GREYLINE instruments inc.

www.greyline.com

USER'S GUIDE

Installation & Operation Instructions

Area-Velocity Flow Meter

Model AVFM 5.0

Manual Series A.2.3

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INDEX

IMPORTANT NOTE: This instrument is manufactured and calibrated to meet product specifications. Please read this manual carefully before installation and operation. Any unauthorized repairs or modifications may result in a suspension of the warranty.

Available in Adobe Acrobat pdf format

CONNECTIONS

POWER INPUT: 100 to 240 VAC 50/60Hz. No adjustments are necessary for voltages within this range. Connect L (Live) N (Neutral) and AC Ground.

Optional DC: 9-32 VDC. Connect to + and - terminals.

Optional Thermostat and Heater modules are available rated for 115 VAC or 230 VAC.

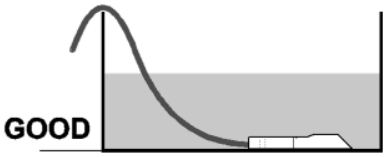
IMPORTANT NOTE: To comply with CSA/UL electrical safety standards, AC power input and relay connection wires must have conduit entry to the instrument enclosure. Installation requires a switch, overcurrent fuse or circuit breaker in the building (in close proximity to the equipment) that is marked as the disconnect switch.

⚠ Risk of electric shock. Loosen cover screw to access connections. Only qualified personnel should access connections.

Note: Use of instrumentation over 40°C ambient requires special field wiring.

Note: User replaceable fuse is 2 Amp 250V (T2AL250V).

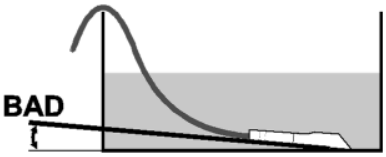
FUNCTION TEST:



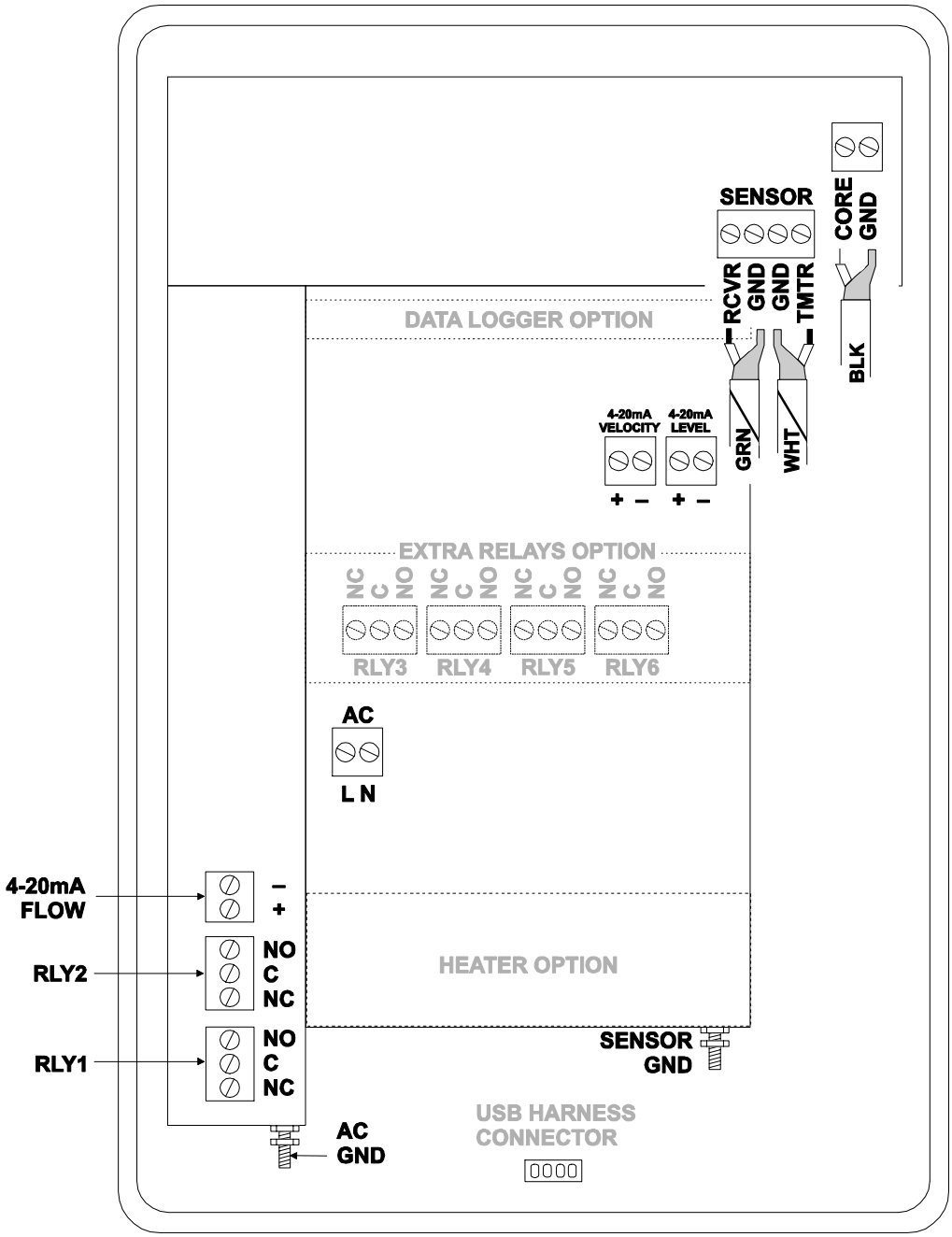
Connect the sensor to the sensor terminals as shown on next page, then apply power. Allow 30 seconds for the AVFM 5.0 to initialize.

A. Place QZ02L sensor (flat to the bottom) in a bucket of water about 6” deep and select Level mode (from UNITS/MODE menu) to see a level reading.

B. Select Velocity mode and stir the water to see a velocity reading.



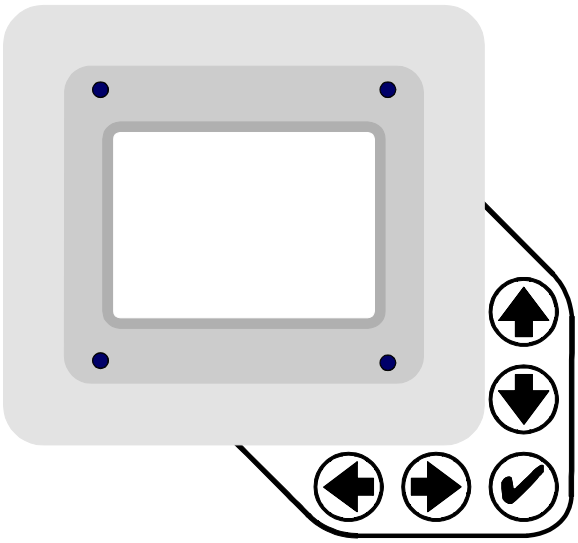
CONNECTIONS



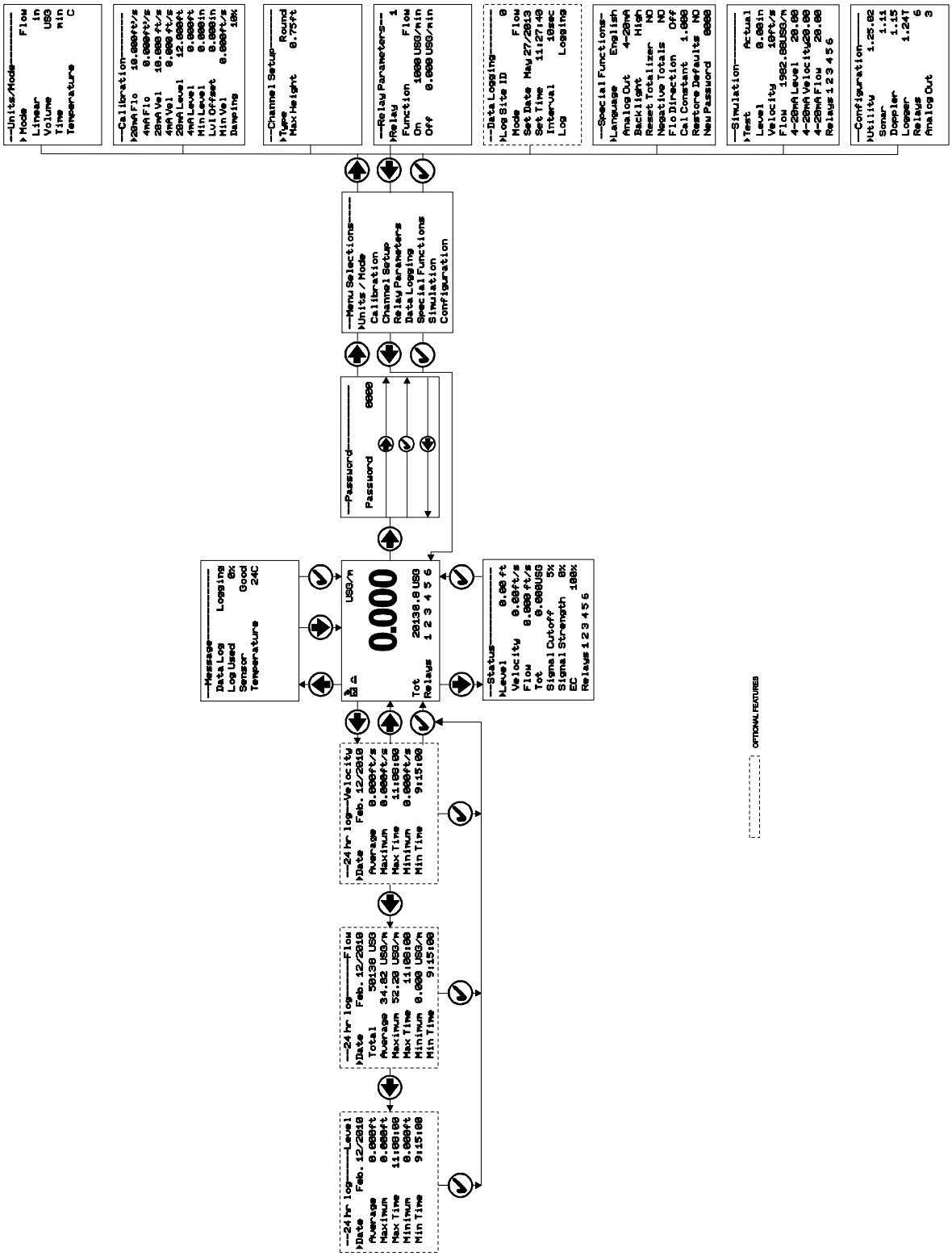
KEYPAD SYSTEM

The AVFM 5.0 uses a menu system. Arrows show the four directions to leave a menu box. Pressing a corresponding keypad arrow will move to the next item in the direction shown. Move the cursor (underline) under numerals and increase or decrease numerals with the ⬆ and ⬇ keys.

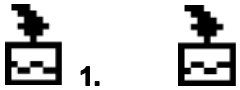
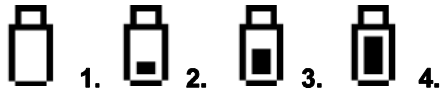
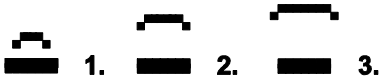
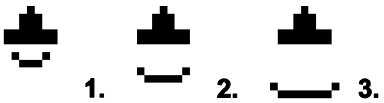
To store calibration values permanently (even through power interruptions), press ✓.

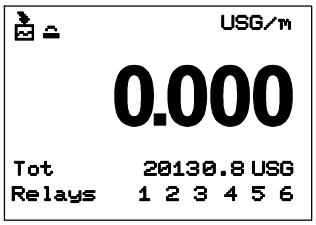


CALIBRATION MENU



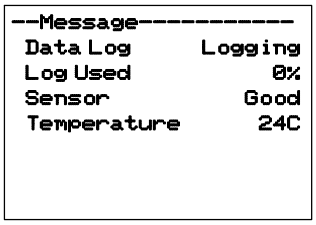
ICONS

 1. 2.	Message waiting. Press ⬆.
	Data logging off.
 1. 2.	Data logging on.
 1. 2. 3. 4.	USB file download.
	File download completed.
	Download Error.
 1. 2. 3.	Echo OK.
	No Echo.
 1. 2. 3.	Echo OK (PZxx series level sensor option).
	No Echo (PZxx series level sensor option).



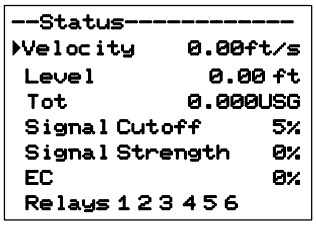
MAIN DISPLAY

The main display shows the units selected from the Units/Mode menu, Flow or Velocity rate being measured, TOTALIZER and RELAY states. The AVFM 5.0 will start-up with this display.



