Instruction

MI 019-146
November 2011

I/A Series® Vortex Flowmeters
Model 84

Installation and Startup

Safety information in many languages is available on our website. For help downloading this information, contact our Global Customer Support Center.

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Preface

This Universal Instruction Manual is designed to provide the user with a single, concise, easy-to-use manual that covers the key points needed for installation and startup of 84 Series Intelligent Vortex Flowmeters.

It covers all models of the 84 Series flowmeter, including flanged body, wafer body, and sanitary vortex flowmeters.

This universal manual, along with a CD containing detailed information, is provided free of charge with every 84 Series flowmeter, unless the purchaser has requested a detailed paper instruction manual (Option -C).

For additional detailed information about each model, including dimensional prints, parts lists, and more detailed instructions, please refer to the standard CD supplied or the optional paper instruction book that is available from Invensys for each model in the line.

Standard documentation shipped with every 84 Series flowmeter is:

- A brief "Ensuring Premium Performance" Pocket-Sized Bulletin
- This Universal Instruction Manual
- A CD that contains the complete documentation set.

NOTE

Newly released products may be shipped with paper documentation until the information pertaining to them is included on the CD.

1. Safety Information

General Warnings

Local Code Warning

WARNING

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

ATEX Warning

WARNING

Apparatus marked as Category 1 equipment and used in hazardous areas requiring this category must be installed in such a way that, even in the event of rare incidents, the versions with an aluminum alloy enclosure can not be an ignition source due to impact and friction.

Intrinsically Safe Warning

WARNING

Since Invensys does not specify live maintenance, to prevent ignition of flammable atmospheres, disconnect power before servicing unless the area is certified to be nonhazardous.

Process Fluid Warning

WARNING

If process containing parts are to be disassembled:
1. Make sure that process fluid is not under pressure or at high temperature.
2. Take proper precautions concerning leakage or spillage of any toxic or otherwise dangerous fluid. Follow any Material Safety Data Sheet (MSDS) recommendations.

WARNING

These flowmeters are built using materials that are corrosion resistant to a wide variety of fluids. However, with aggressive fluids, a potential exists for corrosive failure. Therefore, verify the material compatibility with the NACE guidelines and/or user knowledge of the flowmeter material compatibility with the process fluid at operating conditions.

Abrasive Fluid Warning

WARNING

Fluids containing abrasive particles and flowing at high rates can cause significant wear to pipes. If these conditions exist, check the flowmeter periodically for wear.

Loss of Flow Signal Warning

WARNING

If the flowrate signal appears to have a calibration shift or goes to zero, check the flowmeter for corrosion or wear or an obstruction in the shedder bar.

Parts Replacement Warning

WARNING

If replacing parts, do not use parts made of other materials or that in any other way change the product as described in the model code on the data plate.

Explosionproof/Flameproof and Enclosure Warning

WARNING

To prevent possible explosion and to maintain explosionproof/flameproof and dust-ignitionproof protection, plug unused openings with the provided metal pipe plug. This plug must be engaged a minimum of five full threads. The threaded housing covers must be installed. Turn covers to seat O-ring into the housing and then continue to hand tighten until the cover contacts the housing metal-to-metal.

Flowmeter Identification

Refer to the center portion of the data plate (sample shown in Figure 1) to determine the origin code, supply voltage, maximum working pressure, maximum ambient temperature, and maximum process temperature. The electrical certification rating is shown on the right end of the data plate.

Style A flanged vortex meters have flanges cast for 3/4 to 4 inch line sizes. For 6 to 12 inch line sizes, Style A vortex meters have a modular design with pipe centerbody and welded flanges.

Style B vortex meters have a modular design with cast centerbody and welded flanges for 3/4 to 12 inch line sizes.

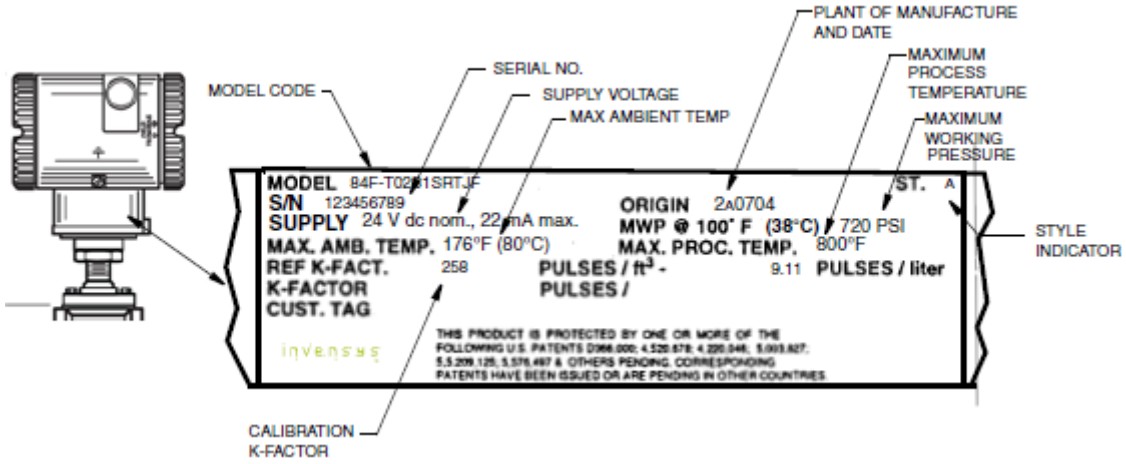


Figure 1. Sample 84 Vortex Flowmeter Identification

When the flowmeter is remotely mounted, the junction box on the flowtube body has an additional agency plate showing its hazardous location rating. See Figure 2.

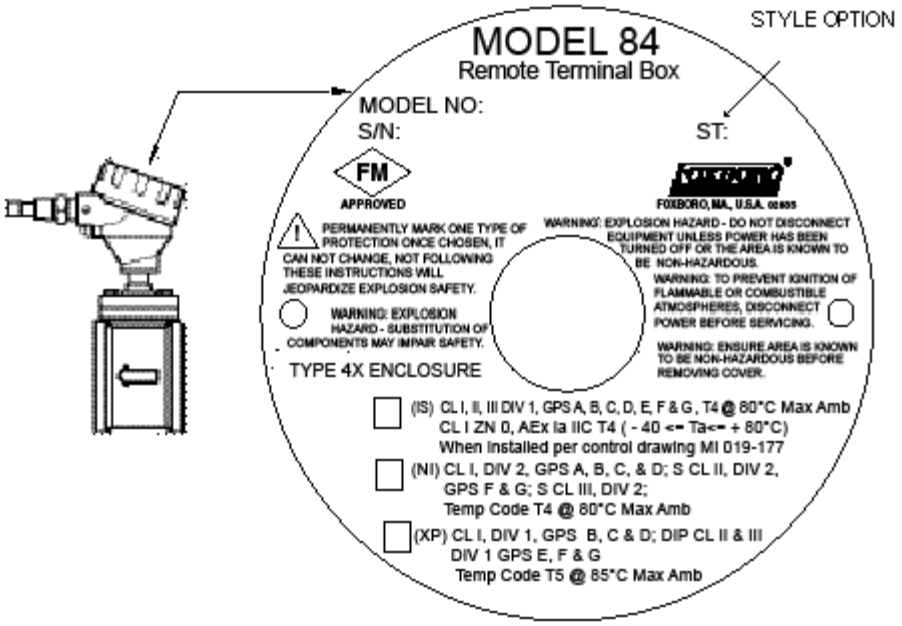


Figure 2. Sample 84 Flowmeter Junction Box Agency Plate

The software version of your device can be found in View mode as **2 SW Rev**.

Origin Code

The origin code identifies the area of manufacture and the year and week of manufacture. See Figure 1. In the example, 2A means the product was manufactured in the Measurement and

Instrument Division, 07 identifies the year of manufacture as 2007, and 04, the week of manufacture in that year.

Electrical Safety Specifications

NOTE

1. These flowmeters have been designed to meet the electrical safety descriptions listed in Table 1. For detailed information or status of testing laboratory approvals/certifications, contact Invensys.
2. Verify whether you have a Style A or Style B flowmeter.
3. See MI 019-179 for additional ATEX and IECEx safety information.
4. With intrinsically safe approvals and certifications with a 24 V dc supply, an active barrier is required.

The electrical safety design code referred to in Table 1 is printed on the data plate as part of the model code. The location of the code within the model number is shown below:

Table 1. *Electrical Safety Specifications*

Agency Certification, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
ATEX intrinsically safe: II 1G / 2D Ex ia IIC T4 Ga Ex tb IIIC T103°C Db	Sira 06ATEX2067X Integrally mounted or remote mounted (electronics and junction box). Temperature Class T4, T103°C; Ta = -40° to +80°C	E
ATEX flameproof: II 2/1 (1) G / 2D Ex d [ia Ga] ia Ga IIC T4 Gb Ex tb IIIC T85°C Db	Sira 06ATEX2067X Integrally mounted electronics. Temperature Class T4, Ta = -20° to +80°C	H
ATEX flameproof: II 2 (1) G / 2D Ex d [ia Ga] IIC T4 Gb Ex tb IIIC T85°C Db	Sira 06ATEX2067X Electronics housing of remote mounted version. Temperature Class T4, T85°C; Ta = -20° to +80°C	
ATEX flameproof: II 1G / 2D Ex ia IIC T4 Ga Ex tb IIIC T103°C Db	Sira 06ATEX2067X Flowtube junction box of remote mounted version. Temperature Class T4, T103°C; Ta = -40° to +80°C	

Table 1. *Electrical Safety Specifications (Continued)*

FM intrinsically safe for Class I, II, III, Div. 1, Groups A, B, C, D, E, F, G. Also, Zone approved AEx ia IIC	Connect per MI 019-177. Temperature Class T4; Ta = 80°C	F
FM explosionproof with IS sensor connection for Class I, Div. 1, Groups B, C, and D; dustignitionproof for Class II, Div. 1, Groups E, F, and G; Class III, Div. 1	Connect per MI 019-177. Temperature Class T5; Ta = 85°C	G
FM nonincendive for Class I, Div. 2, Groups A, B, C, and D; Class II, Div. 2, Groups F and G; Class III, Div. 2	Connect per MI 019-177. Temperature Class T4. T=80°C	K
CSA intrinsically safe for Class I, II, III, Div. 1, Groups A, B, C, D, E, F, G. Also, Zone certified intrinsically safe Ex ia IIC	Temperature Class T4; Ta = -40° to +80°C	C
CSA explosionproof with IS sensor connection for Class I, Div. 1, Groups B, C, and D; dustignitionproof for Class II, Div. 1, Groups E, F, and G; Class III, Div. 1. Also Zone certified Ex d [ia] IIC.	Temperature Class T5. Ta = 60°C Temperature Class T5. Ta = -40° to +80°C	D
CSA for Class I, Div. 2, Groups A, B, C, and D; Class II, Div. 2, Groups F and G; Class III, Div. 2.	Temperature Class T4. T=80°C	M
IECEx intrinsically safe: Ex ia IIC T4 Ga Ex tb IIIC T103°C Db	IECEx SIR 06.0020X Temperature Class T4, T103°C; Ta = -40° to +80°C	L
IECEx flameproof: Ex d [ia Ga] ia Ga IIC T4 Gb Ex tb IIIC T85°C Db	IECEx SIR 06.0020X Integrally mounted electronics. Temperature Class T4, Ta = -20° to +80°C	B
IECEx flameproof: Ex d [ia Ga] IIC T4 Gb Ex tb IIIC T85°C Db	IECEx SIR 06.0020X Electronic housing of remote mounted version. Temperature Class T4, Ta = -20° to +80°C	
IECEx flameproof: Ex ia IIC T4 Ga Ex tb IIIC T103°C Db	IECEx SIR 06.0020X Flowtube junction box of remote mounted version. Temperature Class T4, T103°C; Ta = -40° to +80°C	
Unit with CE mark and PED controls and records.		Y
Unit does not have CE mark; not to be installed in European Union (EU) countries.		Z

PED Certification

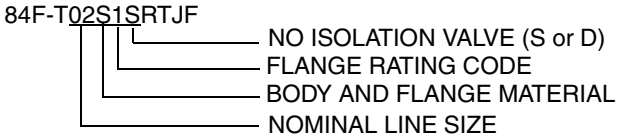
Invensys offers the PED (Harmonized Pressure Equipment Directive for the European Community) certification with 84 Series Flowmeters. Therefore, the CE marking carries the ATEX number 0344. Flowmeters which are 1 1/2 in (40 mm) or larger have PED certification and therefore the CE marking also carries the PED number 0575.

Maximum Working Pressure

84F Flanged Body Flowmeters

The maximum working pressure (MWP) of the flowtube at 100°F is shown on the data label.

The MWP at other temperatures for the 84F Flanged Body Flowmeter is given in Figure 3 to Figure 15. The nominal line size, body and flange material, and flange rating required to use these figures is found within the model number on the data label as follows:



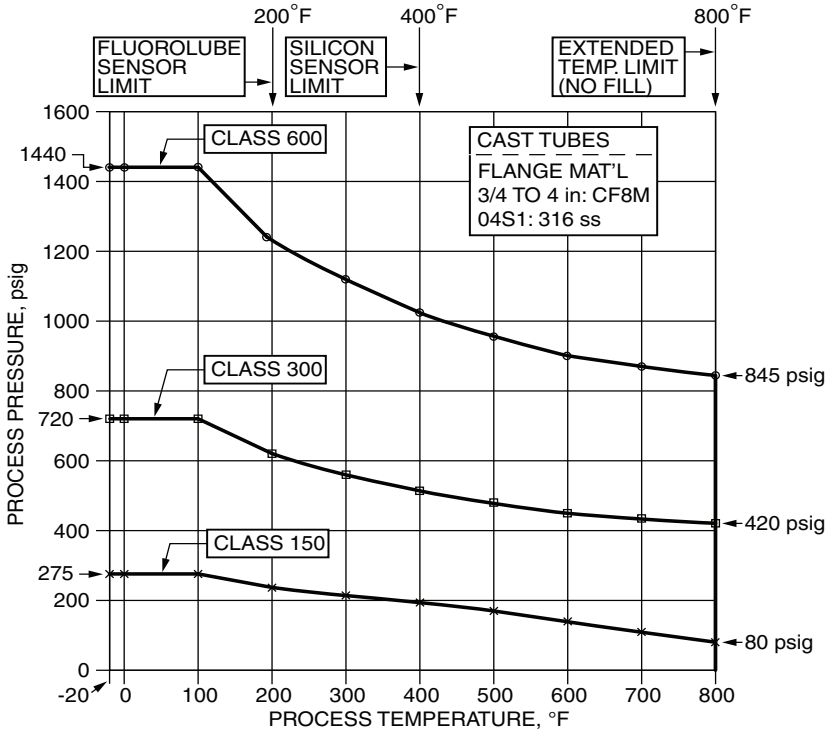


Figure 3. ANSI Flange Ratings; per ASME B16.5; Group 2.2 Materials; Standard Pressure Options: Style A: Cast Tubes (3/4 to 4 Inch, CF8M) and Flanges (CF8M, 4-inch Class 150 with Welded Slip-On Flanges)
Style B: Cast Tubes (3/4 to 4 Inch, CF8M) and Welded Weld-Neck Flanges (316 SS)

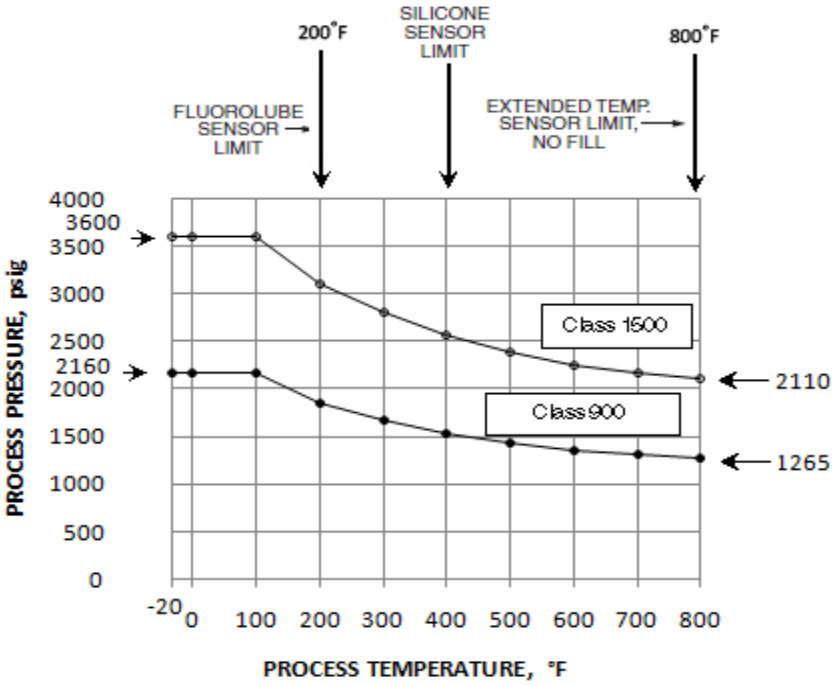


Figure 4. ANSI Flange Ratings; per ASME B16.5; Group 2.2 Materials; High Pressure Options: Style B Only: Cast Tubes (3/4 to 4 Inch, CF8M) and Welded Weld-Neck Flanges (316 SS)

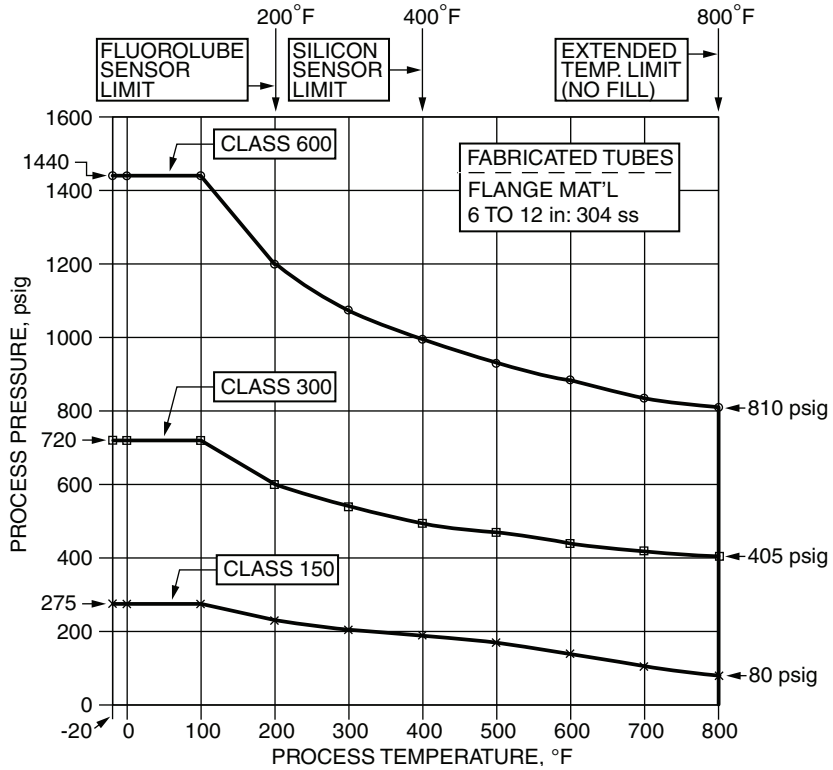


Figure 5. ANSI Flange Ratings; per ASME B16.5; Group 2.1 Materials; Standard Pressure Options: Style A: Fabricated Tubes (6 to 12 Inch, 304 SS) and Welded Flanges (304 SS) Style B: Cast Tubes (6 to 12 Inch, CF8M) and Welded Weld-Neck Flanges (304 SS)

