

Model 1810

Flush Mount Transmitter



Model 1810 Flush Mount Transmitter

NOTICE

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product.

Within the United States, Rosemount Inc. has two toll-free assistance numbers:

Customer Central

Technical support, quoting, and order-related questions.

1-800-999-9307 (7:00 am to 7:00 pm CST)

North American Response Center

Equipment service needs.

1-800-654-7768 (24 hours—includes Canada)

Outside of the United States, contact your local Rosemount representative.

⚠ CAUTION

The products described in this document are NOT designed for nuclear-qualified applications. Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Rosemount Sales Representative.



Fisher-Rosemount satisfies all obligations coming from legislation to harmonize product requirements in the European Union.



Table of Contents

SECTION 1 Introduction

Section 2: Installation	1-1
Section 3: Configuration	1-1
Section 4: Operation and Maintenance	1-1
Appendix A: Reference Data	1-1
Safety Messages	1-1
Return of Materials	1-2

SECTION 2 Installation

Safety Messages	2-1
Mounting	2-2
Process Coupling	2-2
Transmitter Installation- Process Coupling	2-3
Transmitter Installation- PASVE™ Valve	2-3
Electrical Considerations	2-3
Connect Wiring and Power Up	2-4
Signal Wiring Grounding	2-4
Power Supply	2-6

SECTION 3 Configuration

Overview	3-1
Safety Messages	3-1
Warnings	3-1
Commissioning on the bench With HART	3-2
Setting the Loop to Manual	3-2
Wiring	3-3
Bench Hook-up	3-3
Review	3-3
Check Output	3-3
Basic Setup	3-3
Tag	3-3
Output Units	3-4
Rerange	3-4
Method 1: Rerange	3-4
Method 2: Rerange using the communicator and pressure source or process pressure	3-4
Damping	3-5
Detailed Setup	3-5
Failure Mode Alarm and Saturation	3-5
Diagnostics and Service	3-5
Test Device	3-5
Loop Test	3-5
Advanced Functions for HART Protocol	3-6
Saving, Recalling, and Cloning Configuration Data	3-6
Burst Mode	3-7
Multidrop Communication	3-7

Model 1810

Changing the transmitter address	3-9
HART Communicator	3-9
Communicating with a multidropped transmitter	3-9
HART Communicator	3-9
Polling a multidropped transmitter	3-9
HART Communicator	3-9

SECTION 4 Operation

Calibration	4-1
Calibration Overview	4-1
Deciding which trim procedure to use	4-3
Sensor Trim	4-3
Zero Trim	4-3
Full Trim	4-4
Recall Factory Trim	4-4
Recall Factory Trim—Sensor Trim	4-4
Recall Factory Trim—Analog Output	4-4
Analog Output Trim	4-5
Digital-to-Analog Trim	4-5
Scaled Digital-to-Analog Trim	4-5

APPENDIX A Reference Data

Performance Specifications	A-1
Functional Specifications	A-2
Physical Specifications	A-4
Dimensional Drawings	A-5
Ordering Information	A-6

Section 1 Introduction

Safety Messages	page 1-1
Return of Materials	page 1-2

The Model 1810 is a Flush mount transmitter designed specifically for the pulp and paper industry. The transmitter can be mounted using a welded process coupling and is also compatible with the PASVE™ valve.

This manual provides installation, configuration, and other procedures for the use of the Rosemount Model 1810 Flush Mount Transmitter. Specifications and other important information are also included.

Section 2: Installation

- Mounting
- Installation
- Wiring

Section 3: Configuration

- Basic Setup
- Diagnostics and Services
- Multidrop Communication

Section 4: Operation and Maintenance

- Calibration
- Sensor Trim

Appendix A: Reference Data

- Specifications
- Ordering Information
- Dimensional Drawings

SAFETY MESSAGES

Procedures and instructions in this manual may require special precautions to ensure the safety of the personnel performing the operations. Refer to the safety messages, listed at the beginning of each section, before performing any operations.

Model 1810

RETURN OF MATERIALS

To expedite the return process outside of the United States and Finland, please contact the nearest Rosemount representative.

- Within Finland, please call 358-20-1111-300.
- Within the United States and Canada, call the North American Response Center using the 800-654-RSMT (7768) toll-free number. The Response Center, available 24 hours a day, will assist you with any needed information or materials.

The center will ask for product model and serial numbers, and will provide a Return Material Authorization (RMA) number. The center will also ask for the name of the process material to which the product was last exposed.



Mishandling products exposed to a hazardous substance may result in death or serious injury. If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

The North American Response Center will detail the additional information and procedures necessary to return goods exposed to hazardous substances.



See Safety Messages on page 2-1 for complete warning information.

Section 2 Installation

Safety Messages page 2-1
Mounting page 2-2

This section provides installation instructions for the Model 1810 Flush Mount Transmitter.

SAFETY MESSAGES

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please refer to the following safety messages before performing any operation in this section.

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury:

- Make sure only qualified personnel perform the installation.
- Installation of the weld spud should be performed by a skilled welder using a TIG welder. Improper installation may result in process coupling distortion.
- Excessive heat will destroy the process coupling. Weld in sections, cooling each section with a wet cloth. Allow adequate cooling between passes.

⚠ WARNING

Electrical shock can result in death or serious injury

- Avoid contact with leads and terminals. High voltage that may be present on leads can result in electrical shock.

Model 1810

MOUNTING

The Model 1810 is designed to be mounted directly to the process piping using a process coupling or PASVE™ valve. Mount the transmitter using an existing PASVE™ valve or process coupling or install a new process coupling using the following instructions.

Installing the 1810 transmitter involves:

- Attaching a process coupling to the tapped process vessel
- Attaching the transmitter to the process coupling
- Making electrical connections.

