



# ESI Technology Limited

## Protran<sup>®</sup> PR3850

### User Manual



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ESI Technology Limited, Sensor House, Wrexham Technology Park,  
Wrexham, United Kingdom, LL13 7YP  
tel. +44 (0)1978 262 255 email. sales@esi-tec.com web. esi-tec.com



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## General Information

These operating instructions describe the safe and efficient handling and operation of the pressure transmitter or transducer, and must be carefully read and understood prior to use.

Compliance with the specifications regarding safety and operation contained in these instructions is a prerequisite for safe operation.

These operating instructions are part of the product. Failure to comply with the operating instructions will void the manufacturer's liability in the event of damage.

For future reference, keep these instructions in an accessible location.

## Product Coding Protocol

The standard ESI Technology Limited coding for pressure transducers and transmitters is as follows:

| MODEL | VARIANT | PRESSURE RANGE | PROCESS CONNECTION | CONNECTION |
|-------|---------|----------------|--------------------|------------|
|       |         |                |                    |            |

### Coding detail Examples\*\*

|                        |   |  |
|------------------------|---|--|
| <b>Model Code:</b>     | <b>PR8350</b><br><b>PR3851</b><br><b>PR3852</b>   | Flush Diaphragm Pressure Transmitter   |
| <b>Variant:</b>        | <b>EX</b>   | ATEX / IECEx / M1 certified with DIN EN175301 plug & socket (4-20mA only)  |
| <b>Pressure Range:</b> | <b>00.1</b><br><b>0004</b><br><b>0010</b><br><b>0025</b><br><b>0100</b><br><b>0250</b><br><b>0400</b> | 0-100 mbar (1" BSP male with semi-flush membrane only)<br>0-4 bar<br>0-10 bar<br>0-25 bar<br>0-100 bar<br>0-250 bar<br>0-400 bar |
|                        | <b>BA</b><br><b>BC</b>  | 1/2" BSP male with flush membrane<br>1" BSP male with semi-flush membrane (PR385x only)  |

**Product code example:** **PR3850EX0025BA**

\*\*For full scope of pressure ranges and process connections please refer to the technical specifications. For options not listed please contact sales@esi-tec.com for support.

## Intended Use

The pressure transmitter is designed for monitoring liquid and gaseous media within the limits specified in these instructions.

For this purpose, the pressure transducer converts pressure applied to the pressure connection into an electrical signal.

Please pay attention to the correct method of the sealing and process connection for the transmitter (see electrical connections and threads)

Please take into account the environmental conditions such as temperature, humidity and atmospheric pressure, etc.







Should be handled by qualified technical personnel only.

### Limitation of Liability

The manufacturer is not liable for damage resulting from non-observance of these operating instructions.

### Safety symbols


The explanations of the symbols used in these operating instructions are listed below:

|   |   |
|---|---|
|  | <p> <b>HAZARD</b></p> <p><b>Type and Source of the hazard!</b><br/>Consequence - Hazard potentially resulting in death, personal injuries and damage to property</p> |
|  | <p> <b>WARNING</b></p> <p><b>Type and Source of the hazard!</b><br/>Consequence - Hazard potentially resulting in minor personal injuries and damage to property</p> |
|  | <p> <b>CAUTION</b></p> <p><b>Type and Source of the hazard!</b><br/>Consequence - Hazard potentially resulting in damage to property</p>                             |
|  | <p> <b>NOTICE</b></p> <p><b>Type and Source of the hazard!</b><br/>Notes, information and recommendations e.g. for trouble free operation</p>                        |

## Safety


In addition to the safety instructions included in this installation guide, local safety regulations apply. Use the product in its original state only, without making any unauthorised changes. Prior to the installation of the product all transport materials, such as protective covers, caps or cardboard must be removed.

|   |  |
|---|--|
|  | <b>HAZARD</b>  |
|   | <b>Handling with Oxygen</b><br>NOT for use with Oxygen |

|   |  |
|---|--|
|  | <b>HAZARD</b>  |
|   | <b>Handling with Hydrogen</b><br>NOT for use with Hydrogen |