MESSAGE ICON

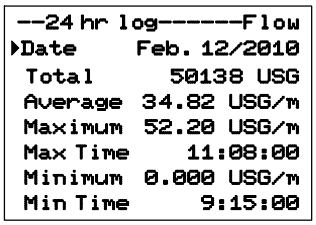
Press ⬆ from the main display to view temperature measurement, status of the data logger and error/warning messages provided by the instrument. The Message Icon will appear on the main display if error messages are being generated by the instrument. Press ✓ to return to the main display.



STATUS

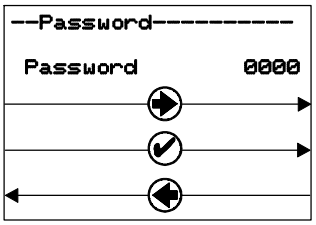
Press ⬇ from the MAIN display to view instrument status.

Velocity	Will be displayed in ft/sec or m/sec.
Level	Is displayed in the selected units.
Tot	Displays the current totalizer reading.
Signal Cutoff	Adjust the setting in percent to suppress flow readings at zero flow when fluid swirling or pipe vibration may cause the instrument to continue reading. Example: Signal Cutoff at 5% will force the display and outputs to zero when signal strength drops below 5%.
Signal Strength	Displays percentage of signal being received by the ultrasonic sensor.
EC	Displays level measurement Echo Confidence
Relays 1 2 3 4 5 6	Energized relays will display with reversed font eg: 2



24 HR LOG (Data Logging option only)

Press ⬅ from the MAIN display to view a formatted flow report from instruments with a built-in data logger. Press ⬅ to pan through Level, Velocity and Flow summaries. Press ⬇ to scroll down one day or repeatedly to scroll to a specific date. Up to 365 days can be stored. Newest date will overwrite the oldest. Press ✓ to return to the main display.



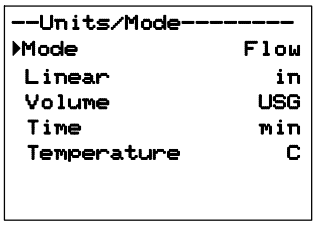
PASSWORD

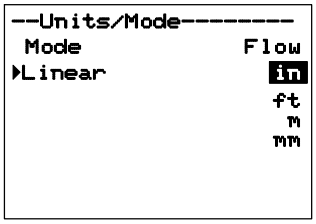
The Password (a number from 0000 to 9999) prevents unauthorized access to the Calibration menu.

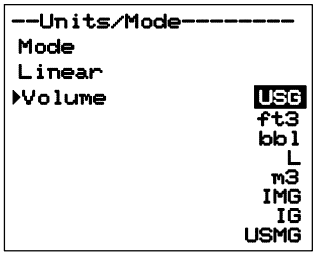
From the Main display press ➡ to get to Password. Factory default password is 0000 and if it has not been changed press ✓ to proceed to the Menu Selections screen.

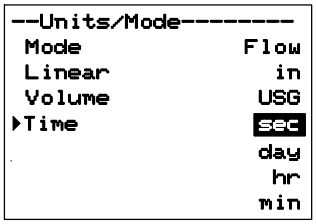
If a password is required, press ➡ to place the cursor under the first digit and ⬇ or ⬆ to set the number, then ➡ to the second digit, etc. Press ➡ or ✓ to proceed to the Menu Selections screen.

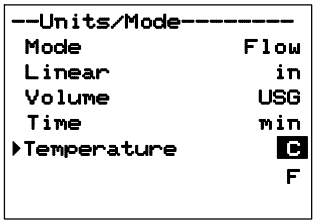
A new password can be stored by going to Special Functions/New Password.











UNITS/MODE

From ▸Mode press the ➡ and then the ⬆ or ⬇ to select Flow, Velocity or Level. Flow mode displays the flow rate in engineering units (e.g. gpm, litres/sec, etc.) Press the ✓ to store your selection then the ⬇ to the next menu item.

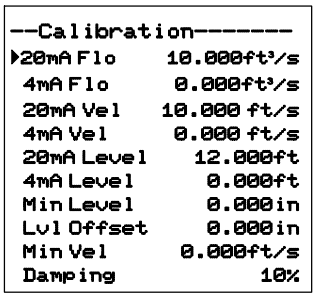
From ▸Linear press the ➡ key and then the ⬆ or ⬇ to select your units of measurement. Press the ✓ to store your selection.

Press the ⬇ key to move the ▸ symbol to each subsequent menu item and the ✓ to save your selections.

Note: the volume selection "bbl" denotes U.S. barrels.

▸ Temperature press ➡ then ⬆ ⬇ to select C or F.

Press ⬅ or ✓ to return to the Menu Selections screen.



CALIBRATION

Press ⬇ to Calibration and ➡ to enter. Use ⬇ or ⬆ to position ▶ before each menu item and ➡ to enter. When settings are completed press ✓ to store and return to the Calibration menu.

20mA Flo [5V Flo] — Press ➡ and enter the flow rate value for 20mA.

Note: Analogue output can be selected as 4-20mA or 0-5V in Special Functions.

4mA Flo [0V Flo] — Press ➡ and enter the flow rate value for 4mA.

20mA Vel [5V Vel] — Press ➡ and enter the velocity value for 20mA.

4mA Vel [0V Vel] — Press ➡ and enter the velocity value for 4mA.

20mA Level [5V Level] — Optional for QZ02L-A type sensor. Press ➡ and enter the level value for 20mA.

4mA Level [0V Level] — Optional for QZ02L-A type sensor. Press ➡ and enter the level value for 4mA.

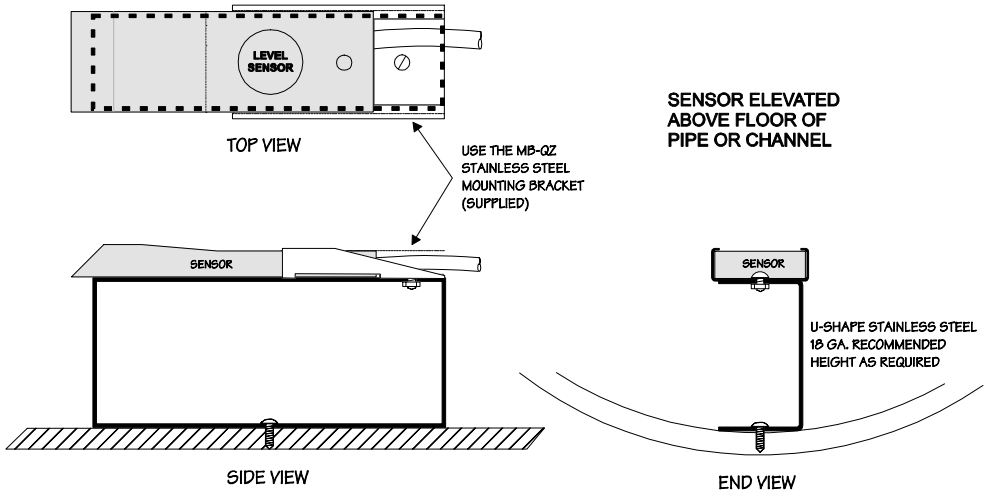
MaxRg — Only for PZ15LP/QZ02L-B type sensor. Press ➡ and enter the zero water level (distance from the PZ15-LP sensor to the zero water level).

MinRg — Only for PZ15LP/QZ02L-B type sensor. Press ➡ and enter the max level (distance from the PZ15-LP sensor to the max water level).

Min Level — Optional for QZ02L-A type sensor. Press ➡ and enter a minimum level cutoff. Level reading less than Min Level will be forced to zero.

Lvl Offset — Optional for QZ02L-A type sensor. Press ➡ and enter an offset to level measurement. Set to 0.00 when sensor mounted on floor of channel. When sensor is mounted above the floor of the channel enter the distance between channel floor and bottom of sensor. Maximum offset is ± 36" (914 mm).

Note: 4mA is not affected by Lvl Offset settings. 4mA is the bottom of the channel or pipe.



Min Vel — Press ➡ and enter a minimum velocity cutoff. Forward and reverse velocities less than Min Vel will be forced to zero.

Damping — Increase damping to stabilize readings under turbulent flow readings or to reject spurious level readings. Decrease for faster response to changes in flow.

Press ✓ from the Calibration display to return to Menu Selections.

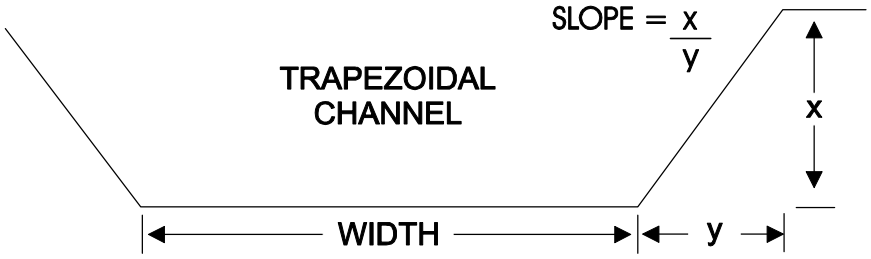
```
--Channel Setup------
▸Type              Round
 Max Height      0.75ft
```

CHANNEL SETUP

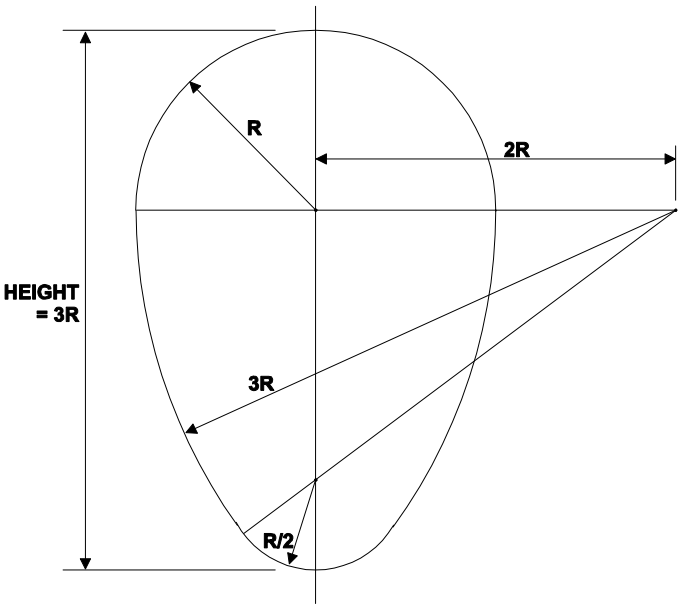
Round — Select Round for open pipes. Set Max Height to the inner diameter of the pipe.

Rectangle — Select Rectangle for rectangular channels. Enter the channel width.

Trapezoid — Select Trapezoid for trapezoidal shaped channels. Specify the Width and Slope of the channel as shown in the following illustration.



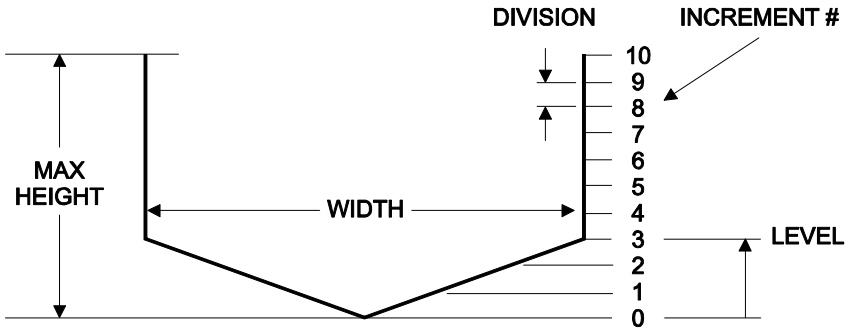
Egg — Select Egg for Egg shaped channels. Enter the Max Height of the channel.



--Custom Channel-----	
▸Type	Custom
Reset Data	No
Max Height	0.75 ft
Division	0.05 ft
Increment #	0
Width	0.000 ft
Level	0.000 ft

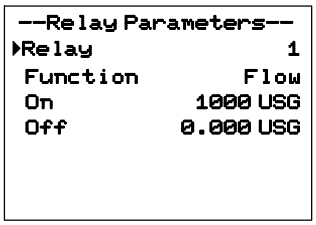
CUSTOM CHANNELS

Reset Data	Old data MUST be removed before entering data for a new channel. Press ➡ then press ⬆ to Yes and press ✓ to clear old data.
Max Height	Enter the maximum height of the channel.
Division	Divide the maximum height into equal increments (maximum of 40) and enter this division value (example 1", 1 cm etc.)
Increment #	Enter the increment number if you want to edit a previous entry or to skip entering widths for some levels (Note: The custom channel will interpolate widths between entry points).
Width	Enter the measured width of the channel at the level shown (Note: To enter 0 width you must press ➡ and then ✓ to store a 0 width data point).
Level	Displays the level of the channel for each increment and width entry.



