

Applicable products:-
Intrinsically safe, industrial pressure transmitter type
**IMP-LR, IND-LR, IMP, IND, IPSAT,
IPSUAT, IPSLAT and IPSSLUAT**
Screw-in transmitter for Zone 0 areas and below.

Table of contents

1. General information
2. Product identification
3. Mechanical installation
4. Special regulations for IS-Areas
5. Electrical Installation
6. Initial start-up
7. Placing out of service
8. Maintenance
9. Service / Repair
10. Disposal
11. Warranty conditions
12. Error handling
13. Declaration of conformity / CE



1. General information

1.1 Information on the operating manual

This operating manual contains important information on proper usage of the device. Read this operating manual carefully before installing and starting up the pressure measuring device. Adhere to the safety notes and operating instructions which are given in the operating manual. Additionally, applicable regulations regarding occupational safety, accident prevention as well as installation standards must be complied with. For the installation, maintenance and cleaning of the device, you must observe the relevant regulations and stipulations on explosion protection (EN 60079-14:2014 and IEC 60079-14:2013) as well as the occupational safety provisions. The device was constructed in accordance to standards: EN60079-0:2012+A11:2013, IEC60079-0:2011 (Edition 6), EN60079-11:2012 and IEC60079-0:2011 (Edition 6). This operating manual is considered part of the device and must be accessible to all employees.

– Technical modifications reserved –

1.2 Advisory Notes

Throughout this document a number of statements have been made to make the user aware. These, and their level of importance, are:

-  DANGER – dangerous situation, which may result in death or serious injuries
-  WARNING – potentially dangerous situation, which may result in death or serious injuries
-  CAUTION – potentially dangerous situation, which may result in minor injuries
-  !CAUTION! – potentially dangerous situation, which may result in physical damage
-  – tips and information to ensure a failure-free operation

1.3 Target group

-  WARNING-To avoid operator hazards and damages to the device, the following instructions have been written to a target audience of qualified technical personnel.

1.4 Limitation of liability

By non-observance of the operating manual, inappropriate use, modification or damage, no liability is assumed and warranty claims will be excluded.

1.5 Intended use

- The pressure transmitters have, according to the type listed, been developed for applications in overpressure and vacuum as well as for absolute pressure measurement. The screw-in transmitters have been particularly developed for process measurement.
- This operating manual applies to devices with explosion protection approval and is intended for the use in IS-areas. A device has an explosion protection approval if this has been specified in the purchase order and confirmed in our order confirmation. In addition, the manufacturing label contains the  symbol.
- It is the operator's responsibility to check and verify the suitability of the device for the intended application. If any doubts remain, please contact the vendor sales department in order to ensure proper usage. The vendor is not liable for any incorrect selections and their effects.

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- Permissible media are gases or liquids, which are compatible with the media wetted parts described in the data sheet. In addition it has to be ensured, that this medium is compatible with the media wetted parts.

- The technical data listed in the current data sheet is important, if the data sheet is not available please order or download it from the vendor.

⚠ WARNING Danger through improper usage.

1.6 Safety technical maximum values

Connector Version:

Ui = 28V, li = 93mA, Pi = 653mA;

Ci = 34.49nF, Li = 10uH.

Permissible temperatures for environment:

Gas: T4, -20°C to +75°C

Dust: T135°C, -20° to +65°C

PVC Cable Version (10m max length)

Ui = 28V, li = 93mA, Pi = 653mA;

Ci = 37.29nF, Li = 60uH.

Non PVC Cable Version (10m max length)

Ui = 28V, li = 93mA, Pi = 653mA

Ci = 40.55nF, Li = 179uH

1.7 Package contents

Please verify that all listed parts are undamaged included in the delivery and check for consistency specified in your order:

- Industrial pressure transmitter or screw-in transmitter
- Declaration of Conformity
- Operating manual

2. Product identification

The device can be identified by its label. It provides important data. From the label the product can be clearly identified.

