

# 2600T series pressure transmitters 266 MODBUS<sup>®</sup> multivariable transmitter

2105216 Rev. AB

The most accurate  
multivariable transmitter  
ABB has ever produced



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## Typographical conventions

The following conventions are used throughout this manual.

Element	Convention	Example
Cross-reference to a figure or table in the document	Hyperlink the figure or table label and number. If the figure or table is not immediately following the cross-reference, add the page number where it is located.	See Figure 2 or See Table 3 (page 12).
Cross-reference to a specific section in the document	Hyperlink both the section number and title, with the section title in italics	Go to section 2.1, <i>Device setup</i> .
Greater than character (>)	Indicates that the following item is an additional menu selection.	Use the key pad to locate and select <b>Calibrate &gt; Diff. Press. Sensor &gt; Calibration Units &gt; Edit</b> .
Menu item names in instructions	Bold text and the capitalization of names agrees with the names as displayed on the HMI menu.	Use the right soft key to enter the <b>Main Menu</b> .
Programs, including utility and accessory programs	Title capitalization	Microsoft Word
URL	All lowercase for a fully specified URL. If necessary, break long URLs before a forward slash or break a long URL before it begins	<a href="http://www.microsoft.com/seattle.sidewalk.com">http://www.microsoft.com/ seattle.sidewalk.com</a>
User input	Lowercase, unless case sensitive. Bold or italic, depending on element. If the user input string contains placeholder text, use italics for that text.	Type <b>Name tag</b>

## Additional publications

Additional free publications for the 266 MODBUS® multivariable transmitter are available for download from the [ABB Library Download Center](#):

266 MODBUS® multivariable startup guide	<a href="#">2105328</a>
266 pressure transmitter short operating instruction manual	<a href="#">2105549</a>
266JSH/JST MODBUS® multivariable transmitter data sheet	<a href="#">2101130</a>
XSeries TFIO module user manual	<a href="#">2101226</a>
XSeriesG4 flow computer user manual	<a href="#">2103335</a>
XSeriesG4 remote controller user manual	<a href="#">2103334</a>
TFIO Comm Interface Module (2100421) to transmitter MODBUS® w/ RTD user drawing	<a href="#">2102345</a>
Transmitter pipe mount bracket user drawing	<a href="#">2104265</a>
XFC G4 (Com2) ABB267/269 and ABB266 user drawing	<a href="#">2102118</a>
XFC G4 (Com2) IMV25 and ABB266 user drawing	<a href="#">2105115</a>
XFC G4 EX (Com2) ABB267/269 and ABB266 user drawing	<a href="#">2102117</a>
XRC G3 (Com1) ABB267/269 and ABB266 user drawing	<a href="#">2105114</a>
XRC G4 (Com2) ABB267/269 and ABB266 user drawing	<a href="#">2105113</a>
XRC G4 (Com2) IMV25 and ABB266 user drawing	<a href="#">2105116</a>

# 1 Health and safety

## 1.1 General information and notes

Read these instructions carefully prior to installation and commissioning. For reasons of clarity, these instructions do not contain all details about every type or version of the product, and therefore, do not take into account every conceivable assembly, operating, or maintenance scenario. For further information, or if specific problems arise which are not addressed in the instructions, please ask the manufacturer. The content of these instructions is neither part of, nor provided for changing a previous or existing agreement, promise, or legal relationship. All obligations to ABB result from the respective sales contract, which also contains the full and solely valid warranty clauses. These are neither limited to, nor extended by the content of these instructions.

Observe warning signs on the packaging and on the device.

## 1.2 Safety, warning, and note symbols



**DANGER – Serious damage to health / risk to life.** This symbol, in conjunction with the signal word "DANGER", indicates an imminent danger. Failure to observe this safety information will result in death or severe injury. The text may state the hazard, how to avoid the hazard, and what the result would be if not followed.



**DANGER – Serious damage to health / risk to life.** This symbol, in conjunction with the signal word "DANGER", indicates an imminent electrical hazard. Failure to observe this safety information will result in death or severe injury. The text may state the hazard, how to avoid the hazard, and what the result would be if not followed.



**WARNING – Bodily injury.** This symbol, in conjunction with the signal word "WARNING", indicates a potentially dangerous situation. Failure to observe this safety information may result in severe injury. The text may state the hazard, how to avoid the hazard, and what the result would be if not followed.



**WARNING – Bodily injury.** This symbol, in conjunction with the signal word "WARNING", indicates a potential electrical hazard. Failure to observe this safety information may result in death or severe injury. The text may state the hazard, how to avoid the hazard, and what the result would be if not followed.



**CAUTION – Minor injuries.** This symbol, in conjunction with the signal word "CAUTION", indicates a potentially dangerous situation. Failure to observe this safety information may result in minor or moderate injury.



**NOTICE – Property damage.** This symbol indicates a potentially damaging situation. Failure to observe this safety information may result in damage to or destruction of the product and other system components.



**IMPORTANT NOTE:** This symbol indicates operator tips, particularly useful information, or important information about the product or its further uses. The signal words "IMPORTANT NOTE" does not indicate a dangerous or harmful situation.

Only qualified and authorized specialists are to be employed for the assembly, electrical connection, commissioning, and maintenance of the transmitter. Specific training and skills required include:

- Training, instruction, and authorization to operate and maintain devices or systems according to safety engineering standards for electrical circuits, high pressures, and corrosive media
- Training or instruction in accordance with safety engineering standards regarding the maintenance and use of adequate safety systems



**WARNING – Bodily injury.** For electrical connections, use sufficiently insulated tools, according to the EN 60900 standard.

Follow the applicable standards, regulations, and recommendations for installation, including:

- The construction and operation of electrical installations. For example, the regulation for technical working materials (safety guidelines for tools)
- Explosion protection, if transmitters with explosion protection are installed

The device can be operated at high levels of pressure and with corrosive media. Serious injury and/or considerable material damage can result if the transmitter is handled incorrectly. Ensure compliance with the regulations applicable in the country of use when working with transmitters.

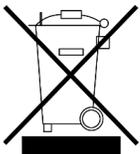
The material of the Sensor Diaphragm, Flanges, and Gaskets, (selected at the time the pressure transmitter order was placed) must be compatible with the environment and process fluids that may be present at the installation location. The environment and process fluids must not adversely affect the materials of the equipment construction.

The enclosure contains either aluminum or stainless steel which may be a risk of ignition of the potentially explosive atmosphere (classified location) by impact or friction. Care must be taken into account during installation and maintenance to prevent impact or friction.

### 1.3 Compliance

#### **EU Directive 2012/19/EU - Waste Electrical and Electronic Equipment (WEEE)**

ABB Industrial Automation, Measurement and Analytics, is committed to actively protecting the environment. Do not dispose of WEEE as unsorted municipal waste. Collect WEEE separately. Participation in the management of WEEE is critical to the success of WEEE collection.



Electrical and electronic equipment marked using the crossed-out wheeled bin symbol shall not be mixed with general household waste. Correct disposal at a recycling facility will help save valuable resources and prevent potential negative effects on health and the environment. These steps ensure compliance with the Waste Electrical and Electronic Equipment (WEEE) Directive.

Waste electrical and electronic equipment (WEEE) shall be treated separately using the national collection framework available to customers for the return, recycling, and treatment of WEEE.

## 2 System description

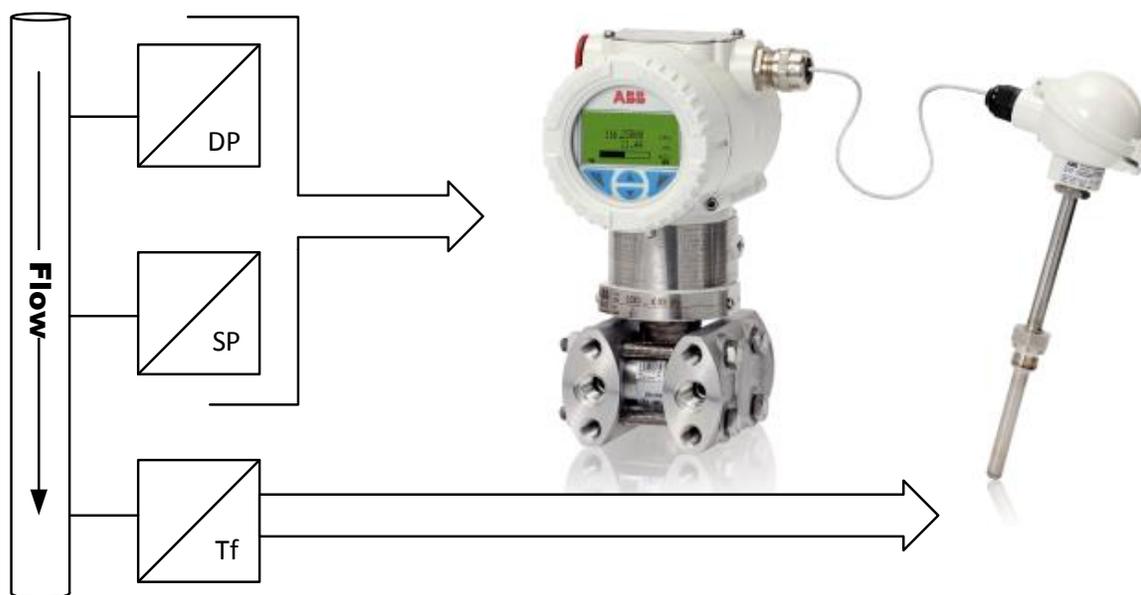
### 2.1 Introduction

The 266 multivariable transmitter is a modular device that provides live readings of differential pressure (DP), static pressure (SP), and temperature (Tf) via MODBUS® protocol to a Host device. Configuration and the display of readings is provided by the LCD assembly located in the front of the unit. Access to wiring terminations is provided by a terminal block located in the rear of the transmitter.

### 2.2 Theory of operation

This intelligent multivariable transmitter provides precise and reliable measurement of static pressure, differential pressure, and process temperature (from an external RTD) once every second. The differential pressure measuring ranges are scaled from 6.2 to 1993 mbar (2.5 to 800 inH<sup>2</sup>O). The measuring ranges for static pressure are 0 to 210 bar (0 to 3046 PSI). The unit transmits a digital output signal utilizing RTU MODBUS® communication protocol and is able to co-exist with an existing ABB 267/269CS multivariable transmitter on the same RS-485 communications bus.

The following graphic demonstrates the live inputs of differential pressure (DP), static pressure (SP) and temperature (Tf) for the 266 transmitter (Figure 1). All three of these input values are derived from the measurement stream: two through the transmitter pressure taps connected to the stream, and the flowing temperature as measured by the RTD.



Where:

- DP = Differential Pressure
- SP = Static Pressure
- Tf = Flowing Temperature

Figure 1: 266 Multivariable transmitter and RTD process inputs

## 2.3 Transmitter accuracy and traceability standards

The 266 MODBUS® multivariable transmitter is available with two accuracy specifications:

- 0.04% of calibrated DP span (JST) and 0.05% of calibrated SP span (JST)
- 0.075% of calibrated DP span (JSH) and 0.075% of calibrated SP span (JSH)

ABB retains the factory calibration report for each transmitter, which serves as the documentation record of measurements and accuracy. A factory calibration report (EN10204-3.1G) is included with each transmitter. Copies of the original calibration report are available upon request during the warranty period of the transmitter. A separate report for the differential pressure and the static pressure, are also included.

The following factory calibration data is kept for all units.

- Calibration data consisting of 5 points for each pressure sensor
- Proof data consisting of 12 points for each pressure sensor

## 2.4 Transmitter dimensions

Figure 2 and Figure 3 provide the dimensions of the horizontal and vertical flange transmitters for installation purposes.

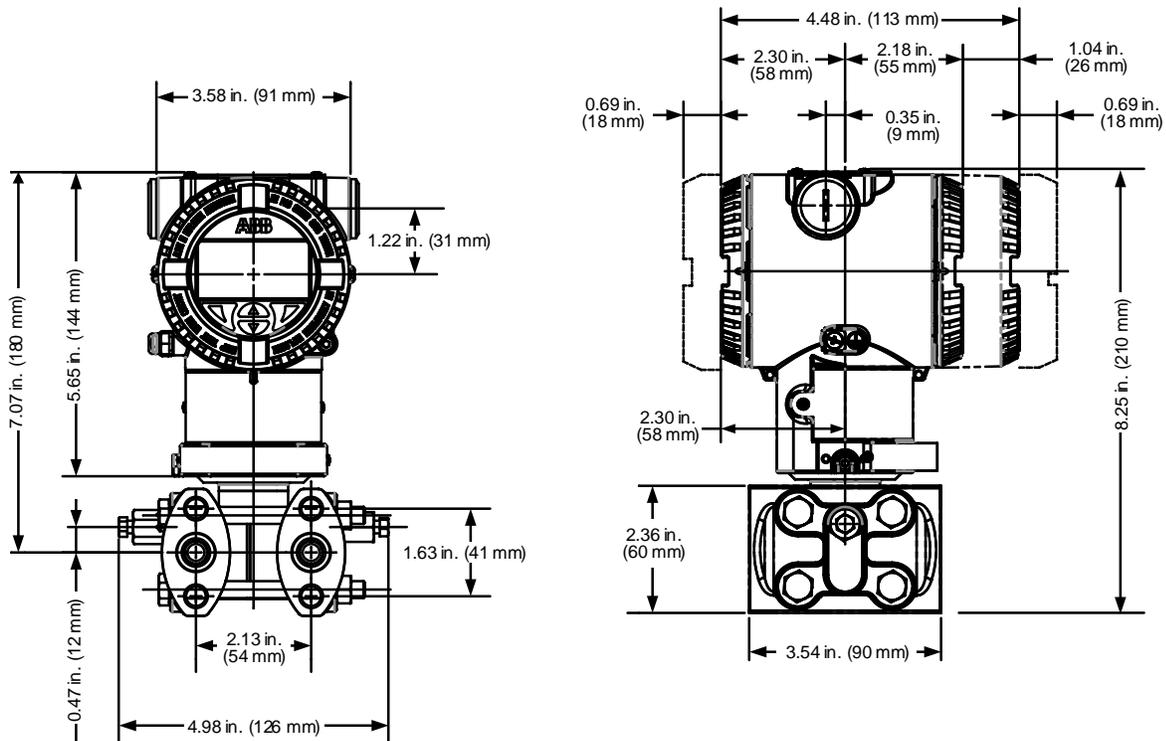


Figure 2: 266 Horizontal flange transmitter dimensions

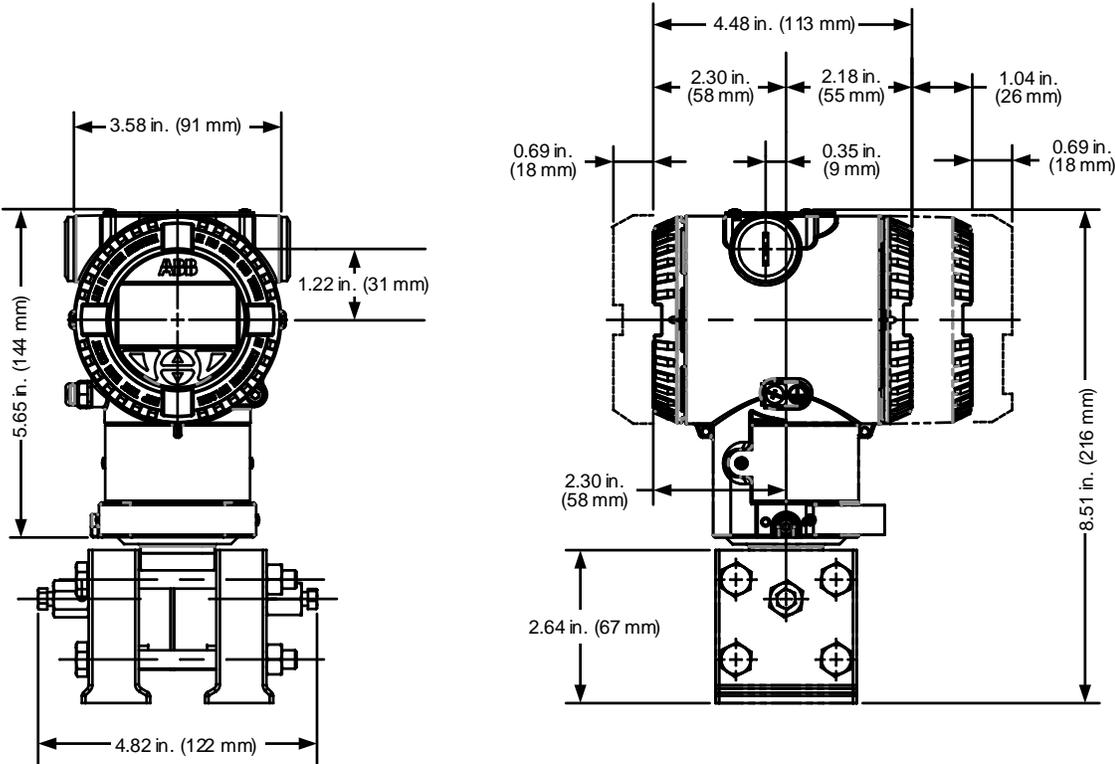


Figure 3: 266 Vertical flange transmitter dimensions

## 2.5 Transmitter hardware subassemblies

The 266 transmitter consists of multiple subassemblies (Figure 4). Table 1 explains each subassembly and provides additional information.

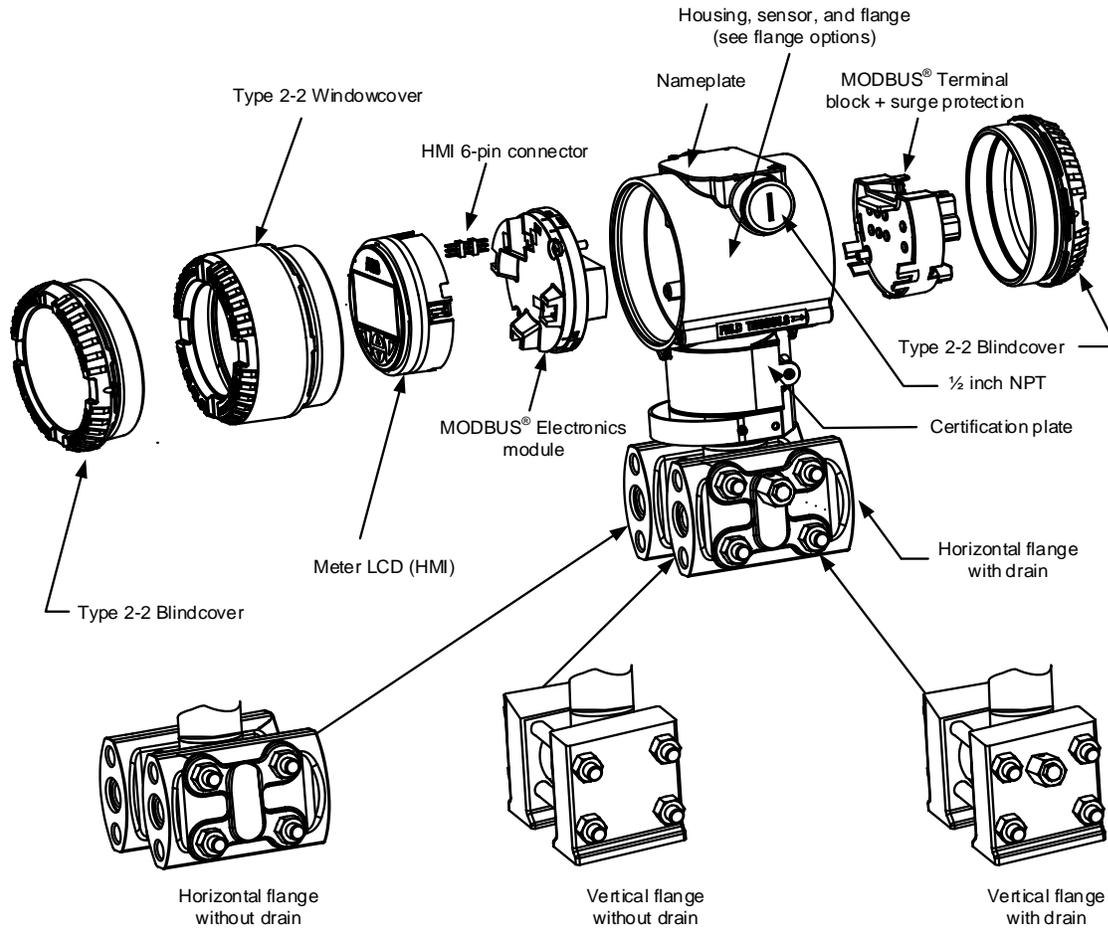


Figure 4: 266 MODBUS® multivariable transmitter exploded view

Table 1: Transmitter subassemblies

Subassembly	Description
Certification plate	Provides optional certification information, if purchased
Blindcover	Provides access to the wiring terminations
Windowcover	Provides visual access to the LCD display. Removal of the window cover provides access to the user interface and the hardware DIP switch settings.
HMI 6-pin connector	Provides connection between the meter LCD assembly and electronics module
Housing, sensor, and flange	The housing protects the transmitter components from environmental conditions and also provides an explosion-proof rating for the unit. The housing includes two NPT entry points for field wiring and a nameplate which states the product ID and the unit serial number. The sensor assembly, which provides the electrical signal from the transducer to the electronics module, is located in the housing neck. The flange assembly provides the connection to the process stream and is factory-installed in the lower housing neck. The housing, sensor, and flange assembly are not field repairable or replaceable.
Meter LCD (HMI)	Provides viewing of parameters and readings
MODBUS® electronics module	Main electronics board, which provides communication and display interface. The electronics module also contains the DIP switches, which are used to write-protect the device and restore configuration data.
MODBUS® terminal block + surge protection	The terminal block provides field wiring terminations for power, RTD, and RS-485 communications. This assembly also provides surge protection for the remaining electronics.

## 2.6 Transmitter operational specifications

The following information details the 266 transmitter operational specifications and other information (Table 2).

Table 2: 266 Transmitter specifications<sup>1</sup>

Item	Description
Dimensions (approx.)	Width: 3.58" (91 mm) without electrical and RTD connections Height: 8.51" (216 mm) with vertical flange and 8.25" (210 mm) with horizontal flange Depth: 4.48" (113 mm) with window display cover
Weight (approx.)	8 lbs. (3.5kg)
Mounting	Wall, pipe or direct
Humidity	Up to 100%; condensation, icing permitted
Operating temperature limits	Compensated: -40 °F to +160 °F (-40 °C to +71 °C)
	Transmitter (ambient): -60 °F to +185 °F (-51 °C to +85 °C) <sup>2</sup>
	LCD display: -4 °F to +158 °F (-20 °C to +70 °C)
	Process temperature limits: -60 °F to +230 °F (-51 °C to +110 °C)
Analog to digital resolution	24-bit maximum resolution
Electromagnetic compatibility (EMC)	Emissions: EN 55022 and FCC: Class B, (radiated and conducted)
	Immunity: Meets or exceeds EN61326-1, (Criteria A) for
	ESD: 8 kV / 6 kV
	RFI: 10 V/m
	EFT: 2 kV
	Lightening surge: 2 kV / 1 kV
	Cond: 10 Vrms
Mag: 100 A/m	
Low voltage directive	Meets 73/23/EC
Certifications	Explosion-proof: Class I, Div 1, Groups A, B, C, D, T5 Ta = -50 °C to +85 °C (Canada: Class I, Div 1, Groups B, C, D, T5) (approved Div 1 RTD available)
	Flame-proof (US and CA): Class I, Zone 1, (A)Ex d, IIC, T4
	Dust ignition proof (US and CA): Class II, III, Div 1, Groups E, F, G, T5
	Non-Incendive (US and CA): Class I, Div 2, Groups A, B, C, D, T4...T6 <sup>3</sup>
	Non Sparking (US and CA): Class I, Zone 2 (A)Ex nA IIC T4...T6 <sup>3</sup>
	Flame-proof: ATEX II 1 / 2 G Ex d IIC T6; IECEx Ex d, IIC T6 Ta = -50 °C to +75 °C
	Dust protected enclosure: ATEX II 1 / 2 D Ex tD A21 IP 67 T85 °C; IECEx Ex tD A21 IP67 T85 °C, Ta = -50 °C to +75 °C
	Non Sparking: ATEX II 3 G Ex nA IIC T4...T6 <sup>3</sup> ; IECEx Ex nA IIC T6
Dust Protected enclosure: ATEX II 3 D Ex tD A22 IP67 T85 °C; IECEx Ex tD A22 IP67 T85 °C, Ta = -50 °C to +75 °C	

<sup>1</sup> Specifications are based on current testing data and are subject to change.

<sup>2</sup> For hazardous atmosphere applications, see the temperature range specified on the relevant certificate or approval.

<sup>3</sup> Energy and ambient temperature (Tamb) dependent.

## 2.7 Power requirements

The supply voltage required range is 10.5 to 30 Vdc. For current draw requirements see Figure 5. For power consumption based on specific supply voltages see Figure 6.

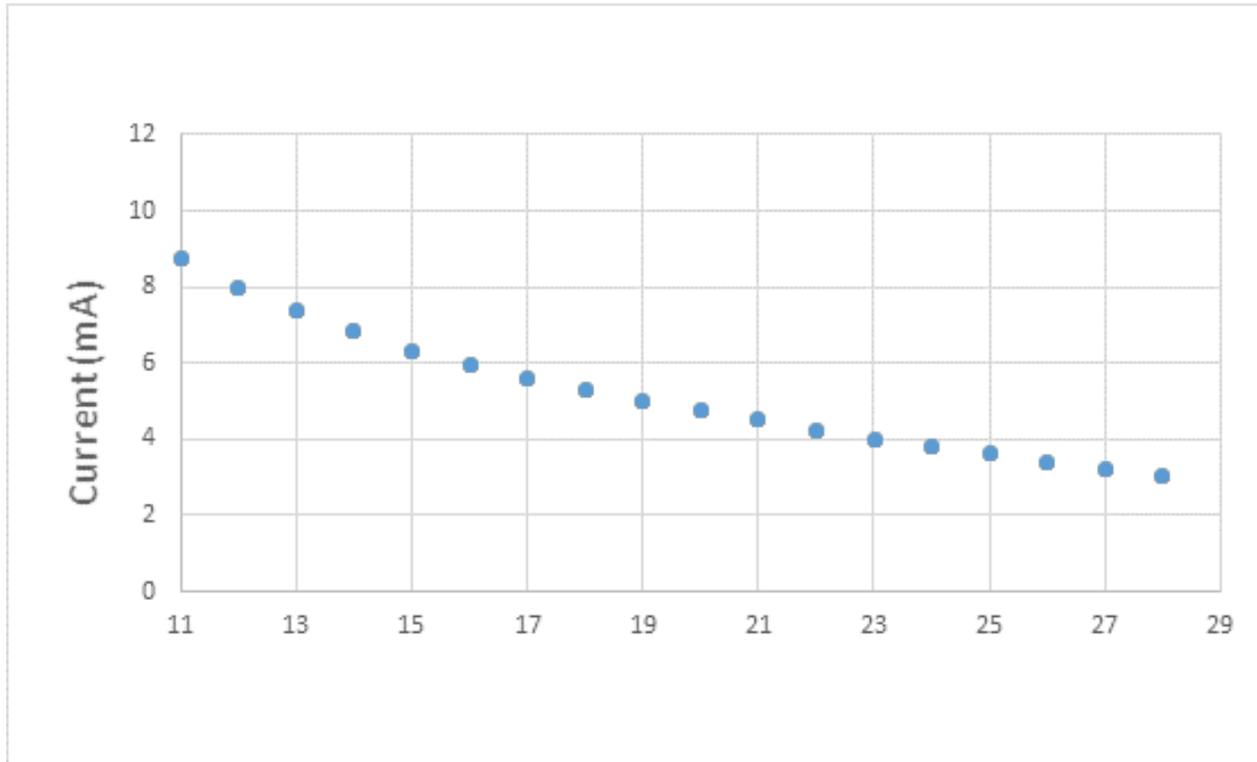


Figure 5: Supply current chart

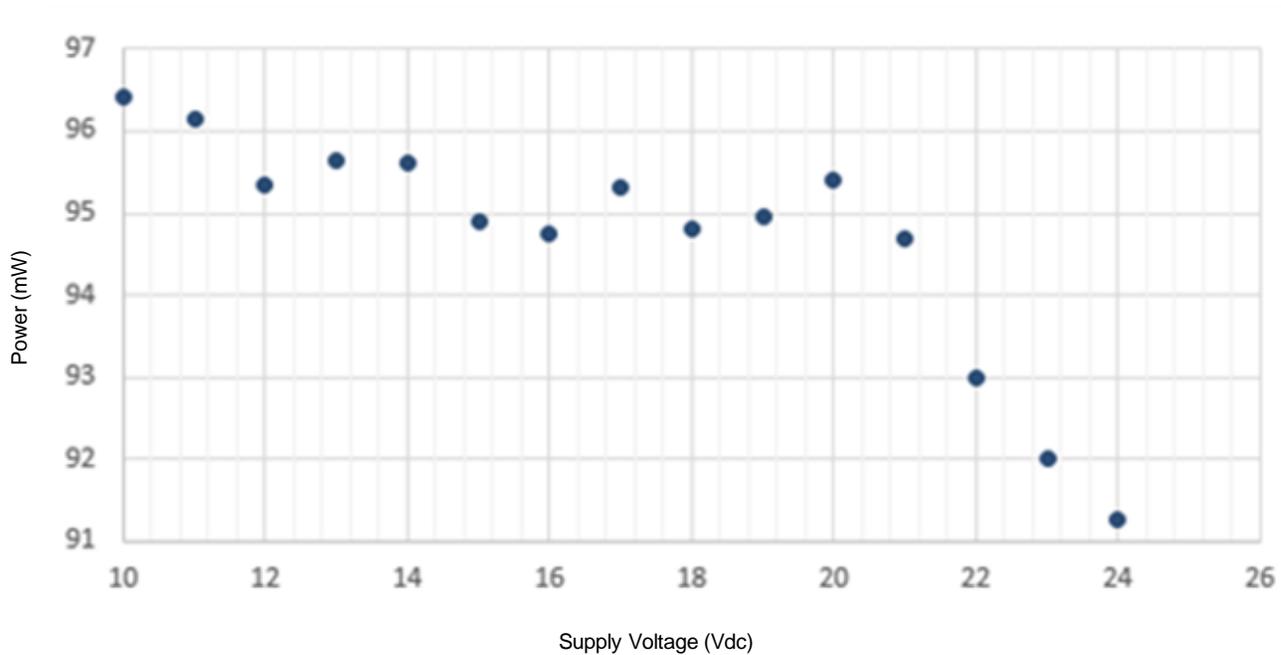


Figure 6: Power consumption chart

## 2.8 Input/output specifications

The multivariable transmitter features multiple inputs that include DP, SP, and temperature. The transmitter output is RS-485 MODBUS® communication.

### 2.8.1 Differential pressure input

The transmitter includes a differential pressure input. The specifications are documented in Table 3.

Table 3: Differential pressure specifications

Item	Description
Accuracy <sup>4</sup>	User calibrate spans from 1:1 to 10:1 (for spans > 10:1, see DS/2101130)
	±0.04% (266JST)
	±0.075% (266JSH)
Static pressure effect (SPE) to DP Zero (zero errors can be calibrated out at line pressure)	Up to 1450 PSI: 0.02% of FCS <sup>5</sup>
	>1450 PSI: 0.02% of FCS <sup>5</sup> per 1450 PSI
Long term stability	±0.15% of FCS <sup>5</sup> over a 24 month period
Ambient temperature effect	Between the temperatures of -35 °F to +185 °F
	±0.04% of FCS <sup>5</sup> , ±0.02% of reading
Static pressure effect (SPE) to DP span	Up to 1450 PSI: 0.02% of reading
	>1450 PSI: 0.02% of reading per 1450 PSI
Vibration effect	±1.5 InH <sup>2</sup> O (3.74 mbar) according to IEC 61298-3 "Field with general application or pipeline with low vibration"

### 2.8.2 Static pressure input

The transmitter includes a static pressure input. The specifications are documented in Table 4.

Table 4: Static pressure specifications

Item	Description
Accuracy <sup>4</sup>	User calibrated spans from 1:1 to 10:1 (for spans > 10:1, see DS/2101130)
	±0.05% (266JST)
	±0.075% (266JSH)
Long term stability	±0.15% of FCS <sup>5</sup> over a 24 month period
Ambient temperature effect	Between the temperatures of -35 °F and +185 °F
	±0.05% of FCS <sup>5</sup> , ±0.02% of reading
Vibration effect	±0.05 InH <sup>2</sup> O (0.00345 bar) according to IEC 61298-3 "Field with general application or pipeline with low vibration"

<sup>4</sup> Including linearity, hysteresis, and repeatability at reference conditions

<sup>5</sup> FCS is Factory Calibrated Span. This is the pressure range over which the factory thermally calibrated the sensor.

### 2.8.3 Resistance thermal detector (RTD) input

The transmitter includes inputs to measure a 4-wire RTD probe. When properly installed, the RTD probe measures fluid temperature in a process line. The input supports a platinum 100 ohm @ 0° C, RTD with a temperature coefficient of resistance (TCR) Curve B of .00385055 ohms/ohm/degree C. The RTD input specifications are documented in Table 5. The calculation table for RTD element errors is documented in Table 6.

Table 5: RTD input specifications<sup>6</sup>

Item	Description
Accuracy <sup>7</sup>	±0.27 °F Typical
	±0.65 °F Maximum
	Over operating range of: -54 °F to +765 °F
Measurement range	-80 °F to +1500 °F

Table 6: RTD element errors<sup>8</sup>

Tolerance class	Temperature range of validity °C		Tolerance Values <sup>9</sup> °C
	Wire wound elements	Film elements	
AA	-50 to +250	0 to +150	±(0.1 + 0.0017 t )
A	-100 to +450	-30 to +300	±(0.15 + 0.002 t )
B	-196 to +600	-50 to +500	±(0.3 + 0.005 t )
C	-196 to +600	-50 to +600	±(0.6 + 0.01 t )

<sup>6</sup> Does not include RTD probe errors

<sup>7</sup> Measurement accuracy before user calibration

<sup>8</sup> Per IEC 60751, Edition 2.0 2008 – 07

<sup>9</sup> |t| = modulus of temperature in °C without regard to sign

## 2.8.4 Communication interface

### 2.8.4.1 MODBUS® communications

The transmitter uses an 8 bit MODBUS® Remote Terminal Unit (RTU) to communicate with host devices. Communication is accomplished by using a 2-wire half-duplex RS-485 MODBUS® hardwire link (Figure 7).

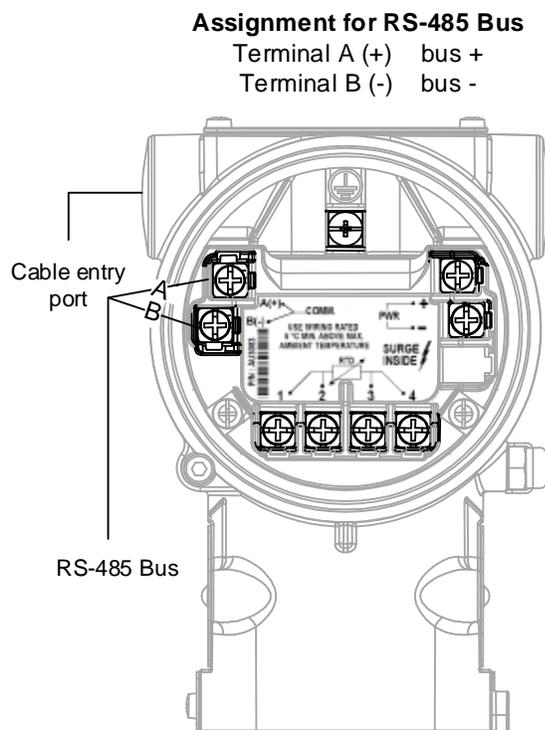


Figure 7: RS-485 MODBUS® communication signal lines



**IMPORTANT NOTE:** For a more detailed description of MODBUS® protocol, see:

"Gould MODBUS® Protocol Reference Guide" published January 1985, by Gould Inc., Programmable Control Division Andover, Massachusetts.

"MODBUS® over serial line specification and implementation guide V1.0" published by modbus.org

MODBUS® uses a master/slave communications concept. Slave transmitters respond only to requests made by the master. Each slave is identified by an unsigned, one byte number ranging from 1 to 247 (inclusive). A slave sends a single response to a master's request for data (Table 7).

- The packet field consists of the MODBUS® packet sent or received. The packet format varies with the function performed and the register group accessed.
- The error check field consists of a 16 bit cyclic redundancy check (CRC) calculated over the length of the packet field.

Table 7: MODBUS® RTU message frame format

<i>Packet</i>	<i>Cyclic redundancy check</i>
N x 8 bits	16 bits

MODBUS® communication can be configured to emulate three different transmitter register maps:

- ABB transmitter 267/269 (Default)
- Rosemount 3095FB
- Invensys IMV25

Go to Appendix C, *MODBUS® register lists* for detailed MODBUS® register tables.

Mapping tables assign 16 bit system objects to 32 bit register addresses. This allows the MODBUS® Master to select and use a single addressing mode. The MODBUS® processor zero-fills any undefined 16 bit objects. The defined bits occupy the LSB (least significant (lower) bits) and the zeroed bits are the MSB (most significant (higher) bits). A 32 bit register address is mapped the same way as a single 16 bit register address. MODBUS® communication prevents a protected register object from being overwritten.

### 2.8.4.2 Communication parameters

For communication to work properly, the transmission mode (and serial port parameters) must be the same for all devices on a MODBUS® serial line.

The default communications parameters are set to:

- Baud Rate = 9600
- Data Bits = 8 (fixed)
- Parity = None
- Stop Bits = 2 (fixed)

MODBUS® RTU mode requires each data byte to be 11 bits (Table 8 and Table 9).

Bits per Byte:

- 1 start bit
- 8 data bits, least significant bit sent first
- 1 bit for parity completion
- 1 stop bit

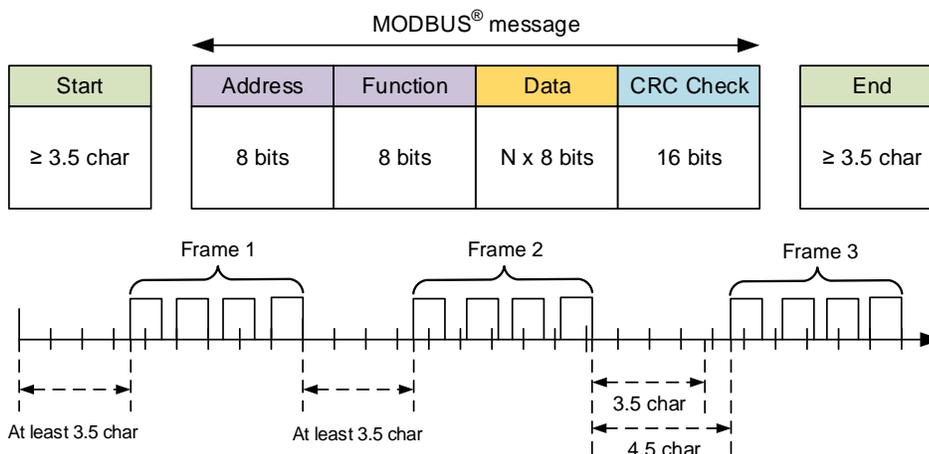
Table 8: Bit sequence in RTU mode (with parity checking)

Start	1	2	3	4	5	6	7	8	Parity	Stop
-------	---	---	---	---	---	---	---	---	--------	------

Table 9: Bit sequence in RTU mode (with no parity)

Start	1	2	3	4	5	6	7	8	Stop <sup>10</sup>	Stop
-------	---	---	---	---	---	---	---	---	--------------------	------

The parity bit can be set from NONE to EVEN or ODD parity. The transmitter automatically adjusts the number of stop bits. Figure 8 depicts a typical MODBUS® message format.



Where:

- Start = Indicates the quiet time before a data transfer
- Address = In the request frame, this is the device being addressed. In the response frame, this is the device answering the request.
- Function = In the request frame, this is the command byte. It presents the device with a read or write sequence. In the response frame, this could be echoed or could be returned as an error code.
- Data = In the request frame, the data is held in the beginning register and read along with the number of consecutive registers. In the response frame, this is the data being read.
- CRC Check = Indicates a data validity test of the data being sent
- End = Indicates the end characters

Figure 8: Sample MODBUS® message frame

<sup>10</sup> When no parity is selected (default for the 266) the parity completion bit is replaced by another stop bit.

## 2.9 User interface

The on-board Human Machine Interface (HMI) consists of a Liquid Crystal Display (LCD) and keypad. The HMI can be used to obtain feedback from the local push button operations and as a configuration tool. The display screen is dot matrix and the menu system is driven with the 4-button keypad. Changes can also be made to transmitter parameters via MODBUS® communications. Go to Appendix C, *MODBUS® register lists* for specific MODBUS® register information.

During normal operation, the operation screen (Figure 9) provides current values and operational information from the transmitter.

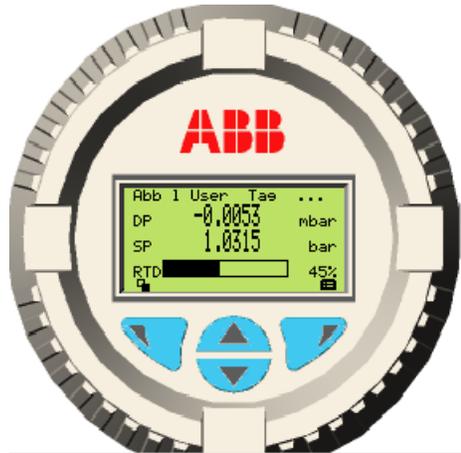


Figure 9: Operation screen (Operator Page 1)

### 2.9.1 HMI keypad

The local LCD display (Figure 10) is used to access the configuration and management menus. The left and right soft keys (Items 1 and 3) allow users to perform the selected action, which is displayed immediately above the soft keys on the LCD (item 5). Options include Select, Exit, Edit, or Back. The up and down soft keys (items 2 and 4) allow users to scroll up or down and to select values from parameter lists. Access to the Main Menu is achieved by pressing the right soft key. Access to the Operator Menu is achieved by pressing the left soft key.

