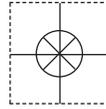


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The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, human applications.

Essential Instructions

Read this page before proceeding!

OMEGA Engineering designs, manufactures and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use and maintain them to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, using and maintaining OMEGA's Products.

- Read all instructions prior to installing, operating and servicing the product. If this instruction manual is not the correct manual, telephone 1-800-872-9436 and the requested manual will be provided. Save this instruction manual for future reference.
- If you do not understand any of the instructions, contact OMEGA Engineering for clarification.
- Follow all warnings, cautions and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation and maintenance of the product.
- Install your equipment as specified in the installation instructions of the appropriate instruction manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified OMEGA Engineering. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look-alike substitutions may result in fire, electrical hazards or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.



⚠ WARNING

**GLASS TUBE
EXPLOSION
HAZARD**

**Plastic protective sleeve must remain over glass tube.
Fasten meter windows securely.
Do not operate above pressure and temperature limits.
Avoid pressure and flow surges.
Do not service or repair while pressurized.
Read and understand instruction manual.
Failure to comply could result in serious personal injury or property damage.**

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Introduction

1-1 Description

The OMEGA® Series FL-1500 A Rotameters are an inexpensive method of providing accurate, local flow rate indication in a flowmeter which is extremely easy to disassemble and clean

Basic elements of the Series FL-1500 A variable area flowmeters are a tapered, glass metering tube with 20 millimeter, usable scale length and a metering float.

1-2 Design Features

- Side plate construction
- Ten-to-one rangeability
- O-ring seal-inlet and outlet same size
- Choice of float type and capacity ranges
- Standard NPT connections

1-3 Specifications

⚠ WARNING

Do not operate this instrument in excess of the specifications listed below. Failure to heed this warning can result in serious personal injury and/or damage to the equipment.

⚠ WARNING

Glass metering tubes are designed for operation up to the maximum operating pressures and temperatures as specified herein. Due to the inherent brittle characteristics of glass and conditions beyond our control, tube breakage could result even within specified operating conditions. Do not use glass tube meters with fluids that are toxic, or chemically react with glass such as water above 140°F, steam, alkalis, fluorine, hydrofluoric acid, or molten metal. Failure to heed warning can result in serious personal injury and/or damage to the equipment.

Capacities

Refer to Table 1-1

Flow Accuracy

Standard: $\pm 2\%$ full scale from 100% down to 10% of scale reading.
Optional: $\pm 1\%$ of full scale from 100% down to 10% of scale reading.

Repeatability

0.5% full scale

Pressure Ratings

Refer to Table 1-2

Scales

Length: 250 mm

Standard: Fused on metering tube, choice of arbitrary millimeter or calibration data sheet; percentage of maximum flow with factor tag.

Optional: Direct reading, engraved detachable metal plate.

Ambient Temperature Limits

33°F to 125°F (1°C to 52°C)

Operating Fluid Temperature Limits

33°F to 250°F (1°C to 121°C)

Materials of Construction:**Metering Tube**

Borosilicate Glass

Protective Tube Sleeve

UV stabilized polycarbonate

	WARNING GLASS TUBE EXPLOSION HAZARD
<p>Plastic protective sleeve must remain over glass tube.</p> <p>Fasten meter windows securely.</p> <p>Do not operate above pressure and temperature limits.</p> <p>Avoid pressure and flow surges.</p> <p>Do not service or repair while pressurized.</p> <p>Read and understand instruction manual.</p> <p>Failure to comply could result in serious personal injury or property damage.</p>	

Floats

316 stainless steel

Float Stops

316 stainless steel

Float Types

Types RV, LJ and RS

Housing

Side-plates: Aluminum, stainless steel

End Fittings

Brass or 316 stainless steel

O-rings

Standard: Buna-N
 Optional: Viton-A®

Window

Scratch resistant, UV stabilized polycarbonate

⚠ WARNING
GLASS TUBE EXPLOSION HAZARD
Protective sleeve must remain over glass tube. Fasten meter windows securely. Failure to comply could result in serious personal injury or property damage.

