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# INSTRUCTIONS FOR SERIES 50 & 50K FLOWMETERS

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THIS BOOKLET CONTAINS PROPRIETARY INFORMATION OF ADVANCED SPECIALTY GAS EQUIPMENT CORP. AND IS PROVIDED TO THE PURCHASER SOLELY FOR USE IN CONJUNCTION WITH SERIES 50 & 50K FLOWMETERS.



Series 50

## IMPORTANT

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These instructions are for experienced operators who know the general principles and safety precautions to be observed in handling specialty gases and operating gas regulation equipment. If you are not certain you fully understand the safety precautions for handling gases, we urge you to obtain and read the Material Safety Data Sheet (MSDS) for each gas being used.

Do not permit untrained persons to install, operate, or maintain this flowmeter. Do not attempt to install or operate this flowmeter until you have read and fully understand these instructions. If you do not fully understand these instructions, contact your Advanced Specialty Gas Equipment Distributor.

**Be sure this information reaches the operator. Your supplier has extra copies.**



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## **SAFETY PRECAUTIONS**

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Protect yourself and others. Read and understand the following instructions before attempting to use these flowmeters. Failure to understand and follow these instructions could result in serious personal injury and/or damage to equipment.

- Know and understand the physical and chemical properties of the gas being used.
- Observe general precautions for the use of gases.
- Observe safety precautions for the gas being used.
- Read and follow precautions on cylinder labels.
- Never use these flowmeters with gases not compatible with the materials of construction. The use of gases not compatible with the materials of construction may cause damage to equipment or injury to personnel.
- If flammable gases are used with these flowmeters, do not locate the flowmeters near open flames or any other source of ignition.
- If toxic or flammable gases are used with these flowmeters, emergency equipment applicable to the gases in use should be available in the operating area.
- Many gases can cause asphyxiation by displacing oxygen in the atmosphere. Make certain the area where flowmeters are operated is well ventilated. Provide a device to warn personnel of oxygen depletion in the work area.
- Do not release toxic or flammable gases in the vicinity of personnel. Use this equipment only in well ventilated areas. Vent gases to the outside atmosphere, and in an area away from personnel. Be sure that venting and disposal methods are in accordance with Federal, State and local requirements. Locate and construct vent lines to prevent condensation or gas accumulation. Be sure the vent outlet cannot be obstructed by rain, snow, ice, insects, birds, etc. Do not interconnect vent lines; if more than one vent is needed, use separate lines.
- Relief devices should be installed and properly vented in all gas handling systems to protect against overpressurization.
- Never use oil or grease on these flowmeters. Oil and grease are easily ignited and may combine violently with some gases under pressure.
- Never connect a flowmeter to a supply source having a pressure greater than the maximum rated pressure of the flowmeter. Refer to Product Specifications (page 10) for maximum inlet pressures.

## **MANUFACTURER STATEMENT**

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The information contained in this instruction booklet has been compiled by Advanced Specialty Gas Equipment Corp., (the Company), from what it believes are authoritative sources and is offered solely as a convenience to its customers. While the Company believes that this information is accurate and factual as of the date printed, the information including design specifications is subject to change without prior notice.

## **DESCRIPTION**

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The Series 50 & 50K Flowmeters offer an economical means of measuring gas or liquid flow at low pressures where  $\pm 10\%$  accuracy is acceptable. Suitable for both plant and laboratory use, these flowmeters are direct reading for air, however, approximate flow ranges for other gases are listed in the Tube Selection Table (pages 12-13).

Each flowmeter comes with a glass tube, spherical float and Type 316 Stainless Steel metering valve. Either aluminum or Type 316 Stainless Steel end blocks and fittings are available with the Series 50 Flowmeters. The end blocks of the Series 50K Flowmeters are constructed of Kynar<sup>®</sup>. Tubes are calibrated with air at standard pressure of 14.7 psia at 70°F and are graduated directly in standard cubic centimeters per minute (sccm) or standard liters per minute (slpm).

## **OPTIONAL EQUIPMENT**

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Baseplate with Leveling Screws and Spirit Level (FM4702) – permits bench use.

