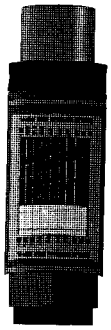
FL2900/6900/7900/8900 Series
FL2700B/6700B/7700B/8700B Series
Pneumatic In-Line Flowmeters
Operator's Manual: M1175/1094



CAUTION , IMPORTANT..... READ BEFORE INSTALLING!

Do **NOT** use Aromatic Hydocarbons, Halogenated Hydrocarbons, Ketones or Ester-based fluids on (or near) polycarbonate guard. Do **NOT** use Loctite thread locker or liquid teflon as thread sealant.

Do **NOT** install this unit within 2 ft. of electrical transformers, high strength electric motors or other electro-magnetic devises that could adversely effect the magnetic coupling between the Flow Indicator and the Piston Magnet.

GENERAL DESCRIPTION

The OMEGA® Pneumatic In-Line Flowmeters monitor air flow rates to determine optimum performance, flow regulator settings, or pneumatic system performance. The FL2700B, 6700B, 7700B, and 8700B Series feature direct reading scales for air flow. The FL2900, 6900, 7900, and 8900 multi-pressure scales (from 40 to 130 PSIG) mean accurate flow measurements can be made without the need for conversion calculations for pressure variations.

INSTALLATION: The flowmeter can be mounted vertically or horizontally in the flow line. Notice the flow arrow which is located on the meter scale, showing the direction which the flow must travel. The multi-pressure meter acts as a check valve in reverse flow.

CAUTION: The flowmeter contains a residual amount of petroleum base test fluid. This fluid may be incompatible or hazardous with some compressed gases.

All air meters must have a pressure gauge installed at the inlet port. The gauge should have PSIG range capacity at least 25% higher than the actual pressure you are expecting to run. For example, if you are running your pressure at 100 PSIG you should have a gauge dial with a PSIG range of at least 125 PSIG. Flow straighteners are not required at the inlet or exhaust ports. In fact, 90 degree elbows can be at either end of the meter or both if necessary.

OPERATION: Inside the meter is a sliding piston moving against a spring when the flow varies. This piston movement opens and closes an orifice, which is followed on the outside of the meter by a moving indicator ring, magnetically coupled to the internal piston. The meter has a graduated scale calibrated for air in SCFM (standard cubic feet per minute). The multi-pressure meters are calibrated for inlet pressure ranges commonly used from 40 PSIG to 130 PSIG, at 70°F. The single pressure meters come standard with a single pressure scale calibrated for inlet pressure of 100 PSIG or otherwise specified by customer.

TO READ MULTI-PRESSURE SCALES:

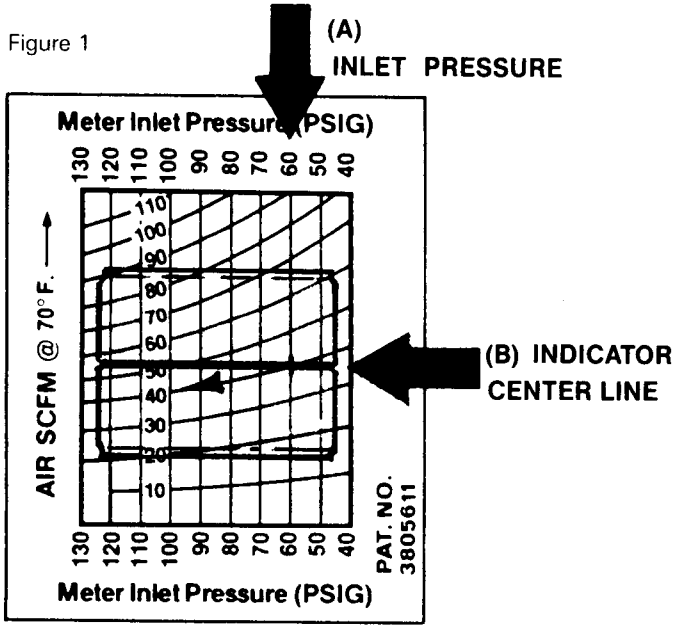
Using the pressure scale line that corresponds to the pressure gauge reading at the inlet port, you will be able to determine your flow within ±4% without additional calculations (See Figure 1). Notice the orange center-line on the indicator ring under the clear lexan dust guard. When flow is moving through the meter, the indicator ring will move along under the guard. The flow rate is determined by matching the position of the indicator ring orange center-line and its related position on the flow scale of the pressure line being used. When the pressure changes, the new flow scale is determined by a new pressure line on the meter (see Figure 1).