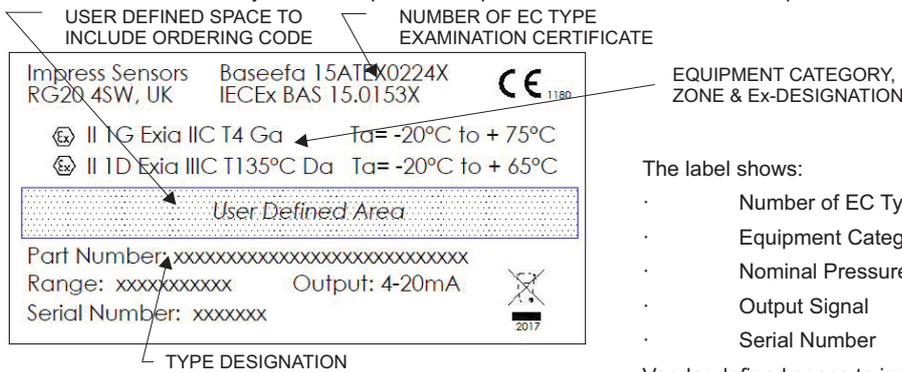


Fig. 1 Identification label

The label shows:

- Number of EC Type examination certificate
- Equipment Category, Zone and Ex Designation
- Nominal Pressure Range
- Output Signal
- Serial Number

Vendor defined space to include ordering information.

⚠ The label must not be removed from the device.

3. Mechanical installation

3.1 Mounting and safety instructions

⚠ WARNING Install the device only when depressurised and unpowered.

⚠ WARNING This device may only be installed by qualified technical personnel who have read and understood the operating manual.

⚠ DANGER Due to the explosion hazard the following instructions have to be complied with:

- The technical data listed in the EC type-examination certificate. If the certificate is not available, please order or download it from the vendor.
- Working on supplied (active) parts, except for intrinsically safe circuits, is strictly prohibited during an explosion hazard.
- Make sure that an equipotential bonding is in place for the entire course of the line, both inside and outside the intrinsic area.
- In case of increased danger of lightning strike or damage by overvoltage, increased lightning protection should be included.
- Observe the limiting values specified in the EC type-examination certificate. (Capacitance and inductance of the connection cable are not included in the values.)
- Make sure that the entire interconnection of intrinsically safe components remains intrinsically safe. The operator is responsible for the intrinsic safety of the overall system (installation of intrinsic parts).
- Do not mount the device in a direct forced air flow.
- Excessive dust deposits (over 5 mm) and a complete dust covering must be avoided.

Oxygen

⚠ DANGER Explosion hazard, with devices for oxygen applications, when used improperly. To ensure a use without danger, the following points must be adhered to:

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- Make sure your device has been ordered and delivered as a special version for oxygen applications. If the ordering code ends with "006", then the device is suitable for oxygen applications.

- At time of delivery the device is packed into a plastic bag in order to prevent it from impurity. Please observe the indication label "Device for oxygen, unpack only directly before assembling". Also, avoid any skin contacts during unpacking and assembly, in order to prevent greasy residues on the device. During installation, the respective explosion protection regulations have to be met.

- For oxygen applications over 25 bar it is recommended that pressure transmitter without seals are used.

 Handle this high-sensitive electronic precision measuring device with care, both in packed and unpacked condition

 There are no modifications/changes to be made on the device.

 Do not throw the package/device.

 To avoid damaging the diaphragm, remove packaging and protective cap (if fitted) directly before starting assembly. The delivered protective cap has to be stored.

 Place the protective cap (if fitted) on the pressure port again immediately after disassembling.

 Handle the unprotected diaphragm very carefully - it is very sensitive and may be easily damaged.

 Do not use unnecessary force when installing the device, to prevent damage of the device and the plant.

 For installations outdoor and in damp areas follow these instructions:

- To prevent moisture ingress in the plug, the device should be immediately connected, electrically, after mounting. Otherwise, any moisture ingress has to be blocked e.g. by using a suitable protection cap. (The ingress protection in the data sheet is valid for the connected device.)

- Choose an assembly position, which allows the flow-off of splashed water and condensation. Avoid permanent fluid at sealing surfaces.

- When using a cable gland and outlet device, turn the outgoing cable downwards. If the cable has to be turned upwards, then point it downward so the moisture can drain.

- Install the device in such a way that it is protected from direct sunlight. Direct sunlight can lead to the maximum permissible operating temperature being exceeded. This is prohibited for applications in IS-areas.

 For devices with gauge reference in the housing (small hole in the electrical connection), install the device in such a way, that the gauge reference is protected from dirt and moisture. Should the device be exposed to fluid ingress, the functionality will be inhibited for the gauge reference. An exact measurement in this condition is not possible. Furthermore this can lead to damages on the device. Take note that no inadmissibly high mechanical stresses occur at the pressure port as a result of the installation, since this may cause a shifting of the characteristic curve. This is especially important for very low pressure ranges. Humidity and dirt can block the vent hole. Dust and dirt must be removed from the edge of the thread connection of the electrical connection if before fitting.