Inlet Filter – a two-micron in-line filter is available in aluminum (FM4741) or Type 316 Stainless Steel (FM4746) for Series 50 Flowmeters. A Type 316 Stainless Steel two-micron in-line filter (SG6113) is available for Series 50K Flowmeters.

Aluminum Bezel (FM4711) – permits flush panel mounting of flowmeter.

Replacement Metering Valves – for flowmeters with tube numbers FM4340 – FM4344 (0202-4113 (L)), tube numbers FM4345 – FM4346 (0202-4114 (M)) or tube numbers FM4347 – FM4349 (0202-4115 (H)).

## **INSTALLATION**

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**WARNING:** Before attempting to install and operate these flowmeters, read and fully understand the safety precautions on page 3 in this booklet. Failure to follow the safety precautions may result in serious personal injury and/or damage to equipment.

1. Inspect the flowmeter for physical damage or contamination. Flowmeters are shipped completely assembled and tested and should not require tightening or adjustment before installation.
2. Flowmeters must be mounted within 6 degrees of true vertical with the inlet connection to the flowmeter at the bottom. Be sure that piping is adequately supported to prevent undue strain on the flowmeter.
3. The built-in metering valve provides flow control through the flowmeter. These control valves are designed for fine control. Although the valve will provide bubble-tight shutoff, excessive tightening may damage the valve seat and limit its effectiveness as a fine control valve. If tight shut-off is required, it is recommended that a separate shut-off valve be installed before the flowmeter.
4. The Series 50 Flowmeter can be mounted on the front of a panel by using the threaded fittings and locking nuts provided with each unit (Fig. 3, see pg. 16). The Series 50K Flowmeter may be front panel mounted using predrilled holes on the rear of the flowmeter and self tapping screws (Fig. 4, see pg. 17). With the use of an optional Aluminum Bezel (FM4711), the flowmeter can be flush panel mounted (Fig. 5, see pg. 18).

## **OPERATION**

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**WARNING: DO NOT exceed pressure and temperature specifications during operation. Injury or death to personnel and/or damage to equipment may result. DO NOT operate the flowmeter under any circumstances if it leaking or otherwise malfunctioning. Glass metering tubes may break and injure operating personnel. A customer supplied safety shield constructed of ½ inch acrylic plastic should be used when operating pressures exceed 50 psig.**

1. The flowmeter is ready for operation after it has been installed in the flow system and connections have been tested for leaks with nitrogen or air and either a soap solution, such as Snoop<sup>®</sup> or a gas leak detector. Do not exceed the flowmeter's maximum operating pressure and temperature (see pg. 10, "Specifications") during the leak test procedure. Vent all pressure from the system and repair any leaks before proceeding.
2. Gradually introduce gas or liquid into the flowmeter to prevent a pressure surge or thermal shock to the flowmeter. Do not exceed the flowmeter's maximum operating pressure and temperature (see pg. 10, "Specifications") during operation. Adjust the metering valve to obtain the desired flow rate. The scale reading at the center of the ball float should be read to obtain an accurate flow rate.

## **SHUTDOWN OR REMOVAL FROM SERVICE**

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1. Shut off the gas or liquid supply to the flowmeter. It should always be shut off when the system is not in use.

**WARNING: Hazardous gases must be discharged into a safety vent. Be sure to use a venting procedure that is environmentally acceptable and complies with Federal, State and local requirements.**

2. Vent the system to atmospheric pressure. If the flowmeter was used with a hazardous gas, purge the flowmeter and entire system with clean dry nitrogen gas. Continue purging until the hazardous gas level in the system is below the TLV for the gas.