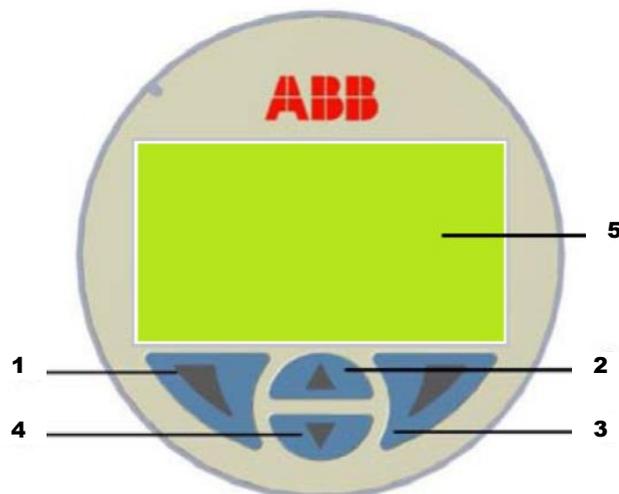


Figure 10: Local HMI display

### 2.9.2 HMI configuration and management menus

Figure 11 shows the first level menu options in the menu tree.

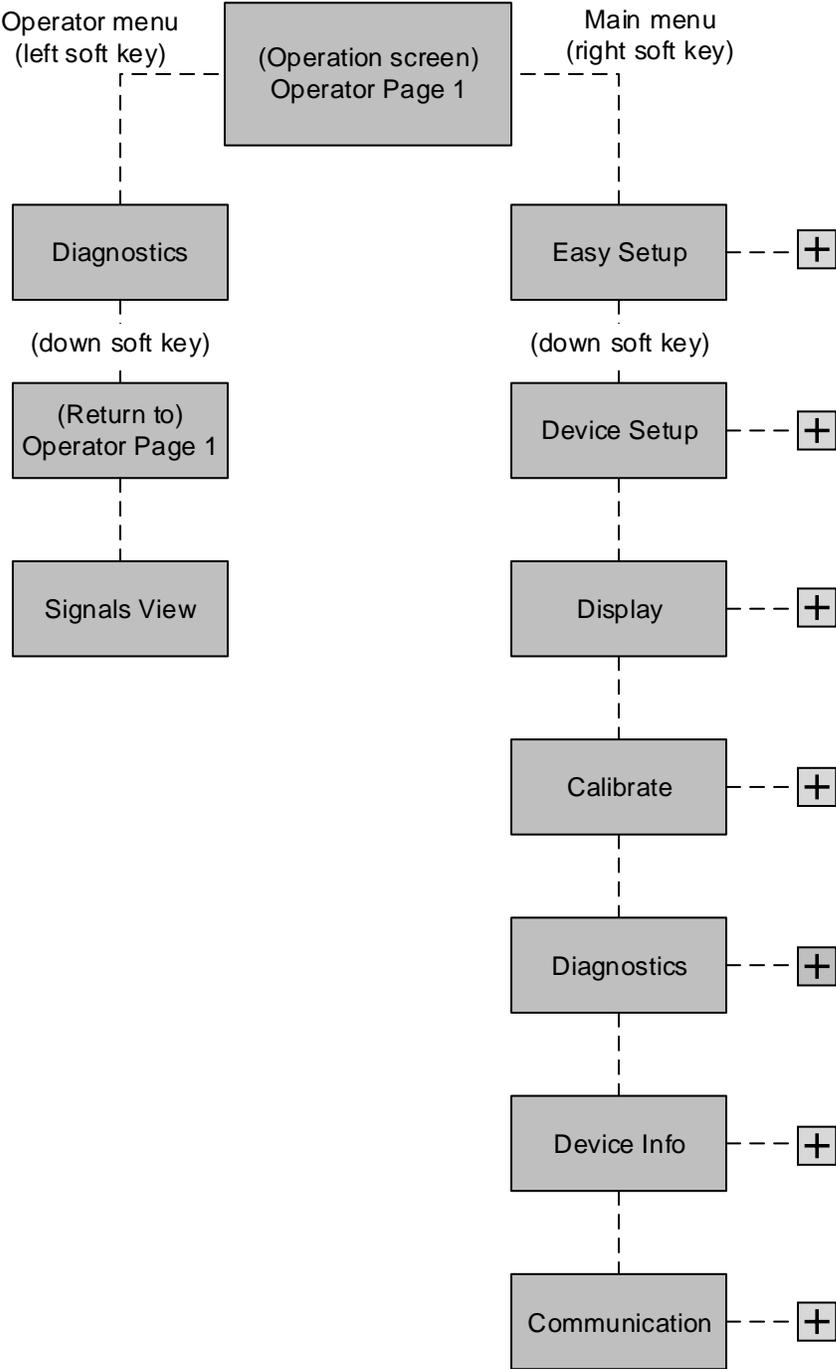


Figure 11: HMI menu tree hierarchy

For more information about submenus, go to Appendix A, *HMI menu structure*.

## 3 Installation

### 3.1 Site planning and preparation

#### 3.1.1 Pre-installation Checklist

Use this checklist for planning the transmitter installation (Table 10).

Table 10: Pre-installation checklist

<input checked="" type="checkbox"/>	Item	Description
<input type="checkbox"/>	Area location	The transmitter installation location needs proper consideration. Assess the location for adequate space for the installation as well as any hazardous area concerns.
<input type="checkbox"/>	Available power	Identify an adequate power source. The Host device must have adequate power for the transmitter.
<input type="checkbox"/>	Cable length required	Consider the distance from the Host device. Specific RS-485 cable is available from ABB that meets design standards for the 266 MODBUS® multivariable.
<input type="checkbox"/>	Transmitter identification	Verify the transmitter received has the proper range.
<input type="checkbox"/>	Process connections	Verify all process connection equipment is correct for the installation.
<input type="checkbox"/>	Mounting	Verify that all necessary mounting hardware is available for the desired mounting of the transmitter.
<input type="checkbox"/>	Tools required	Acquire the tools needed for installation once the hardware is determined.

#### 3.1.2 Tools required

The following tools are required for all general installations. Additional tools may be needed, depending on the specific installation.

- Allen wrench, 3 mm, provided with transmitter (for the housing security screw and stop-screw for housing rotation)
- Adjustable wrench (for various mounting bolts)
- Tubing wrench (appropriate for tubing fittings)
- Tubing cutters (appropriate for tubing size)
- Digital voltmeter (for measuring power and signals)
- Snap-ring pliers (for RTD probe adjustment)

## 3.2 Unpacking, inspection, and verification

### 3.2.1 Unpacking and inspection

1. Inspect the shipping carton for damage.



**IMPORTANT NOTE:** If the shipping carton is damaged, keep it until the contents have been inspected for damage.

2. Unpack and inspect the shipping carton contents. Verify that the carton contains one of each of the following items :
  - 266 MODBUS® multivariable transmitter
  - Calibration certificate
  - Allen wrench
  - Startup guide
  - Other documents per model options
3. Verify that the correct transmitter has been shipped. Use the transmitter tags (nameplates A and B) shown in Figure 12 and the information found on the packing slip and in section 3.2.2, *Product model identification*, for verification. The figure shows a transmitter with a typical barrel housing configuration.
  - **Nameplate A** – This nameplate provides the model number, maximum working pressure, range and span limits, power supply, output signal, diaphragm material, filling fluid, and serial number.
  - **Nameplate B** – The certification nameplate is on the transmitter neck and indicates the specific rating for hazardous (classified) locations (or potentially explosive atmospheres) as provided at the time the order was placed. Go to Appendix E, *Hazardous area ratings and considerations*, for additional identification of equipment ratings and hazardous location information.
  - **Name tag C** – This tag shows the details of the multivariable sensor, including the high (+) and low (-) input sides.

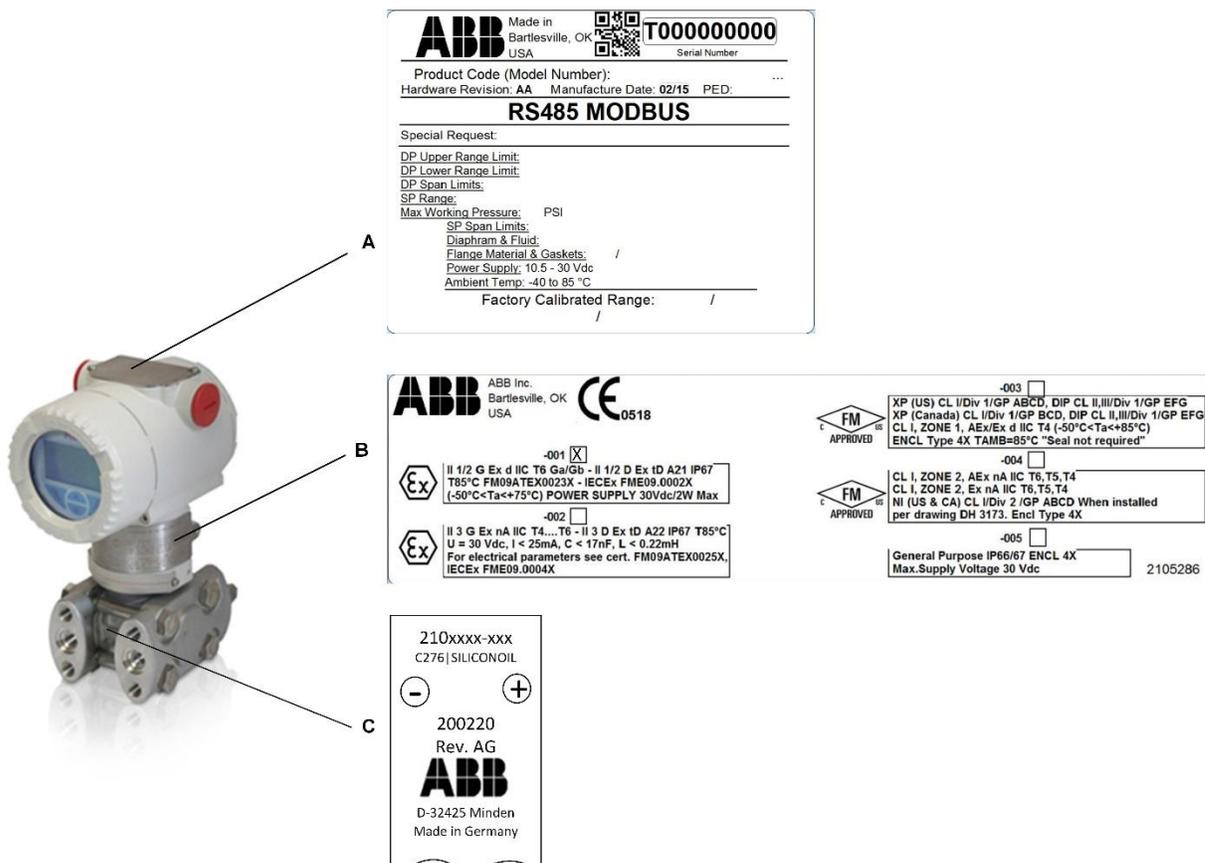


Figure 12: Transmitter name plates

4. Inspect the transmitter exterior for damage.
5. Inspect the transmitter LCD window for breakage.
6. Unpack and inspect optional equipment, if purchased.
7. Contact the ABB customer service department to replace any missing, incorrect, or damaged parts.



**IMPORTANT NOTE:** Please specify the serial number listed on Nameplate A when submitting inquiries to the ABB customer service department.

### 3.2.2 Product model identification

The product code or model number for each unit is listed on Nameplate A. The 18-digit model number identifies each characteristic or pick code of that transmitter based on the position of the digit and the value of those digits. Table 11 describes the pick code and identifies which pick codes are configurable.

Table 11: Model number configuration

Position	Description	Configurable
Digits 1-5	Product family, model, measurement type, construction, and application	No
Digit 6	Accuracy requested	Yes
Digit 7	Sensor span limits (DP)	Yes
Digit 8	Max. working pressure (SP)	Yes
Digit 9	Diaphragm	Yes
Digit 10	Process flanges, adapters, and connections	Yes
Digits 11-15	Bolts, gaskets, housing, output, vent, and drain valve	Yes
Digits 16-17	Explosion protection explosion protection rating code (reference Appendix E)	Yes
Digits 18-19	Integral LCD	Yes

### 3.3 Mounting options

The 266 transmitter can be direct-mounted or pipe-mounted to the meter run. Decide which installation scenario is best suited to the site and the type of flange purchased.

For direct mount instructions, go to section 3.3.1, *Direct mount installation*.

For pipe mount instructions, go to section 3.3.2, *Pipe mount installation*.



**IMPORTANT NOTE:** Before beginning, review the procedure and the materials required for installation.

---

#### 3.3.1 Direct mount installation

The following steps detail the procedures for direct-mounting the transmitter onto the meter run horizontally or vertically.

##### 3.3.1.1 Horizontal flange transmitter direct-mount instructions

To direct-mount the assembly horizontally:

1. Determine where the transmitter is to be placed on the meter run so that the high side (+) is upstream (Figure 13).

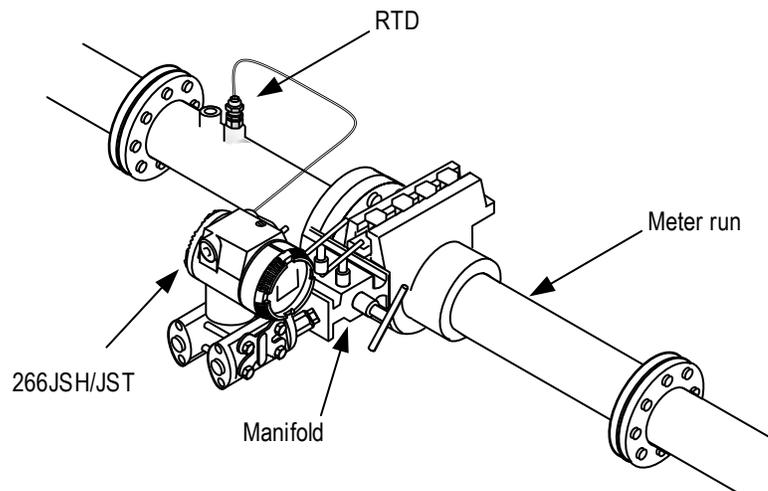


Figure 13: Horizontal flange assembly, direct mount (for illustrative purposes only)

2. Align the sealing rings and bolt holes, then bolt the transmitter to the manifold.
3. Screw the risers into the flange taps on the meter run.
4. Attach the manifold and transmitter assembly to the risers and secure.

The transmitter is now direct-mounted.

### 3.3.1.2 Vertical flange transmitter direct-mount instructions

To direct-mount the assembly vertically:

1. Determine where the transmitter is to be placed on the meter run so that the high side (+) is upstream (Figure 14).

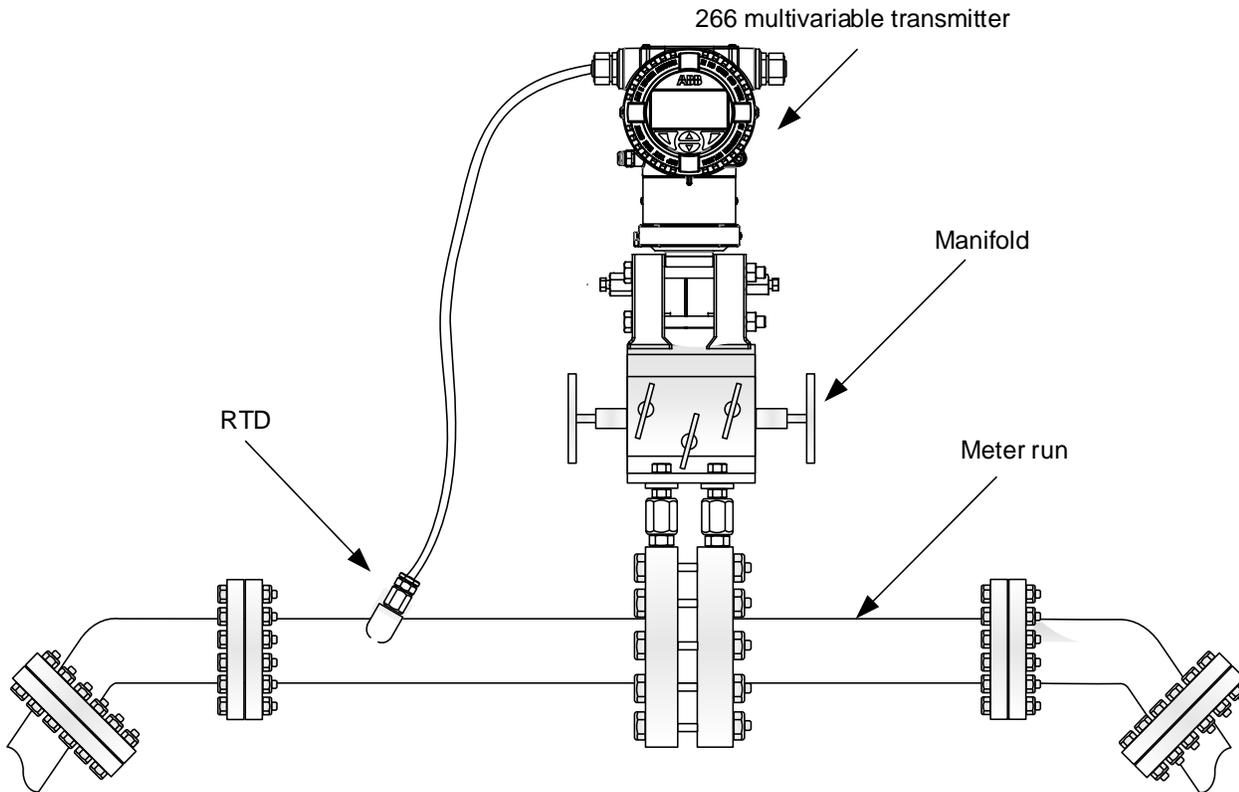


Figure 14: Vertical flange assembly, direct mount (for illustrative purposes only)

2. Align the sealing rings and bolt holes, then bolt the transmitter to the manifold.
3. Screw the risers into the flange taps on the meter run.
4. Attach the manifold and transmitter assembly to the risers and secure.

The transmitter is now direct-mounted.

### 3.3.2 Pipe mount installation

The following steps detail the procedures for pipe-mounting the transmitter onto the meter run.

#### 3.3.2.1 Horizontal flange transmitter pipe mount instructions

<b>Supplied</b>	— Two U-bolts, plus fastening hardware
<b>Materials</b>	— Mounting brackets
<b>Customer-supplied</b>	— One pipe saddle
<b>Materials</b>	— One 2" x 40" pipe
	— Standard 3 or 5 valve manifold
	— Stainless steel tubing

To pipe-mount the horizontal transmitter assembly to the meter run using a vertical pipe mount kit:

1. Determine where the transmitter is to be positioned on the meter run so that the high side (+) is upstream.



**IMPORTANT NOTE:** Select a location that allows easy-user access and is close to the equipment.

---

2. Position the pipe saddle on the meter run (Figure 15).

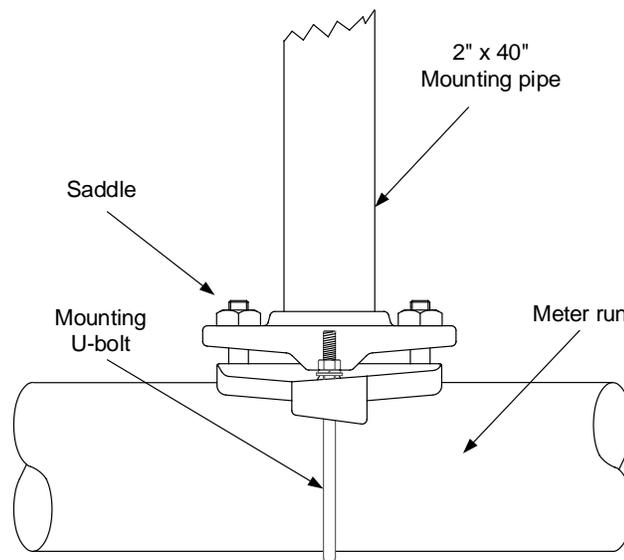


Figure 15: Pipe saddle assembly

- a. Temporarily attach the pipe saddle on the meter run using a U-bolt and associated hardware; do not tighten.
- b. Screw the 2" mounting pipe into the saddle.
- c. Place a leveling device against the pipe and align vertically.
- d. Adjust the pipe, mounted in the saddle, until vertical alignment is achieved.
- e. After vertical alignment, securely tighten the 2" pipe and mounting bolts in the saddle.



**IMPORTANT NOTE:** Be certain the pipe is securely installed in the saddle.

---

- Secure the mounting bracket to the mounting pipe with two U-bolts, flat washers, split washers and bolts (Figure 16).

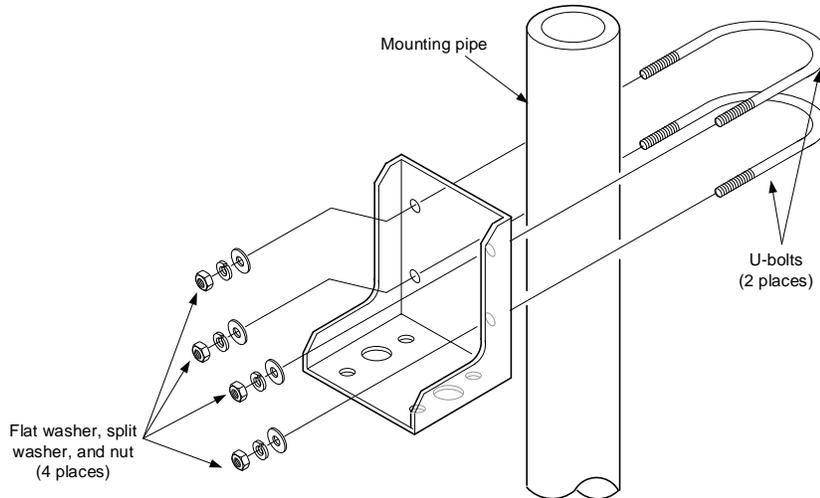


Figure 16: Pipe mounting bracket assembly

- Align the sealing rings and bolt holes between the manifold and the transmitter. Bolt the transmitter to the manifold.
- Attach the transmitter to the underside of the bracket, using four bolts (Figure 17).

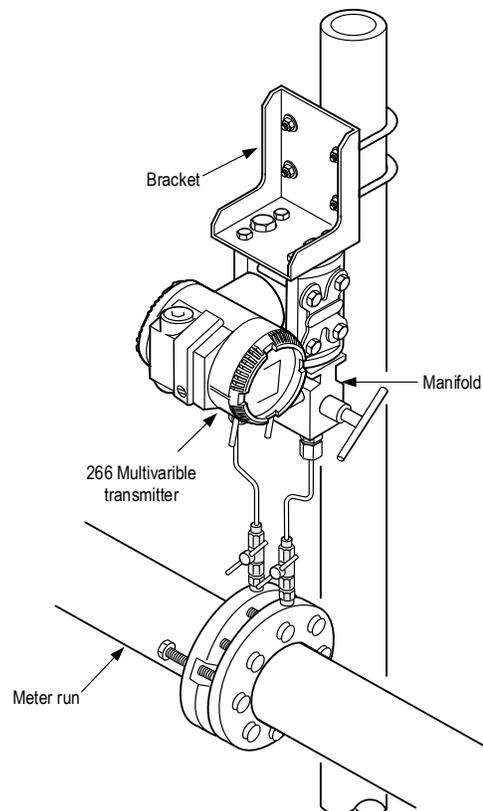


Figure 17: Horizontal flange assembly, pipe-mounted

- Connect the manifold tubing to the orifice fitting. Mounting is now complete.



**IMPORTANT NOTE:** To rotate the housing and display, follow the instructions in section 3.4, *Housing and display orientation*. For additional mounting options, refer to Appendix D, *Additional mounting examples*.

### 3.4 Housing and display orientation

To improve field access to the wiring and viewing of the display, the transmitter housing and display can be rotated up to 360°.

#### 3.4.1 Transmitter housing rotation

To rotate the transmitter housing:

1. Unscrew the housing stop-screw approximately one rotation (do not remove the screw).



**IMPORTANT NOTE:** A stop prevents the housing from being turned too far.

---

2. Rotate the 266 transmitter to the desired position.
3. Retighten the screw once the desired position has been reached (Figure 18).

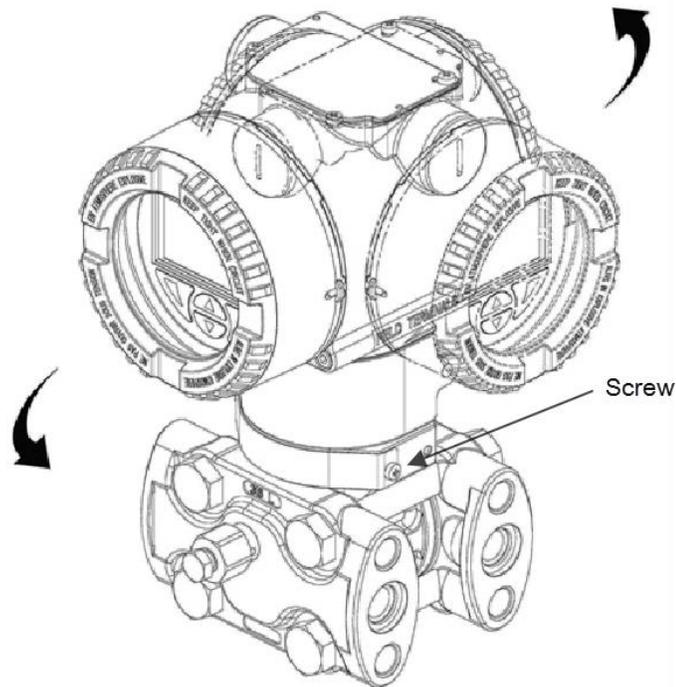


Figure 18: Transmitter housing rotation and stop-screw

### 3.4.2 HMI display rotation

The LCD can be oriented in four different positions, rotated clockwise or counterclockwise with 90° steps.

To rotate the LCD:

1. Remove the front housing cover.



**IMPORTANT NOTE:** Take precautions for any hazardous conditions.

---

2. Disengage the four (4) fixing locks by pressing in on each one with a small slotted screwdriver (Figure 19).

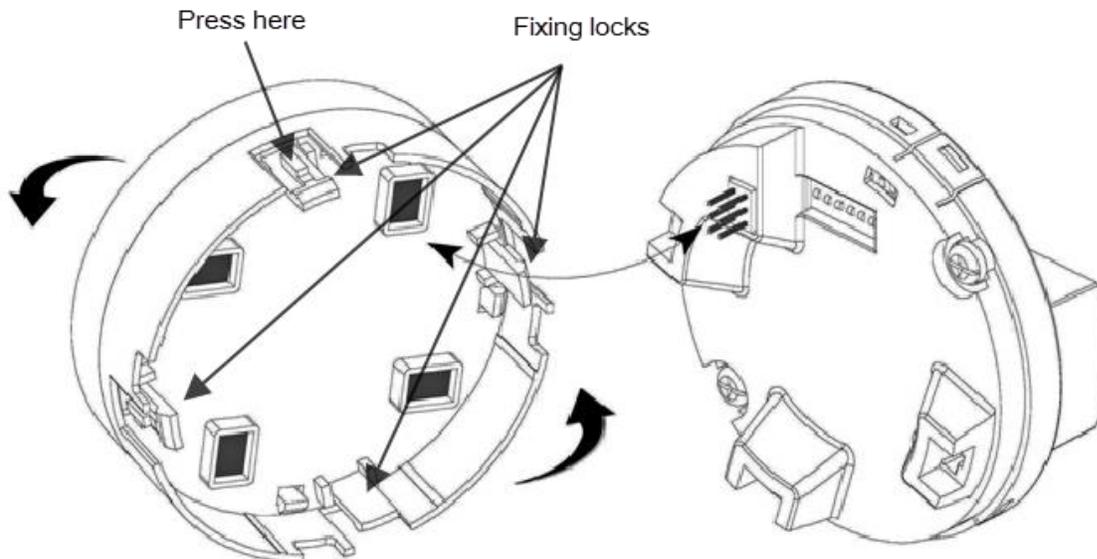


Figure 19: Display rotation

3. Pull the display housing out from the communication board.
4. Reposition the LCD connector to the new desired position.
5. Push the LCD module back onto the communication board.



**IMPORTANT NOTE:** Ensure that the four plastic fixing locks are properly in place by pressing in until the display clicks.

---

6. Re-install the front housing cover.

### 3.5 RTD installation

To use the flowing temperature of the process stream a resistive thermal detector (RTD) must be installed. Dependent upon the classification of the area, either an explosion-proof RTD or a non-incendive RTD should be installed. An explosion-proof RTD should be used in DIV 1 areas; and a standard RTD, non-incendive, may be used in DIV 2 or general purpose areas.

The RTD shall be a platinum 100 ohm @ 0° C, RTD with a temperature coefficient of resistance (TCR) Curve B of .00385055 ohms/ohm/degree C.

If the simulation of flowing temperature is used, then installation of an RTD is not required and the 178 Ω resistor, wired to the terminal block, must remain in place. See *Transmitter wiring* in section 3.6.4 for additional information.



**IMPORTANT NOTE:** Installation of the RTD requires that a thermowell be previously installed in the process stream and that the thermowell extends into the center 1/3 of the stream.

#### 3.5.1 DIV 1 explosion-proof RTD installation



**WARNING – Bodily injury.** Conduit requirements for DIV 1 installations are not addressed in this procedure. To avoid creating a hazardous situation, ensure compliance with the applicable standards, regulations, and recommendations for installation in the country of use. RTD installation in classified DIV 1 areas should only be performed by technicians knowledgeable about explosion protection.

Explosion-proof and flame-proof installations require explosion-proof conduit and poured seals or flame-proof rated cable and cable glands, respectively.

##### 3.5.1.1 Optionally supplied materials

- RTD probe (DIV 1), (probe length TBD by technician)
- Cable (cable length TBD by technician)
- Teflon® tape

##### 3.5.1.2 Instructions

1. Screw the ½ inch nipple fitting, supplied with the RTD, into the thermowell (Figure 20).

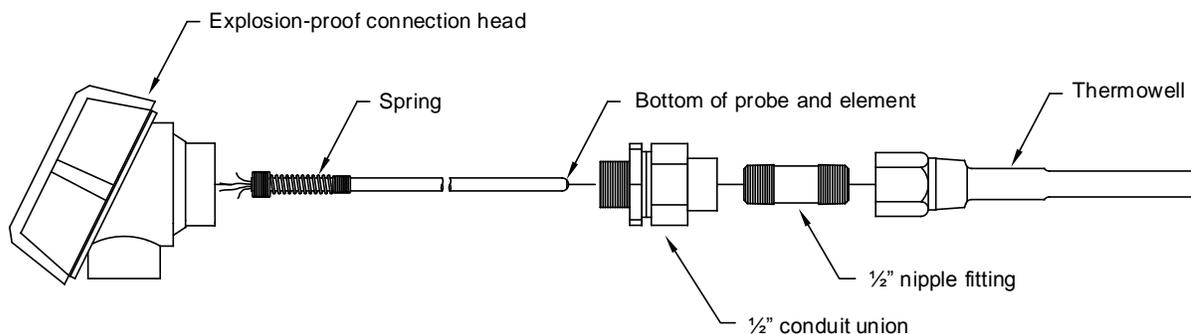


Figure 20: Explosion-proof RTD, disassembled

2. Separate the top and bottom of the conduit union. Screw the union bottom onto the nipple fitting.
3. Screw the top of the conduit union into the bottom of the explosion-proof connection head. Do not tighten.
4. Unscrew and remove the cover from the explosion-proof connection head.
5. Insert the RTD probe through the opening in the connection head. Holding the probe from below, screw the spring clockwise down into the center of the wiring block until the top edge of the spring is flush with the top of the wiring block.

6. Insert the probe and head assembly through the bottom half of the union previously installed onto the thermowell. As union halves meet, the probe should encounter some resistance from the spring. As the probe contacts the bottom of the thermowell, the top of the probe should rise a maximum of  $\frac{3}{4}$ ".



**IMPORTANT NOTE:** The probe should extend into the center 1/3 of the stream. If the probe assembly is too long (the top of the conduit union will not screw into the bottom half of the conduit union) or too short (no resistance is encountered when screwing the probe and head assembly into the bottom half of the union), then the nipple fitting may need to be replaced with one of a different length.

7. Align the RTD head to correspond with the wiring conduit previously installed and complete the connection.
8. Tighten all conduit and fittings to wrench tight.
9. Wire the RTD probe wiring to the wiring block located inside of the explosion-proof head assembly (Figure 21).

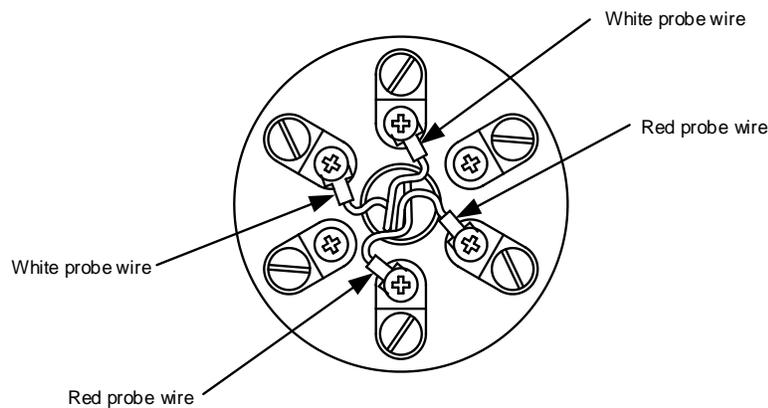


Figure 21: RTD probe wiring to explosion-proof head wiring block

10. Remove the shipping plug from the transmitter housing.
11. Remove the rear housing cover from transmitter if not already removed (go to section 5.2, *Transmitter hardware security* for additional instructions).
12. Install the conduit or cable gland and wire from the RTD explosion-proof head to the transmitter.
13. Connect the transmitter wiring to the RTD wiring block (Figure 22).

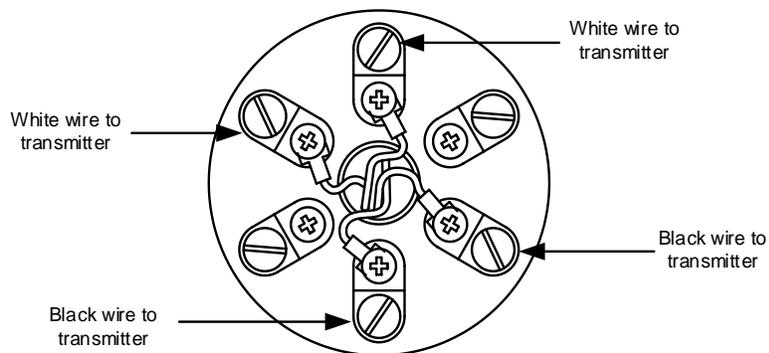


Figure 22: RTD wiring to transmitter

14. Screw the RTD cover onto the explosion-proof housing assembly to complete the RTD installation.
15. Use the procedure in section 5.10, *RTD wiring verification*, to verify that the RTD to transmitter cable is in good working condition or not damaged during installation.

Installation of the RTD is complete. The RTD cable to transmitter wiring instructions are included in section 3.6.4, *Transmitter wiring*.

### 3.5.2 Non-Incendive DIV 2 or general purpose RTD installation

#### 3.5.2.1 Optionally supplied materials

- RTD probe with cable and cable gland installed (probe and cable length TBD by technician)
- Nylon tie wraps
- Teflon® tape

#### 3.5.2.2 Instructions

1. Insert the RTD probe into the thermowell to determine the depth setting for the probe spring.
2. Using snap-ring pliers, adjust the retaining ring below the spring on the probe (Figure 23). Probe depth should be set so that it is spring-loaded against the bottom of the thermowell.

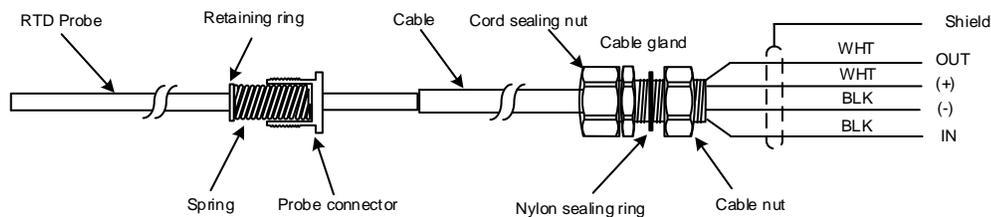


Figure 23: RTD probe

3. Using Teflon® tape, wrap the probe connector threads to create a seal.
4. Screw the probe connector into the thermowell.
5. Remove the shipping plug from the transmitter housing.
6. Remove the rear housing cover from transmitter if not already removed (go to section 5.2, *Transmitter hardware security* for additional instructions).
7. Run the RTD cable along the side of the process stream pipeline in a straight line. Use nylon tie wraps to secure the cable to the pipeline. Do not wrap the RTD cable around the pipeline.
8. Remove the cable nut from the gland and insert the RTD cable end through the transmitter housing wiring port. Leave enough cable inside the housing for wiring to the terminals inside the housing.
9. Screw the cable gland into the transmitter housing port.
10. Tighten the cord sealing nut to the cable gland against the RTD cable.
11. Secure the cable outside of the gland so that the cable turns down immediately. This will keep moisture from seeping into the housing along the RTD cable.
12. Use the procedure in section 5.10, *RTD wiring verification*, to verify that the RTD to transmitter cable is in good working condition.

Installation of the RTD is complete. The RTD cable transmitter wiring instructions are included in section 3.6.4, *Transmitter wiring*.

## 3.6 Electrical connections

### 3.6.1 Protective conductor and grounding

A terminal is available on the transmitter exterior for connection to an earth ground or potential equalization (PE) grid (Figure 24). A connection for attaching wiring shields is located inside of the rear housing cover. For additional field wiring requirements see the following publications:

- For European applications, see Standards IEC60364 and IEC60079-14 for installation of electrical equipment.
- For United States or Canada Division or Zone rated applications, see NEC (NFPA 70) section 500 or CSA C22.1.

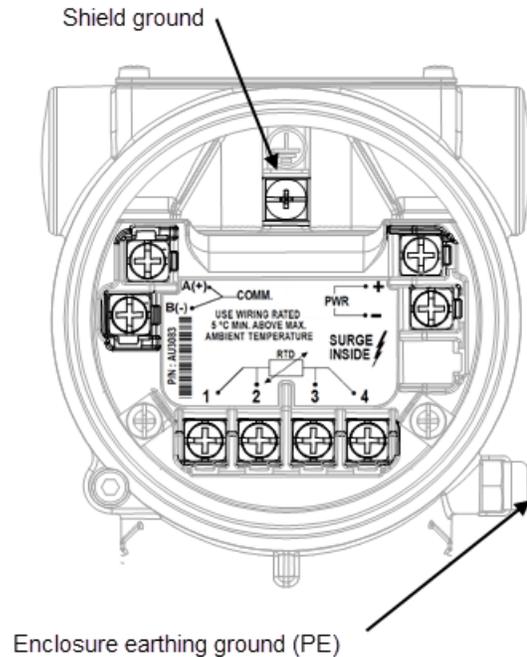


Figure 24: Ground connections

In order to fulfill the requirements of the low-voltage guidelines and the relevant EN 61010 rules for the installation of electrical equipment, the housing must be provided with a protective circuit (for example: grounding or protective conductor) if voltages greater than 150 Vdc could occur.

### 3.6.2 Integrated surge protector

The 266 MODBUS® transmitter terminal block includes transient suppression circuitry built in. The circuitry is based on a four-tier protection design that protects the power inputs and communications.

For correct operation of the suppression system a high-current path to earth ground or potential equalization (PE) grid is required (Figure 24). Section 3.6.1, *Protective conductor and grounding*, includes additional information on grounding the transmitter.



**IMPORTANT NOTE:** The grounding (PE) should be kept as short as possible with a minimum wire size of 12 AWG.

---

### 3.6.3 Electrical guidelines

Since the transmitter has no on-board power switch, it is important to provide a means for disconnecting the power from a remote source. This helps prevent an accidental electrical short of the power wires while making connections to the transmitter.



**NOTICE - Property damage.** Residual static electricity may be present in conductive components located inside the open housing. Avoid leaving the housing cover open to protect against accidental contact. Use appropriate measures to remove residual static charge before contacting the device. Do not directly touch conductive components. Touching charged conductive parts can damage electronic components (in some cases beyond repair) due to electrostatic discharge.

---

Consider the following during electrical installation:

- The existing supply voltage corresponds to that indicated on the name plate.
  - The electrical connection is made via the cable entry 1/2-14 NPT port (optional M20 X 1.5).
  - Appropriate conduit or cable glands must be selected for the application.
  - The cable gland must be screwed into the housing using a suitable sealing compound to ensure Type 4X and IP 67 degree of protection for the transmitter.
- 



**IMPORTANT NOTES:** If cable glands are not used, the red transport screw plugs must be replaced with suitable plugs when the transmitter is installed. The transport plugs are not EX (Explosion) rated. This requirement is particularly relevant in hazardous areas.

Installation of the transmitter and associated devices must conform to the requirements of any national, state, local, and company electrical codes that may apply for the installation type and location.

---

### 3.6.4 Transmitter wiring

ABB strongly recommends the use of shielded 1.5 twisted pair or 2 twisted pair (with drain wire) cable for the communication interface. For a distance up to a maximum of 4000 ft. (1219 m), the wire size should be between 22 AWG (0.35 mm<sup>2</sup>) and 18 AWG (0.8 mm<sup>2</sup>).

For supply voltage connections, ABB recommends the use of a shielded twisted pair cable. For a distance up to a maximum of 4000 ft. (1219 m), the range of wire size could be between 18 AWG (0.8 mm<sup>2</sup>) and 14 AWG (2.1 mm<sup>2</sup>).

Cable entry points, and front and back housing covers are depicted in Figure 25.



**DANGER - Risk to life due to explosion.** In an explosion-proof or flame-proof installation in a hazardous area, do not remove the housing cover while power is connected due to the risk of an electrical spark. Sparking could result in an explosion.

Before removing the wiring cover (rear housing cover), disconnect the equipment from the supply voltage and take suitable measures to prevent reconnection.

Explosion-proof and flame-proof installations require explosion-proof conduit and poured seals or flame-proof rated cable and cable glands, respectively.

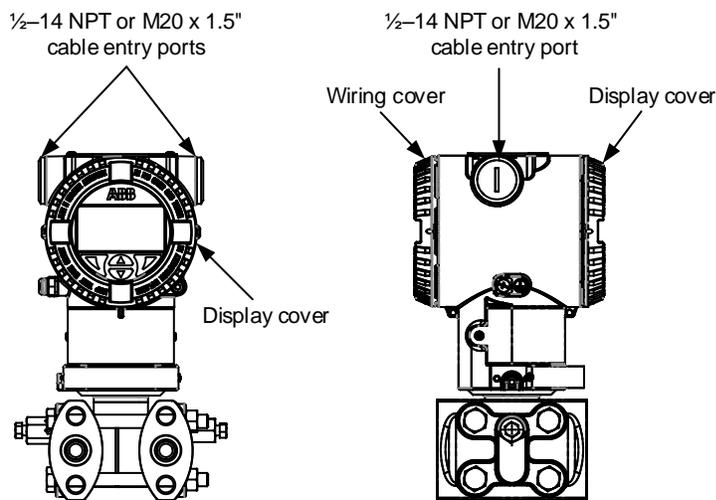


Figure 25: Housing covers and cable entry points

The transmitter requires a supply voltage between 10.5 and 30 Vdc. Avoid cable installation in the vicinity of other power lines (with inductive loads) or large electrical installations.

