Instruction

MI 611-177
February 2017

EP402 Small-Bore Flow-Through Assembly

Life Is On

Foxboro®
by Schneider Electric

Important Information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this manual or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER
DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING
WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION
CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE
NOTICE is used to address practices not related to physical injury.

Please Note

Electrical equipment should be installed, operated, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Introduction

The EP402 Flow-Through Assembly permits the measurement, for monitoring and control, of any conductive solution in very small bore applications. The assembly consists of a nonmetallic bore piece, (available in several bore sizes and thermoplastic materials) and metallic process-wetted end connections (available in a variety of materials and end connection types). O-Rings (available in various materials) provide the seal between the bore piece and the end connections. A temperature element can be used for temperature compensation.

Degaussing

All electrodeless sensors can become magnetized if they come in close proximity to a magnetic source such as an electric motor. If this occurs, measurement values are affected, with the most noticeable effect at low conductivities. For this reason, we degauss all electrodeless sensors at the factory and recommend that any sensor used in a low conductivity application be degaussed by the user.Degaussing is easily accomplished using a magnetic or bulk tape eraser, available from your local electronics store. For information on sensor magnetization and degaussing procedures, see TI 612-005.

Mounting the Sensor in a Large-Bore PEEK Sensor

The EP402 Assembly is designed to mount through the bore of an 871EC large bore PEEK sensor. Selection of the PEEK sensor model is based on the full scale conductivity range desired. If the range is less than 500 microsiemens (to ~9 µS low end), use an 871EC-LB0 Sensor. If the range is greater than 500 microsiemens, use an 871EC-RE0 Sensor.

— NOTE —

The 871EC Sensor is not included as part of the EP402 Assembly.

The EP402 Assembly is shipped assembled. To mount it through the bore of an 871EC Large Bore PEEK Sensor, you must first disassemble the EP402 Assembly. See Figure 1 and Figure 2.

1. Note that the EP402 Assembly has a narrow end and a wide end. Disconnect the wire strap attached to the metallic end-fitting at the narrow end. Save the washers and nut.
2. Remove the end-fitting from the narrow end of the bore piece. Do not lose or damage the internal O-ring that provides the seal between the end of the metallic end-fitting and the bore piece.
3. Remove the external O-ring from the bore piece and slide the EP402 Assembly through the bore of the 871EC Large Bore PEEK Sensor.
4. Replace the external O-ring in the groove on the bore piece. This prevents the sensor from sliding off the bore piece.
5. Ensure that the internal O-ring is positioned properly in the bore piece or on the end of the end-fitting and thread the end-fitting carefully into the bore piece until hand-tight.

⚠ CAUTION
Do not overtighten. Do not mechanically tighten.

6. Reattach the wire strap removed in Step 1.

Figure 1. EP402 Assembly (Present Design)

