



PAPER MACHINE COMPONENTS, INC.

SMART PRESSURE/LEVEL TRANSMITTER INSTALLATION & OPERATING DATA

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PMC® FAMILY OF SMART TRANSMITTERS

INTRODUCTION

The PMC SMT-EL Hart® Protocol Smart pressure and level transmitter combines state-of-the-art temperature compensated capacitive sensor technology with microprocessor-based electronics to provide remote digital communications using a Hart Model 275 Communicator.

The transmitter can be used with a suitable receiver to record, indicate, and/or control a process variable. Its compact size and light weight make the instrument very adaptable to a great variety of applications.

GENERAL DESCRIPTION

The PMC Pressure and Level Transmitter consists of three major modules: the capacitive ceramic pressure sensor, the LCD display, and the microprocessor-electronic module (Smart system).

The pressure sensor requires 5 VDC supply to operate and puts out .5 VDC at zero pressure and 4.5 VDC at maximum pressure. The output voltage is proportional to the pressure applied to the sensor.

The LCD display is a 3.5 digit serial interface device which is controlled by the electronic system. Incorporated in the display are manual push button switches, one for zero and one for span, which are accessible by removing the display cover.

Standard Specifications

Operative Limits

Process Temperature	-30°C to +100°C -40°F to +250°F*
Ambient Temperature	-40°C to 85°C -40°F to +185°F
Relative Humidity	0 to 100%
Supply Voltage	24 VDC nominal supply
** Output Load	550 ohms (at 24 VDC supply)
Mounting Position	No Limit

*Process temperatures above 185°F require derating the ambient temperature limits by a 1.5:1 ratio.

$$\text{Max ambient temp. in } ^\circ\text{F} = 185^\circ - \frac{\text{process temp} - 185^\circ}{1.5}$$

** A 250-ohm minimum load is required for proper digital communication.

Span and Range Limits:

0-1 bar abs.	0-2 bar (0-30psig)
-1 bar to 0 vacuum	0-4 bar (0-60 psig)
0-.2 bar (0-3psig)	0-10 bar (0-150psig)
0-1 bar (0-15psig)	0-20 bar (0-300psig)

Maximum Working Pressure:

The maximum working pressure is the upper range limit of each sensor. A 5% overload is possible without losing sensor linearity.

Turndown:

10:1 capability maintaining excellent linearity and accuracy.

Output Signal:

4 to 20 mA or digital
(software selectable)
Field wiring reversal
Accidental reversal of field wiring will not damage the transmitter.

Power-Up Time:

Less than one second to reach 3.5 mA and then at the present (software selectable) damping rate to reach measured variable value.

Adjustable damping from .2 sec. to 25 sec. in .1 sec. increments.

Figure 2-1 Connecting a Communicator to a Transmitter Loop

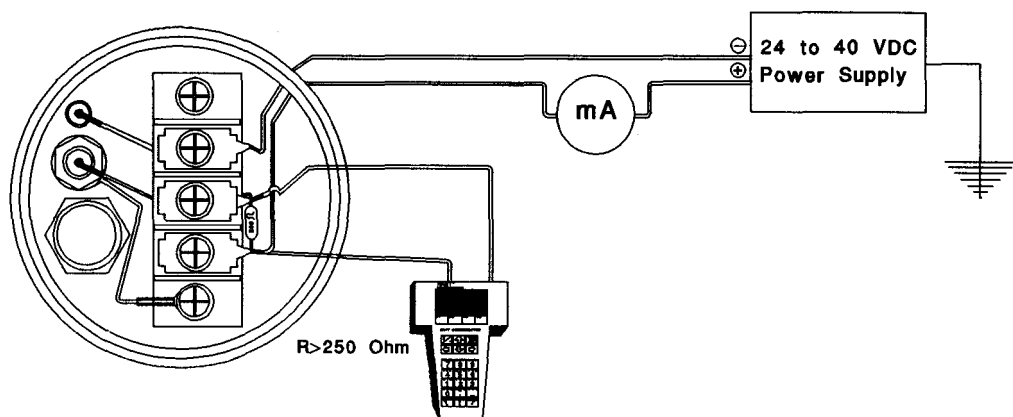
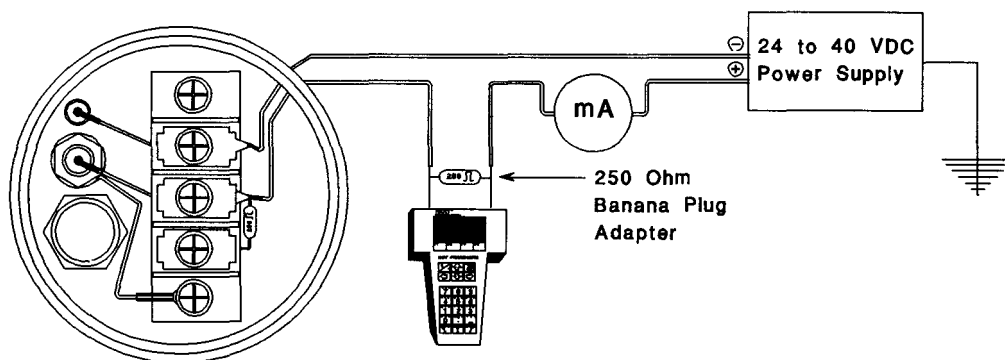


