+GF+ SIGNET Industrial Vortex System (IVS)

ENGLISH

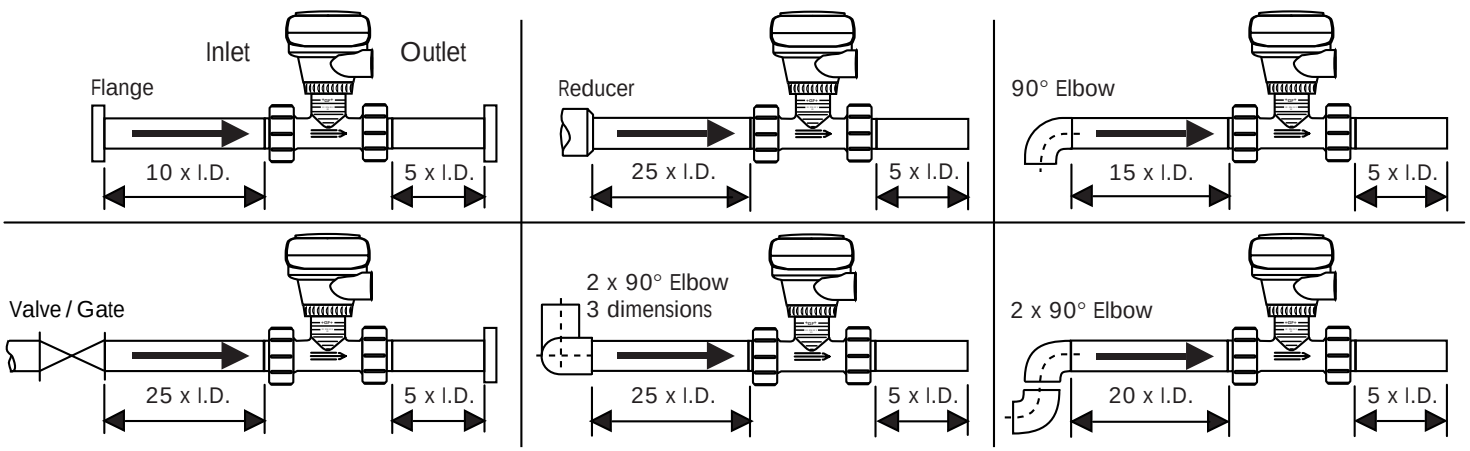
3-7000.090-3
B-2/98

Contents

1. Mounting Location

Minimum upstream / downstream sensor mounting requirements:

- The sensor must be mounted in a rigid pipe to minimize vibration. Always maximize distance between the sensor and pump source.
- Horizontal pipe runs: All mounting angles are acceptable. Avoid air bubbles.
- Vertical pipe runs: All mounting angles are acceptable with either upward or downward flow.
- A Reynolds number is a parameter describing flow velocity, viscosity, and pipeline size. To maintain system accuracy, a Reynolds number >10000 is required.
- To calculate the Reynolds number, use the following formula: **Reynolds number = DV/ υ**
  D = internal pipe diameter (m), V = flow velocity (m/s), υ = kinematic viscosity (m^2/s), Water (υ) = $1 \cdot 10^{-6 m^2/s}$
- Minimum downstream pipe backpressure levels are required to prevent cavitation within the sensor, see environmental specification section 8.



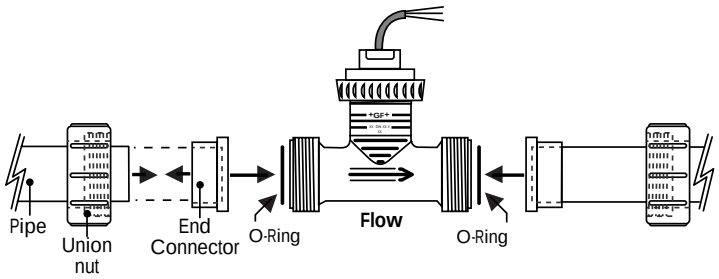
2. Installation

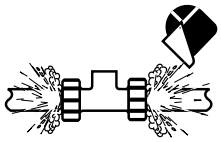
- Choose a mounting location that satisfies section 1 requirements.
- Install sensor with arrow pointing in the direction of flow. Reverse installation will not operate properly.

2.1 Fusion Socket or Solvent Cement Socket Union Sensors

- **Fusion socket version:** available in PVDF or PP. A George Fischer Socket Fusion Joining Machine is required to install the end connectors on the pipeline. Refer to the joining machine manual for installation details.

- **Solvent socket version:** available in PVC. Follow the PVC cement manufacturer's recommended preparation and gluing instructions when gluing end connections to pipe ends. Avoid excess cement in fitting joints to prevent port obstruction.



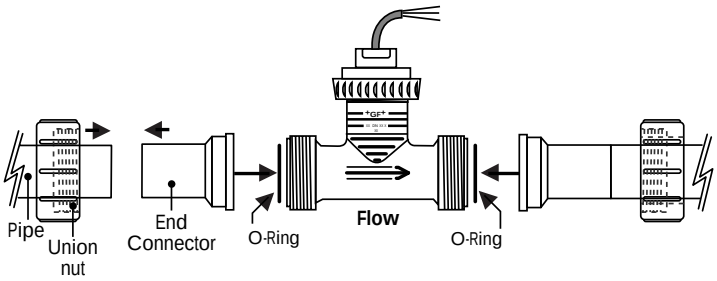


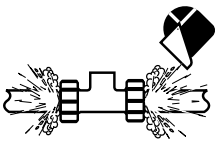
SAFETY INSTRUCTIONS

1. Do not remove from pressurized lines.
2. Never install sensor without O-Rings.
3. Confirm chemical compatibility before use.
4. Do not exceed maximum temperature / pressure specifications.
5. Do not install / service without following mounting procedure.
6. Wear safety goggles and faceshield during installation / service.
7. Do not alter product construction.
8. Failure to follow safety instructions could result in severe personal injury.

