Operating Instructions

for

Smart Pressure Transmitter

Model: PAD

1. Contents

1. Contents 2
2. General 4
   2.1 Hazard warnings 4
3. Introduction 5
   3.1 Using This Manual 6
   3.2 Overview of Transmitter 7
   3.3 Software Compatibility 7
   3.4 Transmitter Components 8
4. Handling Cautions 11
   4.1 Unpacking 12
   4.2 Models and Specifications Check 12
   4.3 Storage 12
   4.4 Selecting the Installation Locations 13
   4.5 Performing Sensor Zero Trim after Installation 13
   4.6 Pressure Connections 14
   4.7 Waterproofing of Cable Conduit Connections 14
   4.8 Restrictions on Use of Radio Transceivers 14
   4.9 Insulation Resistance Test and Dielectric Strength Test 14
   4.10 Installation of Explosion Protected Type Transmitters 15
   4.11 Notes on the machine and pressure equipment directive 20
5. Transmitter Functions 21
   5.1 Overview 21
   5.2 Safety Message 21
   5.3 Warning 21
   5.4 Fail Mode Alarm 22
   5.5 EEProm-Write Enable / Disable Mode Switch 23
   5.6 Configuration of Alarm and Security Jumper Procedures 25
   5.7 Configuration Using Zero and Span Push Buttons 25
   5.8 Additional Functions (valid for PAD-F only) 37
   5.9 Wiring Connections for External HHT/ Ammeter 43
6. Installation 44
   6.1 Overview 44
   6.2 Safety Message 44
   6.3 Warning 45
   6.4 Commissioning on the bench with Hand-Held Terminal 46
   6.5 General Considerations 47
   6.6 Electrical Considerations 47
   6.7 Wiring 48
   6.8 Mechanical Considerations 56
   6.9 Environmental Considerations 58
7. On-line Operation 59
   7.1 Overview 59
   7.2 Safety Message 59
   7.3 Configuration Data Review 59
   7.4 Check Output 59
   7.5 Basic Setup 60
   7.6 Detailed Setup 60

7.7 Tag Information set up 61
7.8 Diagnostics and Services 61
7.9 Calibration 62
8. Maintenance 64
8.1 Overview 64
8.2 Safety Message 64
8.3 Hardware Diagnostics 65
8.4 Hardware Maintenance 66
9. Disposal 69
10. Appendix I 70
11. EU Declaration of Conformance 72
12. EU Declaration of Conformance (ATEX) 73
13. EU Type Examination Ex d 74
14. EU Type Examination Ex ia 77

Manufactured and sold by:

Kobold Messring GmbH
Nordring 22-24
65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

K21/1125

2. General

Before unpacking and commissioning the device, the operating instructions and the “General Safety Instructions” document must be read and followed carefully. The general safety instructions, the operating instructions, the data sheet as well as approvals and further information can be downloaded via the QR code on the device or under the respective product on www.kobold.com.

Due to technical changes, the device documentation available online may not always correspond to the product version you have purchased. If you need an instruction manual that corresponds to the purchased product version, you can request it from us free of charge by email (info.de@kobold.com) in PDF format, specifying the relevant invoice number and serial number. If you wish, the operating instructions can also be sent to you by post in paper form.

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the device should be used only when the entire machine fulfils the EU machinery directive.

2.1 Hazard warnings

The following instructions are intended to ensure your personal safety and to prevent damage to the product described or connected devices. Safety instructions and warnings to prevent danger to the life and health of users or maintenance personnel, or to prevent damage to property, are highlighted in this documentation using the symbols defined here. *The symbols and terms used have the following meaning in the documentation itself:*

Symbol	Explanation	Symbol	Explanation
Note	Is important information about the product, the handling of the product or the respective part of the documentation to which particular attention should be drawn.	Caution	Means that minor personal injury or minor property damage may occur if proper precautions are not taken.

Symbol	Explanation	Symbol	Explanation
Warning	Indicates that serious personal injury or substantial property damage may occur if proper precautions are not taken.	Danger	Means that death can occur if proper precautions are not taken.
Warning	Attention: Hot surface!	Warning	Warning: Dangerous electrical voltage

3. Introduction

The PAD Smart Pressure Transmitter is correctly calibrated at the factory before shipment. To ensure correct and efficient use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it

(1) The contents of this manual are subject to change without prior notice.
(2) All rights reserved. No part of this manual may be reproduced in any form without Kobold Messring's written permission.
(3) If any question arises or errors are found, or if any information is missing from this manual, please inform the nearest sales office.
(4) The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made instrument.
(5) Please note that changes in the specifications, construction, or component parts of the instrument may not immediately be reflected in this manual at the time of change, provided that postponement of revisions will not cause difficulty to the user from a functional of performance standpoint.

3.1 Using This Manual

The Chapters in this operating manual provide information on installing, operating, and maintaining devices from KOBOLD Model PAD Smart Pressure Transmitter. Chapters within this manual are organised as follows.

Chapter 4 Handling
Chapter 4 provides instructions on software functions, configuration parameters, and online variables.

Chapter 5 Transmitter Functions
Chapter 5 contains instructions for configuring and commissioning Model PAD Smart Pressure Transmitters.

Chapter 6 Installation
Chapter 6 contains mechanical, environment and electrical installation instructions for Model PAD Smart Pressure Transmitters.

Chapter 7 On-line Operation
Chapter 7 describes the configuration process and how to use basic and advanced Model PAD Smart Pressure Transmitter software functions during configuration. Included in these sections are details on using:-.
(1) Sensor or Output Trim
(2) Changing range configuration, Output Type, Damping, measurement units etc.
(3) Change of general data such as Tag No. Date, Message etc.

Chapter 8 Maintenance
Chapter 8 contains hardware diagnostics, troubleshooting and maintenance tasks.

Appendix I: List of Error Codes available on LCD display

3.2 Overview of Transmitter

Kobold Smart Pressure Transmitter are microprocessor based “smart” pressure transmitters. It uses a piezoelectric/ capacitance pickup optimised & accurately characterised with a patented temperature compensation algorithm for high precision & long-term stable gauge and absolute pressure measurements over a wide range of operating conditions. PAD is a two-wire loop power transmitter and has a standard 4/20mA output scaled for desired output pressure range. In addition, it also offers digital HART® (digital signal superimposed over the analogue output) communication that allows transmitting additional digital parameters/diagnostic information for advanced control systems like DCS, PLC. This transmitter can be configured remotely via HART® communication through a HHT (HART® Hand-Held Terminal using DDL or DOF technology) or any HART® enabled PC configurator. This allows critical variables to be changed, configured and tested remotely by users. Note: For HART® Communication a minimum 250~500 Ohm loop resistance is mandatory between power supply and transmitter.

3.3 Software Compatibility

KOBOLD Smart Pressure Transmitters are shipped from the factory with the most up to date firmware. However, as product developments and new features are released a firmware update becomes necessary to incorporate these new changes. As such transmitters with older firmware may restrict certain functions when communicating with an external HHT (Model 275/375HART® Communicator). There may also be some differences on supported functions on the local push button menu based on the installed firmware revision of the transmitter. This manual is based on firmware Revision 6.3. Function deviations as to firmware Revision are same as in table below:

FUNCTION	Function Supports	
	ZERO / SPAN Button	HART 275/375
	Version 6.3 or above	
ZERO/SPAN	●	●
ZERO TRIM	●	●
ZERO Adj	●	●
mA HOLD	● (from V6.8x)	x
Units set	●	●
Range set	●	●
Damping set	●	●
Transfer Function (optional)	● (from V6.9)	●
LCD Decimal set	●	Δ
LCD Mode	●	Δ

● : Supported
x : Not supported
Δ : Supported but update required

3.4 Transmitter Components

The various components of PAD Series Smart Pressure Transmitter are shown below:

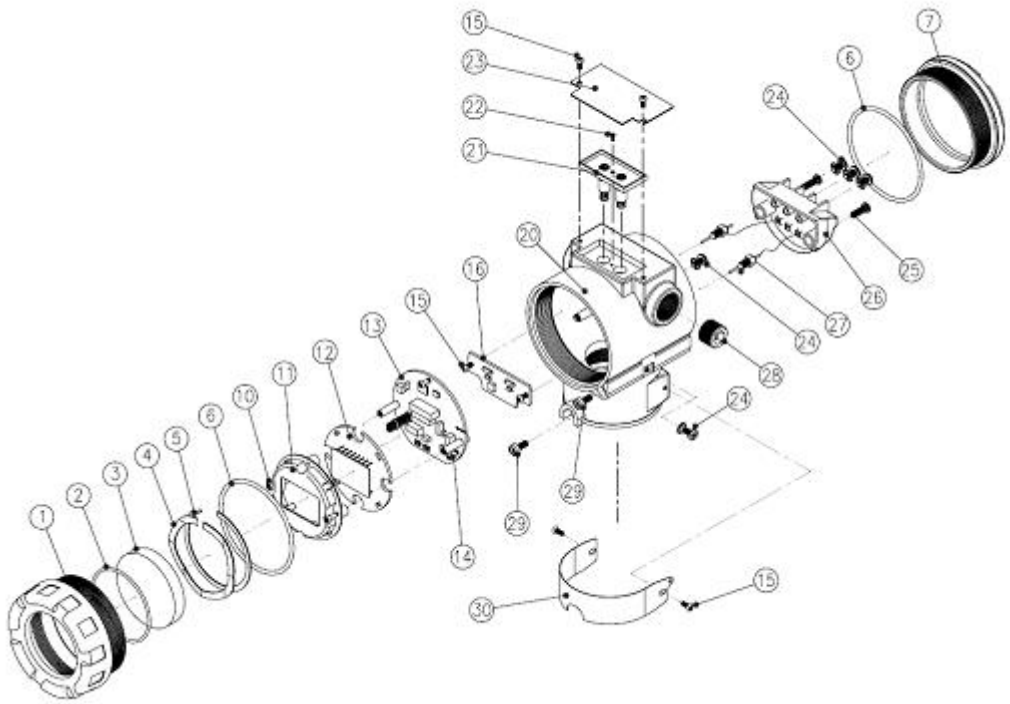


Figure 2-1. Model PAD Transmitter Exposed View (Housing)
Figure 2-2. TRANSMITTER COMPONENTS (HOUSING)

P.N	PART NAME	P.N	PART NAME
1	FRONT COVER	20	HOUSING
2	O-RING/GLASS	21	ZERO/SPAN ADJUSTMENT SWITCH
3	GLASS	22	SCREW/ SWITCH COVER
4	WAVE WASHER	23	NAMEPLATE
5	C-SNAP RING	24	SCREW
6	O-RING/COVER	25	SCREW/TERMINAL BLOCK
7	REAR COVER	26	TERMINAL BLOCK
10	SCREW/LCD	27	EMI FILTER
11	LCD COVER	28	PIPE PLUG
12	LCD BOARD	29	SCREW
13	MAIN BOARD	30	TAGPLATE
14	SCREW/MAIN BOARD		
15	SCREW		
16	TERMINAL BOARD		

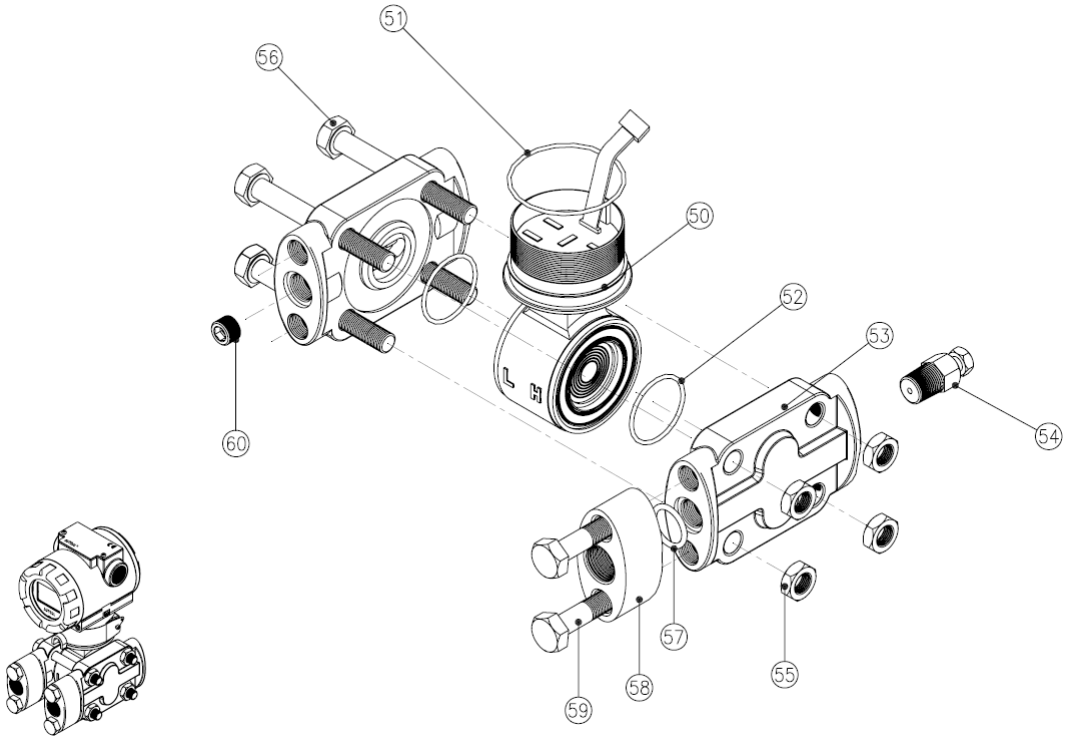


Figure 2-3. Model PAD Exploded View (Sensor Module-D, G)

P.N	PART NAME	P.N	PART NAME
50	SENSOR BODY	51	O-RING/SENSOR BODY
50-1	RANGE 2, 1.5 kPa	52	O-RING/ SENSOR
50-2	RANGE 3, 7.5 kPa	53	FLANGE/DP, GP, SIDE TYPE
50-3	RANGE 4, 37.3 kPa	54	DRAIN/VENT PLUG
50-4	RANGE 5, 186.5 kPa	55	NUT
50-5	RANGE 6, 690 kPa	56	BOLT
50-6	RANGE 7, 2068 kPa	57	O-RING/FLANGE ADAPER
50-7	RANGE 8, 6895 kPa	58	FLANGE ADAPTER
50-8	RANGE 9, 20680 kPa	59	BOLT/ FLANGE ADAPTER
50-9	RANGE 0, 41370 kPa	60	FLANGE PLUG

Figure 2-4. TRANSMITTER COMPONENTS (SENSOR MODULE -D, G)

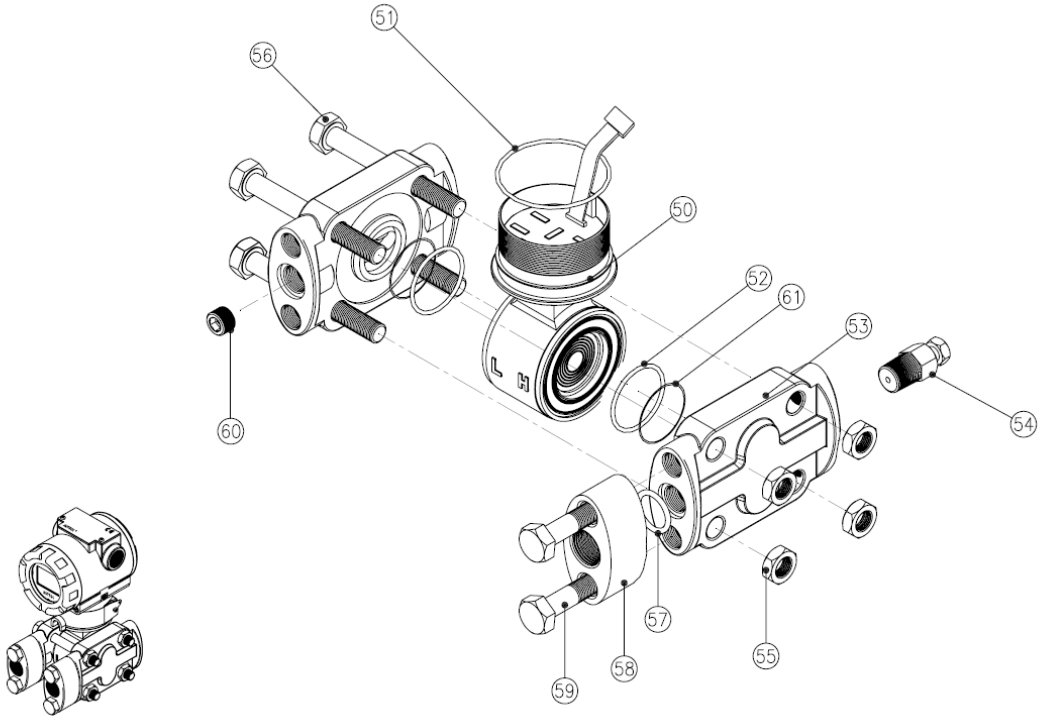


Figure 2-5. Model PAD Exploded View (Sensor Module-H)

P.N	PART NAME	P.N	PART NAME
50	SENSOR BODY (HIGH LINE PRESSURE)	51	O-RING/SENSOR BODY
50-H4	RANGE 4, 37.3 kPa	52	O-RING/ SENSOR
50-H5	RANGE 5, 186.5 kPa	53	FLANGE/DP, GP, SIDE TYPE
50-H6	RANGE 6, 690 kPa	54	DRAIN/VENT PLUG
50-H7	RANGE 7, 2068 kPa	55	NUT
		56	BOLT
		57	O-RING/FLANGE ADAPER
		58	FLANGE ADAPTER
		59	BOLT/ FLANGE ADAPTER
		60	FLANGE PLUG
		61	BACKUP RING

Figure 2-6. TRANSMITTER COMPONENTS (SENSOR MODULE -H)

4. Handling Cautions

This chapter consists of cautions for transmitter handling and storage, selection of installation locations, insulation structure, etc.

[Quick Reference Manual]

Step	Job	Job Details	Instrument
1	Unpacking	- Unpack transmitter packing	
2	Model and Specifications Check	- Make sure whether the delivered transmitter is same as options attached on its nameplate	Nameplate
3	Storage	- Places not exposed to water, non-vibration and non-impact area - Ambient temperature 25 deg C and relative humidity 65 % RH	
4	Calibration Bench	- Configuration of Range, Zero/Span, Unit, Tag, Damping Time, Transfer Function, DA Trim and other parameters	- HHT - Pressure Source - Galvanometer
5	Installation Locations	- Where ambient temperature is not fluctuated - Where no corrosion happens by chemical materials, etc. - Where vibration and impact is not severe - Where maintenance is very easy	(Engineering)
6	Mechanical Considerations	- Where transmitter can be handled easily - Be cautious of the pressure leaks	(Engineering)
7	Electrical Considerations	- Connect 24 V_{DC} (Recommended Power Supply is 12.5 V_{DC} – 45 V_{DC}) - For HART communication, total resistance on transmitter terminal loop should be 250 – 550 Ohm.	(Engineering)
8	Mounting and Installation	- For mounting transmitter, an appropriate bracket should be used. - Transmitter should be firmly to its bracket.	(Mounting and Installation)
9	Calibration on Spot	- Sensor Zero Trim is highly recommended during first installation and start-up. During a Zero trim the zero baseline of transmitter is established. - Before initiating zero trim make sure that PV value of transmitter is zero and current output is at 4 mA	HHT or Zero/Span button
10	Pressure	- Do not apply the differential and/or full line pressure suddenly. - Close equalizing valve of 3/5 valve manifold, then, open stop valve on high and low side slowly and simultaneously.	(Applying pressure)
11	Operation	- Make sure that transmitter operates within specs.	Visual or HHT

4.1 Unpacking

When moving the transmitter to the installation site, transfer it in its original packaging. Only unpack the transmitter on site of installation to avoid damage during transit.

4.2 Models and Specifications Check

The model's name and specifications are indicated on the top name plate fixed to the transmitters. Please check your specification and model supplied for your installation.

4.3 Storage

The following precautions must be observed when storing the instrument, especially for a long period.

(1) Select a storage area that meets the following conditions:
(a) It is not directly exposed to rain, water, snow or sun light.
(b) It is exposed to minimum vibration and shock.
(c) If possible, it is advisable to store at normal temperature and humidity (approx. 25 °C, 65 % RH).

However, it can also be stored under ambient temperature and relative humidity within the following published ranges.

Ambient Temperature: -40 ~ 80 °C (with LCD module) *
* General use only. For explosion proof versions follow product certification requirements.
Relative Humidity: 5 % ~ 98 % RH (at 40 °C)

(2) When storing the transmitter, repack with original (or similar) packaging that was shipped from the factory.

(3) If storing a transmitter that has already been used, thoroughly clean all wetted parts including diaphragm seals (if installed), process connections/manifolds in contact with process fluid. In addition, make sure before storing the transmitter that remote seal (if supplied) assemblies are securely mounted.

4.4 Selecting the Installation Locations

The transmitter is designed to withstand severe environmental conditions. However, to ensure stable and accurate operation for many years, the following precautions must be observed when selecting an installation location.

