FL Flowmeters

Introduction

Flowmeter Selection Guide

Cole-Parmer offers a wide variety of flowmeters and flow controllers for any application. For special or unique applications, use the helpful "Application Parameter" table at right to narrow your selection.

You can also go to **ColeParmer.com/flowmeter** for our online flowmeter parametric search.

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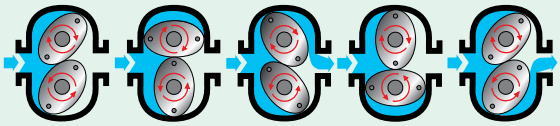
"How It Works" Technology Guide*

Gear 615–616

These oval counter-synchronized rotors (gears) are interlocked to rotate with the passing of liquid. The amount of fluid passing through the oval gears is well controlled giving these meters a very high level of accuracy. These meters are one of few suited to high-viscosity fluids. Designs are typically rugged and simple allowing for installation in the most aggressive environments.



Applications	Hydraulics, food and beverage, pulp and paper industry, fuel industry
Advantages	Flow measurement is independent of fluids viscosity, no straight pipe runs required, high accuracy
Disadvantages	Slight accuracy degradation with thin fluids

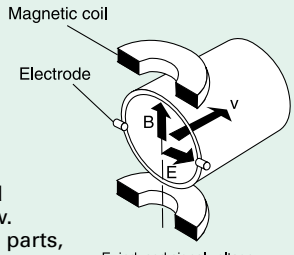
Propeller Type 605–614, 634

This can include meters with rotating paddle wheels, propellers, or even—for purposes of simplified classification—oscillating disks (Multi-Jet types). The rotating component is designed to provide a pulse when passing either a magnetic or optical sensor. The frequency of the pulses is proportional to the velocity of the fluid at one point in the pipe or channel. These designs offer relatively high accuracy for their low cost; some insertion versions are very easy to install.

Applications	Oil and gas industries, utilities
Advantages	Fast response time, easy to maintain, inexpensive
Disadvantages	Difficult to install, moving parts, requires full pipe

Magnetic 620–623

There are two magnetic design styles: insertion and full-bore. Coils in the meter produce a magnetic field. When a conductive fluid is passed through the field, a voltage is produced through an electrode in the meter wall or insertion probe; this generated voltage is proportional to the flow. The technology offers no moving parts, and the full-bore designs offer no intrusions into the flow stream.



E=induced signal voltage
B=magnetic flux density
v= average flow velocity of fluid

Applications	Water/wastewater, pulp and paper, mining, food and beverage, chemical
Advantages	No obstruction of flow path, no pressure drop, no moving parts, can handle heavy slurries
Disadvantages	Fluid must be conductive, must ground pipe

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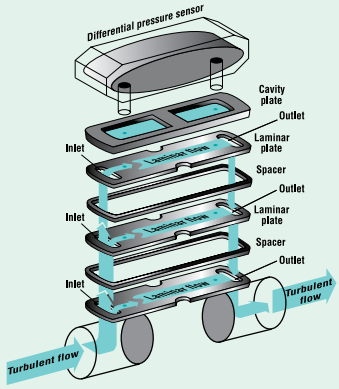
Differential Pressure 594–596

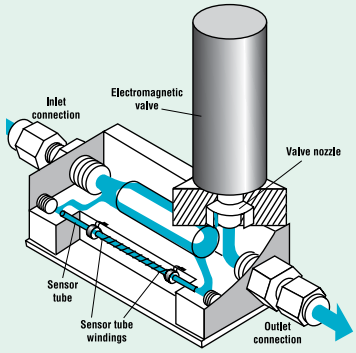
A flow-restrictive orifice or laminar flow element evaluates the pressure drop through the restriction. The pressure drop between upstream and downstream points is proportional to the rate of flow. This technology works well where no moving parts are desired or where an ultra-fast response time is required.



Applications	Pharmaceutical, specialty chemical manufacturing
Advantages	Very high accuracy; multiple calibrations, outputs, and size
Disadvantages	Water or gases only, no particulates, needs power

Thermal Dispersion—Gas Mass 585–593

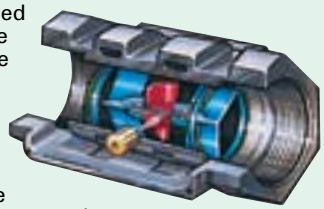
A side-stream flow of gas is directed through a capillary. The capillary includes two external heater-sensor coils, one downstream from the other. Gas flow carries heat from the upstream coil to the downstream coil. The resultant temperature-dependent resistance differential at each coil is measured. The gradient at the coils is linearly proportional to the instantaneous flow rate.