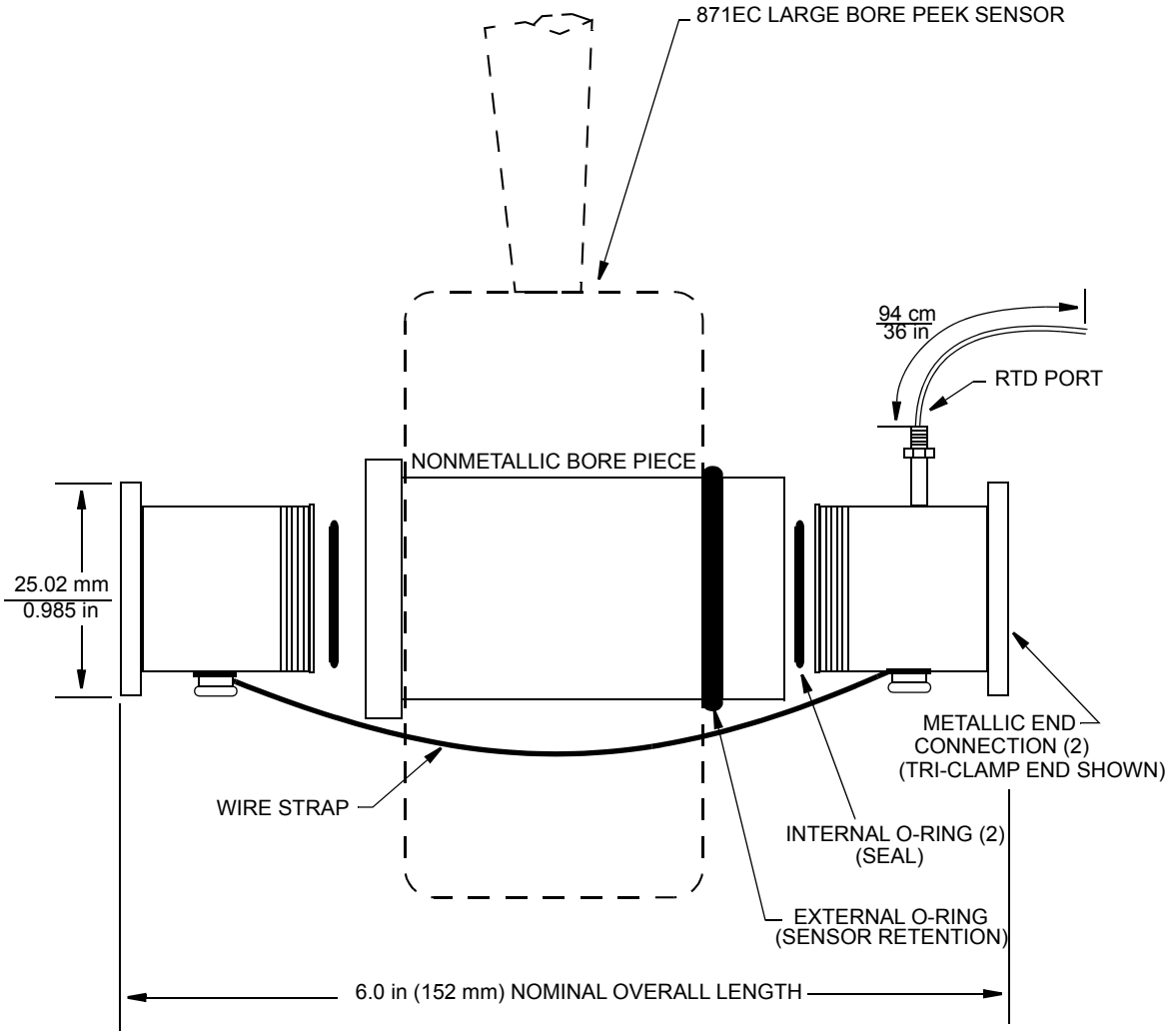
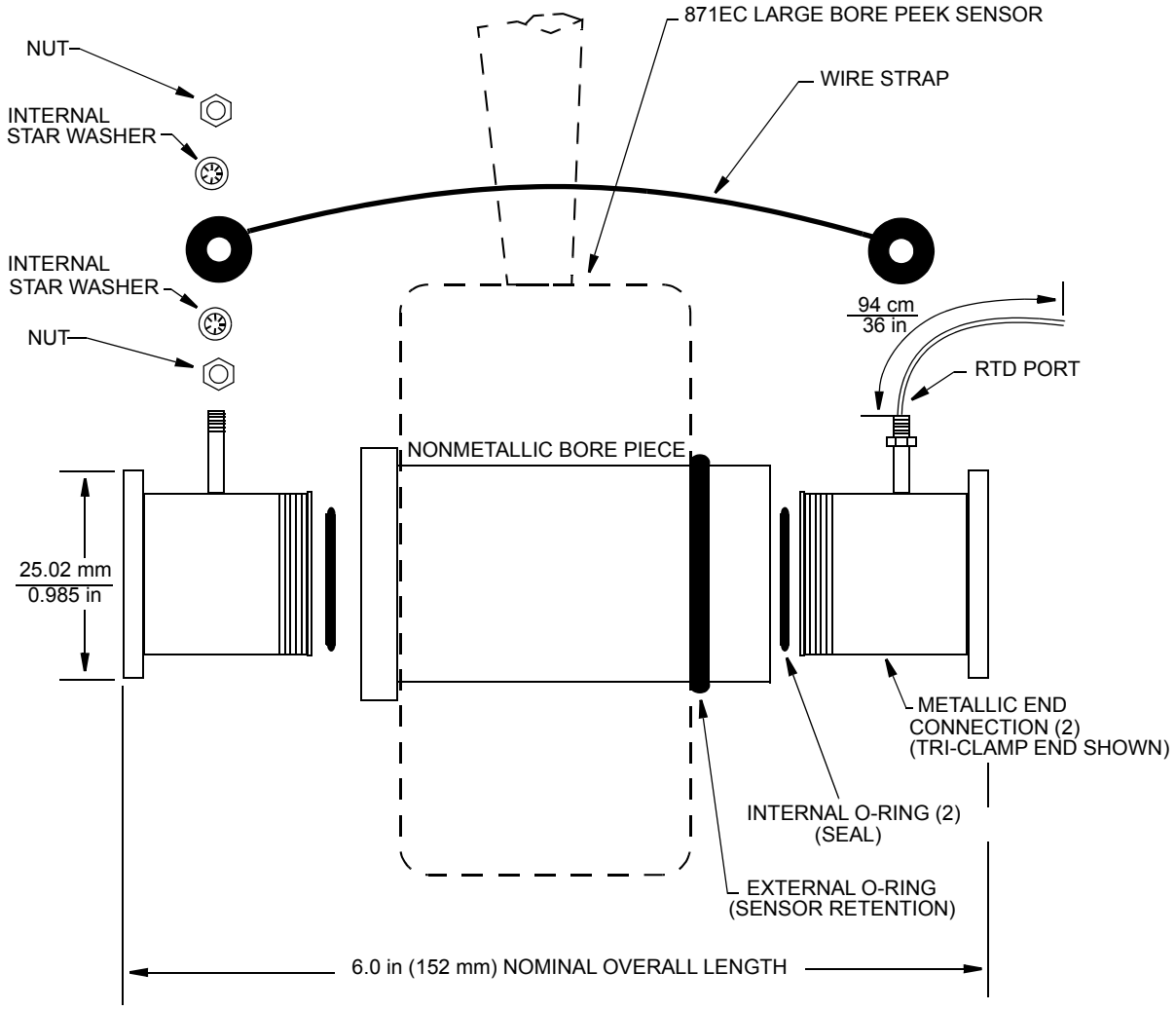