Note:

Custom channel data in equal width increments with variable height measurements must be converted to the format shown above using the "Channel Data Translator" PC software.



RELAY PARAMETERS

Relay — Press ➡ and ⬇ or ⬆ to select a relay (2 relays are standard, 4 additional are optional).

Function — Press ⬇ or ⬆ to select Off, Pulse, Flow, Velocity or Level.

Flow

On — Position the cursor under the numerals and press ⬇ or ⬆ to set digits to the relay On set point.

Off — set digits to the Off set point.

Pulse — Press ⬇ and set digits to the flow volume per relay pulse. Use this feature for remote samplers, chlorinators or totalizers. Minimum time between pulses is 2.25 seconds and pulse duration is 350 milliseconds.

Return to Relay and enter settings for each relay.

Velocity

On — Position the cursor under the numerals and press ⬇ or ⬆ to set digits to the relay On set point.

Off — set digits to the Off set point.

Level

On — Position the cursor under the numerals and press ⬇ or ⬆ to set digits to the relay On set point.

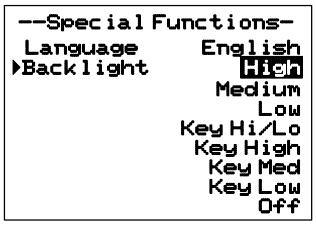
Off — set digits to the Off set point.

LOE — mode Specify the state of the relay for loss of echo condition: Off, On or Hold.

Press ✓ to return to Menu Selections

DATA LOGGING (OPTIONAL)

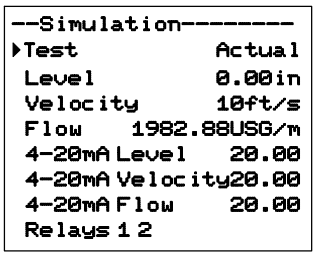
Refer to Options section of this manual.



SPECIAL FUNCTIONS

Language	Select English, French or Spanish
Analog Out	Select 4-20mA or 0-5V mode for the analog output.
Backlight	Select High, Medium or Low for continuous backlight. Select Key Hi/Lo for high backlight (for 1 minute) after a keypress and then Lo backlight until a key is pressed again. Select Key High, Med or Low for backlight after a keypress and then backlight off until a key is pressed again.
Reset Totalizer	Press ➡ and select Yes to erase and restart the totalizer at zero.
Negative Totals	Select Yes to have reverse flow readings deducted from the totalizer. Select No to totalize forward flow only and ignore reverse flow.
Flo Direction	Select On to enable flow direction measurement. Select Off to disable flow direction measurement so that flow in either direction is displayed and output as positive values. Select Invert to invert the sense of the flow measurement.
Cal Constant	Scales the velocity reading. Set to 1.000 for QZ02L sensor.
Restore Defaults	Select Yes and press ✓ to erase all user settings and return the instrument to factory default settings.
New Password	Select any number from 0000 to 9999 and press ✓. Default setting of 0000 will allow direct access to the calibration menus. Setting of any password greater than 0000 will require the password to be entered to access the calibration menus.

Press ✓ to return to Menu Selections.



SIMULATION

Exercises the 4-20mA (0-5V) outputs, digital display and control relays.

Test Select Maximum and press ✓ to simulate maximum Flow, Level and Velocity and to output 20mA (5V) to the analog channels.

Select Minimum and press ✓ to simulate minimum Flow, Level and Velocity and to output 4mA (0V) to the analog channels.

To simulate an intermediate Flow, Level and Velocity set Test to Actual and then enter a value for the Level and Velocity. The Flow calculation, analog outputs and control relays will respond to the simulated values.

INSTALLATION - SENSOR LOCATION

1. Choose a sensor mounting location where silt or deposits are least likely to accumulate.

2. For best results flow should be evenly distributed across the channel and relatively free of turbulence. (The AVFM 5.0 is very effective at averaging level and velocity readings in turbulent conditions, but best accuracy and response time is achieved with evenly distributed flow.)

3. Avoid vertical drops, obstructions or elbows immediately up and downstream from the sensor. Locate the QZ02L sensor at least 10 times maximum Head (level) and 10 times the channel width from these flow disturbances.

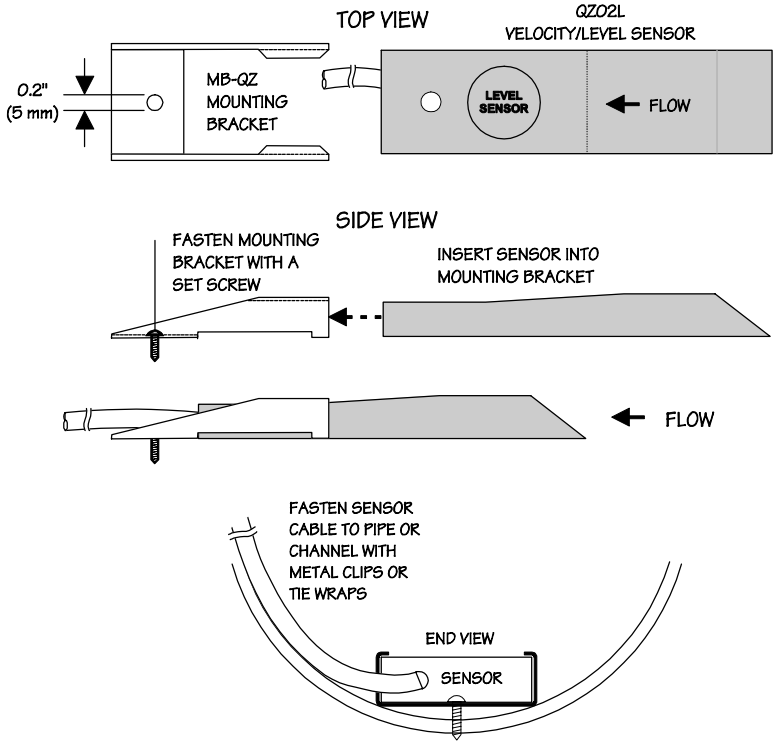
4. The QZ02L submerged level-velocity sensor requires a minimum water level of 1 in. (25.4 mm).

QZ02L VELOCITY-LEVEL SENSOR MOUNTING

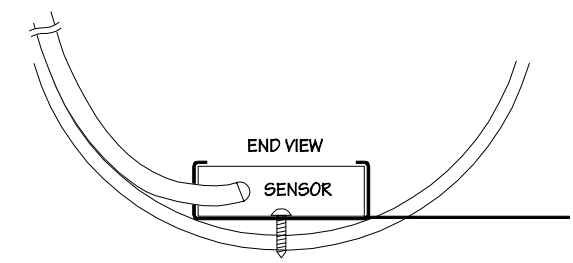
Mount the QZ02L sensor with the stainless steel bracket and hardware supplied. Ensure that the sensor is parallel to the water surface (check with a level). Mount with the tapered end of the sensor pointing upstream and the sensor cable pointing downstream.

Clip or tie wrap the sensor cable securely to the pipe or channel wall.

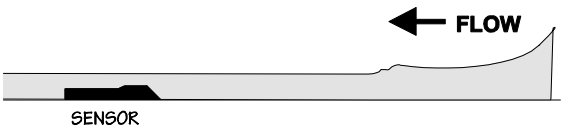
Note: The mounting bracket is designed to release the sensor if weeds or rags are caught by the sensor.

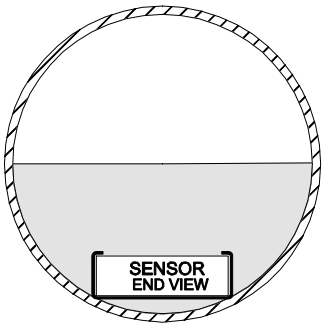


GOOD

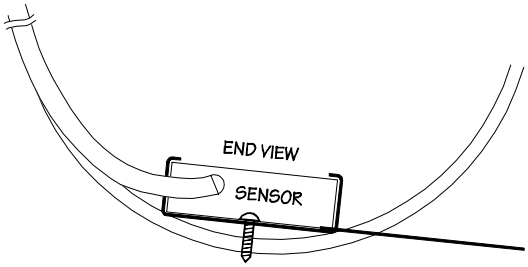

END VIEW
SENSOR

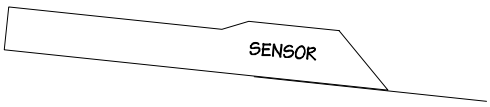

SENSOR

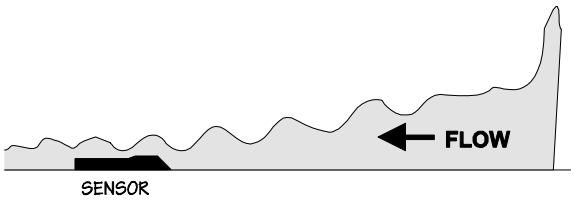

FLOW
SENSOR

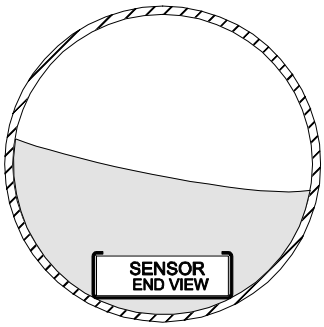

SENSOR
END VIEW

BAD

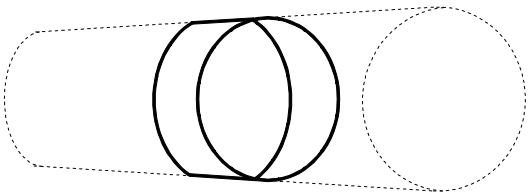

END VIEW
SENSOR


SENSOR


FLOW
SENSOR

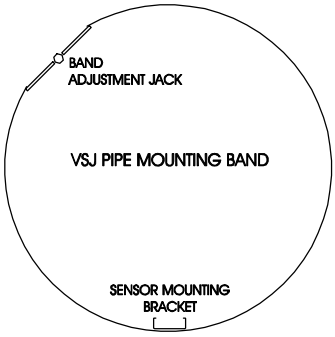

SENSOR
END VIEW

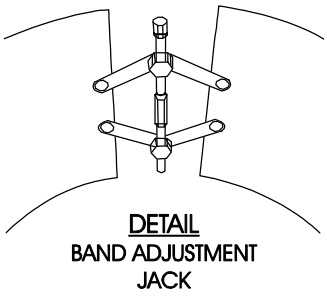
OPTIONAL PIPE BAND MOUNTING WITH QZ02L SENSOR



Install the stainless steel pipe band with the sensor mounting bracket at the invert (bottom) of the pipe. Ensure that the sensor bracket is parallel to the water surface (check with a level). Mount so the tapered end of the sensor will point upstream and the sensor cable will point downstream. (Turn the ¼" adjustment nut clockwise to expand the bracket and secure to the pipe wall by friction fit.)

Insert the sensor into the mounting bracket and tie-wrap the sensor cable securely to the pipe band using the holes provided.



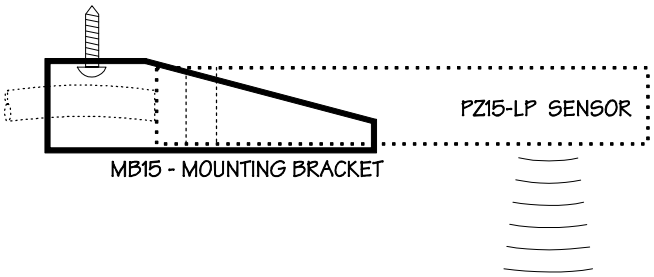


OPTIONAL QZ02L-DP VELOCITY SENSOR MOUNTING

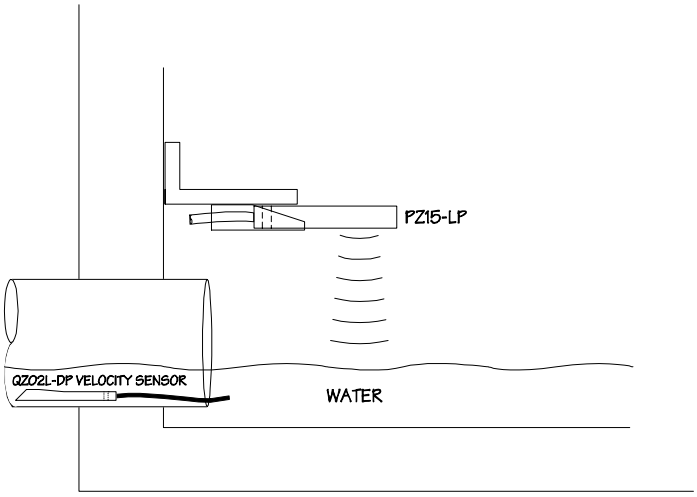
Mount the velocity sensor at or near the bottom of the channel or pipe in a position where it will be continuously submerged. The QZ02L-DP velocity sensor does not have to be parallel to the water surface. Position where silt or solids will not build-up on the sensor.