Applications	Chemical line monitoring, purging instrument air lines, filtration loading
Advantages	No moving parts; measures the mass of gas, not volume, so it's very accurate
Disadvantages	Gas must be dry and free of particulates, fairly slow response time

Turbine 597–604, 606

This mechanism includes a bladed rotor that is positioned along the centerline of the flow stream. The rotating component is designed to provide a pulse when passing either a magnetic or optical sensor. The frequency of the pulses is proportional to the velocity of the fluid. Some designs offer high levels of accuracy and can often handle slightly higher viscosity fluids than basic propeller-type designs. Some turbine designs meet sanitary guidelines (where stipulated by the manufacturer).

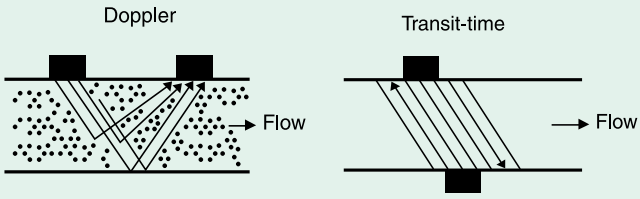


Applications	Oil and gas, utilities
Advantages	High accuracy, millisecond response time, high pressure and temperature capabilities
Disadvantages	Moving parts can wear or become clogged, not good for low flows

"How It Works" Technology Guide* (continued)

Ultrasonic.....617–619

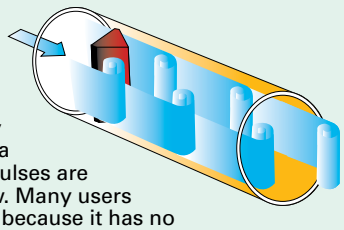
These designs measure the frequency shift of an ultrasonic signal that is sent through the fluid. Doppler technologies utilize particles or aeration in the fluid as a reflective mechanism to gauge the velocity of the fluid. Transit-time technologies rely on a frequency difference in forward and reverse signals sent though a clean liquid to gauge the velocity of the fluid; the fluid must not have solids or aeration, as they will distort the sonic pulses. These are ideal technologies to create flow profiles through an existing process, when modifying piping is not possible.



Applications	Water and wastewater, mining, oil industry
Advantages	Very high accuracy, can be used to measure corrosiveness of slurry fluid flow, no pressure drop, no obstruction of flow path, no moving parts, low maintenance costs
Disadvantages	Higher initial setup costs, fluid must contain particulates, not good for low-flow applications

Vortex.....624–625

Using a pressure sensor, this meter measures the pressure pulses from vortices that come from the fluid passing a bluff body bar across the flow stream. A simple analogy of this phenomenon is that of a flag waving in the wind. The pulses are proportional to the rate of flow. Many users find the technology appealing because it has no moving parts. Because the meter body and vortex bar can be molded as one, this design is ideal for making meters for use in aggressive or high-purity applications.



Applications	Utilities, water and wastewater
Advantages	Low to medium initial setup costs, very low maintenance when used in clean flow conditions
Disadvantages	Low to medium pressure drop due to obstruction in flow path

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Conversion Factors

Additional conversion factors and correction factors for variable area flowmeters can be found on pages 2046–2060 in the back of this catalog.

Multiply →		to get
to get ←		Divide
Volume		
cc/min	1	mL/min
ft^3/hr	0.125	GPM
ft^3/hr	0.035315	LPH
ft^3/hr	472	mL/min
ft^3/min	28.31	LPM
ft^3/min	0.471947	LPS
ft^3/min	1.699	m^3/hr
GPH	0.134	ft^3/hr
GPH	63.1	mL/min
GPM	7.48051	ft^3/min
GPM	3.785	L/min
GPM	0.227	m^3/hr
LPH	0.264172	GPH
LPS	951.019	GPH
mL/min	0.06102	$inch^3$/min
oz/min	29.57	mL/min
Mass		
g/hr	0.0022046	lb/hr
g/min	0.1322775	lb/hr
g/min	0.035274	oz/min
lb/hr	453.592	g/hr
oz/min	28.3495	g/hr

Cole-Parmer®

PTFE Flowmeters for Routine Gases

Ideal for routine gas applications where metal components must be minimized

- Inert PTFE and borosilicate glass wetted parts
- Rugged design with case-enclosed flow tube
- Tubes include a fused ceramic scale as a precise, permanent measuring guide

These meters eliminate the need for correlation charts with direct-reading scales for individual routine gases. The inert PTFE and glass wetted parts combine with the rigid anodized aluminum frame to offer a unique solution for ultra-pure gas applications.

