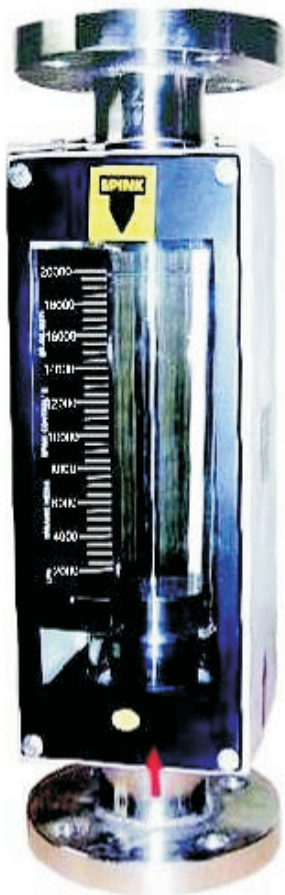




Instruction Manual



**GLASS TUBE ROTAMETER
MODEL SERIES
R – 101,102,103,104**

www.spinkcontrols.com



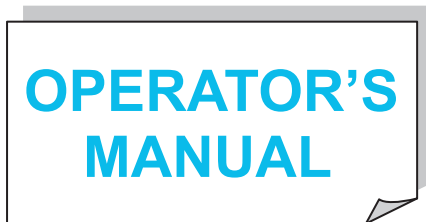
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CONTENTS

Section 1 Handling before Installation -----	Page 3 -3 1.1
Unpacking-----	Page 3
1.2 Storage -----	Page 3
Section 2 Introductions -----	Page 4 - 4
Section 3 Operations -----	Page 4 - 5
3.1 Operating Principle-----	Page 4
3.2 Flow formula-----	Page 4
3.5 Construction-----	Page 5
3.4 Required Operating Data for Manufacturing & Calibration----	Page 5
Section 4 Technical Specification -----	Page 5 - 6
4.1 Technical Data-----	Page 5
4.2 Model sketch-----	Page 6
4.3 Flow and Dimension-----	Page 6
Section 5 Installation -----	Page 7 - 8
5.1 User's Responsibility-----	Page 7
5.2 Installation Guideline-----	Page 7
5.3 Preparation of the pipeline-----	Page 7
5.4 Start-Up-----	Page 7
5.4.1 Measurement of liquids-----	Page 8
5.4.2 Measurement of gases-----	Page 8
Section 6 Maintenance and Trouble shootings -----	Page 9 - 10
6.1 Removal of the Metering Tube and Float-----	Page 9
6.2 Dismantling & Installation of taper tube-----	Page 9
6.3 Trouble Shootings-----	Page 10



Caution

The customer is advised to follow the installation & operating instruction carefully non adherence to which may cause serious personal injury & damage to the Rotameter for which the manufacturer will not be responsible.

Warning

Glass Tube Rotameter are designed for operation upto the maximum operating pressure and temperature 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.

Section 1 Handling before Installation

1.1 Unpacking

Care should be exercised when unpacking the instrument. The instrument should be carefully inspected to determine that no damage has occurred during the shipment. Protective coating or tape on metering edge should not be removed until just prior to installation. Inspection for damage should be made immediately.

The end fittings and metering tube should be inspected to make sure that they are free of any foreign matter and if necessary, should be cleaned with a tube brush or a soft swab. Remove tape and/or protective coating from metering float, and inspect its surface for burrs or scratches. All parts of the meter should be inspected visually for assurance meter will function properly.

1.1 Storage

When the Instrument is not in use, store in secure place away from any hazardous which may cause damage to the glass tube Rotameter. Metering Edge should be covered with Protective coating or tape in order to avoid further damage to the glass tube.