2.2 IR / Butt Fusion Sensors

Both sensor versions are available in PVDF or PP. A George Fischer IR weld or Butt Fusion Joining Machine is required to install the end connectors onto pipeline. Refer to the IR weld or butt fusion joining machine manual for installation details.





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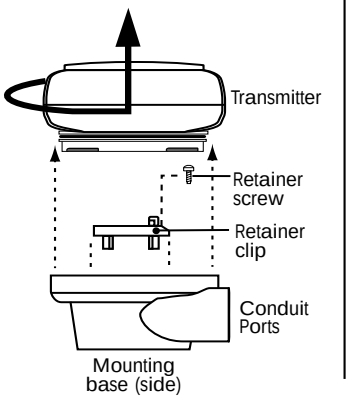
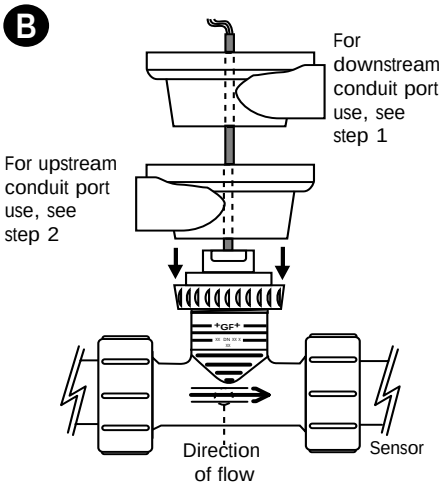
3. Transmitter Assembly

The vortex transmitter mounting base is reversible for either upstream or downstream conduit port orientation. Refer to the following procedure for transmitter assembly instructions (steps A to C) and external cabling requirements (step D).

