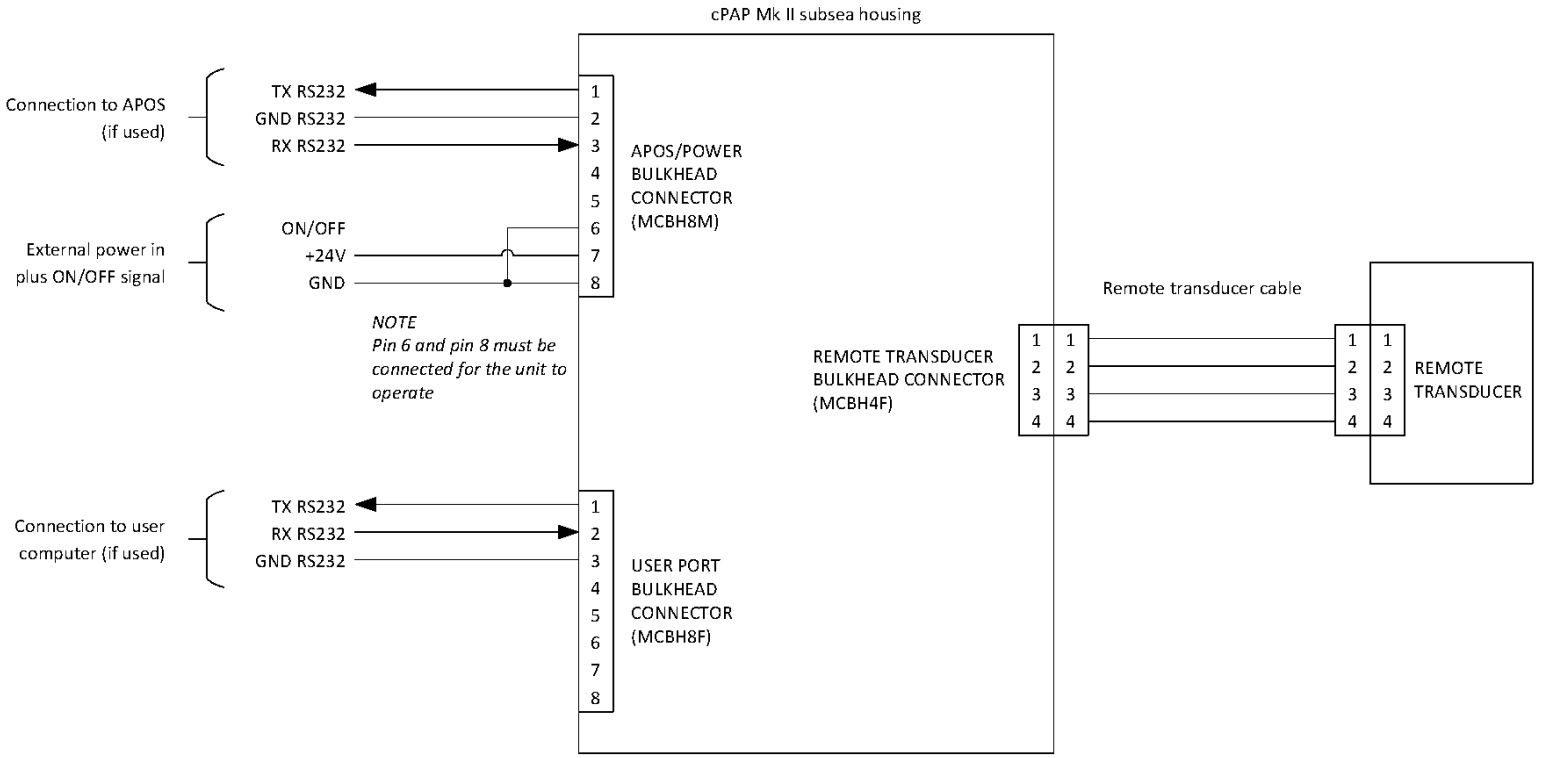

Rev.	Date	Reason for issue / Description of change	Designed by	Checked by	Approved by
A	11.07.2019	First Issue	EB	BU	EB

Project No	Installation No / Item ID	Product name
KONGSBERG Kongsberg Maritime	Title / Sub title / Drawing Type: cPAP Mk II connections Interface drawing	Scale 1:1 · Size A4 · Sheet 1 of 1
	Information Classification: Company shared · Document ID: 453273	Revision: A

Telegram specifications

Topics

Kongsberg transceiver telegrams

In normal use, a cPAP is controlled from APOS using internal Kongsberg communication protocol. Alternatively, simplified functionality can be obtained by controlling the cPAP directly from user equipment by the way of a set of Kongsberg proprietary NMEA-type messages. This is done via the User port.