1. Unscrew the transport screw plug from the cable entry if not already removed.



**IMPORTANT NOTE:** These cable entries have a 1/2 inch NPT or M20 x 1.5 female thread. Various adaptors and bushings can be fitted to these threads to comply with plant wiring (conduit) standards.

2. Remove the rear housing cover from transmitter if not already removed (go to section 5.2, *Transmitter hardware security* for additional instructions).

3. If a live temperature sensor (RTD) is installed in the meter run, remove the jumpers and resistor from the RTD terminals on the termination block. Otherwise, continue to step 5.



**IMPORTANT NOTE:** For the purpose of temperature simulation, a 178  $\Omega$  resistor (206 °C / 402.8 °F) with 2 jumpers has been installed between the terminals for the temperature RTD connection. This resistor (including the jumpers in the case of 4-wire connections) must be removed before connecting the RTD. If a temperature RTD is not connected, the resistor must remain in place. If an RTD is installed, the 178  $\Omega$  resistor removed from the RTD terminals may be used as an RS-485 Bus termination.

- a. Using a small phillips screwdriver, loosen the terminal 2 and 3 screws (Figure 26) and remove resistor.

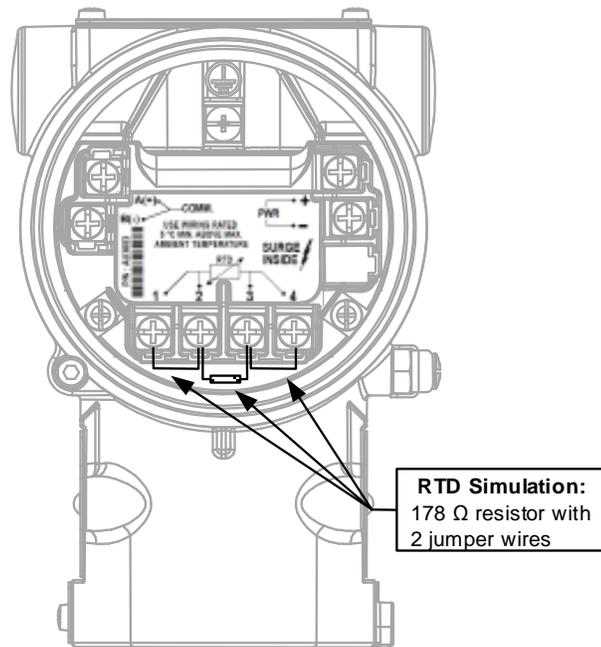


Figure 26: RTD Simulation wiring

- b. Loosen the terminal 1 screw and remove the jumper wire.  
 c. Loosen the terminal 4 screw and remove the jumper wire.

4. Wire the RTD sensor cable to the transmitter RTD terminals.
  - a. Using a small phillips screwdriver, loosen the shield wire terminal (Figure 27).

NOTE: Wiring shown outside of transmitter cable entry ports for clarity

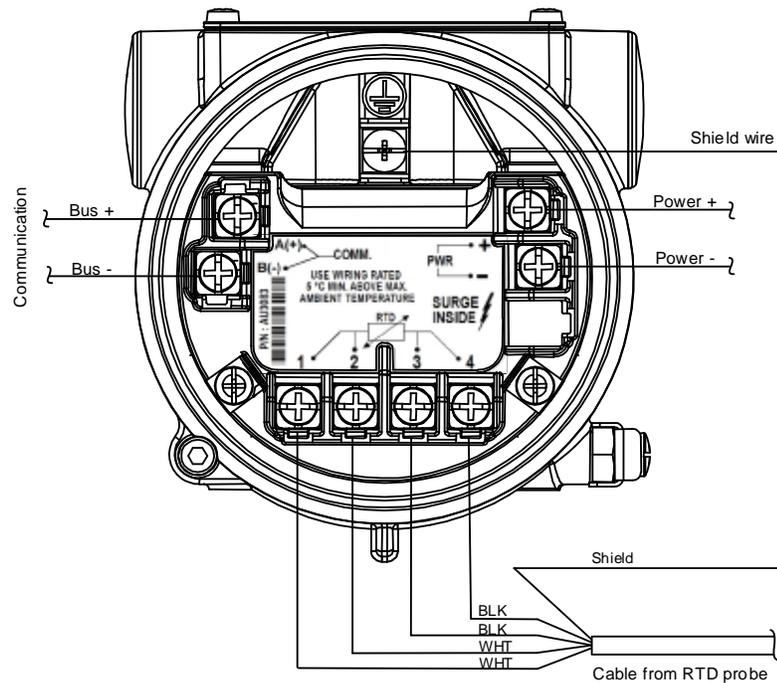


Figure 27: Termination block showing RTD, communication, and electrical connections

- b. Connect the sensor cable to the designated terminal.
  - c. Loosen RTD terminals 1 through 4.
  - d. Connect one each white wire to terminals 1 and 2 and tighten the terminal screws.
  - e. Connect one each black wire to terminals 3 and 4 and tighten the terminal screws.
5. Run the connecting signal/voltage cable(s) from the Host device through the appropriate cable gland or cord grip housing (single or dual wire) and into the cable entry if not already completed.



**IMPORTANT NOTE:** If power and communications are not in the same cable, an adapter can be purchased that will allow two (2) cables to be located in the same cable gland or cord grip housing.

6. Connect the power (+) wire to the PWR (+) terminal.
7. Connect the power (-) wire to the PWR (-) terminal.
8. Connect RS-485 (A) (+) to COMM (+) terminal.
9. Connect RS-485 (B) (-) to COMM (-) terminal.
10. If the cable is provided with a shield or multiple shields and these are not terminated at the RS-485 master, terminate these to the shield ground.
11. Verify that all cable entries are properly sealed in the cable gland or cord grip housing to prevent damage from rain, corrosive vapors, or gases. For explosion-proof or flame-proof housing installations, plug unused openings with a sealing plug that has been certified for explosion protection.
12. Replace the housing cover and follow the instructions in section 5.2.2, *Securing the housing cover*, to secure the transmitter.

## 4 Transmitter start up

Startup of the transmitter may begin after installation (section 3, *Installation*) is successfully completed.



**WARNING – Bodily injury.** When the housing covers are removed and power is still connected, there is a potential for explosion. Failure to observe this safety information may result in death or severe injury.

Do not remove housing covers in hazardous (classified) areas or explosive environments unless the area is known to be non-hazardous. Verify an explosive atmosphere is not present when before applying power with the housing covers removed.

The following sections discuss in detail the requirements to complete a successful startup.

- Section 4.1, *Supplying power*
- Section 4.2, *Configuring the transmitter*
- Section 4.3, *Commissioning the transmitter*
- Section 4.4, *Software configuration security (optional)*



**IMPORTANT NOTE:** Some of the procedures required for startup are also used for maintaining or servicing the transmitter. It will be necessary to skip to the required procedure located in the maintenance instructions and return to this section when that is completed.

### 4.1 Supplying power

1. Apply 10.5 to 30 Vdc power to the transmitter and observe that the display indicates operation as shown in Figure 28.

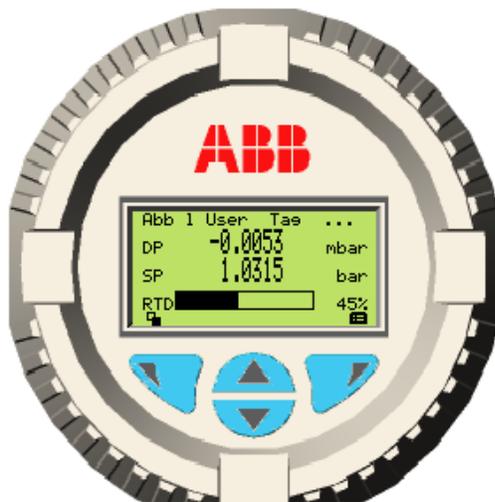


Figure 28: Display operating properly

## 4.2 Configuring the transmitter

The following sections provide instructions for configuring the transmitter.

### 4.2.1 Navigating the HMI menu

When using the local HMI interface, the display screen and soft keys are used to move around the menu, identify selections, and perform actions. Figure 29 identifies each soft key and the associated action.

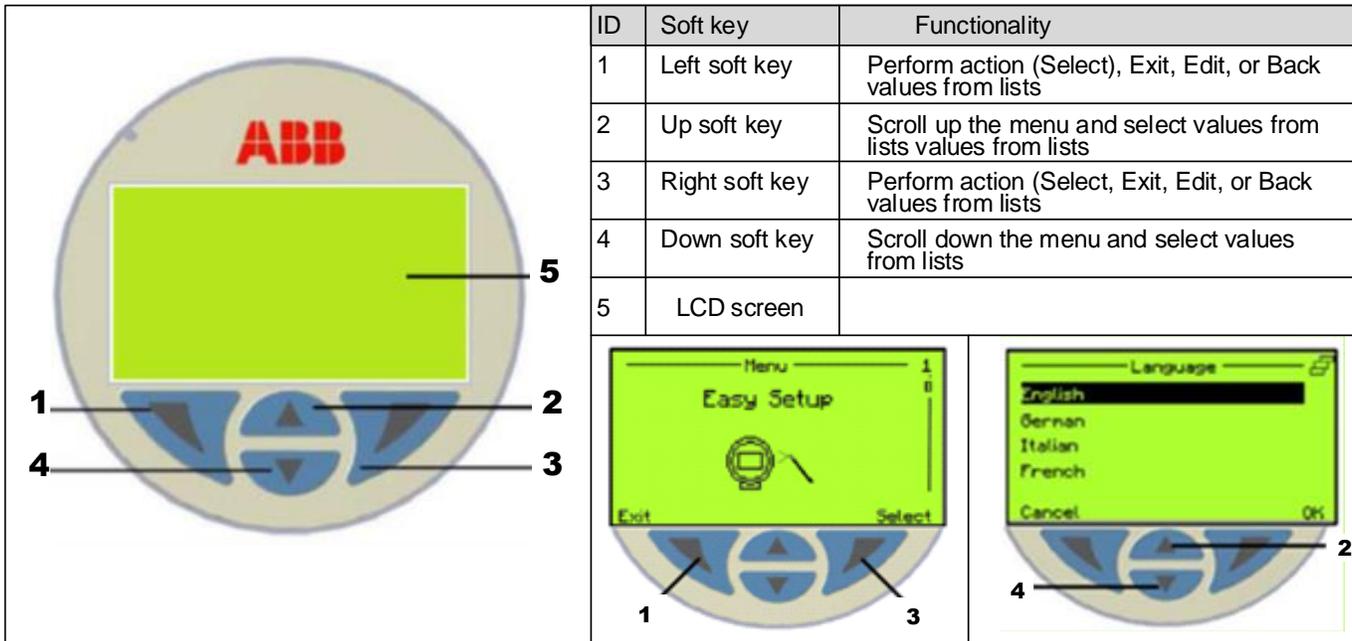


Figure 29: HMI navigation



**IMPORTANT NOTE:** To navigate the menu, submenu, and available selections listed on a screen, the up soft key will take you to the end of the selections list. When navigating to the last item of a list, it is faster to use the up soft key to jump to the end of the list, versus using the down soft key to move through the entire list of selections to reach the end or nearly the end.

Throughout this document, HMI navigation instructions will use abbreviated instructions to identify menu selections rather than a more detailed style that identifies each key to press for each selection. The following example demonstrates the abbreviated instruction which uses the greater than character (>) as an indicator that the following item is an additional menu selection.

Example of abbreviated instruction:

1. Press the right soft key to access the HMI menu.
2. Use the key pad to locate and select **Calibrate > Diff. Press. Sensor > Calibration Units > Edit**.
3. Scroll through the menu for the desired calibration unit selection and select **OK** when finished.

### 4.2.2 Easy Setup menu

The Easy Setup menu allows for fast configuration of the transmitter parameters in a programmed sequence (Figure 30). This guides the user to set parameters critical to the configuration. The menu is available from the display screen by pushing the right soft key from the initial display, and then pushing the right soft key again to select **Easy Setup**. Use the up, down, right, and left soft keys to navigate the menu items. Once in the **Easy Setup** menu, it will be necessary to scroll through the entire menu before reaching an opportunity to exit the menu.

The Easy Setup menu provides access to setting the measurement units, upper and lower range values, and display screen selections.

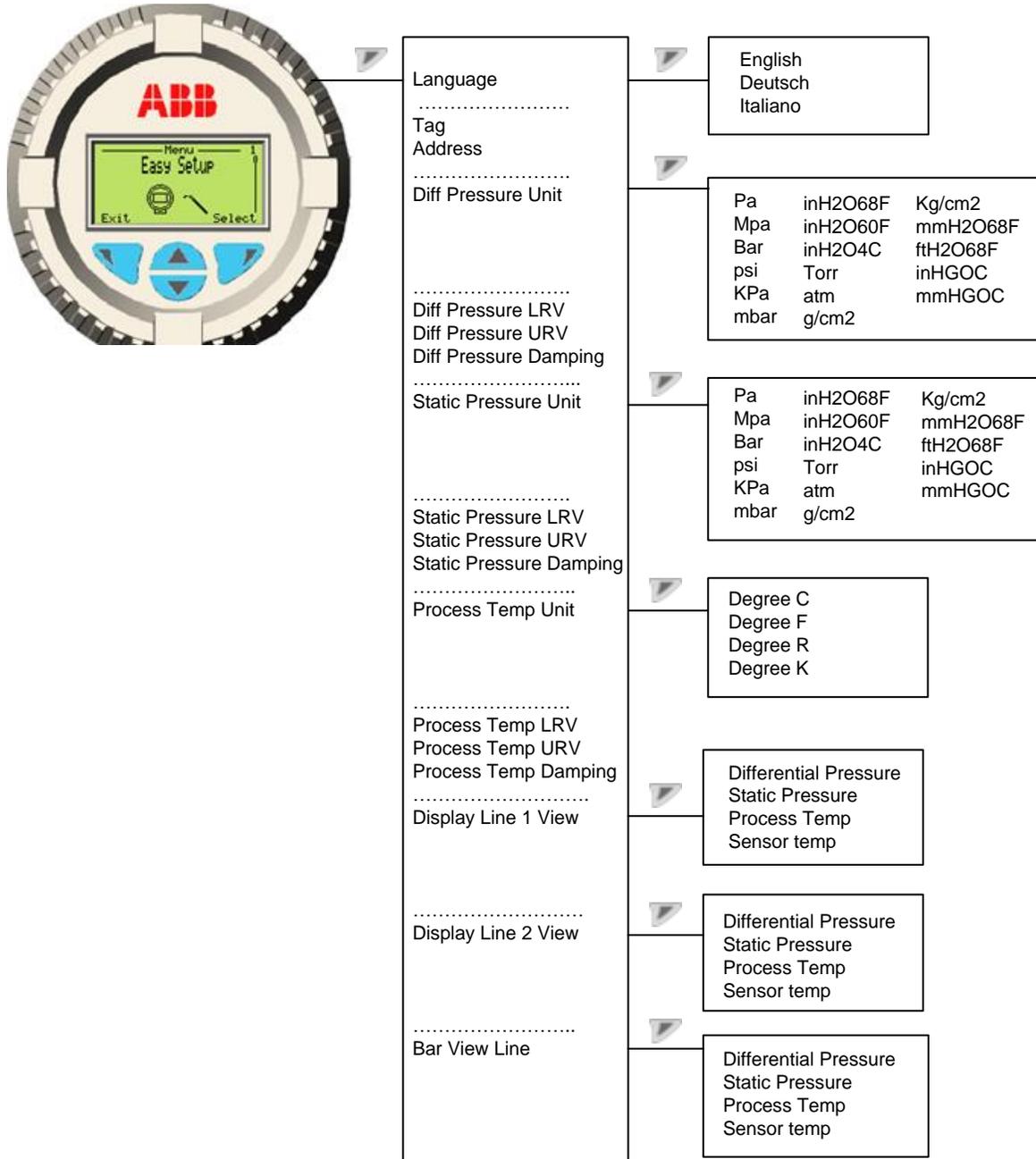


Figure 30: Easy Setup menu

### 4.2.3 Device bias

An important part of device installation is removing the offsets that may occur during shipping, handling, or positioning. To remove the offsets, use the Bias options in the Device Setup menu. For specific information go to section 5.13, *Setting the measurement bias*.

### 4.2.4 Communication configuration

In most installations, a Host device will communicate to the transmitter over an RS-485 MODBUS® communications link.

Use the following instructions to verify that the communication parameters in the transmitter match those in the Host:

1. Press the right soft key to access the HMI menu.
2. Use the key pad to locate and select **Communication**.
3. View each parameter setting by selecting each submenu item and viewing the setting.
4. Edit each parameter shown in Table 12, if necessary, to configure communication for the site's specific requirements.
  - a. To edit a specific parameter, press **Edit** and change the parameter.
  - b. Locate the appropriate selection and select **OK**.
5. When finished viewing and editing the parameters, press the left soft key (**Back**) to exit back to the main screen.

Table 12: Communication parameters

Main Menu	Submenu 1	Selections
Communication	TAG	name
	Address	Modbus address 1-247
	Baud rate	200          2400          4800 9600          19200          38400
	Response Delay (ms)	50 ms (default)
	Parity	None, Even, Odd
	Modbus Map Select	ABB 266\267 Map Rosemount 3095FB Map Invensys IMV25 Map
	Modbus Reg. Offset	Zero Based One Based

### 4.3 Commissioning the transmitter

Once the transmitter has been installed, powered, and configured, commission the transmitter into operation.

The following are requirements to commission the transmitter.

- Validate communication
- Leak-test the connections
- Validate the transmitter measurement
- Put the transmitter in service

#### 4.3.1 Validating communication

The correct procedure for validating communication is based on the usage application. The 266 MODBUS® multivariable is designed to be backward compatible with existing 267/269CS installations. In applications where the 266 MODBUS® device is replacing an existing unit, simply transfer the wiring from the existing unit to the 266 MODBUS® device. Using any of the methods listed in section 4.3.1.1, *Set MODBUS® device address*, set the MODBUS® address to the same address as the device being replaced and communication should immediately be available. No further action is required.

In new installations, setup and validation can still be a simple task if the communication and supply voltage wiring meets the requirements of the device (Figure 31). Once the wiring has been established, communication validation is simply sending a request to the device and receiving the response. Any of the Read registers listed in the MODBUS® register map can be used for the validation process. See section Appendix C, *MODBUS® register lists* (page 86), for information about communication packet structures and host timing.

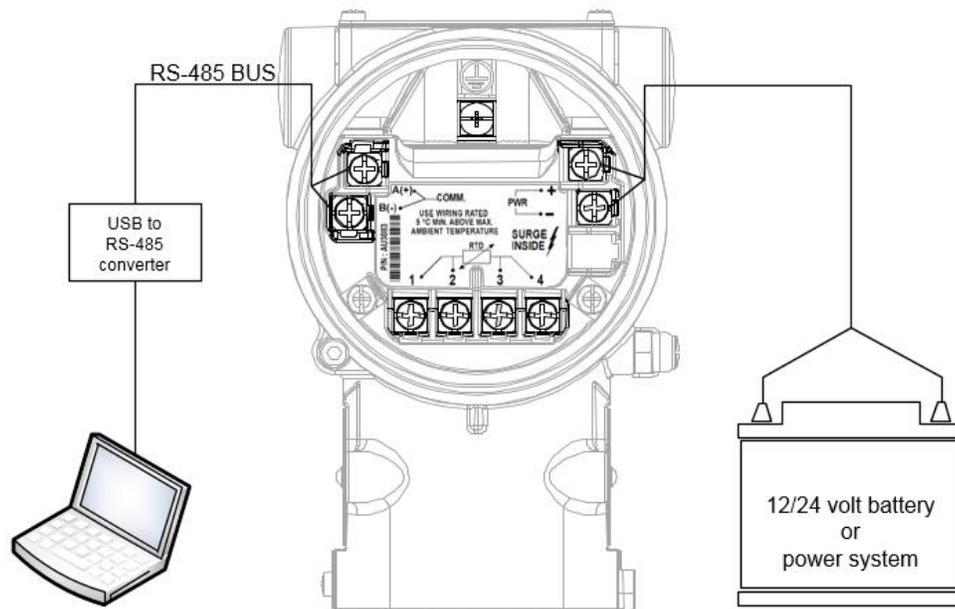


Figure 31: Connections required to validate communication in a non-hazardous area

### 4.3.1.1 Set MODBUS® device address

The MODBUS® address can be set or modified using any one of the following methods:

Method A) The HMI can be used to directly change the MODBUS® address to the application requirements. See Appendix A, HMI menu structure (page 79), for the menu structure.

Method B) If a single device is connected to the MODBUS® Master, the device address can be modified by writing the correct MODBUS® address to MODBUS® register 503. The device supports the global MODBUS® write sequence (MODBUS® Address 0 writes).

Method C) This method allows for plug/play capability into an existing system. A special set of MODBUS® operations are used to change the device address. The MODBUS® Master performs the simplest part of these operations, it just has to write to the Transducer ID / Serial number register using the device address that it wants to assign. However, the value written must match the device's Transducer ID for the device to accept the assignment and acknowledge the command. The Master has three out comes after making the request:

- The Slave answers correctly. The Master changed the device address successfully.
- The Slave did not answer and the communication timed-out. The Master did not change the device address, leaving the device without a Transducer ID or an identification on the bus.
- The Slave replied with a negative acknowledgement (NACK) and the device address did not change. The Master could not reassign the device address because the device address already exists, but does not match the Transducer ID of the device. Reassigning the device address to an existing address would create a duplicate, therefore no device address change occurred.

To use Method C, the MODBUS® Server state processing of request packets needs a couple of adjustments to allow this to work. The shaded areas are the adjustments.

In Figure 32, *MODBUS® Server state diagram*, the “Request Process” must perform a custom “put” operation. The operation compares the data buffer received to the target device Transducer ID. If the data matches, the device modifies the MODBUS® address register to the device address sent in the request frame. NOTE: The data in the Transducer ID register remains unchanged.

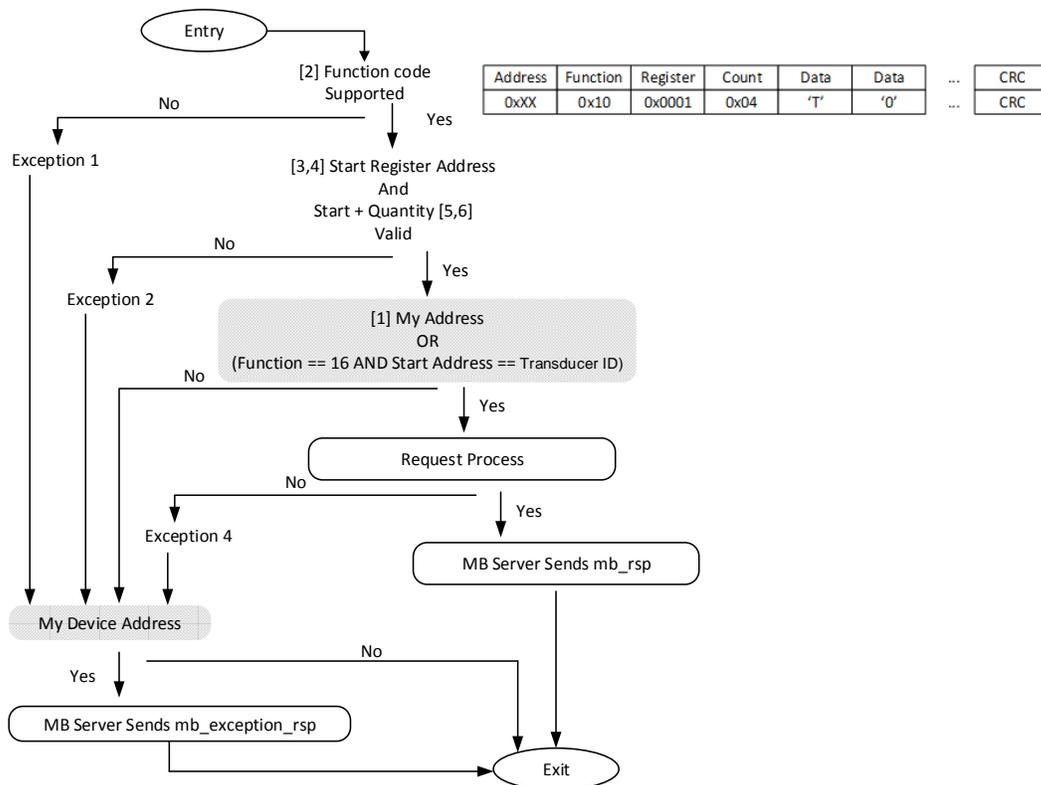


Figure 32: MODBUS® Server state diagram

### 4.3.2 Leak-testing manifold connections

Process stream connections to the manifold and manifold to flange connections must be leak-free prior to system validation and subsequent operation. A leak can produce inaccurate results. Figure 33 shows a view of the transmitter with a 3-valve manifold.

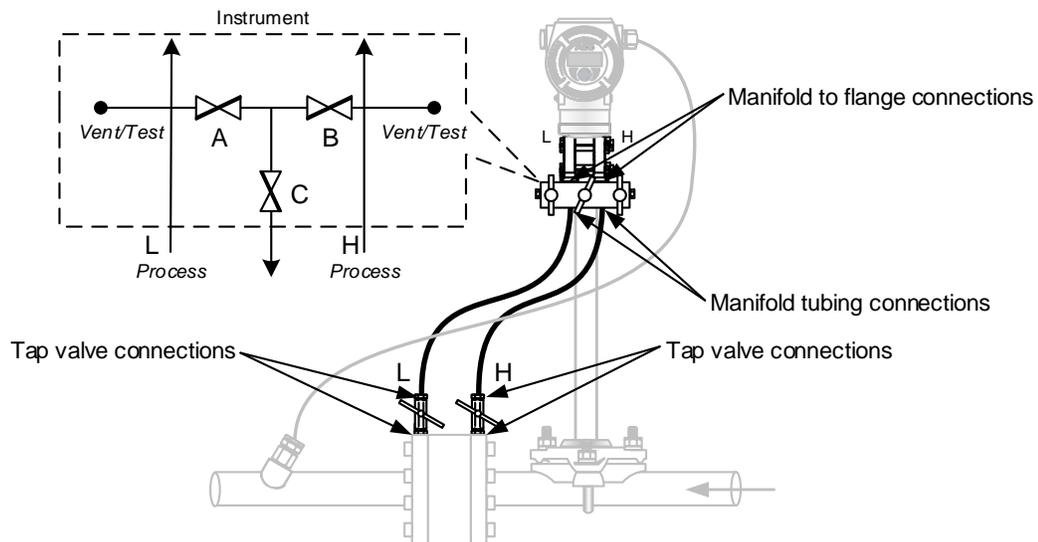


Figure legend:

- A) Low side equalizer valve
- B) High side equalizer valve
- C) Manifold vent valve
- H) High (+) pressure side
- L) Low (-) pressure side

Figure 33: Connections and manifold valve operation (for illustrative purposes only)

Before validating the transmitter measurement system, all tube connections should be leak-tested and leak-free. The following procedure provides instructions for leak-testing a 3-valve manifold. If another type of manifold is used, adjust this procedure accordingly.

1. Verify that the equalizer valves (Figure 33, items A and B) are open and the manifold vent valve is closed (item C).
2. Apply pressure to the high side vent/test port based on the transducer range (100%).
3. Squirt liquid leak detector onto the following connections.
  - High and low pressure tap valve connections
  - High and low pressure manifold tubing connections
  - Connection point between the flange and the manifold
4. Bubbles in the liquid indicate a loose or poor connection.
5. Using the appropriate size wrench, tighten any loose connections, then recheck with the liquid leak detector. Do not over tighten.
6. When all connections are leak-free, continue to section 4.3.3, *Validating transmitter measurement*.

### 4.3.3 Validating transmitter measurement

The transmitter is factory calibrated to traceable standards. For most applications, validation of the device is preferred over a full calibration. For applications that require calibration to the end user's standards refer to section 5.12, *Calibrating*.

#### 4.3.3.1 Validating SP measurement system

This procedure can be used to validate the static pressure measurement system.

1. Verify the high and low pressure tap valve connections on the stream are closed to shut off the process flow (Figure 33, item L and H).
2. Open the low and high side equalizer valves (items A and B).
3. Vent the high (+) and low (-) side of the manifold to atmosphere by opening the manifold vent valve (item C).
4. Verify the static pressure reading is equal to the barometric pressure.
5. Close the manifold vent valve (item C).



**IMPORTANT NOTE:** When validating the static pressure system, pressure must be applied to the high and low side of the transmitter. Failure to do so could result in false indications of measurement and in extreme cases could shift the differential measurement out of specification.

---

6. Attach the static pressure calibration tool to the high side manifold test port.
7. Apply the pressure corresponding to the requirements of the application.
8. The applied pressure will be visible on the device display.
9. Record the data necessary to satisfy the requirements of the application.
10. Continue with the validation until all the requirements have been met.

#### 4.3.3.2 Validating DP measurement system

This procedure can be used to validate the differential pressure measurement system. Use Figure 33 for valve identification.

1. Verify the high and low pressure tap valve connections on the stream are closed to shut off the process flow (Figure 33, item L and H).
2. Open the low and high side equalizer valves (items A and B).
3. Vent the high (+) and low (-) side of the manifold to atmosphere by opening the manifold vent valve (item C).
4. Verify the device is reading the differential pressure as zero.
5. Close the high side equalizer valve (item B).
6. Attach the low pressure calibration tool to the high side manifold vent/test port.
7. Apply the pressure corresponding to the requirements of the application.
8. The applied pressure will be visible on the device display.



**IMPORTANT NOTE:** If the differential pressure measurement changes beyond the limit documented in the device specification, this is an indication of a leak in the system. If the value is increasing positively the leak will be located on the low side of the system. For a increasing negative value the leak will be located on the high side of the system.

- 
9. Record the validation data necessary to satisfy the requirements of the application.



**IMPORTANT NOTE:** The 266 MODBUS® multivariable transmitter does not store validation data.

- 
10. Continue with the validation until all the requirements have been met.

### 4.3.3.3 Variations in validation and error budget

Variations in the validation data, within an error budget, are a normal occurrence. However, influences from other factors (leaks in the system, calibration equipment anomalies, rapid thermal variations on calibration equipment and connections, and other environmental conditions) are not classified as normal occurrences.

Most of the listed contributing factors, listed above, are outside of ABB control. What is presented here is an example for calculating an error budget that takes into account a transmitter and a typical digital calibrator. Refer to the 266 MODBUS multivariable transmitter data sheet, listed under [Additional publications \(page vii\)](#), for device accuracy statements (P/N 2101131).

Error budget calculation example:

Assuming a factory calibrated span (FCS) of 62.5 kPa,

And a validation point of 100% of FCS:

$$\text{The Device Error} = 0.04\% \text{ of Indicated Value}$$

$$\text{The Calibration Device Error} = 0.05\% \text{ of Indicated Value} + 0.01 \text{ kPa (typical digital calibrator)}$$

$$\begin{aligned} \text{Value Error} &= \sqrt{\text{Device Error}^2 + \text{Calibration Device Error}^2} \\ &= \sqrt{0.04\%^2 + (0.05\% + 0.01 \text{ kPa})^2} \\ &= \sqrt{0.04\%^2 + (0.05\% + 0.016\%)^2} \\ &= 0.077\% \text{ of Indicated Value} \end{aligned}$$

$$\text{Validation point} = 5\% \text{ of FCS} = 3.125 \text{ kPa}$$

$$\text{Device Error} = \pm (0.04 + 0.002 * [62.5 / 3.125] - 0.02) \% \text{ of Indicated Value}$$

$$\begin{aligned} \text{Value Error} &= \sqrt{\text{Device Error}^2 + \text{Calibration Device Error}^2} \\ &= \sqrt{0.06\%^2 + (0.05\% + 0.01 \text{ kPa})^2} \\ &= \sqrt{0.06\%^2 + (0.05\% + 0.32\%)^2} \\ &= \pm 0.375\% \text{ of Indicated Value} \end{aligned}$$

### 4.3.4 Putting the transmitter in service

The final procedure to commission the transmitter is to place the transmitter in service. Figure 33 (page 39) shows a view of the transmitter with a 3-valve manifold. If another type of manifold is used, adjust the procedures accordingly.



**IMPORTANT NOTES:** Manifold valve positions are not indicative of whether the valve is open or closed. Some manifold valves are multi-turn, so turning clockwise will close the valve and counterclockwise will open the valve.

During normal operation the equalizing valves and manifold vent (Figure 33, items A, B, and C) will be closed.

---

Valves need to be actuated in the following sequence:

1. Verify the high and low pressure tap valve connections on the stream are closed to shut off the process flow (Figure 33, items L and H).
2. Verify that the equalization valves (items A and B) are open.
3. Verify that the manifold vent valve (item C) is closed.
4. Slowly open the stream tap valves (items H and L) to open the process stream, creating flow. Wait until the system has pressurized, typically less than 1 minute, before continuing.
5. Close the equalizing valves (items A and B) on the manifold. The transmitter is now commissioned into operation.

Completion of the proceeding sections indicates the transmitter is fully commissioned.

## 4.4 Software configuration security

Following the successful configuration and commissioning of the transmitter, write protection can be enabled. Enabling the write protection mode will safeguard the transmitter files from being changed or overwritten. DIP switch 5 is used for transmitter write protection. If DIP switch 5 is ON, the transmitter is in write-protect mode and will not accept write commands. The state of switch 5 may be set before or after power is applied and also at any time during operation of the transmitter. To enable software write protection security, follow the instructions in section 5.3.1, *Enable write protection*.

For additional information about DIP switches, go to Appendix B, *DIP switch settings*.

## 5 Service and maintenance

Maintenance of the 266 MODBUS® multivariable transmitter is modular by design. Replaceable parts are limited to subassemblies. The measurement assembly is not replaceable.

This chapter includes a list of replacement parts, instructions for replacing spare parts and securing the transmitter housing, calibration steps, and other maintenance procedures.

### 5.1 Replacement parts

Some 266 MODBUS® multivariable transmitter parts may be field-replaced. Figure 34 shows an exploded view of the transmitter and the available replacement parts. Table 13 lists each part number and description.

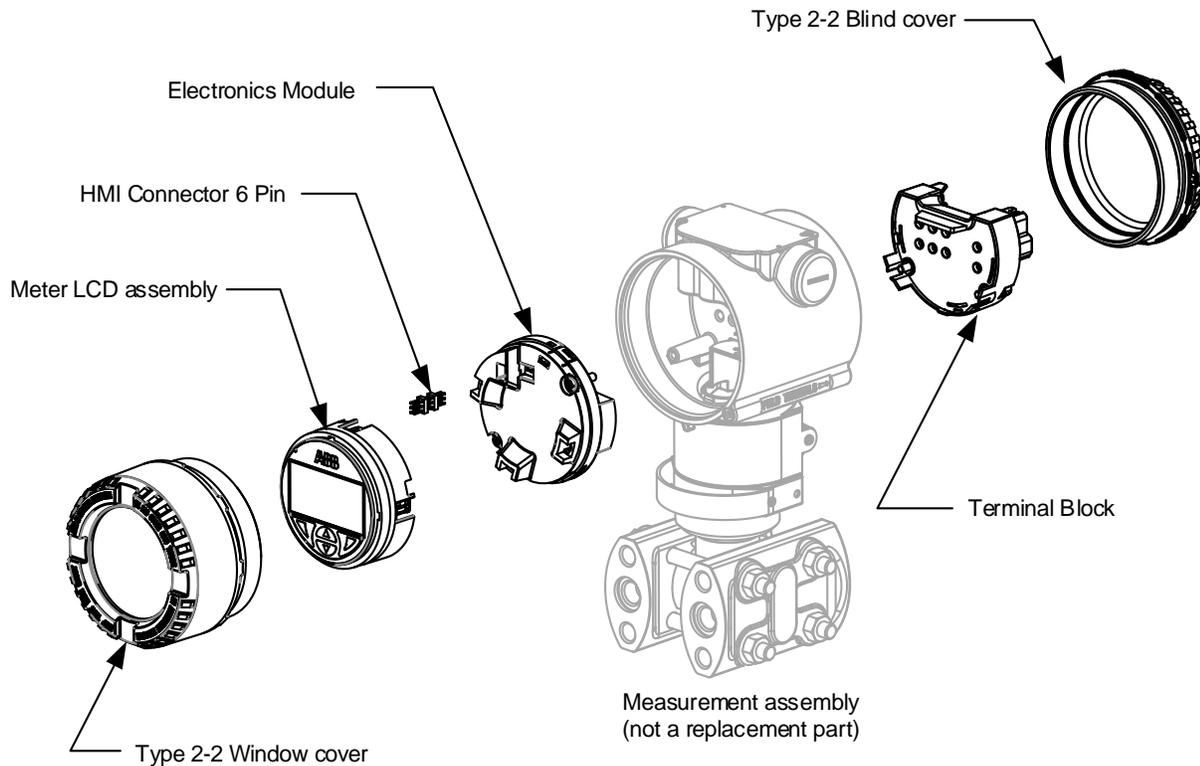


Figure 34: 266 MODBUS® multivariable transmitter replacement parts

Table 13: Replacement parts list

Part Number	Description
3KXP000008U0100	Electronics module
ET3020	HMI connector 6 pin
AU3048	Meter LCD assembly
AU3083	Terminal Block
218036	Type 2-2 Blind cover
218031	Type 2-2 Window cover

## 5.2 Transmitter hardware security

Following the completion of any maintenance or service on a transmitter (rated for “Ex d” protection), the housing cover must be re-secured. A security screw (hexagon socket screw 3 mm) and securing mechanism is built into the enclosure and housing covers. The housing cover is designed with tabs that extend from the outline of the edge. To remove the cover, the screw must be flush with the edge of the securing mechanism, allowing the cover to rotate.

Required tool:

- Allen wrench, 3mm, supplied with transmitter

### 5.2.1 Removing the housing cover



**WARNING – Bodily injury.** When the housing covers are removed and power is still connected, there is a potential for explosion. Failure to observe this safety information may result in death or severe injury.

Do not remove housing covers in hazardous (classified) areas or explosive environments unless the area is known to be non-hazardous. Verify an explosive atmosphere is not present before removing the housing covers when the power is live.

1. Disconnect the power supply to the transmitter if power is not required for maintenance or troubleshooting procedures.
2. Locate the security screw (A or B) adjacent to the housing cover (Figure 35) and turn it clockwise using the provided Allen wrench. As the screw tightens into the socket, it eliminates the obstacle from the tabs that extend from the cover. This allows the cover to rotate past the screw.

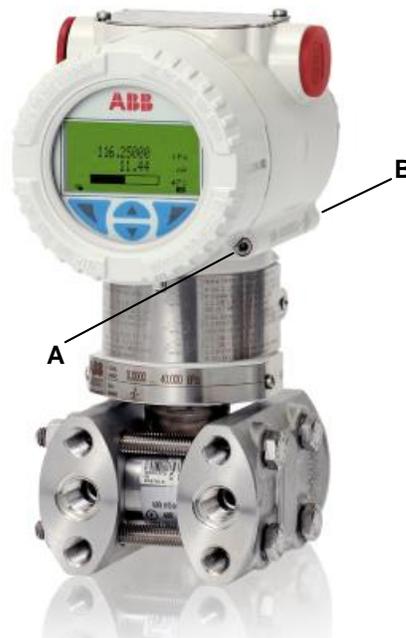


Figure 35: Transmitter housing security screws

3. Unscrew the housing cover from the transmitter.

### 5.2.2 Securing the housing cover

1. Screw the housing cover hand tight onto the transmitter.
2. Locate the security screw (A or B) in the housing (Figure 35) and turn it counterclockwise using the provided Allen wrench. As the screw backs out from the socket, it creates an obstacle for the tabs that extend from the cover. This does not allow the cover to rotate past the screw.
3. If power was initially removed and the unit is ready to return to service, apply power.

## 5.3 Transmitter write protection

### 5.3.1 Enable write protection

Use the following procedure to enable the software security write protection mode.

1. Disconnect the power supply to the transmitter.



**WARNING – Bodily injury.** When the housing covers are removed and power is still connected, there is a potential for explosion. Failure to observe this safety information may result in death or severe injury.

Do not remove housing covers in hazardous (classified) areas or explosive environments unless the area is known to be non-hazardous. Verify an explosive atmosphere is not present before removing the housing covers when the power is live.

This procedure does not require the transmitter to be powered up.

2. Remove the front housing cover following the instructions in section 5.2.1, *Removing the housing cover*.
3. Remove the LCD assembly following the instructions in step 3, section 5.4, *Replacing the LCD assembly*.
4. Locate DIP switch 5 on the electronics module (Figure 36). Switches are numbered from left to right, so switch 5 is the next to the last switch on the right.

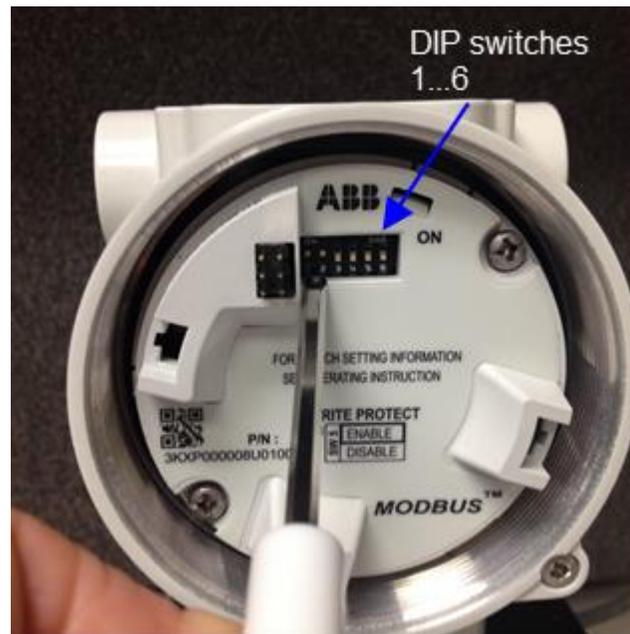


Figure 36: DIP switches on the electronics module

5. Using a small slotted screwdriver, flip switch 5 up to the ON position. The device is now write protected.
6. Replace the LCD assembly and housing cover (go to sections 5.4, *Replacing the LCD assembly*, and 5.2.2, *Securing the housing cover*).
7. Restore power to the transmitter.

