

EMTx30-0C3S

Electromagnetic Transmitter

Operating Manual

The EMTx30 is an electromagnetic transmitter that can be used for pig tracking and locating functions, intended for use in pipeline diameters of 6" to 8"



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CONFIGURATION INFORMATION	
SERIAL NUMBER :	
PRODUCT CODE :	
BATTERY TYPE:	
FREQUENCY :	
OUTPUT SIGNAL STRENGTH :	
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 :	

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

Rev	Date	By	Summary of change
A00	17/12/18	MC	Initial release.
B00	25/02/20	TL	CR00841 Notified Body Number and Email address updated
B01	14/10/20	TL	CR00947 CR01039 New front Page
C00	01/08/22	EI	CR001132 This manual has become specific to Alkaline cells, see EMTx30_5003 for Lithium version. Included BATTERY TYPE in CONFIGURATION INFORMATION page. Updated battery life information from CR01024. All lifetimes now stated at +5°C instead of +20°C. Simplification of specifications section. Added mention of Power range within specifications section. Removed mention of specific battery cell type in BATTERY REPLACEMENT section to make it generic. Removed mention of LSH14 cells. Included mention of water activation in ENDCAP OPTIONS section.

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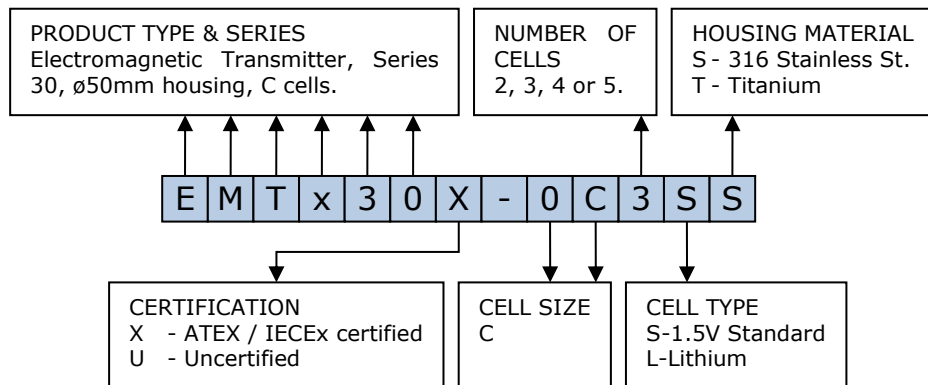
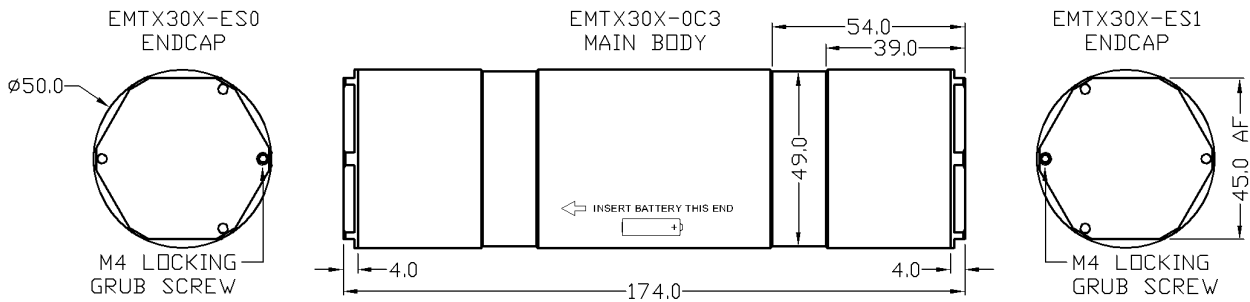
1. GENERAL DESCRIPTION

The EMTx30X-0C3 transmitter is an ATEX CERTIFIED electromagnetic transmitter that can be used for pig tracking and locating functions. The transmitter operates 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 22Hz, however the transmitter can be configured to transmit at any frequency between 10Hz and 30Hz (in 0.1Hz increments). 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.