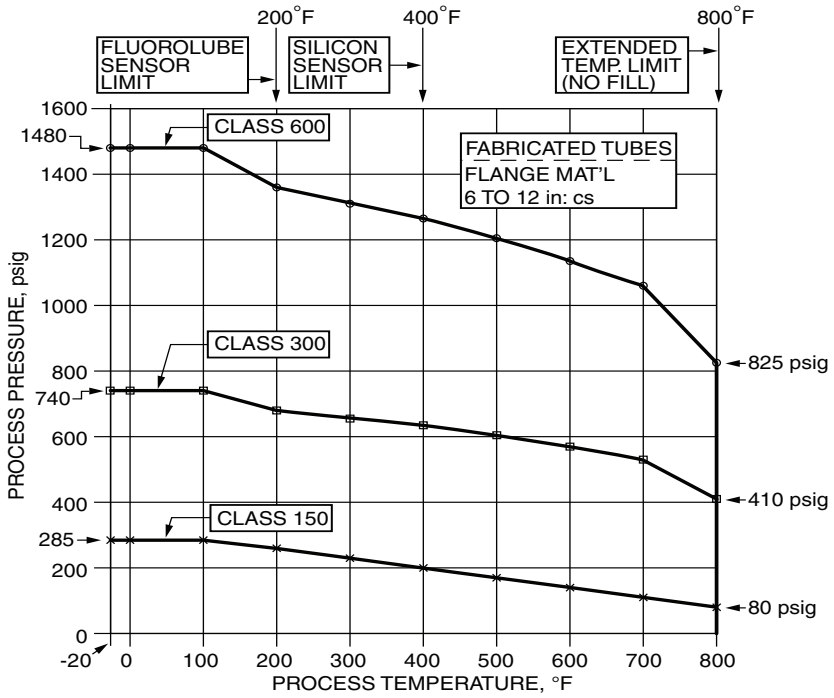


Figure 6. ANSI Flange Ratings; per ASME B16.5; Group 1.1 Materials; Standard Pressure Options: Style A: Fabricated Tubes (3/4 to 12 Inch, 304 SS) and Welded Flanges (Carbon Steel) Style B: Cast Tubes (3/4 to 12 Inch, CF8M) and Welded Weld-Neck Flanges (Carbon Steel)

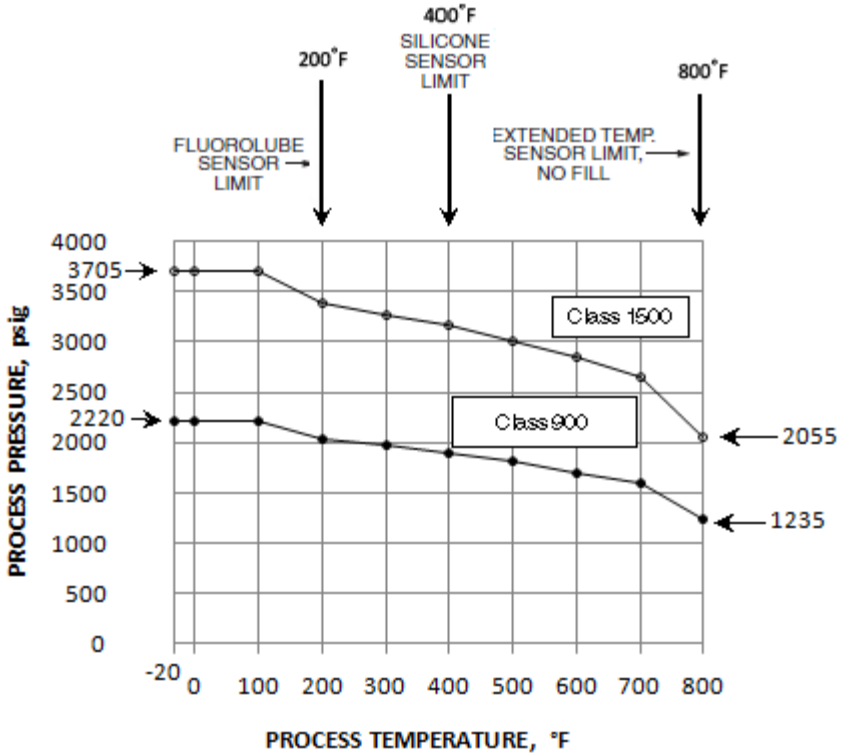


Figure 7. ANSI Flange Ratings; per ASME B16.5; Group 1.1 Materials; High Pressure Options: Style B Only: Cast Tubes (3/4 to 8 Inch, CF8M), and Welded Weld-Neck Flanges (Carbon Steel)

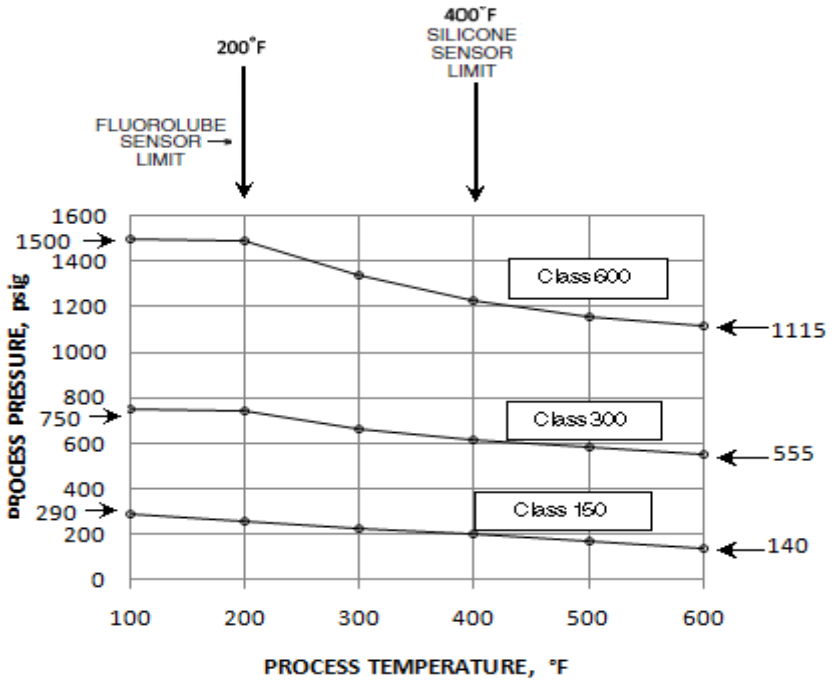


Figure 8. ANSI Flange Ratings; per ASME B16.5; Group 2.8 Materials; Standard Pressure Options: Style B Only: Cast Tubes (3/4 to 12 Inch, CD3MN Duplex SS), and Welded Weld-Neck Flanges (ASTM A182 Gr. F51 Duplex SS)

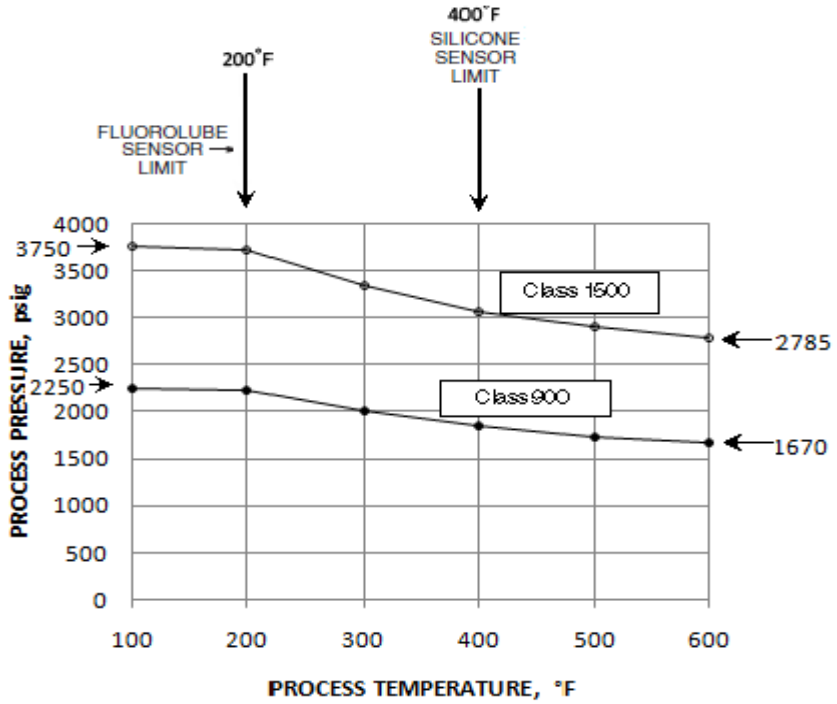


Figure 9. ANSI Flange Ratings; per ASME B16.5; Group 2.8 Materials; High Pressure Options: Style B Only: Cast Tubes (3/4 to 8 Inch, CD3MN Duplex SS) and Welded Weld-Neck Flanges (ASTM A182 Gr. F51 Duplex SS)

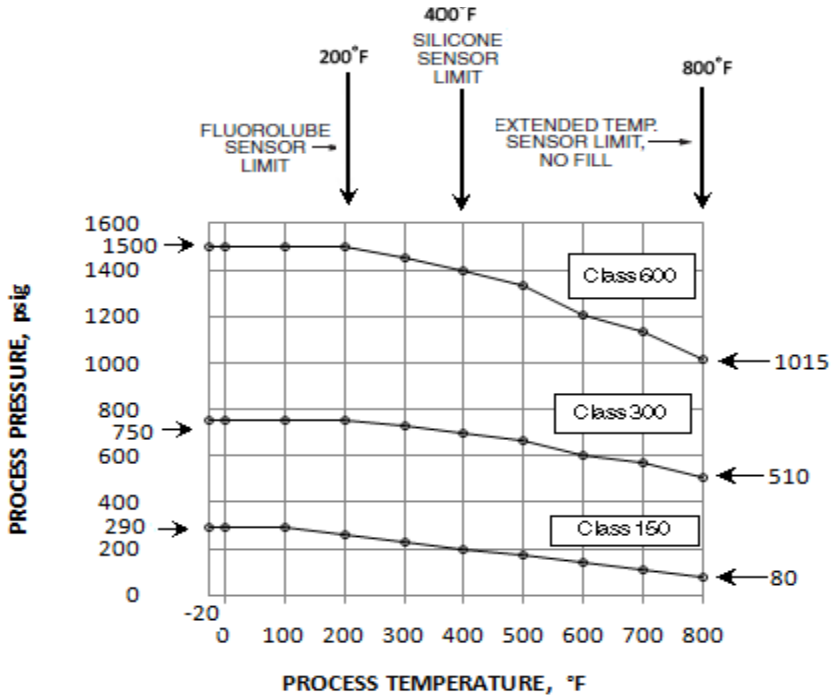


Figure 10. ANSI Flange Ratings; per ASME B16.5; Group 3.8 Materials; Standard Pressure Options: Style B Only: Cast Tubes (3/4 to 12 Inch, CX2MW Nickel Alloy [equivalent to Hastelloy® C-22]) and Welded Weld-Neck Flanges (N06022 [equivalent to Hastelloy® C-22])

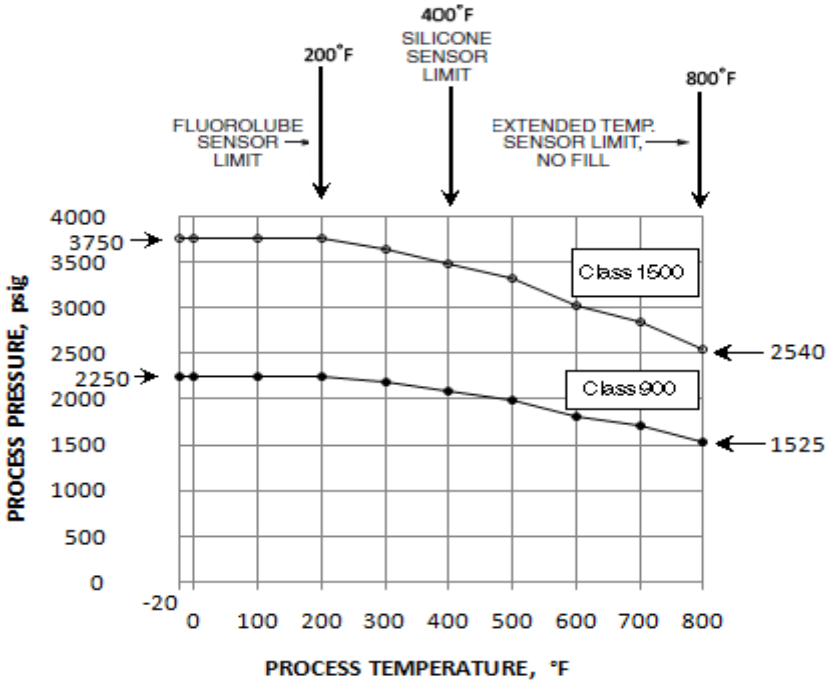


Figure 11. ANSI Flange Ratings; per ASME B16.5; Group 3.8 Materials; High Pressure Options: Style B Only: Cast Tubes (3/4 to 8 Inch, CX2MW Nickel Alloy [equivalent to Hastelloy® C-22]), and Welded Weld-Neck Flanges (N06022 [equivalent to Hastelloy® C-22])

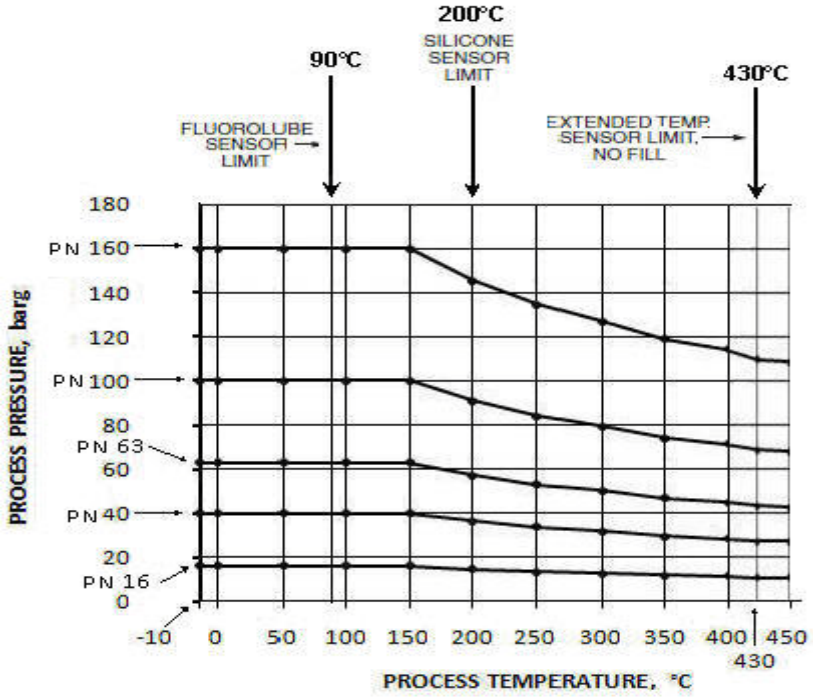


Figure 12. Metric Flange Ratings; per EN 1092-1; Material Group 14E0 Materials:
Style A: Cast Tubes (DN15 to DN100, CF8M) and Flanges (CF8M, 4-inch Class 150 with Welded Slip-On Flanges)
Style B: Cast Tubes (DN15 to DN100, CF8M) and Welded Weld-Neck Flanges (316 SS)

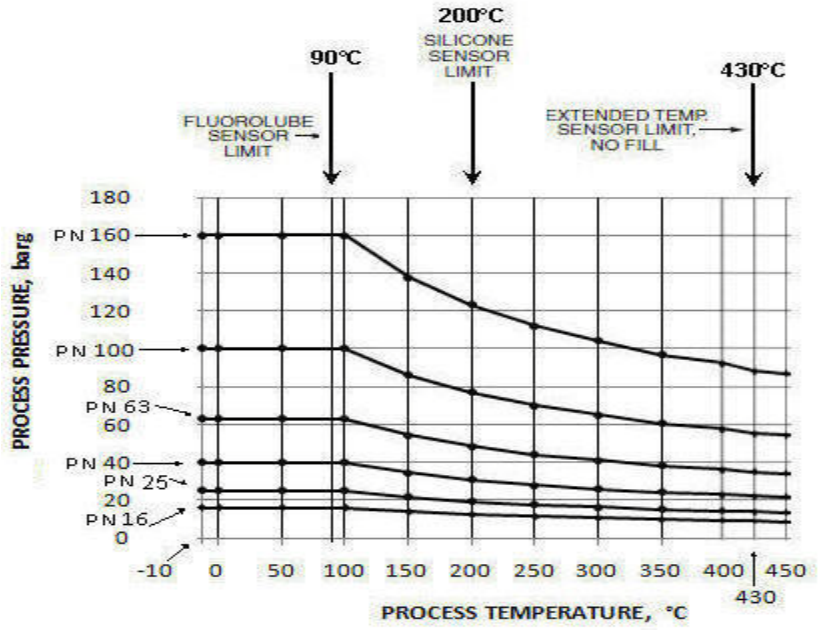


Figure 13. Metric Flange Ratings; per EN 1092-1; Material Group 10E0s:
Style A: Fabricated Tubes (DN150 to DN300, 304 SS) and Welded Weld-Neck Flanges (304 SS)
Style B: Cast Tubes (DN150 to DN300, CF8M) and Welded Weld-Neck Flanges (304 SS)

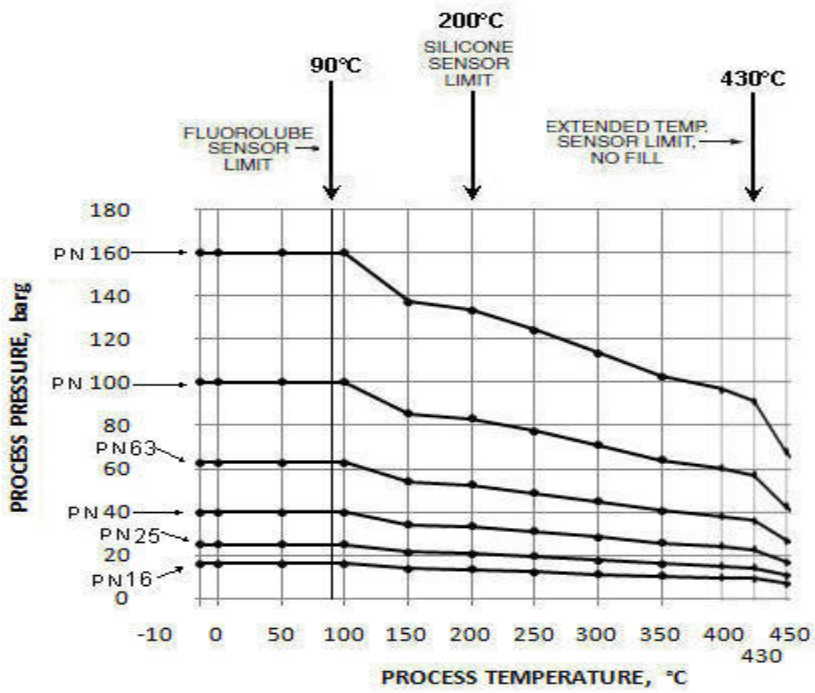


Figure 14. Metric Flange Ratings; per EN 1092-1; Material Group 3E0:
Style A: Fabricated Tubes, (DN150 to DN300, 304 SS) and Welded Weld-Neck Flanges (Carbon Steel)
Style B: Cast Tubes (DN15 to DN300, CF8M) and Welded Weld-Neck Flanges (Carbon Steel)

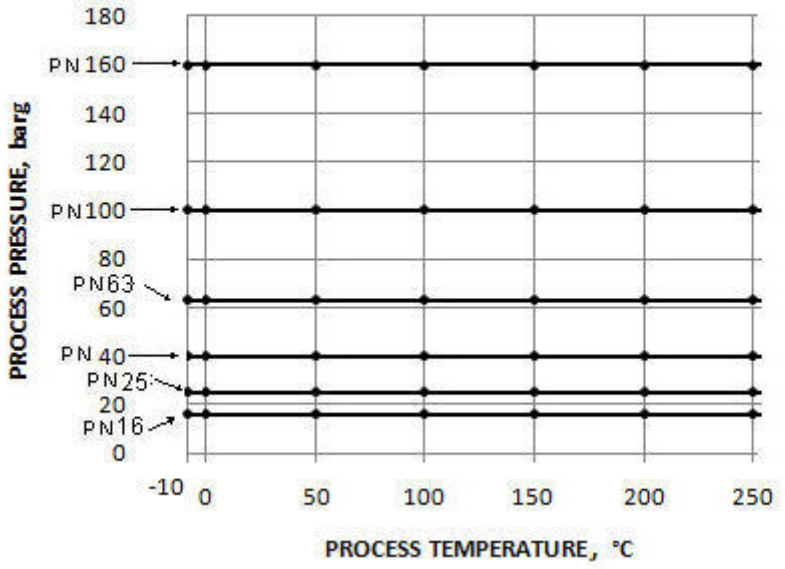


Figure 15. Metric Flange Ratings; per EN 1092-1; Material Group 16E0; Standard Pressure Options:
Style B Only: Cast Tubes, DN15 to DN300 Duplex Materials, and Welded Weld-Neck Flanges

84W Wafer Body Flowmeters

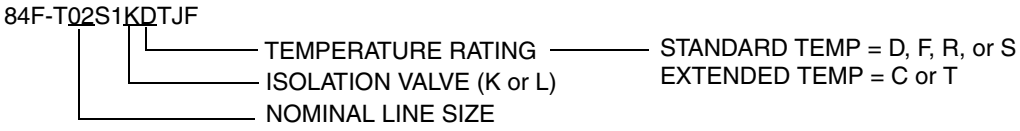
The maximum working pressure (MWP) of the flowtube at 100°F is shown on the data label. The flowmeters are designed to withstand pressure within carbon steel ANSI Class 600 and PN 100 flange ratings. The flowmeters have been designed to withstand the full pressure rating for carbon steel flanges.