### Selection of personnel

Only authorised and qualified personnel who have had experience and knowledge of the country-specific regulations, as well as the applicable standards and directives, may be used for installation and operation. Installation and commissioning must be carried out in accordance with these operating instructions. The pressure transmitter is regarded as "electrical equipment"

|  |  |
|--|--|
|  | <b>WARNING</b>   |
|  | <b>System may be under pressure!</b><br>Inadequate qualification of the personnel may lead to personal injuries or damage to property. |

### Product application

The pressure transducer is intended to monitor liquid and gaseous media. For proper and safe application of the product it is important to follow the specifications and warnings described in these operating instructions. In addition to this installation guide, the specific safety regulations in the country in which the product is used apply.

|   |  |
|---|--|
|  | <b>NOTICE</b>  |
|   | <b>Sensitive sensor technology</b><br>This product responds to environmental conditions. |

Please comply with the specified limit values such as pressure ranges, overpressure safety, operating voltage and temperatures. For current ranges please refer to product datasheet.

### Examples of limit values

Overpressure safety PR3850 - 1.5x across all ranges



- Maximum pressure change rate < 1,0 bar/ms
- Please take into account the prevailing environmental conditions (temperature, humidity, atmospheric pressure, etc)
- Please use the product in its original state only. Do not carry out any unauthorised modifications.
- Remove any transport materials such as protective covers, caps or cardboard.
- Material compatibility should be considered. If in doubt, contact ESI sales.

## Maintenance and Care

The pressure transmitter is maintenance-free. Nevertheless you should check the pressure transducer regularly for excessive dirt and defects.

Recalibrations cycle depends on own industry guidelines.



Zero and span adjustment is available

|   |  |
|---|--|
|  |  <b>WARNING</b>   |
|   | <p><b>System may be under pressure!</b><br/>Loose parts and escaping media may cause personal injuries to the personnel present. Ensure the pressure system is depressurised prior to starting any clean work.</p> |



### Cleaning

Clean the device using a damp cloth.

- Never use sharp or hard objects to clean the device.
- Do not insert or push any objects into the pressure connection hole

|   |   |
|---|---|
|  |  <b>NOTICE</b> |
|   | <p>Repair work on the product must be carried out by the manufacturer only</p>                  |



### Scope of delivery and storage

|   |   |
|---|---|
|  |  <b>WARNING</b>  |
|   | <p><b>Damage to the product!</b><br/>Check the pressure transducer for damage when unpacking. If the pressure transmitter is damaged, contact the manufacturer or your local dealer immediately</p> |

### Scope of delivery

| Quantity | Designation             |
|----------|-------------------------|
| 1x       | Pressure transmitter    |
| 1x       | Calibration certificate |

### Storage

|   |  |
|---|--|
|  |  <b>WARNING</b>                                 |
|   | <p><b>Improper storage!</b><br/>Improper storage of the pressure transducer may result in damage or malfunction of the product</p> |

Ambient conditions during storage

- Temperature: +5°C to +40°C
- Store in dry conditions

## Troubleshooting


In case of malfunctions, first check that the pressure transmitter is mounted correctly. The table shows the most common faults and malfunctions and how they can be rectified.

| Error                                      | Possible cause  | Possible remedial action  |
|--|---|---|
| No output signal                           | <ul style="list-style-type: none"> <li>- No supply voltage</li> <li>- Line interrupted/ disconnected</li> <li>- Polarity reversal</li> </ul>  | <ul style="list-style-type: none"> <li>- Switch on supply voltage</li> <li>- Check cable</li> <li>- Check correct polarity</li> </ul>                 |
| Zero point signal outside of specification | <ul style="list-style-type: none"> <li>- Operating outside of temperature range</li> <li>- Measuring cell damage</li> <li>- Pressure connection hole blocked</li> </ul>                       | <ul style="list-style-type: none"> <li>- Adhere to temperature range</li> <li>- Replace transmitter</li> <li>- Clean pressure inlet hole</li> </ul>   |
| Signal span outside of specification       | <ul style="list-style-type: none"> <li>- Operating outside of temperature range</li> <li>- Measuring cell damaged e.g. by overpressure</li> <li>- Pressure connection hole blocked</li> </ul> | <ul style="list-style-type: none"> <li>- Adhere to temperature range</li> <li>- Replace transmitter</li> <li>- Clean pressure inlet hole</li> </ul>   |
| Output signal fluctuates/ noises           | <ul style="list-style-type: none"> <li>- EMC interference sources outside the specification</li> </ul>  | <ul style="list-style-type: none"> <li>- Eliminate or reduce EMC interference sources</li> <li>- Additional EMC precautions e.g. shielding</li> </ul> |
| Output signal does not change              | <ul style="list-style-type: none"> <li>- Measuring cell damaged e.g. by overpressure</li> <li>- Electronics failure e.g. by short circuit</li> </ul>  | <ul style="list-style-type: none"> <li>- Replace transmitter</li> </ul>   |

