

User's manual

PanaFlow™ Z1G/Z2G

Panametrics gas ultrasonic volumetric flow meter



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Typographical Conventions

Note: These paragraphs provide information that provides a deeper understanding of the situation, but is not essential to the proper completion of the instructions.

IMPORTANT: These paragraphs provide information that emphasizes instructions that are essential to proper setup of the equipment. Failure to follow these instructions carefully may cause unreliable performance.



CAUTION! This symbol indicates a risk of minor personal injury and/or damage to the equipment unless these instructions are followed carefully.



WARNING! This symbol indicates a risk of serious personal injury unless these instructions are followed carefully.

Safety Issues



WARNING! It is the responsibility of the user to follow all site rules and applicable regulatory requirements.



IMPORTANT Any instructions on grounding and cable termination in this manual are necessary for compliance with global EMC / RFI standards. Such compliance may be required by National EMC / RFI legislation.

Local Safety Standards

The user shall ensure that he operates the equipment in accordance with the applicable local codes, standards, regulations, or laws.

Qualification of Personnel

Ensure that all personnel have applicable training to use the equipment.

Personal Safety Equipment

Ensure that operators and maintenance personnel have all safety equipment applicable.

Unauthorized Operation

Ensure that unauthorized personnel cannot gain access to the operation of the equipment.

Environmental Compliance

Waste Electrical and Electronic Equipment

This apparatus required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment. To avoid the dispersal of these substances into our environment and to reduce the pressure on natural resources, we encourage you to use an appropriate “take-back” resource recovery scheme. These schemes will reuse or recycle most of the materials of your end-of-life equipment in an environmentally responsible way. The crossed-out wheeled bin symbol marked on the product invites you to use such a scheme.



If you need more information on the collection, reuse and recycling systems, please contact your local waste management administration.

As part of its commitment to the environment and the EU's WEEE Directive 2012/19/EU, Panametrics participates in a take-back scheme.

Please visit <https://panametrics.com/health-safety-and-environment-hse> for take-back instructions and more information about this initiative.

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Chapter 1. General information

1.1 Theory of operation

The *PanaFlow ZIG/Z2G Process Gas Flowmeter* system uses ultrasonic transit-time technology. A brief description of transit-time theory follows. For more information about the theory, and the use of Panametrics ultrasonic flow meters for measuring flow, please refer to *Ultrasonic Measurements for Process Control* by L.C. Lynnworth (Academic Press, 1989).

1.1.1 Transit-time method

The transit time technique uses a pair of transducers, with each transducer alternately sending and receiving coded ultrasonic signals through the fluid. When the fluid is flowing, signal transit time in the downstream direction is shorter than in the upstream direction. The difference between these transit times is proportional to the flow velocity. The *PanaFlow ZIG/Z2G Process Gas Flowmeter* measures this very small time difference and, using various digital signal processing techniques combined with programmed pipe parameters, determines the flow rate and direction.

1.1.2 Transducers

When in a transmit cycle, transducers convert electrical energy into ultrasonic pulses and then convert the ultrasonic pulses back to electrical energy when in a receive cycle. In other words, they act like loudspeakers when transmitting the signal and like microphones when receiving it. They perform the actual data transmission and collection, thus interrogating the flow.

1.2 Multi-path design

Multi-path ultrasonic flow meters are designed to accommodate more than one pair of transducers to interrogate the flow field in different locations and more accurately determine the actual flow rate. The *PanaFlow ZIG/Z2G Process Gas Flowmeter* system is available in either a 1-Path or 2-Path configuration. For the 2-Path configuration, the measurement paths are located either at Diametrical path or at Midradius configurations. In addition to the flow transducers, the *PanaFlow ZIG/Z2G Process Gas Flowmeter* can be fitted with optional *temperature* and *pressure* transducers to permit mass flow measurements.

1.3 Flow profile

One of the main factors affecting an ultrasonic flow measurement is the flow profile. If the flow profile is known, mathematical modeling of the flow and the relationships between the raw data of the two paths can be made. Maintaining a constant flow-profile shape across all flow velocities, pipe sizes and upstream flow disturbances can be difficult. For this reason, Panametrics has tested the *PanaFlow ZIG/Z2G Process Gas Flowmeter* under various conditions in an effort to determine its operational limits.

1.4 Unpacking

The *PanaFlow ZIG/Z2G Process Gas Flowmeter* is typically packaged in a wooden crate, the size of which will depend on the size of product ordered. The flowcell is secured by several 2x4 wood blocks to prevent shifting during transit. Simply remove these 2x4 braces to unpack the system. For local-mount systems the transmitter electronics enclosure is installed directly on top of the flowcell via an adapter. For remote-mount systems the transmitter electronics enclosure and the remote cable may ship in a separate package.

1.5 Inspection

Prior to installation, inspect all materials to be used in the installation:

- *Gaskets* – check for cracks, tears and over compression
- *Nuts and Bolts* – check for damaged threads and for debris
- *RF Flange Faces* – check for damage to serrations that may cause gaskets to not seal properly.

In general, check for anything that may prevent safe operation of the equipment.

IMPORTANT: If pipes are shipped pre-assembled as a single section, care should be taken to inspect and check the bolts and gaskets.

1.6 Meter components

Figure 1 shows a PanaFlow Z1G/Z2G Process Gas Flowmeter system, with the items described in Table 1 below.

Table 1: Typical system components

Item No.	Component
1	Meter Body with Flanges (material list WCB: LCB: CF8: CF8M: CK3MCuN: CD3MWCuN)
2	Transmitter Electronics
3	Magnetic Stylus (for Transmitter Keypad)
4	Mounting Adapter, Transmitter (for local mount only)
5	Transducers/Inserts

The meter body with Flanges together is called as Flowcell or Spool.

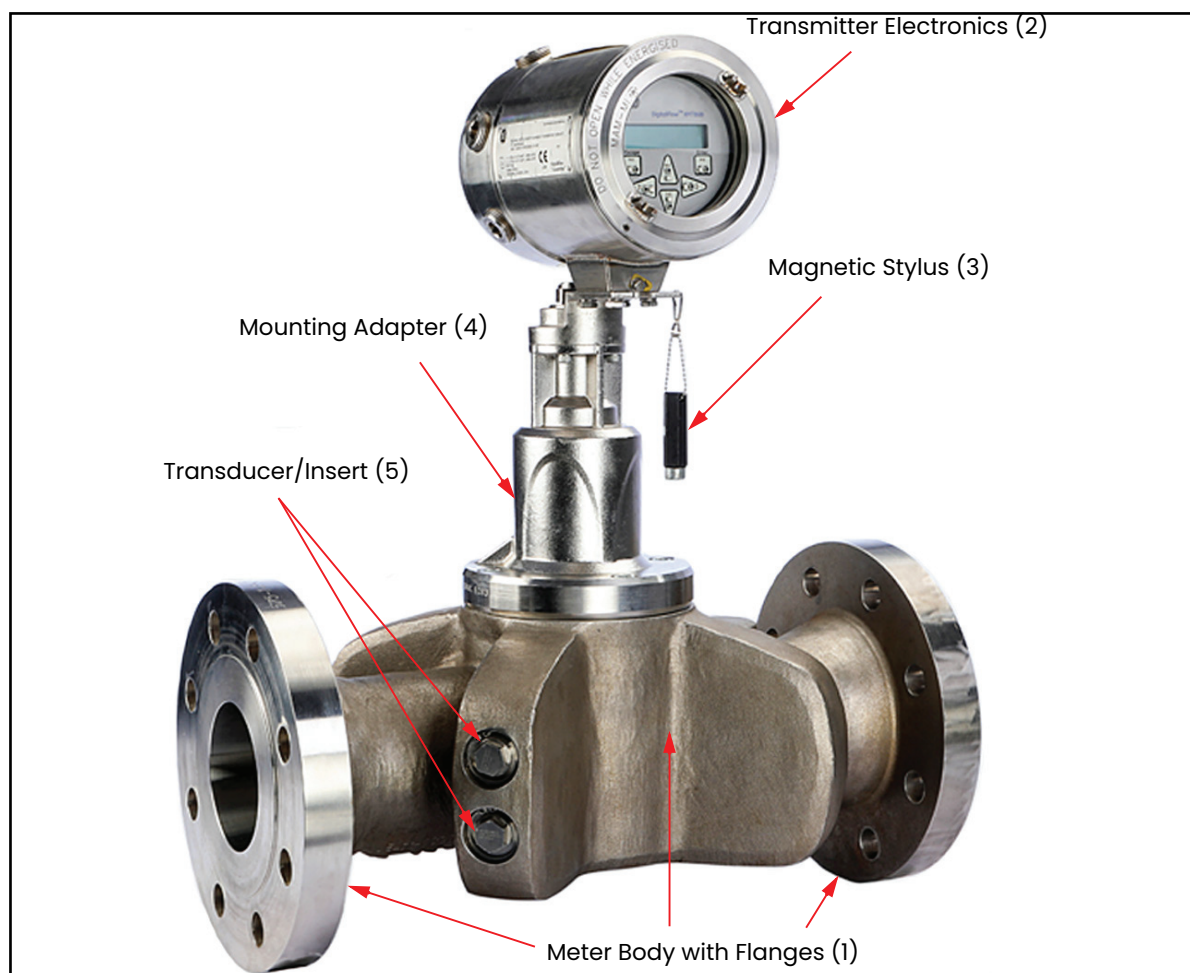


Figure 1: PanaFlow Z1G/Z2G process

1.7 Tag plates

The *PanaFlow Z1G/Z2G Process Gas Flowmeter* is marked with a variety of labels which provide valuable information about your specific system. Examples of typical flowcell tag plates are shown in the following sections.

1.7.1 Model tag plate

The *Model Tag Plate* (see *Figure 2* below) contains the model name and certification markings for the spool and its hazardous area usage..

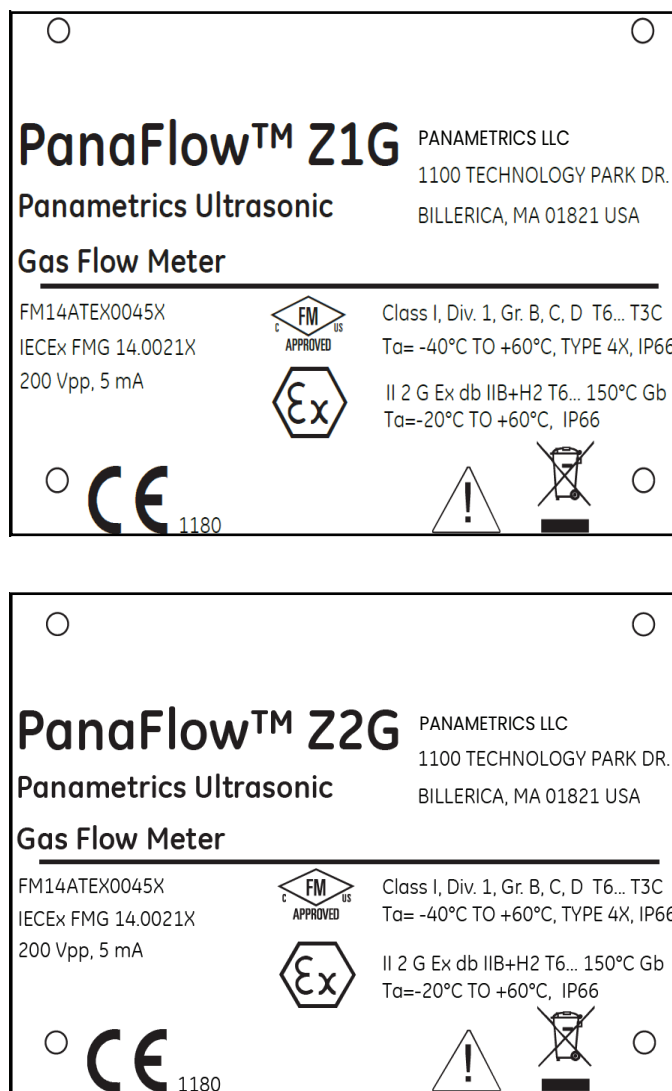


Figure 2: Model tag plate

1.7.2 Specification tag plate

The Specification Tag Plate (see *Figure 3*) contains information pertaining to the build and test of the spool, such as spool nominal size, flange rating, wall thickness, material, dry weight (including transmitter), vessel manufacturing serial number, ambient and fluid temperature ranges, operating pressures, hydro test pressure and date.

 2561		MODEL: PF8M-Z1G panametrics.com	
SIZE/FLANGE/SCH/MAT: 6" #150 80S SA351 GR. CF8M			
DRY WEIGHT: 157 kg			
TEMPERATURE		PRESSURE	
AMBIENT: -40°C to 60°C		MAWP: 78.5 barg @ 150°C	
FLUID:REMOTE -40°C to 150°C		MAWP: 78.5 barg @ 85°C	
FLUID:LOCAL -40°C to 85°C		MAEWP F.V. @ 150°C	
FC MFG SN: 12345678		MDMT: -40°C @ 99.2 barg	
MFG DATE: YYYY/MM		HYDRO: 148.9 barg	
SUPPLY CONNECTION TO BE RATED 5°C ABOVE MAXIMUM FLUID TEMPERATURE CABLE GLAND ENTRY IS 3/4" NPT CAUTION: CONDUIT SEALS REQUIRED WITHIN 18" OF ENCLOSURE WARNING: DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT WARNING: POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE INSTRUCTIONS ATTENTION: LES JOINT DE CONDUIT SONT OBLIGATOIRES DANS UNE DISTANCE DE 18 POUCES AVERTISSEMENT - NE PAS OUVRIR LORSQUE UNE ATMOSPHERE EXPLOSIVE EST PRESENTEE, POTENTIAL DE CHARGE ELECTROSTATIQUE - VOIR LES INSTRUCTIONS			

 2561		MODEL: PF8M-Z2G panametrics.com	
SIZE/FLANGE/SCH/MAT: 6" #150 80S SA351 GR. CF8M			
DRY WEIGHT: 157 kg			
TEMPERATURE		PRESSURE	
AMBIENT: -40°C to 60°C		MAWP: 78.5 barg @ 150°C	
FLUID:REMOTE -40°C to 150°C		MAWP: 78.5 barg @ 85°C	
FLUID:LOCAL -40°C to 85°C		MAEWP F.V. @ 150°C	
FC MFG SN: 12345678		MDMT: -40°C @ 99.2 barg	
MFG DATE: YYYY/MM		HYDRO: 148.9 barg	
SUPPLY CONNECTION TO BE RATED 5°C ABOVE MAXIMUM FLUID TEMPERATURE CABLE GLAND ENTRY IS 3/4" NPT CAUTION: CONDUIT SEALS REQUIRED WITHIN 18" OF ENCLOSURE WARNING: DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT WARNING: POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE INSTRUCTIONS ATTENTION: LES JOINT DE CONDUIT SONT OBLIGATOIRES DANS UNE DISTANCE DE 18 POUCES AVERTISSEMENT - NE PAS OUVRIR LORSQUE UNE ATMOSPHERE EXPLOSIVE EST PRESENTEE, POTENTIAL DE CHARGE ELECTROSTATIQUE - VOIR LES INSTRUCTIONS			

Figure 3: Specification tag plate

1.7.3 Part string and serial number tag plate

The Part String and Serial Number Tag (see *Figure 4* below) contains the specific configuration of the spool as well as the final assembly date, Panametrics serial number and customer tag number.

