

**Electrochemical Products  
Safety Information**



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# 1. General Warnings

## Local Code Warning

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 **WARNING**

These products must be installed to meet all applicable local installation regulations, such as hazardous location requirements, electrical wiring codes, and mechanical piping codes. Persons involved in the installation must be trained in these code requirements to ensure that the installation takes maximum advantage of the safety features designed into the device.

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## Parts Replacement Warning

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 **WARNING**

This product contains components that have critical safety characteristics. Do **not** substitute components. Replace components only with factory-supplied components. Component substitution may impair the electrical safety of this equipment and its suitability for use in hazardous locations.

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# 2. 875 Series Analyzers

## Analyzer Identification

On panel-mounted analyzers, a data label and agency label are fastened to the top surface of the enclosure. On surface- or pipe-mounted devices, the data label is located on the right side and the agency label (if applicable) on the left side of the analyzer. A third label containing user information is also on the analyzer. A typical data label is shown in Figure 1. A typical agency label is shown in Figure 2.

Refer to the data label to determine the model, origin code, supply voltage, maximum power, maximum VA, and alarm contact ratings.

Figure 1. Sample 875 Analyzer Data Label

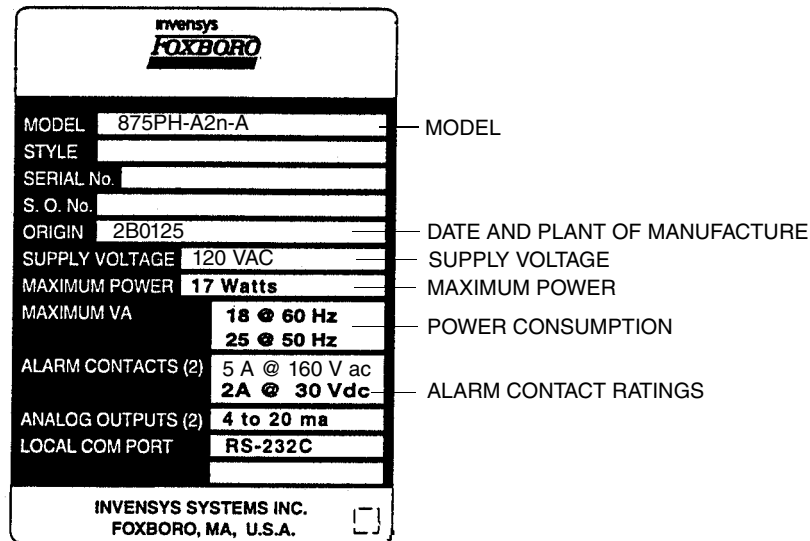
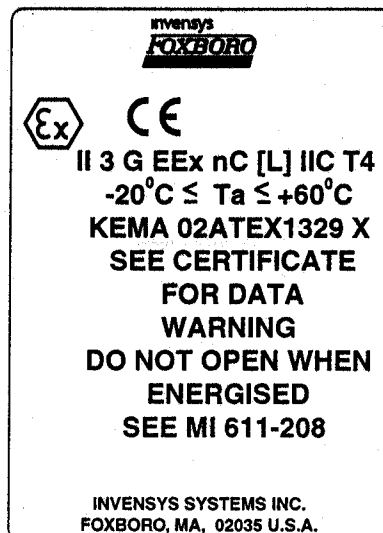


Figure 2. Sample 875 Analyzer Agency Label



## Hazardous Location Code

The electrical safety design code is printed on the data label as part of the model number. See Figure 1. The location of the code within the model number is shown below:

875PH-A2N-A  
 └───┬─── ELECTRICAL SAFETY DESIGN CODE

See Table 1 to identify this code. The type of protection is also located on the agency label. See Figure 2.

*Table 1. Product Safety Specifications*

Testing Laboratory, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
ATEX protection 'n' for Zone 2; II 3 G EEx nC[L] IIC. (a)	Temperature Class T4 at maximum ambient temperature of 60 °C (140 °F. See certificate KEMA 02ATEX1329 X	N

(a) The L means that the unit contains energy limited circuits to the sensor.

### — NOTE —

These analyzers have been designed to meet the electrical safety descriptions listed in the table above. For detailed information, or status of testing laboratory approvals/certifications, contact Invensys Systems, Inc.

## Entity Parameters for 875PH-\*\*N

The entity parameters for the sensor circuit (Terminals 1, 2, 2A, 3, 3A, 4, 5, 5A, 6, 7, and 8) in type of explosion protection energy limited EEx nC[L], with the following maximum values are:

$U_o = 10 \text{ V}$   
 $I_o = 125 \text{ mA}$   
 $P_o = 0.3 \text{ W}$   
 $C_o = 20 \text{ } \mu\text{F}$   
 $L_o = 5 \text{ mH}$

## Entity Parameters for 875EC-\*\*N

The entity parameters for the sensor circuit (Terminals 1, 2, 3, 4, 5, 6, 7, and 8) in type of explosion protection energy limited EEx nC[L], with the following maximum values are:

$$U_o = 5 \text{ V}$$

$$I_o = 45 \text{ mA}$$

$$P_o = 100 \text{ mW}$$

$$C_o = 1000 \text{ } \mu\text{F}$$

$$L_o = 40 \text{ mH}$$

## Entity Parameters for 875CR-\*\*N

The entity parameters for the sensor circuit (Terminals 1, 2, 2A, 3, 4, and 5) in type of explosion protection energy limited EEx nC[L], with the following maximum values are:

$$U_o = 5 \text{ V}$$

$$I_o = 85 \text{ mA}$$

$$P_o = 150 \text{ mW}$$

$$C_o = 1000 \text{ } \mu\text{F}$$

$$L_o = 10 \text{ mH}$$

## Panel-Mounted Enclosure Warning

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**! WARNING**

ATEX panel-mounted units must be installed in an enclosed panel or rack whose degree of ingress protection must be at least IP54 in accordance with EN 60529 and comply with clause 6 of EN 50021.

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## Electrical Connection Warning

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**! WARNING**

For ATEX certified analyzers, electrical connections must be made in such a way that the degree of ingress protection of the enclosure remains at least IP54 per EN 60529 and is suitable for the environment.

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## Grounding Warning

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**! WARNING**

The grounding stud or conductive mounting means of the enclosure must be connected to the potential equalizing system within the explosive atmosphere.

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## Supply Voltage Operative Limits

The supply voltage operative limits are the voltage shown on the data label +15% and -20%. See Figure 1.

## Alarm Contact Limits

The alarm contact limits are shown on the data label. See Figure 1. The standard limits are 5 A at 250 V ac and 2 A at 30 V dc. The ATEX limits are 5 A at 160 V ac and 2 A at 30 V dc.

## Ambient Temperature Limits

The ambient temperature operative limits of the analyzer are -20 and +75 °C (-4 and +165 °F). For analyzers with ATEX certification, the limits are -20 and +60 °C (-4 and +140 °F).

## Installation Instructions

Refer to MI 611-222 (875CR), MI 611-224 (875EC), or MI 611-225 (875PH)

## CE Compliance

For the 875 panel mounted analyzer to meet CE requirements, a grounded metal enclosure is required. To assure a good ground, the edges of the panel opening that receives the analyzer must **not** be painted.



# 3. Sensors

## Dangers, Warnings, and Cautions

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**! DANGER**

When installing or removing sensors, wear appropriate protective clothing including safety goggles. Escaping chemicals can cause severe injury including blindness.

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**! WARNING**

1. Use care when connecting and disconnecting high-pressure service connections. Use proper gloves and follow the recommended procedures to avoid injury to personnel or damage to equipment.
2. When processing hazardous liquids, follow the recommended procedures. Failure to do so could result in injury to personnel and damage to equipment.

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**! WARNING**

In addition to the pressure and temperature limits of the sensor, the sensor mounting accessories also have pressure and temperature limits. The specifications for the mounting accessories may be greater or less than the sensor specifications. Always use the lesser of the specification limits when designing the installation of a sensor with accessories.

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**! CAUTION**

To prevent damage, use care when handling sensitive sensor components such as glass electrodes.

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## 871PH

### Sensor Identification

Typical agency, body, and data labels are shown in Figures 3 and 4.

Figure 3. Sample 871PH (Cable Terminated) Sensor Identification

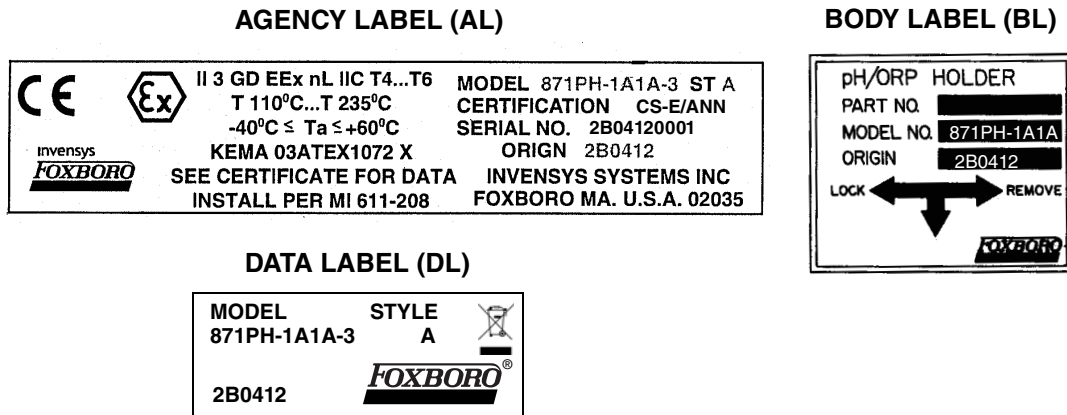
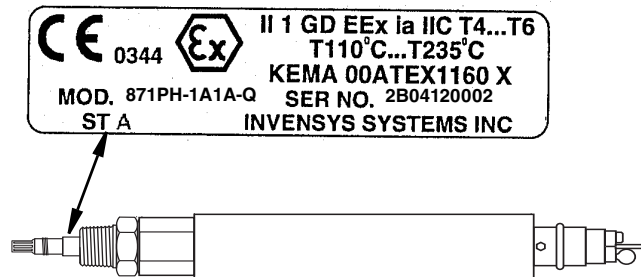


Figure 4. Sample 871PH (Quick Connector Terminated) Sensor Identification



## Electrical Safety Design Code

The electrical safety design code is printed on the agency label. See Figures 3 and 4. See Table 2 for additional information.

Table 2. Electrical Safety Specification

Testing Laboratory, Type of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
<b>ATEX</b> intrinsically safe for II 1 GD EEx ia IIC, Zone 0	Temperature Class T4 - T6 T110 °C...T235 °C	CS-E/AAA
<b>ATEX</b> Type n energy limited for II 3 GD EEx nL IIC, Zone 2	Temperature Class T4 - T6 T110 °C...T235 °C	CS-E/ANN

**— NOTE**

These sensors have been designed to meet the electrical safety descriptions listed in the table above. For detailed information, or status of testing laboratory approvals/certifications, contact Invensys Systems, Inc.

Entity Parameters for CS-E/AAA and CS-E/ANN are as follows:

$$U_i = 10 \text{ V}$$

$$I_i = 125 \text{ mA}$$

$$P_i = \text{See Table 3}$$

$$C_i = 0.15 \text{ } \mu\text{F} \text{ for 871PH-1, -2, -3, and -4 (with preamplifier)}$$

$$C_i = 0 \text{ } \mu\text{F} \text{ for 871PH-5 and -6 (without preamplifier)}$$

$$L_i = 0 \text{ mH}$$

*Table 3. Maximum Input Power ( $P_i$ )*

Model	Temperature Class	Max Process Temp	$P_i$
871PH-1	T4	80 °C	0.6 W
871PH-2	T5	80 °C	0.5 W
871PH-3	T6	60 °C	0.35 W
871PH-4 (with preamplifier)	T6	60 °C	0.35 W
871PH-5	T4	121 °C	1.0 W
871PH-6	T5	80 °C	0.5 W
(without preamplifier)	T6	60 °C	0.35 W

## Electromagnetic Compatibility (EMC)

The 871PH Sensor complies with the requirements of the European EMC Directive 89/336/EEC when its cable is connected through rigid metal conduit as recommended for 873PH\*, 873APH\*, 873DPX\*, and 875PH Analyzers, and 870ITPH Transmitters.

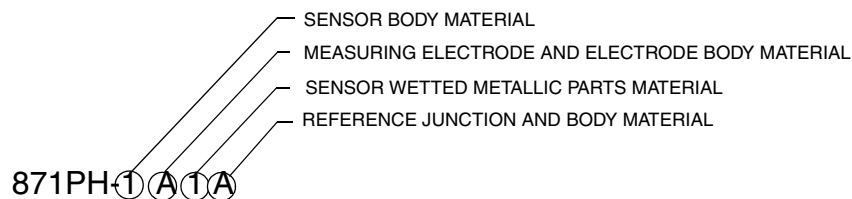
(\*220 V ac, 240 V ac metal enclosures only)

## Pressure and Temperature Limits

The pressure and operating temperature limits vary depending on the sensor body material, the measuring electrode type, and whether a ball valve, submersible, or in-line installation is used.

The sensor body material and measuring electrode is identified in the model number on the data label. See Figure 5.

*Figure 5. 871PH Model Coded Example*



### Sensor Body Material

-1, -3, or -5 = Ryton

-2, -4, or -6 = CPVC

## Measuring Electrode and Electrode Body Material

*Table 4. Measuring Electrode and Electrode Body Material*

Code	Electrode Material	Body Material
A	pH, Spherical Glass	Ryton
B	pH, Antimony	Ryton
D	ORP, Platinum	Ryton
E	ORP, Gold	Ryton
F	pH, Flat Glass	Ryton
G	pH, Domed High Temperature Glass	Ryton
P	pH, Spherical Glass	PTFE
Q	pH, Antimony	CTFE
R	ORP, Platinum	CTFE
S	ORP, Gold	CTFE
T	pH, Flat Glass	PTFE
U	pH, Domed High Temperature Glass	PTFE
X	None	

Refer to Tables 5 and 6 for pressure and temperature limits.