OPTIONAL PZ15-LP LEVEL SENSOR MOUNTING

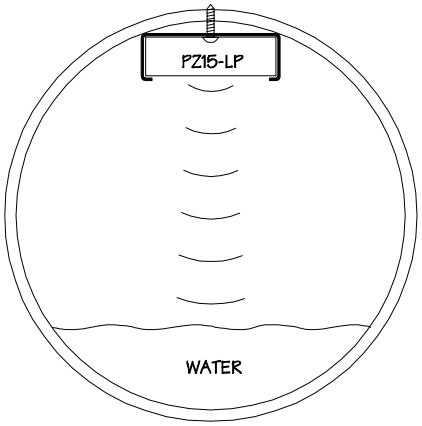
Mount the PZ15-LP non-contacting ultrasonic level sensor in an unobstructed position at least 8” (203.2 mm) above the high water level. Install the stainless steel mounting bracket in a horizontal position (check with a level) and then insert the PZ15-LP sensor.



PZ15-LP MANHOLE MOUNTING



PZ15-LP PIPE MOUNTING



ENCLOSURE INSTALLATION

Locate the enclosure within 20 ft (6 m) of the sensor (up to 500 ft -150 m optional). The enclosure can be wall mounted with the four mounting screws (included) or panel mounted with Option PM Panel Mount kit from Greyline Instruments.

Avoid mounting the enclosure in direct sunlight to protect the electronics from damage due to overheating and condensate. In high humidity atmospheres, or where temperatures fall below freezing, Option TH Enclosure Heater and Thermostat is recommended. Seal conduit entries to prevent moisture from entering enclosure.

NEMA4X (IP66) WITH CLEAR COVER

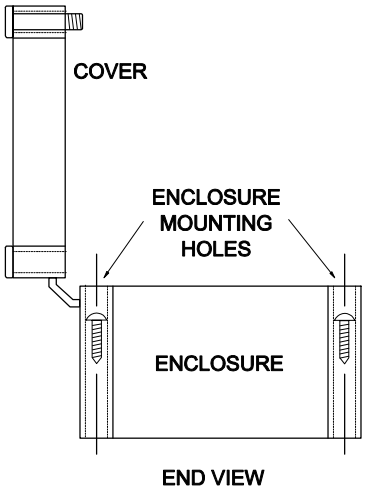
1. Open hinged enclosure cover.

2. Insert #12 screws (supplied) through the four enclosure mounting holes to secure the enclosure to the wall or mounting stand.

Additional conduit holes can be cut in the bottom of the enclosure with a hole saw or Greenlee-type hole cutter.

DO NOT make conduit/wiring entries into the top of the enclosure.

Note: This non-metallic enclosure does not automatically provide grounding between conduit connections. Grounding must be provided as part of the installation. Ground in accordance with the requirements of the National Electrical Code. System grounding is provided by connecting grounding wires from all conduit entries to the steel mounting plate or another point which provides continuity.

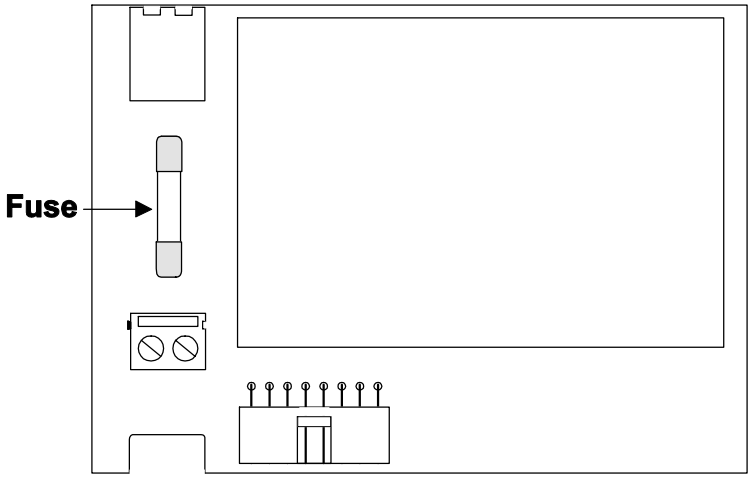


CLEANING

Cleaning is not required as a part of normal maintenance.

FUSE REPLACEMENT

1. Turn OFF power.
2. Loosen cover screw and open.
3. Remove power module.
4. Locate fuse on Power Board.
5. Replace fuse with 2 AMP/ 250V, 5 x 20mm fuse.
6. Reinstall power module into chassis.



POWER MODULE

FIELD TROUBLESHOOTING

The AVFM 5.0 uses an ultrasonic level sensor to determine channel AREA and an ultrasonic Doppler sensor to measure flow VELOCITY.

The QZ02L sensor combines both sensors in one housing.

An optional configuration uses the PZ15-LP "down-looking" level sensor and a QZ02L-DP velocity sensor.

To troubleshoot the AVFM 5.0, verify correct operation of LEVEL and VELOCITY measurements separately.

Note: Selecting "Defaults" in the SPECIAL FUNCTION menu will return the instrument to "as-shipped" factory settings.

LEVEL (QZ02L SENSOR)

SYMPTOMS	FAULTS	SOLUTIONS
EC bar graph at zero	- very turbulent flow	
	- very aerated flow	- relocate sensor or use PZ15-LP
	- sensor not level	- level sensor with "Bullseye" level
	- sediment/dirt/grease build-up on sensor	- clean sensor with liquid soap
- Level display reads 1.0 inches	- Level at or less than 1.0 inches	

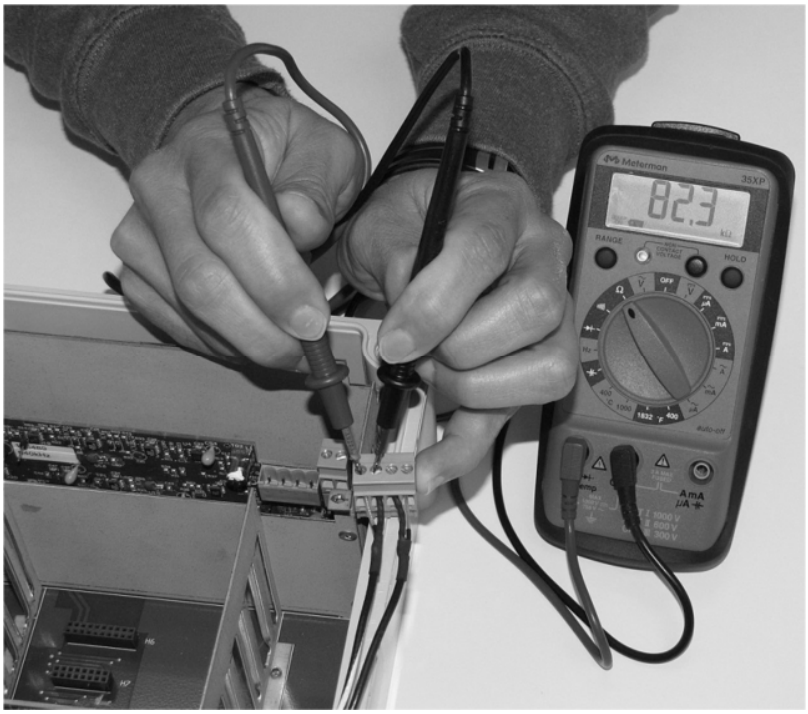
VELOCITY (QZ02L SENSOR)

SYMPTOMS	FAULTS	SOLUTIONS
- No velocity reading	- Grease/sediment on sensor	- Clean sensor with detergent
	- Improper hook-up	- Check sensor connections

SENSOR CABLE RESISTANCE TEST

Unplug the green sensor terminal from the Doppler board and connect the sensor wires as shown. With a multimeter, perform resistance checks for each set of wires. One single loose terminal may cause false readings.

Test across shield and core of each wire: TMTR (black/white) and RCVR (black). Resistance should be approximately 82.5K ohms for any cable length. High readings indicate an open circuit and low readings indicate a short or partial short in the sensor cable.



APPLICATIONS HOTLINE

For applications assistance, advice or information on any Greyline Instrument contact your Sales Representative, write to Greyline or phone the Applications Hotline below:

United States:	Tel: 315-788-9500	Fax: 315-764-0419
Canada:	Tel: 613-938-8956	Fax: 613-938-4857
Toll Free:	888-473-9546	
Email:	info@greyline.com	
Web Site:	www.greyline.com	

Greyline Instruments Inc.

Canada
16456 Sixsmith Drive
Long Sault, Ont. K0C 1P0

USA:
105 Water Street
Massena, NY 13662

PRODUCT RETURN PROCEDURE

Instruments may be returned to Greyline for service or warranty repair.

1 Obtain an RMA Number from Greyline -
Before shipping a product to the factory please contact Greyline by telephone, fax or email to obtain an RMA number (Returned Merchandise Authorization). This ensures fast service and correct billing or credit.

When you contact Greyline please have the following information available:

1. Model number / Software Version
2. Serial number
3. Date of Purchase
4. Reason for return (description of fault or modification required)
5. Your name, company name, address and phone number

2 Clean the Sensor/Product -

Important: unclean products will not be serviced and will be returned to the sender at their expense.

1. Rinse sensor and cable to remove debris.

2. If the sensor has been exposed to sewage, immerse both sensor and cable in a solution of 1 part household bleach (Javex, Clorox etc.) to 20 parts water for 5 minutes. Important: do not immerse open end of sensor cable.

3. Dry with paper towels and pack sensor and cable in a sealed plastic bag.

4. Wipe the outside of the enclosure to remove dirt or deposits.

5. Return to Greyline for service.

3 Ship to Greyline -
After obtaining an RMA number please ship the product to the appropriate address below:

Canadian and International Customers:	USA Customers:
Greyline Instruments Inc. 16456 Sixsmith Drive Long Sault, Ont. K0C 1P0	Greyline Instruments Inc. 204 150th Avenue Madeira Beach, FL 33708
RMA#	RMA#

AREA-VELOCITY FLOW DATA SHEET

Greyline Instruments Inc.

16456 Sixsmith Dr., Long Sault, Ont. K0C 1P0
Tel: 613-938-8956 / Fax: 613-938-4857

105 Water Street, Massena NY 13662
Tel: 315-788-9500 / Fax: 315-764-0419

Please complete and return this form to Greyline. It is important. We use this information to check our database for performance of Greyline flow meters in similar applications, and to provide advice and recommendations to you. Thanks for your cooperation.

Contact: _____ Title/Dept.: _____
Company: _____ Project: _____
Address: _____
Tel: _____ Fax: _____

SENSOR:
Model/Type: _____ Cable Length: _____
Elec. Class: _____ Type of Pump: _____
Distance from nearest Pump, Controlling Valve, Orifice or open Discharge: _____

INSTRUMENT:
Model/Type: _____ Power Input: _____
Calibrated Range: _____ Indication: _____
Operating Temp.: _____ Alarm: _____
Enclosure Class: _____ Pulse/Unit: _____
Elec. Class: _____ Output: _____

SERVICE CONDITIONS:
Pipe ID: _____ ❑ Vertical ❑ Horizontal
Pipe Mat'l: _____ % Solids: _____
Fluid: _____ Material Build-up: _____
Oper. Flow: _____ Vibration: _____
Max. Flow: _____ Max. Pressure: _____
Min. Flow: _____ Max. Temp: _____

Notes / Sketch Pipe Run:

By: _____ Date: _____

LIMITED WARRANTY

Greyline Instruments warrants, to the original purchaser, its products to be free from defects in material and workmanship for a period of one year from date of invoice. Greyline will replace or repair, free of charge, any Greyline product if it has been proven to be defective within the warranty period. This warranty does not cover any expenses incurred in the removal and re-installation of the product.

If a product manufactured by Greyline should prove defective within the first year, return it freight prepaid to Greyline Instruments along with a copy of your invoice.

This warranty does not cover damages due to improper installation or handling, acts of nature, or unauthorized service. Modifications to or tampering with any part shall void this warranty. This warranty does not cover any equipment used in connection with the product or consequential damages due to a defect in the product.

All implied warranties are limited to the duration of this warranty. This is the complete warranty by Greyline and no other warranty is valid against Greyline. Some states do not allow limitations on how long an implied warranty lasts or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

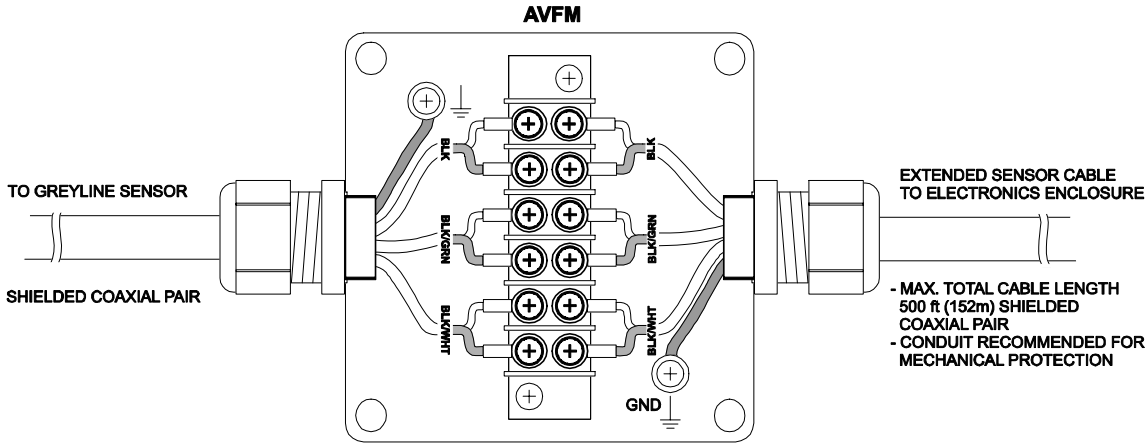
Greyline Instruments Inc.