84S Sanitary Flowmeters

The maximum working pressure (MWP) of the flowtube at 100°F is shown on the data label. The actual pressure-temperature limit is this value or the pressure-temperature limit of your connections, whichever is less.

Isolation Valves

Flowmeters equipped with an isolation valve have a maximum pressure rating of 1440 psi at 100°F (99 bar at 38°C). Isolation valves used with standard temperature range and with extended temperature range flowmeters are further limited to values shown in Figure 16. The temperature range of your flowmeter is found within the model number on the data label as follows:



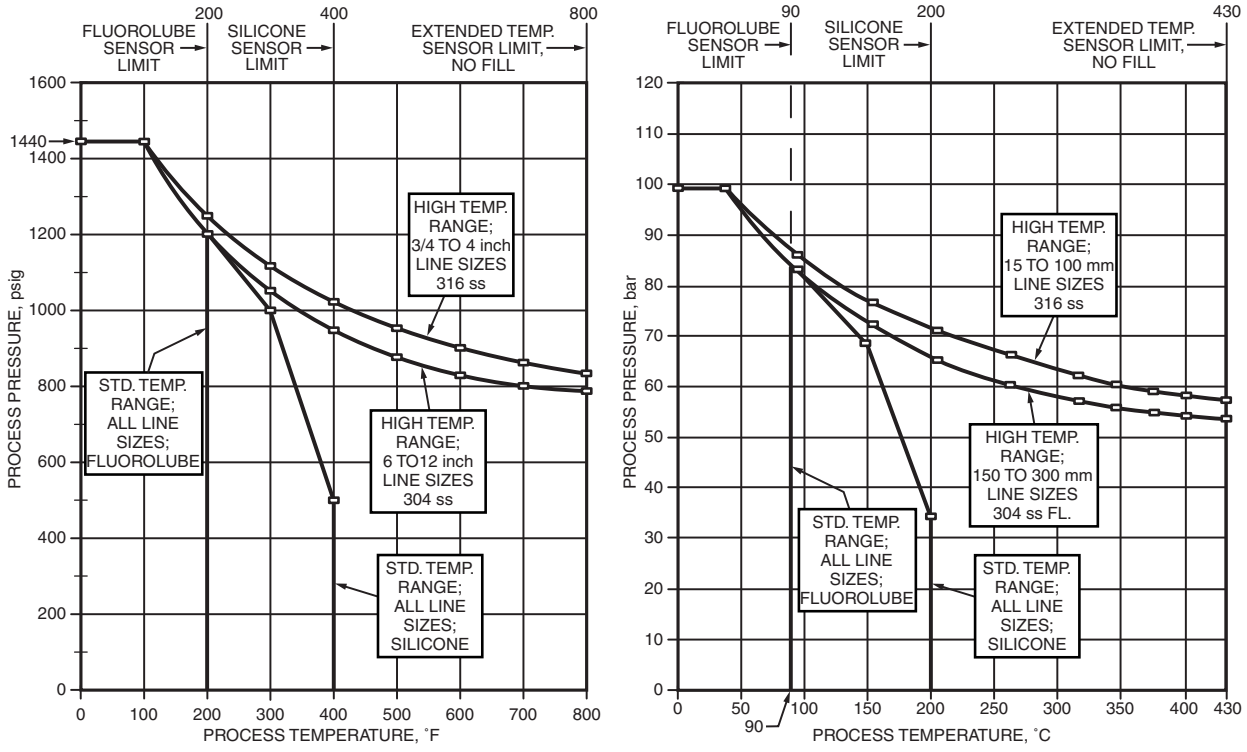


Figure 16. Pressure -Temperature Limits with Isolation Valves in Customary and Metric Units

Flowmeter Materials

Flowmeter Body

The flowmeter body material is shown on the data label.

- CF8M = cast 316 stainless steel body and shedder per ASTM™ A351 grade CF8M
- 304 SS = welded pipe and flange body with 304 ss pipe and shedder per ASTM 312 and 304 ss flanges per ASTM 182
- 304/A105 = welded pipe and flange body with 304 ss pipe and shedder per ASTM 312 and carbon steel flanges per ASTM A105
- CW2M = cast Nickel alloy (equivalent to Hastelloy® C-4C(a)) body and shedder per ASTM A494-CW2M
- 316 SS = AISI Type 316 stainless steel.
- CF8M (316 SS) Cast Body/Shedder and Type 316 SS Flanges (Line Sizes 3Q to 04) and Type 304 SS Flanges (Line Sizes 06 to 12)
- CF8M (316 SS) Cast Body/Shedder and A105 Carbon Steel Flanges
- Duplex SS Cast Body/Shedder per ASTM A995, Grade 4A, CD3MN and Duplex SS Flanges per A 182 Grade F51
- CX2MW Cast Nickel Alloy Body/Shedder and Nickel Alloy N06022 Flanges(a)

(a) Hastelloy® is a registered trade mark of Haynes International Inc.

Sensor Material, Fill Fluid, and Temperature Range

The sensor diaphragm material, fill fluid, and temperature range for the 84F and 84W Flowmeters are found within the model number on the data label as follows:

Table 2. Sensor Material, Fill Fluid, and Temperature Range

Code	Diaphragm Material	Fill Fluid	Temperature Range
D	Nickel alloy CX2MW (equivalent to Hastelloy® C-22) 276	Fluorolube	0 to 200°F (-20 to +90°C)
F	316L Stainless Steel	Fluorolube	0 to 200°F (-20 to +90°C)
R	Nickel alloy CX2MW (equivalent to Hastelloy® C-22) 276	Silicone (DC550)	0 to 400°F (-20 to +200°C)
S	316L Stainless Steel	Silicone (DC550)	0 to 400°F (-20 to +200°C)
C	Nickel alloy CX2MW (equivalent to Hastelloy® C-22) 276	Unfilled	400 to 800 °F (200 to 430°C)

Table 2. Sensor Material, Fill Fluid, and Temperature Range (Continued)

Code	Diaphragm Material	Fill Fluid	Temperature Range
T	316L Stainless Steel Type CF3M	Unfilled	400 to 800 °F (200 to 430°C)
A	Nickel alloy CW2M (equivalent to Hastelloy® C-22)	None	400 to 700 °F (200 to 370°C)
B	Stainless Steel Type CF3M	None	400 to 700 °F (200 to 370°C)
E	Nickel alloy CW2M (equivalent to Hastelloy® C-22)	None	400 to 800 °F (200 to 430°C)
G	Stainless Steel Type CF3M	None	400 to 800 °F (200 to 430°C)

(a) Hastelloy® is a registered trade mark of Haynes International Inc.

The sensor diaphragm for the 84S Flowmeter is 316 Stainless Steel (meets both 316 and 316L properties); the fill fluid is Silicone (DC550); the temperature range is 0 to 400°F (-20 to +200°C).

Isolation Valve

The isolation valve materials are as follows:

Valve Body: ASTM A351 grade CF8M stainless steel
Valve Ball: AISI Type 316 stainless steel
Valve Seats: Glass Filled ptfe for standard temperature flowmeters
Graphite for extended temperature flowmeters

Sensor Replacement

CAUTION

For certified explosionproof/flameproof units, take special care not to scar, mar, ding, or dent the surface of the sensor stem during assembly. This is critical to the integrity of the flameproof surface finish.

WARNING

To prevent injury from escaping process fluids, to maintain agency certification of this product, and to prove the integrity of the parts and workmanship in containing process pressure, a hydrostatic pressure test must be performed after the sensor replacement is complete. The flowmeter must hold the appropriate pressure from Table 3 for one minute (10 minutes to meet PED requirements) without leaking.

Table 3. Maximum Test Pressure

Model	End Connection	Test Pressure		
		316 SS (1.5X MWP)	**Duplex SS,** Nickel alloy CX2MW (equivalent to Hastelloy® C-22(a)) **(1.5X MWP)**	**Carbon Steel (MWP)**
84F	ANSI Class 150	413 psi	435 psi	428 psi
	ANSI Class 300	1080 psi	1125 psi	1110 psi
	ANSI Class 600	2160 psi	2250 psi	2220 psi
	ANSI Class 900	3240 psi	3375 psi	3330 psi
	ANSI Class 1500	5400 psi	5625 psi	5558 psi
	PN 16	2.4 Mpa	2.4 Mpa	2.4 Mpa
	PN 25	3.8Mpa	3.8Mpa	3.8Mpa
	PN 40	6.0 Mpa	6.0 Mpa	6.0 Mpa
	PN 63	9.5 Mpa	9.5 Mpa	9.5 Mpa
	PN 100	15.0 Mpa	15.0 Mpa	15.0 Mpa
	PN 160	24.0 Mpa	24.0 Mpa	24.0 Mpa
84W	All	15 MPa (2250 psi)		

(a) Hastelloy® is a registered trademark of Haynes International Inc.

2. Installation

Reference Documents

The following documents are available on your CD_ROM.

Table 4. Reference Documents

Document Number	Document Description
Dimensional Prints	
DP 019-120	84F Flanged Body - Single Measurement Configuration
DP 019-121	84F Flanged Body - Dual Measurement Configuration
DP 019-122	84W Wafer Body
DP 019-123	84S Sanitary
DP 019-125	84F (Style B) Flanged Body - Single Measurement Configuration
DP 019-126	84F (Style B) Flanged Body - Dual Measurement Configuration
Instructions	
B0800AJ	Ensuring Premium Performance with Foxboro Vortex Flowmeters
MI 019-177	84 Vortex Flowmeter FM and CSA Connection Diagrams
MI 019-179	Flow Products Safety Information[(a)]
MI 019-202	84F-T, 84F-U, 84W-T, and 84W-U Vortex Flowmeters
MI 019-205	84S-T and 84S-U Sanitary Vortex Flowmeter
MI 019-211	84F-L, 84F-M, 84W-L, and 84W-M Low Power Vortex Flowmeters
MI 019-214	84S-L and 84S-M Low Power Sanitary Vortex Flowmeters
MI 020-501	PC50 Intelligent Feld Device Tool (Installation and Parts List)
MI 020-520	PC50 Intelligent Field Device Tool with Advanced DTM Library (Operation Using HART Protocol)
Parts Lists (includes model code interpretation)	
PL 008-714	84F Flanged Body and 84W Wafer Body Flowmeters
PL 008-753	84 (Style B) Flanged Body Flowmeters
PL 008-717	84S Sanitary Flowmeter

(a) Available in many languages via our Web site. For help downloading this document, contact our Global Customer Service Center.

Piping Considerations and Mounting Position

Refer to the pocket-size bulletin, “Ensuring Premium Performance with Foxboro Intelligent Vortex Flowmeters” shipped with your flowmeter. This provides recommended flowmeter mounting position relative to the type of fluid.

Mechanically Installing the Flowmeter Body

84F - Flanged Body

1. Gaskets are required and must be supplied by the user. Select a gasket material suitable for the process.
2. Insert gaskets between the body of the flowmeter and adjacent flanges. See Figure 17. Position the gaskets so that the ID of each gasket is centered on the ID of the flowmeter and adjacent piping.

! CAUTION

Verify that the ID of the gaskets is larger than that of the flowmeter bore and pipe and that the gaskets do not protrude into the meter entrance or exit. Protrusion into the flowstream has an adverse effect on performance.

! CAUTION

Gaskets do not prevent flanges from being wetted by process fluids.

NOTE

When you install new flanges in the process piping and use the meter as a gauge to set the flanges, protect the inside diameter of the flowmeter from weld splatter. Install a solid sheet of gasketing at each end of the meter during welding. Remove this sheet and install the flange gaskets after welding. Remove any splatter in either the pipe or the meter as it could affect flowmeter accuracy.

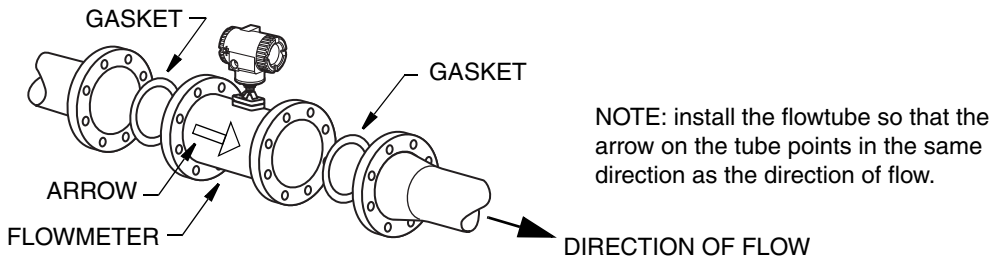


Figure 17. 84F Flowmeter Body Installation

3. Visually inspect for concentricity (centering and alignment) of mating flanges.
4. Tighten bolts in accordance with conventional flange bolt tightening practice (that is, incremental and alternate tightening of bolts).

84W - Wafer Body

For optimal performance, the wafer body flowmeter should be centered with respect to the adjoining pipe. Normally, this requires the use of centering fixtures that are supplied with the meter.

NOTE

Centering fixtures are not required for meters with ANSI Class 150 flanges.

There are two sets of centering fixtures, one for each side.

1. See Figure 18. Insert the first stud through the downstream flange at one of the lower holes, through two hex-nut spacers, and then through the upstream flange. Place the nuts on both ends of the stud, but do not tighten.
2. Using the remaining hex-nut spacers, repeat Step 1 at the lower hole adjacent to the first.
3. Set the flowmeter between the flanges. For centering with the hex-nut spacers, rotate spacers to the thickness that centers the meter.

NOTE

By rotating the hex-nut spacers to the correct thickness, you can center the meter to any type of flange.

4. Gaskets are required and must be supplied by the user. Select a gasket material suitable for the process fluid.
5. Insert gaskets between the body of the flowmeter and adjacent flanges. Position the gaskets so that the ID of each gasket is centered on the ID of the flowmeter and adjacent piping.

CAUTION

Verify that the ID of the gaskets is larger than that of the flowmeter bore and pipe and that the gaskets do not protrude into the meter entrance or exit. Protrusion into the flowstream has an adverse effect on performance.

NOTE

If welding the flanges to the process piping is required, protect the flowmeter from weld splatter, which could affect flowmeter accuracy. A solid sheet of gasketing should be installed at each end of the meter during welding. Remove this sheet and install the flange gaskets after welding.

6. Visually inspect for concentricity (centering and alignment) of mating flanges.
7. Install the rest of the studs and nuts and tighten the nuts in accordance with conventional flange bolt tightening practice (that is, incremental and alternate tightening of bolts). **If flanges cannot be properly aligned, align the meter with the upstream flange rather than the downstream flange.**

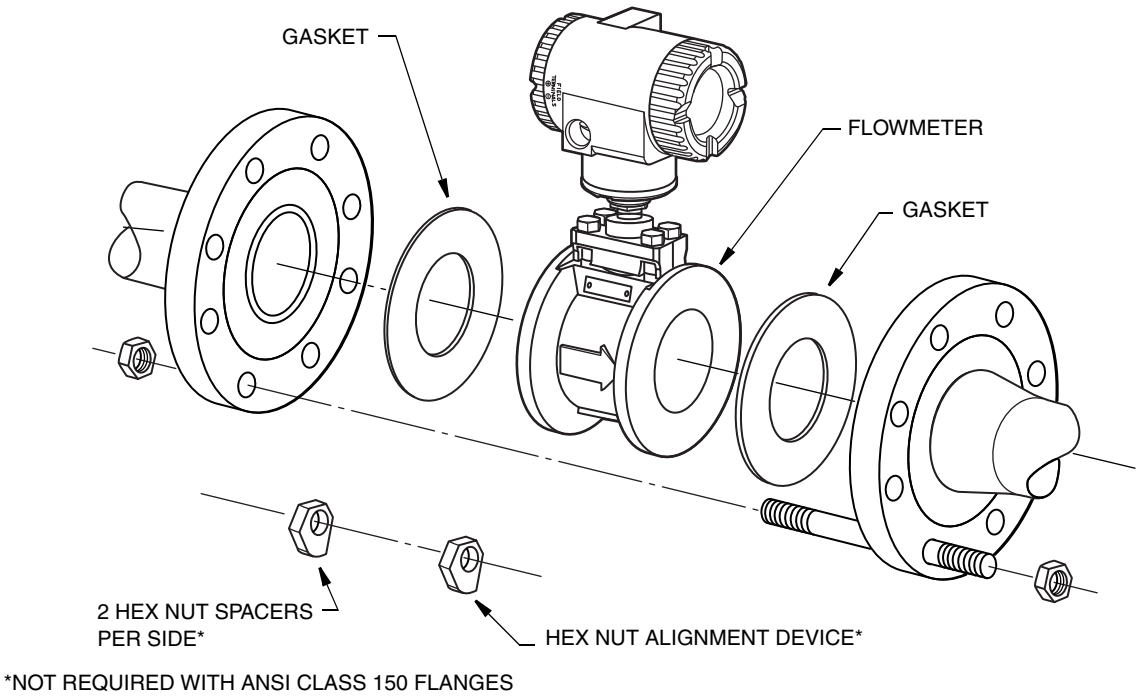


Figure 18. 84W Flowmeter Body Centering

84S - Sanitary Body

Firmly secure the cable that connects the flowmeter body to the electronic housing. The support should be approximately 30 cm (12 in) from the flowmeter body. A loose cable may cause wear at the cable connection and can result in signal noise. The temperature limit of the cable is 105°C (220°F). Do **not** support the cable on a surface exceeding this temperature. See Figure 19.