Figure 2-1.1 Alternate Connection Method



COMMISSION: ON THE BENCH OR IN THE LOOP

Commission the PMC SMART transmitter before or after installation. It may be useful to commission the transmitter on the bench before installation to ensure proper operation, to familiarize yourself with transmitter functionality, and to avoid exposing the transmitter electronics to the plant environment. Commissioning consists of reviewing configuration data, setting output units, setting the 4 and 20 mA points, configuring the transmitter for any non-standard accessories or functions, and testing the transmitter output.

COMMISSIONING THE SMART TRANSMITTER - Set up the Smart Transmitter using the Communicator

To configure the smart transmitter on the bench, connect the transmitter and the communicator as shown in Figure 2-1. To power the transmitter, you will need a power supply capable of providing 24 to 40 VDC and a meter to measure output current. To enable communication, a resistance of at least 250 ohms must be present between the communicator loop connection and the power supply. You can connect the communicator leads at any termination point in the signal loop, but it is most convenient to connect them to the terminals on the terminal block as shown in figure 2-1.

After you connect the bench equipment as shown in Figure 2-1, turn on the communicator by pressing the ON/OFF key. The communicator will search for a HART-compatible device and will indicate when the connection is made. If the connection is not made, the communicator will indicate that no device was found.

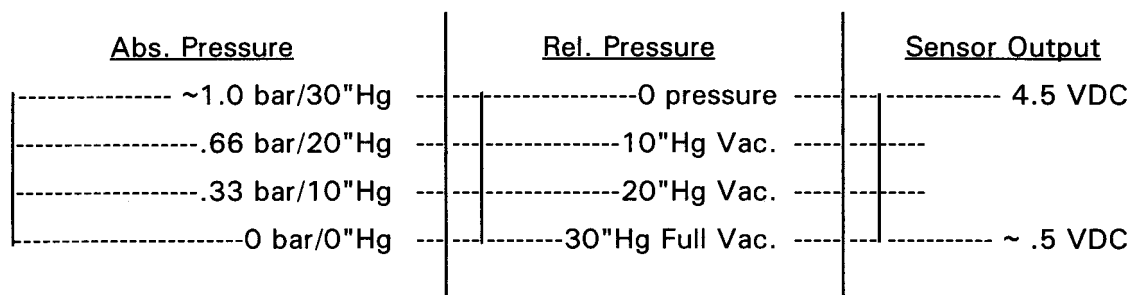
COMMISSIONING A VACUUM TRANSMITTER by using Hart 275 Communicator

The PMC SMT-EL Vacuum Transmitter incorporates a 0 to ~1 bar (0-30"Hg) ceramic capacitive sensor. At atmospheric pressure (~1 bar), the sensor output is ~4.5 VDC and, at 0 absolute pressure, the output is ~.5 VDC.

To accurately calibrate the transmitter, a test bench equipped with a 24-40 VDC power supply, a vacuum pump capable of getting close to full vacuum, precise gauging, and a test cup to connect the transmitter are required.

To do the zero sensor trim, maximum possible vacuum has to be applied to the sensor (see Figure 2-1.2) which will result in a ~.5 VDC sensor output. To do the full sensor trim, atmospheric pressure has to be applied to the sensor, which will result in a ~4.5 VDC sensor output.

Figure 2-1.2



In order to set the transmitter output at 20mA at the desired vacuum and at 4mA at atmospheric pressure, the output has to be **inverted**. The LRV (lower range value) has to be ~1 bar (~30"Hg) and the URV (upper range value) has to be 0 (absolute pressure) or in between if full vacuum is not desired.

Steps for Inverting Range on the Hart Communicator

- 1) Device Setup → ↓
- 2) Basic Set up → ↓ ↓
- 3) Rerange →
- 4) Keypad Rerange →
- 5) LRV enter calibrated range such as 1 bar (~ 30"Hg) atm. pressure
- 6) URV enter 0 for full vacuum (0 pressure absolute)
- 7) Send (inversion completed)

To change the range to 0-20"Hg Vacuum, the range has to be changed to:

LRV 30"Hg (atmospheric pressure)
URV 10"Hg (absolute pressure)

NOTE: It is best to visualize all pressure limits in absolute. In the case of the example ~ 30"Hg is absolute ~ atmospheric pressure, and 10"Hg is absolute pressure or 20"Hg vac. See Figure 2-1.2.

Manual Reset

If the transmitter output has been inverted, the manual (Z) zero and (S) span buttons **can be used only on the test bench where the desired limits can be generated.**

1. Set the pressure for the 4 mA output, push "Z".
2. Set the pressure for the 20 mA output, push "S".

The LCD display always show **ABSOLUTE PRESSURE** on a vacuum transmitter.

