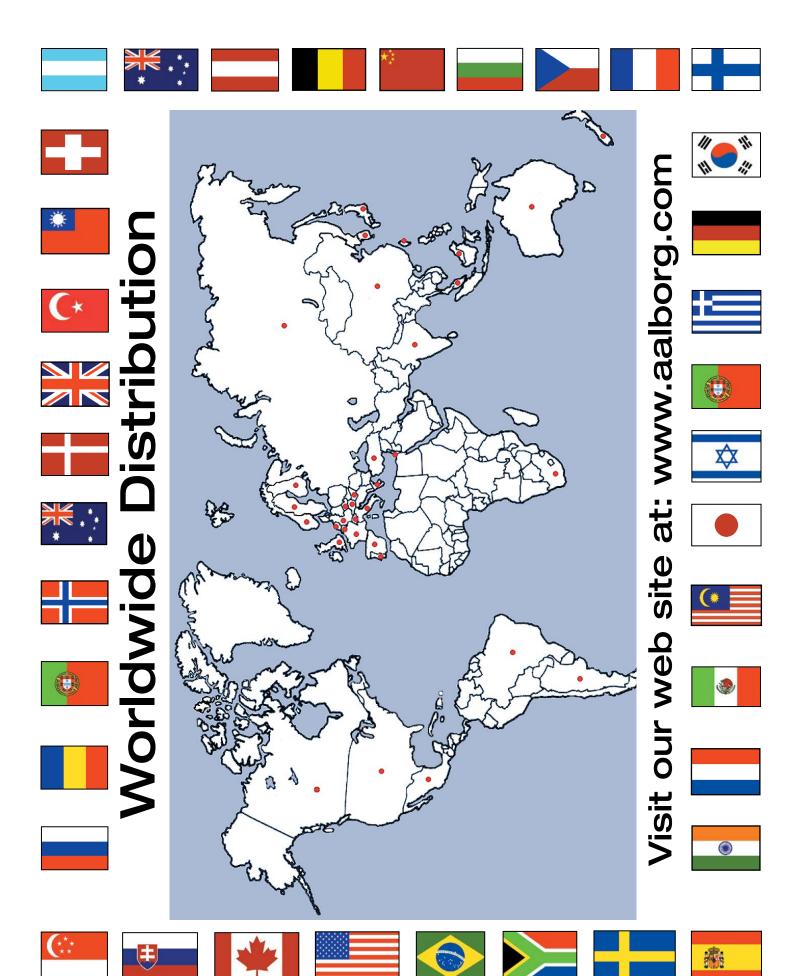
rotameters 10 AALBORG INSTRUMENTS **3**





About the Company

Founded in 1972, AALBORG® is well-known throughout the world as a primary manufacturer of precision instrumentation for flow measurement and control.

We operate two divisions:

The Variable Area Division manufactures a complete line of glass tube rotameters. These flow meters are available with aluminum, brass, stainless steel or PTFE wetted components. AALBORG® also manufactures a unique line of PTFE tube meters for ultrapure or corrosive applications. Precision barstock stainless steel or brass needle valves, as well as PTFE valves, are also manufactured in this division.

The Electronics Division produces analog and digital mass flow meters and controllers, as well as a diverse line of wafer and insertion type vortex flow meters for steam, liquid or gases. In addition a line of peristaltic pumps, stepping motor driven valves made in this department are highly useful in processing and OEM applications.

Our commitment is to provide cutting-edge technology combined with a sincere desire to serve our

NIST Traceability All equipment used for flow calibrations are traceable to NIST. **Accredited** AALFA-KAL Metrology Laboratory, division of Aalborg Instruments & Controls is accredited by A2LA in conformance to ISO17025/2005 and to Z540-1/1994. Gas flow calibrations up to 50L/min are Calibration performed according Scope of Accreditation - Certificate Number: 3989.01. **Services Technical** Technical Assistance is readily available. Customers are invited to contact the company or our distributors to discuss individual requirements. OEM applications are welcome. **Assistance** ISO9001/2015 Aalborg® has been ISO 9001 certified since April of 1995. We are very proud of the design features and the exceptionally high quality for which our products which have been known since 1972. It is our Certification policy that through strict enforcement of exacting manufacturing standards the Aalborg® brand name continues to be associated with a reputation of high quality and reliability. Our products are backed by meticulous innovative engineering combined with efficient manufacturing practices and a highly skilled work force guaranteeing total customer satisfaction. **Our Mission** It is the policy of AALBORG® to develop, produce and deliver products and services which

consistently conform to or exceed customer requirements.

customers and produce the highest quality products attainable.

| Principle of C | Principle of Operation /General Description /Flow Tubes & Valves | | | | | | |
|----------------|--|----|--------|-------------|--|--|--|
| CAL | Calibrations, Services and Certificat | es | | Pages 4-16 | | | |
| | | | | | | | |
| P PX | Single & Multiple Tube Flow Meters | | | Pages 17-21 | | | |
| | | | F 6565 | | | | |
| | PTFE-Glass Single and Multiple Tube Flow Meters | | | Pages 22-26 | | | |
| | | | A T | | | | |
| 8 | S Style Single Tube Flow Meters | | | Pages 27-29 | | | |
| | | | | | | | |
| | Optical Sensor Switch | | | Pages 30-36 | | | |
| | | | | | | | |
| G | Gas Proportioners | | | Pages 37-39 | | | |
| | | | A | | | | |
| K | Kits | | | Pages 40 | | | |



Medium Range Brass, Stainless, PTFE and Direct Reader Flow Meters



Pages 41-45



Stainless Industrial Flow Meters



Pages 46-47



In Line PTFE Flow Meter



Pages 48-50



PTFE Flow Meters



Pages 51-53



Barstock Valves



Pages 54-56



PTFE Needle Valves



Pages 57-59

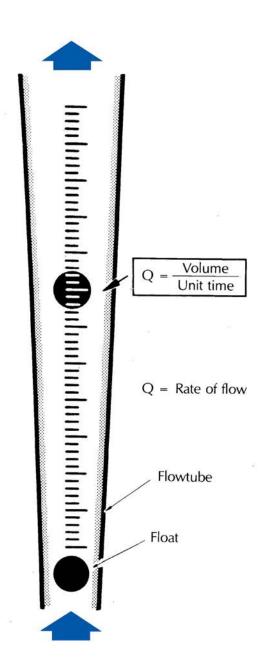
TECHNICAL INFORMATION

Spare Valve Cartridge Flow Capacities Meter Sizing and Calculation vs Calibration Tables of Standard Flow Capabilities Table of Flow Capacities For Gas Direct Reading Scales Conversion Factors Page 60 Pages 61-62 Pages 63-65 Page 66 Pages 67-69 Page 70 Warranty Page 71

TRADEMARKS

Aalborg® -is a registered trademark of Aalborg Instruments. Inc. Buna® -is a registered trademark of DuPont Dow Elastometers. Carboloy® -is a registered trademark of General Electric Company. Lexan® -is a registered trademark of General Electric Company. Kynar® -is a registered trademark of Atochem North America, Inc.

When compared with other types of flow instrumentation, variable area interchangeable flow meters offer the most practical, precise and economical means of visually indicating flow rate measurement.



They require no electrical connections, and have low meter related pressure drops.

Meters are available in a large selection of flow rates and configurations, to accommodate the unique requirements of most applications.

Included in the line are flow tube assemblies. single and multiple tube flow meters. PTFE-Glass meters are for metering corrosive fluids or for high purity requirements.

Back pressure compensated Gas Proportioners are popular choices for blending component gases accurately to customized end use requirements at great savings.

Multiple tube flow meters are available with or without manifolding.

A tapered glass FLOW TUBE, and a spherical FLOAT inside it, constitute the heart of variable area type flow meters.

Flow meters are installed vertically in lines carrying gases or liquids to be monitored.

Fluids enter through the smaller opening at the bottom, and exit through the upper end. Upward pressure causes the float to rise. Flow takes place through the circular area between the float and the inside surface of the flow tube. As the float rises, the flow area increases, due to the tapered bore of the flow tube.

Dynamic equilibrium results when the buoyant force, due to the float and the upward force, due to fluid pressure, balance the weight of the float.

The vertical position of the float at equilibrium corresponds exclusively to one particular flow rate.

This flow rate is obtained by determining the height of the float with the aid of a scale etched on the flow tube.

These meters have the highest useful flow ranges providing consistently reliable readings from maximum flow down to 5 to 10% of capacity.

INTERCHANGEABILITY

Flow tubes and other components are thoroughly interchangeable resulting in greatly increased versatility. Meters are even interchangeable with standard sizes made by other manufacturers.

As a result of simple assembly and installation procedures, it is possible to use several sets of flow tubes in conjunction with one mounting frame.

flow tubes

- ✓ Precision fabricated from heavy walled, shock resistant borosilicate glass.
- ✓ Bores are uniformly tapered or formed with internal "rib-guides" or flutes.
- ✓ Floats are retained by TFE plugs.
- ✓ OPTIGRAD™ scales minimize parallax and eye fatigue.
- Interchangeability.
- Self cleaning.
- ✓ Low differential pressures that stay independent of Flow rate changes.

OPTIGRAD™ SCALES

The vertical "tangential locator line" facilitates hairline accuracy and convenience of reading. Flow tubes are supplied with millimeter, or direct reading scales.

Standard scale lengths are 65 mm (2.56 in) or 150mm (5.91 in). Flow rates are determined by lining up the scale graduation at the center of the spherical float.

Parallax and lack of visual reference will affect the accuracy and reproducibility of metering to a great extent. Such a drawback is eliminated by OPTI-GRAD™ scales.

A vertical "locator" line is incorporated into the geometry of the scale graduation. To pinpoint the center of the float with "hairline" accuracy.

readings are taken as follows:

- 1) Position head in front of flow meter, with eyes at level with the float.
- 2) Move head horizontally to the left until the contour of the float appears to just touch the "locator" line tangentially.
- 3) The intersection of the "locator" line with the horizontal graduation at the center of the float, pinpoints the appropriate reading value.

UNIVERSAL MILLIMETER SCALES

Millimeter scales indicate the height to which the rises within the metering

> tube and are correlated with specific flow rates through the use of appropriate calibration data sheets or curves.

Scales of this type permit utilization of a given flow meter for a great number of different fluids at diverse pressure and temperature conditions. See tables

6,7,8, 9 and 10 on pages 62-65 for maximum flow rates.

To minimize eye fatigue associated with periods of repetitive readings, contrasting yellow backgrounds are provided behind scales

DIRECT READING SCALES

Direct reading scales are indicating flow rates,

in engineering units such as [mL/min], standard cubic feet per hour [scfh]

etc. Such scales are designed exclusively for a specific gas or liquid at a given set of pressure and temperature and are valid for the associated units of flow only.

Thus, the convenience of direct reading scale designs should be weighed against the resultant limitations of applicability.

For listing of flow tubes with standard

Direct Reading Scales, see tables 11-22 on pages 66 thru 68.

BUILT-IN VALVES

Meters are available with built-in needle valves (CV™), high precision metering valves (MFV™) with "non-rising stems", or with no valves.

Built-in valves are mounted at the inlet (bottom) or outlet (top) of flow meters. Generally, for gas metering it is recommended that valves are positioned at inlets - for liquids valves may be positioned either at inlets or outlets. For vacuum service, valves must be mounted at outlets.

If unspecified at the time of ordering, meters will be shipped with valves mounted at the inlets.

HIGH PRECISION VALVES (MFV ™)

The higher cost of MFVTM valves is justified whenever high sensitivity control and resolution are desirable particularly in conjunction with metering tubes of very low flow rates. A choice of six MFVTM flow capacities are offered (see Table 1 on page 59) to be matched with individual flow meter ranges.

This unique design comprises rectilinear motion valve needles, with non-rising stems. As the needle advances into and out of high precision cylindrical orifices, the flat tapered surface of the needle gradually, without turning, uncovers the flow area.



CVTM VALVE CARTRIDGES

These valves are designed for adjusting flow rates in applications where high resolution metering regulation is not essential. Available in three ranges, (see Table 2 on page 59) they represent a relatively inexpensive option.

The simple construction of CVTM valves incorporate a VALVE SPINDLE with conical ends and compound angles for optimal resolution.

The VALVE NEEDLE turns as it travels into or out of the VALVE ORIFICE. In conjunction with the cylindrical cross section, the conical front tip of the VALVE SPINDLE increases or decreases the annular flow area. The cartridge serves as a bubble-tight "shut-off" valve when the tip of the VALVE SPINDLE comes into a stop position against the VALVE ORIFICE.



to reverse the position of valves

- 1) Disassemble flow tubes from frames.
- 2) Install flow tubes upside down in frame.
- 3) Invert flow meter.



FRONT SHIELDS WITH MAGNIFIFR I FNSFS

A unique longitudinal magnifier is part of the molded Lexan® front shield which is supplied on all single tube flow meters.

The magnification of the scale reading facilitates greatly enhanced resolution of measurement.

MOUNTINGS

Flow meters are shipped ready for panel mounting. Meters may be mounted on or behind panels.

For "on-panel" installations holes are drilled for inlet and outlet fittings and meters are mounted simply by means of panel mounting nuts supplied.

Mounting behind panels is done by utilizing the screws from front shields. Panel mounting is easily converted to self standing bench mounting by using the appropriate optional acrylic tripod base.



NIST TRACEABLE CALIBRATIONS

Our laboratories are fully equipped to perform NIST traceable flow calibrations for Rotameters, Mass Flow Meters and Mass Flow Controllers.

We offer calibration services on meters and controllers of other manufacturers' products as well.

AALFA-KAL laboratory is equipped to calibrate Molboxes. Our technicians are trained and certified by the manufacturer of Molboxes and Moblocs.

For fast cost effective service please contact our customer service department.

A2LA ACCREDITED CALIBRATIONS

AALFA-KAL Metrology Laboratory, division of Aalborg Instruments & Controls is accredited by A2LA in conformance to ISO17025/2005 and to Z540-1/1994. Gas flow calibrations up to 50L/min are performed according to Scope of Accreditation - Certificate Number: 3989.01.

COMPLIANCE QUALIFICATIONS

Extensive set of Molbox/Molblocs ensure conveniently overlapping calibration ranges.

- ✓ ANSI/NCSL Z540-1-1994
- √ ISO9001/2015 CERTIFIED
- ✓ MIL-STD-456624A
- ✓ ISO17025 Accredited

Partial view of the gas calibration laboratory.



Technicians calibrating Flow Controllers using Bell Provers and Molbox/Molblocs technology.









Close-up view of Molbox/Molblocs equipment supported by COMPASS software for calibrating GFM flow meters.



Link for an explanation how to use Molbox/Molblocs method of calibrations of Flow Meters and Controllers.

http://www.youtube.com/watch?v=FVDqrW5y70A



PRESSURE LIMITS OF CALIBRATIONS

Up to 500 PSIG for routine gases (Air, N2, He and Ar) with a maximum flow of 250 L/min. Up to 80 PSIG for Air, with a maximum flow of 1000 L/min.

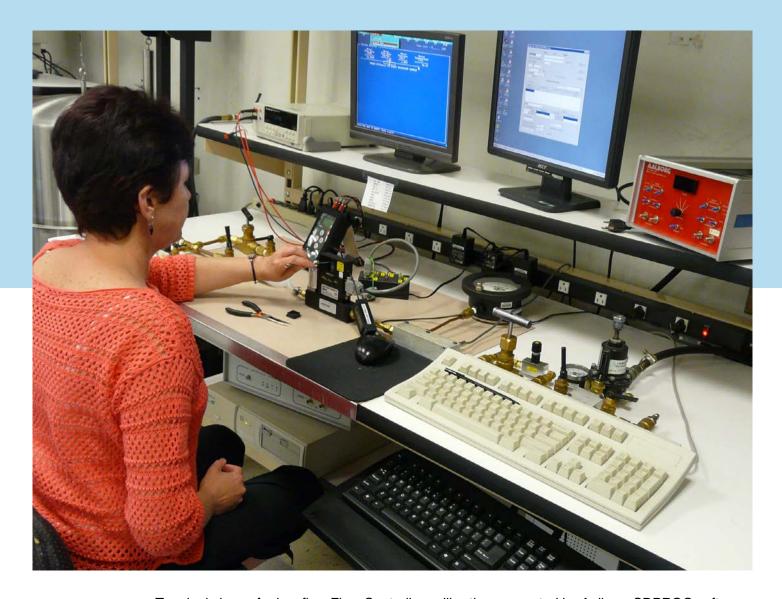
- ✓ Calibrations are performed at standard (STP) conditions (70 °F/21.1 °C and 14.7 psia/1 atm abs).
- ✓ Gas calibrations for up to 1000 L/min and water calibrations up to 4 L/min available.
- Calibrated to NIST traceable standards.



Bell prover used by technician in calibrating high flow capacity Flow Meter.







Terminal shown for low-flow Flow Controller calibration supported by Aalborg SDPROC software.



Piston Gauge, model 7601 with gas operated, gas lubricated piston-cylinder module. It supports definition of pressure against a vacuum reference.



OPERATING MODES: Gauge, Absolute and Differential.

OVERALL SPECIFICATION FOR PRESSURE MEASUREMENT:

Sensitivity: 0.02Pa +0.5 ppm Reproducibility: +/-4 ppm

Measurement Uncertainty (k=2): +/-(0.5Pa + 20 ppm)

Suitable for Molbox 1+ A350/A700.





Our gas calibration laboratory has NIST traceable approved in-house equipment to certify our calibration devices.

Molbox/Molblocs based calibration for GFC Flow Controller.

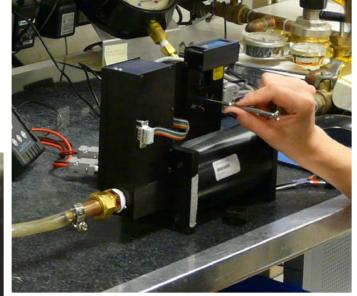


Our technicians are trained and certified and our Laboratory is equipped to calibrate Molboxes. In addition, our laboratory can calibrate NIST traceable approved "In-House" equipment to certify our primary calibration devices.

We also calibrate and certify customers' Molboxes.

For fast cost effective service please contact our customer service department.





Gas flow calibration laboratory is capable of performing calibrations from 1 mL/min to 1000 L/min at 21.1 °C /101.325 kPa (70 °F, 14.69 PSI abs).



According to "state of the art" calibrating practices, calibrations are performed based on 4 to 1 uncertainty ratio.







Specialized software applied to calibration of Flow Meter.



EUROPEAN SERVICE FACILITY

Authorized Repair and Service Facility for Aalborg Thermal Mass Flow Systems

AALBORG - ANALYT-MTC

MESSTECHNIK GMBH Klosterrunsstraße 18 P.O. Box 1321 Müllheim D-79379 Germany

> Telefon: +49 (0)7631 5545 Fax: +49 (0)7631 14740 Website: www.analyt-mtc.de e-mail: info@analyt-mtc.de

> > 175, avenue d'Alsace 68000 COLMAR Tel: 03 89 41 47 78 Fax: 03 89 41 59 88

e-mail: ANALYT_MTC@T-online.de

ASIAN SERVICE FACILITY

Authorized Repair and Service Facility for Aalborg Thermal Mass Flow Systems

AALBORG -Beijing Comity MEASURE & CONTROL CO.

Floor 1 Tower B Jindayuan Office Building Xisanqi, Hai Dian District, Beijing, China

Phone: 86-10-6295-0464, 86-10-6295-0465

Fax: 86-10-6295-0466 Website: http://www.comity-tec.com











American Association for Laboratory Accreditation



Has Attended the

ISO/IEC 17025 and Accreditation Course

- ISO 17025
- Documentation
- Internal Auditing

Sponsored by the

American Association for Laboratory Accreditation

Scottsdale, AZ 1.5 CEUS Awarded February 29-March 2, 2012







Accredited Laboratory

A2LA has accredited

AALFA - KAL METROLOGY LABORATORY, DIVISION OF AALBORG INSTRUMENTS & CONTROLS, INC.

Orangeburg, NY

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. This laboratory also meets the requirements of ANSI/NCSLI Z540-1-1994 and R205 – Specific Requirements: Calibration Laboratory Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 26th day of April 2018

President and CEO For the Accreditation Council Certificate Number 3989.01 Valid to April 30, 2020

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.





SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005 & ANSI/NCSL Z540-1-1994

AALFA - KAL METROLOGY LABORATORY, DIVISION of AALBORG INSTRUMENTS & CONTROLS, INC. 20 Corporate Dr.

Orangeburg, NY 10962 Mr. Stefan Radecki Phone: 845 770 3000

CALIBRATION

Valid To: April 30, 2020 Certificate Number: 3989.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Fluid Quantities

| Parameter | Range | CMC ^{2, 3} (±) | Comments |
|------------|---|--|---|
| Flow – Gas | Up to 20 SCCM (8 to 100) SCCM (16 to 200) SCCM (32 to 400) SCCM (80 to 1000) SCCM (160 to 2000) SCCM (800 to 10 000) SCCM (1600 to 20 000) SCCM (4000 to 50 000) SCCM | 0.18 % 0.18 % 0.18 % 0.18 % 0.18 % 0.18 % 0.18 % 0.19 % 0.27 % | DHI Molbox-1 (Air, He, Arg, CO ₂ , O ₂ , N ₂) |

¹ This laboratory offers commercial calibration services.

(A2LA Cert. No. 3989.01) 04/26/2018

Page 1 of 1

5202 Presidents Court, Suite 220 | Frederick, MD 21703-8515 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

² Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. CMCs represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of k=2. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

³ In the statement of CMC, percentages represent the percent of reading unless otherwise noted.

SINGLE TUBE FLOW METERS



INTERCHANGEABLE

Designed for low flow rates, the *Model P* flow meter is a precision instrument embodying the inherent simplicity, versatility and economy of the classical rotameter. It is particularly suitable for metering carrier gases in chromatography, indicating and controlling gases in manufacturing processes, liquid and gas measurement in laboratories, pilot plants, flow and level indicating, etc.

Shipped completely assembled, flow meters include standard mounting fittings in a choice of materials, side plates, thick protective magnifying front shield and back plate, optional built-in control valve, and flow tubes selected from the Flow Capacities tables. Panel mounting style is convertible to bench mounting through the use of the optional acrylic tripod. The tripod has a built-in spirit leveler and leveling screws.

For multiple tube meters see pages 17 and 18.

design features

- Rib-guided or fluted metering tubes facilitate stable, accurate readings.
- ✓ Magnifier lens in front shield to enhance reading resolution.
- ✓ Interchangeability of flow tubes and floats.
- Ease of installation and exchange of flow tubes.
- "Non-rotating" adapter feature glass flow tubes are prevented from turning during the tightening phase of the assembly procedure.
- ✓ OPTIGRAD™ scales minimize parallax and eye fatigue.
- ✓ Chemical compatibility.
- √ Simple means of panel mounting.





SINGLE TUBE FLOW METERS

BUILT-IN VALVES

Meters are available with built-in needle valves (CVTM), high precision metering valves (MFVTM) with "non-rising stems", or with no valves. The higher cost of MFVTM valves is justified whenever high sensitivity control and resolution are desirable particularly in conjunction with metering tubes of very low flow rates.

Generally, for gas metering it is recommended that valves are positioned at inlets (bottom) for liquids valves may be positioned either at inlets or outlets (top). For vacuum services, valves must be mounted at outlets. If unspecified at the time of ordering, meters will be shipped with valves mounted at the inlets.

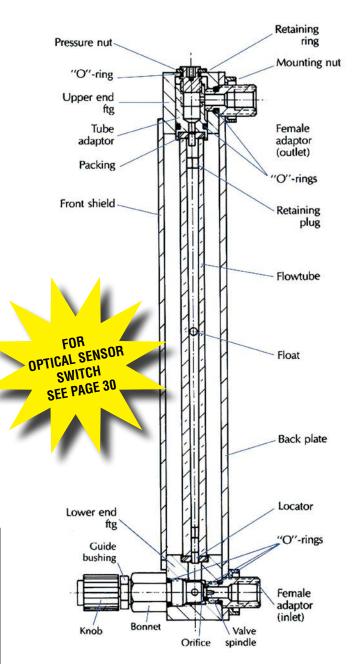
Panel mounting is convertible to bench mounting through the use of an optional acrylic tripod base with spirit leveler (catalog No. TP1).

| SPECIFICATIONS | |
|---------------------|--|
| STANDARD ACCURACY | ±2% FS mm scales except 042 and 032 flow tubes. ±5% FS direct reading scales 042 and 032 flow tubes. |
| CALIBRATED ACCURACY | ±1% FS optional. |
| REPEATABILITY | ±0.25%. |
| USEFUL FLOW RANGE | 10:1 minimum with one float and better |
| | than 20:1 with combination of two floats |
| | installed in meters. |
| MAXIMUM OPERATING I | PRESSURE |
| | 200 psig/13.8 bars. |
| MAXIMUM OPERATING | TEMPERATURE TEMPERATURE |
| | 250 °F/ 121 °C. |

| **MATERIALS OF CONSTRUCTION | | | | | | |
|-----------------------------|---|--|--|--|--|--|
| FLOW TUBES | Heavy walled borosilicate glass. | | | | | |
| FLOATS | Glass, Sapphire, 316 Stainless Steel, | | | | | |
| | Carboloy® and Tantalum. | | | | | |
| CHOICE OF MOUNTING | FITTINGS IN CONTACT WITH FLUIDS | | | | | |
| | a) Aluminum, black anodized. | | | | | |
| | b) Brass, chrome plated. | | | | | |
| | c) 316 stainless steel. | | | | | |
| SIDE PANELS | Aluminum, black anodized. | | | | | |
| FRONT SHIELD | Lexan® with longitudinal magnifier | | | | | |
| | lens for enhanced reading resolution. | | | | | |
| BACK PLATE | 1/8" thick white acrylics. | | | | | |
| O-RINGS AND PACKING | Buna® o-rings in aluminum/ brass model. | | | | | |
| | FKM o-rings in stainless steel meters. | | | | | |
| | OPTIONAL FKM PTFE FFKM and EPR. | | | | | |
| CONNECTIONS | 1/8" NPT female inlet and outlet connections. | | | | | |
| | OPTIONAL 1/4" FNPT, hose and compression | | | | | |
| | fittings are available. | | | | | |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.

Select flow tube consistent with requirements from flow capacity tables 6 to 22 (page 62 to 65).



Assorted flow tubes may be used in conjunction with a single mounting frame, an apparent benefit in many laboratory applications.

Ordering information see page 21. Dimensional information see page 20.