3.2 General installation steps

- Carefully remove the pressure measuring device from the package and dispose of the package properly.

- Follow the detailed instructions below.

3.3 Installation steps for Bs5380 pressure port

- Check to ensure correct chamfer is available for the O-ring

- Ensure O-ring selected is compatible with process media

- Ensure that all sealing surfaces are perfectly smooth and clean

- Screw the device into the corresponding thread by hand.

- Devices with a spanner flat have to be tightened with an open-end spanner (G1/4": approx. 5 Nm; G3/8": approx. 7 Nm; G1/2": approx. 10 Nm;

- The indicated tightening torques must not be exceeded.

3.4 Installation steps for NPT

- Use a suitable seal (e. g. a PTFE-strip).

- Screw the device into the corresponding thread by hand.

- Tighten it with a wrench (for 1/8" NPT: approx. 15 Nm; for 1/4" NPT: approx. 30 Nm; for 1/2" NPT: approx. 70 Nm).

- The indicated tightening torques must not be exceeded.

4. Special regulations for IS-Areas

4.1 Protection against electrostatic charge hazards

 Avoid friction on the plastic surfaces. Do not clean the device and cable dry Use, for example, a damp cloth.

4.2 Overvoltage protection

 If the pressure transmitter is used as electrical equipment of the category 1G, then a suitable overvoltage protection device must be connected in series (attend the valid regulations for operating safety as well as EN60079-14:2014 and IEC 60079-14:2013).

4.3 Schematic circuit

The operation of an intrinsically safe transmitter in intrinsic safe areas requires special care when selecting the necessary Zener barrier or

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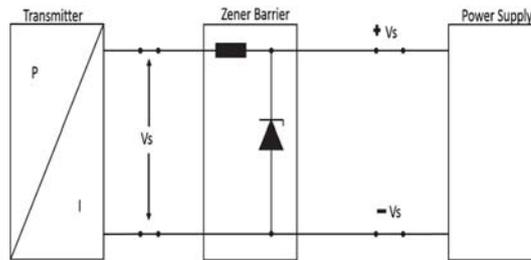


transmitter repeater devices to allow the utilization of the device's properties to the full extent. The following diagram shows a typical arrangement of power supply, Zener barrier and transmitter.

⚠ Please pay attention to the type examination certificate, which stipulates special conditions for intrinsically safe operation.

4.4 Example circuit description

The supply voltage of e.g. 24 VDC provided by the power supply is across a Zener barrier. The Zener barrier contains series resistances and breakdown diodes as protective components. Subsequently, the operating voltage is applied to the transmitter and, depending on the pressure, a particular signal current flows.



⚠ DANGER When installing the intrinsically safe device as zone-0-equipment, the supplying must be carried out by a power supply which must be galvanically insulated and which must not be grounded.

4.5 Functional selection criteria for Zener barriers and galvanic power supply

The minimum supply voltage $V_{S \min}$ of the transmitter must not fall short since a correct function of the device cannot be guaranteed. The minimum supply voltage has been defined in the respective product-specific data sheet under "Output signal and supply voltage".

4.6 Test criteria for the selection of the Zener barrier

In order not to fall below the minimum supply voltage (V_S), it is important to verify the minimum supply voltage available at full level control of the transmitter. The full level control, i.e. a maximum or nominal output signal (20 mA), can be reached by applying the maximum physical input signal (pressure). The technical data of the barrier will usually provide the information needed for the selection of the Zener barrier. However, the value can also be calculated. If a maximum signal current of 0.02 A is assumed, then – according to Ohm's law – a particular voltage drop will result from the series resistance of the Zener barrier. This voltage drop is subtracted by the voltage of the power supply and as a result, the terminal voltage is obtained which is applied on the transmitter at full level control. If this voltage is smaller than the minimum supply voltage, another barrier or a higher supply voltage should be chosen. When selecting the ballasts, the maximum operating conditions according to the EC type-examination certificate must be observed. When assessing these, refer to their current data sheets to ensure that the entire interconnection of intrinsically safe components remains intrinsically safe.

4.7 Calculation example for the selection of the Zener barrier

The nominal voltage of the power supply in front of the Zener barrier is 24 VDC \pm 5 %.