Figure 2. EP402 Assembly (Previous Design)



Wiring

The 871EC Sensor/EP402 Assembly combination can be connected to an 875EC Analyzer (MI 611-224), an 870ITEC Transmitter (MI 611-212) or an 873EC Analyzer (MI 611-167) as shown in the individual instruction manuals noted. If an RTD is provided with the EP402 Assembly and is to be used, connect these RTD leads to the transmitter or analyzer in place of leads 6 and 7 (and 8, if 3-wire RTD) from the 871EC sensor.

— NOTE

The temperature element integral to the large bore PEEK sensor will not provide adequate temperature resolution for any temperature compensation.

Cell Factors

The geometric cell factor of the large bore PEEK sensor should **not** be used. EP402 Assembly cell factors are model code specific. The geometric cell factor, $Cf_{(geom)}$, is used to calculate loop resistance for calibration. The electrical cell factor, $Cf_{(elec)}$, is used in setup of an 875ECAnalyzer and 870ITEC Transmitter. The cell type Ct used in setup of an 873EC Analyzer.

Table 1. Cell Factors

Model Code	Line Size	$Cf_{(geom)}$	870ITEC and 875EC		873EC	
			LB	RE	LB	RE
			$Cf_{(elec)}$ (a)		Ct (a)	
EP402A	1/4 inch	1.42 cm^{-1}	0.277	0.71	9	3
EP402B	3/8 inch	1.28 cm^{-1}	0.25	0.64	9	3
EP402C	1/2 inch	1.14 cm^{-1}	0.223	0.57	9	3
EP402D	5/8 inch	1.09 cm^{-1}	0.213	0.545	1	3
EP402E	5/8 inch	6.41cm^{-1}	1.25	3.21	10	7
EP402H	1/4 inch	1.56 cm^{-1}	0.305	0.78	9	13
EP402J	3/32 inch	8.52 cm^{-1}	1.66	4.26	See (b)	

a. $Cf_{(elec)}$ or Ct selection for each line size is determined by sensor selection LB or RE. Ct selections shown are required only in 873EC Style DL or later analyzers. Consult Global Customer Support if earlier style analyzers are being used.

b. Consult Global Customer Support.

Calibration

Precalibration Procedure

1. Verify that the large bore PEEK sensor being used is appropriate for the desired conductivity range.
2. Verify that the temperature compensation curve being used in the analyzer or transmitter is correct. For example, select `Dilute NaCl` for a condensate measurement (or water < ~1000 µS/cm); NaOH for a caustic measurement).
3. Verify that the analyzer or transmitter is configured for the appropriate temperature element provided by the EP402 Assembly; for example, 100 Ω RTD.
4. Verify that the 871EC sensor has been degaussed if measurement is to be <500 µS.
5. Calculate the full scale range resistance, using the formula:
   R in ohms = ($Cf_{(geom)}$ x 1000) / (Full Scale in mS/cm)

— NOTE

Use the geometric cell factor from Table 1. Do **not** use the cell factor of the 871EC Large Bore PEEK Sensor.