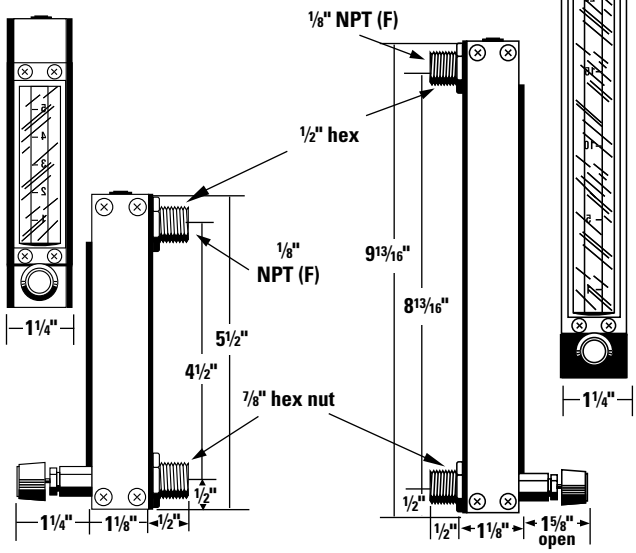
Flowtubes are replaceable (replacement tubes sold separately on pages 580–582). A longitudinal magnifier lens is molded into the transparent front safety shield to enhance reading resolution by 16%.

65-mm flowmeter
32006-08

150-mm flowmeter
32007-64

To Panel Mount

Two holes required to fit the inlet and outlet according to the diagrams below. Face width is 1¼". Secure flowmeter with the two retaining nuts (included).



65-mm flowmeters

150-mm flowmeters

ISO9001:2000 SUPPLIER CERTIFIED

For GASES

Specifications for 65-mm and 150-mm Flowmeters

Accuracy: ±5% full-scale

Repeatability: ±0.25% full-scale

Minimum flow rate: approximately 10% of maximum flow rate

Maximum pressure: 100 psi

Maximum temperature: 150°F (65°C)

Connections: ⅛" NPT(F); optional ¼" compression fittings or glass nipples available upon request

Leak integrity: meters are individually tested on a mass spectrometer leak detector and certified to a leak integrity rating of at least 1 x 10^{-7} sccs of helium

Materials of Construction

Part	Aluminum	Brass	316 SS
Flowtube	Borosilicate glass		
Fittings, valves	PTFE		
O-rings	PTFE		
Float	Glass, 316 SS, carboloy, sapphire, or tantalum		
Frame	Aluminum, acrylic, polycarbonate		

Ordering Information for 65-mm PTFE Direct Reading Flowmeters

Maximum flow rate*	Float**	Flowmeters without valve		Flowmeters with valve	
		Catalog number	Price	Catalog number	Price
For carbon dioxide					
20 mL/min	T	KH-32007-08		KH-32006-08	
55 mL/min	G	KH-32007-10		KH-32006-10	
220 mL/min	Sa	KH-32007-12		KH-32006-12	
1 LPM	G	KH-32007-14		KH-32006-14	
6 LPM	G	KH-32007-16		KH-32006-16	
10 LPM	T	KH-32007-18		KH-32006-18	
For hydrogen					
35 mL/min	G	KH-32007-24		KH-32006-24	
100 mL/min	SS	KH-32007-26		KH-32006-26	
150 mL/min	Sa	KH-32007-28		KH-32006-28	
600 mL/min	G	KH-32007-30		KH-32006-30	
1.5 LPM	C	KH-32007-32		KH-32006-32	
3.5 LPM	G	KH-32007-34		KH-32006-34	
6 LPM	G	KH-32007-36		KH-32006-36	
42 LPM	SS	KH-32007-38		KH-32006-38	

*Based on flow at STP conditions—70°F and 14.7 psi.
**Float material key: G = glass, SS = stainless steel, C = carboloy, Sa = sapphire, T = titanium

Tripod Bases

Bench mount up to three flowmeters. Clear acrylic base features three leveling screws and spirit level.

