TRAX

Intelligent Pipeline Technology

EMTx20 Operating Manual

Electromagnetic Transmitter

www.iktrax.com

Scan the QR Code for additional resources and downloads

CONFIGURATION INFORMATION	
SERIAL NUMBER :	
PRODUCT CODE :	
FREQUENCY :	
RATE 1 PULSE LENGTH :	
RATE 1 REPETITION RATE :	
RATE 1 BATTERY LIFE AT +5°C :	
*RATE 2 PULSE LENGTH :	
*RATE 2 REPETITION RATE :	
*RATE 2 BATTERY LIFE AT +5°C :	
SPECIFIED ON PRESSURE :	
**SPECIFIED OFF PRESSURE :	

*Rate 2 only applicable when a Dual Rate Endcap is fitted.

**Off pressure only applicable when a non-latching Pressure Switch Endcap is fitted.

CONTENTS **Page**

1. GENERAL DESCRIPTION

The EMTx20 EM Transmitter series are ATEX/IECEx CERTIFIED electromagnetic transmitters which can be used for pig tracking and locating functions. The transmitters operate effectively in buried pipelines, pipelines carrying gas or liquid and in pipeline bundles where acoustic transmitters are either less effective or ineffective.

The standard transmission frequency is 22.0Hz, however the frequency is factory and user programmable. An inherent EM null spot is detectable when an EM receiver antenna is at 90 degrees to and pointing towards the centre of the transmitter, allowing for centimetre accurate locating of the pig.

Pigging discs can be fitted directly to the transmitter, meaning the transmitter becomes the pig body. This dramatically increases the received EM signal as it no longer needs to propagate through the pig body in addition to the pipeline.

Using the IK Trax EMTx Config application (Windows) the transmitter frequency, power and pulse pattern can be configured to optimise performance and battery life.

Received signal strength is dependent on several factors including pipeline diameter, pipeline material, pig design, pig speed, transmitter configuration, receiver equipment and background electromagnetic noise levels. Please contact IK Trax to discuss the most effective transmitter configuration.

1.1. IK TRAX SHORTCUT

IK Trax offers a comprehensive range of resources to support the operation and configuration of the EMTx20 device. To make accessing these materials easier, we've provided a QR code that allows you to instantly connect to our online resource hub using any mobile device. Simply scan the QR code to explore detailed guides, troubleshooting tips, and other essential materials to help you get the most out of your EMTx20.

1.2. ENDCAP OPTIONS

EMTx20 transmitters come fitted with ATEX/IECEx certified Battery and PCB Endcaps as standard. There are several different endcaps options available which add additional functionality to the unit. Refer to Appendix D of this manual for further information.

2. OPERATION

The following instructions are for a unit fitted with the standard Battery Endcap and PCB Endcap. For operation instructions relating to a unit fitted with any of the alternative endcaps, please refer to Appendix D of this manual.

⚠ **WARNING**: The Special Conditions for Safe Use as detailed in Appendix C must be followed at all times. Familiarise yourself with all the rules for the safe operation of this equipment as described in Appendix B

2.1. TOOL KIT

The following tools are provided to perform the endcap removal.

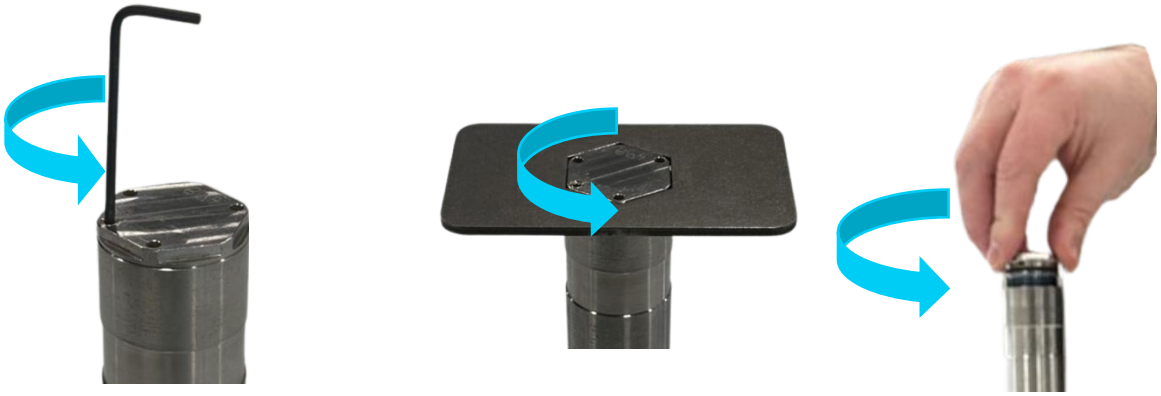
Endcap removal tool.

2.0mm AF Allen key

2.2. TURNING ON

Locate the battery endcap, by finding the battery symbol. Locate the grub screw on top of the endcap that locks the endcap in place. **Do not attempt to remove the battery endcap without having removed the grub screw first, it could cause permanent damage to the device.**

Remove the grub screw and then use the provided tool to turn the battery endcap counterclockwise and remove it.



Remove the isolator from the top of the batteries and store it in a safe place. To be replaced after use.

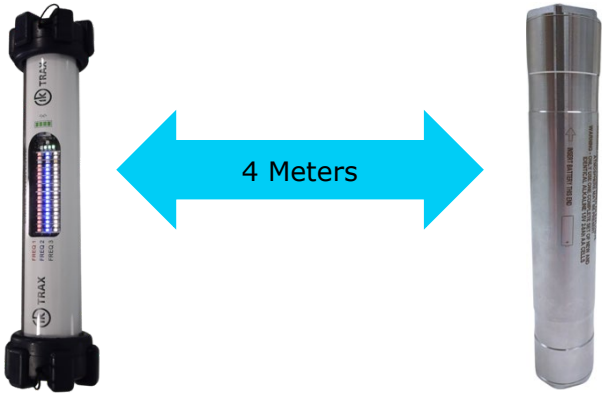
Refit the endcap and the grub screw. Avoid overtightening the endcap or the grub screw, it could damage the device.

The transmitter takes approximately 5 seconds to turn on.