This results in:

- maximum supply voltage:

$$+V_S (\max) = 24 \text{ V} * 1.05 = 25.2 \text{ V}$$

- minimum supply voltage:

$$+V_S (\min) = 24 \text{ V} * 0.95 = 22.8 \text{ V}$$

The series resistance of the Zener barrier is listed with 295 ohm. The following values must still be calculated:

- voltage drop at the barrier (with full conduction):

$$V_S \text{ Barrier} = 295 \Omega * 0.02 \text{ A} = 5.9 \text{ V}$$

- terminal voltage at the transmitter with Zener barrier:

$$\begin{aligned} V_S \text{ Sensor} &= V_{S+} (\min) - V_{ab} \text{ Barrier} \\ &= 22.8 \text{ V} - 5.9 \text{ V} = 16.9 \text{ V} \end{aligned}$$

- minimum supply voltage of the transmitter:

$$V_S \text{ Sensor} (\min) = 10 \text{ VDC (corresponding to } V_S \text{ min)}$$

Condition: $V_S \text{ Sensor} \geq V_S \text{ Sensor} (\min)$

Result: The terminal voltage of the transmitter with Zener barrier lies at 16.9 V and is therefore higher than the minimum supply voltage of the transmitter which lies at 10 VDC. This means, the Zener barrier has been selected correctly regarding the supply voltage.

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Note that no line resistances have been listed in this calculation. However, these will lead to an additional voltage drop that must be taken into account.

5. Electrical Installation

⚠ WARNING. Install the device only when depressurised and unpowered.

⚠ DANGER. Danger of explosion when surpassing the maximum supply of 28 VDC.

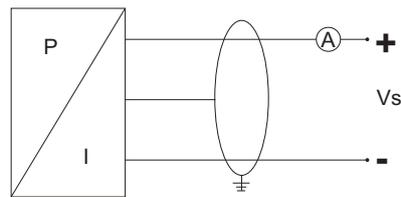
Establish the electrical connection of the device according to the technical data shown on the label and wiring diagram. The following table gives below examples of typical wiring for both connectors and cable types available.

⚠ WARNING Ensure that the labelling and calibration sheet is consulted for wiring of alternative connector and cable options.

Connector	+V	-V	Earth
M12	1	2	3
DIN43650A	1	2	Earth
DIN43650C	1	2	Earth

Cable	+V	-V	Earth
PVC	Red	Blue	Green
PUR	Red	Blue	White

Wiring Diagram:



⚠ For devices with cable gland as well as cable socket, ensure that the external diameter of the used cable is within the allowed clamping range. Moreover ensure that it lies in the cable gland firmly.

For the installation of a device with cable outlet the following bending radii have to be complied with:

Cable without ventilation tube:

Static installation: 5-times cable diameter

Dynamic application: 10-times cable diameter

Cable with ventilation tube:

Static installation: 10-times cable diameter

Dynamic application: 20-times cable diameter

⚠ Prevent the damage or removal of the PTFE filter which is fixed over the end of the air tube on devices with cable outlet and integrated air tube.

Gauge / relative devices are equipped with cable with integrated air tube for atmospheric pressure reference. Install cable end in a control cabinet or suitable terminal box in dry area which is free of aggressive gasses, to avoid damage.

6. Initial start-up

⚠ WARNING. Before start-up, the user has to check for proper installation and for any visible defects.

⚠ WARNING. Only authorised personnel, who have read and understood the operating manual.

⚠ WARNING The device has to be used within the technical specifications, only. (compare the data in the data sheet and the EC type-examination certificate).

7. Placing out of service

⚠ WARNING Disassemble the device only in unpowered and pressure less condition. Check before disassembly, if it is necessary to drained off the media before dismantling.

⚠ WARNING Depending on the medium, it may cause danger for the user. Comply therefore with adequate precautions for purification.

8. Maintenance

⚠ DANGER. The operator is obligated to observe the information concerning operation and maintenance work on the warning signs possibly affixed to the device.

In principle, this device is maintenance-free. If desired, the housing of the device can be cleaned using a damp cloth and non-aggressive cleaning solutions, in unpowered state. With certain media, however, the diaphragm may be polluted or coated with deposit. It is recommended to define corresponding service intervals for control. After placing the device out of service correctly, the pressure port can usually be cleaned carefully with a non-aggressive cleaning solution and a soft brush or sponge. If the pressure port is blocked, it is recommended to send the device to the vendor for cleaning. Please note the chapter "Service/Repair" below.