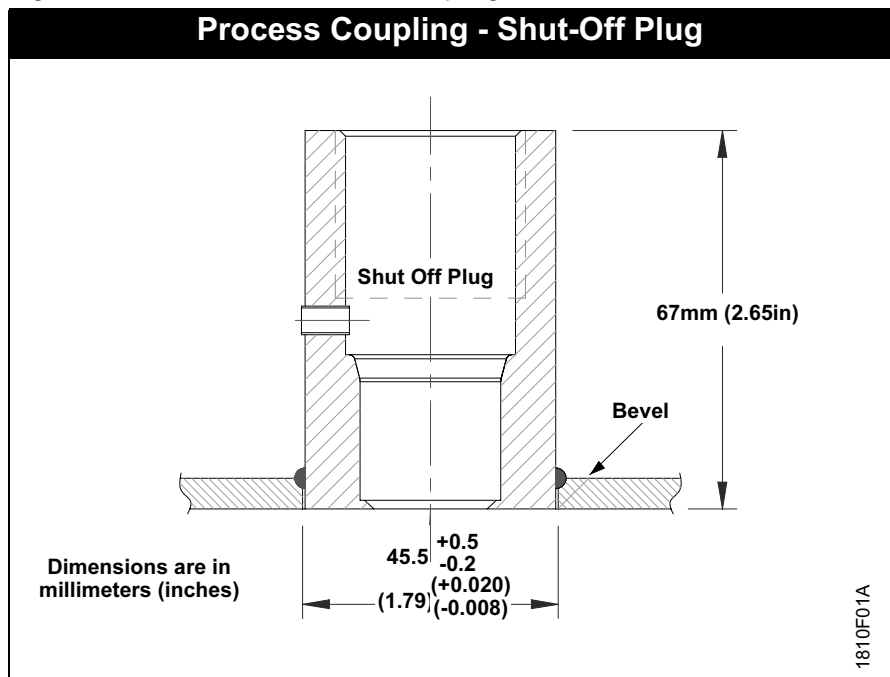
NOTE

If you intend to use an existing process coupling or existing PASVE™ valve, proceed to Transmitter Installation.

Process Coupling

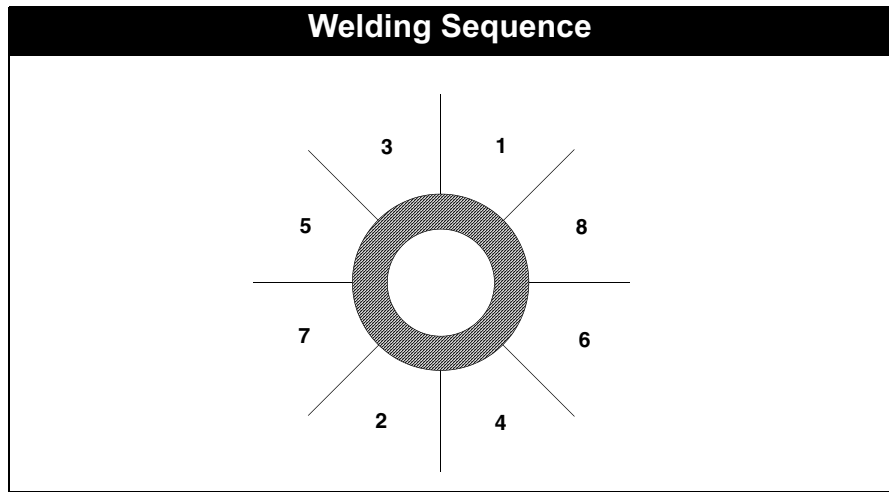
1. Using the appropriate size hole saw, cut a hole in the process vessel to accept the process coupling. The diameter for the process coupling should be $45.5 \text{ mm } +0.5/-0.2 \text{ mm}$ ($1.79 \text{ in } +0.020/-0.008 \text{ in}$). The hole should produce a tight, uniform fit when coupled with the process coupling.
2. Bevel the edge of the vessel hole to accept filler material.
3. Remove the process coupling from the transmitter.
4. Insert the shut-off plug into the process coupling. This will help prevent any distortion due to heat.

Figure 2-1. Model 1810 Process Coupling



5. Position the process coupling in the vessel hole and tack coupling in place using the welding sequence shown in Figure 2-2 on page 2-3. Cool each section with a wet cloth before proceeding to the next section.

Figure 2-2. Model 1810 Welding Sequence



6. Weld the coupling in place using 0.762 to 1.143 mm (0.030 to 0.045 in) stainless steel filler rod as filler in the beveled area. Using between 100 and 125 amps, adjust the amperage for 2.0 mm (0.08 in) penetration.

Transmitter Installation- Process Coupling

1. After the process coupling has cooled, position the transmitter into the process coupling so that the guide groove on the transmitter aligns with the stop pin on the coupling. When the pin and the groove are aligned, the transmitter will not rotate within the process coupling.
2. Using your fingers, tighten the hex nut to ensure that the transmitter is locked into position. In order to eliminate any vibration effects, it is recommended that the nut be tightened with a tool. (Approximately 60 Nm of torque is sufficient.)

Transmitter Installation- PASVE™ Valve

1. Position the transmitter into the PASVE™ valve so that the guide groove on the transmitter aligns with the stop pin on the valve. When the pin and the groove are aligned, the transmitter will not rotate within the valve.
2. Using your fingers, tighten the hex nut to ensure that the transmitter is locked into position. In order to eliminate any vibration effects, it is recommended that the nut be tightened with a tool. (Approximately 60 Nm of torque is sufficient.)


Electrical Considerations

The wiring terminals on the Model 1810 are located in the terminal compartment on the top of the transmitter. Access to these terminations is required during installation and may be necessary during periodic calibration of the transmitter.

Model 1810

Connect Wiring and Power Up

To make connections, perform the following procedure:

-  1. Remove the transmitter housing cover.
2. Connect the positive lead to the terminal marked (+) and the negative lead to the terminal marked (-).
3. To prevent moisture accumulation in the transmitter housing, install wiring (7.5 - 10mm diameter for best results) using the supplied cable gland. Install wiring with a drip loop. Arrange the drip loop so the bottom is lower than the cable gland connections and the transmitter housing.

NOTE

Use only the supplied cable gland for field wiring. Using conduit could result in condensation entering the transmitter housing.

Inductive-based transient protectors, including the Rosemount Model 470, can adversely affect the output of Model 1810 transmitters. Do not use Model 470 for transient protection with a Model 1810.