When operating at a pressure greater than is displayed on scale, use the 100 PSIG scale line and refer to "How to Read Single Pressure Meters".

TO READ SINGLE PRESSURE SCALE METERS:

The flowmeters are available pre-calibrated at 100 PSIG, 70°F and 56% Relative Humidity. You will be able to determine your air flow to within ±4% when operating at 100 PSIG inlet pressure. Notice the center line on the indicator ring under the clear lexan dust guard. When flow is moving through the meter, the indicator ring will move along under the guard. The flow rate is determined by matching the position of the indicator ring center line and it's related position on the scale. When inlet pressure changes, the scale must be corrected to the new inlet pressure. Temperature affects the scale so little that in most cases it can be ignored.

Figure 1



SCALE READING INSTRUCTIONS

Example:

(A) Note inlet pressure from gauge, 60 PSIG
(B) Note where indicator center line crosses the inlet pressure line
(C) Read curve line to datum flow = 40 SCFM @ 60 PSIG.

Use the three following basic steps for simple reading accuracy or conversion.

1. Add the proper size pressure gauge to the line directly in front of the Flowmeter inlet. If an air tool is used downstream of the meter, you will notice no flow through the meter when the trigger valve of the tool is in the on (closed) position, and the pressure gauge will show system pressure.
2. Now, shift the valve or trigger and allow the air to flow through the meter. Notice the pressure reading on the gauge. If it is around 100 PSIG, at the pressure the flowmeter is calibrated, the air flow can be read directly off the meter. If the pressure is higher or lower than 100 PSIG, you must convert the scale (see Figure 2).
3. Conversion Example: Inlet gauge pressure = 50 PSIG
   SCFM indicated on scale = 60 SCFM
   (at 100 PSIG pre-calibrated pressure)

Basic formula, SCFM (actual) = $\frac{\text{SCFM (indicated)}}{f_1}$

Basic equation = $f_1 = \sqrt{\frac{114.7}{14.7 + \text{PSIG}}}$

Substituting your **inlet pressure** into the basic equation, in place of PSIG:

$$f_1 = \sqrt{\frac{114.7}{14.7 + 50\ (\text{PSIG})}} = 1.33$$

NOW: SCFM (actual) = $\frac{60\ \text{SCFM @ 100 PSIG (indicated)}}{f_1}$

= 45 SCFM @ 50 PSIG

Reading directly off the pre-calibrated chart (see Figure 2), under "50 PSIG", read 1.331 as the conversion factor f_1.

Figure 2

DETERMINE FLOW RATES USING DIFFERENT PRESSURES & TEMPERATURES

SCFM (actual) = $\frac{\text{SCFM (indicated)}}{f_1 \times f_2 \times f_3}$

Where f_1 = Conversion factor for inlet pressure
f_2 = Conversion factor for temperature
f_3 = Conversion factor for specific gravity

TABLE 1 PRESSURE CORRECTION FACTOR (f_1)

OPERATING PRESSURE psig										
psig	25	50	75	100	125	150	175	200	225	250
f_1	1.700	1.331	1.131	1.00	902	835	778	731	692	658

$$f_1 = \sqrt{\frac{114.7}{14.7 + \text{psig}}}$$

TABLE 2 TEMPERATURE CORRECTION FACTOR (f_2)

OPERATING TEMPERATURE °F										
°F	10	30	50	70	90	110	130	150	170	190
f_2	942	962	981	1.00	1.018	1.037	1.055	1.072	1.090	1.107

$$f_2 = \sqrt{\frac{460 + °F}{530}}$$

TABLE 3 SPECIFIC GRAVITY CORRECTION FACTOR (f_3)

$$f_3 = \sqrt{\text{Sp Gr}}$$

SUMMARY:

1. Add the pressure gauge as close as possible to the inlet port of the meter.
2. Turn on air and operate.
3. Use conversion factor when operating at pressures other than 100 PSIG.