**DISASSEMBLY** (Fig. 1 or Fig. 2, see pages 14-15)

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1. Remove the front and back plates.
2. Loosen the seal spindle located at the top of the flowmeter by turning it counterclockwise with a  $\frac{5}{32}$  in. hex wrench. For Series 50K Flowmeters, use a  $\frac{3}{8}$  in. slotted screwdriver. Remove the tube from the meter housing.
3. The tube, float and float stops may be cleaned as a unit or may be disassembled for cleaning. Using a small hook, remove either of the Teflon<sup>®</sup> float stops from the metering tube and remove the float. Be careful not to chip the ends of the tube.
4. Remove the packing gaskets and grommets.
5. Remove the seal spindle, if necessary, by rotating it clockwise for the Series 50 Flowmeter and counterclockwise for the Series 50K Flowmeter. Do not remove the seal spindle unless the O-Ring which seals the spindle requires replacement. The O-Ring may be used as long as it is not torn or distorted.
6. Remove the metering valve assembly by turning the valve body counterclockwise. Remove and clean the valve seat, stem and packing.

**Note:** If the flowmeter is equipped with a filter, it may be necessary to change the element periodically. Unscrew the filter assembly and replace the element and the O-Ring seal.

## REASSEMBLY

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1. Use the reverse of steps 1 through 6 of the disassembly procedure to reassemble the meter. Note the following during reassembly:
  - Prior to installing the needle control valve assembly make certain that the valve stem is turned completely counterclockwise to prevent damage to the valve seat.
  - When replacing the packing gaskets in the flowmeter body, be sure the packing grommets are approximately  $\frac{1}{16}$  in. above the top of the packing gasket. Also, be certain the tube seats firmly on the packing gasket and does not overlap onto the end block.
  - The seal spindle serves to radially compress the tube packing gasket and exert a uniform pressure on the metering tube to prevent any possibility of leakage. Do not over tighten the seal spindle. Damage to the equipment may result.
2. After the flowmeter has been reassembled, it is important that it be leak tested with nitrogen or air and either a soap solution, such as Snoop<sup>®</sup> or a gas leak detector. Do not exceed the flowmeter's maximum operating pressure and temperature during the leak test procedure. Vent all pressure from the system and repair any leaks before proceeding.



## CALIBRATION

Flowmeters are calibrated using Air at normal temperature (70°F) and pressure (14.7 psia) to an accuracy of ±10% of full scale from 10% to 100% of range. Approximate flow ranges for other gases are listed on pages 12-13 — for gases and conditions not found in the table approximate flow ranges can be mathematically derived using the following conversion formulas.

**Note:** These are approximate flow corrections; if precise flow corrections are required, on site calibration of the flowmeter should be performed.

$$\text{Gas Conversion Factor} = \sqrt{\frac{1}{\text{Specific Gravity of Process Gas}}}$$

$$\text{Pressure Conversion Factor} = \sqrt{\frac{\text{Actual Operating Pressure in psia}}{14.7 \text{ psia}}}$$

$$\text{Temperature Conversion Factor} = \sqrt{\frac{530}{\text{Actual Temperature in } ^\circ\text{F} + 460}}$$

Determine the corrected flow rate by multiplying the flow reading obtained by one, two and/or three of the conversion factors calculated above.

$$\text{Flow Reading} \times \text{Gas Factor} \times \text{Pressure Factor} \times \text{Temperature Factor} = \text{Corrected Flow Reading}$$

**EXAMPLE:** To calculate corrected flow reading for Argon at the following conditions.

The **Flow Reading** from the tube calibrated for Air at NTP is 150 sccm.

The **Gas Conversion Factor** is calculated for Argon. (Specific gravity of Argon at 70°F (Air=1) is 1.378)

$$\sqrt{\frac{1}{1.378}} = 0.85$$

The **Pressure Conversion Factor** is calculated for a pressure of 30 psia through the flow tube. (Measured at outlet of flowmeter)

$$\sqrt{\frac{30 \text{ psia}}{14.7 \text{ psia}}} = 1.43$$

The **Temperature Conversion Factor** is calculated for a gas temperature of 60°F.

$$\sqrt{\frac{530}{60^\circ\text{F} + 460}} = 1.01$$

$$150 \text{ sccm} \times 0.85 \times 1.43 \times 1.01 = 184 \text{ sccm}$$

Flow Reading      Gas Factor      Pressure Factor      Temperature Factor      Corrected Flow Reading

## MAINTENANCE AND REPAIRS

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Periodically inspect the tube and float, and clean if necessary. Dirt or foreign materials adhering to the float or the inside of the tube may cause inaccuracy and sticking of the float. Borosilicate glass metering tubes and related parts may be cleaned ultrasonically or with a solvent that does not attack glass.