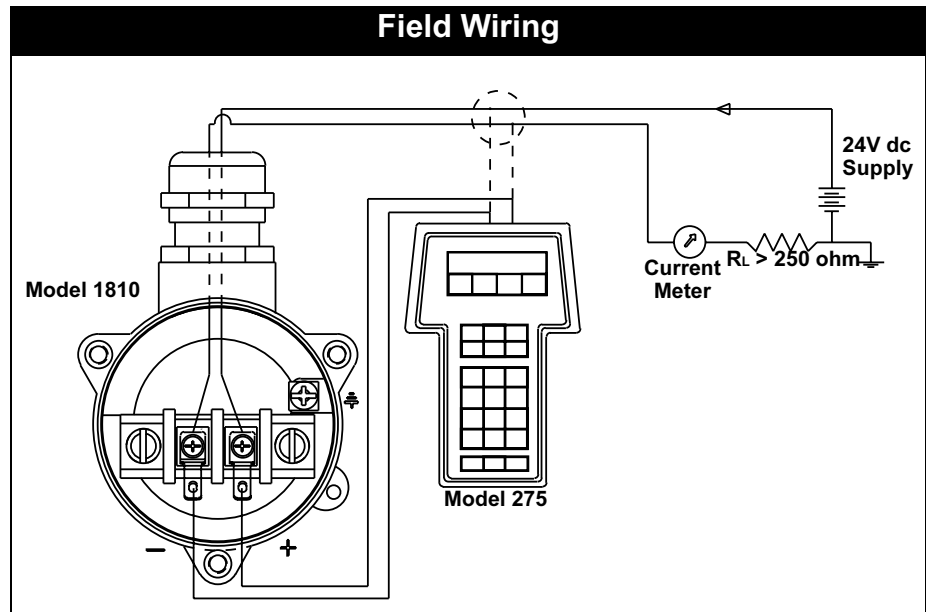
Signal Wiring Grounding

Do not run signal wiring in conduit or open trays with power wiring, or near heavy electrical equipment. Ground the signal wiring at any one point on the signal loop, or leave it ungrounded. The negative terminal of the power supply is a recommended grounding point. Wiring should be shielded in electrically noisy environments to provide additional immunity.

NOTE

A minimum loop resistance of 250 ohms is required to communicate with a HART Communicator. If a single power supply is used to power more than one Model 1810 transmitter, the power supply and circuitry common to the transmitter, should not have more than 20 ohms of impedance at 1200 Hz.

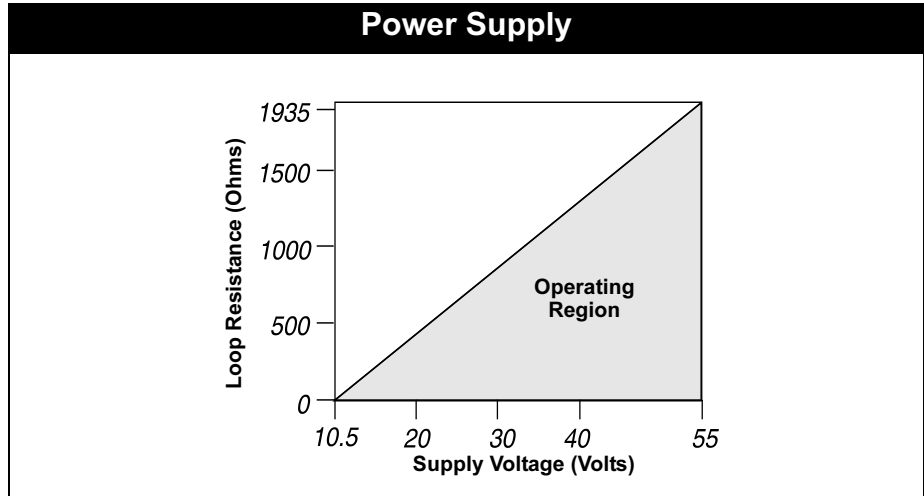
Figure 2-3. Model 1810 Field Wiring



Power Supply

The DC power supply should provide power to the transmitter with less than one percent ripple. The total loop resistance is the sum of the resistance of the signal wires and the resistance load of the controller, indicator and other pieces of equipment in the loop. Figure 2-4 shows the transmitter power supply load limitations.

Figure 2-4. Model 1810 Power Supply



Section 3 Configuration

Safety Messages	page 3-1
Commissioning on the bench With HART	page 3-2
Check Output	page 3-3
Basic Setup	page 3-3
Detailed Setup	page 3-5
Diagnostics and Service	page 3-5
Advanced Functions for HART Protocol	page 3-6
Multidrop Communication	page 3-7

OVERVIEW

This section contains information on commissioning and tasks that can be performed on the bench prior to installation or in the field after installation. This section contains Model 1810 configuration information only.

HART™ Communicator instructions are given to perform configuration functions. For convenience, HART Communicator fast key sequences are labeled “Fast Keys” for each software function below the appropriate headings.

SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

Warnings

⚠ WARNING

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

Model 1810

COMMISSIONING ON THE BENCH WITH HART

Commissioning consists of testing the transmitter and verifying transmitter configuration data. The Model 1810 can be commissioned either before or after installation. Commissioning the transmitter on the bench before installation using a Model 275 HART Communicator ensures that all transmitter components are in working order.

To commission on the bench, connect the transmitter and the HART Communicator. Connect HART Communicator leads at any termination point in the signal loop.

The power supply must provide 10.5 to 55 V dc at the transmitter terminals, and a current meter to measure output current are required to commission the Model 1810. To enable communication, a resistance of at least 250 ohms must be present between the HART Communicator loop connection and the power supply.

When using a HART Communicator, any configuration changes made must be sent to the transmitter by using the "Send" key (F2).

For more information on the Model 275 HART Communicator see document 00275-8026-0002.

Setting the Loop to Manual

Whenever sending or requesting data that would disrupt the loop or change the output of the transmitter, set the process application loop to manual. The HART Communicator will prompt you to set the loop to manual when necessary. Acknowledging this prompt does not set the loop to manual. The prompt is only a reminder; set the loop to manual as a separate operation.

Wiring

Bench Hook-up

Connect the bench equipment and turn on the HART Communicator by pressing the ON/OFF key. The HART Communicator will search for a HART-compatible device and indicate when the connection is made.

Review

HART Fast Keys	1,5
----------------	-----

Review the transmitter configuration parameters set at the factory to ensure accuracy and compatibility with your particular application. After activating the review function, scroll through the data list to check each variable. Refer to "Basic Setup" on page 3-3 in this section of the manual if a change to the transmitter configuration data is necessary.

CHECK OUTPUT

HART Fast Keys	1,1
----------------	-----

Before performing other on-line operations, review the digital output parameters to ensure that the transmitter is operating properly and is configured to the appropriate process variables.

The process variables for the Model 1810 provide the transmitter output, and are continuously updated. The *Process Variables* menu displays the following process variable:

- Pressure
- Percent Range
- Analog Output
- Sensor Temperature

BASIC SETUP

From the *Basic Setup* menu you can configure the transmitter for certain basic variables. In most cases, all of these variable are pre-configured at the factory.

Tag

HART Fast Keys	1, 3, 1
----------------	---------

The *Tag* variable is the easiest way to identify and distinguish between transmitters in multi-transmitter environments. Use this variable to label transmitters electronically according to the requirements of your application. The tag you define is automatically displayed when a HART-based communicator establishes contact with the transmitter at power-up. The tag may be up to eight characters long and has no impact on the output of the transmitter.