2.3. FUNCTION TEST

To receive the signal from the transmitter, an EM receiver is required. For optimal performance, it is recommended to use the IK Trax EMRx receiver. Refer to the EMRx manual for instructions on setup and operation

1. Place the EMRx receiver antenna approximately 4m away and parallel to the transmitter.



2. Confirm that the received signal frequency and pulse rate are as expected.

3. If all results were as expected, then the system is functional.

2.4. TURNING OFF

1. To turn the transmitter off, loosen the locking grub screw on the battery endcap.

2. Remove the battery endcap and place the isolator on top of the batteries.

3. Refit the battery endcap and the grub screw, avoid overtightening which could cause damage to the device.

4. Use the IK Trax EMRx receiver to confirm that the device is off.

3. STORAGE

If the transmitter is to be placed in storage for a long period of time remove the batteries from the transmitter and store separately.

4. CONFIGURATION

To adjust the pulse rate, signal frequency or strength, the device needs to connect to a Windows application via USB ENDCAP.

WARNING: **This endcap is NON-SEALING and NON-ATEX rated and must NEVER be fitted to an EMTx20 transmitter during deployment. For use only in a clean laboratory environment.**

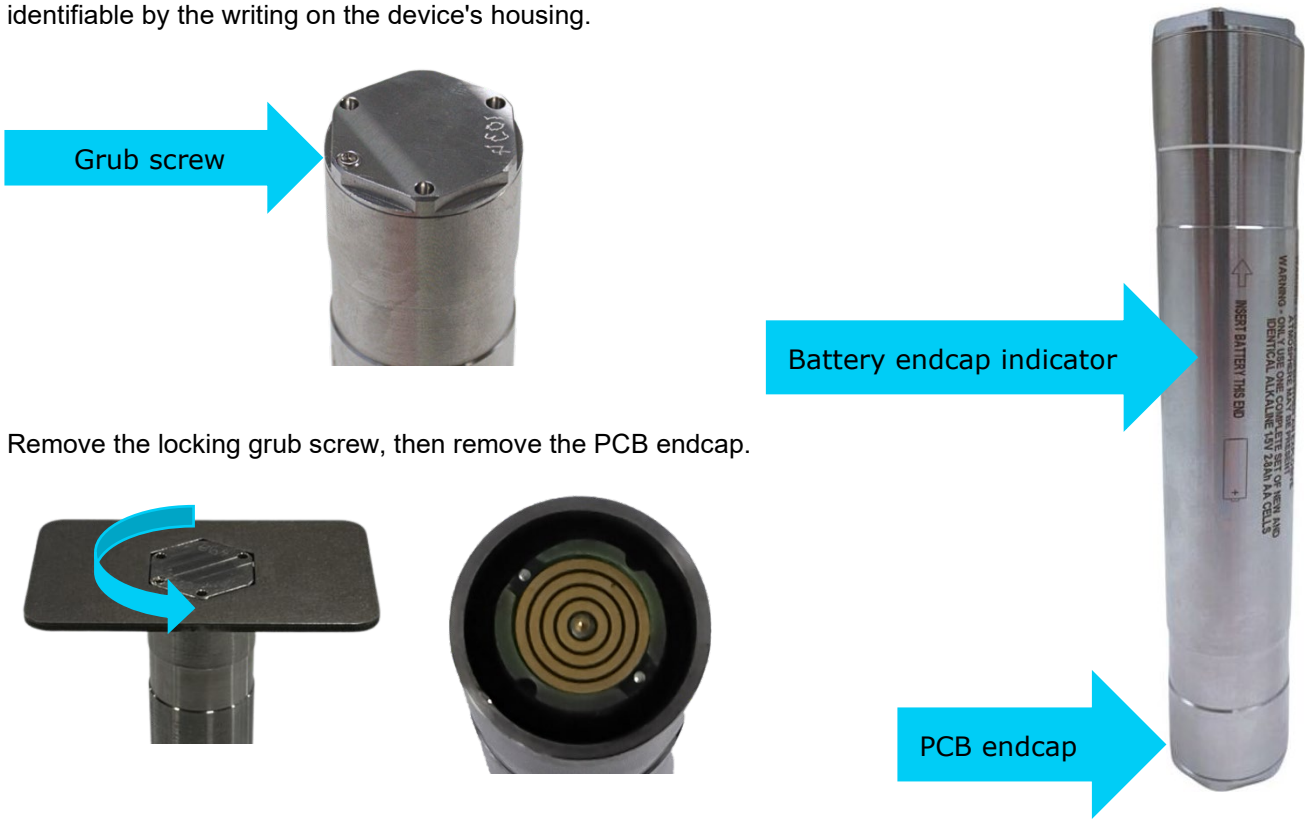
The USB endcap connects to a PC using a USB Type-A to Mini-B cable. The computer will need the necessary drivers installed before the endcap can be used. These drivers should install automatically upon connecting the USB cable. If this automatic installation fails, the power light on the endcap will not illuminate, indicating that the drivers need to be installed manually. Necessary drivers can be found through the following link https://ftdichip.com/drivers/.
The windows app is available for a download from the company website via this link. Alternatively, you can refer to the EMTx Config manual for more information on downloading and installing the software.

In addition, the following QR code provides quick access to the IK Trax resource hub.
It includes shortcuts to manuals, device downloads, and other essential materials.

4.1. HOW TO CONNECT

The EMTx20 can remain switched off for the following operation.

Locate the PCB endcap on the EMTx20 device. This endcap is opposite the battery endcap, which is identifiable by the writing on the device's housing.



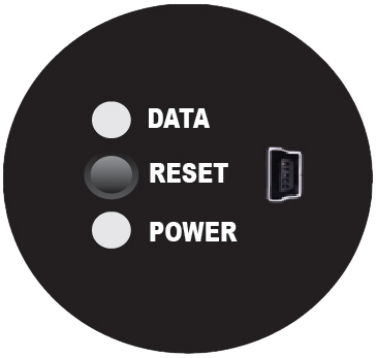
Remove the locking grub screw, then remove the PCB endcap.

The USB endcap toolkit is used to connect to the PC and perform configurations changes. USB endcap toolkit is composed of a detachable (Micro-USB B) wire and the USB endcap.