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**— NOTE**

In the tables, in-line installation means that only the sensing end, not the sensor body, is immersed in the solution. Submersion installation is when the entire sensor assembly (sensing end and body) is completely submersed.

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**Table 5. Maximum Pressure and Operating Temperature Limits for Sensor with Ryton Body**

Measuring Electrode Type	Ball Valve or Submersible Installation		In-Line Installation	
	Maximum Pressure	Temperature Range	Maximum Pressure	Temperature Range
Flat Glass pH	1 MPa (150 psi)	-5 to +80 °C (20 to 175 °F)	1 MPa (150 psi)	-5 to +85 °C (20 to 185 °F)
Spherical Glass pH	0.7 MPa (100 psi)	-5 to +80 °C (20 to 175 °F)	0.7 MPa (100 psi)	-5 to +100 °C (20 to 212 °F)
Domed Glass pH	0.7 MPa (100 psi)	0 to +80 °C (32 to 175 °F)	0.7 MPa (100 psi)	0 to +121 °C (32 to 250 °F)
Antimony pH	1 MPa (150 psi)	-5 to +80 °C (20 to 175 °F)	1 MPa (150 psi)	-5 to +125 °C (20 to 255 °F)
ORP	1 MPa (150 psi)	-5 to +80 °C (20 to 175 °F)	1 MPa (150 psi)	-5 to +125 °C (20 to 255 °F)

**WARNING**

Maximum allowable temperature and pressure may be limited by installation hardware used. Refer also to the temperature and pressure specifications on all appropriate bushings, tees, flow chambers, and ball valve assemblies.

**Table 6. Maximum Pressure at Various Operating Temperatures for Sensor with CPVC Body**

Measuring Electrode Type	Ball Valve or Submersible Installation			In-Line Installation		
	Maximum Pressure at Operating Temperature			Maximum Pressure at Operating Temperature		
Flat Glass pH	0.9 MPa (125 psi) at	0.6 MPa (90 psi) at	0.3 MPa (50 psi) at	0.9 MPa (125 psi) at	0.3 MPa (50 psi) at	0.1 MPa (15 psi) at
Spherical Glass pH (a)	-5 °C (20 °F)	50 °C (120 °F)	80 °C (175 °F)	-5 °C (20 °F)	80 °C (175 °F)	100 °C (212 °F)
Domed Glass pH*						
Antimony pH						
ORP						

a. Maximum pressure at -5 °C (20 °F) for Spherical Glass pH and at 0 °C (32 °F) for Domed Glass pH Electrode is 0.7 MPa (100 psi).

**WARNING**

Maximum allowable temperature and pressure may be limited by installation hardware used. Refer also to the temperature and pressure specifications on all appropriate bushings, tees, flow chambers, and ball valve assemblies.

## Process Wetted Materials

The process wetted materials of your sensor are identified in the model code on the data label. See Figure 5 and the following text.

### Sensor Body Material

- 1, 3, or 5 = Ryton
- 2, 4, or 6 = CPVC

### Sensor Wetted Metallic Parts Material

- 1 = Titanium
- 2 = Carpenter 20 Cb-3
- 3 = 316L Stainless Steel
- 5 = Monel®
- 6 = Tantalum

### Reference Junction and Body Material

*Table 7. Reference Junction and Body Material*

Code	Reference Junction Material	Body Material
A	Ceramic	Ryton
B	Ceramic	PTFE
D	Ceramic	PVDF

## 871A

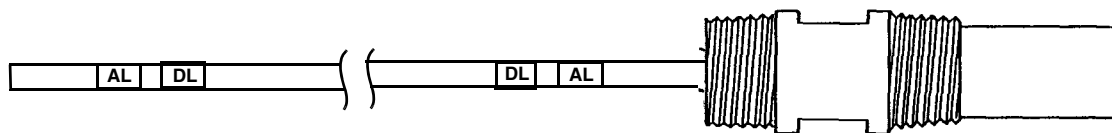
### Sensor Identification

Typical agency and data labels are shown in Figure 6.

*Figure 6. Sample 871A Sensor Identification*

**AGENCY LABEL (AL)**

**DATA LABEL (DL)**



## Electrical Safety Design Code

The electrical safety design code is printed on the agency label. See Figure 6. See Table 8 for additional information.

*Table 8. Electrical Safety Specification*

Testing Laboratory, Type of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
<b>ATEX</b> intrinsically safe for II 1 GD EEx ia IIC, Zone 0	Temperature Class T4 - T6 T110 °C...T235 °C	CS-E/AAA
<b>ATEX</b> Type n energy limited for II 3 GD EEx nL IIC, Zone 2	Temperature Class T4 - T6 T110 °C...T235 °C	CS-E/ANN

### — NOTE

These sensors have been designed to meet the electrical safety descriptions listed in the table above. For detailed information, or status of testing laboratory approvals/certifications, contact Invensys Systems, Inc.

Entity Parameters for CS-E/AAA and CS-E/ANN are as follows

$$U_i = 10 \text{ V}$$

$$I_i = 125 \text{ mA}$$

$$P_i = \text{See Table 9}$$

$$C_i = 0.15 \text{ } \mu\text{F} \text{ for } 871\text{A-2, and -4 (with preamplifier)}$$

$$C_i = 0 \text{ } \mu\text{F} \text{ for } 871\text{A-1 and -3 (without preamplifier)}$$

$$L_i = 0 \text{ mH}$$

*Table 9. Maximum Input Power ( $P_i$ )*

Model	Temperature Class	Max Process Temp	$P_i$
871A-2 871A-4 (with preamplifier)	T4	80 °C	0.6 W
	T5	80 °C	0.5 W
	T6	60 °C	0.35 W
871A-1 871A-3 (without preamplifier)	T4	121 °C	1.0 W
	T5	80 °C	0.5 W
	T6	60 °C	0.35 W

## Electromagnetic Compatibility (EMC)

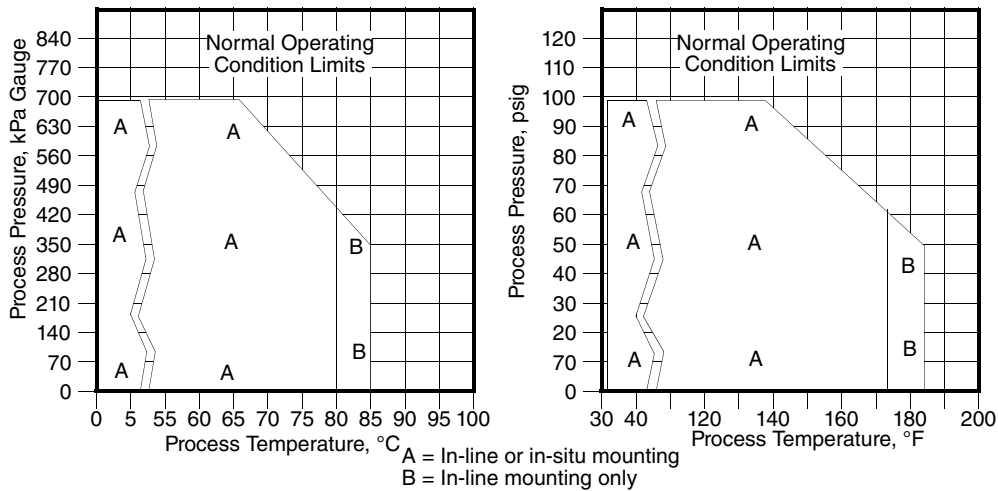
The 871A Sensor complies with the requirements of the European EMC Directive 89/336/EEC when its cable is connected through rigid metal conduit as recommended for 873PH\*, 873APH\*, 873DPX\*, and 875PH Analyzers, and 870ITPH Transmitters.

(\*220 V ac, 240 V ac metal enclosures only)

## Pressure and Temperature Limits

Pressure and temperature limits are shown in Figure 7.

*Figure 7. Pressure and Temperature Limits*



## Process Wetted Parts

Process wetted parts are as follows:

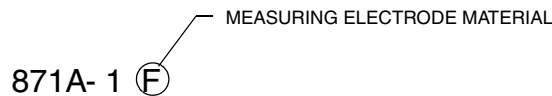
Body: PVDF (polyvinylidene fluoride)

Reference Electrode: Ceramic Junction

O-ring: EPR (ethylene propylene rubber)

Measuring Electrode: Per the model number on the data label. See Figure 8

*Figure 8. 871A Model Code Example*



where:

D = ORP, Platinum

E = ORP, Gold

F = pH, Flat Glass

## PH10 and ORP10

### Sensor Identification

Typical agency and data labels are shown in Figures 9 through 11.





*Table 10. Electrical Safety Specifications*

Testing Laboratory, Type of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
ATEX Type n energy limited for Ex ic IIC	Temperature Class T3..T6; -20 °C ≤ Ta ≤ +85 °C	AN

**NOTE**

These sensors have been designed to meet the electrical safety descriptions listed in the table above. For detailed information, or status of testing laboratory approvals/certifications, contact Invensys Systems, Inc.

With the exception of PH10-\*S sensors, entity parameters for Electrical Safety Codes AA and AN are as follows for all PH10 and ORP sensors:

- $U_i = 10 \text{ V}$
- $I_i = 125 \text{ mA}$
- $P_i = \text{See Table 11}$
- $C_i = 0.15 \mu\text{F}$  for PH10-\*P and ORP10-\*P (with preamplifier)
- $C_i = 0 \mu\text{F}$  for PH10-\*N and ORP10-\*N (without preamplifier)
- $L_i = 0 \text{ mH}$

For PH10-\*S sensors, entity parameters for Electrical Safety Codes AA and AN are as follows:

- $U_i = 11 \text{ V}$
- $I_i = 50 \text{ mA}$
- $P_i = 0.5 \text{ W}$
- $C_i = 0 \mu\text{F}$
- $L_i = 0 \text{ mH}$

*Table 11. Maximum Input Power (Pi)*

Model	Temperature Class	Max Process Temp	Pi
PH10-*P ORP10-*P (with preamplifier)	T4	80 °C	0.6 W
	T5	80 °C	0.5 W
	T6	60 °C	0.35 W
PH10-*N ORP10-*N (without preamplifier)	T4	121 °C	1.0 W
	T5	80 °C	0.5 W
	T6	60 °C	0.35 W
PH10-*S Smart	T3	121 °C	0.5 W
	T5	80 °C	0.5 W
	T6	60 °C	0.35 W

## Electromagnetic Compatibility (EMC)

The PH10 and ORP10 Sensors comply with the requirements of the European EMC Directive 89/336/EEC when its cable is connected through rigid metal conduit as recommended for 873PH\*, 873APH\*, 873DPX\*, and 875PH Analyzers, and 870ITPH, and 876PH Transmitters. (\*220 V ac, 240 V ac metal enclosures only)

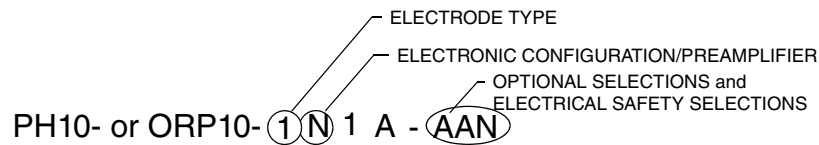
## Process Pressure Limits

0 and 0.7 MPa (0 and 100 psi)

## Process Temperature Limits

The temperature limits vary depending on the electrode type, whether a preamplifier is integral to the sensor, and whether submersible or in-line installation is used. The electrode type and whether a preamplifier is integral to the sensor is identified in the model number on the data label. See Figure 12.

*Figure 12. PH10 or ORP10 Model Code Example*



### Electrode Type

For pH Sensors

- 1 = Domed, High Temperature, Glass Bulb with Protective Guard
- 2 = Domed, High Temperature, Glass Bulb without Protective Guard
- 3 = Flat Ruggedized Glass
- 4 = Antimony

For ORP Sensors

- 1 = Platinum
- 2 = Gold

### Electronic Configuration/Preamplifier

- N = Analog without Preamplifier
- P = Analog with Internal Preamplifier
- S = Smart

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#### NOTE

In Table 12, in-line installation means that only the sensing end, not the sensor body, is immersed in the solution. Submersion installation is when the entire sensor assembly (sensing end and body) is completely submersed.

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### Optional Selections

- AA = ATEX Intrinsically Safe Zone 0
- AN = ATEX Intrinsically Safe Zone 2

*Table 12. Process Temperature Limits*

Measuring Electrode Type	Analog without Internal Pre-amplifier	Analog with Internal Pre-amplifier		Smart Digital (b)
		Ball Valve or Submersion Installation	In-Line Installation (a)	
Domed Glass - pH	0 to 121 °C (32 to 250 °F)	0 to 85 °C (32 to 185 °F)	0 to 121 °C (32 to 250 °F)	0 to 121 °C (32 to 250 °F)
Flat Glass - pH	0 to 85 °C (32 to 185 °F)	0 to 85 °C (32 to 185 °F)	0 to 85 °C (32 to 185 °F)	0 to 85 °C (32 to 185 °F)
Antimony - pH	0 to 121 °C (32 to 250 °F)	0 to 85 °C (32 to 185 °F)	0 to 121 °C (32 to 250 °F)	0 to 121 °C (32 to 250 °F)
Platinum - ORP	0 to 121 °C (32 to 250 °F)	0 to 85 °C (32 to 185 °F)	0 to 121 °C (32 to 250 °F)	Not applicable
Gold - ORP	0 to 121 °C (32 to 250 °F)	0 to 85 °C (32 to 185 °F)	0 to 121 °C (32 to 250 °F)	Not applicable

- a. For Analog Sensors with Pre-Amplifiers (PH10-\*P), the upper body must be in ambient temperatures of 54 °C (130 °F) or lower.
- b. For Smart Sensors (PH10-\*S) in Intrinsically Safe or Non-Incendive hazardous locations, upper body must be in ambient temperature of 85 °C (185 °F) or lower.