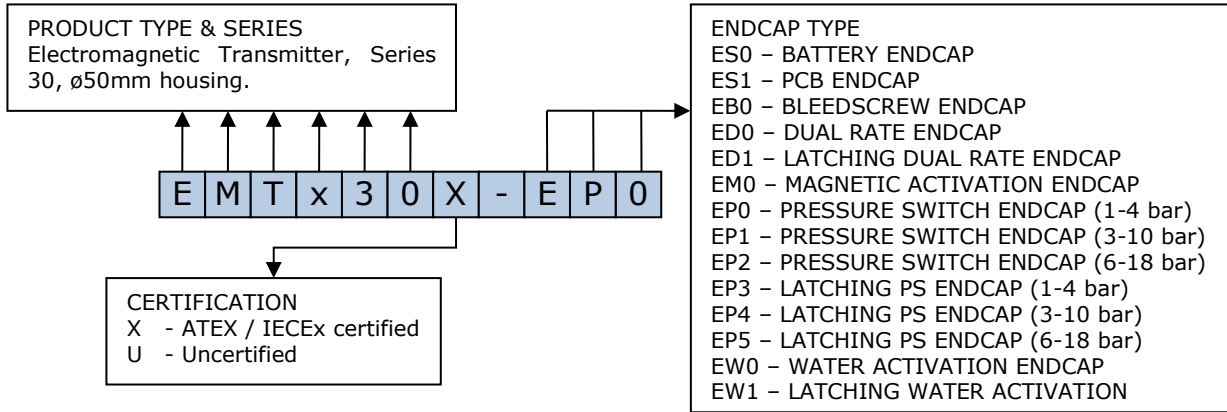
The EMTx30X transmitter produces a very strong EM signal for its size which can be detected through pipeline walls. The received signal strength will be dependent on several factors including pipeline diameter, pipeline material, pig design, pig speed as well as the strength of the transmitted signal. The ease at which the signal can be detected will also be dependent on the receiver equipment as well as the background EM noise levels. The transmitter power level can be adjusted to achieve the optimum balance between signal strength and battery life. Pulsed signalling is generally also utilised as it greatly extends the battery life, and can help to differentiate between different units. Please contact OEL to discuss the most effective configuration.

Pigging discs can be fitted directly to the transmitter, meaning the transmitter itself 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.



2. ENDCAP OPTIONS

In addition to the standard Battery Endcap (EMTx30X-ES0) and PCB Endcap (EMTx30X-ES1), there are a number of different endcaps available that add additional functionality to the unit. The EMTx30 incorporates an endcap detection circuit that allows it to determine the type of endcap that has been fitted and behave accordingly. As a result, any endcap can be fitted to any EMTx30 housing without having to update any configurations/settings in firmware.



BLEEDSCREW ENDCAP – The bleedscrew endcap is ATEX rated and replaces the battery endcap. When fitted the unit is activated/deactivated by screwing/unscrewing the bleedscrew rather than the endcap itself. The bleedscrew incorporates a HEX socket for a 5mm (AF) Allen Key so that any internal pressure can be released and the unit can be activated/deactivated when access to the endcap is limited. Please see the bleedscrew endcap manual for more information.

DUAL RATE ENDCAP – The dual rate endcap replaces the PCB endcap but is **not** ATEX rated - fitting this endcap to an ATEX body means that the unit is no longer ATEX rated. With a dual rate endcap fitted, the unit will transmit at pulse rate 2 when pins 1 and 2 on the IE55 connector are shorted together and at pulse rate 1 when the contacts are open circuit. This allows the pulse rate to be controlled by an external piece of equipment, e.g. a BWGP (Break-Wire-Gauge-Plate). Please see the dual rate endcap manual for more information.


MAGNETIC ACTIVATION ENDCAP – The magnetic activation endcap is ATEX rated and replaces the PCB endcap to allow the unit to be deactivated when placed in a suitable magnetic field. Please see the magnetic activation endcap manual for more information.

PRESSURE SWITCH ENDCAPS – The pressure switch endcap is ATEX and replaces the PCB endcap to allow the unit to be activated in the presence of a suitable external pressure. Please see the pressure switch endcap manual for more information.