Model 1810

Output Units

HART Fast Keys	1,3,2
----------------	-------

The *Unit* command sets the desired primary variable units. See the transmitter output to one of the following engineering units:

- inH₂O
- inHg
- ftH₂O
- mmH₂O
- mmHg
- psi
- bar
- mbar
- g/cm²
- kg/cm²
- Pa
- kPa
- torr
- atm
- inH₂O @ 4°C
- mmH₂O @ 4°C

Rerange

HART Fast Keys	1,3,3
----------------	-------

The Range Values command sets the 4 and 20 mA points (lower and upper range values). Setting the range values to the limits of expected readings maximizes transmitter performance; the transmitter is most accurate when operated within the expected pressure ranges for your application. In practice, you may reset the transmitter range values as often as necessary to reflect changing process conditions.

You may use either of two different methods to rerange the transmitter. Each method is unique; examine both closely before deciding which method to use.

Method 1: Rerange

Reranging using only the communicator is the easiest and most popular way to rerange the transmitter. This method changes the values of the analog 4 and 20 mA points independently without a pressure input.

To rearrange using only the communicator enter the fast-key sequence above, select *1: Keypad input*, and follow the on-line instructions. Or, enter the values directly from the HOME screen.

Method 2: Rerange using the communicator and pressure source or process pressure

When specific 4 and 20 mA points are not known, the transmitter can be reranged using the communicator and a pressure source. This method changes the values of the analog 4 and 20 mA points. When you set the 4 mA point the span is maintained; when you set the 20 mA point the span changes. To rerange using the HART communicator and a pressure source, use the fast key sequence and select *2: Apply Values* and proceed following the instructions provided by the communicator.

Damping

HART Fast Keys	1, 3, 6
----------------	---------

The *Damping* command changes the response time of the transmitter to smooth variations in output readings caused by rapid changes in input. Determine the appropriate damping setting based on the necessary response time, signal stability, and other requirements of the loop dynamics of your system. The default damping value is 0.40 seconds and can be reset in fixed increments of 0.05, 0.10, 0.20, 0.40, 0.80, 1.60, 3.20, 6.40, 12.8, and 25.6 seconds.

DETAILED SETUP

Failure Mode Alarm and Saturation

The Model 1810 transmitter automatically and continuously perform self-diagnostic routines. If the self-diagnostic routines detect a failure, the transmitter drives the output to the standard high alarm value of 21.75mA. The transmitter will also drive the output to configured saturation values if the applied pressure goes outside the 4-20 mA range values.

DIAGNOSTICS AND SERVICE

Test Device

HART Fast Keys	1, 2, 1, 1
----------------	------------

The *Test Device* command initiates a more extensive diagnostic routine than that performed continuously by the transmitter. If the transmitter test detects a problem, the communicator displays messages to indicate the source of the problem.

Loop Test

HART Fast Keys	1, 2, 2
----------------	---------

The *Loop Test* command verifies the output of the transmitter, the integrity of the loop, and the operations of any recorders or similar devices installed in the loop. To initiate a loop test, perform the following procedure:

1. Connect a reference meter to the transmitter. Connect a current meter in series with the signal loop, or shunt the power to the transmitter through the meter at some point in the loop.
2. From the HOME screen, select *1 Device setup, 2 Diagnostics and Service, and 2 Loop Test*, to prepare for a loop test.
3. Select OK after you set the control loop to manual. The communicator displays the loop test menu.
4. Select a discreet milliamp level for the transmitter to output. At the Choose Analog Output prompt, select *1: 4mA, 2: 20mA*, or select *3: Other* to manually input a value between 4 and 20 milliamps.
5. Check the current meter installed in the test loop to verify that it reads the value you commanded the transmitter to output. If the readings do not match, the transmitter requires a D/A trim or the current meter is malfunctioning.

After completing the test procedure, the display returns to the loop test screen and allows you to choose another output value.

Model 1810

ADVANCED FUNCTIONS FOR HART PROTOCOL

Saving, Recalling, and Cloning Configuration Data

Fast Keys	left arrow, 1, 2
-----------	------------------

Use the cloning feature of the HART Communicator to configure several Model 1810 transmitters similarly. Cloning involves configuring a transmitter, saving the configuration data, then sending a copy of the data to a separate transmitter. Several possible procedures exist when saving, recalling, and cloning configuration data. For complete instructions refer to the HART Communicator manual (publication no. 00809-0100-4275). One common method is as follows:

1. Completely configure the first transmitter.
2. Save the configuration data:
 - a. Select **F2 SAVE** from the HART Communicator **HOME/ONLINE** screen.
 - b. Ensure that the location to which the data will be saved is set to **MODULE**. If it is not, select *1: Location* to set the save location to **MODULE**.
 - c. Select *2: Name*, to name the configuration data. The default is the transmitter tag number.
 - d. Ensure that the data type is set to **STANDARD**. If the data type is **NOT STANDARD**, select *3: Data Type* to set the data type to **STANDARD**.
 - e. Select **F2 SAVE**.
3. Connect and power the receiving transmitter and HART Communicator.
4. Select the back arrow from the **HOME/ONLINE** screen. The HART Communicator menu appears.
5. Select *1: Offline, 2: Saved Configuration, 1: Module Contents* to reach the **MODULE CONTENTS** menu.
6. Use the **DOWN ARROW** to scroll through the list of configurations in the memory module, and use the **RIGHT ARROW** to select and retrieve the required configuration.
7. Select *1: Edit*.
8. Select *1: Mark All*.
9. Select **F2 SAVE**.
10. Use the **DOWN ARROW** to scroll through the list of configurations in the memory module, and use the **RIGHT ARROW** to select the configuration again.
11. Select *3: Send* to download the configuration to the transmitter.
12. Select **OK** after the control loop is set to manual.
13. After the configuration has been sent, select **OK** to acknowledge that the loop can be returned to automatic control.

When finished, the HART Communicator informs you of the status. Repeat Steps 3 through 13 to configure another transmitter.

NOTE

The transmitter receiving cloned data must have the same software version (or later) as the original transmitter.

Burst Mode

HART Fast Keys	1, 4, 3, 3, 3
----------------	---------------

Burst Mode sets the transmitter to maintain digital contact with a Digital Control System that has custom software to support burst mode. When the Model 1810 Smart is configured for burst mode, it provides faster digital communication from the transmitter to the control system by eliminating the time required for the control system to request the information from the transmitter.

Burst Mode is compatible with use of the analog signal. The HART protocol features simultaneous digital and analog data transmission which allows the analog output to drive other equipment in the loop while the control system is receiving digital information. Burst mode applies only to the transmission of dynamic data (pressure and temperature in engineering units, pressure in percent of range, and/or analog output in mA), and does not affect the way other transmitter data is accessed.