## Process Wetted Parts

Process wetted parts are as follows:

Sensor Body: Kynar

Reference Electrode: Ceramic Junction

Solution Ground: Conductive Kynar

Measuring Electrode

pH: Domed Glass, Flat Glass, or Antimony as specified.

See Figure 12 and the following text.

ORP: Platinum or Gold as specified.

See Figure 12 and the following text.

O-Ring: Viton standard; EPDM and Chemraz optional, as specified.

See Figure 12 and the following text.

## Electrode Type

For pH Sensors

- 1 = Domed, High Temperature, Glass Bulb with Protective Guard
- 2 = Domed, High Temperature, Glass Bulb without Protective Guard
- 3 = Flat Ruggedized Glass
- 4 = Antimony

For ORP Sensors

- 1 = Platinum
- 2 = Gold

## Optional Selections

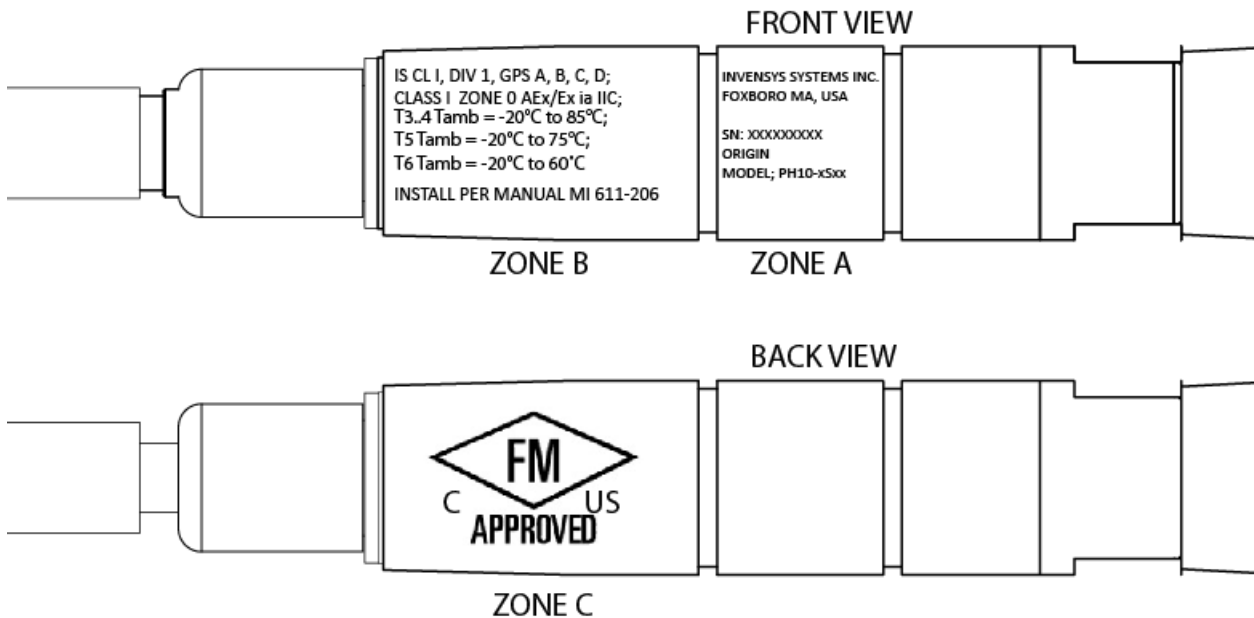
- E = EPDM O-ring
- C = Chemraz O-ring

# PH10-\*S

## Introduction

A Typical PH10-\*S sensor is shown in Figure 13. Note that all Markings are laser etched onto the sensor probe housing.

*Figure 13. PH10-\*S Sensor (Cutaway View)*



### Referencing Figure 13:

#### Zone A:

- ◆ Location of Manufacture
- ◆ Location of Sensor Serial Number: SN:
- ◆ Origin Code: The origin code identifies the area of manufacture, and the year and week the sensor was manufactured. Example 2A1508, 2A identifies the manufacturing location, 15 is the year 2015 and 08 is the week of the year that the sensor was manufactured.
- ◆ MODEL: Identifies the sensors complete model code

#### Zone B:

Is the location of certification markings

#### Zone C:

Is the location of certification company logo (if required).

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**! DANGER**

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When installing or removing sensors, wear appropriate protective clothing including safety goggles. Escaping chemicals can cause severe injury including blindness.

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**! WARNING**

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-Use care when connecting and disconnecting high-pressure service connections. Use proper gloves and follow the recommended procedures to avoid injury to personnel or damage to equipment.  
-When processing hazardous liquids, follow the recommended procedures. Failure to do so could result in injury to personnel and damage to equipment.

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**! WARNING**

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In addition to the pressure and temperature limits of the sensor, the sensor mounting accessories also have pressure and temperature limits. The specifications for the mounting accessories may be greater or less than the sensor specifications. Always use the lesser of the specification limits when designing the installation of a sensor with accessories.

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**! CAUTION**

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To prevent damage, use care when handling sensitive sensor components such as glass electrodes.

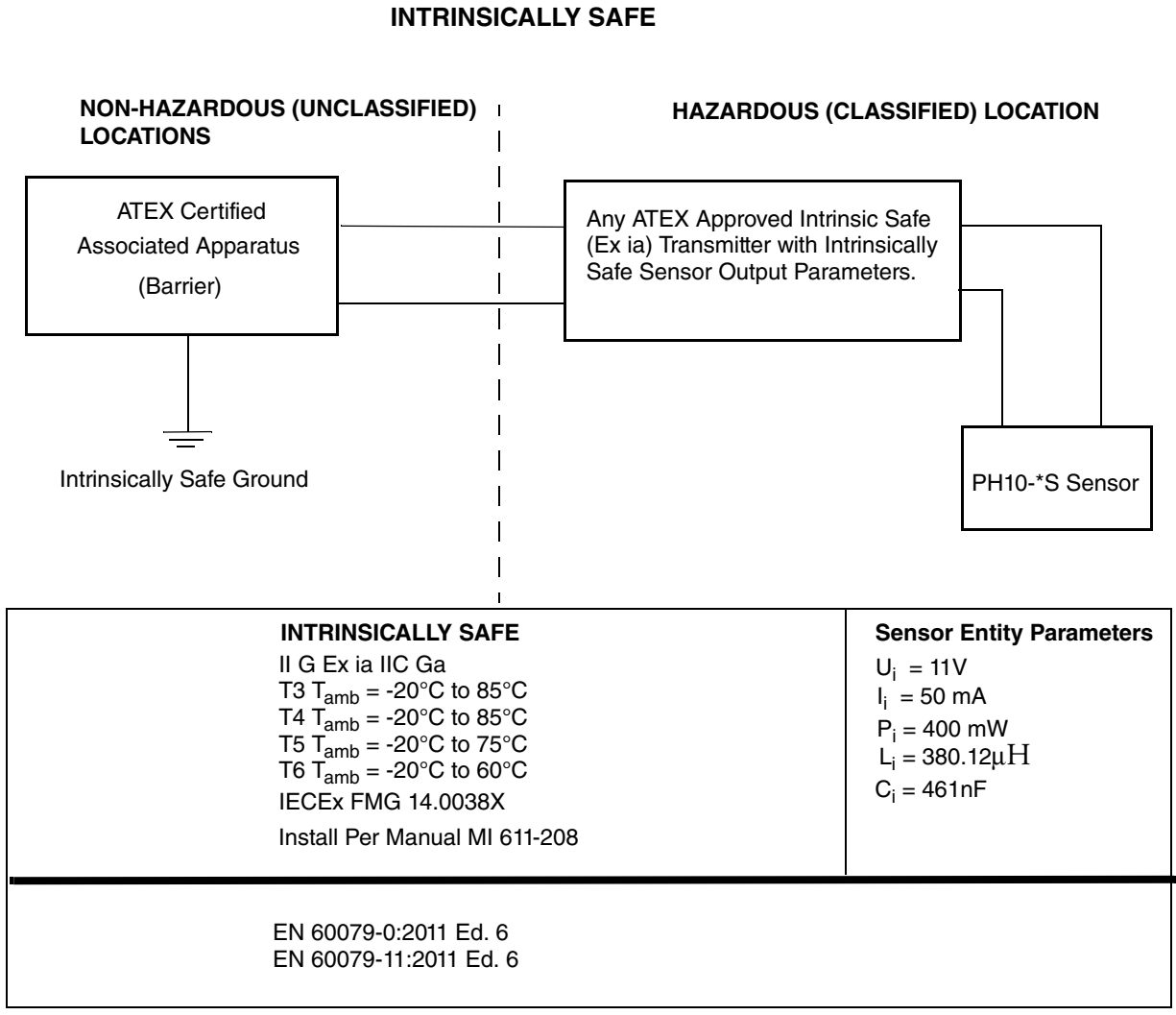
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## General Notes

1. The PH10-\*S is only certified for use in ambient temperatures marked on the sensor housing and should not be used outside this range.
2. The maximum process temperature must not exceed the ambient temperatures marked on the sensor.
3. All field wiring must be rated for 85°C or greater.
4. The PH10-\*S sensor contains no user-replaceable parts and is not intended to be repaired by the user. Repair of the PH10-\*S sensor is to be carried out by the manufacturer, or their approved agents, in accordance with the applicable code of practice.
5. The surface resistivity of the PH10-\*S sensor's enclosure may be greater than one gigaohms. Care should be taken to avoid electrostatic charge build-up. The PH10-\*S sensor's enclosure must not be rubbed or cleaned with solvents or a dry cloth.

# ATEX Entity Approval

The following instructions are relevant to safe use in a hazardous area and apply to PH10-\*S sensors covered by the following certificate number: FMG 14ATEX0080X.



**! WARNING** —————  
Substitutions of components may impair intrinsic safety.

**! WARNING** —————  
Do not connect while circuit is live unless area is known to be nonhazardous.

---

**! WARNING**


---

The PH10-\*S sensor is nonconducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. Ensure that the equipment is not installed in a location where it may be subjected to external conditions which might cause a build-up of electrostatic charge on nonconducting surfaces. Additionally, cleaning of the PH10-\*S sensor should only be done with a damp cloth.

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### *Intrinsically Safe Notes*

1. Figure noted above must not be modified without prior FM approval.
2. Barrier must be ATEX certified and must be installed in accordance with manufacturer's instructions.
3. Maximum nonhazardous area voltage must not exceed 250 V.
4. Total resistance between Intrinsic Safety Ground and Earth Ground must be less than 1 ohm.
5. Entity parameters must meet the following requirements:
  - $U_o \leq U_i$
  - $I_o \leq I_i$
  - $C_o \text{ or } C_a \leq C_i + C_{\text{cable}}$
  - $L_o \text{ or } L_a \leq L_i + L_{\text{cable}}$
6. Installation shall be carried out in accordance with the applicable code of practice (typically EN 60079-14) by suitably-trained personnel.
7. The certificate number has an 'X' suffix which indicates that special conditions of installation and use apply. Those installing or inspecting this equipment must have access to the contents of the certificate or these instructions. The conditions listed in the certificate are reproduced below:
  - ◆ Installation shall be carried out in accordance with the applicable code of practice (typically EN 60079-14) by suitably-trained personnel.
  - ◆ All field wiring must be rated for 85°C or greater.
  - ◆ There are no special checking or maintenance conditions. All explosion-protected equipment should be periodically inspected in accordance with the applicable code of practice (typically EN 60079-17). The interval between inspections should not normally exceed 3 years, unless justification for a longer interval is given
  - ◆ Parts of the enclosure are non-conducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. Ensure that the equipment is not installed in a location where it may be subjected to external conditions which might cause a build up of electrostatic charge on nonconducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.

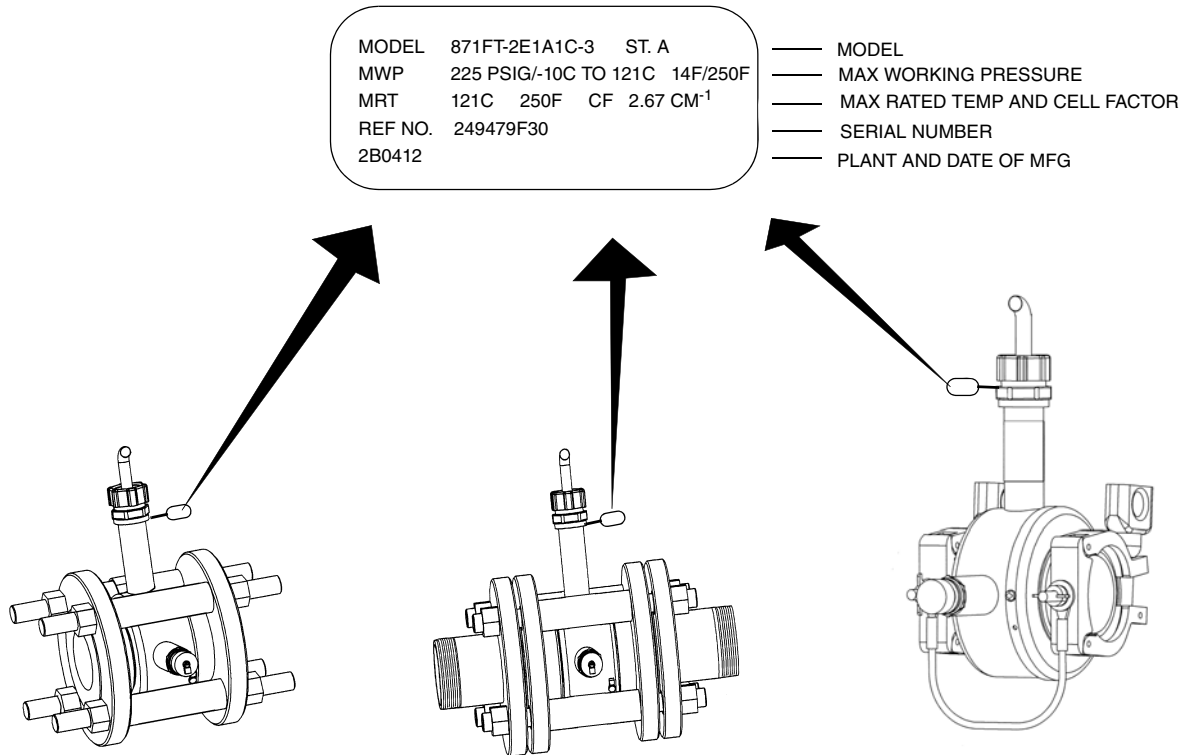


# 871FT

## Sensor Identification

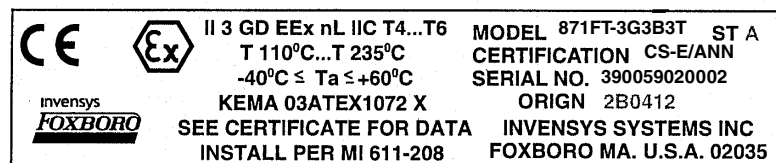
A typical data plate is shown in Figure 14.