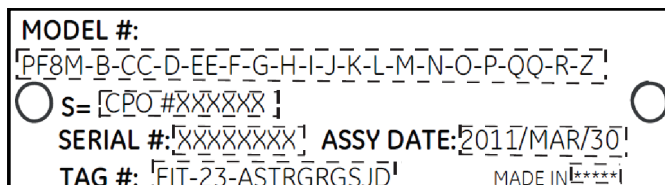


Figure 4: Part string and S/N tag plate

1.7.4 Transmitter tag plate

The Flow Transmitter Tag Plate (see *Figure 5*) is affixed to the transmitter and includes the configuration per the model information detailed on the Model Tag Plate. This tag plate also contains the hazardous area certification information for the transmitter.

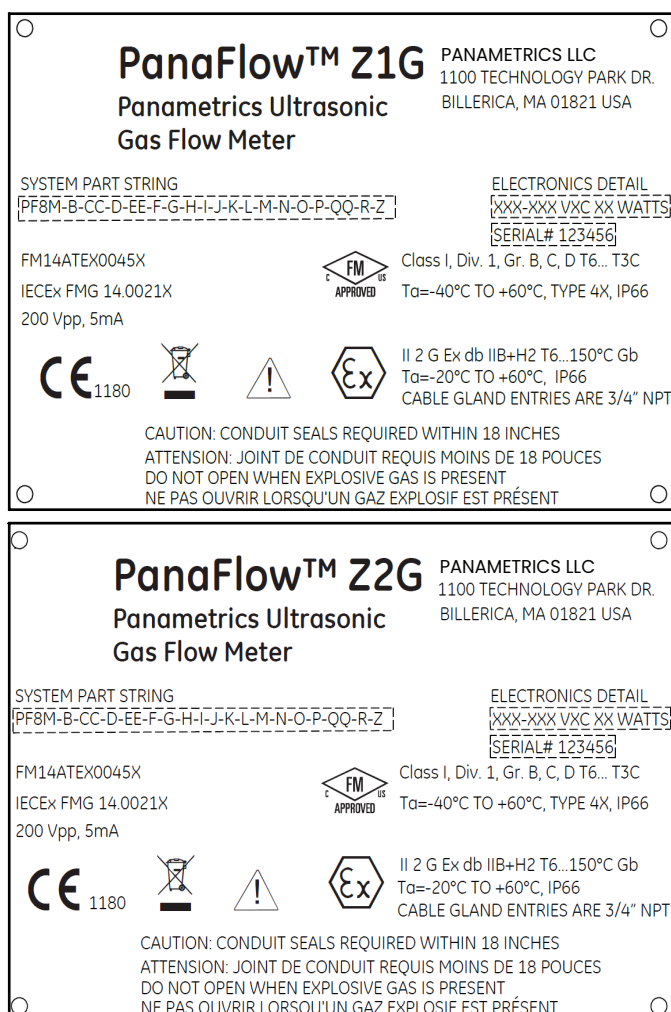


Figure 5: Flow transmitter tag plate

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Chapter 2. Installation

2.1 Introduction

To ensure safe and reliable operation of the *PanaFlow Z1G/ Z2G Process Gas Flowmeter*, the system must be installed in accordance with the guidelines established by Panametrics engineers. Those guidelines are explained in detail in this chapter.



WARNING! The *PanaFlow Z1G/Z2G Process Gas Flowmeter* can measure the flow rate of many gases, some of which are potentially hazardous. In such cases, the importance of proper safety practices cannot be overemphasized.

Be sure to follow all applicable local safety codes and regulations for installing electrical equipment and working with hazardous gases or flow conditions. Consult company safety personnel or local safety authorities to verify the safety of any procedure or practice.



**Attention
European
Customers!**

Attention European Customers! The procedures in this section must be performed only by trained technicians who have the necessary skills and qualifications.

2.2 Lifting instructions

Use proper lifting techniques when moving the *PanaFlow Z1G/Z2G Process Gas Flowmeter*. No lifting hooks or eyelets are provided. The recommended method for lifting the *PanaFlow Z1G/Z2G Process Gas Flowmeter* is by using lifting straps on each side of the spool with a stabilizer bar between them, located above the transmitter head. Additional care may need to be taken to prevent the transmitter from rotating, especially on the smaller systems where the transmitter weight is a larger percentage of the total system weight. A label similar to *Figure 6*, which illustrates these required precautions, is attached to the flowcell.

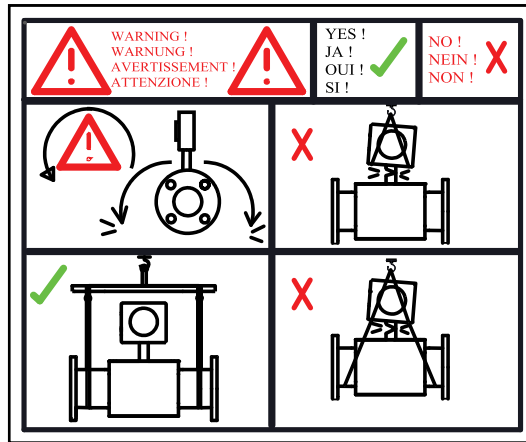


Figure 6: Spoolpiece lifting label (ref. dwg. 442-1232)

While lifting the *PanaFlow Z1G/Z2G Process Gas Flowmeter*, be sure to observe the warnings and figures below:



WARNING! Never stand below any object being lifted.

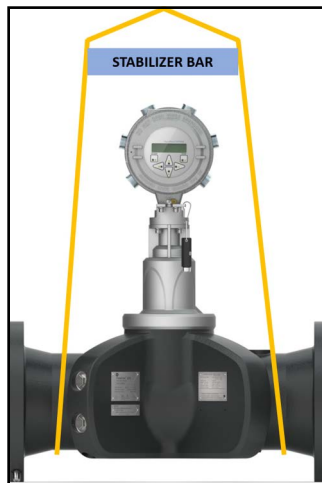


Figure 7: Proper lifting method



WARNING! Do not use the transmitter to support the weight of the flowcell as shown in Figure 8. The transmitter cannot support the weight of the Flowcell/Spool..



Figure 8: Improper lifting method

2.3 Flowcell location guidelines

The flowcell includes the flow transducers and, optionally, pressure and temperature transmitters. Ideally, install the flowcell in a section of pipe with access to the flowcell, such as a long run of pipe that is above ground. Observe the following recommendations:

- There should be at least 20 pipe diameters of straight, undisturbed flow upstream and 10 pipe diameters of straight, undisturbed flow downstream from the measurement point. To ensure undisturbed flow, avoid sources of disturbances in the fluid such as valves, flanges, expansions, and elbows.
- Because condensate or sediment at the bottom of the pipe may cause attenuation of the ultrasonic signal, always install the *PanaFlow ZIG/Z2G Process Gas Flowmeter* with the transmitter in a vertical orientation on the top of the pipe. This ensures that the transducers are located on the sides of the pipe rather than on the top or bottom.
- Only authorized personnel should perform the installation. The proper personal protection equipment (PPE) should always be used when working with this equipment.
- The flowcell shall be installed in such a way that it can be safely operated, maintained and inspected. Please refer to specific outline and installation drawings for proper clearances and specific distances for each system size. In general, allow for a minimum of 12" of space on all sides of the flowcell and flow transmitter, with an ideal clearance of 24" on all sides.
- You must provide suitable over-pressure protection at the main piping to the flowcell in order to prevent damage to the flowcell and injury to personnel. The utilized over-pressure protection device shall be supplied with all declarations of conformity and EC-type design certificates.
- Make sure the difference between the inside diameter of the pipe and that of the *PanaFlow ZIG/Z2G Process Gas Flowmeter* does not exceed 0.5%, as changes in internal diameters will cause flow profile disturbances.
- Make sure any non-symmetrical offset does not exceed 1%, as misalignment between the piping and the meter may cause flow profile disturbances.
- Make sure the gasket is centered on the flange faces and does not protrude into the pipe, as protrusion of the gasket into the pipe may cause flow profile disturbances.
- If pipe insulation is required, install all insulation materials and accessories in accordance with the manufacturer's instructions and recognized industry practices. Adhere to the local code where applicable to ensure that the safe and proper installation will serve its intended purpose.

2.4 Making the electrical connections

This section contains instructions for making all the necessary electrical connections to the *PanaFlow ZIG/Z2G Process Gas Flowmeter*. Refer to *Figure 13* for a complete wiring diagram.

Note: Except for the power connector, all electrical connectors are stored on their terminal blocks during shipment and may be removed from the enclosure for more convenient wiring. Simply, feed the cables through the conduit holes on the side of the enclosure, attach the wires to the appropriate connectors, and plug the connectors back into their terminal blocks.

To prepare the *PanaFlow ZIG/Z2G Process Gas Flowmeter* for wiring, refer to *Figure 9* below, and complete the following steps:

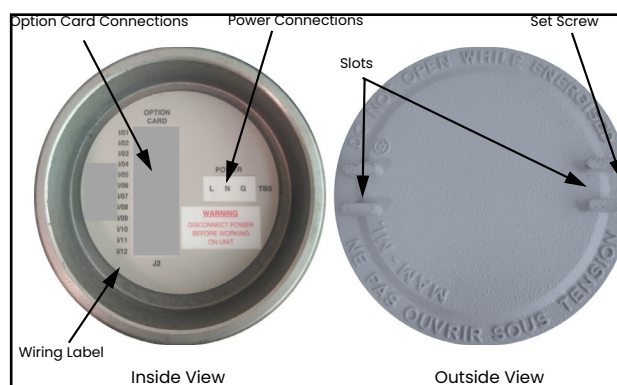


Figure 9: Rear cover with connection labels



WARNING! Always disconnect the line power from the PanaFlow Z1G/Z2G Process Gas Flowmeter electronics before removing either the front or rear cover. This is especially important in a hazardous environment.

1. Disconnect any existing power line from its source.
2. Loosen the set screw on the rear cover.
3. Place a rod or long screwdriver across the cover in the slots provided, and rotate the cover counterclockwise until it comes free from the enclosure.
4. Install any required cable clamps in the appropriate conduit holes around the side of the enclosure.
5. Refer to the labels inside the rear cover to assist in making the power and option card connections. Also, *Figure 14* shows the specific connection labels for all available option cards.

2.4.1 Wiring the line power

The *PanaFlow Z1G/Z2G Process Gas Flowmeter* may be ordered for operation with power inputs of either 85–240 VAC (standard) or 12–28 VDC (optional). The tag plate on the side of the electronics enclosure lists the required line voltage and the power rating. Be sure to connect the meter only to the specified line voltage.



WARNING! Proper grounding of the *PanaFlow Z1G/Z2G Process Gas Flowmeter* is required to prevent the possibility of electric shock. See *Figure 11* for the location of the chassis grounding screw.



WARNING! For compliance with the European Union's Low Voltage Directive, this unit requires an external power disconnect device such as a switch or circuit breaker. The disconnect device must be marked as such, clearly visible, directly accessible, and located within 1.8 m (6 ft) of the meter.



WARNING! Improper connection of the line power leads or connecting the meter to the incorrect line voltage may damage the unit. It may also result in hazardous voltages at the flowcell and associated piping as well as within the electronics enclosure.

Refer to *Figure 13* to locate the correct terminal block, and connect the line power as follows:

1. Prepare the line power leads by trimming the line and neutral AC power leads (or the positive and negative DC power leads) to a length 0.5 in. (1 cm) shorter than the ground lead. This ensures that the ground lead is the last to detach if the power cable is forcibly disconnected from the meter.
2. Install a cable clamp in the conduit hole closest to the power terminal block. Avoid using the other conduit holes for this purpose to minimize any interference in the circuitry from the AC power line.
3. Strip 1/4 in. of insulation from the end of each of the three power line leads.
4. Route the cable through the conduit hole and connect the line power leads to the terminal block, using the pin number assignments shown in *Figure 13*.
5. Leaving a bit of slack, secure the power line with the cable clamp.



WARNING! Make sure both covers, with their o-ring seals, are installed and the set screws tightened before applying power in a hazardous environment.



CAUTION! The transducers must be properly wired before applying power to the meter.
(If the electronics enclosure is mounted directly on the flowcell, these connections are made at the factory prior to shipment.)

Proceed to the next section to continue the wiring of the *PanaFlow Z1G/Z2G Process Gas Flowmeter*.

2.4.2 Wiring the transducers



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To meet CE Mark requirements for all units intended for use in the EU or in high electrical noise environments, all electrical cables must be installed as described in *Appendix A*, “CE Mark compliance and high noise environments”.