## Recycling

Dispose of the product and transport packaging materials according to applicable disposal regulations specific to the respective country. Upon request, used parts can be taken back free of charge and disassembled, disposed of and recycled in accordance with the legal regulations



|   |  |
|---|--|
|  | <b>⚠ WARNING</b>   |
|   | <p><b>After removal!</b><br/>After removal, there may be residual media in and at the pressure connection that can endanger persons and the environment.<br/><b>Please take appropriate precautions.</b></p> |



## ESI Product Instructions - General

| INTENDED USE            |  |
|-------------------------|--|
|                         | Please refer to datasheet, calibration certificate and read installation instructions before starting installation   |
|                         | The device must be used within the specified pressure, temperature and supply voltage range.   |
| INSTALLATION            |  |
|                         | During installation please comply with the relevant national guidelines  |
|                         | Installer must be technically competent and familiar with pressure monitoring technology   |
| MECHANICAL INSTALLATION |  |
|                         | Ensure system is not pressurised before installation   |
|                         | Ensure that the measurement cell is not damaged during installation  |
|                         | Use either a correct sized AF wrench on the hexagon with tightening torque in accordance with the table. The customer must ensure that the pressure seal is suitable for application |
|                         | Tightening torque setting guideline in table overleaf  |
| ELECTRICAL INSTALLATION |  |
|                         | Make mechanical installations first so as not to twist the cable   |
|                         | Refer to product calibration certificate for wiring diagram  |
|                         | Ensure electrical connector and cable gland are securely fitted and sealed   |
| MAINTENANCE             |  |
|                         | Recalibration interval depends on own industry guidelines  |
|                         | Do not insert pointed or hard objects in to the pressure port  |
|                         | Repairs must be performed by manufacturer only   |
| REMOVAL/ END OF LIFE    |  |
|                         | Ensure system is depressurised before removal  |
|                         | Remaining media in pressure port may be hazardous  |
|                         | WEEE can be returned to factory at end of life for recycling   |

### PR3850 SERIES

#### DISCLAIMER

ESI Technology Lts operates a policy of continuous improvement and product development. We reserve the right to change specification and operating instructions without prior notice.

Please observe applicable safety regulations when installing or removing pressure transmitter.

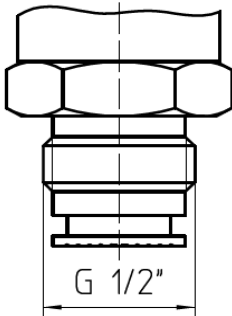
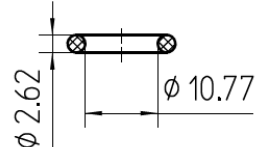
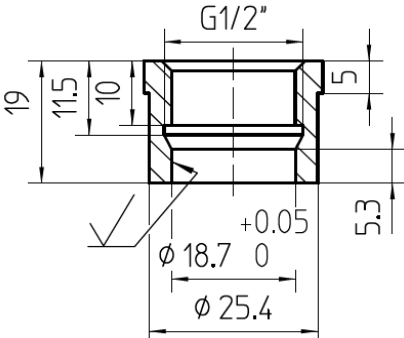
#### ELECTRICAL CONNECTION AND ADJUSTMENT