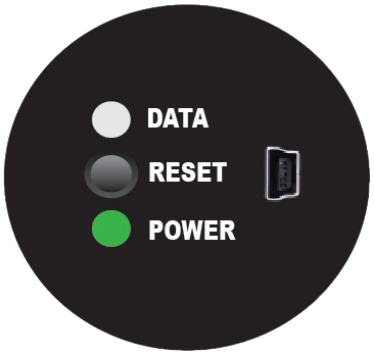
The USB endcap must be mounted on the PCB endcap slot, in the same way as the other endcaps

Once mounted insert the micro-b cable into the micro-b slot on the endcap. Then connect the USB-A end of the cable to the PC.

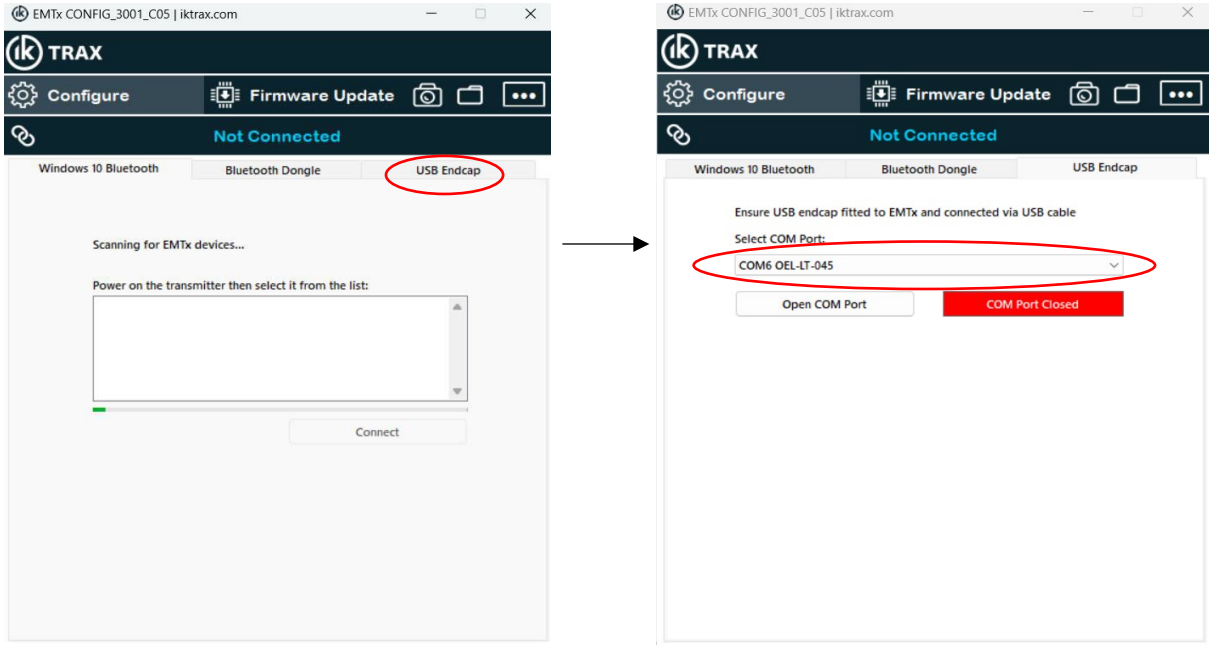
NOTE: If the green light doesn't light up, then it's likely you don't have the right driver, refer to the Configuration introduction section for information on how to install the driver.



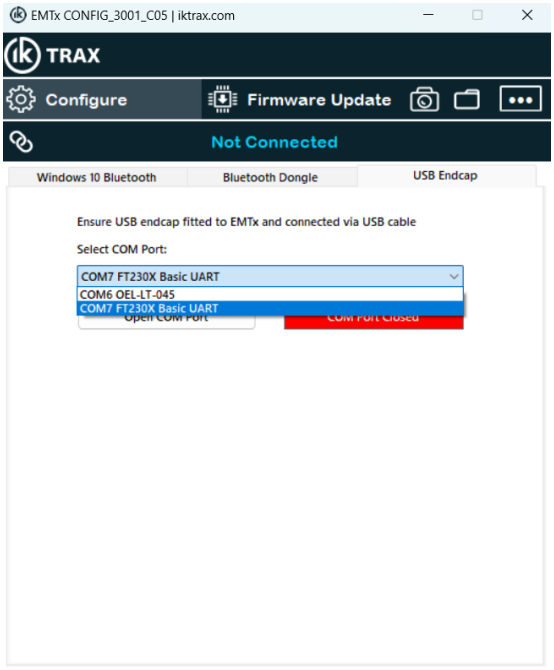
Once connected to the PC the green light will switch on.



Launch the EMTx CONFIG application on windows. Then choose the USB Endcap option on the input ribbon. Choose the appropriate COM port by using the dropdown menu.