MULTIPLE TUBE FLOW METERS



The **Model Px** multiple tube flow meter line offers, the convenience and simplicity of 2, 3, 4, 5 and 6 tube meters, retaining most of the unique design features associated with single tube units. Multiple tube meters are available with 65mm or 150mm flow tubes same as used in single unit flow meters.

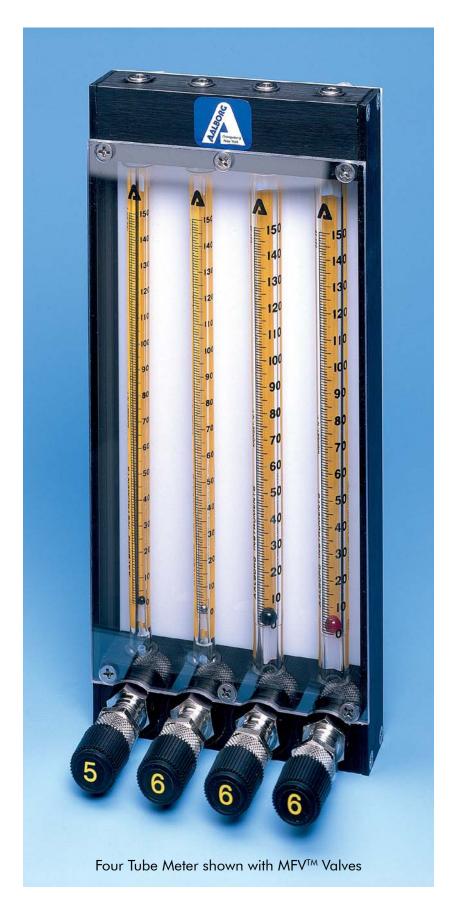
Px meters are convenient for applications where several streams of gases or liquids are to be metered in individual channels, or manifolded.

Shipped completely assembled, flow meters include standard mounting fittings in a choice of materials, side plates, thick protective front shield and back plate, optional built-in control valve, and flow tubes selected from the Flow Capacities tables.

Panel mounting style is convertible to bench mounting through the use of the optional acrylic tripod. The tripod has a built-in spirit leveler and leveling screws.

design features

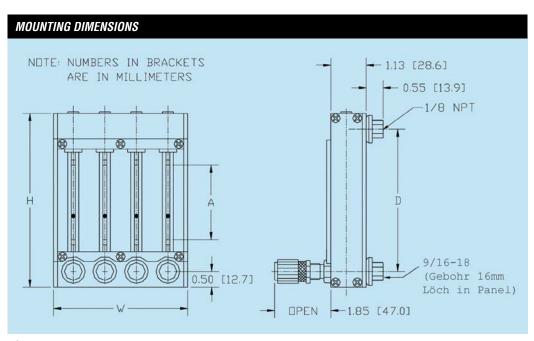
- ✓ Rib-guided or fluted metering tubes facilitate stable, accurate readings.
- ✓ Interchangeability of flow tubes and floats.
- ✓ Manifolding at inlet or outlet.
- Ease of installation and exchange of flow tubes.
- ✓ "Non-rotating" adapter feature glass flow tubes are prevented from turning during the tightening phase of the assembly procedure.
- ✓ OPTIGRAD™ scales minimize parallax and eye fatigue.
- ✓ Chemical compatibility.
- ✓ Simple means of panel mounting.



MULTIPLE TUBE FLOW METERS

BUILT-IN VALVES

Meters may be supplied with built-in needle valves (CV™), high precision metering valves (MFV™) with "non-rising stems", or with no valves. Generally for gas metering, it is recommended that valves are positioned at inlets (bottom) for liquids valves may be positioned either at outlets (top) or inlets. For vacuum service, valves must be mounted at outlets. If unspecified at the time of ordering, meters will be shipped with valves mounted at inlets.



NOTE: Aalborg* reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Aalborg*.

SPECIFICATIONS

STANDARD ACCURACY

±2% FS mm scales except 042 and 032 flow tubes. ±5% FS direct reading scales 042 and 032 flow. Conforming to ISA RP. 16-1.2.3

Specification 2-S-10. Manifolded models excepted.

CALIBRATED ACCURACY

±1% FS optional.

REPEATABILITY ±0.25%.

USEFUL FLOW RANGE

10:1 minimum with one float. Better than 20:1 with combinations of two floats installed in meters.

MAXIMUM OPERATING PRESSURE

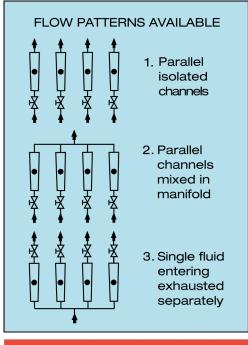
200 psig/13.8 bars.

MAXIMUM OPERATING TEMPERATURE

250 °F/ 121 °C.

MATERIALS OF CONSTRUCTION FLOW TUBES Heavy walled borosilicate glass. CHOICE OF MOUNTING FITTINGS IN CONTACT WITH FLUIDS a) Aluminum, black anodized. b) 316 Stainless Steel. SIDE PANELS Aluminum, black anodized. FRONT SHIELD AND BACK PLATE 1/8" thick clear polycarbonate and white acrylics. **O-RINGS AND PACKING Buna® O-rings in aluminum model. FKM O-rings in stainless steel meters. OPTIONAL FKM, PTFE/FFKM, EPR. **CONNECTIONS** 1/8" NPT female inlet and outlet connections. OPTIONAL: 1/4" FNPT, hose & compression fittings are available.

Ordering information see page 21.



The built-in-valves are always installed in the end block opposite to the manifolded one.

Thus, if a meter is manifolded at the outlet, valves are installed at the inlets; if a meter is manifolded at the inlet, valves are installed at the outlets.

| DIMENSIONS FOR P STYLE METERS | | | | | | | | | |
|-------------------------------|---------------|-------------------------------|--------------|-----------|-----------|-----------|-----------|-----------|--|
| SCALE LENGTH (A) | | L P Ters | WIDTH (W) | | | | | | |
| | HEIGHT (H) | CENTER TO CENTER (D) | 1 Tube | 2 TUBE | 3 TUBE | 4 TUBE | 5 TUBE | 6 TUBE | |
| 65mm | 5.500 | 4.500 | 1.250 | 2.250 | 3.250 | 4.250 | 5.250 | 6.250 | |
| 150mm | 9.813 | 8.813 | 1.250 | 2.250 | 3.250 | 4.250 | 5.250 | 6.250 | |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.

ORDERING INFORMATION MODEL P METERS



Configure and Order Online: Model P Single Flow Tube meters

Model Px Multi Flow Tube Meters

| Р | P STYLE | METERS | | | | |
|---|---------|-----------|----------------------|------------------|----------------|---|
| | CODE | NUMBER | OF CHANN | IELS | | |
| | 1 | | CHANNEL (| | | |
| | 2 | | ANNEL MET | | | |
| | 3 | | | | REE TUBES) | |
| | 5 | | ANNEL ME NNEL MET | | | |
| | 6 | | NEL METE | | | |
| | | | | (0.1.1.0 | | |
| | | CODE 6 | 65 mm | | | |
| | | 1 | 150 mm | | | |
| | | | · | | | |
| | | | | MATERIA | | |
| | | | A B | ALUMINU BRASS | JIVI | |
| | | | S | STAINLES | SS STEEL | |
| | | | | | | |
| | | | | CODE | | ION RECISION) INLET |
| | | | | 3 | NO VALVE | REGISION) INLET |
| | | | | 4 | | RD CARTRIDGE) INLET |
| | | | | 5 | | RECISION) OUTLET |
| | | | | 6 | CV (STANDAR | RD CARTRIDGE) OUTLET |
| | | | | | CODE V B E T S | E SEALS FKM STANDARD ON STAINLESS METERS BUNA® STANDARD ON BRASS AND ALUMINUM EPR PTFE / FFKM SILICON CODE FITTINGS A 1/8" FNPT (STANDARD) B 1/4" FNPT C 1/8" HOSE NIPPLE D 1/4" HOSE NIPPLE D 1/4" HOSE NIPPLE E 1/8" COMPRESSION F 1/4" COMPRESSION F 1/4" COMPRESSION F 1/4" COMPRESSION G 1/4" HOSE NIPPLE E 1/8" COMPRESSION F 1/4" TOP |
| Р | 1 | 1 1 | Α | 4 | — В | B 0 - *TUBE |

EXAMPLE: P11A4-BB0

P Style Meter, Single Channel, 150 mm, Aluminum, Standard Valve at inlet, Buna Seals, 1/4" fitting, No Manifold.

Optional Accessories

TP1-Tripod for single channel meter.

TP2-Tripod for 2, 4 and 6 isolated channels or manifolding at top.

TP3-Tripod for 3 and 5 isolated channels or manifolding at bottom.

TP5-Tripod for 3 single tube meters.

*Tube selection:

Millimeter tubes: Tables 6 thru 9
Direct Reading tubes: Tables 11 thru 22.



PTFE-SINGLE GLASS FLOW METERS

GENERAL DESCRIPTION

Model T flow meters incorporate the principles of traditional variable area flow technology.

These rugged PTFE-Glass flow meters offer solutions to low to medium flow range measurements of highly corrosive or ultra-pure liquids and gases.

Wetted inert components are surrounded by structurally rigid anodized aluminum. The resultant design represents a unique combination of a rugged mechanically rigid frame and chemically inert wetted parts.

For additional protection of personnel each meter is supplied with a thick protective magnifying safety shield.

*Glass and Sapphire floats are recommended.

design features

- ✓ Constructed of inert materials: Borosilicate Glass, PTFE and PCTFE.
- Chemically inert wetted parts within mechanically rigid frame.
- Rib-guided or fluted metering tubes facilitate stable, accurate readings.
- Magnifier lens in front shield to enhance reading resolution.
- ✓ OPTIGRAD[™] scales minimize parallax and eye fatigue.
- ✓ Simple means of panel mounting.
- ✓ Interchangeability of flow tubes and floats.
- Conveniently overlapping flow ranges available in both standard millimeter and "direct reading" scales.



PTFE-SINGLE GLASS FLOW METERS



LEAK INTEGRITY

Flow meters are individually tested on a Mass Spectrometer Leak Detector and certified to a leak integrity rating of 1 X 10⁻⁷ sccs Helium or better.

BUILT-IN VALVES

Meters are available with built-in needle valves (CVT™), high precision metering valves (MVT™) with "non-rising stems", or with no valves. The higher cost of MVT™ valves is justified whenever high sensitivity control and resolution are desirable particularly in conjunction with metering tubes of very low flow rates.

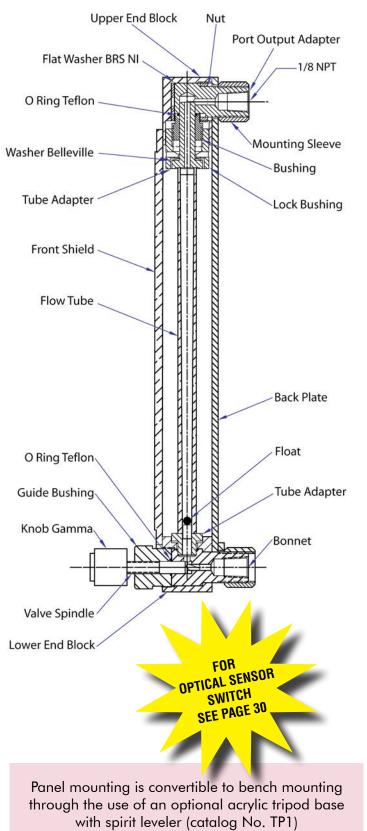
When meters with valves are ordered the valve cartridges are installed at the inlet. For vacuum service it is recommended that meters are ordered with valves at the outlet.

Assorted flow tubes may be used in conjunction with a single mounting frame, an apparent benefit in many laboratory applications.

| SPECIFICATIONS | |
|---------------------|---|
| STANDARD ACCURACY | ±2% FS mm scales except 042 and 032 flow |
| | tubes. ±5% FS direct reading scales 042 and |
| | 032 flow tubes. |
| REPEATABILITY | ± 0.25%. |
| USEFUL FLOW RANGES | 10:1 minimum with one float. |
| MAXIMUM OPERATING F | PRESSURE |
| | 100 psig/6.7 bars. |
| MAXIMUM OPERATING T | EMPERATURE |
| | 150 °F/ 65 °C. |
| LEAK INTEGRITY | Individually pressure and leak tested and |
| | certified to a rating of 1 \times 10 ⁻⁷ sccs Helium. |

| **MATERIALS | **MATERIALS OF CONSTRUCTION | | | | |
|----------------|--|--|--|--|--|
| FLOW TUBES | Heavy walled borosilicate glass. | | | | |
| | (Sapphire or glass floats recommended). | | | | |
| FITTINGS IN CO | NTACT WITH FLUIDS | | | | |
| | Virgin PTFE and PCTFE. | | | | |
| SIDE PLATES | Aluminum, black anodized. | | | | |
| FRONT SHIELD | AND BACK PLATE | | | | |
| | 1/8" thick clear polycarbonate and white acrylics. | | | | |
| 0-RINGS | PTFE. | | | | |
| CONNECTIONS | 1/8" NPT female inlet and outlet connections. | | | | |
| OPTIONAL | glass hose nipples or compression fittings. | | | | |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.



Ordering information see page 26. Dimensional information see page 25.



MULTIPLE TUBE-PTFE GLASS FLOW METERS



Model Tx Multiple Tube PTFE-Glass Flow meters combine the convenience of multiple tube meters with the unique design features of single tube PTFE-Glass flow meters. These meters are available with the same interchangeable 65mm or 150mm glass flow tubes used in single tube designs and they are available with or without built-in PTFE needle valves.

Wetted inert components are surrounded by structurally rigid anodized aluminum. The resultant design represents a unique combination of a rugged mechanically rigid frame and chemically inert wetted parts.

They are ideal for applications where several streams of corrosive gases or liquids are to be metered in individual channels or as a controlled mixer in manifolded models.

design features

- Constructed of inert materials:
 Borosilicate Glass, PTFE and PCTFE.
- Chemical inert wetted parts within mechanically rigid frame.
- Rib-guided or fluted metering tubes facilitate: stable, accurate readings.
- ✓ OPTIGRAD[™] scales minimize parallax and eye fatigue.
- ✓ Simple means of panel mounting.
- ✓ Interchangeability of flow tubes and floats.
- Conveniently overlapping flow ranges available in both standard millimeter and direct reading scales.

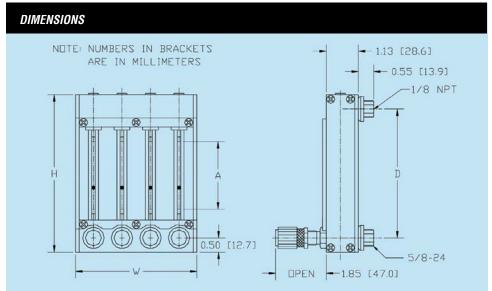
PTFE-SINGLE GLASS FLOW METERS



BUILT-IN VALVES

Meters are available with built-in needle valves (CVT™), high precision metering valves (MVT™) with non-rising stems, or with no valves. The higher cost of MVT™ valves is justified whenever high sensitivity control and resolution are desirable particularly in conjunction with metering tubes of very low flow rates.

For vacuum service it is recommended that meters are ordered with valves at the outlet.



Note: To obtain millimeters multiply inch dimensions by 2.54.

NOTE: Aalborg* reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Aalborg*.

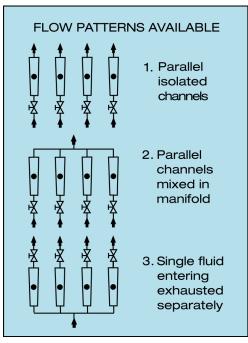
LEAK INTEGRITY

Flow meters are individually tested on a Mass Spectrometer Leak Detector and certified to a leak integrity rating of 1 X 10⁻⁷ sccs Helium or better.

| SPECIFICATIONS | | | | | |
|----------------------------|--|--|--|--|--|
| STANDARD ACCURACY | ±2% FS mm scales except 042 and 032 flow tubes. ±5% FS direct reading scales and 042 and 032 flow tubes. | | | | |
| REPEATABILITY | ± 0.25%. | | | | |
| USEFUL FLOW RANGES | 10:1 minimum with one float. | | | | |
| MAXIMUM OPERATING PRESSURE | | | | | |
| | 100 psig/6.7 bars. | | | | |
| MAXIMUM OPERATING T | EMPERATURE | | | | |
| | 150 °F/ 65 °C. | | | | |
| LEAK INTEGRITY | Individually pressure and leak tested and certified to a rating of 1 x 10 ⁻⁷ sccs Helium. | | | | |

| **MATERIALS | **MATERIALS OF CONSTRUCTION | | | | | |
|----------------|--|--|--|--|--|--|
| FLOW TUBES | Heavy walled borosilicate glass. | | | | | |
| | (Sapphire or glass floats recommended). | | | | | |
| FITTINGS IN CO | NTACT WITH FLUIDS | | | | | |
| | Virgin PTFE and PCTFE. | | | | | |
| SIDE PLATES | Aluminum, black anodized. | | | | | |
| FRONT SHIELD | AND BACK PLATE | | | | | |
| | 1/8" thick clear polycarbonate and white acrylics. | | | | | |
| 0-RINGS | PTFE. | | | | | |
| CONNECTIONS | 1/8" NPT female inlet and outlet connections. | | | | | |
| OPTIONAL | glass hose nipples or compression fittings. | | | | | |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.



When meters with valves are ordered the valve cartridges are installed at the inlet.

| DIMENSIONS FOR T STYLE METERS | | | | | | | | | |
|-------------------------------|---------------|-------------------------------|-----------|-----------|-----------|-----------|--|--|--|
| | ALL IV | IETERS | WIDTH (W) | | | | | | |
| SCALE LENGTH (A) | HEIGHT (H) | CENTER TO CENTER (D) | TUBE 1 | TUBE 2 | TUBE 3 | TUBE 4 | | | |
| 65mm | 6.156 | 5.156 | 1.250 | 2.250 | 3.250 | 4.250 | | | |
| 150mm | 10.46 | 9.469 | 1.250 | 2.250 | 3.250 | 4.250 | | | |



ORDERING INFORMATION MODEL T METERS

Configure and Order Online: Model T Single Flow Tube PTFE Meters **Model Tx Multi Flow Tube PTFE Meters**

| Т | T STYLE MET | ERS | \neg |
|---|-------------|---|------------|
| | | | _ |
| | | MBER OF CHANNELS NGLE CHANNEL (ONE TUBE) | ႕ |
| | | /O CHANNEL (ONE TOBE) | _ |
| | | REE CHANNEL METER (TWO TOBES) | \dashv |
| | | UR CHANNEL METER (FOUR TUBES) | \dashv |
| | | ` ' | _ |
| | | ODE SIZE 6 65 mm | _ |
| | | 6 65 mm 1 150 mm | \dashv |
| | | | _ |
| | | CODE MATERIAL | _ |
| | | T PTFE | |
| | | CODE VALVE POSITION | |
| | | 1 MFV (HIGH PRECISION) INLET 3 NO VALVE | _ |
| | | 4 CV (STANDARD CARTRIDGE) INLET | \dashv |
| | | 5 MFV (HIGH PRECISION) OUTLET | ᅥ |
| | | 6 CV (STANDARD CARTRIDGE) OUTLET | 一 |
| | | | |
| | | | |
| | | | |
| | | CODE SEALS | \neg |
| | | T PTFE | \neg |
| | | CODE FITTINGS | 二 |
| | | A 1/8" FNPT (STANDARD) | \dashv |
| | | F 1/4" COMPRESSION | \neg |
| | | G 0.390 O.D. GLASS HOSE NIPPLE | |
| | | CODE MANIFOLD | \neg |
| | | 0 NONE (STANDARD FOR SINGLE CHANNE | <u>:L)</u> |
| | | 1 BOTTOM | |
| | | 2 TOP | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Т | 1 | 1 T 3 - T F 0 - *TUBE | |
| | . — | | |

EXAMPLE: T11T3-TF0

T-Style Meter, Single Channel, 150mm, PTFE, No Valve, PTFE Seals, 1/4" compression fittings, No Manifold.

Optional Accessories

TP1-Tripod for single channel meter.

TP2-Tripod for 2 and 4 isolated channels or manifolding at top.

TP3-Tripod for 3 isolated channels or manifolding at bottom.

TP5-Tripod for 3 single tube meters.

*Tube selection:

Millimeter tubes: Tables 6 thru 9 **Direct Reading tubes:** Tables 11 thru 22.

S STYLE

Model S single-tube flow meters pictured on this page are similar to P meters in design, employing the same interchangeable flow tubes, valves and accessories. Likewise they may be panel or bench mounted.



The important advantage of the S meter is convenience in applications, where frequent changing of tubes in meter cases is desired.

An example is when several flow tubes are used in conjunction with a single meter case, or when because of the nature of the fluid, periodic cleaning necessitates disassembly.

Aalborg's[®] exclusive TUBELOK[™] design facilitates simple installation and replacement of tubes in mounting cases.

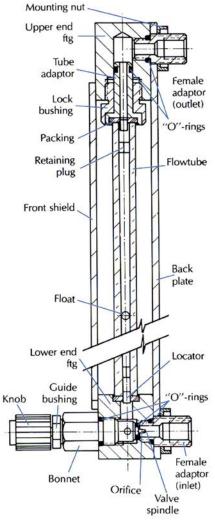
As a result of the "non-rotating" adapter feature, glass flow tubes are prevented from turning during the tightening phase of the assembly procedure.

design features

- ✓ TUBELOKTM design simplifies installation and replacement of tubes.
- ✓ Rib-guided or fluted metering tubes facilitate stable, accurate readings.
- ✓ Magnifier lens in front shield to enhance reading resolution.
- ✓ OPTIGRAD™ scales minimize parallax and eye fatigue.
- ✓ Simple means of panel mounting.
- ✓ Interchangeable flow tubes and floats.



SINGLE TUBE FLOW METERS



1.25 1.13 [28.6] 1.25 1.18 NPT 1.18 NP

NOTE: Aalborg* reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Aalborg*.

BUILT-IN VALVES

Meters are available with built-in needle valves (CVTM), high precision metering valves (MFVTM) with "non-rising stems", or with no valves. The higher cost of MFVTM valves is justified whenever high sensitivity control and resolution are desirable particularly in conjunction with metering tubes of very low flow rates. Generally, for gas metering it is recommended that valves are positioned at inlets (bottom) for liquids valves may be positioned either at inlets or outlets (top). For vacuum services, valves must be mounted at outlets. If unspecified at the time of ordering, meters will be shipped with valves mounted at the inlets.

| SPECIFICATIONS | | | | | | |
|--|---|--|--|--|--|--|
| STANDARD ACCURACY | ±2% FS mm scales except 042 and 032 flow | | | | | |
| | tubes. ±5% FS direct reading scales and 042 | | | | | |
| | and 032 flow tubes. | | | | | |
| CALIBRATED ACCURACY ±1% FS optional. | | | | | | |
| REPEATABILITY | ±0.25%. | | | | | |
| USEFUL FLOW RANGE | 10:1 minimum with one float. | | | | | |
| Better than 20:1 with combination of two floats installed in meters. | | | | | | |
| MAXIMUM OPERATING TEMPERATURE | | | | | | |
| | 200 psig/13.8 bars. | | | | | |
| MAXIMUM OPERATING TEMPERATURE | | | | | | |
| | 250 °F/ 121 °C. | | | | | |

| **MATERIALS OF CONSTRUCTION | | | | | | |
|--|---|--|--|--|--|--|
| FLOW TUBES | Heavy walled borosilicate glass. | | | | | |
| FLOATS | Glass, Sapphire, 316 Stainless Steel, Carboloy® and Tantalum. | | | | | |
| CHOICE OF MOUNTING FITTINGS IN CONTACT WITH FLUIDS | | | | | | |
| | a) Aluminum, black anodized. | | | | | |
| | b) Brass, chrome plated. | | | | | |
| | c) 316 stainless steel. | | | | | |
| SIDE PANELS | Aluminum, black anodized. | | | | | |
| FRONT SHIELD | Lexan® with longitudinal magnifier lens for | | | | | |
| | enhanced reading resolution. | | | | | |
| BACK PLATE | 1/8" thick white acrylics. | | | | | |
| O-RINGS AND PACKING Buna® o-rings in aluminum model. | | | | | | |
| | FKM o-rings in stainless steel meters. | | | | | |
| | OPTIONAL FKM, PTFE/FFKM and EPR. | | | | | |
| CONNECTIONS | 1/8" NPT female inlet and outlet connections. | | | | | |
| OPTIONAL | 1/4" FNPT, hose and compression fittings are available. | | | | | |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.

| DIMENSIONS FOR S STYLE METERS | | | | | | | | |
|-------------------------------|------------|----------------------|--|--|--|--|--|--|
| SCALE LENGTH | ALL METERS | | | | | | | |
| (A) | HEIGHT (H) | CENTER TO CENTER (D) | | | | | | |
| 65mm | 6.156 | 5.156 | | | | | | |
| 150mm | 10.46 | 9.469 | | | | | | |

ORDERING INFORMATION MODEL S METERS

Configure and Order Online: Model S Single Tube Flow Meters

| CODE | | | | | | | |
|------|-----------|--------|------------|----------|---------|-----------|---------------------------------|
| S | S STYLE I | METERS | | | | | |
| | | | | | | | |
| | CODE | NUMBER | OF CHAN | NELS | | | |
| | 1 | | CHANNEL | | (F) | | |
| | | ONVALL | JIIAININEE | (ONL TOL | ,L) | | |
| | | CODE | SIZE | | | | |
| | | | | | | | |
| | | 6 | 65 mm | | | | |
| | | 1 | 150 mm | | | | |
| | | | CODE | MATERIA | \.I | | |
| | | | - | MATERIA | | | |
| | | | A | ALUMIN | JIVI | | |
| | | | В | BRASS | 00 0755 | | |
| | | | S | STAINLE | SS STEE | <u>:L</u> | |
| | | | | | | | |
| | | | | | | POSITO | |
| | | | | 1 | | | ECISION) INLET |
| | | | | 3 | NO VA | | |
| | | | | 4 | | | CARTRIDGE) INLET |
| | | | | 5 | | | ECISION) OUTLET |
| | | | | 6 | CV (ST | ANDARI | CARTRIDGE) OUTLET |
| | | | | | | CODE | SEALS |
| | | | | | | | FKM STD ON STAINLESS METERS |
| | | | | | | В | BUNA® STD ON BRASS AND ALUMINUM |
| | | | | | | E | EPR |
| | | | | | | T | PTFE/FFKM |
| | | | | | | _ | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | CODE FITTINGS |
| | | | | | | | A 1/8" FNPT |
| | | | | | | | B 1/4" FNPT |
| | | | | | | | C 1/8" HOSE NIPPLE |
| | | | | | | | D 1/4" HOSE NIPPLE |
| | | | | | | | E 1/8" COMPRESSION |
| | | | | | | | F 1/4" COMPRESSON |
| | | | | | | | G VCR |
| | | | | | | | LOODE LAMANIFOLD |
| | | | | | | | CODE MANIFOLD |
| | | | | | | | 0 NONE |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| S |] [1] | 6 | S | 1 | | V | A 0 *TUBE |

EXAMPLE: S16S1-VA0

S-Style meter, Single Channel, 65mm, Stainless, High precision valve at inlet, FKM Seals, 1/8" FNPT fittings, No Manifold.