Example DIN 43650 Connector



## Connections and Tightening Torques

| PR3850 SERIES             |  |
|---------------------------|--|
| <b>Process Connection</b> | <p>Sensitive Membrane,<br/>handle with care!</p>  <p style="text-align: center;">G 1/2"</p>  |
| <b>Sealing Method</b>     | <p><b>O-Ring</b></p> <p>Part No.: Z0093</p>  <p style="text-align: center;"><math>\phi</math> 2.62      <math>\phi</math> 10.77</p>  |
| <b>Counter Part</b>       | <p>Weld Socket / Part No.: 8016</p>  <p style="text-align: center;">G1/2"</p> <p style="text-align: center;">19    11.5    10    5    5.3</p> <p style="text-align: center;"><math>\phi</math> 18.7 <sup>+0.05</sup>/<sub>0</sub>      <math>\phi</math> 25.4</p> |

$\sqrt{\quad} = \sqrt{\quad} \text{ Ra } 3.2 \text{ max}$

## Tightening Torques

| Thread Type                | Torque Settings*                                      |
|----------------------------|---|
|                            | All Pressures   |
| G1/2" BSPP male (flush)**  | Max. 50 Nm  |
| G1" BSPP male (semi-flush) | For more information please contact sales@esi-tec.com |

\* The torque values apply only to test conditions and are a guide only. Tightening torques for installation depend on many factors, including materials, lubrication, coating and surface treatment. If in doubt the manufacturer is to be consulted.

\*\* It is recommended that the PR3850 is used in conjunction with weld socket part No. 8016 for best results. Alternatively customer may machine an appropriate mating connection in their equipment to replicate the dimensions detailed in part 8016 (detailed diagrams available on request).



**Materials for mating part should be selected to suit pressure and media requirements.**

## ATEX Product Instructions

Specified to hazardous area installations

(Reference European ATEX Directive 2014/34/EU, Annex II, 1.0.6.)

The following instructions apply to equipment covered by certificate numbers

TRAC12ATEX0060X V2, IECEXTRC12.0025X issue 01. The wording and format may be altered providing the meaning remains unchanged.

All products were evaluated against standards:

- EN 60079-0:2012+A11:2013
- EN 60079-11:2012
- EN 60079-26:2015
- EN 50303:2000
- IEC 60079-0:2017
- IEC 60079-11:2011
- IEC 60079-26:2014

### ESI Technology Ltd

Wrexham, LL137YP, UK

Serial No :

Part No :

Range :

Output :

U<sub>i</sub> = 28 V      I<sub>i</sub> = 119 mA      C<sub>i</sub> = xx Nf

Li = 0.1 Uh Pi = 0.65 W



TRaC Certificate No. TRAC12ATEX0060X V2  
IECEXTRC12.0025X issue 01

**WARNING: POTENTIAL ELECTROSTATIC CHARGING HAZARD DUE  
TO PROPOGATING BRUSH DISCHARGE - SEE INSTRUCTIONS**



II 1 GD

**\*\*Arrangement of details can be altered to suit different housing types provided the content of the marking remains unchanged. Year of manufacture shall precede the serial number.**

When the product cannot be laser marked directly the product marking will be laser marked on to a stainless steel plate which will be permanently fixed to the housing.

## ATEX Product Instructions

- 1 The power source feeding the apparatus shall be an ATEX/IECEx approved barrier only
- 2 For the maximum cable lengths stated the cable capacitance shall not exceed 200pF/m otherwise the overall capacitance of Ci plus the cable capacitance shall not exceed 83nF
- 3 The equipment may be used with flammable gases, vapours and dust with apparatus group IIC and with temperature class T4. The apparatus is not permitted for use with dusts that have a layer smouldering temperature of 135oC or less.
- 4 The equipment may be used above surface Group II and Group III and in mining zone Group I.
- 5 The equipment is only certified for use in ambient temperatures in the range -20oC to +70 oC and should not be used outside this range.
- 6 Propagating brush discharges are caused by non-conducting fluid flow over a non-conducting plastic surface. The product shall not be installed in areas where a high fluid flow may occur (for example in the case of a ruptured process pipe or compressed air pipe).
- 7 All repairs are to be carried out by ESI Technology Ltd, Sensor House, Wrexham Technology Park, Wrexham, LL13 7YP, United Kingdom.
- 8 Installation shall be carried out in accordance with the applicable code of practice by suitably-trained personnel
- 9 If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