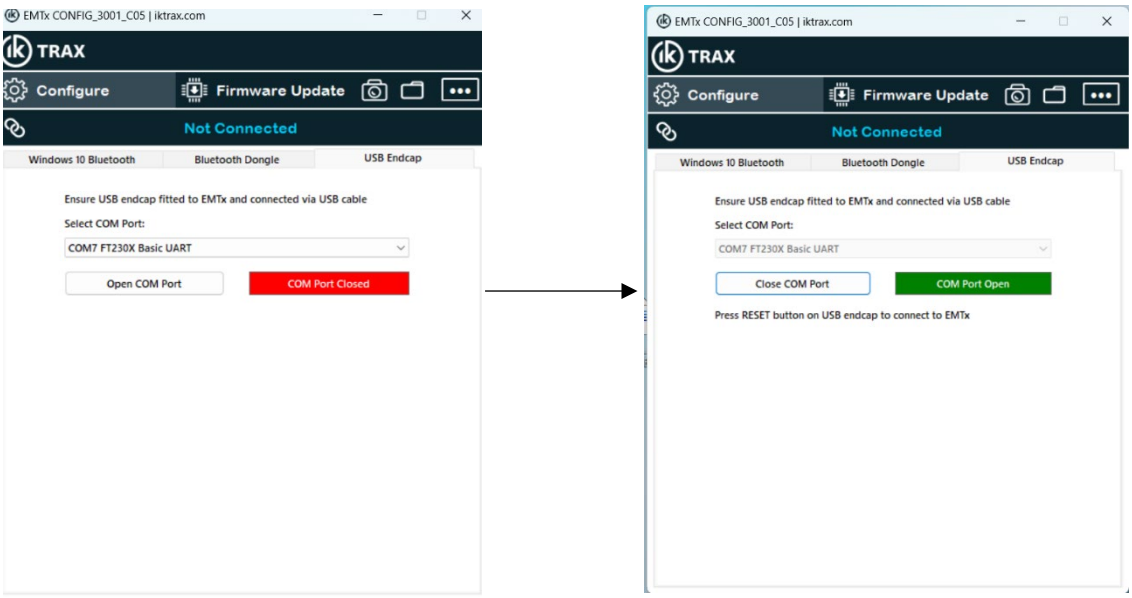


The name of the COM port will likely be similar to “FT230X Basic UART”, depending on your system.

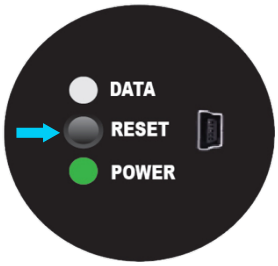


Note: If the available COM ports do not match the example provided, it is likely that the correct driver is not installed. Please refer to the Configuration Introduction section for instructions on how to install the appropriate driver

Once the port is selected click on the “Open COM Port” button.

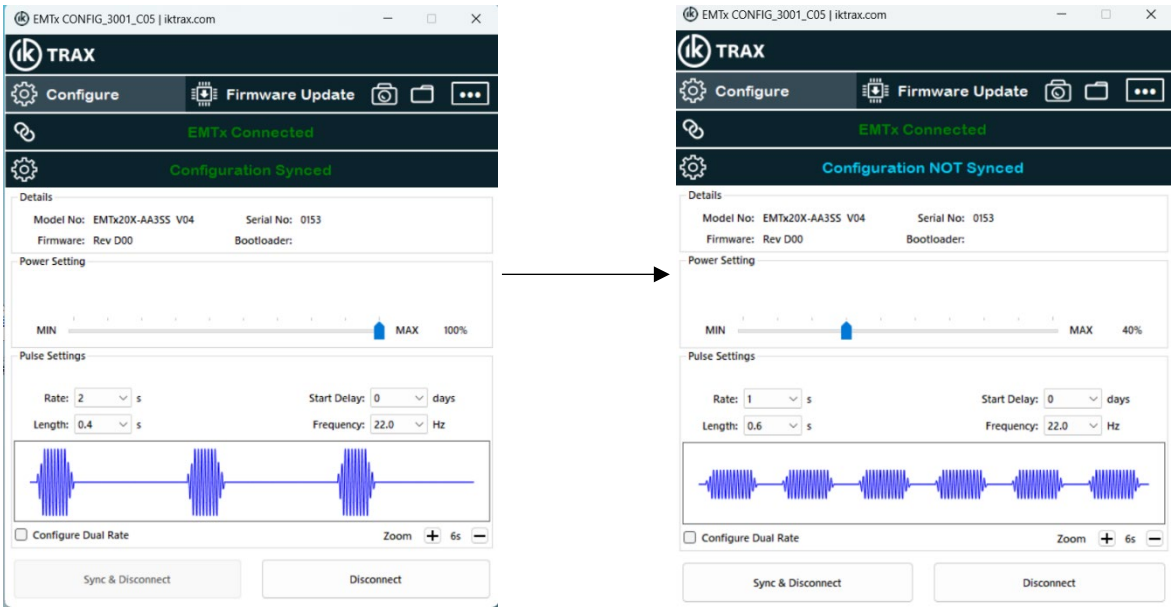


Once COM port is open, the “Reset” button must be pressed on the USB endcap to initiate the connection.



The “Data” LED light will start flashing when the connection is established

Once connected to the app proceed to change the required configurations. If you no longer wish to reconfigure the device, press the “Disconnect” button, this will disconnect the device and cancel the reconfiguration.



Once the new configuration is chosen, proceed to press the “Sync & Disconnect”.

4.2. DEPLOYMENT

Before each deployment ensure that the following checks have been completed.

1. Ensure that the transmitter has been installed as detailed in Appendix C.
2. Visually inspect all system components to ensure that they are secure and undamaged.
3. Refer to Appendix A of this manual for the expected battery lifetime and ensure that it is adequate for the planned operations.
4. Activate the transmitter.
5. Perform a Function Test (page 7).

5. MAINTENANCE

Familiarise yourself with all the rules for the safe operation of this equipment as described in Appendix B.

The EMTx20 EM transmitters are designed to require minimum maintenance. The transmitter should be cleaned using fresh water and cleaning agents as necessary (e.g. WD40). Do not use chemicals which could be damaging to the housing or O-rings.

Check flame paths / threads on the housing body and endcaps for signs of corrosion or damage. If badly pitted or damaged, consult IK Trax for advice on replacing the relevant part.

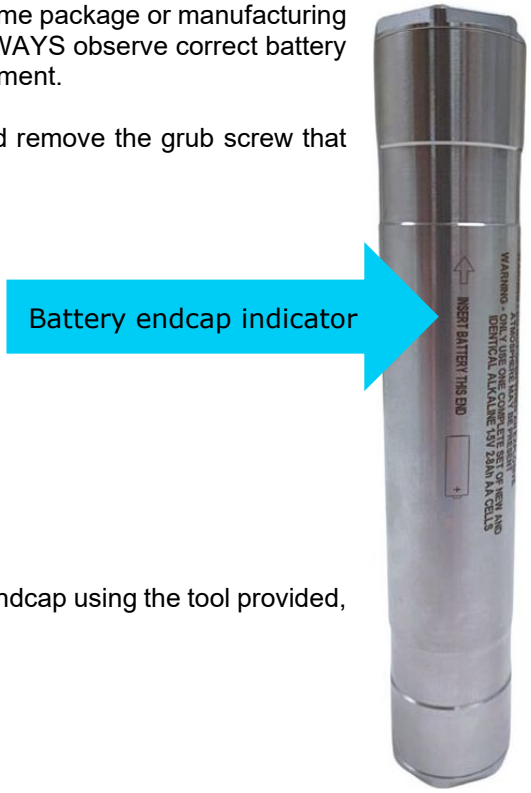
All parts which are replaced must be in accordance with the manufacturers' specifications. Failure to use such components may invalidate the certification/approval and may make the equipment dangerous.