Catalog number	Number of meters held	Price
EK-03226-10	One	
EK-03226-30	One, two, or three	

Ordering Information for 150-mm PTFE Direct Reading Flowmeters

Maximum flow rate*	Float**	Flowmeters without valve		Flowmeters with valve	
		Catalog number	Price	Catalog number	Price
For argon gas					
33 mL/min	Sa	KH-32007-64		KH-32006-64	
15 LPM	T	KH-32007-66		KH-32006-66	
For helium					
100 mL/min	Sa	KH-32007-68		KH-32006-68	
500 mL/min	C	KH-32007-70		KH-32006-70	
1500 mL/min	G	KH-32007-72		KH-32006-72	
5 LPM	C	KH-32007-74		KH-32006-74	
40 LPM	SS	KH-32007-76		KH-32006-76	
1025 scfh	Sa	KH-32007-78		KH-32006-78	
For nitrogen					
100 mL/min	G	KH-32007-80		KH-32006-80	
200 mL/min	C	KH-32007-82		KH-32006-82	
300 mL/min	SS	KH-32007-84		KH-32006-84	
500 mL/min	Sa	KH-32007-86		KH-32006-86	
2 LPM	G	KH-32007-88		KH-32006-88	
1.6 scfh	SS	KH-32007-90		KH-32006-90	
For oxygen					
250 mL/min	SS	KH-32007-92		KH-32006-92	
400 mL/min	G	KH-32007-94		KH-32006-94	
5 LPM	Sa	KH-32007-96		KH-32006-96	
16.5 LPM	SS	KH-32007-98		KH-32006-98	
58 LPM	C	KH-32007-99		KH-32006-99	

*Based on flow at STP conditions (70°F and 14.7 psi).
**Float material key: G = glass, SS = stainless steel, C = carboloy, Sa = sapphire, T = titanium

FL Flowmeters

Variable-Area, Direct Reading

GILMONT® Benchtop Flowmeters with PTFE Fittings

Design makes each meter suitable for a broad range of laboratory applications

- Modular components allow for meter flexibility across a wide range of flow rates
- Multiple end connections to suit process requirements

Unshielded Flowmeters work well in low-pressure applications. Connect the flowtube end directly to tubing having the proper inner diameter—flowtube outer diameters are listed below. Glass taper joints are an alternate connection option which slip on the PTFE stops that contain the float (contact our Application Specialists to order the glass taper joints).

Shielded Flowmeters are better suited to higher-pressure applications or for installations requiring a panel-mounted flowmeter. End bushings are molded with dual connection capability—tubing or threaded; listed below are the appropriate tubing and threaded connections provided with each meter.

Shielded Flowmeters with Valves offer flow monitoring along with precise control through an integrated 20-turn micrometer valve. The valve can be adjusted from 0.1 to 100% of maximum flow (semilogarithmic) and provides precise regulation from 0.3 to 60% of maximum flow.

Materials of Construction

Part	Unshielded	Shielded	Shielded with Valve
Tube	Borosilicate glass		
O-rings	Viton®		
Inserts	PTFE	—	
Body	—	PTFE	
Couplings	—	Polypropylene (PP) with PTFE inserts*	
Shield	—	Polycarbonate	
Valve	—	Glass chamber with PCTFE plug**	

*Order PTFE couplings (below) for a full PTFE connection. **Tube sizes 14 and 15 have PTFE plug.

ISO 9001:2000 CERTIFIED SUPPLIER

Specifications

Accuracy: ±5% of reading or 2 mm of the scale length, whichever is greater

Repeatability: ±1% of reading or ½ scale graduation, whichever is greater

Maximum pressure: 60 psi

Maximum temperature: 150°F (65°C)

Connections

For shielded flowmeters:
Tube sizes 10, 11, 12, 13: ⅜" ID tubing
Tube sizes 14, 15: ⅝" ID tubing

For unshielded flowmeters:
Refer to OD dimensions in table, or contact our Application Specialists for tapered glass fittings

Dimensions

Tube size(s)	Unshielded	Shielded	Shielded with valves
10, 11, 12 13	5⅛"H x 5⁄16"OD 5⅛"H x 7⁄16"OD	8"H x 1"OD	8⅞"H x 6"W x 1⁵⁄16"OD
14 15	5½"H x 11⁄16"OD 5½"H x 15⁄16"OD	9¾"H x 1½"OD	11"H x 7"W x 15⁄16"OD

Ordering Information

Flow ranges		Floats† included	Tube size	Unshielded flowmeters			Shielded flowmeters				Shielded flowmeters with valves			
Air (mL/min)	Water (mL/min)			Catalog number	Max psi	Price	Catalog number	Ports‡ NPT	Max psi	Price	Catalog number	Ports‡ NPT	Max psi	Price
0.2 to 90 0.36 to160	0.002 to 1.1 0.004 to 2.3	Glass 316 SS	10	KH-03230-10	15		KH-03232-20	¼"	125		KH-03234-51	⅛"	125	
1 to 280 2 to 500	0.01 to 4.0 0.02 to 8.6	Glass 316 SS	11	KH-03230-11	15		KH-03232-21	¼"	125		KH-03234-52	⅛"	125	
20 to 2100 36 to 3700	0.4 to 40 0.86 to 86	Glass 316 SS	12	KH-03230-12	15		KH-03232-22	¼"	100		KH-03234-53	⅛"	100	
200 to 14,000 360 to 25,000	2 to 300 4 to 640	Glass 316 SS	13	KH-03230-13	15		KH-03232-23	¼"	75		KH-03234-54	⅛"	75	
1000 to 6,000 1800 to 64,000	10 to 850 21 to 1820	Glass 316 SS	14	KH-03230-14	15		KH-03232-24	½"	60		KH-03234-56	¼"	60	
3000 to 77,000 5300 to 137,000	30 to 1900 64 to 4100	Glass 316 SS	15	KH-03230-15	15		KH-03232-25	½"	50		KH-03234-57	¼"	50	

