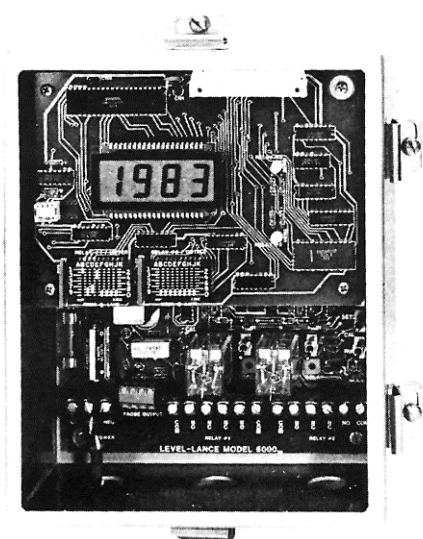




Model 5000A Microprocessor μ P "Level Lance"



GENERAL DESCRIPTION

The Robertshaw Model 5000A Level-Lance is a microprocessor based indicator/controller employing a pulse frequency modulation (PFM) measuring system. Changing level conditions at the sensing probe cause a change in the pulse frequency output of the miniature transmitter that is normally mounted directly on the sensing probe. This pulse frequency is detected by the remote mounted indicator/controller and converted to a signal that is proportional to the level being measured. This resultant level signal can be:

- Displayed on the instrument door by means of 4 digit LCD display reading in percent or engineering units field selectable.
- Retransmitted via a 4-20 mADC output signal. This optional signal is compatible with all common receivers used for recording, indication, or control purposes.
- Used to communicate with a larger computer via 20 mA loop. The Model 5000A continuously sends product level information to the larger computer.

FEATURES AND BENEFITS

- **Microprocessor Based.**
- **Auto-Set** - Automatic calibration
- **Calibrate without completely emptying and filling vessel.**
- **Field Selectable Control Mode Programs.**
- **Duplex Alarm Relays.**
- **Digital Display** - Percent or engineering units.
- **Field Reversible Output.**
- **Uses Standard Two-Wire Cable** - Up 1 mile between probe system and the indicating controller.
- **NEMA-4, 4X, or Explosion-Proof Enclosures.**
- **Self-Diagnostic** - Indicates out of calibration, sensor failure, etc.
- **Calibration Retained via Battery Back-Up on Loss of Power.**
- **Linearization Optional for Level to Volume/Flow Conversion.**
- **UL/c-UL Listed Transmitter**

PRINCIPAL OF OPERATIONAL

The miniature pulse frequency modulation (PFM) transmitter is a two-wire unit that has the following features:

- **NO CALIBRATION ADJUSTMENTS**
- **NO MOVING PARTS**
- **NO SPECIAL CABLE - 2 PLAIN WIRES**
- **NO PRIMARY POWER REQUIRED**
- **LOW INSTALLATION COST**
- **LOW ENERGY**
- **INTRINSICALLY SAFE PFM & PROBE INPUT CIRCUIT.**

The Model 5000A has - as a standard feature - a "Control Mode Switch" which provides flexibility for the user. On one position of the switch, a diagnostic feature of the device is indicated.

This diagnostic position will show by means of a "CAL" light if the system is out of calibration. Also "SEN" light will indicate if the probe, PFM transmitter, or interconnecting wire is open or shorted. Other positions of the switch are used for calibration in "per-cent" or in "engineering units."

A parent "mother-board" contains all hook-up wiring, terminals, power supply and sockets for optional plug-in circuit boards. On this parent board are two (2) DPDT 10 amps relays for use as cyclic control relays and/or alarm functions.

The relays are completely independent and both may be set anywhere within the span, allowing an alarm/control combination. Calibration of the relays is accomplished by the "AUTOSET" feature (digitally). Each relay has an adjustable differential (deadband), adjustable time delay, and can be set for High or Low Fail-Safe operations.

Calibration of the instrument is simplified by the use of the microprocessor - ie - if a known level is present on the probe, this level value may be entered and shown on the display by utilizing the appropriate calibration switches. By pressing the proper momentary contact switch, the microprocessor automatically calibrates the instrument to that point. Two such entries are all that is required for full calibration to the process. Calibration can be accomplished without completely emptying and filling vessel. Alarm conditions for both high and low alarm relay trip point settings are also switches and the digital display. Alarm points are set by simple data entry without the need to vary the process level.

Power supply options include DC voltages from 18 to 30, 120 volts AC or 240 volts AC. The AC voltages are field selectable.