Access to information other than dynamic transmitter data is obtained through the normal poll/response method of HART communication. A HART-based communicator or the control system may request any of the information that is normally available while the transmitter is in burst mode. Between each message sent by the transmitter, a short pause allows the HART-based communicator or a control system to initiate a request. The transmitter will receive the request, process the response message, and then continue 'bursting' the data approximately three times per second.

To configure the transmitter for burst mode, perform the following step:

1. From the HOME screen, enter the fast key sequence shown.
2. Select "ON" from the burst mode selection screen.

MULTIDROP COMMUNICATION

Multidropping transmitters refers to the connection of several transmitters to a single communications transmission line. Communication between the host and the transmitters takes place digitally with the analog output of the transmitters deactivated. With the HART communications protocol, up to 15 transmitters can be connected on a single twisted pair of wires.

NOTE

The Burst Mode Operation is not compatible with multidrop communications.

The application of a multidrop installation requires consideration of the update rate necessary from each transmitter, the combination of transmitter models, and the length of the transmission line. Communication with the transmitters can be accomplished with commercially available Bell 202 modems and a host implementing the HART protocol. Each transmitter is identified by a unique address (1-15) and responds to the commands defined in the HART protocol.

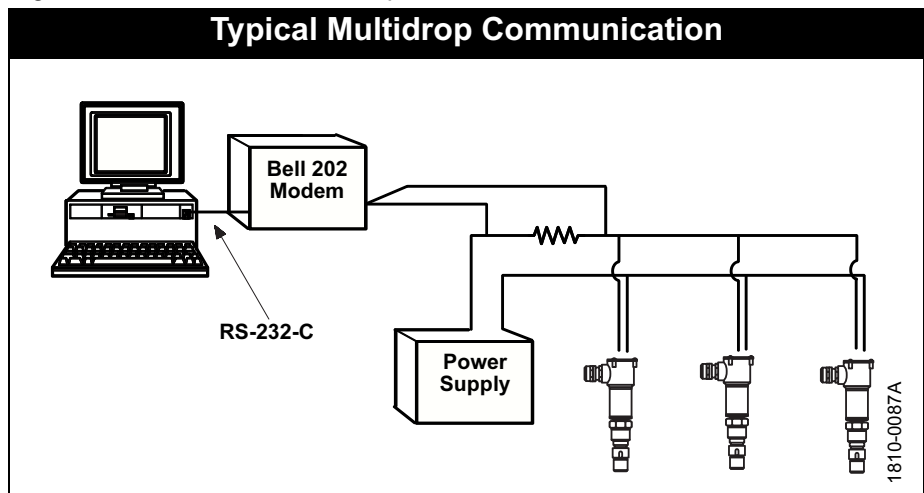
The following drawing shows a typical multidrop network. This figure is not intended as an installation diagram. Contact Rosemount product support with specific requirements for multidrop applications.

HART-based communicators can test, configure, and format a multidropped transmitter the same way as a transmitter in a standard point-to-point installation.

NOTE

The transmitter is set to address 0 at the factory, allowing it to operate in the standard point-to-point manner with a 4-20 mA output signal. To activate multidrop communications, you must change the transmitter address to a number from 1 to 15. This change deactivates the 4-20 mA analog output, locking it to 4 mA.

Figure 3-1. Model 1810 Multidrop Communication



NOTE

A minimum loop resistance of 250 ohms is required to communicate with a HART Communicator. If a single power supply is used to power more than one Model 1810 transmitter, the power supply and circuitry common to the transmitter, should not have more than 20 ohms of impedance at 1200 Hz.

Changing the transmitter address

HART Fast Keys	1, 4, 3, 3, 1
----------------	---------------

To activate multidrop communication, the transmitter poll address must be assigned a number from 1 to 15, and each transmitter in a multidropped loop must have a unique poll address.

HART Communicator

From the **HOME** screen, enter the fast key sequence shown.

Communicating with a multidropped transmitter

HART Fast Keys	Left Arrow, 4, 1,1
----------------	--------------------

HART Communicator

To communicate with a multidropped transmitter, configure the HART Communicator to poll for a non-zero address.

1. From the **HOME** screen, enter the fast key sequence shown.
2. On the polling menu, scroll down and select "Digital Poll." In this mode, the HART Communicator automatically polls for devices at addresses 0-15 upon start up.

Polling a multidropped transmitter

HART Fast Keys	Left Arrow, 4, 1, 1
----------------	---------------------

HART Communicator

From the **HOME** screen, enter the fast key sequence shown.

NOTE

The Model 275 HART Communicator requires you to use to the Utility Menu to perform an auto poll. This menu is available from the Main Menu of the HART Communicator. Press the left arrow to move from the Online Menu to the Main Menu. Press 4 from the Main Menu to access the Utility Menu.

Model 1810

Section 4 Operation

Calibration	page 4-1
Sensor Trim	page 4-3
Recall Factory Trim	page 4-4
Analog Output Trim	page 4-5

CALIBRATION

Calibrating the transmitter increases the precision of your measurement system. You may use one or more of a number of trim functions when calibrating.

To understand the trim functions, it is necessary to understand that Smart transmitters operate differently from analog transmitters. An important difference is that Smart transmitters are factory-characterized; they are shipped with a standard sensor curve stored in the transmitter firmware. In operation, the transmitter uses this information to produce a process variable output, in engineering units, dependent on the sensor input. The trim functions allow you to make corrections to the factory-stored characterization curve by digitally altering the transmitter's interpretation of the sensor input.

The trim functions should not be confused with the rerange functions. Although the rerange command matches a sensor input to a 4-20 mA output-as in conventional calibration - it does not affect the transmitter's interpretation of the input.