Connections

NPT female

Dimensions

Refer to Figure 1-2

1-4 Equipment Description

Mounting - front of panel screws

Table 1-1. Capacities

MODEL NUMBER	FLOAT	WATER				AIR @ 14.7 PSIA and 21°C (70°F)			
		GPM	LPM	PRESSURE DROP INCHES W.C.	VISCOSITY IMMUNITY CEILING, CS(**)	SCFM	SLPM	PRESURE DROP INCHES W.C.	PSI CRITICAL (*)
FL-1501A	8-RV-3	0.78	2.95	4.0	2.0	3.17	89.80	4.0	0
FL-1502A	8-RV-14	1.45	5.49	12.0	5.4	5.88	165.5	14.0	0
FL-1503A	9-RV-33	2.53	9.58	6.0	11.0	10.45	295.9	7.0	0
FL-1504A	10-RV-64	6.28	23.77	11.0	15.0	25.76	729.5	13.0	0

(*) MINIMUM OPERATING DOWNSTREAM PRESSURE FOR GAS SERVICE (PSIG)

(**) VISCOSITY IMMUNITY CEILING LISTED IS FOR STAINLESS STEEL FLOAT AND FLUID SP.GR. 1.0.

Table 1-2. Pressure Ratings.

Model Number	Maximum Working Pressure (psig)	Max Temp.
		Gas Service
FL-1501A, FL-1502A	300	121°C (250°F)
FL-1503A	175	
FL-1504A	100	

1. Pressure ratings are based on static pressure applicable at 250°F.
2. Glass tubes are not usable for caustic service.
3. Fluid temperatures below 32°F will cause frosting of the glass metering tube. Please consult factory for applications below this temperature.

Figure 1-1. Float Type

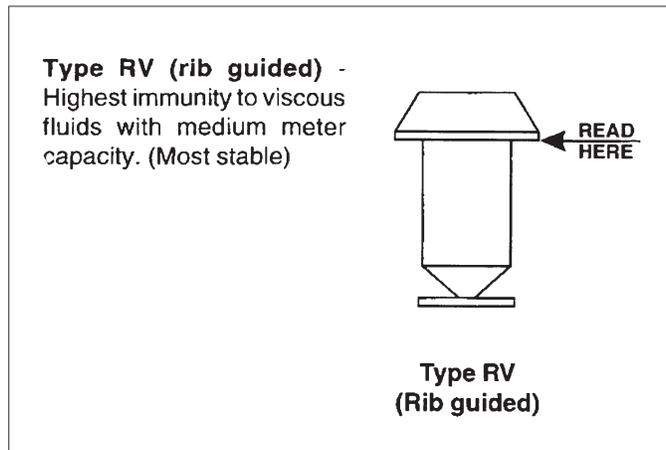
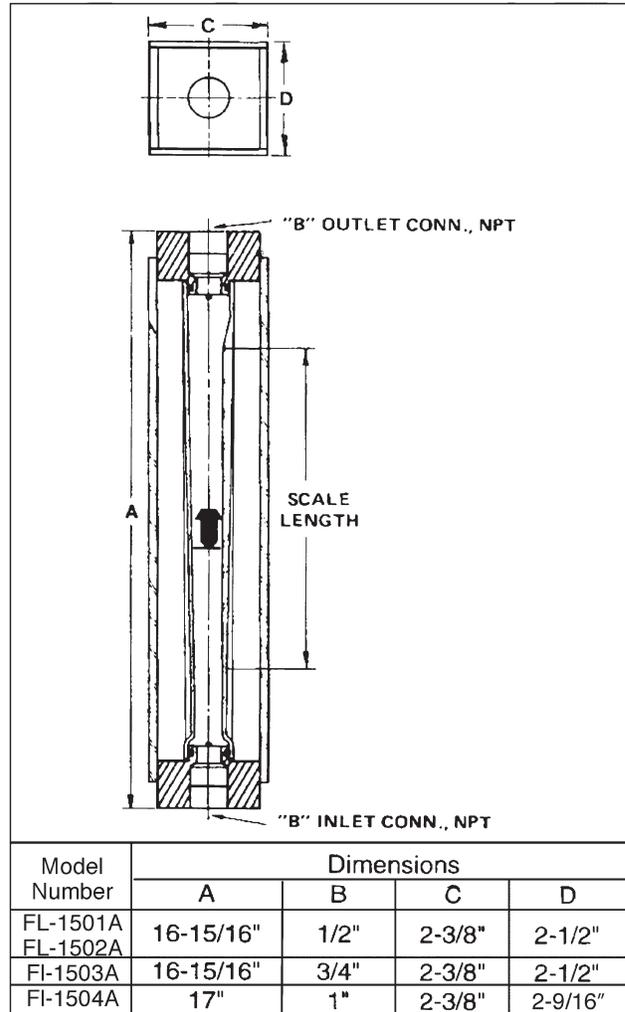


Figure 1-2. Dimensions.



Installation

2-1 Receipt of Equipment

When the equipment is received, the outside of the packing case should be checked for any damage incurred during shipment. If the packing case is damaged, the local carrier should be notified at once regarding his liability. Remove the envelope containing the shipping list. Carefully remove the equipment from the packing case and inspect for any damaged or missing parts.