### 5.3.2 Disable write protection

1. Disconnect the power supply to the transmitter.
- 



**WARNING – Bodily injury.** When the housing covers are removed and power is still connected, there is a potential for explosion. Failure to observe this safety information may result in death or severe injury.

Do not remove housing covers in hazardous (classified) areas or explosive environments unless the area is known to be non-hazardous. Verify an explosive atmosphere is not present before removing the housing covers when the power is live.

This procedure does not require the transmitter to be powered up.

---

2. Remove the front housing cover following the instructions in section 5.2.1, *Removing the housing cover*.
3. Remove the LCD assembly following the instructions in step 3, section 5.4, *Replacing the LCD assembly*.
4. Locate DIP switch 5 on the electronics module (Figure 36). Switches are numbered from left to right, so switch 5 is the next to the last switch on the right.
5. Using a small slotted screwdriver, flip switch 5 down to the OFF position. Write protection has been disabled.
6. Replace the LCD assembly and housing cover (go to sections 5.4, *Replacing the LCD assembly*, and 5.2.2, *Securing the housing cover*).
7. Restore power to the transmitter.

## 5.4 Replacing the LCD assembly

The following procedure provides steps to remove and replace the LCD assembly.



**WARNING – Bodily injury.** When the housing covers are removed and power is still connected, there is a potential for explosion. Failure to observe this safety information may result in death or severe injury.

Do not remove housing covers in hazardous (classified) areas or explosive environments unless the area is known to be non-hazardous. Verify an explosive atmosphere is not present before removing the housing covers when the power is live.

This procedure does not require the transmitter to remain powered up.

1. Disconnect the power supply to the transmitter.
2. Use the instructions in section 5.2.1, *Removing the housing cover*, to remove the front housing cover, exposing the interior.
3. Use a slotted screwdriver to press the tabs on the LCD fixing locks to release the assembly and remove it (Figure 37).



**NOTICE – Property damage.** Removing the LCD assembly improperly may damage the assembly. Release the fixing locks on the LCD assembly before attempting to remove the LCD. Failure to release the locks may cause the LCD assembly to break apart, damaging the part beyond repair. Damage caused by a failure to properly remove the assembly is not warranted.

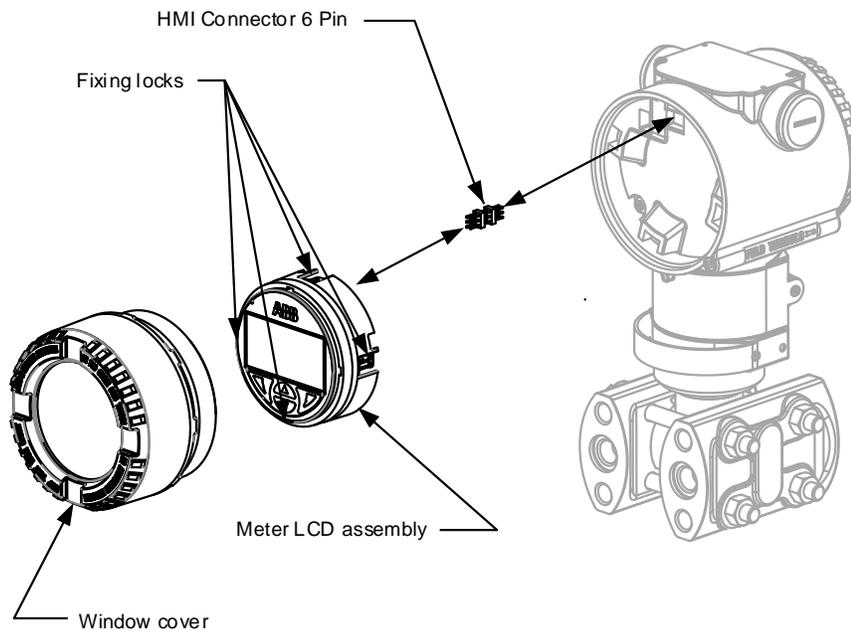


Figure 37: Transmitter disassembly

4. Carefully replace the LCD assembly with a new one. Use caution to avoid bending the HMI connector pins.
5. Replace the front housing cover over the LCD assembly and secure the housing cover (go to section 5.2.2, *Securing the housing cover*).
6. Reconnect the power supply to the transmitter and view the HMI screen.
7. To adjust the display contrast, if necessary, go to section 5.8, *Adjusting the LCD screen contrast*.

## 5.5 Replacing the HMI connector

If the HMI connector becomes damaged, it may be necessary to replace the part. The following procedure provides steps to replace the HMI connector located between the LCD assembly and the electronics module.



**WARNING – Bodily injury.** When the housing covers are removed and power is still connected, there is a potential for explosion. Failure to observe this safety information may result in death or severe injury.

Do not remove housing covers in hazardous (classified) areas or explosive environments unless the area is known to be non-hazardous. Verify an explosive atmosphere is not present before removing the housing covers when power is live.

This procedure does not require the transmitter to remain powered up.

1. Disconnect the power supply to the transmitter.
2. Use the instructions in section 5.2.1, *Removing the housing cover*, to remove the front housing cover, exposing the interior.
3. Use a slotted screwdriver to press the tabs on the LCD fixing locks to release the assembly and remove it.
4. Locate the damaged HMI connector and remove (Figure 37, page 48). If necessary, use a small pair of needle-nose pliers to remove.
5. Carefully insert the replacement connector. Do not bend the pins.
6. Reinstall the LCD assembly, being careful to avoid damaging the connector pins.
7. Replace the front housing cover over the LCD assembly. Secure the housing cover (go to section 5.2.2, *Securing the housing cover*).
8. Restore power to the transmitter.

## 5.6 Replacing the electronics module

The following procedure provides steps to replace the electronics module in the transmitter.

**WARNING – Bodily injury.** When the housing covers are removed and power is still connected, there is a potential for explosion. Failure to observe this safety information may result in death or severe injury.



Do not remove housing covers in hazardous (classified) areas or explosive environments unless the area is known to be non-hazardous. Verify an explosive atmosphere is not present before removing the housing covers when power is live.

Initially, this procedure does not require the transmitter to remain powered up. However, the power must be applied to upload the device configuration, then powered down again, and powered up to finish the procedure.

1. Determine the device software version:
  - a. Press the right soft key to access the HMI menu.
  - b. Use the key pad to locate and select Device Info > Revisions > Software Revision.
  - c. View the software revision (Figure 38). The first seven (7) digits before the slash mark represent the electronic module software revision and the six (6) digits following the slash mark represent the measurement assembly software revision.

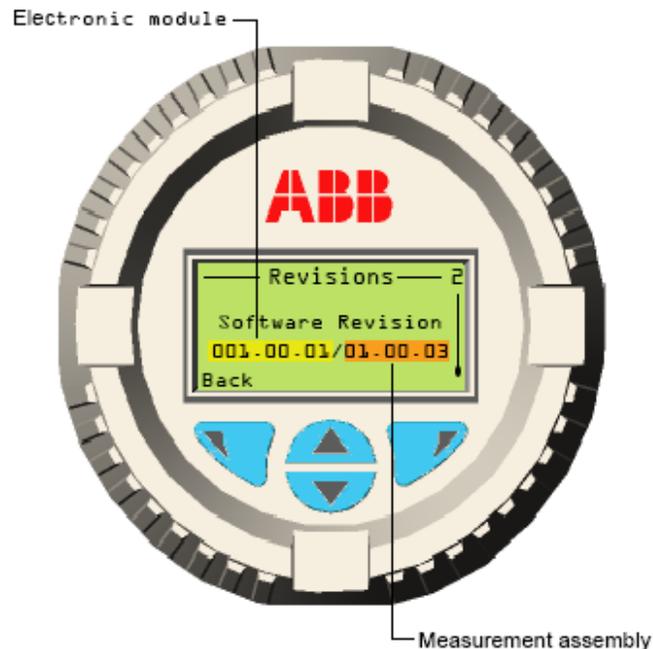


Figure 38: Software revision numbers

- d. Record the electronic module software revision. This revision will determine which procedure to follow after replacing the electronic module.
2. Disconnect the power supply to the transmitter.
3. Use the instructions in section 5.2.1, *Removing the housing cover*, to remove the front housing cover, exposing the interior.
4. Use a slotted screwdriver to press the tabs on the LCD fixing locks to release the assembly then remove it (Figure 37, page 48).
5. Remove the electronics module by removing the 2 fastening screws (Figure 39).

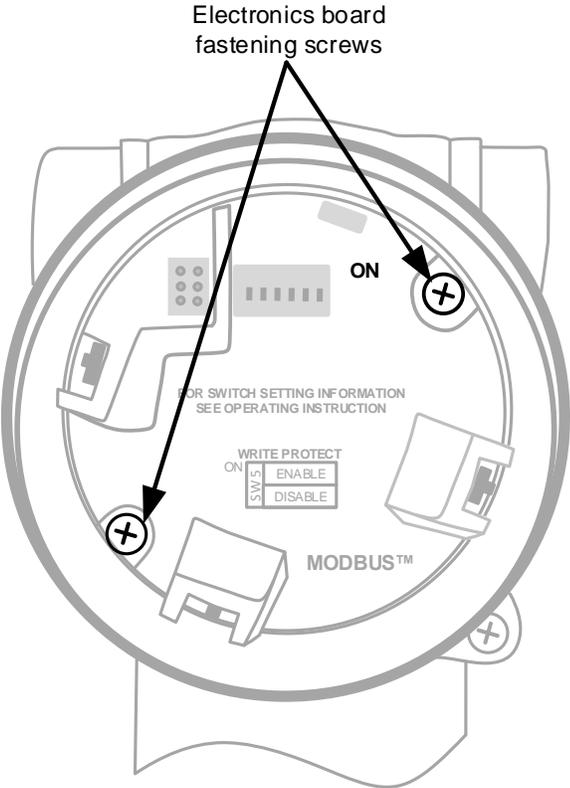


Figure 39: Electronics module

- 6. Disconnect the ribbon cable from the base of the electronics module (Figure 40).



Figure 40: Ribbon cable

7. If the new module does not have an HMI connector installed, carefully remove the connector from the old electronics module and insert it into the new electronics module (Figure 41). Go to section 5.5, *Replacing the HMI connector*, for additional information.



Figure 41: HMI connector

8. Install the new electronics module.
  - a. Attach ribbon cable to the new module (Figure 40, page 51).
  - b. Push the new module into place.
  - c. Secure the module with the fastening screws (Figure 39, page 51).
9. Disable write protection by flipping switch 5 to the down (OFF) position (Figure 42). DIP switches are numbered from left to right starting with 1.



Figure 42: DIP switch 1

10. Referring to the software revision noted during step 1, select one of the following procedures to transfer the configuration:
    - a. If the electronic module software revision is greater than 001.00.01, use procedure 11-A.
    - b. If the electronic module software revision (first six (6) digits) is 001.00.01, use procedure 11-B.
- 



**NOTICE – Software corruption possible.** Procedure A should be used in the majority of situations. Procedure B should only be used in special circumstances and only on early 266 MODBUS® multivariable models. Use the software revision code determined in step 1 as a guideline for choosing procedure 11-A or 11-B.

---

11. Transfer configuration using one of the following procedures:
    - a. Procedure A:
      - i. Using a small slotted screwdriver, move DIP switch 1 to the ON (up) position.
      - ii. Reconnect the power to the transmitter. After 60 seconds the configuration will transfer to the electronics module.
      - iii. Disconnect the power to the transmitter.
      - iv. Using a small slotted screwdriver, move DIP switch 1 back to the OFF (down) position.
    - b. Procedure B:
      - i. Using a small slotted screwdriver, move DIP switches 1, 2, 3, and 4 to the ON (up) position.
      - ii. Reconnect the power to the transmitter. After 60 seconds the configuration will transfer to the electronics module.
      - iii. Disconnect the power to the transmitter.
      - iv. Using a small slotted screwdriver, move DIP switches 1, 2, 3, and 4 back to the OFF (down) position.
  12. Enable write protection for the transmitter, if disabled for this procedure, by moving DIP switch 5 to the up position.
  13. Carefully reinstall the LCD assembly using caution to avoid damaging the HMI connector pins.
  14. Reconnect the power to the transmitter.
  15. Verify that the device configuration is correct and that the LCD is displaying correctly.
- 



**IMPORTANT NOTE:** If the device LCD is not displaying correctly, contact technical support for additional instructions.

---

16. Replace the front housing cover over the LCD assembly.
17. Secure the housing cover (go to section 5.2.2, *Securing the housing cover*).
18. If required, re-enter the Tag number and MODBUS address using the HMI Communication menu.

## 5.7 Replacing the terminal block

The following procedure provides steps to replace the terminal block in the transmitter.



**DANGER – Serious damage to health / risk to life.** Hazardous voltages may be present at the transmitter if the power source is not disconnected before opening the transmitter housing. Eliminate unnecessary exposure to live electrical wiring by disconnecting the power supply at the source. Failure to disconnect power at the source can cause death or severe injury from direct or indirect contact with live wires, or lead to indirect injuries resulting from an electrical shock.

This procedure requires that power be removed from the transmitter at the power supply source.

1. Disconnect the power supply at the source.
2. Use the instructions in section 5.2.1, *Removing the housing cover*, to remove the rear housing cover, exposing the terminal block.
3. Disconnect the following terminations from the terminal block in order(Figure 43):
  - a. Power
  - b. RS-485
  - c. RTD

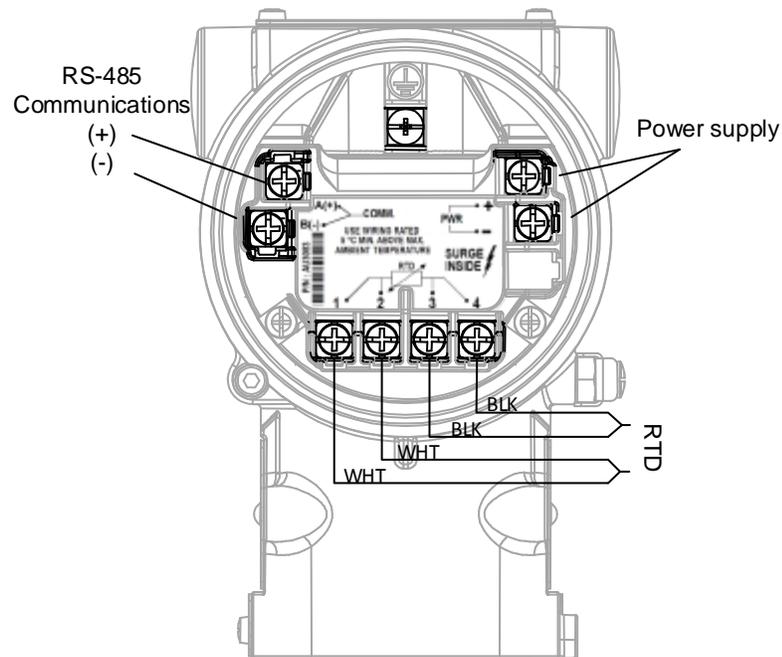


Figure 43: Termination points

4. Remove the terminal block.
  - a. Remove the 2 fastening screws (Figure 44).
  - b. Pull the block out.

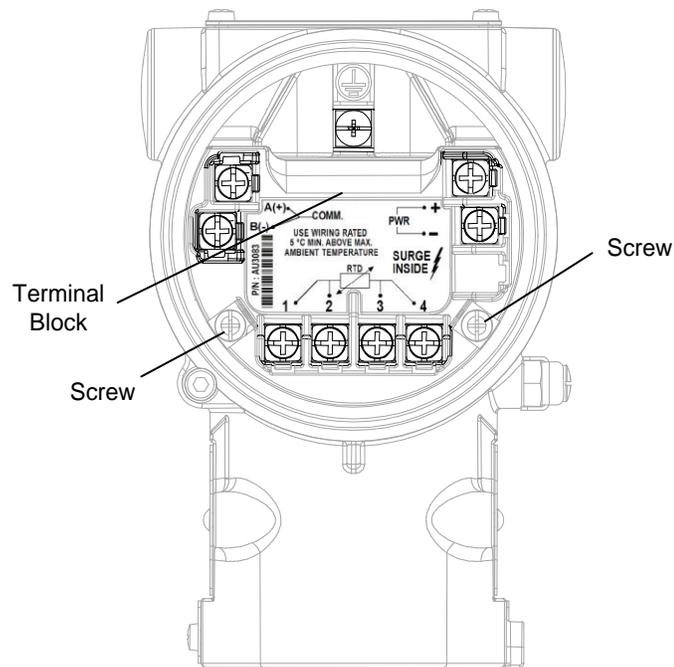


Figure 44: Terminal block

5. Install the new terminal block.
  - a. Push into place.
  - b. Secure with screws.



**NOTICE – Property damage.** Connecting field terminations to the termination block before the block is screwed securely inside of the transmitter housing could damage the block, rendering it useless, inoperable, or dangerous to operate. Be sure to secure the block mounting screws before reconnecting the wires. The terminal block mounting screws act as a ground and connecting field terminations prematurely could create a short circuit.

---

6. Reconnect the following terminations to the terminal block in this order (Figure 43):
  - a. RTD.
  - b. RS-485.
  - c. Power.
7. Replace and secure the rear housing cover (go to section 5.2.2, *Securing the housing cover*).
8. Reconnect power to the transmitter.
9. Verify that the device configuration is correct and that the LCD is displaying correctly.

## 5.8 Adjusting the LCD screen contrast

It may be necessary to adjust the contrast on the HMI display screen. If the screen is blank, go to section 6.2, *Blank display screen*, to troubleshoot the issue. If the screen text is dim or the contrast is too high, the following procedure allows the user to view the setting and make an adjustment if necessary. The LCD screen contrast should be set between 0 and 100, with the highest possible contrast being 100.



**WARNING – Bodily injury.** When the housing covers are removed and power is still connected, there is a potential for explosion. Failure to observe this safety information may result in death or severe injury.

Do not remove housing covers in hazardous (classified) areas or explosive environments unless the area is known to be non-hazardous. Verify an explosive atmosphere is not present before removing the housing covers and power is live.

This procedure requires the transmitter to remain powered up.

1. Do not disconnect power. This procedure requires the transmitter to remain powered up.
2. Use the instructions in section 5.2.1, *Removing the housing cover*, to remove the front housing cover, exposing the interior.
3. Press the right soft key and the left soft key simultaneously. This will reset the contrast to a default value of 50. If this contrast setting works for this site, no further adjustments are needed. If further adjustments are needed, continue to the next step.
4. Press the right soft key to access the main **Menu** on the HMI.
5. Use the key pad to locate and select **Display > Contrast**.
6. Verify that the contrast setting is set to a value of 50 (Figure 45). If the value is near 0 or 100, adjust the contrast that best works for the site:



Figure 45: Contrast setting

- a. Select **Edit** to edit the new contrast value number.



**IMPORTANT NOTES:** The contrast field is defined as 6 digits, xxx.xxx. The **Edit** screen will open with the first digit flashing and ready to be changed. If the contrast value is set to 100.000, it will be necessary to set the first digit to 0 and then move to the second digit and so on. If the contrast value is a number less than 100.000, press the left soft key (for **Next**) to move to the second digit.

Adjusting the screen contrast lightens or darkens the screen backlight, not the text. Decreasing the contrast value lightens the screen backlight, which has the appearance of darkening the text. Increasing the contrast value darkens the screen backlight, which has the appearance of lightening the text.

- i. To enter a value, use the up or down arrow to locate the new value of the first digit. When selected, press the left soft key for **Next**. This moves the cursor to the next digit.
- ii. Repeat this process for each digit until the entire new value is reflected on the screen. To change a digit's value after moving past it, select the **Next** key until the cursor circles back to the incorrect digit then change it.
- b. When the screen contrast is to a value that best works for the site, select **OK**.
7. Replace the front housing cover over the LCD assembly and secure the housing cover (go to section 5.2.2, *Securing the housing cover*).

## 5.9 Replacing the RTD probe

The following procedure provides steps to replace the RTD probe in the transmitter.



**WARNING – Bodily injury.** When the housing covers are removed and power is still connected, there is a potential for explosion. Failure to observe this safety information may result in death or severe injury.

Do not remove housing covers in hazardous (classified) areas or explosive environments unless the area is known to be non-hazardous. Verify an explosive atmosphere is not present before removing the housing covers when power is live.

This procedure does not require the transmitter to remain powered up.

1. Disconnect power to the transmitter.
2. Use the instructions in section 5.2.1, *Removing the housing cover*, to remove the rear housing cover, exposing the terminal block.
3. Disconnect all RTD termination wires from the terminal block (Figure 46).

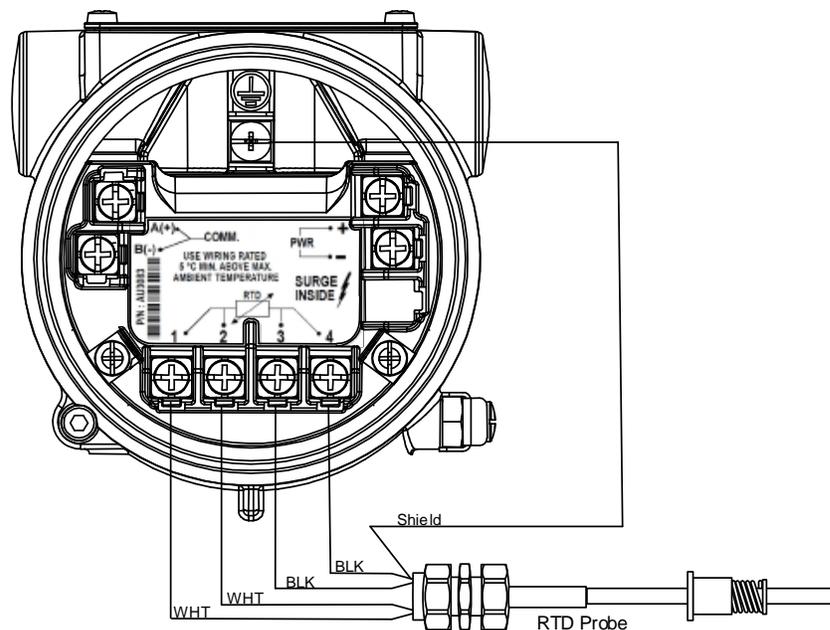


Figure 46: RTD replacement

4. Install the new RTD.
5. Reconnect all RTD wires to the terminal block.
6. Replace and secure the rear housing cover (go to section 5.2.2, *Securing the housing cover*).
7. Reconnect power to the transmitter.
8. Verify that the device configuration is correct and that the LCD is displaying correctly.

## 5.10 RTD wiring verification

Before finalizing the installation of the RTD, verify the RTD to transmitter cable is functioning properly. Perform the following procedure to verify that the cable is free from damage.

1. Verify that the RTD to transmitter cable length does not exceed the maximum distance of 100 ft.
2. Use a digital voltmeter, set to ohms, to perform the following measurements at the cable end nearest the transmitter:
  - a. Attach the voltmeter alligator clips to each white wire end. The measured value should be  $\leq 2.5$  ohms.
  - b. Attach voltmeter alligator clips to each black wire end. The measured value should be  $\leq 2.5$  ohms.
3. If either measurements are out of specification, the RTD to transmitter wire may be damaged. Further investigate cable for damage or replace cable.

## 5.11 Removing the transmitter from service

If the transmitter is in production and needs to be removed from service, isolate the transmitter from the measurement stream by decommissioning the transmitter.

1. Open the equalizing valves (Figure 47, items A and B) on the manifold.
2. Close the high and low pressure tap valves (Figure 47, items L and H) to block the process stream.
3. Vent the system by opening the manifold vent valve (item C).

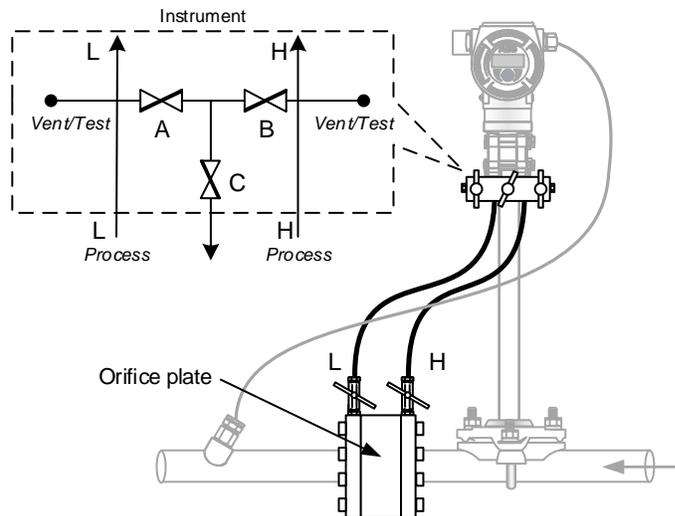


Figure legend:

- A) Low side equalizer valve
- B) High side equalizer valve
- C) Manifold vent valve
- H) High pressure side
- L) Low pressure side

Figure 47: Transmitter with a 3-valve manifold (for illustrative purposes only)

## 5.12 Calibrating

Calibration of the transmitter is performed using the on-board HMI and the user's calibration equipment. Once calibrated by the user, this field calibration can be saved in the transmitter's protected memory. The user can toggle between the original factory calibration and the user-saved calibration performed at the site.



**IMPORTANT NOTES:** Prior to calibration, it is very important to ensure the system is leak-free or errors will be introduced into the readings. Follow the instructions in section 4.3.2, Leak-testing manifold connections.

It is also recommended to use the *Easy Setup* menu to set the *Units*, *LRV (Lower Range Value)*, and *URV (Upper Range Value)* for Differential Pressure, Static Pressure, and Temperature to match the calibration equipment.

The Calibration menu selections (Table 14) are used to calibrate the main pressure sensors (differential and static) and process temperature. In this menu, the user may save the calibration (Save to User), revert to the factory calibration (Reset to Factory) or revert to the user saved calibration (Reset to User) for individual sensors or for the entire calibration. For more details concerning calibration, go to section 5.12.8, *Additional calibration menu commands*.

Table 14: Calibration menu

Main Menu	Submenu 1	Submenu 2	Selections
Calibrate	Diff. Press. Sensor	Calibration Units	Pa inH2068F kg/cm2
			Mpa inH2060F mmH2068F
			bar inH204C ftH2068F
			PSI Torr inHgOC
			kPa Atm mmHgOC
			mbar g/cm2
	Low Trimming		
	High Trimming		
	Save to User	Stores DP sensor settings in the transmitter's nonvolatile memory	
	Reset to User	Reverts to the last Save to User DP settings	
	Reset to Factory	Reverts to DP sensor settings as shipped from the factory	
	Static Press. Sensor	Calibration Units	
Mpa inH2060F mmH2068F			
bar inH204C ftH2068F			
PSI Torr inHgOC			
kPa Atm mmHgOC			
mbar g/cm2			
Low Trimming			
High Trimming			
Save to User		Stores SP sensor settings in the transmitter's nonvolatile memory.	
Reset to User		Reverts to the last Save to User SP settings.	
Reset to Factory	Reverts to SP sensor settings as shipped from the factory.		
Calibrate, Cont.	Process Temp Sensor	Calibration Units	Degree: °C, °F, °R, °K
		Low Trimming	

Main Menu	Submenu 1	Submenu 2	Selections
		High Trimming	
		Save to User	Stores RTD sensor settings in the transmitter's nonvolatile memory.
		Reset to User	Reverts to the last Save to User RTD settings.
		Reset to Factory	Reverts to RTD sensor settings as shipped from the factory.
	Reset All	To Factory Cal.	Reverts all settings as shipped from the factory.
		To User Cal.	Reverts all settings to the last Save to User settings.

### 5.12.1 Defining SP calibration units (first time only)

1. Press the right soft key to access the HMI menu.
2. Use the key pad to locate and select **Calibrate > Static Press. Sensor > Calibration Units > Edit.**
3. Scroll through the menu for the desired calibration unit selection and select **OK** when finished.

### 5.12.2 Defining DP calibration units (first time only)

1. Press the right soft key to access the HMI menu.
2. Use the key pad to locate and select **Calibrate > Diff. Press. Sensor > Calibration Units > Edit.**
3. Scroll through the menu for the desired calibration unit selection and select **OK** when finished.

### 5.12.3 Defining process temperature calibration units (first time only)

1. Press the right soft key to access the HMI menu.
2. Use the key pad to locate and select **Calibrate > Process Temp. Sensor > Calibration Units > Edit.**
3. Scroll through the menu for the desired calibration unit selection and select **OK** when finished.

### 5.12.4 Isolating the transmitter

Prior to starting the calibration process, the transmitter must be isolated from the measurement stream. Follow the instructions in section 5.11, *Removing the transmitter from service*, before proceeding.

### 5.12.5 Calibrating the static pressure (SP) sensor

1. Verify that the transmitter SP calibration unit is set to the same measurement unit as the calibration device.
2. Attach the SP pressure calibrator to the manifold high side vent/test port.
3. Verify the manifold high and low equalizing valves and vent valve (Figure 47, items A, B, and C) are open.



**IMPORTANT NOTE:** If the calibration device does not have venting capability, then the manifold vent (item C) can be used to set the system to barometric pressure.

---

4. Set the SP low trim value.
  - a. Press the right soft key to access the HMI menu.
  - b. Use the key pad to locate and select **Calibrate > Static Press. Sensor > Low Trimming**.
  - c. Verify that the transmitter is sensing the low value desired through the manipulation of the pressure calibrator. Select **Continue** when the value is stable.
  - d. Enter the low value number next to the **New** field.
    - i. To enter a value, use the up or down arrow to locate the value of the first digit. When selected, press the left soft key for **Next**. This moves the cursor to the next digit.
    - ii. Repeat this process for each digit until the entire low value is selected. To change a digit's value after moving past it, select the **Next** key until the cursor reaches the incorrect digit then change it.
  - e. When the value is equal to the value of the pressure calibrator, then select **Continue**. The user should now see the indication that the low trim calibration is complete.
5. Set the SP high trim value.
  - a. Verify that the equalizer valves (items A and B) are open and that the manifold vent valve (item C) is closed.
  - b. Use the key pad to locate and select **High Trimming** from the menu.
  - c. Pressurize the calibrator to the desired high trim value (100% of the static pressure URV). Affirm that the transmitter is sensing the high value, verified by the user's calibration equipment. Select **Continue** when the value is stable.
  - d. Enter the high value number next to the **New** field.
    - i. To enter a value, use the up or down arrow to locate the value of the first digit. When selected, press the left soft key for **Next**. This moves the cursor to the next digit.
    - ii. Repeat this process for each digit until the entire high value is selected. To change a digit's value after moving past it, select the **Next** key until the cursor reaches the incorrect digit then change it.
  - e. When the value is equal to the value of the pressure calibrator, then select **Continue**. The user should now see the indication that the high trim calibration is complete.
6. Select **Save to User**.
  - a. Select **OK**.
  - b. The bar graph will show the status of the save.
  - c. Select **Back** to return to the main calibration screen.

The static pressure sensor is now calibrated.

### 5.12.6 Calibrating the differential pressure (DP) sensor

1. Verify that the transmitter DP calibration unit is set to the same measurement unit as the calibration device.
2. Attach the low pressure calibrator to the manifold high side vent/test port.
3. Verify that the high and low equalizing manifold valves (Figure 47, items A, B, and C, page 58) are open and that the high (H) and low (L) tap valves are closed.
4. Set the DP low trim value.
  - a. Press the right soft key to access the HMI menu.
  - b. Use the key pad to locate and select **Calibrate > Diff. Press. Sensor > Low Trimming**.
  - c. Verify that the transmitter is sensing the low value desired through the manipulation of the pressure calibrator. Select **Continue** when the value is stable.
  - d. Enter the low value number next to the **New** field.
    - i. To enter a value, use the up or down arrow to locate the value of the first digit. When selected, press the left soft key for **Next**. This moves the cursor to the next digit.
    - ii. Repeat this process for each digit until the entire low value is selected. To change a digit's value after moving past it, select the **Next** key until the cursor reaches the incorrect digit then change it.
  - e. When the value is equal to the value of the pressure calibrator, then select **Continue**. The user should now see the indication that the low trim calibration is complete.
5. Set the DP high trim value.
  - a. Close the high equalizer valve (item B)
  - b. Use the key pad to locate and select **High Trimming** from the menu.
  - c. Pressurize the calibrator to the desired high trim value (100% of the differential pressure URV). Affirm that the transmitter is sensing the high value, verified by the user's calibration equipment. Select **Continue** when the value is stable.
  - d. Enter the high value number next to the **New** field.
    - i. To enter a value, use the up or down arrow to locate the value of the first digit. When selected, press the left soft key for **Next**. This moves the cursor to the next digit.
    - ii. Repeat this process for each digit until the entire high value is selected. To change a digit's value after moving past it, select the **Next** key until the cursor reaches the incorrect digit then change it.
  - e. When the value is equal to the value of the pressure calibrator, then select **Continue**. The user should now see the indication that the high trim calibration is complete.
6. Select **Save to User**.
  - a. Select **OK**.
  - b. The bar graph will show the status of the save.
  - c. Select **Back** to return to the main calibration screen.

The differential pressure sensor is now calibrated.

### 5.12.7 Calibrating the process temperature sensor

The process temperature input can be calibrated to match the user's reference over a range of -80 °F to +1500 °F. To calibrate the input use the following steps.



**IMPORTANT NOTE:** If using a RTD simulator or digital RTD calibrator, remove the RTD from the transmitter and wire the connections according to the calibrator documentation.

---

1. Use the key pad to locate and select **Calibrate > Process Temp. Sensor > Low Trimming**.
2. Set the input to the lowest thermal point expected from the application:
  - a. Allow the display to stabilize, showing the current measured value. When stabilized, continue.
  - b. Enter the low value in the **New** field.
    - i. To enter a value, use the up or down arrow to locate the value of the first digit. When selected, press the left soft key for **Next**. This moves the cursor to the next digit.
    - ii. Repeat this process for each digit until the entire low value is selected. To change a digit's value after moving past it, select the **Next** key until the cursor reaches the incorrect digit then change it.
  - c. When the value is equal to the value of the calibrator, then select **Continue**. The user should now see the indication that the low trim calibration is complete.
3. Select **High Trimming** from the menu.
  - a. Set the input to the highest thermal point expected from the application.
  - b. The display will have the current measured value. Select **Continue** when the reading is stable.
  - c. Enter the high value in the **New** field.
    - i. To enter a value, use the up or down arrow to locate the value of the first digit. When selected, press the left soft key for **Next**. This moves the cursor to the next digit.
    - ii. Repeat this process for each digit until the entire high value is selected. To change a digit's value after moving past it, select the **Next** key until the cursor reaches the incorrect digit then change it.
  - d. When the value is equal to the value of the calibrator, then select **Continue**. The user should now see the indication that the low trim calibration is complete.
4. Select **Save to User**.
  - a. Select **OK**.
  - b. The bar graph will show the status of the save.
5. Select **Exit** to return to the main screen.
6. Remove the RTD simulator or calibrator and re-attach the RTD wiring.
7. When the DP, SP, and process temperature sensors have been calibrated, follow the procedure in section 4.3.4, *Putting the transmitter in service*, to return the transmitter to operation.

The process temperature sensor is now calibrated.

### 5.12.8 Additional calibration menu commands

Additional commands are available to save or reset parameters.

- **Reset All.** Resets the calibration for SP, DP, and Temperature:
  - **To Factory Cal.** Resets all to the factory stored calibration values.
  - **To User Cal.** Resets all to the user saved calibration values.
- **Save to User.** This command saves the calibration value for either SP, DP, or Temperature, depending on the sensor menu involved. The data is stored for safekeeping in the nonvolatile memory. This should be performed after the user has completed the calibration of all sensors.
- **Reset to User.** Resets the value for either SP, DP, or Temperature, depending on the sensor menu involved, to the values saved by the **Save to User** command.
- **Reset to Factory.** Resets the calibration for either SP, DP, or Temperature, depending on the sensor menu involved, to the values saved during the factory calibration.

The additional calibration menu commands listed above are detailed in Table 14, *Calibration menu* (page 59). It is important to save user-defined calibration values in the nonvolatile memory so that the settings can be restored following a power failure. Likewise, it may be beneficial to reset the unit to factory calibration standards. User calibration values are not saved unless the command parameter is set.

## 5.13 Setting the measurement bias

### 5.13.1 Removing offsets

An important part of device installation is removing the offsets that may occur during shipment, handling, positioning, or other sources.

Examples of installation issues that could cause a zero shift include: a slightly inclined mounting position, different liquid columns in the differential pressure lines, and remote seals.



**IMPORTANT NOTE:** For accurate correction, the transmitter must be allowed to acclimate to the surrounding temperature and achieve operating temperature (Operating temperature is achieved approximately 5 min after power is applied). The acclimation process may also be completed within the warm up period.

Standard acclimation time: 1 minute for each 1 °C difference at start-up

For example:

*Acclimation time (15 minutes)* = Application sight temperature (30° C)  
less transmitter temperature (15° C).

*Optimum warm-up time (20 minutes)* = Operating temperature (5 minutes)  
plus acclimation time (15 minutes)

The correction must also be made at zero flow (DP = 0).

To remove the offsets, use the bias options in the Device Setup menu (Table 15).

Table 15: Device menu

Menu	Submenu 1	Submenu 2	Selections or Description		
Device Setup	Set Diff. Press	Units	Pa	inH2068F	kg/cm2
			Mpa	inH2060F	mmH2068F
			bar	inH204C	ftH2068F
			PSI	Torr	inHgOC
			kPa	Atm	mmHgOC
			mbar	g/cm2	
		Lower Range Value			
		Upper Range Value			
		Damping			
	Set Diff. Press Bias	Set DP To Zero	Applies a bias to make the current displayed value equal zero		
			Set DP To value	Applies a bias to make current displayed value equal the entered value	
				Reset DP Bias	
	Set Static Press.	Units	Pa	inH2068F	kg/cm2
Mpa			inH2060F	mmH2068F	
bar			inH204C	ftH2068F	
PSI			Torr	inHgOC	
kPa			Atm	mmHgOC	
mbar			g/cm2		
	Lower Range Value				
	Upper Range Value				
Device Setup, Cont.	Set Static Press., Cont.	Damping			
	Set Static Press. Bias	Set SP To Value	Applies a bias to make current displayed value equal the entered value		

Menu	Submenu 1	Submenu 2	Selections or Description
		Reset SP Bias	This removes the user saved bias
	Set Proc. temp	Unit	Degree: °C, °F, °R, °K
		Lower Range Value	
		Upper Range Value	
		Damping	
	Factory Reset	N/A	Ok or Back

### 5.13.2 Setting the SP offset to barometric pressure



**IMPORTANT NOTE:** The user must supply either a live barometric pressure or the average for the area. If the average pressure is used, downstream adjustments may be necessary for compensation of live to average pressures.

Perform the following steps to set the current static pressure value to barometric pressure:

1. Disable transmitter write protection security if enabled. DIP switch 5 must be OFF before continuing. To disable write protection follow the instructions in section 5.3.2, *Disable write protection*.
2. Isolate the transmitter from the measurement stream by decommissioning the transmitter using the procedure in section 5.11, *Removing the transmitter from service*.
3. Verify that the manifold equalizer and vent valves (Figure 47, items A, B, and C, page 58) are open and that the high (H) and low (L) tap valves are closed.
4. Press the right soft key to access the HMI menu.
5. Use the key pad to locate and select **Device Setup**.
6. Check the SP reading on the HMI display.
  - a. If SP = The barometric pressure being used, no correction is necessary
  - b. If the SP  $\neq$  The barometric pressure being used, proceed as follows:
7. Use the key pad to locate and select **Set Stat. Press. Bias > Set SP to Value**. The current set point value shows on the HMI display.



**IMPORTANT NOTE:** If the device does not have a current adjustment value, the displayed entry will be 0.0000.

8. Use the key pad to select **Edit**.
  9. Use the key pad to adjust the value to the new barometric pressure in the current units of measure.
    - a. To enter a value, use the up or down arrow to locate the value of the first digit. When selected, press the left soft key for **Next**. This moves the cursor to the next digit.
    - b. Repeat this process for each digit until the entire barometric pressure is selected. To change a digit's value after moving past it, select the **Next** key until the cursor reaches the incorrect digit then change it.
  10. When the entry is complete select **OK**.
  11. Once complete, use the left key to navigate back to the **Operator** screen. Observe that the SP value is now the current barometric pressure.
  12. Re-enable transmitter write protection security if enabled before this procedure (see section 5.3.1, *Enable write protection*).
- Continue to section 5.13.3, *Setting the DP offset to zero*, to set the differential pressure offset.

### 5.13.3 Setting the DP offset to zero

Perform the following steps to set the current differential pressure value to zero:

1. Disable transmitter write protection security if enabled. DIP switch 5 must be OFF before continuing. To disable write protection follow the instructions in section 5.3.2, *Disable write protection*.
2. Isolate the transmitter from the measurement stream by decommissioning the transmitter using the procedure in section 5.11, *Removing the transmitter from service*.
3. Verify that the manifold equalizer and vent valves (Figure 47, items A, B, and C, page 58) are open and that the high (H) and low (L) tap valves are closed.
4. Press the right soft key to access the HMI menu.
5. Use the key pad to locate and select **Device Setup**.
6. Check the DP reading on the HMI display.
  - a. If  $DP = 0$ , correction is not required.
  - b. If the  $DP \neq 0$ , proceed as follows:
7. Use the key pad to locate and select **Set Diff. Press. Bias > Set DP to Zero**.
  - a. On the HMI display, the current differential pressure reading is displayed.
  - b. Use the key pad to select **OK**. The progress bar will fill up and the value will change to zero.
8. Once completed, use the left key to navigate to the **Operator** screen. Observe that the DP value is now zero.

Return the transmitter to service using the procedure in section 4.3.4, *Putting the transmitter in service*.

## 5.14 Resetting the transmitter to factory defaults

This command allows the user to restore the transmitter to all of the original factory settings, including:

- Measurement units
- Calibration values
- Display setup
- High and low sensor limits and values
- Communication parameters

Access this command by using the following procedure.

1. Verify that DIP switch 5 (write protection) is set to **OFF**. If necessary, go to Appendix B.1, *DIP switch access*, for assistance.
2. Press the right soft key to access the HMI menu.
3. Use the key pad to locate and select **Device Setup > Factory Reset > OK**. This restores all of the original factory settings.



**IMPORTANT NOTES:** When a Factory Reset is commanded, the transmitter baud rate will be changed to a value of 9600 (default). If another value is required, go to the Communication submenu and change the baud rate to the required selection.