WATER ACTIVATION ENDCAPS – The Water Activation endcap replaces the PCB endcap but is **not** ATEX rated - fitting this endcap to an ATEX body means that the unit is no longer ATEX rated. The water activation endcap activates the EMTx in the presence of an electrically conductive fluid such as water. Please see the water activation endcap manual for more information.

3. 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.

Battery Type	3x Alkaline DURACELL ID1400 C CELLS
Battery lifetime in continuous mode at +5°C ^(1,2)	2.0 days
Battery lifetime at 1s pulse rate (0.4s ON / 0.6s OFF) at +5°C ^(1,2)	5.6 days
Battery lifetime at 2s pulse rate (0.4s ON / 1.6s OFF) at +5°C ^(1,2)	12.4 days
Battery lifetime at 3s pulse rate (0.4s ON / 2.6s OFF) at +5°C ^(1,2)	18.6 days
Battery lifetime at 4s pulse rate (0.4s ON / 3.6s OFF) at +5°C ^(1,2)	24.8 days
Battery lifetime at 5s pulse rate (0.4s ON / 4.6s OFF) at +5°C ^(1,2)	31.0 days
Frequency range ⁽¹⁾	10Hz to 30Hz in 0.1Hz increments
Power range ⁽¹⁾	20% to 100% in 10% increments
Temperature range	See SECTION 10
Bump rating	20G
Housing material	316L Stainless Steel or Grade 5 Titanium
Endcap material	2205 Duplex Stainless Steel
O-ring material	NBR70
Transmitter weight in 316L Stainless Steel (including batteries)	1.7kg
Transmitter weight in Grade 5 Titanium (including batteries)	1.5kg
External pressure rating in 316L Stainless Steel	300bar
External pressure rating in Grade 5 Titanium	500bar
ATEX code	 II 2 G
IECEX code	Ex db IIC Gb T5..T6
EU Type Examination Certificate Number	EMT 17 ATEX 0058X
IECEX Certificate Number	IECEX EMT 17.0024X

⁽¹⁾ Parameters such as Power, Lifetime, Frequency, ON time and OFF time can be customised, please contact Online Electronics Ltd to discuss your project requirements.

⁽²⁾ Battery lifetimes stated are at 100% output (190mVpp at 1m with Online Electronics reference antenna).

4. RULES FOR SAFE OPERATION

⚠ WARNING: The Special Conditions for Safe Use as detailed in Section 10 must be followed at all times.

⚠ WARNING: Any operation involving pressure is potentially hazardous. No person should use this equipment unless they are 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: This equipment should only be opened 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 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.

5. OPERATION

Familiarise yourself with all of the rules for the safe operation of this equipment as described in Section 4 RULES FOR SAFE OPERATION. The following instructions are for a unit fitted with the standard Battery Endcap (EMTx30X-ES0) and PCB Endcap (EMTx30X-ES1). For operation instructions relating to a unit fitted with any of the alternative endcaps, please refer to the relevant endcap manual.

5.1. TURNING ON

1. To turn the transmitter on, fully tighten the EMTx30-ES0 ENDCAP using the supplied ENDCAP REMOVAL TOOL. Do not use excessive torque. The transmitter takes approximately 15 seconds to turn on. Note that the transmitter is shipped with an insulator disc inside the EMTx30-ES0 ENDCAP to prevent accidental activation during transport. This must be removed before the transmitter can be turned on.
2. Use an EM receiver system to confirm that the transmitter is functioning properly at the expected pulse rate.

5.2. TURNING OFF

1. To turn the transmitter off, loosen the EMTx30-ES0 ENDCAP 5 full turns using the supplied ENDCAP REMOVAL TOOL.
2. Use an EM receiver system to confirm that the transmitter has turned off.

5.3. FUNCTION TEST

An OEL EM receiver system is required to receive the signal from the EMTx30X transmitter. Refer to the relevant EM receiver manual for instruction on setup and operation of the EM receiver system.