CLEANING/MAINTENANCE

See Figure 3. It is not necessary to remove the clear lexan dust guard to clean the meter. DO NOT use cleaning solvent on the lexan guard.

I. Note how the flow disassembles, for ease of reassembly.
   1. Remove flow meter from system. Remove excess piping from meter.
   2. Thoroughly wipe off outside of flow meter assembly, removing all foreign matter.
   3. Remove inlet cap from body assembly. This should be the only part which needs to be disassembled with tools. The internal parts should slide out when tilted. If they do not, refer to Section II before continuing.
   4. Place all meter parts on a work surface in order of disassembly.
   5. Clean and dry the spring and cap assembly.
   6. Disassemble and clean piston, magnet, shim and piston ring.
   7. Clean disassembled parts.
   8. Reassemble the cleaned parts and check the inlet cap to make sure the O-ring does not have any nicks or cuts. If it does, it is recommended that you replace it.

II. Maintenance check after disassembly
   1. Did the parts come out of the meter freely? If not, push parts out by inserting a wooden rod into the outlet end.
   2. Look for any foreign matter within the meter and on internal parts.
      a. It may be necessary to determine where the foreign matter is coming from.
      b. It may be necessary to add a finer filtration system.
   3. Look for any scored or worn parts inside the body, especially around the piston assembly.
      a. Replace any badly worn parts.
      b. Meters may be sent back to OMEGA for inspection and repair.

Before placing meter back into operation, the cause of contamination should be determined and eliminated, otherwise this problem will be repeated. Meter damage caused by excessive contamination will not be covered under warranty.

SPECIFICATIONS

ALL MODELS

ACCURACY: ±4% FS

REPEATABILITY: ±1% FS

PRESSURE RATING: 600 PSIG max.

MAX. TEMPERATURE: 210°F (180°F for ½" series)

FL2700B, 6700B, 7700B, 8700B SERIES:

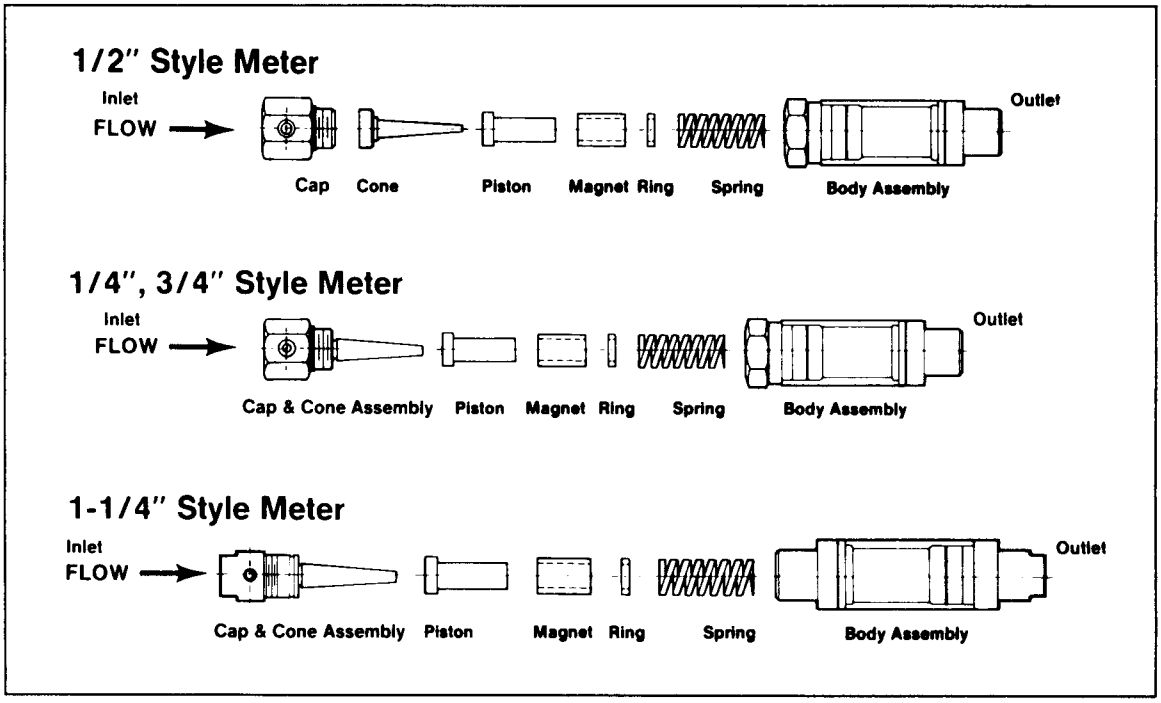
MATERIALS: #CA360 brass body with plastic gland, piston, and metering cone (except ½" series -Celcon cone), stainless steel spring and nickel-plated Alnico magnet