A



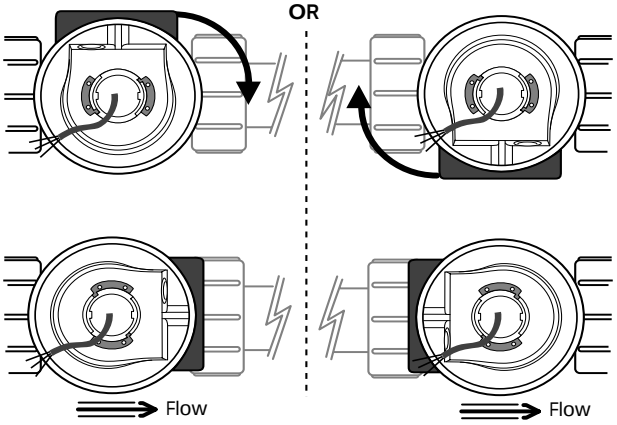
B



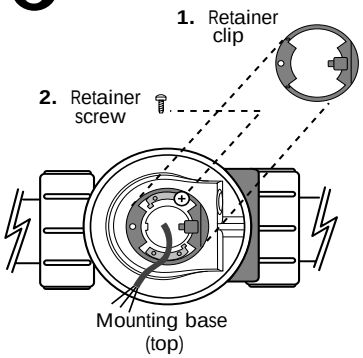
1. Downstream conduit port orientation

OR

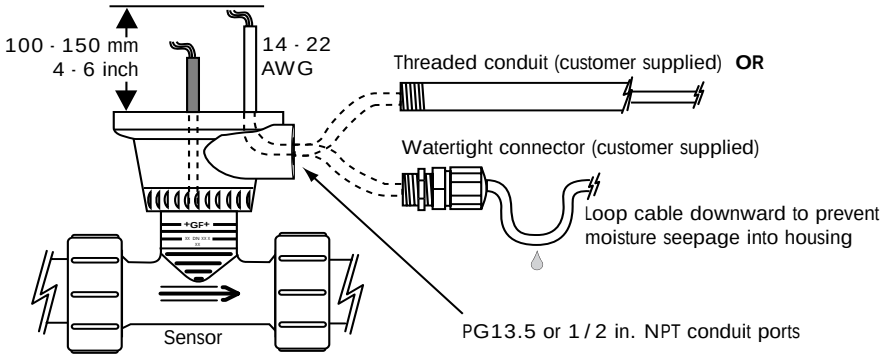
2. Upstream conduit port orientation



C

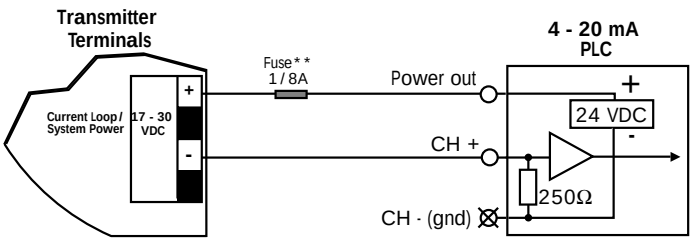


D

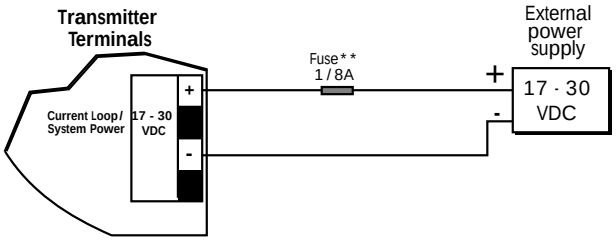


4. Current Loop / System Power Connections

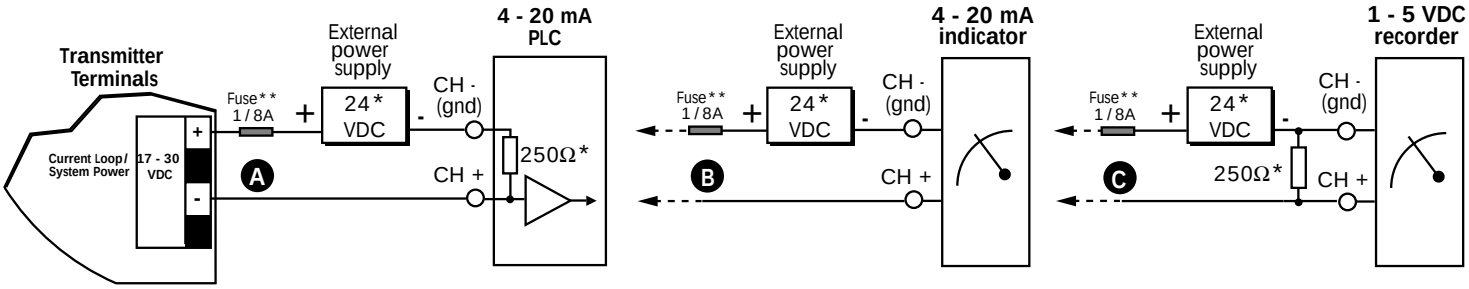
4.1 PLC **with internal** transmitter power supply



4.2 System power connection for transmitter display use only

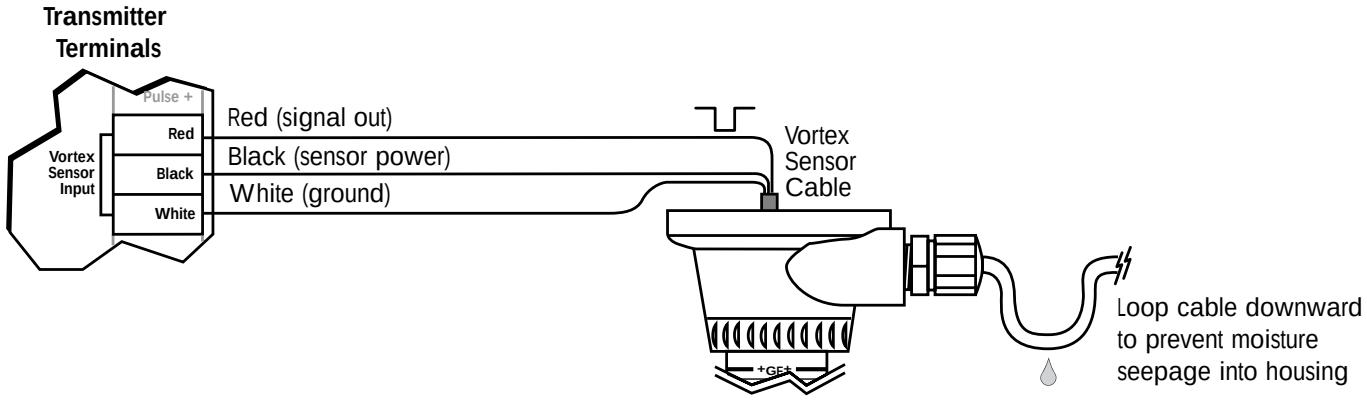


4.3 PLC (A), 4 to 20 mA indicator (B), and 1 to 5 VDC chart recorder (C) connections **without internal** transmitter power supply



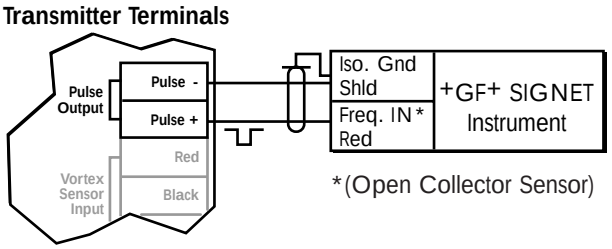
*Refer to the maximum loop impedance specification for minimum operating voltage requirements (section 8)
**1/8 A fuse recommended (customer supplied)

5. Sensor Wiring



6. Sensor Pulse Output Wiring

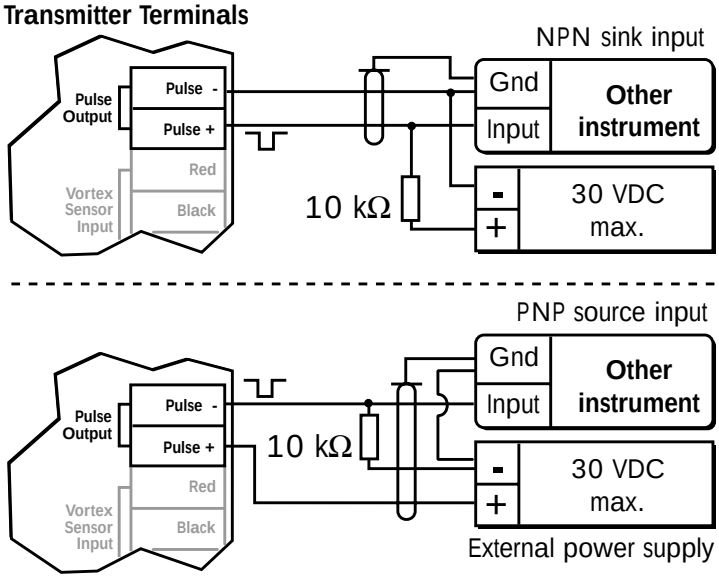
6.1 +GF+ SIGNET instrument **with** internal open-collector excitation voltage and pull-up resistor.