TP1-Tripod for single channel meter. *Tube selection: Millimeter tubes: Tables 6 thru 9 Direct Reading tubes: Tables 11 thru 22.



OPTICAL SENSOR SWITCH

P Style Meter with Single Optical Sensor Switch



GENERAL DESCRIPTION

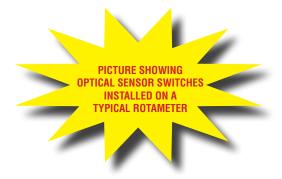
The Optical Sensor Switch is a non-invasive means for detection of a HI or LOW flow. This sensor is ideal for signaling an alarm, cutoff valve, or other device when the float passes the detector (alarm, valve, etc. are not included). The Optical Sensor Switch helps protect processes and equipment from damage caused by extreme flow rates.

Used in conjunction with P, S and T Style Flow Meters.

Its compact design and ease of operation make it a non-obtrusive, simple to use addition to your flow meter. Perfect for OEM applications, use whenever maximum or minimum flow levels need to be monitored automatically. It also can be used in conjunction with a control relay to power alternate equipment or monitoring devices.

PRINCIPLE OF OPERATION

A self-contained miniature photoelectric sensor (Thrubeam type) consisting of a transmitter and receiver are mounted at opposite sides of the flow tube on a solid carrier. The float inside the flow tube is detected as it passes across the beam of light. The sensor can be used to detect the float passage beyond the setpoint of the sensor and can also be set to monitor the float position at a specific level, signaling when the float is outside of the range of the sensor light beam.



Configure and Order Online:

Optical Sensor Switch for Rotameters (Single)

To order a flow meter with a single Optical Sensor Switch add "O1-" to P, S, or T Model Numbers.

Example: O1-P11A4-BA0-032-41-ST-VN.

| OPTICAL SENSOR SWITCH CONNECTION | | | |
|----------------------------------|--|--|--|
| WIRE LEAD COLOR | CONNECTION | | |
| BLACK | Positive Power Lead (+10 to 30 VDC) | | |
| YELLOW | Negative Power Lead | | |
| GREEN | NPN output #1 | | |
| RED | NPN output #2 (Complementary to Output #1) | | |

| ORDERING INFORMATION FOR OPTICAL SENSOR SWITCH ACCESSORY | | | | | |
|--|--|--|--|--|--|
| PART NUMBER DESCRIPTION | | | | | |
| 0SV1-6-P | Optical Sensor Switch for 65mm P Style Meters | | | | |
| 0SV1-1-P | Optical Sensor Switch for 150mm P Style Meters | | | | |
| 0SV1-6-S | Optical Sensor Switch for 65mm S Style Meters | | | | |
| 0SV1-1-S | Optical Sensor Switch for 150mm S Style Meters | | | | |
| 0SV1-6-T | Optical Sensor Switch for 65mm T Style Meter | | | | |
| 0SV1-1-T | Optical Sensor Switch for 150mm T Style Meter | | | | |

The sensor consists of two parts: transmitter and receiver. When power is properly connected the power supply indicator (green LED) on the transmitter is constantly on.

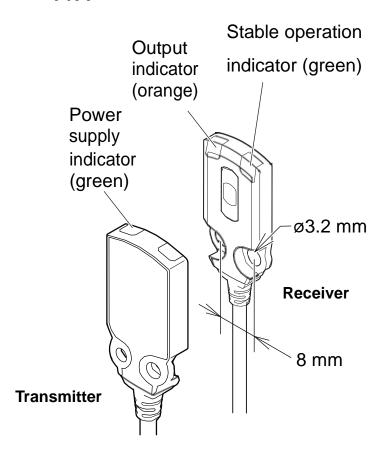
The receiver has two indicators:

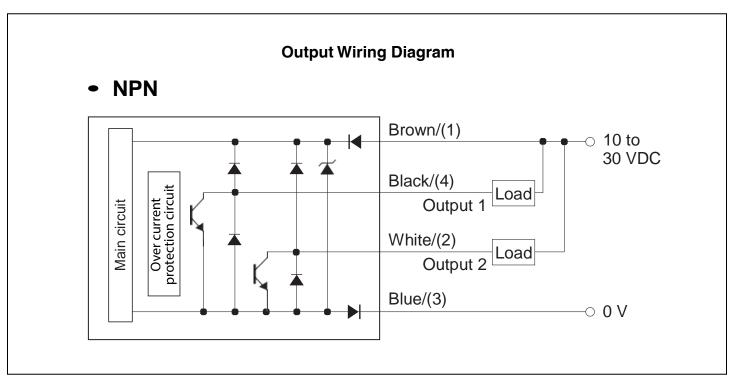
Stable operation indicator (green LED) turns on with a stable incoming beam and with a stable blocked light. Output indicator (orange LED) turns on when the beam from emitter is blocked by the float.

| TROUBLESHOOTING | | | | | |
|------------------------------------|---|--|--|--|--|
| PROBLEM | CAUSE | CHECK & ACTION | | | |
| All indicators are off. | The power supply is not connected. | Connect the power supply. | | | |
| The output indicators | Incorrect wiring. | Check the wiring for the output wires. | | | |
| turn on and off but output does | The input device has failed. | Try connecting the sensor output to a separate input | | | |
| not turn on or off. | Sensor output has failed or an output wire is broken. | device. | | | |
| | Overcurrent has passed through an output. | Check that the rated current for the input device has not exceeded 50 mA. | | | |
| The output indicator is flashing. | overcurrent has passed through an output. | Check that the output wires are not shorted by any other wires. | | | |
| | The sensor is affected by ambient light. | When there are light sources nearby (sensors, lighting), adjust the sensor installation. | | | |



PR-F







GENERAL DESCRIPTION

The Optical Sensor Switch Hi-Lo is a non-invasive means for detection of a HI or LOW flow. This set of sensors is ideal for signaling an alarm, cutoff valve, or other device when the float passes the detector (alarm, valve, etc. are not included). The Optical Sensor Switch helps protect processes and equipment from damage caused by extreme flow rates.

Its compact design and ease of operation make it a non-obtrusive, simple to use addition to your flow meter. Perfect for OEM applications, use whenever maximum or minimum flow levels need to be monitored automatically. It also can be used in conjunction with a control relay to power alternate equipment or monitoring devices.

Used in conjunction with P, S and T Style Flow Meters.

PRINCIPLE OF OPERATION

The Optical Sensor Switch Hi-Lo consists of two self-contained mini-slim photoelectric sensors (Thrubeam type). Every sensor has a transmitter and receiver. Two sets of sensors are mounted on two solid carriers on opposite sides of the flow tube. The float inside the flow tube is detected as it passes across the beam of light. The sensors can be used to detect the float passage beyond the setpoint of the sensor and can also be set to monitor the float position at a specific level, signaling when the float is outside of the range of the sensor light beam.

Configure and Order Online:

Optical Sensor Switch for Rotameters (Double)

To order a flow meter with Hi-Lo Optical Sensor Switches add "O2-" to P, S, or T Model Numbers. Example: O2-P11A4-BA0-032-41-ST-VN



OPTICAL SENSOR SWITCH

Each sensor consists of two parts: transmitter and receiver. When power is properly connected the power supply indicator (green LED) on the transmitter is constantly on.

The receiver has two indicators:

Stable operation indicator (green LED) turns on with a stable incoming beam and with a stable blocked light. Output indicator (orange LED) turns on when the beam from emitter is blocked by the float.

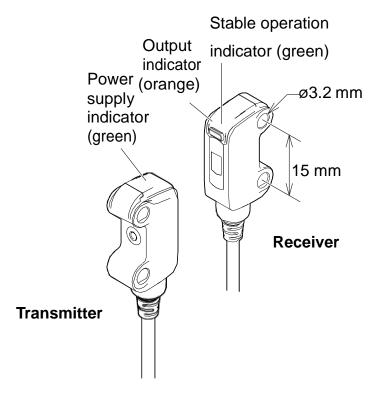
| TROUBLESHOOTING TROUBLESHOOTING | | | | |
|------------------------------------|---|--|--|--|
| PROBLEM | CAUSE | CHECK & ACTION | | |
| All indicators are off. | The power supply is not connected. | Connect the power supply. | | |
| The output indicators | Incorrect wiring. | Check the wiring for the output wires. | | |
| turn on and off but | The input device has failed. | Try connecting the sensor output to a separate input device. | | |
| output does not turn on or off. | Sensor output has failed or an output wire is broken. | | | |
| | Overcurrent has passed through an output. | Check that the rated current for the input device has not exceeded 50 mA. | | |
| The output indicator is flashing. | - ' | Check that the output wires are not shorted by any other wires. | | |
| is natining. | The sensor is affected by ambient light. | When there are light sources nearby (sensors, lighting), adjust the sensor installation. | | |

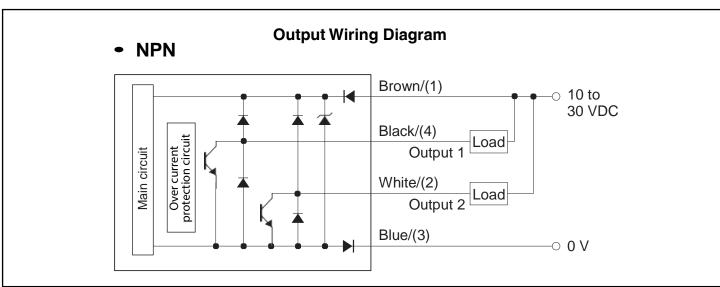
| SPECIFICATIONS | |
|---|--|
| MODE OF DETECTION | Red LED Thrubeam type. |
| POWER REQUIREMENTS | 10 to 30 Vdc @50 mA max. |
| OUTPUT TRANSISTORS | NPN source up to 50 mA. |
| RESPONSE TIME | 0.5 ms. |
| LIGHT IMMUNITY | 4 Element, point light source, red LED 650 nm. |
| AMBIENT TEMPERATURE | 25 degree C to +55 degree C. |
| SENSOR CONSTRUCTION | Heavy duty metal housing, IP-67 protection. |
| SENSOR CERTIFICATION UL CE:EMC DIRECTIVE (2004/108/EC) | File #: E301717; Category: NRKH2/NRKH8; Enclosure type: 1 (UL50) Applicable Standard: EMI: EN60947-5-2 Class A/EMS:EN60947-5-2 |

Configure and Order Online: Optical Sensor Switch for Rotameters (Single)
Optical Sensor Switch for Rotameters (Double)

| ORDERING INFORMATION FOR OPTICAL SENSOR SWITCH ACCESSORY | | | | |
|--|---|--|--|--|
| PART NUMBER DESCRIPTION | | | | |
| 0SV2-6-P | Hi-Lo Optical Sensor Switch for 65mm P Style Meter | | | |
| 0SV2-1-P | Hi-Lo Optical Sensor Switch for 150mm P Style Meter | | | |
| 0SV2-6-S | Hi-Lo Optical Sensor Switch for 65mm S Style Meter | | | |
| 0SV2-1-S | Hi-Lo Optical Sensor Switch for 150mm S Style Meter | | | |
| 0SV2-6-T | Hi-Lo Optical Sensor Switch for 65mm T Style Meter | | | |
| 0SV2-1-T | Hi-Lo Optical Sensor Switch for 150mm T Style Meter | | | |

PR-M



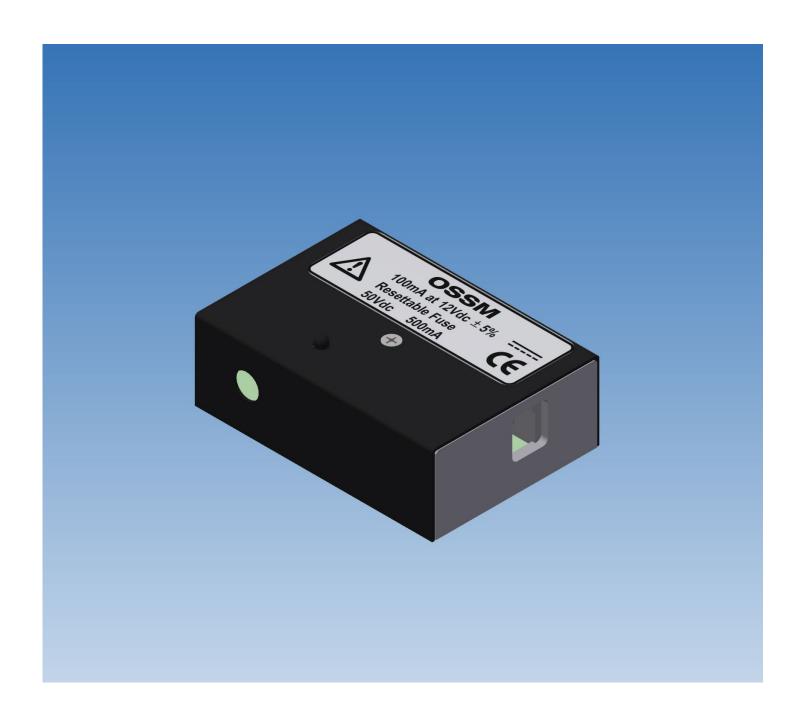


| OPTICAL SENSOR SWITCH CONNECTION | | | | |
|----------------------------------|--|--|--|--|
| WIRE LEAD COLOR | CONNECTION | | | |
| BLACK | Positive Power Lead (+10 to 30 VDC) | | | |
| YELLOW | Negative Power Lead | | | |
| GREEN | NPN output #1 | | | |
| RED | NPN output #2 (Complementary to Output #1) | | | |

MOMENTARY OR LATCH OPERATION

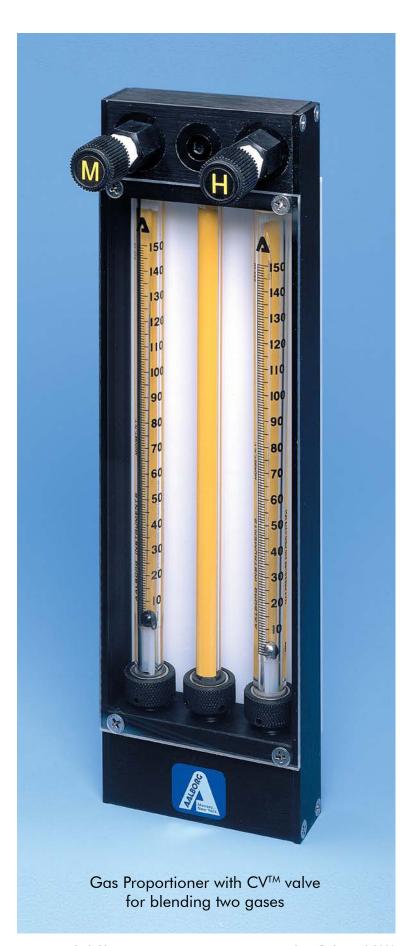
Optionally the, Hi-Lo Optical Sensor Switch could be supplied with OSSM Module, allowing each sensor to be separately set for momentary or latch operation of buzzer, LED and relay.

The OSSM module is equipped with the 8 position DIP switch and requires a +12 VDC power supply with a minimum current rating of 250 mA.



GAS PROPORTIONERS BACK PRESSURE COMPENSATED





To blend two or three gases in homogeneous infinitely variable concentrations, directly at the end use point, this Model G gas proportioner is unsurpassed in convenience and economy.

Gas proportioners pay for themselves since they eliminate the need for expensive custom blended gas mixtures.

They lend flexibility and economy to the utilization of component gas cylinders and "piped-in" supply lines.

Another advantage in laboratory investigations is the freedom to reproducibility increase or decrease concentrations during the course of an experiment.

The flow rates are not affected by downstream pressure variations as long as back pressures do not approach or exceed the input pressure. Input pressures of up to 200 psig (13.8 bars) can be used; however, customers' very often find 50 psig (3.45 bars) a convenient setting to work with.

design features

- ✓ Blending of two or three gases with gas proportioners obviates the need for:
- ✓ ORDERING FIXED GAS MIXTURES.
- ✓ CONTAMINATION FROM REUSABLE GAS CYLINDERS.
- ✓ POTENTIALLY INACCURATE MIXTURES BY GAS SUPPLIERS.
- Rib-guided or fluted metering tubes facilitate stable, accurate readings.
- ✓ OPTIGRAD™ scales minimize parallax and eye fatigue.
- ✓ Interchangeability of flow tubes and floats.
- ✓ Simple means of panel mounting.



GAS PROPORTIONERS BACK PRESSURE COMPENSATED

BUILT-IN VALVES

Meters are available with built-in needle valves (CV™), high precision metering valves (MFV™) with "non-rising stems", or with no valves.

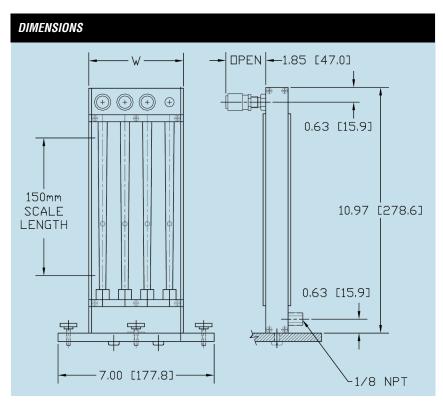
The higher cost of MFVTM valves is justified whenever high sensitivity control and resolution are desirable particularly in conjunction with metering tubes of very low flow rates.

design features

- Precision fabricated from heavy walled, shock resistant borosilicate glass.
- ✓ Bores are uniformly tapered or formed with internal "rib-guides" or flutes.
- √ Floats are retained by TFE plugs.
- ✓ Self cleaning.
- Low differential pressures that stay independent of flow rate changes.

| DIMENSIONS FOR G STYLE METERS | | | | | | |
|----------------------------------|--|--|--|--|--|--|
| WIDTH (W) | | | | | | |
| SCALE LENGTH 2 CHANNEL 3 CHANNEL | | | | | | |
| 150 mm 3.24 4.23 | | | | | | |

Bench mounting acrylic tripod bases are optional.



NOTE: Aalborg* reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Aalborg*.

SPECIFICATIONS STANDARD COMPONENT

FLOW TUBE ACCURACY

 $\pm 2\%$ FS mm scales except 042 and 032 flow tubes $\pm 5\%$, from 10 to 100% of scale. Conforming to ISA RP. 16-1.2.3. Specification 2-S-10.

COMPONENT FLOW TUBE REPEATABILITY

 $\pm 0.25\%$. Typical calibration curves for air at 50 psig /3.5 bars using glass floats are available. Consult the company on the availability of calibration data for non-hazardous gases and special individual calibrations.

| • | |
|---------------------------|---------------------|
| MAX OPERATING PRESSURE | 200 psig/13.8 bars. |
| MAX OPERATING TEMPERATURE | 250 °F/ 121 °C. |

| **MATERIALS OF CONSTRUCTION | | | |
|--|--|--|--|
| FLOW TUBES | Heavy walled borosilicate glass. | | |
| CHOICE OF MOUNTING | G FITTINGS IN CONTACT WITH GASES | | |
| a) Aluminum, black an | odized. b) 316 stainless steel. | | |
| SIDE PANELS | Aluminum, black anodized. | | |
| FRONT SHIELD Clear polycarbonate. | | | |
| BACK PLATE | 1/8" thick white acrylics. | | |
| O-RINGS AND PACKIN | G Buna® O-rings in aluminum model. | | |
| | FKM, O-rings in stainless steel meters. | | |
| <i>OPTIONAL</i> FKM ,PTFE/FFKM/EPR. | | | |
| CONNECTIONS 1/8" NPT female inlet and outlet connections. | | | |
| OPTIONAL | Hose and compression fittings are available. | | |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.

Ordering information see page 38. For flow capacities see table 10 page 65.

ORDERING INFORMATION G STYLE METER



Configure and Order Online: Model G Gas Proportioner Meters

| CODE | | | | | | | |
|------|---------|---|---------------|--|--|--|--|
| G | G STYLE | NETERS | | | | | |
| | CODE | TUBE QUANTITIES | | | | | |
| | 2 | TWO CHANNEL METER (TWO TUBES AND ONE MIXING TUBE) | | | | | |
| | 3 | THREE CHANNEL METER (THREE TUBES AND ONE MIXING TUBE) | \dashv | | | | |
| | | · | ᆜ | | | | |
| | | CODE SIZE | | | | | |
| | | 1 150 mm | | | | | |
| | | CODE MATERIAL | \Box | | | | |
| | | A ALUMINUM | | | | | |
| | | S STAINLESS | | | | | |
| | | CODE VALVE | $\overline{}$ | | | | |
| | | 5 MFV (HIGH PRECISION) | _ | | | | |
| | | 6 CV OUTLET (STANDARD CARTRIDGE) | \dashv | | | | |
| | | | | | | | |
| | | | | | | | |
| | | CODE SEALS | | | | | |
| | | V FKM STD ON STAINLESS METERS | | | | | |
| | | B BUNA® STD ON BRASS AND ALUMINUM | _ | | | | |
| | | E EPR T PTFE | \dashv | | | | |
| | | | ᆜ | | | | |
| | | CODE FITTINGS | \dashv | | | | |
| | | A 1/8" FNPT B 1/4" FNPT | \dashv | | | | |
| | | C 1/8" HOSE NIPPLE | | | | | |
| | | D 1/4" HOSE NIPPLE | \dashv | | | | |
| | | E 1/8" COMPRESSION | | | | | |
| | | F 1/4" COMPRESSON | | | | | |
| | | H VCR | | | | | |
| | | CODE MANIFOLD | \neg | | | | |
| | | 0 NONE | \neg | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| G | 2 | 1 A 6 — B A 0 — *TUBE | | | | | |
| | | | | | | | |

EXAMPLE: G21A6-BA0

G-Style Meters, Two Channels, 150mm, Aluminum, CV Outlet, Buna Seals, 1/8" FNPT fittings, No Manifold.

Optional Accessories

TPG-Tripod for 2 channel gas proportioner.

TPH-Tripod for 3 channel gas proportioner.

*Tube selection:

Millimeter tubes: Table 10.



Designed especially for the laboratory these kits offer a diverse economical way of acquiring flow measurement capabilities. Since all 150 mm flow tubes in this catalog are interchangeable, additional flow tubes may be added later (see flow tables, pages 62 to 65). A handy selection of flow meters is presented in kit form.

THREE TYPES OF KITS ARE OFFERED
Aluminum Flow Meter Kit.
Stainless Steel Flow Meter Kit.
PTFE Flow Meter Kit.

Kits are shipped in convenient molded plastic carrying cases. Flow tubes and floats are interchangeable in frames supplied facilitating overlapping flow ranges.

For non-corrosive fluids use the Aluminum Kit. For corrosives consider the Stainless Steel Kit. For corrosive applications at lower pressure or for high purity fluid service specify the PTFE Kit.

All three units are supplied with glass floats installed.



Aluminum and
Stainless Steel kits
come with spare
stainless steel and
tantalum interchangeable floats to extend
flow capacities. Due to
chemical compatibility
considerations PTFE
kits are supplied with
spare sapphire floats.

| FLOW CAPACITIES OF FLOW TUBES USED IN KITS [mL/min] | | | | | | | |
|---|--|----------------|-----------------------|------------|--|--------------|--|
| E1 014 | | FLOAT MATERIAL | | | | | |
| FLOW TUBE Number | GLASS ALUMINUM, STAINLESS & PTFE KITS | | SAPPHIRE PTFE KITS | | STAINLESS STEEL ALUMINUM AND STAINLESS STEEL KITS | | |
| NOMBER | AIR | WATER | AIR | WATER | AIR | WATER | |
| 042-29 | 1.77 to 11.6 | - | 1 to 18.3 | - | 1.6 to 34 | - | |
| 112-02 | 27.8 to 371 | 0.28 to 5.71 | 43.7 to 513 | 0.57 to 10 | 86.6 to 816 | 1.39 to 19.2 | |
| 102-05 | 135 to 3780 | 1.7 to 88.7 | 202 to 4942 | 3.3 to 134 | 389 to 7720 | 7.9 to 234 | |
| 044-40 | 797 to 23105 | 9 to 579 | 1077 to 29410 | 17 to 833 | 1540 to 42860 | 40 to 1339 | |

Configure and Order Online: Flow Meter Kits

| ORDERING INFORMATION FOR FLOW METER KITS | | | | | | |
|--|--|---|--|--|--|--|
| MODEL NUMBER | CONTENTS | DESCRIPTION | | | | |
| KIT-S1A-BA | ALUMINUM FLOW METER KIT: Assembled with 042-29-GL flow tube. Extra flow tubes as listed in above table. Stainless steel float for 042,112 and 102 flow tubes. Stainless float for 044 flow tube. High flow valve cartridge. Tripod base, tweezers, pushrod and locking tool for changing floats and flow tubes. Calibration data and carrying case. | Wetted parts are borosilicate glass, aluminum, 316 stainless steel. Buna® o-rings and FKM packings. | | | | |
| KIT-S1S-VA | STAINLESS STEEL FLOW METER KITS: Assembled with 042-29-GL flow tube. Extra flow tubes as listed in above table. Stainless steel float for 042, 112 and 102 flow tubes. Stainless float for 044 flow tube. High flow valve cartridge. Tripod base, tweezers, pushrod and locking tool for changing floats and flow tubes. Calibration data and carrying case. | Wetted parts are borosilicate glass, 316 stainless steel, FKM o-rings and packings. | | | | |
| KIT-T1T-TA | PTFE FLOW METER KIT: Assembled with 042-29-GL flow tube. Extra flow tubes as listed in above table. Sapphire floats. High flow valve cartridge. Tripod base, tweezers, pushrod and locking tool for changing floats and flow tubes. Calibration data and carrying case. | Wetted parts are borosilicate glass, PTFE and PCTFE. | | | | |

MEDIUM RANGE BRASS AND STAINLESS FLOW METERS



Incorporating traditional rotameter precision glass technology, these rugged brass and stainless steel flow meters offer accurate and economical solutions to medium flow range measurements. *V meters* are designed with unique rotatable scales of dual air-water direct reading graduations showing SCFM and L/min (air), as well as GPM and LPM (water) markings.

design features

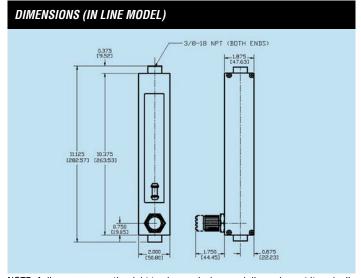
- √ Rigid, compact construction.
- ✓ Dual, rotatable direct reading scales for air and water.
- ✓ Graduations reflect both metric and English systems.
- √ Vertical In-line or Panel Mount.
- \checkmark Flow ranges from 4 to 20 L/min water and 140 to 900 L/min air.

| SPECIFICATIONS | |
|---------------------|---|
| SCALES | Rotatable, direct reading air, |
| | (SCFM-L/min) and water (GPM-LPM). |
| ACCURACY | ±5% of full scale. |
| MAXIMUM TEMPERATURE | 250 °F (121 °C). |
| MAXIMUM PRESSURE | 150 psig (@ 200 °F). |
| CONNECTIONS | 3/8" NPT female in line or horizontal rear. |

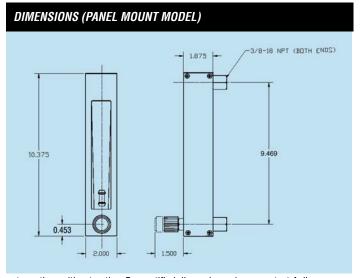
| **MATERIALS OF CONSTRUCTION | | | | | |
|-----------------------------|---|--|--|--|--|
| TUBE SHIELDS | Polycarbonate. | | | | |
| FLOW TUBES | Heavy walled precision formed borosilicate glass. | | | | |
| FLOATS | Type 316 stainless steel. | | | | |
| WETTED PARTS | Brass or type 316 stainless steel. | | | | |
| SEALS | FKM standard. | | | | |
| OPTIONAL | Buna®, PTFE /FFKM and EPR. | | | | |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.