(1) Ambient Temperature
Avoid locations subject to wide temperature variations or a significant temperature gradient. If the location is exposed to radiant heat from plant equipment, provide adequate insulation or ventilation.
(2) Ambient Atmosphere
Avoid installing the transmitter in a corrosive atmosphere. If the transmitter must be installed in a corrosive atmosphere, there must be adequate ventilation as well as measures to prevent intrusion or stagnation of rainwater in conduits. Moreover, there should be appropriate ventilation preventing corrosion by rain gathered on conduit.
(3) Shock and Vibration
Select an installation site suffering minimum shock and vibration (although the transmitter is designed to be relatively resistant to shock and vibration)
(4) Accessibility
Select location that provides easy access for maintenance & calibration.
(5) Installation of Explosion Protected Transmitters.
Explosion – protected transmitters can be installed in hazardous areas according to gas types for which they are certified.

4.5 Performing Sensor Zero Trim after Installation

(1) Sensor Zero Trim should be done after transmitter is installed because zero point can shift due to mounting status of the sensor pick up.

(2) For Sensor Zero Trim, make input pressure of transmitter zero prior to initiating zero trim calibration. Any Sensor Trim done in field must be carried out after installation is finalized and with transmitter position fixed. Also, if applying external pressure ensure the display is sufficiently stabilized (after approximately 10 to 15 seconds) before initiating any Trim function.

(3) There are two recommendations for making input pressure “zero”. One is to apply a “zero” pressure source (mandatory for absolute pressure models). The second option is to open equalizing valve of manifolds and venting to atmospheric pressure (allowed only for Gauge type models).

(4) Sensor Zero Trim can be performed using an external HHC (Hand held calibrator), PC or PDA configurator, and/ or using Zero/Span local push buttons provided on the transmitter.

(5) When using local push buttons please refer to Chapter 4.7 of this manuals for detailed instructions. If using an external HHT or HART® PC configurator please refer to the user manuals supplied by the third-party supplier.

4.6 Pressure Connections

Warning	Instrument installed in the process is under pressure. Never loosen or tighten the flange bolts as it may cause dangerous spouting of process fluid. If the accumulated process fluid may be toxic or otherwise harmful, take appropriate care to avoid contact with the body or inhalation of vapours even after dismounting the instrument from process line for maintenance.

The following precautions must be observed in order to safely operate the transmitter under pressure.

(1) Never apply a pressure higher than the maximum working pressure specified on the nameplate.
(2) Use adequate seals for leak tight process connections and use only quality and standardized parts.
(3) Regularly inspect for signs of leakage and apply corrective actions when necessary.

4.7 Waterproofing of Cable Conduit Connections

Apply a non-hardening sealant (silicone or tape, etc.) to the threads to waterproof the transmitter cable conduit connections.

4.8 Restrictions on Use of Radio Transceivers

Note	Although the transmitter has been designed to resist high frequency electrical noise, if a radio transceiver is used near the transmitter or its external wiring, the transmitter may be affected by high frequency noise pickup. To test for such effects, bring the transceiver in use slowly from a distance of several meters from the transmitter, and observe the measurement loop for noise effects. Thereafter, always use the transceiver outside the area affected by noise.

4.9 Insulation Resistance Test and Dielectric Strength Test

Since the transmitter has undergone insulation resistance and dielectric strength tests at the factory before shipment, normally these tests are not required. However, if required, observe the following precautions in the test procedures.

(1) Do not perform such tests more frequently than is absolutely necessary. Even test voltages that do not cause visible damage to the insulation may degrade the insulation and reduce safety margins.

(2) Never apply a voltage exceeding 500 V_{DC} (100 V_{DC} with an internal lightening protector) for the insulation resistance test, nor a voltage exceeding 500 V_{AC} (100 V_{AC} with an internal lighting protector) for the dielectric strength test.

(3) Before conducting these tests, disconnect all signal lines from the transmitter terminals. Perform the tests in the following procedure.

(4) Insulation Resistance test
  (a) Short-circuit the + and - SUPPLY terminals in the terminal box.
  (b) Turn OFF the insulation tester. Then connect the insulation tester plus (+) lead wire to the shorted SUPPLY terminals and the minus (-) lead wire to the grounding terminal.
  (c) Turn ON the insulation tester power and measure the insulation resistance. The voltage should be applied as short as possible to verify that insulation resistance is at least 20 MΩ.
  (d) After completing the test and being very careful not to touch exposed conductors disconnect the insulation tester and connect a 100KΩ resister between the grounding terminal and the short-circuiting SUPPLY terminals. Leave this resistor connected at least three second to discharge any static potential. Do not touch the terminal while it is discharging.

(5) Dielectric Strength Test
  (a) Short-circuit the + and - SUPPLY terminals in the terminal box.
  (b) Turn OFF the dielectric strength tester. Then connect the tester between the shorted SUPPLY terminal and the grounding terminal. Be sure to connect the grounding lead of the dielectric strength tester to the ground terminal.
  (c) Set the current limit on the dielectric strength tester to 10mA, then turn ON the power and gradually increase the tester voltage from '0' to the specified voltage.
  (d) When the specified voltage is reached, hold it for one minute.
  (e) After completing this test, slowly decrease the voltage to avoid any voltage surges.

4.10 Installation of Explosion Protected Type Transmitters

4.10.1 ATEX Approval Explosion Proof

ATEX Certification number: **KEMA 10ATEX0141 X** Issue Number: 3
CE 0158 Ⓔx II 2 D G

Note 1. Model PAD for potentially explosive atmosphere
Ex db IIC T6...T4 Gb, Ex tb IIIC T85 °C…T130 °C Db
Ambient Temperature: -20℃≤ T_{amb} ≤ +60°C
T6 for -20 °C ≤ TP ≤ 85 °C;
T5 for -20 °C ≤ TP ≤ 100 °C;
T4 for -20 °C ≤ TP ≤ 130 °C

Ambient temperature range	Process temperature range	Temperature class for EPL Gb	Maximum surface temperature for EPL Db
-20 °C to +60 °C	-20 °C to +85 °C	T6	85 °C
-20 °C to +60 °C	-20 °C to +100 °C	T5	100 °C
-20 °C to +60 °C	-20 °C to +130 °C	T4	130 °C

Note 2. Electrical Data
Supply Voltage: 12.5…45 V_{DC}
Output Signal: 4 to 20 mA + HART

Note 3. Electrical Connection: 2x 1/2-14 NPT Female

Note 4. PAD ATEX Certification is according to the below standards
EN IEC 60079-0:2018
EN 60079-1:2014
EN 60079-31:2014

Note 5. Installation

- All wiring shall comply with IEC/EN 60079-14
- The cable glands and blanking elements shall be of a certified one with Ex db IIC and/or Ex tb IIIC, suitable for the condition of use and correctly installed. Also, the operating temperature of these cable glands and blanking elements shall be more than 130°C.
- Housing Ground must be followed to “local electrical codes”. The most efficient ground procedure is to connect directly to the earth as least impedance.
- How to Housing Ground:
  * Internal Ground Connection: Internal ground connection screw is located in terminal in housing, the screw can be identified as ground sign.
  * External Ground Assembly: This is located in the right side of housing and identified as ground sign.
- When use tubing, Ex db IIC and/or Ex tb IIIC cable gland or sealing fittings must be connected with the wall of housing directly.
- Tubing is installed a minimum of 5 threads.
- Sensor module is to be threaded a minimum of 7 threads and prevented from loosening by tightening the housing rotation set screw.
- Precautions shall be taken to minimize the risk of electrostatic discharge.
- How to prevent electrostatic discharge:
  1) Make sure that all equipment is correctly grounded.
  2) Make sure that the housing and adjacent objects do not rub together.
  3) If dirt collects on the equipment, clean it with a damp cloth as soon as possible.
  4) Do not install in a location where the electrostatic charge can increase. This includes:
     - Locations near ventilation systems
     - Locations where there is a risk of an increase in electrostatic charge caused by compressed air and dust,
     - Locations near machines that use friction,

- Locations near systems that apply electrons as a spray (e.g. near electrostatic painting systems
- Locations near other machines and systems that can have large electrostatic charges

Note 6. Operation

- WARNING-DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE MAY BE PRESENT
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous location.
- Do not open the unit in Ex area.
- To get maximum efficient of grounding, it needs to connect with more than 4 mm^2 conductor.

Note 7. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of KOBOLD Messring GmbH is prohibited.
  For more information regarding the dimensions of the flameproof joints the manufacturer shall be contacted.

4.10.2 ATEX Approval Intrinsic Safe

ATEX Certificate Number : DEKRA 18ATEX0092 X
Equipment or protective systems intended for use in potentially explosive atmospheres
– Directive 2014/34/EU
The marking of the product shall include the following:
Ex II 1 G or 2 G Ex ia IIC T5 or T4 Ga or Gb
For T5: -30 to 40 deg C
For T4: -30 to 80 deg C

Electric Safety Parameter (Ui, Ii, Pi, Ci, Li)

- Ui = 30 Vdc
- Ii = 200 mA
- Pi = 0.9 W
- Ci = 27 nF
- Li = 104 uH

Compliance with Essential Health and Safety Requirements assured with:
EN 60079-0:2009
EN 60079-11:2007
EN 60079-26:2007

Safety Instructions: General

- Comply with the installation and safety instructions in the operating instructions.
- Staff must meet the following conditions for mounting, electrical installation, commissioning and maintenance of the device:
  - Be suitable qualified for their role and the tasks they perform
  - Be trained in explosion protection
  - Be familiar with national regulations
- Install the device according to the manufacturer's instruction and national regulations
- Only use the device in media to which the wetted materials have sufficient durability.
- Avoid electrostatic charging:
  - Of plastic surface (e.g. housing, sensor element, special varnishing, attached additional plates,...)
  - Of isolated capacities (e.g. isolated metallic plates)

Safety Instructions: Special Conditions

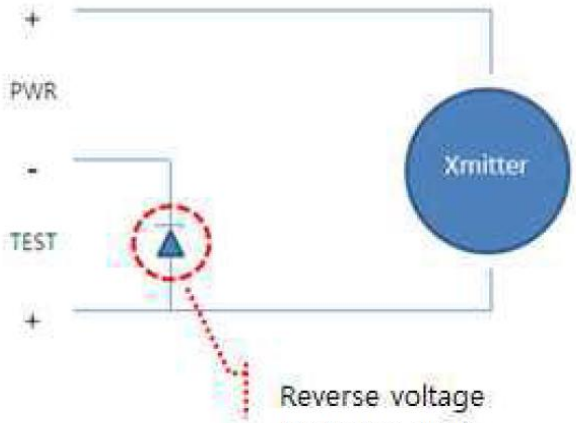
The non-metallic parts incorporated in the enclosure of this equipment may generate an ignition capable level of electrostatic charge. Therefore, particularly when it is used for application that specifically require Group IIC, EPL Ga equipment, the equipment shall not be installed in a location where the external conditions can result in the build-up of electrostatic charge on such surfaces. Additionally, the equipment shall only be cleaned with a damp cloth.

Models with enclosures made of aluminium (ASTM B85) are considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction. Particularly, it must not be used for applications that specifically require EPL Ga equipment.
The insulation between the intrinsically safe circuit and the frame of the equipment is not capable of withstanding a 500 V dielectric strength test as defined in clause 6.3.12 of EN 60079-11:2007. This shall be taken into account during installation.

Note	- There are two cable entries. User shall select one of them to wire the cable. - Make sure to use a cable gland at one cable entry with sufficient protection category and suiting the outer cable diameter used. The second cable entry shall be blocked by using a conduit plug or any other parts. - For hazardous area usage, the choice of cable gland should suit the application and fulfill the corresponding certification requirements & end user's requirement.

INSTALLATION

◈ Wiring is to be carried out only by qualified staff.
◈ The power supply voltage limits shall not be exceeded.
◈Maintenance and repair should be isolated by power supply and any pressure.
◈Wiring methods and length of cable of power supply cable and ground cable should be considered by proper Ex condition.
◈ Transmitter has the 'reverse polarity protection diode' in order to prevent failure in the field while wiring +, - power supply voltage. However if the wiring is not performed correctly or wrong terminals on rear terminal board are used for power supply, the transmitter may malfunction.



(Diagram of control flow)

◈ Any additional part or accessory connected to transmitter shall have correct approval certificate to comply with the given Ex/ Non-Ex requirement. Cable gland, connector, adapter or any other connection used shall have the appropriate certification/ approval for use with the transmitter
◈ Additional electrical connection parts shall only be plugged by suitable plugs.
◈ Grounding of housing shall follow the "Local Electrical Codes". For grounding a wire cross section of at least 4 mm^2 is recommended.
◈Any cable grand must be approved by Ex condition in hazardous area.
◈Connecting point of any joint (thread) parts should be followed by IEC 60079-1, 5.3 clause.

◈ **Housing Grounding**

- Internal Ground Connection: Open rear cover on transmitter, the ground bolt is located inside with grounding mark ⏚
- External Ground Assembly: On the left side of transmitter, there is a bolt for ground with grounding mark (for grounding use a cable lug).
- Housing Rotation hexa screw bolt shall be screwed tightly in order to hold the position of transmitter.

◇ Compliance for intrinsically safety is ensured only if the intrinsically safe safety barrier complies with safety parameters as provided in the relevant ATEX certification

◇ To comply with intrinsic safe system concept, the transmitter is connected with the safety barrier in a loop (see chapter 6.7. Wiring).
◇ To assure an Intrinsic Safety System, the transmitter and barrier must be wired in accordance with the barrier manufacturer's field wiring instructions and the applicable circuit diagram.

NOTE Note	The entity concept allows interconnection of intrinsic safe apparatus to associated apparatus not specifically examined in combination as a system.

◇ The approved value of open circuit max. voltage Uo, max. short circuit current Io and max. power Po in associated equipments are should be less than or equal for max. safe input voltage Uo, max. input current Ii and max. safe power Pi of the transmitter with Ex ia.
◇ The approved value of max. capacitance Co in associated equipments should be bigger than total value of capacitance Ci in transmitter with Ex ia + cable capacitance in associated equipment.
◇ The approved value of max. inductance Lo should be bigger than total value of inductance Li in transmitter with Ex ia + cable inductance in associated equipment.

Equip with Ex ia	Comparison	Associated Equipment
Ui = 30 VDC	≥	Uo
Ii = 200 mA	≥	Io
Pi = 0.9 W	≥	Po
Ci = 27 nF	<	C_o
Li = 104 uH	<	L_o

Operating

◇ Do not open or disassemble of the transmitter in Ex area or while operating.
◇ Do not make any spark in Ex area with Kobold transmitters.

NOTE Note	External load resistance includes the safety barrier resistance for intrinsic safety device.

4.11 Notes on the machine and pressure equipment directive

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

As per PED 2014/68/EU

"Pressure gauges with a volume ≤ 0.1 L"
In acc. with Article 4 Paragraph (3), "Sound Engineering Practice", of the PED 2014/68/EU no CE mark.

Diagram 2
Vessels referred to in Article 4(1)(a)(i), second indent

5. Transmitter Functions

5.1 Overview

This Chapter contains information on operating Model PAD. Tasks that should be performed on the bench prior to installation are explained in this chapter.

5.2 Safety Message

Procedures and instructions in this chapter may require special precautions to ensure the safety of the personal performing the operations. Information that raises potential safety issues is indicated by warning symbols. Refer to the following safety messages before performing an operation preceded by these symbols.

5.3 Warning

Danger	Explosion can result in death or serious injury: - Do not remove the transmitter covers in explosion environments when the circuit is alive. - Transmitter covers must be fully engaged to meet explosionproof requirements.

Warning	Electrical shocks can result in death serious injury: - Only qualified & trained personnel should be allowed to operate these transmitters.

Warning	Electrical shocks can result in death serious injury: - Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

5.4 Fail Mode Alarm

Kobold Smart Pressure Transmitter automatically and continuously performs self-diagnostic routines. If the self-diagnostic routines detect a failure, the transmitter drives its output outside of the normal saturation values. The transmitter will drive its output low (down) or high (up) based on the position of the failure mode alarm jumper. See Table 4.1 for Output values.

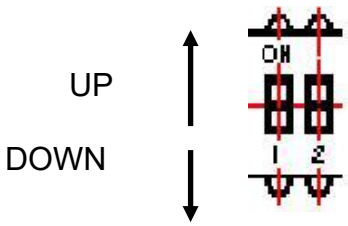
[Table 4-1 Standard Alarm and Saturation Value]

Level	4~20 mA Saturation	4~20 mA Alarm
Low/Down	3.9 mA	≤ 3.75 mA
High/Up	20.8 mA	≥ 21.75 mA

Fail Mode Selection (Fail High/UP or Low/DOWN) can be configured using the appropriate jumper switch provided on the LCD Module or DIP switches included on the Main CPU Module. For units provided with a LCD module one can select desired fail safe mode directly from the jumper switch included in the front display and this setting overrides the DIP settings on the back-end Main CPU module, provided the DIP switch “2” on CPU module is DOWN. If DIP switch “2” on CPU module is UP, this setting overrides the jumper setting on LCD module. Default setting from the factory is “Fail Down” (DIP Switch “2” on CPU Module is DOWN). However, in case of blind units please select your required DIP switch settings from the DIP switch labelled (2) marked on the Main CPU board. Recommended jumper & DIP settings are listed in the table below for ready reference.

Select Fail Mode	Both LCD Module and CPU Module		Only CPU Module
	CPU Module	LCD Module	CPU Module
Fail Down	Down	D	D
Fail Up	Down	U	U
	Up	U or D	

< Fail Mode Selection DIP Switch of CPU Module >

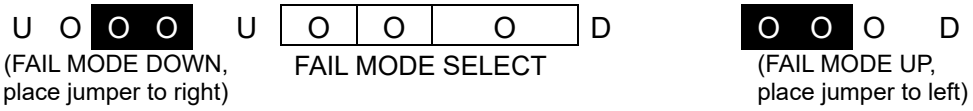


1. WR_EN (EEPROM Write Enable)
   DOWN : ENABLE CONFIGURATION CHANGES
   UP : DISABLE/ LOCK CONFIGURATION CHANGES
2. Fail Mode(Alarm)
   DOWN : LOW
   UP : HIGH

NOTE Note	DIP Switch (1) shown on Left in Fig 4-1 is for Write Enable/ Disable selection. DIP switch (2) shown on right in Fig 4-1 is for Fail Mode.

(Figure 4-1. Fail Mode and EEPROM-Write Selection DIP Switch)

< Fail Mode Selection Jumper Switch of LCD Module >



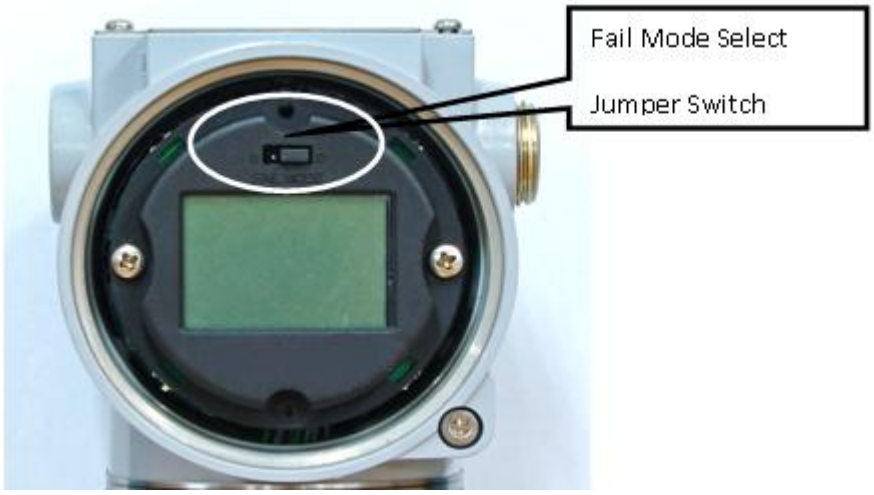


Figure 4-2 Fail Mode Selection Jumper Switch of LCD Module

5.5 EEProm-Write Enable / Disable Mode Switch

PAD includes an EEPROM (Electrically Erasable Programmable Read Only Memory) that allows saving and restoring various configuration data within the transmitter on power failure. To lock configuration and protect changes to stored configuration data, one can use a HHC and or external HART® enabled PC device to enable a software lock feature under Status menu. Optionally for security lock on hardware side there is a Write-Protect Mode DIP Switch (1) on the Main CPU Module placed right next to the Fail Safe Mode switch (2). If you push DIP switch to UP you can lock out users from making any changes to configuration data through push buttons and/ or remote HHC already saved in the EEPROM. Alternatively, when you push DIP Switch (1) to DOWN you can allow changes made to configuration data in EEPROM. Default state from factory (including with NO Jumpers) installed is EN (enable configuration changes).