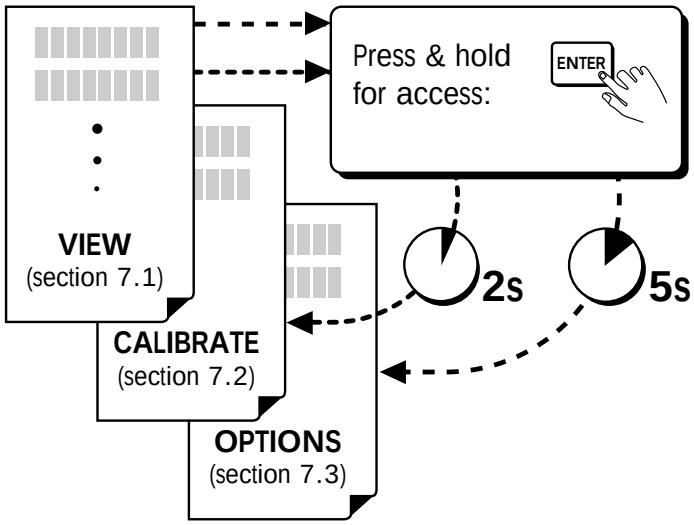
Technical Notes

- Use 2-conductor **shielded twisted-pair** cable for output lines up to 30 m (100 ft.) max.
- Pull-up resistor NOT REQUIRED when connecting to +GF+ SIGNET instruments.
- +GF+ SIGNET Intelek-Pro, use 2535/2536 input card setting.

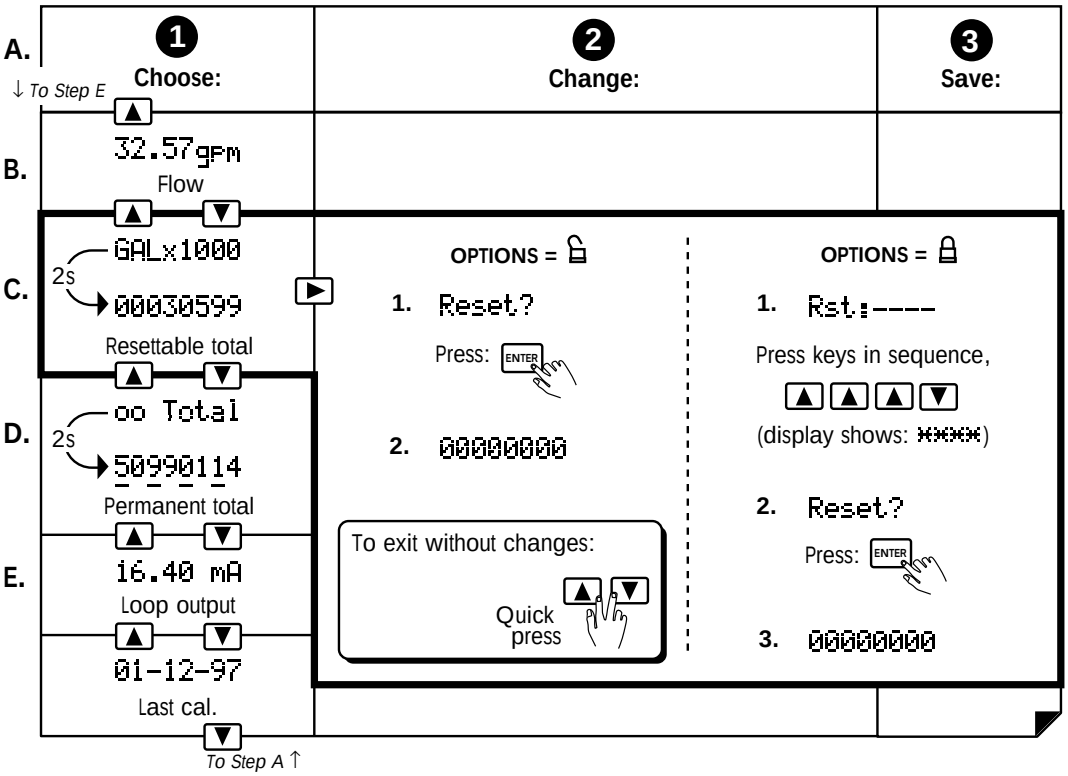
6.2 Instrument **without** internal open-collector excitation voltage and pull-up resistor.



7. Menu Functions



7.1 **VIEW** (example)



VIEW Menu Functions A to E:

A. Displays current flow rate

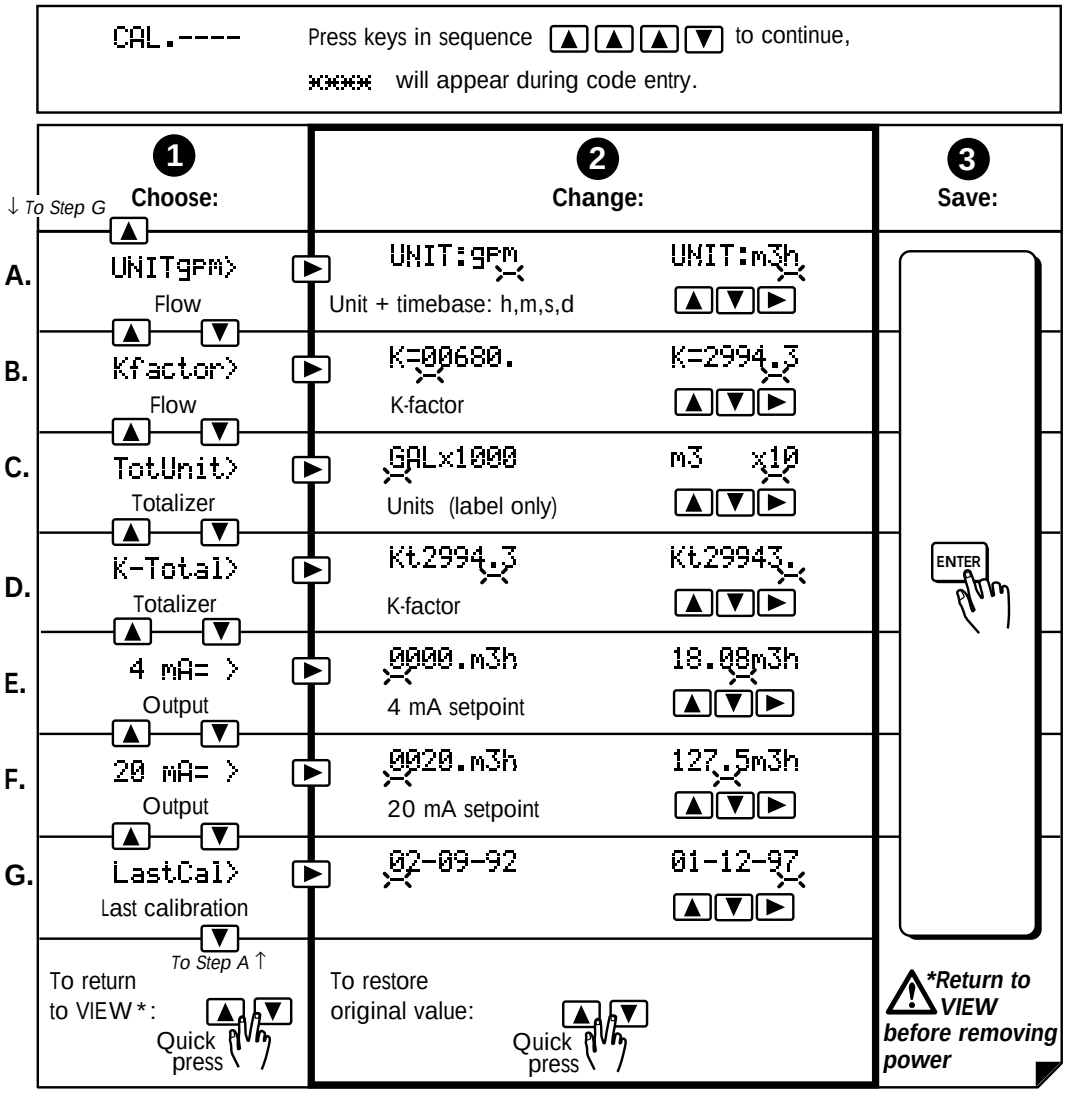
B. Displays total flow units measured since the last totalizer reset. Totalizer can be reset at any time from the front keypad. A keypad sequence is required to reset the totalizer when the OPTIONS menu totalizer "Lock: on" selection is chosen (section 7.3A). Choose the "Lock:off" selection to disable this feature (section 7.3A).

C. Displays the total flow units measured for the life of the product. The totalizer cannot be manually reset but will roll over after maximized (99999999 → 00000000). Note: A scrolling cursor under the number identifies the permanent totalizer during operation.

D. Displays current loop mA level for the displayed flow rate A.

E. Displays the user defined setup date (not an internal timer).

7.2 **CALIBRATE** (example)



Menu Functions A to G:

A. Sets flow units (**gp**m) and timebase (gp**m**). Timebase options: s=seconds, m=minutes, h=hours, d=days

B. Sets flow K-factor: 000.01 to 99999. (see technical notes below)

C. Sets totalizer units: For label purposes only

D. Sets totalizer K-factor: 000.01 to 99999. (see technical notes below)

E. Sets 4 mA setpoint. 4 mA and 20 mA setpoints are reversible.

F. Sets 20 mA setpoint. 20 mA and 4 mA setpoints are reversible.

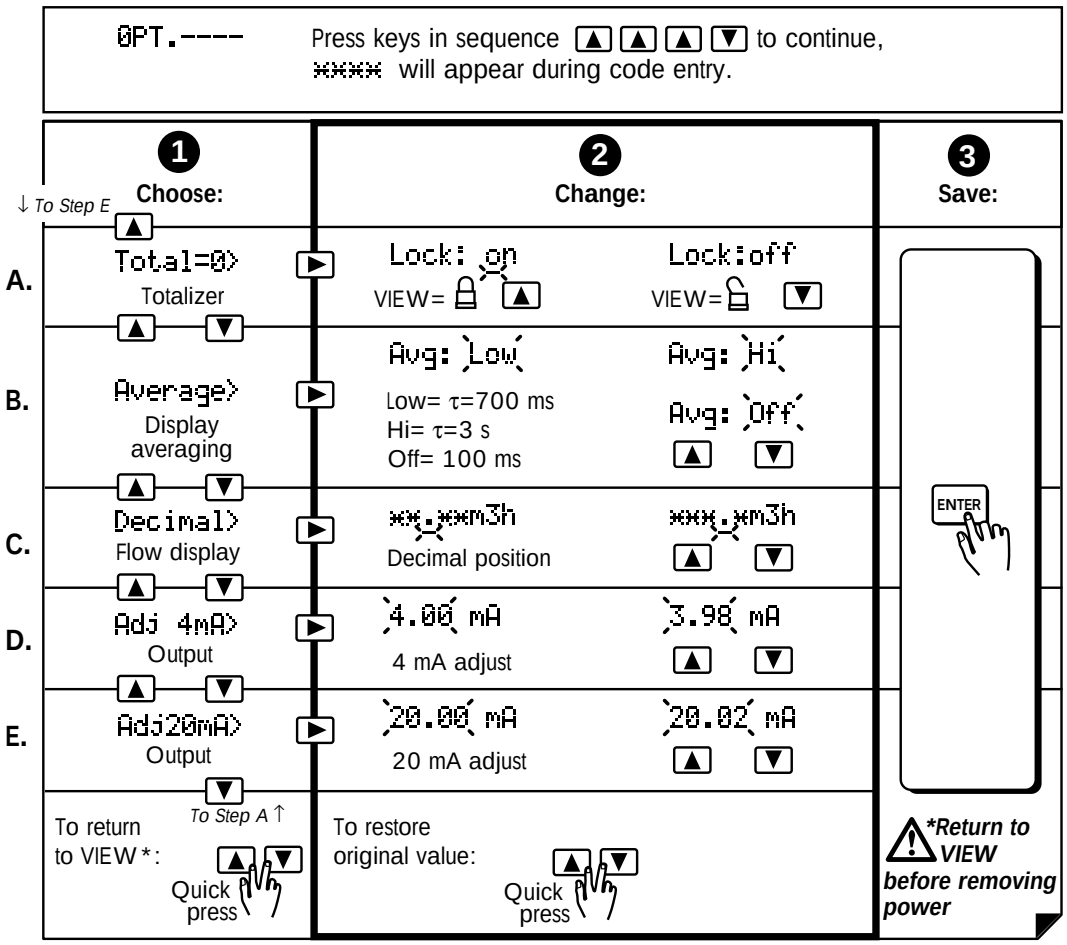
G. Sets user defined date (not an internal timer)