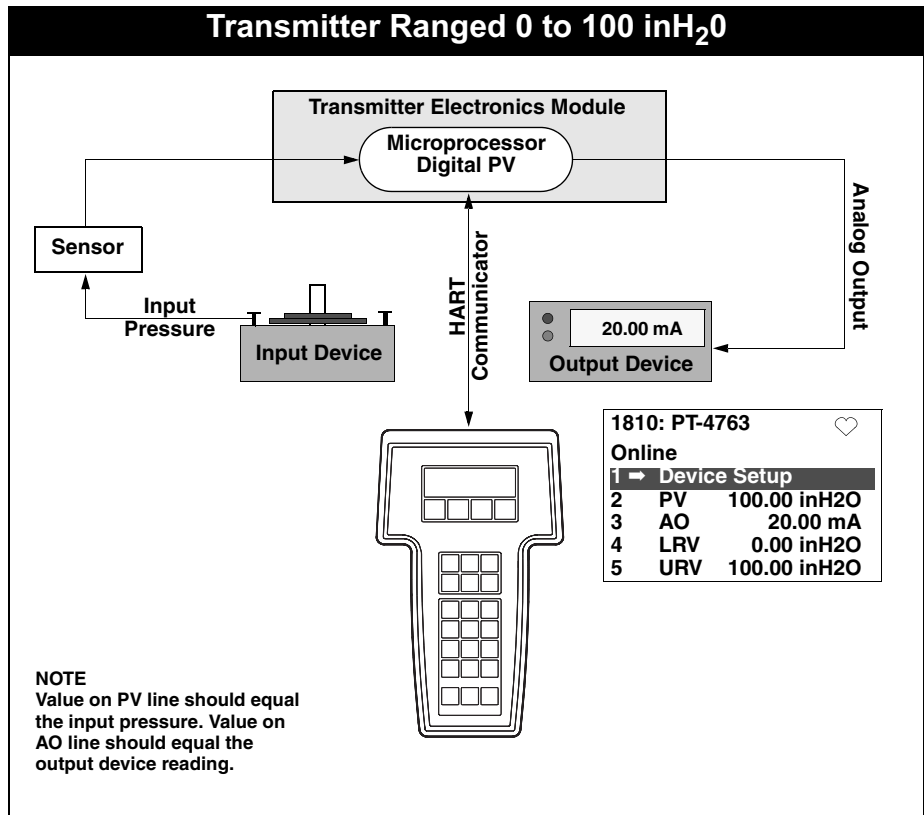
Calibration Overview

Complete calibration of the Model 1810 Flush Mount Transmitter involves one or more of the following tasks:

Configure the analog output parameters

- Set process variable units (See Review on page 3-3)
- Set output type (See Output Units on page 3-4)
- Rerange (See Rerange on page 3-4)
- Set damping (See Damping on page 3-5)

Figure 4-1. Model 1810 Transmitter Range



Calibrate the Sensor

- Full Trim (See Full Trim on page 4-4)
- Zero Trim (Zero Trim on page 4-3)

Calibrate the 4-20 mA output

- Digital to analog trim (See Digital-to-Analog Trim on page 4-5)
- Scaled digital to analog trim (See Scaled Digital-to-Analog Trim on page 4-5)

Figure 4-1 on page 4-2 illustrates the Model 1810 Flush Mount Transmitter data flow. This data flow can be summarized in four major steps:

1. A change in pressure is measured by a change in the sensor output (Sensor Signal).
2. The sensor signal is converted to a digital format that can be understood by a microprocessor (Analog to Digital Signal Conversion).
3. Corrections are performed in the microprocessor to obtain a digital representation of the process input (Digital PV).
4. The Digital PV is converted to an analog value (Digital-to-Analog Signal Conversion).

Deciding which trim procedure to use

Follow the steps below to determine whether the analog-to-digital section or the digital-to-analog section of the transmitter electronics is in need of calibration.

1. Connect a pressure source, a HART communicator, and a digital readout device to the transmitter.
2. Establish communication between the transmitter and the communicator.
3. Apply pressure.
4. Compare the applied pressure to the Process Variable (PV) line on the Communicator Online Menu. If the PV reading on the communicator does not match the applied pressure, and you are certain your test equipment is accurate, perform a sensor trim.
5. Compare the Analog Output (AO) line on the communicator online menu to the digital readout device. If the AO reading on the communicator does not match the digital readout device, and you are certain that your test equipment is accurate, perform an output trim.

SENSOR TRIM

You can trim the sensor using either a full trim or the zero trim function. The trim functions vary in complexity, and their use is application dependent. Both alter the transmitter's interpretation of the input signal.

Zero Trim

HART Fast Keys	1, 2, 3, 3, 1
----------------	---------------

A *Zero Trim* is a single-point adjustment. It is useful for compensating for mounting position effects, and is most effective when performed with the transmitter installed in its final mounting position. Since this correction maintains the slope of the characterization curve, it should not be used in place of a full trim over the full sensor range.

NOTE

Use full trim on absolute transmitters; do not use zero trim.

To calibrate the sensor using the Zero Trim function, perform the following procedure:

1. Vent the transmitter and attach a communicator to the measurement loop.
2. From the HOME screen select *1: Device setup, 2: Diagnostics and service, 3: Calibration, 3: Sensor Trim, 1: Zero trim* to prepare and adjust the zero trim.
3. Follow the commands provided by the communicator to complete the adjustment of the zero trim.

Model 1810

Full Trim

HART Fast Keys	1, 2, 3, 3
----------------	------------

A *Full Trim* is a two-point sensor calibration where two end-point pressures are applied, and all output is linearized between them. You should always adjust the low trim value first to establish the correct offset. Adjustment of the high trim value provides a slope correction to the characterization curve based on the low trim value. The factory-established characterization curve is not changed by this procedure. The trim values allow you to optimize performance over your specified measuring range at the calibration temperature.

To calibrate the sensor using the Full Trim function, perform the following procedure:

1. Assemble and power the entire calibration system including a transmitter, communicator, power supply, pressure input source, and readout device.

NOTE

Use a pressure input source that is at least three times more accurate than the transmitter, and allow the input values to stabilize for 10 seconds before entering any values.

2. From the communicator menu select *1: Device setup, 2: Diagnostics and service, 3: Calibration, 3: Sensor trim, 2: Lower sensor trim* to prepare and adjust lower trim point.

NOTE

Do not attempt to obtain reverse output by reversing the high and low points. The transmitter allows approximately a 5% URL deviation from the characterization curve established at the factory.

3. Follow the commands provided by the communicator to complete the adjustment of the lower value.
4. Repeat the procedure for the upper value, replacing *2: Lower sensor trim* with *3: Upper sensor trim* in Step 2.

RECALL FACTORY TRIM

The Recall Factory Trim commands allow the restoration of the as-shipped factory settings of the sensor trim and analog output trim.

Recall Factory Trim— Sensor Trim

Fast Keys	1, 2, 3, 4, 1
-----------	---------------

This command resets the transmitter sensor trim to the “as shipped” factory settings. The Recall Factory Trim—Sensor Trim command can be useful for recovering from an inadvertent zero trim of an absolute pressure unit or inaccurate pressure source.

Recall Factory Trim— Analog Output

Fast Keys	1, 2, 3, 4, 2
-----------	---------------

This command resets the transmitter analog output trim to the “as shipped” factory settings. The Recall Factory Trim—Analog Output command can be useful for recovering from an inadvertent trim, incorrect Plant Standard or faulty meter.