**Aggressive substances** - e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials.

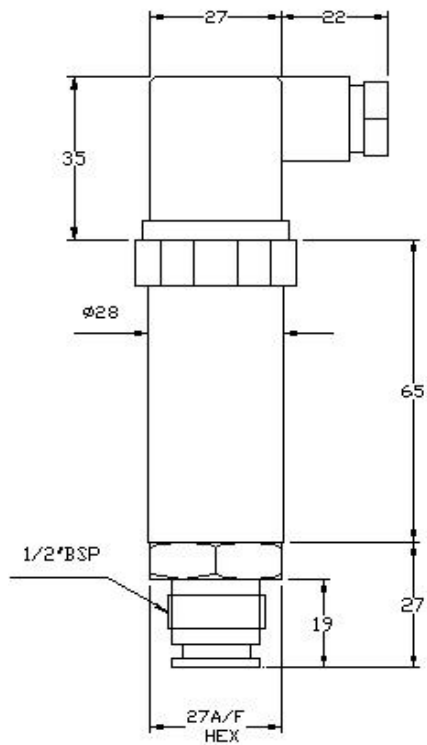
**Suitable precautions** - e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals

- 10 For products other than PR3200 and PR3202 there are no special checking or maintenance conditions other than a periodic check. These products which may have aluminium enclosures (powder coated) should be located where friction sparks with steel objects are avoided. They should also be regularly inspected to ensure the coating is not damaged

### Additional Notes

- A A copy of certification marking as detailed on drawing number 8727.
- B A copy of the EC type examination certificates TRAC12ATEX0060X V2, IECXTRC12.0025X issue 01.
- C Diagrams that may be necessary for safety, putting into service, maintenance, inspection etc.
- D Where applicable, the address of the importer or repairer will be specified.
- E On being put into service, the equipment will be accompanied by a translation of the instructions in the language or languages of the country in which the equipment is to be used and by the instructions in the original language.
- F In addition to the wording normally applied (e.g. Clean Only With A Damp Cloth) the wording of the label shall include the words 'Warning: Danger of propagating brush discharge' followed by the warning symbol ISO3864 No. B.3.1 (black exclamation mark in black triangle, meaning: Caution, refer to accompanying documents). The manufacturer's instructions shall include details of the ignition hazard caused by propagating brush discharges and the precautions to be taken to avoid the build up of static charge. (See note 6 above)

## Dimensions



**Notes:**

1. Item is shown for pictorial purpose only to define critical dimensions
2. Construction shall be in accordance with specification information
3. Label will show: product name, range and output signal

| ELECTRICAL CONNECTION (mA) |             |
|----------------------------|-------------|
| Pin No.                    | 2 wire      |
| 1                          | +supply     |
| 2                          | 4-20mA sig. |
| 3                          | N/C         |
| ⏏                          | to case     |

| ELECTRICAL CONNECTION (Vdc) |         |         |
|-----------------------------|---------|---------|
| Pin No.                     | 4 wire  | 3 wire  |
| 1                           | -supply | common  |
| 2                           | +supply | +supply |
| 3                           | +output | +output |
| ⏏                           | to case |         |