*Figure 14. Sample 871FT Data Plate*



A typical agency label is shown in Figure 15. The label is attached to the sensor cable.

*Figure 15. Sample 871FT Agency Label*



## Electrical Safety Design Code

The electrical safety design code is printed on the agency plate. See Figure 14. See Table 13 for additional information.

*Table 13. Electrical Safety Specification*

Testing Laboratory, Type of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
<b>ATEX</b> intrinsically safe for II 1 GD EEx ia IIC, Zone 0	Temperature Class T4 - T6 T110 °C...T235 °C	CS-E/AAA
<b>ATEX</b> Type n energy limited for II 3 GD EEx nL IIC, Zone 2	Temperature Class T4 - T6 T110 °C...T235 °C	CS-E/ANN

**NOTE**

These sensors have been designed to meet the electrical safety descriptions listed in the table above. For detailed information, or status of testing laboratory approvals/certifications, contact Invensys Systems, Inc.

Entity Parameters for CS-E/AAA are as follows:

- $U_i = 7.5 \text{ V}$
- $I_i = 55 \text{ mA}$
- $P_i = 0.4 \text{ W}$
- Effective  $C_i =$  negligibly small
- Effective  $L_i = 11.5 \text{ mH}$

Entity Parameters for CS-E/ANN are as follows:

- $U_i = 7.5 \text{ V}$
- $I_i = 55 \text{ mA}$
- $P_i = 0.4 \text{ W}$
- $C_i = 0 \text{ nF}$
- $L_i = 11.5 \text{ mH}$

*Table 14. Relationship Between Process Temperature and Temperature Class*

Temperature Class	Max Process Temp
T4	125 °C
T5	100 °C
T6	85 °C

## Electromagnetic Compatibility (EMC)

The 871FT Sensor complies with the requirements of the European EMC Directive 89/336/EEC when its cable is connected through rigid metal conduit as recommended for 873EC\*, 873AEC\*, and 875EC Analyzers, and 870ITEC and 876PH Transmitters.

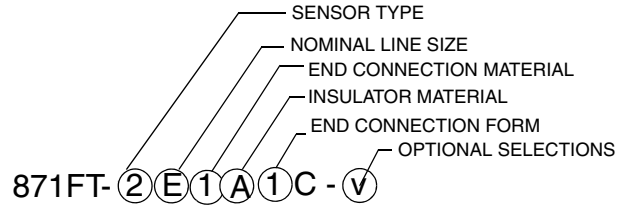
(\*220 V ac, 240 V ac metal enclosures only)

## Temperature and Pressure Limits

The temperature and pressure limits vary depending on the sensor type, the nominal line size, the insulator material, and the end connection form. The sensor type, insulator material, nominal

line size, and end connection form are identified in the model number on the data label. See Figure 16.

*Figure 16. 871FT Model Code Example*



### Sensor Type

- 1 = Sanitary, High Range Conductivity
- 2 = Sanitary, Low Range Conductivity
- 3 = Industrial, High Range Conductivity
- 4 = Industrial, Low Range Conductivity

### Nominal Line Size

- C = 1/2 in
- D = 3/4 in
- E = 1 in
- F = 1 1/2 in
- G = 2 in
- H = 3 in
- J = 4 in

### Insulator Material

- A = VPEEK
- B = PVDF
- C = PCTFE
- D = Glass Filled PEEK

### End Connection Form

- 1 = Tri-Clamp Fitting
- 2 = Pipe Adapter
- 3 = ANSI Class 150 Flange
- 4 = ANSI Class 300 Flange

*Table 15. Temperature and Pressure Limits*

Item	Description
<b>Sanitary Sensors with Tri-Clamp Fittings:</b>	
Virgin PEEK: 1/2, 3/4, 1, 1 1/2, and 2 in 3 in 4 in	225 psi, -10 to +121 °C (14 to 250 °F) not derated linearly derated from 225 psi at 85 °C (185 °F) to 160 psi at 121 °C (250 °F) linearly derated from 225 psi at 43 °C (110 °F) to 150 psi at 121 °C (250 °F)
PCTFE:	60 psi, -10 to +60 °C (14 to 140 °F) linearly derated to 10 psi at 121 °C (250 °F) <i>NOTE: Tri-Clamp wing nut tightened to 25 in-lb torque.</i>
<b>Industrial Sensors with ANSI Class 150 Flanges or NPT Mounting:</b>	
Glass Filled PEEK:	275 psi, -10 to +60 °C (14 to 140 °F) linearly derated to 190 psi at 210 °C (411 °F)
PVDF:	100 psi, -10 to +60 °C (14 to 140 °F) linearly derated to 60 psi at 121 °C (250 °F) (a)
PCTFE:	100 psi, -10 to +60 °C (14 to 140 °F) linearly derated to 10 psi at 121 °C (250 °F)
<b>Industrial Sensors with ANSI Class 300 Flanges:</b>	
Glass Filled PEEK:	400 psi, -10 to +210 °C (14 to 411 °F)

a. The 2-in version with ANSI flange is rated to 150 psig (1034 kPag) from 14 to 212 °F (-10 to 100 °C).

## Process Wetted Parts

The Sanitary sensor type has only the insulator (bore piece) as a wetted part. The Industrial sensor type has end connection, insulator (bore piece) and O-ring as wetted parts. The sensor type, end connection material, and insulator are identified in the model number on the data label. See Figure 16 and the following text. EPDM O-rings are used unless Viton or Chemraz is specified as an optional O-ring material in the last model code designator.

### Sensor Type

- 1 = Sanitary, High Range Conductivity
- 2 = Sanitary, Low Range Conductivity
- 3 = Industrial, High Range Conductivity
- 4 = Industrial, Low Range Conductivity

### End Connection Material

- 1 = None
- 2 = Hastelloy C-276
- 3 = 316 ss
- 4 = Carpenter 20-CB3

### Insulator Material

- A = VPEEK
- B = PVDF
- C = PCTFE
- D = Glass Filled PEEK

### Optional Selections

- P = Chemraz O-rings
- V = Viton O-rings

## Pressure Equipment Directive (PED) Compliance

With the exception of the model codes listed in Table 16, the 871FT Sensors are in compliance with the Pressure Equipment Directive 97/23/EC as Sound Engineering Practice (SEP).

*Table 16. Exceptions to PED Compliance*

Model Code	Description
871FT-1J1A1 871FT-2J1A1	4 inch Sanitary Type with Virgin PEEK Insulator Material and Tri-Clamp Flange End Connections.
871FT-3H.D4 871FT-4H.D4	3-inch Industrial Type with Glass Filled PEEK Insulator Material and ANSI Class 300 End Connections
871FT-3J.D3 871FT-4J.D3	4-inch Industrial Type with Glass Filled PEEK Insulator Material and ANSI Class 150 End Connections
871FT-3J.D4 871FT-4J.D4	4-inch Industrial Type with Glass Filled PEEK Insulator Material and ANSI Class 300 End Connections

## 871EC

### Sensor Identification

Typical agency and data labels shown in Figure 17.

*Figure 17. Sample 871EC Sensor Identification*

**AGENCY LABEL (AL)**

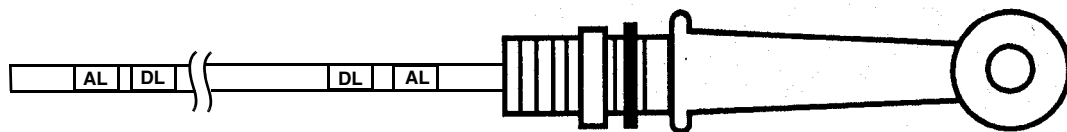
II 3 GD EEx nL IIC T3...T6  
T 110°C...T 260°C  
-40°C ≤ Ta ≤ +60°C  
KEMA 03ATEX1072 X  
SEE CERTIFICATE FOR DATA  
INSTALL PER MI 611-208

MODEL 871EC-SP0 ST A  
CERTIFICATION CS-E/ANN  
SERIAL NO. 2B04120007  
ORIGN 2B0412  
INVENSYS SYSTEMS INC  
FOXBORO MA. U.S.A. 02035

**DATA LABEL (DL)**

MODEL 871EC-SP0  
STYLE A  
2B0412

**FOXBORO**<sup>®</sup>



### Electrical Safety Design Code

The electrical safety design code is printed on the agency plate. See Figure 17. See Table 17 for additional information.

*Table 17. Electrical Safety Specification*

Testing Laboratory, Type of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
<b>ATEX</b> intrinsically safe for II 1 GD EEx ia IIC, Zone 0	Temperature Class T3 - T6 T110 °C...T260 °C	CS-E/AAA
<b>ATEX</b> Type n energy limited for II 3 GD EEx nL IIC, Zone 2	Temperature Class T3 - T6 T110 °C...T260 °C	CS-E/ANN

**NOTE**

These sensors have been designed to meet the electrical safety descriptions listed in the table above. For detailed information, or status of testing laboratory approvals/certifications, contact Invensys Systems, Inc.

Entity Parameters for CS-E/AAA are as follows

- $U_i = 7.5 \text{ V}$
- $I_i = 70 \text{ mA}$
- $P_i = 0.4 \text{ W}$
- Effective  $C_i =$  negligibly small
- Effective  $L_i = 7.8 \text{ mH}$

Entity Parameters for CS-E/ANN are as follows

- $U_i = 7.5 \text{ V}$
- $I_i = 65 \text{ mA}$
- $P_i = 0.4 \text{ W}$
- $C_i = 0 \text{ nF}$
- $L_i = 7.8 \text{ mH}$

*Table 18. Relationship Between Process Temperature and Temperature Class*

Temperature Class	Max Process Temp
T3	200 °C
T4	135 °C
T5	100 °C
T6	85 °C

## Electromagnetic Compatibility (EMC)

The 871EC Sensor complies with the requirements of the European EMC Directive 89/336/EEC when its cable is connected through rigid metal conduit as recommended for 873EC\*, 873AEC\*, and 875EC Analyzers, and 870ITEC and 876PH Transmitters.

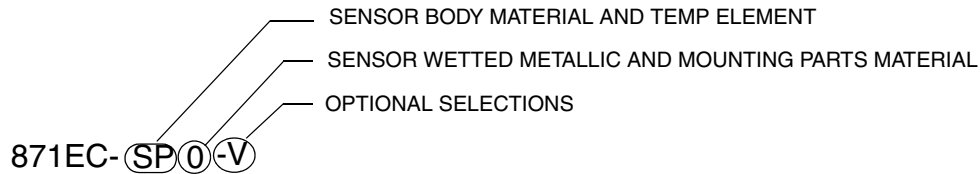
(\*220 V ac, 240 V ac metal enclosures only)

## Pressure and Temperature Limits

The pressure and temperature limits vary depending on the sensor type, the nominal line size, the insulator material, and the end connection form. The sensor type, insulator material, nominal line size, and end connection form are identified in the model number on the data label. See the following example:

Pressure and temperature limits vary per the sensor body code as shown in the model number. See Figure 18.

*Figure 18. 871EC Model Code Example*



### Sensor Body Material and Temperature Element

- SP = Glass-filled PEEK, 100 k $\Omega$  Thermistor
- HP = Glass-filled PEEK, 100  $\Omega$  RTD
- PP = Virgin Polypropylene, 100  $\Omega$  RTD
- PT = Virgin Polypropylene, 100 k $\Omega$  Thermistor
- NL = Glass-filled Noryl, 100 k $\Omega$  Thermistor
- TF = Fluorocarbon head, 100 k $\Omega$  Thermistor
- PN = Glass-filled Noryl, 100 k $\Omega$  Thermistor
- PX = Glass-filled Noryl, 100 k $\Omega$  Thermistor
- RE = Glass-filled PEEK, 100 k $\Omega$  Thermistor
- LB = Glass-filled PEEK, 100 k $\Omega$  Thermistor
- BW = Glass-filled PEEK, 100  $\Omega$  RTD
- UT = Glass-filled PEEK, 100  $\Omega$  RTD
- EV = Epoxy head, 316 ss extension, 100 k $\Omega$  Thermistor
- AB = Linatex, 316 ss extension, 100 k $\Omega$  Thermistor

*Table 19. Pressure and Temperature Limits*

Sensor Body Code	Pressure Limits	Temperature Limits
-SP	-0.1 and +1.75 MPa (-15 and +250 psi)	-5 and +120 °C (20 and 250 °F)
-HP	-0.1 and +1.75 MPa (-15 and +250 psi)	-5 and +200 °C (20 and 390 °F)
-PP	-0.1 and +1.4 MPa (-15 and +200 psi) <sup>(a)</sup>	-5 and +120 °C (20 and 250 °F)
-PT	-0.1 and +1.4 MPa (-15 and +200 psi) <sup>(a)</sup>	-5 and +120 °C (20 and 250 °F)
-NL	-0.1 and +1.4 MPa (-15 and +200 psi)	-5 and +65 °C (20 and 150 °F)
-TF	-0.1 and +1.4 MPa (-15 and +200 psi)	-5 and +105 °C (20 and 225 °F)
-PN	-0.1 and +1.4 MPa (-15 and +200 psi)	-5 and +105 °C (20 and 225 °F)
-PX	-0.1 and +1.4 MPa (-15 and +200 psi)	-5 and +105 °C (20 and 225 °F)
-RE	-0.1 and +2.41 MPa (-15 and +350 psi)	-5 and +120 °C (20 and 250 °F)
-LB	-0.1 and +2.41 MPa (-15 and +350 psi)	-5 and +120 °C (20 and 250 °F)
-BW	-0.1 and +2.41 MPa (-15 and +350 psi)	-5 and +200 °C (20 and 390 °F)
-UT	-0.1 and +2.41 MPa (-15 and +350 psi)	-5 and +200 °C (20 and 390 °F)
-EV	-0.1 and +0.7 MPa (-15 and +100 psi)	-5 and +105 °C (20 and 225 °F)
-AB	-0.1 and +0.7 MPa (-15 and +100 psi)	-5 and +65 °C (20 and 150 °F)

(a) 1.4 MPa at 80 °C (200 psi at 176 °F) is linearly derated to 1.05 MPa at 120 °C (150 psi at 250 °F)

## Process Wetted Parts

Process wetted parts vary per the sensor body material, sensor metallic parts (in some sensors) and O-ring material. The sensor body material and sensor wetted metallic parts are identified in the model number on the data label. See Figure 18 and following text. EPDM O-rings are used unless Viton, Kalrez, or Chemraz is specified as an optional O-ring material in the last model code designator.