For a *PanaFlow ZIG/Z2G Process Gas Flowmeter* system with the flow transmitter mounted on the flowcell, no external transducer wiring is required. However, for a system with a remote mounted flow transmitter, refer to the wiring diagram in *Figure 12* to connect the transducers and preamplifiers to the transmitter.

2.4.3 Wiring the standard 4–20 mA analog outputs

The standard configuration of the *PanaFlow ZIG/Z2G Process Gas Flowmeter* includes two isolated 4–20 mA analog outputs (designated as outputs 1 and 2). Connections to these outputs may be made with standard twisted-pair wiring, but the current loop impedance for these circuits must not exceed 600 Ω .



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To meet CE Mark requirements for all units intended for use in the EU or in high electrical noise environments, all electrical cables must be installed as described in *Appendix A*, “CE Mark compliance and high noise environments”.

To wire the analog outputs, complete the following steps:

1. Disconnect the main power and remove the rear cover.
2. Install a cable clamp in the chosen conduit hole on the side of the electronics enclosure.
3. Refer to *Figure 13* to locate the correct terminal block, and wire the analog outputs as shown. Secure the cable clamp.

Note: Analog outputs 1 and 2 in the wiring diagram correspond to analog outputs A and B in Slot 0 in the Panaview software.

4. If wiring of the unit has been completed, reinstall the rear cover on the enclosure and tighten the set screw.



WARNING!

Make sure both covers, with their o-ring seals, are installed and the set screws tightened before applying power in a hazardous environment.

Note: Prior to use, the analog outputs must be set up and calibrated.

Proceed to the next section to continue the wiring of the *PanaFlow ZIG/Z2G Process Gas Flowmeter*.

2.4.4 Wiring the standard RS485 serial port

The *PanaFlow ZIG/Z2G Process Gas Flowmeter* is equipped with a standard RS485 serial interface. This serial port will be used to communicate with PC/DCS system. In addition, the *PanaFlow ZIG/Z2G Process Gas Flowmeter* can receive and execute remote commands, using Panametrics's PanaView software.

Note: For more detailed information on serial communications refer to Panametrics's EIA-RS Serial Communications manual (document #916-054).



Attention
European
Customers!

To meet CE Mark requirements for all units intended for use in the EU or in high electrical noise environments, all electrical cables must be installed as described in *Appendix A*, “CE Mark compliance and high noise environments”.

Refer to *Figure 13* to locate the correct terminal block, and wire the RS485 serial port as follows:



WARNING!

Always disconnect the line power from the *PanaFlow ZIG/Z2G Process Gas Flowmeter* electronics before removing either the front or rear cover. This is especially important in a hazardous environment.

1. Disconnect the main power and remove the rear cover.
2. Install the required cable clamp in the chosen conduit hole on the side of the electronics enclosure.
3. Feed one end of the cable through the conduit hole, wire it to terminal block, and secure the cable clamp. Use the information in *Table 2* below to prepare a suitable cable for connecting the PanaFlow ZIG/Z2G Process Gas Flowmeter to the external serial device.

Table 2: RS485 cable connections

TB Pin #	Signal description
1	RS485+
2	RS485-
3	COM
4	Not Used
5	Not Used

4. If wiring of the unit has been completed, reinstall the rear cover on the enclosure and tighten the set screw.

Proceed to the next section to continue the wiring of the *PanaFlow ZIG/Z2G Process Gas Flowmeter*.

2.4.5 Wiring the option cards

The *PanaFlow ZIG/Z2G Process Gas Flowmeter* can accommodate two option cards one in Slot 1 and other option card in Slot 2. The following option card functions are available only in certain combinations.

- Analog Inputs (Slot 1)
- RTD Inputs (Slot 1)
- Modbus Communications (Slot 2)
- HART Communications (Slot 2)
- Foundation Fieldbus Communications (Slot 2)

Figure 14 shows the connection labels for the available option cards. Wiring any option card installed in Slot 1 requires completion of the following steps:



Attention European Customers!

To meet CE Mark requirements for all units intended for use in the EU or in high electrical noise environments, all electrical cables must be installed as described in *Appendix A, "CE Mark compliance and high noise environments"*.

1. Disconnect the main power and remove the rear cover.
2. Install a cable clamp in the chosen conduit hole on the side of the electronics enclosure and feed a standard twisted-pair cable through this conduit hole.
3. Locate the 12-pin terminal block in *Figure 13* and wire the option card as indicated on the label inside the rear cover (see *Figure 9*). Secure the cable clamp

IMPORTANT: If you have multiple flow transmitters, because of the attached wiring label, all rear covers must remain with their original meters!

4. If wiring of the unit has been completed, reinstall the rear cover on the enclosure and tighten the set screw.

IMPORTANT: Prior to use, the option card must be set up and calibrated.

For more specific instructions on particular option cards, proceed to the appropriate section(s) that follow.

2.4.5.1 Wiring a 4–20 mA analog inputs option card

To calculate standard flow rates, the *PanaFlow Z1G/Z2G Process Gas Flowmeter* requires accurate temperature and pressure data from the measurement site. Transmitters installed in the flowcell can provide this information via an optional 4–20 mA analog inputs option card. This option card includes two or four isolated 4–20 mA analog inputs (designated as A, B, C and D), each of which includes a 24 VDC power supply for loop-powered transmitters. Either input may be used to process the temperature signal, while the other input is used to process the pressure signal.

IMPORTANT: To properly enter programming data into the meter, it is necessary to know which input is assigned to which process parameter.

The analog inputs, which have an impedance of 118 Ω , should be connected with standard twisted-pair wiring. Power to the transmitters may be supplied either by the integral 24 VDC power supply on the analog input option card or by an external power supply. *Figure 10* below shows typical wiring diagrams, with and without an external power supply, for one of the analog inputs.

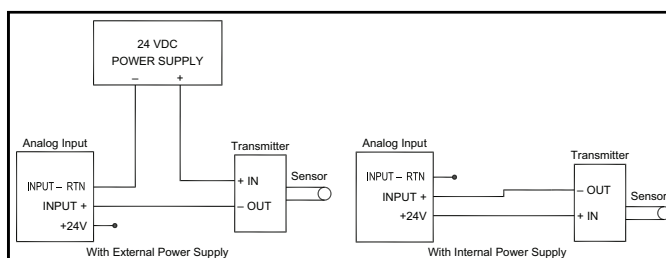


Figure 10: Typical analog input wiring diagrams

Before making any connections, complete the steps in *Section 2.4, “Making the electrical connections”*. Then, wire the analog inputs as shown on the label in the rear cover (see *Figure 9*).

IMPORTANT: The analog inputs option card can be calibrated with the *PanaFlow Z1G/Z2G Process Gas Flowmeter's* built-in analog outputs. However, be certain that the analog outputs have been calibrated first.

2.4.5.2 Wiring an RTD inputs option card

The *PanaFlow Z1G/Z2G Process Gas Flowmeter* RTD inputs option card provides two or four direct RTD inputs (designated as A, B, C and D). Each RTD input requires three wires, and should be connected as shown on the label in the rear cover (see *Figure 9*).

Before making any connections, complete the steps in *Section 2.4, “Making the electrical connections”*.

2.4.5.3 Wiring a Modbus option card

A Modbus option card uses the RS485 standard for communication, and it must be installed in Slot 2. The RS485 standard allows up to 32 nodes (drivers and receivers) on one multi-drop network, at distances up to 4000 ft (1200 m). Panametrics recommends using 24-gauge (24 AWG) twisted-pair wire with a characteristic impedance of 120 Ω and 120 Ω termination at each end of the communications line.

Note: The Modbus option card provides its own RS485 connections.

2.4.5.4 Wiring the HART interface

To connect the HART interface, refer to *Figure 13* and proceed as follows:

1. Connect the HART Net (+) wire to pin #1.
2. Connect the HART Net (–) wire to pin #2.
3. Connect the optional cable shield to pin #3.

2.4.5.5 Wiring the Foundation Fieldbus interface

To connect the Foundation Fieldbus interface, refer to *Figure 13* and proceed as follows:

1. Connect the Fieldbus Net (+) wire to pin #1.
2. Connect the Fieldbus Net (-) wire to pin #2.
3. Connect the optional cable shield to pin #3.

Make sure both covers, with their o-ring seals, are installed and the set screws tightened before applying power in a hazardous environment.



WARNING! Make sure both covers, with their o-ring seals, are installed and the set screws tightened before applying power in a hazardous environment.

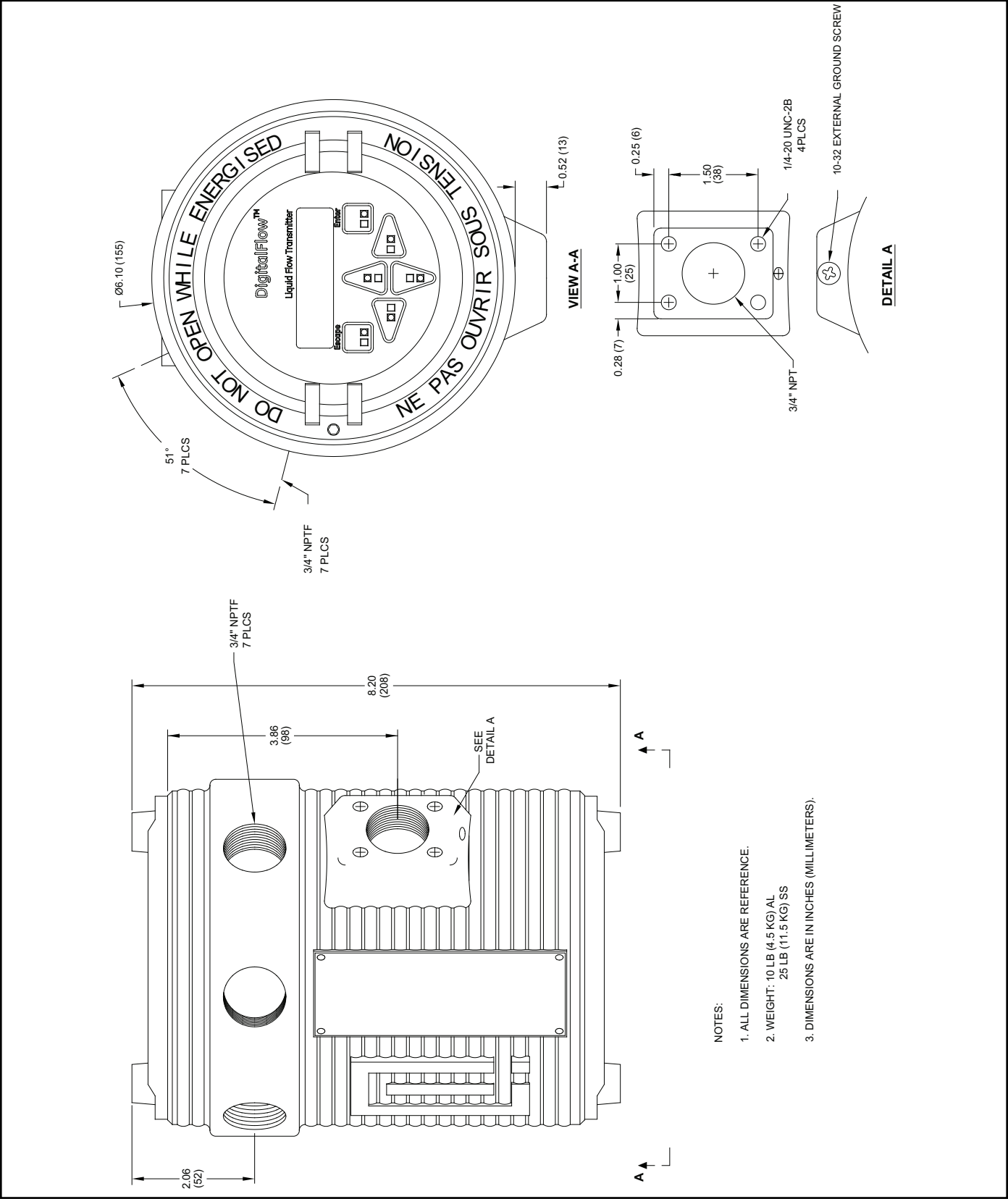


Figure 11: Transmitter electronics enclosure - outline and dimensions (ref. dwg. 712-1318)