In the event that the meter is damaged during shipment, please call customer service at 1-800-872-9436.

2-2 Recommended Storage Practice

If intermediate or long term storage is required for equipment, it is recommended that said equipment be stored in accordance with the following:

- a. Within the original shipping container.
- b. Stored in a sheltered area, preferably a warm, dry heated warehouse.
- c. Ambient temperature 70°F (21.0°C) nominal 110°F maximum/45°F minimum (43°C maximum/7.1°C minimum).
- d. Relative humidity 45% nominal 60% maximum/25% minimum.

Upon removal from storage, a visual inspection should be conducted to verify the condition of equipment is "as received".

2-3 Installation

⚠ NOTICE

Prior to meter installation remove the plastic shipping tube preventing float movement during shipping.

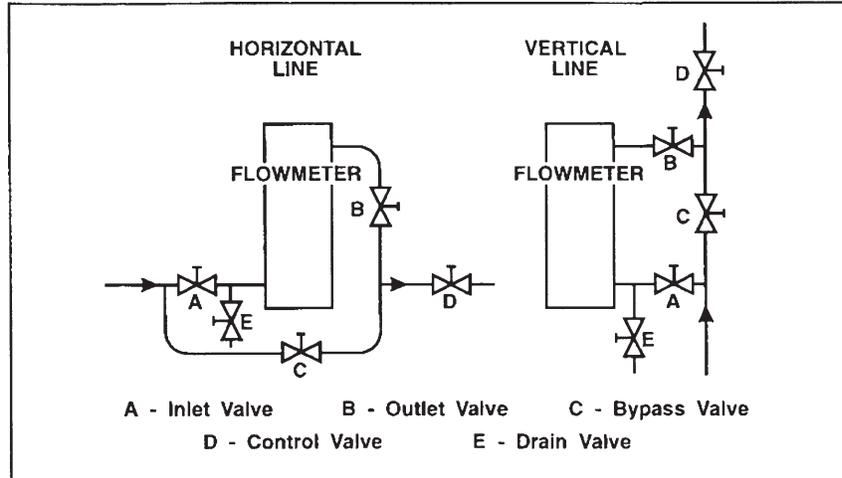
A. Location

For proper operation, the FL-1500A Series must be mounted within 6 degrees of true vertical, with the inlet connection at the bottom, and the outlet at the top. The use of a level is recommended to assure vertical positioning. Piping must be adequately supported to prevent undue strain on the flowmeter.

B. Piping Arrangement

It is recommended that bypass piping be installed around the flowmeter so it may be isolated from the process line for servicing and cleaning. Refer to Figure 2-1 for a typical installation.

Figure 2-1. Typical Bypass Installation.



⚠ CAUTION

Do not allow the float to fall out of the metering tube. A damaged float will affect the accuracy of the meter. Be careful not to break the tube by pulling on it at an extreme angle or applying excessive force.

⚠ CAUTION

Failure to drain the flowmeter when isolated in a bypass loop may result in tube breakage caused by thermal expansion of the process liquid.

Operation

3-1 Operating Instructions

After the flowmeter has been properly installed in the system, it is ready for operation.

	<p>! WARNING</p> <p>GLASS TUBE EXPLOSION HAZARD</p>
<p>Plastic protective sleeve must remain over glass tube. Fasten meter windows securely. Do not operate above pressure and temperature limits. Avoid pressure and flow surges. Do not service or repair while pressurized. Read and understand instruction manual. Failure to comply could result in serious personal injury or property damage.</p>	

<p>! WARNING</p>
<p>GLASS TUBE EXPLOSION HAZARD</p>
<p>Protective sleeve must remain over glass tube. Fasten meter windows securely. Failure to comply could result in serious personal injury or property damage.</p>

To initiate flow through a flowmeter using bypass piping, refer to Figure 3-1.

1. Close flowmeter isolation valves (A) and (B).
2. Fully open bypass valve (C) and slightly open control valve (D).
3. Initiate process flow. When flow has stabilized, fully open isolation valve (B), then slowly open isolation valve (A) fully.
4. Close bypass valve (C).
5. Regulate process flow using control valve (D).
6. If meter is left in by pass configuration, open drain valve (E) to prevent tube damage caused by thermal expansion of the process liquid.

<p>! CAUTION</p>
<p>Failure to drain the flowmeter when isolated in a bypass loop may result in tube breakage caused by thermal expansion of the process liquid.</p>

Rate of flow is indicated by reading the increments inscribed on the metering tube or direct etched scale parallel with the metering edge of the float. For the correct reading edge of the float, refer to Figure 3-2.