ANALOG OUTPUT TRIM

The *Output Trim* commands allow you to alter the transmitter's conversion of the input signal to a 4-20 mA output (See Check Output on page 3-3). You can trim the transmitter output using either the digital to analog trim or the scaled digital to analog trim function.

Digital-to-Analog Trim

HART Fast Keys	1, 2, 3, 2, 1
----------------	---------------

To perform a *Digital-to-Analog Trim*, perform the following procedure:

1. From the **HOME** screen, select *1: Device setup, 2: Diag/Service, 3: Calibration, 2: Analog output trim, 1: D/A trim*. Select **OK** after you set the control loop to manual.
2. Connect an accurate reference meter to the transmitter at the **Connect reference meter** prompt. Connect the meter in series with the signal loop, or shunt the transmitter power through the reference meter at some point.
3. Select **OK** after connecting the reference meter.
4. Select **OK** at the Setting fld dev output to 4 mA prompt. The transmitter outputs 4.00 mA.
5. Record the actual value from the reference meter, and enter it at the Enter Meter Value prompt. The communicator prompts you to verify whether or not the output value equals the value on the reference meter.
6. Select *1: Yes* if the reference meter value equals the transmitter output value, or *2: No* if it does not.

NOTE

If you selected *1 Yes*, proceed to step 7.
If you selected *2 No*, repeat step 5.

7. Select **OK** at the Setting fld dev output to 20 mA prompt, and repeat steps 5 and 6 until the reference meter equals the transmitter output value.

Select **OK** after you return the control loop to automatic control.

Scaled Digital-to-Analog Trim

HART Fast Keys	1, 2, 3, 2, 2
----------------	---------------

The *Scaled Digital-to-Analog Trim* command matches the 4 and 20 mA points to user-selectable reference scale other than 4 and 20 mA. To perform a scaled D/A trim, connect an accurate reference meter to the transmitter and trim the output signal to scale as outlined in the Scaled Output Trim procedure.

Model 1810

Appendix A Reference Data

Performance Specifications	page A-1
Functional Specifications	page A-2
Physical Specifications	page A-4
Dimensional Drawings	page A-5
Ordering Information	page A-6

PERFORMANCE SPECIFICATIONS

Conformance to specifications (± 3 Sigma)

Technology leadership, advanced manufacturing techniques and statistical process control ensure specification conformance to at least ± 3 sigma.

Reference Accuracy

For zero-based spans, reference conditions, silicone oil fill, SST materials, standard process connection, and digital trim values set to equal range points.

Includes the effects of nonlinearity, hysteresis, and repeatability

Range 1: $\pm 0.15\%$ of span for spans of 1:1 to 7.5:1

Ranges 2, 3, 4: $\pm 0.1\%$ of span for spans 1:1 to 10:1

Long Term Stability

$\pm 0.1\%$ URL per year

Ambient Temperature Effect per 50°C (90°F)

$\pm (0.25\% \text{ URL} + 0.25\% \text{ span})$ per 50°C

Vibration Effect

Less than $\pm 0.1\%$ of URL when tested per the requirements of IEC60770-1 field or pipeline with high vibration level (10-60 Hz 0.21mm peak to peak displacement / 60-2000 Hz 3g)

Power Supply Effect

Less than $\pm 0.005\%$ of calibrated span per volt

RFI Effects

$\pm 0.1\%$ of span from 20 to 1000 MHz and for field strength up to 10 V/m

FUNCTIONAL SPECIFICATIONS

Range and Sensor Limits

Model 1810 Range and Sensor Limits				
Range	Minimum Span	Upper (URL)	Lower (LRL) (Abs.)	Lower ⁽¹⁾
1	4 psi (27.6 kPa)	30 psi (207 kPa)	0 psia (0 kPa)	-14.7 psig (-101.3 kPa)
2	15 psi (103 kPa)	150 psi (1034 kPa)	0 psia (0 kPa)	-14.7 psig (-101.3 kPa)
3	80 psi (552 kPa)	800 psi (5,516 kPa)	0 psia (0 kPa)	-14.7 psig (-101.3 kPa)
4	250 psi (1,724 kPa)	2500 psi (17,237 kPa)	0 psia (0 kPa)	-14.7 psig (-101.3 kPa)

(1) Assume atmospheric pressure of 14.7 psig.

Overpressure Limits

Range 1: 750 psi (5,170 kPa)

Range 2: 1,500 psi (10,342 kPa)

Range 3: 1,600 psi (11,032 kPa)

Range 4: 3,750 psi (25,855 kPa)

Burst Pressure

Ranges 1-4: 11,000 psi (75,842 kPa)

Service

Liquid, gas, slurry, and vapor applications

4-20 mA (output code A)

Zero and Span Adjustment

Zero and span values can be set anywhere within the range.

Span must be greater than or equal to the minimum span.

Output

Two-wire 4-20 mA output. Digital process variable superimposed on 4-20 mA signal, available to any host that conforms to the HART protocol.

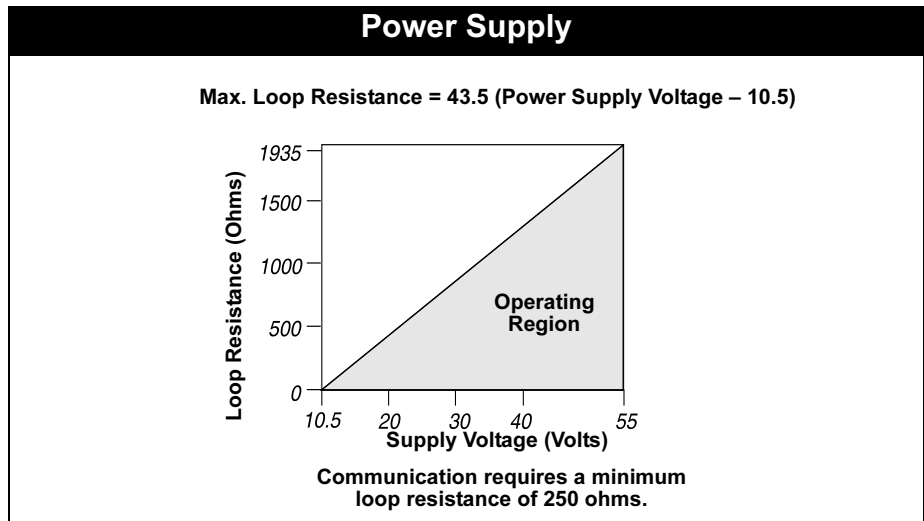
Power Supply

External power supply required. Transmitter operates on 10.5 to 55.0 V dc with no load.