Technical Notes:
Flow and totalizer K-factors are independent of each other. These K-factors represent the number of pulses generated by the +GF+ SIGNET flow sensor for each engineering unit **of water** measured. The total K-factor can be changed to totalize in different units other than the flow display, as required. If fluids other than water are used, the system must be field calibrated volumetrically.

K-factors - ANSI Piping Systems							
Sensor Material	**Flow Units**	**0.5 inch**	**0.75 inch**	**1 inch**	**1.25 inch**	**1.5 inch**	**2 inch**
PVC, SCH 80	U.S. Gallons	1837.39	802.34	361.30	138.76	88.296	39.133
	Liters	485.44	211.98	95.455	36.660	23.328	10.339
K-factors - Metric Piping Systems							
Sensor Material	**Flow Units**	**d20 DN15** (i.d.≈0.5 inch)	**d25 DN20** (i.d.≈0.75 inch)	**d32 DN25** (i.d.≈1 inch)	**d40 DN32** (i.d.≈1.25 inch)	**d50 DN40** (i.d.≈1.5 inch)	**d63 DN50** (i.d.≈2 inch)
PVC, Metric	U.S. Gallons	1248.3	538.45	243.84	114.66	61.415	29.686
	Liters	329.81	142.26	64.422	30.292	16.226	7.843
PP, Metric	U.S. Gallons	1385.5	572.51	265.76	138.41	70.719	35.096
	Liters	366.04	151.26	70.213	36.568	18.684	9.272
PVDF, Metric	U.S. Gallons	1381.7	582.63	265.97	111.81	50.732	25.443
	Liters	365.05	153.93	70.270	29.540	13.403	6.722

K-factor Conversion Formulas:
1 U.S. gallon = 0.003785 cubic meters, 0.0000003069 acre feet, or 8.3454 pounds of water

7.3 **OPTIONS** (example)



Menu Functions A to E:

A. Selects totalizer pulse reset options: Lock **on** (enables) or lock **off** (disables) the VIEW menu totalizer reset security code feature (RST: - - - -).

B. Selects display averaging: Off= 100 ms, Low= τ=700 ms, Hi= τ=3 s (also effects 4-20 mA output signal).

C. Selects display decimal: **** · to ** · **

D. Adjusts 4 mA output: 3.9 to 4.9 mA (overrides 4.00 mA factory calibration).

E. Adjusts 20 mA output: 19.8 to 23 mA (overrides 20.00 mA factory calibration).

8. Specifications

General

Wetted materials:
- Sensor: PVC, PP, or PVDF
- Union O-Rings: FPM or EPDM

Pipe size range:
- Metric: d20 to 63 mm, DN15 to 50 mm
- PVC, SCH 80: 0.5 to 2.0 in.

Flow range:
- d20 - d25 (0.5 - 0.75 in.) sensors: 0.5 to 4 m/s (1.6 to 13 ft/s)
- d32 - d40 (1.0 - 1.25 in.) sensors: 0.4 to 4 m/s (1.3 to 13 ft/s)
- d50 - d63 (1.5 - 2.0 in.) sensors: 0.3 to 4 m/s (1.0 to 13 ft/s)

System:
- Accuracy: ±1% of reading @ 25 °C
- Repeatability: ±0.5% of reading @ 25 °C

Enclosure:
- Rating: NEMA 4X/IP65
- Material: Glass-filled polypropylene
- Seals (2): Buna-N
- Window: SMMA (Novacor)

Display:
- Type: 8-digit alphanumeric dot matrix LCD
- Contrast: Automatic, temp. compensated
- Update rate: 1s

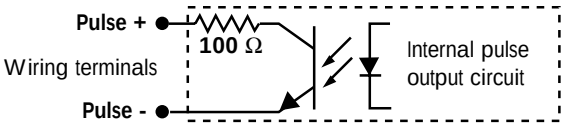
Totalizers:
- 8-digit resettable with security option
- 8-digit non-resettable

Agency Approvals
- CE
- Manufactured under ISO 9001

Electrical
- Current loop/system power (section 4): 17 to 30 VDC, regulated, 23 mA max.