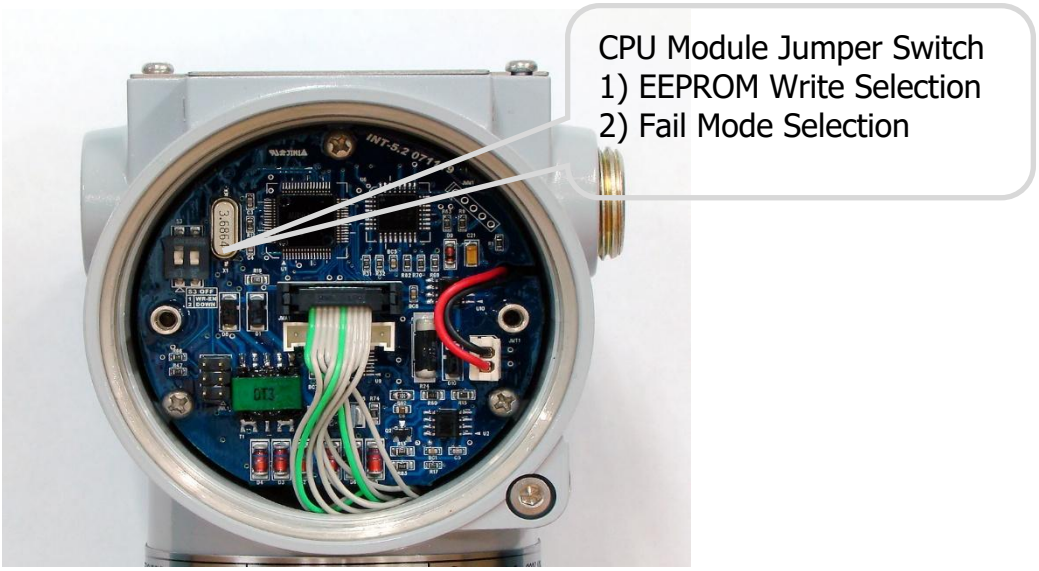


Figure 4-3. CPU Module Fail Mode, EEPROM-Write Selection Jumper Switch

NOTE Note	DIP Switch (1) shown on Left in Fig 4-1 is for Write Enable/ Disable selection. DIP switch (2) shown on right in Fig 4-1 is for Fail Mode.

5.5.1 Security

To quickly summarize there are two options available to implement configuration security lock out within the PAD. These include:

(1) DIP settings on CPU Board

(2) Physically removing Zero and Span Magnetic Buttons from Transmitter thereby restricting local access to push button menus. This option will still allow changes via a remote HHT or HART® enabled configurator.

5.5.2 Zero and Span Magnetic Push Buttons

To access push buttons please remove top name plate to expose the magnetic style push buttons labelled zero/ span. To disable please unscrew and remove these push buttons.

5.6 Configuration of Alarm and Security Jumper Procedures

To change Jumper/ DIP switch position in field:
(1) If transmitter is already wired and installed, cut off power.
(2) Open the housing front side covers.

Warning	In hazardous areas DO NOT open the covers of Transmitter when power is energized as this can create a potentially dangerous situation. Always kill power and de-energize the transmitter prior to opening front OR back covers in a hazardous location.

(3) Adjust required jumper/ DIP position as detailed in section 5.4 & 5.5 above.
(4) Close the housing covers. You must fully engage all cover threads to ensure compliance to explosion proof requirements (see chapters 4.10 and 6 for type approvals and installation precautions)

5.7 Configuration Using Zero and Span Push Buttons

There are ZERO and SPAN Buttons to be seen when the nameplate is opened (Figure 4-4). You may reconfigure the function settings of ZERO, SPAN, ZERO TRIM, ZERO ADJ, Units, Range, Damping, LCD and Decimal place, using ZERO / SPAN buttons.

[Figure 4-4 Transmitter Zero/Span configuration Buttons]

(a) Unscrew both name plate screws on upper part of transmitter.
(b) Flip the name plate to access Zero and Span Buttons. (Figure 4-4)

Note	Do not fully unscrew all screws in order not to lose them.

5.7.1 Advance Configuration via Push Buttons

The advanced “smart” functions which can be initiated using ZERO / SPAN Buttons are shown below. This includes re-ranging of transmitters (Set URV/LRV) without an external pressure source.

To access advanced configuration and enter programming menu press both (Zero + Span) buttons simultaneously for 3 seconds. When display reads “MENU” release both push buttons immediately. This will put user into top of main programming menu indicated by message “1-TRIM” on display. To navigate through Main Menus and/ or Sub-Menus:

(1) Use (Zero) button to scroll down a menu (or sub-menu if active). Example: Press (approx. 3 sec. (Option “V” approx. 1 sec.))/ Release (Zero) to scroll down from Main Menu 1-Trim> 2-Setup > 3-LCD>1-Trim > 2-Setup etc. Or from an active sub-menu press/ release (Zero) to scroll down within a sub menu Example 21-Units> 22-URL > 23-LRL > 24-Damping > 21-Units > 22-URL etc.

(2) Use (Span) button to enter into a specific Sub Menu or data input function. Example: Pressing (approx. 3 sec. (Option “V” approx. 1 sec.)) (Span) button from Main Menu <1-TRIM> will put user into Sub menu “11 ZERO TRIM”. Releasing and Pressing (Span) button again will initiate Zero Trim configuration OR Releasing and Pressing (Zero) button instead will increment user down to submenu “12 Z- ADJ”

(3) Within an active sub-menu use of (Span) button also acts as an <enter> key to allow user to save changes and exit programming mode.

(4) For moving back to previous menu press (Zero + Span) button together. During numeric value entry mode use (Zero + Span) button together to save numeric data inputted and exit from programming menu. See 5.7.3.3 below.

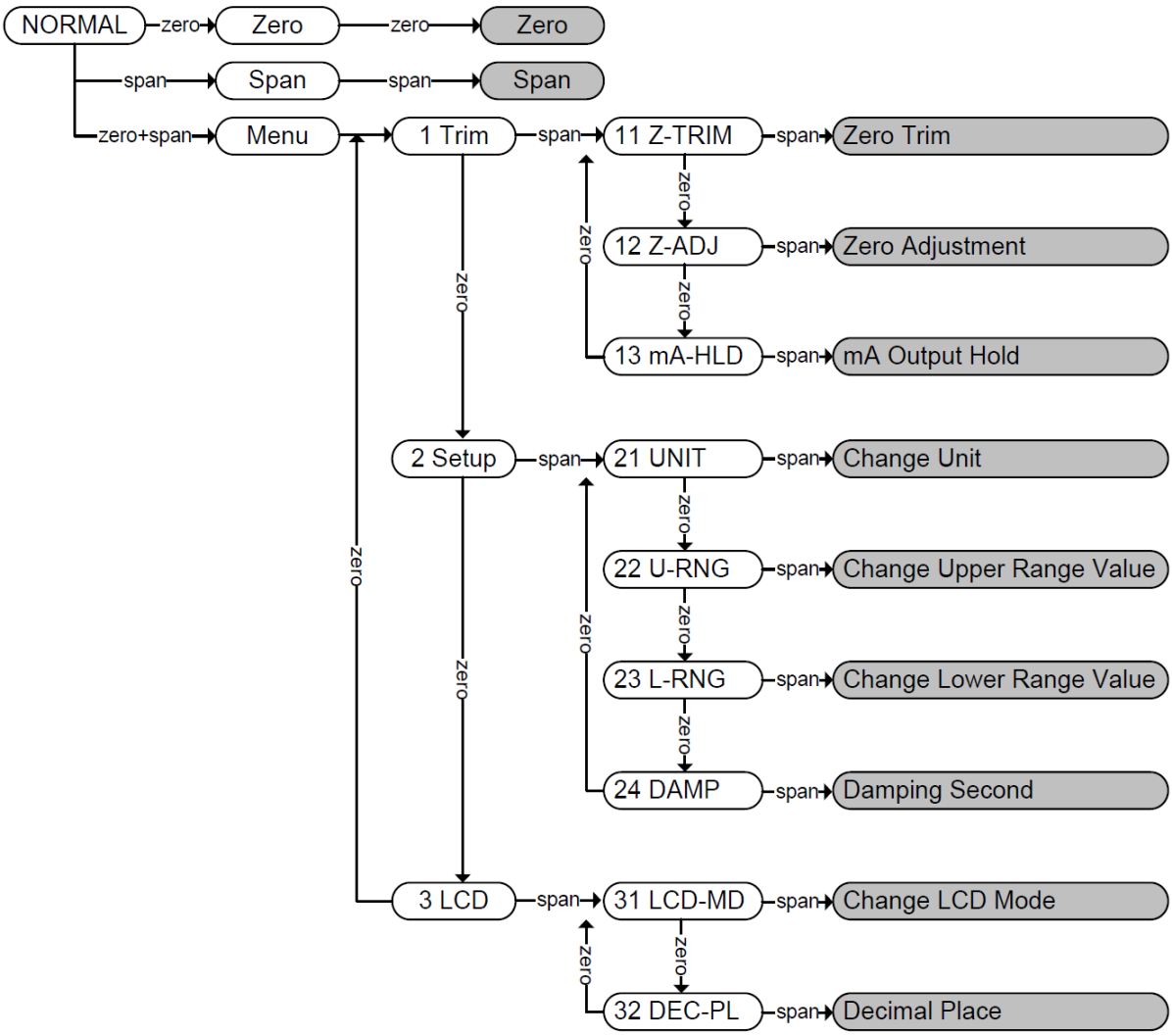
Note	After 30 seconds inactivity the automatic time out feature will default user back to normal measurement mode with a “BT-Err” message on display. Please refer to Appendix 1 for LCD display messages and the button errors.

5.7.2 Button functions and Purpose

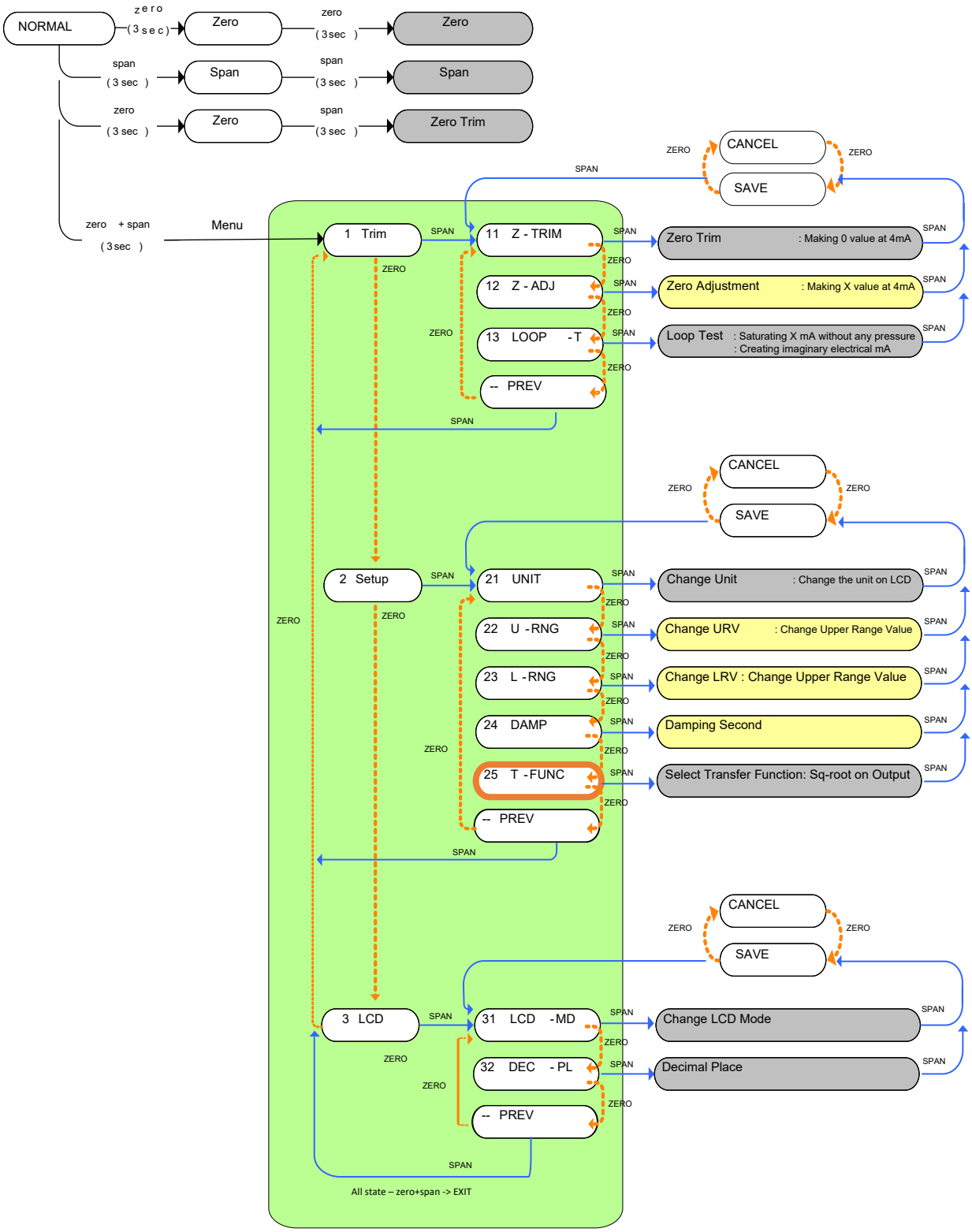
Grey colour parts in the following menu tree in section 5.7.3

Function	Purpose	Remark
Zero	Sets the current process value for Lower Range Value (4 mA)	
Span	Sets the current process value for Upper Range Value (20 mA)	
Zero Trim	To modify exact “zero shift” to compensate for the mounting position	
Zero Adjustment	allows user to add a pre-defined offset (other than zero) to measured PV	
Loop Test	Saturating X mA without any pressure: Creating imaginary electrical mA	
Change Unit	To modify units as user desires	
Change Upper Range Value	To modify upper range value as user desires	
Change Lower Range Value	To modify lower range value as user desires	
Select Transfer Function	To select Sq-root on Output	Only for Option “V”
Damping Second	Modifies damping setting based on the required response time, signal stability, and other requirements of the loop dynamics of your system	
Change LCD Mode	To modify LCD Mode as user desires	
Decimal Place	To modify decimal place as user desires	

5.7.3 Menu Tree of ZERO/ SPAN Button Functions



Menu Tree of ZERO/SPAN Button Functions (Option “V”)



MENU AREA

5.7.3.1 Zero Configuration

- Sets the current process value for Lower Range Value (4 mA).
- Apply zero value pressure for 10 seconds and press ZERO button over 3 seconds. The LCD should display “ZERO”. After checking this message, remove finger from the button.
- After 1 second, push the Zero button for 3 seconds. The LCD should display “-ZR-“. This message means that the Zero configuration is completed and saved.
- If Zero Configuration was incorrectly performed the LCD will display error code “ZR-ERR” indicating failure and possible LRV setting out of sensor range capabilities. Try repeating the Zero configuration steps.

5.7.3.2 Span Configuration

- Sets the current process value for Upper Range Value (20 mA).
- Apply the desired pressure for 10 seconds and press SPAN button over 3 seconds. The LCD should display “SPAN”. After checking this message, remove finger from the button.
- After 1 second, push the Span button for 3 seconds. The LCD should display “-SP-“. This message means that the Span configuration is completed and saved.
- If the Span configuration was incorrectly performed the LCD will display error code “SP-ERR” indicating failure and possible URV setting out of sensor range capabilities. Try repeating the Span configuration steps.

5.7.3.3 STEPS TO INPUT NUMERIC DATA VALUE:

Specific functions that need users to input a numerical value are found in following sub-menus:
12 Zero Adjustment,
22 Change Upper Range Value,
23 Change Lower Range Value,
24 Damping Second

First time users should familiarize themselves with numeric value input sequence prior to accessing above sub menus. Due to limited flexibility with only 2 push buttons
available for configuration, it is not possible to directly input numeric values within these sub-menus. Instead, the correct sequence requires user to first set an increment (10x) rate e.g. 0.01, 0.1, 1.0, 10. 100, 1000 etc and then proceed with changing numeric value by the set rate increment.
For example, to input a numeric value as “3810” from existing displayed value of “0000”:

->First Set increment rate as “1000”
->Increase display “0000” value 3 times in steps of 1000 till it reads “3000”
->Then set increment rate again as “100”
->Increase 8 times in steps of 100 till display reads “3800”
->Set increment rate again as 10
->Increase 1 time for a step change of 10 till display reads 3810.

This section outlines the push button sequence for facilitating direct numeric value input from following sub-menus:
“12 Zero Adjustment”, “22 Change Upper Range Value”,
“23 Change Lower Range Value” and “24 Damping”.

When activating these sub-menus (by pushing down & releasing (span) button from within its active menu) the display will automatically prompt for “SEL INC” message.

From here:

(a) To select an increment rate push down on (Zero) button when “SEL INC” Message is displayed on LCD sub-menu. Release (Zero) button when display value changes.
Each subsequent (Zero) push-release key stroke will shift display decimal point to left. Example when display shows “SEL INC” 1000. Subsequently for every push release keystroke of (Zero) button the display will cycle from >100>10>1>0.1>0.01>100>10 etc

(b) Once desired “SEL INC” (0.1, 1, 10, 100 etc) increment rate is set push the (Span) button to accept and enable set numeric “VALUE” mode.

Note	When executing (Span) button from “SEL INC” menu the LCD display will typically show the last saved numerical value along with a “VALUE” message on second line indicating that user can now initiate changes by incrementing or decrementing numeric value.

(c) From within “VALUE” menu pushing down on either (Zero) OR (Span) button (not both) will allow the numeric value to increment (Zero) or decrement (Span) by the “SEL INC” value selected by user in the previous step (b).

(d) After desired numeric value is displayed, push down on (Zero + Span) buttons together to accept new data inputted and this will bring user back to <SEL INC> menu. Step (a) screen above.

(e) Repeat steps (a) through (c) detailed above until the final numeric value required is displayed in “VALUE” Menu.

(f) To store final numeric value to EEProm push (Zero + Span) button twice to save and exit. Note pressing Zero + Span once from “VALUE” menu will bring user back to “SEL INC” menu step (a). However, pressing (Zero + Span) buttons together second time (from “SEL INC” menu) and releasing these buttons, when screen shows “INC OK” message, will save the last numeric value inputted and brings the user back to Measurement Mode.

(g) If the programming sequence is successful, the display will read –DONE- else “BR-ERR” to indicate failure. If display shows “RANGOVR” it indicates numerical value inputted is out of specs.

5.7.4 Push Button sequence for each Programming Sub-Menu

5.7.4.1 ZERO TRIM (Sub Menu 11)

- Enter programming menu by pushing both (ZERO+SPAN) buttons together for 3 seconds. Release buttons when LCD displays MENU and display will automatically change to “1 TRIM” confirming access into programming menu.
- Access “Zero Trim” Function by pressing the SPAN button until “11 Z-TRIM” message appears.
- To save the settings, press SPAN button again until “-TR-“message appears.

Note	Make sure process input to transmitter is at true zero else this may create an incorrect Zero Offset. If a wrong zero is suspected please execute Zero Trim again ensuring the proper steps & correct Zero PV input is applied to transmitter.

5.7.4.2 ZERO ADJUSTMENT (Sub Menu 12)

- **Example used to show changing the PV value as 14**
  - Enter programming menu by pushing both (ZERO + SPAN) buttons together for 3 seconds. Release buttons when LCD displays MENU and display will automatically change to “1 TRIM” confirming access into programming menu.
  - Access Zero Trim Function by pressing the SPAN button until “11 Z-TRIM” message appears.
  - Press ZERO button until the “12 Z-ADJ” message appears.
  - Press SPAN button to access the “Zero Adjustment” function.
  - When the “SEL INC” message appears, press ZERO button repetitively until LCD value changes to 10.0. Select it as increment rate by pressing SPAN button.
  - When “VALUE” message appears on display, increment forward (Zero) or decrement backward (Span) to set the LCD value to “10.0”. You will note the LCD display will increment or decrement by factor of 10 which is the “SEL INC” value selected in previous menu. Once desired base value of “10” is displayed push (Zero + Span) button to accept new value and “SEL INC” message appears upon which release buttons.
  - From menu where “SEL INC” message appears again, change the LCD value to 1.0 by pushing (Zero) button once and then push (Span) button to enter input “VALUE” menu.
  - Here push (Zero) or (Span) to increment or decrement by SEL INC (1) until display reads “14”. Push (Zero + Span) button after LCD value is changed to 14.0 and release both buttons when display reads “SEL INC”.
  - To save the numeric value of 14 set from previous steps push ZERO + SPAN buttons until the “IN_OK” message appears.
  - Release ZERO + SPAN buttons. Message “ZA” confirms that Zero Adjustment is finished.
  - If display shows “BT-ERR” instead of –ZA- please repeat all steps once again.
  - If display shows “ADJ-U” or “ADJ-L” the inputted numerical value is out of specs for zero adjustment range for the supplied range codes.

LOOP TEST (not on all firmware versions):
Fix the 4-20mA Loop current output to a specific value (Sub Menu 13)

(a) Press ZERO and SPAN button together to access menu.
(b) When LCD shows “1 TRIM”, press SPAN button to enter sub-menu.
(c) When LCD shows “11 Z-TRIM”, press ZERO button and scroll to next menu.
(d) When LCD shows “12 Z-ADJ”, press ZERO button and scroll to next menu.
(e) When LCD shows “13 LOOP-T”, press SPAN button to run Loop Test.
(f) In Loop Test function, the following available modes are shown on the second line of LCD display.