### Sensor Body Material

- SP = Glass-filled PEEK
- HP = Glass-filled PEEK
- PP = Virgin Polypropylene
- PT = Virgin Polypropylene
- NL = Glass-filled Noryl
- TF = Fluorocarbon head, 316 ss or Carpenter 20 Cb housing
- PN = Glass-filled Noryl
- PX = Glass-filled Noryl
- RE = Glass-filled PEEK
- LB = Glass-filled PEEK
- BW = Glass-filled PEEK
- UT = Glass-filled PEEK
- EV = Epoxy head, 316 ss extension
- AB = Linatex, 316 ss extension



### Sensor Wetted Metallic and Mounting Parts Material

- 0 = None
- 2 = Carpenter 20 Cb
- 3 = 316 ss Universal Mount
- 7 = 316 ss Sanitary Mounting

### Optional Selections

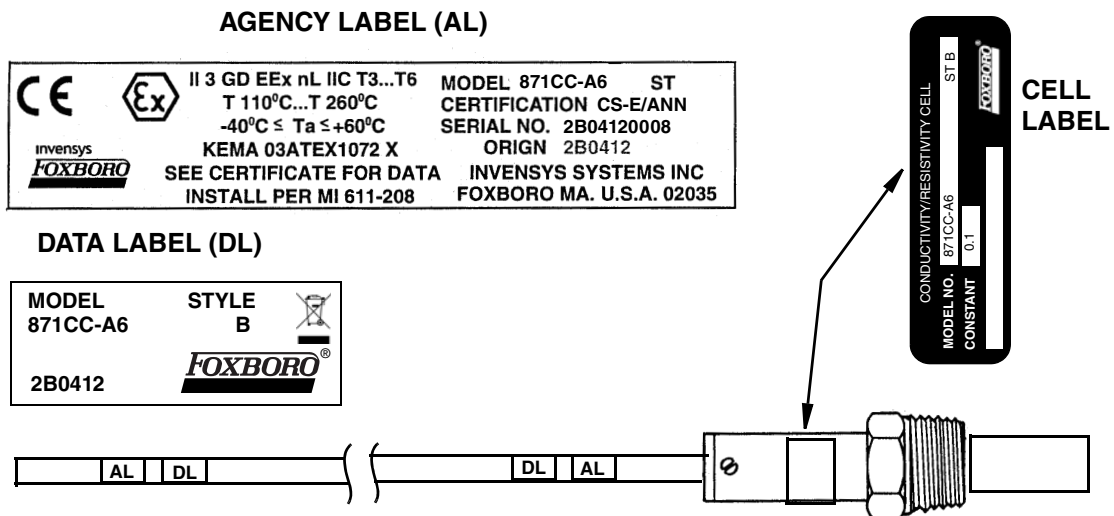
- C = Chemraz O-rings
- K = Kalrez O-rings
- V = Viton O-rings

## 871CC

### Sensor Identification

A cell label similar to that shown in Figure 19 is attached to sensors 871CC-A, -E, -F, and -K. Agency and data labels are attached to all 871CC cables as shown in Figure 19.

*Figure 19. Sample 871CC Sensor Identification*



### Electrical Safety Design Code

The electrical safety design code is printed on the agency plate. See Figure 19. See Table 20 for additional information.

*Table 20. Electrical Safety Specification*

Testing Laboratory, Type of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
<b>ATEX</b> intrinsically safe for II 1 GD EEx ia IIC, Zone 0	Temperature Class T3 - T6 T110 °C...T260 °C	CS-E/AAA
<b>ATEX</b> Type n energy limited for II 3 GD EEx nL IIC, Zone 2	Temperature Class T3 - T6 T110 °C...T260 °C	CS-E/ANN

**NOTE**

These sensors have been designed to meet the electrical safety descriptions listed in the table above. For detailed information, or status of testing laboratory approvals/certifications, contact Invensys Systems, Inc.

Entity Parameters for CS-E/AAA are as follows

- $U_i = 35 \text{ V}$
- $I_i = 150 \text{ mA}$
- $P_i = \text{See Table 21}$
- Effective  $C_i = \text{negligibly small}$
- Effective  $L_i = 0 \text{ mH}$

Entity Parameters for CS-E/ANN are as follows

- $U_i = 35 \text{ V}$
- $I_i = 150 \text{ mA}$
- $P_i = \text{See Table 21}$
- $C_i = 0 \text{ nF}$
- $L_i = 0 \text{ mH}$

*Table 21. Maximum Input Power ( $P_i$ )*

Temperature Class	Max Process Temp(°C)	
	$P_i = 0.4 \text{ W}$	$P_i = 0.6 \text{ W}$
T3	175	175
T4	135	135
T5	100	85
T6	85	50*

\* Maximum Ambient Temperature = +45 °C

## Electromagnetic Compatibility (EMC)

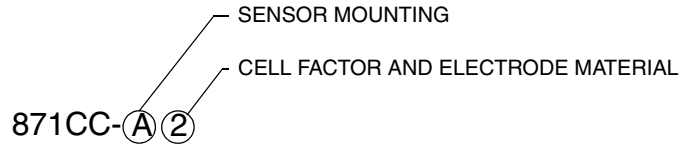
The 871CC Sensor complies with the requirements of the European EMC Directive 89/336/EEC when its cable is connected through rigid metal conduit as recommended for 873CC\*, 873ACC\*, 873RS\*, 873ARS\*, and 875CC Analyzers, and 870ITCC and 876PH Transmitters.

(\*220 V ac, 240 V ac metal enclosures only)

## Pressure and Temperature Limits

Pressure and temperature limits vary per sensor mounting as shown in the model number. See Figure 20.

*Figure 20. 871CC Model Code Example*



### Sensor Mounting

- A = Threaded Bushing, 3/4 NPT
- B = Universal
- C = Sanitary
- D = Insertion
- E = Twist-Lock
- F = Threaded Bushing, 3/4 NPT with 1/2 NPT Conduit Connector
- G = Dip Sensor
- K = Threaded Bushing, 3/4 NPT, High Temperature
- L = Sanitary, High Temperature
- M = Insertion, High Temperature

*Table 22. Pressure and Temperature Limits*

Sensor Mounting Code	Temperature Limits	Pressure Limits
-A through -G	0 and 120 °C (32 and 250 °F)	-0.1 and +1.4 MPa (-15 and +200 psi)
-K through -M	120 °C at 3.4 MPa (250 °F at 500 psi) 150 °C at 2.5 MPa (300 °F at 375 psi) 175 °C at 1.7 MPa (350 °F at 250 psi)	

## Process Wetted Parts

Process wetted parts vary per the cell factor and sensor mounting codes as shown in the model number. See Figure 20 and the following text.

## Sensor Mounting

- A = Threaded Bushing, 3/4 NPT
- B = Universal
- C = Sanitary
- D = Insertion
- E = Twist-Lock
- F = Threaded Bushing, 3/4 NPT with 1/2 NPT Conduit Connector
- G = Dip Sensor
- K = Threaded Bushing, 3/4 NPT, High Temperature
- L = Sanitary, High Temperature
- M = Insertion, High Temperature

## Cell Factor and Electrode Material

- 2 = 0.1 cm<sup>-1</sup>, Titanium
- 4 = 10 cm<sup>-1</sup>, Graphite
- 6 = 0.1 cm<sup>-1</sup>, Monel

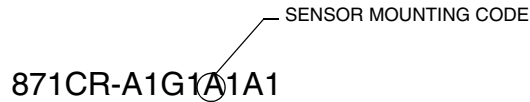
*Table 23. Process Wetted Parts*

Cell Factor	Sensor Mounting Code	Seals/O-Rings	Insulator	Removable Sheath	Bushing	Electrodes
Sensors with 3/4 NPT Bushing or Twist-Lock Process Connection						
0.1 cm <sup>-1</sup>	-A	EPDM	Ryton (a)	None	Teflon-S Coated 300 Grade ss	Titanium or Monel, as specified by Model Code
	-F	EPDM	Ryton	None		
	-K	EPDM	pctfe (a)	None		
	-E	EPDM	Ryton	None	None (Twist Lock)	
10 cm <sup>-1</sup>	-A	EPDM	Noryl	ptfe (a)	Teflon-S Coated 300 Grade ss	High density graphite encapsulated in gold- plated cups
	-F	EPDM	Noryl	ptfe		
	-K	EPDM	pctfe	ptfe	None (Twist Lock)	
	-E	EPDM	Noryl	ptfe		
Universal Mount, Insertion, and Dip Sensors						
0.1 cm <sup>-1</sup>	-B	EPDM	Ryton	None	316 ss	Titanium or Monel, as specified by Model Code
	-G	EPDM	Ryton	None	Noryl	
	-D	EPDM	Ryton	None	316 ss (Includes insertion shaft)	
	-M	EPDM	pctfe	None		
10 cm <sup>-1</sup>	-B	EPDM	Noryl	ptfe	316 ss	High density graphite encapsulated in gold- plated cups
	-G	EPDM	Noryl	ptfe	Noryl	
	-D	EPDM	Noryl	ptfe	316 ss (Includes insertion shaft)	
	-M	EPDM	pctfe	ptfe		
Sensors with Sanitary Fittings						
0.1 cm <sup>-1</sup>	-C	EPDM	Ryton	None	316 ss	Titanium or Monel, as specified by Model Code
	-L	EPDM	pctfe	None	316 ss	
10 cm <sup>-1</sup>	-C	EPDM	Noryl	ptfe	316 ss	High density graphite encapsulated in gold- plated cups
	-L	EPDM	pctfe	ptfe	316 ss	

# 871CR

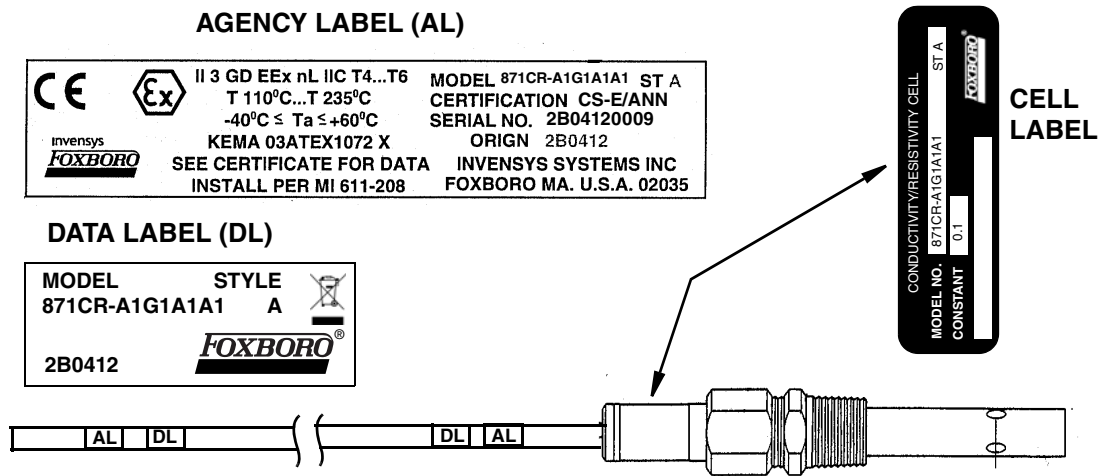
## Sensor Identification

A cell label similar to that shown in Figure 21 is attached to sensors with sensor mounting codes A, B, C, D, E, J, and K.



Agency and data labels are attached to all 871CR cables as shown in Figure 21.

Figure 21. Sample 871CR Sensor Identification



## Electrical Safety Design Code

The electrical safety design code is printed on the agency plate. See Figure 21. See Table 24 for additional information.

Table 24. Electrical Safety Specification

Testing Laboratory, Type of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
ATEX intrinsically safe for II 1 GD EEx ia IIC, Zone 0	Temperature Class T3 - T6 T110 °C...T260 °C	CS-E/AAA
ATEX Type n energy limited for II 3 GD EEx nL IIC, Zone 2	Temperature Class T3 - T6 T110 °C...T260 °C	CS-E/ANN

**NOTE**

These sensors have been designed to meet the electrical safety descriptions listed in the table above. For detailed information, or status of testing laboratory approvals/certifications, contact Invensys Systems, Inc.