SIZE/SHIPPING WEIGHT: ¼" —12 oz, ½" —2 lbs, ¾" —4 lbs, 1¼" -20¼ lbs

FL2900, 6900, 7900, 8900 SERIES

MATERIALS: Anodized aluminum body with dichromate sealed anodized aluminum cone and piston (FL6900 series uses polyacetal cone), SS spring, and nickel plated alnico magnet

Figure 3



Model No.	Flow Range (SCFM)	Port Size	Dimensions OD	Length
FL2904 FL2909 FL2918 FL2924	1 - 4 2 - 9 2 - 18 4 - 24	1/4"	1.4"	4.8"
FL6920 FL6960 FL6911 FL6915	2 - 20 10 - 60 10 - 110 20 - 150	1/2"	1.8"	6.6"
FL7918 FL7950 FL7990 FL7915 FL7922	4 - 18 5 - 50 10 - 90 15 - 150 20 - 220	3/4"	2.3"	7.2"
FL8925 FL8945 FL8960 FL8980 FL8910	20 - 250 25 - 450 50 - 600 50 - 800 50 - 1000	1 1/4"	4.0"	12.2"

Model No.	SCFM @ 100 PSIG, 70°F	FNPT Port Size	O.D.	Length
FL2704B FL2709B FL2718B FL2724B	1-4 2-9 2-18 4-24	1/4"	1.4"	4.8"
FL6760B FL6711B FL6715B	10-60 10-110 20-150	1/2"	1.8"	6.6"
FL7750B FL7722B	5-50 20-220	3/4"	2.3"	7.2"
FL8745B FL8760B FL8780B FL8710B	25-450 50-600 50-800 50-1000	1 1/4"	4.0"	12.2"

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Customer Service: 1-800-622-2378 / 1-800-622-BEST℠
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN℠
TELEX: 996404 EASYLINK: 62968934 CABLE: OMEGA

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Telephone: 44 (1455) 285520 FAX: 44 (1455) 283912

MADE IN USA

WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product. If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. However, this WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

OMEGA is glad to offer suggestions on the use of its various products. Nevertheless, OMEGA only warrants that the parts manufactured by it will be as specified and free of defects.

OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

Every precaution for accuracy has been taken in the preparation of this manual; however, OMEGA ENGINEERING, INC. neither assumes responsibility for any omissions or errors that may appear nor assumes liability for any damages that result from the use of the products in accordance with the information contained in the manual.

SPECIAL CONDITION: Should this equipment be used in or with any nuclear installation or activity, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the equipment in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA ENGINEERING Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS OR **CALIBRATION**, consult OMEGA for current repair/calibration charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair/calibration,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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