SPECIFICATIONS

Electrical/Electronics:

Supply Voltages 120 VAC, $\pm 10\%$, Std.
240 VAC, $\pm 10\%$, Opt.
18 to 30 VDC, Opt.

Supply Current less than 100 mA

Ambient Temperature Effect $\pm .005$ pF/ $^{\circ}$ F or
 ± 0.01 %/ $^{\circ}$ F whichever is greater

Supply Variation Effect None

Span 10 to 6000 pF

Linearity $\pm 0.5\%$

Alarms Electro-mechanical relay contacts, DPDT,
10 amp 120 VAC/28 VDC non-inductive

Current Output (Optional) 4-20 mADC Isolated

Maximum distance between PFM transmitter and the

Indicator/Controller One mile

Type interconnection cable Standard 2 wire

Environmental:

Operating or Storage Temperature Range

- 40 $^{\circ}$ F to +140 $^{\circ}$ F (-40 $^{\circ}$ C to +60 $^{\circ}$ C)

Intrinsic Safety:

UL/c-UL listed PFM & probe input circuit Intrinsically safe for Class I, Div. 1, Groups A, B, C & D; Class II, Div. 1, Groups E, F & G (Requires safety barrier, wiring connections, and probes per Robertshaw Drawing #907GA811. See page 7.)

Enclosure:

PFM Transmitter:

Standard: Raintight NEMA 4, blue polyurethane painted cast aluminum

Optional: Raintight NEMA 4X, gray epoxy painted cast aluminum

Controller (Receiver):

Standard: Raintight NEMA 4, blue polyurethane painted steel

Optional: Raintight NEMA 4X, gray epoxy painted steel

Optional: Raintight NEMA 4X, stainless steel

Optional: Raintight NEMA 4X, glass reinforced polyester

Optional Raintight NEMA 4 & explosion proof, cast aluminum. UL Listed and CSA Certified for Class I, Groups C & D; Class II, Groups E, F & G; Class III

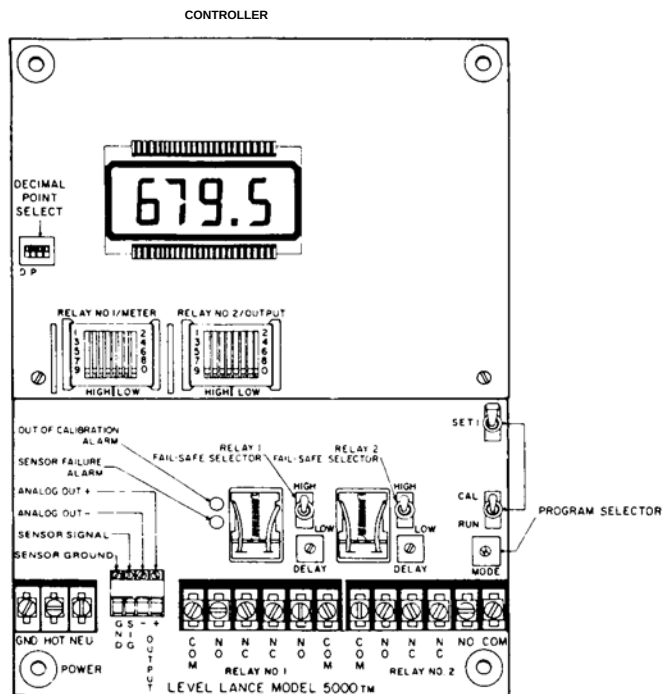
OPTIONAL FEATURES

Non-Linear Characterization

(for volume indication of horizontal cylindrical tanks, etc.)

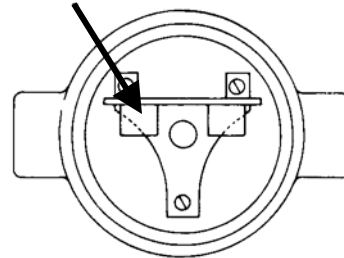
By utilization of this option using the "Smart Chip," characterization of the signal for non-linear applications is accomplished. After addition of the "Smart Chip" to the instrument, calibration is done as is normally done with standard Model 5000A and the signal is automatically characterized to indicate/control the actual volume in the vessel, or flow in the weir or flume.