Load Limitations

Maximum loop resistance is determined by the voltage level of the external power supply, as described by Figure A-1 on page A-3.

Figure A-1. Model 1810 Power Supply



Temperature Limits

Ambient

Silicone and Inert: -40 to 85 °C (-40 to 185 °F)
Neobee: -20 to 85 °C (-4 to 185 °F)

Storage

Silicone and Inert: -46 to 110 °C (-50 to 230 °F)
Neobee: -30 to 85°C (-22 to 185°F)

Process Temperature Limits

Silicone: -40 to 121°C (-40 to 250°F)
Inert: -30 to 121°C (-22 to 250°F)
Neobee: -20 to 140°C (-4 to 284°F)

Humidity Limits

0–100% relative humidity

Turn-On Time

Performance within specifications less than 2.0 seconds after power is applied to the transmitter

Damping

The default damping value is 0.40 seconds and can be reset in fixed increments of 0.05, 0.10, 0.20, 0.40, 0.80, 1.60, 3.20, 6.40, 12.8, and 25.6 seconds.

Failure Mode Alarm

HART/4-20mA (output code A)

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven off scale to alert the user. The Model 1810 provides a high alarm value of ≥ 21.75 mA.

Model 1810

PHYSICAL SPECIFICATIONS

Electrical Connections

M20 × 1.5 (CM20) for use with supplied cable gland (use 7.5 - 10mm diameter for best results). HART interface connections fixed to terminal block for output code A.

Process Connections

- PASVE™ valve compatible process connection
- Welded process coupling

Process-Wetted Parts

Process Isolating Diaphragms

316L SST, *Hastelloy C-276*®

Non-Wetted Parts

Electronics Housing

316L SST
NEMA 4X

Sensor Module Fill Fluid

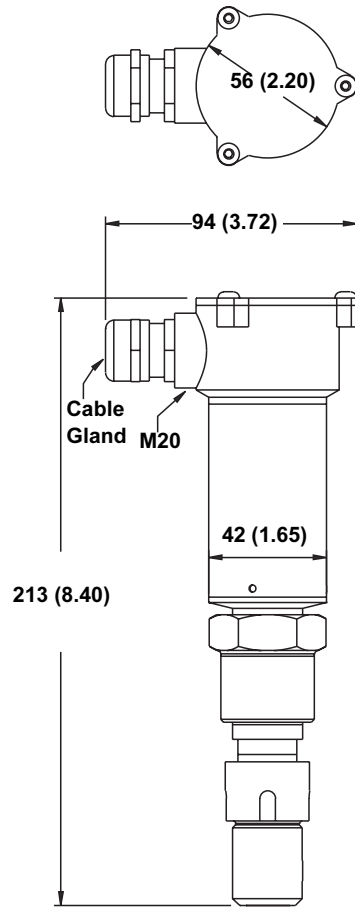
Silicone (standard)
Inert (optional ordering code)
Neobee (optional ordering code)

Shipping Weights for Model 1810

2.2lb (1 kg)

**DIMENSIONAL
DRAWINGS**

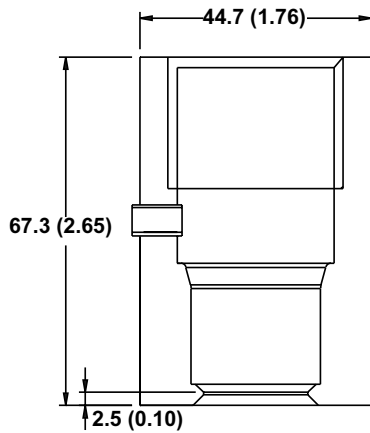
Model 1810 Flush Mount Transmitter



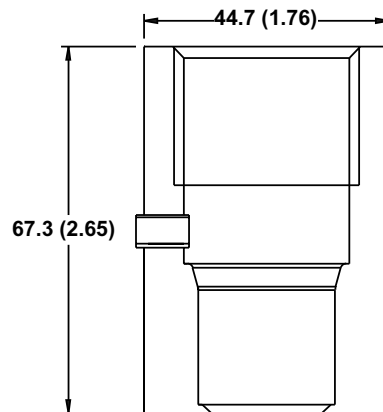
NOTE
Dimensions are in
millimeters (inches)

1810C01A

Standard Coupling



Hygienic Coupling



Model 1810

ORDERING INFORMATION

Model	Transmitter Type
1810	Flush Mount Transmitter
Code	Measurement Type
G	Gauge
A	Absolute
Code	Pressure Range
1	30 psi (207 kPa)
2	150 psi (1034 kPa)
3	800 psi (5,516 kPa)
4	2500 psi (17,237 kPa)
Code	Isolating Diagram/Process Connection Material
2	316L SST
3	Hastelloy C [®] -276
Code	Process Coupling Style
D00	No Coupling
D01	Hygienic, 316L SST
D02	Hygienic, Hastelloy
D11	Standard 316L SST
D12	Standard Hastelloy
Code	Output
A	4-20 mA HART [®] protocol
Code	Electrical Connection
2B	Terminal Box, M20
Code	Options
A1	Shut-off Plug
C1	Calibration Data Sheet
L0	Neobee Oil Fill
L1	Inert Oil Fill
Q4	Calibration Certificate
Q8	Material traceability certificate per EN 10204-3.1B
Q31	Certificate of Compliance according to EN10204-2.1
Q32	Test Report according to EN10204-2.2
Typical Model Number: 1810 A 2 2 D11 A 2B A1	

Reference Manual

00809-0100-4020, Rev BA
September 2002

Model 1810

*Rosemount and the Rosemount logotype are registered trademarks of Rosemount Inc.
PlantWeb is a mark of one of the Emerson Process Management companies.
All other marks are the property of their respective owners.
HART is a registered trademark of the HART Communication Foundations.
Foundation is a trademark of the Fieldbus Foundation.
Hastelloy and Hastelloy C are registered trademarks of Haynes International.
PASVE is a trademark of the Satron Instruments Inc.
Monel is a registered trademark of International Nickel Co.
Cover photo: 1810-1810h0101.tif*

Emerson Process Management

Rosemount Inc.

8200 Market Boulevard
Chanhassen, MN 55317 USA
T (U.S.) 1-800-999-9307
T (International) (952) 906-8888
F (952) 949-7001

Fisher-Rosemount Oy Finland

Pakkalankuja 6
FIN 01510 Vantaa
Finland
T (358) 201 111 200
F (358) 201 111 250

Fisher-Rosemount Singapore Pte, Ltd.

1 Pandan Crescent
Singapore 128461
T (65) 777-8211
F (65) 777-0947

www.rosemount.com