Calibration When Connected to an 875EC Analyzer

Electronic Bench Calibration (refer to MI 611-224)

1. Select `Other` in the 875EC configuration menu and enter the `electrical` cell factor listed in Table 1.
2. Select desired full scale (`Scale`) in the 875EC configuration menu.
3. Disconnect the wire strap from one side of the EP402 Assembly.
4. With an empty EP402 Assembly (infinite resistance), enter the low value 0.0 µS/cm, mS/cm, or S/cm, depending on the desired range. (See structure diagram in MI 611-224.)
5. Reconnect the wire strap and route a loop of wire through the EP402 Assembly (or use the calibration wire) and connect to a decade resistance box.
6. Set the resistance to the value calculated in the precalibration procedure.
7. Enter the full scale value. (See structure diagram in MI 611-224.)
8. Reinstall the EP402 Assembly into the process line.

Calibration Using a Known Solution

1. Select `Other` in 875EC configuration menu and enter `electrical` cell factor according to Table 1.
2. Select desired full scale (`Scale`) in the 875EC configuration menu.
3. With the wire strap disconnected from one side of the EP402 Assembly or with the EP402 Assembly filled with a solution having 1000-fold less conductivity than the desired full scale, enter the low value 0.0 mS/cm, mS/cm, or S/cm, depending on the desired range. (See structure diagram in MI 611-224.)
4. Reconnect the wire strap if it was disconnected in Step 3. Fill the EP402 Assembly with a solution having known conductivity at the existing temperature or measure the conductivity independently using a grab sample.
5. Enter the known conductivity value.
6. Reinstall the EP402 Assembly into the process line.

Calibration When Connected to an 870ITEC Transmitter

Electronic Bench Calibration (refer to MI 611-212)

1. Select `Other` in the 870ITEC configuration menu and enter the `electrical` cell factor listed in Table 1.
2. Select desired full scale (`Scale`) in the 870ITEC configuration menu.
3. Disconnect the wire strap from one side of the EP402 Assembly.
4. With an empty EP402 Assembly (infinite resistance), enter the low value 0.0 mS/cm, mS/cm, or S/cm, depending on the desired range. (See structure diagram in MI 611-212.)
5. Reconnect the wire strap and route a loop of wire through the EP402 Assembly (or use the calibration wire) and connect to a decade resistance box.
6. Set the resistance to the value calculated in the precalibration procedure.
7. Enter the full scale value. (See structure diagram in MI 611-212.)
8. Reinstall the EP402 Assembly into the process line.

Calibration Using a Known Solution

1. Select `Other` in 870ITEC configuration menu and enter `electrical` cell factor according to Table 1.
2. Select desired full scale (`Scale`) in the 870ITEC configuration menu.
3. With the wire strap disconnected from one side of the EP402 Assembly or with the EP402 Assembly filled with a solution having 1000-fold less conductivity than the desired full scale, enter the low value 0.0 µS/cm, mS/cm, or S/cm, depending on the desired range. (See structure diagram in MI 611-212.)
4. Reconnect the wire strap if it was disconnected in Step 3. Fill the EP402 Assembly with a solution having known conductivity at the existing temperature or measure the conductivity independently using a grab sample.
5. Enter the known conductivity value.
6. Reinstall the EP402 Assembly into the process line.

Calibration When Connected to an 873EC Analyzer

Electronic Bench Calibration (refer to MI 611-167)

1. Select `Ct` according to Table 1 for an 871EC-LB sensor or 871EC-RE sensor. (Also see note in Table 1.)
2. Select desired `Full Scale Range (FSC)` in the 873EC configuration menu.

— NOTE —

If the existing FSC is the desired value, it is important to re-enter the same value. When the FSC is entered, `ERR 4` should begin to flash. This message disappears when the calibration is complete.

3. Ensure that Cd = `0000` (no compensation or damping).
4. Disconnect the wire strap from one side of the EP402 Assembly.
5. With an empty EP402 Assembly (infinite resistance), press `Shift + Cal Lo` and enter the low value 0.0 mS/cm, mS/cm, or S/cm, depending on the desired range.
6. Reconnect the wire strap disconnected in Step 4.
7. Route a loop of wire through the EP402 Assembly and connect to a decade resistance box as shown in MI 611-167.
8. Set the resistance to the value calculated above in the precalibration procedure.
9. Press `Shift + Cal Hi`.
10. Using the `Next` and Δ keys, change the display to read the full-scale value. Press `Enter`.
11. Reinstall the EP402 Assembly into the process, change `Cd` back to the desired compensation and damping, and verify that temperature is reading correctly in automatic mode.

Calibration Using a Known Solution

1. Select `Ct` per Table 1 for an 871EC-LB sensor, or an 871EC-RE sensor. (Also see note in Table 1.)
2. Select desired `Full Scale Range (FSC)`.