Ordering information see page 42.







NOTE: Aalborg® reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Aalborg®.



MEDIUM RANGE PTFE FLOW METERS

Incorporating traditional variable area precision glass technology, these rugged PTFE flow meters offer accurate and economical solutions to medium flow range measurements. **V meters** are designed with unique rotatable scales of dual air-water direct reading graduations showing SCFM and L/min (air), as well as GPM and LPM (water) markings.

LEAK INTEGRITY

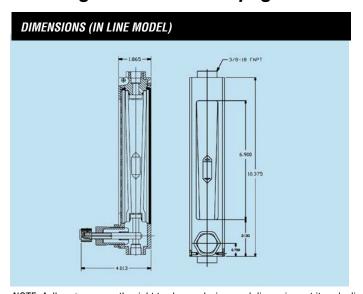
Flow meters are individually tested on a Mass Spectrometer Leak Detector and certified to a leak integrity rating of 1 x 10^{-7} sccs Helium or better.

| SPECIFICATIONS | |
|---------------------|---|
| SCALES | Rotatable, direct reading air, |
| | (SCFM-L/min) and water (GPM-LPM). |
| | Scale length is 127mm (nominal). |
| ACCURACY | ±5% of full scale. |
| MAXIMUM TEMPERATURE | 150 °F (65 °C.) |
| MAXIMUM PRESSURE | 100 psig (6.7) bars. |
| CONNECTIONS | 3/8" NPT female in line or horizontal rear. |
| LEAK INTEGRITY | Individually leak tested and certified. |

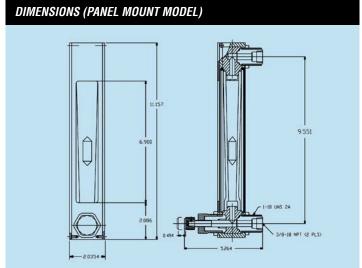
| **MATERIALS OF CONSTRUCTION | | | | | |
|-----------------------------|---|--|--|--|--|
| TUBE SHIELDS | Polycarbonate. | | | | |
| FLOW TUBES | Heavy walled precision formed borosilicate glass. | | | | |
| FLOATS | PTFE. | | | | |
| WETTED PARTS | PCTFE and Borosilicate glass. | | | | |
| SEALS | PTFE. | | | | |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.

Ordering information see page 42.







NOTE: Aalborg® reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Aalborg®.

42 WWW.AALBORG.COM ● E-MAIL ⊠ INFO@AALBORG.COM ● **PHONE 8 845.770.3000** ● TOLL FREE IN U.S.A. AND CANADA **1.800.866.3837** ● ORANGEBURG N.Y. U.S.A.

ORDERING INFORMATION MEDIUM RANGE FLOW METERS



Configure and Order Online: Model V Medium Range Flow Meters

| VERTICAL IN LINE | | | | | | | |
|-------------------|-------------------|----------|------|------------------|-------|------|--|
| MODEL N | MODEL NUMBER | | | END MAXIMUM FLOW | | | |
| BUILT IN VALVE | NO VALVE | FITTING | Air | | Water | | |
| BUILI IN VALVE | NO VALVE | MATERIAL | SCFM | L/min | GPM | LPM | |
| VIB4-VA-V01-01-ST | VPB3-VA-V01-02-ST | Brass | 5 | 140 | 1.2 | 4 | |
| VIB4-VA-V02-01-ST | VIB3-VA-V02-01-ST | Brass | 10 | 280 | 2 | 8 | |
| VIB4-VA-V03-01-ST | VIB3-VA-V03-01-ST | Brass | 15 | 425 | 3 | 11.5 | |
| VIB4-VA-V04-01-ST | VIB3-VA-V04-01-ST | Brass | 20 | 575 | 4 | 15 | |
| VIB4-VA-V05-01-ST | VIB3-VA-V05-01-ST | Brass | 30 | 900 | 5 | 20 | |
| VIS4-VA-V01-01-ST | VIS3-VA-V01-01-ST | 316 s.s | 5 | 140 | 1.2 | 4 | |
| VIS4-VA-V02-01-ST | VIS3-VA-V02-01-ST | 316 s.s | 10 | 280 | 2 | 8 | |
| VIS4-VA-V03-01-ST | VIS3-VA-V03-01-ST | 316 s.s | 15 | 425 | 3 | 11.5 | |
| VIS4-VA-V04-01-ST | VIS3-VA-V04-01-ST | 316 s.s | 20 | 575 | 4 | 15 | |
| VIS4-VA-V05-01-ST | VIS3-VA-V05-01-ST | 316 s.s | 30 | 900 | 5 | 20 | |

| PANEL MOUNT METERS | | | | | | | | |
|--------------------|-------------------|----------|------|--------------|-------|------|--|--|
| MODEL N | MODEL NUMBER | | | MAXIMUM FLOW | | | | |
| BUILT IN VALVE | NO VALVE | FITTING | Air | | Water | | | |
| BUILI IN VALVE | NO VALVE | MATERIAL | SCFM | L/min | GPM | LPM | | |
| VPB4-VA-V01-02-ST | VPB3-VA-V01-02-ST | Brass | 5 | 140 | 1.2 | 4 | | |
| VPB4-VA-V02-02-ST | VPB3-VA-V02-02-ST | Brass | 10 | 280 | 2 | 8 | | |
| VPB4-VA-V03-02-ST | VPB3-VA-V03-02-ST | Brass | 15 | 425 | 3 | 11.5 | | |
| VPB4-VA-V04-02-ST | VPB3-VA-V04-02-ST | Brass | 20 | 600 | 4 | 15 | | |
| VPB4-VA-V05-02-ST | VPB3-VA-V05-02-ST | Brass | 30 | 900 | 5 | 20 | | |
| VPS4-VA-V01-02-ST | VPS3-VA-V01-02-ST | 316 s.s | 5 | 140 | 1.2 | 4 | | |
| VPS4-VA-V02-02-ST | VPS3-VA-V02-02-ST | 316 s.s | 10 | 280 | 2 | 8 | | |
| VPS4-VA-V03-02-ST | VPS3-VA-V03-02-ST | 316 s.s | 15 | 425 | 3 | 11.5 | | |
| VPS4-VA-V04-02-ST | VPS3-VA-V04-02-ST | 316 s.s | 20 | 600 | 4 | 15 | | |
| VPS4-VA-V05-02-ST | VPS3-VA-V05-02-ST | 316 s.s | 30 | 900 | 5 | 20 | | |

| PTFE VERTICAL IN LINE METERS | | | | | | | | |
|------------------------------|-------------------|----------|------|--------------|-------|-------|--|--|
| MODEL N | MODEL NUMBER | | | MAXIMUM FLOW | | | | |
| BUILT IN VALVE | NO VALVE | FITTING | Air | | Water | | | |
| BOILT IN VALVE | NO VALVE | MATERIAL | SCFM | L/min | GPM | LPM | | |
| VIT4-TA-V06-01-TF | VIT3-TA-V06-01-TF | PTFE | 3.5 | 100 | 0.8 | 3 | | |
| VIT4-TA-V07-01-TF | VIT3-TA-V07-01-TF | PTFE | 7 | 200 | 1.5 | 5.75 | | |
| VIT4-TA-V08-01-TF | VIT3-TA-V08-01-TF | PTFE | 10.5 | 300 | 2.2 | 8.25 | | |
| VIT4-TA-V09-01-TF | VIT3-TA-V09-01-TF | PTFE | 14 | 400 | 2.9 | 11 | | |
| VIT4-TA-V10-01-TF | VIT3-TA-V10-01-TF | PTFE | 17.5 | 500 | 3.5 | 13.25 | | |
| VIT4-TA-V11-01-TF | VIT3-TA-V11-01-TF | PTFE | 22 | 625 | 4.1 | 16 | | |

| PTFE PANEL MOUNT METERS | | | | | | | |
|-------------------------|-------------------|----------|------|------------------|-------|-------|--|
| MODEL I | MODEL NUMBER | | | END MAXIMUM FLOW | | | |
| DINIT IN VALVE | NO VALVE | FITTING | A | ir | Water | | |
| BUILT IN VALVE | NO VALVE | MATERIAL | SCFM | L/min | GPM | LPM | |
| VPT4-TA-V06-02-TF | VPT3-TA-V06-02-TF | PTFE | 3.5 | 100 | 0.8 | 3 | |
| VPT4-TA-V07-02-TF | VPT3-TA-V07-02-TF | PTFE | 7 | 200 | 1.5 | 5.75 | |
| VPT4-TA-V08-02-TF | VPT3-TA-V08-02-TF | PTFE | 10.5 | 300 | 2.2 | 8.25 | |
| VPT4-TA-V09-02-TF | VPT3-TA-V09-02-TF | PTFE | 14 | 400 | 2.9 | 11 | |
| VPT4-TA-V10-02-TF | VPT3-TA-V10-02-TF | PTFE | 17.5 | 500 | 3.5 | 13.25 | |
| VPT4-TA-V11-02-TF | VPT3-TA-V11-02-TF | PTFE | 22 | 625 | 4.1 | 16 | |



DIRECT READING MULTI-GAS FLOW METERS

Incorporating traditional rotameter precision glass technology, these rugged brass and stainless steel flow meters offer accurate and economical solutions to medium flow range measurements.

xV meters are designed with unique rotatable scales in either SCFM or L/min. Each features direct reading scales for 5 gases. (Argon, CO₂, He, N₂, & O₂).

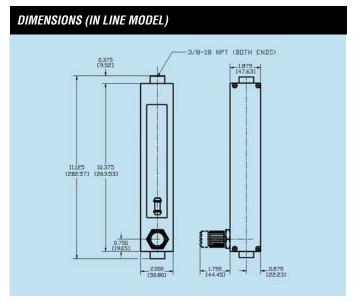
design features

- ✓ Rigid, compact construction.
- ✓ Multi-gas, rotatable direct reading scales for 5 gases.
- ✓ Graduations reflect metric or English systems.
- ✓ Vertical In-line or Panel Mount.

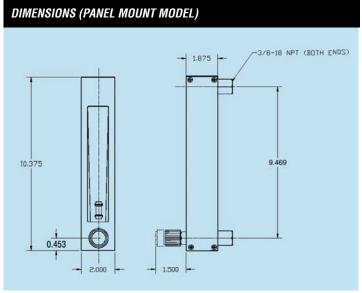
| SPECIFICATIONS | |
|--------------------|---|
| SCALES | Rotatable, direct reading Argon, CO2, He, |
| | N2, & O2. |
| ACCURACY | ±5% of full scale. |
| MAXIMUM TEMPERATUR | E 250 °F (121 °C). |
| MAXIMUM PRESSURE | 150 psig (@ 200 °F). |
| CONNECTIONS | 3/8" NPT female in line or horizontal rear. |

| **MATERIALS OF CONSTRUCTION | | | | | |
|-----------------------------|---|--|--|--|--|
| TUBE SHIELDS | Polycarbonate. | | | | |
| FLOW TUBES | Heavy walled precision formed borosilicate glass. | | | | |
| FLOATS | Type 316 stainless steel. | | | | |
| WETTED PARTS | Brass or type 316 stainless steel. | | | | |
| SEALS FKM standard. | | | | | |
| OPTIONAL: | Buna®, PTFE /FFKM and EPR. | | | | |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.







NOTE: Aalborg® reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Aalborg®.

ORDERING INFORMATION MEDIUM RANGE FLOW METERS



Configure and Order Online: Model xV Medium Range Flow Meters

| VERTICAL IN LINE | | | | | | | | |
|-------------------|-------------------|----------|-------|--------------|--------|----------|--------|--|
| MODEL | MODEL NUMBER | | | MAXIMUM FLOW | | | | |
| BUILT IN VALVE | NO VALVE | FITTING | SCFM | | | | | |
| BOILI IN VALVE | NU VALVE | MATERIAL | Argon | CO2 | Helium | Nitrogen | Oxygen | |
| VIB4-VA-V01-03-ST | VIB3-VA-V01-03-ST | Brass | 4.2 | 3.8 | 12.0 | 4.5 | 4.5 | |
| VIB4-VA-V02-03-ST | VIB3-VA-V02-03-ST | Brass | 8.0 | 8.0 | 23.0 | 9.5 | 9.0 | |
| VIB4-VA-V03-03-ST | VIB3-VA-V03-03-ST | Brass | 12.5 | 12.5 | 35.0 | 14.0 | 14.0 | |
| VIB4-VA-V04-03-ST | VIB3-VA-V04-03-ST | Brass | 15.5 | 15.5 | 42.5 | 19.0 | 18.0 | |
| VIB4-VA-V05-03-ST | VIB3-VA-V05-03-ST | Brass | 26.0 | 24.0 | 60.0 | 30.0 | 28.0 | |
| VIS4-VA-V01-03-ST | VIS3-VA-V01-03-ST | 316 s.s | 4.2 | 3.8 | 12.0 | 4.5 | 4.5 | |
| VIS4-VA-V02-03-ST | VIS3-VA-V02-03-ST | 316 s.s | 8.0 | 8.0 | 23.0 | 9.5 | 9.0 | |
| VIS4-VA-V03-03-ST | VIS3-VA-V03-03-ST | 316 s.s | 12.5 | 12.5 | 35.0 | 14.0 | 14.0 | |
| VIS4-VA-V04-03-ST | VIS3-VA-V04-03-ST | 316 s.s | 15.5 | 15.5 | 42.5 | 19.0 | 18.0 | |
| VIS4-VA-V05-03-ST | VIS3-VA-V05-03-ST | 316 s.s | 26.0 | 24.0 | 60.0 | 30.0 | 28.0 | |

| VERTICAL IN LINE | | | | | | | | |
|-------------------|-------------------|----------|-------|-----|-------------|----------|--------|--|
| MODEL | NUMBER | END | | M | AXIMUM FLOW | | | |
| BUILT IN VALVE | NO VALVE | FITTING | | | L/min | L/min | | |
| BOILI IN VALVE | NU VALVE | MATERIAL | Argon | CO2 | Helium | Nitrogen | Oxygen | |
| VIB4-VA-V01-05-ST | VIB3-VA-V01-05-ST | Brass | 120 | 105 | 350 | 130 | 130 | |
| VIB4-VA-V02-05-ST | VIB3-VA-V02-05-ST | Brass | 230 | 220 | 650 | 270 | 260 | |
| VIB4-VA-V03-05-ST | VIB3-VA-V03-05-ST | Brass | 360 | 360 | 1000 | 400 | 400 | |
| VIB4-VA-V04-05-ST | VIB3-VA-V04-05-ST | Brass | 440 | 440 | 1250 | 550 | 525 | |
| VIB4-VA-V05-05-ST | VIB3-VA-V05-05-ST | Brass | 750 | 700 | 1800 | 850 | 800 | |
| VIS4-VA-V01-05-ST | VIS3-VA-V01-05-ST | 316 s.s | 120 | 105 | 350 | 130 | 130 | |
| VIS4-VA-V02-05-ST | VIS3-VA-V02-05-ST | 316 s.s | 230 | 220 | 650 | 270 | 260 | |
| VIS4-VA-V03-05-ST | VIS3-VA-V03-05-ST | 316 s.s | 360 | 360 | 1000 | 400 | 400 | |
| VIS4-VA-V04-05-ST | VIS3-VA-V04-05-ST | 316 s.s | 440 | 440 | 1250 | 550 | 525 | |
| VIS4-VA-V05-05-ST | VIS3-VA-V05-05-ST | 316 s.s | 750 | 700 | 1800 | 850 | 800 | |

| PANEL MOUNT METERS | | | | | | | | |
|--------------------|-------------------|----------|--------------|------|--------|----------|--------|--|
| MODEL | MODEL NUMBER | | MAXIMUM FLOW | | | | | |
| BUILT IN VALVE | NO VALVE | FITTING | | | SCFM | | | |
| DUILI IN VALVE | NU VALVE | MATERIAL | Argon | CO2 | Helium | Nitrogen | Oxygen | |
| VPB4-VA-V01-04-ST | VPB3-VA-V01-04-ST | Brass | 4.2 | 3.8 | 12.0 | 4.5 | 4.5 | |
| VPB4-VA-V02-04-ST | VPB3-VA-V02-04-ST | Brass | 8.0 | 8.0 | 23.0 | 9.5 | 9.0 | |
| VPB4-VA-V03-04-ST | VPB3-VA-V03-04-ST | Brass | 12.5 | 12.5 | 35.0 | 14.0 | 14.0 | |
| VPB4-VA-V04-04-ST | VPB3-VA-V04-04-ST | Brass | 15.5 | 15.5 | 42.5 | 19.0 | 18.0 | |
| VPB4-VA-V05-04-ST | VPB3-VA-V05-04-ST | Brass | 26.0 | 24.0 | 60.0 | 30.0 | 28.0 | |
| VPS4-VA-V01-04-ST | VPS3-VA-V01-04-ST | 316 s.s | 4.2 | 3.8 | 12.0 | 4.5 | 4.5 | |
| VPS4-VA-V02-04-ST | VPS3-VA-V02-04-ST | 316 s.s | 8.0 | 8.0 | 23.0 | 9.5 | 9.0 | |
| VPS4-VA-V03-04-ST | VPS3-VA-V03-04-ST | 316 s.s | 12.5 | 12.5 | 35.0 | 14.0 | 14.0 | |
| VPS4-VA-V04-04-ST | VPS3-VA-V04-04-ST | 316 s.s | 15.5 | 15.5 | 42.5 | 19.0 | 18.0 | |
| VPS4-VA-V05-04-ST | VPS3-VA-V05-04-ST | 316 s.s | 26.0 | 24.0 | 60.0 | 30.0 | 28.0 | |

| PANEL MOUNT METERS | | | | | | | | |
|--------------------|-------------------|----------|-------|------------|------------|----------|--------|--|
| MODEL | NUMBER | END | | M <i>A</i> | XIMUM FLOW | | | |
| BUILT IN VALVE | NO VALVE | FITTING | | | L/min | | | |
| DUILI IN VALVE | NU VALVE | MATERIAL | Argon | CO2 | Helium | Nitrogen | Oxygen | |
| VPB4-VA-V01-06-ST | VPB3-VA-V01-06-ST | Brass | 120 | 105 | 350 | 130 | 130 | |
| VPB4-VA-V02-06-ST | VPB3-VA-V02-06-ST | Brass | 230 | 220 | 650 | 270 | 260 | |
| VPB4-VA-V03-06-ST | VPB3-VA-V03-06-ST | Brass | 360 | 360 | 1000 | 400 | 400 | |
| VPB4-VA-V04-06-ST | VPB3-VA-V04-06-ST | Brass | 440 | 440 | 1250 | 550 | 525 | |
| VPB4-VA-V05-06-ST | VPB3-VA-V05-06-ST | Brass | 750 | 700 | 1800 | 850 | 800 | |
| VPS4-VA-V01-06-ST | VPS3-VA-V01-06-ST | 316 s.s | 120 | 105 | 350 | 130 | 130 | |
| VPS4-VA-V02-06-ST | VPS3-VA-V02-06-ST | 316 s.s | 230 | 220 | 650 | 270 | 260 | |
| VPS4-VA-V03-06-ST | VPS3-VA-V03-06-ST | 316 s.s | 360 | 360 | 1000 | 400 | 400 | |
| VPS4-VA-V04-06-ST | VPS3-VA-V04-06-ST | 316 s.s | 440 | 440 | 1250 | 550 | 525 | |
| VPS4-VA-V05-06-ST | VPS3-VA-V05-06-ST | 316 s.s | 750 | 700 | 1800 | 850 | 800 | |

M

STAINLESS INDUSTRIAL FLOW METERS

design features

- ✓ Heavy duty stainless steel.
- √ Thick polycarbonate safety shields.
- √ Fluted or plain tapered tubes.
- ✓ Direct reading metric and English system scales.
- ✓ Unique design facilitates ease of maintenance cleaning processes.

Heavy-duty flow meters are fully enclosed in a brushed stainless steel case. Ideal for industrial applications with flow rates of up to 116 GPM / 440 L/min and 250 SCFM /7080 L/min. Used for flow measurements of liquids (water) and gases (air).



Meters are graduated for direct reading of water and air. Flow meters come with FNPT or flanged end fittings for easy in-line installation. Wetted parts include borosilicate glass flow tubes, FKM o-rings, and 316 Stainless steel fittings, guide rods, floats and float stops.

Flanged M Style Meter



| SPECIFICATIONS | |
|------------------------------------|---|
| ACCURACY | ±3% of full scale. |
| MINIMUM FLOW RATE | Approximately 10% of maximum flow rate. |
| REPEATABILITY | ±0.5% of full scale. |
| MAXIMUM PRESSURE AT 200 °F (93 °C) | 200 PSIG /13.6 bar gauge (tube size 3, 4, 5 and 6). |
| | 125 PSIG / 8.5 bar gauge (tube SIZE 8 and 9). |
| MAXIMUM OPERATING TEMPERATURE | 200 °F (93 °C). |

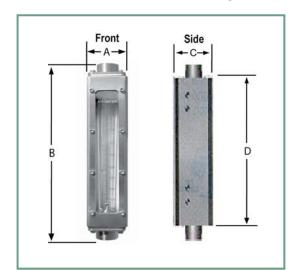
| **MATERIALS OF CONSTRUCTION | |
|---------------------------------|---|
| FLOW TUBES | Heavy walled borosilicate glass. |
| FITTINGS IN CONTACT WITH FLUIDS | 316 Stainless Steel. |
| FRONT SHIELD | Thick clear polycarbonate and white acrylics. |
| 0-RINGS | FKM. |
| <i>OPTIONAL</i> | PTFE/ FFKM, EPR. |
| CONNECTIONS | IN LINE: 1/2", 1-1/2", 2", NPT. |
| | 150 ANSI FLANGED: 3/4", 1-1/2", 2-1/2". |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.