The transceiver telegrams comes in pairs to and from the transceiver.

Transponder interrogation asks the transceiver to measure accurate range to a specific transponder. Send a TPI telegram and receive a TPR telegram.

TPI telegram format, page 37

TPR telegram format, page 38

Set default transmit power sends the power level you want to use to the transceiver. Send a PWR telegram and receive a PWA telegram.

PWR telegram format, page 39

PWA telegram format, page 40

Read version info asks the transceiver for its current software and firmware information. Send a VER telegram and receive a VEA telegram.

VER telegram format, page 41

VEA telegram format, page 41

Read battery level asks the transceiver for its current battery level. Send a BAT telegram and receive a BAA telegram.

BAT telegram format, page 42

BAA telegram format, page 43

Related topics

User connector pinout, page 16

TPI telegram format

Transponder interrogation is sent from the user to the cPAP and on to the transponder.

Format

```
$PSIMCUP,TPI,Mnn,s.sss*hh<CR,LF>
```

Description

- **$PSIMCUP**: Talker identifier
- **TPI**: Datagram identifier

- **Mnn**: Channel number
- **s.sss**: Timeout - Maximum time to wait for a reply in seconds.
- ***hh**: Checksum
- **CR,LF**: Carriage return,Line feed

Example

```
$PSIMCUP,TPI,M30,1.0*41
```

Interrogation of transponder M30 with 1 second timeout.

Related topics

TPR telegram format, page 38

Kongsberg transceiver telegrams, page 37

TPR telegram format

Transponder interrogation reply is sent from the transponder to the cPAP and on to the user.

Format

```
$PSIMCUP,TPR,Mnn,x,s.sss,t.ttt,yy*hh<CR,LF>
```

Description

- **$PSIMCUP**: Talker identifier
- **TPR**: Datagram identifier
- **Mnn**: Channel number
- **x**: Status
  - 0: OK
  - 1: Timeout
- **s.sss**: Time - The time from the pulse was sent from the transponder to the pulse was received by the cPAP transducer.
- **t.ttt**: Age - The time from the pulse was received by the cPAP transducer to the serial line signal was sent to the vessel.
- **yy**: Signal to noise ratio - The signal to noise level of the reply pulse in dB.
- ***hh**: Checksum
- **CR,LF**: Carriage return, Line feed

Example

```
$PSIMCUP,TPR,M30,1,0.00141,0.102,17*69
```

Reply from transponder M30. Status is OK, it took 0.00141 seconds from the transponder sent the signal to it was received by the cPAP and 0.102 seconds from the signal was received by the cPAP and the TPR telegram was sent to the vessel.

Related topics

TPI telegram format, page 37

Kongsberg transceiver telegrams, page 37

PWR telegram format

Transmit power is sent from the user to the cPAP.

Format

```
$PSIMCUP,PWR,x*hh<CR,LF>
```

Description

- **$PSIMCUP**: Talker identifier
- **PWR**: Datagram identifier
- **x**: Power level
  - 1: Minimum
  - 2: Low
  - 3: High
  - 4: Maximum
- ***hh**: Checksum
- **CR,LF**: Carriage return,Line feed

Example

```
$PSIMCUP,PWR,1*25
```

Set cPAP to transmit minimum power.

Related topics

PWA telegram format, page 40

Kongsberg transceiver telegrams, page 37

PWA telegram format

Transmit power answer is sent from the cPAP to the user.

Format

```
$PSIMCUP,PWA,x*hh<CR,LF>
```

Description

- **$PSIMCUP**: Talker identifier
- **PWA**: Datagram identifier
- **x**: Power level
  - 1: Minimum
  - 2: Low
  - 3: High
  - 4: Maximum
- ***hh**: Checksum
- **CR,LF**: Carriage return,Line feed

Example

```
$PSIMCUP,PWA,1*36
```

The transmit power is minimum.

Related topics

PWR telegram format, page 39

Kongsberg transceiver telegrams, page 37

VER telegram format

Read version is sent from the user to the cPAP.

Format

```
$PSIMCUP,VER*hh<CR,LF>
```

Description

- **$PSIMCUP**: Talker identifier
- **VER**: Datagram identifier
- ***hh**: Checksum
- **CR,LF**: Carriage return,Line feed

Example

```
$PSIMCUP,VER*2C
```

Ask for software versions on the cPAP.