To reset only a portion of the transmitter's settings to the original factory settings, see the menu for the specific value and select reset from that submenu. For example:

Use the key pad to locate and select **Calibrate > Process Temp. Sensor > Low Trimming > Reset to Factory**.

---

## 6 Troubleshooting

### 6.1 Diagnostic codes

When an alarm condition is triggered in the transmitter, an indicator displays on the HMI LCD (Figure 48).

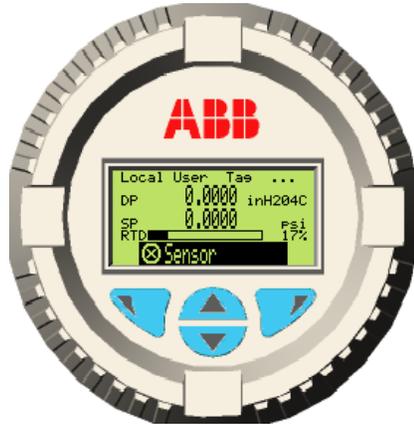


Figure 48: Alarm condition indicated (Sensor)

The following procedure will determine the diagnostic code for the alarm, possible causes, and available corrective action(s).

1. Press the left soft key to access the **Operator Menu > Diagnostics** (Figure 49).

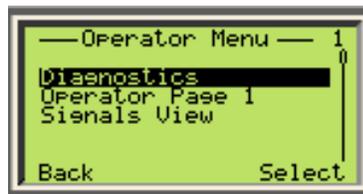


Figure 49: Operator menu, diagnostics screen

2. The alarm and diagnostic code are shown in the window (Figure 50).



Figure 50: Sensor alarm detail screen

3. Press the right soft key (**Exit**) to return to the main display.



**IMPORTANT NOTES:** Alarm conditions, if any, display one at a time. If multiple alarms exist in the transmitter, each condition must be cleared before the next alarm may be viewed.

Diagnostic flags are updated once per second.

---

4. Lookup the diagnostic code in Table 16 to determine the possible cause(s) and recommended actions to aid in clearing the alarm and take the recommended action.

5. Once the recommended action has been taken, access the diagnostics menu again to determine if the alarm has cleared. If the alarm has not cleared, and multiple actions were recommended, move to the next action and complete it. When the alarm clears, it is not necessary to continue. If additional alarms are present, repeat steps 4 through 6 for each alarm, repeating until all alarms are cleared.

Table 16: Diagnostic code cause and action

Diagnostic code	Possible Cause	Recommended action
P-dP Sensor Fail	<ul style="list-style-type: none"> <li>— Mechanical damage on the measuring cell.</li> <li>— Measuring cell loses filling fluid, diaphragm is torn, sensor damaged.</li> </ul>	The measuring cell is not field replaceable. Replace the 266 MODBUS <sup>®</sup> multivariable transmitter.
Static Pressure Sensor Fail	Error in the current circuit for scanning the static pressure.	The measuring cell is not field replaceable. Replace the 266 MODBUS <sup>®</sup> multivariable transmitter.
Sensor Temperature Fail	Error in the current circuit for scanning the temperature.	The measuring cell is not field replaceable. Replace the 266 MODBUS <sup>®</sup> multivariable transmitter.
Process Temperature Sensor Fail	A/D converter error of the temperature sensor.	Replace the transmitter's electronics module (go to section 5.6, <i>Replacing the electronics module</i> ).
	<ul style="list-style-type: none"> <li>— Incorrect wiring</li> <li>— Wire break</li> <li>— Process conditions exceed critical limit</li> <li>— Process conditions have changed, causing the device to have operated out of the design limits</li> </ul>	<ul style="list-style-type: none"> <li>— Verify that the RTD is properly wired to the transmitter (go to section 3.6.4, <i>Transmitter wiring</i>). Rewire if necessary.</li> <li>— Verify that the process temperature has not reached a critical limit, causing the RTD to fail. Use the MODBUS<sup>®</sup> registers to view the RTD maximum ever measured value and the RTD minimum ever measured value. If the RTD has exceeded a critical limit, replace the RTD (go to section 5.9, <i>Replacing the RTD probe</i>).</li> </ul>
P-dP Out Of Limits	The transmitter's measuring range or model configuration is not appropriate for this application.	<p>Verify that the measuring range was calculated correctly and that the transmitter is the correct model for the current application conditions. If incorrect:</p> <ul style="list-style-type: none"> <li>— Replace the transmitter with the correct model configuration.</li> <li>— The incorrect model may still operate correctly, just not for this application or measurement range.</li> </ul>
Static Pressure Out of Limits	The static pressure of the process exceeds the limits of the measuring cell.	Verify that the measuring range was calculated correctly and that the transmitter is the correct model for the current application conditions. If incorrect:
	A wrong transmitter model may have been selected.	<ul style="list-style-type: none"> <li>— Replace the transmitter with the correct model configuration.</li> </ul> <p>The incorrect model may still operate correctly, just not for this application or measurement range.</p>
	An overshoot of the static pressure can reduce accuracy, mechanically damage the membrane, and make a calibration or replacement necessary.	Use the MODBUS <sup>®</sup> registers to view the SP maximum ever measured value and the SP minimum ever measured value. If an overshoot of the SP has occurred, the unit is damaged. Replace the 266 MODBUS <sup>®</sup> multivariable transmitter.
Sensor Temperature Out of Limits	The temperature of the process environment influences the pressure transmitter. Excess temperatures can reduce accuracy, impair device components, and make a calibration or replacement necessary.	The 266 MODBUS <sup>®</sup> multivariable transmitter requires replacement. Verify that the replacement transmitter is suitable for the process conditions. A different type of installation could be necessary, e.g. use of diaphragm seals.

Diagnostic code	Possible Cause	Recommended action
Process Temperature Out of Limits	<ul style="list-style-type: none"> <li>— Incorrect RTD wiring</li> <li>— Wire break</li> <li>— Deviating process conditions</li> </ul>	<ul style="list-style-type: none"> <li>— Verify that the RTD is properly wired to the transmitter (go to section 3.6.4, <i>Transmitter wiring</i>). Rewire if necessary.</li> <li>— Use the procedure in section 5.10, <i>RTD wiring verification</i>, to determine if the RTD to transmitter cable is damaged or requires replacement.</li> <li>— Use the MODBUS® registers to view the customer set maximum and minimum values (5549 through 5556) are set inside of the normal process operational boundaries. It may be necessary to replace the RTD or change the operational limits.</li> </ul>
Sensor Invalid	The measuring cell signal is not updated correctly due to an electronics error, a measuring cell error or a poorly connected measuring cell cable.	Verify the measurement assembly ribbon cable is correctly connected to the back of the electronics module.
	The turn-stop has been disengaged, allowing the housing to be rotated more than one revolution. This can dislodge the ribbon cable inside of the housing.	Disengaging the turn-stop voids the warranty. Replace the 266 MODBUS® multivariable transmitter.
	The model or version of the measuring cell is no longer compatible with the connected version of the electronics.	The measuring cell is not field replaceable. Replace the 266 MODBUS® multivariable transmitter.
Sensor Memory Fail	Measuring cell memory damaged	The measuring cell is not field replaceable. Replace the 266 MODBUS® multivariable transmitter.
NV Sensor Memory Burn Error	Writing to non-volatile memory of the measuring cell was not successful.	The measuring cell is not field replaceable. Replace the 266 MODBUS® multivariable transmitter.
Electronic Interface Error	Data exchange between measuring cell and electronics is faulty.	Remove power from transmitter, then restore. If the error persists, replace the transmitter's electronics module (go to section 5.6, <i>Replacing the electronics module</i> )
Electronic Memory Failure	Electronic memory is damaged	Replace the transmitter's electronics module (go to section 5.6, <i>Replacing the electronics module</i> ).
NV Electronic Memory Burn Error	Writing to non-volatile memory was not successful.	Replace the transmitter's electronics module (go to section 5.6, <i>Replacing the electronics module</i> ).
Max Working Pressure Exceeded	The static pressure of the process exceeds the maximum permissible working pressure (operating pressure, not burst pressure) for the transmitter.	Use the MODBUS® registers to view the SP maximum ever measured value and the SP minimum ever measured value. Determine whether the pressure transmitter is suitable for the process conditions. It is possible that a different transmitter type is required. If necessary, replace the 266 MODBUS® multivariable transmitter.
Pressure Over range	<p>This effect may have been induced by other devices in the process (valves, etc.).</p> <p>A pressure range overshoot, on either the DP or SP side, can result in reduced accuracy or mechanical damage of the diaphragm material and can make calibration or replacement necessary.</p>	Use the MODBUS® registers to view the SP maximum ever measured value, the SP minimum ever measured value, DP maximum ever measured value, and the DP minimum ever measured value. Determine whether the pressure transmitter is suitable for the process conditions. It is possible that a different transmitter type is required. If necessary, replace the 266 MODBUS® multivariable transmitter.
Electronic Temperature Out of Limits	The measurement cell's circuit board has had a catastrophic failure on the micro-controller.	The measuring cell circuit board is not field replaceable. Replace the 266 MODBUS® multivariable transmitter. It is likely that additional error codes may also be present along with this code.
Replace Info	The electronics module has been replaced, but replacement mode has not been executed.	Complete the remaining instructions in section 5.6, <i>Replacing the electronics module</i> , beginning with step 8, <i>Uploading the device configuration</i> . This will upload the configuration files into the new electronics module.

## 6.2 Blank display screen

There are four approaches for troubleshooting the LCD. First, reset the display contrast to the default setting. Second, verify that power is reaching the transmitter and that it has been correctly connected. Third, verify that the HMI connector is installed and has not been damaged. Last, test component viability and potential need for replacement. The following procedures will address the steps to eliminate a blank LCD.

### 6.2.1 Resetting display contrast

If the display screen is blank, the contrast adjustment may not be set in a viewable range. The setting range is between 0 and 100. The following procedure resets the display screen to the default setting of 50.



**WARNING – Bodily injury.** When the housing covers are removed and power is still connected, there is a potential for explosion. Failure to observe this safety information may result in death or severe injury.

Do not remove housing covers in hazardous (classified) areas or explosive environments unless the area is known to be non-hazardous. Verify an explosive atmosphere is not present before removing the housing covers when power is live.

This procedure requires the transmitter to remain powered up.

- 
1. Use the instructions in section 5.2.1 to remove the front housing cover, exposing the LCD assembly.
  2. Press the right soft key and the left soft key simultaneously. This will reset the contrast to a default value of 50.
  3. If the display has been restored, follow the instructions in section 5.2.2, *Securing the housing cover*, to secure the unit. Otherwise, continue to the next step.
  4. If the display is still blank, proceed to section 6.2.2, *Verifying power connections*.



**IMPORTANT NOTE:** If the display screen is dim, or the contrast too high for optimal visibility, go to section 5.8, *Adjusting the LCD screen contrast*, to make additional adjustments before securing the housing covers.

---

## 6.2.2 Verifying power connections

A low power or no power connection to the transmitter may be the cause of a blank LCD screen.



**WARNING – Bodily injury.** When the housing covers are removed and power is still connected, there is a potential for explosion. Failure to observe this safety information may result in death or severe injury.

Do not remove housing covers in hazardous (classified) areas or explosive environments unless the area is known to be non-hazardous. Verify an explosive atmosphere is not present when before removing the housing covers and the power is live.

This procedure requires the transmitter to remain powered up.

1. Using a multimeter, measure the power source and verify that it is transmitting at least 10.5 Vdc, but less than 30 Vdc.
  - a. If the voltage is outside of this range, determine the cause and repair.
  - b. If a correction was made to the power source and the LCD screen is now visible and operational, it is not necessary to continue this procedure. Follow the instructions in section 5.2.2, *Securing the housing cover*, to secure the unit.
2. If the power transmission is within the proper range, and the screen is still blank, verify that the power supply at the termination block is within range.
  - a. Leaving the transmitter powered-up, use the instructions in section 5.2.1 to remove the rear housing cover, exposing the terminal block.
  - b. Using a multimeter, measure the power supply at the termination block and verify it is receiving at least 10.5 Vdc, but less than 30 Vdc. If the voltage is outside of this range, determine the cause and repair.
  - c. If a correction was made and the LCD is now visible, go to step 5.
3. If the power supply at the termination block is within the proper range, and the screen is still blank, verify that the positive and negative power supply wires are tightly connected to the proper terminals on the termination block.
  - a. Disconnect the power supply to the transmitter.
  - b. Compare the actual wiring to the termination identification printed on the block (Figure 51). Verify that the wiring is correct, the terminal screws are tight, and the supply lines are firmly connected.

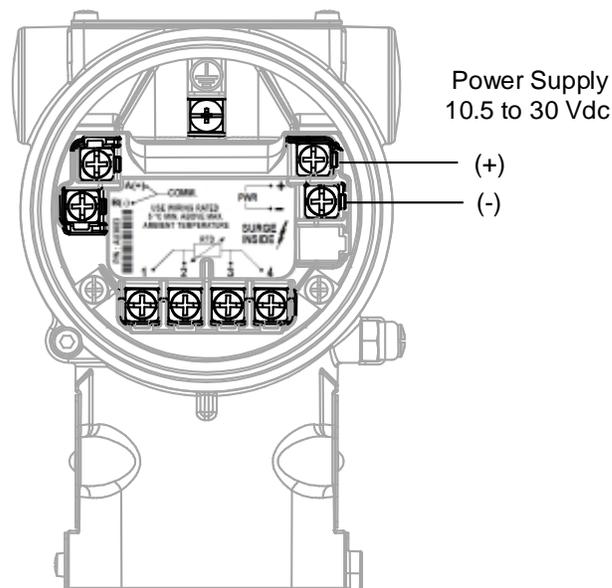


Figure 51: Transmitter power connections

- i. If no corrections were necessary to the wiring on the terminal block, go to section 6.2.3, *Verifying HMI connector viability*.
- ii. If the wiring is incorrect (reversed polarity or loose terminal screws), make adjustments and then go to step 4.



**NOTICE – Reverse polarity protection.** Transmitter circuitry is designed to protect the transmitter if the power supply polarity is reversed.

A determination that the power supply positive and negative wires were reversed does not necessarily indicate that the termination block has been damaged.

4. If a correction was made to the power supply terminations, reconnect power to the transmitter and observe the LCD screen. If the LCD is now visible and operational, continue to the next step. Otherwise, go to section 6.2.3, *Verifying HMI connector viability*.
5. Secure the housing cover using instructions in section 5.2.2, *Securing the housing cover*, to secure the unit, and return the transmitter to operation.

### 6.2.3 Verifying HMI connector viability

If the electronics module has recently been replaced, the LCD assembly removed or replaced, or the DIP switches have been accessed, it is possible that the HMI connector is missing or was damaged.

1. Inspect the HMI connector if installed (go to section 5.5, *Replacing the HMI connector*).
2. If no HMI connector is installed, install a new connector.
3. If the HMI connector appears damaged, replace the connector with a new or undamaged one.

### 6.2.4 Verifying component viability

If prior attempts to troubleshoot a blank LCD screen have not identified the problem, the LCD assembly or terminal block should be replaced. The following instructions provide the steps for replacing these assemblies.



**WARNING – Bodily injury.** When the housing covers are removed and power is still connected, there is a potential for explosion. Failure to observe this safety information may result in death or severe injury.

Do not remove housing covers in hazardous (classified) areas or explosive environments unless the area is known to be non-hazardous. Verify an explosive atmosphere is not present before removing the housing covers when power is live.

This procedure requires the transmitter to remain powered up.

1. If the wiring at the power supply terminations was correct, the LCD contrast was reset to factory defaults, and the screen is still blank, the LCD assembly should be replaced. Go to section 5.4, *Replacing the LCD assembly*, for replacement instructions. If the LCD is now visible, go to step 4.
2. If the LCD assembly has been replaced and the LCD screen is still blank, the terminal block should be replaced. Go to section 5.7, *Replacing the terminal block*, for replacement instructions. If the LCD is now visible, go to step 4.
3. If the terminal block has been replaced and the LCD screen is still blank, contact customer service. Customer service contact information may be found in section 6.4.2, *Customer services*.
4. Secure the housing cover using instructions in section 5.2.2, *Securing the housing cover*, to secure the unit, and return the transmitter to operation.
5. Verify the LCD is displaying correctly.

## 6.3 Communication failure

There are two approaches for troubleshooting communication. First, verify that the communication parameters in the transmitter have been properly set. Second, verify that the RS-485 MODBUS® communication connection (Bus + and Bus -) is correctly wired and properly terminated. Use the following procedures to troubleshoot a communication failure.

### 6.3.1 Verifying communication parameters

Communication setup parameters must match the settings in the Host device for proper communication.

1. Press the right soft key to access the HMI **Main Menu**.
2. Use the key pad to locate and select **Communication**.
3. Scroll through the **communication** menu and verify that all the parameters for this transmitter match those set in the Host device (Table 17).

Table 17: Communication parameters

Main Menu	Submenu 1	Selections		
Communication	TAG	(enter name)		
	Address	Modbus address 1-247		
	Baud rate	1200	2400	4800
		9600	19200	38400
	Response Delay	(in ms)		
	Parity	None Even Odd		
	Modbus Map Select	ABB 266\x2F267 Map Rosemount 3095FB Map Invensys IMV25 Map		
Modbus Reg. Offset	Zero Based One Based			

- a. If the parameters do not match those set in the Host device, make adjustments.
  - b. If an adjustment was made to the parameters and the communication has been restored, it is not necessary to continue this procedure.
  - c. **Exit** the menu when finished.
4. If there are multiple transmitters on the bus, verify that all parameters for each transmitter match those set in the Host device.
    - a. If the parameters do not match those set in the Host device, make adjustments.
    - b. If an adjustment was made to the parameters and the communication has been restored, it is not necessary to continue this procedure.
  5. If communication has not been restored, proceed to section 6.3.2, *RS-485 wiring connections*.

### 6.3.2 RS-485 wiring connections

Reversed polarity for the Bus + and Bus - connections will cause the transmitter to not communicate to the Host device even though all communication parameters are correct.

1. Verify that the communication wiring Bus (+) is wired to COMM A (+), Bus (-) is wired to COMM B (-), and that the terminal connections are tight (Figure 52).

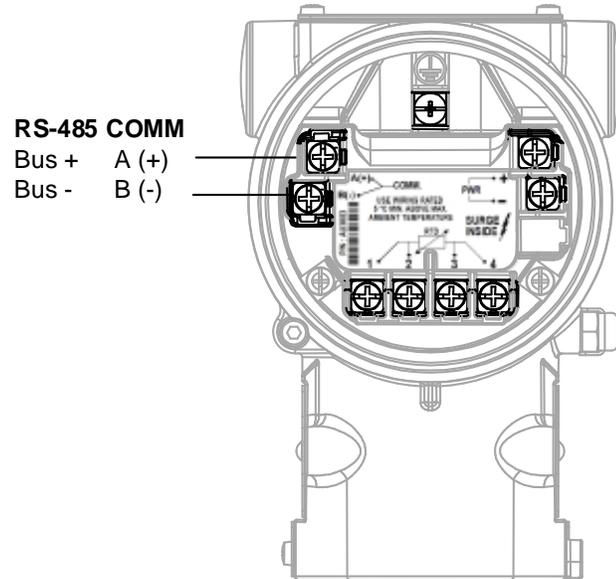


Figure 52: RS-485 communication wiring

2. If multiple transmitters are part of the same RS-485 Bus, then each must be checked for proper wiring connections and that the last unit is properly terminated. If communication has been restored, it is not necessary to continue this procedure.
3. If the transmitter is still experiencing a communication failure, the terminal block should be replaced. Go to section 5.7, *Replacing the terminal block*, for replacement instructions.
4. If after replacing the terminal block, the transmitter is still experiencing a communication failure, contact customer service. Customer service contact information may be found in section 6.4.2, *Customer services*.

## 6.4 Customer service and support

### 6.4.1 Determine hardware and software versions

When requesting support for the transmitter, it will be necessary to supply the hardware and software version of the device. To locate the version, use the following procedure.

1. Press the right soft key to access the HMI menu.
2. Use the key pad to locate and select **Device Info > Revisions > Hardware Revision** and make note of the number.
3. Select **Back > Software Revision** and make note of the number.

### 6.4.2 Customer services

To contact ABB, use one of the following methods.

- Toll Free Number (USA): 1-800-442-3097
- International Number: +1 918-338-4880
- Fax: 918-338-4607
- Email: totalflow.order@us.abb.com

### 6.4.3 Transmitter return information

Use the original packaging, or a secure transport container, to return the transmitter for repair. Comply with the following instructions concerning the return of equipment.

- All returns to ABB require a Return Authorization (RA) number before shipping.
- Contact our Returns department at 1-800-442-3097 (USA) or 918-338-4880 (International), prompt 1. Include the following information when requesting a return:
  - Reason for return
  - P.O. number for exchanges and repairs not covered by warranty
  - Warranty sticker expiration date
- Transmitters should be free from any hazardous materials (acids, alkalis, solvents, etc.).
- Any material returned to ABB without a RA number will be returned to the customer at the customer's expense.

## Appendix A HMI menu structure

When the transmitter is operating normally, the Operator Page 1 screen is displayed on the LCD (Figure 53). The default screen displays the DP and SP values, the defined units of measure and a bar view of the operating temperature measured as a percent of the temperature between the upper and lower range values. The Operator Page 1 is also user-definable by editing the properties in the Display menu.

To access the Operator Menu, press the right soft key. Press the left soft key to access the Main Menu. Use the up and down arrow keys and the right and left keys to navigate to the submenus and selections (Table 18).

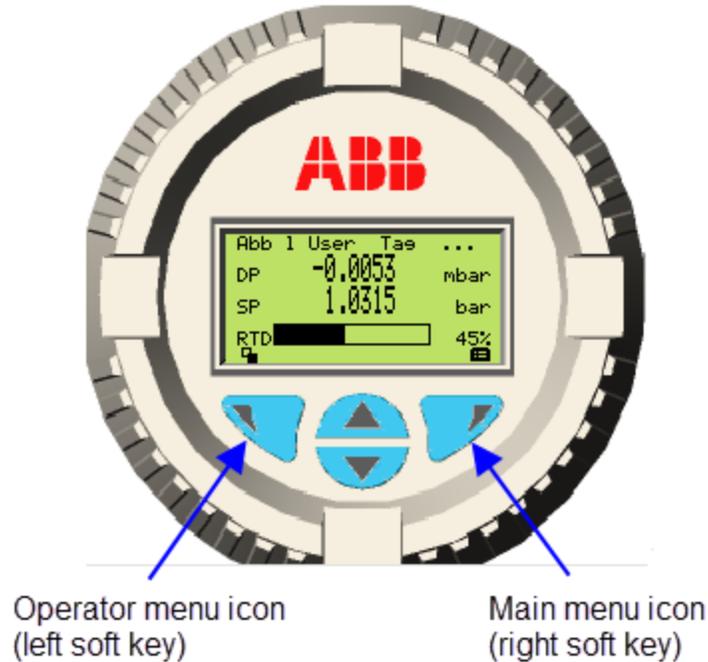


Figure 53: HMI display

Table 18: HMI menu structure

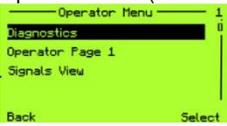
Menu	Submenu 1	Submenu 2	Selections or Description
Operator Page 1			
Operator Menu (Left soft key)			
	Diagnostics	N/A	
	Signals View	N/A	
	Operator Page 1	N/A	
Main Menu (Right soft key)			
	Language	N/A	English, Deutsch, Italiano
	Tag	N/A	
	Address	N/A	
	Diff. Pressure Unit	N/A	Pa inH2068F kg/cm2 Mpa inH2060F mmH2068F bar inH204C ftH2068F PSI Torr inHgOC kPa Atm mmHgOC mbar g/cm2
	Diff. Pressure LRV	N/A	
	Diff. Pressure URV	N/A	
	Diff. Pressure Damping	N/A	
	Static Pressure Unit	N/A	Pa inH2068F kg/cm2 Mpa inH2060F mmH2068F bar inH204C ftH2068F PSI Torr inHgOC kPa Atm mmHgOC mbar g/cm2
	Static Pressure LRV	N/A	
	Static Pressure URV	N/A	
	Static Pressure Damping	N/A	
	Process Temp. Unit	N/A	Degree: °C, °F, °R, °K
	Process Temp. LRV	N/A	
	Process Temp. URV	N/A	
	Process Temp. Damping	N/A	
	Display Line 1 View	N/A	Differential Pressure, Static Pressure, Process Temp, Sensor Temp
	Display Line 2 View	N/A	Differential Pressure, Static Pressure, Process Temp, Sensor Temp
	Bar View line	N/A	Differential Pressure, Static Pressure, Process Temp, Sensor Temp

Table 18: HMI menu structure, continued

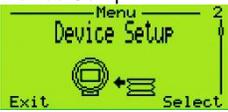
Menu	Submenu 1	Submenu 2	Selections or Description		
	Set Diff. Press	Units	Pa	inH2068F	kg/cm2
			Mpa	inH2060F	mmH2068F
			bar	inH204C	ftH2068F
			PSI	Torr	inHgOC
			kPa	Atm	mmHgOC
			mbar	g/cm2	
			Lower Range Value		
			Upper Range Value		
			Damping		
	Set Diff. Press Bias	Set DP To Zero	Applies a bias to make the current displayed value equal zero		
			Set DP To value	Applies a bias to make current displayed value equal the entered value	
				Reset DP Bias	This removes the user saved bias
	Set Static Press.	Units	Pa	inH2068F	kg/cm2
			Mpa	inH2060F	mmH2068F
			bar	inH204C	ftH2068F
			PSI	Torr	inHgOC
			kPa	Atm	mmHgOC
			mbar	g/cm2	
Lower Range Value					
Upper Range Value					
Damping					
Set Static Press. Bias	Set SP To Value	Applies a bias to make current displayed value equal the entered value			
		Reset SP Bias	This removes the user saved bias		
Set Proc. temp	Unit	Degree: °C, °F, °R, °K			
		Lower Range Value			
		Upper Range Value			
		Damping			
Factory Reset	N/A	Ok or Back			
	Language	N/A	English, Deutsch, Italiano		
	Display Revision	N/A			
	Contrast	N/A	0-100		
	Mode	N/A	One Line, One line = Bar graph, Two lines, Two Lines + Bar graph		
	Line 1 View	N/A	Differential Pressure, Static Pressure, Process Temperature, Sensor Temperature		
	Line 2 View	N/A	Differential Pressure, Static Pressure, Process Temperature, Sensor Temperature		
	Bar View	N/A	Differential Pressure, Static Pressure, Process Temperature, Sensor Temperature		

Table 18: HMI menu structure, continued

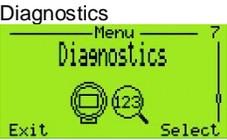
Menu	Submenu 1	Submenu 2	Selections or Description
	Diff. Press. Sensor	Calibration Units	Pa inH2068F kg/cm2
			Mpa inH2060F mmH2068F
			bar inH204C ftH2068F
			PSI Torr inHgOC
			kPa Atm mmHgOC
			mbar g/cm2
		Low Trimming	
		High Trimming	
		Save to User	Stores DP sensor settings in the transmitter's nonvolatile memory
		Reset to User	Reverts to the last Save to User DP settings
	Reset to Factory	Reverts to DP sensor settings as shipped from the factory	
	Static Press. Sensor	Calibration Units	Pa inH2068F kg/cm2
			Mpa inH2060F mmH2068F
			bar inH204C ftH2068F
			PSI Torr inHgOC
			kPa Atm mmHgOC
			mbar g/cm2
		Low Trimming	
High Trimming			
Save to User		Stores SP sensor settings in the transmitter's nonvolatile memory.	
Reset to User		Reverts to the last Save to User SP settings.	
Reset to Factory	Reverts to SP sensor settings as shipped from the factory.		
Process Temp Sensor	Calibration Units	Degree: °C, °F, °R, °K	
	Low Trimming		
	High Trimming		
	Save to User	Stores RTD sensor settings in the transmitter's nonvolatile memory.	
	Reset to User	Reverts to the last Save to User RTD settings.	
Reset All	To Factory Cal.	Reverts all settings as shipped from the factory.	
	To User Cal.	Reverts all settings to the last Save to User settings.	
	Monitoring	Diff. Pressure	
		Static Pressure	
		Sensor Temperature	
		Process Temperature	

Table 18: HMI menu structure, continued

Menu	Submenu 1	Submenu 2	Selections or Description		
	Sensor Type	N/A	Pres Piezo Min		
	Diff. Pressure	High Sensor Limit			
		Low Sensor Limit			
		Upper Range Value			
		Low Range Value			
	Static Pressure	High Sensor Limit			
		Low Sensor Limit			
		Upper Range Value			
		Low Range Value			
	Sensor Temp.	High Sensor Limit			
		Low Sensor Limit			
	Revisions	Hardware Revision			
		Software Revision			
		TAG	N/A	Name	
Address		N/A	MODBUS® address 1-247		
Baud rate		N/A	1200	2400	4800
			9600	19200	38400
Response Delay		N/A			
Parity		N/A	None Even Odd		
MODBUS® Map Select		N/A	ABB 266\x2F267 Map, Rosemount 3095FB Map, Invensys IMV25 Map		
MODBUS® Reg. Offset		N/A	Zero Based, One Based		

## Appendix B DIP switch settings

The following information details the functions of the DIP switch settings within the transmitter. The unit has six DIP switches mounted on the electronics module. DIP switches 1, 2, 3, 4, and 5 are the only active switches. Switches are ON in the up position and OFF in the down position (Figure 54). By default, all DIP switches are set to the OFF position.

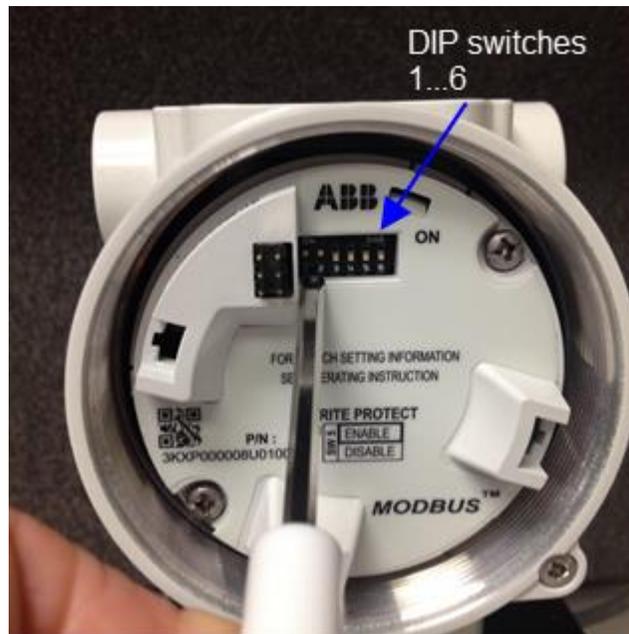


Figure 54: DIP switches

When power is applied to the transmitter, the application software checks for the states of DIP switches 1, 2, 3, 4, and 5 on the electronics module. The configuration of the switch settings defines what action, if any, is taken.

The state of switch 5 may be set before or after power is applied and also at any time during operation. This alternate functionality allows the unit to be moved into write-protect mode while still operating.



**IMPORTANT NOTES:** DIP switch 6 is not connected.

Always disconnect the transmitter from the power supply before making changes to DIP switches 1 through 4. The transmitter must then be restarted in order for the new configurations to be loaded.

---

### B.1 DIP switch access

Use the following steps to access the DIP switches through the front of the transmitter:

1. Disconnect power to the transmitter if necessary. (Altering switches 1 through 4 requires the power to be disconnected.)
2. Locate the security screw in the housing and, using the provided Allen wrench, turn it clockwise until flush with the housing.
3. Unscrew the housing cover and remove to expose the electronics.
4. Use a slotted screwdriver to press the tabs on the LCD fixing locks to release the assembly and remove it. For additional information about removing the LCD assembly, go to section 5.4, *Replacing the LCD assembly*.

## B.2 Write protection

DIP switch 5 is used for transmitter write protection. If DIP switch 5 is ON, the transmitter is in write-protect mode and will not accept write commands. The state of switch 5 may be set before or after power is applied and also at any time during operation of the transmitter.

## B.3 DIP switch states

When power is applied to the transmitter, the application software checks for the states of DIP switches 1 through 5 on the electronics module. Depending upon the combination of the switches, nonvolatile contents may be transferred from the measurement assembly to the electronics module (Table 19). Nonvolatile contents will be transferred if, and only if, the write-protect switch is OFF.

Table 19: DIP switch states

DIP switch and states						Description
1	2	3	4	5	6	
OFF	OFF	OFF	OFF	OFF	Not used	Default settings. Writing to the transmitter is allowed.
ON	ON	ON	ON	OFF	Not used	SPECIAL NOTE: Clears the nonvolatile memory in the transmitter and reloads the fixed defaults. It will then copy the current configuration of the electronics module to the measurement assembly. This should only be used when upgrading a device in which the software revision is 1.0.1.
ON	OFF	OFF	OFF	OFF	Not used	Copies nonvolatile content (Factory calibration values and User saved calibration values) from the measurement assembly to the electronics module. Performed when the electronics module is replaced in the field.
ON	ON	OFF	OFF	OFF	Not used	Copies nonvolatile content from the electronics module to the measurement assembly.
OFF	OFF	ON	ON	OFF	Not used	Clears the nonvolatile memory in the transmitter. The fixed defaults will be loaded into the run time memory.
OFF	OFF	OFF	OFF	ON	Not used	Writing to the transmitter configuration is not allowed. Editing capabilities using the HMI will not be present. DIP switches 1-4 are disabled.

## Appendix C MODBUS® register lists

All registers in this document are referenced to base one. The MODBUS® message frame for read and write access is base zero. This means that the number of the mapped register is one higher than the number that is sent in a MODBUS® message frame.

Function code 4 is meant to access the process parameters, which possibly could be polled in a low cycle time (> 100 ms). Therefore the data of the parameters is held in an internal buffer, which has a low access time. Function code 3 should be used to access parameters that are non-cyclic or with a high cycle time (> seconds).

By reading or writing 32 bit or 16 bit registers, 4 or 2 byte are transmitted. If a parameter has a data type which uses fewer bytes than that, the data is transmitted in the lower data bytes of the MODBUS® message frame. The data bytes that are not used are set to zero.

### C.1 ABB transmitter register map

This register map is an expanded map from the ABB 267 MODBUS® transmitter.

Table 20: ABB transmitter register map

Register Address		Data Type	Object description	Read/Write	Added Ext.
32 bit	16 bit				
1 – 8	5001 – 5016	Pack ASCII	Transducer ID / Serial number 16 ASCII characters string. Ex. "T090100001" (See 4.3.1.1, <i>Set MODBUS® device address</i> , page 38)	RO	√
9	5017 – 5018	U32	Date Factory Characterized seconds since 1970 Jan 1st	RO	√
10	5019 – 5020	U32	Communication Board Hardware example value 0x00010203 represents 1.2.3 bits 23-16 = Major Revision (compatibility change) bits 15-8 = Minor Revision (functionality or operation) bits 7-0 = Sub-minor Revision (bug fixes)	RO	√
11	5021 – 5022	U32	Sensor Board Hardware base part number 3 MSB version number 1LSB see register 10 for more information	RO	√
12	5023 – 5024	U32	Communication Board firmware base part number 3 MSB version number 1LSB see register 10 for more information	RO	√
13	5025 – 5026	U32	Sensor Board firmware base part number 3 MSB version number 1LSB see register 10 for more information	RO	√
14	5027 – 5028	F	DP Upper Range Limit (Set by Measurement Sensor URL)	RO	√
15	5029 – 5030	F	DP Lower Range Limit (Set by Measurement Sensor LRL)	RO	√
16	5031 – 5032	F	SP Upper Range Limit (Set by Measurement Sensor URL)	RO	√
17	5033 – 5034	F	SP Lower Range Limit (Set by Measurement Sensor LRL)	RO	√
18	5035 – 5036	F	Transducer cell Temperature Upper Range Limit (URL)	RO	√
19	5037 – 5038	F	Transducer cell Temperature Lower Range Limit (LRL)	RO	√
20	5039 – 5040	F	Second since last Restart	RO	√
Normal Operation Polling registers					
21	401 – 402	F	Differential Pressure (Damping, Calibration and Units applied ) floating point, 401 is high word, 402 is low word	RO	
22	403 – 404	F	Static Pressure (Damping, Calibration and Units applied ) floating point, 403 is high word, 404 is low word	RO	

Register Address		Data Type	Object description	Read/Write	Added Ext.
-32 bit	16 bit				
23	405 – 406	F	Process Temperature (Damping, Calibration and Units applied) floating point, 405 is high word, 406 is low word. This may be external RTD or sensor value depending on configuration	RO	
24	407 – 408	F	Mass flow rate value	RO	
25	409 – 410	F	Volume Flow rate value	RO	
26	411 – 412	U32	Diagnostic status flag words 1 and 2	RO	
27	413 – 414	U32	Diagnostic status flag words 3 and 4	RO	
28	415 – 416	U32	Diagnostic status flag words 5 and 6	RO	
41	441 – 442	F	DP calibration high point (span) Default URL. See 481 for unit of value	R/W	
42	443 – 444	F	DP calibration low point (offset). Default LRL. See 481 for unit of value	R/W	
43	445 – 446	F	SP calibration high point (span) Default URL. See 482 for unit of value	R/W	
44	447 – 448	F	SP calibration low point (offset). Default LRL. See 482 for unit of value	R/W	
45	449 – 450	U16	Calibration Unit Pressure Register 449 is not a register, and it returns zero when read, and does nothing when written. Register 450 Default (65535) reads as register 481 until it is written. Values: 1 = Inches H2O 4C 2 = Inches HG 0C 3 = Feet H2O_68F 4 = Millimeter H2O_68F 5 = Millimeter HG 0C 6 = PSI 7 = BAR 8 = Millibar 9 = Gram per square centimeter 10 = Kilogram per square centimeter 11 = Pascal 12 = Kilopascal 13 = Torr 14 = Atmosphere 117 = Megapascal 16 = Inches H2O 60F 17 = Inches H2O 68F Default 65535 reverts back to using 481 unit	R/W	
46	451 – 452	F	T calibration high point (span) default URL. See 483 for unit of value	R/W	
47	453 – 454	F	T calibration low point (offset) default 0 °C. See 483 for unit of value	R/W	
48	455 – 456	U16	Calibration Unit Temperature Register 455 is not a register, and it returns zero when read, and does nothing when written. Register 456 Default (65535) reads as register 483 until it is written. Values: 32 = Degree Celsius 33 = Degree Fahrenheit 34 = Degree Rankine 35 = Degree Kelvin 65535 Default reverts back to using 483 unit	R/W	
49 – 50	457 – 460		RESERVED un-implemented registers All access returns an ILLEGAL FUNCTION error code.	NONE	
51	461 – 462	F	DP Damping time constant (Default 0.0 = disabled)	R/W	

Register Address		Data Type	Object description	Read/Write	Added Ext.
32 bit	16 bit				
52	463 – 464	F	SP Damping time constant (Default 0.0 = disabled)	R/W	
53	465 – 466	F	T Damping time constant (Default 0.0 = disabled)	R/W	
54 – 190	467 – 740		RESERVED un-implemented registers All access returns an ILLEGAL FUNCTION error code.	NONE	
191	481	U16	Differential Pressure Units Code (ABB) 1 = inches of water 8 = Millibar (ROM default) 11 = Pascal 12 = Kilopascal	R/W	
192	482	U16	Static Pressure Units select Code 6 = PSIA 7 = Bar (ROM default) 12 = Kilopascal 117 = Megapascal	R/W	
193	483	U16	Temperature Units select Code 32 = Degree Celsius (ROM default) 33 = Degree Fahrenheit 34 = Degree Rankine 35 = Degree Kelvin	R/W	
194	484	F	Mass / Volume Flow Unit (ref 407-408 register)	R/W	
195	485	F	Volume Flow Unit (ref 409-410 register)	R/W	
196 197 198	486 487 – 488 489 – 490		RESERVED un-implemented registers All access returns an ILLEGAL FUNCTION error code	NONE	
199	491	U16	Reset to factory configuration Value written is the specific subsystem index to reset -1 = ALL subsystem 0 = Coordinator subsystem 1 = Diagnosis subsystem 2 = Electronic subsystem 3 = HMI display subsystem 4 = Pressure subsystem 5 = Measurement sensor interface subsystem 6 = Sservice port interface subsystem 7 = Modbus subsystem 9 = Access role manager subsystem 10= Flow subsystem 11= Process temperature subsystem  Warning: all configuration for each subsystem will need to be reloaded.	R/W	
200	492	U16	Modbus display text write lock 0 = able to change display text see 1001-1019 1 = disabled register writes to 1001-1019	R/W	
205	501		RESERVED un-implemented registers All access returns an ILLEGAL FUNCTION error code	NONE	
206	502	U8	Baud rate selector 1 = 1200, 2=2400, 3=4800, 4=9600, 5=1200, 6=2400, 7=4800, 8=9600, 9=19200, 10=38400	R/W	
207	503	U8	Modbus Device address	R/W	
208	504	U8	Modbus turn-around response delay (ms per count)	R/W	
209	505	U8	Modbus protocol communication Parity 0 = None 1 = Even 2 = Odd	R/W	

Register Address		Data Type	Object description	Read/Write	Added Ext.
-32 bit	16 bit				
210 – 211	1001-1004	Char	Display line 1, 8 ASCII characters per line. Protection see 492 Write protection Dip Switch does not protect this register.	R/W	
212-213	1005-1008	Char	Display line 2, 8 ASCII characters per line. Protection see 492 Write protection Dip Switch does not protect this register.	R/W	
214-218	1009-1018	Char	Display Tag 1 line, 20 ASCII characters per line. Protection see 492 Write protection Dip Switch does not protect this register.	R/W	
Customer Diagnostic Limits					
5541	5041 – 5042	F	DP URV, Upper Range Value (default set to URL)	R/W	√
5542	5043 – 5044	F	DP LRV, Operating Lower Range Value (default set to LRL)	R/W	√
5543	5045 – 5046	F	SP URV, Operating Upper Range Value (default set to URL)	R/W	√
5544	5047 – 5048	F	SP LRV, Operating Lower Range Value (default set to 0.0697 MPa ~1 atm @ 10000 ft ~10.1 psi )	R/W	√
5545	5049 – 5050	F	Transducer cell Temperature Operating Upper Range Value	R/W	√
5546	5051 – 5052	F	Transducer cell Temperature Operating Lower Range Value	R/W	√
5547	5053 – 5054	F	RTD Temperature Operating Upper Range Value	R/W	√
5548	5055 – 5056	F	RTD Temperature Operating Lower Range Value	R/W	√
Customer Max / Min Values					
5549	5057 – 5058	F	DP Maximum measured value Write always sets value to current measurement; the value from the write request is ignored.	R/W	√
5550	5059 – 5060	F	DP Minimum measured value Write always sets value to current measurement; the value from the write request is ignored.	R/W	√
5551	5061 – 5062	F	SP Maximum measured value Write always sets value to current measurement; the value from the write request is ignored.	R/W	√
5552	5063 – 5064	F	SP Minimum measured value Write always sets value to current measurement; the value from the write request is ignored.	R/W	√
5553	5065 – 5066	F	Transducer Temperature Maximum measured value Write always sets value to current measurement; the value from the write request is ignored.	R/W	√
5554	5067–5068	F	Transducer Temperature Minimum measured value Write always sets value to current measurement, the value from the write request is ignored.	R/W	√
5555	5069–5070	F	RTD Maximum measured value Write always sets value to current measurement; the value from the write request is ignored.	R/W	√
5556	5071–5072	F	RTD Minimum measured value Write always sets value to current measurement; the value from the write request is ignored.	R/W	√
Service Max value ever measured					
5557	5073–5074	F	DP Maximum ever measured value	RO	√
5558	5075–5076	F	DP Minimum ever measured value	RO	√
5559	5077–5078	F	SP Maximum ever measured value	RO	√
5560	5079–5080	F	SP Minimum ever measured value	RO	√