Current loop:
- Reversible span
- Loop impedance: 1 Ω max at 17 VDC,
  300 Ω max at 24 VDC,
  800 Ω max at 30 VDC
- Update rate: <100 milliseconds
- Resolution: 6 µA
- Reverse polarity protection

Sensor pulse output: Open-collector transistor, sink or source capability, optically isolated, 10 mA max sink, 30 VDC max pull-up voltage, 0 to 400 Hz (size dependant), ≈50% duty cycle



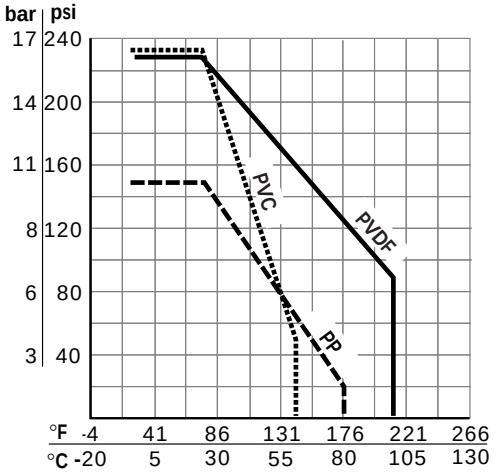
Immunity: EN50082-2
Emissions: EN55011

Environmental

Maximum media press. / temp.:

- PVDF: 16 bar @ 0 °C, 6.5 bar @ 100 °C (232 psi @ 32 °F, 94 psi @ 212 °F)
- PP: 10 bar @ 0 °C, 1.5 bar @ 80 °C (145 psi @ 32 °F, 22 psi @ 176 °F)
- PVC: 16.2 bar @ 0 °C, 3.7 bar @ 60 °C (235 psi @ 32 °F, 54 psi @ 140 °F)

Ambient temp.: 0 to 70 °C (32 to 158 °F)
Storage temp.: -15 to 80 °C (5 to 176 °F)
Relative humidity: 0 to 95%, non-condensing
Max. vibration: 1 mm or 1g double amplitude @ 500 Hz



Backpressure Calculation

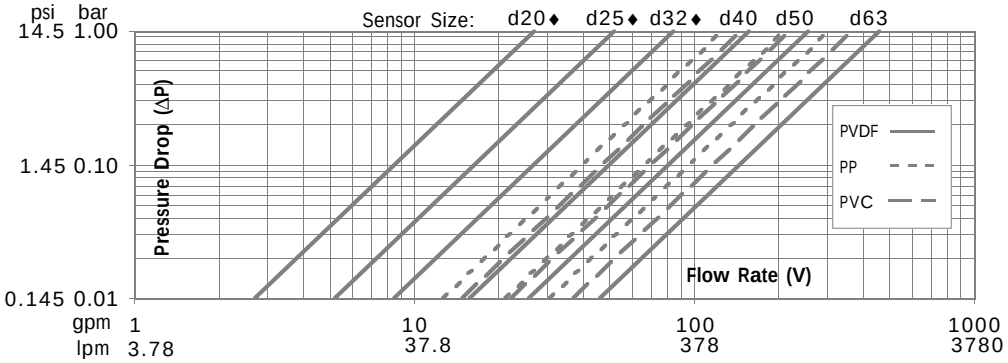
Minimum downstream pipe backpressure levels are required to prevent cavitation within the sensor. The minimum back pressure is calculated by the following formula:

2.7 x ΔP + 1.3 x Po

(**ΔP** = Pressure drop across sensor.
Po = Water saturation vapor pressure at operating temperature.)

1. Using pressure drop graph, find **ΔP** by locating your maximum flow rate on specific sensor size line. ♦ Note: Same curve for all materials in d20, d25, and d32 sizes
2. Using the water saturation vapor pressure chart, find Po at operating temperature.
3. Calculate minimum back pressure needed using formula.

Pressure Drop Graph

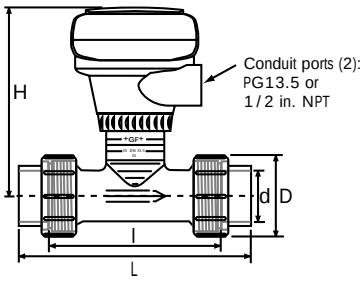


Water Saturation Vapor Pressures at Operation Temperatures

°C	-20	-10	0	5	10	15	20	25	30	35	40	50
°F	-4	14	32	41	50	59	68	77	86	95	104	122
bar	0.001	0.003	0.006	0.009	0.012	0.017	0.023	0.032	0.042	0.056	0.074	0.123
psia	0.014	0.038	0.088	0.126	0.178	0.247	0.338	0.458	0.614	0.813	1.067	1.784

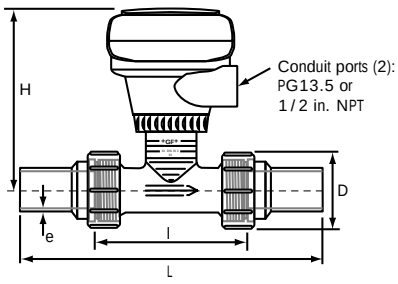
9. Dimensions

Fusion / Solvent Socket Union Sensors



Dimension L ± 3 mm (±0.1 in.)

IR Weld & Butt Fusion Sensors



Dimension L ± 3 mm (±0.1 in.)