— NOTE —

If the existing FSC is the desired value, it is important to re-enter the same value. When the FSC is entered, `ERR 4` should begin to flash. This message disappears when the calibration is complete.

3. With the wire strap disconnected from one side of the EP402 Assembly or with the EP402 Assembly filled with a solution having 1000-fold less conductivity than the desired FSC, enter the low value 0.0 mS/cm, mS/cm, or S/cm, depending on the desired range.
4. Ensure that Cd = `0000` (no compensation or damping).

5. With the wire strap disconnected from either metallic end-fitting or with the EP402 Assembly filled with a solution having 1000-fold less conductivity than the desired FSC, press `Shift + Cal Lo`.
6. Reconnect the wire strap if it was disconnected in Step 3. Fill the EP402 Assembly with a solution having known conductivity at the existing temperature or measure the conductivity independently using a grab sample.
7. Press `Shift + Cal Hi`.
8. Using the `Next` and Δ keys, change the display to read the known conductivity. Press `Enter`.
9. Reinstall the EP402 Assembly into the process, change `Cd` back to the desired compensation and damping, and verify that temperature is reading correctly in automatic mode.

Calibration When Connected to an 876EC Transmitter

Electronic Bench Calibration (refer to MI 611-261)

1. In the configuration menu, select `871EC` from the Sensor Type, then specify appropriate sub-type (LB, UT, or RE).
2. Select desired Base Display Scale in the 876EC configuration menu.
3. Enter Calibration mode, select `measurement` and `manual`.
4. Disconnect the wire strap from one side of the EP402 Assembly.
5. With an empty EP402 Assembly (infinite resistance), enter the low value 0.0 µS/cm, mS/cm, S/cm, depending on the desired range.
6. Reconnect the wire strap and route a loop of wire through the EP402 Assembly (or use the calibration wire) and connect to a decade resistance box.
7. Set the resistance to the value calculated in the precalibration procedure using $Cf_{(geom)}$ for `LB` or `RE` in Table 1.
8. Enter the full scale value and accept the calibration.
9. Reinstall the EP402 Assembly into the process line.

Calibration Using a Known Solution

1. In the configuration menu, select `871EC` from the Sensor Type, then specify appropriate sub-type (LB, UT, or RE).
2. Select desired Base Display Scale in the 876EC configuration menu.
3. Enter Calibration mode, select `measurement` and `process`.
4. With the wire strap disconnected from one side of the EP402 Assembly or with the EP402 Assembly filled with a solution having 1000-fold less conductivity than the desired full scale, enter the low value 0.0 µS/cm, mS/cm, or S/cm, depending on the desired range.
5. Reconnect the wire strap if it was disconnected in Step 4. Fill the EP402 Assembly with a solution having known conductivity at the existing temperature or measure the conductivity independently using a grab sample.
6. Enter the known conductivity value and accept the calibration.
7. Reinstall the EP402 assembly into the process line.

Model Code

EP402 Electrodeless Conductivity Sensors	EP402
Bore Size	
0.250 inch bore	A
0.375 inch bore	B
0.500 inch bore	C
0.625 inch bore	D
End Connection Metal	
Nickel alloy (equivalent to Hastelloy(R) C-276) (a)	2
316 ss	3
Titanium	4
Monel	5
C-20	6
316L	7
Nickel alloy (equivalent to Hastelloy B) (a)	8
304L	9
Bore Material	
PEEK, glass-filled	A
PVDF	B
Teflon	C
Virgin PVDF	D
PCTFE (also known as KEL-F)	E
Virgin PEEK	F
Glass-filled Teflon	G
End Connection Form	
Tri-Clamp	1
1/2 inch NPT	2
3/4 inch NPT	3
3/8 inch NPT boss	7
Temperature Element	
No RTD	C
100 Ω RTD (2-wire)	T
1000 Ω RTD (3-wire)	R
100 ohm RTD (4-wire)	D
O-Ring Material	
Chemraz	1
Viton	2
EPR	3
Kalrez	4

a. Hastelloy is a registered trademark of Haynes International, Inc.

ISSUE DATES

FEB 2005
FEB 2016
FEB 2017

Vertical lines to the right of text or illustrations indicate areas changed at last issue date.

Schneider Electric Systems USA, Inc.
38 Neponset Avenue
Foxboro, MA 02035
United States of America
http://www.schneider-electric.com

Global Customer Support
Inside U.S.: 1-866-746-6477
Outside U.S.: 1-508-549-2424
https://pasupport.schneider-electric.com

Life Is On

Foxboro®

by Schneider Electric