## Technical Specification

| Type   | PR3850  | PR3851         | PR3852     |
|--|---|----------------|------------|
| Sensor Technology                                  | Ceramic thick film  |                |            |
| Output signal                                      | 4-20mA (2 wire)   | 0-5 V (4 wire) | 0-10 V (4) |
| Supply Voltage                                     | 13-36 Vdc   | 13-30 Vdc      |            |
| Pressure Reference                                 | Gauge   |                |            |
| Protection of Supply Voltage:                      | Protected against supply voltage reversal up to 50 V  |                |            |
| Standard Pressure Ranges (bar):                    | 0-1 bar Vac; 0-0.5 bar; 0-1 bar; 0-2.5 bar; 0-6 bar; 0-10 bar; 0-16 bar; 0-25 bar; 0-100 bar;   |                |            |
|  | 0-250 bar; 0-400 bar; 0-600 bar; 0-1,000 bar; 0-1,500 bar (other ranges available)  |                |            |
| Overpressure Safety:                               | 1.5x for all pressure ranges  |                |            |
| Load Drive Capability:                             | 4-20 mA: $RL < [UB - 13 V] / 20 \text{ mA}$ ; (e.g. with supply voltage (UB) of 36V max. load (RL) is 1150 $\Omega$ ); 0-5 V: max load $RL > 5 \text{ K}\Omega$ ; 0-10 V: max load $RL > 10 \text{ K}\Omega$  |                |            |
| Accuracy NLHR:                                     | $\leq \pm 0.3 \%$ of span BFSL  |                |            |
| Zero Offset and Span Tolerance:                    | $\pm 1.0\%$ FS at room temperature; $\pm 5\%$ FS (approx.) adjustment with easy access trimming potentiometers on amplified versions only   |                |            |
| Operating Temperatures:                            | <b>Ambient and Media:</b> -20 °C to +85 °C (-4 °F to +185 °F)   |                |            |
| Storage Temperature:                               | +5 °C to +40 °C (+41 °F to +104°F) Recommended Best Practice  |                |            |
| Temperature Effects:                               | Temperature Effects: $\pm 2.5\%$ FS total error band for -20 °C to +70 °C.<br>Typical thermal zero and span coefficients $\pm 0.04\%$ FS/ °C  |                |            |
| ATEX/IECEx Approval Option (4-20 mA version only): | Ex II 1 G Ex ia IIC T4 Ga (zone 0)<br>Ex II 1 D Ex ia IIIC T135°C Da (zone 20)<br>Ex I M 1 Ex ia I Ma (group 1 M1)  |                |            |
| ATEX/IECEx Safety Values:                          | $U_i = 28 \text{ V}$<br>$I_i = 119 \text{ mA}$<br>$P_i = 0.65 \text{ W}$<br>$L_i = 0.1 \mu\text{H}$<br>$C_i = 62 \text{ nF}$<br>Temperature Range = -20 °C to +70 °C<br>Max. cable length = 105 m             |                |            |
| Electromagnetic Compatibility:                     | Emissions: EN61000-6-3; Immunity: EN61000-6-2; Certification: CE Marked   |                |            |
| Insulation Resistance:                             | $> 100 \text{ M}\Omega @ 50 \text{ VDC}$  |                |            |
| Response time 10-90%:                              | 10 mS   |                |            |
| Wetted Parts:                                      | SAE 316L stainless steel  |                |            |
| Pressure Media:                                    | All fluids compatible with SAE 316L stainless steel   |                |            |
| Pressure Connection:                               | 1/2" BSP male (G1/2) with standard integral Viton o-ring seal and flush SAE 316L stainless steel diaphragm or 1" BSP male with semi-flush SAE 316L Stainless steel diaphragm (from 100 mbar up to 4 bar only) |                |            |
| Electrical Connection:                             | Mating socket EN175301-803 Form A (ex DIN43650) rated IP65 with PG9 cable entry (other options available)   |                |            |
| Net. Weight (Kg):                                  | 0.3 Kg  |                |            |

## Version Information

Date of creation: May 2022

Prepared by: ESI Technology Limited

Location: Wrexham, UK

### Document version: 22/6/Eng

- PR3850
- PR3851
- PR3852

Operation of this equipment should always be carried out by trained personnel and in accordance with the manufacturers guidelines. Failure to do so will be at the users own risk. ESI Technology will not be liable for any losses and/ or damages incurred from improper use of equipment.

ESI Technology Limited operated a policy of continuous product development. We reserve the right to change specification without prior notice. All products manufactured by ESI Technology Limited are calibrated using precision calibration equipment, traceable to national measurement standards.

**Information provided within this manual is current and correct as of 01/09/2022.**