1. Place the EM receiver antenna approximately 4m away and parallel to the transmitter.
2. Activate the transmitter as detailed in Section 5.1 TURNING ON.
3. Confirm that a clear signal is received and the pulse rate is as expected.
4. Switch the transmitter between OFF and ON a few times to ensure that the signal received reacts as expected.
5. An inherent null spot is detectable when the antenna is at 90 degrees to and pointing towards the centre of the transmitter allowing accurate positioning of a pig. Refer to the relevant EM receiver manual for further information.
6. Turn OFF the transmitter as detailed in Section 5.2 TURNING OFF.
7. If all results were as expected, then the system is functional.

5.4. DEPLOYMENT

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

1. Ensure that the transmitter has been installed as detailed in Section 5.5 INSTALLATION.
2. Visually inspect all system components to ensure that they are secure and undamaged.
3. Refer to Page 1 of this manual for the expected battery lifetime and ensure that it is adequate for the planned operations.
4. Activate the transmitter as detailed in Section 5.1 TURNING ON.
5. Complete a Section 5.3 FUNCTION TEST.

5.5. INSTALLATION

⚠ WARNING: The Special Conditions for Safe Use as detailed in SECTION 10 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.

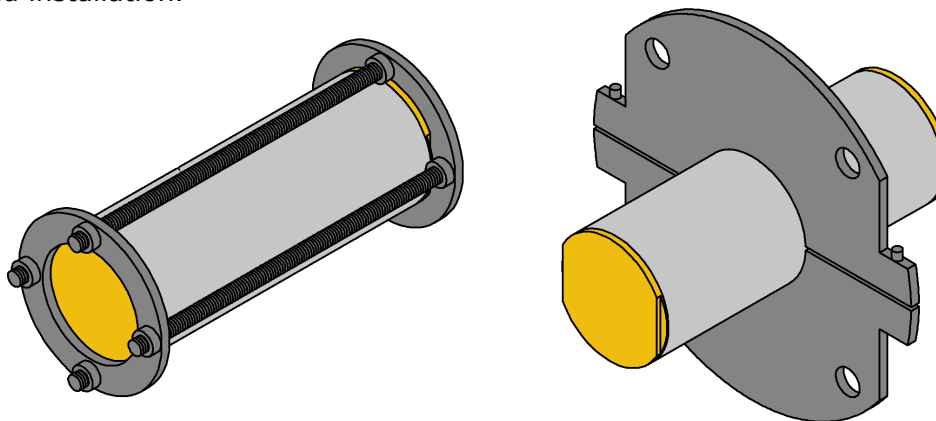
⚠ WARNING: Transmitters with the main body manufactured from Titanium, such as the EMTx30X-0C3ST MUST be installed in such a way that ignition sources due to impact and friction sparks are excluded. Refer to the main body markings for the material type supplied.

⚠ 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 ($\mu\Omega.m$)	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 discs 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 below. 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 Online Electronics for further information and guidelines regarding EM transmitter mounting and installation.



5.6. BATTERY LIFETIME

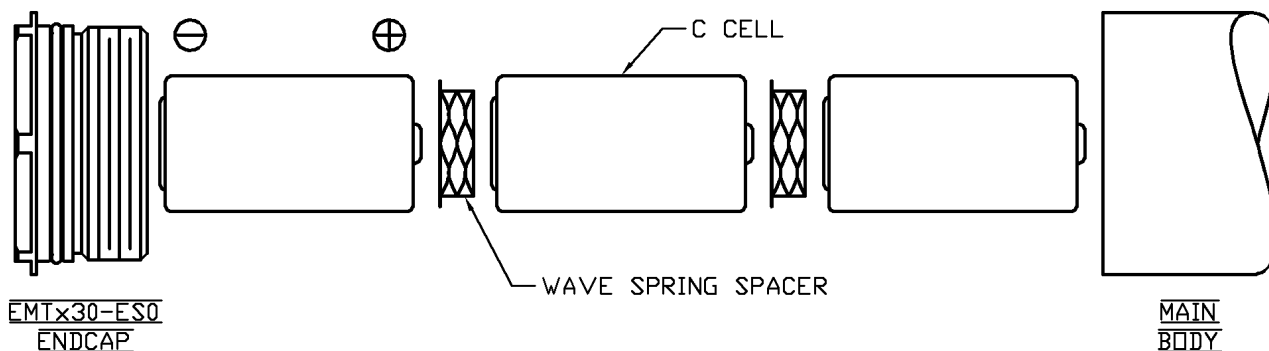
The operating temperature which the transmitter is used at alters the operating lifetime. Typically colder temperatures will shorten the stated lifetime.