Display	Description
OFF	Loop Test is deactivated, and the corresponding current of the measured PV is shown.
mA-HDL	The output current becomes a fixed output.
4 mA, 8 mA, 12 mA, 16 mA, 20 mA	Each selected current value becomes fixed output.
OTHER	The current entered by user becomes a fixed output. Select “OTHER”, and press SPAN button. Then input a numeric value to fix the current.

(g) Every single pressing of the ZERO button will scroll available modes. Select the desired mode and press SPAN button to configure the value.
(h) When LCD shows “SAVE”, press SPAN button to save configuration.
(i) Once the current is fixed, the current value will not change despite any change to the measured value or parameter, and such configuration will be maintained until this function is terminated via the above procedure, or the power supply is disconnected. Once the current is fixed via Loop Test function, LCD display will show “LOOP”, and the current output shall be maintained.

5.7.4.3 CHANGE UNITS (Sub-Menu 21)

- Enter programming menu by pushing both (ZERO+SPAN) buttons together for 3 seconds. Release buttons when LCD displays MENU and display will automatically change to “1 TRIM” confirming access into programming menu.
- Move to the next menu by pressing ZERO button until the “2 SETUP” message appears.
- Press SPAN button to access 21 UNIT, press SPAN button to access function of “Change Unit”. To execute this function push SPAN button. Release button when display changes to 211 (xxx) where “ xxx “ are the last units (e.g. bar, kpa, “H2O etc) saved previously.
- Press ZERO button repetitively until the desired unit is displayed on the bottom of the LCD. Save and exit by pressing (Span) button.

5.7.4.4 CHANGE Upper Range Value (Sub-Menu 22)

- Enter programming menu by pushing both (ZERO + SPAN) buttons together for 3 seconds. Release buttons when LCD displays MENU and display will automatically change to “1 TRIM” confirming access into programming menu.
- Move to the next menu by pressing ZERO button until the “2 SETUP” message appears.
- Press SPAN button until the “21 Unit” message appears.
- Press ZERO button until the 22 U-RNG message appears.
- Press SPAN button to access function “Change Upper Range Value”.
- Follow Set numeric value procedure explained under section 5.7.3.3 to
- input desired URV numeric value.

5.7.4.5 CHANGE Lower Range Value (Sub-Menu 23)

- Enter programming menu by pushing both (ZERO + SPAN) buttons together for 3 seconds. Release buttons when LCD displays MENU and display will automatically change to “1 TRIM” confirming access into programming menu.
- Move to the next menu by pressing the Zero button until the “2 SETUP” message appears.
- Press SPAN button until the “21 Unit” message appears.
- Press ZERO button until the “23 L-RNG” message appears.
- Press SPAN button to access function “Change Lower Range Value”.
- Follow Set numeric value procedure explained under section 5.7.3.3 to input desired LRV numeric value.

Note	When setting URV/ LRV numeric data please ensure values being inputted fall within the allowed minimum/maximum specifications published for the installed sensor range code. Only if display shows –DONE- will the transmitter update its stored configuration & accept the new values. If out of limits the transmitter will reject values entered and default to previous saved values after displaying a “RNGOVR” error message.

5.7.4.6 CHANGE Damping Value (Sub-Menu 24)

- Enter programming menu by pushing both (ZERO + SPAN) button together for 3 seconds. Release buttons when LCD displays Menu and display will automatically change to “1 TRIM” confirming access into programming menu.
- Push (Zero) button when “1 TRIM” message appears on LCD. Release button when display changes to “2 SETUP”.
- To move into sub directory push (Span) button when “2 SETUP” message appears on display. Release button when 21 UNIT message is displayed.
- Push (Zero) button to move down to sub-menu 22. When display shows “22 U-RNG” release button.
- Push (Zero) button to move down to sub-menu 23. When display shows “23 L-RNG” release button.
- Push (Zero) button to move down to sub-menu 24. When display shows “24 DAMP” release button.
- You are now in Change Damping sub menu. To execute this function push (Span) button when “24-Damping” message appears on display. Release button when display changes to 241 (xxxx) when xxxx is last configured damping value saved.
- Follow Set numeric value procedure explained under section 5.7.3.3 to input desired URV numeric value.

Select TRANSFER FUNCTION (Option "V"):
Select transfer function for 4-20mA output (Sub-Menu 25)

(a) Press ZERO and SPAN button together to access menu.
(b) When LCD shows "1 TRIM", press ZERO button and scroll to next menu.
(c) When LCD shows "2 SETUP", press SPAN button to enter sub-menu.
(d) When LCD shows "21 UNIT", press ZERO button and scroll to next menu.
(e) When LCD shows "22 U-RNG", press ZERO button and scroll to next menu.
(f) When LCD shows "23 L-RNG", press ZERO button and scroll to next menu.
(g) When LCD shows "24 DAMP", press ZERO button and scroll to next menu.
(h) When LCD shows "25 T-FUNC", press SPAN button to run function.
(i) Repeat pressing ZERO button until the desired transfer function between "LINEAR" and "SQRT" is shown on LCD.
(j) When LCD shows the desired transfer function, press SPAN button to select transfer unit.
(k) When LCD shows "SAVE", press SPAN button to save configuration.

5.7.4.7 CHANGE LCD Mode (Cyclic or Fixed Display) (Sub-Menu 31)

- Enter programming menu by pushing both (ZERO + SPAN) button together for 3 seconds. Release buttons when LCD displays Menu and display will automatically change to "1 TRIM" confirming access into programming menu.
- Move to the next menu by pressing ZERO button until the "2 SETUP" message appears.
- Move to the next menu by pressing ZERO button until the "3 LCD" message appears
- Press SPAN button until "31 LCD-MD" message appears. Press SPAN button again to access function "LCD Multi-display".
- Press ZERO button repetitively until the desired display form is displayed on the bottom of the LCD (see table below for different options).

Message on LCD	Definition	Description	Remark
NOR_RO	Normal Rotation Mode	Indicating the value with PV, %, mA units as continually on LCD	
NOR_PV	Normal PV Mode	Indicating measured PV value only on LCD	
NOR_%	Normal Percent Mode	Indicating percentage of Cal. Range of measuring PV value on LCD	
NOR_mA	Normal mA Mode	Indicating 4 ~ 20 mA value depending on measured PV value on LCD	
ENG_RO	Engineering Rotation Mode	Indicating the value with Engineering PV, Engineering %, Engineering mA units as continually on LCD	
ENG_PV	Engineering PV Mode	Indicating changed PV value with modified Engineering range	

- To save the settings, press SPAN button. And indicating "DONE" message.

NOTE Note	Always select only one of NOR (normal) modes. Though it is possible to set ENG (engineering) modes also from this menu it is not recommended unless specific Engineering mode parameters such as engineering units, High/Low values, Linear/Sq-Root functions etc have been pre-configured either from factory (if specified on your order) or using an external HHC based configuration when available. With engineering mode enabled users have the added flexibility of configuring LCD display to emulate custom preferences separate from the transmitter current output functions. As such with engineering mode enabled users can program custom units, engineering units for flow, volume totals and level, scale different URV/LRV, linear mode etc independent of those explained in previous sections.

5.7.4.8 CHANGE LCD Resolution (Decimal Place) (Sub-Menu 32)

- Enter programming menu by pushing both (ZERO + SPAN) button together for 3 seconds. Release buttons when LCD displays MENU and display will automatically change to “1 TRIM” confirming access into programming menu.
- Move to the next menu by pressing ZERO button until the “2 SETUP” message appears.
- Move to the next menu by pressing the Zero button until the “3 LCD” message appears.
- Press the Span button until the “31 LCD-MD” message appears.
- Push (Zero) button to move down one sub menu and release button when “32- DEC-PL” message is displayed.
- Press the Span button to access function “Decimal Place”. All available resolution modes are listed in table below.
- Push Zero button to cycle through display options i.e. AUTO, 5-0, 4-1, 3-2, 2-3 and 1-4 and once desired resolution is displayed push SPAN to save and exit.

Display	Description	Max. Value
AUTO	Auto ranging of display	99999
5 - 0	No decimal place	99999
4 - 1	Display one decimal place	9999.9
*3 - 2	Display two decimal place	999.99
2 - 3	Display three decimal place	99.999
1 - 4	Display four decimal place	9.9999

*3-2 format will be displayed for mA and % regardless of any other setting.

- The set value will be applicable for displaying PV value and Engineering value.
- The LCD will display “LCD_OV” and current setting unit when the pressure exceeds the limit of the setting value.

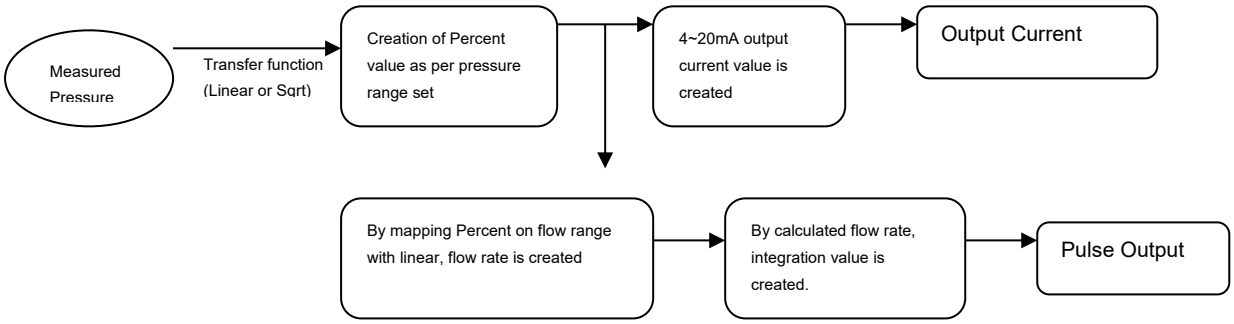
Please refer to Appendix 1 for LCD display message and the button errors.

5.8 Additional Functions (valid for PAD-F only)

5.8.1 Summary

The functioning of Flow Meter “Totaliser”:
The measured differential pressure corresponds to a specific flow range (programmed as “Flow rate LRV” and “Flow rate URV” in the programming menu). Example: 0...1200 mmH2O = 4...20 mA = 0...+100% = -30...+50 l/h (to be confirmed by the user while ordering))
The percentage of delta P thus determines the actual flow rate as the relationship between percentage delta P and flow rate is linear, e.g. +50%=+10 l/h.
By integrating the flow rate function with respect to time over a specific time span, flow totalisation value is determined.
By knowing the flow rate URV and choosing a pre-defined pulse scale (unit volume per pulse e.g. m3/pulse), the pulse duty cycle (pulses/sec) is calculated (see section 4.8.2.3 for an example).

	LRV	to	URV	Unit	Remark
Cal. Range	0	600	1200	mmH2O	Measuring Pressure
Percentage	0	50	100	%	% of Cal. Range
Flow Range	-30	10	50	l/h	Indicating value on LCD
Current Output	4	12	20	mA	Output signal value depending on Cal. Range



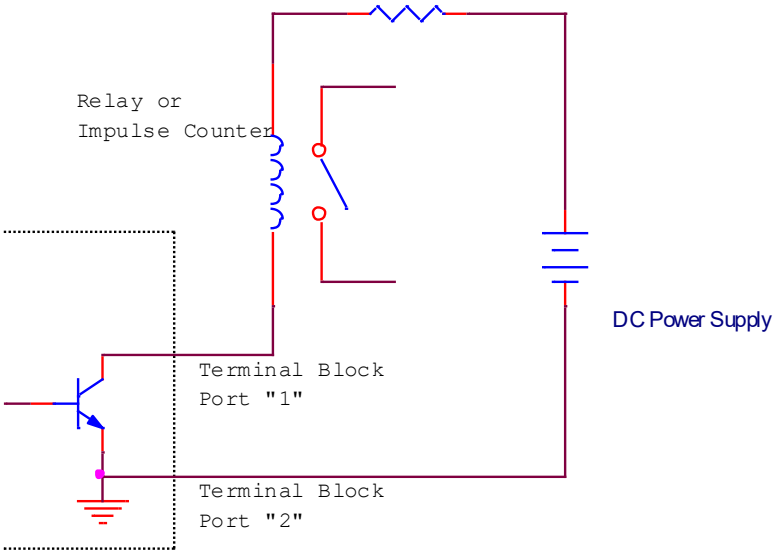
Note: PAD-F measures the flow rate by using differential pressure. It cannot compensate the changes in operating temperature and static pressure.

5.8.2 Pulse Output

5.8.2.1 The appearance and definition of port.

1: Pulse Output+, 2: Pulse Output-

5.8.2.2 Wiring Structure



[In case of operating external Relay or Counter]

5.8.2.3 Spec.

Scaled Pulse: A Single pulse is output for a specified flow amount.
Pulse Width: 10 ms, 50 ms, 100 ms selectable (Negative going pulse)
Duty Cycle: 49 Pulse/sec. Max.
Output Type: Open Collector, 30 V, 500 mA Max.

Duty_cycle = Flow_rate / (Pulse_Scale * Unit_Time[s])
Unit_Time = MIN:60, HOUR:3600, ….
Ex) Flow_rate : 17,640
Flow_rate_unit : normal cubic meter per hour
In case of Pulse_Scale : 0.1
Pulse Duty Cycle = 17,640 / (0.1 * 3600) = 49 [Pulse/sec]
Flow_rate = Duty_cycle * Pulse_Scale * Unit_Time[s]
Unit_Time = MIN:60, HOUR:3600, ….
Ex) Duty_cycle : 10
Flow_rate_unit : kilograms per minute
In case of Pulse_Scale : 1 …
Flow_rate = 10 * 1 * 60 = 600 kg/min

When pulse output is used, the most important thing is to check the above Duty_cycle, Flow_rate and Pulse_scale. The specification check of the system in which PAD-F pulse output will be input is also important. For examples, if the system to which PAD-F will be applied is used to measure the flow rate 0~20,000l/h and the Pulse_Scale is set to 0.1, Pulse Duty Cycle will be shown as follows.

Pulse Duty Cycle = 20,000 / (0.1 * 3600) = 55.55 [Pulse/sec].

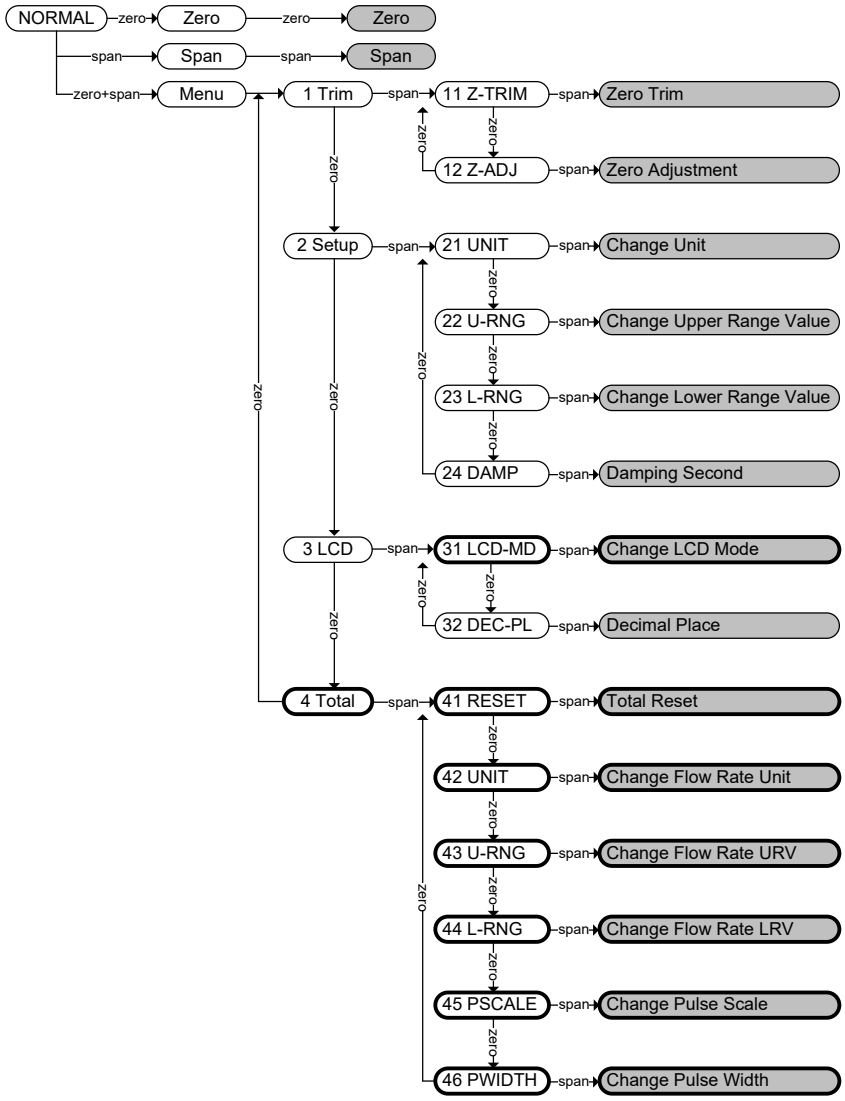
On the above result, the value exceeds the maximum Duty cycle (49Pulse/sec) PAD-F can output. In this case, Pulse_Scale must be set to 1 or more. If the system requires Pulse_Scale to be set to 0.1 or less, you can not use PAD-F. On the contrary, in case of the system that Duty_cycle is primarily decided, you need to calculate the Flow_rate and check it matches the value of system design.

If the pulse is beyond maximum Duty Cycle like the above case, the output pulse will be set to 49 Pulse/sec and “PLS-OV” mark will be shown on the LCD.

5.8.3 Button Input method

5.8.3.1 Changed function

Zero or Span function is executed in the same way it is done on the existing standard model.
In case you push Zero+ Span button for 3 seconds, Menu function is executed.



[Button input structure]

(1) Item movement between menus: Zero
(2) Movement to lower menus or function execution: Span
(3) Movement to Top menu: Zero+ Span

5.8.3.2 STEPS TO INPUT NUMERIC DATA VALUE:

Specific functions that need users to input a numerical value are found in following sub-menus:

12 Zero Adjustment
22 Change Upper Range Value
23 Change Lower Range Value
24 Damping Second
43 Change Flow Rate URV
44 Change Flow Rate LRV

First time users should familiarize themselves with numeric value input sequence prior to accessing above sub menus. For an example to demonstrate push button sequence for facilitating direct numeric value input, refer to section 4.7.3.3.

5.8.3.3 Push Button Sequence for each Programming Sub-Menu

5.8.3.3.1 ZERO TRIM (Sub Menu 11)

Refer to section 5.7.4.1

5.8.3.3.2 ZERO ADJUSTMENT (Sub Menu 12)

Refer to section 5.7.4.2

5.8.3.3.3 CHANGE UNITS (Sub-Menu 21)

Refer to section 5.7.4.3

5.8.3.3.4 CHANGE Upper Range Value (Sub-Menu 22)

Refer to section 5.7.4.4

5.8.3.3.5 CHANGE Lower Range Value (Sub-Menu 23)

Refer to section 5.7.4.5

5.8.3.3.6 CHANGE Damping Value (Sub-Menu 24)

Refer to section 5.7.4.6

5.8.3.3.7 CHANGE LCD Mode (Cyclic or Fixed Display) (Sub-Menu 31)

Refer to section 5.7.4.7. Following LCD Modes are available in addition to those described in section 5.7.4.7:

Message on LCD	Definition	Description	Remark
FL_RO	Flow Rotation Mode	Shows Flow Rate/ Totaliser/ PV values in rotation on LCD	
F_RATE	Flow Rate	Shows Flow Rate value on LCD	
FTOTAL	Flow Totaliser	Shows Flow Totaliser value on LCD	

5.8.3.3.8 CHANGE LCD Resolution (Decimal Place) (Sub-Menu 32)

Refer to section 5.7.4.8

5.8.3.3.9 Total Reset (Sub-Menu 41)

- Enter programming menu by pushing both (ZERO + SPAN) button together for 3 seconds. Release buttons when LCD displays MENU and display will automatically change to “1 TRIM” confirming access into programming menu.
- Move to the next menu by pressing ZERO button until the “2 SETUP” message appears.
- Move to the next menu by pressing the ZERO button until the “3 LCD” message appears.
- Move to the next menu by pressing the ZERO button until the “4 TOTAL” message appears.
- Press the Span button until the “41 RESET” message appears.
- Press the Span button reset the accumulated total value to “0”.

5.8.3.3.10 Change Flow Rate Unit (Sub-Menu 42)

- Enter programming menu by pushing both (ZERO + SPAN) button together for 3 seconds.
- Release buttons when LCD displays MENU and display will automatically change to “1 TRIM” confirming access into programming menu.
- Move to the next menu by pressing ZERO button until the “2 SETUP” message appears.
- Move to the next menu by pressing the ZERO button until the “3 LCD” message appears.
- Move to the next menu by pressing the ZERO button until the “4 TOTAL” message appears.
- Press the Span button until the “41 RESET” message appears.
- Push (Zero) button to move down one sub menu and release button when “42 UNIT” message is displayed.
- Press SPAN button to access function of “Change Flow Rate Unit”. To execute this function push SPAN button. Release button when display changes to “xxx” where “xxx“ are the last flow units saved previously.
- Press ZERO button repetitively until the desired Flow Rate Unit is displayed on the bottom of the LCD.
- Save and exit by pressing (Span) button.