Register Address		Data Type	Object description	Read/Write	Added Ext.
32 bit	16 bit				
5561	5081–5082	F	Transducer Temperature Maximum ever measured value	RO	√
5562	5083–5084	F	Transducer Temperature Minimum ever measured value	RO	√
5563	5085–5086	F	RTD Maximum ever measured value	RO	√
5564	5087–5088	F	RTD Minimum ever measured value	RO	√
Customer Operating Range Alarm Levels					
5565	5089- 5090	F	DP Above URV Alarm Set at this level (in DP units) referenced to register 5541 = $s URV + ((URV-LRV) * DPHysteresis * 0.01)$	RO	√
5566	5091- 5092	F	DP Below LRV Alarm Set at this level (in DP units) referenced to register 5542 = $s LRV - ((URV-LRV) * DPHysteresis * 0.01)$	RO	√
5567	5093-5094	F	DP Below URV Alarm Clears at this level (in DP units) referenced to register 5541 = $s URV - ((URV-LRV) * DPHysteresis * 0.01 / 2)$	RO	√
5568	5095-5096	F	DP Above LRV Alarm Clears at this level (in DP Units) referenced to register 5542 = $s LRV + ((URV-LRV) * DPHysteresis * 0.01 / 2)$	RO	√
5569	5097-5098	F	DP Alarm Hysteresis Percent of User Range Span referenced to register 5541 & 5542 (default 2%) (DPHysteresis)	RO	√
5570	5099-5100	F	SP Alarm Hysteresis Percent of User Range Span referenced to register 5543 & 5544 (default 2%) (SPHysteresis)	RO	√
5571	5101-5102	F	SP Above URV Alarm Set at this level (in SP units) referenced to register 5543 = $s URV + ((URV-LRV) * SPHysteresis * 0.01)$	RO	√
5572	5103-5104	F	SP Below LRV Alarm Set at this level (in SP units) referenced to register 5544 = $s URV - ((URV-LRV) * SPHysteresis * 0.01)$	RO	√
5573	5105-5106	F	SP Below URV Alarm Clears at this level (in SP units) referenced to register 5543 = $s LRV - ((URV-LRV) * SPHysteresis * 0.01 / 2)$	RO	√
5574	5107-5108	F	SP Above LRV Alarm Clears at this level (in Sp Units) referenced to register 5544 = $s LRV + ((URV-LRV) * SPHysteresis * 0.01 / 2)$	RO	√
Measurements Bias Parameters					
5575	5109-5110	F	DP bias value is being added to the DP measurement producing an overall offset adjustment.	RO	√
5576	5111 – 5112	F	SP bias, see preceding register for discussion.	RO	√
5577	5113 – 5114	F	Set DP to a value, units are same as the DP measurement. DP bias = value – current measurement. This results in the reported value in register 401-402 to be the value.	R/W	√
5578	5115 – 5116	F	Set SP to value, see preceding register for discussion.	R/W	√
5579	5117	x	Reset DP Bias, sets the bias value to zero, effectively removing any effects of bias on DP measurement. This is an action register and the data value has no meaning.	WO	√
5580	5118	x	Reset SP Bias, sets the bias value to zero, see preceding register.	WO	√
Informative / Maintenance (Available in all Modbus mapping modes)					
64001	64001	U8	Modbus mapping selection: 0 = ABB map 1 = Rosemont map 2 = Invensys map	RO	√
64002	64002-64003	U32	Date and time the CB firmware was built. Julian date number of seconds since Jan 01, 1970 00:00:00	RO	√



## C.2 Rosemount 3095FB emulation register map

Table 21: Rosemont MODBUS® register map

Register Address		Type	*Constant / Default	Object description
32 bit	16 bit			
7001	1	U8	*0	Manufacturer's Code Rosemount
7002	2	U8	*31	Transmitter Type Code Multivariable Transmitter with Modbus
7003	3	U8+U8	*0x6803	Output Board Software Rev Level (rev 104.3)
7004	4	U8	*4	Sensor Module Software Rev Level
7005-7006	5 & 6	U24		Device serial Number made from the 32 byte transducer number. The number is made from the last 6 decimal digits in the string. See (ABB map register 0001-0008) Ex. "T123456789001" Reg 5&6 read as 32bit integer is 789001 Reg 5 read as 16bit integer is 0x000C Reg 6 read as 16bit integer is 0x0A09
7007-7008	7 & 8	U24		Same information as 7005-7006.
7009	09	U8	*0	Hardware Rev Level
7010	10	U8	*16	Modbus Specific Rev Level
7011	11	U8	*23	Sensor Type absolute SP
7012	12	U8	*1	reserved
7013	13	U8	*0	Reserved
7014	14	U8	*0	Reserved
7015	15	U8	8	Baud rate selector 1 = 1200, 2 = 2400, 3 = 4800, 4 = 9600, 5 = 1200, 6 = 2400, 7 = 4800, 8 = 9600, 9 = 19200
7016	16	U8	247	Modbus Transmitter address
7017	17	U8	*252	DP Sensor Range Code (unknown code)
7018	18	U8	*252	SP Sensor Range Code
7019	19	U8	*252	PT Sensor Range Code
7020	20	U8	*252	Module Isolator Code
7021	21	U8	*252	Module Fill Fluid Code
7022	22	U8	*252	flange material code
7023	26	U8	*252	flange type code
7024	24	U8	*252	drain/vent code
7025	25	U8	*252	O-ring gasket material
7026	26	U8	*252	remote seal type
7027	27	U8	*252	remote seal fill fluid
7028	28	U8	*252	remote seal isolator material
7029	29	U8	*252	number of remote seals
7030 – 7031	30 – 31	U32	*0	N/A
7032 – 7041	32 – 41	U8 string	Read/Write	user-entered tag, user-entered descriptor, 20 char
7042 – 7056	42 – 56	U8 string	Read	Nonvolatile memory page 30 bytes
7057	57	U8	*0	N/A
7058	58	U8	*0	N/A
7059	59	U8	*0	N/A

Register Address		Type	*Constant / Default	Object description
32 bit	16 bit			
* Means these are ROM constant defaults and a read will always return these values.				
7060	60	U8	†	Differential Pressure units select code 1 inch of water at 60 °F (ROM default) 2 Pascal 3 Kilopascals 6 inches of water at 68 °F
7061	61	U8	†	Static Pressure units select code 3 Kilopascal 4 Megapascal 5 PSIA (ROM default)
7062	62	U8	†	Temperature units select code 20 Degree Celsius 21 Degree Fahrenheit (ROM default)
7131	131	U8		Modbus turn-around response delay (ms per count)
† Value selected using HMI must equal one of these specific measurement units, or a NAK will be returned.				
7401	401 – 402	F		Differential Pressure (Damping, Calibration and Units applied) floating point, 401 is high word, 402 is low word.
7402	403 – 404	F		Static Pressure (Damping, Calibration and Units applied) floating point, 401 is high word, 402 is low word.
7403	405 – 406	F		Process Temperature (Damping, Calibration and Units applied) floating point, 401 is high word, 402 is low word. This may be external RTD or sensor value depending on configuration.
7404	407 – 408	U32		Diagnostics Status Word 1 and 2
7405	409 – 410	U32		Diagnostics Status Word 3 and 4
7406	411 – 412	U32		Diagnostics Status Word 5 and 6
7407	413 – 414	F		DP URL, Upper Range Limit (Set by Measurement Sensor)
7408	415 – 416	F		DP LRL, Lower Range Limit (Set by Measurement Sensor)
7409	417 – 418	F		DP URV, Operating Upper Range Value (default URL)
7410	419 – 420	F		DP LRV, Operating Lower Range Value (default LRL)
7411	421 – 422	F		SP URL, Upper Range Limit (Set by Measurement Sensor)
7412	423 – 424	F		SP LRL, Lower Range Limit (Set by Measurement Sensor)
7413	425 – 426	F		SP URV, Operating Upper Limit (default SP URL)
7414	427 – 428	F		SP LRV, Operating Lower Limit (default SP LRL)
7415	429 – 430	F		T URL, Upper Range Limit (default 850°C)
7416	431 – 432	F		T LRL, Lower Range Limit (default -200°C)
7417	433 – 434	F		T URV, Operating Upper Range Value (default URL)
7418	435 – 436	F		T LRV, Operating Lower Range Value (default LRL)
7419	437 – 438	F		DP offset calibration value (default 0.0)
7420	439 – 440	F		DP span calibration value ( default URL)
7421	441 – 442	F		DP damping (default 0.0)
7422	443 – 444	F		SP offset calibration value (default 0.0)
7423	445 – 446	F		SP span calibration value ( default URL)
7424	447 – 448	F		SP damping (default 0.0)
7425	449 – 450	F		T offset calibration value (default 0.0)
7426	451 – 452	F		T span calibration value (default URL)
7427	453 – 454	F		T dampening (default 0.0)

### C.3 Invensys IMV25 emulation register map

Invensys Model IMV25 MODBUS® compatibility register map will use the Rosemount map after subtracting 40000 from the requested register address. The fixed register range 40000 – 40500 is used for this emulation mode.

For example, an Invensys register of 40401 will be a Rosemount register of 401.

## Appendix D Additional mounting examples

Process piping configuration depends on the specific measurement application. The following are some examples of the various applications available.

### D.1 Steam or clean liquids flow measurement

The installation guidelines for steam (condensable vapor) or clean liquids flow measurement are:

1. Place taps to the side of the line.
2. Mount the transmitter beside or below the taps.
3. Mount the drain or vent valve upward.
4. Fill the vertical section of the connecting lines with a compatible fluid through the filling tees.
5. Commission the transmitter.
  - a. Open the equalizing valve (C) (Figure 55).
  - b. Close the low pressure (B) and high pressure (A) valves.
  - c. Open the gate valves (items HG and LG)
  - d. Slowly open the high pressure (A) valve to admit process fluid to both sides of the primary.
  - e. Vent or drain the primary unit and then close the gate valves (items HG and LG).
  - f. Open the low pressure valve (B) and close the equalizing valve (C).

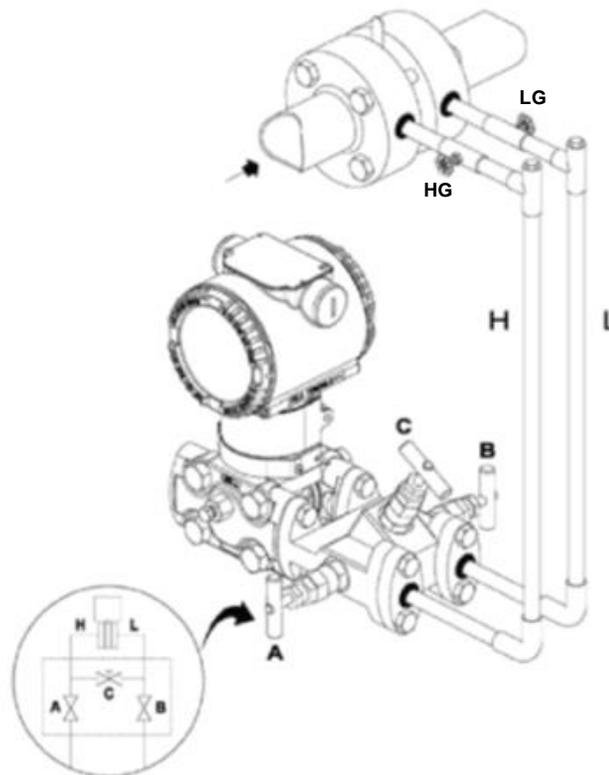


Figure legend:

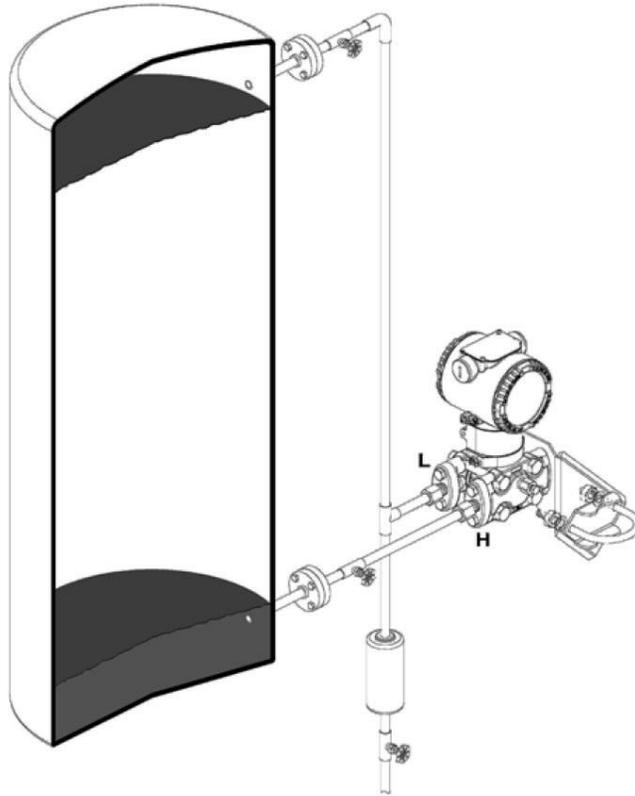
- A = High pressure valve (H = high pressure line)
- B = Low pressure valve (L = low pressure line)
- C = Equalizing valve
- HG = High pressure gate valve
- LG = Low pressure gate valve

Figure 55: Steam or clean liquid flow measurement (transmitter and manifold)

## D.2 Liquid level in a closed tank (dry leg)

The installation guidelines for liquid level measurement in a closed tank with non-condensable fluids (dry leg) are:

1. Mount the transmitter at the same height or below the lowest level to be measured (Figure 56).
2. Connect the + (H) side of the transmitter to the bottom of the tank.
3. Connect the - (L) side of the transmitter to the upper part of the tank, above the maximum fill level of the tank.



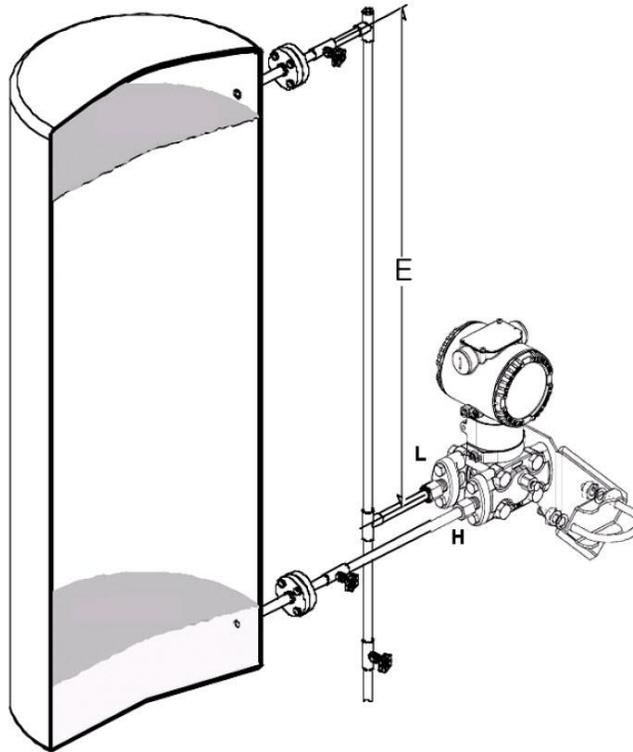
Where:  
H = High pressure flange  
L = Low pressure flange

Figure 56: Level measurement on a closed tank with dry leg

### D.3 Liquid level in a closed tank (wet leg)

The installation guidelines for liquid level measurement in a closed tank with condensable fluids (wet leg) are:

1. Mount the transmitter at the same height or below the lowest level to be measured (Figure 57).
2. Connect the + (H) side of the transmitter to the bottom of the tank.
3. Connect the - (L) side of the transmitter to the upper part of the tank.
4. Fill the vertical section (E) of the connecting line to the upper part of the tank with a compatible liquid through the dedicated filling tee.



Where:

E = Vertical connecting line

H = High pressure flange

L = Low pressure flange

Figure 57: Level measurement on a closed tank with wet leg

## Appendix E Hazardous area ratings and considerations

### E.1 Ex Explosion protection aspects (Europe and International)

According to ATEX Directive (European Directive 94/9/EC of March 23, 1994) and applicable European standards which assure compliance with Essential Safety Requirements, the following ratings apply to the transmitters with or without integrated digital display.

- EN 60079-0: “Explosive atmospheres - Part 0: Equipment - General requirements”
- EN 60079-1: “Explosive atmospheres - Part 1: Equipment protection by flame-proof enclosures “d””
- EN 60079-15: “Explosive atmospheres - Part 15: Equipment protection by type of protection “n””
- EN 60079-26: “Explosive atmospheres - Part 26: Equipment with Equipment Protection Level (EPL) Ga”
- EN 61241-0: “Electrical apparatus for use in the presence of combustible dust - Part 0: General requirements”
- EN 61241-1: “Electrical apparatus for use in the presence of combustible dust - Part 1: Protection by enclosures “tD””
- EN 60529: “Degrees of protection provided by enclosures (IP Code)”

The transmitters are certified for the following gas groups, categories, and media in dangerous atmosphere, temperature classes, and types of protection. The sketches located below are examples of applications.

#### E.1.1 Type of protection: “Ex d” Certifications ATEX (Code E2) and IECEx (Code E9)

**Code E2 Rating: ATEX II 1/2 G Ex d IIC T6 and ATEX II 1/2 D Ex tD A21 IP67 T85 °C Ta = -50 °C to +75 °C**

FM Approvals Certificate: FM09ATEX0023X, The meaning of the ATEX code is as follows:

- II: Equipment Group for hazardous surface areas (not mines)
- 1/2: Category - This means the transmitter is suitable for use in the partition to category 1 (e.g., sensor category 1 / transmitter category 2) (see application sketch).
- G: Gas (dangerous media)
- D: Dust (dangerous media)
- Ex d: Flame-proof enclosure
- IIC: Explosion group gases
- T6: Temperature class of the transmitter (corresponds to 85 °C maximum) with an ambient temperature from -50 °C to 75 °C.
- Ex tD: Dust protected Flame-proof enclosure
- A21: Dust Intended Zone of Installation
- T85 °C: Maximum surface temperature of the transmitter housing at an ambient temperature Ta from -50 °C to +75 °C for dust (not for gas) with a dust layer up to 50 mm thick
- IP67: For protection type, the first characteristic numeral indicates the protection of the integrated electronics against ingress of solid foreign objects including dusts. The assigned “6” means a dust-tight enclosure (no ingress of dust). The second characteristic numeral indicates the protection of the integrated electronics against ingress of water. The assigned “7” means a water-protected enclosure against a temporary immersion in water under standardized conditions of pressure and time.



**IMPORTANT NOTES:** The number printed by the CE mark on the safety label identifies the Notified Body which has responsibility for the surveillance of the production.

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**Code E9 Rating: IECEx Ex d IIC T6 and IECEx Ex tD A21 IP67 T85 °C, Ta = -50 °C to +75 °C**

FM Approvals Certificate: IECEx FME 09.0002X, The meaning of the IECEx rating code is as follows:

- Ex d: Flame-proof enclosure
- IIC: Explosion group gases
- T6: Temperature class of the transmitter (corresponds to 85 °C maximum) with an ambient temperature from -50 °C to 75 °C.
- Ex tD: Dust protected Flame-proof enclosure
- A21: Dust Intended Zone of Installation
- T85 °C: Maximum surface temperature of the transmitter housing at an ambient temperature Ta from -50 °C to +75 °C for dust (not for gas) with a dust layer up to 50 mm thick
- IP67: For protection type, the first characteristic numeral indicates the protection of the integrated electronics against ingress of solid foreign objects including dusts. The assigned “6” means a dust-tight enclosure (no ingress of dust). The second characteristic numeral indicates the protection of the integrated electronics against ingress of water. The assigned “7” means a water-protected enclosure against a temporary immersion in water under standardized conditions of pressure and time.

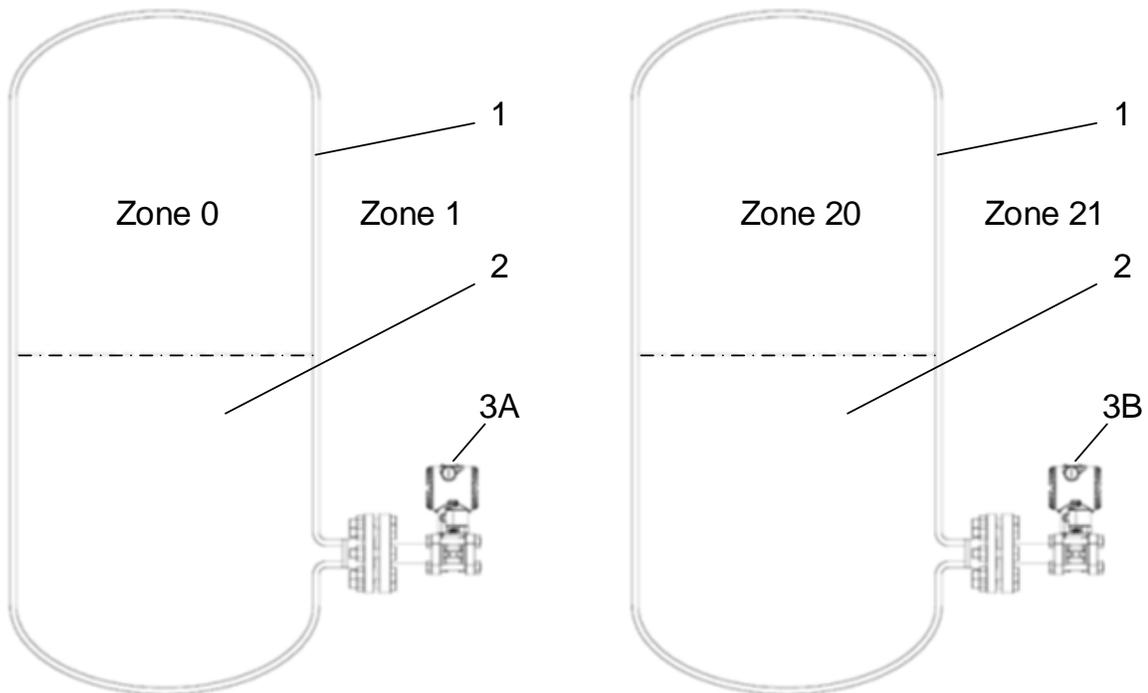


Figure legend:

- 1) Container
- 2) Dangerous medium (process)
- 3A) 266 transmitter, category 1/2 G, Ex d
- 3B) 266 transmitter, category 1/2 D, Ex tD

Figure note: Only the "process measuring part" of this transmitter can be connected to Zone 0 (gas)-zone 20 (dust); the remaining parts of the transmitter, for example, its housing, can only be used on Zone 1 (gas)-zone 21 (dust).

Figure 58: Examples of gas and dust application zone separations

E.1.2 Type of Protection: "Ex n" Certifications ATEX (Code E3) and IECEx (Code ER)

**Code E3 Rating: ATEX II 3 G Ex nA IIC T4/T5/T6 (T4 for Ta= -50 °C to +85 °C), (T5 and T6 for Ta = -50 °C to +40 °C) IP67 and ATEX II 3 D Ex tD A22 IP67 T85 °C Ta = -50 °C to +75 °C**

Electrical Data: U = 30 Vdc, I = 25mA, C = 17nF, L = 0.22mH

FM Approvals Certificate: FM09ATEX0025X, The meaning of the ATEX code is as follows:

- II: Equipment Group for hazardous surface areas (not mines)
- 3: Category of equipment protection.
- G: Gas (dangerous media)
- D: Dust (dangerous media)
- Ex nA: Non Sparking
- IIC: Explosion group gases
- T4: Temperature class of the transmitter (which corresponds to 135 °C Max) with Ta= -50 °C to +85 °C
- T5: Temperature class of the transmitter (which corresponds to 100 °C Max) with Ta= -50 °C to +40 °C
- T6: Temperature class of the transmitter (which corresponds to 85 °C Max) with Ta= -50 °C to +40 °C
- Ex tD: Dust protected Flame-proof enclosure
- A22: Dust Intended Zone of Installation
- T85 °C: Maximum surface temperature of the transmitter housing at an ambient temperature Ta from -50°C to +75 °C for dust (not for gas) with a dust layer up to 50 mm thick
- IP67: For protection type, the first characteristic numeral indicates the protection of the integrated electronics against ingress of solid foreign objects including dusts. The assigned "6" means a dust-tight enclosure (no ingress of dust). The second characteristic numeral indicates the protection of the integrated electronics against ingress of water. The assigned "7" means a water-protected enclosure against a temporary immersion in water under standardized conditions of pressure and time.



**IMPORTANT NOTES:** The number printed by the CE mark on the safety label identifies the Notified Body which has responsibility for the surveillance of the production.

**Code ER Rating: IECEx Ex nA IIC T6, Ta = -50 °C to +85 °C and IECEx Ex tD A22 IP67 T85 °C, Ta = -50 °C to +75 °C**

FM Approvals Certificate: IECEx FME09.0004X, The meaning of the IECEx rating code is as follows:

- Ex nA: Non Sparking
- IIC: Explosion group gases
- T6: Temperature class of the transmitter (corresponds to 85 °C maximum) with an ambient temperature from -50 to 85 °C.
- Ex tD: Dust protected Flame-proof enclosure
- A22: Dust Intended Zone of Installation
- T85 °C: Maximum surface temperature of the transmitter housing at an ambient temperature Ta from -50 °C to +75 °C for dust (not for gas) with a dust layer up to 50 mm thick
- IP67: For protection type, the first characteristic numeral indicates the protection of the integrated electronics against ingress of solid foreign objects including dusts. The assigned "6" means a dust-tight enclosure (no ingress of dust). The second characteristic numeral indicates the protection of the integrated electronics against ingress of water. The assigned "7" means a water-protected enclosure against a temporary immersion in water under standardized conditions of pressure and time.



**WARNING –** When installed, power must be supplied to the transmitter by a voltage limiting device which will prevent the rated voltage of 30 Vdc being exceeded.

The temperature sensor circuit (Pt100) must be connected in accordance with the requirements of the FM certificate.

For correct installation in field of 266 pressure transmitters please see the related control drawing.

## E.2 Ex Explosion protection aspects (United States and Canada)

According to Factory Mutual standards for the assurance of fundamental safety requirements in the United States of America. Ratings are with or without integrated digital display.

- FM 3600: "Approval Standard for Electrical Equipment for use in Hazardous (Classified) Locations, General Requirements".
- FM 3611: "Approval Standard for Non-Incendive Electrical Equipment for Use in Class I and II, Division 2 and Class III Division 1 and 2 Hazardous (Classified) Locations".
- FM 3615: "Approval Standard for Explosion-proof Electrical Equipment General Requirements".
- FM 3810: "Approval Standard for Electrical Equipment for Measurement, Control and Laboratory Use".
- NEMA 250: "Enclosures for Electrical Equipment (1000 Volts Maximum)".

According to CSA standards for the assurance of fundamental safety requirements in Canada. Ratings are with or without integrated digital display.

- C22.2 No 142-M1987: "Process Control Equipment Industrial Products".
- C22.2 No 213-M1987: "Non-incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations Industrial Products".
- C22.2 No 30: "Explosion-Proof Enclosures for Use in Class I Hazardous Locations Industrial Products".
- C22.2 No 25: "Enclosures for Use in Class II Groups E, F and G Hazardous Locations".
- CSA-C22.2 No 94-M91: Special Purpose Enclosures Industrial Products".
- ANSI/ISA 12.27.01: Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids".

### E.2.1 Type of protection: "Explosion-proof" Certification (Code EB)

**Code EB ratings:** The 266 transmitters have FM certification for the following hazardous location protections:

- Explosion-proof (US): Class I, Division 1, Groups ABCD, T5 for Ta = -50 °C to +85 °C
- Flame-proof (US): Class I, Zone 1, AEx d, IIC, T4 for Ta = -50 °C to +85 °C
- Explosion-proof (Canada): Class I, Division 1, Groups BCD, T5 for Ta = -50 °C to +85 °C
- Flame-proof (Canada): Class I, Zone 1, Ex d, IIC, T4 for Ta = -50 °C to +85 °C
- Dust Ignition Proof (US and Canada): Class II, III Division 1, Groups EFG, T5 for Ta = -50 °C to +85 °C
- Environmental enclosure rating: Type 4X

**E.2.2 Type of protection: "Non-Incendive" Certification (Code EC)**

**Code EC ratings:** The 266 transmitters have FM certification for the following hazardous location protections:

- Non-Incendive (US and Canada): Class I, Division 2, Groups ABCD, T\* in accordance with Non-Incendive field wiring requirements for hazardous (classified) locations per Control Drawing DH3173
- Non Sparking (US and Canada): Class I, Zone 2, (A)Ex nA IIC T\* in accordance with Non-Incendive field wiring requirements for hazardous (classified) locations per Control Drawing DH3173
- T\*: Temperature class is dependent on the maximum input current and the maximum ambient temperature per Table 22

Table 22: Temperature class definitions

T Class	Minimum ambient °C	Maximum ambient °C	I <sub>max</sub> mA	Power W
T4	-50 °C	+85 °C	100	0.75
T4	-50 °C	+70 °C	160	1
T5	-50 °C	+40 °C	100	1.75
T6	-50 °C	+40 °C	50	0.4

- Type 4X applications Indoors/Outdoors
- "Dual Seal" per ANSI/ISA 12.27.01 as indicated



**WARNING** – When installed, power must be supplied to this transmitter by a voltage limiting device which will prevent the rated voltage of 30 Vdc being exceeded.

The temperature sensor circuit (Pt100) must be connected in accordance with the requirements of the FM certificate.

For correct field installation of the 266 pressure transmitters, please see the related control drawing.

**E.2.3 Type of protection: "Explosion-proof" combined with "Non-Incendive" Certification (Code ET )))**

**Code ET ratings:** This code provides a nameplate that has all the ratings of the Explosion-proof (Code EB) described in section E.2.1 and all the ratings of the Non-Incendive (Code EC) described in section E.2.2. The ratings are listed on the nameplate with one mark showing the instrument can be installed as either Explosion-proof or as Non-Incendive.

## Appendix F Approvals and certifications

### F.1 USA, Explosion-Proof



FM Approvals  
1151 Boston Providence Turnpike  
P.O. Box 9102 Norwood, MA 02062 USA  
T: 781 762 4300 F: 781-762-9375 www.fmapprovals.com

# CERTIFICATE OF COMPLIANCE

## HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

**266bcdefg1g2h1h2imnoqrstu 2600T Pressure Transmitter, Model 266 – Dual Seal.**

XP/II/1/ABCD/T5 Ta = -50°C to +85°C; I/1/AEx d IIC/T4 Ta = -50°C to +85°C;

DIP/II, III/1/EFG/T5 Ta = -50°C to +85°C ; Type 4X

b = measure type and construction: A, C, D, G, H, J, M, N, P, or R, V

c = application: D\*\*, H, L, R\*\*, or S

d = performance\*\*\*: Single digit not relevant to safety.

e = upper range limits: A, B, E, F, G, H, M, P, Q, or S

f = static pressure range: H, or S

g = transducer diaphragm material and fill fluid; 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, I, J, K, L,

M, N, P, Q, R, S, T, V, W, Y, or Z

h = process flanges material & connection: 1, 2, 3, 4, 5, 6, 7, A, B, C, D, E, F, G, H, K, L, M, N, P, Q, R, S, T, U, V, Y, or Z

i = gasket: 5, 6, 8 or N

m (only for 266 DLH and 266 DHH) = high pressure side process flange standard rating – size : A, B, D, E, M, N, or L

n (only for 266 DLH and 266 DHH) = high pressure side process flange material-form-finish : A, D, G, or L.

o (only for 266 DLH and 266 DHH) = low pressure side diaphragm material and fill fluid : 4, 5, A, B, C, D, F, H, K, L, M, P, Q, S, or T

q (only for 266 DLH) = low pressure side seal type and capillary length : 1, 2, 3, 4, 5, 6, 7, 8, M, N, Q, S, T, U, V, or Z

r = bolts and gasket: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, C, N, R, S or T

s = electronic housing: A, B, T, or S

t = communication: 1, 2, 3, 7, 8, F, H, L, P, or T. (If t = F, P, H, L, or T then u = blank)

u = Options: Blank, or A1, A2, A3, AA, AB, B<sup>†</sup>, C<sup>†</sup>, D<sup>†</sup>, E6, EB, EN, H<sup>†</sup>, I<sup>†</sup>, L1, L3, L5, L7, L9, M<sup>†</sup>, N<sup>†</sup>, P<sup>†</sup>, R1, S2, T<sup>†</sup>, V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, Y<sup>†</sup> or Z1

\*\* Note 1: If option "c" is D or R this denotes remote seal elements.

\*\*\* Note 2: For Inductive Sensors only

<sup>†</sup> Note 2: Any single letter or number.

Code of remote seal:

S6 for 600TEN series

S26 for 2600T series

To verify the availability of the Approved product, please refer to [www.approvalguide.com](http://www.approvalguide.com)  
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**266bcdefg1g2h1h2imnoqrstu 2600T Pressure Transmitter, Model 266**

XP/1/1/ABCD/T5 Ta = -50°C to +85°C; V1/AEx d IIC/T4 Ta = -50°C to +85°C ;

DIP/II,III/1/EFG/T5 Ta = -50°C to +85°C ; Type 4X

b = measure type and construction: A, C, D, G, H, J, M, N, P, R, or V

c = application: D\*\*, H, L, R\*\*, or S.

d = performance: Single digit not relevant to safety.

e = upper range limits: A, B, C, D, E, F, G, H, L, M, N, P, Q, R, U, Y, V, Z, or S

f = static pressure range: 1, 2, 3, 4, C, H, M, S, W, Y, or Z. A, T

g = transducer diaphragm material and fill fluid; 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, I, J, K, L, M, N, P, Q, R, S, T, V, W, Y, or Z

h = process flanges material & connection: 1, 2, 3, 4, 5, 6, 7, A, B, C, D, E, F, G, H, K, L, M, N, P, Q, R, S, T, U, V, Y, or Z

i = gasket: 5, 6, 8 or N.

m (only for 266 DLH and 266 DHH) = high pressure side process flange standard rating – size : A, B, D, E, M, N, or L

n (only for 266 DLH and 266 DHH) = high pressure side process flange material-form-finish : A, D, G, or L.

o (only for 266 DLH and 266 DHH) = low pressure side diaphragm material and fill fluid : 4, 5, A, B, C, D, F, H, K, L, M, P, Q, S, or T

q (only for 266 DLH) = low pressure side seal type and capillary length : 1, 2, 3, 4, 5, 6, 7, 8, M, N, Q, S, T, U, V, or Z

r = bolts and gasket: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, C, N, R, S or T.

s = electronic housing: A, B, T, or S

t = communication: 1, 2, 3, 7, 8, F, H, L, P, or T. (If t = F, P, H, L, or T then u = blank)

u = Options: Blank, or A1, A2, A3, AA, AB, B<sup>†</sup>, C<sup>†</sup>, D<sup>†</sup>, E6, EB, EN, H<sup>†</sup>, I<sup>†</sup>, L1, L3, L5, L7, L9, M<sup>†</sup>, N<sup>†</sup>, P<sup>†</sup>, R1, S2, T<sup>†</sup>, V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, Y<sup>†</sup>, or Z1

\*\* Note 1: If option "c" is D or R this denotes remote seal elements.

† Note 2: Any single letter or number.

Code of remote seal:

S6 for 600TEN series

S26 for 2600T series

**266bcdefghrs5u 2600T Pressure Transmitter, Model 266 Modbus version – Single Seal.**

XP/1/1/ABCD/T5 Ta = -50°C to +85°C;

V1/AEx d IIC/T4 Ta = -50°C to +85°C;

DIP/II,III/1/EFG/T5 Ta = -50°C to +85°C ; Type 4X

b = measure type and construction: C or J

c = application: D\*\*, R\*\*, or S

d = performance: Single digit not relevant to safety

e = upper range limits: A, C, F, L, N, R 1 or 2

f = static pressure range: 1, 2, 3, 4, 5, 6, or 7

g = transducer diaphragm material and fill fluid: S, K, M, V, T, A, F, C, Y, D, R, or 2

h = process flanges material & connection: A, Q, B, C, D, E, G, H, P, or R.

r = bolts and gasket: 3, 4, 5, 6, 7, T or R

s = electronic housing: A, S, B, or T

u = EN or ET and A1, A8, A9, B<sup>†</sup>, C<sup>†</sup>, D<sup>†</sup>, F<sup>†</sup>, H<sup>†</sup>, I<sup>†</sup>, L1, L5, L9, M<sup>†</sup>, N<sup>†</sup>, P<sup>†</sup>, T<sup>†</sup>, UA, UB, UC, V1, V2, V3, V4, V5, V6, V7, V8, V9, W<sup>†</sup>, Y<sup>†</sup> or Z1.

\*\* Note 1: if on option "c" is D or R denotes remote seal elements.

† Note 2: Any single letter or number.

Code of remote seal :

S6 for 600TEN series

S26 for 2600T series

To verify the availability of the Approved product, please refer to [www.approvalguide.com](http://www.approvalguide.com)

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**266bcdeghs4u 2600T Pressure Transmitter, Model 266 (1-5 Vdc) Dual Seal**

XP/II/1/ABCD/T5 Ta = -50°C to +85°C; V1/AEx d IIC/T4 Ta = -50°C to +85°C;

DIP/II,III/1/EFG/T5 Ta = -50°C to +85°C ; Type 4X

b = measure type and construction: H

c = application: D\*\*, R\*\*, or S

d = performance: Single digit not relevant to safety

e = upper range limits: P, Q, or S

g = transducer diaphragm material and fill fluid: S, or K,

h = process flanges material & connection: B, T, E, or K.

s = electronic housing: A, or S

u = options: A1, B†, C†, D†, EB, F†, H†, I†, LS, M†, N†, P†, T†, S2, R1, VA, or VB.

\*\* Note 1: if on option "c" is D or R denotes remote seal elements.

† Note 2: Any single letter or number.

Code of remote seal:

S26 for 2600T series

**Equipment Ratings:**

For use as Explosionproof for Class I, Division 1, Groups A, B, C and D, T5 Ta = -50°C to +85°C;

Flameproof for Class I, Zone 1, AEx d IIC T4 Ta = -50°C to +85°C; and Dust-ignitionproof for Class II &

III, Division 1, Groups E, F and G T5 Ta = -50°C to +85°C; hazardous (Classified) locations; indoor and

outdoor (Type 4X). "Dual Seal" or "Single Seal" per ANSI/ISA 12.27.01 as indicated.