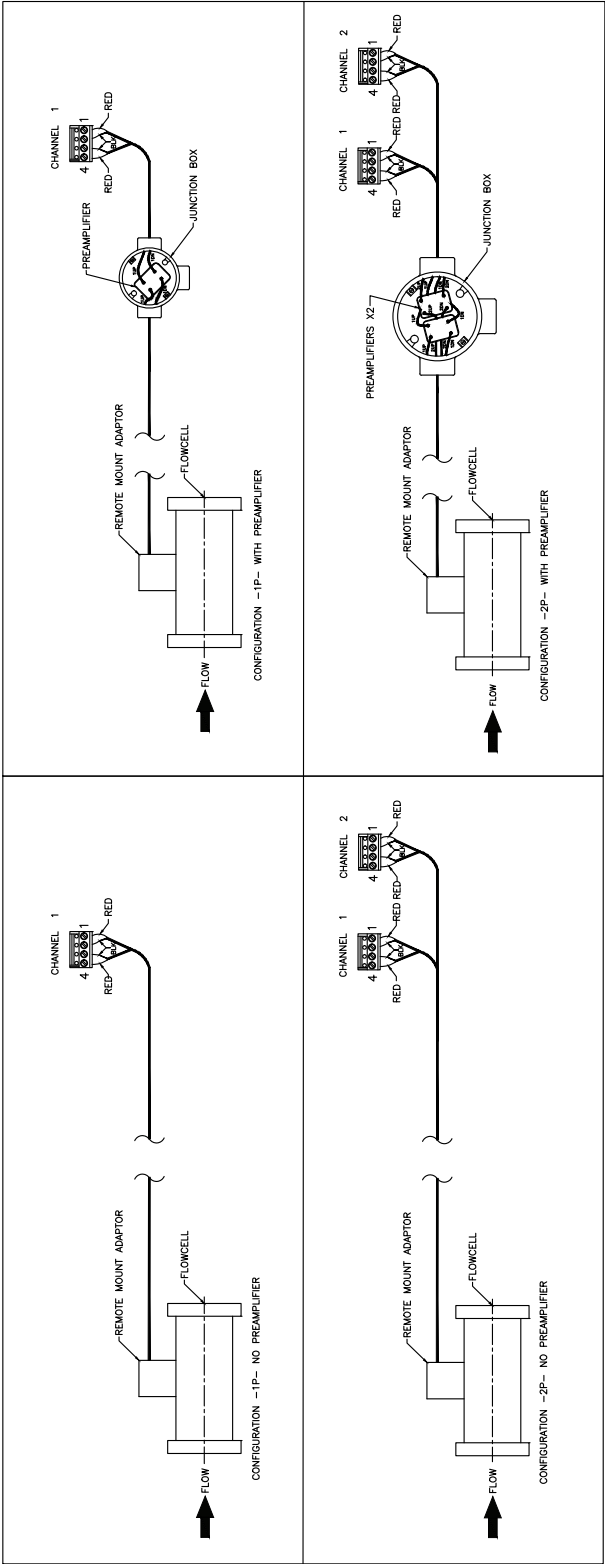
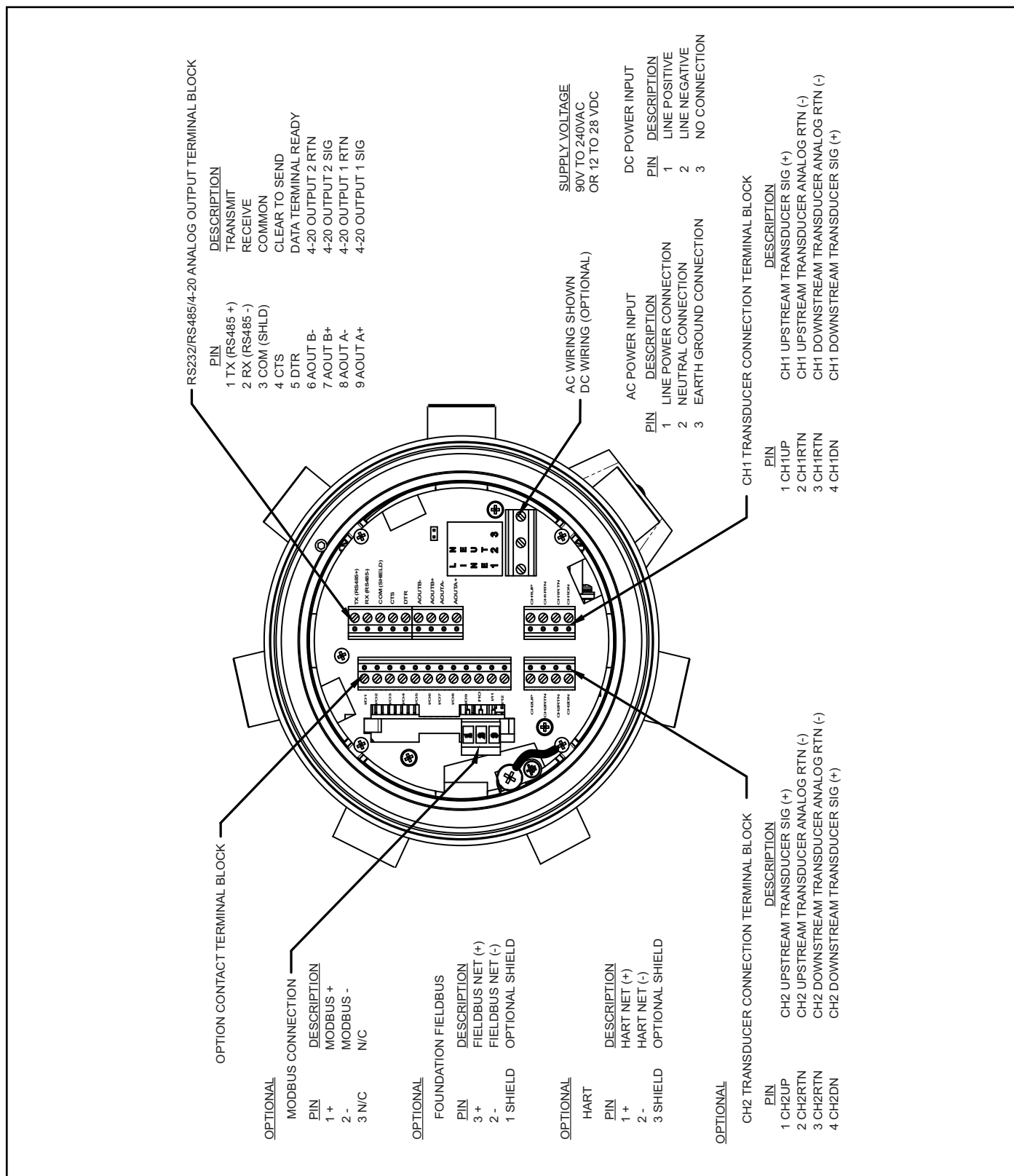


Figure 12: Remote mount electronics - transducer and preamplifier wiring (ref. dwg. 702-731, 732)



-05 (CI, TI, FI)		-08 (AI, HI)		-09 (OI)	
Pin 1	OUT - A	Pin 1	ALARM A - NO	Pin 1	NC
2	RTN - A	2	ALARM A - COM	2	NC
3	NC	3	ALARM A - NC	3	NC
4	OUT - B	4	ALARM B - NO	4	NC
5	RTN - B	5	ALARM B - COM	5	NC
6	NC	6	ALARM B - NC	6	NC
7	OUT C - +24V	7	OUT C - +24V	7	OUT C - +24V
8	INPUT C - +	8	INPUT C - +	8	INPUT C - +
9	INPUT C - RTN	9	INPUT C - RTN	9	INPUT C - RTN
10	OUT D - +24V	10	OUT D - +24V	10	OUT D - +24V
11	INPUT D - +	11	INPUT D - +	11	INPUT D - +
12	INPUT D - RTN	12	INPUT D - RTN	12	INPUT D - RTN

NOTE:
R = RTD Input
A = Standard Alarm
H = Hermetic Alarm
F = Frequency Output
T = Totalizer Output
I = Current Input
C = Current Output
O = Blank/No Connection

Figure 14: Labels – option card connections

Chapter 3. Initial setup

3.1 Introduction

This chapter provides instructions for programming the data required to place the *PanaFlow Z1G/Z2G Process Gas Flowmeter* into operation. Before the *PanaFlow Z1G/Z2G Process Gas Flowmeter* can begin taking measurements and displaying valid data, the current system and pipe parameters must be entered.

Additional programming options provide access to the more advanced features of the *PanaFlow Z1G/Z2G Process Gas Flowmeter*, but this information is not required to begin taking measurements.

Note: Be sure to record all programming data in Appendix B, “Gas process flowmeter service record”.

As a guide in following the programming instructions in this chapter, see *Figure 16* for the relevant portions of the *PanaFlow Z1G/Z2G Process Gas Flowmeter* menu map.

3.2 Programming methods

You can program the *PanaFlow Z1G/Z2G Process Gas Flowmeter* with the magnetic keypad on the electronics enclosure, or with *PanaView™*, Panametrics’s PC-based non-resident software program that communicates with the *PanaFlow Z1G/Z2G Process Gas Flowmeter* via its serial port. *PanaView* provides additional programming capabilities, such as:

- Load and save site file data
- Create and save graph and log files
- Display text output and graphs of live measurement data
- Create custom templates for displaying text, graph, and log data
- Interface with multiple Panametrics instruments.

This chapter focuses on programming via the magnetic keypad. For information on programming the *PanaFlow Z1G/Z2G Process Gas Flowmeter* via *PanaView*, refer to the *PanaView User’s Manual* (Panametrics document #910-211).

3.3 The magnetic keypad

The glass window on the electronics enclosure includes the components shown in *Figure 15* below.



Figure 15: Display and magnetic keypad

IMPORTANT: The PanaFlow Z1G/Z2G Process Gas Flowmeter magnetic keypad enables programming of the instrument through the glass faceplate without removing the cover. Thus, all programming procedures may be performed while the unit is installed in a hazardous area.

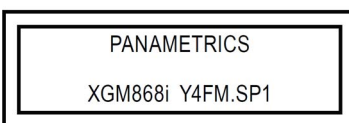
The six keys on the magnetic keypad (see *Table 3* below) enable users to program the *PanaFlow Z1G/Z2G Process Gas Flowmeter*.

Table 3: Keypad keys and functions

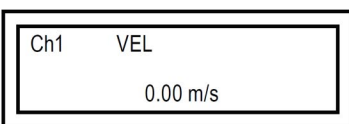
Key	Key Name	Functions
✕	Escape Key	To cancel a numeric entry change, or exit a menu or as Back key
✓	Enter Key	To accept a numeric entry or select a menu option
◀	Left Arrow Key	To navigate among menu choices or to set cursor position
▶	Right Arrow Key	To navigate among menu choices or to set cursor position
▲	Up Arrow Key	To navigate among menu choices or to Increment numeric entries
▼	Down Arrow Key	To navigate among menu choices or to Decrement numeric entries

3.4 Initial power on screens

When you power On the *PanaFlow Z1G/Z2G Process Gas Flowmeter*, the display first shows the model name and software version:



The meter then starts to display measured parameters.



To enter the Keypad Program, press the [✕] key, followed by the [✓] key, and the [✕] key again. Each successive key must be entered within 10 seconds of the prior key.

As a guide in following the programming instructions in this chapter, the relevant portions of the *PanaFlow Z1G/Z2G Process Gas Flowmeter* menu map can be found in *Figure 16*. Proceed to the following sections to enter data in the *Channel* or *GLOBL* menus.

IMPORTANT: If the keypad has not been pressed for 10 minutes, the PanaFlow Z1G/Z2G Process Gas Flowmeter exits the Keypad Program and returns to displaying measurements. The meter retains any configuration changes that were confirmed with the [✓] key, and restarts as if the programming had been completed.

3.5 Entering data in the GLOBL menu

To begin programming your meter, you must select the system units from the GLOBL menu as discussed below. Refer to *Figure 16* and remember to record all programming data in *Appendix B, "Gas process flowmeter service record"*.

3.5.1 Entering global system data

The *GLOBL-SYSTEM* submenu is used to enter several general system parameters (e.g., English or metric units). For meters with 2 channels, this menu is also used to compute parameters such as the sum, difference or average of the channel 1 and channel 2 signals. When calculating the *SUM*, *DIF* or *AVE* readouts, data from the *GLOBL-SYSTEM* submenu is used. Any conflicting data entered in the *CHANNEL-SYSTEM* submenu is overridden. Complete the following steps:

1. In the Keypad Program, scroll to PROG and press [✓].
2. In the PROG menu, scroll to GLOBL and press [✓].
3. In the Global PROGRAM menu, scroll to SYSTM and press [✓].
4. Scroll to the desired System Units selection (either metric or English) and press [✓] to display all parameters and measurements in the designated units.
5. Scroll to the desired Pressure Units selection (absolute or gauge) and press [✓].
6. Do one of the following:
 - If PSId (absolute) was selected, skip this step.
 - If PSIG (gauge) was selected, enter the desired atmospheric pressure and press [✓].
7. The program automatically returns to the Global PROGRAM menu.

3.5.2 Selecting volumetric units

1. Scroll to the desired *Volumetric Units* for the flow rate display and press [✕]. *Table 4* below lists the available volumetric units.

Table 4: Available volumetric / Totalizer units

English	Metric
ACF = Actual Cubic Feet	ACM = Actual Cubic Meters
KACF = Thousands of ACF	KACM = Thousands of ACM
MMACF = Millions of ACF	MMACM = Millions of ACM
SCF = Standard Cubic Feet	SCM = Standard Cubic Meters
KSCF = Thousands of SCF	KSCM = Thousands of SCM
MMSCF = Millions of SCF	MMSCM = Millions of SCM

2. Scroll to the desired unit of *Volumetric Time* (from *seconds* to *days*) and press [✓].
3. Scroll to the desired number of *Vol Decimal Digits* (*digits* to the right of the decimal point) in the volumetric flow display and press [✓].

3.5.3 Selecting totalizer units

4. Scroll to the desired *Totalizer Units* for the flow rate display and press [✓]. Available units are listed in *Table 4* above.
5. Scroll to the desired number of *Tot Decimal Digits* (digits to the right of the decimal point in the totalized flow rate display) and press [✓].
6. Do one of the following:
 - If *MASS FLOW* is *ON*, proceed to *Section 3.5.4, "Selecting mass flow units"*.
 - If *MASS FLOW* is *OFF*, the meter returns to the *Global PROGRAM* window. Press [✕] twice and proceed to *Chapter 4, "Operation"*.

Note: The following prompts appear only if Mass Flow is activated for both channels.

3.5.4 Selecting mass flow units

1. Scroll to the desired *Mass Flow* units for the flow rate display and press [✓]. The available units for this prompt are determined by the selection made at the *System Units* screen. See *Table 5* for the available units.

Table 5: Available mass flow units

English	Metric
LB = Pounds	Kilograms
KLB = Thousands of LB	Metric Tons (1000 KG)
MMLB = Millions of LB	
Tons (2000 LB)	

2. Scroll to the desired *Mass Flow Time* units for the mass flow rate display (from *seconds* to *days*) and press [✓].
3. Scroll to the desired number of *Mdot Dec. Digits* (digits to the right of the decimal point in the mass flow rate display) and press [✓].
4. Scroll to the desired *Mass (Totalizer)* units for the totalized mass flow rate display and press [✓]. The available units for this prompt are determined by the selection made at the *System Units* prompt.
5. Scroll to the desired number of *Mass Dec. Digits* (digits to the right of the decimal point in the totalized mass flow rate display) and press [✓].
6. After completing the above steps, the *PanaFlow Z1G/ Z2G Process Gas Flowmeter* returns to the *Global PROGRAM* window. Press [✓] and scroll to *CH1* or *CH2* to continue the initial setup programming.