Note that upon customer request, the transmitters can be adjusted at Online Electronics Ltd to provide a stronger signal at the expense of lifetime or extended lifetime at the expense of signal, contact Online Electronics Ltd for more details and to discuss your requirements.

In extreme circumstances the transmitter operating lifetime may be reduced by how the transmitter is installed on a pig. Refer to section 5.5 INSTALLATION within this manual for tips on how to achieve optimum performance from the transmitter with regards to the mounting arrangement.

5.7. BATTERY REPLACEMENT

1. Familiarise yourself with all warnings given at the start of Section 4 RULES FOR SAFE OPERATION.
2. Loosen the M4 locking grub screw on the EMTx30-ES0 ENDCAP by 3 turns, using a 2.0mm AF Allen key.
3. Loosen the ENDCAP 5 full turns using the supplied ENDCAP REMOVAL TOOL to release any internal pressure and to turn the transmitter off.
4. Fully remove the ENDCAP using the supplied ENDCAP REMOVAL TOOL.
5. Remove all cells and M12 Form B Washers. Visually inspect the cells, contact Online Electronics Ltd immediately if there are any signs of damage or electrolyte leakage. Dispose of them in a responsible way.
6. Observing correct battery orientation as shown below, insert 3x new cells into the battery compartment POSITIVE END first with Stainless Steel M12 Form B Washers between the cells (note that the washer will self-locate once inside the unit).



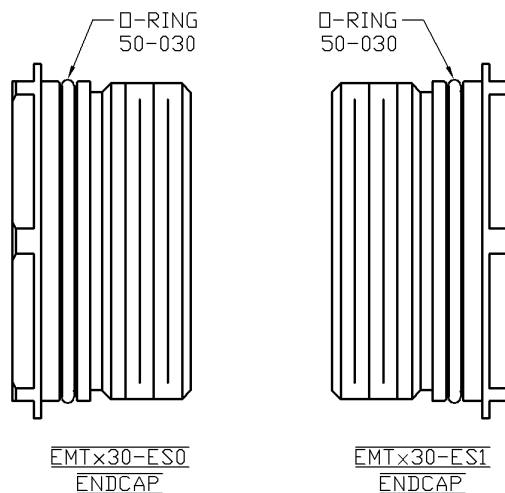
7. Once all cells are installed ensure that it is the FLAT, NEGATIVE END of the cells which you see when looking into the open end of the transmitter.
8. Examine the O-ring seals for any signs of contamination or damage, replace and/or re-grease if necessary. Refer to Section 6.1 O-RING REPLACEMENT for guidance.
9. Replace the ENDCAP using the supplied ENDCAP REMOVAL TOOL. Do not use a vice or spanner, it only needs to be hand tight. Damage may occur if over tightened.
10. Tighten the M4 grub screw (until the grub screw engages with the housing to lock the ENDCAP). Note that very little torque is required. Damage may occur if over tightened.
11. Fully tighten the EMTx30-ES0 ENDCAP to turn on the transmitter. Using an EM receiver, confirm transmitter function and correct transmission rate.
12. If the transmitter is not to be used immediately after battery replacement, loosen the EMTx30-ES0 ENDCAP 5 full turns to switch the transmitter off.

6. MAINTENANCE

Familiarise yourself with all of the rules for the safe operation of this equipment as described in Section 4 RULES FOR SAFE OPERATION.

6.1. O-RING REPLACEMENT

1. Using a 2.0mm AF Allen key fully unscrew the M4 locking grub screw on both ENDCAPS by 3 turns.
2. Loosen the EMTx30-ES0 ENDCAP at this end 5 full turns using the supplied ENDCAP REMOVAL TOOL to release any internal pressure and to turn the transmitter off.
4. Using the supplied ENDCAP REMOVAL TOOL, fully remove this ENDCAP, any batteries and then the other ENDCAP.
5. Referring to the figure below, remove all O-rings and clean all sealing surfaces on all parts.