Section 2 Introduction

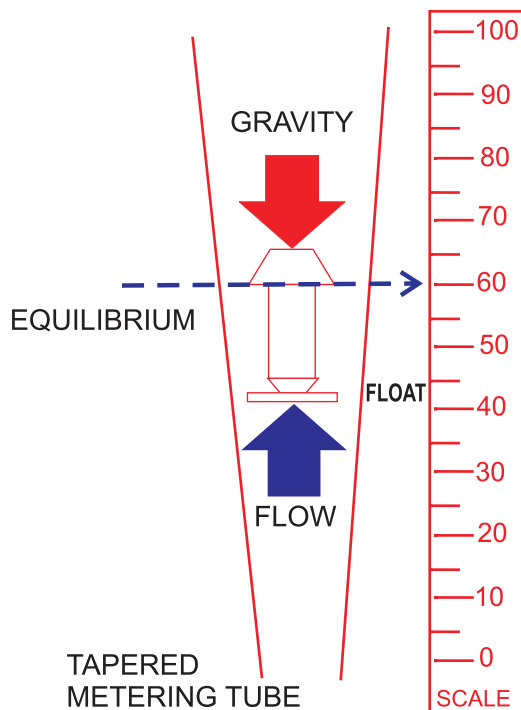
GLASS TUBE ROTAMETER (MODELS R – 101,102,103,104)

SPINK CONTROLS offer an industrial Flowmeter used to measure flow rates of liquids and gases. It operates on the variable Area Principle. It has high accuracy working capability and this Rotameter are used for wide application depending upon the flow rate, viscosity and turbidity of fluid.

Section 3 Operations 3.1 Operating Principle:

When a fluid or gas flow through a taper tube containing a float, a pressure difference of P1 and P2 is created between the upper and lower side of the float. The float moves upwards by a force obtained by multiplying the pressure differential by the maximum cross-sectional area of the float. Due to the nature of the taper tube as the float moves upwards, the fluid passing area increase as a result of which the differential pressure decreases. The upward movements of float stops when the differential pressure dynamically balances the dead load. The tapering of the metering tube is so designed that the vertical movement of the float becomes linearly proportional to the rate of flow and the scale is provided to read the position of the float, thus bringing birth to the flow indication.

3.2 Flow formula



Based on Bernoulli's theorem, the principle mentioned above can be theoretically expressed as follows.

$$Q = CA \frac{2gV(\rho - \gamma)}{Af \gamma}$$

Where

Q = Volumetric flow rate.

C = Flow coefficient.

A = Fluid passing Area.

g = gravimetric acceleration.

V = Volume of float.

Af = Maximum pressure receiving area of float.

ρ = Float density.

γ = Fluid density



3.5 Construction

The Taper glass tube is formed of Borosilicate glass of extremely high accuracy of bore obtained by collapsing the taper tube while in hot and plastic state on precision ground and polished mandrill. The tubes are annealed in furnace to relieve the stress formed during manufacturing. Float of various configuration and material are used for a wide range of application depending upon flow rate, viscosity and turbidity of fluid. The float has a sharp metering edge where the reading is observed by means of scale mounted along side of the tube. The scale is calibrated to directly read the flow rate.

3.4 Required Operating Data for Manufacturing & Calibration

For any gas & liquid the water equivalent is calculated from the operating data's of **pressure, temperature, density and viscosity** by computer using special software developed by us. After manufacturing the flow meter is then inspected by QC department for Pressure and Temperature testing. And calibration procedure followed.

Method: GRAVIMETRIC CALIBRATION OF FLOWMETER

A Flowmeter can be calibrated gravimetrically by weighing the quantity of liquid collected in a vessel. The vessel is weighed and the weight (in air) of the fluid collected is noted. The instrument is calibrated by using water at various flow rates by measuring volume of water collected in a known time. For this purpose we use various calibrated tanks and stop watch having an accuracy of 0.01. Detailed Calibration & Test Report is attached along with Material when it is dispatched.

Section 4 Technical Specification

4.1 Technical Data

Accuracy	+/- 2% FSR.
Repeatability	+/- 0.25 % FSR.
Rangeability	10:01.
Temperature rating	150° C.
Pressure Rating	10 kg/cm ²
Body	MS powder coated.
Flow Direction	From Bottom to top.
End Connection	Flanged/screwed as per Customers Specification.
MOC of Wetted part	CS/SS304/SS316/PP/PVC/PTFE.
Metering tube	Borosilicate Glass, Resistance to high temperature
MOC of Float	SS304/SS316 and other depending upon fluid.
Mounting Position	Vertical.
Elastomer	Neoprene/Silicon/Viton/PTFE