Repairs beyond those contained in this instruction booklet must be made by Advanced Specialty Gas Equipment Corp. who have the special tools, test equipment and trained personnel required to make a safe repair. Contact your Advanced Specialty Gas Equipment Distributor to arrange for repair.

*Warranty Repairs* are only available through Advanced Specialty Gas Equipment Corp., and will be performed at no charge for parts and labor. For information on warranty, see the last page of this instruction booklet.

*Non-Warranty Repairs* are available through your distributor. Upon receipt at the factory, the flowmeter will be inspected and you will be contacted by your distributor with a repair cost estimate. No item will be repaired until approval is received. There will be an evaluation charge assessed for equipment not repaired.

## SPECIFICATIONS

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Maximum Operating  
Pressure and Temperature

Series 50

200 psig at 250° F

Series 50K

150 psig at 100° F

Minimum Operating Temperature

32°F

Accuracy

±10% of full scale from  
10% to 100% of range.

Repeatability

Within 0.5% of full scale

Tube Graduations

Standard cubic centimeters per  
minute or standard liters per  
minute of Air depending on  
range. See Tube Selection Table.

Scale Length

65 millimeters

Available Ranges

See Tube Selection Table

Inlet and Outlet Connections

Series 50

½ in. NPT female

Series 50K

¼ in. NPT female

Weight (approx.)

1 lb.

## MATERIALS OF CONSTRUCTION

Tubes	Borosilicate Glass with float stops of Teflon <sup>®</sup>
Floats	Borosilicate Glass, Type 316 Stainless Steel or Carboly as specified in Tube Selection Table
End Blocks	See Table 1
Inlet/Outlet Adaptors	See Table 1
Side Plates	Aluminum
Back Plate	White Plastic
Front Plate	Clear Plastic
Seals and Packing	Viton <sup>®</sup> (other material available on special order)
Valve	Type 316 Stainless Steel

**Table 1**

Series	Part Number	End Blocks Material	Inlet/Outlet Adaptor Material
50	FM4350-(* )	Aluminum	Aluminum
50	FM4360-(* )	Type 316 SS	Type 316 SS
50K	FM4451-(* )	Kynar <sup>®</sup>	None

\* Indicates tube number. See Tube Selection Table on the following page for ranges available.

## TUBE SELECTION TABLE FOR SERIES 50 & 50K FLOWMETERS

Flow rates shown are at 70°F and 14.7 psia.