†When using the stainless steel float, refer to the correlation chart (included) for proper readings.
‡Port sizes are relevant only if couplings are removed; otherwise, users should reference information in the specifications list.

Accessories

Flowmeter Stand Kit contains everything you need to mount your Gilmont flowmeter on a benchtop or wall. Mount valved flowmeters directly—base accepts two large flowmeters (tube size 14 or 15) or three of the smaller flowmeters (tube size 10, 11, 12, and 13).

KH-03198-00 **Flowmeter stand kit.** Includes one base, one rod, and two mounting clamps
KH-03198-10 **Replacement flowmeter base**
KH-03198-20 **Replacement rod,** 18"L
KH-03198-30 **Replacement mounting clamp**

KH-03198-40 **PTFE coupling adapter** with Viton O-rings replaces the threaded polypropylene bushings on shielded flowmeters to provide an all-PTFE connection; ¼" NPT(F) port

GILMONT® Benchtop Flowmeters with PTFE Fittings

Correlation charts enable use with gases and liquids other than air and water

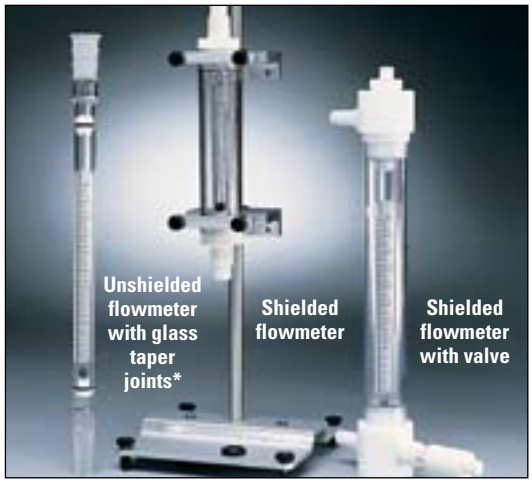
- Modular components allow for meter flexibility across a wide range of flow rates
- Multiple end connections to suit process requirements

Unshielded Flowmeters work well in low-pressure applications. Connect the flowtube end directly to tubing having the proper inner diameter—flowtube outer diameters are listed below. Glass taper joints are an alternate connection option which slip on the PTFE stops that contain the float (contact our Application Specialists to order the glass taper joints).

Shielded Flowmeters are better suited to higher-pressure applications or for installations requiring a panel-mounted flowmeter. End bushings are molded with dual connection capability—tubing or threaded; listed below are the appropriate tubing and threaded connections provided with each meter.

Shielded Flowmeters with Valves offer flow monitoring along with precise control through an integrated 20-turn micrometer valve. The valve can be adjusted from 0.1 to 100% of maximum flow (semilogarithmic) and provides precise regulation from 0.3 to 60% of maximum flow.

Computer-calibrated flow charts are included for floats used with both air and water at standard temperature and pressure. An "R factor" chart and formulas are included to convert scale readings for other gases or liquids or for floats other than glass. Order the flow rate analysis software below to generate flow charts specific to other applications.



Materials of Construction

Part	Unshielded	Shielded	Shielded with valve
Tube	Borosilicate glass		
O-rings	Viton®		
Inserts	PTFE	—	
Body	—	PTFE	
Couplings	—	Polypropylene (PP) with PTFE Inserts*	
Shield	—	Polycarbonate	
Valve	—	Glass chamber with PCTFE plug**	

*Order PTFE Couplings (below) for a full PTFE connection.
** Tube sizes 14 and 15 have PTFE plug.