IK Trax can supply redress kits containing a complete set of replacement batteries, washers, O-rings, O-ring grease, thread lubricant and endcap locking screws, contact IK Trax for more information.

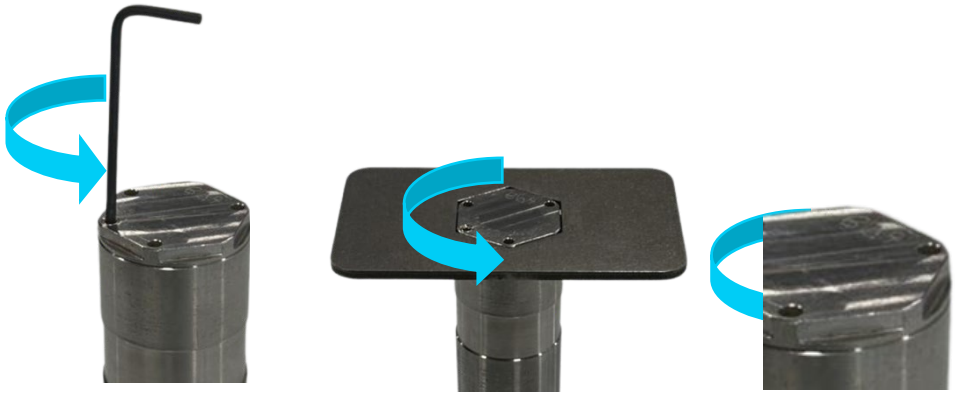
6. BATTERY REPLACEMENT

⚠ **WARNING**: Replace all batteries at the same time. NEVER install used batteries. NEVER install a mix of new and used batteries. USE ONLY new batteries from the same package or manufacturing batch. DO NOT mix different brands or types of batteries. ALWAYS observe correct battery polarity. New batteries should be installed before each deployment.

Locate the battery endcap, by finding the battery symbol, and remove the grub screw that keeps the endcap in place.



Once the grub screw has been removed, remove the battery endcap using the tool provided, by turning it counterclockwise.



Once battery endcap removed, remove the old batteries from the transmitter.

Between the batteries, washers are placed to reduce the shock caused by the vibrations.

As per the diagram start placing the batteries inside the transmitter, one by one.

Once batteries have been replaced assess the state of the O rings on the endcap for sign for any damage or dirt. If such present remove the O ring and clean all the grooves.

Lightly grease the new O ring and replace it in the groove.

Apply a small amount of an oil-based thread lubricant such as “Blue Goop” to the endcap threads.

Once greased and assessed the battery endcap can be replaced and tightened using the provided endcap removal tool. Do not overtight the endcap to avoid any damage.

Then add the grub screw and tighten it up to fully secure the endcap.

6.1. BATTERY LIFETIME

The operating temperature which the transmitter is used at alters the operating lifetime. Typically, colder temperatures will shorten the stated lifetime.

In extreme circumstances the transmitter operating lifetime may be reduced by how the transmitter is installed on a pig. Refer to section Appendix D within this manual for tips on how to achieve optimum performance from the transmitter with regards to the mounting arrangement.

7. DISPOSAL OF UNIT

IK Trax takes its responsibilities under the WEEE Regulations extremely seriously and has taken steps to be compliant in line with our corporate and social responsibilities. In the UK, IK Trax has joined a registered compliance scheme WeeeCare (registration number **WEE/MP3538PZ/SCH**).

Electrical and electronic equipment should never be disposed of with general waste but must be separately collected for the proper treatment and recovery.

The crossed-out bin symbol, placed on the product, reminds you of the need to dispose of it correctly at the end of its life.

When buying a new product, you will have the possibility to return, free of charge, another end-of-life product of equivalent type that has fulfilled the same functions as the supplied equipment. These items may be deposited at:

Online Electronics Ltd
Doing business as IK Trax
Blackburn Business Park
Woodburn Road
Blackburn
Aberdeen
AB21 0PS
UK

Alternatively, to arrange a collection of any waste electrical equipment, obligated to IK Trax please telephone WeeeCare on **0844 800 2004**.

8. WARRANTY

Online products are guaranteed for one year from the date of purchase. Goods should be returned transportation prepaid to IK Trax.

There is no charge for parts or labour should any product require repair due to a manufacturing deficiency during the guarantee period.

In the event of a manufacturing deficiency the inward transportation costs will be repaid to the client.

9. CERTIFICATION

EQUIPMENT: EMTx20X 1V5 range of electromagnetic transmitters

MANUFACTURER:
Online Electronics Ltd
Online House
Blackburn Business Park
Woodburn Road
Blackburn
Aberdeen
AB21 0PS
UK
Tel: +44 (0) 1224 714 714
Web:www.online-electronics.com

NOTIFIED BODY NUMBER: 2812

ATEX CERTIFICATE: EMT16ATEX0011X

IECEx CERTIFICATE: IECEx EMT 16.0009X

MARKINGS:  II 2 G Ex db IIC Gb T6

APPLICABLE STANDARDS: EN 60079-0:2012/A11:2013
EN 60079-1:2014
IEC 60079-0:2011
IEC 60079-1:2014

SPECIAL CONDITIONS FOR SAFE USE:

1. Only use one complete set of new and identical cells.

2. Only the following permitted batteries shall be used with the corresponding ambient temperature and temperature class.