4.2 Model sketch

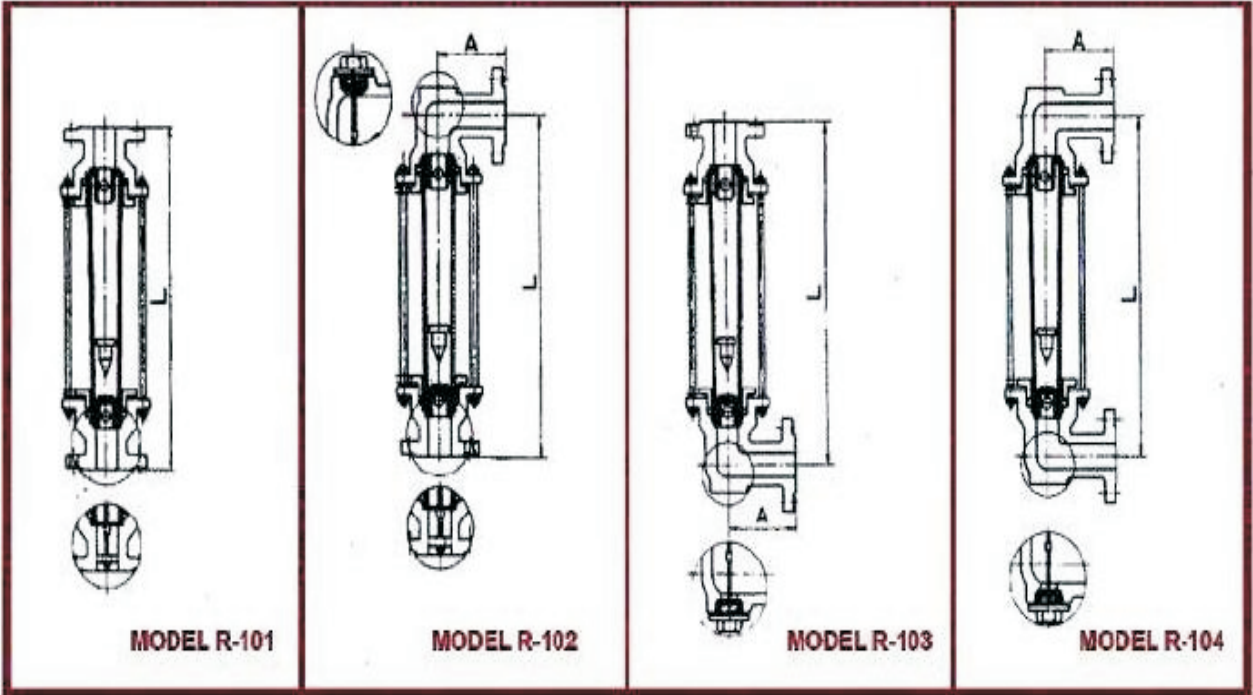


FIGURE: 02

4.3 Flow and dimension Table

Standard Sizes	20°C Water Maximum flow and pressure loss.				0°C 1 atm air maximum flow and pressure loss				Dimension	
	Flow LPH			Approx. Pressure loss mmwc (Float SS)	Flow Nm ³ /hr			Approx. Pressure loss mmwc (Float SS)	L mm	A mm
	Float Material				Float Material					
	SS	PVC	PTFE	SS316	PVC	PTFE				
½"	430	250	250	200-300	-----	7.1	6.51	50-150	500	75
¾"	1100	740	740	220-370	11-35	20.5	26	120-200	500	100
1"	1890	1200	1250	200-550	54	32	37	120-200	500	100
	2500	2100	2100	250-550	75	44	56	160-210	500	100
1½"	4400	3500	3500	250-600	145	83	100	160-210	500	120
2"	9100	7000	7000	250-650	299	168	260	160-210	500	120
	12100	10100	10100	350-700	415	230	340	140-220	500	140
2½"	15000	13200	13200	350-950	520	440	500	140-250	500	140

Section 5 Installation

5.1 User's Responsibility

The mechanical installation, start up and maintenance of the instrument should only be carried out by trained who have been authorized to perform these task by the systems operated. The technician must have read and understood this operating instruction and fallow its instruction.