Dimensions

Tube size(s)	Unshielded	Shielded	Shielded with valves
Micro	5⅛"H x 5/16"OD	8"H x 1"OD	8⅛"H x 6"H x 1 5/16"OD
0, 1, 2 3	7½"H x 5/16"OD 7½"H x 7/16"OD	10¼"H x 1"OD	11"H x 6"W x 1 5/16"OD
4 5	9"H x 1 1/16"OD 9"H x 15/16"OD	13¼"H x 1½"OD	14½"H x 6"W x 1 15/16"OD
6	—	15⅞"H x 1¾"OD	—

Specifications

ISO 9001:2000 SUPPLIER CERTIFIED

Accuracy
Micro tube size: ±5% of reading or ±2% of scale, whichever is greater; for water, ±10% of reading or ±3 scale divisions, whichever is greater
All other tube sizes: ±2% of reading or ±1 scale division, whichever is greater

Repeatability: ±1% of reading or ½ scale graduation, whichever is greater

Maximum temperature: 150°F (65°C)

Connections (for shielded flowmeters)
Tube sizes Micro, 0, 1, 2, 3: ⅜" ID tubing
Tube sizes 4, 5: ⅝" ID tubing

Ordering Information

Flow ranges		Floats† included	Tube size	Unshielded flowmeters			Shielded flowmeters				Shielded flowmeters with valves			
Air (mL/min)	Water (mL/min)			Catalog number	Max psi	Price	Catalog number	Ports‡ NPT	Max psi	Price	Catalog number	Ports‡ NPT	Max psi	Price
0.02 to 15	0.0002 to 0.12	Ruby	Micro	KH-03210-00	15		KH-03210-20	¼" (M)	125		KH-03234-50	⅛" (M)	125	
0.2 to 100 0.36 to 180	0.002 to 1.1 0.004 to 2.3	Glass 316 SS	0	KH-03201-02	15		KH-03201-22	¼" (M)	125		KH-03234-10	⅛" (M)	125	
1 to 280 2 to 500	0.01 to 4.0 0.02 to 8.6	Glass 316 SS	1	KH-03201-00	15		KH-03201-20	¼" (M)	125		KH-03234-11	⅛" (M)	125	
10 to 1900 20 to 3400	0.2 to 36 0.43 to 77	Glass 316 SS	2	KH-03202-00	15		KH-03202-20	¼" (M)	100		KH-03234-12	⅛" (M)	100	
200 to 14,000 360 to 25,000	3 to 300 6 to 640	Glass 316 SS	3	KH-03203-00	15		KH-03203-20	¼" (M)	75		KH-03234-13	⅛" (M)	75	
1000 to 36,000 1800 to 64,000	10 to 850 21 to 1820	Glass 316 SS	4	KH-03204-00	15		KH-03204-20	¼" (M)	60		KH-03234-15	¼" (M)	60	
3000 to 77,000 5300 to 137,000	30 to 1900 64 to 4100	Glass 316 SS	5	KH-03205-00	15		KH-03205-20	½" (M)	50		KH-03234-16	¼" (M)	50	
25,000 to 330,000 50,000 to 675,000	500 to 8000 1500 to 20,000	Glass 316 SS	6	—	—	—	KH-03205-22	½" (M)	50		—	—	—	—

†When using the stainless steel float, refer to the correlation chart (included) for proper readings.
‡Port sizes are relevant only if couplings are removed; otherwise, users should reference information in the specifications list.

Flow Rate Analysis Software generates accurate flow rate tables specific to your fluid, temperature, pressure, density, and viscosity using factory calibration data for the specific Gilmont flow tube used.

KH-32120-10 **Flow rate analysis software** runs with Windows® 95/98/NT computers; CD-ROM

KH-03198-00 **Flowmeter stand kit.** Use to mount a flowmeter on a benchtop or wall. Mount valved flowmeters without intermediate support—base accepts two large flowmeters (tube size 4, 5 or 6) or three of the smaller flowmeters (tube size micro, 0, 1, 2, 3). Includes one base, one rod, and two mounting clamps

KH-03198-10 **Replacement flowmeter base**

KH-03198-20 **Replacement rod,** 18"L

KH-03198-30 **Replacement mounting clamp**

KH-03198-40 **PTFE coupling adapter** with Viton O-rings replaces the threaded polypropylene bushings on shielded flowmeters to provide an all-PTFE connection; ¼" NPT(F) port

FL Flowmeters

Variable-Area, Direct Reading

Cole-Parmer® Panel-Mount Flowmeters

Many unique features make these the ideal economical flowmeters

- Front shield magnifies scale 16% for more accurate readings
- Fused ceramic scale for a precise, permanent measuring guide
- A vertical-tangential locator line for readings with hairline accuracy

Aluminum is economical and good for general use with noncorrosive gases and liquids. A 150-mesh inlet screen is included.

Brass is economical and good for use with water. A 150-mesh inlet screen is included.