CELL MANUFACTURER & PART NUMBER	CELL TYPE	CELL VOLTAGE	OPERATING AMBIENT TEMPERATURE	TEMPERATURE CLASS
DURACELL ID1500	Alkaline	1.5V	-20°C to +50°C	T6
DURACELL MN1500	Alkaline	1.5V	-20°C to +50°C	T6
DURACELL MX1500	Alkaline	1.5V	-20°C to +50°C	T6
ENERGIZER EN91	Alkaline	1.5V	-18°C to +51°C	T6

3. Batteries must be installed into the enclosure in accordance with the orientation detailed on the markings.

4. Repair of flame paths is not permitted by the end user.

5. Do not open when an explosive atmosphere may be present.

6. Enclosures manufactured from titanium must be installed such that ignition sources due to impact and friction sparks are excluded.

7. Where used, the bleed screw must be tightened to a torque between 4 Nm and 8 Nm. Do not exceed 8 Nm.

APPENDIX A: SPECIFICATIONS

NOTE: THAT THE SPECIFICATIONS BELOW ARE VALID FOR THE STANDARD CONFIGURATION ONLY. REFER TO PAGE 1 OF THIS MANUAL FOR THE CONFIGURATION INFORMATION SPECIFIC TO THE TRANSMITTER BEING USED.

MODELS:

EMTx20 AA1 (1 cell) [1] ..... Non certified.

EMTx20 AA2 (2 cell)..... ATEX/IECEx certified.

EMTx20 AA3 (3 cell)..... ATEX/IECEx certified.

BATTERY LIFETIMES:

EMTx20 (2 Cell Alkaline) predicted lifetimes (days), 0.4s pulse length, +5°C						
Power Setting	**Continuous**	**1-sec pulse**	**2-sec pulse**	**3-sec pulse**	**4-sec pulse**	**5-sec pulse**
100%	4.5	11.3	22.5	33.8	45.1	56.3

EMTx20 (3 Cell Alkaline) predicted lifetimes (days), 0.4s pulse length, +5°C						
Power Setting	**Cont.**	**1 sec**	**2 sec**	**3 sec**	**4 sec**	**5 sec**
100%	3.7	9.2	18.3	27.5	36.6	45.8

GENERAL:

Battery Type (1AA) ..... Lithium Thionyl Chloride AA cell.

Battery Type (2AA & 3AA)..... Alkaline AA DURACELL ID1500 cells.

Standard signal at 1m +20°C in air [3].....1 cell (12mVpp), 2 cell (35mVpp), 3 cell (80mVpp)

Standard frequency [3] 22Hz

Temperature range ..... See section 9 CERTIFICATION

Bump rating 20G

Housing material..... 316L Stainless Steel or Grade 5 Titanium

Endcap material..... 2205 Duplex Stainless Steel

O-ring material NBR70

Weight in SS 316L (including batteries) ..... 1 cell (0.35kg), 2 cell (0.6kg), 3 cell (0.9kg)

Weight in Grade 5 Titanium (including batteries) ..... 1 cell (0.4kg), 2 cell (0.4kg), 3 cell (0.7kg)

External pressure rating in 316L Stainless Steel..... 300bar/4,531 Psi

External pressure rating in Grade 5 Titanium..... 500bar/7,252 Psi

ATEX/IECEx code ..... II 2 G Ex db IIC Gb T6 Tamb -20°C to 51°C

EU Type Examination Certificate Number..... EMT 16 ATEX 0011X

IECEx Certificate Number..... IECEx EMT 16.0009X

(1) EMTx20 AA1 is available as a Lithium battery powered unit only and is not ATEX/IECEx certified.
(2) Dependent on Model and configuration. Contact IK Trax to discuss individual requirements.
(3) Parameters such as Power, Lifetime, Frequency, ON time and OFF time can be customised, please contact IK Trax to discuss your project requirements.

APPENDIX B: OPERATION WARNINGS

RULES FOR SAFE OPERATION

⚠ **WARNING**: The Special Conditions for Safe Use as detailed in Section 8 CERTIFICATION must be followed at all times.

⚠ **WARNING**: Any operation involving pressure is potentially hazardous. No person should use this equipment unless fully aware of the potential hazards of working with pressurised vessels. The purchaser of this equipment is responsible for the training and competence of operators and the manner in which it is used. This manual should be read through and understood before installation and commissioning so that the operator is familiar with the equipment. Contact Online Electronics Ltd immediately should any difficulty arise in the use of this equipment.

⚠ **WARNING**: DO NOT open when an explosive atmosphere may be present. Always use caution when opening equipment which has been in a pressurised environment. It is possible for pressure to leak into the equipment and remain there even after external pressure has been removed. ALWAYS point the end to be opened towards a safe area and away from yourself or others. Contact Online Electronics immediately if there is a suspicion that the equipment has become pressurised.

⚠ **WARNING**: Replace all batteries at the same time. NEVER install used batteries. NEVER install a mix of new and used batteries. USE ONLY new batteries from the same package or manufacturing batch. DO NOT mix different brands or types of batteries. ALWAYS observe correct battery polarity. New batteries should be installed before each deployment.

⚠ **WARNING**: Do not expose to aggressive solvents or chemicals which could be harmful to the HOUSING, O-RINGS, CONNECTORS or any other parts of the equipment.

⚠ **CAUTION**: Opening of the equipment should take place in a clean laboratory environment.

⚠ **CAUTION**: To prevent the formation of condensation within the transmitter, allow the transmitter temperature to stabilise within the laboratory environment at a room temperature for a minimum of 6 hours prior to opening.

⚠ **CAUTION**: It is possible for liquids to become trapped in threads and/or gaps around openings. ALWAYS point the end to be opened downwards to allow any trapped liquid to drain out of and not into the equipment.

APPENDIX C: PIG INSTALLATION WARNINGS

⚠ **WARNING**: The Special Conditions for Safe Use as detailed in Section 8 CERTIFICATION must be followed at all times.