3.6 Activating a channel

The *Channelx-ACTIV* submenu permits selection of the desired measurement method. In addition, it is used to activate/deactivate one or both of the channels in a 2-Channel *PanaFlow Z1G/Z2G Process Gas Flowmeter*.

To access the *Channelx-ACTIV* submenu, proceed as follows:

1. From the *Keypad Program*, scroll to *CH1* or *CH2* and press [✓].
2. In the *Channel PROGRAM* menu, scroll to *ACTIV* and press [✓].
3. Scroll to *Burst* to activate the channel/path, and press [✓].

Note: *Burst* is automatically selected for a 1-Channel meter.

4. Scroll to one of the measurement methods described below and press [✓].
 - *Skat Only* is the preferred technique for locating the acoustic signal and for high velocity measurements. It is more robust in a noisy environment than the *Measure* technique.

- *Skani/Measure* is the preferred technique to use for low velocity measurements.

If *Skani Only* is selected at the above prompt, the meter uses this technique exclusively. However, if *Skani/Measure* is selected, the meter uses *Skani Only* to find the acoustic signal and then tries to use the *Skani/Measure* technique for the actual measurement.

After completing the above step, the meter returns to the *Channel PROGRAM* menu. Proceed to the next section to continue programming your meter.

3.7 Entering system data for a channel

The *Channelx-System* submenu is used to enter system parameters for the channel.

3.7.1 Accessing the channelx-system submenu

1. From the Channel PROGRAM menu, scroll to SYSTM and press [✓].
2. The first prompt asks for the *Channel Label*. Use the four arrow keys to enter the desired label (in any numeric or text combination up to five characters), and then press [✓].
3. The next prompt asks for the *Channel (Site) Message*. Enter the desired text in the same manner as the channel label with up to 15 characters, and then press [✓].

3.7.2 Selecting volumetric units

1. Scroll to the desired *Volumetric Units* for the flow rate display and press [✓]. the available units are listed in *Table 6* below.
2. Scroll to the desired *Volumetric Time* units for the flow rate display (from *seconds* to *days*) and press [✓].
3. Scroll to the desired number of *Vol Decimal Digits* (*digits* to the right of the decimal point in the volumetric flow rate display) and press [✓]

Table 6: Available volumetric / Totalizer units

English	Metric
ACF = Actual Cubic Feet	ACM = Actual Cubic Meters
KACF = Thousands of ACF	KACM = Thousands of ACM
MMACF = Millions of ACF	MMACM = Millions of ACM
SCF = Standard Cubic Feet	SCM = Standard Cubic Meters
KSCF = Thousands fo SCF	KSCM = Thousands of SCM
MMSCF = Millions of SCF	MMSCSM = Millions of SCM

3.7.3 Selecting totalizer units

1. Scroll to the desired *Totalizer Units* for the totalized flow rate display and press [✓]. The available units are listed in *Table 6* above.
2. Scroll to the desired number of *Tot Decimal Digits* (*digits* to the right of the decimal point in the totalized flow rate display) and press [✓].
3. Do one of the following:
 - If *MASS FLOW* is *ON*, proceed to *Section 3.7.4, "Selecting mass flow units"*.
 - If *MASS FLOW* is *OFF*, the meter returns to the *Channel PROGRAM* menu.

3.7.4 Selecting mass flow units

1. Scroll to the desired *Mass Flow* units for the flow rate display and press [✓]. The available units for this prompt are determined by the selection made at the *System Units* prompt (see *Table 7* below).

Table 7: Available mass flow units

LB = Pounds	Kilograms
KLB = Thousands of LB	Metric Tons (1000 KG)
MMLB = Millions of LB	
Tons (2000 LB)	

2. Scroll to the desired *Mass Flow Time* units for the mass flow rate display and press [✓].
3. Scroll to the desired number of *Mdot Decimal Digits* (*digits* to the right of the decimal point in the mass flow rate display) and press [✓].
4. Scroll to the desired *Mass (Totalizer)* units for the totalized mass flow rate display and press [✓]. The available units for this prompt are determined by the selection made at the *System Units* prompt.
5. Scroll to the desired number of *Mass Dec. Digits* (*digits* to the right of the decimal point in the totalized mass flow rate display) and press [✓].

IMPORTANT: After completing the above steps, the *PanaFlow Z1G/Z2G Process Gas Flowmeter* returns to the *Channel PROGRAM* menu.

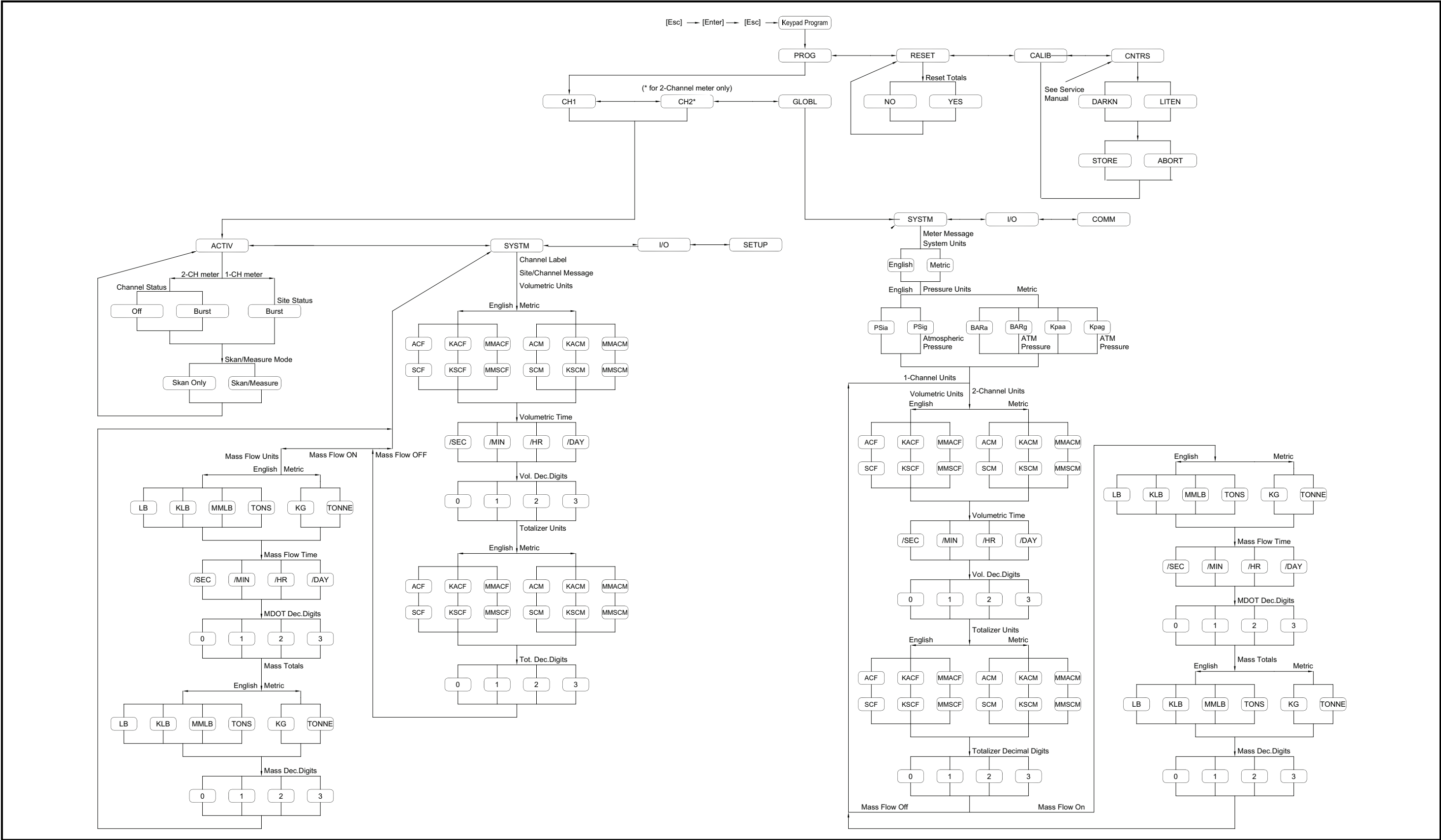


Figure 16: PanaFlow Z1G/Z2G menu map

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Chapter 4. Operation

4.1 Introduction

See *Chapter 2, "Installation"*, and *Chapter 3, "Initial setup"*, to prepare your *PanaFlow Z1G/Z2G Process Gas Flowmeter* system for operation. When the meter is ready to take measurements, proceed with this chapter. The following specific topics are discussed:

- Section 4.2, "Powering up"
- Section 4.3, "The *PanaFlow Z1G/Z2G* process gas flowmeter LCD display"
- Section 4.4, "The optional *PanaView* display"
- Section 4.5, "Taking measurements"

Note: All inputs and outputs of the *PanaFlow Z1G/Z2G Process Gas Flowmeter* are calibrated at the factory prior to shipment. If it becomes necessary to recalibrate any of the inputs and/or outputs, consult the factory for instructions.



WARNING! To ensure the safe operation of the *PanaFlow Z1G/Z2G Process Gas Flowmeter*, it must be installed and operated as described in this manual. In addition, be sure to follow all applicable local safety codes and regulations for the installation of electrical equipment.

4.2 Powering up

Because the *PanaFlow Z1G/Z2G Process Gas Flowmeter* does not have an ON/OFF switch, it will power up as soon as the connected power source is energized.



WARNING! For compliance with the European Union's Low Voltage Directive, this unit requires an external power disconnect device such as a switch or circuit breaker. The disconnect device must be marked as such, clearly visible, directly accessible, and located within 1.8 m (6 ft) of the meter.

There are three methods for obtaining readings from the *PanaFlow Z1G/Z2G Process Gas Flowmeter*:

- Built-in *PanaFlow Z1G/Z2G Process Gas Flowmeter* LCD display
- *PanaView* software installed on a personal computer
- External analog device to read the *PanaFlow Z1G/Z2G Process Gas Flowmeter* analog output

At least one of the above display options must be installed in order to obtain flow rate readings from the meter.

Immediately upon power up, the *software version* display appears. Then, the meter performs a series of internal checks, which take about 45 seconds, prior to displaying the *flow rate data* (see Section 3.4, "Initial power on screens").

Note: If the *PanaFlow Z1G/Z2G Process Gas Flowmeter* fails any of the internal checks, try disconnecting the power and then re-powering the unit. If the meter continues to fail any of the internal checks, contact the factory for assistance.

After successfully performing the internal checks, the *PanaFlow Z1G/Z2G Process Gas Flowmeter* begins taking measurements and the *software version* display is replaced by a measurement mode display. Proceed to the appropriate section for instructions on using the LCD display and the *PanaView* display option.

Note: As a minimum, the system and pipe parameters for each installed channel must be entered before the *PanaFlow Z1G/Z2G Process Gas Flowmeter* can display valid data. Refer to Chapter 3, "Initial setup", for specific instructions.

4.3 The PanaFlow Z1G/Z2G process gas flowmeter LCD display

The components of the *PanaFlow Z1G/Z2G Process Gas Flowmeter* LCD display are shown in *Figure 17* below, along with a typical mass flow rate readout.

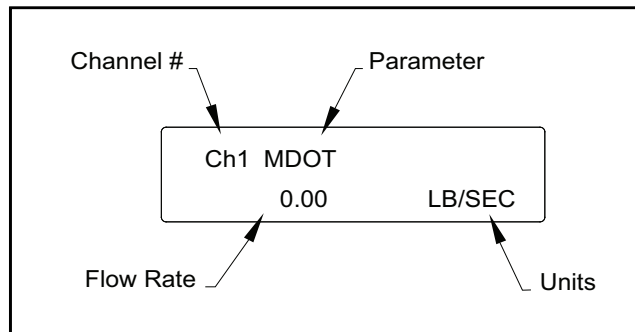


Figure 17: A typical LCD flow rate display

As shown in *Figure 17* above, the *PanaFlow Z1G/Z2G Process Gas Flowmeter* display screen includes the following information:

- Channel Number
- Flow Parameter
- Units of Measure
- Flow Rate Value

However, the items in this list may be reprogrammed to display a variety of alternative choices (see *Section 4.5.1, "Programming the LCD display"*).

Note: The LCD backlight flashes to signal errors. If the backlight is Off when an error is detected, the display is illuminated briefly, but if the backlight is already On, the light is interrupted briefly. In addition, Error Code messages may appear in the upper right corner of the LCD display.

4.4 The optional PanaView display

The components of the PanaView text display are shown in *Figure 18* below, along with a typical flow rate readout.

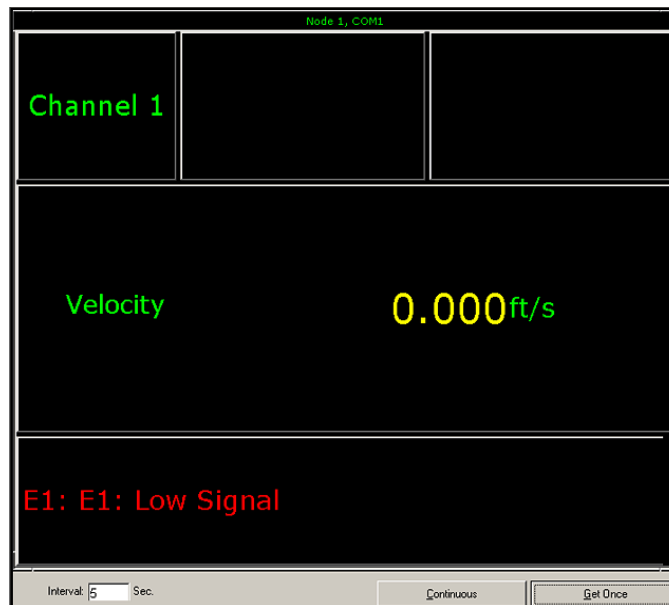


Figure 18: A Typical PanaView text display pane

As shown in *Figure 18*, the *PanaView* text pane includes the following information:

- Channel Number
- Flow Parameter
- Units of Measure
- Flow Rate Value

However, the items in this list may be reprogrammed to display a variety of alternative choices (see *Section 4.5.2, "Programming the PanaView display"*).