Entity Parameters for CS-E/AAA are as follows:

- $U_i = 35 \text{ V}$
- $I_i = 150 \text{ mA}$
- $P_i = 0.6 \text{ W}$
- Effective  $C_i =$  negligibly small
- Effective  $L_i =$  negligibly small

Entity Parameters for CS-E/ANN are as follows:

- $U_i = 35 \text{ V}$
- $I_i = 150 \text{ mA}$
- $P_i = 0.6 \text{ W}$
- $C_i = 0 \text{ nF}$
- $L_i = 0 \text{ mH}$

*Table 25. Relationship Between Process Temperature and Temperature Class*

Temperature Class	Max Process Temp
T3	175 °C
T4	135 °C
T5	85 °C
T6	45 °C

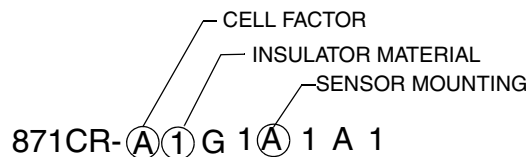
## Electromagnetic Compatibility (EMC)

The 871CR Sensor with Integral Conduit Fitting (Sensor Mounting Code K) and cable connected through rigid metal conduit as recommended to 870ITCR Transmitters, complies with the requirements of the European EMC Directive 89/336/EEC and CENELEC standards for electromagnetic compatibility for generic emissions EN50081-2 and immunity EN50082-2 (Part 2: Industrial Environment).

## Pressure and Temperature Limits

Pressure and temperature limits vary per the sensor accessory used for mounting and the insulator material. The insulator material is identified in the model number. See Figure 22.

*Figure 22. 871CR Model Code Example*



### Insulator Material

- 1 = CPVC
- 2 = Virgin PVDF
- 3 = Virgin PEEK
- 4 = Glass-filled PEEK
- 5 = Glass-filled Noryl

Refer to Tables 26 through 30 for pressure and temperature limits.

*Table 26. Maximum Pressure/Temperature Ratings for Sensors in Bushing Mounts*

Bushing Material/Insulator Material	Maximum Pressure/ Temperature Rating
CPVC/CPVC	250 psig at 27 °C (80 °F) (a)
Virgin PVDF/Virgin PVDF	250 psig at 24 °C (75 °F) (b)
Virgin PEEK/Virgin PEEK	250 psig at 175 °C (350 °F)
Titanium/Virgin PVDF	250 psig at 121 °C (250 °F)
Titanium/Virgin PEEK	250 psig at 175 °C (350 °F)
Glass-Filled Noryl/Glass-Filled Noryl	150 psig at 121 °C (250 °F)
Glass-Filled PEEK/Glass-Filled PEEK	250 psig at 175 °C (350 °F)
316 SS/Glass-Filled Noryl	250 psig at 121 °C (250 °F)
316 SS/Glass-Filled PEEK	250 psig at 175 °C (350 °F)

(a) Linearly derated to 50 psig at 88 °C (190 °F)

(b) Linearly derated to 42 psig at 121 °C (250 °F)

*Table 27. Maximum Pressure/Temperature Ratings for Flow Chambers*

Material	Maximum Pressure/ Temperature Rating <sup>(a)</sup>
PVC	60 psig at 50 °C (122 °F)
CPVC	60 psig at 50 °C (122 °F)
Virgin PVDF	60 psig at 50 °C (122 °F)
Virgin PEEK	250 psig at 175 °C (350 °F)
316 SS	500 psig at 175 °C (350 °F)

(a) Actual sensor rating may derate actual pressure-temperature ratings listed.

*Table 28. Maximum Pressure/Temperature Ratings for Sensors in Tri-Clamp Mountings*

Used With Insulator	Maximum Pressure/Temperature Rating
Virgin PDVF	250 psig at 121 °C (250 °F)
Virgin PEEK	250 psig at 175 °C (350 °F)
Glass-Filled PEEK	250 psig at 175 °C (350 °F)
Glass-Filled Noryl	250 psig at 121 °C (250 °F)

*Table 29. Maximum Pressure/Temperature Ratings for Sensors in Flange Mounts*

Used With Insulator	Maximum Pressure/Temperature Rating
CPVC	198 psi at 88 °C (190 °F)
Virgin PVDF	184 psig at 121 °C (250 °F)
Virgin PEEK	167 psig at 175 °C (350 °F)
Glass-Filled PEEK	167 psig at 175 °C (350 °F)
Glass-Filled Noryl	184 psig at 121 °C (250 °F)

*Table 30. Maximum Pressure/Temperature Ratings for Ball Valves and Insertion Sensors*

Ball Valve/Insertion Sensor Material	Maximum Pressure/Temperature Rating
Virgin PVDF/Virgin PVDF	100 psig at 60 °C (140 °F)
316 ss/CPVC	250 psig at 82 °C (180 °F)
316 ss/Virgin PVDF	250 psig at 121 °C (250 °F)
316 ss/Virgin PEEK	500 psig at 175 °C (350 °F)
316 ss/Glass-Filled PEEK	500 psig at 175 °C (350 °F)
316 ss/Glass-Filled Noryl	250 psig at 175 °C (350 °F)

(a) Linearly derated to 60 psig at 121 °C (250 °F)

## Process Wetted Parts

Process wetted parts vary per the cell factor and sensor mounting codes as shown in the model number. See Figure 22 and the following text.

### Cell Factor

- A =  $0.1 \text{ cm}^{-1}$  Conductivity/Resistivity with Class B 1000  $\Omega$  RTD
- B =  $0.1 \text{ cm}^{-1}$  Resistivity with Class A 1000  $\Omega$  RTD
- C =  $10 \text{ cm}^{-1}$  Conductivity with Class B 1000  $\Omega$  RTD

### Sensor Mounting

- A = Universal Bore Piece with 3/4 NPT CPVC Bushing
- B = Universal Bore Piece with 3/4 NPT Virgin PVDF Bushing
- C = Universal Bore Piece with 3/4 NPT Virgin PEEK Bushing
- D = Universal Bore Piece with 3/4 NPT Glass Filled PEEK Bushing
- E = Universal Bore Piece with 3/4 NPT Glass Filled Noryl Bushing
- F = Universal Bore Piece with 1 1/2 inch Tri-Clamp Fitting



Table 31. Process Wetted Parts

Cell Factor	Mounting Code	Mounting	Insulator	Electrodes	Seals/O-ring	Sheath
0.1 cm <sup>-1</sup>	A, B, C, F, J, K	CPVC, Virgin PVDF, Virgin PEEK, or Titanium Bushings; Titanium or 316 ss Tri-Clamp Fittings; or 316 ss Flanges	CPVC or Virgin PVDF or Virgin PEEK	Titanium or Monel	Teflon-coated EPDM	–
	G	PVDF Insertion Shaft	Virgin PVDF	Titanium or Monel		
	H	316 ss Insertion Shaft	CPVC or Virgin PVDF or Virgin PEEK	Titanium		
10 cm <sup>-1</sup>	D, E, F, J, K	Glass-Filled PEEK, Glass-Filled Noryl, 316 ss Bushings, or 316 ss Tri-Clamp Fittings; or 316 ss Flanges	Glass-Filled PEEK or Glass-Filled Noryl	Graphite/Titanium Cup	EPDM and Teflon-coated EPDM	Teflon and Titanium (a)
	H	316 ss Insertion Shaft	Glass-Filled PEEK or Glass-Filled Noryl	Graphite/Titanium Cup		

## FT10 Electrodeless Conductivity Sensor, ATEX Entity Approval as Type ia and Type n

The FT10 Conductivity Sensor is ATEX Approved as Type ia and Type n for use in Zone 0 and Zone 2 hazardous (classified) areas respectively.

The sensor is typically installed in the (potentially) hazardous area. The 875EC Analyzer (Type n only), the 870ITEC Transmitter or other ATEX Approved apparatus can be installed in either the non-hazardous or the hazardous area. Wiring and installation methods are determined by the area (hazardous or nonhazardous) in which the associated equipment is installed. In all cases, installation should be in accordance with regulations of the country of installation

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### **WARNING**

Explosion Hazard - Do not disconnect equipment when a flammable or combustible atmosphere is present unless power has been switched off.

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### **WARNING**

Safety Ground - The grounding stud or conductive mounting means of the enclosure of the associated apparatus must be connected to the potential equalizing system within the explosive atmosphere.

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**! WARNING**

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Ingress Protection - The FT10 sensor housing meets IP66 ingress protection only when the Calibration Port Cover is securely installed on the sensors with integral cable (FT10-MT\*\*\*1 or FT10-MT\*\*\*2). The patch cable or protective cover must also be securely installed on the sensors with cable connector (FT10-MT\*\*\*6) to meet IP66 ingress protection.

Associated Apparatus - Connection of the FT10 Sensor to the associated apparatus must be made in such a way that the degree of ingress protection remains at least IP54 per IEC 60529 and is suitable for the environment.

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**! WARNING**

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Calibration Port Cover - The Calibration Port Cover must remain securely installed during normal operation in a (potentially) hazardous location.

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**! WARNING**

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Associated Apparatus - The associated apparatus must be ATEX certified as either Type ia or Type n and must have compatible entity parameters. The associated apparatus manufacturer's installation instructions must be followed when installing the associated apparatus.

Both the Sensor and the Associated Apparatus must have the same safety rating, either both Type ia or both Type n.

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**! WARNING**

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Ultra-Violet Radiation Exposure - The housing material will yellow and become brittle with extended exposure to UV radiation (sunlight).

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**! WARNING**

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Parts of the enclosure are non-conducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. Ensure that the equipment is not installed in a location where it may be subjected to external conditions which might cause a build up of electrostatic charge on nonconducting surfaces.

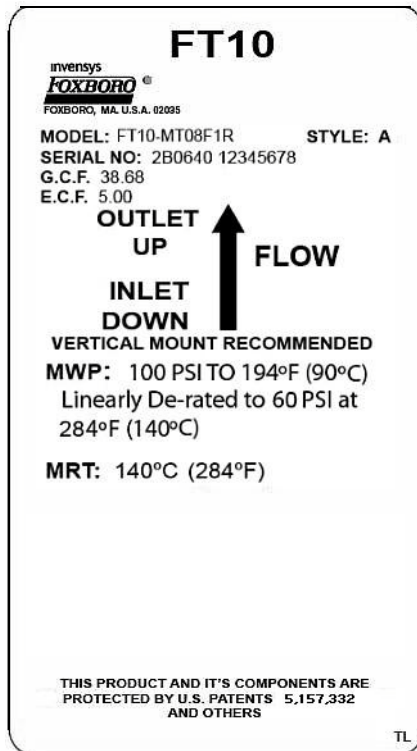
Additionally, cleaning of the equipment should be done only with a damp cloth.

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## Sensor Identification

A Data Label with model number, serial number including date of manufacture, cell constants, pressure and temperature information is affixed to the front surface of the sensor. An Agency Label with certification information is affixed to the rear surface. A third Warning Label is affixed to the side with the calibration connector. Refer to the sample labels in Figures 23, 24, and 25.

Figure 23. Sample Data Label



Model Number: Per Sales Order

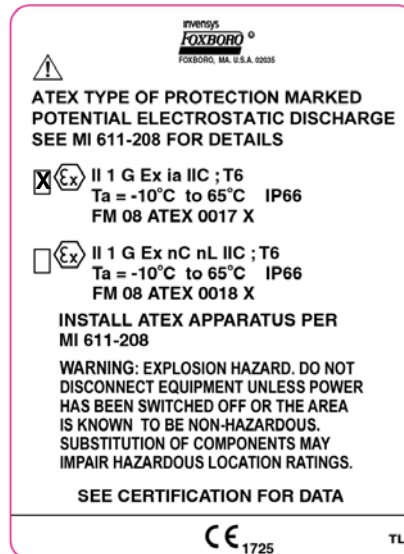
Serial Number: Origin code followed by a number set per manufacturing standard procedures. The Origin Code is explained immediately below this figure.

GCF and ECF: Geometric and Electronic Cell Factor values are determined by the model number (line size) of the sensor.

MWP: Maximum Working Pressure values are determined by the model number (line size) of the sensor.

MRT: Maximum Rated Temperature is the maximum process fluid temperature allowed at the maximum ambient temperature  $T_a=65^\circ\text{C}$ .

Figure 24. Sample Agency Label



The type of protection (Type ia or Type n) is determined during fabrication and marked on the Agency Label. Once determined, the type of protection may not be changed.

Figure 25. Sample Warning Label



## Associated Apparatus in Nonhazardous Area, Sensor in Hazardous Area

There are no special requirements when the 870ITEC Transmitter or other ATEX entity approved associated apparatus is installed in a nonhazardous area. See Figure 26.