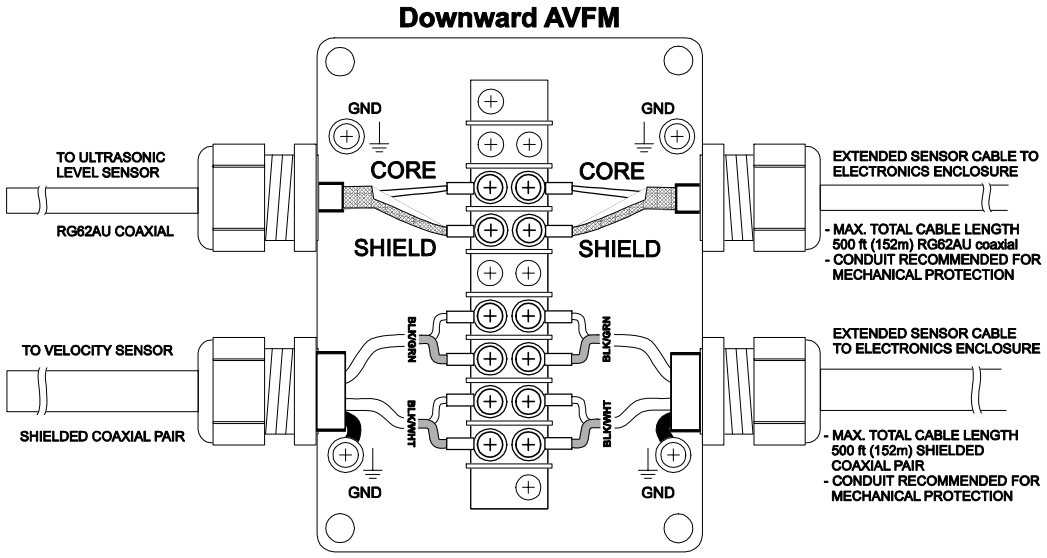
APPENDIX A – OPTIONS

EXTRA SENSOR CABLE (OPTION VXC)

Each Greyline AVFM 5.0 flow meter includes 26.25 ft. (8 m), 50 ft. (15 m) or 100 ft. (30 m) tri-coaxial sensor cable. This cable is shielded from electrical interference and is watertight with a polyurethane jacket. Additional cable and Cable Junction Box (Option JB2X or JB4X) may be ordered with the Flow Meter, or the cable may be spliced and extended up to 500 ft (152 m) total length as required during installation. No adjustment is required when the sensor cable is extended or shortened. Use only Greyline tri-coaxial VXC shielded cable, or run three RG174U coaxial cables in a metal conduit.

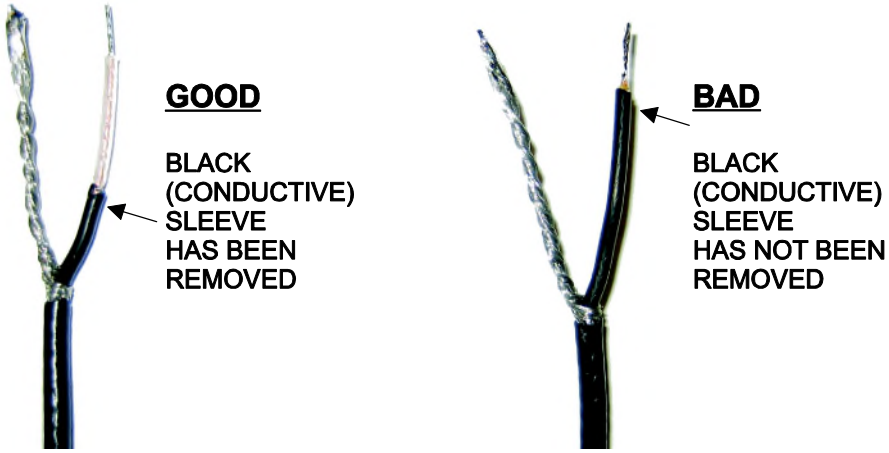
Extended sensor cable can be installed in conduit for mechanical protection. Recommended installation with a junction box is illustrated below:





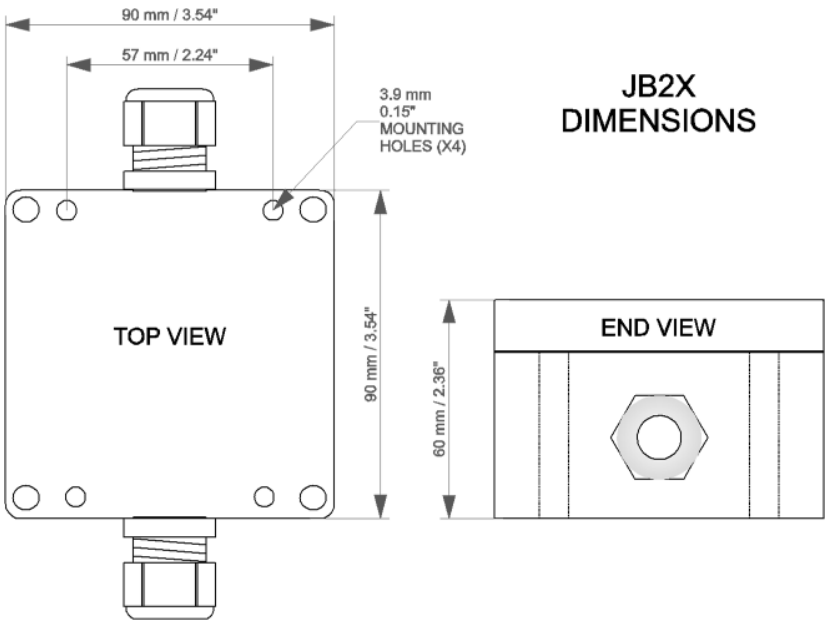
COAXIAL CABLE PREPARATION

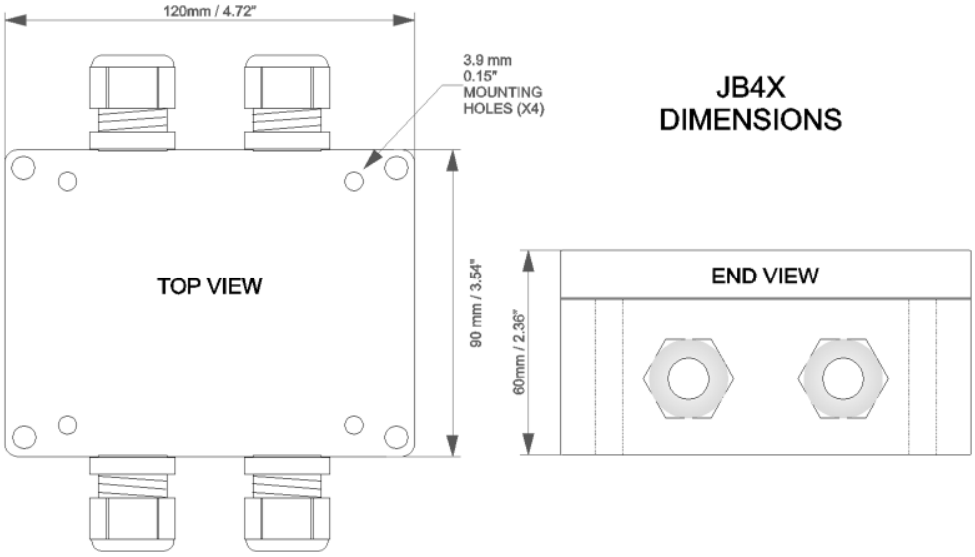
VXC Doppler sensor cable can be cut and spliced up to a maximum length of 500 ft (152 m). Cable ends must be prepared as illustrated below.



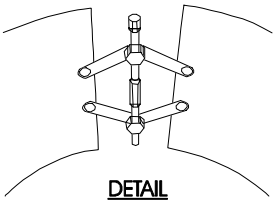
JUNCTION BOX - OPTION JB2X & JB4X

NEMA4X (IP66) polycarbonate Junction Box with terminal strips is available from Greyline Instruments. Includes compression fittings for watertight coaxial cable entries.





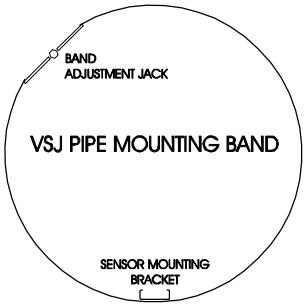
SS PIPE MOUNTING BAND – OPTION VSJ

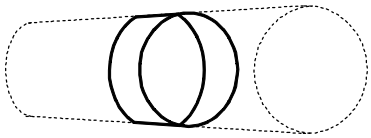


Use optional VSJ stainless steel Pipe Mounting Bands for easy Sensor installation in round pipes.

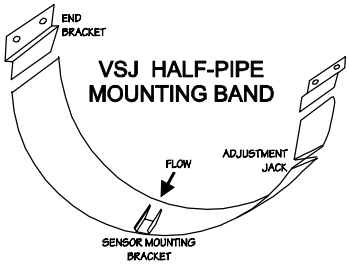
Each Pipe Band includes:

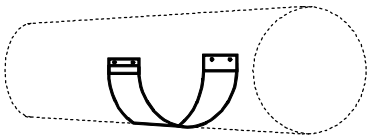
- Band Adjustment Jack allowing ±0.5" (13 mm) adjustment from the nominal band size
- Stainless steel bracket for Sensor mounting
- Pre-drilled for tie wraps (included) to secure Sensor cable





CODE	BAND SIZE
VSJ6	6"/150 mm ID pipes
VSJ8	8"/200 mm ID pipes
VSJ10	10"/250 mm ID pipes
VSJ12	12"/300 mm ID pipes
VSJ14	14"/350 mm ID pipes
VSJ15	15"/375 mm ID pipes
VSJ16	16"/400 mm ID pipes
VSJ18	18"/450 mm ID pipes
VSJ20	20"/500 mm ID pipes
VSJ24	24"/600 mm ID pipes
VSJ30	30"/750 mm ID pipes



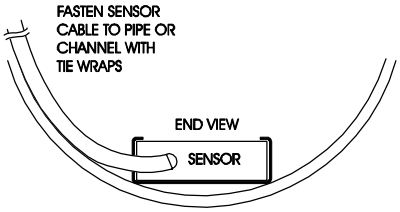


VSJ32-40	32-40" / 800-1000 mm ID pipes
VSJ42-54	42-54" / 1100-1375 mm ID pipes
VSJ56-72	56-72" / 1400-1800 mm ID pipes

Mounting Instructions:

Install the stainless steel pipe band with the sensor mounting bracket at the invert (bottom) of the pipe. Ensure that the sensor bracket is parallel to the water surface (check with a level). Mount so the tapered end of the sensor will point upstream and the sensor cable will point downstream. Turn the ¼" adjusting nut clockwise to expand the bracket and secure to the pipe wall by friction fit.

Insert the sensor into the mounting bracket and tie wrap the sensor cable securely to the stainless steel pipe band.