Electrical Connections



Direct Mounted Standard PFM Transmitter

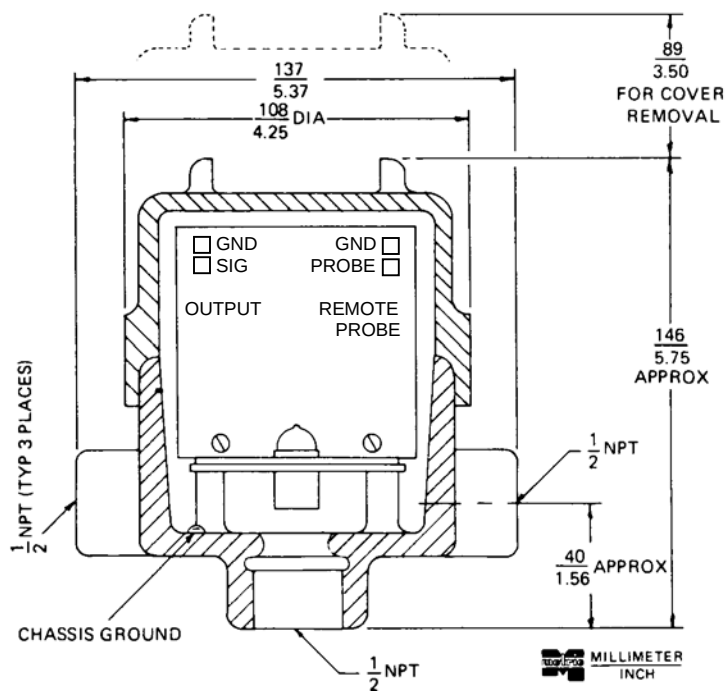
OUTPUT TERMINALS



PFM ELECTRICAL CONNECTIONS

TERMINAL	DESCRIPTION	REMARKS
SIG	OUTPUT	TO CONTROLLER SENSOR TERMINALS
GND		

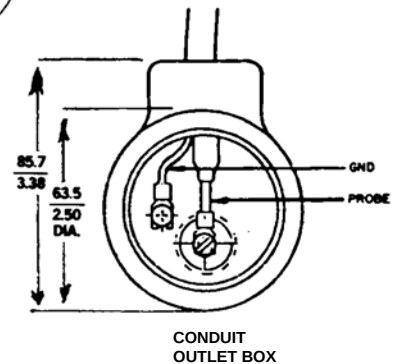
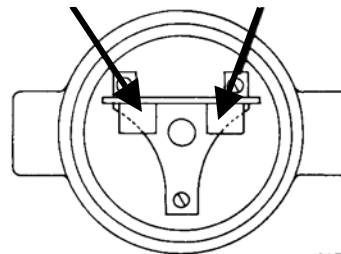
Outline Dimensions, PFM Transmitter



Remote Mounted Standard PFM Transmitter

OUTPUT TERMINALS

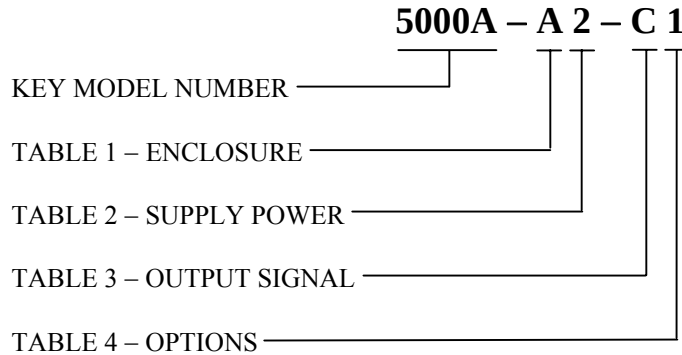
INPUT TERMINALS



PFM ELECTRICAL CONNECTIONS

TERMINAL	DESCRIPTION	REMARKS
GND	OUTPUT	TO CONTROLLER SENSOR TERMINALS
SIG		
GND	INPUT	CO-AX TO PROBE MTD CONDUIT OUTLET BOX
PROBE		

ORDERING INFORMATION



KEY MODEL NUMBER

Model No.	Description
5000A	Microprocessor- based continuous level measurement system. Includes the digital display, 2 DPDT relays and the direct mounted PFM Transmitter that is in an explosion-proof enclosure.