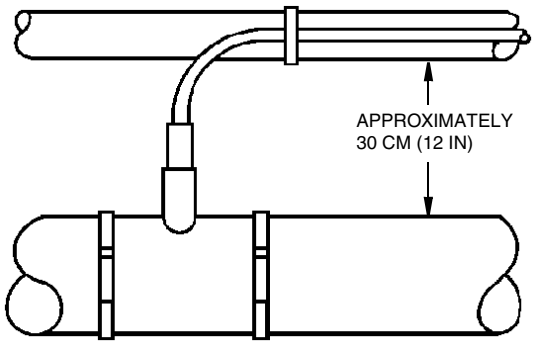


Figure 19. 84S Flowmeter Body Cable Support

The flowmeter body has six different end connection possibilities. The end connections on your flowmeter body were specified as part of your order. All end connections are welded to the flowmeter body. The mating end connections, gaskets, and clamps are supplied by you, the user.

WARNING

The maximum pressure limit of the flowmeter is 1.9 MPa (275 psig) or the limit of the end connection used, whichever is less.

Mounting the Remote Electronics Housing

84F and 84W

If you specified a remote electronics housing on your order, your flowmeter body and electronics housing are connected by a signal cable. Mount the housing to a wall or to a DN50 or 2-inch pipe using the mounting bracket assembly provided. It may be easier to secure the mounting bracket to the wall without the housing attached. To do this, use the following procedure:

1. Remove the jam nut under the bracket.
2. Raise the housing until you can slide the cable through the cutout in the bracket.
3. Lay the housing aside and secure the mounting bracket to the wall.
4. Reverse steps 2 and 1.

If the cable must be disconnected (to shorten the cable, run the cable through conduit, or for some other reason), you **must** disconnect the cable at the flowmeter (junction box) end. You cannot disconnect the cable at the electronics housing end because it has been epoxied into the metal connector. It is labeled “Factory Sealed / Electronics End / Do Not Remove.” If the cable must be shortened, shorten the electronic housing end per the procedure in MI 019-202.

To run the cable through conduit, the -T option must have been purchased. This option facilitates a standard 1/2 NPT conduit connection at both the housing end and the flowmeter end.

1. Disconnect the cable at the flowmeter (junction box) end.
2. Slide the remote conduit adapter (part number K0149LE), longer end first, up the cable and attach it at the housing end.
3. Slide the conduit and fittings over the cable.
4. Slide a second remote conduit adapter, shorter end first, onto the cable and attach it at the junction box end.

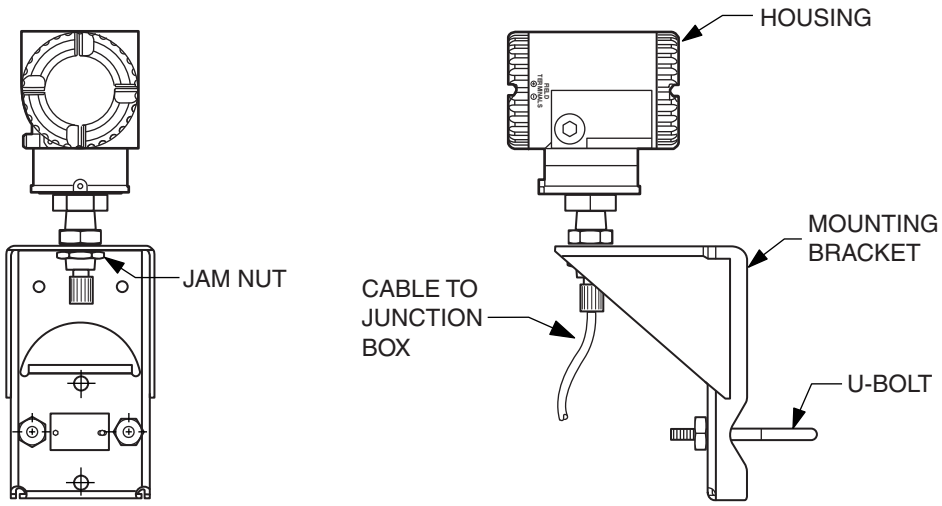


Figure 20. Mounting an 84 Remote Electronics Housing

84S

The remote electronics housing can be mounted to a vertical or horizontal DN 50 or 2-in pipe using the mounting bracket and U-bolt supplied. To mount the housing to a horizontal pipe, turn the U-bolt 90 degrees from the position shown in Figure 20.

The housing can be surface mounted by securing the mounting bracket to a wall using the U-bolt mounting holes. It may be easier to secure the mounting bracket to the wall without the housing attached. To do this, use the following procedure:

1. Remove the jam nut under the bracket.
2. Raise the housing until you can slide the cable through the cutout in the bracket.
3. Lay the housing aside and secure the mounting bracket to the wall.
4. Reverse steps 2 and 1.

Setting the Write Protect Jumper

Your transmitter has write protection capability which meets the security requirements of ISA-S84.01-1986 for use in safety shutdown systems. This means that the local display and remote electronics can be prevented from writing to the electronics. Write protection is set by moving a jumper that is located in the electronics compartment behind the display. To activate write protection, remove the display and remove the jumper or place it in the 'protect' position. In the 'write' position, writing to certain functions can be limited by password protection. See "Password" on page 36.

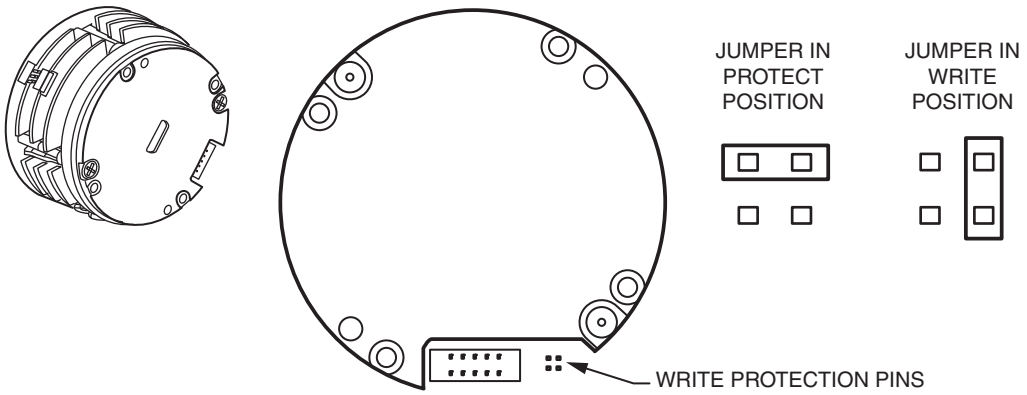


Figure 21. Write Protect Jumper

Positioning the Housing

The flowmeter housing can be rotated up to one full turn in the counterclockwise direction when viewed from above for optimum access to adjustments, display, or conduit connections. Housings have either an anti-rotation screw or a retention clip that prevent the housing from being rotated beyond a safe depth of housing/sensor thread engagement.

- If your housing has an anti-rotation screw, engage the anti-rotation screw until it touches the cup and back it off 1/8th turn. It is important that the screw is not touching the cup. Fill the screw recess with red lacquer (Foxboro part number X0180GS or equivalent). the housing may then be rotated up to one full turn counterclockwise for optimum access.
- If your housing has a retention clip, insert the clip over the boss in the housing neck so that the hole in the clip is aligned with the hole in the boss. Install the screw but do not tighten. Rotate the housing up to one full turn counterclockwise for optimum access. Tighten the retention clip screw and fill the screw recess with red lacquer (Foxboro part number X0180GS or equivalent). The housing can still be rotated for optimum access.

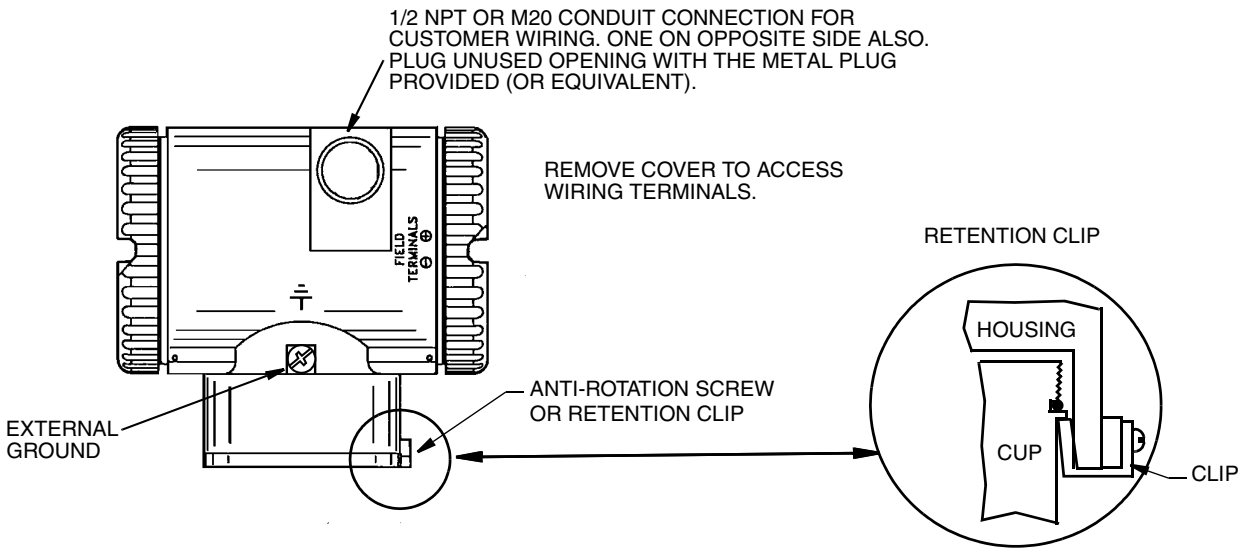


Figure 22. Anti-Rotation Screw and Retention Clip

Field Termination Wiring

NOTE

The wiring installation must conform to local code requirements. Also, for FM and CSA installations, refer to MI 019-177; for ATEX and IECEx installations, refer to MI 019-179.

The electronics housing has two conduit connections to allow access from either side of the housing. See Figure 23. These connections are 1/2 NPT or M20. Make sure to use the correct threaded devices when making these connections.

The housing comes with a safety-agency approved threaded metal plug in one of the conduit holes and a plastic plug in the other. After the conduit or cable gland is connected, plug the unused hole with the metal plug using thread sealant.

For access to the field terminals, remove the cover from the field terminals compartment as shown in Figure 23. Note that the embossed letters **FIELD TERMINALS** identify the proper compartment. Remove the field terminal compartment cover to make field wiring connections. When replacing the cover, turn the cover to seat the O-ring into the housing and continue to hand tighten until the cover contacts the housing metal-to-metal.

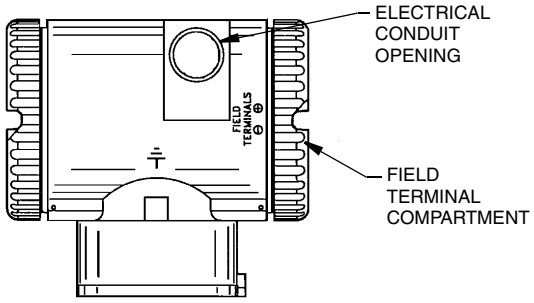


Figure 23. Electronics Housing

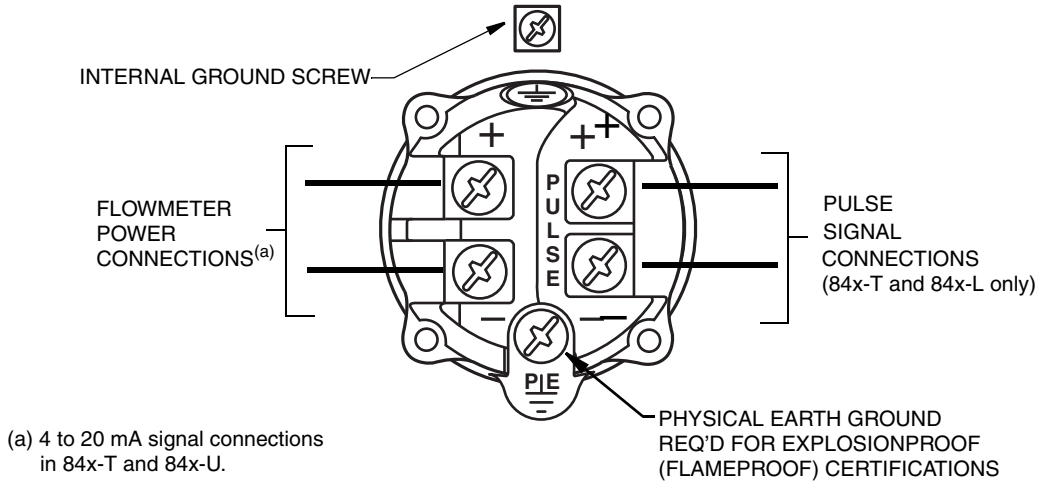


Figure 24. Identification of Field Terminals

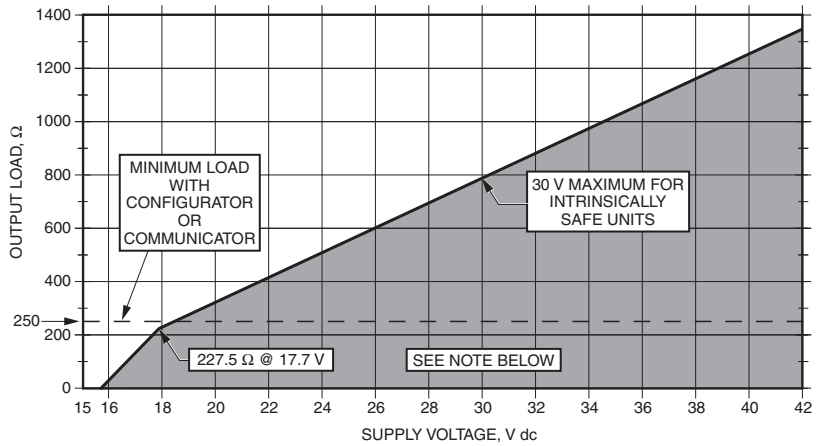
Wiring an 84x-T and 84x-U Flowmeter

— NOTE

To use a 4-20 mA output signal, your flowmeter must be configured for **4-20 mA**.

When wiring a flowmeter with 4 to 20 mA output signal, the supply voltage and loop load must be within specified limits. The supply output load vs. voltage relationship is shown in Figure 25.

Any combination of supply voltage and loop load resistance in the shaded area can be used. To determine the loop load resistance (flowmeter output load), add the series resistance of each component in the loop, excluding the flowmeter. The power supply must be capable of supplying 22 mA of loop current.



NOTE:
THE FLOWMETER FUNCTIONS WITH AN OUTPUT LOAD LESS THAN 250 Ω PROVIDED THAT A PC-BASED CONFIGURATOR OR HART COMMUNICATORIS NOT CONNECTED TO IT. CONNECTING A PC-BASED CONFIGURATOR OR HART COMMUNICATOR WHILE OPERATING BELOW A 250 Ω LOAD MAY CAUSE OUTPUT DISTURBANCE AND/OR COMMUNICATION PROBLEMS.

Figure 25. Supply Voltage and Loop Load

Examples:

1. For a loop load resistance of 300 Ω, the supply voltage can be any value from 19.1 to 42 V dc (19.1 to 30 V dc for an intrinsically safe flowemter).
2. For a supply voltage of 24 V dc, the loop load resistance can be any value from 250 to 520 Ω (zero to 520 Ω without a HART Communicator or PC-Based Configurator connected to the flowmeter).

To wire one or more flowmeters to a power supply, proceed with the following steps.

1. Remove the cover from the field terminals compartment.
2. Run signal wires (0.50 mm^2 or 20 AWG, typical) through one of the flowmeter conduit connections. Use twisted pair to protect the 4 to 20 mA output and/or remote communications from electrical noise. Maximum recommended length for signal wires is 1800 m (6000 ft)

— NOTE

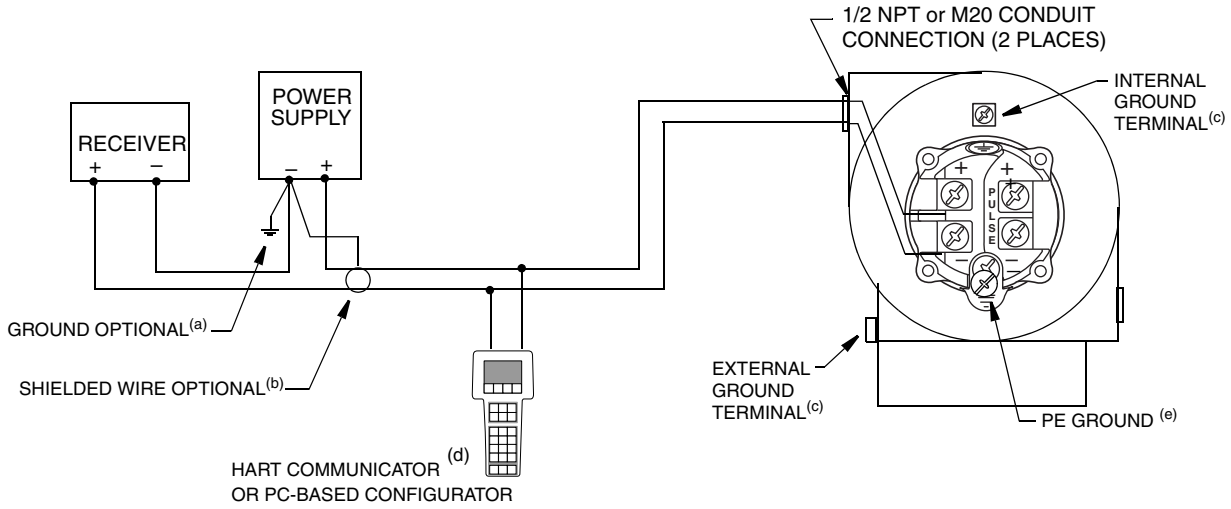
Do **not** run flowmeter wires in same conduit as mains (ac power) wires.

3. If shielded cable is used, ground the shield at the negative terminal of the power supply. Do **not** ground the shield at the flowmeter.
4. Plug the unused conduit connection with the 1/2 NPT or M20 metal plug provided (or equivalent). To maintain specified explosionproof and dust-ignitionproof protection, the plug must engage a **minimum** of five full threads.
5. The flowmeter is equipped with an internal and external ground connection. Connect a ground wire to either terminal in accordance with local practice.

CAUTION

If the loop is grounded, it is preferable to do so at the negative terminal of the dc power supply. To avoid errors resulting from earth loops or the possibility of short-circuiting groups of instruments in a loop, there should be only one earth in a loop.

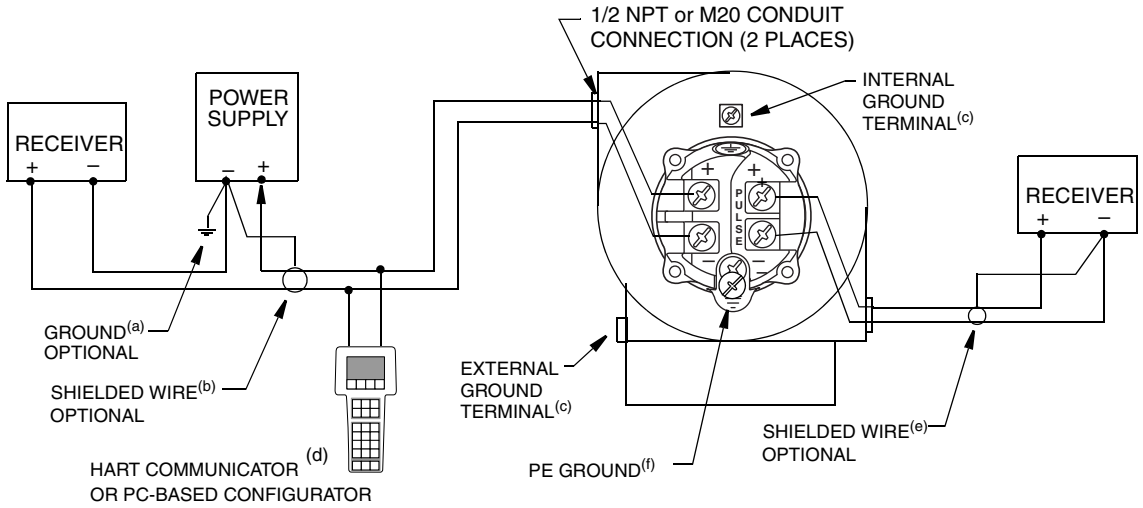
6. Connect the power supply and receiver loop wires to the "+" and "–" terminal connections.
7. Connect receivers (such as controllers, recorders, indicators) in series with power supply and flowmeter as shown in Figure 26.
8. Install the cover onto the flowmeter. Turn the cover to seat the O-Ring into the housing and continue to hand tighten until the cover contacts the housing metal-to-metal. If cover locks are present, secure the cover locks.