316 Stainless Steel (SS) withstands higher temperatures and pressures; and features excellent chemical compatibility. A 150-mesh inlet screen is included.

Valved meters have valves mounted at the inlet (bottom) of the flowmeters. This arrangement is typically used for positive pressure applications with liquids and gases. The valve can be reconfigured to mount at the outlet (top), often for vacuum applications.

ISO9001:2000 SUPPLIER CERTIFIED

For GASES

For LIQUIDS

Specifications

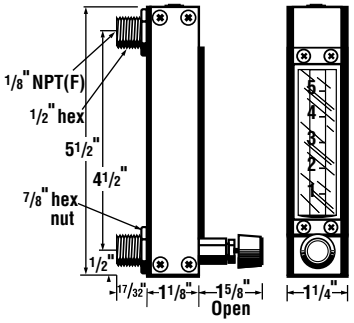
Accuracy: ±5% full-scale
Repeatability: ±0.25% full-scale
Minimum flow rate: approximately 10% of maximum flow rate (see tables on facing page)
Maximum pressure: 200 psi
Operating Temperature: –15 to 250°F (–26 to 121°C)
Connections: 1/8" NPT(F)

Materials of Construction

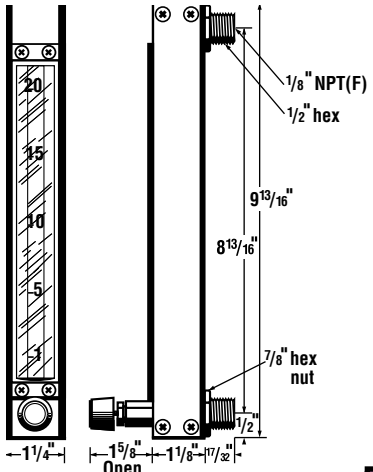
Part	Aluminum	Brass	316 SS
Flowtube	Borosilicate glass		
Fittings, valves	Aluminum	Chrome-plated brass	316 SS
O-rings	Buna N		Viton®
Float	Glass, 316 SS, carboloy, sapphire, or tantalum		
Frame	Aluminum, acrylic, polycarbonate		

To Panel Mount

Drill two holes to fit the inlet and outlet according to the diagrams below. Secure flowmeter with two retaining nuts (included).



65-mm flowmeters



150-mm flowmeters

65-mm flowmeter
32012-29
without valve

150-mm flowmeter
32003-28
with valve

GO to ColeParmer.com

For pressure drop information for the flowmeters on this page, simply click on the Catalog Number and go to the "More Info" sidebar."

Tripod Bases

Bench mount up to three flowmeters in any combination. Three leveling screws and spirit level are built into a clear acrylic base.

Catalog number	Number of meters held	Price
EK-03226-10	One	
EK-03226-30	One, two, or three	

INNOCAL®
INNOVATIVE CALIBRATION SOLUTIONS

NIST TRACEABLE

Service includes a NIST-traceable calibration certificate with before and after test data at five- to seven points across range (0.1 to 60 LPM, 1 to 60,000 sccm).

EK-17080-00 **NIST-traceable certificate for air/gas flowmeter**

EK-17080-10 **NIST-traceable certifi cate for mass flowmeter**

GO to page(s) 487–546
For our selection of barbed and compression fittings.

GO to page(s) 559–561, 566, 576–578
Our wide selection of PTFE flowmeters for your demanding applications

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Even MORE online!
Our Parametric Search helps you find the ideal flowmeter technology for your application.