TABLE 1-ENCLOSURE

Desig.	Description
A	NEMA 4 painted steel with window & NEMA 4 PFM Transmitter
F	NEMA 4 painted steel with window & NEMA 4X (Gray Epoxy) PFM Transmitter
B	Explosion Proof Blind (without window) & NEMA 4 PFM Transmitter
G	Explosion Proof Blind (without window) & NEMA 4X (Gray Epoxy) PFM Transmitter
C	Explosion Proof with window & NEMA 4 PFM Transmitter
H	Explosion Proof with window & NEMA 4X (Gray Epoxy) PFM Transmitter
D	NEMA 4X Stainless Steel with window & NEMA 4 PFM Transmitter
J	NEMA 4X Stainless Steel with window & NEMA 4X (Gray Epoxy) PFM Transmitter
E	NEMA 4X Glass reinforced polyester with window & NEMA 4 PFM Transmitter
K	NEMA 4X Glass reinforced polyester with window & NEMA 4X (Gray Epoxy) PFM Transmitter

TABLE 2 - SUPPLY POWER

Desig.	Description
1	18 to 30 VDC
2	120VAC, ±10%
3	240 VAC, ± 10%

TABLE 3 - OUTPUT SIGNAL

Desig.	Description
A	None
C	4 to 20 mADC Isolated

TABLE 4 - OPTIONS

Desig.	Description
1	None
2	Non-Linear Characterization (Smart Chip)
4*	Remote PFM transmitter 15 ft. max.)
6	Combination of 2 and 4 above

* Maximum distance between transmitter and probe is 15 feet. Includes nipple plug and floor flange.

NOTE:

Remote mounted PFM Transmitter requires 032KC Series coaxial cable and conduit outlet box. Order separately. See Table 5 for available cables.

Table 5 - Accessories

Part Number	Description
032KC700-XX*	Coax cable with NEMA 4 conduit outlet box
032KC710-XX*	Coax cable with general purpose conduit and NEMA 4 conduit outlet box
032KC720-05	Coax cable, 5 ft. long, with explosion proof conduit and NEMA 4 conduit outlet box**
032KC720-08	Coax cable, 8 ft. long, with explosion proof conduit and NEMA 4 conduit outlet box**
032KC720-10	Coax cable, 10 ft. long, with explosion proof conduit and NEMA 4 conduit outlet box**
032KC800-XX*	Coax cable with NEMA 4X epoxy painted conduit outlet box
032KC810-XX*	Coax cable with general purpose conduit and NEMA 4X epoxy painted conduit outlet box
032KC820-05	Coax cable, 5 ft. long, with explosion proof conduit and NEMA 4X epoxy painted conduit outlet box**
032KC820-08	Coax cable, 8 ft. long, with explosion proof conduit and NEMA 4X epoxy painted conduit outlet box**
032KC820-10	Coax cable, 10 ft. long, with explosion proof conduit and NEMA 4X epoxy painted conduit outlet box**
032KC900-XX*	Coax cable with NEMA 4X stainless steel conduit outlet box
032KC910-XX*	Coax cable with general purpose conduit and NEMA 4X stainless steel conduit outlet box
032KC920-05	Coax cable, 5 ft. long, with explosion proof conduit and NEMA 4X stainless steel conduit outlet box**
032KC920-08	Coax cable, 8 ft. long, with explosion proof conduit and NEMA 4X stainless steel conduit outlet box**
032KC920-10	Coax cable, 10 ft. long, with explosion proof conduit and NEMA 4X stainless steel conduit outlet box**

* Substitute the desired cable length, in feet, for "XX" to complete the Cable Assembly Part Number.

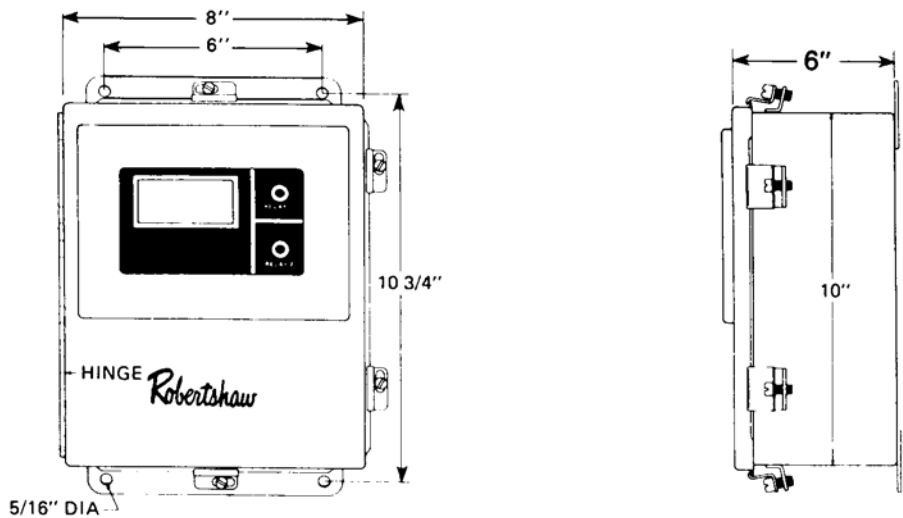
Maximum Allowable Coax Cable Length is 15 feet.