5.8.3.3.11 Change Flow Rate URV (Sub-Menu 43)

- Enter programming menu by pushing both (ZERO + SPAN) button together for 3 seconds.
- Release buttons when LCD displays MENU and display will automatically change to “1 TRIM” confirming access into programming menu.
- Move to the next menu by pressing ZERO button until the “2 SETUP” message appears.
- Move to the next menu by pressing the ZERO button until the “3 LCD” message appears.
- Move to the next menu by pressing the ZERO button until the “4 TOTAL” message appears.
- Press the Span button until the “41 RESET” message appears.

- Push (Zero) button to move down one sub menu and release button when “42 UNIT” message is displayed.
- Push (Zero) button to move down one sub menu and release button when “43 U-RNG” message is displayed.
- Press SPAN button to access function “Change Upper Range Value”.
- Follow Set numeric value procedure explained in section 5.7.3.3 to input desired Flow Rate URV numeric value equivalent to 100% of pressure (20mA).

5.8.3.3.12 Change Flow Rate LRV (Sub-Menu 44)

- Enter programming menu by pushing both (ZERO + SPAN) button together for 3 seconds.
- Release buttons when LCD displays MENU and display will automatically change to “1 TRIM” confirming access into programming menu.
- Move to the next menu by pressing ZERO button until the “2 SETUP” message appears.
- Move to the next menu by pressing the ZERO button until the “3 LCD” message appears.
- Move to the next menu by pressing the ZERO button until the “4 TOTAL” message appears.
- Press the Span button until the “41 RESET” message appears.
- Push (Zero) button to move down one sub menu and release button when “42 UNIT” message is displayed.
- Push (Zero) button to move down one sub menu and release button when “43 U-RNG” message is displayed.
- Push (Zero) button to move down one sub menu and release button when “44 L-RNG” message is displayed.
- Press SPAN button to access function “Change Lower Range Value”.
- Follow Set numeric value procedure explained in section 5.7.3.3 to input desired Flow Rate LRV numeric value equivalent to 0% of pressure (4mA).

5.8.3.3.13 Change Pulse Scale (Sub-Menu 45)

- Enter programming menu by pushing both (ZERO + SPAN) button together for 3 seconds.
- Release buttons when LCD displays MENU and display will automatically change to “1 TRIM” confirming access into programming menu.
- Move to the next menu by pressing ZERO button until the “2 SETUP” message appears.
- Move to the next menu by pressing the ZERO button until the “3 LCD” message appears.
- Move to the next menu by pressing the ZERO button until the “4 TOTAL” message appears.
- Press the Span button until the “41 RESET” message appears.
- Push (Zero) button to move down one sub menu and release button when “42 UNIT” message is displayed.
- Push (Zero) button to move down one sub menu and release button when “43 U-RNG” message is displayed.
- Push (Zero) button to move down one sub menu and release button when “44 L-RNG” message is displayed.

- Push (Zero) button to move down one sub menu and release button when “45 PSCALE” message is displayed.
- Press SPAN button to access function “Change Pulse Scale”.
- You could set numerical value for 1 pulse output (available options: 0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000). The set numerical value has same “Units” as programmed for flow rate.
- Push Zero button to cycle through display options and once desired value is displayed, push SPAN to save and exit.

5.8.3.3.14 Change Pulse Width (Sub-Menu 46)

- Enter programming menu by pushing both (ZERO + SPAN) button together for 3 seconds.
- Release buttons when LCD displays MENU and display will
- automatically change to “1 TRIM” confirming access into programming menu.
- Move to the next menu by pressing ZERO button until the “2 SETUP” message appears.
- Move to the next menu by pressing the ZERO button until the “3 LCD” message appears.
- Move to the next menu by pressing the ZERO button until the “4 TOTAL” message appears.
- Press the Span button until the “41 RESET” message appears.
- Push (Zero) button to move down one sub menu and release button when “42 UNIT” message is displayed.
- Push (Zero) button to move down one sub menu and release button when “43 U-RNG” message is displayed.
- Push (Zero) button to move down one sub menu and release button when “44 L-RNG” message is displayed.
- Push (Zero) button to move down one sub menu and release button when “45 PSCALE” message is displayed.
- Push (Zero) button to move down one sub menu and release button when “46 PWIDTH” message is displayed.
- Press SPAN button to access function “Change Pulse Width”.
- Choose one Output Pulse Width from among 10ms, 50ms, 100ms. Push Zero button to cycle through display options and once desired value is displayed, push SPAN to save and exit.

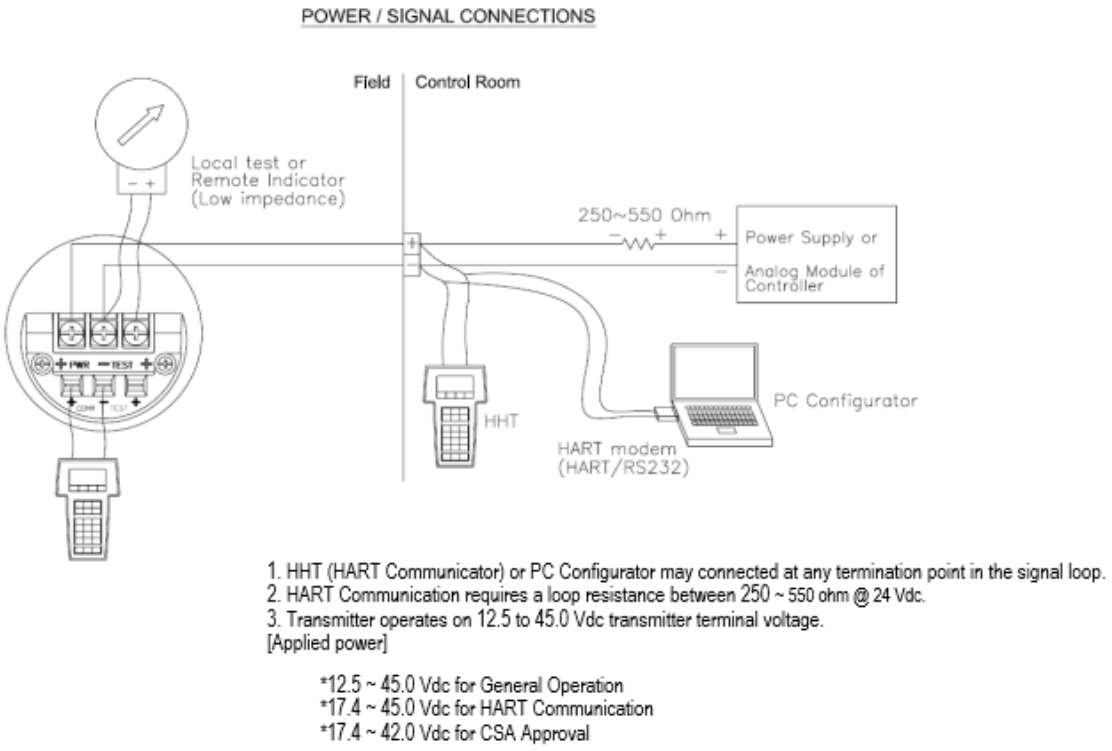
5.9 Wiring Connections for External HHT/ Ammeter

PAD Pressure Transmitter can also be commissioned using a HART® enable HHT or PC configurator either before or after installation. A complete commissioning consists of configuring and/ or verifying transmitter configuration data, testing the transmitter, testing the loop and zero trimming.
For hazardous area installation to avoid exposure of “live” electronic circuits in field it is recommended that all Jumper settings of transmitter (Fail safe, write disable etc) be done in the shop prior to moving the transmitter on to field installation.

NOTE	Test pins can be used to connect an Ampere meter for measuring output current without disconnecting loop connections or for connecting a remote indicator. You cannot initiate HART® digital communication if connecting a HHT directly across "TEST" pins. Use terminals marked communication for connecting an external HART® MASTER. You must ensure a minimum of

Note	250~550 ohm resistance in Current Loop for any HART® Communication or PC configurator to work. If needed connect a 250 ohm resistor in loop to enable digital communications. Also, for correct operation of a 4~20 mA loop, required power supply (12.5 V ~ 45 Vdc) must be provided at supply inputs marked (+) and (-).

[Figure 4-5 Connection the transmitter to HHT]



6. Installation

6.1 Overview

The information in this chapter covers installation considerations. Dimensional drawings for Model PAD variation and mounting configuration are included in this chapter.

6.2 Safety Message

Procedures and instructions in this chapter may require special precautions ensure the safety of the personnel performing the operation. Information that raises potential safety issues is indicated by warning symbols. Refer to the following safety messages before performing an operation proceeded by these symbols.

6.3 Warning

Danger	Explosion can result in death or serious injury (see chapters 4.10 and 6 for type approvals and installation precautions): - Do not remove the transmitter covers in hazardous locations when the circuit is live. - Transmitter covers must be fully engaged to meet explosion proof approval requirements.

Warning	Electrical shock can result in death serious injury: - Only qualified & trained personnel should be allowed to operate these transmitters.

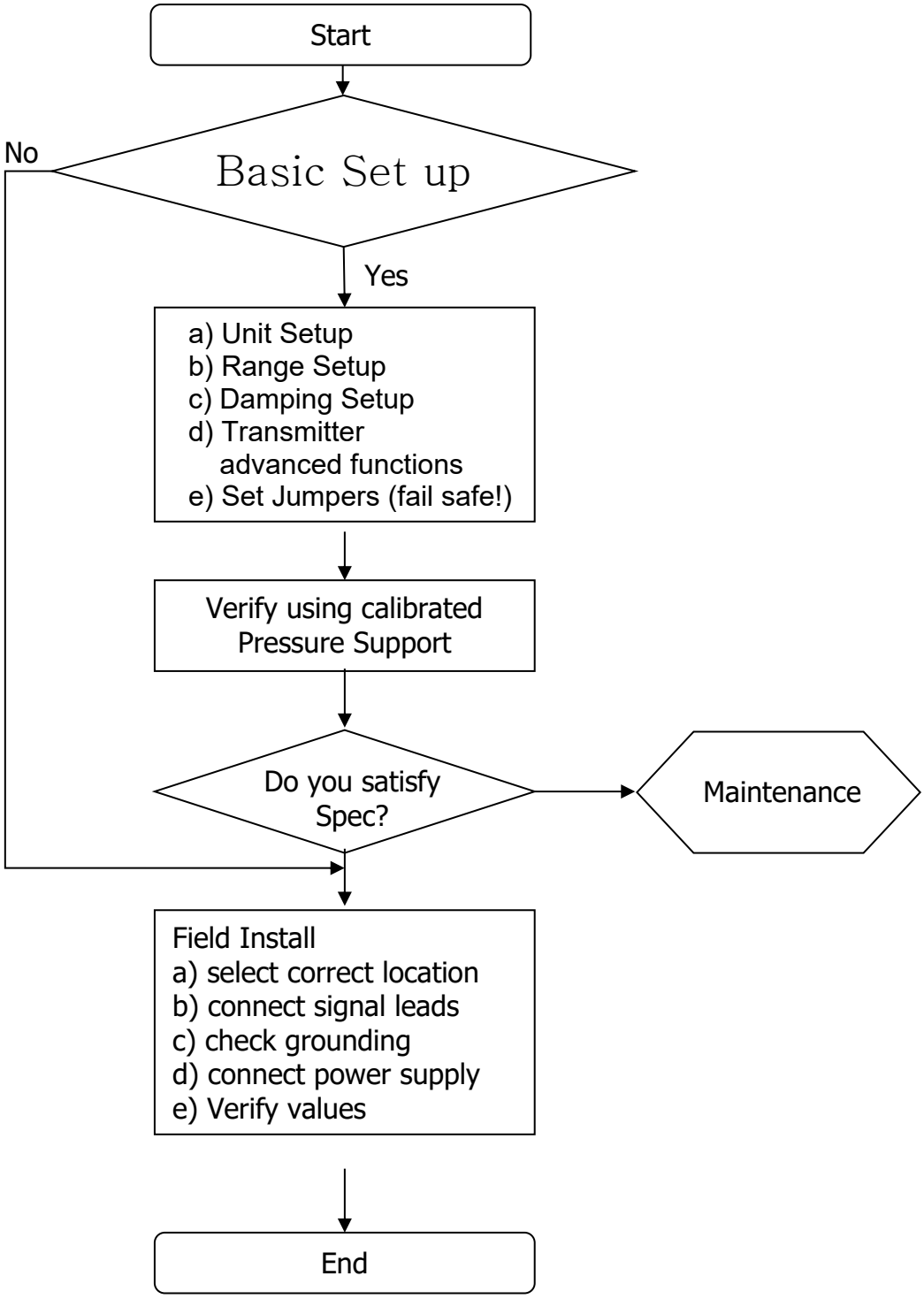
Warning	- Instrument installed in the process is under pressure. Never loosen or tighten the flange bolts as it may cause leakage of process fluid. - If the process fluid may be toxic or otherwise harmful, take appropriate care to avoid contact and/ or exposure to direct vapours even after dismounting the instrument from process line for maintenance.

Warning	Electrical shock can result in death or serious injury. If you install transmitter around a high voltage environment e.g. power lines there may be a very high likelihood of high voltages induced on to the signal lines. - Avoid direct contact with the signal leads and terminals to avoid potential electrocution.

Danger	Process leaks can cause death or serious injury: - Install and tighten before applying pressure. Inspect regularly for process leaks.

6.4 Commissioning on the bench with Hand-Held Terminal

Use of a HHT is possible before or after field installation. However, as a good engineering practice it is recommended to first familiarise with available functions before installation so that you have pre-commissioning done on the bench before installing the transmitters in field. In line with good engineering practice please follow the flow chart outlined below:



[Figure 5-1 Commissioning Flow Chart]

6.5 General Considerations

The PAD transmitter uses a capacitance or piezoresistive pick up. As changes in pressure are accurately detected, any zero shift or installation offsets will be transmitted as a pressure change on the 4~20mA analogue current output. Hence it is recommended that the transmitter be mounted as close to the process as possible and use short impulse piping, when possible, to achieve best accuracy. However, it is equally important to be mindful of basic requirements including ease of access, safety of personnel, practical field calibration accessibility and a suitable transmitter environment when selecting a mounting location. In general, install the transmitter so as to minimize vibration, shock, and temperature fluctuations.

6.6 Electrical Considerations

The internal of the transmitter housing comprises of two sections. The front section is for the electronics module, and Rear side is for the terminal block. On backplane of the Rear Cover “Field Wiring Diagram" is included for easy identification. This can be accessed by opening the rear housing cover and exposing the terminal block inside. Terminal blocks have polarity cleared marked for supply, TEST and communication connections. Please connect transmitter power to supply connections with proper polarity. Hand held configurators connect directly to "COMM" pin provided below the Supply connections. Similarly, a remote field Indicator or current ammeter can connect to "TEST" pins provided. Though transmitter is protected from reverse polarity protection it is recommended not to apply incorrect polarity across TEST pins as it may damage the protection diodes included.

6.6.1 Power Supply

For powering transmitter an external DC voltage between 12.5 ~ 45 Volts DC is recommended. The external power supply ripple noise should not be higher than 2 %. When calculating loop resistances please include resistance of all devices added in the loop.

Max. Loop Resistance [Ω] = (E-12.5) [Vdc] / 0.022 [mA]

Here, loop resistance of minimum 250 ~ 550Ω (@24 V_{DC}) is recommended for HART® communication.

6.7 Wiring

6.7.1 Cautions during Wiring

(1) Install signal cables away from electrical noise resources like capacitive transformers, motors, power supplies where possible.
(2) Before wiring pull out the electrical lead connection cap included and replace with appropriate cable glands.
(3) Please use waterproof sealants on conduit screws. Use of silicon-based sealants is recommended when possible.
(4) Do not run signal lines & power lines in same cable duct to reduce noise on signal lines.
(5) For explosion-proof transmitters in order to maintain explosion-proof requirements please follow additional local electrical codes and practices where applicable.

6.7.2 Selecting the Wiring Materials

(1) Use PVC shielded wire or standard lead line of same class or cable rated for 600 V or higher. In order to ensure proper communication use 24 AWG or larger wire specs, and do not exceed 1500 meters.
(2) Use twisted pair double shielded wires in high electrical noise affected areas.
(3) For high or lower ambient temperature areas ensure wires or cables installed also meet the operating temperature specs.
(4) Similar use appropriate insulation in environment with high likelihood of oil, solvent, toxic gas or liquid spills.
(5) Wiring leads must NOT be soldered to terminal lug. Use the mounting screws included instead to ensure a tight rigid hook up to the terminals.

6.7.3 Connections of External Wiring to Transmitter Terminal Box

Wiring method is following this.

(1) Open the housing cover indicated "FIELD TERMINAL". In explosion environment when circuit is powered on, don’t open the covers.
(2) Connect the power supply in the terminal indicated "+PWR" (left terminal) and "-" power supply in the central terminal. Don’t connect "+" power supply in "+" terminal of the point indicated "TEST". It will be damage to the test diode used to connecting TEST terminal.
(3) Unused holes shall be blocked by Ex db IIC and/or Ex tb IIIC blanking element.
(4) Transmitter power is supplied to Signal Wiring. So, don’t install near to Signal Wiring with Power Wiring or near Power Apparatus. In case of ground signal, ground the signal loop’s one side and other side is not grounded. Promote to ground “-“ side of power.
(5) For the better adjustment completely turn Screw terminal.
(6) Again close the transmitter cover. Specially in case of using in explosion area, you must satisfy requirement about explosion.

[Note]
Don't supply high voltage (AC power) in transmitter leads. It can be caused damages to transmitter.

(7) You have to connect 250~600 W Loop Resistor in Current Loop (between Power Supply and Transmitter) for HART Communication HART. Follow Figure 5-2 about connection of Current Loop.