Note: As shown in *Figure 18*, Error Code messages may appear in the lower left corner of the *PanaView* text display window.

4.5 Taking measurements

The *PanaFlow ZIG/Z2G Process Gas Flowmeter* is capable of displaying several different variables in a variety of formats. However, this manual discusses only the basic measurement displays using the LCD display or the *PanaView* display. Refer to the *PanaView User's Manual* (Panametrics document #910-211) for details on using *PanaView* and the *PanaFlow ZIG/Z2G Process Gas Flowmeter* analog outputs to obtain the flow rate data.

4.5.1 Programming the LCD display

Note: When you first initialize the *PanaFlow ZIG/Z2G Process Gas Flowmeter* the number of LCD parameters is set to OFF. You must program the LCD to display any measured parameters.

Using the *Keypad Program*, you can program the LCD display to display up to four variables in sequence. Complete the following steps to program the LCD display:

1. Power up the *PanaFlow ZIG/Z2G Process Gas Flowmeter* and wait until it has initialized.
2. To enter the *Keypad Program*, press the [✖] key, followed by the [✓] key, and the [✖] key again. Each successive key must be entered within 10 seconds of the prior key.
3. In the *Keypad Program* window, scroll to *PROG* and press [✓]
4. In the *PROG* menu, scroll to *GLOBL* and press [✓]
5. Scroll to *I/O* and press [✓]
6. Scroll to *LCD* and press [✓]
7. At the *# of LCD Parameters* screen, scroll to the desired number (from *OFF* through *1-4* and *KEY*) and press [?] The *OFF* setting switches the measurement display Off. The *KEY* setting enables users to change the measurement display with the arrow keys, without accessing the *Keypad Program*. If you select *KEY*:
 - To view a parameter other than the one currently displayed, press the [▲] and [▼] keys to scroll through the various available parameters.
8. Select the desired *Measurement Parameter* (see *Table 8* for a list of the available parameters).

Table 8: Available measurement parameters

Option Bar	Description	Good	Bad
VEL	Displays the flow velocity.	N.A.	N.A.
VOLUM	Displays the volumetric flow.	N.A.	N.A.
+TOTL	Displays the forward totaled volume flow.	N.A.	N.A.
-TOTL	Displays the reverse totaled volume flow.	N.A.	N.A.
TIMER	Displays the total flow measurement time.	N.A.	N.A.t
MDOT	Displays the mass flow.	N.A.	N.A.
+MASS	Displays the forward totaled mass flow.	N.A.	N.A.
-MASS	Displays the reverse totaled mass flow.	N.A.	N.A.
SS up	Displays the signal strength for the upstream direction.	50 – 75	<50 or >75
SS do	Displays the signal strength for the downstream direction.	50 – 75	<50 or >75
SNDSP	Displays the measured speed of sound in the gas.	N.A.	N.A.
Tup	Displays the upstream ultrasonic signal transit time.	N.A.	N.A.
Tdown	Displays the downstream ultrasonic signal transit time.	N.A.	N.A.
DELTA	Displays the transit time difference between the upstream and downstream signals.	N.A.	N.A.
Tot K	Displays the total K factor.	N.A.	N.A.
PEAK%	Displays the percentage of peak (set to +50 by default).	N.A.	N.A.
Qup	Displays the signal quality for the upstream direction.	≥ 1200	-400 to +400
Qdown	Displays the signal quality for the downstream direction.	≥ 1200	-400 to +400
AMPup	Displays the value for the signal amplitude of the upstream direction.	24 ± 5	<19 or >29
AMPdn	Displays the value for the signal amplitude of the downstream direction.	24 ± 5	<19 or >29
CNTup	Displays the AGC DAC count for the upstream gain setting.	N.A.	N.A.
CNTdn	Displays the AGC DAC count for downstream gain setting.	N.A.	N.A.
P#up	Displays signal peaks for the upstream direction.	100 – 2300	<100 or >2300
P#dn	Displays signal peaks for the downstream direction.	100 – 2300	<100 or >2300
TEMP	Displays the gas temperature (from 0/4-20mA input).	N.A.	N.A.
PRESR	Displays the gas pressure (from 0/4-20mA input).	N.A.	N.A.
AcVOL	Displays the actual volumetric flow.	N.A.	N.A.
StVOL	Displays standard volumetric flow.	N.A.	N.A.
Tu S1	Displays Skan transit time upstream.	N.A.	N.A.
Td S1	Displays Skan transit time downstream.	N.A.	N.A.
DT S1	Displays Skan Delta T.	N.A.	N.A.
Tu M1	Displays Measure transit time upstream.	N.A.	N.A.
Td M1	Displays Measure transit time downstream.	N.A.	N.A.
DT M1	Displays Measure Delta T.	N.A.	N.A.
Vinst	Displays the instantaneous velocity.	N.A.	N.A.

¹available only if Burst Mode = S/M

Note: The measurement units that appear in these prompts are those selected in the GLOBL-SYSTM menu. Also, when differences in one channel's programming invalidates an output previously chosen for the other channel, the measurement defaults to the nearest selectable item in the parameter list.

The previous two prompts repeat until all of the specified # of LCD Parameters have been set up. When all of the display parameters have been set up, the meter returns to the Global I/O window. To leave the Keypad Program, press [*] three times.

After leaving the Keypad Program, the PanaFlow ZIG/Z2G Process Gas Flowmeter resets itself and begins to display the parameters specified in this section. If more than one parameter was set up, each of the parameters is displayed in sequence, with a pause of several seconds between display changes.

To use the programmed LCD display to obtain flow rate data, simply power on the PanaFlow ZIG/Z2G Process Gas Flowmeter as described earlier in this chapter. Then, read the flow rate directly from the display (see Figure 17).

4.5.2 Programming the PanaView display

Launch the PanaView software on the PC and establish communications with the PanaFlow ZIG/Z2G Process Gas Flowmeter (see the PanaView manual, Panametrics document #910-211 as necessary). Then, enter the required startup parameters, as described in Chapter 3, "Initial setup". Proceed as follows:

1. In PanaView, open the Output menu (see Figure 19 below) and click on the Text Display option.

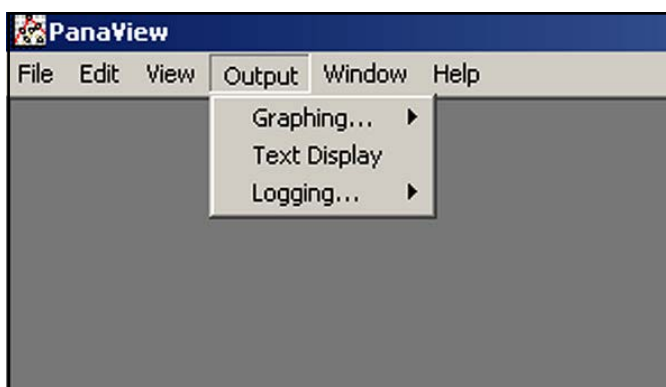


Figure 19: The output menu

Note: The Text Display window is actually stacked on top of any previously opened PanaView windows, such as the Meter Browser window.

2. Using the Window menu, as described in the PanaView manual, arrange the open windows in the desired format. For this discussion, Figure 20 shows the Text Display window in its maximized (full-screen) size.

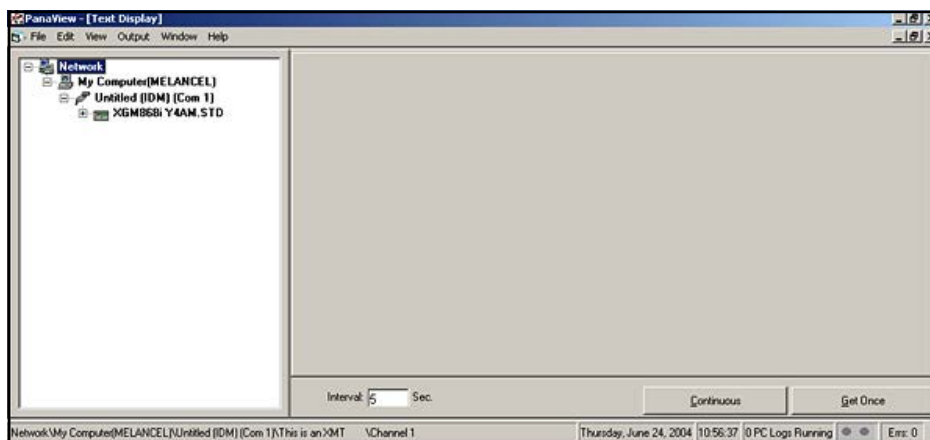


Figure 20: The text display window

3. The left pane of the *Text Display* window contains the standard *PanaView* network tree. Expand the branch for your *PanaFlowZ1G/Z2G Process Gas Flowmeter* model, and double-click on the desired channel. On 2-channel units, you can also display the *SUM*, *DIFF* or *AVG* parameters.
4. From the expanded tree, double-click on the desired *flow parameter* to display it in the right pane of the window.
5. Before actual data values can be displayed in the text pane, activate one of the following data collection modes (see *Figure 20* above):
 - Click on the **[Get Once]** option button at the bottom of the right pane in the *Text Display* window. The current value of the selected process parameter, as specified in the *PanaView* network tree, is displayed in the right pane of the *Text Display* window.
 - Enter an *Interval* in the text box at the bottom of the right pane in the *Text Display* window, or check the *Max. Comm Rate* box to collect readings as fast as the system allows (i.e., 1 sec). Then, click on the **[Continuous]** option button to begin collecting data for display in the right pane of the *Text Display* window. The right pane now appears similar to *Figure 18*.

Note: Any value entered in the *Interval* text box is overridden if the *Max. Comm Rate* box is checked.

6. If the **[Continuous]** option was selected in Step 5, click on the **[Stop]** option button, which has replaced the original **[Continuous]** option button, to terminate data collection.

The *Text Display* window may be left open while other tasks are performed, or it may be closed by clicking on the lower **[X]** control button at the far right of the menu bar.

IMPORTANT: If you click on the upper **[X]** control button at the far right of the *PanaView* title bar, you will exit *PanaView* completely.

4.5.2.1 Displaying multiple process parameters

The procedure for displaying a single process parameter in a text screen may be repeated to simultaneously display multiple process parameters. To do so, proceed as follows:

1. Display the first process parameter in a text screen, as described in the previous section.
2. Repeat Step 1 for any desired additional process parameters, by double clicking on them in the *PanaView* network tree. *PanaView* automatically tiles the multiple text screens in the right pane of the *Text Display* window, as shown in *Figure 21* below.

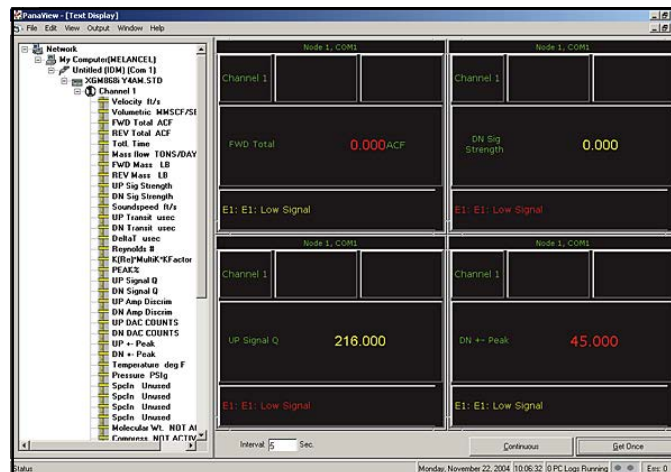


Figure 21: Multiple text screens in the text display window

3. As in any standard *Windows*® application, the multiple text screens may be resized by dragging their borders. Also, the individual panes within a parameter's text screen may be resized by dragging the borders within that text screen.
4. To close an open text screen, right click anywhere within that screen, except in the title bar or the error section, and click on the **[Remove]** option that pops up in the context menu.

Note: After resizing or removing any of the multiple text screens, the default tiled layout may be restored by opening the Window menu (see the *PanaView User's Manual*) and clicking on the *Tile Output Displays* option.

4.5.2.2 Displaying multiple text windows

The procedures for displaying one or more process parameters in a single *Text Display* window may be repeated to open multiple *Text Display* windows. To do so, proceed as follows:

1. To open another *Text Display* window and display the desired process parameter(s) in the new window, repeat the steps in Section 4.5.2, "Programming the PanaView display".
2. Arrange the multiple *Text Display* windows as desired via the *Window* menu (see the *PanaView Manual*).

4.5.3 Pausing measurements

On occasion, you may wish to stop taking measurements. With *PanaView*, you can direct the *PanaFlow Z1G/Z2G Process Gas Flowmeter* to pause measurements without disconnecting the power from the meter. Proceed as follows:

1. From the meter tree in the *New Meter Browser*, click on the *PanaFlow Z1G/Z2G Process Gas Flowmeter* entry.
2. Expand the *Edit Functions* option, and double-click on the *Pause Measurement* entry to open a window similar to Figure 22 below.

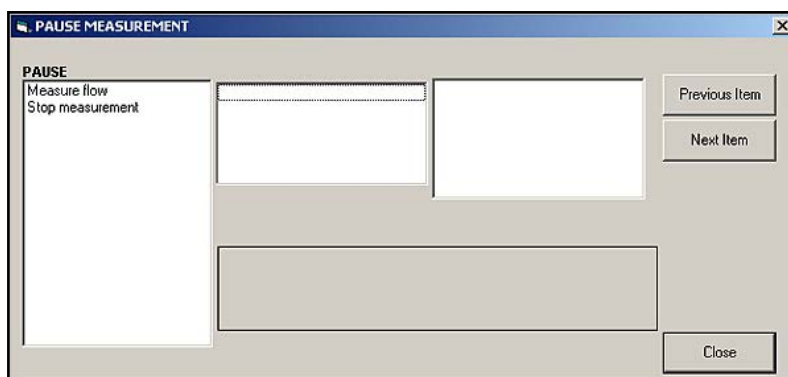


Figure 22: The pause measurement window

3. To pause the active measurements, double-click on the *Stop Measurement* option. The window closes and the *PanaFlow Z1G/Z2G Process Gas Flowmeter* stops taking measurements.
4. To restart the measurements, double-click on the *Pause Measurement* entry, and then on the *Measure Flow* option. The *PanaFlow Z1G/Z2G Process Gas Flowmeter* resumes flow measurement.