SENSOR INTRINSIC SAFETY

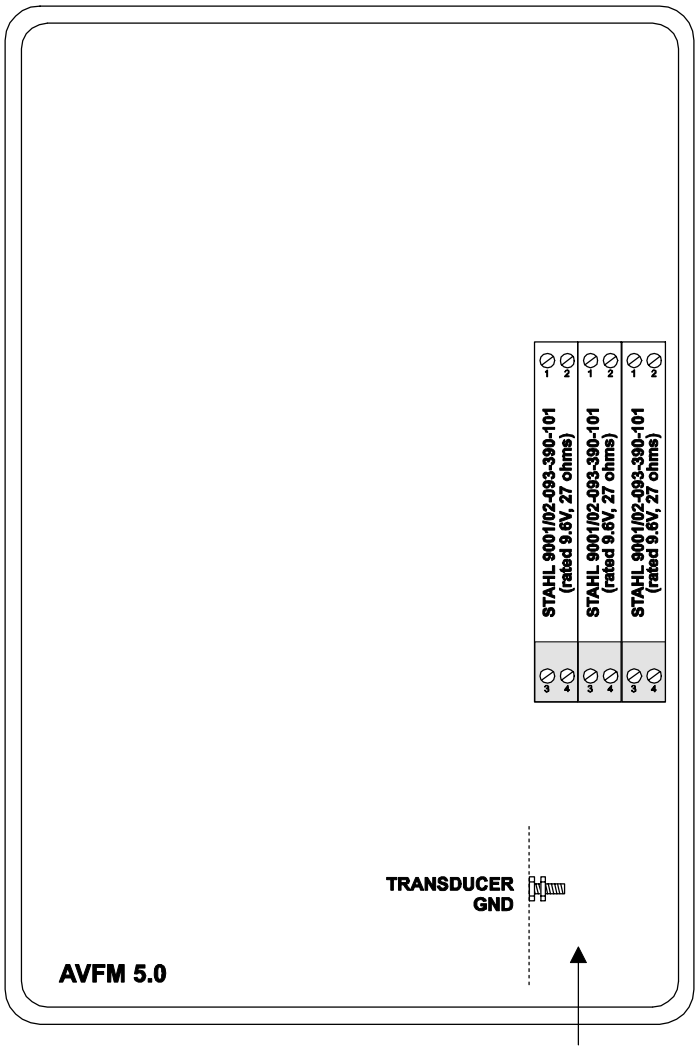
When connected through Intrinsic Safety Barriers, the Greyline Sensor Model QZ02L and PZ series are CSA certified for installation in a hazardous location rated:

Class I, Groups C,D
Class II, Groups E,F,G
Class III

Intrinsic Safety Barriers may be ordered with the Greyline instrument and are supplied mounted in the Greyline instrument enclosure. Replacement barrier fuses (Part No. ISB- 011239) may be purchased separately. The instrument enclosure containing the Intrinsic Safety Barriers must be installed in a non-hazardous location.

GN3SPEC-ISB-02

The intrinsic safety barrier assemblies installed in the AVFM 5.0 limit the voltage and current supplied to the transducers to the values listed under 'Barrier Specifications'. To safely install Greyline transducer(s) certified for use in hazardous locations you must refer to the installation drawings/specifications of the certified transducer(s).



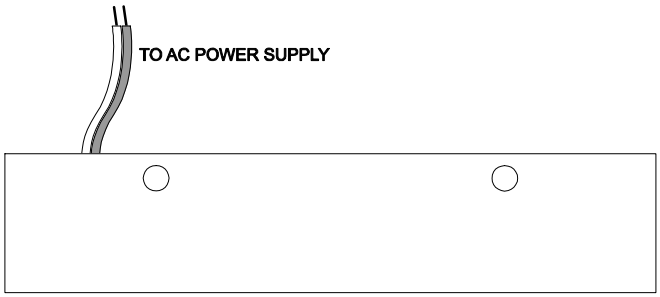
Installed in
Non-Hazardous Location

BARRIER SPECIFICATIONS

STAHL BARRIER	System Parameters	Entity Parameters					
		U_m	V_{OC}	I_{SC}	P_0	C_a	L_a
9001/02-093-390-101	9.6V, 27 ohms	250V	9.3V	390mA	906.8mW	4.1µF	0.16mH

ENCLOSURE HEATER AND THERMOSTAT - Option TH

Instruments can be factory-equipped with an Enclosure Heater and Thermostat or the module can be customer-installed. The Thermostat is factory set to turn ON at 40°F (4.5°C) and OFF at 60°F (15.5°C). Power consumption is 15 Watts.



ENCLOSURE SUNSCREEN - Option SCR

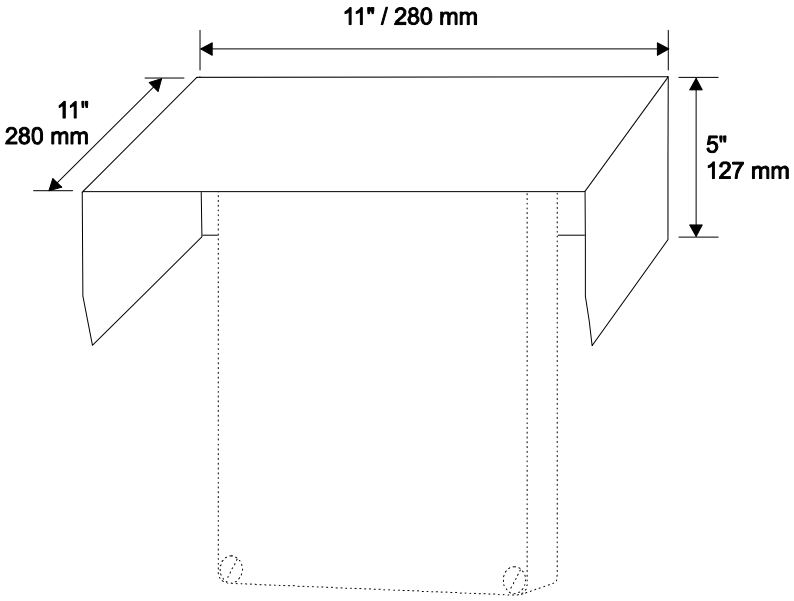
Do not mount instrument electronics in direct sunlight. Overheating will reduce the life of electronic components and condensate may form during the heat/cool cycles and cause electrical shorts.

Note:

Exposure to direct sunlight can cause overheating and moisture condensation which will reduce the operating life of electronics.

Protect Instruments from direct sunlight with this iridite finished aluminum sun screen (Greyline Option SCR).

Seal conduit entries with caulking compound to further reduce moisture condensation.

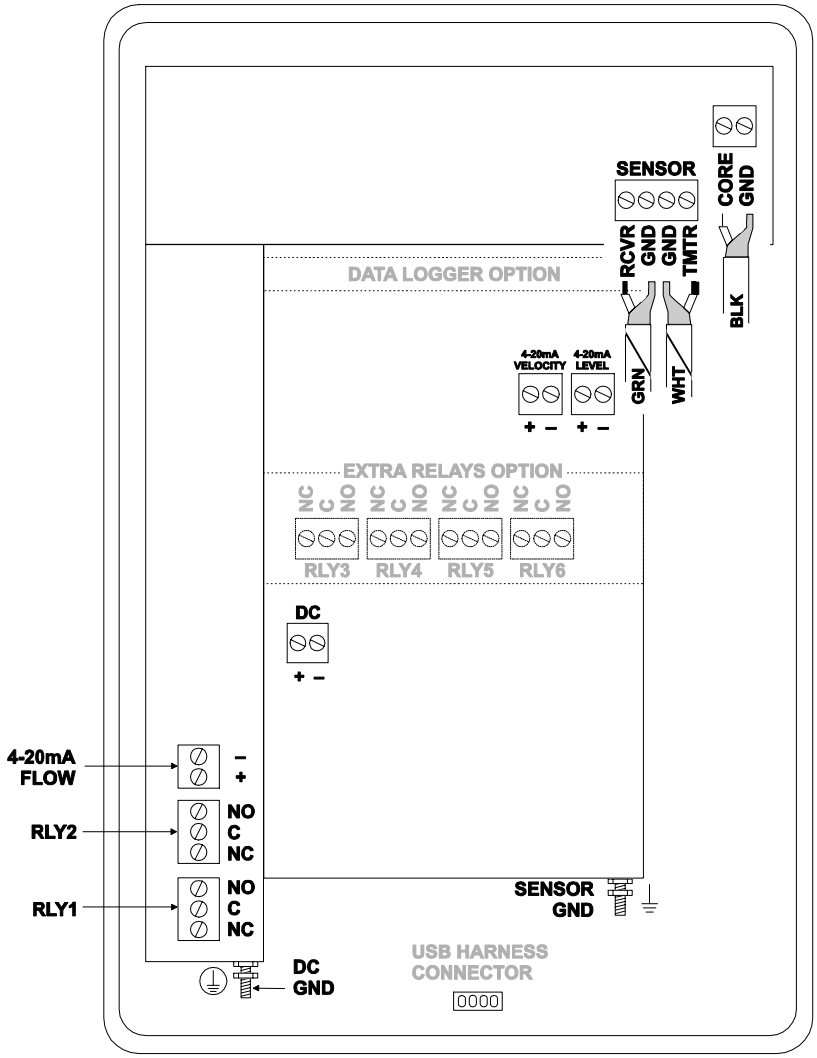


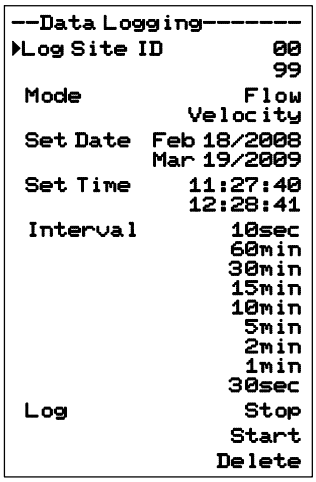
POWER INPUT OPTION
9-32VDC

AVFM 5.0 Flow Meters may be ordered factory-configured for 9-32VDC power input.

CONNECTIONS:

POWER INPUT: Connect 9-32VDC to the + and - terminals. The Power Input GND terminal must be connected to the nearest Ground pole. A 1-amp fuse in line is recommended.





DATA LOGGING (Optional)

Setup

Select Data Logging from Menu Selections.

Log Site ID	Enter a number from 00 to 99. The site ID will become part of the downloaded file name to help distinguish downloads from different instruments. Press ✓ to store the setting.
Mode	Select Velocity, LVT, Level or Flow. Press ✓ to store the setting.
Set Date	Press ⬆ or ⬇ to scroll and select Month, Day and Year. Press ✓ to store the setting.
Set Time	Press ⬆ or ⬇ to select the current time in Hours, Minutes and Seconds. Press ✓ to store the setting.
Interval	Press ⬆ or ⬇ to select the logging interval. Press ✓ to store the setting.
Log	Stop, Start or Delete the log file. Press ⬆ or ⬇ to Delete and ✓ to delete the log file. Press ⬆ or ⬇ to Start and ✓ to start the logger.

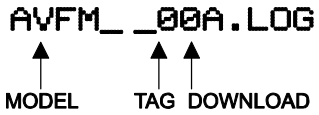
Note: You MUST delete old log and start a new log AFTER having set changes to Log Site ID, Mode and/or Interval for those changes to be applied to the log file.

View 24-hr formatted Reports on the AVFM 5.0 display. Press ⬅ from the main display to view a formatted flow report from instruments with a built-in data logger. Press ⬅ to pan through Level, Velocity and Flow summaries. Press ⬇ to scroll down one day or repeatedly to scroll to a specific date. Up to 365 days can be stored. Newest date will overwrite the oldest. Press ✓ to return to the main display.

RETRIEVE LOG FILE

Plug a USB Flash Memory Drive (not supplied by Greyline) into the USB output cable from the instrument. The instrument display will show the USB file download icon until the log file is transferred to the memory card and then display file download completed icon. The USB flash drive may be removed.

Download file names will appear in this format:



Tag is set according to the Log Site ID entered in the instrument Data Logging menu.

Download letter will be A for the first download from an instrument. B for the second, then C etc. At the letter Z a - character will appear indicating that the maximum number of downloads for that instrument are on the USB flash drive. Older files can be erased or moved from the flash memory drive or a new memory drive can be used.

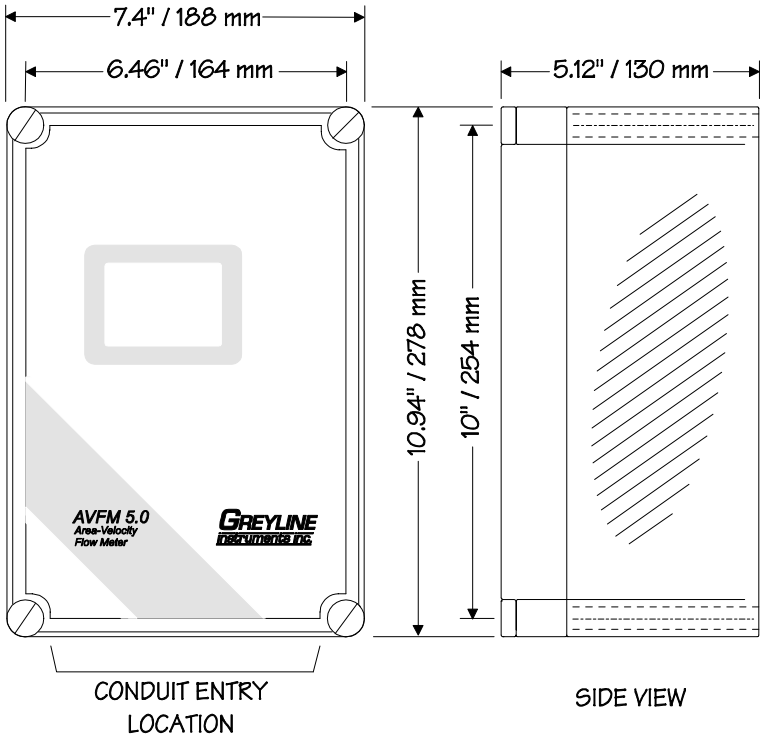
OPENING LOG FILES

Install Greyline Logger on your PC or laptop. Refer to the Help menu in the program for detailed instructions.