Figure 3-1. Typical Bypass Installation.

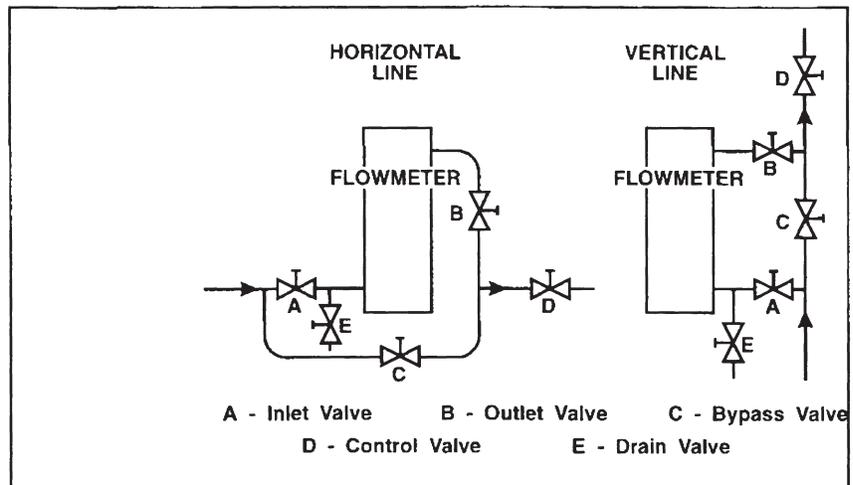
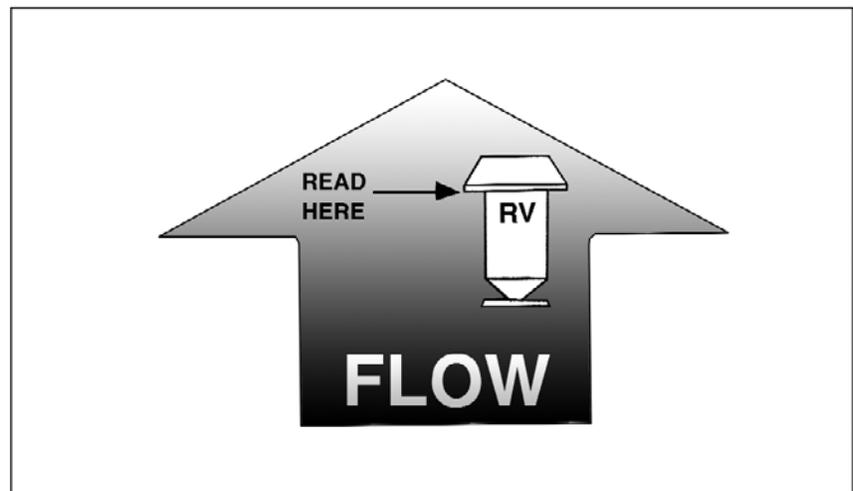


Figure 3-2. Reading edge of floats.



Maintenance

4-1 General

The FL-1500A Series flowmeters require little maintenance except routine cleaning. It is necessary to remove the flowmeter for the line for tube and float cleaning. The tube and float may be cleaned with a soft, absorbent swab. To disassemble the flowmeter, proceed as follows:

- a. Remove the front and rear window shields.
- b. Remove four (4) screws connecting the bottom end fitting to the side plate.
- c. Carefully pull the end fitting and tube away from the side plates and top fitting. DO NOT cock the tube when removing it from the top fitting.
- d. Remove the polycarbonate sleeve surrounding the flow tube.
- e. Remove the float from the tube.

CAUTION

Do not allow the float to fall out of the metering tube. A damaged float will affect the accuracy of the meter. Be careful not to break the tube by pulling on it at an extreme angle or applying excessive force.

- f. Using a suitable solvent, carefully swab and flush the inside of the metering tube. Clean the float and blow dry all parts thoroughly.

NOTICE

Anytime the meter is removed for service, new O-rings should be installed in both the inlet and outlet end fittings.

Reassemble the flowmeter as follows:

- a. Carefully install the float in the tube with the metering edge up. Refer to Figure 3-1 to determine the metering edge location.
- b. Carefully hold the tube, (with float installed), sleeve, and end fitting, and push the tube on the top fitting.
- c. Tighten the four (4) side plate screws in place.
- d. Install the front and rear windows.

WARNING

Pressure test the meter before returning it to service. Hydrostatic pressure testing should be performed by qualified personnel or serious injury and/or damage to the equipment can result.



WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's 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 malfunctions, 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. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been 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 in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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Direct all warranty and repair requests/inquiries to the OMEGA 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.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

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

1. Purchase Order 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, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

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

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