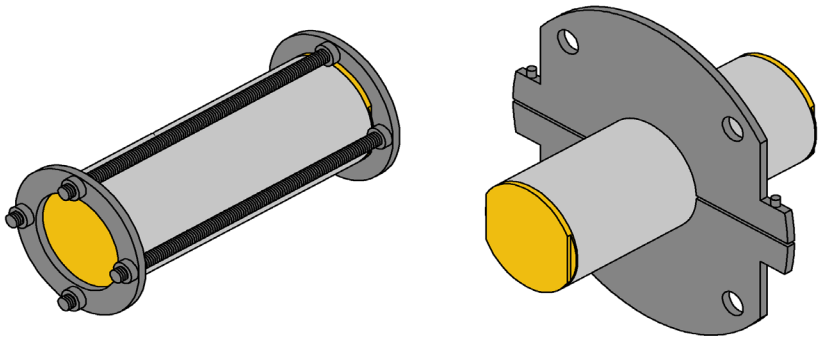
⚠ **WARNING**: The transmitter must be mounted in such a way that no movement or vibration is possible whatsoever (e.g. clamped). If the transmitter is allowed to rattle and/or vibrate within the pig then the resultant hammering effect can exceed the bump rating of the transmitter leading to damage and/or failure. This is particularly important in gas pipelines.

⚠ **WARNING**: Transmitters with the main body manufactured from Titanium MUST be installed in such a way that ignition sources due to impact and friction sparks are excluded. Refer to the main body markings for the material type supplied.

⚠ **CAUTION**: All EM transmitters will induce electrical currents in any conductive materials closely surrounding them which can result in a severe reduction in signal strength and/or battery lifetime. This effect can be minimised by reducing the amount of conducting material surrounding the transmitter and leaving as much of the transmitter exposed as possible. Any slits or apertures which can be made in the surrounding material will help. Use materials with as high resistance as possible. Non-conducting materials such as plastics will not suffer from this effect. EM transmitters must not be surrounded by low resistance metals such as aluminium (including tubes or mounting clamps) under any circumstances.

⚠ **CAUTION**: Any magnetic material surrounding the transmitter will tend to block the EM signal from the transmitter and reduce the received signal strength outside the pipeline. This effect can be minimised by reducing the amount of magnetic material surrounding the transmitter and leaving as much of the transmitter exposed as possible. Any slits or apertures which can be made in the surrounding material will help. Use materials with as low magnetic permeability as possible. Non-magnetic materials such as plastics will not suffer from this effect. The table below shows the typical characteristics of several potential pig and mounting materials with the best choice at the top, and the worst choice at the bottom. 316 stainless steel provides a good balance of properties and cost. An aluminium alloy would be a very poor choice because of the very low resistivity and should not be used under any circumstances.

MATERIAL	RESISTIVITY (μΩ.m)	MAGNETIC PERMEABILITY
PLASTIC	∞	1.000
316 STAINLESS STEEL	0.75	1.008
2205 DUPLEX SS	0.80	>25.0
1005 STEEL	0.20	>100
ALUMINIUM ALLOYS	0.04	1.000



For optimum performance the transmitter should be clamped inside a plastic pig body or plastic guide disc should be clamped around the transmitter to form a pig. The advantage of these methods is the fact that there is no metal around the transmitter apart from the pipeline itself. Two alternative mounting arrangements are shown above. The first uses several lengths of threaded studding to clamp the transmitter between two plates. The second uses a clamping disc. The advantage of these arrangements is that they have limited amounts of metal around the transmitter and will therefore have limited effect on the transmitter performance. Please contact IK Trax for further information and guidelines regarding EM transmitter mounting and installation.

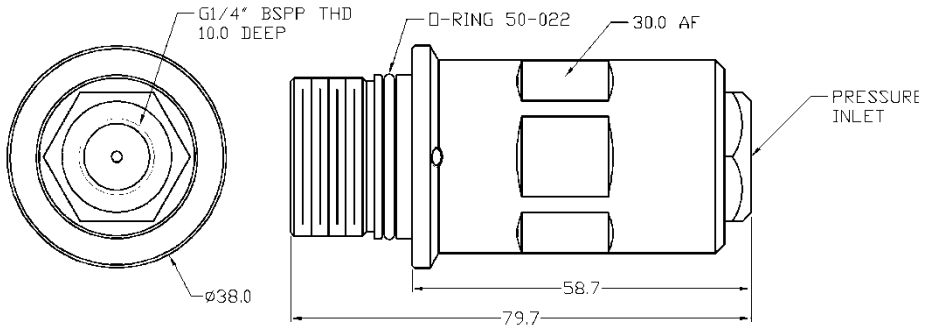
APPENDIX D: ENDCAP OPTIONS

Using the IK Trax EMTx Config application (Windows) the transmitter frequency, power and pulse pattern can be configured to optimise performance and battery life.

PRESSURE SWITCH ENDCAP

The EMTx20 PRESSURE SWITCH ENDCAP is an ATEX/IECEx certified endcap that can be fitted in place of the standard PCB endcap to allow the unit to be activated once the external pressure exceeds a pre-configured ON PRESSURE.

There are six different pressure switch endcaps available that cover both latching and non-latching versions and three different pressure bands: 1-4 bar, 3-10 bar, and 6-18 bar. Transmitters configured with non-latching pressure switches will stop transmitting when the external pressure drops below the ON PRESSURE minus the DEAD BAND, whereas transmitters configured with latching pressure switches will continue transmitting until the batteries are depleted or one of the endcaps is removed.



SPECIFICATIONS

ENDCAP TYPE	LATCHING	PRESSURE RANGE (bar)	ON PRESSURE REPEATABILITY (bar)	AVERAGE DEAD BAND
EP0	NO	1-4	±0.1 + 3% of setting	12% of setting
EP1	NO	3-10	±0.17 + 3% of setting	13% of setting
EP2	NO	6-18	±0.26 + 3% of setting	13% of setting
EP3	YES	1-4	±0.1 + 3% of setting	12% of setting
EP4	YES	3-10	±0.17 + 3% of setting	13% of setting
EP5	YES	6-18	±0.26 + 3% of setting	13% of setting

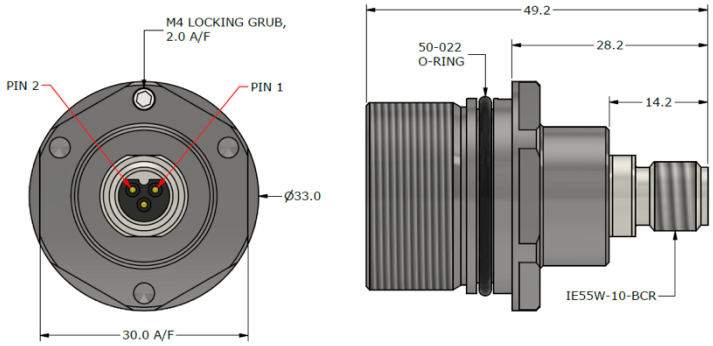
Note that the values above are given for +20°C. The ON PRESSURE and DEAD BAND tolerances will typically be greater at lower temperatures.