Coax cable is Teflon insulated, maximum temperature 350°F, with terminations for attachment to probe and PFM Transmitter.

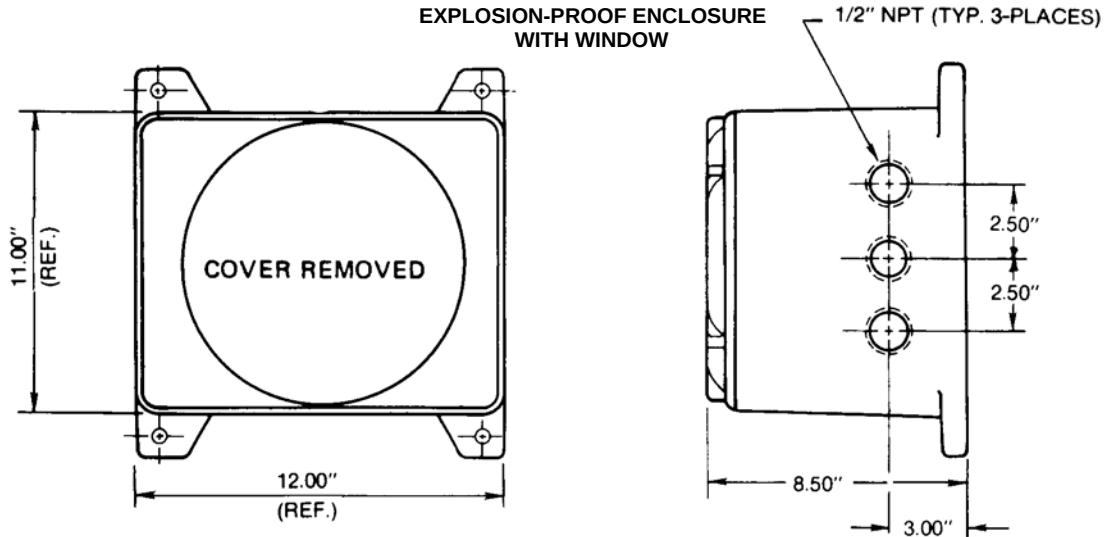
** Conduit outlet boxes are explosion proof.