ORDERING INFORMATION STAINLESS INDUSTRIAL FLOW METERS

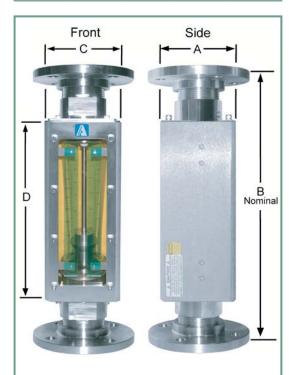


Configure and Order Online: Model M Industrial Flow Meters



DIMENSIONS FOR IN-LINE M STYLE METERS

| NPT (F) | A | В | C | D |
|---------|-----|-------|------|-------|
| 1/2" | 2 | 9.54 | 2.25 | 8.04 |
| 1" | 3.5 | 13.69 | 3.75 | 10.50 |
| 2" | 5 | 15.59 | 5.25 | 11.55 |



DIMENSIONS FOR FLANGED M STYLE METERS

| Flange Size | A | B (Nominal) | C | D |
|----------------|-----|----------------|------|-------|
| 3/4" | 2 | 9.58 | 2.25 | 8.04 |
| 1½" | 3.5 | 14.15 | 3.75 | 10.50 |
| 2½" | 5 | 17.98 | 5.25 | 11.55 |

| | | IN LIN | IE M STYL | E METER | rs . | | |
|-----------------|----------------|---------------|------------------|----------------|-------------------------------|------|------------|
| CATALOG | | MAX FLO |)W RATE | | PRESSURE | TUBE | NPT |
| NUMBER | WATER [GPM] | AIR [SCFM] | WATER [L/min] | AIR [L/min] | DROP (OF H ₂ 0) | SIZE | CONNECTION |
| MS-VJ-M01-02-ST | 0.25 | 1.2 | .95 | 35 | 3 | 3 | |
| MS-VJ-M02-02-ST | 0.36 | 1.9 | 1.3 | 54 | 3 | 3 | |
| MS-VJ-M03-02-ST | 0.76 | 3.3 | 3.0 | 90 | 7 | 3 | 4 /0 |
| MS-VJ-M04-02-ST | 1.0 | 4.2 | 3.8 | 120 | 8 | 4 | 1/2" |
| MS-VJ-M05-02-ST | 1.5 | 6.5 | 5.6 | 180 | 11 | 4 | |
| MS-VJ-M06-02-ST | 2.2 | 8.5 | 8.2 | 250 | 14 | 4 | |
| MS-VK-M07-02-ST | 3.8 | 16 | 14 | 480 | 14 | 5 | |
| MS-VK-M08-02-ST | 5.0 | 22 | 18 | 650 | 20 | 5 | |
| MS-VK-M09-02-ST | 6.0 | 25 | 22 | 725 | 7 | 6 | |
| MS-VK-M10-02-ST | 7.4 | 34 | 27.5 | 950 | 8 | 6 | 1" |
| MS-VK-M11-02-ST | 9.6 | 40 | 36 | 1200 | 14 | 6 | ' |
| MS-VK-M12-02-ST | 11 | 47.5 | 42 | 1400 | 18 | 6 | |
| MS-VK-M13-02-ST | 15 | 62.5 | 57.5 | 1800 | 34 | 6 | |
| MS-VK-M14-02-ST | 20 | 90 | 80 | 2600 | 55 | 6 | |
| MS-VL-M15-02-ST | 22 | 90 | 85 | 2550 | 23 | 8 | 2" |
| MS-VK-M16-02-ST | 25 | - | 95 | - | 99 | 6 | 1" |
| MS-VQ-M17-02-ST | 41 | 170 | 155 | 4600 | 7 | 9 | |
| MS-VL-M18-02-ST | 44 | 180 | 165 | 5000 | 42 | 8 | |
| MS-VQ-M19-02-ST | 60 | 250 | 230 | 7000 | 23 | 9 | 2" |
| MS-VL-M20-02-ST | 62 | 250 | 230 | 7000 | 70 | 8 | |
| MS-VQ-M21-02-ST | 86 | - | 320 | - | 35 | 9 | |
| MS-VQ-M22-02-ST | 116 | - | 440 | - | 56 | 9 | |

| | | FLANG | ED M STY | LE METE | RS | | |
|-------------------|----------------|---------------|------------------|----------------|-------------------------------|--------------|----------------------|
| CATALOC | | MAX FLO | OW RATE | | PRESSURE | TUDE | EL ANCE |
| CATALOG NUMBER | WATER [GPM] | AIR [SCFM] | WATER [L/min] | AIR [L/min] | DROP (OF H ₂ 0) | TUBE SIZE | FLANGE CONNECTION |
| MS-VR-M01-02-ST | 0.25 | 1.2 | .95 | 35 | 3 | 3 | |
| MS-VR-M02-02-ST | 0.36 | 1.9 | 1.3 | 54 | 3 | 3 | |
| MS-VR-M03-02-ST | 0.76 | 3.3 | 3.0 | 90 | 7 | 3 | 3/4" |
| MS-VR-M04-02-ST | 1.0 | 4.2 | 3.8 | 120 | 8 | 4 | 0/4 |
| MS-VR-M05-02-ST | 1.5 | 6.5 | 5.6 | 180 | 11 | 4 | |
| MS-VR-M06-02-ST | 2.2 | 8.5 | 8.2 | 250 | 14 | 4 | |
| MS-VS-M07-02-ST | 3.8 | 16 | 14 | 480 | 14 | 5 | |
| MS-VS-M08-02-ST | 5.0 | 22 | 18 | 650 | 20 | 5 | |
| MS-VS-M09-02-ST | 6.0 | 25 | 22 | 725 | 7 | 6 | |
| MS-VS-M10-02-ST | 7.4 | 34 | 27.5 | 950 | 8 | 6 | 1½" |
| MS-VS-M11-02-ST | 9.6 | 40 | 36 | 1200 | 14 | 6 | 1 72 |
| MS-VS-M12-02-ST | 11 | 47.5 | 42 | 1400 | 18 | 6 | |
| MS-VS-M13-02-ST | 15 | 62.5 | 57.5 | 1800 | 34 | 6 | |
| MS-VS-M14-02-ST | 20 | 90 | 80 | 2600 | 55 | 6 | |
| MS-VT-M15-02-ST | 22 | 90 | 85 | 2550 | 23 | 8 | 2½" |
| MS-VS-M16-02-ST | 25 | - | 95 | - | 99 | 6 | 1½" |
| MS-VU-M17-02-ST | 41 | 170 | 155 | 4600 | 7 | 9 | |
| MS-VT-M18-02-ST | 44 | 180 | 165 | 5000 | 42 | 8 | |
| MS-VU-M19-02-ST | 60 | 250 | 230 | 7000 | 23 | 9 | 2½" |
| MS-VT-M20-02-ST | 62 | 250 | 230 | 7000 | 70 | 8 | 2 72 |
| MS-VU-M21-02-ST | 86 | - | 320 | - | 35 | 9 | |
| MS-VU-M22-02-ST | 116 | - | 440 | - | 56 | 9 | |

IN LINE PTFE FLOW METER

Made entirely of FEP and PCTFE, the Model F flow meter is excellent for high-purity applications or use with corrosive liquids.

Units are available with a standard valve to monitor and control flow or without a valve to just monitor flow.

Flow meters are individually tested on a Mass Spectrometer Leak Detector and certified to a leak integrity rating of 1 x 10⁻⁷ sccs Helium or better.

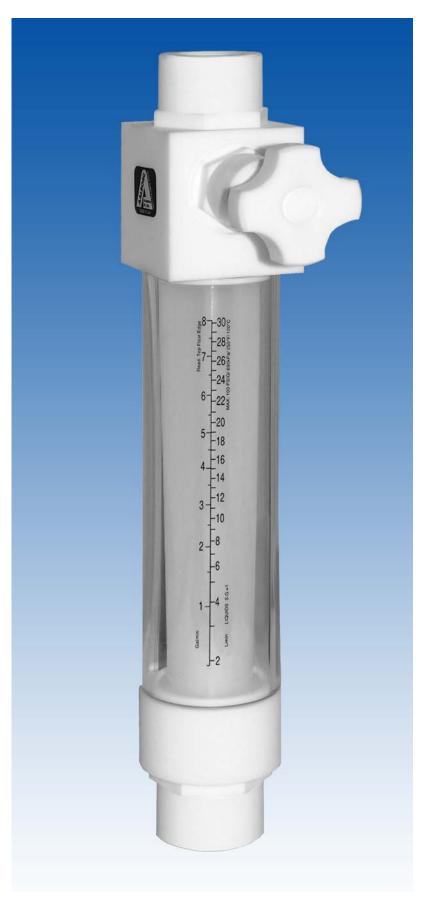
design features

- √ Chemically inert wetted components.
- ✓ Removable protective shield.
- ✓ Individually leak tested.

| SPECIFICATIONS | |
|-------------------|--------------------------------------|
| SCALES | Direct reading scales for |
| | liquids with 1.0 specific gravity. |
| ACCURACY | ±5% of full scale. |
| MAXIMUM TEMPERATI | JRE 250 °F (121 °C). |
| MAXIMUM PRESSURE | 100 psig (6.7 bars). |
| LEAK INTEGRITY | Individually, leak tested |
| | and certified to a rating of |
| | 1 x 10 ⁻⁷ sccs of Helium. |

| **MATERIALS OF CONSTRUCTION | | | | |
|-----------------------------|--------------------|--|--|--|
| TUBE SHIELDS | Polycarbonate. | | | |
| FLOW TUBES | FEP. | | | |
| FLOATS | PTFE. | | | |
| WETTED PARTS | PTFE end fittings. | | | |
| PCTFE guide rods. | | | | |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.

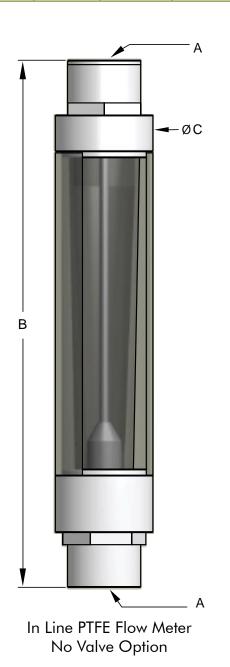


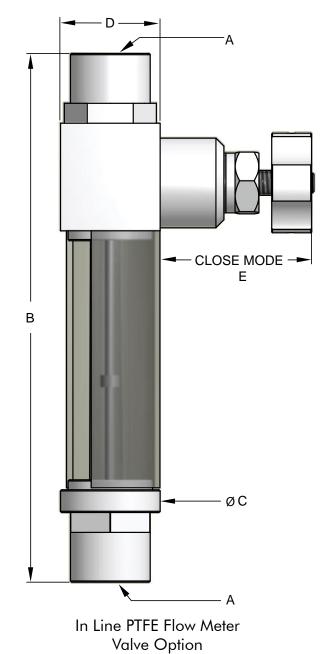
IN LINE PTFE FLOW METER



| F STYLE IN LINE PTFE FLOW METER DIMENSIONS NO VALVE OPTION | | | | | | | |
|---|----------|----------------------|--------------------|--|--|--|--|
| | A B C | | | | | | |
| F3C | 1/4 FNPT | 5.52" (140.2 mm) | 1.25" (31.8 mm) | | | | |
| F3D | 3/8 FNPT | 5.52" (140.2 mm) | 1.25" (31.8 mm) | | | | |
| F3E | 1/2 FNPT | 10.81" (274.6 mm) | 2.00" (50,8 mm) | | | | |
| F3F | 3/4 FNPT | 10.81" (274.6 mm) | 2.00" (50,8 mm) | | | | |

| | F STYLE IN LINE PTFE FLOW METER DIMENSIONS VALVE OPTION | | | | | | | |
|-----|---|----------------------|--------------------|--------------------|--------------------|--|--|--|
| | A | A B C D E | | | | | | |
| F6C | 1/4 FNPT | 6.65" (168.9 mm) | 1.25" (31.8 mm) | 1.25" (31.8 mm) | 3.17" (80.5 mm) | | | |
| F6D | 3/8 FNPT | 6.65" (168.9 mm) | 1.25" (31.8 mm) | 1.25" (31.8 mm) | 3.17" (80.5 mm) | | | |
| F6E | 1/2 FNPT | 12.35" (313.7 mm) | 2.00" (50.8 mm) | 2.00" (50.8 mm) | 3.88" (98.5 mm) | | | |
| F6F | 3/4 FNPT | 12.35" (313.7 mm) | 2.00" (50.8 mm) | 2.00" (50.8 mm) | 3.88" (98.5 mm) | | | |





NOTE: Aalborg® reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Aalborg®.



ORDERING INFORMATION IN LINE PTFE FLOW METER

Configure and Order Online: Model F PTFE in-line Flow Meters

| F STYLE LOW RANGE METERS | | | | | |
|--------------------------|---------------|------------------------|----------------|-------------|--|
| MODEL | NUMBER | CONNECTION | MAXIMUM FLOW | | |
| BUILT IN VALVE | NO VALVE | CONNECTION | [mL/min] WATER | [gph] WATER | |
| F6C-F01-01-TF | F3C-F01-01-TF | 1/4" FNPT | 125 | 2.0 | |
| F6C-F02-01-TF | F3C-F02-01-TF | 1/4" FNPT | 250 | 4.0 | |
| F6C-F03-01-TF | F3C-F03-01-TF | 1/4" FNPT | 400 | 6.5 | |
| F6C-F04-01-TF | F3C-F04-01-TF | 1/4" FNPT | 500 | 8.0 | |
| MODEL | NUMBER | CONNECTION | MAXIMUI | M FLOW | |
| BUILT IN VALVE | NO VALVE | CONNECTION | [Lpm] WATER | [gph] WATER | |
| F6C-F05-01-TF | F3C-F05-01-TF | 1/4" FNPT | 1.0 | 16.0 | |
| F6D-F06-01-TF | F3D-F06-01-TF | 3/8" FNPT | 2.0 | 30.0 | |
| F6D-F07-01-TF | F3D-F07-01-TF | 3/8" FNPT | 2.5 | 40.0 | |
| F6D-F08-01-TF | F3D-F08-01-TF | 3/8" FNPT | 3.0 | 50.0 | |
| F6D-F09-01-TF | F3D-F09-01-TF | 3/8" FNPT | 5.0 | 80.0 | |
| | F S | TYLE HIGH RANGE METERS | 3 | | |
| MODEL | NUMBER | CONNECTION | MAXIMUM FLOW | | |
| BUILT IN VALVE | NO VALVE | CONNECTION | [L/min] WATER | [gpm] WATER | |
| F6E-F10-01-TF | F3E-F10-01-TF | 1/2" FNPT | 13 | 3.5 | |
| F6E-F11-01-TF | F3E-F11-01-TF | 1/2" FNPT | 20 | 5.2 | |
| F6F-F12-01-TF | F3F-F12-01-TF | 3/4" FNPT | 30 | 8.0 | |
| F6F-F13-01-TF | F3F-F13-01-TF | 3/4" FNPT | 40 | 10.5 | |
| F6F-F14-01-TF | F3F-F14-01-TF | 3/4" FNPT | 45 | 12.0 | |

PTFE FLOW METERS FOR LIQUIDS AND GASES



Incorporating the principles of traditional rotameter flow technology, these rugged PTFE flow meters offer solutions to low to medium flow range measurements of highly corrosive or ultra-pure liquids and gases.

Model L meters are constructed of inert materials: PTFE and PCTFE. The unique design construction brings about an inert, mechanically rigid flow meter line. Flow meters are also resistant to external, ambient corrosives. For the protection of personnel each flow meter is supplied with a safety shield.

Flow meters are supplied with or without built-in needle valves at the top for liquids, at the bottom for gases and they are panel mountable.

design features

- ✓ Constructed from PTFE and PCTFE.
- ✓ Overlapping flow ranges are available for water from 5 mL/min (0.00132 GPM) to 45 L/min (12 GPM) and air from 4 L/ min (8.5 scfh) to 1000 L/min. (35 scfm).
- ✓ Individually leak tested.

PRINCIPLES OF OPERATION

A cylindrical float freely moving inside a tapered flow tube comprises the flow measurement element of PTFE flow meters. The translucent flow tube is installed vertically in-line in the liquid stream.

As flow takes place the float is propelled up inside the flow tube. The area between the float and the inside diameter of the flow tube gradually increases with increasing flow and correspondingly the pressure lifting the float decreases until the weight of the float and its buoyant force come to equilibrium. At equilibrium the top of the float is lined up with a scale graduation on the flow tube denoting a discrete rate of flow.

High Range PTFE meter with Valve



LEAK INTEGRITY

Flow meters are individually tested on a Mass Spectrometer Leak Detector and certified to a leak integrity rating of 1 X 10⁻⁷ sccs Helium or better.



PTFE FLOW METERS FOR LIQUIDS AND GASES

Configure and Order Online: Model L PTFE Flow Meters

| | ORDERING INFORMATION | | | | | |
|-------------|----------------------|--------------------|--------------------|----------------|-------------|--|
| | | L STYLE LIQUID MET | TERS VALVE AT THE | ГОР | | |
| METER OUT | MODEL N | UMBER | | MAXIMU | M FLOW | |
| METER SIZE | BUILT IN VALVE | NO VALVE | CONNECTION | [mL/min] WATER | [gph] WATER | |
| | L6C-L01-01-SA | L3C-L01-01-SA | 1/4" FNPT | 75 | 1.20 | |
| | L6C-L02-01-TF | L3C-L02-01-TF | 1/4" FNPT | 250 | 4.0 | |
| С | L6C-L03-01-TF | L3C-L03-01-TF | 1/4" FNPT | 400 | 6.5 | |
| | L6C-L04-01-TF | L3C-L04-01-TF | 1/4" FNPT | 500 | 8.0 | |
| | L6C-L05-01-TF | L3C-L05-01-TF | 1/4" FNPT | 1000 | 16.0 | |
| METER SIZE | MODEL N | UMBER | CONNECTION | MAXIMU | M FLOW | |
| WILTER SIZE | BUILT IN VALVE | NO VALVE | CONNECTION | [Lpm] WATER | [gph] WATER | |
| | L6D-L06-01-TF | L3D-L06-01-TF | 3/8" FNPT | 2.0 | 31.0 | |
| D | L6D-L07-01-TF | L3D-L07-01-TF | 3/8" FNPT | 2.5 | 40.0 | |
| D L | L6D-L08-01-TF | L3D-L08-01-TF | 3/8" FNPT | 3.0 | 47.5 | |
| | L6D-L09-01-TF | L3D-L09-01-TF | 3/8" FNPT | 5.0 | 80.0 | |
| METER OLZE | MODEL NUMBER | | CONNECTION | MAXIMUM FLOW | | |
| METER SIZE | BUILT IN VALVE | NO VALVE | CONNECTION | [L/min] WATER | [gpm] WATER | |
| - | L6E-L10-01-TF | L3E-L10-01-TF | 1/2" FNPT | 13 | 3.4 | |
| E | L6E-L11-01-TF | L3E-L11-01-TF | 1/2" FNPT | 20 | 5.25 | |
| | L6F-L12-01-TF | L3F-L12-01-TF | 3/4" FNPT | 30 | 8.0 | |
| F | L6F-L13-01-TF | L3F-L13-01-TF | 3/4" FNPT | 40 | 10.5 | |
| | L6F-L14-01-TF | L3F-L14-01-TF | 3/4" FNPT | 45 | 12.0 | |
| | | L STYLE GAS METERS | S VALVE AT THE BOT | TOM | | |
| METER SIZE | MODEL N | UMBER | | MAXIMUM FLOW | | |
| WEIER SIZE | BUILT IN VALVE | NO VALVE | CONNECTION | [L/min] AIR | [scfm] AIR | |
| | L4M-L01-01-TF | L3M-L01-01-TF | 1/4" FNPT | 4 | 8.5 | |
| M | L4M-L02-01-TF | L3M-L02-01-TF | 1/4" FNPT | 18 | 38 | |
| | L4M-L05-01-TF | L3M-L05-01-TF | 1/4" FNPT | 50 | 105 | |
| METER SIZE | MODEL N | UMBER | | MAXIMUM FLOW | | |
| WEIER SIZE | BUILT IN VALVE | NO VALVE | CONNECTION | [L/min] AIR | [scfm] AIR | |
| | L4N-L06-01-TF | L3N-L06-01-TF | 3/8" FNPT | 100 | 3.5 | |
| N | L4N-L07-01-TF | L3N-L07-01-TF | 3/8" FNPT | 200 | 7 | |
| | L4N-L09-01-TF | L3N-L09-01-TF | 3/8" FNPT | 250 | 8.8 | |
| METER CITE | MODEL N | UMBER | CONNECTION | MAXIMU | M FLOW | |
| METER SIZE | BUILT IN VALVE | NO VALVE | CONNECTION | [L/min] AIR | [gpm] AIR | |
| Р | L4P-L10-01-TF | L3P-L10-01-TF | 1/2" FNPT | 500 | 17.5 | |
| Q | L4Q-L12-01-TF | L4Q-L12-01-TF | 3/4" FNPT | 1000 | 35 | |

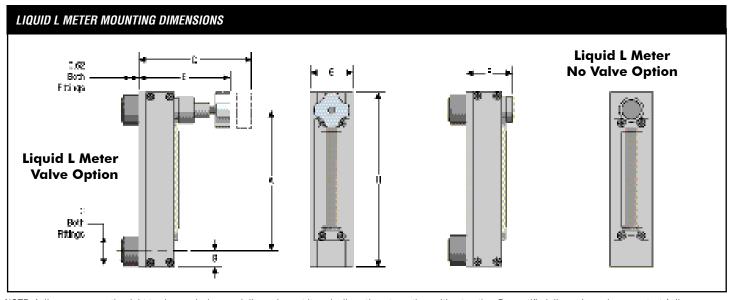
| SPECIFICATIONS | |
|---------------------|---|
| SCALES | Direct reading scales for liquids with 1.0 specific gravity and air. |
| ACCURACY | ±5% of full scale. |
| MAXIMUM TEMPERATURE | 250 °F (121 °C). |
| MAXIMUM PRESSURE | 100 psig (6.7 bars). |
| LEAK INTEGRITY | Individually pressure and leak tested and certified to a rating of 1 x 10 ⁻⁷ sccs of Helium. |

| **MATERIALS OF CONSTRUCTION | | | |
|-----------------------------|------------------------------|--|--|
| FLOW TUBES | FEP. | | |
| FITTINGS | PTFE. | | |
| FLOATS | PTFE (Sapphire for size 01). | | |
| GUIDE RODS | PCTFE. | | |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.

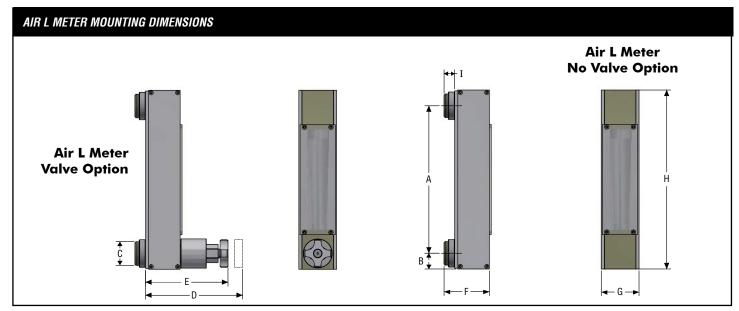
PTFE FLOW METERS FOR LIQUIDS AND GASES





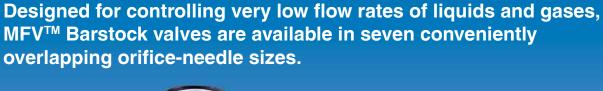
NOTE: Aalborg* reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Aalborg*.

| | DIMENSIONS FOR LIQUID L STYLE METERS | | | | | | | | |
|------------|--------------------------------------|------|-------|------|------|------|------|-------|--------------|
| METER SIZE | A | В | C | D | E | F | G | Н | SCALE LENGTH |
| С | 4.97 | 0.56 | 0.812 | 3.42 | 3.22 | 1.65 | 1.50 | 6.16 | 75mm |
| D | 4.97 | 0.56 | 1.00 | 4.72 | 4.32 | 1.95 | 1.75 | 6.16 | 75mm |
| Е | 8.72 | 0.88 | 1.50 | 4.64 | 4.14 | 2.25 | 2.25 | 10.47 | 125mm |
| F | 8.47 | 1.00 | 1.50 | 6.00 | 5.06 | 2.80 | 2.50 | 10.47 | 125mm |



NOTE: Aalborg* reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Aalborg*.

| | DIMENSIONS FOR AIR L STYLE METERS | | | | | | | | | |
|------------|-----------------------------------|------|------|------|------|------|------|-------|------|--------------|
| METER SIZE | A | В | C | D | E | F | G | Н | ı | SCALE LENGTH |
| M | 4.6 | 0.63 | 0.81 | 3.66 | 3.36 | 2.25 | 1.65 | 5.85 | 0.68 | 75mm |
| N | 4.6 | 0.63 | 1 | 3.09 | 3.43 | 2.25 | 1.65 | 5.85 | 0.68 | 75mm |
| Р | 9.37 | 1 | 1.5 | 6.09 | 5.24 | 2.88 | 2.4 | 11.37 | 0.68 | 125mm |
| Q | 9.37 | 1 | 1.5 | 6.16 | 5.24 | 2.88 | 2.4 | 11.37 | 0.68 | 125mm |





design features

- ✓ Virtually free of hysteresis (see-sawing).
- ✓ Bubble tight shutoff.
- ✓ Straight or 90 degree flow patterns.
- ✓ Brass or 316 stainless steel high resolution.
- ✓ Sixteen turns to full open.

| SPECIFICATIONS | |
|-----------------------|---------------------------------|
| MAXIMUM PRESSURE | 500 psig (3792 kPa). |
| MAXIMUM TEMPERATURE | 180 °F (82 °C) -brass. |
| | 250 °F (121 °C). |
| VALVE STEM | Sixteen turns, non-rising type. |

BARSTOCK METERING VALVES MFVTM

Offered in straight (T) and 90 degree (L) flow patterns, the MFVTM Barstock Valve includes a "non-rising stem" design, it's unique non-rotating needle is cylindrical with a precision ground tapered metering surface. The needle moves in a rectilinear fashion which accounts for its desirable sixteen- turn high resolution attribute. Hysteresis is virtually eliminated due to the needle design and the closely fitting fine thread on its adjustment plunger. The valve body is precision machined chrome plated brass or type 316 stainless steel.

| **MATERIALS OF CONSTRUCTION | | | | |
|-----------------------------|--|--|--|--|
| BODY | Chrome plated brass or 316 stainless steel. | | | |
| VALVE NEED | DLE 316 stainless steel. | | | |
| ORIFICE | 316 stainless steel with PTFE liner for valve sizes 1, 2 | | | |
| | and 3; PCTFE for valve sizes 4,5,6 and 7. | | | |
| 0-RINGS | Buna® (brass valves). FKM (stainless valves). | | | |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.



Configure and Order Online: Barstock Metering Valves MFV $^{\text{IM}}$

| ORDERING INFORMATION BARSTOCK METERING VALVES MFV™ | | | | | | | |
|--|--------------|-----------------------|-------|-------|---------------|--------|--|
| MODEL MUMBER | FLOW DATTERN | MAXIMUM FLOW [mL/min] | | | ODIEIOE II. 1 | 01/ | |
| MODEL NUMBER | FLOW PATTERN | MATERIAL | Air | Water | ORIFICE [in] | CV | |
| VM1-BB-1A | Straight | Brass | 200 | 6 | 0.042 | 0.0005 | |
| VM2-BB-1A | Straight | Brass | 400 | 12 | 0.042 | 0.001 | |
| VM3-BB-1A | Straight | Brass | 1000 | 30 | 0.042 | 0.0025 | |
| VM4-BB-1A | Straight | Brass | 2500 | 70 | 0.093 | 0.0061 | |
| VM5-BB-1A | Straight | Brass | 6200 | 200 | 0.093 | 0.016 | |
| VM6-BB-1A | Straight | Brass | 21500 | 650 | 0.093 | 0.054 | |
| VM7-BB-1A | Straight | Brass | 46090 | 1410 | 0.093 | 0.118 | |
| VM1-SV-2A | Straight | Stainless | 200 | 6 | 0.042 | 0.0005 | |
| VM2-SV-2A | Straight | Stainless | 400 | 12 | 0.042 | 0.001 | |
| VM3-SV-2A | Straight | Stainless | 1000 | 30 | 0.042 | 0.0025 | |
| VM4-SV-2A | Straight | Stainless | 2500 | 70 | 0.093 | 0.0061 | |
| VM5-SV-2A | Straight | Stainless | 6200 | 200 | 0.093 | 0.016 | |
| VM6-SV-2A | Straight | Stainless | 21500 | 650 | 0.093 | 0.054 | |
| VM7-SV-2A | Straight | Stainless | 46090 | 1410 | 0.093 | 0.118 | |
| VM1-BB-6A | 90 degree | Brass | 200 | 6 | 0.042 | 0.0005 | |
| VM2-BB-6A | 90 degree | Brass | 400 | 12 | 0.042 | 0.001 | |
| VM3-BB-6A | 90 degree | Brass | 1000 | 30 | 0.042 | 0.0025 | |
| VM4-BB-6A | 90 degree | Brass | 2500 | 70 | 0.093 | 0.0061 | |
| VM5-BB-6A | 90 degree | Brass | 6200 | 200 | 0.093 | 0.016 | |
| VM6-BB-6A | 90 degree | Brass | 21500 | 650 | 0.093 | 0.054 | |
| VM7-BB-6A | 90 degree | Brass | 46090 | 1410 | 0.093 | 0.118 | |
| VM1-SV-7A | 90 degree | Stainless | 200 | 6 | 0.042 | 0.0005 | |
| VM2-SV-7A | 90 degree | Stainless | 400 | 12 | 0.042 | 0.001 | |
| VM3-SV-7A | 90 degree | Stainless | 1000 | 30 | 0.042 | 0.0025 | |
| VM4-SV-7A | 90 degree | Stainless | 2500 | 70 | 0.093 | 0.0061 | |
| VM5-SV-7A | 90 degree | Stainless | 6200 | 200 | 0.093 | 0.016 | |
| VM6-SV-7A | 90 degree | Stainless | 21500 | 650 | 0.093 | 0.054 | |
| VM7-SV-7A | 90 degree | Stainless | 46090 | 1410 | 0.093 | 0.118 | |

Note: Based on 10psig(69 kPa) inlet pressure and atmospheric exhaust.

design features

- ✓ Bubble tight shutoff.
- ✓ Straight or 90 degree flow patterns.
- ✓ Brass or 316 stainless steel.