PVC System - Solvent Cement Socket

d	DN	D		L		l		H		Inch
mm	mm	mm	inch	mm	inch	mm	inch	mm	inch	Size
20	15	43	1.69	128	5.04	90	3.54	137	5.39	1 / 2
25	20	53	2.09	144	5.67	100	3.94	140	5.51	3 / 4
32	25	60	2.36	160	6.30	110	4.33	143	5.63	1
40	32	74	2.91	168	6.61	110	4.33	147	5.79	1-1 / 4
50	40	83	3.27	188	7.40	120	4.72	152	5.98	1-1 / 2
63	50	103	4.06	212	8.35	130	5.12	159	6.26	2

PP and PVDF System - Fusion Socket

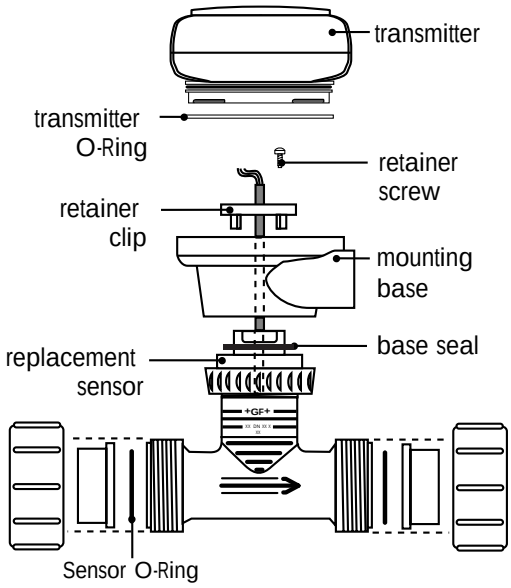
d	DN	D		L		l		H		Closest
mm	mm	mm	inch	mm	inch	mm	inch	mm	inch	Inch Size
20	15	43	1.69	128	5.04	90	3.54	137	5.39	1 / 2
25	20	53	2.09	142	5.59	100	3.94	140	5.51	3 / 4
32	25	60	2.36	156	6.14	110	4.33	143	5.63	1
40	32	74	2.91	160	6.30	110	4.33	147	5.79	1-1 / 4
50	40	83	3.27	176	6.93	120	4.72	152	5.98	1-1 / 2
63	50	103	4.06	194	7.64	130	5.12	159	6.26	2

PP and PVDF System - Butt Fusion

d	DN	D		L		l		H		e	Closest
mm	mm	mm	inch	mm	inch	mm	inch	mm	inch	mm	Inch Size
20	15	43	1.69	196	7.72	90	3.54	137	5.39	1.9	1 / 2
25	20	53	2.09	212	8.35	100	3.94	140	5.51	1.9	3 / 4
32	25	60	2.36	228	8.98	110	4.33	143	5.63	2.4	1
40	32	74	2.91	234	9.21	110	4.33	147	5.79	2.4	1-1 / 4
50	40	83	3.27	250	9.84	120	4.72	152	5.98	3.0	1-1 / 2
63	50	103	4.06	266	10.47	130	5.12	159	6.26	3.0	2

10. Spare Parts

Miscellaneous	Part No.	Code
Transmitter	3-7000-2	198 864 702
Transmitter o-ring	1223-0151	198 864 900
Retainer Screw	2800-0031	198 864 901
Retainer Clip	3-8001.526	198 864 902
Mounting Base NPT	3-8001.522-3	198 864 911
Mounting Base PG13.5	3-8001-522-4	198 864 912
Base Seal	1203-1121	198 864 920



Replacement Sensor

d mm	PVC, SCH 80	PVC, Metric	PP, Metric	PVDF, Metric
20	152.502.001	152.602.001	152.402.001	152.302.001
25	152.502.002	152.602.002	152.402.002	152.302.002
32	152.502.003	152.602.003	152.402.003	152.302.003
40	152.502.004	152.602.004	152.402.004	152.302.004
50	152.502.005	152.602.005	152.402.005	152.302.005
63	152.502.006	152.602.006	152.402.006	152.302.006

Sensor O-Rings

d mm	FPM Part No.	EPDM Part No.
20	749.410.038	748.410.038
25	749.410.044	748.410.044
32	749.410.195	748.410.195
40	749.410.052	748.410.052
50	749.410.134	748.410.134
63	749.410.135	748.410.135

Sensor Component Parts

d	PVC, SCH 80		PVC, Metric		PP, Metric			PVDF, Metric		
	Solv. Cem Inch	Union	Solv. Cem mm	Union	Fusion Socket	Butt Fusion	Union	Fusion Socket	Butt Fusion	Union
mm	End Connector	Nut	End Connector	Nut	End Connector	End Connector	Nut	End Connector	End Connector	Nut
20	721.601.106	721.690.006	721.600.106	721.690.006	727.600.106	727.608.506	727.690.406	735.600.106	735.608.606	735.690.406
25	721.601.107	721.690.007	721.600.107	721.690.007	727.600.107	727.608.507	727.690.407	735.600.107	735.608.607	735.690.407
32	721.601.108	721.690.008	721.600.108	721.690.008	727.600.108	727.608.508	727.690.408	735.600.108	735.608.608	735.690.408
40	721.601.109	721.690.009	721.600.109	721.690.009	727.600.109	727.608.509	727.690.409	735.600.109	735.608.609	735.690.409
50	721.601.110	721.690.010	721.600.110	721.690.010	727.600.110	727.608.510	727.690.410	735.600.110	735.608.610	735.690.410
63	721.601.111	721.690.011	721.600.111	721.690.011	727.600.111	727.608.511	727.690.411	735.600.111	735.608.611	735.690.411

11. Troubleshooting

Display Message	Cause	Solution
OVER^gpm	1) Display overrange 2) Display timebase too large	1) Move display decimal to right in OPTIONS menu. 2) Change display timebase (H,M,S,D) to smaller value (e.g. LP**H** to LP**M**).
K=0error	K-Factor cannot be zero	Change K-Factor to a non-zero value.
Check > 2s ↑ 2s Setup >	CALIBRATE or OPTIONS menu setup changes were made and instrument power was removed **before** returning to VIEW mode	Press ▶ to reload factory defaults then reprogram system setup parameters. Note: the resettable totalizer will reset to zero; the permanent totalizer will remain unaffected. Both totalizers will resume after instrument reset. ⚠ **Always return to VIEW before removing power after making changes in either CALIBRATE or OPTIONS menus.**

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