**FM Approved for:**

ABB SpA

Via Statale 113 Lenno (Como) Italy

To verify the availability of the Approved product, please refer to [www.approvalguide.com](http://www.approvalguide.com)

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This certifies that the equipment described has been found to comply with the following Approval Standards and other documents:

Class 3600	2011
Class 3615	2006
Class 3810	2005
ANSI/ISA-60079-0	2005
ANSI/ISA-60079-1	2005
ANSI/NEMA 250	2003
ANSI/ISA 12.27.01	2003

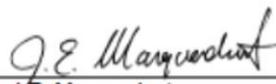
Original Project ID: 3030274

Approval Granted: July 21, 2009

Subsequent Revision Reports / Date Approval Amended

Report Number	Date	Report Number	Date
3038181	June 24, 2010		
3040202	August 1, 2012		
130404	July 17, 2013		
3051310	October 24, 2014		
RR200058	June 19, 2015		
RR200862	November 4, 2015		

FM Approvals LLC

  
 \_\_\_\_\_  
 J.E. Marquedant  
 Manager, Electrical Systems

4 November 2015  
 \_\_\_\_\_  
 Date

## F.2 USA, Non-Incendive



Member of the FM Global Group

FM Approvals  
 1151 Boston Providence Turnpike  
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# CERTIFICATE OF COMPLIANCE

## HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

**266bcdefghlmnoqrstu 2600T Series Pressure Transmitter model 266 – Dual Seal.**

IS / I, II, III / 1 / ABCDEFG / T\* - DH3173; Entity (For communication option 1, 7, 8, H, L, T); Type 4X; IP67

IS / I, II, III / 1 / ABCDEFG / T\* - DH3173; FISCO (For communication option 2, 3, F, P); Type 4X; IP67

I / 0 / AEx ia IIC / T\* - DH3173; Entity (For communication option 1, 7, 8, H, L, T); Type 4X

I / 0 / AEx ia IIC / T\* - DH3173; FISCO (For communication option 2, 3, F, P); Type 4X

NI / 1 / 2 / ABCD / T\* DH3173; NIFW (For communication option 1, 7, 8, H, L, T); Type 4X

I / 2 / AEx nC IIC / T\* DH3173; FNICO (For communication option 2, 3, F, P); Type 4X

**\*HART/Entity**

T Class	minimum ambient °C	maximum ambient °C	I <sub>max</sub> mA	Power W
T4	-50°C	+85°C	100	0.75
T4	-50°C	+70°C	160	1
T5	-50°C	+40°C	100	1.75
T6	-50°C	+40°C	50	0.4

**\*Profibus/Fieldbus**

Temperature Class	Minimum Ambient Temperature	Maximum Ambient Temperature
T4	-50°C	+85°C
T5	-50°C	+40°C
T6	-50°C	+40°C

b = measure type and construction: D, H, N, P, A, G, or V

c = application: D\*\*, H, L, R\*\*, or S.

d = performance: \*\*\*: Single digit not relevant to safety.

e = upper range limits: A, B, E, F, G, H, M, P, Q, or S.

f = static pressure range: H, or S,

g = transducer diaphragm material and fill fluid; 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, I, J, K, L,

To verify the availability of the Approved product, please refer to [www.approvalguide.com](http://www.approvalguide.com)

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M, N, P, Q, R, S, T, V, W, Y, or Z  
 h = process flanges material & connection: 1, 2, 3, 4, 5, 6, 7, A, B, C, D, E, F, G, H, K, L, M, N, P, Q, R, S, T, U, V, Y, or Z  
 i = gasket: 5, 6, 8 or N.  
 m (only for 266 DLH and 266 DHH) = high pressure side process flange standard rating – size : A, B, D, E, M, N, or L.  
 n (only for 266 DLH and 266 DHH) = high pressure side process flange material-form-finish : A, D, G, or L.  
 o (only for 266 DLH and 266 DHH) = low pressure side diaphragm material and fill fluid : 4, 5, A, B, C, D, F, H, K, L, M, P, Q, S, or T.  
 q (only for 266 DLH) = low pressure side seal type and capillary length : 1, 2, 3, 4, 5, 6, 7, 8, M, N, Q, S, T, U, V, or Z.  
 r = bolts and gasket: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, C, N, R, T or S.  
 s = electronic housing: A, B, E, G, J, K, S, T, W or Z.  
 t = communication: 1, 2, 3, 7, 8, F, H, L, P, or T. (If t = F, P, H, L, or T then u = blank)  
 u = Options: Blank, or A1, A2, A3, A8, A9, AA, AB, B<sup>†</sup>, C<sup>†</sup>, D<sup>†</sup>, E6, EA, EC, EN, H<sup>†</sup>, I<sup>†</sup>, L1, L3, L5, L7, L9, M<sup>†</sup>, N<sup>†</sup>, P<sup>†</sup>, R1, S2, T<sup>†</sup>, V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, Y<sup>†</sup>, or Z1

\*\* Note 1: If on option "c" is D or R denotes remote seal elements.  
 \*\*\* Note 2: For Inductive Sensors only  
 † Note 3: Any Single letter or Number

Code of remote seal  
 S6 for 600TEN series  
 S26 for 2600T series

**266bcdefghlmnoqrstu 2600T Series Pressure Transmitter model 266.**

IS / I, II, III / 1 / ABCDEFG / T\* - DH3173; Entity (For communication option 1, 7, 8, H, L, T); Type 4X; IP67  
 IS / I, II, III / 1 / ABCDEFG / T\* - DH3173; FISCO (For communication option 2, 3, F, P); Type 4X; IP67  
 I / 0 / AEx ia IIC / T\* - DH3173; Entity (For communication option 1, 7, 8, H, L, T); Type 4X  
 I / 0 / AEx ia IIC / T\* - DH3173; FISCO (For communication option 2, 3, F, P); Type 4X  
 NI / I / 2 / ABCD / T\* DH3173; NIFW (For communication option 1, 7, 8, H, L, T); Type 4X  
 I / 2 / AEx nC IIC / T\* DH3173; FNICO (For communication option 2, 3, F, P); Type 4X

**\*HART/Entity**

T Class	minimum ambient °C	maximum ambient °C	I <sub>max</sub> mA	Power W
T4	-50°C	+85°C	100	0.75
T4	-50°C	+70°C	160	1
T5	-50°C	+40°C	100	1.75
T6	-50°C	+40°C	50	0.4

**\*Profibus/Fieldbus**

Temperature Class	Minimum Ambient Temperature	Maximum Ambient Temperature
T4	-50°C	+85°C
T5	-50°C	+40°C
T6	-50°C	+40°C

b = measure type and construction: A, C, D, G, H, J, M, N, P, or V.  
 c = application: D\*\*, H, L, R\*\*, or S.  
 d = performance: Single digit not relevant to safety.  
 e = upper range limits: A, B, C, D, E, F, G, H, L, M, N, P, Q, R, S, U, Y, V, or Z

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f = static pressure range: 1, 2, 3, 4, C, H, M, S, W, Y, or Z., A or T  
 g = transducer diaphragm material and fill fluid; 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, I, J, K, L, M, N, P, Q, R, S, T, V, W, Y, or Z  
 h = process flanges material & connection: 1, 2, 3, 4, 5, 6, 7, A, B, C, D, E, F, G, H, K, L, M, N, P, Q, R, S, T, U, V, Y, or Z  
 i = gasket: 5, 6, 8 or N.  
 m (only for 266 DLH and 266 DHH) = high pressure side process flange standard rating – size : A, B, D, E, M, N, or L.  
 n (only for 266 DLH and 266 DHH) = high pressure side process flange material-form-finish : A, D, G, or L.  
 o (only for 266 DLH and 266 DHH) = low pressure side diaphragm material and fill fluid : 4, 5, A, B, C, D, F, H, K, L, M, P, Q, S, or T.  
 q (only for 266 DLH) = low pressure side seal type and capillary length : 1, 2, 3, 4, 5, 6, 7, 8, M, N, Q, S, T, U, V, or Z.  
 r = bolts and gasket: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, C, N, R, or S.  
 s = electronic housing: A, B, E, G, J, K, S, T, W, or Z  
 t = communication: 1, 2, 3, 7, 8, F, H, L, P, or T. (If t = F, P, H, or T then u = blank)  
 u = Options: Blank, or A1, A2, A3, A8, A9, AA, AB, Bt, Ct, Dt, E6, EA, EC, EN, Ht, It, L1, L3, L5, L7, L9, Mt, Nt, Pt, R1, S2, Tt, V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, Yt, or Z1

\*\* Note 1: If on option "c" is D or R denotes remote seal elements.  
 † Note 2: Any Single letter or Number

Code of remote seal  
 S6 for 600TEN series  
 S26 for 2600T series

**266bcdefghrstu 2600T Series Pressure Transmitter model 266 (multivariable).**

IS / I, II, III / 1 / ABCDEFG / T\* - DH3173; Entity (For communication option 1, 8, H, T); Type 4X; IP67  
 IS / I, II, III / 1 / ABCDEFG / T\* - DH3173; FISCO (For communication option 2, 3, F, P); Type 4X; IP67  
 I / 0 / AEx ia IIC / T\* - DH3173; Entity (For communication option 1, 8, H, T); Type 4X  
 I / 0 / AEx ia IIC / T\* - DH3173; FISCO (For communication option 2, 3, F, P); Type 4X  
 NI / I / 2 / ABCD / T\* DH3173; NIFW (For communication option 1, 8, H, T); Type 4X  
 I / 2 / AEx nC IIC / T\* DH3173; FNICO (For communication option 2, 3, F, P); Type 4X

T Class	minimum ambient °C	maximum ambient °C	I <sub>max</sub> mA	Power W
T4	-50°C	+85°C	100	0.75
T4	-50°C	+70°C	160	1
T5	-50°C	+40°C	100	1.75
T6	-50°C	+40°C	50	0.4

b = measure type and construction: C, , or J  
 c = application: R\*\*, or S  
 d = performance: Single digit not relevant to safety.  
 e = upper range limits: A, C, F, L, N, or R,  
 f = static pressure range: 1, 2, 3, 4,  
 g = transducer diaphragm material and fill fluid: 2, A, C, D, F, K, M, P, S, T, V, or Y  
 h = differential process flanges material & connection: 4, 5, 6, 7, A, B, C, D, E, G, H, P, Q, or R  
 r = bolts and gasket: 3, 4, 5, 6, 7, R, or T,  
 s = electronic housing: A, B, J, S, or T  
 t = communication: 1, 8, H, T, P, 2, 3, or F (If t = H, or T then u = blank)  
 u = Options: Blank, or A1, Bt, Ct, Dt, E6, EA, EC, EN, Ht, It, L1, L3, L5, L7, L9, Mt, Nt, Pt, R1, S2, Tt, Ut,

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V1, V2, V3, V4, V5, V6, V7, V8, V9, Y1, or Z1

\*\* Note 1: If on option "c" is D or R denotes remote seal elements.

† Note 2: Any Single letter or Number

Code of remote seal  
S6 for 600TEN series  
S26 for 2600T series

**266bcdefghrs5u 2600T Pressure Transmitter, Model 266 Modbus version – Single Seal.**

NI / I / 2 / ABCD / T\* DH3173; Type 4X

I / 2 / AEx nC IIC / T\* DH3173; Type 4X

T Class	minimum ambient °C	maximum ambient °C	I <sub>max</sub> mA	Power W
T4	-50°C	+85°C	100	0.75
T4	-50°C	+70°C	160	1
T5	-50°C	+40°C	100	1.75
T6	-50°C	+40°C	50	0.4

b = measure type and construction: C or J

c = application: D\*\*, R\*\*, or S

d = performance: Single digit not relevant to safety

e = upper range limits: A, C, F, L, N, R 1 or 2

f = static pressure range: 1, 2, 3, 4, 5, 6, or 7

g = transducer diaphragm material and fill fluid: S, K, M, V, T, A, F, C, Y, D, R, or 2

h = process flanges material & connection: A, Q, B, C, D, E, G, H, P, or R

r = bolts and gasket: 3, 4, 5, 6, 7, T or R

s = electronic housing: A, S, B, or T

u = EN or ET and A1, A8, A9, B1, C1, D1, F1, H1, I1, L1, L5, L9, M1, N1, P1, T1, UA, UB, UC, V1, V2, V3, V4, V5, V6, V7, V8, V9, W1, Y1 or Z1.

\*\* Note 1: if on option "c" is D or R denotes remote seal elements.

† Note 2: Any single letter or number.

Code of remote seal:  
S6 for 600TEN series  
S26 for 2600T series

### Equipment Ratings:

Intrinsically safe for Class I, II, and III, Division 1, Groups A, B, C, D, E, F and G and Class I, Zone 0 Group IIC; indoor and outdoor Hazardous Locations for Entity and FISCO when installed in accordance with Control Drawing DH3173.

Nonincendive for Class I, Division 2, Groups A, B, C and D and Energy limited for Class I Zone 2 Group IIC Hazardous Locations for Nonincendive Field Wiring and FNICO when installed in accordance with

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Control Drawing DH3173.

"Dual Seal" or "Single Seal" per ANSI/ISA 12.27.01 as indicated

FM Approved for:

ABB SpA  
Lenno (Como) Italy

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This certifies that the equipment described has been found to comply with the following Approval Standards and other documents:

FM Class 3600	2011
FM Class 3610	2010
FM Class 3611	2004
ISA 60079-0	2002
ISA 60079-11	2002
ISA 60079-15	2003
ISA 61241-0	2006
ISA 61241-11	2006
FM Class 3810	2005
ANSI/NEMA 250	1991
ANSI/NEMA 60529	2004
ANSI/ISA 12.27.01	2003

Original Project ID: 3030281

Approval Granted: July 22, 2009

Subsequent Revision Reports / Date Approval Amended

Report Number	Date	Report Number	Date
3038181	June 24, 2010		
3038183	August 26, 2010		
100912	September 29, 2010		
120203	May 31, 2012		
120116	October 8, 2012		
120620	October 8, 2012		
130404	July 17, 2013		
3051310	October 24, 2014		
RR200862	November 4, 2015		

FM Approvals LLC

  
 \_\_\_\_\_  
 J.E. Marquedant  
 Manager, Electrical Systems

4 November 2015  
 \_\_\_\_\_  
 Date

To verify the availability of the Approved product, please refer to [www.approvalguide.com](http://www.approvalguide.com)

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## F.3 Canada, Explosion-Proof



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FM Approvals  
 1151 Boston Providence Turnpike  
 P.O. Box 9102 Norwood, MA 02062 USA  
 T: 781 762 4300 F: 781-762-9375 www.fmapprovals.com

## CERTIFICATE OF COMPLIANCE

### HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT PER CANADIAN REQUIREMENTS

This certificate is issued for the following equipment:

**266bcdefghimnoqrstu 2600T Pressure Transmitter, Model 266 – Dual Seal.**

XP/II/1/BCD/T5 Ta = -50°C to +85°C; V1/Ex d IIC/T4 Ta = -50°C to +85°C;

DIP/II,III/1/EFG/T5 Ta = -50°C to +85°C; Type 4X

b = measure type and construction: A, C, D, G, H, J, M, N, P, R, or V.

c = application: D\*\*, H, L, R\*\*, or S

d = performance: \*\*\*: Single digit not relevant to safety.

e = upper range limits: A, B, E, F, G, H, M, P, Q, R, or S.

f = static pressure range: H, or S.

g = transducer diaphragm material and fill fluid; 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, I, J, K, L, M, N, P, Q, R, S, T, V, W, Y, or Z

h = connection material and type: 1, 2, 3, 4, 5, 6, 7, A, B, C, D, E, F, G, H, K, L, M, N, P, Q, R, S, T, U, V, Y, or Z

i = gasket: 5, 6, 8 or N.

m (only for 266 DLH and 266 DHH) = high pressure side process flange standard rating – size : A, B, D, E, M, N, or L.

n (only for 266 DLH and 266 DHH) = high pressure side process flange material-form-finish : A, D, G, or L.

o (only for 266 DLH and 266 DHH) = low pressure side diaphragm material and fill fluid : 4, 5, A, B, C, D, F, H, K, L, M, P, Q, S, or T.

q (only for 266 DLH) = low pressure side seal type and capillary length : 1, 2, 3, 4, 5, 6, 7, 8, M, N, Q, S, T, U, V, or Z.

r = bolts and gasket: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, C, N, R, S, or T.

s = electronic housing: A, B, T or S.

t = communication: 1, 2, 3, 7, 8, F, H, L, P, or T. (If t = F, P, H, L, or T then u = blank)

u = Options: Blank, or A1, A2, A3, AA, AB, B1, C1, D1, E4, EB, EN, H1, I1, L1, L3, L5, L7, L9, M1, N1, P1, R1, S2, T1, V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, Y1, or Z1.

\*\* Note 1: If option "c" is D or R this denotes remote seal elements.

\*\*\* Note 2: For Inductive Sensors only

† Note 3: Any Single letter or Number

Code of remote seal:

S6 for 600TEN series

S26 for 2600T series

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**266bcdefg1g2h1h2imnoqrstu 2600T Pressure Transmitter, Model 266**

XP/II/1/BCD/T5 Ta = -50°C to +85°C; V1/Ex d IIC/T4 Ta = -50°C to +85°C;

DIP/II,III/1/EFG/T5 Ta = -50°C to +85°C; Type 4X

b = measure type and construction: A, C, D, G, H, J, M, N, P, R, or V

c = application: D\*\*, H, L, R\*\*, or S

d = performance: Single digit not relevant to safety.

e = upper range limits: A, B, C, D, E, F, G, H, L, M, N, P, Q, R, U, Y, V, Z, or S

f = static pressure range: 1, 2, 3, 4, C, H, M, S, W, Y, Z A, or T.

i = gasket: 5, 6, 8 or N

g = transducer diaphragm material and fill fluid; 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, I, J, K, L, M, N, P, Q, R, S, T, V, W, Y, or Z

h = connection material and type: 1, 2, 3, 4, 5, 6, 7, A, B, C, D, E, F, G, H, K, L, M, N, P, Q, R, S, T, U, V, Y, or Z

m = (only for 266 DLH and 266 DHH) = high pressure side process flange standard rating – size: A, B, D, E, M, N, or L

n = (only for 266 DLH and 266 DHH) = high pressure side process flange material-form-finish: A, D, G, or L.

o = (only for 266 DLH and 266 DHH) = low pressure side diaphragm material and fill fluid: 4, 5, A, B, C, D, F, H, K, L, M, P, Q, S, or T

q = (only for 266 DLH) = low pressure side seal type and capillary length: 1, 2, 3, 4, 5, 6, 7, 8, M, N, Q, S, T, U, V, or Z

r = bolts and gasket: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, C, N, R, S, or T

s = electronic housing: A, B, T, or S

t = communication: 1, 2, 3, 7, 8, F, H, L, P, or T. (If t = F, P, H, L, or T then u = blank)

u = Options: Blank, or A1, A2, A3, AA, AB, B†, C†, D†, E4, EB, EN, H†, I†, L1, L3, L5, L7, L9, M†, N†, P†, R1, S2, T†, V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, Y†, or Z1.

\*\* Note 1 : If option "c" is D or R this denotes remote seal elements.

† Note 2: Any Single letter or Number

Code of remote seal :

S6 for 600TEN series

S26 for 2600T series

**266bcdefghrs5u 2600T Pressure Transmitter, Model 266 Modbus version – Single Seal.**

XP/II/1/BCD/T5 Ta = -50°C to +85°C; V1/Ex d IIC/T4 Ta = -50°C to +85°C;

DIP/II,III/1/EFG/T5 Ta = -50°C to +85°C; Type 4X

b = measure type and construction: C or J

c = application: D\*\*, R\*\*, or S

d = performance: Single digit not relevant to safety

e = upper range limits: A, C, F, L, N, R 1 or 2

f = static pressure range: 1, 2, 3, 4, 5, 6, or 7

g = transducer diaphragm material and fill fluid: S, K, M, V, T, A, F, C, Y, D, R, or 2

h = process flanges material &amp; connection: A, Q, B, C, D, E, G, H, P, or R.

r = bolts and gasket: 3, 4, 5, 6, 7, T or R

s = electronic housing: A, S, B, or T

u = EN or ET and A1, A8, A9, B†, C†, D†, F†, H†, I†, L1, L5, L9, M†, N†, P†, T†, UA, UB, UC, V1, V2, V3, V4, V5, V6, V7, V8, V9, W†, Y† or Z1.

\*\* Note 1: if on option "c" is D or R denotes remote seal elements.

† Note 2: Any single letter or number.

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Code of remote seal :  
S6 for 600TEN series  
S26 for 2600T series

**266bcdeghs4u 2600T Pressure Transmitter, Model 266 (1-5Vdc) Dual Seal**

XP/II/1/BCD/T5 Ta = -50°C to +85°C; V1/Ex d IIC/T4 Ta = -50°C to +85°C;

DIP/II,III/1/EFG/T5 Ta = -50°C to +85°C ; Type 4X

b = measure type and construction: H

c = application: D\*\*, R\*\*, or S

d = performance: Single digit not relevant to safety

e = upper range limits: P, Q, or S

g = transducer diaphragm material and fill fluid: S, or K,

h = process flanges material & connection: B, T, E, or K.

s = electronic housing: A, or S

u = options: A1, B†, C†, D†, EB, Ft, H†, It, LS, Mt, N†, Pt, T†, S2, R1, VA, or VB.

\*\* Note 1: if on option "c" is D or R denotes remote seal elements.

† Note 2: Any single letter or number.

Code of remote seal :  
S26 for 2600T series

**Equipment Ratings:**

For use as Explosionproof for Class I, Division 1, Groups B, C and D, T5 Ta = -50°C to +85°C;  
Flameproof for Class I, Zone 1, Ex d IIC T4 Ta = -50°C to +85°C; and Dust-ignitionproof for Class II & III,  
Division 1, Groups E, F and G T5 Ta = -50°C to +85°C; hazardous locations; indoor and outdoor (Type  
4X). "Dual Seal" or "Single Seal" per ANSI/ISA 12.27.01 as indicated

**FM Approved for:**

ABB SpA  
Via Statale 113 Lenno (Como) Italy

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This certifies that the equipment described has been found to comply with the following Approval Standards and other documents:

CSA C22.2 No. 0.4-04	2004
CSA C22.2 No. 0.5	1982
CSA C22.2 No. 30	1986
CSA-C22.2 No. 94	1991
CSA-C22.2 No. 142	1987
CAN/CSA E60079-0	2002
CAN/CSA E60079-1	2002
ANSI/ISA 12.27.01	2003

Original Project ID: 3030274C

Approval Granted: July 21, 2009

Subsequent Revision Reports / Date Approval Amended

Report Number	Date	Report Number	Date
3038181	June 24, 2010		
3040202	August 1, 2012		
130404	July 17, 2013		
3051310	October 24, 2014		
RR200058	June 19, 2015		
RR200862	November 4, 2015		

FM Approvals LLC

  
 J.E. Marquedant  
 Manager, Electrical Systems

4 November 2015  
 Date

To verify the availability of the Approved product, please refer to [www.approvalguide.com](http://www.approvalguide.com)  
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F.4 Canada, Non-Incendive



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# CERTIFICATE OF COMPLIANCE

## HAZARDOUS LOCATION ELECTRICAL EQUIPMENT PER CANADIAN REQUIREMENTS

This certificate is issued for the following equipment:

**266bcdefg1g2h1h2l1mnoqrstu 2600T Series Pressure Transmitter model 266 – Dual Seal.**  
 IS / I, II, III / 1 / ABCDEFG / T\* - DH3173; Entity (For communication option 1, 7, 8, H, L, T); Type 4X;  
 IP67  
 IS / I, II, III / 1 / ABCDEFG / T\* - DH3173; FISCO (For communication option 2, 3, F, P); Type 4X; IP67  
 I / 0 / Ex ia IIC / T\* - DH3173; Entity (For communication option 1, 7, 8, H, L, T); Type 4X  
 I / 0 / Ex ia IIC / T\* - DH3173; FISCO (For communication option 2, 3, F, P); Type 4X  
 NI / I / 2 / ABCD / T\* DH3173; NIFW (For communication option 1, 7, 8, H, L, T); Type 4X  
 I / 2 / Ex nL IIC / T\* DH3173; FNICO (For communication option 2, 3, F, P); Type 4X

**\*HART/Entity**

T Class	minimum ambient °C	maximum ambient °C	I <sub>max</sub> mA	Power W
T4	-50°C	+85°C	100	0.75
T4	-50°C	+70°C	160	1
T5	-50°C	+40°C	100	1.75
T6	-50°C	+40°C	50	0.4

**\*Profibus/Fieldbus**

Temperature Class	Minimum Ambient Temperature	Maximum Ambient Temperature
T4	-50°C	+85°C
T5	-50°C	+40°C
T6	-50°C	+40°C

- b = measure type and construction: D, H, N, P, A, G, or V
- c = application: D\*\*, H, L, R\*\*, or S.
- d = performance: \*\*: Single digit not relevant to safety.
- e = upper range limits: A, B, E, F, G, H, M, P, Q, or S.
- f = static pressure range: H, or S

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g = transducer diaphragm material and fill fluid; 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, I, J, K, L, M, N, P, Q, R, S, T, V, W, Y, or Z  
 h = process flanges material & connection: 1, 2, 3, 4, 5, 6, 7, A, B, C, D, E, F, G, H, K, L, M, N, P, Q, R, S, T, U, V, Y, or Z  
 i = gasket: 5, 6, 8 or N.  
 m (only for 266 DLH and 266 DHH) = high pressure side process flange standard rating – size: A, B, D, E, M, N, or L.  
 n (only for 266 DLH and 266 DHH) = high pressure side process flange material-form-finish: A, D, G, or L.  
 o (only for 266 DLH and 266 DHH) = low pressure side diaphragm material and fill fluid : 4, 5, A, B, C, D, F, H, K, L, M, P, Q, S, or T.  
 q (only for 266 DLH) = low pressure side seal type and capillary length : 1, 2, 3, 4, 5, 6, 7, 8, M, N, Q, S, T, U, V, or Z.  
 r = bolts and gasket: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, C, N, R, T, or S.  
 s = electronic housing: A, B, E, G, J, K, S, T, W, or Z.  
 t = communication: 1, 2, 3, 7, 8, F, H, L, P, or T. (If t = F, P, H, L, or T then u = blank)  
 u = Options: Blank, or A1, A2, A3, A8, A9, AA, AB, Bt, Ct, Dt, E4, EA, EC, EN, Ht, It, L1, L3, L5, L7, L9, Mt, Nt, Pt, R1, S2, Tt, V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, Yt, or Z1

\*\* Note 1: If on option “c” is D or R denotes remote seal elements.

\*\*\* Note 2: For Inductive Sensors only

† Note 3: Any Single letter or Number

Code of remote seal:

S6 for 600TEN series

S26 for 2600T series

**266bcdefg1g2h1h2imnoqrstu 2600T Series Pressure Transmitter model 266.**

IS / I, II, III / 1 / ABCDEFG / T\* - DH3173; Entity (For communication option 1, 7, 8, H, L, T); Type 4X; IP67

IS / I, II, III / 1 / ABCDEFG / T\* - DH3173; FISCO (For communication option 2, 3, F, P); Type 4X; IP67

I / 0 / Ex ia IIC / T\* - DH3173; Entity (For communication option 1, 7, 8, H, L, T); Type 4X

I / 0 / Ex ia IIC / T\* - DH3173; FISCO (For communication option 2, 3, F, P); Type 4X

NI / I / 2 / ABCD / T\* DH3173; NIFW (For communication option 1, 7, 8, H, L, T); Type 4X

I / 2 / Ex nL IIC / T\* DH3173; FNICO (For communication option 2, 3, F, P); Type 4X

**\*HART/Entity**

T Class	minimum ambient °C	maximum ambient °C	I <sub>max</sub> mA	Power W
T4	-50°C	+85°C	100	0.75
T4	-50°C	+70°C	160	1
T5	-50°C	+40°C	100	1.75
T6	-50°C	+40°C	50	0.4

**\*Profibus/Fieldbus**

Temperature Class	Minimum Ambient Temperature	Maximum Ambient Temperature
T4	-50°C	+85°C
T5	-50°C	+40°C
T6	-50°C	+40°C

b = measure type and construction: A, C, D, G, H, J, M, N, P, or V.

To verify the availability of the Approved product, please refer to [www.approvalguide.com](http://www.approvalguide.com)

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- c = application: D\*\*, H, L, R\*\*, or S.
- d = performance: Single digit not relevant to safety.
- e = upper range limits: A, B, C, D, E, F, G, H, L, M, N, P, Q, R, S, U, V, Y, or Z
- f = static pressure range: 1, 2, 3, 4, A, C, H, M, S, T, W, Y, or Z.
- g = transducer diaphragm material and fill fluid; 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, I, J, K, L, M, N, P, Q, R, S, T, V, W, Y, or Z
- h = process flanges material & connection: 1, 2, 3, 4, 5, 6, 7, A, B, C, D, E, F, G, H, K, L, M, N, P, Q, R, S, T, U, V, Y, or Z
- i = gasket: 5, 6, 8 or N
- m (only for 266 DLH and 266 DHH) = high pressure side process flange standard rating – size : A, B, D, E, M, N, or L.
- n (only for 266 DLH and 266 DHH) = high pressure side process flange material-form-finish : A, D, G, or L.
- o (only for 266 DLH and 266 DHH) = low pressure side diaphragm material and fill fluid : 4, 5, A, B, C, D, F, H, K, L, M, P, Q, S, or T.
- q (only for 266 DLH) = low pressure side seal type and capillary length : 1, 2, 3, 4, 5, 6, 7, 8, M, N, Q, S, T, U, V, or Z.
- r = bolts and gasket: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, C, N, R, or S.
- s = electronic housing: A, B, E, G, J, K, S, T, W, or Z.
- t = communication: 1, 2, 3, 7, 8, F, H, L, P, or T. (If t = F, P, H, or T then u = blank)
- u = Options: u = Options: Blank, or A1, A2, A3, A8, A9, AA, AB, B1, C1, D1, E4, EA, EC, EN, H1, I1, L1, L3, L5, L7, L9, M1, N1, P1, R1, S2, T1, V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, Y1, or Z1.

\*\* Note 1 :If on option "c" is D or R denotes remote seal elements.

Code of remote seal :  
 S6 for 600TEN series  
 S26 for 2600T series

**266bcdefghrstu 2600T Series Pressure Transmitter model 266 (multivariable).**

IS / I, II, III / 1 / ABCDEFG / T\* - DH3173; Entity (For communication option 1, 8, H, T); Type 4X; IP67  
 IS / I, II, III / 1 / ABCDEFG / T\* - DH3173; FISCO (For communication option 2, 3, F, P); Type 4X; IP67  
 I / 0 / Ex ia IIC / T\* - DH3173; Entity (For communication option 1, 8, H, T); Type 4X  
 I / 0 / Ex ia IIC / T\* - DH3173; FISCO (For communication option 2, 3, F, P); Type 4X  
 NI / I / 2 / ABCD / T\* DH3173; NIFW (For communication option 1, 8, H, T); Type 4X  
 I / 2 / Ex nL IIC / T\* DH3173; FNICO (For communication option 2, 3, F, P); Type 4X

T Class	minimum ambient °C	maximum ambient °C	I <sub>max</sub> mA	Power W
T4	-50°C	+85°C	100	0.75
T4	-50°C	+70°C	160	1
T5	-50°C	+40°C	100	1.75
T6	-50°C	+40°C	50	0.4

- b = measure type and construction: C, or J
- c = application: R\*\*, S
- d = performance: Single digit not relevant to safety.
- e = upper range limits: A, C, F, , L, N, or R
- f = static pressure range: 1, 2, 3, or 4
- g = transducer diaphragm material and fill fluid: 2, A, C, D, F, K, M, P, S, T, V, or Y

To verify the availability of the Approved product, please refer to [www.approvalguide.com](http://www.approvalguide.com)

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h = differential process flanges material & connection: 4, 5, 6, 7, A, B, C, D, E, G, H, P, Q, or R  
 r = bolts and gasket: 3, 4, 5, 6, 7, R, or T.  
 s = electronic housing: A, B, J, S, or T  
 t = communication: 1, 8, H, T, P, 2, 3, or F (If t = H, or T then u = blank)  
 u = Options: u = Options: Blank, or A1, A2, A3, B<sup>†</sup>, C<sup>†</sup>, D<sup>†</sup>, E4, EA, EC, EN, H<sup>†</sup>, I<sup>†</sup>, L1, L3, L5, L7, L9, M<sup>†</sup>, N<sup>†</sup>, P<sup>†</sup>, R1, S2, T<sup>†</sup>, V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, Y<sup>†</sup>, or Z1

\*\* Note 1: If on option "c" is D or R denotes remote seal elements.

Code of remote seal :  
 S6 for 600TEN series  
 S26 for 2600T series

**266bcdefghrs5u 2600T Pressure Transmitter, Model 266 Modbus version – Single Seal.**

NI / I / 2 / ABCD / T\* DH3173; Type 4X  
 I / 2 / AEx nC IIC / T\* DH3173; Type 4X

T Class	minimum ambient °C	maximum ambient °C	I <sub>max</sub> mA	Power W
T4	-50°C	+85°C	100	0.75
T4	-50°C	+70°C	160	1
T5	-50°C	+40°C	100	1.75
T6	-50°C	+40°C	50	0.4

b = measure type and construction: C or J  
 c = application: D<sup>\*\*</sup>, R<sup>\*\*</sup>, or S  
 d = performance: Single digit not relevant to safety  
 e = upper range limits: A, C, F, L, N, R 1 or 2  
 f = static pressure range: 1, 2, 3, 4, 5, 6, or 7  
 g = transducer diaphragm material and fill fluid: S, K, M, V, T, A, F, C, Y, D, R, or 2  
 h = process flanges material & connection: A, Q, B, C, D, E, G, H, P, or R  
 r = bolts and gasket: 3, 4, 5, 6, 7, T or R  
 s = electronic housing: A, S, B, or T  
 u = EN or ET and A1, A8, A9, B<sup>†</sup>, C<sup>†</sup>, D<sup>†</sup>, F<sup>†</sup>, H<sup>†</sup>, I<sup>†</sup>, L1, L5, L9, M<sup>†</sup>, N<sup>†</sup>, P<sup>†</sup>, T<sup>†</sup>, UA, UB, UC, V1, V2, V3, V4, V5, V6, V7, V8, V9, W<sup>†</sup>, Y<sup>†</sup> or Z1.  
 \*\* Note 1: if on option "c" is D or R denotes remote seal elements.  
 † Note 2: Any single letter or number.

Code of remote seal:  
 S6 for 600TEN series  
 S26 for 2600T series

**Equipment Ratings:**

Intrinsically safe for Class I, II, and III, Division 1, Groups A, B, C, D, E, F and G and Class I, Zone 0 Group IIC; indoor and outdoor Hazardous Locations for Entity and FISCO when installed in accordance with Control Drawing DH3173.

To verify the availability of the Approved product, please refer to [www.approvalguide.com](http://www.approvalguide.com)

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*Member of the FM Global Group*

Nonincendive for Class I, Division 2, Groups A, B, C and D and Energy limited for Class I Zone 2 Group IIC Hazardous Locations for Nonincendive Fied Wiring and FNICO when installed in accordance with Control Drawing DH3173.

"Dual Seal" or "Single Seal" per ANSI/ISA 12.27.01 as indicated

FM Approved for:

ABB SpA  
Lenno (Como) Italy

To verify the availability of the Approved product, please refer to [www.approvalguide.com](http://www.approvalguide.com)

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3030281C  
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This certifies that the equipment described has been found to comply with the following Approval Standards and other documents:

CSA 60079-0	2007
CSA 60079-11	2002
CSA 60079-15	2002
CSA 61241-1-1	2002
CSA-C22.2 NO. 157	1992
CSA C22.2 No. 213	1987
CSA C22.2 No. 1010.1	1992
CSA C22.2 No. 25	1966
CSA C22.2 No. 142	1987
ANSI/ISA 12.27.01	2003

Original Project ID: 3030281C

Approval Granted: July 22, 2009

Subsequent Revision Reports / Date Approval Amended

Report Number	Date	Report Number	Date
3038181	June 24, 2010		
3038183	August 26, 2010		
100912	September 29, 2010		
120203	May 31, 2012		
120116	October 8, 2012		
120620	October 8, 2012		
130404	July 17, 2013		
3051310	October 24, 2014		
RR200862	November 4, 2015		

FM Approvals LLC

J.E. Marquedant  
 Manager, Electrical Systems

4 November 2015  
 Date

To verify the availability of the Approved product, please refer to [www.approvalguide.com](http://www.approvalguide.com)

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## F.5 IECEx, Flame-Proof

		<h2 style="text-align: center;">IECEX Certificate of Conformity</h2>	
<b>INTERNATIONAL ELECTROTECHNICAL COMMISSION</b> <b>IEC Certification Scheme for Explosive Atmospheres</b> <small>for rules and details of the IECEx Scheme visit <a href="http://www.iecex.com">www.iecex.com</a></small>			
Certificate No.:	IECEX FME 09.0002X	Issue No: 10	<b>Certificate history:</b>
Status:	Current	Page 1 of 4	Issue No. 11 (2015-12-18)
Date of Issue:	2015-11-10		Issue No. 10 (2015-11-10)
Applicant:	ABB SpA Via Statale 113 Lenno (Como) 22016 Italy		Issue No. 9 (2014-11-04)
Electrical Apparatus:	2800T Pressure Transmitter Model 288		Issue No. 8 (2014-03-10)
Optional accessory:			Issue No. 7 (2012-10-23)
Type of Protection:	Flameproof, protection by enclosure		Issue No. 6 (2012-08-02)
Marking:	Ex d IIC T6 Ex tD A21 IP67 T85°C Ta = -50°C to +75°C		Issue No. 5 (2012-05-28)
			Issue No. 4 (2012-02-20)
			Issue No. 3 (2012-01-19)
			Issue No. 2 (2010-08-20)
			Issue No. 1 (2010-03-11)
			Issue No. 0 (2009-07-24)
Approved for issue on behalf of the IECEx Certification Body:		Mick Gower	
Position:		Certification Manager	
Signature: (for printed version)		_____	
Date:		_____	
<ol style="list-style-type: none"> <li>1. This certificate and schedule may only be reproduced in full.</li> <li>2. This certificate is not transferable and remains the property of the issuing body.</li> <li>3. The Status and authenticity of this certificate may be verified by visiting the <a href="http://www.iecex.com">Official IECEx Website</a>.</li> </ol>			
Certificate issued by:			
FM Approvals Ltd 1 Windsor Dials SL4 1RS Windsor United Kingdom		 <small>Member of the FMGlobal Group</small>	



## IECEX Certificate of Conformity

Certificate No: IECEx FME 09.0002X Issue No: 10  
 Date of Issue: 2015-11-10 Page 2 of 4  
 Manufacturer: ABB SpA  
 Via Statale 113  
 Lenno (Como) 22016  
 Italy

**Additional Manufacturing  
location(s):**

ABB Automation Products GmbH  
 Schillerstraße 72  
 32425 Minden  
 Germany

See Attachment for additional manufacturing sites

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

**STANDARDS:**

The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2004 Edition:4.0	Electrical apparatus for explosive gas atmospheres - Part 0: General requirements
IEC 60079-1 : 2007-04 Edition:6	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
IEC 61241-0 : 2004 Edition:1	Electrical apparatus for use in the presence of combustible dust - Part 0: General requirements
IEC 61241-1 : 2004 Edition:1	Electrical apparatus for use in the presence of combustible dust - Part 1: Protection by enclosures "tD"

*This Certificate does not indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

**TEST & ASSESSMENT REPORTS:**

A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in

Test Report:

GB/FME/ExTR09.0001/01	GB/FME/ExTR09.0001/02	GB/FME/ExTR09.0001/03
GB/FME/ExTR09.0001/04	GB/FME/ExTR09.0001/05	GB/FME/ExTR09.0001/06
GB/FME/ExTR09.0001/09	GB/FME/ExTR09.0001/10	GB/FME/ExTR09.0001/12
GB/FME/ExTR09.0002/00	GB/FME/ExTR09.0002/01	

Quality Assessment Report:

CA/CSA/QAR06.0010/05	DE/TUN/QAR06.0012/01	GB/FME/QAR10.0007/04
IT/CES/QAR07.0001/02		



## IECEx Certificate of Conformity

Certificate No: IECEx FME 09.0002X

Issue No: 10

Date of Issue: 2015-11-10

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### Schedule

#### EQUIPMENT:

*Equipment and systems covered by this certificate are as follows:*

The 2600T Pressure transmitter, Model 266 consists of an aluminium alloy or stainless steel housing with an internal partition which separates the enclosure into a terminal compartment and an electronics compartment. RF leadthroughs are fitted in the partition wall. The terminal compartment is fitted with a flat threaded cover and the electronics compartment is fitted with a window cover having a cemented-in flat glass window. The housing is also provided with a threaded opening on the electronics side to accommodate a pressure sensor (primary) which can be of gauge or differential design and having various sensor types. All joints are sealed using 'O' rings and all threaded joints are locked against removal. The enclosure body also has 2 threaded conduit entries and the threads are either M20 x 1.5 or 1/2 inch NPT. The 2600T Pressure transmitter, Model 266 is rated at 42V dc, 2W. Instruction Manual: SOI-266-EN Rev J

#### CONDITIONS OF CERTIFICATION: YES as shown below:

1. When the manufacturer of the equipment has not identified the type of protection on the label, the user shall, on installation, mark the label with the type of protection used.
2. The material of the partition wall (sensing diaphragm) shall not be subject to environmental conditions which might adversely affect it.
3. The Model 266 enclosure contains aluminium and is considered to present a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact or friction.



## IECEX Certificate of Conformity

Certificate No: IECEx FME 09.0002X

Issue No: 10

Date of Issue: 2015-11-10

Page 4 of 4

**DETAILS OF CERTIFICATE CHANGES (for issues 1 and above):**

Addition of model code options for the Modbus option.

Changes to enhance the EMC performance of the Modbus version.

**Annex:**

[Annex to FME09\\_0002X Issue 10.pdf](#)

Annex to IECEx FME 09.0002X issue No.:10



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 Windsor, Berkshire, UK. SL4 1RS  
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 www.fmapprovals.com

**266 bcdefghrstu 2600T Pressure transmitter, Model 266 Modbus Version**

Electrical ratings;

U = 30 Vdc      P = 2 W

b = measure type and construction: C or J

c = application: D\*\*, R\*\*, or S

d = performance: Single digit not relevant to safety

e = upper range limits: A, C, F, L, N, R, 1, or 2

f = static pressure range: 1, 2, 3, 4, 5, 6, or 7

g = transducer diaphragm material and fill fluid: S, K, M, V, T, A, F, C, Y, D, R, or 2

h = process flanges material & connection: A, Q, B, C, D, E, G, H, P, or R

r = bolts and gasket: 3, 4, 5, 6, 7, T, or R

s = electronic housing: A, S, B, or T

u = option: E2 or E9 and A1, A8, A9, B\*, C\*, D\*, F\*, H\*, I\*, L1, L5, L9, M\*, N\*, P\*, T\*, UA, UB, UC, V1, V2, V3, V4, V5, V6, V7, V8, V9, W\*, Y\*, or Z1.

\*\* Note 1: if on option "c" is D or R denotes remote seal elements.

\* Note 2: Any single letter or number.

Code of remote seal:

S6 for 600TEN series

S26 for 2600T series

Additional manufacturing locations for the Modbus Communication option "t" (communications) = 5 only.

ABB Inc.  
 7051 Industrial Blvd  
 Bartlesville, OK 74006  
 U.S.A.

ABB Engineering (Shanghai) Limited  
 No 5 Lane 369 Chuang Ye Road  
 Kang Qiao  
 Shanghai 201319  
 China

## F.6 IECEx, Non Sparking

		<h2>IECEX Certificate of Conformity</h2>	
<p><b>INTERNATIONAL ELECTROTECHNICAL COMMISSION</b>  <b>IEC Certification Scheme for Explosive Atmospheres</b>  <small>for rules and details of the IECEx Scheme visit <a href="http://www.iecex.com">www.iecex.com</a></small></p>			
Certificate No.:	IECEX FME 09.0004X	Issue No: 11	<u>Certificate history:</u>
Status:	Current	Page 1 of 5	Issue No. 12 (2015-12-18)
Date of Issue:	2015-11-10		Issue No. 11 (2015-11-10)
Applicant:	ABB SpA Via Statale 113 Lenno (Como) 22016 Italy		Issue No. 10 (2014-11-04)
Electrical Apparatus:	2600T Pressure Transmitter Model 266		Issue No. 9 (2014-03-10)
Optional accessory:			Issue No. 8 (2013-07-18)
Type of Protection:	Type 'n'		Issue No. 7 (2012-11-15)
Marking:	Ex nL IIC T* FMICO *see ratings for temperature class IP67		Issue No. 6 (2012-10-23)
			Issue No. 5 (2012-05-28)
			Issue No. 4 (2012-02-20)
			Issue No. 3 (2012-01-19)
			Issue No. 2 (2010-08-20)
			Issue No. 1 (2010-03-11)
			Issue No. 0 (2009-07-24)
Approved for issue on behalf of the IECEx Certification Body:		Mick Gower	
Position:		Certification Manager	
Signature: (for printed version)			
Date:			
<ol style="list-style-type: none"> <li>1. This certificate and schedule may only be reproduced in full.</li> <li>2. This certificate is not transferable and remains the property of the issuing body.</li> <li>3. The Status and authenticity of this certificate may be verified by visiting the <a href="#">Official IECEx Website</a>.</li> </ol>			
Certificate issued by:			
FM Approvals Ltd 1 Windsor Dials SL4 1RS Windsor United Kingdom		 <small>Member of the FMGlobal Group</small>	



## IECEX Certificate of Conformity

Certificate No: IECEX FME 09.0004X Issue No: 11

Date of Issue: 2015-11-10 Page 2 of 5

Manufacturer: ABB SpA  
Via Statale 113  
Lenno (Como) 22016  
Italy

**Additional Manufacturing  
location(s):**

ABB Automation Products GmbH  
Schillerstraße 72  
32425 Minden  
Germany

See Attachment for additional manufacturing locations

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEX Quality system requirements. This certificate is granted subject to the conditions as set out in IECEX Scheme Rules, IECEX 02 and Operational Documents as amended.