Select File/Open/Instrument Log (.log) to open the log file from your USB flash drive.

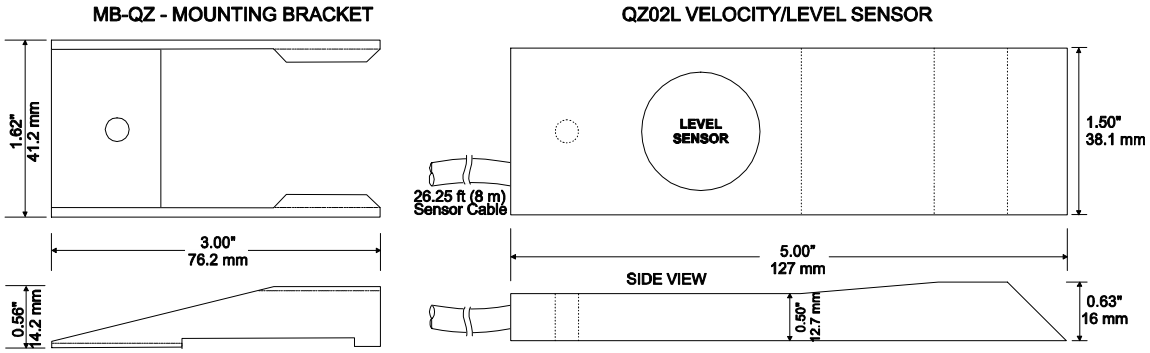
SPECIFICATIONS

Electronics Enclosure:	NEMA4X (IP 66), watertight and dust tight, polycarbonate with clear, shatterproof hinged Lexan cover
Accuracy:	Level: ± 0.25% of Range Velocity: ± 2% of Reading. Requires solids or bubbles minimum size of 100 microns, minimum concentration 75 ppm. Repeatability: 0.1% of Full Scale, Linearity: 0.1% of Full Scale
Display:	White, backlit matrix – displays flow rate, totalizer, relay states, operating mode and calibration menu
Programming:	Built-in 5-key calibrator with English, French or Spanish language selection
Power Input:	100-240VAC, 50/60 Hz, (30 W max.) Optional 9-32VDC, rated 9W (typical **5.8W** with standard features)
Outputs:	3 Isolated 4-20mA, 1000 ohm load maximum or 3 Isolated 0-5V
Control Relays:	Qty 2, rated 5 ampere SPDT
Temperature Compensation:	Automatic, temperature probe built in to level Sensor
Electrical Surge Protection:	Sensor, 4-20mA, AC power input
Environmental Conditions:	Relative humidity up to 80% -23 to 60°C ambient temperature, maximum 5000 m altitude, pollution degree 4, Installation Category II. Optional Enclosure Heater recommended for condensation protection below 32°F (-1°C)



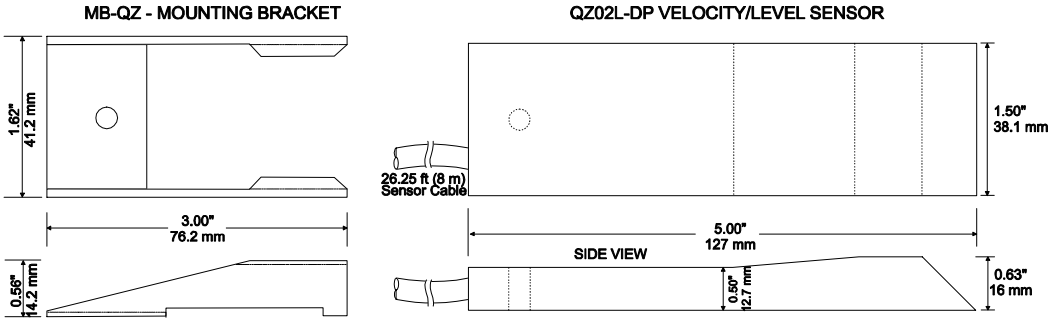
Velocity/Level Sensor QZ02L

Minimum Velocity:	0.1 ft/sec (0.03 m/sec)
Maximum Velocity:	20 ft/sec (6.2 m/sec) [reverse flow to -5 ft/sec (-1.5 m/sec)]
Minimum Head:	1 in. (25.4 mm)
Maximum Head:	16 ft. (4.88 m)
Operating Temperature:	5 to 175°F (-15 to 80°C)
Exposed Materials:	316 Stainless Steel, epoxy resin, polyurethane
Sensor Cable:	26.25 ft. (8 m) submersible polyurethane jacket, shielded, 3 coaxial
Hazardous Rating:	CSA rated Intrinsically Safe Class I, Groups C,D, Class II, Groups E,F,G with optional Intrinsic Safety Barrier



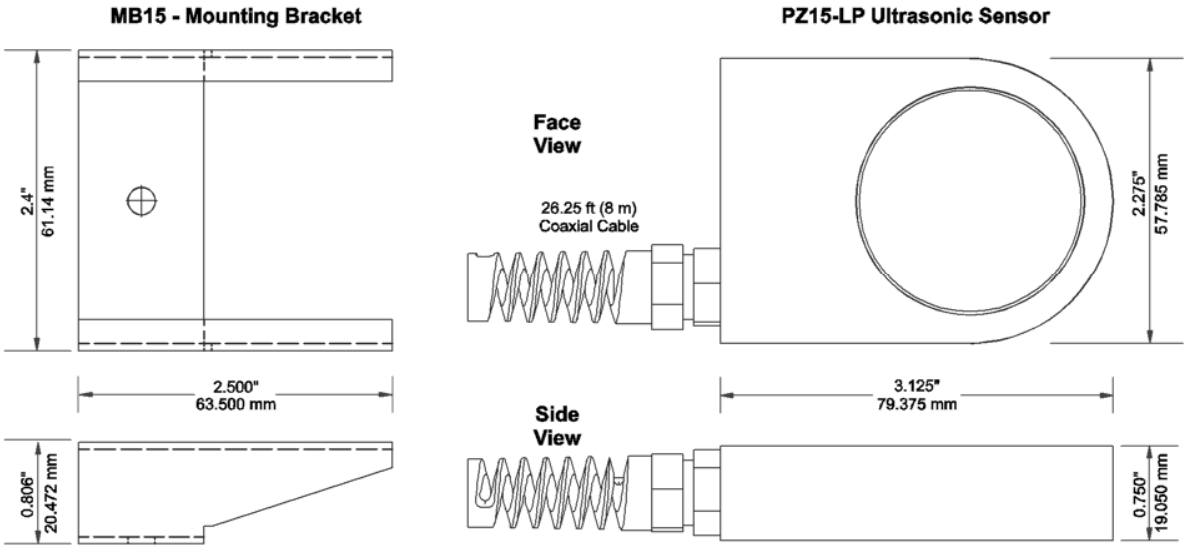
Optional (Velocity only) Sensor QZ02L-DP

Minimum Velocity: 0.1 ft/sec (0.03 m/sec)
Maximum Velocity: 20 ft/sec (6.2 m/sec) [reverse flow to -5 ft/sec (-1.5 m/sec)]
Operating Temperature: 5 to 150°F (-15 to 65°C)
Exposed Materials: PVC, epoxy resin, polyurethane, ultem
Sensor Cable: 26.25 ft (8 m) submersible polyurethane jacket, shielded, 3-coaxial
Hazardous Rating: CSA rated Intrinsically Safe Class I, Groups C,D, Class II, Groups E,F,G, with optional Intrinsic Safety Barrier

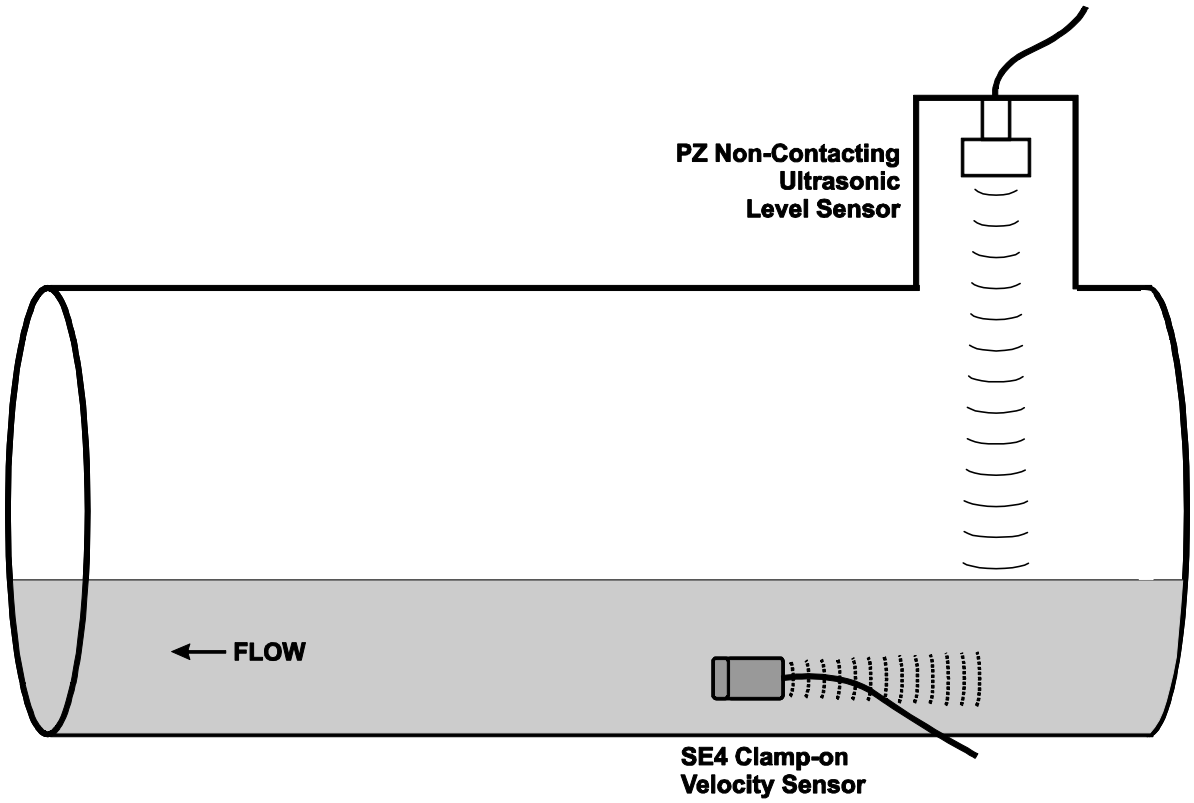


Optional Sensor PZ15-LP

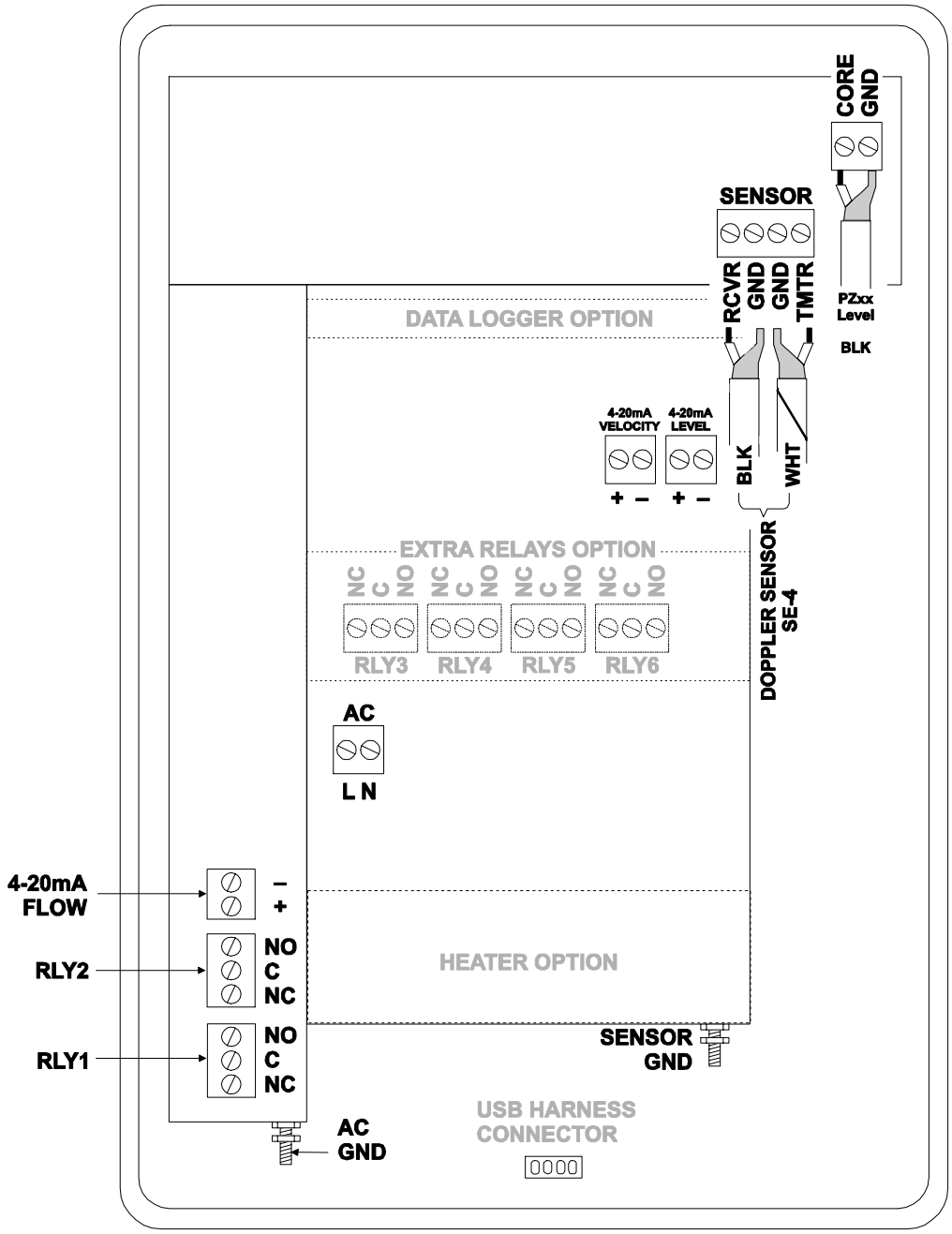
Maximum Range: 15 ft (4.57 m)
Minimum Range: 8" (203.2 mm)
Beam Angle: 8°
Operating Temperature: -40 to 150°F (-40 to 65°C)
Exposed Materials: Sensor - PVC, Mounting Bracket - 316 Stainless
Hazardous Rating: CSA rated Intrinsically Safe Class I, Groups C,D,Class II, Groups E,F,G with optional Intrinsic Safety Barrier