Prior to use for metering corrosive and aggressive fluid the user must consider the resistance of the fluid wetted parts. Spink Controls will gladly provide assistance in their selection, however cannot accept any liability for their selection.

5.2 Installation Guideline

Unpack the Rotameter carefully. The float in the Rotameter is located at one place to avoid damage during transit. Plastic rods are fitted as transport locks.

Unpack the ends make the float free & check the float retainer at the top, if it is loose tighten it.

The Rotameter should be used only for the fluid or gas for which it is designed.

For case of maintenance, please install isolating valve at the inlet & outlet of Rotameter & also on the bypass line. See figure 03.

The Rotameter is to be mounted vertically with inlet at bottom & outlet at the top.

The Rotameter should be used only for the fluid or gas for which it is designed.

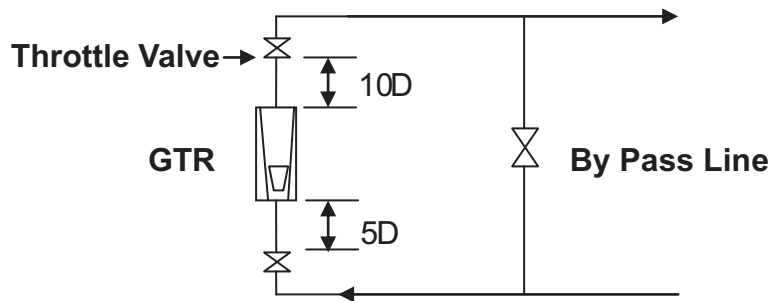


Figure 03: Installation of Rotameter for gas and Liquid.

5.3 Preparation of the pipeline

The vertical line should always be checked with a plumb bob & a maximum of 1 deg is allowed from the vertical position. If the flow meter is not installed correctly there will be operational difficulty & its accuracy will be affected.

Before installing clean the pipe by blowing flushing out. Straight pipe section, in particular, is required either on the inlet or outlet side of the meter. A straight pipe section of approximately 5D upstream and 10D downstream, if any, will effectively stabilize reading. **D = Diameter of pipe**

Strainer: Generally the strainer is not indispensable required, if there is a possibility that dust may enter, however, maintenance will be easier if the strainer is provided.

Bypass piping: From the viewpoint of safety, is recommendable to provide a bypass piping.

5.4 Start-Up

At start-up, increase the flow rate stepwise by slowly opening the throttle valve. This will prevent pressure shocks, which could possibly damage the float, float stops or the glass metering tube. When metering liquids, a method to draining the pipeline system at start-up should be considered if required. The flow rate is read from the graduations on the scale on the metering tube at the location of the reading edge of the float. The reading edge is shown below.fig. 04