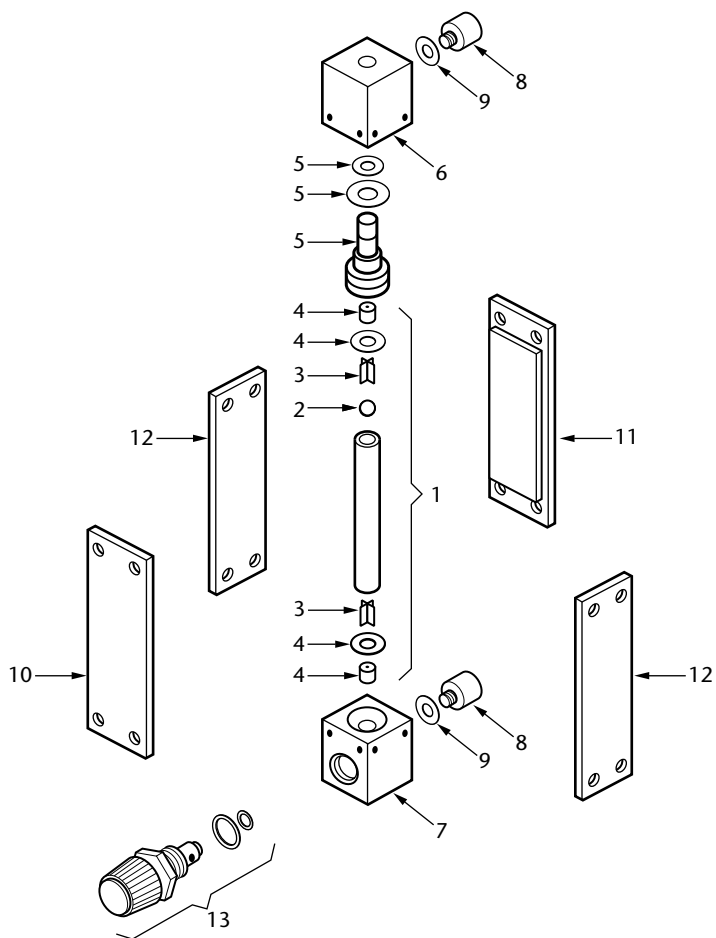
<b>Tube No.</b>	<b>Float Material</b>	<b>Air Actual Graduations</b>	<b>Argon* Approx. Range</b>	<b>Carbon Dioxide* Approx. Range</b>
0	Glass	8.0–50 sccm	4.3–43 ccm	6.1–61 ccm
1	Glass	5.0–85 sccm	7.1–71 ccm	10.4–104 ccm
2	Glass	40.0–440 sccm	38–375 ccm	36–355 ccm
3	316 Stn. Stl.	100–950 sccm	81–808 ccm	77–767 ccm
4	Glass	0.2–1.8 slpm	0.15–1.52 Lpm	0.16–1.6 Lpm
5	316 Stn. Stl.	0.4–3.6 slpm	0.31–3.09 Lpm	0.32–3.18 Lpm
6	Glass	0.5–7 slpm	0.6–5.92 Lpm	0.6–5.95 Lpm
7	316 Stn. Stl.	1.0–13 slpm	1.1–11.08 Lpm	1.1–10.91 Lpm
8	316 Stn. Stl.	6.0–24 slpm	2.1–20.54 Lpm	2.0–20.13 Lpm
9	Carboloy	4.0–44 slpm	3.8–37.4 Lpm	3.6–36.3 Lpm

<b>Tube No.</b>	<b>Replacement Tubes and Packing Part No.</b>
0	FM4340
1	FM4341
2	FM4342
3	FM4343
4	FM4344
5	FM4345
6	FM4346
7	FM4347
8	FM4348
9	FM4349

\*Series 50 & 50K flow tubes are directly calibrated for air at 70°F and 14.7 psia. Flow rates shown for other gases are for reference purposes only. Approximate flow capacities for other gases and operating conditions may be mathematically derived using the conversion factors shown on page 9, "Calibration."

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<b>Helium*</b> Approx. Range	<b>Hydrogen*</b> Approx. Range	<b>Nitrogen*</b> Approx. Range	<b>Oxygen*</b> Approx. Range
4.7–47 ccm	10.5–105 ccm	5.1–51 ccm	4.5–45 ccm
7.9–79 ccm	17.8–178 ccm	8.7–86.7 ccm	9.3–93 ccm
52–513 ccm	0.11–1.11 Lpm	44.9–448.8 ccm	41.1–411 ccm
0.15–1.48 Lpm	0.3–2.83 Lpm	96.9–969.0 ccm	88.4–884 ccm
0.38–3.78 Lpm	0.6–6.02 Lpm	0.2–1.84 Lpm	0.2–1.7 Lpm
0.78–7.82 Lpm	1.2–12.04 Lpm	0.4–3.67 Lpm	0.3–3.39 Lpm
1.55–15.49 Lpm	2.4–23.81 Lpm	0.7–7.14 Lpm	0.8–8.16 Lpm
3.1–30.56 Lpm	4.6–45.85 Lpm	1.4–13.26 Lpm	1.6–15.51 Lpm
5.7–56.4 Lpm	8.5–84.48 Lpm	2.5–24.48 Lpm	2.9–28.7 Lpm
10.4–103.3 Lpm	15.5–155.0 Lpm	4.5–44.88 Lpm	5.3–52.43 Lpm