Figure 26. Sensor in Zone 0 Hazardous Location

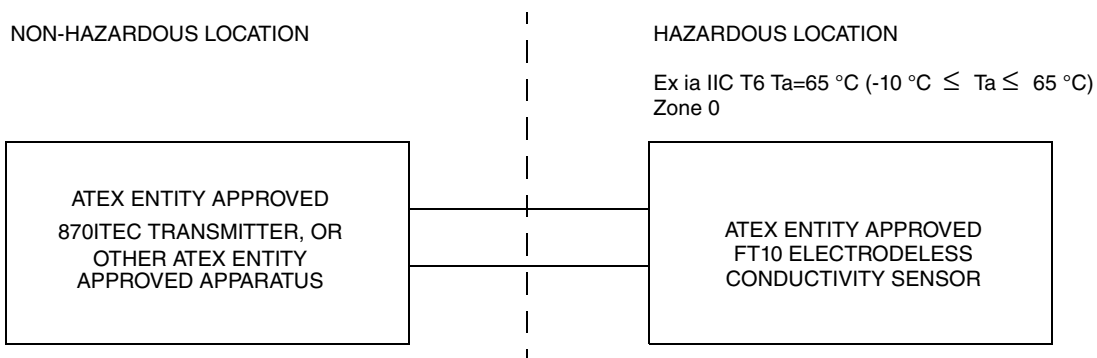
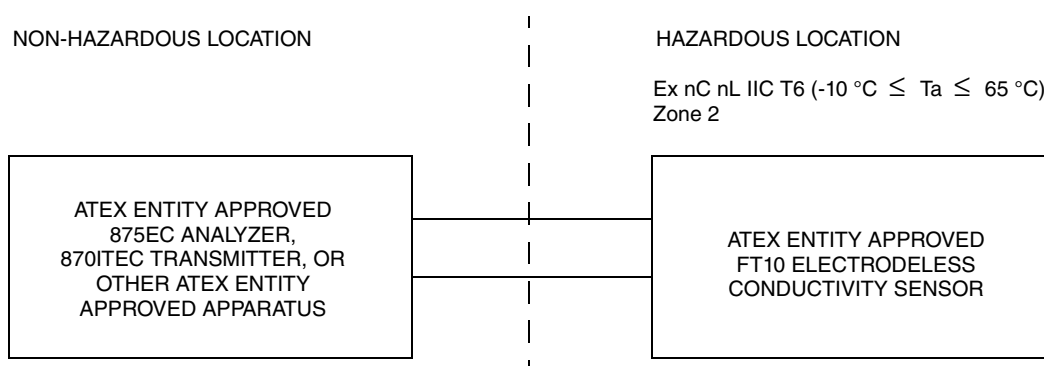


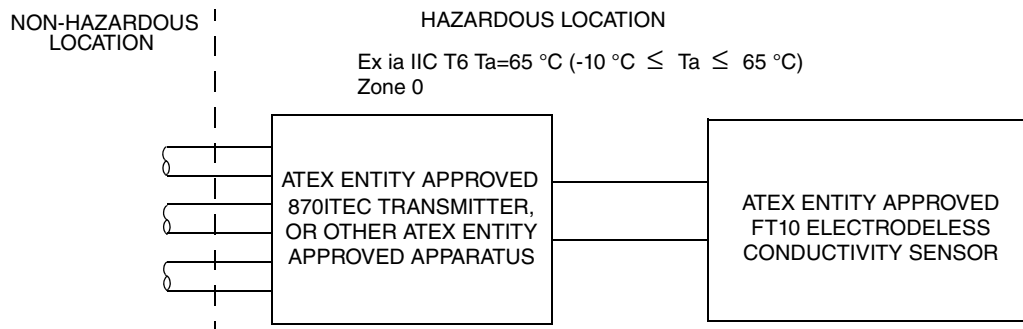
Figure 27. Sensor in Zone 2 Hazardous Location



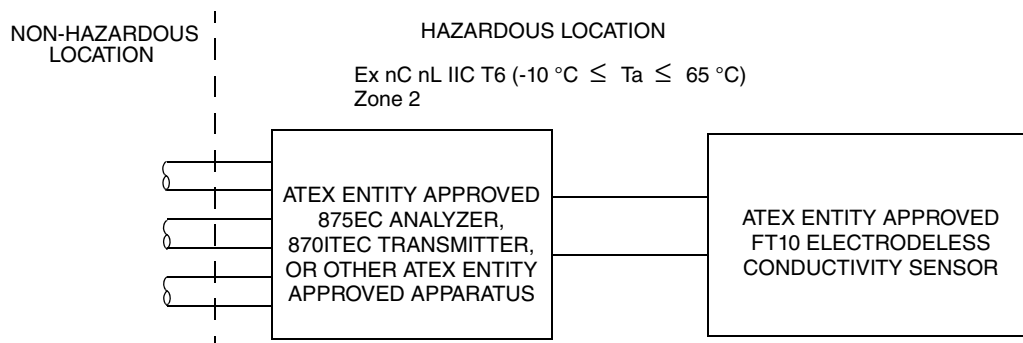
## Associated Apparatus and Sensor in Hazardous Area

All connections to the 870ITEC Transmitter or other ATEX entity approved associated apparatus (except connections to the sensor) must be protected by conduit to prevent damage to the wiring in the hazardous area. Conduit and all fittings to the 870ITEC Transmitter or associated apparatus, including the sensor cable fitting must meet ingress protection ratings of IEC IP66 within the hazardous area; follow the manufacturer's safety installation instructions for the associated apparatus. See Figure 28.

*Figure 28. Sensor and Associated Apparatus in Zone 0 Hazardous Location*



*Figure 29. Sensor and Associated Apparatus in Zone 2 Hazardous Location*



## Entity and Field Wiring Parameters

The entity and field wiring parameters listed below apply to all models of the FT10 Electrodeless Conductivity Sensor.

$$V_{\max}(U_i) = 10 \text{ V}$$

$$I_{\max}(I_i) = 80 \text{ mA}$$

$$P_{\max}(P_i) = 0.200 \text{ W}$$

$$C_i = 0 \text{ F}$$

$$L_i = 5.5 \text{ mH}$$

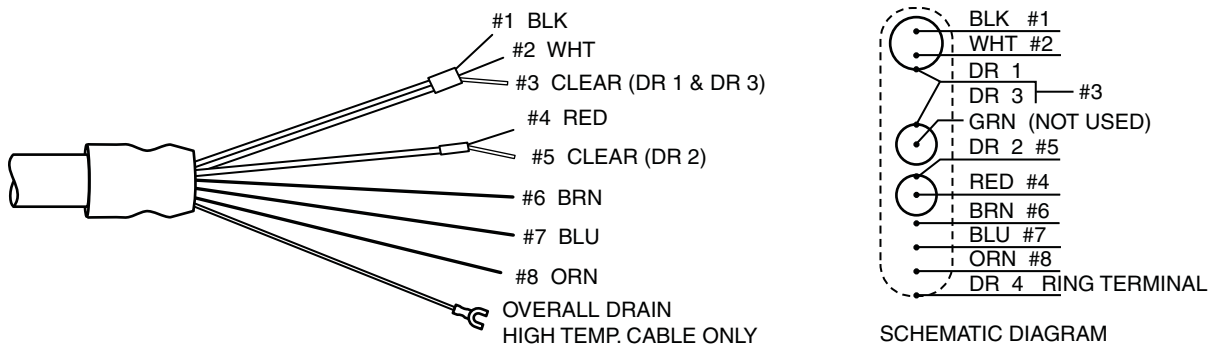
# Pin Terminated Integral Cable and Patch Cable Connections

The individual connections are color coded. Additionally, each connection has a numbered sleeve corresponding to the terminal number on the 875EC Analyzer or 870ITEC Transmitter for increased wiring ease. Refer to Figure 32 for 875EC Sensor Interface terminal connections or refer to MI 611-224 for this and more general information. Refer to Figure 33 or 870ITEC Sensor Interface terminal connections or refer to MI 611-212 for this and more general information. The ring terminal on the high temperature cable should be connected to chassis or earth ground in the associated apparatus.

*Table 32. Cable Connections*

Function/Signal Description	Wire Sleeve Designation	Connector Pin	Standard Temperature (PVC) Cable	High Temperature (TFE) Cable
Sensor Drive	1	A	BLK	BLK
Sensor Drive	2	B	WHT	WHT
Drive Screen	3	C	CLEAR (Shield 1)	CLEAR (Shield 1)
Sensor Return	4	D	RED	RED
Sensor Return	5	E	CLEAR (Shield 2)	CLEAR (Shield 2)
RTD Return	6	F	BRN	BRN
RTD Drive	7	G	BLU	BLU
RTD 3-Wire	8	H	ORN	ORN
Cable Shield	Ring Terminal	No Connection	Not Used	CLEAR (Shield)

*Figure 30. Cable Connections*



## Patch Cable Connector

Connector pin designations and the connector layout are shown for reference. Patch Cables in both PVC (standard temperature) and TFE (high temperature) are available. Refer to MI 611-217 for information.

Figure 31. Patch Cable Connector (as viewed on sensor)

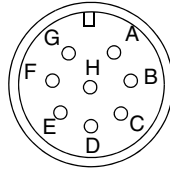


Figure 32. 875EC Analyzer Sensor Wiring Connections

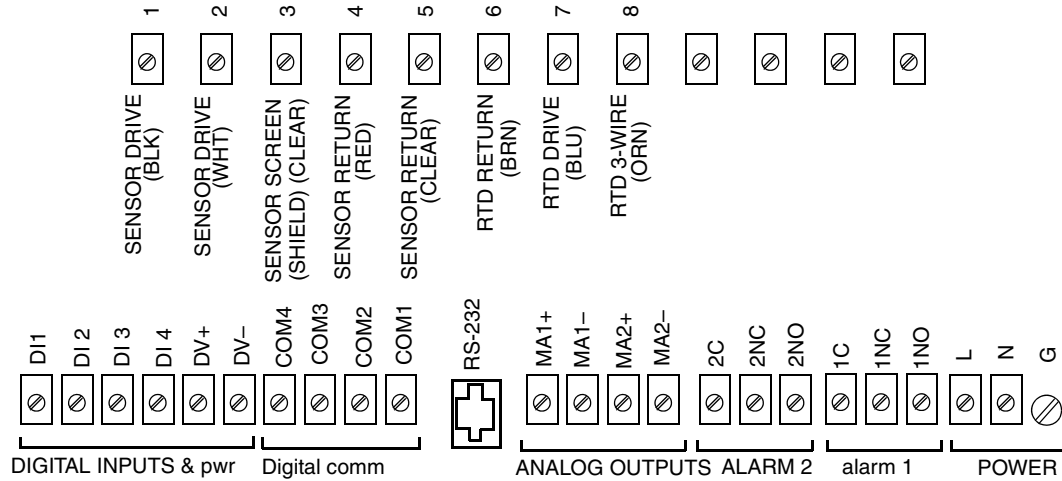
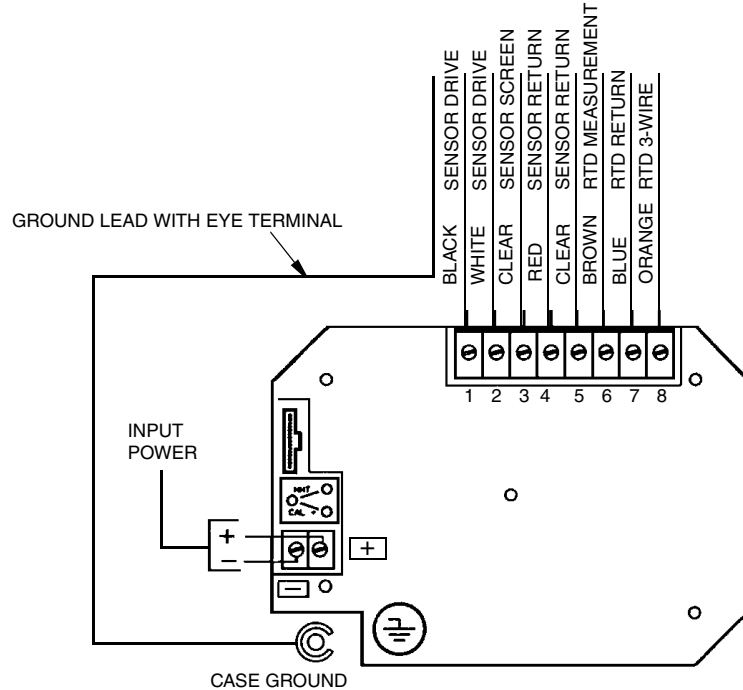


Figure 33. 870ITEC Transmitter Sensor Wiring Connections



## Special Conditions of Use

The housing is designed for indoor use only. Refer to Ultra-Violet Radiation Exposure warning on page 50.





# 4. 870IT Series Transmitters

## Transmitter Identification

The data label and agency label are fastened to left side surface of the enclosure. A typical data label is shown in Figure 34. A typical agency label is shown in Figure 35.

Refer to the data label to determine the model number, origin code, supply voltage, and maximum power.

*Figure 34. Sample 870IT Transmitter Data Label*


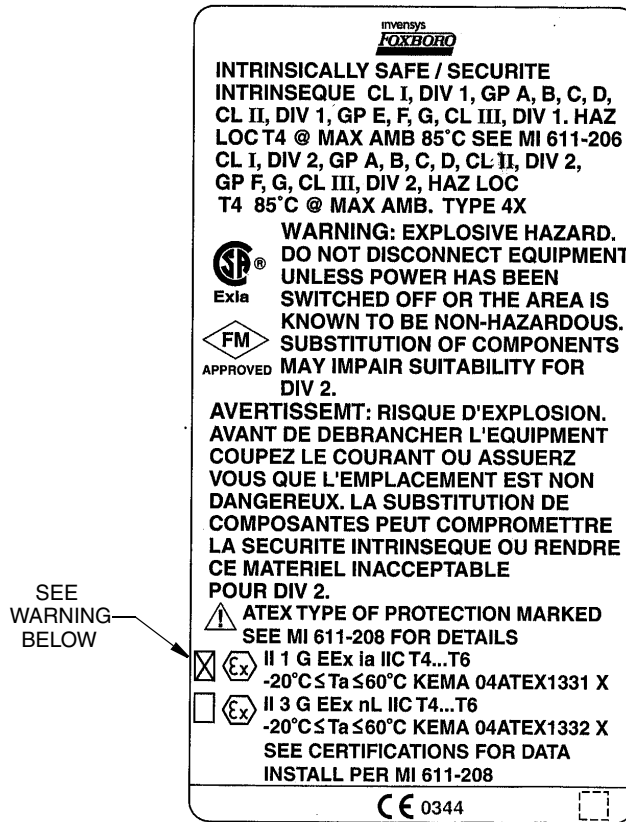
<b>MODEL / ST</b>	<b>870ITCR-FYAAA-7</b>	<b>BB</b>	— MODEL AND STYLE
<b>CERT SPEC</b>	<b>AAA</b>		— ELECTRICAL CLASSIFICATION CODE
<b>REF NO</b>	<b>377482F10</b>		— SALES ORDER / SERIAL NUMBER (IF APPLICABLE)
<b>ORIGIN</b>	<b>2B05320526</b>		— PLANT OF MANUFACTURE, DATE, SERIAL NO.
<b>SUPPLY</b>	<b>12.5 TO 42 VDC</b>		— SUPPLY VOLTAGE
<b>POWER</b>	<b>1 WATTS MAX</b>		— POWER CONSUMPTION
<b>FUSE</b>	<b>N/A</b>		
<b>CALIB</b>	<b>0 - 200 uS/cm</b>		— MEASUREMENT RANGE
<b>CONFIG CD</b>	<b>I/A FoxCom</b>		— COMMUNICATIONS
<b>ALARM</b>	<b>N/A</b>		
<b>OUTPUT</b>	<b>4 - 20 mA</b>		— OUTPUT
<b>CUST DATA</b>	<b>STK 08630</b>		— USER INFORMATION
 <b>INVENSYS PROCESS SYSTEMS INC</b> <b>FOXBORO, MA 02035 U.S.A.</b>			

Figure 35. Sample Type ia Certified 870IT Transmitter Agency Label



## Electrical Certification Rating

The electrical certification information is printed on the agency label. See Figure 35. See Table 33 for additional information.