**STANDARDS:**

The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2004 Edition:4.0	Electrical apparatus for explosive gas atmospheres - Part 0: General requirements
IEC 60079-15 : 2005-03 Edition:3	Electrical apparatus for explosive gas atmospheres Part 15: Construction, test and Marking of Type of Protection "n" electrical apparatus
IEC 60079-27 : 2005-04 Edition:1.0	Electrical apparatus for explosive atmospheres- Part 27: Fieldbus intrinsically safe concept (FISCO) and Fieldbus non-incident concept (FNICO)

*This Certificate does not indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

**TEST & ASSESSMENT REPORTS:**

*A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in*

Test Report:

GB/FME/ExTR09.0001/00	GB/FME/ExTR09.0001/10	GB/FME/ExTR09.0001/12
-----------------------	-----------------------	-----------------------

Quality Assessment Report:

CA/CSA/QAR06.0010/06	DE/TUN/QAR06.0012/01	GB/FME/QAR10.0007/04
IT/CES/QAR07.0001/02		



## IECEx Certificate of Conformity

Certificate No: IECEx FME 09.0004X

Issue No: 11

Date of Issue: 2015-11-10

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### Schedule

#### EQUIPMENT:

*Equipment and systems covered by this certificate are as follows:*

The 2000T Pressure transmitter, Model 266 consists of an aluminium alloy or stainless steel housing with an internal partition which separates the enclosure into a terminal compartment and an electronics compartment. RF leadthroughs are fitted in the partition wall. The terminal compartment is fitted with a flat threaded cover and the electronics compartment is fitted with a window cover having a cemented-in flat glass window. The housing is also provided with a threaded opening on the electronics side to accommodate a pressure sensor (primary) which can be of gauge or differential design and having various sensor types. All joints are sealed using 'O' rings and all threaded joints are locked against removal. The design includes a number of different configurations:

1. HART 4-20mA
2. Foundation Fieldbus/Profibus
3. Modbus

There are 5 different terminal arrangements

1. 2 terminals with and without surge protection
2. 3 terminals with and without surge protection
3. 6 terminals with and without surge protection
4. 8 terminals with and without surge protection
5. 9 terminals with and without surge protection

CONDITIONS OF CERTIFICATION: YES as shown below:

The User shall permanently mark the protection type chosen. Once the type of protection has been marked it shall not be changed.



## IECEX Certificate of Conformity

Certificate No: IECEx FME 09.0004X

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### EQUIPMENT (continued):

There are three different communications boards

1. HART
2. FieldBus
3. Modbus

There are 5 different Front End boards

1. Inductive Type (DH3115)
2. P-Capacitive Type (9280309\_3\_P01)
3. DP-Piezo Resistive Type (3280301\_4\_P01)
4. P-Resistive Type (9280305\_3\_P01)
5. DP-Piezo Resistive HP Type (3280308\_3\_P01)

There is an optional second front end board and HMI display board Type B included in this certificate.



## IECEX Certificate of Conformity

Certificate No: IECEx FME 00.0004X

Issue No: 11

Date of Issue: 2015-11-10

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**DETAILS OF CERTIFICATE CHANGES (for issues 1 and above):**

Addition of model code options for the Modbus option

Changes to enhance the EMC performance of the Modbus version.

**Annex:**

[Annex to FME00\\_0004X Issue 11.pdf](#)

Annex to IECEx FME 09.0004X issue No.:11



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www.fmapprovals.com

Electrical ratings;  $U_i = 42V_{dc}$   $I_i = 25mA$   $C_i = 5 nF$   $L_i = 10 \mu H$

HART/Entity

T Class	minimum ambient °C	maximum ambient °C	I <sub>max</sub> mA	P W
T4	-50°C	+85°C	100	0.75
T4	-50°C	+70°C	160	1
T5	-50°C	+40°C	100	1.75
T6	-50°C	+40°C	50	0.4

Profibus/Fieldbus

Temperature Class	Lower Limit Of Ambient Temperature	Upper Limit Of Ambient Temperature
T4	-50°C	+85°C
T5	-50°C	+40°C
T6	-50°C	+40°C

Additional manufacturing locations for the Modbus Communication option "t" (communications) = 5 only covered by the following model code options;

**266 bcdefghrstu 2600T Pressure transmitter, Model 266 Modbus Version**

Electrical ratings

$U = 30 V_{dc}$   $I = 25 mA$   $C = 17 nF$   $L = 0.22 \mu H$

b = measure type and construction: C or J

c = application: D\*\*, R\*\*, or S

d = performance: Single digit not relevant to safety

e = upper range limits: A, C, F, L, N or R

f = static pressure range: 1, 2, 3 or 4

g = transducer diaphragm material and fill fluid: S, K, M, V, T, A, F, C, Y, D, R or 2

h = process flanges material & connection: A, Q, B, C, D, E, G, H, P or R

r = bolts and gasket: 3, 4, 5, 6, 7, T or R

s = electronic housing: A, S, B or T

t = communication: 5

u = Option: E3 or ER and A1, A8, A9, B\*, C\*, D\*, F\*, H\*, I\*, L1, L5, L9, M\*, N\*, P\*, T\*, UA, UB, UC, V1, V2, V3, V4, V5, V6, V7, V8, V9, W\*, Y\* or Z1.

\*\* Note 1: if on option "c" is D or R denotes remote seal elements.

\* Note 2: Any single letter or number.

Code of remote seal:

S6 for 600TEN series

S26 for 2600T series

Annex to IECEx FME 09.0004X issue No.:11



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## F.7 ATEX, Flame-Proof

1	<b>EC-TYPE EXAMINATION CERTIFICATE</b>	
2	Equipment or Protective systems intended for use in Potentially Explosive Atmospheres - Directive 94/9/EC	
3	EC-Type Examination Certificate No:	FM09ATEX0023X
4	Equipment or protective system: (Type Reference and Name)	2600T Pressure transmitter, Model 266
5	Name of Applicant:	ABB SpA
6	Address of Applicant:	Via Statale 113 Lenno (Como) 22016 Italy
7	This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and documents therein referred to.	
8	FM Approvals Ltd, notified body number 1725 in accordance with Article 9 of Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.	
	The examination and test results are recorded in confidential report number:  3030274EC dated 24 <sup>th</sup> July 2009	
9	Compliance with the Essential Health and Safety Requirements with the exception of those identified in item 15 of the schedule to this certificate, has been assessed by compliance with the following documents:  EN 60079-0: 2006, EN 60079-1: 2007, EN 61241-0: 2006, EN61241-1: 2004, EN60079-26: 2004 and EN 60529: 1991 +A1: 2000	
10	If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.	
11	This EC-Type Examination certificate relates only to the design, examination and tests of the specified equipment or protective system in accordance to the directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.	
12	The marking of the equipment or protective system shall include:	
		II 1/2 G Ex d IIC T6 Ta = -50°C to +75°C IP67 II 1/2 D Ex tD A21 IP67 T85°C Ta = -50°C to +75°C IP67
	 <small>Digitally signed by Mick Gower DN: cn=Mick Gower, o=FM Approvals, ou=UK email=mick.gower@fmapprovals.com, c=GB Date: 2015.11.08 10:44:12</small>	
	<b>Mick Gower</b> Certification Manager, FM Approvals Ltd.	
	Issue date: 09 <sup>th</sup> November 2015	
	<b><u>THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE</u></b>	
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## SCHEDULE



to EC-Type Examination Certificate No. FM09ATEX0023X

### 13 Description of Equipment or Protective System:

The 2600T Pressure transmitter, Model 266 consists of an aluminium alloy or stainless steel housing with an internal partition which separates the enclosure into a terminal compartment and an electronics compartment. RF leadthroughs are fitted in the partition wall. The terminal compartment is fitted with a flat threaded cover and the electronics compartment is fitted with a window cover having a cemented-in flat glass window. The housing is also provided with a threaded opening on the electronics side to accommodate a pressure sensor (primary) which can be of gauge or differential design and having various sensor types. All joints are sealed using 'O' rings and all threaded joints are locked against removal.

The enclosure body has 2 threaded conduit entries and the threads are either M20 x 1.5 or ½ inch NPT.

#### Electrical Ratings:

Modbus version:	U = 30 Vdc	P = 2 W
Other versions:	U = 42 Vdc	P = 2 W

The various options are as follows:

**266bcdefghimnoqrstu** 2600T Pressure transmitter, Model 266.

- b = measure type and construction: A, C, D, G, H, J, M, N, P, R, or V.
- c = application: D\*\*, H, L, R\*\*, or S
- d = performance: Single digit not relevant to safety
- e = upper range limits: A, B, C, D, E, F, G, H, L, M, N, P, Q, R, S, U, V, Y or Z
- f = static pressure range: 1, 2, 3, 4, A, C, H, M, S, T, W, Y, or Z.
- g = transducer diaphragm material and fill fluid: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, I, J, K, L, M, N, P, Q, R, S, T, V, W, Y, or Z
- h = process flanges material & connection: 1, 2, 3, 4, 5, 6, 7, A, B, C, D, E, F, G, H, K, L, M, N, P, Q, R, S, T, U, V, Y, or Z
- i = gasket: 5, 6, 8 or N.
- m (only for 266 DLH and 266 DHH) = high pressure side process flange standard rating – size : A, B, D, E, M, N, or L.
- n (only for 266 DLH and 266 DHH) = high pressure side process flange material-form-finish : A, D, G, or L.
- o (only for 266 DLH and 266 DHH) = low pressure side diaphragm material and fill fluid : 4, 5, A, B, C, D, F, H, K, L, M, P, Q, S, or T.
- q (only for 266 DLH) = low pressure side seal type and capillary length : 1, 2, 3, 4, 5, 6, 7, 8, M, N, Q, S, T, U, V, or Z.
- r = bolts and gasket: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, C, N, R, T or S.
- s = electronic housing: A, B, S or T.
- t = communication: 1, 2, 3, 7, 8, F, H, L, P, or T. (If t = F, P, H, L or T, then u = blank)
- u = Options: Blank, or A1, A2, A3, AA, AB, B1, C1, D1, E2, EN, E7, EW, H1, I1, L1, L3, L5, L7, L9, M1, N1, P1, R1, S2, T1, V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, Y1, or Z1.
- \*\* Note 1: If option "c" is D or R, this denotes remote seal elements.
- † Note 2: Any single letter or number.
- Code of remote seal :  
S6 for 600TEN series  
S26 for 2600T series

**266 bcdefghrs5u** 2600T Pressure transmitter, Model 266 Modbus Version

- b = measure type and construction: C or J
- c = application: D\*\*, R\*\*, or S
- d = performance: Single digit not relevant to safety

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## SCHEDULE



to EC-Type Examination Certificate No. FM09ATEX0023X

e = upper range limits: A, C, F, L, N, R, 1, or 2  
 f = static pressure range: 1, 2, 3, 4, 5, 6, or 7  
 g = transducer diaphragm material and fill fluid: S, K, M, V, T, A, F, C, Y, D, R, or 2  
 h = process flanges material & connection: A, Q, B, C, D, E, G, H, P, or R  
 r = bolts and gasket: 3, 4, 5, 6, 7, T, or R  
 s = electronic housing: A, S, B, or T  
 u = option: E2 or E9 and A1, A8, A9, B<sup>1</sup>, C<sup>1</sup>, D<sup>1</sup>, F<sup>1</sup>, H<sup>1</sup>, I<sup>1</sup>, L1, L5, L9, M<sup>1</sup>, N<sup>1</sup>, P<sup>1</sup>, T<sup>1</sup>, UA, UB, UC, V1, V2, V3, V4, V5, V6, V7, V8, V9, W<sup>1</sup>, Y<sup>1</sup> or Z1.  
 \*\* Note 1: if on option "c" is D or R denotes remote seal elements.  
 † Note 2: Any single letter or number.  
 Code of remote seal:  
 S6 for 600TEN series  
 S26 for 2000T series

### 14 Special Conditions for Safe Use:

1. When the manufacturer of the equipment has not identified the type of protection on the label, the user shall, on installation, mark the label with the type of protection used.
2. The material of the partition wall (sensing diaphragm) shall not be subject to environmental conditions which might adversely affect it.
3. The Model 266 enclosure contains aluminium and is considered to present a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact or friction.

### 15 Essential Health and Safety Requirements:

The relevant EHSRs that have not been addressed by the standards listed in this certificate have been identified and assessed in the confidential report identified in item 8.

### 16 Test and Assessment Procedure and Conditions:

This EC-Type Examination Certificate is the result of testing of a sample of the product submitted, in accordance with the provisions of the relevant specific standard(s), and assessment of supporting documentation. It does not imply an assessment of the whole production.

Whilst this certificate may be used in support of a manufacturer's claim for CE Marking, FM Approvals Ltd accepts no responsibility for the compliance of the equipment against all applicable Directives in all applications.

This Certificate has been issued in accordance with FM Approvals Ltd's ATEX Certification Scheme.

### 17 Schedule Drawings

A list of the significant parts of the technical documentation is annexed to this certificate and a copy has been kept by the Notified Body.

### 18 Certificate History

Details of the supplements to this certificate are described below:

Date	Description
24 <sup>th</sup> July, 2009	Original Issue.

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**SCHEDULE**

to EC-Type Examination Certificate No. FM09ATEX0023X

Date	Description
18 <sup>th</sup> March, 2010	<u>Supplement 1:</u> Report Reference: 3030281EC Supplement 1 - 18 <sup>th</sup> March, 2010. Description of the Change: 1) Addition of alternative self adhesive label. 2) Removal of Ceramic Isolator in the inductive type pressure sensors.
30 <sup>th</sup> January, 2012	<u>Supplement 2:</u> Report Reference: 3030281EC Supplement 3 – 18 <sup>th</sup> January, 2012. Description of the Change: 1) Improvement of communication board FF. 2) New sensor for gauge type for ovp 1379 Bar single seal. 3) New second front end for the multivariable version. 4) Replacement of capacitive sensor type with new piezo type.
20 <sup>th</sup> February, 2012	<u>Supplement 3:</u> Report Reference: 3030274rev120211 – 14 <sup>th</sup> February, 2012. Description of the Change: Addition of descriptive drawings for the 1000 Bar versions of the transmitter when configured as; 1) 1575 Bar for connection type F250C or 2) 1350 Bar for connection type 1/4 - 18 NPT.
7 <sup>th</sup> June, 2012	<u>Supplement 4:</u> Report Reference: 3030274rev120203 – 31 <sup>st</sup> May, 2012 and 3030274rev120412 – 31 <sup>st</sup> May, 2012 Description of the Change: Improvement of the manufacturing process regarding the inductive technology transducer.
7 <sup>th</sup> August, 2012	<u>Supplement 5:</u> Report Reference: 3030274EC Supplement 1 – 1 <sup>st</sup> August, 2012 Description of the Change: 1) Introduction of capillaries as replacement of the flameproof devices used in the primary transducer differential Tx inductive type portion of the 2600T Pressure Transmitter, Model 266.
19 <sup>th</sup> October 2012	<u>Supplement 6:</u> Report Reference: 3030274rev120116 - Description of the Change: 1) Improvement of model 266 (only inductive type with Hart protocol communication) 2) Modification to nameplate.
18 <sup>th</sup> July 2013	<u>Supplement 7:</u> Report Reference: 3030281rev130404 dated 17 <sup>th</sup> July 2013 Description of the Change: 1) General Product listing update.
11 <sup>th</sup> March 2014	<u>Supplement 8:</u> Report Reference: 3030274rev130315 dated 27 <sup>th</sup> February 2014 Description of the Change: 1) Modification to Gauge Pressure Sensor.
04 <sup>th</sup> November 2014	<u>Supplement 9:</u> Report Reference: 3051310 dated 24 <sup>th</sup> October 2014 Description of the Change: 1) Addition of modbus communication option. 2) Addition of Bartlesville as a Product Manufacturing Unit.

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**SCHEDULE**

to EC-Type Examination Certificate No. FM09ATEX0023X

Date	Description
09 <sup>th</sup> November 2015	Supplement 10: Report Reference: RR200862 dated 4 <sup>th</sup> November 2015 Description of the Change: 1) Addition of model code options for the Modbus option 2) Changes to enhance the EMC performance of the Modbus version.

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F ATEX 020 (May/12)

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## F.8 ATEX, Non Sparking

1	<b>TYPE EXAMINATION CERTIFICATE</b>	
2	Equipment or Protective systems intended for use in Potentially Explosive Atmospheres - Directive 94/9/EC	
3	Type Examination Certificate No:	FM09ATEX0025X
4	Equipment or protective system: (Type Reference and Name)	2600T Pressure transmitter, Model 266
5	Name of Applicant:	ABB SpA
6	Address of Applicant:	Via Statale 113 Lenno (Como) 22016 Italy
7	This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and documents therein referred to.	
8	FM Approvals Ltd. certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.	
	The examination and test results are recorded in confidential report number: 3030281EC dated 23 <sup>rd</sup> July, 2009	
9	Compliance with the Essential Health and Safety Requirements, with the exception of those identified in item 15 of the schedule to this certificate, has been assessed by compliance with the following documents: EN 60079-0: 2006, EN60079-15: 2005 and EN 60529: 1991 + A1: 2000	
10	If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.	
11	This Type Examination certificate relates only to the design, examination and tests of the specified equipment or protective system in accordance to the directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.	
12	The marking of the equipment or protective system shall include:	
		II 3 G Ex nL IIC T* IP67
		II 3 G Ex nA IIC T* IP67 (Modbus version only – Communication = 5)
		II 3 D Ex tD A22 IP67 T85°C IP67 Ta = -50°C to +75°C
		* See Description of Equipment or Protective System for the temperature class
		Digitally signed by Mick Gower DN: cn=Mick Gower, o=FM Approvals, ou, email=mick.gower@fmaprovals.com, c=GB Date: 2015.11.09 16:59:41 Z
	Mick Gower Certification Manager, FM Approvals Ltd.	
	Issue date: 09 <sup>th</sup> November 2015	
	<b><u>THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE</u></b>	
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	F ATEX 029 (Oct/12)	Page 1 of 6

## SCHEDULE



to Type Examination Certificate No. FM09ATEX0025X

### 13 Description of Equipment or Protective System:

The 2600T Pressure transmitter, Model 266 consists of an aluminium alloy or stainless steel housing with an internal partition which separates the enclosure into a terminal compartment and an electronics compartment. RF leadthroughs are fitted in the partition wall. The terminal compartment is fitted with a flat threaded cover and the electronics compartment is fitted with a window cover having a cemented-in flat glass window. The housing is also provided with a threaded opening on the electronics side to accommodate a pressure sensor (primary) which can be of gauge or differential design and having various sensor types. All joints are sealed using 'O' rings and all threaded joints are locked against removal.

The enclosure body has 2 threaded conduit entries and the threads are either M20 x 1.5 or ½ inch NPT. The various options are as follows:

#### **266bcdefghimnoqrstu 2600T Series Pressure Transmitter model 266.**

Electrical ratings;

Ui= 42Vdc li = 25mA Ci = 5 nF Li = 10 uH

\*HART/Entity Version

Temperature Class - Gas	Temperature Class - Dust	Minimum Ambient Temperature	Maximum Ambient Temperature
T4	T135°C	-50°C	+85°C
T4	T135°C	-50°C	+70°C
T5	T100°C	-50°C	+40°C
T6	T85°C	-50°C	+40°C

\*Profibus/Fieldbus Version

Temperature Class - Gas	Temperature Class - Dust	Minimum Ambient Temperature	Maximum Ambient Temperature
T4	T135°C	-50°C	+85°C
T5	T100°C	-50°C	+40°C
T6	T85°C	-50°C	+40°C

b = measure type and construction: A, C, D, G, H, J, M, N, P, R, or V

c = application: D\*\*, H, L, R\*\*, or S.

d = performance: Single digit not relevant to safety

e = upper range limits: A, B, C, D, E, F, G, H, L, M, N, P, Q, R, S, U, V, Y or Z.

f = static pressure range: 1, 2, 3, 4, A, C, H, M, S, T, W, Y, or Z.

g = transducer diaphragm material and fill fluid; 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, I, J, K, L, M, N, P, Q, R, S, T, V, W, Y, or Z

h = differential process flanges material & connection; 1, 2, 3, 4, 5, 6, 7, A, B, C, D, E, F, G, H, K, L, M, N, P, Q, R, S, T, U, V, Y, or Z

i = gasket: 5, 6, 8 or N.

m (only for 266 DLH and 266 DHH) = high pressure side process flange standard rating – size : A, B, D, E, M, N, or L.

n (only for 266 DLH and 266 DHH) = high pressure side process flange material-form-finish : A, D, G, or L.

o (only for 266 DLH and 266 DHH) = low pressure side diaphragm material and fill fluid : 4, 5, A, B, C, D, F, H, K, L, M, P, Q, S, or T.

q (only for 266 DLH) = low pressure side seal type and capillary length : 1, 2, 3, 4, 5, 6, 7, 8, M, N, Q, S, T, U, V, or Z.

r = bolts and gasket: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, C, N, R, T or S.

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## SCHEDULE



to Type Examination Certificate No. FM09ATEX0025X

s = electronic housing: A, B, E, G, J, K, S, T, W, or Z.  
 t = communication: 1, 2, 3, 7, 8, F, H, L, P, or T. (If t = F, P, H, L or T then u = blank)  
 u = Options: Blank, or AA, AB, A1, A2, A3, A8, A9, B<sup>†</sup>, C<sup>†</sup>, D<sup>†</sup>, E3, EN, EW, F<sup>†</sup>, H<sup>†</sup>, I<sup>†</sup>, L1, L3, L5, L7, L9, M<sup>†</sup>, N<sup>†</sup>, P<sup>†</sup>, R1, S2, T<sup>†</sup>, U<sup>†</sup>, V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, W<sup>†</sup>, Y<sup>†</sup> or Z1.  
 \*\* Note 1: If on option "c" is D or R denotes remote seal elements.  
 † Note 2: Any single letter or number.

Code of remote seal :  
 S6 for 800TEN series  
 S26 for 2600T series

**266bdefghrstu 2600T Series Pressure Transmitter model 266 (multivariable).**

Electrical ratings:  
 Ui= 42Vdc      li = 25mA      Ci = 5 nF      Li = 10 uH

\*HART/Entity Version

Temperature Class - Gas	Temperature Class - Dust	Minimum Ambient Temperature	Maximum Ambient Temperature
T4	T135°C	-50°C	+85°C
T4	T135°C	-50°C	+70°C
T5	T100°C	-50°C	+40°C
T6	T85°C	-50°C	+40°C

b = measure type and construction: C, , J,  
 c = application: R\*\*, S  
 d = performance: Single digit not relevant to safety.  
 e = upper range limits: A, C, F, L, N, R,  
 f = static pressure range: 1, 2, 3, 4,  
 g = transducer diaphragm material and fill fluid : A, C, D, F, K, , M, , S, T, V, , Y.  
 h = differential process flanges material & connection: A, B, C, D, E, G, H, P, Q, R,  
 r = bolts and gasket: 3, 4, 5, 6, 7, , R, T  
 s = electronic housing: A, B, , J, , S, T,  
 t = communication: 1, 8, H, or T. (If t = H, or T then u = blank)  
 u = Options: Blank, or A1, , B<sup>†</sup>, C<sup>†</sup>, D<sup>†</sup>, E1, E7, EN, EW, F<sup>†</sup>, H<sup>†</sup>, I<sup>†</sup>, L1, L3, L5, L7, L9, M<sup>†</sup>, N<sup>†</sup>, P<sup>†</sup>, R1, S2, T<sup>†</sup>, U<sup>†</sup>, V1, V2, V3, V4, V5, V6, V7, V8, V9, W<sup>†</sup>, Y<sup>†</sup> or Z1.  
 \*\* Note 1: If on option "c" is D or R denotes remote seal elements.  
 † Note 2: Any single letter or number.

**THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE**

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**SCHEDULE**

to Type Examination Certificate No. FM09ATEX0025X

**266 bdefghrs5u 2600T Pressure transmitter, Model 266 Modbus Version**

Electrical ratings

U = 30 Vdc I = 25 mA C = 17 nF L = 0.22 µH

Temperature Class - Gas	Temperature Class - Dust	Minimum Ambient Temperature	Maximum Ambient Temperature
T4	T135°C	-50°C	+85°C
T4	T135°C	-50°C	+70°C
T5	T100°C	-50°C	+40°C
T6	T85°C	-50°C	+40°C

b = measure type and construction: C or J

c = application: D\*\*, R\*\*, or S

d = performance: Single digit not relevant to safety

e = upper range limits: A, C, F, L, N, R, 1, or 2

f = static pressure range: 1, 2, 3, 4, 5, 6, or 7

g = transducer diaphragm material and fill fluid: S, K, M, V, T, A, F, C, Y, D, R or 2

h = process flanges material &amp; connection: A, Q, B, C, D, E, G, H, P or R

r = bolts and gasket: 3, 4, 5, 6, 7, T, or R

s = electronic housing: A, S, B, or T

u = Option: E3 or E9 and A1, A8, A9, B1, C1, D1, F1, H1, I1, L1, L5, L9, M1, N1, P1, T1, UA, UB, UC, V1, V2, V3, V4, V5, V6, V7, V8, V9, W1, Y1, or Z1.

\*\* Note 1 : if on option "c" is D or R denotes remote seal elements.

† Note 2 : Any single letter or number.

Code of remote seal :

S8 for 600TEN series

S26 for 2600T series

**14 Special Conditions for Safe Use:**

1. When the manufacturer of the equipment has not identified the type of protection on the label, the user shall, on installation, mark the label with the type of protection used.

**15 Essential Health and Safety Requirements:**

The relevant EHSRs that have not been addressed by the standards listed in this certificate have been identified and assessed in the confidential report identified in item 8.

**16 Test and Assessment Procedure and Conditions:**

This Type Examination Certificate is the result of testing of a sample of the product submitted, in accordance with the provisions of the relevant specific standard(s), and assessment of supporting documentation. It does not imply an assessment of the whole production.

Whilst this certificate may be used in support of a manufacturer's claim for CE Marking, FM Approvals Ltd accepts no responsibility for the compliance of the equipment against all applicable Directives in all applications.

This Certificate has been issued in accordance with FM Approvals Ltd's ATEX Certification Scheme.

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## SCHEDULE



to Type Examination Certificate No. FM09ATEX0025X

### 17 Schedule Drawings

A list of the significant parts of the technical documentation is annexed to this certificate and a copy has been kept by FM Approvals Ltd.

### 18 Certificate History

Details of the supplements to this certificate are described below:

Date	Description
24 <sup>th</sup> July, 2009	Original Issue.
18 <sup>th</sup> March, 2010	<p><u>Supplement 1:</u> Report Reference: 3030281EC Supplement 1 – 18<sup>th</sup> March, 2010. Description of the Change:</p> <ol style="list-style-type: none"> <li>1) Changes to the layout for Front End</li> <li>2) Changes on Hart communication board</li> <li>3) Changes on FF and PA communication board</li> <li>4) Addition of alternative self adhesive label</li> <li>5) Removal of Ceramic Isolator in the inductive type pressure sensors</li> </ol>
14 <sup>th</sup> May, 2010	<p><u>Supplement 2:</u> Report Reference: 3030281EC Supplement 2 – 14<sup>th</sup> May 2010. Description of the Change:</p> <ol style="list-style-type: none"> <li>1) Addition of HMI Type B Touch Key display option L5</li> </ol>
30 <sup>th</sup> January 2012	<p><u>Supplement 3:</u> Report Reference: 3030281EC Supplement 3 – 18 January 2012. Description of the Change:</p> <ol style="list-style-type: none"> <li>1) Improvement of communication board FF.</li> <li>2) New sensor for gauge type for ovp 1379 Bar single seal.</li> <li>3) New second front end for the multivariable version.</li> <li>4) Replacement of capacitive sensor type with new piezo type.</li> </ol>
20 <sup>th</sup> February, 2012	<p><u>Supplement 4:</u> Report Reference: 3030274rev120211 – 14<sup>th</sup> February, 2012. Description of the Change: Addition of descriptive drawings for the 1000 Bar versions of the transmitter when configured as:</p> <ol style="list-style-type: none"> <li>1) 1575 Bar for connection type F250C or</li> <li>2) 1350 Bar for connection type 1/4 - 18 NPT.</li> </ol>
8 <sup>th</sup> June, 2012	<p><u>Supplement 5:</u> Report Reference: 3030274rev110203 – 31<sup>st</sup> May, 2012, 3030274rev120801 – 31<sup>st</sup> May, 2012 and 3030274rev120203 – 31<sup>st</sup> May, 2012. Description of the Change:</p> <ol style="list-style-type: none"> <li>1) Modification of the 266 Fieldbus Foundation communication board.</li> <li>2) Replacement of the capacitive transducer with a new piezo type for low pressure ranges.</li> <li>3) Modification of the 266 Multivariable version, with Hart protocol communication.</li> <li>4) Addition of Extended EMC terminal board option.</li> </ol>
19 <sup>th</sup> October 2012	<p><u>Supplement 6:</u> Report Reference: 3030274rev120116 and 3030274rev120820 both dated 8<sup>th</sup> October 2012 Description of the Change:</p> <ol style="list-style-type: none"> <li>1) Improvement of model 266 (only inductive type with Hart protocol</li> </ol>

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**SCHEDULE**

to Type Examination Certificate No. FM09ATEX0025X

Date	Description
	communication) 2) Modification to nameplate.
5 <sup>th</sup> December 2012	<u>Supplement 7:</u> Report Reference: 3030274rev120708 dated 8 November 2012 Description of the Change: 1) Change to the capillaries used in the pressure transducer.
18 <sup>th</sup> July 2013	<u>Supplement 8:</u> Report Reference: 3020281rev130214 and 3030281rev130404 dated 17 <sup>th</sup> July 2013 Description of the Change: 1) Modification to the MidTier Inductive Sensor Board 2) Modification to Microcontroller for HART version 3) General Product listing update.
11 <sup>th</sup> March 2014	<u>Supplement 9:</u> Report Reference: 3030274rev130315 dated 27 <sup>th</sup> February 2014 Description of the Change: 1) Modification to Gauge Pressure Sensor.
04 <sup>th</sup> November 2014	<u>Supplement 10:</u> Report Reference: 3051310 dated 24 <sup>th</sup> October 2014 Description of the Change: 1) Addition of modbus communication option. 2) Addition of Bartlesville as a Product Manufacturing Unit.
09 <sup>th</sup> November 2015	<u>Supplement 11:</u> Report Reference: RR200862 dated 4 <sup>th</sup> November 2015 Description of the Change: 1) Addition of model code options for the Modbus option. 2) Changes to enhance the EMC performance of the Modbus version.

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## Appendix G Glossary

Term	Definition
ABB Inc.	Asea, Brown and Boveri, parent company of Totalflow
absolute pressure	is zero-referenced against a vacuum, so it is equal to gauge pressure plus atmospheric pressure
ac	alternating current
accuracy	how closely a measured value agrees with the correct value. It is usually expressed as $\pm$ percent of the full scale output or reading.
address	a unique memory designation for the location of data or the identity of a peripheral transmitter. It allows each transmitter on a single communications line to respond to its own message.
AGA	American Gas Association. Trade group representing natural gas distributors and pipelines
AGA3	American Gas Association Report No. 3. AGA3 1985 (wet gas), <i>Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids</i> . Method for calculating gas volume across an Orifice Plate. This method requires two pressure readings: Differential Pressure (DP) and Static Pressure (SP). AGA3 1992, <i>Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids</i> . Addresses standards for flow rate, orifice diameter and differential pressure. <i>Part 1-General Equations and Uncertainty Guidelines</i> <i>Part 2-Specifications and Installation Requirements</i> <i>Part 3-Natural Gas Applications</i> AGA3 2012, <i>Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids</i> . Revision of Part 1- <i>General Equations and Uncertainty Guidelines</i> . It gives equations and guidelines for computing flow through orifice meters. <sup>11</sup>
alternating current	an electric current whose direction changes with a frequency independent of circuit components
ambient temperature	the temperature of the air, atmosphere or other fluid that completely surrounds the apparatus, equipment or work piece under consideration. For devices which do not generate heat, this temperature is the same as the temperature of the medium at the point of device location when the device is not present. For devices which do generate heat, this temperature is the temperature of the medium surrounding the device when the device is present and generating heat. Allowable ambient temperature limits are based on the assumption that the device is not exposed to significant radiant energy sources such as sunlight or heated surfaces.
analog	a system in which data is represented as a continuously varying voltage/current
asynchronous	a communications protocol where information can be transmitted at an arbitrary, unsynchronized point in time, without synchronization to a reference time or clock
ATEX	term used for the European Union's New Approach Directive 94/9/EC which concerns equipment and protective systems intended for use in potentially explosive atmospheres
atmosphere (one)	a unit of pressure. The pressure that will support a column of mercury 760 mm high at 0 °C.
atmospheric pressure	the pressure exerted on the earth by the earth's atmosphere (air and water vapor). A pressure of 760 mm of mercury, 29.92 inches of mercury, or 14.696 pounds per square inch absolute, is used as a (scientific) standard for some measurements. Atmospheric pressure may also refer to the absolute ambient pressure at any given location.
AWG	American Wire Gauge
bar	A bar is equal to 1 atmosphere of pressure, 0.987 standard atmospheric pressure or 14.504 PSIA.
base pressure	the pressure used as a standard in determining gas volume. Volumes are measured at operating pressures and then corrected to base pressure volume. Base pressure is normally defined by a gas measurement contract. The standard value for natural gas in the United States is 14.73 PSIA, established by the American National Standards Institute as standard Z-132.1 in 1969.
baud	unit of signaling speed. The speed in baud is the number of discrete conditions or events per second. If each event represents only one bit condition, baud rate equals bits per second (bps).
baud rate	serial communications data transmission rate expressed in bits per second (b/s)

<sup>11</sup> This adapted text summarizes abstracts of AGA Report No. 3, Report No. 5, Report No. 7, Report No. 8, and PRCI NX-19. ©AGA – All rights reserved.

Term	Definition
bias	refers to adjusting the measurement to agree with the calibrated standard. This figure maybe either positive or negative.
binary	abase-2 (instead of base-ten) numbering system. The binary digits are 0 and 1.
binary-coded decimal	a code for representing decimal digits in a binary format.
bit	one binary digit, either 0 or 1, which is the smallest unit of binary data. Used as an adjective, it may refer to the number of bits used internally by a computer's CPU or in a computer application (16 bit processor, 32 bit application). Also see <i>byte</i> .
bits per second	unit of rate for data transmission
board	the common name used to identify an electronic board. It is also called motherboard, engine card and circuit board.
b/s, BPS	bits per second
buffer	1) a temporary storage device used to compensate for a difference in data rate and data flow between two devices (typically a computer and a printer); also called a spooler. 2)an amplifier to increase the drive capability, current or distance of an analog or digital signal
bus	a data path shared by many transmitters, for example a multipoint line with one or more conductors for transmitting signals, data, or power
byte	a basic unit of information in computer storage and processing. A byte consists of 8 adjacent binary digits (bits), each of which consists of a 0 or a 1.
cal checks	calibration checks
calibrate	to ascertain, usually by comparison with a standard, the locations at which scale or chart graduations should be placed to correspond to a series of values of quantity which the instrument is to measure, receive, or transmit. Also, to adjust the output of a transmitter, to bring it to a desired value within a specified tolerance for a particular value of the input. And, to ascertain the error in the output of a transmitter by checking it against a standard
central processing unit, CPU	the central part of a computer system that performs operations on data. In a personal computer the CPU is typically a single microprocessor integrated circuit.
character	a letter, digit or other symbol that is used as the representation of data. A connected sequence of characters is called a character string.
COMM	abbreviation for communication port
communication port, COMM	communication port (abbreviated COMM) refers to the Host computer's physical communication's port used to communicate with peripheral equipment. The term is used by Totalflow when discussing local or remote communication with various equipment including the XFC, FCU, XRC, RTU and LevelMaster.
CPU	central processing unit
differential pressure, DP	the pressure difference between two points in a system. For example, it is the difference in pressure between the upstream and downstream taps of an orifice plate, used to measure volume passing through the orifice.
digit	a measure of the display span of a panel meter. By convention, a full digit can assume any value from 0 through 9, a 1/2-digit will display a 1 and overload at 2, a 3/4-digit will display digits up to 3 and overload at 4, etc. For example, a meter with a display span of $\pm 3999$ counts is said to be a 3-3/4 digit meter.
digital	a signal which has distinct states, either on or off (0 or 1). Digital computers process data as binary information having either true or false states.
DIP switches	Dual In-line Package. A bank of switches typically used in setting the hardware configuration and base address of an option card
flowing temperature, $T_f$	temperature of the flowing fluid, usually gas, and measured by an RTD.
flowing, DP	differential pressure of the flowing fluid, usually gas. See <i>differential pressure</i> for more information.
FM	Factory Mutual Research Corporation is an organization which sets industrial safety standards.
gauge pressure	absolute pressure minus local atmospheric pressure
HMI	human machine interface
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
LRL, lower range limit	the lower range limit of a specific sensor is the lowest measured value that can be measured by the transmitter within the specified accuracy.

Term	Definition
LRV, lower range value	the lower range value is the lowest measured value to which the transmitter is calibrated.
LSB	least significant byte (lowest)
MSB	most significant byte (highest)
manifold	1) a pipe or tubular with one inlet and several outlets. 2) a pipe with several inlets and one outlet. 3) pipes, valves, and fittings where fluid from one or more sources is directed to several systems. 4) an area where pipelines enter and exit a pumping station or tank battery and where the control valves are located
human machine interface, HMI	a software program that converts machine instructions and commands into a user interface.
MODBUS®	refers to the MODBUS® protocol standard for hardware transmitter communications. The MODBUS® protocol is fully described in the document entitled "Gould MODBUS® Protocol Reference Guide" published January, 1985 by Gould Inc., Programmable Control Division Andover, Massachusetts.
multivariable transducer, XMV	a smart multivariable transducer that is an external stand-alone transmitter measuring static pressure (SP), differential pressure (DP) and flowing temperature (T <sub>r</sub> ). This refers to both the transducer portion of the transmitter and the circuitry required to supply measurements via MODBUS® communications to the host device.
NEMA	National Electrical Manufacturers Association
NEMA, Type 4	a standard from the National Electrical Manufacturers Association which identifies an enclosure constructed for indoor or outdoor use to provide protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water, and remain undamaged by external formation of ice.
NEMA, Type 4X	a standard from the National Electrical Manufacturers Association which identifies an enclosure constructed as for Type 4 but also with protection against corrosion.
nonvolatile memory	A storage medium that maintains all data, even after suffering a loss of power. Examples of nonvolatile memory include read-only memory and flash memory.
NPT	National Pipe Thread
resistive thermal detector, RTD	a device that measures temperature based upon its coefficient of resistivity
RTD	resistive thermal detector
serial port	a communication interface that uses one data line (one bit) to transfer data bits sequentially. The term serial port usually is limited to hardware that is more or less compliant to the RS-232 standard, rather than other serial interfaces like USB and Ethernet.
span	measuring span. The algebraic difference between the start of the measuring range and the end of the measuring range. The smallest span is the smallest value that can be selected without impairing the specified measuring accuracy.
static pressure, SP	equals PSIG or PSIA. A unit of measure can be PSIG (pressure measurement referenced to current atmospheric conditions) or PSIA (pressure measurement referenced to a vacuum). It is defined as the pressure exerted by a non-moving liquid or gas. In the case of a gas well, this is the natural PSI of the gas inside of the well.
termination	the placement of a connector on a cable
termination block (also board or panel)	a circuit board with screw terminals or other connector system that allows convenient connection of field signals and power to a data acquisition or communication system.
T <sub>r</sub>	1) absolute temperature of flowing fluid. 2) formation temperature
thermowell	a closed-end tube designed to protect temperature sensors from harsh environments, high pressure, and flows. It can be installed into a system by pipe thread or welded flange and is usually made of corrosion-resistant metal or ceramic material depending upon the application.
Totalflow	product line of ABB Inc. Maker and distributor of the XSeries flow computers (XFC) and remote controllers (XRC)
traceable standards	Traceable standards or traceability refers to an unbroken record of documentation or an unbroken chain of measurements and associated uncertainties (accuracy). To establish and maintain traceability, manufactured devices are tested against a benchmarked source and records are kept reflecting the results and the allowable tolerance or accuracy standards. This testing process is often called verification, performance validation, or calibration. While some devices may be call certified, to be traceable, it must have the authentic documentation records.
transducer	a transmitter for converting energy from one form to another, specifically the measurement of pressure differential in natural gas gate stations, for example, converting pressure to voltage or current
transmitter	a circuit that accepts signals or data in and translates them into a form that can be sent across a medium (transmitted), usually over a distance. The medium can be wireless or wired.

Term	Definition
UL	Underwriters Laboratories, Inc. is an independent laboratory that establishes standards for commercial and industrial products.
universal serial bus	an external peripheral interface standard for communication between a computer and external peripherals over a cable using bi-serial transmission. It supports both isochronous and asynchronous data transfers.
URL, upper range limit	the maximum value that can be measured by a transmitter within the stated accuracy
URV, upper range value	the highest measured value to which the transmitter is calibrated
USB	universal serial bus
Vdc	volts of direct current
volatile memory	a storage medium that loses all data when power is removed
volt	the unit of voltage or potential difference. One thousand volts = 1kV.
voltage	electrical pressure, the force, which causes current to flow through a conductor. Voltage must be expressed as a difference of potential between two points since it is a relational term. Connecting both voltmeter leads to the same point will show no voltage present although the voltage between that point and ground may be hundreds or thousands of volts.
voltmeter	a meter for reading voltage. Reading voltage is one of several functions of a multimeter.
write	to record data in a storage transmitter or on a data medium
XFC G4	Totalflow's new Generation 4 extendable XFC equipment featuring technology that is expandable and flexible for changing needs
XMV	see <i>multivariable transducer</i>
XRC G4	Totalflow's Generation 4 extendable XRC equipment featuring technology that is expandable and flexible for changing needs
XSeries	Totalflow's extendable equipment series featuring technology that is expandable and flexible for changing needs

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