1. Metering Tube Assembly
2. Float
3. Float Stops
4. Packing Gaskets & Grommets
5. Seal Spindle & O-Rings
6. End Block (Outlet)
7. End Block (Inlet)
8. Inlet & Outlet Adaptors
9. Adaptor O-Rings
10. Front Plate
11. Back Plate
12. Side Plates
13. Metering Valve Assembly

Figure 1 - Series 50 Flowmeter Assembly

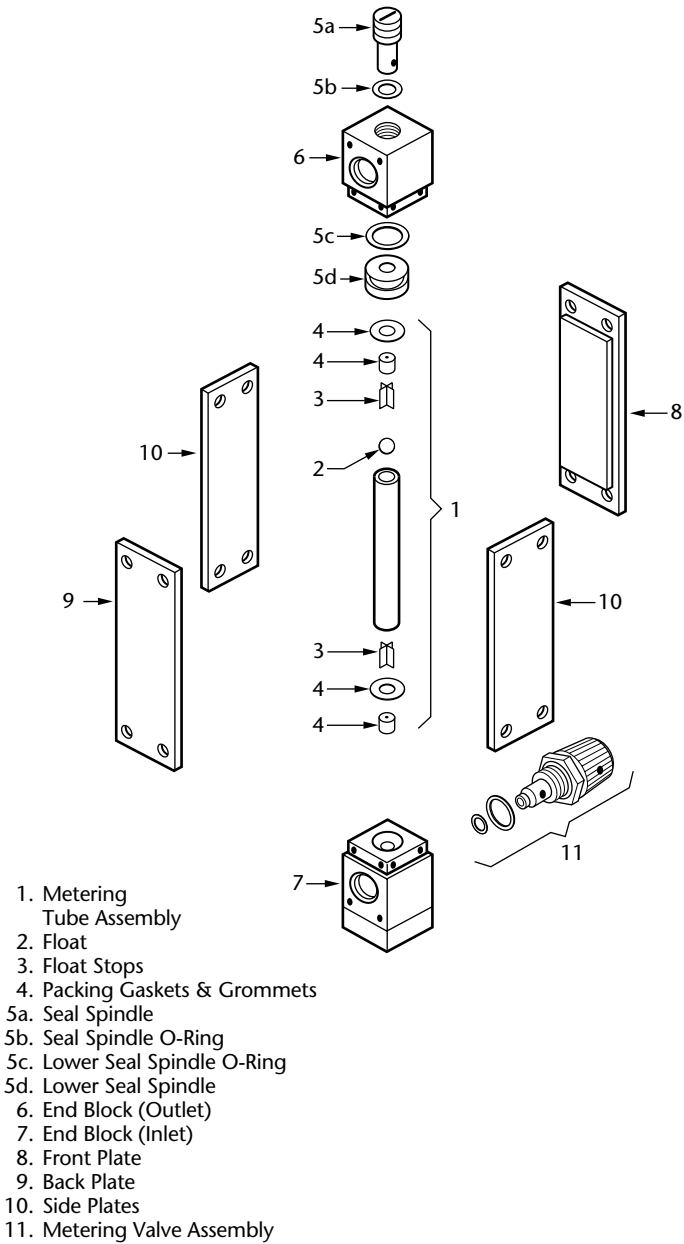


Figure 2 - Series 50K Flowmeter Assembly

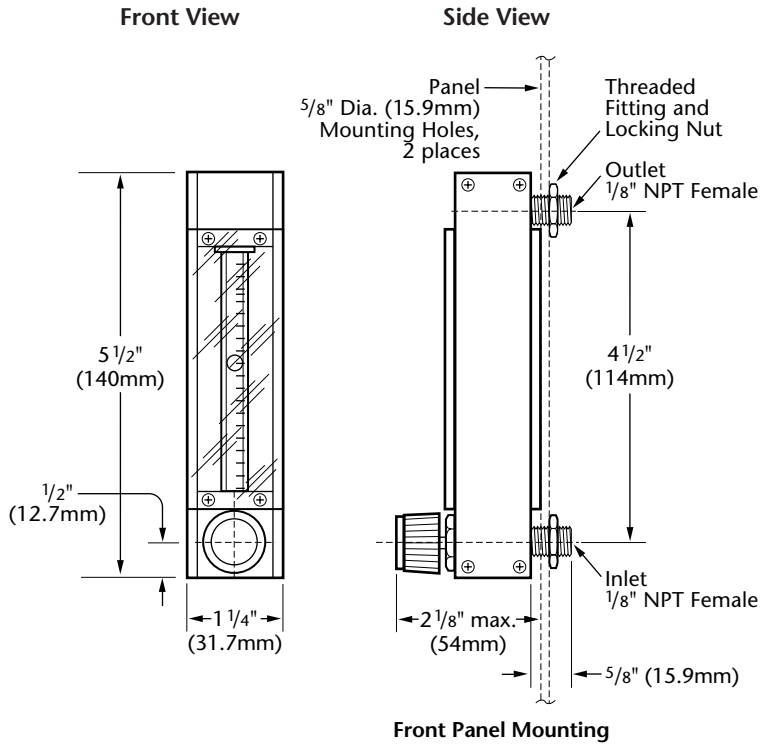


Figure 3 - Series 50 Flowmeter Dimensions



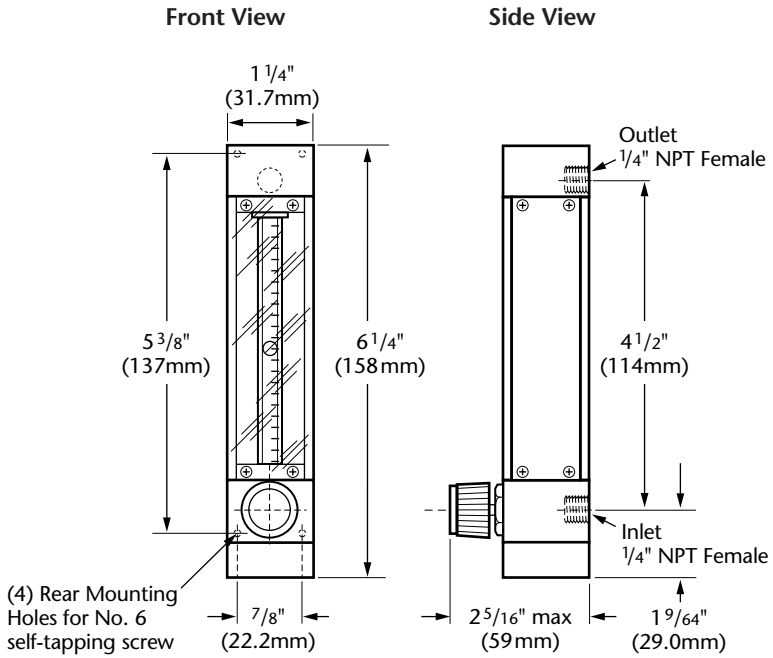


Figure 4 - Series 50K Flowmeter Dimensions

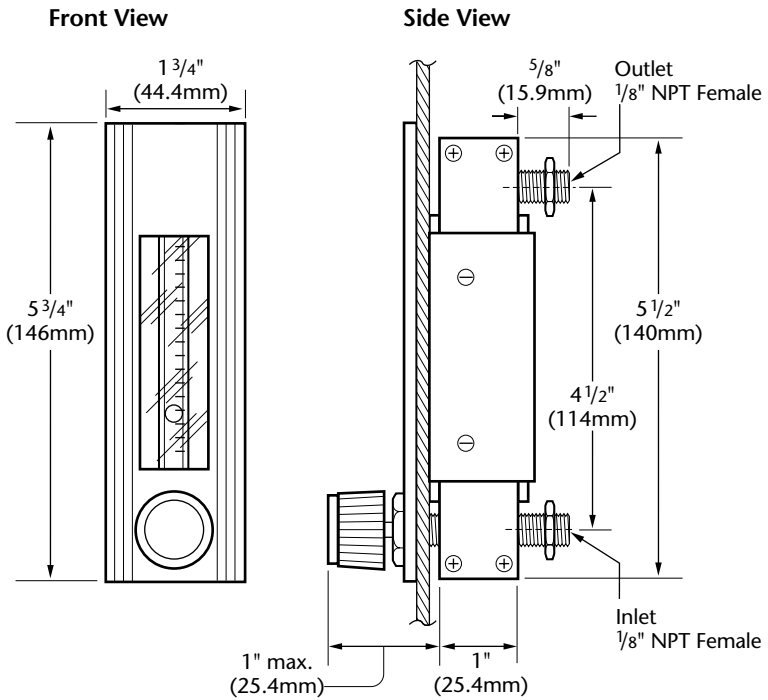


Figure 5 - Series 50 Flowmeter Dimensions with optional Aluminum Bezel (FM4711)

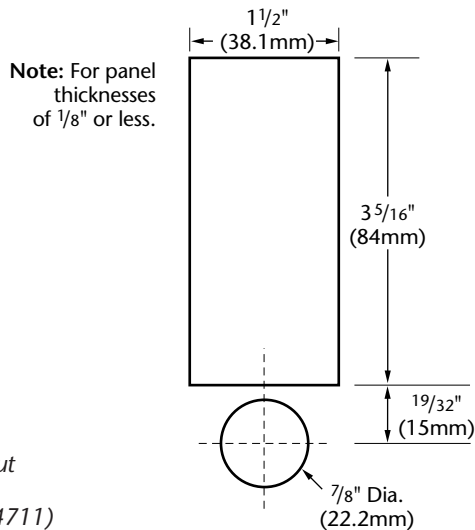


Figure 6 - Panel Cutout Dimensions for Aluminum Bezel (FM4711)

## **WARRANTY**

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Advanced Specialty Gas Equipment Corp., (the Company), warrants to the initial purchaser of each flowmeter described herein, that such equipment will be free from defects in material and workmanship which result in breakdown or failure under normal use during a period of 12 months from date of shipment by the Company if used and maintained according to Advanced Specialty Gas Equipment written instructions. This warranty