(a) GROUNDING THE LOOP AT THE NEGATIVE TERMINAL OF THE POWER SUPPLY IS RECOMMENDED BUT NOT REQUIRED.
(b) IF SHIELDED WITE IS USED, TERMINATE THE SHIELD AT THE NEGATIVE TERMINAL OF THE POWER SUPPLY.
(c) THE TRANSMITTER IS EQUIPPED WITH AN INTERNAL AND EXTERNAL GROUND CONNECTION.
CONNECT A GROUND WIRE TO EITHER TERMINAL IN ACCORDANCE WITH LOCAL PRACTICE.
(d) THERE MUST BE AT LEAST 250 Ω TOTAL RESISTANCE BETWEEN THE PC-BASED CONFIGURATOR OR THE HART COMMUNICATOR AND THE POWER SUPPLY.
(e) REQUIRED FOR EXPLOSIONPROOF (FLAMEPROOF) APPLICATIONS

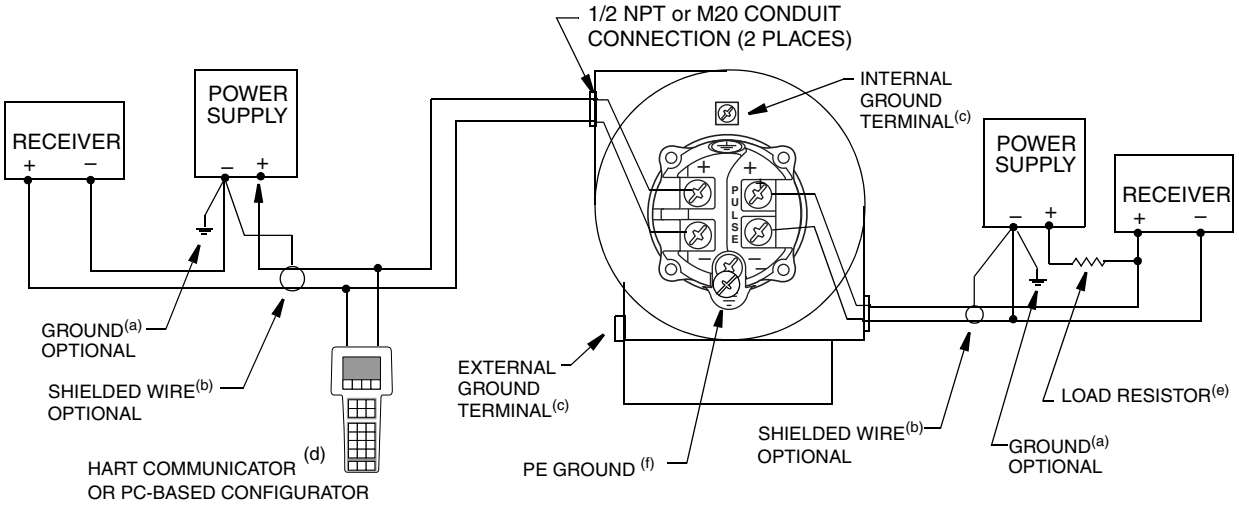
Figure 26. Loop Wiring 4 to 20 mA Output Flowmeters

Two separate loops are required when using the pulse output on an 84F-T, 84W-T, or 84S-T Flowmeter with the 4 to 20 mA or digital signal. Each loop requires its own power supply. Figure 27 shows the connections with a transistor switch (sinking) counter input with receiver supplied power; Figure 28, with a transistor switch (sinking) counter input and external power supply and pull-up resistor; and Figure 29 with a transistor switch (sourcing) counter input and external power supply and pull-up resistor.



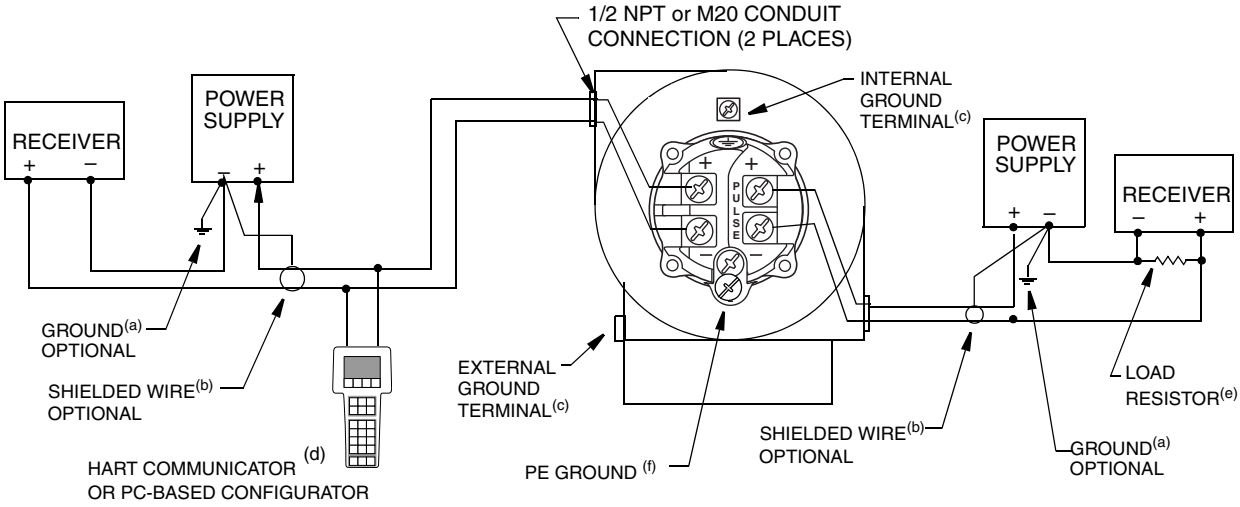
(a) GROUNDING THE LOOP AT THE NEGATIVE TERMINAL OF THE POWER SUPPLY IS RECOMMENDED BUT NOT REQUIRED.
(b) IF SHIELDED WITE IS USED, TERMINATE THE SHIELD AT THE NEGATIVE TERMINAL OF THE POWER SUPPLY.
(c) THE TRANSMITTER IS EQUIPPED WITH AN INTERNAL AND EXTERNAL GROUND CONNECTION.
CONNECT A GROUND WIRE TO EITHER TERMINAL IN ACCORDANCE WITH LOCAL PRACTICE.
(d) THERE MUST BE AT LEAST 250 Ω TOTAL RESISTANCE BETWEEN THE PC-BASED CONFIGURATOR OR THE HART COMMUNICATOR AND THE POWER SUPPLY.
(e) IF SHIELDED WITE IS USED, TERMINATE THE SHIELD AT THE NEGATIVE TERMINAL OF THE RECEIVER.
(f) REQUIRED FOR EXPLOSIONPROOF (FLAMEPROOF) APPLICATIONS.

Figure 27. Wiring an 84F-T or 84W-T Flowmeter with a Pulse Output Transistor Switch (sinking) Counter Input with Receiver Supplied Power



(a) GROUNDING THE LOOP AT THE NEGATIVE TERMINAL OF THE POWER SUPPLY IS RECOMMENDED BUT NOT REQUIRED.
(b) IF SHIELDED WITE IS USED, TERMINATE THE SHIELD AT THE NEGATIVE TERMINAL OF THE POWER SUPPLY.
(c) THE TRANSMITTER IS EQUIPPED WITH AN INTERNAL AND EXTERNAL GROUND CONNECTION.
CONNECT A GROUND WIRE TO EITHER TERMINAL IN ACCORDANCE WITH LOCAL PRACTICE.
(d) THERE MUST BE AT LEAST 250 Ω TOTAL RESISTANCE BETWEEN THE PC-BASED CONFIGURATOR
OR THE HART COMMUNICATOR AND THE POWER SUPPLY.
(e) MAXIMUM PULSE OUTPUT CURRENTIS 20 mA. LOAD RESISTOR MUST BE SIZED ACCORDINGLY.
(f) REQUIRED FOR EXPLOSIONPROOF (FLAMEPROOF) APPLICATIONS.

Figure 28. Wiring an 84F-T or 84W-T Flowmeter with a Pulse Output Transistor Switch (sinking) Counter Input with External Power Supply and Pull-Up Resistor



(a) GROUNDING THE LOOP AT THE NEGATIVE TERMINAL OF THE POWER SUPPLY IS RECOMMENDED BUT NOT REQUIRED.
(b) IF SHIELDED WITE IS USED, TERMINATE THE SHIELD AT THE NEGATIVE TERMINAL OF THE POWER SUPPLY.
(c) THE TRANSMITTER IS EQUIPPED WITH AN INTERNAL AND EXTERNAL GROUND CONNECTION.
CONNECT A GROUND WIRE TO EITHER TERMINAL IN ACCORDANCE WITH LOCAL PRACTICE.
(d) THERE MUST BE AT LEAST 250 Ω TOTAL RESISTANCE BETWEEN THE PC-BASED CONFIGURATOR OR THE HART COMMUNICATOR AND THE POWER SUPPLY.
(e) MAXIMUM PULSE OUTPUT CURRENTIS 20 mA. LOAD RESISTOR MUST BE SIZED ACCORDINGLY.
(f) REQUIRED FOR EXPLOSIONPROOF (FLAMEPROOF) APPLICATIONS.

Figure 29. Wiring an 84F-T or 84W-T Flowmeter with a Pulse Output Transistor Switch (sourcing) Counter Input with External Power Supply and Pull-Up Resistor

Wiring an 84x-L and 84x-M Flowmeter

For proper operation, a minimum of 10 V dc must be maintained at the flowmeter terminals. For HART communications, a 250 Ω load resistor must be present in the power supply loop and a supply voltage of 12.5 Vdc minimum must be maintained.

To wire one or more flowmeters to a power supply, proceed with the following steps.

1. Remove the cover from the field terminals compartment.
2. Run signal wires (0.50 mm^2 or 20 AWG, typical) through one of the flowmeter conduit connections. Use twisted pair to protect the remote communications from electrical noise. Maximum recommended length for signal wires is 1800 m (6000 ft)

— NOTE

Do **not** run flowmeter wires in same conduit as mains (ac power) wires.

3. If shielded cable is used, ground the shield at the negative terminal of the power supply. Do **not** ground the shield at the flowmeter.
4. Plug the unused conduit opening with the 1/2 NPT or M20 metal plug provided (or equivalent). To maintain specified explosionproof and dust-ignitionproof protection, plug must be engaged a minimum of five full threads for 1/2 NPT connections; seven full threads for M20 connections.

5. The flowmeter is equipped with an internal and external ground connection. Connect a ground wire to either terminal in accordance with local practice.

CAUTION

If the loop is grounded, it is preferable to do so at the negative terminal of the dc power supply. To avoid errors resulting from earth loops or the possibility of short-circuiting groups of instruments in a loop, there should be only one earth in a loop.

6. Connect the power supply wires to the "+" and "–" terminal connections.
7. Install the cover onto the flowmeter. Turn the cover to seat the O-Ring into the housing and continue to hand tighten until the cover contacts the housing metal-to-metal. If cover locks are present, secure the cover locks.
8. If wiring additional flowmeters to the same power supply, repeat Steps 1 through 8 for each additional flowmeter.
9. A HART Communicator or PC-based Configurator can be connected in the loop between the flowmeter and the power supply as shown in Figure 26. Note that a 250 Ω resistor must separate the power supply from the HART Communicator or PC-Based Configurator.

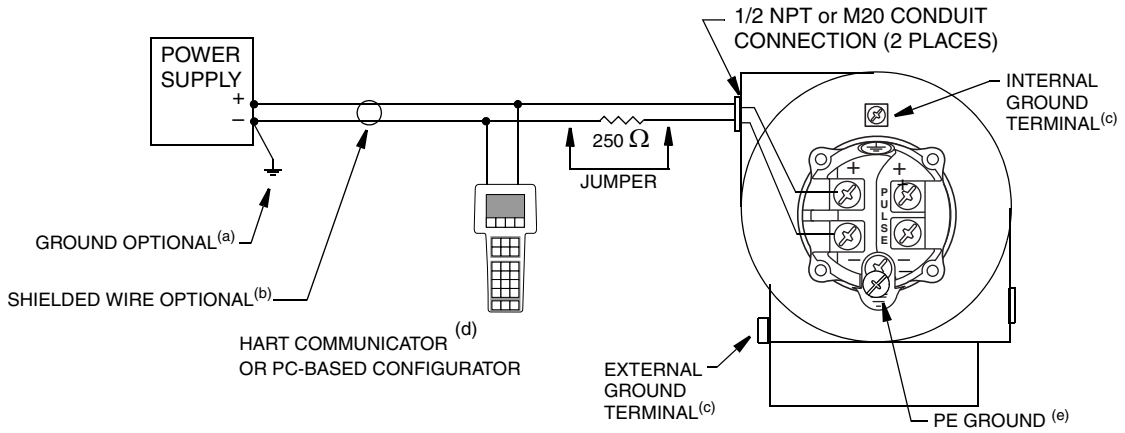
There are three methods to wire the flowmeter depending on which outputs are used.

2-Wire Method

This method is preferred for a local display and/or a HART communication output. For pulse output, see "4-Wire Method" on page 34.

If HART communication is required, the 250 Ω, 12.5 V dc requirements must be met.

If HART communication is required only for configuration or intermittent data collection, a shorting jumper can be installed as shown. In that way HART communication is available with the jumper removed but the flowmeter can work down to the 10 V dc minimum with the jumper installed.



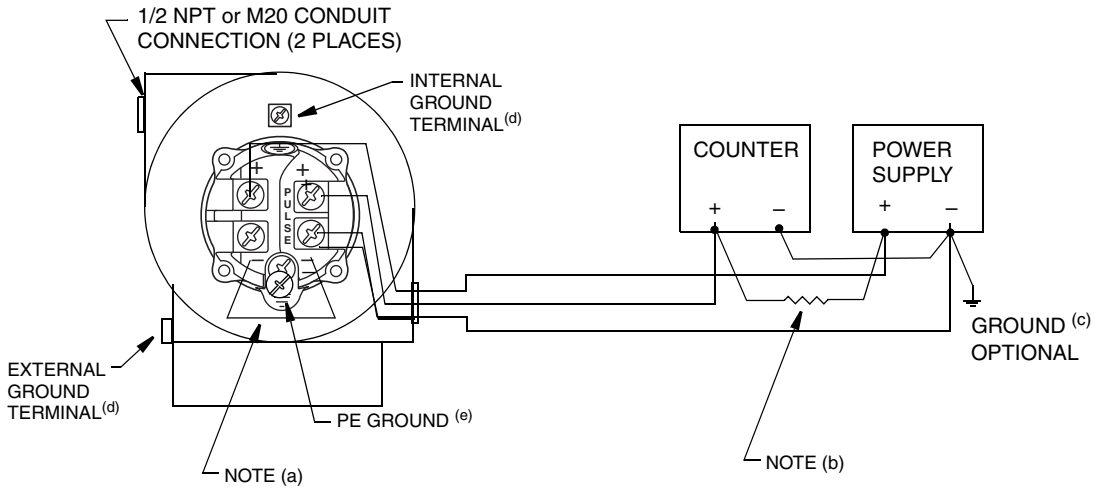
(a) GROUNDING THE LOOP AT THE NEGATIVE TERMINAL OF THE POWER SUPPLY IS RECOMMENDED BUT NOT REQUIRED.
(b) IF SHIELDED WIRE IS USED, TERMINATE THE SHIELD AT THE NEGATIVE TERMINAL OF THE POWER SUPPLY.
(c) THE TRANSMITTER IS EQUIPPED WITH AN INTERNAL AND EXTERNAL GROUND CONNECTION.
CONNECT A GROUND WIRE TO EITHER TERMINAL IN ACCORDANCE WITH LOCAL PRACTICE.
(d) FOR HART COMMUNICATIONS, A 250 Ω RESISTOR MUST BE PRESENT IN THE POWER SUPPLY LOOP AND A SUPPLY.
VOLTAGE OF 12.5 V dc MINIMUM MUST BE MAINTAINED.
(e) REQUIRED FOR EXPLOSIONPROOF (FLAMEPROOF) APPLICATIONS

Figure 30. Loop Wiring (2-Wire Method)

3-Wire Method

This method is used for a local display and/or pulse output. This method is **not** recommended for the HART communications output because this wiring method can interfere with HART communications at certain pulse output frequencies. However, if HART communication is used,

a 250 ohm resistor is required in the power supply loop and a supply voltage of 12.5 V dc minimum must be maintained.

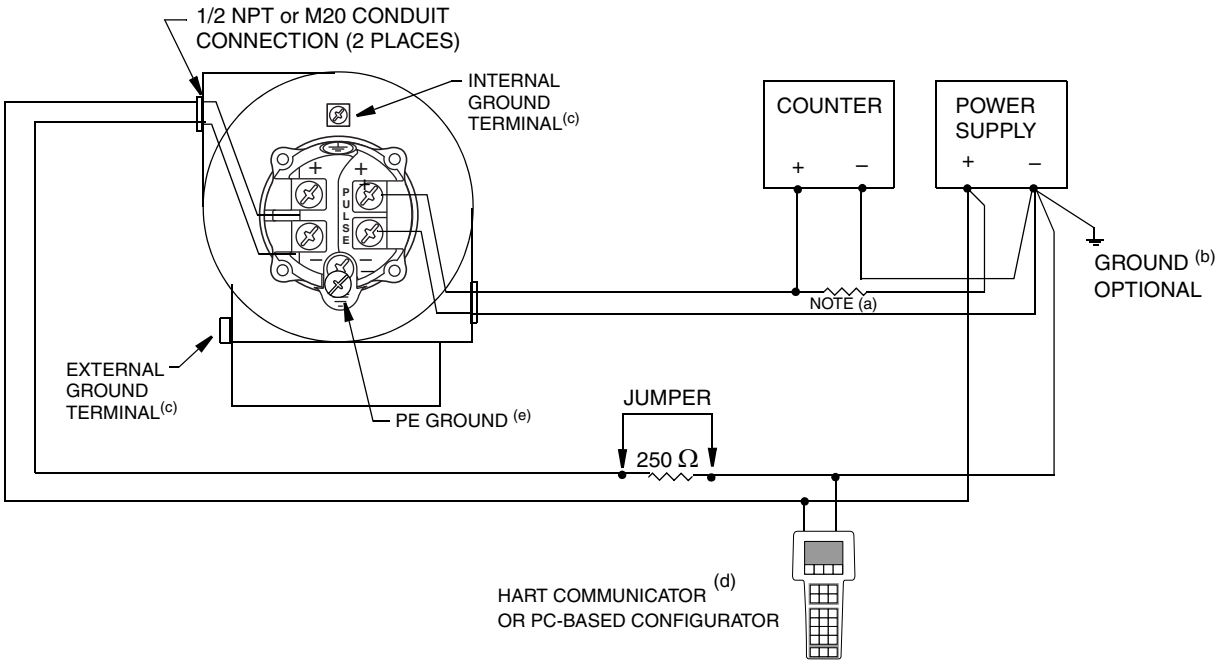


(a) PLACE JUMPER BETWEEN THE TWO NEGATIVE TERMINALS AS SHOWN.
(b) ADD A 1200 OHM MINIMUM (1-2 WATT) RESISTOR BETWEEN POWER SUPPLY (+) AND COUNTER (+).
(c) GROUNDING THE LOOP AT THE NEGATIVE TERMINAL OF THE POWER SUPPLY IS RECOMMENDED BUT NOT REQUIRED.
(d) THE TRANSMITTER IS EQUIPPED WITH AN INTERNAL AND EXTERNAL GROUND CONNECTION. CONNECT A GROUND WIRE TO EITHER TERMINAL IN ACCORDANCE WITH LOCAL PRACTICE.
(e) REQUIRED FOR EXPLOSIONPROOF (FLAMEPROOF) APPLICATIONS.