6. Examine all surfaces for signs of corrosion, scoring, and other damage. If there is excessive damage the mechanical parts may need to be replaced.
7. Lightly grease all sealing surfaces using a suitable grease (e.g. DOW CORNING MOLYKOTE 111 COMPOUND).
8. Lightly grease each O-ring with a suitable grease (e.g. DOW CORNING MOLYKOTE 111 COMPOUND) before fitting.
9. Apply a small amount of an oil-based thread lubricant such as "Blue Goop" to the endcap threads.
10. Referring to Section 5.7 BATTERY REPLACEMENT re-insert the batteries, then refit the EMTx30-ES0 ENDCAP to the BATTERY end of the housing and the other ENDCAP to the PCB end of the housing using the ENDCAP REMOVAL TOOL. Do not use a vice or spanner, the endcaps only need to be hand tight. Apply lubrication to the threads of both ENDCAPS if required, to assist the re-fitting.
11. Tighten the M4 grub screw on each ENDCAP (until the grub screw engages with the housing to lock each endcap in place). Note that very little torque is required. Damage may occur if over tightened.

7. ROUTINE MAINTENANCE AND STORAGE

Familiarise yourself with all of the rules for the safe operation of this equipment as described in Section 4 RULES FOR SAFE OPERATION.

All Online Electronics Ltd transmitters are designed to require minimum maintenance. The housing 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, replace the relevant component.

All components that 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.

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

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

As a minimum the EMTx30-ES0 ENDCAP must be loosened 5 full turns to switch the transmitter off.

8. DISPOSAL OF UNIT

Online Electronics Ltd 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, OEL 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
Online House
Blackburn Business Park
Woodburn Road
Blackburn
Aberdeen
AB21 0PS
UK

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

9. WARRANTY

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

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.

10. SAFETY INSTRUCTIONS

Refer to certificate(s) and section 11 DECLARATION OF CONFORMITY.

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 ID1400	Alkaline	1.5V	-20°C to +50°C	T6
DURACELL MN1400	Alkaline	1.5V	-20°C to +50°C	T6
DURACELL MX1400	Alkaline	1.5V	-20°C to +50°C	T6
ENERGIZER E93	Alkaline	1.5V	-18°C to +50°C	T6
VARTA 4914	Alkaline	1.5V	-10°C to +46°C	T6

3. Batteries must be installed into the enclosure in accordance with the orientation detailed on the markings.
4. Repair of flamepaths is not permitted by the end user.
5. Do not open when an explosive atmosphere may be present.
6. Units 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 4Nm and 8Nm. Do not exceed 8Nm.

11. DECLARATION OF CONFORMITY


This declaration of conformity is issued under the sole responsibility of the manufacturer:

Online Electronics Ltd
Online House
Blackburn Business Park
Woodburn Road
Blackburn
Aberdeen
AB21 0PS
UNITED KINGDOM

Object of declaration:

EMTx30X range of electromagnetic transmitters

With the following markings:

 II 2 G Ex db IIC Gb T5..T6

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

ATEX: ATEX Directive 2014/34/EU
IECEX: IECEX System
EMC: EMC Directive 2014/30/EU

The following standard(s) and technical specification(s) have been applied:

ATEX: EN 60079-0:2012+A11:2013
 EN 60079-1:2014
IECEX: IEC 60079-0:2011
 IEC 60079-1:2014
EMC: EN61000-6-4:2007
 EN61000-6-2:2005

As per the certificate(s) below:

ATEX: EU Type Examination Certificate EMT 17 ATEX 0058X issued by Element Materials Technology, Notified Body 2812, under QANTRAC08QAN1047. Refer to Special Conditions of Safe Use within EMT 17 ATEX 0058X.
IECEX: IECEX Certificate of Conformity IECEX EMT 17.0024X issued by Element Materials Technology, under QAR GB/TRC/QAR11.0002. Refer to Conditions of Certification within IECEX EMT 17.0024X.
EMC: Certificates TBC and TBC issued by York EMC Services Ltd.

The apparatus named above has been designed to comply with the relevant sections of the above referenced specifications and complies with all essential requirements of the Directives and Systems.