does not cover damage or malfunction due to corrosion. Purchaser is aware that this equipment is designed for specific applications and that using this equipment with the wrong or improperly purged gas or at the wrong pressure may damage or corrode the unit and cause personal injury. Purchaser must confirm that this equipment is compatible with the gas being passed through it. If there is any doubt about compatibility, consult your Advanced Specialty Gas Equipment Corp. distributor.

The Company's liability under this warranty shall be limited to the repair, or at its option, replacement or refund of the purchase price, of such equipment which proves to be defective, provided; however, that this warranty shall only apply if the purchaser (1) gives the Company written notice within ten (10) days after discovery of such defect, (2) immediately on discovery of the claimed defect, discontinues all use of such equipment, and (3) returns such equipment freight prepaid to plant of manufacture.

**THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE SPECIFIED HEREIN. NO WARRANTIES BY ADVANCED SPECIALTY GAS EQUIPMENT CORP. (OTHER THAN WARRANTY OF TITLE AS PROVIDED IN THE UNIFORM COMMERCIAL CODE) SHALL BE IMPLIED OR OTHERWISE CREATED UNDER ANY APPLICABLE LAW, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY AND WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.** No claim against the Company of any kind, whether as to equipment delivery or for nondelivery of equipment and whether or not based on contract, warranty, negligence, strict liability in tort or otherwise, shall be greater in amount than the purchase price of the equipment in respect of which such claim is made.

Without limiting the generality of the foregoing, Advanced Specialty Gas Equipment Corp. shall not be liable for any special, indirect, or consequential damage, such as failure of parts resulting from corrosion.

If it is determined by Advanced Specialty Gas Equipment Corp. that the equipment is to be repaired or replaced under the terms of this warranty, the cost of returning said equipment to the initial purchaser will be paid by the Company. If, however, equipment returned to the Company in connection with a claim under this warranty is found by the Company not to be defective hereunder, then such equipment will be returned to the initial purchaser, shipping charges collect, and additionally, a service charge will be paid by the purchaser to the Company to cover the cost of handling and testing such equipment.



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