Related topics

VEA telegram format, page 41

Kongsberg transceiver telegrams, page 37

VEA telegram format

The versions are sent from the cPAP to the user.

Format

```
$PSIMCUP,VEA,DSP,x.xx,FPGA,y.yy*hh<CR,LF>
```

Description

- **$PSIMCUP**: Talker identifier
- **VEA**: Datagram identifier
- **x.xx**: Software version
- **y.yy**: Firmware version
- ***hh**: Checksum
- **CR,LF**: Carriage return,Line feed

Example

```
$PSIMCUP,VEA,DSP,7.00,FPGA,4.09*hh
```

The software version is 7.00 and the firmware version is 4.09.

Related topics

VER telegram format, page 41

Kongsberg transceiver telegrams, page 37

BAT telegram format

Read battery level is sent from the user to the cPAP.

Format

```
$PSIMCUP,BAT*hh<CR,LF>
```

Description

- **$PSIMCUP**: Talker identifier
- **BAT**: Datagram identifier
- ***hh**: Checksum
- **CR,LF**: Carriage return,Line feed

Example

```
$PSIMCUP,BAT*3A
```

Ask for the cPAP's battery level.

Related topics

BAA telegram format, page 43

Kongsberg transceiver telegrams, page 37

BAA telegram format

The battery level is sent from the cPAP to the user.

Format

```
$PSIMCUP,BAA,xxx*hh<CR,LF>
```

Description

- **$PSIMCUP**: Talker identifier
- **BAT**: Datagram identifier
- **xxx**: Battery level - The battery charge level in percentage.
- ***hh**: Checksum
- **CR,LF**: Carriage return,Line feed

Example

```
$PSIMCUP,BAA,86*0D
```

The battery is 86 % full.

Related topics

BAT telegram format, page 42

Kongsberg transceiver telegrams, page 37

Battery safety

Topics

SECTION 1: Identification

The specification describes the technical parameters for the battery.

The cPAP MKII contains a custom made 58 Wh Li-Ion battery.

- **Product name**: Battery cNODE MiniS
- **Part number**: 396782
- **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
- **Website**: https://www.kongsberg.com/maritime

Note

The battery is provided as a solid and sealed unit. The battery cannot be opened to reveal 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 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 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 a solid, manufactured article.

The lithium metal cells have the following chemical formula:

Li-Ion ($LiFePO_4$)

- **Negative electrode**: Lithium
- **Positive electrode**: Carbon
- **Battery name**: Battery cNODE MiniS
- **Part number**: 396782
- **Lithium weight**: 5.3 g
- **Certification**: UN 38.3
- **Class 9 exception**: The battery is excepted from Class 9.

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 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 material is 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.

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. Use a self-contained breathing apparatus.

Note

In case of an external fire, always remove transponder 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, dissemble, crush or burn the battery.

1 Do not open, dissemble, crush or burn the battery.

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

3 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). Elevated temperatures can result in shortened life.

For long term storage the transponder should be fully charged and recharged every 6 months. If the transponders are left to deplete completely, it might be impossible to charge them again.

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**: Chemical-resistant gloves and safety glasses.

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**: 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 HF (hydrofluoric acid).

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

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 can contain 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

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 cPAP MKII must be performed in accordance with rules and regulations stated for transportation of dangerous goods in the applicable countries. Required battery state for transportation is 30% or less remaining capacity to comply with regulations.

- **Shipment of transponder**

  Each cPAP MKII is transported as a closed and sealed unit, and shall not be opened by unauthorized personnel.

  As a battery with less than 100 Wh capacity, the transportation is made according to **ICAO/IATA packing instructions 967 Section II**; *Cells or batteries installed in equipment*.

  The cPAP MKII must be shipped in accordance with the prevailing national regulations; **UN No. 3481**, *Miscellaneous (Lithium Ion batteries included in equipment)*.

- **Shipment of separate battery**

  Separate batteries conform to **ICAO/IATApacking instructions 965 Section II**; *Cells or battery in a package, without electronic equipment*.

  If the battery is shipped separately, the prevailing national regulations that apply are: **UN No. 3480**, *Miscellaneous (Lithium Ion battery)*.

For all shipments – cPAP MKII 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 sensors that are returned to the manufacturer for repair shall be transported without batteries. Damaged or spent batteries that have been recalled by the manufacturer for safety reasons shall 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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