Designed for controlling a broad range of flow rates of liquids and gases, CV™ Utility valves are available in three conveniently overlapping orifice-needle sizes.

BARSTOCK \ UTILITY VALVES CV™

These versatile, rugged and reliable valves are suitable for laboratory instrumentation, bench top or OEM flow control purposes.

Valves are offered in straight (T) and 90 degree (L) flow patterns. All valves are supplied with 1/8" FNPT inlet and outlet ports.

Valve cartridges are also interchangeable with built-in valves of Aalborg's series of P, T, S, and G flow meter product line.

The valve body is precision machined chrome plated brass or type 316 stainless steel.



| **MATERIALS OF CONSTRUCTION | | | |
|-----------------------------|---|--|--|
| BODY | Chrome plated brass or 316 stainless steel. | | |
| VALVE NEEDLE | 316 stainless steel. | | |
| ORIFICE | KEL-F. | | |
| 0-RINGS | Buna® (brass valves). FKM (stainless valves). | | |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.

| SPECIFICATIONS | |
|---------------------|---------------------------------------|
| MAXIMUM PRESSURE | 500 psig (3792 kPa). |
| MAXIMUM TEMPERATURE | 180 °F (82 °C) - (brass valves). |
| | 250 °F (121 °C) - (stainless valves). |

Configure and Order Online: Barstock Utility Valves CV™

| ORDERING INFORMATION BARSTOCK UTILITY VALVES CV™ | | | | | | |
|--|-----------|-----------|------------|--------------|---------|------|
| MODEL | FL0W | MATERIAL | MAXIMUM FL | .OW [mL/min] | ORIFICE | Cv |
| NUMBER | PATTERN | WAIERIAL | Air | Water | [in] | GV |
| VCL-BB-1A | Straight | Brass | 5000 | 350 | 0.052 | 0.03 |
| VCL-SV-2A | Straight | Stainless | 5000 | 350 | 0.052 | 0.03 |
| VCL-BB-6A | 90 degree | Brass | 5000 | 350 | 0.052 | 0.03 |
| VCL-SV-7A | 90 degree | Stainless | 5000 | 350 | 0.052 | 0.03 |
| VCM-BB-1A | Straight | Brass | 20000 | 1200 | 0.082 | 0.10 |
| VCM-SV-2A | Straight | Stainless | 20000 | 1200 | 0.082 | 0.10 |
| VCM-BB-6A | 90 degree | Brass | 20000 | 1200 | 0.082 | 0.10 |
| VCM-SV-7A | 90 degree | Stainless | 20000 | 1200 | 0.082 | 0.10 |
| VCH-BB-1A | Straight | Brass | 60000 | 3500 | 0.120 | 0.30 |
| VCH-SV-2A | Straight | Stainless | 60000 | 3500 | 0.120 | 0.30 |
| VCH-BB-6A | 90 degree | Brass | 60000 | 3500 | 0.120 | 0.30 |
| VCH-SV-7A | 90 degree | Stainless | 60000 | 3500 | 0.120 | 0.30 |

Note: Based on 10psig (69 kPa) inlet pressure and atmospheric exhaust.

PTFE NEEDLE VALVES



These compact and reliable PTFE needle valves are designed for laboratory and industrial applications for regulating corrosive gases and liquids or for high purity service. They may also be used as shut off valves.

Pliant PTFE bodies of the valves are reinforced by structurally rigid metallic shells. Fluids contact only PTFE and PCTFE materials. Shells are made of anodized aluminum or type 316 stainless steel and bushings are made of plated brass or 316 stainless steel. Where externally corrosive conditions exist stainless steel is recommended.

Valve spindles are made of rigid PCTFE to minimize the undesirable material "creeping" normally associated with PTFE. PTFE valves are designed for relatively high flow ranges while still performing well in low flow rates. Valves may be used in pressure or non-critical vacuum service.

The simplicity of design - there are only seven components (including a single PTFE o-ring) - assures reliability and minimizes sources of leakage. It takes seconds to disassemble the valve for cleaning and maintenance. The PTFE o-ring is radially compressed and due to this unique design feature the degree of compression may be adjusted without disassembly by tightening the hexagonal bushing.

| SPECIFICATIONS | | | | | | |
|--|--|--|--|--|--|--|
| MAXIMUM PRESSURE | 75 psig (517 kPa) | | | | | |
| MAXIMUM TEMPERATUR | ₹E 150 °F (65 °C) | | | | | |
| ORIFICE SIZE | 0.125" diameter (3.175 mm) | | | | | |
| **MATERIALS OF CONST | **MATERIALS OF CONSTRUCTION FLUID CONTACTING | | | | | |
| | Body and o-ring-PTFE. Valve spindle-PCTFE. | | | | | |
| NON FLUID CONTACTING | | | | | | |
| Shell - Aluminum (anodized) or 316 stainless steel. Bushing plated brass, or | | | | | | |
| 316 stainless steel. Adjusting Knob-phenolic. | | | | | | |



design features

- ✓ Fluids contact PTFE and PCTFE only.
- ✓ Structurally Rigid Metal Shell.
- ✓ One PTFE o-ring.
- ✓ Simplicity only seven components.

Note: Based on 10psig (69 kPa) inlet pressure and atmospheric exhaust.

Configure and Order Online: PTFE Needle Valves

| ORDERING INFORMATION PTFE NEEDLE VALVES | | | | | | |
|---|-----------------------|-------|---------------|-----------|-----------|--------------------------|
| MODEL NUMBER | MAXIMUM FLOW [ml/min] | | CV NON WETTED | | MATERIALS | CONNECTIONS |
| MODEL NUMBER | AIR | WATER | UV | SHELL | BUSHING | CONNECTIONS |
| VCL-TT-OA | 2400 | 130 | 0.011 | Aluminum | Brass | 1/8" FNPT |
| VCH-TT-OA | 55000 | 2800 | 0.250 | Aluminum | Brass | 1/8" FNPT |
| VCL-TT-OF | 2400 | 130 | 0.011 | Aluminum | Brass | 1/4" Comp. |
| VCH-TT-OF | 55000 | 2800 | 0.250 | Aluminum | Brass | 1/4" Comp. |
| VCL-TT-OG | 2400 | 130 | 0.011 | Aluminum | Brass | 0.390 O.D. Glass Nipples |
| VCH-TT-OG | 55000 | 2800 | 0.250 | Aluminum | Brass | 0.390 O.D. Glass Nipples |
| VCL-TT-2A | 2400 | 130 | 0.011 | Stainless | Stainless | 1/8" FNPT |
| VCH-TT-2A | 55000 | 2800 | 0.250 | Stainless | Stainless | 1/8" FNPT |
| VCL-TT-2F | 2400 | 130 | 0.011 | Stainless | Stainless | 1/4" Comp. |
| VCH-TT-2F | 55000 | 2800 | 0.250 | Stainless | Stainless | 1/4" Comp. |
| VCL-TT-2G | 2400 | 130 | 0.011 | Stainless | Stainless | 0.390 O.D. Glass Nipples |
| VCH-TT-2G | 55000 | 2800 | 0.250 | Stainless | Stainless | 0.390 O.D. Glass Nipples |

^{**}The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.



PTFF NFFDI F VAIVFS



| SPECIFICATIONS | | | | | | |
|----------------------|---|--|--|--|--|--|
| MAXIMUM PRESSURE | 75 psig (517 kPa) | | | | | |
| MAXIMUM TEMPERATURI | E 150 °F (65 °C) | | | | | |
| ORIFICE SIZE | 0.125" diameter (3.175 mm) | | | | | |
| NUMBER OF TURNS TO F | ULLY OPEN | | | | | |
| | Eight. | | | | | |
| STEM | Non-rising type. | | | | | |
| FLUID CONTACTING COM | PONENTS | | | | | |
| | Body /o-ring-PTFE. Valve spindle-PCTFE. | | | | | |
| NON-FLUID CONTACTING | NON-FLUID CONTACTING COMPONENTS | | | | | |
| | Shell + Handle - Aluminum (anodized). | | | | | |

^{*} Based on 10 psig (69 kPa) inlet pressure and atmospheric exhaust.

MVT[™] Metering valves are constructed of PTFE and PCTFE materials.

Non-fluid contacting external parts are made of anodized aluminum. Valves are offered in three conveniently overlapping flow ranges. Safety handle prevents over tightening and facilitates fine metered regulation. MVT™ valves are useful in regulating the flow of corrosive gases and liquids.

They may be used in pressure or non-critical vacuum service and serve as bubble tight shutoff valves.



PTFE Metering Valve

Configure and Order Online: VT PTFE Metering Valves

| ORDERING INFORMATION PTFE METERING VALVE | | | | | | |
|--|------------|--------------|-------|--------------------------|--|--|
| MODEL NUMBER | MAXIMUM FL | .OW [ml/min] | Cv | CONNECTIONS | | |
| MODEL NUMBER | Air | Water | GV | CONNECTIONS | | |
| VM1-TT-0A | 600 | 36 | 0.003 | 1/8" FNPT | | |
| VM3-TT-0A | 3000 | 180 | 0.015 | 1/8" FNPT | | |
| VM6-TT-0A | 30000 | 1800 | 0.150 | 1/8" FNPT | | |
| VM1-TT-0F | 600 | 36 | 0.003 | 1/4" Comp. | | |
| VM3-TT-0F | 3000 | 180 | 0.015 | 1/4" Comp. | | |
| VM6-TT-0F | 30000 | 1800 | 0.150 | 1/4" Comp. | | |
| VM1-TT-0G | 600 | 36 | 0.003 | 0.390 O.D. Glass Nipples | | |
| VM3-TT-0G | 3000 | 180 | 0.015 | 0.390 O.D. Glass Nipples | | |
| VM6-TT-0G | 30000 | 1800 | 0.150 | 0.390 O.D. Glass Nipples | | |



design features

- ✓ Fluids contact PTFE and PCTFE only.
- ✓ One PTFE o-ring.
- ✓ Simplicity, only six components.

PTFE needle valves are
designed for laboratory and
industrial applications for
regulating corrosive gases and
liquids or for high purity
service. They may also be used
as shut off valves.

Fluids contact only PTFE and PCTFE materials.

Valve spindles are made of rigid PCTFE to minimize the undesirable material "creeping" normally associated with PTFE.

PTFE valves are designed for relatively high flow ranges while still performing well in low flow rates.

Valves may be used in pressure or non-critical vacuum service.

The simplicity of design - there are only six components (including a single PTFE o-ring) - assures reliability and minimizes sources of leakage. It takes seconds to disassemble the valve for cleaning and maintenance.

The PTFE o-ring is radially compressed and due to this unique design feature the degree of compression may be adjusted without disassembly by tightening the bushing.



| SPECIFICATIONS | |
|------------------------|--|
| MAXIMUM PRESSURE | 75 psig (517 kPa) |
| MAXIMUM TEMPERATURE | 150 °F (65 °C) |
| ORIFICE SIZE | 6.0 mm (0.250") diameter. |
| **MATERIALS OF CONSTRU | JCTION FLUID CONTACTING |
| | Body and o-ring-PTFE. Valve spindle-PCTFE. |
| NON FLUID CONTACTING | Set screws 18-8 stainless steel. |

Configure and Order Online: VT6 PTFE Needle Valve 6mm Orifice

| ORDERING INFORMATION FOR 6mm PTFE NEEDLE VALVES | | | | | |
|---|------------------------|-------|-------|-------------|--|
| MODEL | MODEL MAXIMUM FLOW LPM | | | CONNECTIONS | |
| NUMBER | Air | Water | Cv | OUNIEUTIONO | |
| VT6-TT-0 | 300 | 9 | 0.765 | 3/8" FNPT | |

Note: Based on 10psig (69 kPa) inlet pressure and atmospheric exhaust.



FLOW CAPACITIES Spare valve cartridges P, Px and S meters

| TABLE 1 - MFV™ VALVE FLOW CAPACITIES 10 psig (0.7 kPa gauge) INLET PRESSURE, ATMOSPHERIC EXHAUST | | | | | | |
|--|----------|--------|----------|--------|----------|--------|
| 0175 | Al | R | HEL | HELIUM | | TER |
| SIZE | [mL/min] | [scfh] | [mL/min] | [scfh] | [mL/min] | [gph] |
| 1 | 200 | 0.42 | 400 | 0.85 | 6 | 0.095 |
| 2 | 400 | 0.85 | 850 | 1.80 | 12 | 0.190 |
| 3 | 1020 | 2.15 | 2100 | 4.45 | 28 | 0.444 |
| 4 | 2600 | 5.50 | 6050 | 12.80 | 85 | 1.347 |
| 5 | 8900 | 18.85 | 20800 | 44.05 | 270 | 4.279 |
| 6 | 35000 | 74.15 | 84500 | 179.10 | 1070 | 16.960 |
| 7 | 63000 | 133.50 | 156000 | 330.50 | 1930 | 30.590 |



| TABLE 2 - CV™ VALVE FLOW CAPACITIES 10 psig (0.7 kPa gauge) INLET PRESSURE, ATMOSPHERIC EXHAUST | | | | | | |
|---|----------|--------|----------|--------|----------|-------|
| 0175 | AIR | | HELIUM | | WATER | |
| SIZE | [mL/min] | [scfh] | [mL/min] | [scfh] | [mL/min] | [gph] |
| L | 5050 | 10.70 | 11500 | 24.35 | 360 | 5.70 |
| M | 30000 | 63.55 | 71500 | 151.50 | 1760 | 27.90 |
| Н | 76000 | 161.05 | 180000 | 381.40 | 4500 | 71.33 |



FLOW CAPACITIES Spare valve cartridges T and Tx meters

| TABLE 1a - MVT™ VALVE FLOW CAPACITIES 10 psig (0.7 kPa gauge) INLET PRESSURE, ATMOSPHERIC EXHAUST | | | | | | |
|---|----------|--------|----------|--------|----------|-------|
| 0175 | AIR | | HELIUM | | WATER | |
| SIZE | [mL/min] | [scfh] | [mL/min] | [scfh] | [mL/min] | [gph] |
| 1 | 600 | 1.25 | 1250 | 2.65 | 36 | 0.57 |
| 3 | 3000 | 6.35 | 6900 | 14.60 | 180 | 2.85 |
| 6 | 30000 | 63.55 | 71500 | 151.50 | 1800 | 28.53 |



| TABLE 2a - CVT™ VALVE FLOW CAPACITIES 10 psig (0.7 kPa gauge) INLET PRESSURE, ATMOSPHERIC EXHAUST | | | | | | |
|---|----------|--------|----------|--------|----------|-------|
| 0175 | AIR | | HELIUM | | WATER | |
| SIZE | [mL/min] | [scfh] | [mL/min] | [scfh] | [mL/min] | [gph] |
| L | 2400 | 5.10 | 5300 | 11.23 | 130 | 2.05 |
| Н | 55000 | 116.55 | 135000 | 286.05 | 2800 | 44.40 |

METER SIZING FOR P, PX, T, TX AND S METERS

Flow capacity tables 6, 7, 8, 9 and 10 (pages 62 to 65) are based on calibrations at standard conditions, meaning 14.7 psia (1 atm) pressure and 70 °F (21.1 °C).

Tables list maximum flow rates of flow tubes. The usable range of meters is at least 10:1, often more. Thus, as a rule of thumb, to estimate the minimum metering limit divide the flow rates listed, by ten.

For gases or liquids with fluid properties not greatly different from the calibration media, tables apply directly, when working pressure and temperature are also approximately standard.

Where the above conditions do not apply the maximum flow rates of the metered fluids are converted to equivalent standard flow rates of air or water.

To do this calculate "K" as shown in charts, multiply the maximum flow rate with this factor, and select the appropriate flow tube size from the Flow Capacity tables 6, 7, 8, 9 and 10 (pages 62 to 65).

gas flow

 $Q_{air} = K_{gas} \times Q_{gas}$

$$K_{gas} = \sqrt{G \times \frac{T_{act}}{T_0} \times \frac{P_0}{P_{act}}}$$

where:

Qair = equivalent air flow capacity at Standard Conditions (SPT).

Qgas = maximum flow of metered gas.

G = specific gravity of metered gas (from table 5).

Tact = absolute temperature at flow condition, deg R or deg K.

To = absolute temperature at Standard Conditions.

(STP) deg R (530) or deg K (294).

Pact = pressure at flow conditions, psia.

Po = pressure at Standard Conditions (STP), (14.7 psia).

liquid flow

Qwater = Kliq x Qliq

$$K_{liq} = \sqrt{\frac{(d_F - d_W)}{(d_F - d_L)}} \times \frac{d_L}{d_W}$$

where:

Qwater = equivalent water flow capacity at Standard Conditions (STP).

Qliq = maximum flow of metered liquid.

dF = density of float selected, (see table 3), (g/ml).

dL = density of metered liquid, (g/ml).

dW = density of water at Standard Conditions (STP) (1.0 g/ml).

CALCULATION VS. CALIBRATION FOR P, PX, S, T AND TX METERS

In case of liquid flows at each major point along the scale, sample volumes are collected in a buret of a volumetric flask during measured time intervals. Volumes are interpolated to a unit of time such as for example [mL/min] or [cu. ft/hr] etc. A table or a graph is then constructed to establish a complete set of calibration data. In case of gas flows, calibration data can be similarly developed, except that collection of sample volumes is accomplished by means of gas sampling devices, the simplest of which is a "soap bubble" meter.

It is very important that the correction factors as calculated from the accompanying equations are used for sizing only. These relationships are greatly simplified and will not provide precise predictable flow corrections. It is always best practice to calibrate meters for non-standard conditions on site, by using reliable means of calibration.

TECHNICAL INFORMATION

| TABLE 3 - FLOAT DENSITIES | | | | | | |
|---------------------------|----------------|--|--|--|--|--|
| MATERIAL | DENSITY [g/ml] | | | | | |
| GLASS | 2.53 | | | | | |
| SAPPHIRE | 3.98 | | | | | |
| STAINLESS STEEL | 8.04 | | | | | |
| CARBOLOY | 14.98 | | | | | |
| TANTALUM | 16.58 | | | | | |

| MULTIPLY | BY | TO OBTAIN |
|----------------|-------------------------------|----------------------|
| atm | 14.70 | lbs/sq. in. |
| atm | 1.0333 | kg/sq. cm. |
| bs/square inch | 0.07031 | kg/sq. cm. |
| ml/min | 0.001 | liters/min. |
| ml/min | 3.531 x 10 ⁻⁵ | cu. ft/min. |
| ml/min | 1.585 x 10 ⁻² | gal/hr. |
| cubic ft/hr | 472 | ml/min. |
| gal/min | 3785 | ml/min. |
| g/ml | 62.43 | lbs/cu. ft. |
| g/ml | 0.03613 | lbs/cu. in. |
| cc/mn | 1 | mL/min. |
| cfm (ft3/min) | 28.31 | L/min. |
| cfm (ft3/min) | 1.699 | m³/hr. |
| oz/min | 29.57 | mL/min. |
| | PRESSURE | |
| MULTIPLY | BY | TO OBTAIN |
| PSI | 27.71 | in. H ₂ O |
| PSI | 2.036 | in. Hg |
| PSI | 703.1 | mm/H ₂ O |
| PSI | 51.75 | mm/Hg |
| PSI | .0703 | kg/cm ² |
| PSI | .0689 | bar |
| PSI | 68.95 | mbar |
| PSI | 6895 | Pa |
| PSI | 6.895 | kPa |
| | TEMPERATURE | |
| (| F = (1.8 x °C) + 32 | |
| | $C = (CF - 32) \times 0.555$ | |
| | Kelvin = $^{\circ}$ C + 273.2 | |
| | LENGTH | |
| MULTIPLY | BY | TO OBTAIN |
| Multiply | 2.54 | cm |
| Inch | 12 | inch |
| Ft. | 0.305 | meter |
| Yard | 1.094 | meter |
| Angstrom | 1010 | meter |

| TABLE 5- DENSITY | , VISCOSITY | & SPECIFIC 0 | GRAVITY OF GASES |
|-------------------|-------------------|--------------------------|---------------------------------|
| GAS | DENSITY [g/ml] | VISCOSITY [centipols] | SPECIFIC GRAVITY G [air=1.0] |
| Acetylene | 0.001090 | 0.00988 | 0.9073 |
| Air | 0.001200 | 0.01812 | 1.0000 |
| Ammonia | 0.000716 | 0.00994 | 0.5963 |
| Argon | 0.001660 | 0.02220 | 1.3796 |
| Butane | 0.002484 | 0.00848 | 2.0854 |
| Carbon Dioxide | 0.001835 | 0.01470 | 1.5290 |
| Carbon Monoxide | 0.001163 | 0.01750 | 0.9671 |
| Chlorine | 0.002983 | 0.01330 | 2.4860 |
| Ethane | 0.001260 | 0.00901 | 1.0493 |
| Ethylene | 0.001170 | 0.00994 | 0.9749 |
| Helium | 0.0001656 | 0.01980 | 0.13804 |
| Hydrogen | 0.0000834 | 0.00885 | 0.06952 |
| Hydrogen Chloride | 0.001512 | 0.01560 | 1.2678 |
| Methane | 0.0006653 | 0.01099 | 0.5544 |
| Nitrogen | 0.001160 | 0.01756 | 0.96724 |
| Nitrous Oxide | 0.001833 | 0.01453 | 1.5297 |
| Oxygen | 0.001326 | 0.02030 | 1.10527 |
| Propane | 0.001874 | 0.00805 | 1.5620 |
| Sulfur Dioxide | 0.002717 | 0.01270 | 2.2638 |

TABLES OF STANDARD FLOW CAPACITIES P, PX, T, TX AND S METERS

| 150mm | Flow tubes (S | TABLE 6 See Table 8 for | Gas Flow Cap | acities) |
|------------------------|----------------|----------------------------|-----------------|----------------|
| | FLOW TUBI | E MAXIMUM FI | LOW RATES | |
| ELOW TURE | Α | IR | WA ⁻ | TER |
| FLOW TUBE NUMBER | [smL/min] | [scfh] | [smL/min] | [gph] |
| 042-29-GL | 11.6 | 0.024 | - | - |
| 042-29-SA | 18.3 | 0.038 | - | - |
| 042-29-ST | 34 | 0.07 | - | - |
| 042-29-CA | 62.8 | 0.13 | - | - |
| 032-41-GL | 46.6 | 0.098 | 0.50 | 0.007 |
| 032-41-SA | 73.1 | 0.154 | 0.99 | 0.015 |
| 032-41-ST | 138.3 | 0.293 | 2.36 | 0.037 |
| 032-41-CA | 239.1 | 0.506 | 4.60 | 0.072 |
| 032-41-TA | 258.7 | 0.548 | 5.10 | 0.080 |
| 062-01-GL | 91.6 144.3 | 0.194 0.306 | 1.13 2.19 | 0.020 0.035 |
| 062-01-SA 062-01-ST | 262.2 | 0.306 | 4.97 | 0.035 |
| 062-01-81 062-01-CA | 431.7 | 0.915 | 9.23 | 0.079 |
| 062-01-CA | 467.1 | 0.990 | 10.15 | 0.140 |
| 112-02-GL | 370.6 | 0.784 | 5.71 | 0.090 |
| 112-02-SA | 513.3 | 1.087 | 10.00 | 0.050 |
| 112-02-ST | 816.0 | 1.729 | 19.2 | 0.301 |
| 112-02-CA | 1216.9 | 2.579 | 31.6 | 0.500 |
| 112-02-TA | 1291.7 | 2.738 | 34.1 | 0.540 |
| 082-03-GL | 817 | 1.731 | 15.2 | 0.240 |
| 082-03-SA | 1093 | 2.316 | 24.9 | 0.394 |
| 082-03-ST | 1665 | 3.528 | 44.3 | 0.702 |
| 082-03-CA | 2405 | 5.096 | 69.0 | 1.094 |
| 082-03-TA | 2558 | 5.420 | 74.1 | 1.175 |
| 092-04-GL | 2214 | 4.690 | 49.9 | 0.792 |
| 092-04-SA | 2975 | 6.300 | 77.7 | 1.234 |
| 092-04-ST | 4494 | 9.520 | 132.5 | 2.092 |
| 092-04-CA | 6467 | 13.70 | 203.2 | 3.218 |
| 092-04-TA | 6979 | 14.79 | 219 | 3.471 |
| 102-05-GL | 3780 | 8.00 | 89 | 1.411 |
| 102-05-SA | 4942 | 10.47 | 134 | 2.124 |
| 102-05-ST | 7720 | 16.35 | 234 | 3.70 |
| 102-05-CA | 10780 | 22.84 | 343 | 5.437 |
| 102-05-TA 034-39-GL | 11287 8555 | 23.92 18.12 | 361 200 | 5.722 3.170 |
| | | | | |
| 034-39-SA 034-39-ST | 11140 16493 | 23.60 34.94 | 301 498 | 4.771 7.893 |
| 034-39-81 034-39-CA | 23001 | 48.73 | 736 | 11.67 |
| 034-39-CA 034-39-TA | 24540 | 51.99 | 784 | 12.43 |
| 034-39-1A 044-40-GL | 23105 | 48.95 | 579 | 9.177 |
| 044-40-SA | 29410 | 62.30 | 833 | 13.2 |
| 044-40-ST | 42860 | 90.80 | 1339 | 21.22 |
| 044-40-CA | 60212 | 127.5 | 1972 | 31.26 |
| 044-40-TA | 65625 | 139.0 | 2144 | 33.98 |
| או טדי דרט | 00020 | 100.0 | 2177 | 00.00 |

| *SUFFIX REFERS | TO | FLOAT | MATERIALS; |
|----------------|----|--------------|------------|
|----------------|----|--------------|------------|