Figure 31. Loop Wiring (3-Wire Method)

4-Wire Method

This method is used for a local display, a HART communication output, and/or a pulse output.



(a) ADD A 1 KILOHM MINIMUM (1-2 WATT) RESISTOR BETWEEN POWER SUPPLY (+) AND COUNTER (+).
(b) GROUNDING THE LOOP AT THE NEGATIVE TERMINAL OF THE POWER SUPPLY IS RECOMMENDED BUT NOT REQUIRED.
(c) THE TRANSMITTER IS EQUIPPED WITH AN INTERNAL AND EXTERNAL GROUND CONNECTION. CONNECT A GROUND WIRE TO EITHER TERMINAL IN ACCORDANCE WITH LOCAL PRACTICE.
(d) FOR HART COMMUNICATIONS, A 250 Ω RESISTOR MUST BE PRESENT IN THE POWER SUPPLY LOOP AND A SUPPLY. VOLTAGE OF 12.5 V dc MINIMUM MUST BE MAINTAINED.
(e) REQUIRED FOR EXPLOSIONPROOF (FLAMEPROOF) APPLICATIONS.

Figure 32. Loop Wiring (4-Wire Method)

Troubleshooting and Maintenance

Refer to the following documents:

Document Number	Document Description
MI 019-202	84F-T, 84F-U, 84W-T, and 84W-U Vortex Flowmeters
MI 019-205	84S-T and 84S-U Sanitary Vortex Flowmeter
MI 019-211	84F-L, 84F-M, 84W-L, and 84W-M Low Power Vortex Flowmeters
MI 019-214	84S-L and 84S-M Low Power Sanitary Vortex Flowmeters

3. Operation

Communication with the 84 Series Vortex Flowmeters is carried out using a HART Communicator, a PC-Based configurator, or optional Local Display. For instructions on using a HART Communicator with an 84 Series flowmeter, see “Operation via a HART Communicator” on page 50. Instructions for using the PC-Based configurator are included with the configurator software. Instructions for using the Local Display is found immediately below.

Operation via Local Keypad/Display

A local display, as shown in Figure 33 provides local indication of the measurement information, function status, and reference information. The display also provides a means of performing totalizer reset, and full configuration, calibration, and self-test. Operation is accomplished via four multi-function keys.

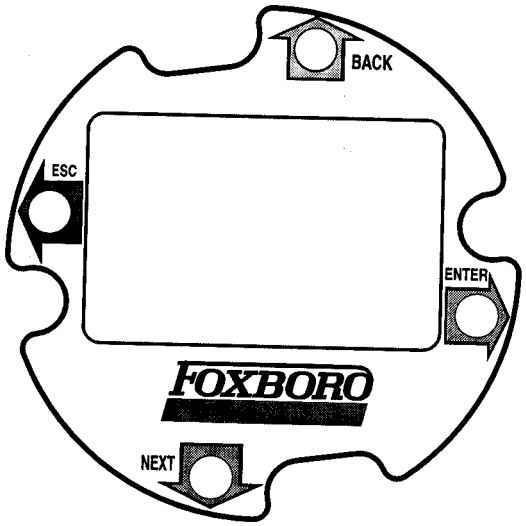


Figure 33Local Display

Table 5Operation of Function Keys

Key	Function
Left Arrow (**ESC**)	Moves left in the menu structure. Moves the cursor to the left in a data entry field. Escapes from changes in a picklist menu or data entry.* Answers No.

Table 5Operation of Function Keys

Key	Function
Right Arrow (**ENTER**)	Moves right in the menu structure. Used to access the data entry edit mode of a parameter. Moves the cursor to the right in a data entry field. Enters and saves the changed menu picklist choices or data entry.* Answers Yes.
Up Arrow (**BACK**)	Moves upward in the menu structure, a picklist menu, or list of characters.
Down Arrow (**NEXT**)	Moves downward in the menu structure, a picklist menu, or list of characters.

*On data entry, repeatedly press the key until the cursor reaches the end of the display.

Display Bar Indicator

The bar indicator at the top of the display indicates the flow measurement, as a percentage of the upper range value.

— NOTE

If the flow measurement is out-of-range, the bar indicator blinks.
If the flowmeter is off-line, the middle four bars of the bar indicator blink.

Password

Display of information requires no password. However, the ability to access certain functions, (for purposes other than Read Only), such as totalizer, setup, and calibration/testing, may require a user-definable password. The **LoPwd** allows enables you to reset the Net Totalizer and Pulse Totalizer. The **HiPwd** gives you access to all flowmeter functions. In addition, the write protect jumper must have been placed in the 'write' position. See 'Setting the Write Protection Jumper' in MI 019-202 (84F and 84W) or MI 019-205 (84S) on the CD-ROM with your flowmeter.

— NOTE

The flowmeter is shipped from the factory with a blank password. This allows access to all flowmeter functions. If password protection is required, enter a **LoPwd** and/or **HiPwd** in Setup mode.

The totalizer, setup, and calibration/test functions may require a password (a 4-character alphanumeric string). Select the **TotPul**, **TotNet**, **TotGrd**, **Setup** or **Cal/Tst** top level menu and press **Enter** at the password prompt. Two brackets surrounding four spaces (**[_ _ _ _]**) then appear on the second line of the display. The cursor, a flashing icon, appears at the first character.

To enter the password, use the Up/Down arrow keys to scroll through the list of acceptable characters. After selecting the desired character, press the Right arrow key to move to the next character. Continue this process until the password is complete. Pressing the Right arrow key once more moves the flashing cursor to the right bracket. Pressing **Enter** now completes the process. Prior to pressing **Enter**, you can use the Left/Right arrow keys to move back and forth to modify an incorrect selection.

If you enter an incorrect password, the display indicates **Sorry** for one second, then goes to Read Only.

You can change a password in the **Passwd** parameter in the Setup menu.

Activating an Edit, Pick-List, or User Menu Block

To open a menu block that allows you to edit or select data or to perform a function, move to the menu block and press the Right arrow (**Enter**) key.

Editing Numbers and Strings

Editing any number or string in the menu system is done in the same way as entering the password. The Up/Down arrow keys scroll through a list of acceptable characters for the current position. The Right arrow key moves the cursor to the right. It also accepts the change at the end. The Left arrow key moves the cursor to the left. It also cancels the change at the beginning.

There are three kinds of edit items: signed numbers, unsigned numbers, and strings.

Signed Numbers

Signed numbers always have a + or - sign at the beginning. The + can only be changed to –, and vice versa.

Unsigned Numbers

For unsigned numbers, cycle through the digits 0-9, and the decimal point, with the Up/Down arrow keys. When you enter a decimal point in any position, and there is already a decimal point to the left of the cursor, the new decimal point overrides the old one.

Strings

Characters in strings can be changed to any valid character. You can sequence through the list of characters by pressing the Up/Down arrow keys. To enter the change, you must still press **Enter** from the right side of the data field, after scrolling to the right side with the Right arrow key.

Picking from a List

Picklist items allow you to choose a selection from a flowmeter-supplied list of alternatives. Go to the applicable parameter, and press **Enter**. The entire bottom line of the display flashes. If you press the Up/Down arrow keys, the display shows the previous or next choice respectively from its list. Pressing **Enter** accepts the change; pressing **Esc** returns the previous selection.

Configuration Database

Each flowmeter is shipped from the factory with an operating configuration database. However, the flowmeter will not provide an accurate measurement if the configuration does not fit your application. **Be sure to check the configuration of our flowmeter prior to start-up.**

If the user information is not supplied with the purchase order, the flowmeter is shipped with the following defaults:

Table 6. Default Database When User Information Not Supplied

Item	Metric	English
Fluid Type	**Liquid** (water)	**Liquid** (water)
Type of Flow	Volume	Volume
Measurement Units	m^3/s	ft^3/min
Flowing Temperature	20°C	68°F
Flowing Density	998.21 kg/m^3	62.316 lb/ft^3
Base Density (N/A)	999.20 kg/m^3	62.378 lb/ft^3
Absolute Viscosity	1.002 cP	1.002 cP
Upper Range Value	Upper Range Limit for Flowmeter Size	Upper Range Limit for Flowmeter Size

These defaults are **not** recommended for general operation. If no other process information is available, entering **Liquid**, **Gas**, or **Steam** as fluid type in **Setup > Fluid > New** establishes default data bases as shown in Tables 7, 8, or 9 respectively.

Table 7. Default Database for Liquid

Parameter	Metric	English
Fluid Type	**Liquid** (water)	**Liquid** (water)
Type of Flow	Same as present configuration (exceptions)	
Measurement Units	Same as present configuration (exceptions)	
Flowing Temperature	20°C	68°F
Flowing Density	998.21 kg/m^3	62.316 lb/ft^3
Base Density (N/A)	999.20 kg/m^3	62.378 lb/ft^3
Absolute Viscosity	1.002 cP	1.002 cP
Upper Range Value	Upper Range Limit for Flowmeter Size	Upper Range Limit for Flowmeter Size

Table 8. Default Database for Gas

Parameter	Metric	English
Fluid Type	**Gas** (air)	**Gas** (air)
Type of Flow	Same as present configuration (exceptions)	
Measurement Units	Same as present configuration (exceptions)	
Flowing Temperature	20°C	68°F
Flowing Density	9.546 kg/m^3	0.596 lb/ft^3
Base Density	1.293 kg/m^3	0.0807 lb/ft^3
Absolute Viscosity	0.0185 cP	0.0185 cP
Upper Range Value	Upper Range Limit for Flowmeter Size	Upper Range Limit for Flowmeter Size

Table 9. Default Database for Steam

Parameter	Metric	English
Fluid Type	**Steam**	**Steam**
Type of Flow	Volume	Volume
Measurement Units	m^3/s	ft^3/s
Flowing Temperature	178.3°C	352.9°F
Flowing Density	4.966 kg/m^3	0.310 lb/ft^3
Absolute Viscosity	0.015 cP	0.015 cP
Upper Range Value	Upper Range Limit for Flowmeter Size	Upper Range Limit for Flowmeter Size

Using the Menu Tree

Moving Inside the Menu System

Pressing the **Enter** key stops the display of measurements and shows the first top level Totalizer menu item, 1 **TotPul**. Use the Down arrow key to go to 1 **TotNet** and 1 **Tot Grd**. At any one of these choices, press **Enter** to edit your selection. Use the Down arrow key to select Off (turn the totalizer off), On (turn the totalizer on), or Clear (reset the totalizer) and then press **Enter**. Press the **ESC** key to return to Measure mode.

Pressing the **Esc** key stops the display of measurements, and shows the first item in the rest of the top level menu, 1 **Measure**. From here, the four keys allow you to move around the menu tree, as indicated by the arrows. Press the Down arrow key to cycle through each of the current menu level items. Press the Right arrow key to move from the current level to its submenu level. Press the Left arrow key to move from the current level to the next higher level.

— NOTE

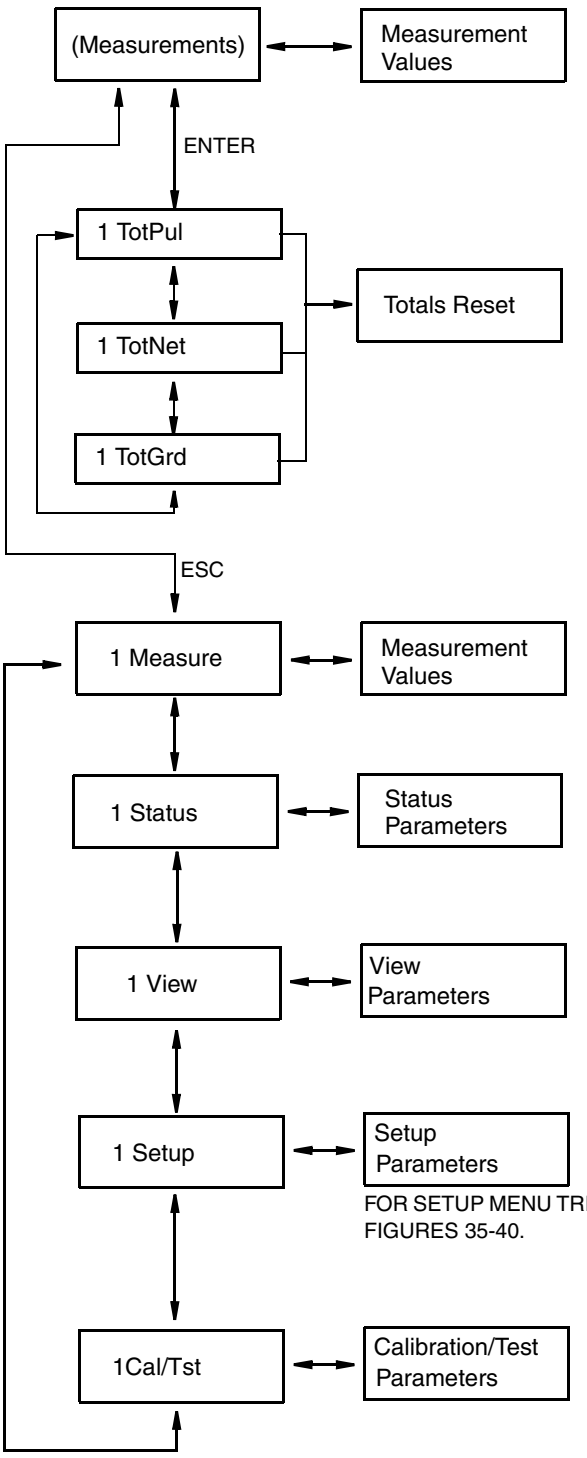
Each menu item has its level (1 - 5) displayed at the beginning of the top line.

Top Level Menu

The three totalizer items in the main menu were discussed immediately above. The remainder of the Top Level menu displays six modes – Measure, Status, View, Setup, and Calibration/Test. You can switch from one to another in sequence by using the Up/Down arrow keys. To enter the second level menu from a particular top level display, press the Right arrow key. To return to the top level from a second level menu item, press the Left arrow key. The level of the first, second, third, fourth, and fifth level menus is indicated by the digit appearing as the first character in Line 1 of the display; a 1 indicates Level 1 (Top Level), a 2 indicates Level 2, and a 3 indicates Level 3, and so forth.

The top level menu is shown in Figure 34. The Setup menu tree is shown in Figures 35 through 40. For other details, refer to the following instructions on the CD-ROM with your flowmeter.

Model	Instruction
84F-T, 84W-T, 84F-U, 84W-U	MI 019-202
84S-T, 84S-U	MI 020-205
84F-L, 84W-L, 84F-M, 84W-M	MI 020-211
84S-L, 84S-M	MI 020-214



THIS IS THE NORMAL OPERATION MODE. IT DISPLAYS CONFIGURED MEASUREMENTS. IT ALSO INDICATES IF DIAGNOSTIC CONDITIONS EXIST. THE SELECTED DEFAULT MEASUREMENT IS DISPLAYED WHEN THE TRANSMITTER IS TURNED ON.

THIS MODE ALLOWS RESETTING OF EACH TOTALIZER.

PRESSING THE ESC KEY MOVES YOU TO THE MEASURE MODE.

THIS MODE PROVIDES THE STATUS OF VARIOUS PARAMETERS, WRITE PROTECTION, AND ANY DIAGNOSTIC ERRORS.

THIS MODE IS USED TO DISPLAY REFERENCE INFORMATION SUCH AS MODEL, CALIBRATOR, AND CALIBRATION DATES. THE TRANSMITTER SOFTWARE REVISION NUMBER CAN ALSO BE FOUND HERE.

THIS MODE IS USED TO CUSTOMIZE (CONFIGURE) THE FLOWMETER TO YOUR APPLICATION. THIS INCLUDES DEFINING, FLUID, FLOW, TUNING, TOTAL, OUTPUT, PIPING, TAGS, FLOWTUBE, AND PASSWORD PARAMETERS.

THIS MODE IS USED TO PERFORM SEVERAL CALIBRATION AND TEST FUNCTIONS.

Figure 34. Top Level Modes and Their Basic Functions

The following table lists the engineering units (EGUs) available. The available EGU options depend on the **FlwMap** selection (**VolFlow**, **BVolFlow**, **MassFlow**, or **Velocity**), and the actual EGUs are entered in the **1 Setup** > **2 Flow** > **3 FlwEGU** menu.

Table 10. Available Engineering Units

Fluid Type	FlwMap Selected	Available EGUs
Liquid	Volume (VolFlow)	m3/s, m3/m, m3/h, m3/d, gal/s, gal/m, gal/h, gal/d, Mgal/d, l/s, l/m, l/h, l/d, Ml/h, Ml/d, ft3/s, ft3/m, ft3/h, ft3/d, bbl3/s(31.5), bbl3/m, bbl3/h(31.5), bbl3/d, bbl/s, bbl/m, bbl/h , bbl/d, igal/s, igal/m, igal/h, igal/d, mcfd, mmcfd, Custom
	Base Volume, Standard (BVolFlow > StdVol)	Sm3/s, Sm3/m, Sm3/h, Sm3/d, Sft3/s, Sft3/m, Sft3/h, Sft3/d, Sgal/s, Sgal/m, Sgal/h, Sgal/d, Sbl3/s (31.5), Sbl3/m (31.5), Sbl3/h (31.5), Sbl3/d (31.5), Sbbl/s (42), Sbbl/m (42), Sbbl/h (42), Sbbl/d (42), mScfd, mmScfd, Custom
	Base Volume, Normal (BVolFlow > NormVol)	Ngal/s, Ngal/m, Ngal/h, Ngal/d, Nl/s, Nl/m, Nl/h, Nl/d, Nm3/s, Nm3/m, Nm3/h, Nm3/d, Custom
	Mass (MassFlow)	kg/s, kg/m, kg/h, kg/d, g/s, g/m, g/h, g/d, lb/s, lb/m, lb/h, lb/d, mton/h, mton/d, STon/s, STon/m, STon/h, STon/d, oz/s, oz/m, oz/h, oz/d, mton/s, mton/m, LTon/m, LTon/h, LTon/d, Custom
	Velocity	m/s, m/m, m/h, m/d, ft/s, ft/m, ft/h, ft/d
Gas	Volume (VolFlow)	ft3/s, ft3/m, ft3/h, ft3/d, m3/s, m3/m, m3/h, m3/d, mcfd, mmcfd, Custom
	Base Volume, Standard (BVolFlow > StdVol)	Sft3/s, Sft3/m, Sft3/h, Sft3/d, mScfd, mmScfd, Sm3/s, Sm3/m, Sm3/h, Sm3/d, Custom
	Base Volume, Normal (BVolFlow > NormVol)	Nm3/s, Nm3/m, Nm3/h, Nm3/d, Nl/s, Nl/m, Nl/h, Nl/d, Custom
	Mass (MassFlow)	lb/s, lb/m, lb/h, lb/d, kg/s, kg/m, kg/h, kg/d, g/s, g/m, g/h, g/d, mTon/s, mTon/m, mTon/h, mTon/d, STon/s, STon/m, STon/h, STon/d, LTon/m, LTon/h, LTon/d, oz/s, oz/m, oz/h, oz/d, Custom
	Velocity	ft/s, ft/m, ft/h, ft/d, m/s, m/m, m/h, m/d
Steam	Volume (VolFlow)	ft3/s, ft3/m, ft3/h, ft3/d, m3/s, m3/m, m3/h, m3/d, mcfd, mmcfd, Custom
	Mass (MassFlow)	lb/s, lb/m, lb/h, lb/d, kg/s, kg/m, kg/h, kg/d, g/s, g/m, g/h, g/d, mTon/s, mTon/m, mTon/h, mTon/d, STon/s, STon/m, STon/h, STon/d, LTon/m, LTon/h, LTon/d, oz/s, oz/m, oz/h, oz/d, Custom
	Velocity	ft/s, ft/m, ft/h, ft/d, m/s, m/m, m/h, m/d