**! WARNING**

The type of protection (Type ia or Type n) is determined at the time of fabrication and the agency label is appropriately marked. Once determined, this certification may not be changed.

Table 33. Product Safety Specifications

Testing Laboratory, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
ATEX intrinsically safe for II 1 G EEx ia IIC	Temperature Class T4 -T6.	AAA
ATEX Type n energy limited for II 3 G EEx nL IIC	Temperature Class T4 -T6.	ANN

**— NOTE**

These transmitters have been designed to meet the electrical safety descriptions listed in the table above. For detailed information, or status of testing laboratory approvals/certifications, contact Invensys Systems, Inc.

The entity parameters for the supply and output circuit in type of protection EEx ia IIC and EEx nL IIC with the following maximum values are:

$$U_i = 30 \text{ V}$$

$$I_i = 110 \text{ mA}$$

$$P_i = \text{See Table 34 for EEx ia IIC; Table 35 for EEx nL IIC}$$

$$C_i = 2 \text{ nF}$$

$$L_i = 0 \text{ mH}$$

The entity parameters for the sensor circuit in type of protection intrinsic safety EEx ia IIC with the following maximum values are:

870ITPH- <b>**AAA</b> -* (Terminals 1, 2, 2A, 3, 3A, 4, 5, 5A, 6, 7, 8, G)	870ITEC- <b>**AAA</b> -* (Terminals 1, 2, 3, 4, 5, 6, 7, 8)	870ITCR- <b>**AAA</b> -* (Terminals 1, 1A, 1B, 1C, 1D, 1E, 2, 3, 4, 5)
$U_o = 8.6 \text{ V}$	$U_o = 6.5 \text{ V}$	$U_o = 13 \text{ V}$
$I_o = 40 \text{ mA}$	$I_o = 110 \text{ mA}$	$I_o = 40 \text{ mA}$
$P_o = 0.35 \text{ W}$	$P_o = 0.1 \text{ W}$	$P_o = 0.35 \text{ W}$
$C_o = 0.5 \mu\text{F}$	$C_o = 0.3 \mu\text{F}$	$C_o = 0.5 \mu\text{F}$
$L_o = 1 \text{ mH}$	$L_o = 0.1 \text{ mH}$	$L_o = 1 \text{ mH}$

The entity parameters for the sensor circuit in type of protection EEx nL IIC, with the following maximum values are:

**— NOTE**

The 870ITEC-**\*\*AAA**-\* Transmitter is also approved for Type ia protection when used with a Type ia certified 871EC or 871FT Sensor with a maximum cable length of 30 m (100 ft).

870ITPH- <b>..ANN</b> - (Terminals 1, 2, 2A, 3 3A, 4, 5, 5A, 6, 7, 8, G)	870ITEC- <b>..ANN</b> - (Terminals 1, 2, 3, 4, 5, 6, 7, 8)	870ITCR- <b>..ANN</b> - (Terminals 1, 1A, 1B, 1C, 1D, 1E, 2, 3, 4, 5)
$U_o = 8.6 \text{ V}$	$U_o = 6.5 \text{ V}$	$U_o = 13 \text{ V}$
$I_o = 40 \text{ mA}$	$I_o = 110 \text{ mA}$	$I_o = 40 \text{ mA}$
$P_o = 0.35 \text{ W}$	$P_o = 0.1 \text{ W}$	$P_o = 0.35 \text{ W}$
$C_o = 43 \mu\text{F}$	$C_o = 300 \mu\text{F}$	$C_o = 5.5 \mu\text{F}$
$L_o = 28 \text{ mH}$	$L_o = 3.7 \text{ mH}$	$L_o = 28 \text{ mH}$

**— NOTE**

The 870ITEC-**\*\*ANN**-\* Transmitter is also approved for Type n protection when used with a Type n certified 871EC or 871FT Sensor with a maximum cable length of 30 m (100 ft).

*Table 34. Maximum Input Power (Pi) for Intrinsic Safety (EEx ia) Protection*

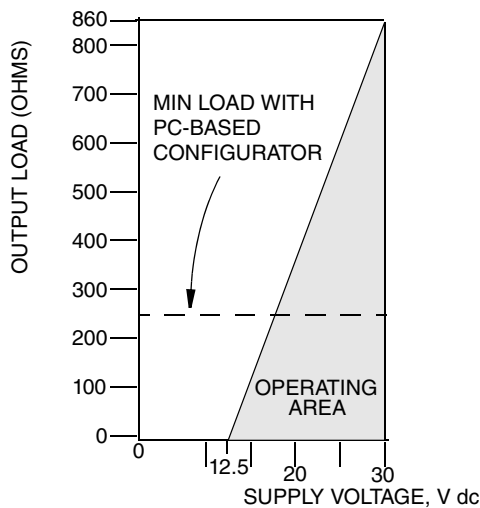
Temperature Class	Max Process Temp (°C)	Pi (W)
T4	-20 to +70	0.8
T4	-20 to +75	0.7
T4	-20 to +85	0.6
T5	-20 to +40	0.7
T5	-20 to +60	0.6
T5	-20 to +85	0.5
T6	-20 to +40	0.5

*Table 35. Maximum Input Power (Pi) for Energy Limited (EEx nL) Protection*

Temperature Class	Max Process Temp (°C)	Pi (W)
T4	-20 to +70	0.8
T4	-20 to +75	0.7
T4	-20 to +85	0.6
T5	-20 to +70	0.8
T5	-20 to +75	0.7
T6	-20 to +60	0.8

The power supply requirements for a 4 to 20 mA output are 12.5 to 30 V dc for 870IT Series ATEX certified products. See Figure 36.

*Figure 36. Power Supply Requirements*



$$\text{MAX LOAD} = (V-12.5)/0.0204$$

**NOTE**

The transmitter will function with an output load less than 250 ohms provided that a PC-Based configurator is not connected to it. Connecting a PC-Based configurator while operating with less than a 250 ohm load may cause disturbances and/or communication problems.

## Origin Code

The origin code identifies the area of manufacture, the year and week of manufacture, and the serial number. See Figure 34. In the example 2B04120526, 2B means the product was manufactured in the Analytical Division, 04 identifies the year of manufacture as 2004, 12, the week of manufacture in that year, and 0526 the serial number.

## Special Warnings

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**! WARNING**

On intrinsically safe transmitters, if the optional storm door (option -7) is employed, take precautions to avoid electrostatic charges.

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**! WARNING**

The housing on 870IT transmitters is aluminum. Therefore, transmitters certified as intrinsically safe must be installed so that ignition sources due to impact and friction sparks are excluded.

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**! WARNING**

Make electrical connections in such a way that the degree of ingress protection of the enclosure remains at least IP54 per IEC 60529 and is suitable for the environment.

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# 5. 876 Series Transmitters

## Transmitter Identification

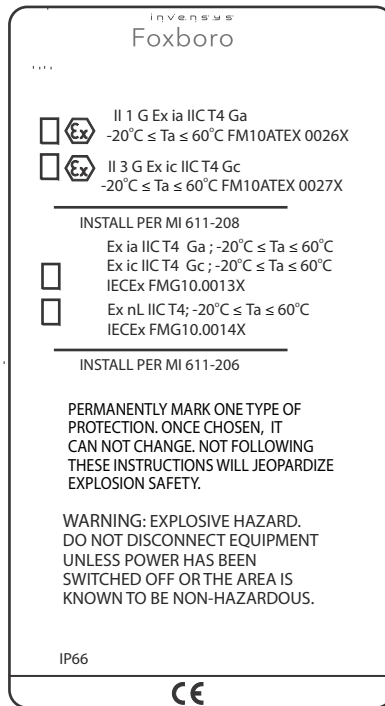
The data label and agency label are fastened to left side surface of the enclosure. A typical data label is shown in Figure 37. A typical agency label is shown in Figure 38.

Refer to the data label to determine the model number, origin code, supply voltage, and maximum power.

*Figure 37. Sample 876 Transmitter Data Label*

i n v e n s y s		
Foxboro		
MODEL / ST	_____	— MODEL AND STYLE
CERT SPEC	_____	— ELECTRICAL CLASSIFICATION CODE
REF NO	_____	— SALES ORDER / SERIAL NUMBER (IF APPLICABLE)
ORIGIN	_____	— PLANT OF MANUFACTURE, DATE, SERIAL NO.
SUPPLY	_____	— SUPPLY VOLTAGE
POWER	_____	— POWER CONSUMPTION
CALIB	_____	— MEASUREMENT RANGE
CONFIG CD	_____	— COMMUNICATIONS
OUTPUT	_____	— OUTPUT
CUST DATA	_____	— USER INFORMATION
INVENSY PROCESS SYSTEMS INC		
FOXBORO, MA 02035 U.S.A.		

Figure 38. Sample Type ia Certified 876PH Transmitter Agency Label



## Electrical Certification Rating

The electrical certification information is printed on the agency label. See Figure 38. See Table 36 for additional information.

### **WARNING**

The type of protection (Type ia or Type ic) is determined at the time of fabrication and the agency label is appropriately marked. Once determined, this certification may not be changed.



Table 36. Product Safety Specifications

Testing Laboratory, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
ATEX intrinsically safe for Zone 0 II 1 G Ex ia IIC T4 Ga	FM10ATEX0026X Temperature Class T4 (-20 ≤ Ta ≤ +60 °C) IP66	AA
ATEX intrinsically safe for Zone 2 II 3 G Ex ic IIC T4 Gc	FM10ATEX0027X Temperature Class T4 (-20 ≤ Ta ≤ +60 °C) IP66	AN

**— NOTE**

These transmitters have been designed to meet the electrical safety descriptions listed in the table above. For detailed information, or status of testing laboratory approvals/certifications, contact Invensys.

The entity parameters for the supply and output circuit in type of protection Ex ia IIC and Ex ic IIC with the following maximum values are:

$$U_i \leq 30 \text{ V}$$

$$I_i \leq 110 \text{ mA}$$

$$P_i \leq 800 \text{ mW}$$

$$C_i = 3 \text{ nF}$$

$$L_i = 9.9 \text{ } \mu\text{H}$$

The entity parameters for the sensor circuit in type of protection intrinsic safety Ex ia IIC with the following maximum values are:

876PH-T*AA-* (Terminals 1, 2, 2A, 3, 3A, 4, 5, 5A, 6, 7, 8)	876PH-S*AA-*	876EC-**AA-* (Terminals 1, 2, 3, 4, 5, 6, 7, 8)	876CR-**AA-* (Terminals 1, 2, 2A, 3, 4, 5)
U <sub>o</sub> = 8.6 V	U <sub>o</sub> = 11 V	U <sub>o</sub> = 6.5 V	U <sub>o</sub> = 13 V
I <sub>o</sub> = 40 mA	I <sub>o</sub> = 50 mA	I <sub>o</sub> = 110 mA	I <sub>o</sub> = 40 mA
P <sub>o</sub> = 0.35 W	P <sub>o</sub> = 0.5 W	P <sub>o</sub> = 0.10 W	P <sub>o</sub> = 0.35 W
C <sub>o</sub> = 0.5 μF	C <sub>o</sub> = 0 μF	C <sub>o</sub> = 0.3 μF	C <sub>o</sub> = 0.5 μF
L <sub>o</sub> = 1 mH	L <sub>o</sub> = 0 mH	L <sub>o</sub> = 0.1 mH	L <sub>o</sub> = 1 mH

The entity parameters for the sensor circuit in type of protection Ex ic IIC, with the following maximum values are:

876PH-T*AN-* (Terminals 1, 2, 2A, 3, 3A, 4, 5, 5A, 6, 7, 8)	876PH-S*AN-*	876EC-**AN-* (Terminals 1, 2, 3, 4, 5, 6, 7, 8)	876CR-**AN-* (Terminals 1, 2, 2A, 3, 4, 5)
Uo = 8.6 V	Uo = 11 V	Uo = 6.5 V	Uo = 13 V
Io = 40 mA	Io = 50 mA	Io = 110 mA	Io = 40 mA
Po = 0.35 W	Po = 0.5 W	Po = 0.10 W	Po = 0.35 W
Co = 43 µF	Co = 0 µF	Co = 300 µF	Co = 5.5 µF
Lo = 28 mH	Lo = 0 mH	Lo = 3.7 mH	Lo = 28 mH

## Special Warnings

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**! WARNING**

The 876 Transmitter enclosure is made of aluminum alloy. When used in a potentially explosive atmosphere requiring apparatus equipment category 1 G, the 876 Transmitter must be installed so that, even in the event of rare incidents, an ignition source due to impact or friction between the enclosure and iron/steel is excluded.

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**! WARNING**

The optional storm door (option code -7) and keypad area is nonconducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. Ensure that the equipment is not installed in a location where it may be subjected to external conditions which might cause a build-up of electrostatic charge on nonconducting surfaces. Additionally, cleaning of the storm door and keypad area should only be done with a damp cloth.

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**! WARNING**

Make electrical connection in such a way that the degree of ingress protection on the enclosure remains at least IP66 per IEC 60529 and is suitable for the environment.

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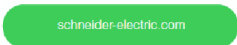
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Invensys Systems, Inc.  
10900 Equity Drive  
Houston, TX 77041  
United States of America



Global Customer Support  
Inside U.S.: 1-866-746-6477  
Outside U.S.: 1-508-549-2424  
Website: <http://support.ips.invensys.com>

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