DUAL RATE ENDCAP (NON-CERTIFIED)

⚠ **WARNING**: This endcap is NON-ATEX/IECEx certified. If this endcap is fitted to an ATEX/IECEx certified transmitter body, then the transmitter must NOT be used in an ATEX/IECEx only environment.

DUAL RATE ENDCAP - Can be fitted to an EMTx20 transmitter in place of the PCB endcap to allow an external piece of equipment (e.g. an IK Trax 7000 ARGF) to switch between two pre-configured pulse rates. With a DUAL RATE ENDCAP fitted, the unit will transmit at pulse rate 1 when pins 1 and 2 on the IE55 Connector are open (resistance > 3k), and at pulse rate 2 when pins 1 and 2 are shorted together (resistance < 3k). This allows the pulse rate of the EMTx20 transmitter to be controlled by an external piece of equipment, e.g. a BWGP (Break Wire Gauge Plate).

LATCHING DUAL RATE ENDCAP –Works in the same way as the DUAL RATE ENDCAP except that the unit will permanently switch from pulse rate 2 to pulse rate 1 when the unit detects an open circuit between pins 1 and 2 on the IE55 connector.



WATER ACTIVATED ENDCAP (NON-CERTIFIED)

⚠ **WARNING**: This endcap is NON-ATEX/IECEx certified. If this endcap is fitted to an ATEX/IECEx certified transmitter body, then the transmitter must NOT be used in an ATEX/IECEx only environment.

WATER ACTIVATED NON-LATCHING ENDCAP - Can be fitted in place of the standard PCB endcap to allow the unit to be activated only in the presence of conductive fluid such as water. The presence of a suitable fluid between pin 1 and pin 2 of the IE55W connector fitted to the endcap will activate the transmitter and will deactivate the transmitter when dry.

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MAGNETIC ACTIVATION ENDCAP

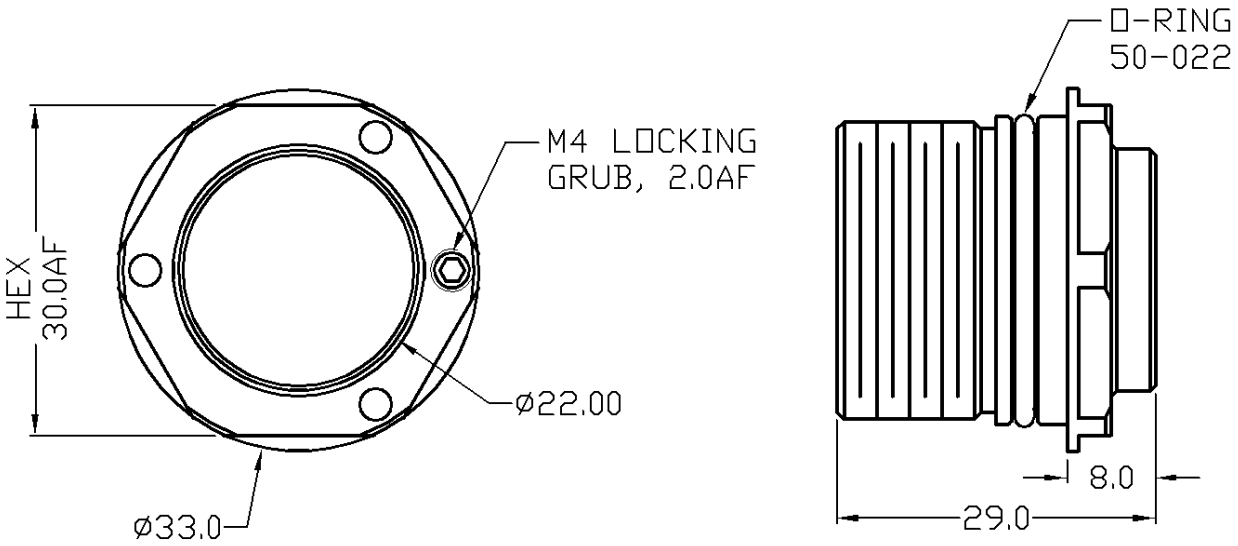
The EMTx20 MAGNETIC ACTIVATION ENDCAP (EMTx20X-EM0) is an ATEX/IECEx certified endcap that replaces the standard PCB endcap, allowing the transmitter to deactivate in the presence of a magnetic field. It is compatible with an Eclipse ring magnet, which will deactivate the unit when placed within 10 mm of the endcap face and aligned within 10 mm of the transmitter's central axis.

It is ideal for use in pig launchers, where the transmitter remains inactive near a mounted magnet and activates automatically once the magnet is removed (e.g., when the pig launches). A MA Mating Cap can also be used to deactivate the unit when attached and activate it when removed.

To power on the transmitter, fully tighten both endcaps using the removal tool—avoid over-torquing. Remove the nylon washer from the battery endcap (used for shipping) before activation. The transmitter powers on in about 5 seconds. Confirm operation using an EM receiver.

To turn off, loosen the battery endcap by five full turns and verify shutdown using an EM receiver such as EMRx.

To test magnetic activation, activate the transmitter and bring a magnet (e.g., MA Mating Cap) within 10 mm of the endcap face and aligned within 10 mm of the central axis. Transmission should stop. Remove the magnet to confirm the signal resumes.



SPECIFICATIONS

ENDCAP TYPE	CERTIFIED	ACTIVATION METHOD	ENDCAP MATERIAL	EXTERNAL PRESSURE RATING
EM0	YES	Magnetic	2205 Duplex Stainless Steel	500 bar

Note that the presence of a magnet within the activation range will **deactivate** the unit. Removing the magnet will **reactivate** the unit. Always confirm operation using an EM receiver.