Table 11. All Flow EGU Descriptions (Volume, Mass, Base Volume, and Velocity)

EGU	Description
lb/ft3	pounds per cubic foot
lb/gal	pounds per US gallon
oz/in3	Ounces per cubic in
kg/m3	kilograms per cubic meter
kg/l	kilograms per liter
g/cm3	grams per cubic centimeter
lb/Yd3	pounds per cubic yard
LT/Yd3	long tons per cubic yard
ST/Yd3	short tons per cubic yard
kg/s	kilograms per second
kg/m	kilograms per minute
kg/h	kilograms per hour
kg/d	kilograms per day
lb/s	pounds per second
lb/m	pounds per minute
lb/h	pounds per hour
lb/d	pounds per day
g/s	grams per second
g/m	grams per minute
g/h	grams per hour
g/d	grams per day
oz/s	Ounces per second
oz/m	Ounces per minute
oz/h	Ounces per hour
oz/d	Ounces per day
mTon/s	metric tons per second
mTon/m	metric tons per minute
mTon/h	metric tons per hour
mTon/d	metric tons per day
STon/s	short tons per second (2000 lbs)
STon/m	short tons per minute (2000 lbs)
STon/h	short tons per hour (2000 lbs)
STon/d	short tons per day (2000lbs)
LTon/m	long tons per minute (2240lbs)
LTon/h	long tons per hour (2240lbs)

EGU	Description
LTon/d	long tons per day (2240 lbs)
m3/s	cubic meters per second
m3/m	cubic meters per minute
m3/h	cubic meter per hour
m3/d	cubic meters per day
ft3/s	cubic feet per second
ft3/m	cubic feet per minute
ft3/h	cubic feet per hour
ft3/d	cubic feet per day
gal/s	US gallons per second
gal/m	US gallons per minute
gal/h	US gallons per hour
gal/d	US gallons per day
Igal/s	imperial gallons per second
Igal/m	imperial gallons per minute
Igal/h	imperial gallons per hour
Igal/d	imperial gallons per day
bbl3/s	Barrels per second (31.5 US gallons = barrel)
bbl3/m	Barrels per minute (31.5 US gallons = barrel)
bbl3/h	Barrels per hour (31.5 US gallons = barrel)
bbl3/d	Barrels per day (31.5 US gallons = barrel)
bbl/s	Barrels per second (42 US gallons = barrel)
bbl/m	Barrels per minute (42 US gallons = barrel)
bbl/h	Barrels per hour (42 US gallons = barrel)
bbl/d	Barrels per day (42 US gallons = barrel)
l/s	liters per second
l/m	liters per minute
l/h	liters per hour
l/d	liters per day
Ml/h	million liters per hour
Ml/d	million liters per day
Mgal/d	million US gallons per day
mcfd	thousand cubic ft per day
mmcfd	million cubic ft per day
Sm3/s	Standard cubic meters per second

EGU	Description
Sm3/m	Standard cubic meters per minute
Sm3/h	Standard cubic meters per hour
Sm3/d	Standard cubic meters per day
Sft3/s	Standard cubic feet per second US System
Sft3/m	Standard cubic feet per minute US System
Sft3/h	Standard cubic feet per hour US System
Sft3/d	Standard cubic feet per day US System
Sgal/s	Standard US gallon per second
Sgal/m	Standard US gallon per minute
Sgal/h	Standard US gallon per hour
Sgal/d	Standard US gallon per day
Sbl3/s	Standard barrel per second (31.5 US gallons per barrel)
Sbl3/m	Standard barrel per minute (31.5 US gallons per barrel)
Sbl3/h	Standard barrel per hour (31.5 US gallons per barrel)
Sbl3/d	Standard barrel per day (31.5 US gallons per barrel)
Sbbl/s	Standard barrel per year (42 US gallons per barrel)
Sbbl/m	Standard barrel per year (42 US gallons per barrel)
Sbbl/h	Standard barrel per year (42 US gallons per barrel)
Sbbl/d	Standard barrel per year (42 US gallons per barrel)
mScfd	thousand of standard cubic feet per 24 hours
mmScfd	millions of standard cubic feet per 24 hours
Nm3/s	Normal Cubic meter per second MKS System
Nm3/m	Normal Cubic meter per minute MKS System
Nm3/h	Normal Cubic meter per hour MKS System
Nm3/d	Normal Cubic meter per day MKS System
Ngal/s	Normal US gallon per second
Ngal/m	Normal US gallon per minute
Ngal/h	Normal US gallon per hour
Ngal/d	Normal US gallon per day
Nl/s	Normal liter per second MKS System
Nl/m	Normal liter per minute MKS System
Nl/h	Normal liter per hour MKS System
Nl/d	Normal liter per day MKS System
Custom	Custom VolumeNorm-Rate

Setup Menu Tree

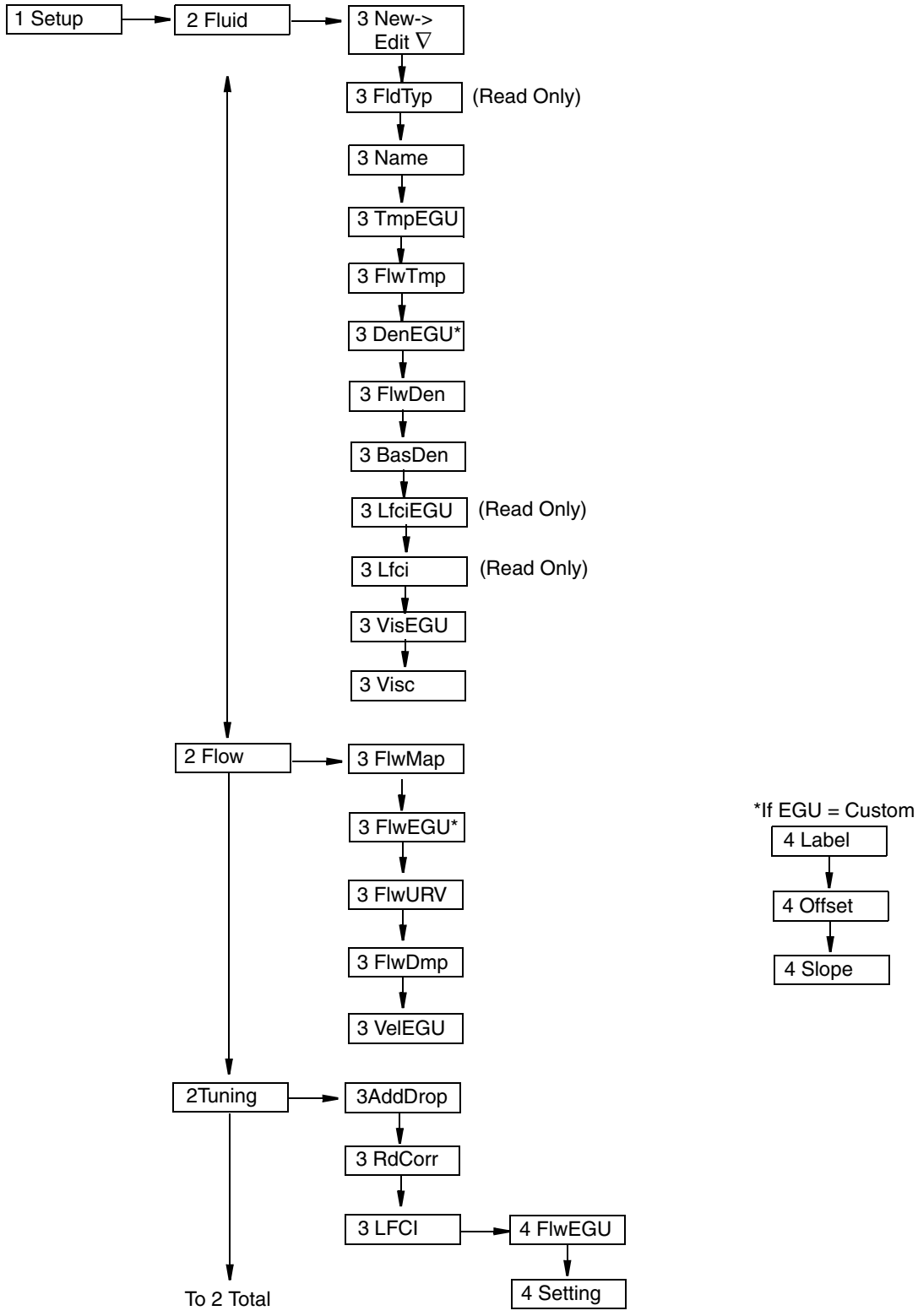


Figure 35. Setup Menu Tree (1 of 3)

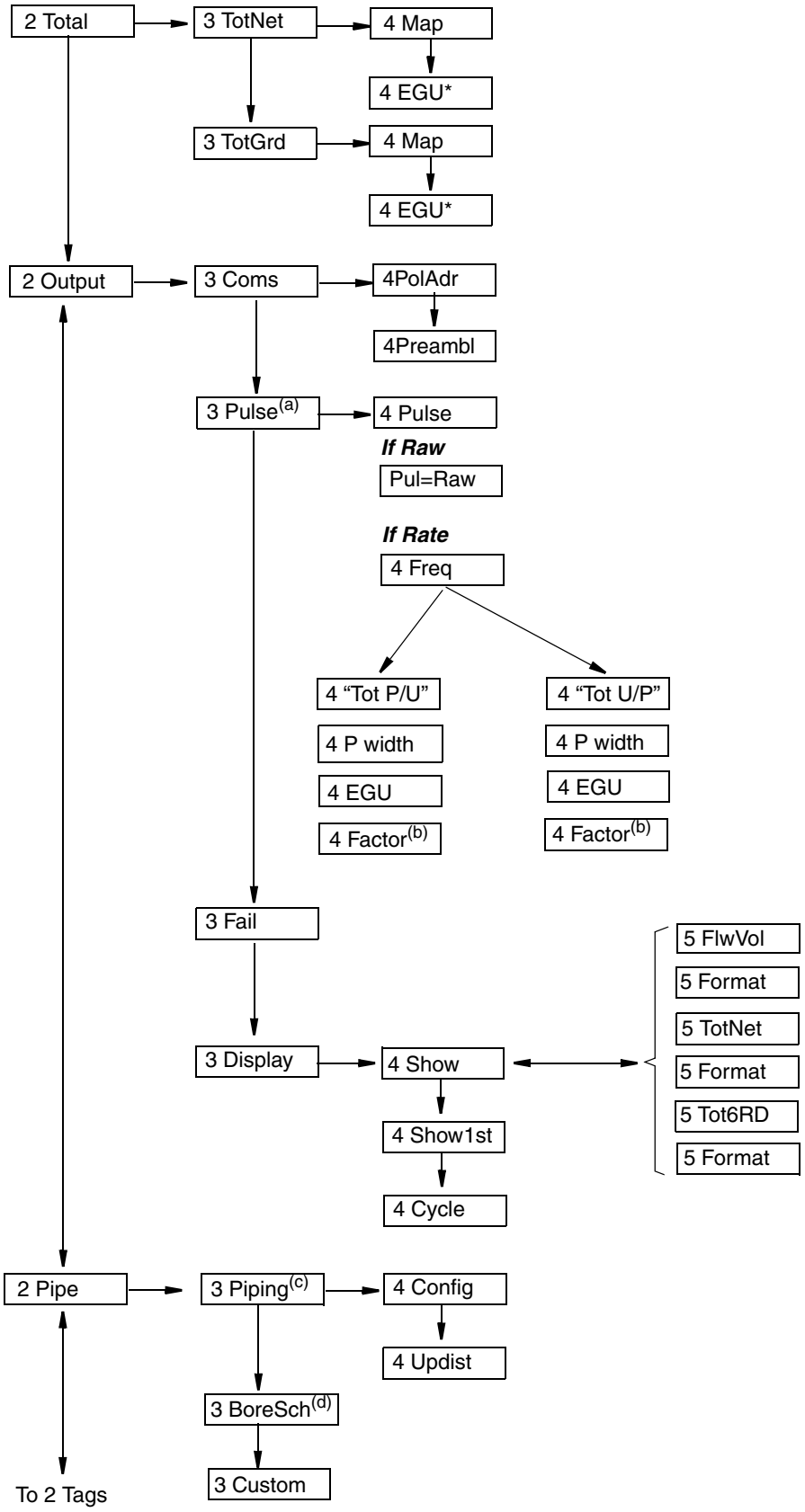


Figure 36. Setup Menu Tree (2 of 3)

(a) Only applies to option “T”.
(b) Factor equals Pulse/Units or Units/Pulse.
(c) Not available with option “T” or with special (customized) Flowtubes; available with Schedule 160.
(d) Not available with option “T”, with special (customized) flowtubes, or with Schedule 160.

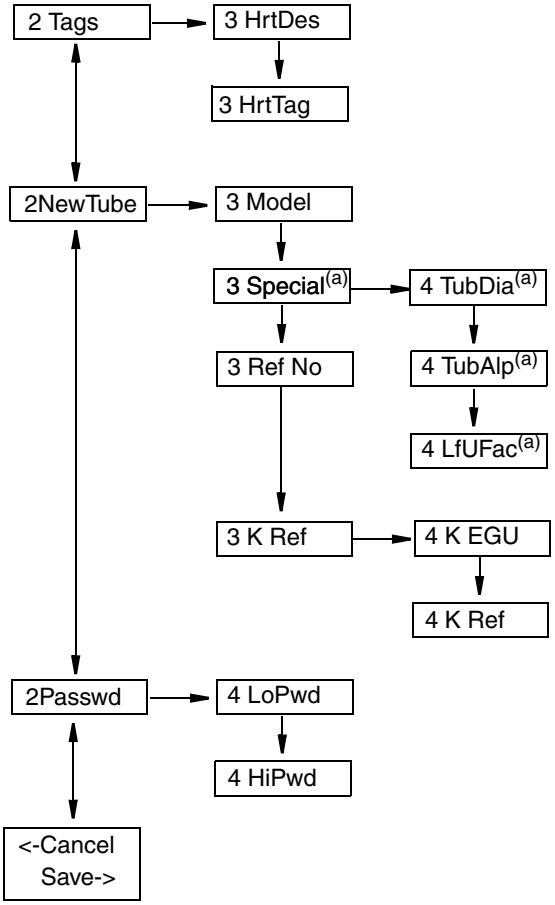


Figure 37. Setup Menu Tree (3 of 3)

(a) Available with option “Y” only.

Setup Menu Tree (Low Power)

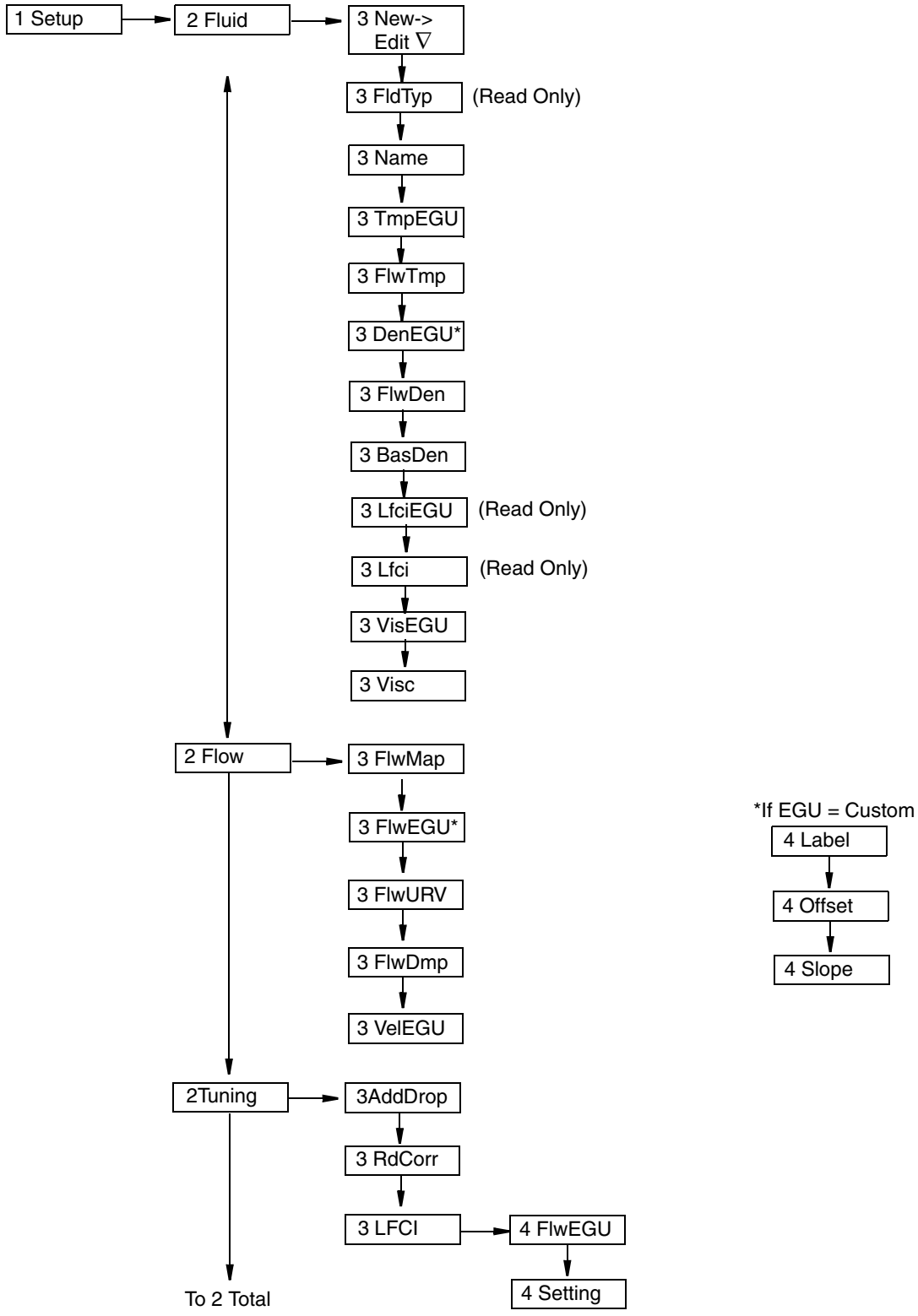


Figure 38. Setup Menu Tree - Low Power(1 of 3)