4.6 PT sensor drift and recalibration

The PT sensor is an optional accessory, that comes with select models of Z1G/Z2G. The sensor is specified to have a maximum drift of 0.1% of full scale (FS) output per year.

Although, the output drift of this sensor reduces over time, as the innate stresses in the materials relax and stop shifting around, we recommend removing the sensor for recalibration every 5 years. However, user may decide on the recalibration frequency based on the application process needs, to have it calibrated earlier than the recommended period.

When the sensor is removed for calibration, either install the spare sensor or an approved Ex d plug to close the sensor mounting slot. Follow all the safety precautions and recommendations while removing and installing the sensor.

Send the sensor to the Customer Support Center addresses mentioned on the rear cover of this manual. We will return the calibrated sensor to the specified address, along with the calibration certificate

[no content intended for this page]

Chapter 5. Specifications

5.1 Operation and performance

Fluid types

Acoustically conductive gases

Pipe sizes

2 to 16 in. (50 to 400 mm)

Meter body materials

Carbon Steel, SA216 Gr. WCB

Low Temp Carbon Steel, SA352 Gr. LCB

Stainless Steel, SA351 Gr. CF8M

Duplex Stainless Steel, SA995 Gr. CD3MWCuN

Flange ratings

ASME 150 lb, 300 lb or 600 lb

DIN PN10, PN16, PN25, PN40 or PN63

Meter body certifications

PED Cat III, Module B+C2

CRN (All Canadian Provinces)

NACE MR01-75/MR-01-03

Flow measurement range (bi-directional)

0.5 to 250 ft/s (0.15 to 76 m/s)

Turndown Ratio = 500:1

Flow measurement accuracy

- 1 Path:
 - ± 0.075 ft/s (± 0.02 m/s) at flow range of 0.5 to 5 ft/s (0.15 to 1.5 m/s)
 - $\pm 1.5\%$ of reading at flow range of 5 to V_{max} /s (1.5 to V_{max})
- 2 Path:
 - ± 0.05 ft/s (0.015 m/s) at flow range of 0.5 to 5 ft/s (0.15 to 1.5 m/s)
 - $\pm 1.0\%$ of reading at flow range of 5 to V_{max} (1.5 to 76 V_{max})

Note: Accuracy/repeatability specifications assume a final installation with fully developed flow profile (typically 20 diameters upstream and 10 diameters downstream of straight pipe run) Reynolds Number > 5000 and single phase fluids. Applications with piping arrangements that induce swirl (e.g., two out-of-plane elbows) may require additional straight run and/or flow conditioning. For shorter straight pipe runs, consult the factory for a computational flow dynamic evaluation.

Repeatability

±0.2% to 0.5% of reading

Measurement parameters

Mass flow, standard and actual flow, totalized flow, and flow velocity

Electronics enclosure

NEMA Type 4X explosion-proof and weatherproof (IP66)

Standard: Epoxy-coated aluminum

Optional: Stainless steel

Hazardous area certifications

US/CAN Class I, Div. 1 Group B,C,D

ATEX: II 2 G Ex db IIB+H2 T6... 150° C Gb

IECEX: Ex db IIB+H2 T6... 150° C Gb

Input power

Standard: 90 to 240 VAC

Optional 12 to 28 VDC, ±5%

Power consumption

20 W maximum

Process temperature range

-40 to 302°F (-40 to 150°C)

Note: 40 to 257° F (-40 to 125° C) range when used with pressure and temperature sensor option.

Ambient temperature range

-40 to 140°F (-40 to 60°C) US/CAN

-4 to 140°F (-20 to 60°C) ATEX/IECEX

Below -20 Display readability will be affected

Storage temperature

-40 to +185°F (-40 to +85°C)

Digital communication

Standard: RS485

Optional: HART®

Optional: Modbus®

Optional: Foundation Fieldbus®

Table 9: Example for a 3 in. [80 mm], 2-Path Flowcell

Flange Rating	A in. [mm]	C in. [mm]	D in. [mm]	X in. [mm]	Y in. [mm]	Z in. [mm]	CX in. [mm]	CY in. [mm]	CZ in. [mm]	Approx. Weight
ASME 150# RF	12.7 [322]	19.0 [481]	7.5 [190]	20.0 [508]	22.7 [576]	9.8 [247]	44.0 [1117]	34.7 [881]	33.8 [857]	66.7 kg
ASME 150# RF	12.7 [322]	19.0 [481]	8.3 [209]	20.0 [508]	23.1 [586]	9.8 [247]	44.0 [1117]	35.1 [890]	33.8 [857]	70.7kg
ASME 150# RF	12.7 [322]	19.0 [481]	8.3 [209]	20.2 [508]	23.1 [586]	9.8 [247]	44.0 [1117]	35.1 [890]	33.8 [857]	72.9 kg

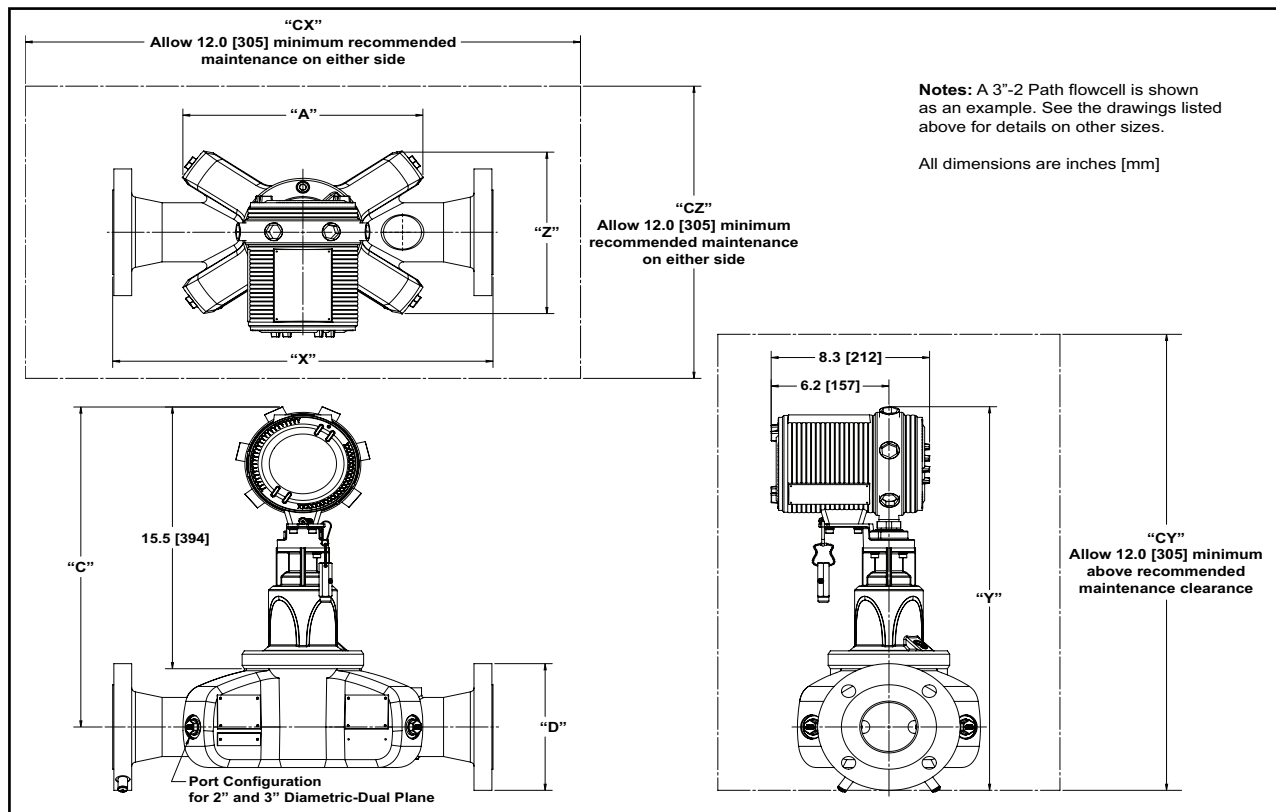


Figure 23: PanaFlow Z1G/Z2G dimensions

Table 10: Reference drawings

Drawing number	Drawing reference
712-2158	General arrangement drawing, PanaFlow Z1G/Z2G, Local Mount
712-2160	General arrangement drawing, PanaFlow Z1G/Z2G, Remote Mount

[no content intended for this page]

Chapter 6. Certification and safety statements for the PanaFlow Z1G/Z2G ultrasonic gas flow meters

When installing this apparatus in potentially hazardous areas, the following requirements must be met:

- Field wiring shall be rated at least 5°C above maximum ambient or fluid temperature, whichever is greater.
- Connecting cables shall be mounted securely and protected from mechanical damage, pulling and twisting.
- Conduit seals are required within 18 inches of the enclosure.
- Cable entries are 3/4" or 1/2" NPT.
- Cable glands of an approved flameproof design are required. These must be installed according to the manufacturer's instructions. Where the cable glands are provided by Panametrics, the manufacturer's instructions, as supplied, to Panametrics, will be included in the documentation.
- The system is certified as ATEX and IECEx: II 2 G Ex d IIB +H2 T6 Gb in Ta = -20°C to +60°C ambient, Type 4X and IP66. The system temperature code is dependent upon the process fluid temperature ranges of -20°C to +150°C. Refer specific conditions of use for ATEX and US/Canada for more information about temperature code.
- Unused entries must be sealed using a suitably certified threaded plug.
- Modifications to the flameproof enclosure are not permitted.
- The apparatus should be de-energized before opening.
- Installation shall be in accordance with the installation instructions and the National Electrical Code® ANSI/NFPA 70, the Canadian Electrical Code C22.1, or IEC/EN 60079-14, as applicable.
- Equipment is of type flameproof "d" design and complies with the standards listed in table below.
- The product contains no exposed parts which produce surface temperature infrared, electromagnetic ionizing, or non-electrical dangers.
- The product must not be subjected to mechanical or thermal stresses more than those permitted in the certification documentation and the instruction manual.
- The product cannot be repaired by the user; it must be replaced by an equivalent certified product. Repairs should only be carried out by the manufacturer or by an approved repairer.
- Only trained, competent personnel may install, operate and maintain the equipment.
- The product is an electrical apparatus and must be installed in the hazardous area in accordance with the requirements of the EU Type Examination Certificate. The installation must be carried out in accordance with all the appropriate international, national and local standard codes and practices and site regulations for flameproof apparatus and in accordance with the instructions contained in the manual. Access to the circuitry must not be made during operation.

6.1 Standards

IEC 60079-0:2011	EN 60079-0:2012 + A1:2013
IEC 60079-1:2014	EN 60079-1:2014
IEC 60529:2001	EN 60529:1991 + A1:2000

6.2 ATEX

6.3 Specific conditions of use:

1. The flameproof joints of the equipment are not intended to be repaired. Consult the manufacturer if dimensional information on the flameproof joints is necessary.
2. Follow the manufacturer's instructions to reduce the potential of an electrostatic charging hazard.

3. Consult the manufacturer for genuine replacement flange fasteners. M10x35 hexagon socket cap screws of ISO 12.9 DIN912 grade steel (zinc-plated) or better with a minimum yield strength of 135,000 psi are acceptable alternatives.
4. Consult the manufacturer for genuine replacement enclosure/adaptor fasteners. M6x16 and M6x30 hexagon socket cap screws of ISO 12.9 DIN912 grade steel (zinc-plated) or better with a minimum yield strength of 135,000 psi are acceptable alternatives.
5. Care should be taken to avoid creating an ignition hazard due to impact or friction on the titanium transducers which form part of the flameproof enclosure.
6. The electronics enclosure is rated for an ambient temperature range of -20°C to +60°C (when local or remote mounted). The remote mount junction box and flow body is rated for an ambient temperature range of -20°C to +60°C (when local mounted) or -40°C to +60°C (when remote mounted).
7. The equipment temperature class is dependent on the maximum process temperature and mounting configuration according to the following table:

Mounting Configuration	Maximum Process Temperature	Temperature Class	
		Enclosure	Remote Junction Box/ Flow Body
Local Remote	85 ° C	T6	T6
Remote	100 ° C	T6	T6
Remote	135 ° C	T6	T6
Remote	150 ° C	T6	150 ° C

6.4 US/CANADA:

6.5 Specific conditions of use:

1. The electronics enclosure is rated for an ambient temperature range of -20°C to +60°C (when local or remote mounted). The remote mount junction box and flow body is rated for an ambient temperature range of -20°C to +60°C (when local mounted) or -40°C to +60°C (when remote mounted).
2. The equipment temperature class is dependent on the maximum process temperature and mounting configuration according to the following table:

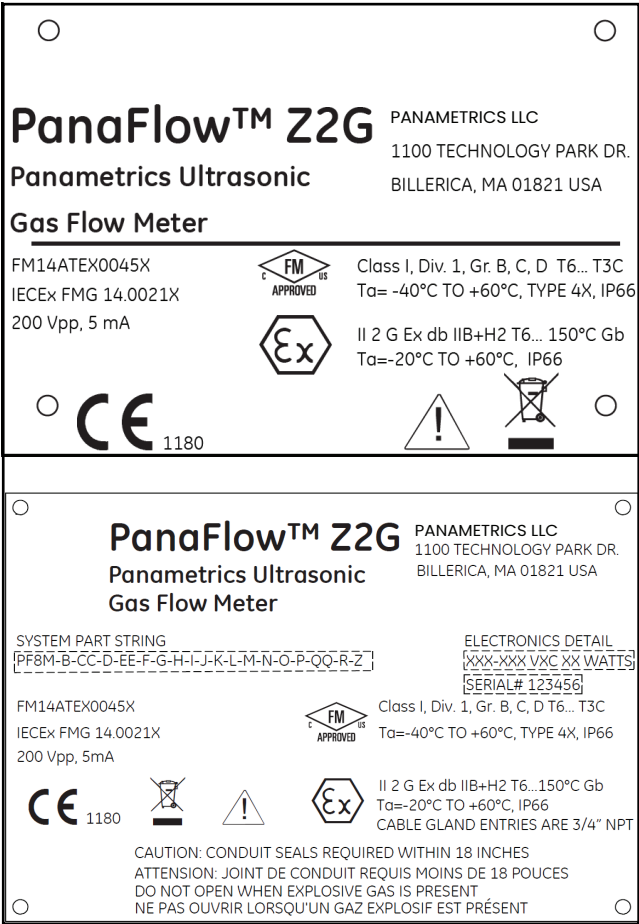
Mounting Configuration	Maximum Process Temperature	Temperature Class	
		Enclosure	Remote Junction Box/ Flow Body
Local Remote	85 ° C	T6	T6
Remote	100 ° C	T6	T5
Remote	120 ° C	T6	T4A
Remote	135 ° C	T6	T4
Remote	150 ° C	T6	T3A

6.6 Markings

1. Shall appear on the meter as shown below for the AC and DC powered versions.

PanaFlow™ Z1G Panametrics Ultrasonic Gas Flow Meter		PANAMETRICS LLC 1100 TECHNOLOGY PARK DR. BILLERICA, MA 01821 USA
FM14ATEX0045X IECEx FMG 14.0021X 200 Vpp, 5 mA	 	Class I, Div. 1, Gr. B, C, D T6... T3C Ta= -40°C TO +60°C, TYPE 4X, IP66 II 2 G Ex db IIB+H2 T6... 150°C Gb Ta=-20°C TO +60°C, IP66
 1180	 	
 2561	MODEL: PF8M-Z1G panametrics.com	
SIZE/FLANGE/SCH/MAT: [6" #150 80S SA351 GR. CF8M]		
DRY WEIGHT: [157 kg]		
TEMPERATURE		
AMBIENT: [-40°C to 60°C]		
FLUID:REMOTE: [-40°C to 150°C]		
FLUID:LOCAL: [-40°C to 85°C]		
FC MFG SN: [12345678]		
MFG DATE: [YY YY / MM]		
PRESSURE		
MAWP: [78.5] barg @ 150°C		
MAWP: [78.5] barg @ 85°C		
MAEWP F.V. @ 150°C		
MDMT: [-40°C] @ [99.2] barg		
HYDRO: [148.9] barg		
SUPPLY CONNECTION TO BE RATED 5°C ABOVE MAXIMUM FLUID TEMPERATURE CABLE GLAND ENTRY IS 3/4" NPT CAUTION: CONDUIT SEALS REQUIRED WITHIN 18" OF ENCLOSURE WARNING: DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT WARNING: POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE INSTRUCTIONS ATTENTION: LES JOINT DE CONDUIT SONT OBLIGATOIRES DANS UNE DISTANCE DE 18 POUCES Avertissement - NE PAS OUVRIR LORSQUE UNE ATMOSPHERE EXPLOSIVE EST PRESENTEE, POTENTIAL DE CHARGE ELECTROSTATIQUE - VOIR LES INSTRUCTIONS		

2. Shall appear on the meter as shown below.



3. Following marking shall additionally appear on the flowcell:

PanaFlow™ Z1G Panametrics Ultrasonic Gas Flow Meter PANAMETRICS LLC 1100 TECHNOLOGY PARK DR. BILLERICA, MA 01821 USA		
FM14ATEX0045X IECEX FMG 14.0021X 200 Vpp, 5 mA	 	Class I, Div. 1, Gr. B, C, D T6... T3C Ta= -40°C TO +60°C, TYPE 4X, IP66 II 2 G Ex db IIB+H2 T6... 150°C Gb Ta=-20°C TO +60°C, IP66
 1180		

PanaFlow™ Z1G Panametrics Ultrasonic Gas Flow Meter PANAMETRICS LLC 1100 TECHNOLOGY PARK DR. BILLERICA, MA 01821 USA	
SYSTEM PART STRING [PF8M-B-CC-D-EE-F-G-H-I-J-K-L-M-N-O-P-QQ-R-Z] FM14ATEX0045X IECEX FMG 14.0021X 200 Vpp, 5mA	ELECTRONICS DETAIL [XXX-XXX VXC XX WATTS] [SERIAL# 123456] Class I, Div. 1, Gr. B, C, D T6... T3C Ta=-40°C TO +60°C, TYPE 4X, IP66 II 2 G Ex db IIB+H2 T6...150°C Gb Ta=-20°C TO +60°C, IP66 CABLE GLAND ENTRIES ARE 3/4" NPT
 1180	  
CAUTION: CONDUIT SEALS REQUIRED WITHIN 18 INCHES ATTENTION: JOINT DE CONDUIT REQUIS MOINS DE 18 POUCES DO NOT OPEN WHEN EXPLOSIVE GAS IS PRESENT NE PAS OUVRIR LORSQU'UN GAZ EXPLOSIF EST PRÉSENT	

MODEL #: [PF8M-B-CC-D-EE-F-G-H-I-J-K-L-M-N-O-P-QQ-R-Z]
S= [CPO-#XXXXXX]
SERIAL #: [XXXXXXXX] ASSY DATE: 2011/MAR/30
TAG #: [FIT-23-ASTRGRGSJD] MADE IN: [****]

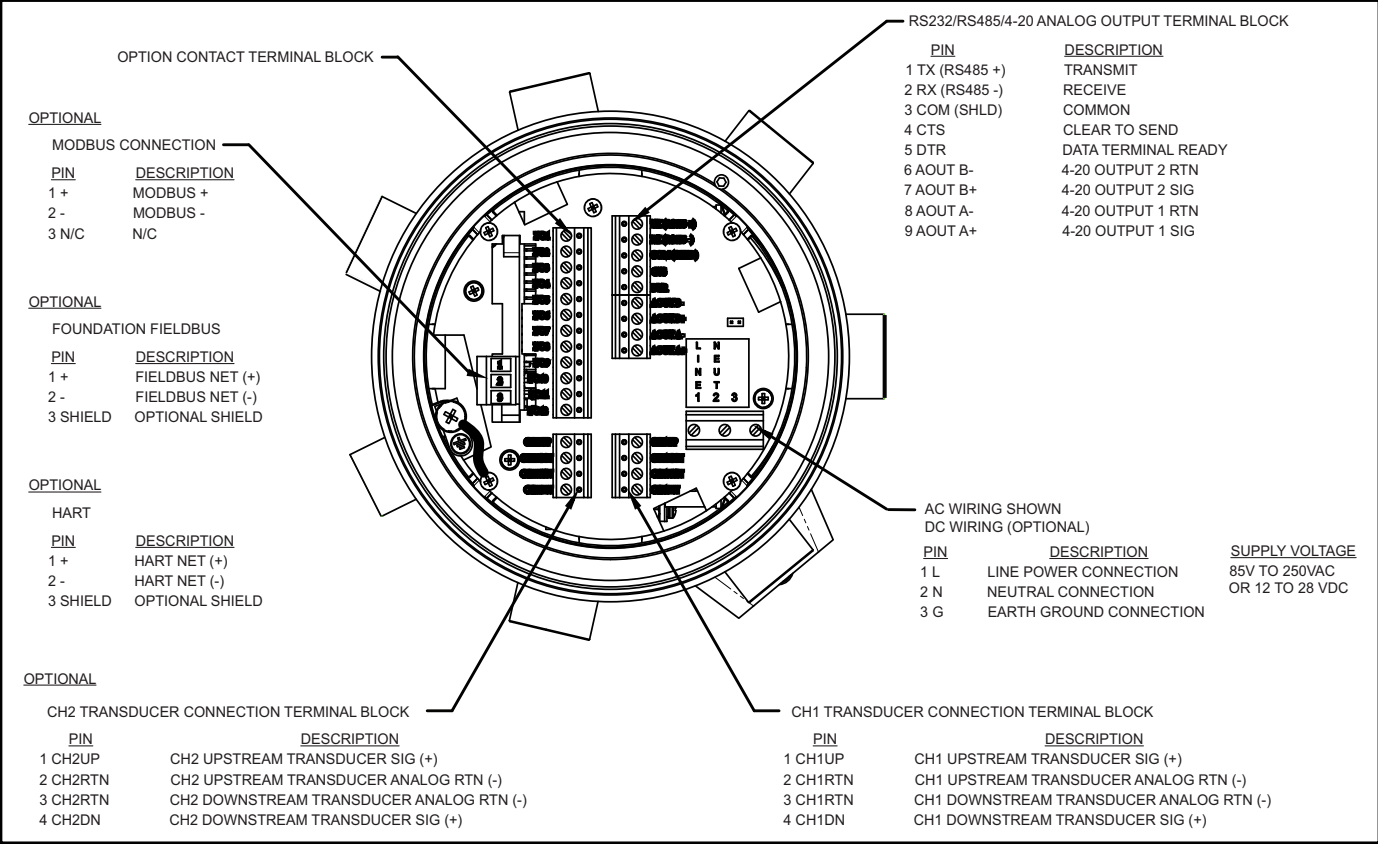


Figure 24: Connection and wiring diagram (ref. dwg. 702-1846)

Appendix A. CE Mark compliance and high noise environments

A.1 Introduction

For CE Mark compliance, the *PanaFlow Z1G/Z2G Process Gas Flowmeter* must meet the EMC and LVD directives.



Attention
European
Customers!

CE Mark compliance is required for all units intended for use in EU countries, and it is also recommended for installation in high electrical noise environments.

A.2 EMC compliance

In addition to the standard wiring requirements, the electrical connections must be shielded and grounded as described in *Table 11* below for EMC compliance. After all the necessary electrical connections have been made, seal any unused cable entry holes.

Note: If the instructions in this appendix are followed, the unit will comply with the EMC Directive.

Table 11: Wiring modifications

Connection	Cable Type	Termination Modification
Transducer	Shielded Cable	Terminate the shield using the cable glands (already done).
Power	Shielded Cable	Terminate the shield using the cable glands.
Shielding	Wires enclosed in a properly-grounded metal conduit do not require additional shielding.	
All Input / Output Options	Shielded Cable	

IMPORTANT: Make sure to connect the *PanaFlow Z1G/Z2G Process Gas Flowmeter* case to the earth ground with a grounding cable, using the external ground screws found on either side of the enclosure. The connection should be less than 9.8 feet (3 meters) long.

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Appendix B. Gas process flowmeter service record

B.1 Option cards installed

Table 12: Option cards installed

Slot #	Type of option card	Additional setup information
0	Analog Outputs (A, B)	
1		
2		

B.2 Data entry

Record complete and detailed service data for the *PanaFlow Z1G/Z2G Process Gas Flowmeter* in *Table 13* below. Make additional copies of this table as needed.

Table 13: Service record

Date	Description of service	Performed by

Table 13: Service record(Continued)

Date	Description of service	Performed by

B.3 Setup data

After the *PanaFlow Z1G/Z2G Process Gas Flowmeter* has been installed, setup data must be entered via the User Program prior to operation. Record that information in *Table 14* below.

Table 14: Setup data

General Information						
Model #				Serial #		
Software Vers.				Setup Date		
Channel - Status						
Channel 1				Channel 2		
Channel Status	Off	Burst		Channel Status	Off	Burst
Measure Mode	Skan	S/M		Measure Mode	Skan	s/m
Channel - System						
Channel Label				Channel Label		
Site / Channel Msg.				Site / Channel Msg.		
Vol. Units				Vol. Units		
Vol. Time Units				Vol. Time Units		
Vol. Dec. Digits				Vol. Dec. Digits		
Totalizer Units				Totalizer Units		
Mass Flow				Mass Flow		
Mass Flow Time				Mass Flow Time		
MDOT Dec. Dig.				MDOT Dec. Dig.		
Mass Totalizer				Mass Totalizer		
Mass Dec. Dig.				Mass Dec. Dig.		
Channel - Input / Output						
Zero Cutoff				Zero Cutoff		
Temp. Input				Temp. Input		
Base Temp.				Base Temp.		
Pressure Input				Pressure Input		
Base Pressure				Base Pressure		
Lw Press. Switch	No	Yes		Lw Press. Switch	No	Yes
Pressure Limit				Pressure Limit		
Channel - SETUP - V Averaging						
Response Time				Response Time		
Channel - SETUP - Advanced features - Multi K factors						

Table 14: Setup data(Continued)

K-Factor #	Reynolds Number	K-Factor		K-Factor #	Reynolds Number	K-Factor
1				1		
2				2		
3				3		
4				4		
5				5		
6				6		
7				7		
8				8		
9				9		
10				10		
11				11		
12				12		
13				13		
14				14		
15				15		
16				16		
17				17		
18				18		
19				19		
20				20		
Channel - SETUP - Advanced features - Mass flow calculation						
Mass Flow	Yes	No		Mass Flow	Yes	No
Density Type	Fluid Dens.	Mole. Wgt.		Density Type	Fluid Dens.	Mole. Wgt.
Qact or Qstd?	Actual	Standard		Qact or Qstd?	Actual	Standard
Fluid Density				Fluid Density		
Mole. Weight				Mole. Weight		
Global - System						
Meter Message				Totalizer Units		
System Units	English	Metric		Tot. Dec. Digits		
Pressure Units				Mass Flow		
Atmos. Pressure				Mass Flow Time		
Vol. Units				MDOT Dec. Digit		
Vol. Time Units				Mass Totals		
Vol. Dec. Digits				Mass Dec. Digits		
Global - Input / Output - Error handling						
Error Handling				2-Path Error	No	Yes
Global - Communications port						
Meter Address				MOD. Parity		
Baud Rate				MOD. Stop Bits		
MOD. Baud Rate				MOD. Address		

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