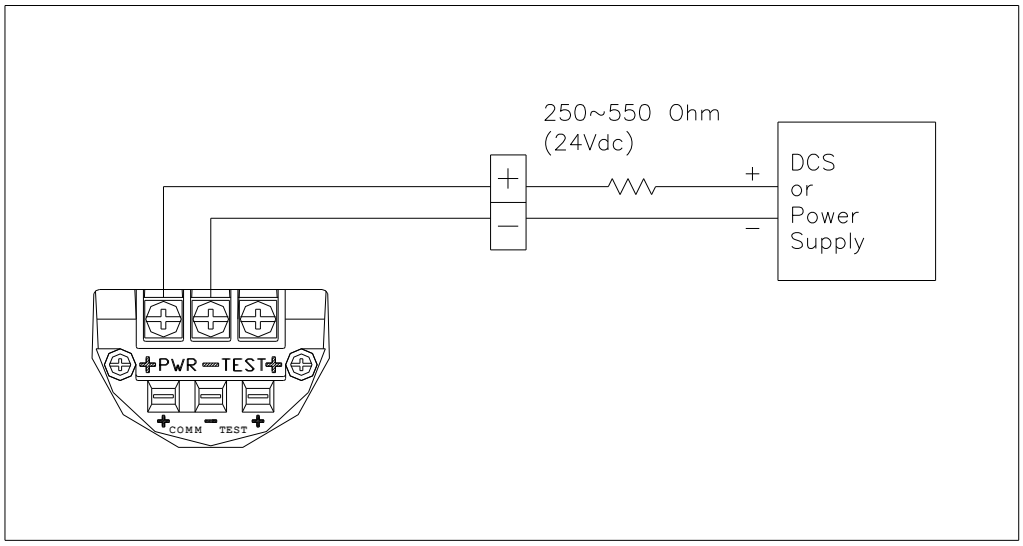


Figure 5-2 Connection with Terminal Board of Transmitter

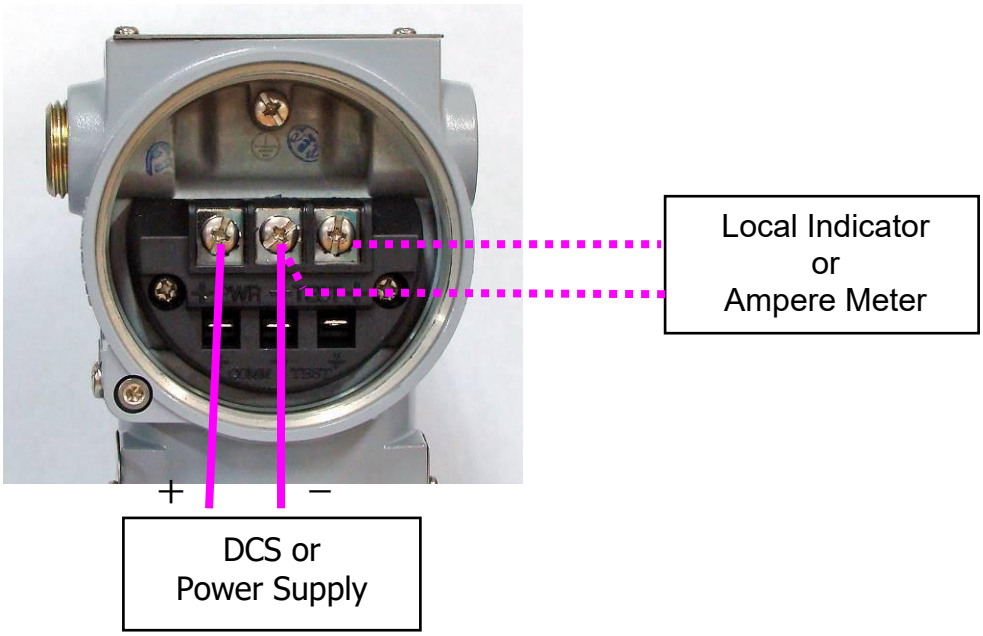


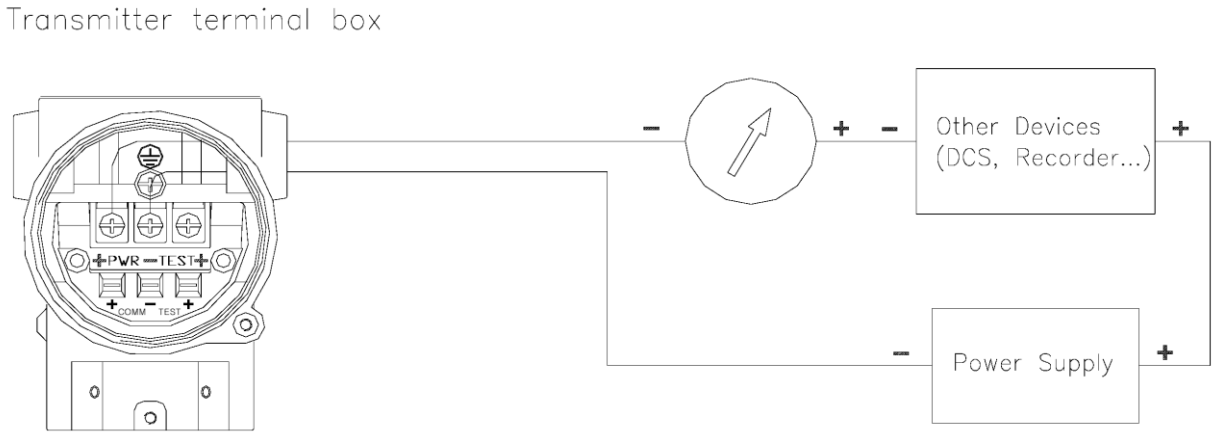
Figure 5-3 Picture of Terminal Board of Transmitter

6.7.4 Wiring

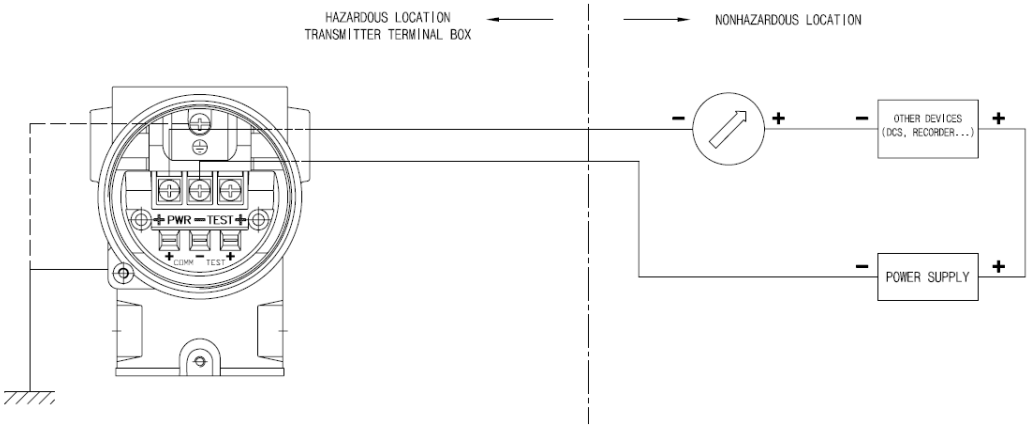
A. Loop Configuration

Kobold Series Transmitters use a two-wire system for power supply, 4~20mA analogue signal transmission and HART digital transmission.
DC Power Supply is required for the transmitter loop. The Transmitter and distributor are connected as shown below.

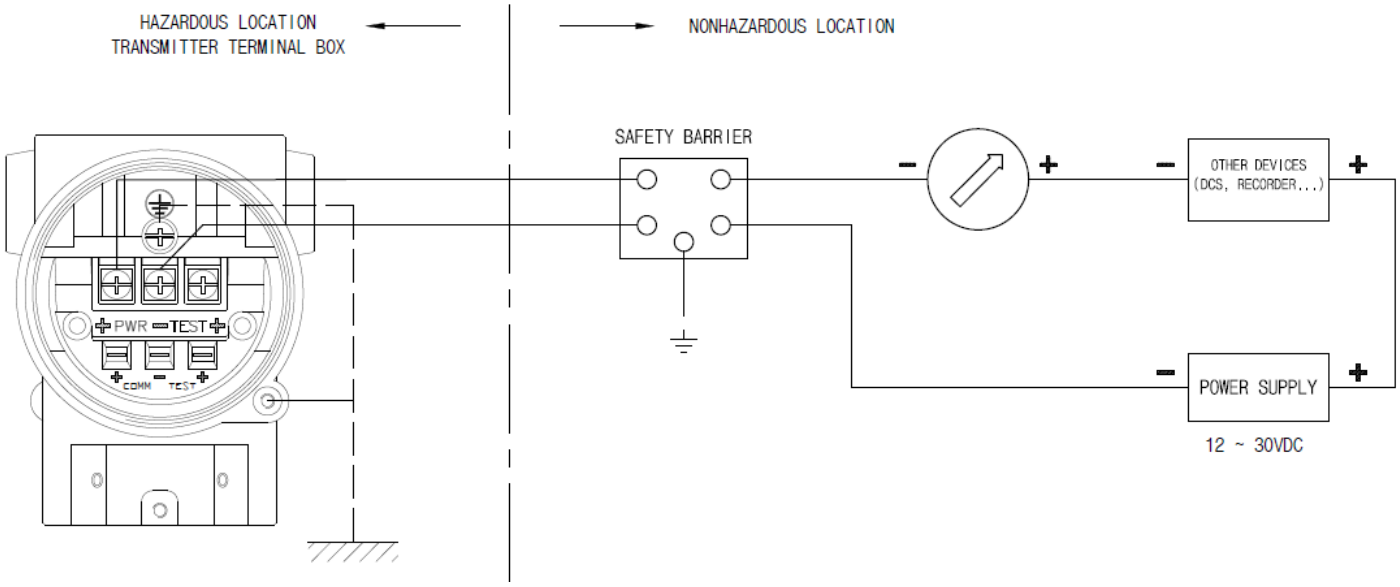
(1) Non-Explosionproof / Non-Flameproof Type



(2) Explosionproof Type



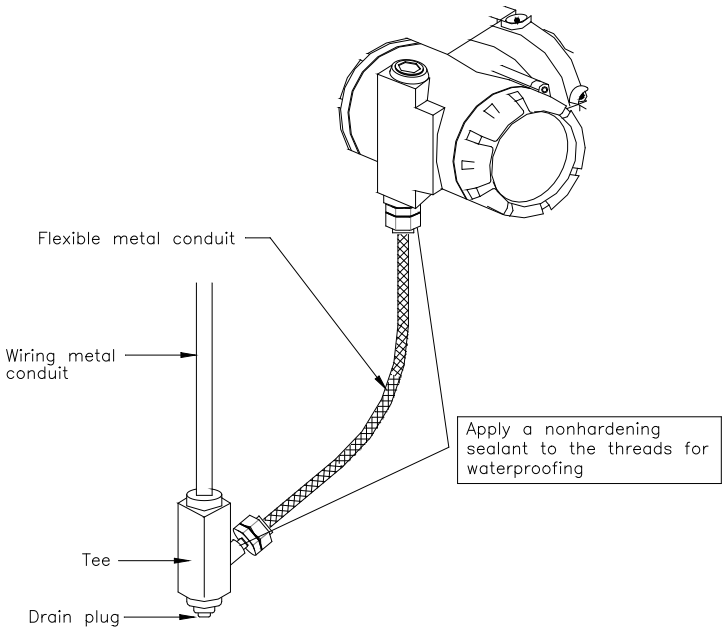
(3) Intrinsically Safe (Ex ia) Type
For an intrinsically safe operation, an appropriate intrinsically safe (IS) safety barrier should be used. The IS safety barrier should have an appropriate approval and placed outside the hazardous area (in non-hazardous area). IS Safety Barrier manufacturer's instructions should be followed in this respect.



B. Wiring Installation

(1) General-use Type Make cable wiring using metallic conduit or Waterproof cable glands.

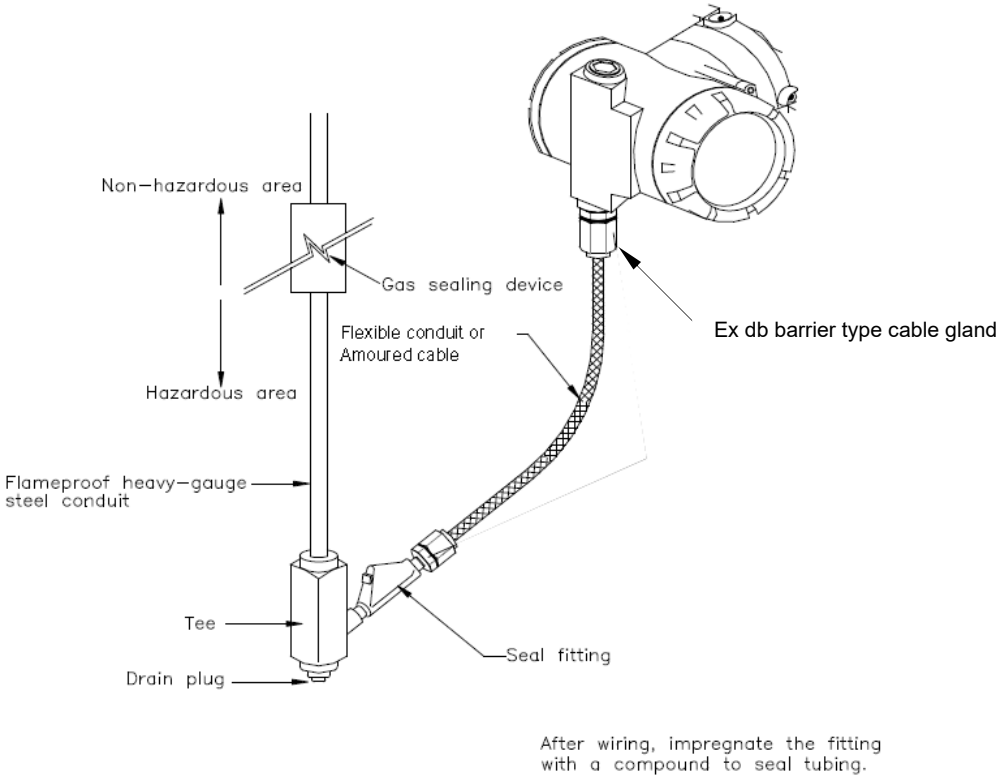
- Apply a non-hardening sealant to the terminal box connection port and the threads on the flexible metal conduit for the waterproofing.



[Figure 5-4a Typical Wiring using Flexible Metal Conduit]

(2) Flameproof Type (Ex db)

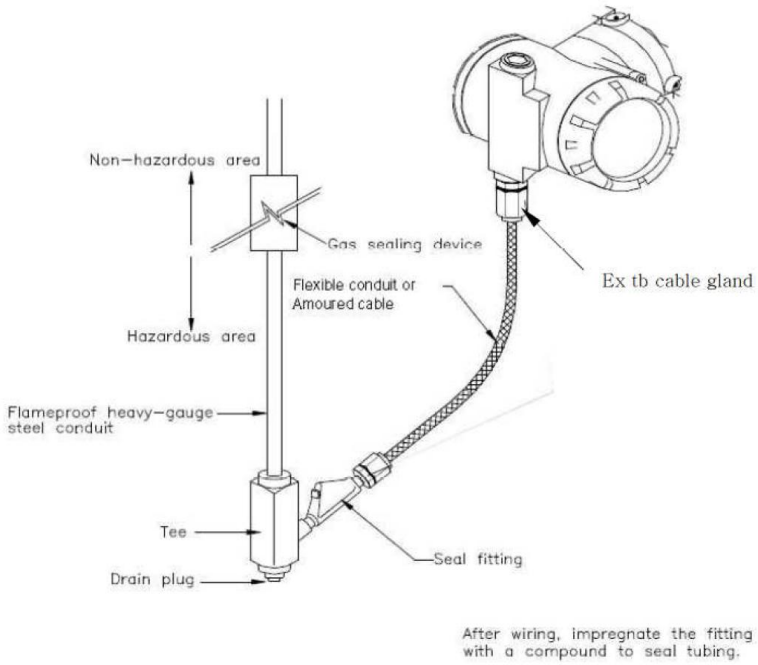
- Wire cables through Ex db barrier type cable gland and Ex db sealing fitting
- Wiring cable through Ex db barrier type cable gland (see figure 5-4b)
- The cable glands and blanking elements shall be of a certified one with Ex db IIC and/or Ex tb IIIC, suitable for the condition of use and correctly installed. Also, the operation temperature of these cable glands and blanking elements shall be more than 130 °C.
- The selection of cable, cable gland shall meet the requirement of Ex db and/or Ex tb per IEC 60079-14.



[Figure 5-4b
Typical Wiring using Ex db cable gland]

(3) Protection by enclosure (Ex tb)

- Wire cables through Ex tb cable gland and Ex tb sealing fitting.
- Wiring cable through Ex tb cable gland (see figure 5-4c)
- The cable glands and blanking elements shall be of a certified one with Ex db IIC and/or Ex tb IIIC, suitable for the condition of use and correctly installed. Also, the operating temperature of these cable glands and blanking elements shall be more than 130 °C.
- The selection of cable, cable gland shall meet the requirement of Ex db and/or Ex tb per IEC 60079-14.



[Figure 5-4c
Typical Wiring using Ex tb cable gland]

6.7.5 Grounding

(a) Grounding should satisfy typical requirements (grounding resistance 10 Ohm or less). Grounding is required below 10 Ohm for explosion proof requirements.

NOTE Note	In case of with Built-in Lightening Protector, grounding should satisfy special requirements of 1 Ohm or less.

(b) There is ground terminal provided on the inside and outside of the terminal box. Either one of these terminals may be used for grounding the transmitters.
(c) Use PVC insulated wire (600V min rated) for grounding.
(d) The size of insulated wire for grounding is per the table below.
(e) Insulated wire for grounding shall be clamped to avoid twisting and loosening.

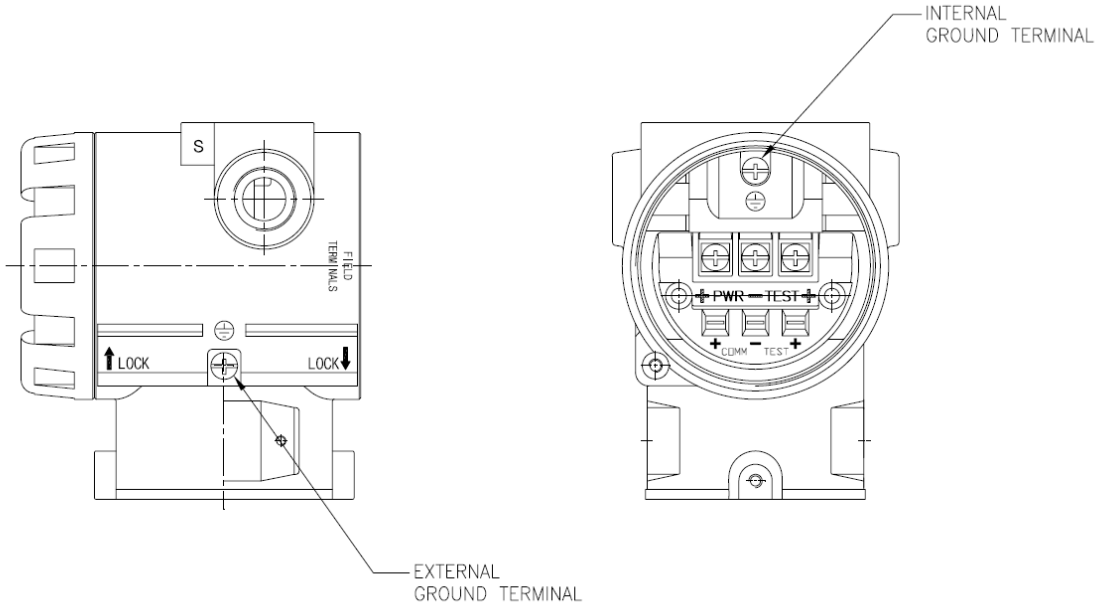


Figure 5-5 Internal and external ground terminal

Cross-sectional area of phase conductors, S mm²	Minimum cross-sectional area of the corresponding PE conductor, S_P mm²
S ≤ 16 16 < S ≤ 35 S > 35	S 18 0,5 S

6.7.6 Power Supply Voltage and Load Resistance

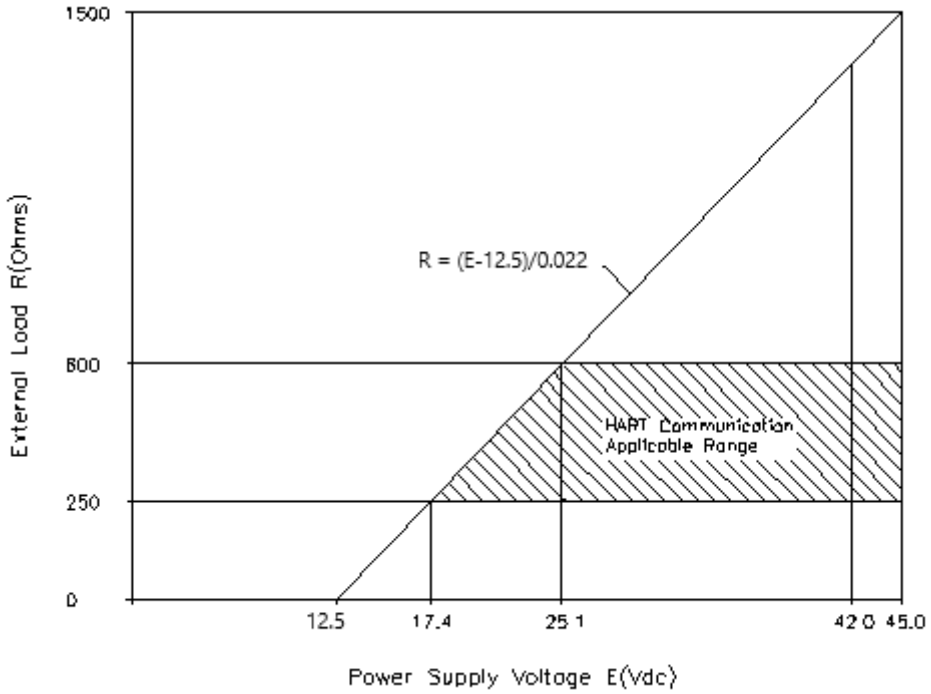
When configuring the loop, make sure that the external load resistance is within the range in the figure below. Since the voltage of transmitter terminal input is same as follows.

- General Standard: 12.5 to 45 V_{DC}
- Hart Communication: 17.4 to 45 V_{DC}
- Explosionproof: 12.5 to 45 V_{DC}
- CSA Explosionproof: 17.4 to 42V_{DC} max.

And maximum loop current is 24mA, Load resistance R:

R = (E-12.5) / 0.022 (E = Power Supply Voltage)

NOTE Note	In case of an intrinsically safe transmitter, external load resistance includes safety barrier resistance.



6.8 Mechanical Considerations

Figure 5-6 is transmitter dimensional drawings of PAD. A mounting example and dimensional drawings are shown in Figure 5-7.