⚠ Any poor cleaning of the device can cause irreparable damages on the device. Therefore, never use pointed objects or pressured air for cleaning the pressure port.

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**9. Service / Repair****9.1 Recalibration**

During the life-time of a transmitter, the value of offset and span may shift. As a consequence, a deviating signal value in reference to the nominal pressure range starting point or end point may be transmitted. If one of these two phenomena occurs after prolonged use, a recalibration is recommended to ensure furthermore high accuracy.

9.2 Return

Before every return of your device, whether for recalibration, cleaning, modifications or repair, it has to be cleaned carefully and packed. You have to enclose a notice of return with detailed defect description when sending the device. If your device came in contact with harmful substances, a declaration of decontamination is additionally required. Should you dispatch a device without a declaration of decontamination and if there are any doubts in our service department regarding the used medium, repair will not be started until an acceptable declaration is sent. If the device came in contact with hazardous substances, certain precautions have to be complied with for purification.

10. Disposal

The device has to be disposed of according to the European Directives 2012/19/EU (on waste electrical and electronic equipment). It is prohibited to place electrical and electronic equipment in domestic refuse.

⚠ WARNING Depending on the used medium, deposit on the device may cause danger for the user and the environment. Comply with adequate precautions for purification and dispose of it properly.

11. Warranty conditions

The warranty conditions are subject to the legal warranty period of 12 months from the date of delivery. In case of improper use, modifications or damages to the device, we do not accept warranty claims. Damaged diaphragms will also not be accepted. Furthermore, defects due to normal wear are not subject to warranty services.

12. Error handling

See Table

13. Declaration of conformity / CE

The delivered device fulfils all legal requirements. The applied directives, harmonised standards and documents are listed in the EC declaration of

Conformity.	Possible cause	Error detection / corrective
no output signal	wrongly connected	inspect the connection
	line break	inspect all line connections necessary to supply the device (including the connector plugs)
analogue output signal too low	load resistance too high	verify the value of the load resistance
	supply voltage too low	verify the output voltage of the power supply
	defective energy supply	inspect the power supply and the applied supply voltage at the device
small shift of output signal	diaphragm is highly contaminated	careful cleaning with non-aggressive cleaning solution and a soft brush or sponge; incorrect cleaning can cause irreparable damages on diaphragm or seals
	diaphragm is coated with deposit	if possible, it is recommended to send the device to Impress Sensors for cleaning
large shift of output signal	diaphragm is damaged (caused by overpressure or manually)	check the diaphragm
wrong or no output signal	manually, thermal or chemically damaged cable	check the cable

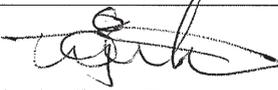
⚠ If you detect an error, please try to eliminate it by using this table or send the device to our service address for repair.

Improper action and opening can damage the device. Therefore repairs on the device may only be executed by the manufacturer

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**EU DECLARATION OF CONFORMITY
 DIRECTIVE 2014/34/EU**

Provisions of the directive fulfilled by the equipment:	Group II Category 1G Ex ia IIC T4 Ga (-20°C ≤ Ta ≤ +75°C) Group II Category 1D Ex ia IIIC T135°C Da (-20°C ≤ Ta ≤ +65°C)
Notified Body for EC-Type Examination:	Baseefa 1180 Buxton UK
EC - Type Examination Certificate:	Baseefa 15ATEX0224x
Harmonised Standards used:	EN 60079-0:2012+A11:2013 EN 60079-11:2012
Model Types:	IMP-LR, IND-LR, IMP, IND, IPSAT, IPSUAT, IPSLAT, IPSSLUAT, IND-SFS, IND-SFC, IPSSAT and IPSSUAT
Manufacturer Address:	Impress Sensors & Systems Ltd Regency House 22-25 Kingsclere Park Kingsclere Hampshire RG20 4SW
Declaration:	We, the aforementioned company, declare under our sole responsibility that, on the date the equipment accompanied by this declaration is placed upon the market, the equipment conforms with all the technical and regulatory requirements of the above listed directives.
Signed	Date
 Warwick Tatton, Engineering Manager	June 21st 2018 Kingsclere, Hampshire

Certificates can be viewed and downloaded from www.cynergy3.com/approvals

Doc0146 Iss2.0 (Master)

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