GL = Black Glass
SA = Sapphire (red)
ST = 316 Stainless Steel
CA = Carboloy®
TA = Tantalum

| , , | AND S INL | TABLE 7 | | |
|------------------------|----------------|-------------------------|---------------|----------------|
| 65mm | Flow tubes (S | ee Table 9 for | Gas Flow Cana | icities) |
| 00111111 | | E MAXIMUM FI | | |
| | | E IMAXIIVIUIVI FI IR | | TER |
| FLOW TUBE | A | in | WA | IEN |
| NUMBER | [smL/min] | [scfh] | [smL/min] | [gph] |
| 042-07-GL | 5.8 | 0.013 | - | - |
| 042-07-SA | 9 | 0.017 | - | - |
| 042-07-ST | 19 | 0.036 | - | - |
| 042-07-CA | 33 | 0.070 | - | - |
| 042-07-TA | 36 | 0.072 | - | - |
| 032-15-GL | 49 | 0.104 | 0.55 | 0.009 |
| 032-15-SA | 74 | 0.153 | 0.98 | 0.016 |
| 032-15-ST | 145 | 0.307 | 2.38 | 0.038 |
| 032-15-CA | 246 | 0.528 | 4.60 | 0.073 |
| 032-15-TA | 271 | 0.578 | 5.25 | 0.084 |
| 022-13-GL | 107 | 0.22 | 1.28 | 0.020 |
| 022-13-SA | 167 | 0.35 | 2.60 | 0.041 |
| 022-13-ST | 314 | 0.66 | 6.15 | 0.098 |
| 022-13-CA | 517 | 1.09 | 11.21 | 0.179 |
| 022-13-TA | 563 | 1.19 | 12.67 | 0.202 |
| 012-10-GL | 216 | 0.46 | 3.0 | 0.048 |
| 012-10-SA | 320 | 0.68 | 5.7 | 0.091 |
| 012-10-ST 012-10-CA | 538 | 1.14 1.75 | 11.7 20.0 | 0.187 0.320 |
| 012-10-CA 012-10-TA | 826 898 | 1.75 | 20.0 | 0.320 |
| 052-01-GL | 1036 | 2.42 | 20 | 0.320 |
| 052-01-GE | 1383 | 2.93 | 33 | 0.527 |
| 052-01-ST | 2088 | 4.42 | 57 | 0.912 |
| 052-01-CA | 3007 | 6.37 | 89 | 1.42 |
| 052-01-TA | 3196 | 6.77 | 95 | 1.52 |
| 023-92-GL | 1249 | 2.65 | 25 | 0.396 |
| 023-92-SA | 1623 | 3.44 | 36.7 | 0.581 |
| 023-92-ST | 2520 | 5.34 | 70.7 | 1.121 |
| 023-92-CA | 3680 | 7.80 | 103.5 | 1.641 |
| 013-88-GL | 2030 | 4.3 | 40.01 | 0.641 |
| 013-88-SA | 2655 | 5.62 | 63.1 | 1.0 |
| 013-88-ST | 4041 | 8.56 | 111.2 | 1.76 |
| 013-88-CA | 5769 | 12.22 | 169.9 | 2.69 |
| 365-02-GL | 2522 | 5.35 | 54.7 | 0.86 |
| 365-02-ST | 4917 | 10.42 | 143 | 2.26 |
| 014-96-GL | 6318 | 13.4 | 147 | 2.33 |
| 014-96-SA | 8145 | 17.3 | 217 | 3.44 |
| 014-96-ST | 12058 | 25.5 | 364 | 5.77 |
| 014-96-CA 014-96-TA | 16943 18213 | 35.8 | 540 569 | 8.56 |
| 014-96-1A 054-17-GL | | 38.6 | 568 307 | 9.00 |
| 054-17-GL 054-17-SA | 12860 16617 | 27.2 35.2 | 307 449 | 4.86 7.11 |
| 054-17-SA 054-17-ST | 24452 | 51.8 | 723 | 11.46 |
| 054-17-CA | 34507 | 73.1 | 1049 | 16.63 |
| 054-17-TA | 36466 | 77.2 | 1111 | 17.61 |
| 064-63-GL | 21969 | 46.5 | 550 | 8.71 |
| 064-63-SA | 28518 | 60.4 | 811 | 12.85 |
| 064-63-ST | 41289 | 87.4 | 1297 | 20.56 |
| 064-63-CA | 58348 | 123.6 | 1895 | 30.04 |
| 064-63-TA | 61299 | 129.9 | 2000 | 31.70 |

TABLE OF STANDARD FLOW CAPACITIES P, PX, T, TX AND S METERS

| | | TAB | LE 8 - 150r | nm FLOV | V TUBES, (| GAS FLOV | V CAPACITII | ES OF RO | UTINE GAS | SES | | |
|------------------------|-----------------|----------------|-------------|----------------|------------------|----------------|--------------------|----------------|-------------------|----------------|-----------------|----------------|
| | | | | FLC |)W TUBE N | MUMIXA | FLOW RAT | ES | | | | |
| FLOW TUBE NUMBER | ARG [smL/min | | CARBON I | | HELI [smL/min | | HYDRO [smL/min] | | NITR([smL/min | | OXY [smL/mir | |
| 042-29-GL | 10.1 | 0.021 | 14.9 | 0.031 | 10.7 | 0.023 | 22.7 | 0.048 | 12 | 0.025 | 11 | 0.023 |
| 042-29-SA | 14.3 | 0.030 | 22 | 0.046 | 16 | 0.033 | 35.8 | 0.075 | 18 | 0.038 | 16 | 0.034 |
| 042-29-ST | 28 | 0.059 | 42 | 0.089 | 33 | 0.070 | 67 | 0.14 | 35 | 0.074 | 31 | 0.066 |
| 042-29-CA | 55 | 0.116 | 79 | 0.167 | 66 | 0.14 | 126 | 0.26 | 69 | 0.146 | 61 | 0.129 |
| 032-41-GL | 38.1 | 0.080 | 55.1 | 0.116 | 41.1 | 0.087 | 95 | 0.201 | 48 | 0.101 | 42 | 0.088 |
| 032-41-SA | 59.1 | 0.125 | 83 | 0.175 | 66 | 0.139 | 151 | 0.319 | 74 | 0.156 | 65 | 0.137 |
| 032-41-ST | 114 | 0.241 | 153 | 0.324 | 136 | 0.288 | 304 | 0.644 | 142 | 0.300 | 125 | 0.264 |
| 032-41-CA | 197 | 0.417 | 255 | 0.540 | 254 | 0.538 | 553 | 1.171 | 246 | 0.521 | 217 | 0.459 |
| 032-41-TA | 215 | 0.455 | 276 | 0.584 | 281 | 0.595 | 609 | 1.29 | 268 | 0.567 | 237 | 0.502 |
| 062-01-GL | 79.2 | 0.168 | 112.8 | 0.239 | 94 | 0.200 | 211 | 0.447 | 93 | 0.197 | 87 | 0.185 |
| 062-01-SA | 119 | 0.253 | 156 | 0.331 | 149 | 0.316 | 327 | 0.693 | 148 | 0.314 | 131 | 0.278 |
| 062-01-ST | 217 | 0.460 | 272 | 0.577 | 288 | 0.611 | 632 | 1.339 | 269 | 0.570 | 239 | 0.507 |
| 062-01-CA | 368 | 0.780 | 431 | 0.914 | 518 | 1.098 | 1100 | 2.331 | 443 | 0.939 | 396 | 0.839 |
| 062-01-TA | 388.3 | 0.823 | 464.1 | 0.983 | 571.9 | 1.212 | 1200.3 | 2.543 | 478.8 | 1.015 | 429 | 0.909 |
| 112-02-GL | 307 | 0.650 | 358.3 | 0.758 1.028 | 453 | 0.959 | 981 1420 | 2.079 | 378 525 | 0.800 1.112 | 340 | 0.012 |
| 112-02-SA 112-02-ST | 429 682 | 0.909 1.445 | 485 740 | 1.026 | 708 1352 | 1.500 2.865 | 2366 | 3.009 5.013 | 832 | 1.763 | 478 756 | 1.013 1.621 |
| 112-02-31 112-02-CA | 1022 | 2.165 | 1080 | 2.288 | 2228 | 4.721 | 3688 | 7.814 | 1243 | 2.634 | 1141 | 2.418 |
| 112-02-CA 112-02-TA | 1022 | 2.310 | 1140.9 | 2.418 | 2404.6 | 5.096 | 4257 | 9.020 | 1321.4 | 2.799 | 1211 | 2.566 |
| 082-03-GL | 685 | 1.451 | 705 | 1.494 | 1488 | 3.153 | 2459 | 5.210 | 834 | 1.767 | 761 | 1.612 |
| 082-03-GL 082-03-SA | 919 | 1.431 | 950 | 2.013 | 2105 | 4.460 | 3546 | 7.514 | 1117 | 2.367 | 1022 | 2.165 |
| 082-03-ST | 1403 | 2.973 | 1362 | 2.886 | 3443 | 7.295 | 5359 | 11.36 | 1699 | 3.600 | 1573 | 3.333 |
| 082-03-01 | 2029 | 4.299 | 2076 | 4.399 | 5197 | 11.01 | 7967 | 16.88 | 2452 | 5.195 | 2275 | 4.820 |
| 082-03-TA | 2159 | 4.575 | 2182 | 4.623 | 5530 | 11.72 | 8511 | 18.03 | 2608 | 5.526 | 2406 | 5.098 |
| 092-04-GL | 1896 | 4.01 | 1976 | 4.18 | 4727 | 10.02 | 7557 | 16.01 | 2288 | 4.84 | 2113 | 4.47 |
| 092-04-GE | 2516 | 5.33 | 2610 | 5.53 | 6310 | 13.37 | 10202 | 21.62 | 3032 | 6.42 | 2806 | 5.94 |
| 092-04-ST | 3805 | 8.06 | 3887 | 8.23 | 9728 | 20.61 | 15754 | 33.38 | 4578 | 9.70 | 4247 | 8.99 |
| 092-04-CA | 5525 | 11.71 | 5599 | 11.86 | 14158 | 30.00 | 23232 | 49.23 | 6640 | 14.07 | 6170 | 13.07 |
| 092-04-TA | 5914 | 12.53 | 5954 | 12.62 | 15227 | 32.26 | 24927 | 52.82 | 7103 | 15.05 | 6604 | 13.99 |
| 102-05-GL | 3148 | 6.67 | 3334 | 6.92 | 8526 | 18.07 | 13164 | 27.89 | 3824 | 8.10 | 3549 | 7.52 |
| 102-05-SA | 4185 | 8.86 | 4314 | 9.14 | 10384 | 22.00 | 17434 | 36.94 | 5033 | 10.66 | 4672 | 9.89 |
| 102-05-ST | 6641 | 14.06 | 6520 | 13.80 | 16163 | 34.24 | 27705 | 58.69 | 7992 | 16.93 | 7475 | 15.83 |
| 102-05-CA | 9082 | 19.24 | 8976 | 19.02 | 23416 | 49.62 | 39080 | 82.81 | 10974 | 23.25 | 10185 | 21.58 |
| 102-05-TA | 9573 | 20.28 | 9351 | 19.81 | 24794 | 52.54 | 40968 | 86.81 | 11490 | 24.35 | 10697 | 22.67 |
| 034-39-GL | 7266 | 15.39 | 7304 | 15.47 | 19040 | 40.33 | 29795 | 63.12 | 8695 | 18.42 | 8091 | 17.14 |
| 034-39-SA | 9373 | 19.85 | 9406 | 19.92 | 24810 | 52.56 | 39101 | 82.84 | 11270 | 23.87 | 10535 | 22.31 |
| 034-39-ST | 13977 | 29.61 | 13728 | 29.08 | 39280 | 83.22 | 58968 | 124.9 | 16794 | 35.58 | 15610 | 33.07 |
| 034-39-CA | 19580 | 41.48 | 19296 | 40.88 | 54965 | 116.4 | 84023 | 178.0 | 23444 | 49.66 | 22000 | 46.61 |
| 034-39-TA | 20938 | 44.36 | 20543 | 43.52 | 60207 | 127.5 | 89109 | 188.7 | 25084 | 53.14 | 23500 | 49.78 |
| 044-40-GL | 19472 | 41.25 | 19220 | 40.72 | 53552 | 113.4 | 83730 | 177.3 | 23432 | 49.64 | 21832 | 46.25 |
| 044-40-SA | 24878 | 52.70 | 24263 | 51.40 | 71100 | 150.6 | 106992 | 226.6 | 29798 | 63.13 | 27937 | 59.26 |
| 044-40-ST | 36564 | 77.46 | 35541 | 75.29 | 106151 | 224.8 | 157719 | 334.1 | 43607 | 92.38 | 41076 | 87.02 |
| 044-40-CA | 51689 | 109.5 | 50243 | 106.4 | 161232 | 341.5 | 224353 | 475.3 | 61653 | 130.6 | 57480 | 121.7 |
| 044-40-TA | 55248 | 117.0 | 53771 | 113.9 | 171090 | 362.4 | 243016 | 514.8 | 66954 | 141.8 | 61892 | 131.1 |

*Suffix refers to float materials: G = black glass, S = sapphire (red), ST = 316 stainless steel, $C = \text{Carboloy}^{\text{®}}$, T = tantalum.

Flow capacities shown in Tables 4, 5, 6 and 7 are based on calibrations at standard (STP) conditions (70 °F /21.1 °C and 14.7psia/1 atm abs). For fluids other than air or water at STP conditions see paragraph on METER SIZING on page 60. For special OEM requirements call toll free 1-800-866-3837.

for direct reading (engineering units) scale flow tubes contact the company or visit us at www.aalborg.com

TABLE OF STANDARD FLOW CAPACITIES P, PX, T, TX AND S METERS

| | | TAB | BLE 9 - 65n | nm FLOW | TUBES, G | AS FLOW | / CAPACITI | ES OF RO | UTINE GAS | ES | | |
|------------------------|-----------------|----------------|---------------------|----------------|------------------|----------------|-------------------|---------------|-------------------|----------------|-------------------|----------------|
| | | | | FLO |)W TUBE I | MUMIXAN | I FLOW RA | TES | | | | |
| FLOW TUBE NUMBER | ARG [smL/mir | | CARBON [smL/min] | | HEL [smL/min] | | HYDR [smL/min] | | NITR [smL/min] | | OXY([smL/min] | GEN [scfh] |
| 042-07-GL | 4 | 0.01 | 6.5 | 0.01 | 5.5 | 0.01 | 9.6 | 0.02 | 5.6 | 0.01 | 5 | 0.01 |
| 042-07-SA | 7.7 | 0.02 | 10 | 0.02 | 8 | 0.02 | 15.3 | 0.03 | 8.5 | 0.02 | 7 | 0.01 |
| 042-07-ST | 14 | 0.03 | 20 | 0.04 | 16 | 0.03 | 32.3 | 0.07 | 18 | 0.04 | 15 | 0.03 |
| 042-07-CA | 28 | 0.06 | 39 | 0.08 | 30 | 0.06 | 53.6 | 0.11 | 34 | 0.07 | 29 | 0.06 |
| 042-07-TA | 29 | 0.06 | 40 | 0.08 | 32 | 0.07 | 64.8 | 0.14 | 34 | 0.07 | 30 | 0.06 |
| 032-15-GL | 38 | 0.08 | 59 | 0.13 | 47 | 0.10 | 100 | 0.21 | 51 | 0.11 | 46 | 0.10 |
| 032-15-SA | 63 | 0.13 | 90 | 0.19 | 71 | 0.15 | 150 | 0.32 | 78 | 0.17 | 72 | 0.15 |
| 032-15-ST | 122 | 0.26 | 160 | 0.34 | 146 | 0.31 | 314 | 0.67 | 149 | 0.32 | 132 | 0.28 |
| 032-15-CA | 214 | 0.45 | 263 | 0.56 | 274 | 0.58 | 593 | 1.26 | 264 | 0.56 | 239 | 0.51 |
| 032-15-TA | 224 | 0.47 | 279 | 0.59 | 294 | 0.62 | 654 | 1.39 | 276 | 0.58 | 248 | 0.53 |
| 022-13-GL | 87 | 0.18 | 126 | 0.26 | 101 | 0.21 | 237 | 0.50 | 109 | 0.23 | 96 | 0.20 |
| 022-13-SA | 137 | 0.29 | 189 | 0.40 | 161 | 0.34 | 386 | 0.81 | 173 | 0.36 | 151 | 0.31 |
| 022-13-ST | 265 | 0.56 | 330 | 0.69 | 335 | 0.70 | 777 | 1.64 | 332 | 0.70 | 295 | 0.62 |
| 022-13-CA | 432 | 0.91 | 499 | 1.05 | 600 | 1.27 | 1352 | 2.86 | 535 | 1.13 | 482 | 1.02 |
| 022-13-TA | 472 | 1.00 | 539 | 1.14 | 675 | 1.43 | 1492 | 3.16 | 581 | 1.23 | 525 | 1.11 |
| 012-10-GL | 169 | 0.35 | 218 305 | 0.46 | 207 331 | 0.43 0.70 | 496 768 | 1.05 1.62 | 210 | 0.44 | 187 277 | 0.39 |
| 012-10-SA 012-10-ST | 251 432 | 0.53 0.91 | 501 | 0.64 1.06 | 665 | 1.40 | 1399 | 2.96 | 310 531 | 0.65 1.12 | 478 | 0.58 1.01 |
| 012-10-31 012-10-CA | 677 | 1.43 | 729 | 1.54 | 1194 | 2.52 | 2298 | 4.86 | 828 | 1.75 | 751 | 1.59 |
| 012-10-CA 012-10-TA | 712 | 1.50 | 771 | 1.63 | 1273 | 2.69 | 2426 | 5.13 | 870 | 1.84 | 789 | 1.67 |
| 052-01-GL | 886 | 1.87 | 939 | 1.98 | 2070 | 4.38 | 3294 | 6.98 | 1086 | 2.30 | 1003 | 2.12 |
| 052-01-GL 052-01-SA | 1185 | 2.51 | 1227 | 2.59 | 2852 | 6.04 | 3294 4477 | 9.49 | 1419 | 3.00 | 1344 | 2.12 |
| 052-01-SX | 1794 | 3.80 | 1838 | 3.89 | 4573 | 9.68 | 7061 | 14.96 | 2164 | 4.58 | 2022 | 4.28 |
| 052-01-CA | 2573 | 5.45 | 2629 | 5.56 | 6762 | 14.32 | 10394 | 21.93 | 3105 | 6.57 | 2912 | 6.16 |
| 052-01-TA | 2742 | 5.80 | 2774 | 5.87 | 7190 | 15.23 | 11056 | 23.43 | 3293 | 6.97 | 3094 | 6.55 |
| 023-92-GL | 1030 | 2.19 | 1114 | 2.36 | 1934 | 4.10 | 3590 | 7.61 | 1251 | 2.65 | 1150 | 2.44 |
| 023-92-SA | 1399 | 2.97 | 1494 | 3.17 | 2878 | 6.10 | 5022 | 10.64 | 1702 | 3.61 | 1568 | 3.33 |
| 023-92-ST | 2141 | 4.54 | 2224 | 4.72 | 4886 | 10.36 | 8251 | 17.48 | 2576 | 5.46 | 2381 | 5.05 |
| 023-92-CA | 3103 | 6.58 | 3194 | 6.77 | 7580 | 16.06 | 12517 | 26.52 | 3767 | 7.98 | 3480 | 7.38 |
| 013-88-GL | 1687 | 3.57 | 1787 | 3.78 | 3344 | 7.08 | 6255 | 13.25 | 2048 | 4.33 | 1876 | 3.97 |
| 013-88-SA | 2240 | 4.74 | 2338 | 4.95 | 4966 | 10.52 | 8506 | 18.02 | 2737 | 5.79 | 2493 | 5.28 |
| 013-88-ST | 3426 | 7.25 | 3508 | 7.43 | 8258 | 17.49 | 13435 | 28.46 | 4112 | 8.71 | 3817 | 8.08 |
| 013-88-CA | 4928 | 10.44 | 4957 | 10.50 | 12672 | 26.84 | 19783 | 41.91 | 5943 | 12.59 | 5494 | 11.63 |
| 365-02-GL | 2106 | 4.47 | 2188 | 4.64 | 4748 | 10.06 | 7770 | 16.47 | 2563 | 5.43 | 2373 | 5.03 |
| 365-02-ST | 4141 | 8.78 | 4106 | 8.70 | 10903 | 23.10 | 16980 | 35.98 | 5034 | 10.67 | 4657 | 9.87 |
| 014-96-GL | 5290 | 11.21 | 5379 | 11.4 | 13639 | 28.9 | 21327 | 45.2 | 6380 | 13.52 | 5880 | 12.45 |
| 014-96-SA | 6900 | 14.62 | 6980 | 14.79 | 18500 | 39.19 | 28211 | 59.77 | 8280 | 17.54 | 7690 | 16.29 |
| 014-96-ST | 10175 | 21.56 | 10150 | 21.50 | 27300 | 57.84 | 41889 | 88.76 | 12058 | 25.55 | 11250 | 23.83 |
| 014-96-CA | 14293 15168 | 30.28 32.14 | 14200 15088 | 30.08 | 40036 42396 | 84.84 89.84 | 58498 63885 | 123.9 | 17253 18250 | 36.55 38.67 | 16031 | 33.97 35.89 |
| 014-96-TA | | | | 36.55 | | | | 135.4 | | | 16939 | |
| 054-17-GL 054-17-SA | 10895 14085 | 23.09 29.85 | 10811 14000 | 22.91 29.67 | 29355 38325 | 62.20 81.20 | 47100 61715 | 99.8 130.7 | 13096 16919 | 27.75 35.85 | 12166 15733 | 25.78 33.34 |
| 054-17-SA 054-17-ST | 20740 | 43.94 | 20307 | 43.03 | 57120 | 121.0 | 90323 | 191.3 | 24891 | 52.74 | 23174 | 49.10 |
| 054-17-31 054-17-CA | 29280 | 62.04 | 28420 | 60.22 | 81800 | 173.3 | 130805 | 277.1 | 35122 | 74.42 | 32724 | 69.33 |
| 054-17-0A | 30944 | 65.56 | 30570 | 64.77 | 87573 | 185.5 | 139224 | 294.9 | 37115 | 78.64 | 34585 | 73.28 |
| 064-63-GL | 18625 | 39.46 | 18159 | 38.48 | 50441 | 106.87 | 79680 | 168.82 | 22501 | 47.68 | 20812 | 44.10 |
| 064-63-SA | 24193 | 51.26 | 23513 | 49.82 | 66312 | 140.50 | 104110 | 220.58 | 29027 | 61.50 | 27038 | 57.29 |
| 064-63-ST | 35263 | 74.71 | 34151 | 72.36 | 104993 | 222.45 | 152772 | 323.67 | 41985 | 88.96 | 39416 | 83.51 |
| 064-63-CA | 49534 | 104.95 | 47860 | 101.40 | 143606 | 304.25 | 215595 | 456.77 | 59377 | 125.80 | 55375 | 117.32 |
| 064-63-TA | 52041 | 110.26 | 50268 | 106.50 | 156768 | 332.14 | 226636 | 480.17 | 62380 | 132.17 | 57772 | 122.40 |

TECHNICAL INFORMATION

TABLE OF FLOW CAPACITIES AT 50 PSIG FOR GAS PROPORTIONERS

| | TABLE 10 - 150 | Dmm FLOW TUB | ES, GAS FLOW CAP | ACITIES FOR G | AS PROPORTION | ERS at 50 PSIG | |
|---------------------|------------------|--------------------|--------------------------|---------------------|-----------------------|-----------------------|---------------------|
| | | | FLOW TUBE MAXIM | UM FLOW RATE | S | | |
| FLOW TUBE Number | AIR [smL/min] | ARGON [smL/min] | CARBON DIOXIDE [smL/min] | HELIUM [smL/min] | HYDROGEN [smL/min] | NITROGEN [smL/min] | OXYGEN [smL/min] |
| 032-41-GL | 191 | 161 | 203 | 195 | 399 | 197 | 166 |
| 032-41-SA | 270 | 229 | 279 | 302 | 662 | 283 | 246 |
| 032-41-ST | 460 | 383 | 478 | 573 | 1185 | 471 | 442 |
| 032-41-CA | 743 | 625 | 702 | 1094 | 2013 | 771 | 719 |
| 062-01-GL | 324 | 270 | 346 | 333 | 844 | 331 | 294 |
| 062-01-SA | 505 | 412 | 494 | 569 | 1209 | 467 | 460 |
| 062-01-ST | 825 | 687 | 771 | 1089 | 2432 | 833 | 764 |
| 062-01-CA | 1275 | 1062 | 1132 | 1972 | 3732 | 1303 | 1175 |
| 112-02-GL | 1086 | 855 | 934 | 1779 | 3110 | 1016 | 930 |
| 112-02-SA | 1324 | 1115 | 1168 | 2468 | 4289 | 1340 | 1228 |
| 112-02-ST | 2024 | 1717 | 1724 | 4083 | 6740 | 2034 | 1905 |
| 112-02-CA | 2912 | 2472 | 2521 | 6927 | 9979 | 2997 | 2703 |
| 082-03-GL | 2008 | 1697 | 1747 | 4214 | 6711 | 2039 | 1865 |
| 082-03-SA | 2590 | 2186 | 2264 | 5656 | 8995 | 2643 | 2503 |
| 082-03-ST | 3903 | 3274 | 3343 | 8669 | 14490 | 3731 | 3685 |
| 082-03-CA | 5547 | 4697 | 4691 | 12717 | 19993 | 6169 | 5210 |
| 092-04-GL | 5528 | 4794 | 4954 | 12540 | 18862 | 5801 | 5381 |
| 092-04-SA | 7240 | 6163 | 6217 | 15703 | 25235 | 7415 | 6826 |
| 092-04-ST | 10813 | 9077 | 9178 | 24629 | 38556 | 11044 | 10335 |
| 092-04-CA | 15322 | 12904 | 12879 | 34709 | 55936 | 15433 | 14451 |
| 102-05-GL | 9294 | 7705 | 7888 | 19830 | 30900 | 9419 | 8749 |
| 102-05-SA | 11647 | 9969 | 10042 | 26008 | 45263 | 11955 | 11137 |
| 102-05-ST | 17311 | 14489 | 14420 | 40831 | 60300 | 17525 | 16353 |
| 102-05-CA | 24065 | 20744 | 20099 | 59702 | 86369 | 24549 | 22905 |
| 034-39-GL | 19767 | 17978 | 17936 | 48193 | 73500 | 21676 | 19931 |
| 034-39-SA | 27514 | 23001 | 54010 | 63240 | 97000 | 27449 | 25800 |
| 034-39-ST | 38995 | 33778 | 33087 | 98676 | 142000 | 40086 | 36821 |
| 034-39-CA | 55293 | 47151 | 45745 | 139847 | 200500 | 55930 | 52494 |
| 044-40-GL | 49374 | 41899 | 40520 | 125617 | 182239 | 50258 | 46851 |
| 044-40-SA | 62480 | 53038 | 51220 | 159976 | 231239 | 63595 | 59304 |
| 044-40-ST | 89880 | 76322 | 73584 | 231946 | 333775 | 91478 | 85341 |
| 044-40-CA | 123846 | 105182 | 101303 | 321265 | 460942 | 126041 | 117615 |