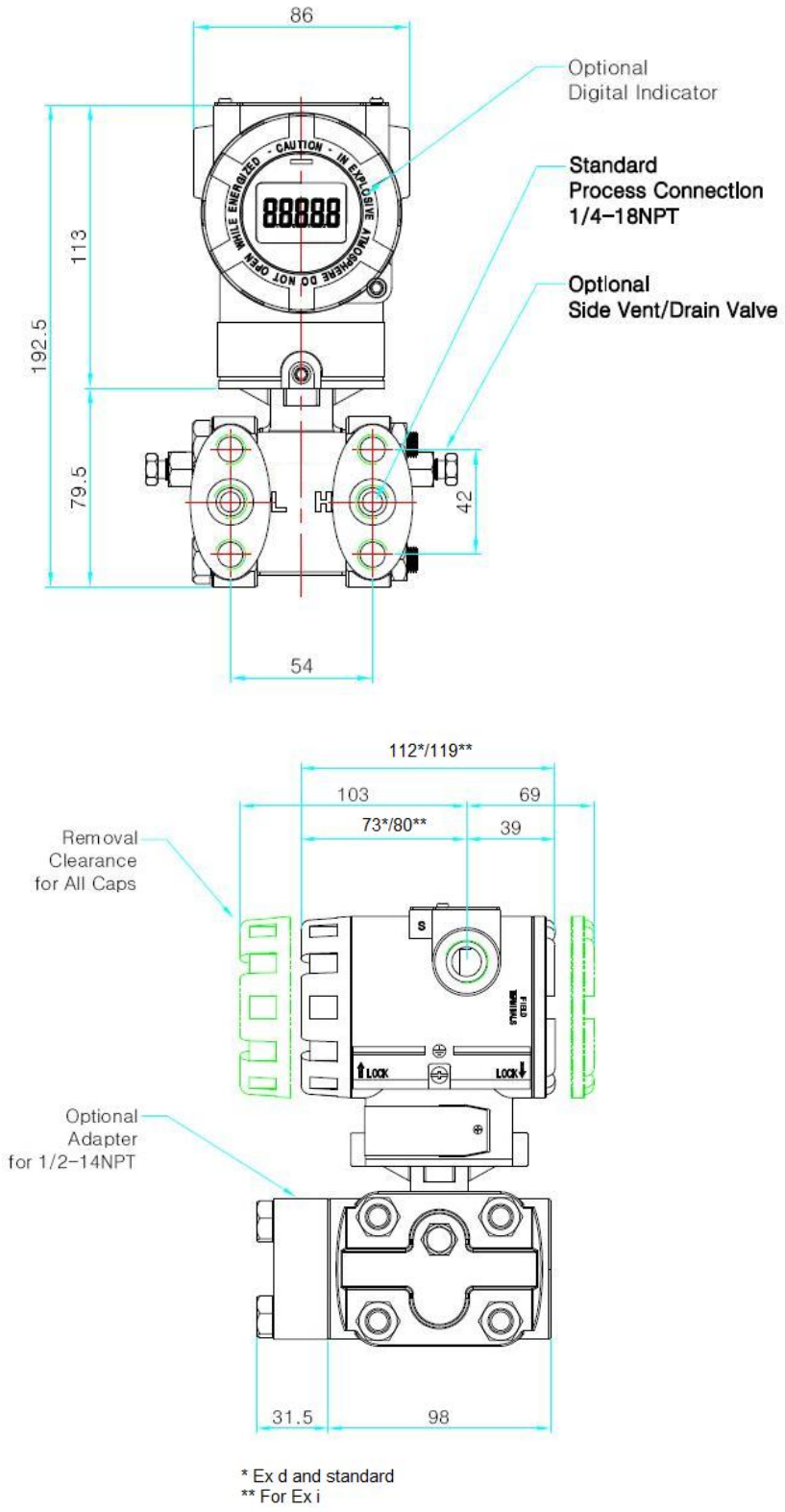
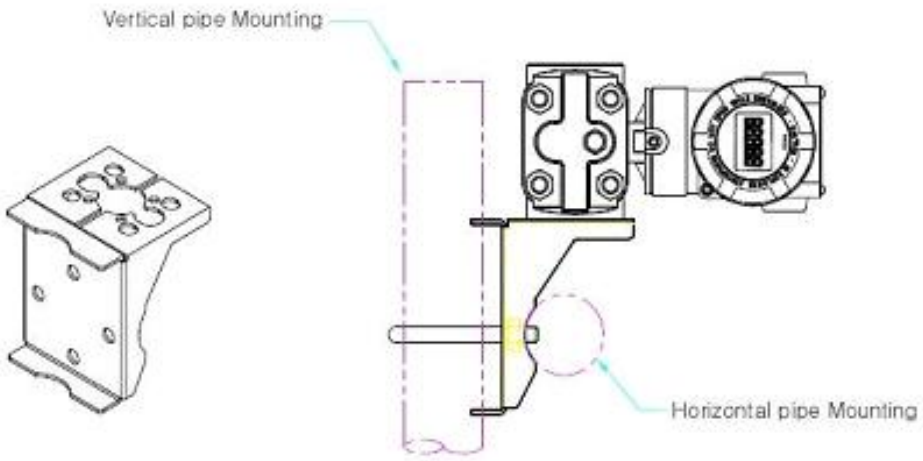
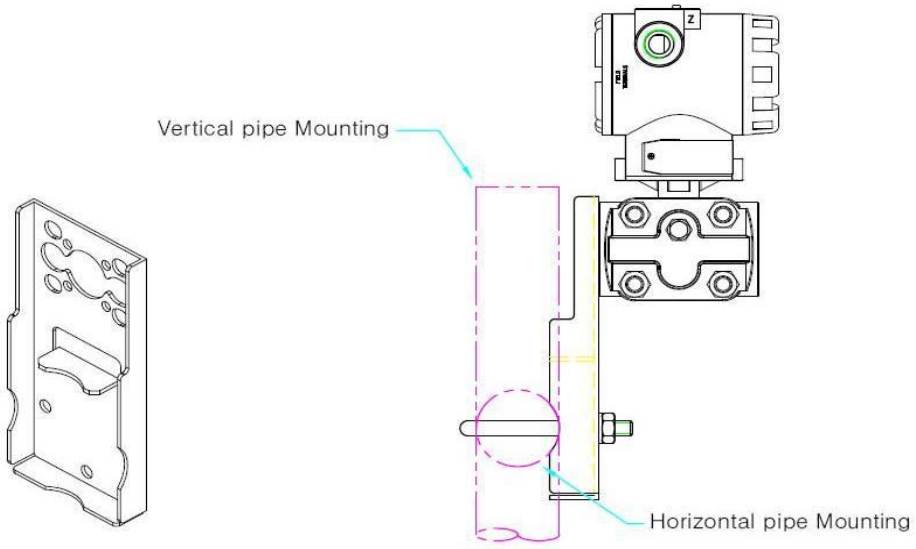


Figure 5-6. Model PAD Outline Dimension Drawing



Vertical Mounting Type
2“ Pipe Mounting Bracket
Model: ZUB-PAD/PAS-K



Horizontal Mounting Type
2“ Pipe Mounting Bracket
Model: ZUB-PAD/PAS-L

Figure 5-7. Typical Bracket Mounting

6.8.1 Mounting

During installation provide transmitters with adequate support. In the case of severe vibration, we recommend mounting to a 2” pipe using appropriate mounting bracket available as option. Kobold offers two styles of mounting brackets in SS. These include an “Angle type” and a “Flat type”.

6.8.2 Transmitter Accessibility

When selecting a suitable location to install the transmitter it may be convenient to also consider following options.

(1) Ensure adequate clearance is provided for rear cover access and wiring terminals.
(2) If LCD option is installed provide adequate access for front.
(3) Housing can be rotated up to 180° clockwise or 90° anticlockwise to provide easy access to front (or rear) of the transmitter. When rotating housing loosen lock nut placed above neck tag and ensure that sensor cable connectors are not damaged.
(4) LCD Module can also be rotated 90° clockwise or anticlockwise, if required.

6.9 Environmental Considerations

6.9.1 Effect of Ambient Temperature

You have to install at -20℃~60℃ (-4~180℉), operating ambient temperature range. If predicted heat seems to exceed or equivalent to ambient temperature range limit, you have to consider additional method to cutoff the process heat.

6.9.2 Toxic/ High Humidity considerations

Housing of PAD Smart transmitters is protected from direct exposure to moisture or toxic materials provided front and rear covers are engaged fully with appropriate O-rings included. Electronic circuits are separated from terminal side; however, it must be protected from moisture ingress entering housing through conduit lines. To avoid moisture, build up, use appropriate water tight sealants on conduits entries and ensure correct positioning of conduit pipes to avoid condensation build up from occurring inside the terminal housing.

6.9.3 Installation in Hazardous locations

Transmitter Housing is designed to meet explosion proof protection requirements, if marked accordingly. When installing transmitter inside a hazardous classified area please ensure all required explosion proof installation & wiring requirements outside of the transmitter as stated by relevant regulatory bodies are also complied with.

7. On-line Operation

7.1 Overview

This chapter describes configuration functions of PAD smart pressure Transmitter. Transmitter can be configured in either On-Line or Off-Line mode. In On-Line configuration mode, you must connect through an external HHT (Hand Held Terminal) supporting HART® DDL technologies. When connecting in Multi-drop mode ensure each device on the HART® bus is provided with a unique HART® device ID for identification.

7.2 Safety Message

For safety of operator please pay specific attention to safety note identified under Warning symbol (▲).

7.2.1 Warning

Danger	Explosion can result in death or serious injury: - Do not remove the transmitter covers in hazardous areas when the circuit is live (see chapters 3.10 and 5 for type approvals and installation precautions). -Before connecting HHT in a classified zone, check that the configuration device connecting to transmitter also complies to required safety regulations. -Both transmitter covers must be fully engaged to meet explosion proof certification requirements

7.2.2 Closed loop configuration

Please note that in a closed current loop, i.e. with a connected control system, all menu settings can have a direct effect!
Please passivate the control input to your PLC /DCS during all configuration settings.

7.3 Configuration Data Review

In case transmitter is already installed on site, review configuration data to reconfirm it meets the application requirements.

7.4 Check Output

Transmitter is provided with a Loop Test function (accessible only via an HHT) under service/ maintenance menu which can be used to output desired values 4, 8, 12, 16, 20 mA for testing current outputs.

7.4.1 Process Variable

The PAD Smart pressure transmitter measures two variables. Primary Variable is always the process pressure measured and SV (Secondary Variable) is the temperature.

NOTE Note	Temperature measured is used strictly for internal compensation. Only PV value can be assigned to current output on a 4~20mA loop. However, in digital mode both PV and SV can be read through a compatible HART® communicating device.

7.5 Basic Setup

This involves configuring minimal settings required to operate transmitter correctly.

7.5.1 Select Sensor Range

This value is automatically set from factory based on the sensor Range code installed on the transmitter. This Range defines the minimum/ maximum range limits and span settings for installed sensor which should not be exceeded for normal operation or during re-ranging or Zero/ Span configuration.

7.5.2 Set Output Units

Select required measurement units e.g. kPa, kg/cm2, bar, psi, mmH2O etc.

NOTE Note	This is different to Engineering mode unit as settings configured under this menu affect only the transmitter current 4/20 mA output configuration. In normal LCD mode these units are indicated on LCD module.

7.5.3 Rerange

Set the Zero and Span for the 4~20mA analogue output.

7.6 Detailed Setup

7.6.1 Set Fail Safe Mode

Sets failure mode (fail down or fail up) for 4/20mA outputs in case of an error or malfunction detected automatically during self diagnostic routine included within the transmitter.

7.6.2 Set Damping Time

In general, the following note serves to damp the output signal:
The damping is an electrically adjustable time constant that can be changed via the menu by means of the keys or via HART communication if a dynamic measuring signal produces an undesired unsteady output signal (e.g. due to pulsation). Increasing the time constant, i.e. varying the damping time (>0 s) leads to a smooth analogue output signal, but at the same time to slower reaction times of the transmitter.
The result is therefore often a compromise between reaction speed and the behaviour of the output signal.
The total reaction time of the transmitter is an addition of the response time Td =>120 ms + the preset damping time in the menu item.
The default value (factory setting) is 1.0 seconds and can be set between 0 and 60 seconds.

7.7 Tag Information set up

7.7.1 Set Tag

Set tag information to uniquely classify transmitter. Tag information is limited to max of 8 alpha-numeric characters. For additional description use Set Message option under 6.7.2.

7.7.2 Set Messages

When using several transmitters, user may classify each transmitter by using 32 alpha-numeric characters. This message is saved in EEPROM of transmitter.

7.8 Diagnostics and Services

7.8.1 Loop Test

The Loop Test verifies the output of the transmitter, the integrity of the loop, and the operations of any recorders or similar devices installed loop. Perform the following procedure for a loop test.

(1) Connect a reference meter to the transmitter.
(2) Select the Loop Test of HHT and operate the Loop Test.
(3) Select output current (4 mA/20 mA/etc.)
(4) If the readings match, then the transmitter and the loop are configured and functioning properly. If the readings do not match, then you may have the current meter attached to the wrong loop, there may be a fault in the wiring, the transmitter may require an output trim, or the electrical current meter may be malfunctioning.

7.9 Calibration

Re-Ranging scales the upper and lower ranges of transmitter outputs and does not affect the stored calibration data of the transmitter. On the other hand, a Sensor Trim function can be used to tune/modify the stored calibration.
It is important to keep in mind that Smart transmitters operate differently from conventional analogue transmitters. A Smart transmitter uses a microprocessor that contains information about the sensor's specific characteristics in response to pressure and temperature inputs which is what is used for calculating final PV (Process Variable). These calibration curves are performed under traceable laboratory standards and stringent quality control parameters. Changing factory calibration data is advisable only if it is necessary to correct transmitter offsets and only when checking against a traceable calibration source which is at least five time more accurate than the transmitter under test.
As such a Sensor trim and Output Re-range function differ. Re-ranging sets the transmitter analogue output to the selected upper and lower range points and can be done with or without an applied pressure. Re-ranging does not change the factory characterization curve stored in the microprocessor. Sensor trimming requires an accurate pressure input and adds additional compensation that adjusts the position of the factory characterization curve to optimize transmitter performance over a specific pressure range.

7.9.1 Sensor Trim

The Sensor trim function adjusts the A/D signal conversion within the transmitter sensor electronics and determines how it digitally interprets any pressure changes applied to the sensor inputs. It is highly recommended to perform a sensor trim when first commissioning the transmitter on site. There are three ways to trim the sensor: Sensor zero trim, full trim and zero adjustment.

Sensor zero trim is a one-point adjustment typically used to compensate for the mounting position.
Two point trim is a full sensor trim, in which two accurate pressures with difference within the published sensor span specifications for the specific range codes are applied (equal to or greater than the range values), and the output is set to linear. You should always adjust the low trim value first to establish the correct offset.

Zero adjustment allows user to add a pre-defined offset (other than zero) to measured PV that may be required on certain applications such as Level measurements to compensate for nozzle placements.

7.9.2 DA (Digital to Analogue) Trim

The Sensor Trim functions adjust the calibration values of the PV applied to sensor (on input side only), however a D/A trim adjusts sensor input to match the 4~20mA current output. When executing a D/A trim the current output can be adjusted minutely to match desired current values outputted from the transmitter. To perform a D/A Trim a precise and traceable reference current meter is required to be connected on the output loop. When performing a D/A trim avoid using TEST pin and try to install reference meter directly in series in output loop to eliminate any undesirable offsets. Here again make sure that reference meter used for D/A trim is 5 times more accurate than published accuracy specs. of the transmitter. When performing a D/A trim it is recommended to do a minimum of two points i.e. trim at (4mA) and (20mA). It may however be necessary to perform repeated trims at both 4/20 mA to achieve optimum results.

8. Maintenance

8.1 Overview

This chapter describes breakdown diagnostic and maintenance.

8.2 Safety Message

When operation, it requires specially notice for the safety of operator. Information that raises potential safety issues is indicated by warning symbols. Refer to the following safety messages before performing an operation proceeded by these symbols.

8.2.1 Warning

Danger	Explosion can result in death or serious injury (see chapters 3.10 and 5 for type approvals and installation precautions): - Do not remove the transmitter covers in hazardous locations when the circuit is live. - Transmitter covers must be fully engaged to meet explosion proof approval requirements.

Warning	Electrical shock can result in death or serious injury. If you install transmitter around a high voltage environment e.g. power lines there may be a very high likelihood of high voltages induced on to the signal lines. - Avoid direct contact with the signal leads and terminals to avoid potential electrocution.

Warning	Electrical shocks can result in death serious injury: - Only qualified and trained personnel should be allowed to operate these transmitters.

Danger	Process leaks can cause death or serious injury: - Install and tighten before applying pressure. Inspect regularly for process leaks.

Warning	- Instrument installed in the process is under pressure. Never loosen or tighten the flange bolts as it may cause leakage of process fluid. - f the process fluid may be toxic or otherwise harmful, take appropriate care to avoid contact and/ or exposure to direct vapours even after dismounting the instrument from process line for maintenance.

8.3 Hardware Diagnostics

If you suspect a malfunction despite the absence of any diagnostic messages on the HHT follow Table 6-1 described here to verify that transmitter hardware and process connections are in good working order.

[Table 6-1 Troubleshooting]

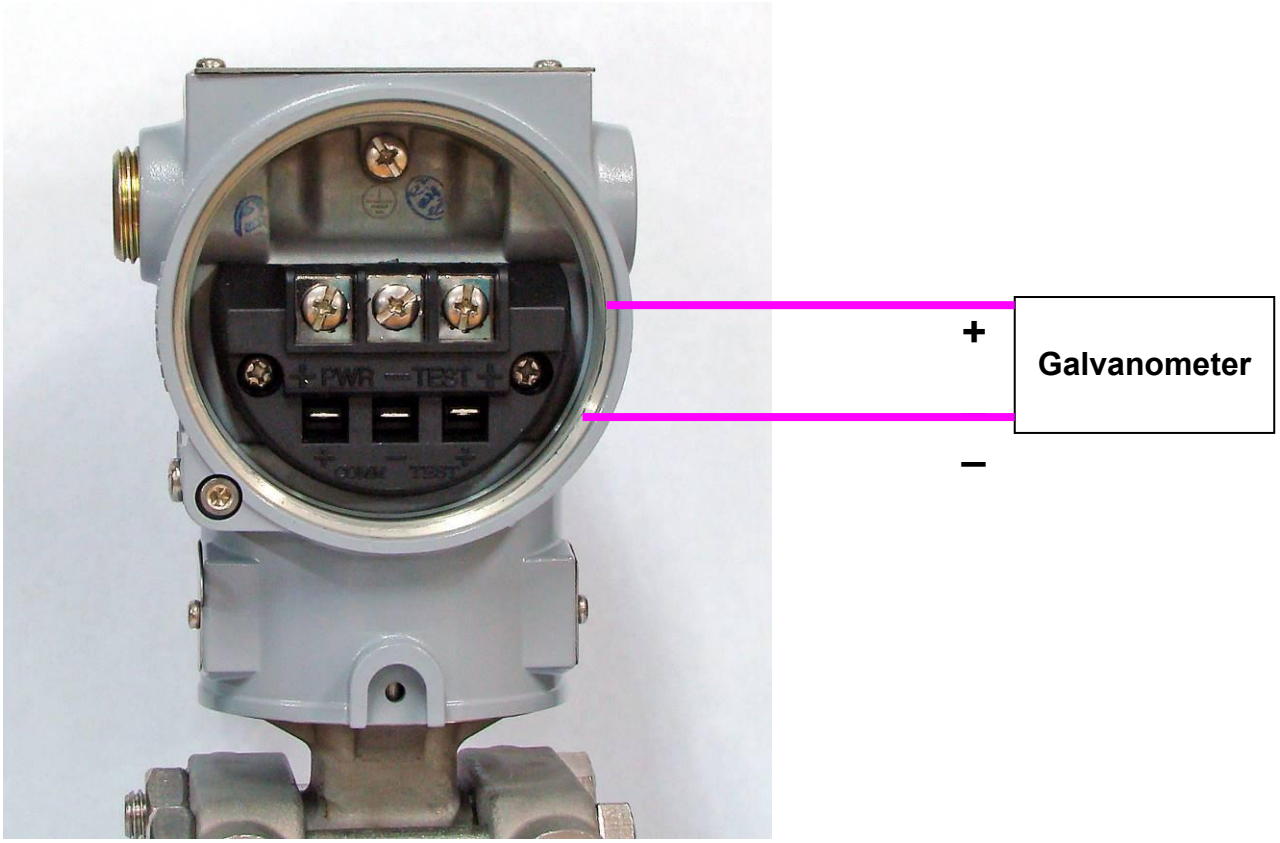
Symptom	Potential Source	Corrective Action
Transmitter Does not Communicate With HART Communicator	Loop Wiring	• Check for a minimum of 250 ohms resistance between the power supply and HHT. • Check for adequate voltage to the transmitter. The transmitter always requires 12.5 ~ 45 V_{DC}. • Check for intermittent shorts, open circuits, and multiple grounds.
High Output	Sensor Input Failure	• Connect HHT and enter the Transmitter test mode to isolate a sensor failure.
	Loop Wiring	• Check for dirty or defective terminals, interconnecting pins, or receptacles.
	Power Supply	• Check the output voltage of the power supply at the transmitter terminals. It should be 12.5 to 45 V_{DC} in spite of loop scale.
	Electronics Module	• Connect HHT and enter the Transmitter test mode to isolate module failure. Check the sensor limits to ensure calibration adjustments are within the sensor range.
Erratic Output	Loop Wiring	• Check the output voltage of the power supply at the transmitter terminals. It should be 12.5 to 45 V_{DC}. • Check for intermittent shorts, open circuits, and multiple grounds. • Check for proper polarity at the signal terminals. • In case of measuring electric current while digital communication, output current should be appeared around +-0.013mA
	Electronics Module	• Connect HHT and enter the Transmitter test mode to isolate an electronics mode failure.
Low Output or No Output	Sensor Element	• Connect HHT and enter the Transmitter test mode to isolate a sensor failure. • Check the PV to see if it is out of range.
	Loop Wiring	• Check for adequate voltage to the transmitter. The transmitter always requires 12.5 ~ 45 V_{DC}. • Check for intermittent shorts, open circuits, and multiple grounds. • Check polarity of signal terminal • Check the loop impedance.
	Electronics Module	• Connect HHT and check the sensor limits to ensure calibration adjustments are within the sensor range.