Outline Dimensions

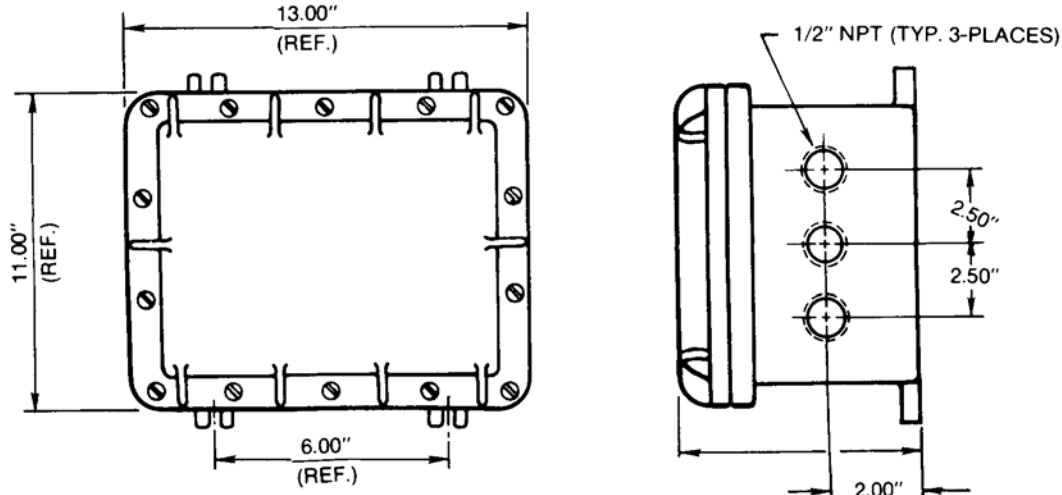
WEATHER-TIGHT ENCLOSURE



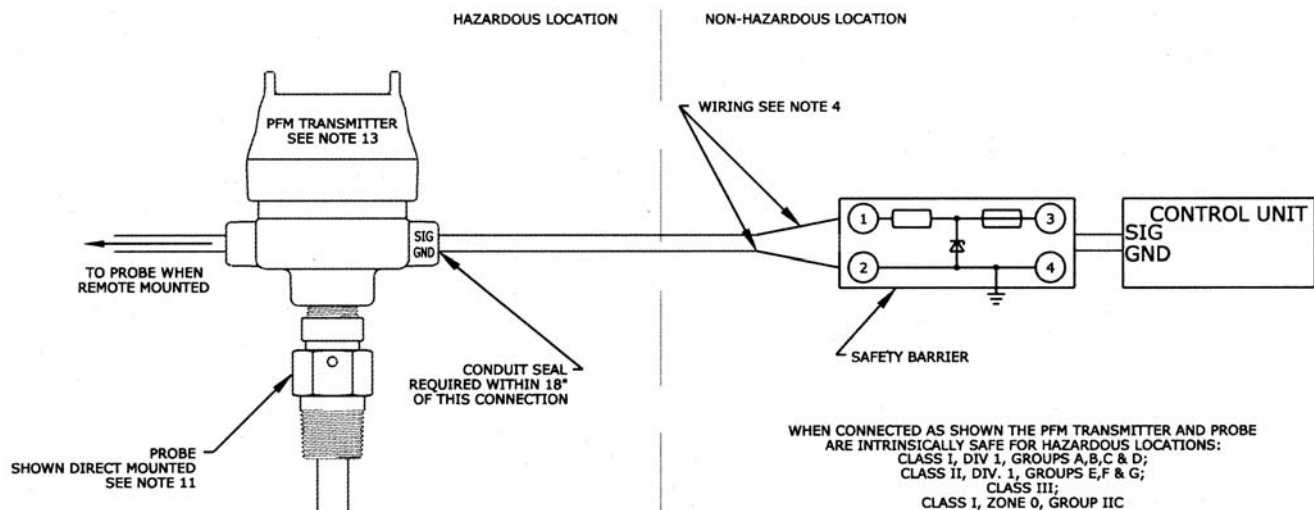
EXPLOSION-PROOF ENCLOSURE WITH WINDOW



EXPLOSION-PROOF ENCLOSURE WITHOUT WINDOW



DRAWING 907GA811 (for Intrinsically Safe PFM transmitter and probe)



NOTES

- Selected safety barriers shall be listed or approved with intrinsically safe circuits for Class I, II and III, Division 1, Groups A, B, C, D, E, F and G, and Class I, Zone 0, Group IIC as appropriate for the application.
- Output current of the barrier must be limited by a resistor such that the output voltage current plot is a straight line drawn between open circuit voltage and short circuit current.
- Safety barriers must be installed in accordance with manufacturer's installation instructions.
- Safety barriers and it's intrinsically safe wiring must be installed in accordance with articles 504 of the NEC ANSI/NFPA 70 or, if applicable, with the Canadian Electrical Code.
- The safety barrier must meet the following parameters:
 $V_{oc} \leq V_{max} = 15.7 \text{ V}$
 $I_{sc} \leq I_{max} = 386.8 \text{ mA}$
 $C_a \geq C_i + C_{\text{cable}}$
 $L_a \geq L_i + L_{\text{cable}}$
- If the electrical parameters of the cable are unknown, the following values must be used:
Capacitance = 60 pF/ft.
Inductance = 0.20 uH/ft.
Example: 1000 feet of cable would equal: C cable = 1000 x 60 pF = 0.06 uF L cable = 1000 x 0.20 uH = 0.2 mH
- If the safety barrier requires an earth ground then the resistance between the terminal on the safety barrier and earth ground shall be less than 1 ohm.
- The PFM Transmitter entity parameters are:
 $V_{max} = 15.7 \text{ V}$
 $C_i = 0.54 \text{ uF}$
 $I_{max} = 386.8 \text{ mA}$ $L_i = 0$
- Recommended safety Barriers:
A. R. Stahl incorporated No. 9001/01-158-390-10 (UL listed, FM Approved & CSA Certified)
B. Measurement technology Ltd. No. MTL 715P+ (FM Approved & CSA Certified)
- Not applicable.
- Robertshaw Model 702, 728, 729, 736, 737, 738, 739, 740, 741, 750, 150KB284 or 150KB285 probe. Insulated probes only may be used in Class II, Group E & F areas.
- Tighten PFM field wiring terminal screws to 5 pound-inches (0.56Nm)
- PFM Transmitter, Part Numbers 900GA336-01 & -03 are probe mounted. Part Numbers 900GA336-02 & -04 are remote mounted.



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