DIRECT READING SCALES FOR P, PX, T, TX AND S METERS

| TABLE 11 - FLOW TUBES FOR AIR | | | | | | | | | | |
|-------------------------------|---------|---------|------------|-----------|--------|---------|------------|--|--|--|
| | 6 | 5mm | | | 150 | mm | | | | |
| FLOW TUBE | QMAX | [UNITS] | PRESSURE | FLOW TUBE | QMAX | [UNITS] | PRESSURE | | | |
| 042-10-GL | 7.00 | mL/min | 14.70 psia | 042-12-SA | 25.00 | mL/min | 14.70 psia | | | |
| 032-01-ST | 50.00 | mL/min | 14.70 psia | 032-06-SA | 52.00 | mL/min | 14.70 psia | | | |
| 062-04-ST | 75.00 | mL/min | 14.70 psia | 042-06-CA | 75.00 | mL/min | 14.70 psia | | | |
| 022-14-GL | 100.00 | mL/min | 14.70 psia | 032-10-ST | 100.00 | mL/min | 14.70 psia | | | |
| 032-11-ST | 130.00 | mL/min | 14.70 psia | 032-21-ST | 150.00 | mL/min | 14.70 psia | | | |
| 032-03-CA | 250.00 | mL/min | 14.70 psia | 062-03-ST | 200.00 | mL/min | 14.70 psia | | | |
| 022-05-CA | 500.00 | mL/min | 14.70 psia | 112-10-GL | 300.00 | mL/min | 14.70 psia | | | |
| 052-12-GL | 1000.00 | mL/min | 14.70 psia | 112-08-SA | 500.00 | mL/min | 14.70 psia | | | |
| 052-04-GL | 1.00 | L/min | 14.70 psia | 082-02-GL | 800.00 | mL/min | 14.70 psia | | | |
| 023-03-GL | 1.15 | L/min | 14.70 psia | 112-19-CA | 1.25 | L/min | 14.70 psia | | | |
| 052-07-ST | 2.00 | L/min | 14.70 psia | 082-12-ST | 1.80 | L/min | 14.70 psia | | | |
| 013-89-ST | 4.00 | L/min | 14.70 psia | 092-25-GL | 2.50 | L/min | 14.70 psia | | | |
| 014-03-GL | 5.00 | L/min | 14.70 psia | 102-07-GL | 4.00 | L/min | 14.70 psia | | | |
| 014-02-ST | 10.00 | L/min | 14.70 psia | 102-03-SA | 4.50 | L/min | 14.70 psia | | | |
| 044-11-ST | 16.00 | L/min | 14.70 psia | 092-14-ST | 4.80 | L/min | 14.70 psia | | | |
| 054-01-ST | 25.00 | L/min | 14.70 psia | 102-01-SA | 5.00 | L/min | 14.70 psia | | | |
| 064-03-ST | 40.00 | L/min | 14.70 psia | 102-16-CA | 10.00 | L/min | 14.70 psia | | | |
| 052-05-GL | 2.20 | scfh | 14.70 psia | 034-13-ST | 17.00 | L/min | 14.70 psia | | | |
| 365-18-GL | 6.00 | scfh | 14.70 psia | 044-14-GL | 23.00 | L/min | 14.70 psia | | | |
| 365-19-ST | 10.00 | scfh | 14.70 psia | 044-41-ST | 42.00 | L/min | 14.70 psia | | | |
| 034-61-ST | 18.00 | scfh | 14.70 psia | 044-16-CA | 60.00 | L/min | 14.70 psia | | | |
| 014-17-ST | 25.00 | scfh | 14.70 psia | 112-01-CA | 2.50 | scfh | 14.70 psia | | | |
| 054-02-ST | 50.00 | scfh | 14.70 psia | 092-09-GL | 5.00 | scfh | 14.70 psia | | | |
| 064-62-ST | 90.00 | scfh | 14.70 psia | 102-06-GL | 8.25 | scfh | 14.70 psia | | | |
| 074-02-CA | 150.00 | scfh | 14.70 psia | 092-10-ST | 10.00 | scfh | 14.70 psia | | | |
| 014-01-CA | 0.60 | scfm | 14.70 psia | 102-08-ST | 16.50 | scfh | 14.70 psia | | | |
| | | | | 102-09-CA | 23.00 | scfh | 14.70 psia | | | |
| | | | | 044-05-GL | 55.00 | scfh | 14.70 psia | | | |
| | | | | 044-18-ST | 90.00 | scfh | 14.70 psia | | | |
| | | | | 044-07-ST | 94.00 | scfh | 14.70 psia | | | |
| | | | | 044-23-SA | 1.00 | scfm | 14.70 psia | | | |
| | | | | 044-43-ST | 1.50 | scfm | 14.70 psia | | | |

| | | | , | | | | | | | |
|---------------------------------|--------|---------|------------|-----------|--------|---------|------------|--|--|--|
| TABLE 12 - FLOW TUBES FOR WATER | | | | | | | | | | |
| | 65 | 5mm | | 150mm | | | | | | |
| FLOW TUBE | QMAX | [UNITS] | PRESSURE | FLOW TUBE | QMAX | [UNITS] | PRESSURE | | | |
| 032-04-GL | 0.50 | mL/min | 14.70 psia | 032-05-SA | 1.00 | mL/min | 14.70 psia | | | |
| 022-08-ST | 6.00 | mL/min | 14.70 psia | 112-12-SA | 10.00 | mL/min | 14.70 psia | | | |
| 052-09-GL | 25.00 | mL/min | 14.70 psia | 112-05-ST | 20.00 | mL/min | 14.70 psia | | | |
| 052-08-ST | 60.00 | mL/min | 14.70 psia | 092-02-GL | 50.00 | mL/min | 14.70 psia | | | |
| 013-02-ST | 115.00 | mL/min | 14.70 psia | 092-08-GL | 60.00 | mL/min | 14.70 psia | | | |
| 365-01-ST | 150.00 | mL/min | 14.70 psia | 102-11-GL | 100.00 | mL/min | 14.70 psia | | | |
| 044-09-GL | 250.00 | mL/min | 14.70 psia | 092-06-CA | 200.00 | mL/min | 14.70 psia | | | |
| 064-05-GL | 500.00 | mL/min | 14.70 psia | 044-15-ST | 1.20 | L/min | 14.70 psia | | | |
| 054-03-ST | 750.00 | mL/min | 14.70 psia | 044-01-TA | 2.00 | L/min | 14.70 psia | | | |
| 064-04-SA | 1.00 | L/min | 14.70 psia | 044-12-SA | 0.22 | gpm | 14.70 psia | | | |
| 064-06-ST | 1.20 | L/min | 14.70 psia | 044-42-CA | 0.45 | gpm | 14.70 psia | | | |
| 052-16-ST | 3.00 | L/hr | 14.70 psia | 044-10-CA | 29.00 | gph | 14.70 psia | | | |
| 064-12-GL | 10.00 | gph | 14.70 psia | | | | | | | |
| 064-09-CA | 24.00 | gph | 14.70 psia | | | | | | | |
| 064-11-TA | 32.00 | aph | 14.70 psia | | | | | | | |

013-08-ST

30.00

scfh

DIRECT READING SCALES FOR P, PX, T, TX AND S METERS

| • | TABLE 13 -FLOW TUBES FOR ARGON | | | | | | | | | | | |
|-----------|--------------------------------|---------|------------|-----------|--------|---------|------------|--|--|--|--|--|
| | 6 | 5mm | | | 150 |)mm | | | | | | |
| FLOW TUBE | QMAX | [UNITS] | PRESSURE | FLOW TUBE | QMAX | [UNITS] | PRESSURE | | | | | |
| 052-15-SA | 1000.00 | mL/min | 14.70 psia | 062-10-CA | 325.00 | mL/min | 14.70 psia | | | | | |
| 013-09-CA | 4.5 | L/min | 14.70 psia | 032-18-GL | 33.00 | mL/min | 14.70 psia | | | | | |
| 064-14-SA | 26.00 | L/min | 14.70 psia | 082-11-CA | 2.00 | L/min | 14.70 psia | | | | | |
| 023-05-GL | 2.50 | scfh | 14.70 psia | 034-07-ST | 15.00 | L/min | 14.70 psia | | | | | |
| 365-17-ST | 10.00 | scfh | 14.70 psia | 044-22-SA | 25.00 | L/min | 14.70 psia | | | | | |
| 014-14-ST | 22.00 | scfh | 14.70 psia | | | | | | | | | |
| 064-01-GL | 50.00 | scfh | 14.70 psia | | | | | | | | | |

| | TABLE 14 - FLOW TUBES FOR CARBON DIOXIDE | | | | | | | | | | |
|-----------|--|---------|------------|-----------|--------|---------|------------|--|--|--|--|
| | 6 | 5mm | | 150mm | | | | | | | |
| FLOW TUBE | QMAX | [UNITS] | PRESSURE | FLOW TUBE | QMAX | [UNITS] | PRESSURE | | | | |
| 042-20-SA | 10.00 | mL/min | 14.70 psia | 062-09-GL | 100.00 | mL/min | 14.70 psia | | | | |
| 042-09-ST | 20.00 | mL/min | 14.70 psia | 032-32-ST | 150.00 | mL/min | 14.70 psia | | | | |
| 032-20-GL | 55.00 | mL/min | 14.70 psia | 062-14-ST | 300.00 | mL/min | 14.70 psia | | | | |
| 022-24-SA | 220.00 | mL/min | 14.70 psia | 092-18-SA | 2.5 | L/min | 14.70 psia | | | | |
| 052-14-GL | 1.00 | L/min | 14.70 psia | 034-18-SA | 10.00 | L/min | 14.70 psia | | | | |
| 023-07-ST | 2.00 | L/min | 14.70 psia | | | | | | | | |
| 014-18-GL | 6.00 | L/min | 14.70 psia | | | | | | | | |
| 014-19-ST | 10.00 | L/min | 14.70 psia | | | | | | | | |
| 064-08-ST | 35.00 | L/min | 14.70 psia | | | | | | | | |

| TABLE 15 - DIRECT READING FLOW TUBES FOR FUEL OIL | | | | | |
|---|------|---------|----------|--|--|
| 150mm | | | | | |
| FLOW TUBE | QMAX | [UNITS] | PRESSURE | | |
| 034-60-GL 3.00 gph 14.70 psia | | | | | |

| TABLE 16 - DIRECT READING FLOW TUBES FOR HELIUM | | | | | | | |
|---|--------|---------|------------|-----------|---------|---------|------------|
| 65mm | | | | 150 | mm | | |
| FLOW TUBE | QMAX | [UNITS] | PRESSURE | FLOW TUBE | QMAX | [UNITS] | PRESSURE |
| 032-07-SA | 65.00 | mL/min | 14.70 psia | 062-13-GL | 100.00 | mL/min | 14.70 psia |
| 022-02-GL | 120.00 | mL/min | 14.70 psia | 062-07-CA | 500.00 | mL/min | 14.70 psia |
| 014-04-GL | 30.00 | scfh | 14.70 psia | 082-05-GL | 1500.00 | mL/min | 14.70 psia |
| | | | | 082-07-CA | 5.00 | L/min | 14.70 psia |
| | | | | 034-09-ST | 40.00 | L/min | 14.70 psia |

| TABLE 17 - DIRECT READING FLOW TUBES FOR HYDROGEN | | | | | | | |
|---|--------|---------|------------|-----------|--------|---------|------------|
| | 6 | 5mm | | | 150 | mm | |
| FLOW TUBE | QMAX | [UNITS] | PRESSURE | FLOW TUBE | QMAX | [UNITS] | PRESSURE |
| 032-13-GL | 35.00 | mL/min | 14.70 psia | 032-12-GL | 100.00 | mL/min | 14.70 psia |
| 042-01-CA | 100.00 | mL/min | 14.70 psia | 092-15-SA | 20.00 | scfh | 14.70 psia |
| 032-02-SA | 150.00 | mL/min | 14.70 psia | 044-20-SA | 225.00 | scfh | 14.70 psia |
| 012-01-GL | 600.00 | mL/min | 14.70 psia | | | | |
| 022-01-CA | 1.50 | L/min | 14.70 psia | | | | |
| 023-01-GL | 3.50 | L/min | 14.70 psia | | | | |
| 013-01-GL | 6.00 | L/min | 14.70 psia | | | | |
| 014-15-ST | 42 00 | I /min | 14 70 nsia | | | | |

14.70 psia

DIRECT READING SCALES FOR P, PX, T, TX AND S METERS

| TABLE 18- | TABLE 18- DIRECT READING FLOW TUBES FOR METHANE | | | | | | |
|-----------------------------------|---|--|--|--|--|--|--|
| | 65mm | | | | | | |
| FLOW TUBE | FLOW TUBE QMAX [UNITS] PRESSURE | | | | | | |
| 042-03-ST 40.00 mL/min 14.70 psia | | | | | | | |

| TABLE 19- DIRECT READING FLOW TUBES FOR NITROUS OXIDE | | | | | | |
|---|--|--|--|--|--|--|
| 150mm | | | | | | |
| FLOW TUBE QMAX [UNITS] PRESSURE | | | | | | |
| 112-11-SA 500.00 mL/min 14.70 psia | | | | | | |

| TABLE 20 - DIRECT READING FLOW TUBES FOR NITROGEN | | | | | | | |
|---|--------|---------|------------|-----------|--------|---------|------------|
| 65mm | | | 150mm | | | | |
| FLOW TUBE | QMAX | [UNITS] | PRESSURE | FLOW TUBE | QMAX | [UNITS] | PRESSURE |
| 042-08-GL | 6.00 | mL/min | 14.70 psia | 062-12-GL | 100.00 | mL/min | 14.70 psia |
| 032-16-ST | 50.00 | mL/min | 14.70 psia | 032-22-CA | 200.00 | mL/min | 14.70 psia |
| 032-08-SA | 60.00 | mL/min | 14.70 psia | 062-30-CA | 300.00 | mL/min | 14.70 psia |
| 022-15-GL | 120.00 | mL/min | 14.70 psia | 112-06-SA | 500.00 | mL/min | 14.70 psia |
| 022-06-SA | 200.00 | mL/min | 14.70 psia | 032-31-GL | 50.00 | mL/min | 14.70 psia |
| 014-16-ST | 12.00 | L/min | 14.70 psia | 092-05-GL | 2.00 | L/min | 14.70 psia |
| 064-13-GL | 20.00 | L/min | 14.70 psia | 102-21-ST | 7.00 | L/min | 14.70 psia |
| | | | | 034-24-ST | 14.00 | L/min | 14.70 psia |
| | | | | 044-25-CA | 50.00 | L/min | 14.70 psia |
| | | | | 044-24-TA | 66.00 | L/min | 14.70 psia |
| | | | | 044-06-ST | 1.60 | scfm | 14.70 psia |

| | TABLE 21 - DIRECT READING FLOW TUBES FOR OXYGEN | | | | | | |
|-----------|---|---------|------------|-----------|--------|---------|------------|
| | 65mm | | | 150mm | | | |
| FLOW TUBE | QMAX | [UNITS] | PRESSURE | FLOW TUBE | QMAX | [UNITS] | PRESSURE |
| 042-21-ST | 10.00 | mL/min | 14.70 psia | 032-33-ST | 150.00 | mL/min | 14.70 psia |
| 032-09-GL | 35.00 | mL/min | 14.70 psia | 062-02-ST | 250.00 | mL/min | 14.70 psia |
| 032-19-GL | 50.00 | mL/min | 14.70 psia | 112-04-SA | 400.00 | mL/min | 14.70 psia |
| 022-07-ST | 300.00 | mL/min | 14.70 psia | 062-16-CA | 600.00 | mL/min | 14.70 psia |
| 012-02-ST | 500.00 | mL/min | 14.70 psia | 082-08-SA | 1.00 | L/min | 14.70 psia |
| 052-02-GL | 1.00 | L/min | 14.70 psia | 102-12-SA | 5.00 | L/min | 14.70 psia |
| 013-25-ST | 4.00 | L/min | 14.70 psia | 034-77-SA | 10.00 | L/min | 14.70 psia |
| 034-08-ST | 8.00 | L/min | 14.70 psia | 034-15-ST | 16.50 | L/min | 14.70 psia |
| 044-04-ST | 15.00 | L/min | 14.70 psia | 044-19-CA | 58.00 | L/min | 14.70 psia |

| TABLE 22 - DIRECT READING FLOW TUBES FOR PROPANE | | | | | |
|--|-------|---------|------------|--|--|
| 150mm | | | | | |
| FLOW TUBE | QMAX | [UNITS] | PRESSURE | | |
| 092-01-ST | 4.20 | L/min | 14.70 psia | | |
| 102-02-CA | 10.00 | L/min | 14.70 psia | | |
| 044-02-ST | 38.00 | L/min | 14.70 psia | | |

COMMON EQUIVALENTS AND CONVERSIONS

Approximate Common Equivalents = 25 millimeter 1 inch 1 foot = 0.3 meter 1 yard = 0.9 meter = 1.6 kilometers 1 mile 1 square inch = 6.5 sq centimeters 1 square foot = 0.09 square meter 1 square yard = 0.8 square meter 1 acre = 0.4 hectare + 1 cubic inch = 16 cu centimeters 1 cubic foot = 0.03 cubic meter = 0.8 cubic meter 1 cubic yard 1 quart (lq) = 1 liter + 1 gallon = 0.004 cubic meter 1 ounce (avdp) = 28 grams 1 pound (avdp) = 0.45 kilogram 1 horsepower = 0.75 kilowatt 1 millimeter = 0.04 inch = 3.3 feet 1 meter 1 meter = 1.1 yards = 0.6 mile 1 kilometer 1 square centimeter = 0.16 square inch 1 square meter = 11 square feet 1 square meter = 1.2 square yards 1 hectare + = 2.5 acres 1 cubic centimeter = 0.06 cubic feet 1 cubic meter = 35 cubic feet 1 cubic meter = 1.3 cubic yards

= 1 quart

= 250 gallons = 0.035 ounces (avdp)

= 2.2 pounds (avdp) = 1.3 horsepower

1 liter +

1 gram

1 kilogram

1 kilowatt

1 cubic meter

| Conversions Accurate to Pa | rts Per Million |
|-----------------------------------|----------------------|
| inches X 25.4* | = millimeters |
| feet X 0.3048* | = meters |
| yards X 0.9144* | = meters |
| miles X 1.603 34 | = kilometers |
| square inches X 6.4516* | = square centimeters |
| square feet X 0.92 903 0 | = square meters |
| square yards X 0.836 127 | = square meters |
| acres X 0.404 686 | = hectares |
| cubic inches X 16.3871 | = cubic centimeters |
| cubic feet X 0.028 316.8 | = cubic meters |
| cubic yards X 0.764 555 | = cubic meters |
| quarts (Iq) X 0.946 353 | = liters |
| gallons X 0.003 785 41 | = cubic meters |
| ounces (avdp) X 28.3495 | = grams |
| pounds (avdp) X 0.453 592 | = kilograms |
| horsepower X 0.745 700 | = kilowatts |
| millimeters X 0.039 370 1 | = inchs |
| meters X 3.280 84 | = feet |
| meters X 1.093 61 | = yards |
| kilometers X 0.621 371 | = miles |
| sq centimeters X 0.155 000 | = square inchs |
| square meters X 10.7639 | = square feet |
| square meters X 1.195 99 | = square yards |
| hectares X 2.471 05 | = acres |
| cu centimeters X 0.061 623 7 | = cubic inches |
| cubic meters X 35.3147 | = cubic feet |
| cubic meters X 1.307 95 | = cubic yards |
| liters X 1.056 69 | = quarts (Iq) |
| cubic meters X 264.172 | = gallons |
| grams 0.035 274 0 | = ounces (avdp) |
| kilograms X 2.204 62 | = pounds (avdp) |
| kilowatts 1.341 02 | = horsepower |

| THESE PREFIXES MAY BE APPLIED T | O ALL SI UNITS |
|---------------------------------|----------------|
| Multiples and Submultip | ples |
| 1 000 000 000 000 | = 1012 |
| 1 000 000 000 | $= 10^9$ |
| 1 000 000 | = 106 |
| 1000 | $= 10^3$ |
| 100 | $= 10^{2}$ |
| 10 | = 10 |
| 0.1 | $= 10^{-1}$ |
| 0.01 | = 10-2 |
| 0.001 | $= 10^{-3}$ |
| 0.000 001 | = 10-6 |
| 0.000 000 001 | = 10-9 |
| 0.000 000 000 001 | $= 10^{-12}$ |
| 0.000 000 000 000 001 | $= 10^{-15}$ |
| 0.000 000 000 000 000 0001 | $= 10^{-18}$ |

| Prefixes | Symbols |
|-----------------|---------|
| tara (ter'a) | T |
| giga (ji ga) | G |
| mega (meg'a) | Ma |
| kilo (kil o) | k* |
| hecto (hek'to) | h |
| deka (dek'a) | da |
| deci (des'i) | d |
| centi (sen'ti) | C* |
| milli (mil'i) | m* |
| micro (mi' kro) | u* |
| nano (nan'o) | n |
| pico (pe'ko) | p |
| femto (fem'to) | f |
| atto (at'to) | a |

⁺ common term not used in S1
* exact

Limited Warranty Policy

Warranty Coverage

Aalborg® warrants its products to be free from defects in materials and workmanship for a period of not to exceed (12) months from the date of purchase.

Customer Responsibilities

It is the sole responsibility of the customer to ensure the proper selection of equipment that is compatible with the flow medium and operating conditions in use. Products must be operated by qualified personnel knowledgeable in the equipment's intended application, limitations, and proper usage. Use of the equipment in a manner inconsistent with operational guidelines, including exposure to incompatible gases, liquids, or conditions, voids all warranty coverage.

Limitations and Exclusions

This warranty does not cover:

Product that was used outside of its stated specifications.

Products that, upon examination by Seller, or Seller's authorized service provider, are found to have been mishandled, misused, abused, or damaged by Buyer or any third party.

A product repaired or modified by performed by a party other than Aalborg® or its authorized representatives.

Improperly stored, installed, operated, or maintained in a manner inconsistent with Seller's instructions.

Defects attributed to normal wear and tear or failure to comply with Seller's safety warnings.

Indirect, incidental, consequential, special, punitive, or consequential damages, including lost profits.

Shipping or transportation charges to Aalborg® or its authorized service facility.

Return Authorizations

Goods shall not be returned without Seller's prior authorization.

It is recommended that our service representatives be contacted to rectify product issues remotely, if possible. When not possible, request a Return Authorization Number (RAN) and a SERVICE SAFETY ASSURANCE CERTIFICATE form to be completed and attached for factory evaluation.

If a defect covered by this warranty is discovered, the product will be repaired or replaced at Aalborg's sole discretion, free of charge for parts and labor.

Such repair, replacement, or credit shall be Buyer's sole remedy for defective Goods and Services.

For defective Goods not covered by this warranty, repair or replacement shall not be performed until and unless Buyer issues an Order to Seller authorizing such repair or replacement at Seller's then-current repair or replacement price. In addition, Seller may charge Buyer for any testing or inspection costs. In no event shall Seller retain or store returned Goods for more than three (3) months.

Disclaimer

THESE WARRANTIES, INCLUDING THE REMEDIES SET FORTH HEREIN, ARE EXCLUSIVE AND ARE IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IS INTENDED OR GIVEN.

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Form nr.: AAL-WP1

EUROPEAN SERVICE CENTER

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Products Manufactured By Aalborg

ROTAMETERS

Single Tube

Aluminum / Brass / Stainless ● Interchangeable Glass Flow Tubes ● Optional Valves

Multiple Tube

Two to Six Channels • Aluminum or Stainless

PTFE Single and Multiple Tube

Chemically Inert • 1 to 4 Channels • Interchangeable Glass Flow tubes

PTFE

Chemically Inert ● Low to Medium Flow of Corrosive Liquids

Kits

Aluminum / Stainless / PTFE ● Including Five Glass Flow Tubes and a Set of Floats

Gas Proportioners

Aluminum / Stainless • Used for Blending Two or Three Gases

Medium Range
Glass Safety Shield ● Dual Air and Water Scale
Optical Sensor Switch
Non-Invasive Means for Detection of a High or Low Flow

High Flow Industrial Stainless Steel Flow Meters

Heavy Duty Stainless Steel

Direct Reading Air and Water Scales

ELECTRONIC METERS & CONTROLLERS

Low Cost Mass Flow Meters
Aluminum or Stainless ● With or Without LCD Readout

Low Cost Mass Flow Controllers

Aluminum or Stainless

With or Without LCD Readout

Mass Flow Controllers

Stainless • One to Four Channel Systems

Digital Mass Flow Controllers Auto Zero ● Totalizer ● Alarms = Built in RS485

Multi Parameter Digital Mass Flow Meters

Displays Flow Pressure and Temperature

Paddle Wheel Meters

Steam / Liquid and Gas Service

Smart Rate / Totalizer / Signal Conditioner LCD Keypad ● RS232 / 485 ● Pulse Output ● Alarms

VALVES

Barstock

Brass or Stainless

Standard or High Precision

PTFE

Chemically Inert

Needle or Metering

Proportionating SolenoidStainless ● For Controlling Gas or Liquid Flow

Pulse width Modulated

SMV • Stepping Motor Valve

PERISTALTIC PUMPS

Fixed RPM Pumps

Pump Heads

Tubing Pumps

Variable Speeds

Dispensing Pumps

Flexible Tubings