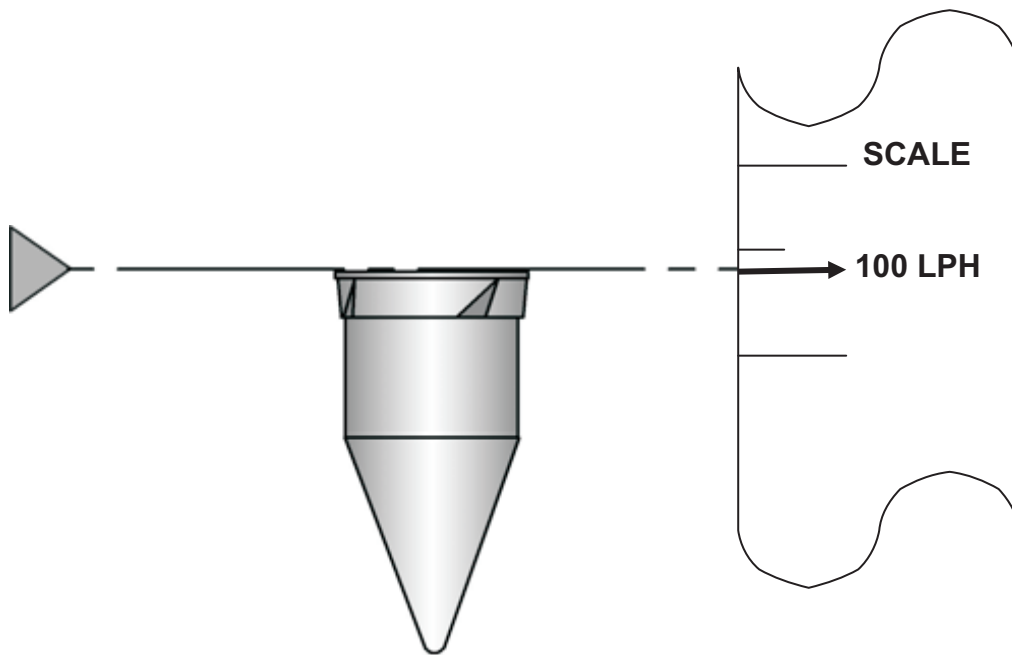


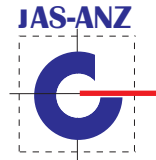
FIGURE : 04

5.4.1 Measurement of liquids

- ✓ Vent the pipeline during start-up.
- ✓ Open valves slowly to avoid water hammer!

5.4.2 Measurement of gases

- ✓ The device should not be subjected to pulsating flows.
- ✓ Increase pressure slowly up to operating pressure.
- ✓ Basically, vary the flow rate with the aid of adjusting valves downstream of the device to prevent the float from accelerating up to the upper stop (e.g. when solenoid valves are used) and possibly damaging the measuring section.



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Section 6 Maintenance and Trouble shootings

When it is necessary to replace metering tube, float or packing, reference must be made to manufacturer's maintenance instructions for correct procedure.

The following are considered normal spare parts:

- 1) Metering tube
- 2) Window glass gasket
- 3) Gland Packing
- 4) Metering float
- 5) Window glass
- 6) Measuring Scale

When ordering the above spare parts, complete information must be supplied, giving serial number, size of meter, metering tube, metering float, and materials of construction.

6.1 Removal of the Metering Tube and Float

The float is a precision machined part. Therefore it is especially important to assure that the guide ring and metering edge are not damaged. A damaged float will result in inaccuracies and possible damage to the metering tube. The metering tube should not be exposed to any shock or other stresses.

However if the glass taper tube and float becomes dirty, it has to be cleaned using soft brush, trichloroethylene and compressed air. It is not necessary to remove the body of Rotameter from the line except in cases where guide rod is used with the float.

6.2 Dismantling & Installation of taper tube:

- ✓ Shut of the flow.
- ✓ Remove the front cover.
- ✓ Unscrew the gland screws & push the gland upwards in case of bottom gland & downwards in case top gland, Turn the glass tube to & from while taking care not to drop the glands & float. The top edge of the float, which serves, as an indicator point should not be damaged.
- ✓ Remove the glass & float & clean / replace, remove the old packing & replace them with new ones.
- ✓ Wrap Teflon tape to the two ends of the glass.
- ✓ Put the glands in position & put the packing.
- ✓ Insert the glass tube in the place.
- ✓ Push the glass downwards & upwards & tighten the gland adjustment screws evenly till the gap between the gland & bottom plate is around 3 mm. Start the flow & check the GTR for leakage & if present tighten the gland adjusting screws till the leakage disappears.
- ✓ Fix the covers.

Note: It is not necessary to touch the scale if the glass tube is removed from the rear end.

6.3 Trouble Shootings

Fault Observed	Reason	Trouble shoots
Leakage on glands	Gland packing failure	Replace gland packing
Reading shows high/low flow rate than specified	Check operating condition	Contact Spink Controls
Rotameter shows correct reading but stuck	Float is damaged or corroded	Replace float In case of gases also check for leakage
Rotameter shows correct reading but starts showing higher reading after sometime	Scaling / deposition of foreign particles on the inside of the glass tube or on the float or both	Clean the Rotameter glass & float with suitable solvent or soft brush
Fluctuation of float	Wrong operating pressure	Maintain operating pressure as prescribed for the design
Frequent breakage of glass tube	Flow rate very high wrong selection of Glass tube Rotameter Operating pressure very high. Heavy turbulence Water Hammer effect Rotameter not fixed vertically as per instruction	Restudy the operating parameter to calculate the flow rate and contact Spink controls.