PROCEDURE FOR RE-RANGING SMT/EL SMART PRESSURE AND LEVEL TRANSMITTERS

Connect transmitter to 24-40V DC power source.

Connect communicator

Communicator will show  Device set up.

Go to DEVICE INFORMATION.





Find sensor range. Make sure the sensor range covers your planned range change.

Go back to BASIC SET UP.

Go to RE-RANGE  keypad, re-range.

To change LRV (Lower Range Value):





Go to LRV. Type new value in the blinking field.

Hit  Enter, then  Send, then  ok,  ok again.


LRV (low range value) is now entered.

To change URV (Upper Range Value):

Go to URV, hit  Key, then type changed value

Hit  Enter, then  Send, then  ok,  ok again.

Revised URV (upper range value) is now entered.

Hit  Home.

Device set up will now show changed range values. To test and recalibrate transmitter, attach test cup to transmitter and connect to calibrated pressure source. Follow menu on communicator to recalibrate.



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Install Transmitter

Remove the diaphragm protector cap.

For sanitary version, install teflon gasket, transmitter, and hand tighten lock ring. Tighten the lock ring an additional 1/8 turn using 2" hook wrench to compress the teflon gasket, in order to assure a leak-free seal. Do not over-tighten. Position transmitter and adapter fittings before tightening, but **do not restrain transmitter from turning during final tightening**. (This could move diaphragm retainer ring and affect calibration.)

Connect to Two Wire Loop

Connect the transmitter two wire vented cable to a 24 VDC power supply. Supply voltage may vary between 24 to 40 VDC depending upon loop resistance. PMC offers a NEMA 4X type junction box for cable conduit connections.

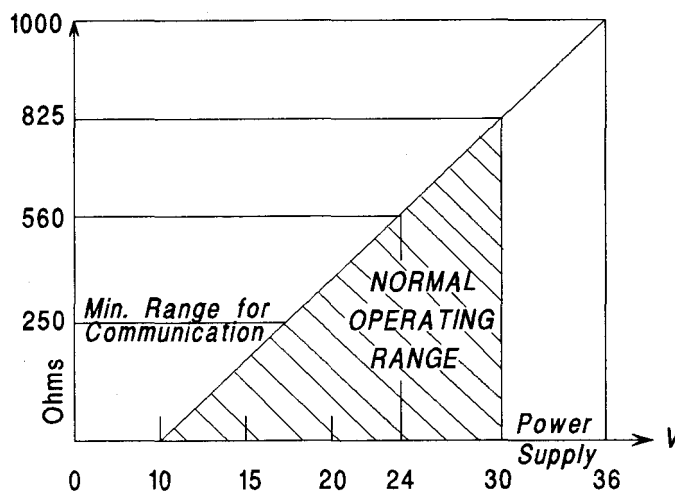
JUNCTION BOXES SHOULD BE LOCATED **BELOW** THE LEVEL OF THE CONNECTED TRANSMITTER TO PREVENT MOISTURE FLOW THROUGH THE CABLE TO THE TRANSMITTER ELECTRONICS.

If field wiring is brought directly through the 1/2" NPT conduit opening to the integral terminal strip, THE CONDUITS SHOULD BE ARRANGED SUCH THAT CONDENSATION FROM THE CONDUIT CANNOT DRAIN INTO THE TRANSMITTER TERMINAL COMPARTMENT. The 1/2" NPT conduit entry should be sealed using silicon gel.

Orientation of the Display on the Model SMT-MIN-EL

Since the miniature transmitter is fastened with a screw through the weld-on nipple, the transmitter cannot be rotated in order to have the display face in the desired direction. The standard orientation of the display is in line with the lock screw. Any other orientation has to be specified and set at the factory.

Transmitter Load Limitations



The total loop resistance load 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. At 24 VDC supply voltage, the maximum loop resistance is 560 ohms. For Cenelec EX ia approval, power supply cannot exceed 30 VDC. Maximum loop resistance at 30 VDC is 825 ohms. To communicate, a minimum resistance of 250 ohms is required.



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Disassembly/Assembly Instructions

NOTE: Do not depress detent pin and rotate housing unless digital display is removed!

Disassembly Sequence

1. Remove display cover.
2. Pull out display cartridge.
3. Unplug display cable (use needle nose pliers).
4. Unplug power supply wires.
5. Depress detent pin and carefully pull out sensor housing with electronic circuit board about 1 3/4". Disconnect breather tube using small needle nose pliers and unplug ground wire.
6. Carefully slide out sensor and circuit board assembly.

Assembly Instructions

1. Roughly orient circuit board to housing (plug headers facing display opening).
2. Slide circuit board in housing, leave about 3/8" gap. Connect ground wire. Using needle nose pliers, connect breather tube to connector barb.
3. Slide assembly in the rest of the way while making sure wires are out of the way and support ring is properly seated in c'bore. Engage detent pin.
4. Plug in power supply wires (red (+) left).
5. Plug in display cable.
6. Be sure the cover O-ring seal surface is clean before replacing. Screw on cover.
Tighten firmly by hand only.