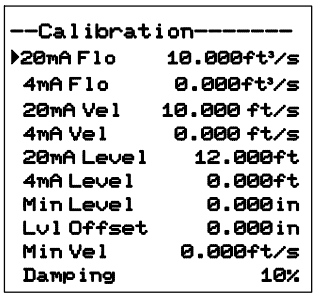


Dual Non-Contacting Sensor Configuration



CONNECTIONS
Dual Sensor Configuration





CALIBRATION
Non Contacting Level Sensor Configuration

Press ⬇ to Calibration and ➡ to enter. Use ⬇ or ⬆ to position ▶ before each menu item and ➡ to enter. When settings are completed press ✓ to store and return to the Calibration menu.

20mA Flo [5V Flo] — Press ➡ and enter the flow rate value for 20mA.

Note: Analogue output can be selected as 4-20mA or 0-5V in Special Functions.

4mA Flo [0V Flo] — Press ➡ and enter the flow rate value for 4mA.

20mA Vel [5V Vel] — Press ➡ and enter the velocity value for 20mA.

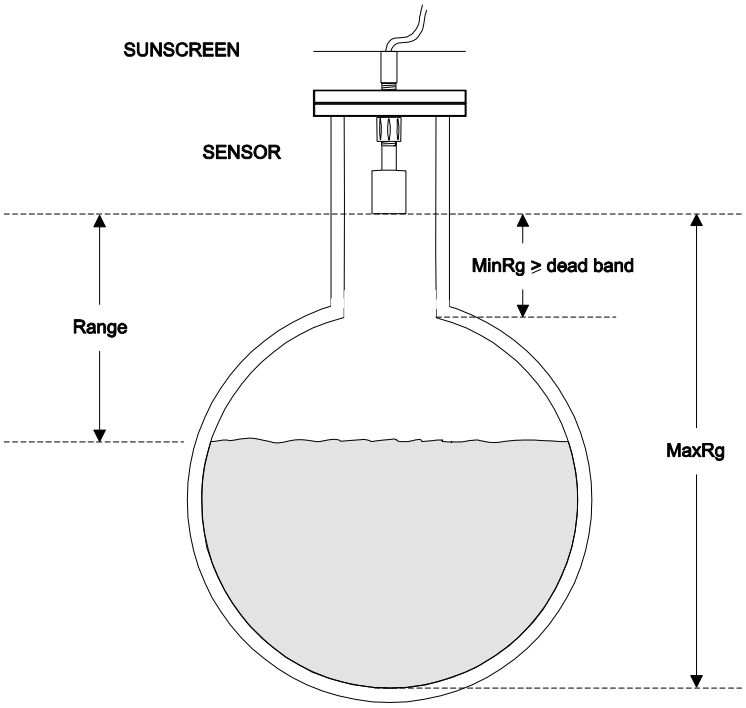
4mA Vel [0V Vel] — Press ➡ and enter the velocity value for 4mA.

20mA Level [5V Level] — Optional for QZ02L-A type sensor. Press ➡ and enter the level value for 20mA.

4mA Level [0V Level] — Optional for QZ02L-A type sensor. Press ➡ and enter the level value for 4mA.

MaxRg — Only for PZxx type sensor. Press ➡ and enter the zero water level (distance from the PZxx sensor to the zero water level).

MinRg — Only for PZxx type sensor. Press ➡ and enter the max level (distance from the PZxx sensor to the max water level).



Min Vel — Press ➡ and enter a minimum velocity cutoff. Forward and reverse velocities less than Min Vel will be forced to zero.

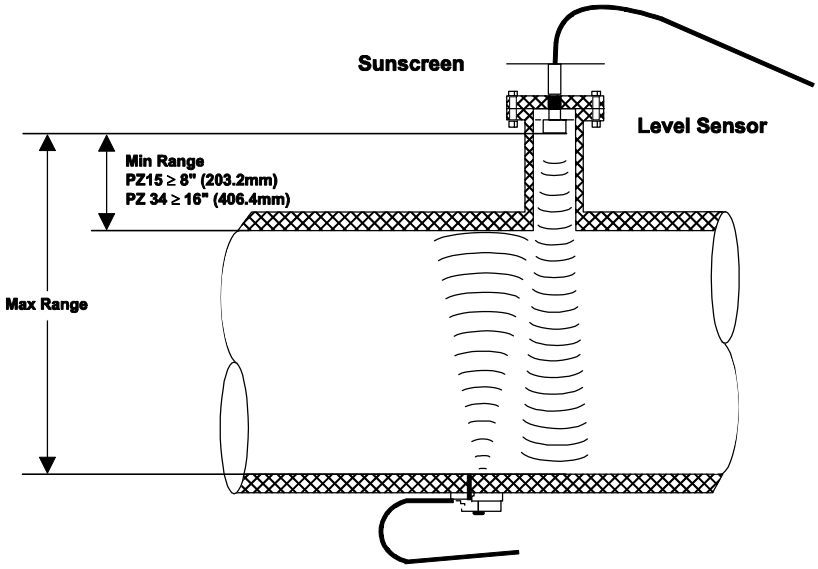
Damping — Increase damping to stabilize readings under turbulent flow readings or to reject spurious level readings. Decrease for faster response to changes in flow.

Press ✓ from the Calibration display to return to Menu Selections.

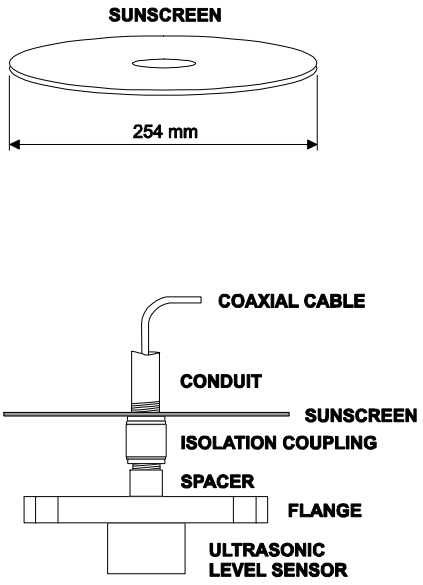
PZxx FLANGE SENSOR MOUNTING METHODS IN ROUND PIPES

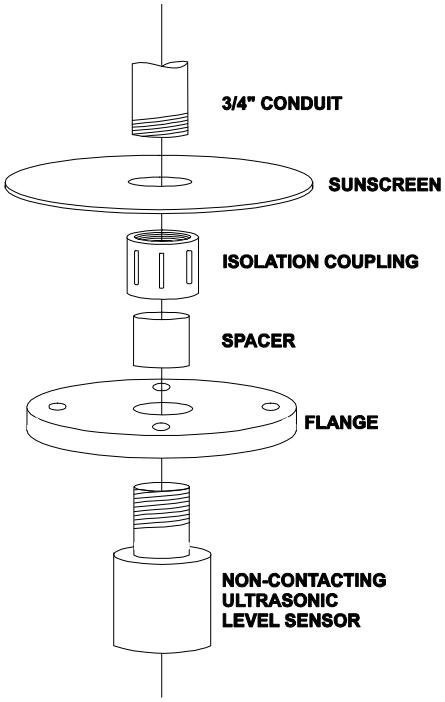
Notes:

1. Use the ¾" NPT "Isolation Coupling" supplied and hand tighten only. Do not clamp sensor body or stem.
2. Do not mount sensor or cover flange in direct sunlight.
3. Extend sensor cable up to 500 ft (150 m) with RG62AU coaxial only and junction box.
4. Standpipe diameter as large as possible, typical standpipe: 6" / 150 mm diameter, 12" – 16" (300 – 500 mm) height.



Use a Sensor Sunscreen (option PZS) when sensor is installed indirect sunlight.



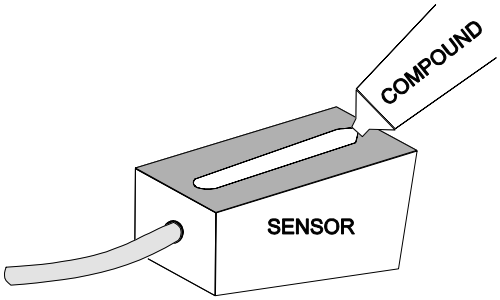


DOPPLER VELOCITY SENSOR COUPLING
Dual Sensor Configuration

For permanent or temporary bonding, the following are recommended:

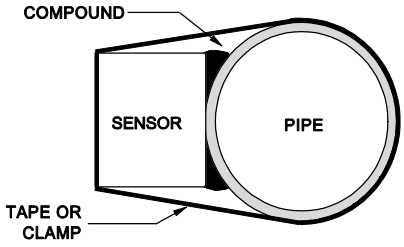
a) Dow Corning silicon compound #4 (supplied)
   Additional supply: order Greyline Option CC
b) High Temperature compound
   Additional supply: order Greyline Option AP-1W
c) Water-based sonic compound: Order Greyline Option CC30
d) Electrocardiograph gel
e) Petroleum gel (Vaseline)

The above are arranged in their order of preferred application.
d & e are only good for temporary bonding at room temperature.
DO NOT USE: Silicon RTV caulking compound (silicon rubber).



Use the PC4 pipe clamp (supplied) as illustrated above or use a loop of electrical tape for temporary mounting. Apply silicon coupling compound #4 to the coloured face of the sensor. A bead, similar to toothpaste on a toothbrush, is ideal. Do not overtighten (crush the sensor).

The sensor must be fixed securely to the pipe with coupling material between the sensor face and the pipe. Sensor installation with excessive coupling compound can result in gaps or voids in the coupling and cause errors or loss of signal. Insufficient coupling compound will create similar conditions.



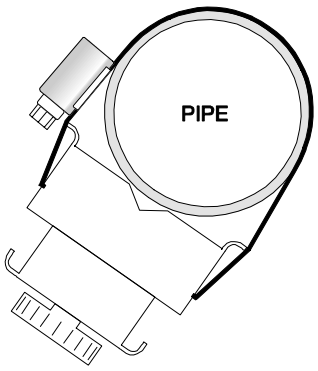
Over time temporary coupling compounds (e.g. Petroleum Gel) may gradually sag away from the sensor resulting in reduced signal strength and finally complete loss of signal. Warm temperatures, moisture and vibration will accelerate this process. Dow Corning Silicone Compound #4 as supplied with the AVFM 5.0 (and available from Greyline Instruments) is recommended for semi-permanent installations.

SENSOR MOUNTING
Dual Sensor Configuration

Prepare an area 2" wide by 4" long (50mm x 100mm) for sensor bonding by removing loose paint, scale and rust. The objective of site preparation is to eliminate any discontinuity between the sensor and the pipe wall, which would prevent acoustical coupling.

A PC4 Sensor Mounting Kit is supplied with each Greyline flow meter. It includes recommended coupling compound in a plastic applicator and a stainless steel mounting bracket with adjustable pipe straps.

END VIEW



Additional stainless steel bands (by customer) may be combined to mount on pipes up to 180" / 4.5 m OD.