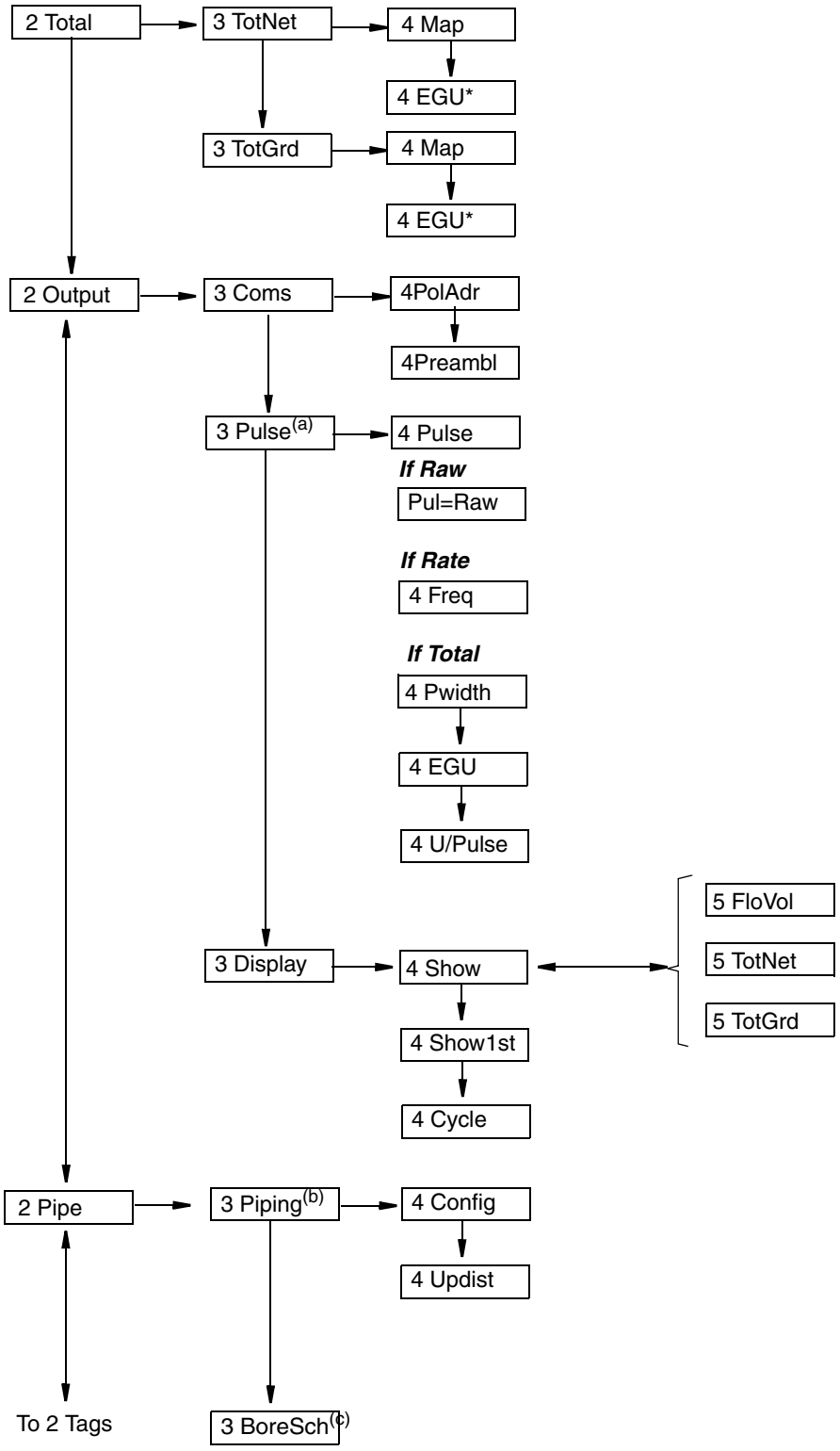


Figure 39. Setup Menu Tree - Low Power (2 of 3)

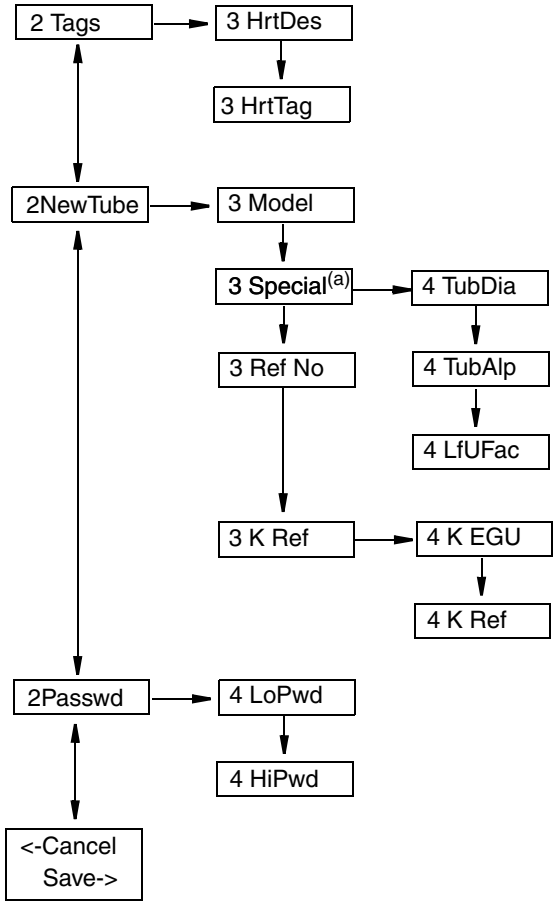


Figure 40. Setup Menu Tree - Low Power (3 of 3)

Operation via a HART Communicator

The Online menu is shown in Figures 41 through 44. For an explanation of the parameters and the fast-key path, refer to the following instructions on the CD-ROM with your flowmeter.

Model	Instruction
84F-T, 84W-T, 84F-U, 84W-U	MI 019-202
84S-T, 84S-U	MI 020-205
84F-L, 84W-L, 84F-M, 84W-M	MI 020-211
84S-L, 84S-M	MI 020-214

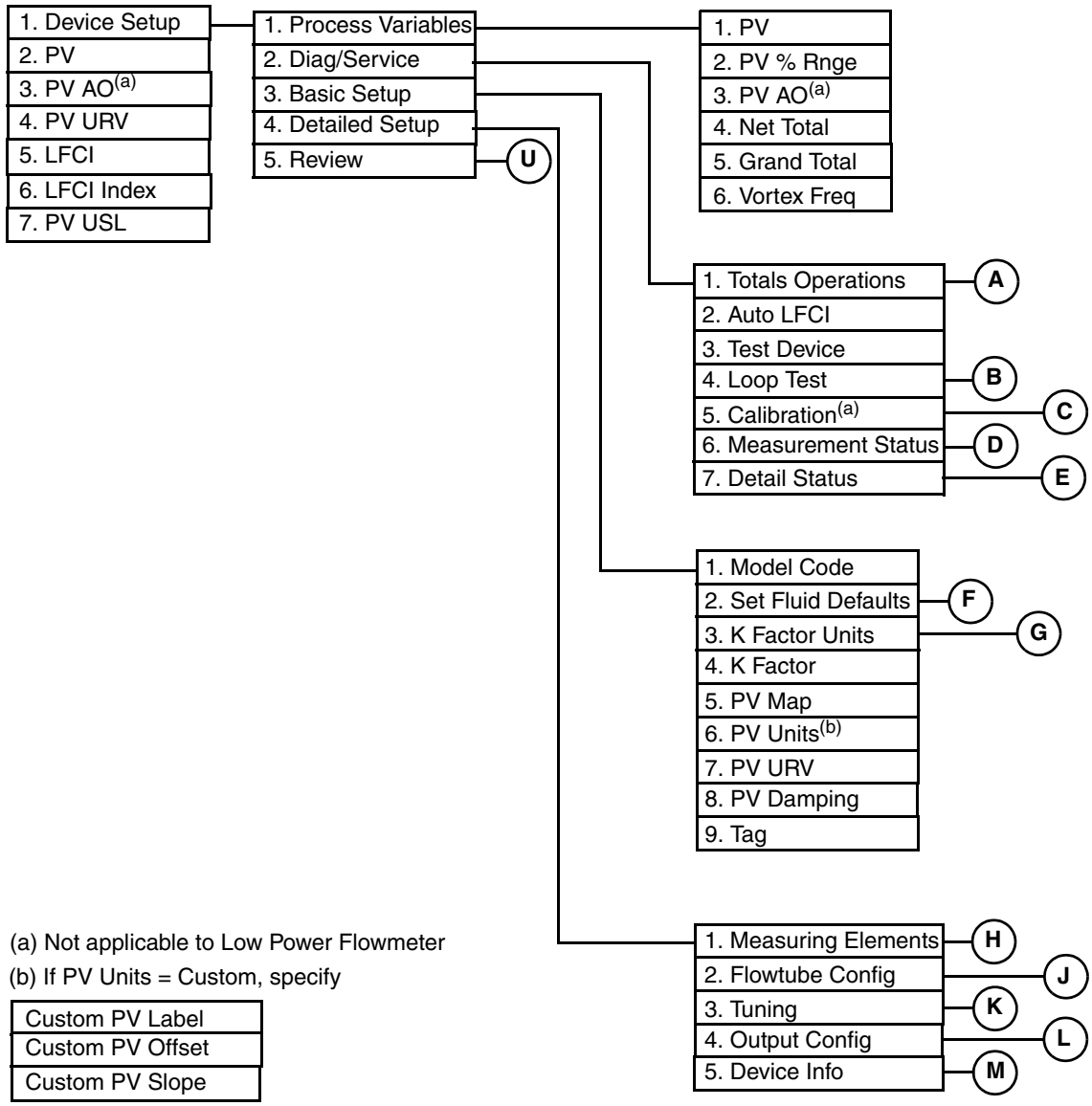
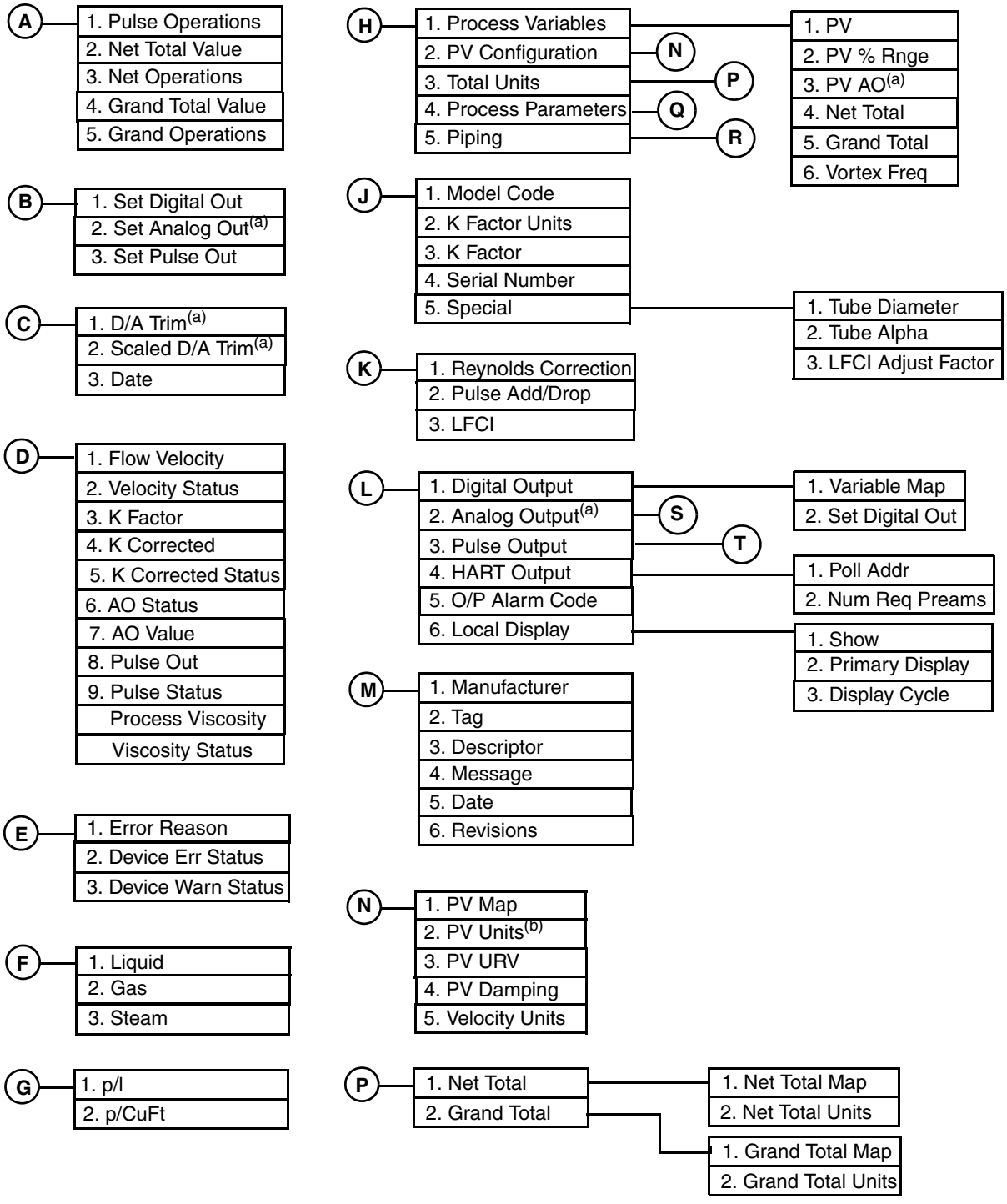


Figure 41. 84 Vortex Flowmeter Online Menu Tree (1 of 4)



(a) Not applicable to Low Power Flowmeter

(b) If PV Units = Custom, specify

Custom PV Label
Custom PV Offset
Custom PV Slope

Figure 42. 84 Vortex Flowmeter Online Menu Tree (2 of 4)

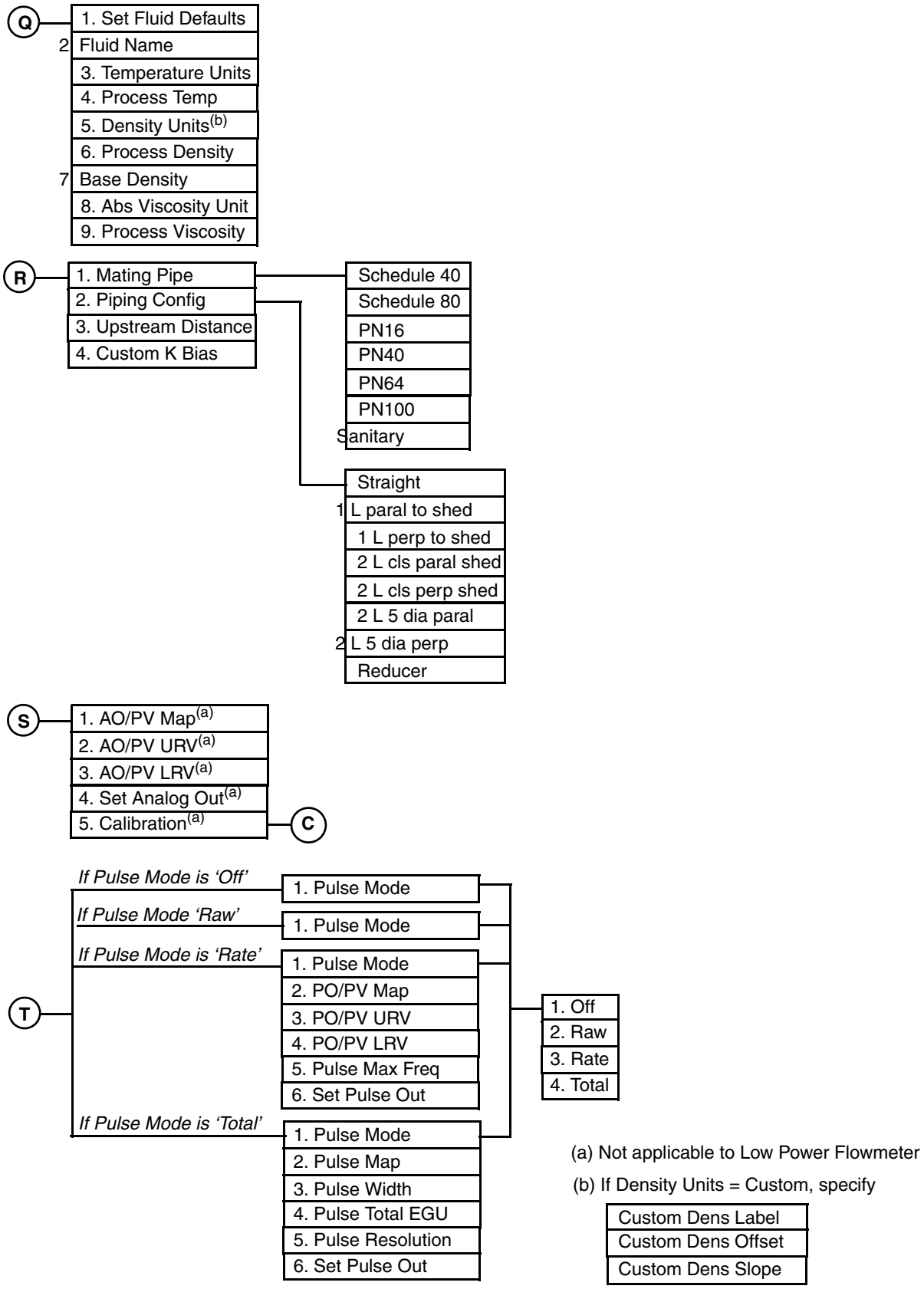
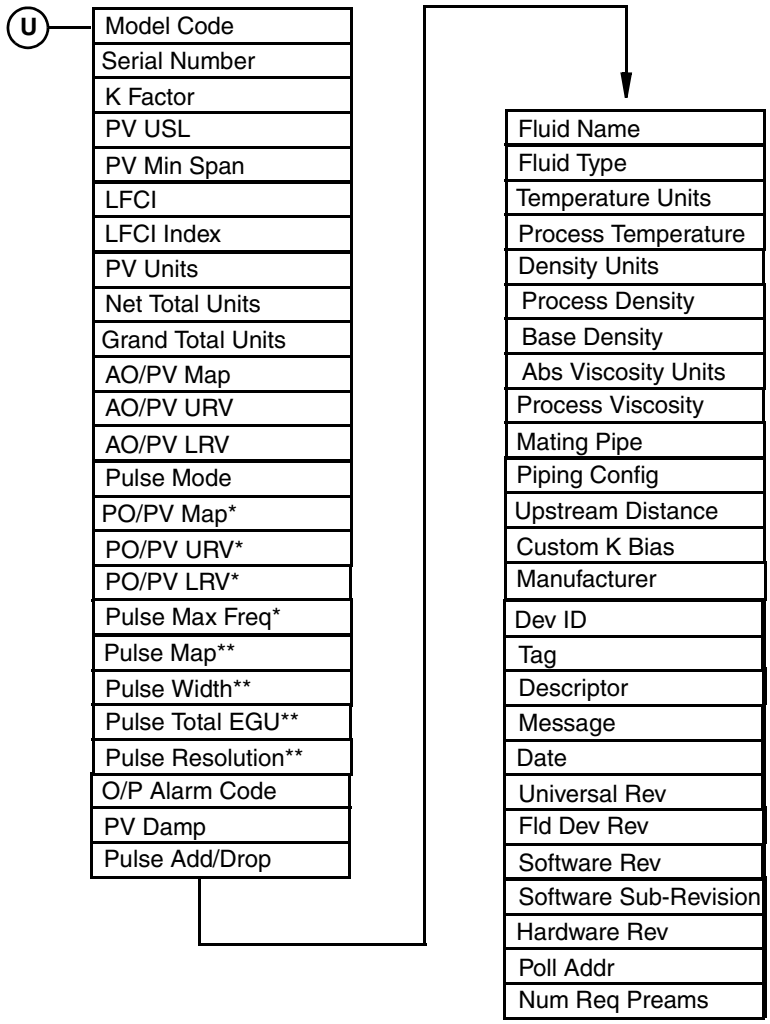


Figure 43. 84 Vortex Flowmeter Online Menu Tree (3 of 4)



* If Pulse mode = Rate
** If Pulse Mode = Total

Figure 44. 84 Vortex Flowmeter Online Menu Tree (4 of 4)

Troubleshooting and Maintenance

Refer to the following documents:

Document Number	Document Description
MI 019-202	84F-T, 84F-U, 84W-T, and 84W-U Vortex Flowmeters
MI 019-205	84S-T and 84S-U Sanitary Vortex Flowmeter
MI 019-211	84F-L, 84F-M, 84W-L, and 84W-M Low Power Vortex Flowmeters
MI 019-214	84S-L and 84S-M Low Power Sanitary Vortex Flowmeters

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