8.4 Hardware Maintenance

Kobold PAD Smart Transmitters have no moving parts and require a minimum of scheduled maintenance. Both transmitters feature modular design for easy maintenance. If you suspect a malfunction, check for an external cause before performing the diagnostics as discussed later in this section. If you must return failed transmitters or parts, send them to Kobold Messring GmbH for inspection, repair, or replacement.

8.4.1 Test Terminals

The test terminal is clearly marked as TEST on the terminal block behind the rear cover. The test and negative terminals are connected internally via a diode. As long as the voltage across these terminals is kept below the diode threshold voltage, no current passes through the diode. To ensure that there is no leakage current through the diode while making a test reading, or while an indicating meter is connected, the resistance of the test connection or meter should not exceed 10 ohms. A resistance value of 30 ohms will cause an error of approximately 10 percent of reading.



[Figure 7.1 Test Terminals]

8.4.2 Disassembling the Electronics Housing

The transmitter is designed with dual-compartment housing; one contains the electronics module, and the other contains all wiring terminals and the communication receptacles.

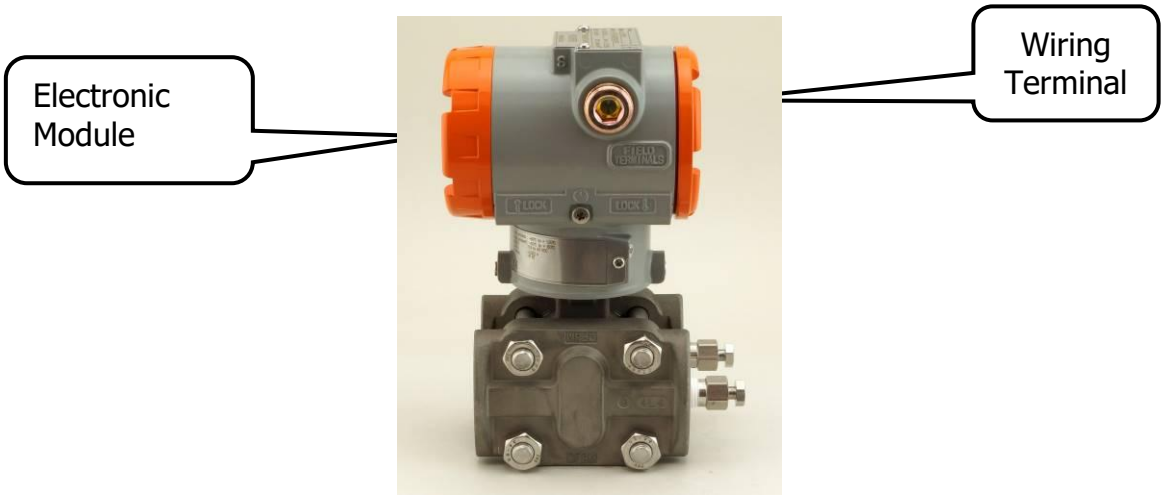


Figure 7.3 Structure of Housing

8.4.2.1 Disassembling Electronics Module

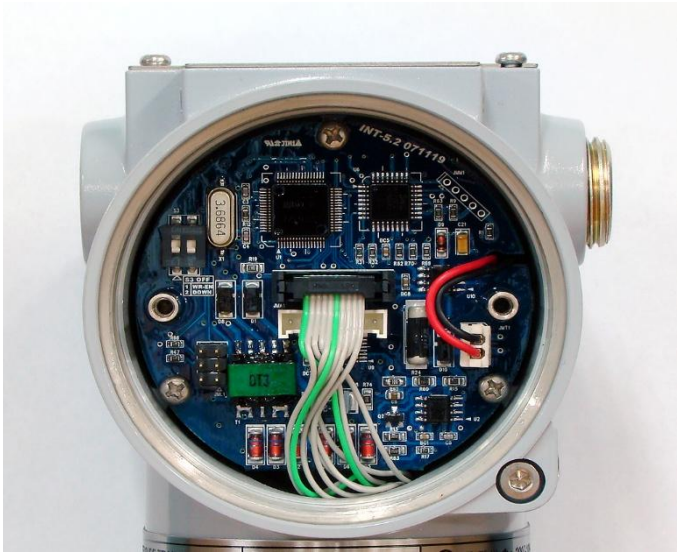
Use the following procedure to remove the electronics module.

NOTE Note	Note1:-The electronics module Board comes standard with conformal coating for added protection in tropicalised environments. These modules are designed as non-repairable units. If a malfunction does occur the entire unit must be replaced.

1. Disconnect the power to the transmitter. Remove the cover from the electronics side of the transmitter housing (Figure 7.2).
2. Do not remove the instrument cover of explosion proof isolated instruments in explosive atmosphere when the circuit is alive (see chapter 3.10 and 5 for type approvals and installation precautions).
3. Remove the LCD meter by first disconnecting the screws and then pulling out the LCD module from the plug in connector located behind the module.
4. Remove the two screws that anchor the electronics module to the transmitter housing.
5. Remove the analogue sensor cable & power cables from their plug in connectors.
6. Firmly grasp the electronics module and pull it straight out of the housing, taking care not to damage the interconnecting pins.

NOTE Note	Note2: The transmitter EEP-Write Enable and failure mode DIP-Switches are located on the front of the electronics module. When replacing with a new one, make sure to duplicate the same DIP-Switches settings on the replacement board.

Figure 7.3 Structure of Electronics Module inner Transmitter



8.4.2.2 Fail Mode and Jumper Switch of EEPROM-write

Fail-mode and jumper switch of EEPROM-write are located front of electronics module (Refer to Figure 4-3)

8.4.3 Assembling the Electronics Housing

Re-assembling procedure is as follows:

1. Make sure that Fail-mode and Jumper Switch are set exactly as the electronics board being replaced.
2. Insert electronics module into housing Connect back the cable connectors of analogue sensor board and power.

NOTE Note	An improper connection on either connector can cause wrong outputs and/ or effect power to the transmitter. Also make sure neither of the connector cables are pinched or twisted between the electronics board and transmitter housing.

3. Anchor electronics module with the 3 screws.
4. Attach LCD module making sure plug in connectors are installed correctly on appropriate mating connectors on the electronics board.
5. Secure LCD module with the screws provided.
6. Close the front cover of housing. For explosion proof rated transmitters ensure covers are fully engaged and O-Ring seal is securely in place.
7. Power on the transmitter and note the start up screen/ boot sequence.
8. If all self checks are completed and found OK, the transmitter will enter measurement mode automatically.
9. If any errors are found, same will be displayed on LCD. Follow the troubleshooting guide included in this manual to help identify and correct any fault conditions.

9. Disposal

See “General Safety Instructions” - via the QR code on the device or via www.kobold.com

10. Appendix I

PAD SMART PRESSURE TRANSMITTER
LCD DISPLAY CODE

Message	Description	Remarks
ADJ-U	Out of Zero setting value when Zero Adj function using button (Upper side)	
ADJ-L	Out of Zero setting value when Zero Adj function using button (Lower side)	
ZERO	Initial message in using Zero button	
SPAN	Initial message in using Span button	
BT-ERR	Button input Sequence error	
P-LOCK	Button input error when Protect Locked	
ZT-ERR	Setting Limit (10 %) Error when Zero Trim	
-TR-	Zero Trim Done	
ZR-ERR	Setting Limit error when executing Zero button function	
SP-ERR	Setting Limit error when executing Span button function	
-ZR-	Zero button function done	
-SP-	Span button function done	
-ZA-	Zero Adjustment done	
-DONE-	Setting Done using button	
RNGOVR	Setting Limit error when executing other setting function	
LCD_OV	Over figure values for LCD	
SCD-ER	Sensor Code Error	
F-RST	Flash Setting Data Reset	
F-LOCK	While Flash Setting Data Reset, Protect Locked	
F-FAIL	Flash Setting Data Reset Failure	
-FR-	Flash Reset Done	
A-RST	Analogue EEPROM Initialising Start	
A-STOR	Analogue EEPROM Whole Write	
A-FAIL	Analogue EEPROM Whole Write Failure	

Message	Description	Remarks
-AC-	Analogue EEPROM Whole Write Done	
S-FL	Sensor Fail	
S-OP	Sensor Overpressure	
AEP-RF	Analogue EEPROM read checksum error	
TS-FL	Temperature Sensor Error	
AEP-WF	Analogue EEPROM write fail	
EOSC	Crystal Element Defect Alarm	
FAVE	Flash Access Violation	
NOR_RO	Indicating the value with PV, %, mA units as continually on LCD	
NOR_PV	Indicating measured PV value only on LCD	
NOR_%	Indicating percentage of Cal. Range of measuring PV value on LCD	
NOR_mA	Indicating 4 ~ 20 mA value depending on measured PV value on LCD	
ENG_RO	Indicating the value with Engineering PV, Engineering %, Engineering mA units as continually on LCD	
ENG_PV	Indicating changed PV value with modified Engineering range	

11. EU Declaration of Conformance

We, KOBOLD Messring GmbH, Nordring 22-24, 65719 Hofheim, Germany, declare under our sole responsibility that the product:

Smart Pressure Transmitter **Model: PAD**

to which this declaration relates is in conformity with the following EU directives stated below:

2014/30/EU EMC Directive
2011/65/EU RoHS (category 9)
2015/863/EU Delegated Directive (RoHS III)

Also, the following standards are fulfilled:

EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

EN 61326-2-2:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-2: Particular requirements - Test configurations, operational conditions and performance criteria for portable test, measuring and monitoring equipment used in low-voltage distribution systems

EN 62321:2008 Electrotechnical products - Determination of levels of six regulated substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ethers)

EN IEC 63000:2018 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Kobold Messring GmbH recommends customer to apply the Metal Conduit Wiring or to upset the twisted pair Shield Cable for signal wiring to conform the requirement of EMC Regulation, when customer installs Kobold Series Transmitters to the plant.

Hofheim, 15 March 2024

H. Volz
General Manager

J. Burke
Compliance Manager

12. EU Declaration of Conformance (ATEX)

EU-Konformitätserklärung zur Bestätigung der Übereinstimmung mit der Richtlinie 2014/34/EU

EU-Declaration of conformity for confirmation with the Directive 2014/34/EU

Der Hersteller:

The Manufacturer:

Kobold Messring GmbH, Nordring 22-24, D 65719 Hofheim am Taunus

erklärt hiermit in alleiniger Verantwortung, dass das nicht-elektrische Gerät

hereby declares under its sole responsibility, that the non-electrical equipment

PAD-*** / PAS-*****

mit dem Modell aus der EU-Baumusterprüf-bescheinigungen mit den Nummern KEMA 10ATEX0141 X, sowie DEKRA 18ATEX0092 X mit den Bestimmungen folgender harmonisierter Normen der Europäischen Union übereinstimmt:

complies with the model, assessed during the EU-Type Approvals with the certificate numbers: KEMA 10ATEX0141 X and DEKRA 18ATEX0092 X is conform with the provisions of the following harmonised standards of the European Union:

Zertifikat Nr. ***Certificate Nº.***	**Norm –Ref. Nr. /** ***Standard Ref. Nº***	**Ausgabe** ***Edition***	**Normbeschreibung** ***Standard Description***
Beide / both	EN IEC 60079-0	2018	Teil 0: Betriebsmittel – Allgemeine Anforderungen *Part 0: Equipment - General requirements*
KEMA10ATEX0141X	EN 60079-1	2014	Teil 1: Geräteschutz durch druckfeste Kapselung „d“ *Part 1: Equipment Protection by Flame-Proof Enclosure „d“*
	EN 60079-31	2014	Teil 31: Geräte-Staubexplosionsschutz durch Gehäuse "t" *Part 31: Equipment dust ignition protection by enclosure "t"*
DEKRA18ATEX0092X	EN 60079-11	2012	Teil 11: Geräteschutz durch Eigensicherheit „i“ *Part 11: Equipment protection by intrinsic safety "i"*
	EN 60079-26	2015	Teil 26: Betriebsmittel mit Geräteschutzniveau (EPL) „Ga“ *Part 26: Equipment with Equipment Protection Level (EPL) “Ga”*

Das oben genannte Produkt entspricht der Richtlinie 2014/34/EU. Neue Editionen können bereits eine oder mehrere der in den EU-Baumusterprüfbescheinigungen genannten Normen ersetzt haben. Kobold Messring erklärt, dass das in dieser Konformitätserklärung erwähnte Produkt den Anforderungen der neuen Editionen entweder entspricht oder von den Änderungen nicht betroffen ist.

The above-mentioned product complies with Directive 2014/34/EU. New editions may have already replaced one or more of the standards mentioned in the EU type examination certificates. Kobold Messring declares that the product mentioned in this declaration of conformity either meets the requirements of the new editions or is not affected by the changes.

Kennzeichnungen:

Markings:

Zertifikat Nr. ***Certificate Nº.***	**Zertifizierende Stelle/** ***Certification Body***	**Kennzeichnung:** ***Marking:***	
KEMA10ATEX0141X	DEKRA Certification B.V. ID-Nr / *ID-Nº.*: 0344	II 2G Ex db IIC T6…T4 Gb	II 2D Ex tb IIIC T85°C…T130°C Db
DEKRA18ATEX0092X		II 1G Ex ia IIC T5 or T4 Ga	II 2G Ex ia IIC T5 or T4 Gb

Benannte Stelle

Die notifizierte Stelle DEKRA Testing and Certification GmbH, Kenn-Nr. 0158, wurde, gemäß Artikel 17 der Richtlinie 2014/34/EU, eingeschaltet zur Überwachung der Qualitätssicherung bezogen auf den Produktionsprozess.

Notified Body

The notified body DEKRA Testing and Certification GmbH, identification number: 0158, was activated, in accordance with Article 17 of Directive 2014/34/EU, to monitor quality assurance related to the production process.

Zertifikat: BVS 24 ATEX ZQS/E110

Certificate: BVS 24 ATEX ZQS/E110

Ausgefertigt in Hofheim am 22.05.2025

Issued at Hofheim on 22th May 2025

Hans Volz Geschäftsführer / CEO

Joseph Burke ExB / ExR

13. EU Type Examination Ex d

CERTIFICATE

EU-Type Examination

(1) EU-Type Examination

(2) **Equipment or protective systems intended for use in potentially explosive atmospheres - Directive 2014/34/EU**

(3) EU-Type Examination Certificate Number: **KEMA 10ATEX0141 X** Issue Number: 3

(4) Product: **Smart Pressure Transmitter Series PAD and PAS**

(5) Manufacturer: **Kobold Messring GmbH**

(6) Address: **Nordring 22-24, 65719 Hofheim, Germany**

(7) This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) DEKRA Certification B.V., Notified Body number 0344 in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential test report number 213610600, issue 3.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN IEC 60079-0 : 2018 **EN 60079-1 : 2014** **EN 60079-31 : 2014**

except in respect of those requirements listed at item 18 of the Schedule.

(10) If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

(12) The marking of the product shall include the following:

II 2 G Ex db IIC T6.../T4 Gb
II 2 D Ex tb IIIC T85 °C...T130 °C Db

Date of certification: 11 November 2022

DEKRA Certification B.V.

L.G. van Schie
Certification Manager

Page 1/3

© Integral publication of this certificate and adjoining reports is allowed. This Certificate may only be reproduced in its entirety and without any change.

DEKRA Certification B.V. Meander 1051, 6825 MJ Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands
T +31 88 96 83000 F +31 88 96 83100 www.dekra-product-safety.com Registered Arnhem 09085396

(13) **SCHEDULE**

(14) **to EU-Type Examination Certificate DEKRA 10ATEX0141 X** Issue No. 3

(15) **Description**

Smart Pressure Transmitter, Series PAD and PAS measure the pressure of a process and converts it into an electrical 4 to 20 mA analog current signal with digital communication (HART protocol).
The complete transmitter is in type of protection flameproof enclosure "d" and type of Protection by enclosures "t".

The enclosure provides a degree of protection of IP6X per EN IEC 60079-0 and EN 60529.

Thermal data

The relation between the maximum ambient temperature, maximum process temperature, temperature class for gas group II and maximum surface temperature for dust group III is per table shown below.

Ambient temperature range	Process temperature range	Temperature class for EPL Gb	Maximum surface temperature for EPL Db
-20 °C to +60 °C	-20 °C to +85 °C	T6	85 °C
-20 °C to +60 °C	-20 °C to +100 °C	T5	100 °C
-20 °C to +60 °C	-20 °C to +130 °C	T4	130 °C

Electrical data

Supply: 12,5 to 45 Vdc
Output: 4 to 20 mA

Installation instructions

The instructions provided with the product shall be followed in detail to assure safe operation.

(16) **Report Number**

No. 213610600, issue 3.

(17) **Specific conditions of use**

For information regarding the dimensions of the flameproof joints the manufacturer shall be contacted.

(18) **Essential Health and Safety Requirements**

Covered by the standards listed at item (9).

(19) **Test documentation**

As listed in Report No. 213610600, issue 3.

DEKRA

(13) **SCHEDULE**

(14) **to EU-Type Examination Certificate DEKRA 10ATEX0141 X** Issue No. 3

(20) **Certificate history**

Issue 1 -	213610600	initial certificate
Issue 2 -	221519800	Assesment according to EN 60079-0 : 2012 + A11 and EN 60079-1:2007
Issue 3 -	227010900	Assessed per standards listed under (9) Minor constructional and electrical data changes

Page 3/3

Form 227A
Version 2 (2019-06)

14. EU Type Examination Ex ia

CERTIFICATE

EU-Type Examination

(1)

(2) **Equipment or protective systems intended for use in potentially explosive atmospheres - Directive 2014/34/EU**

(3) EU-Type Examination Certificate Number: **DEKRA 18ATEX0092 X** Issue Number: **0**

(4) Product: **Smart Pressure Transmitter Series PAD and PAS**

(5) Manufacturer: **Kobold Messring GmbH**

(6) Address: **Nordring 22-24, 65719 Hofheim, Germany**

(7) This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) DEKRA Certification B.V., Notified Body number 0344 in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential test report number 223118100 issue 0.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0 : 2009 **EN 60079-11 : 2007** **EN 60079-26 : 2007**

except in respect of those requirements listed at item 18 of the Schedule.

(10) If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

(12) The marking of the product shall include the following:

II 1 G or 2 G Ex ia IIC T5 or T4 Ga or Gb

Date of certification: 26 October 2018

DEKRA Certification B.V.

L.G. van Schie
Certification Manager

Page 1/2

© Integral publication of this certificate and adjoining reports is allowed. This Certificate may only be reproduced in its entirety and without any change.

DEKRA Certification B.V. Meander 1051, 6825 MJ Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands
T +31 88 96 83000 F +31 88 96 83100 www.dekra-certification.com Registered Arnhem 09085396

(13) **SCHEDULE**

(14) **to EU-Type Examination Certificate DEKRA 18ATEX0092 X** Issue No. **0**

(15) **Description**

The Smart Pressure Transmitter Series PAD and PAS are used to measure and convert differential (Series PAD only), gauge and absolute pressures into a 4-20 mA HART signal. Optionally an analog board and a LCD display can be provided.

Ambient temperature ranges:
- For T5: -30 °C to +40 °C
- For T4: -30 °C to +80 °C

Electrical data

Power supply and output circuit (terminals PWR + and -): in type of protection intrinsic safety Ex ia IIC, only for connection to a certified intrinsically safe circuit, with the following maximum values: Ui = 30 V, Ii = 200 mA, Pi = 0,9 W, Ci = 27 nF, Li = 104 µH.

Installation instructions

The instructions provided with the product shall be followed in detail to assure safe operation.

(16) **Report Number**

No. 223118100 issue 0.

(17) **Specific conditions of use**

The non-metallic parts incorporated in the enclosure of this equipment may generate an ignition capable level of electrostatic charge. Therefore particularly when it is used for applications that specifically require Group IIC, EPL Ga equipment, the equipment shall not be installed in a location where the external conditions can result in the build-up of electrostatic charge on such surfaces. Additionally, the equipment shall only be cleaned with a damp cloth.

Models with enclosures made of aluminium (ASTM B85) are considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction. Particularly, it must not be used for applications that specifically require EPL Ga equipment.

The insulation between the intrinsically safe circuit and the frame of the equipment is not capable of withstanding a 500 V dielectric strength test as defined in clause 6.3.12 of EN 60079-11 : 2007. This shall be taken into account during installation.

(18) **Essential Health and Safety Requirements**

Covered by the standards listed at item (9).

(19) **Test documentation**

As listed in Report No. 223118100 issue 0.

(20) **Certificate history**

Issue 0 - 223118100 initial certificate

Page 2/2

Form 227A
Version 1 (2016-04)