Ordering Information for 65-mm Direct Reading Flowmeters

Max flow	Float†	Flowmeters without valve						Flowmeters with valve					
		Aluminum fittings*		Brass fittings*		316 SS fittings*		Aluminum fittings*		Brass fittings*		316 SS fittings*	
		Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price
For air													
7 mL/min	G	KH-32010-15		KH-32011-15		KH-32012-15		KH-32013-15		KH-32014-15		KH-32015-15	
50 mL/min	SS	KH-32010-01		KH-32011-01		KH-32012-01		KH-32013-01		KH-32014-01		KH-32015-01	
100 mL/min	G	KH-32010-03		KH-32011-03		KH-32012-03		KH-32013-03		KH-32014-03		KH-32015-03	
250 mL/min	C	KH-32010-05		KH-32011-05		KH-32012-05		KH-32013-05		KH-32014-05		KH-32015-05	
500 mL/min	C	KH-32010-07		KH-32011-07		KH-32012-07		KH-32013-07		KH-32014-07		KH-32015-07	
1.0 LPM	G	KH-32010-09		KH-32011-09		KH-32012-09		KH-32013-09		KH-32014-09		KH-32015-09	
2.0 LPM	SS	KH-32010-11		KH-32011-11		KH-32012-11		KH-32013-11		KH-32014-11		KH-32015-11	
5.0 LPM	G	KH-32010-13		KH-32011-13		KH-32012-13		KH-32013-13		KH-32014-13		KH-32015-13	
10.0 LPM	SS	KH-32010-17		KH-32011-17		KH-32012-17		KH-32013-17		KH-32014-17		KH-32015-17	
16.0 LPM	SS	KH-32010-16		KH-32011-16		KH-32012-16		KH-32013-16		KH-32014-16		KH-32015-16	
2.2 scfh	G	KH-32010-18		KH-32011-18		KH-32012-18		KH-32013-18		KH-32014-18		KH-32015-18	
6.0 scfh	G	KH-32010-19		KH-32011-19		KH-32012-19		KH-32013-19		KH-32014-19		KH-32015-19	
10.0 scfh	SS	KH-32010-21		KH-32011-21		KH-32012-21		KH-32013-21		KH-32014-21		KH-32015-21	
25.0 scfh	SS	—	—	—	—	—	—	KH-32013-23		KH-32014-23		KH-32015-23	
50.0 scfh	SS	—	—	—	—	—	—	KH-32013-24		KH-32014-24		KH-32015-24	
90.0 scfh	SS	—	—	—	—	—	—	KH-32013-27		KH-32014-27		KH-32015-27	
1.9 scfm	SS	—	—	—	—	—	—	KH-32013-28		KH-32014-28		KH-32015-28	
For water													
0.5 mL/min	G	KH-32010-29		KH-32011-29		KH-32012-29		KH-32013-29		KH-32014-29		KH-32015-29	
6.0 mL/min	SS	KH-32010-31		KH-32011-31		KH-32012-31		KH-32013-31		KH-32014-31		KH-32015-31	
115 mL/min	SS	KH-32010-33		KH-32011-33		KH-32012-33		KH-32013-33		KH-32014-33		KH-32015-33	
500 mL/min	G	KH-32010-35		KH-32011-35		KH-32012-35		KH-32013-35		KH-32014-35		KH-32015-35	
750 mL/min	SS	—	—	—	—	—	—	KH-32003-09		KH-32004-09		KH-32005-09	

Ordering Information for 150-mm Direct Reading Flowmeters

Max flow	Float†	Flowmeters without valve						Flowmeters with valve					
		Aluminum fittings*		Brass fittings*		316 SS fittings*		Aluminum fittings*		Brass fittings*		316 SS fittings*	
		Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price
For air													
25 mL/min	Sa	KH-32030-00		KH-32031-00		KH-32032-00		KH-32033-00		KH-32034-00		KH-32035-00	
50 mL/min	Sa	KH-32000-00		KH-32001-00		KH-32002-00		KH-32003-00		KH-32004-00		KH-32005-00	
75 mL/min	C	KH-32000-02		KH-32001-02		KH-32002-02		KH-32003-02		KH-32004-02		KH-32005-02	
100 mL/min	C	KH-32000-04		KH-32001-04		KH-32002-04		KH-32003-04		KH-32004-04		KH-32005-04	
200 mL/min	SS	KH-32000-06		KH-32001-06		KH-32002-06		KH-32003-06		KH-32004-06		KH-32005-06	
300 mL/min	C	KH-32000-08		KH-32001-08		KH-32002-08		KH-32003-08		KH-32004-08		KH-32005-08	
500 mL/min	Sa	KH-32030-08		KH-32031-08		KH-32032-08		KH-32033-08		KH-32034-08		KH-32035-08	
800 mL/min	G	KH-32030-09		KH-32031-09		KH-32032-09		KH-32033-09		KH-32034-09		KH-32035-09	
1.25 LPM	C	KH-32030-10		KH-32031-10		KH-32032-10		KH-32033-10		KH-32034-10		KH-32035-10	
2.5 LPM	G	KH-32000-10		KH-32001-10		KH-32002-10		KH-32003-10		KH-32004-10		KH-32005-10	
5.0 LPM	Sa	KH-32000-12		KH-32001-12		KH-32002-12		KH-32003-12		KH-32004-12		KH-32005-12	
10.0 LPM	G	KH-32000-14		KH-32001-14		KH-32002-14		KH-32003-14		KH-32004-14		KH-32005-14	
23 LPM	G	KH-32030-14		KH-32031-14		KH-32032-14		KH-32033-14		KH-32034-14		KH-32035-14	
42 LPM	SS	KH-32030-15		KH-32031-15		KH-32032-15		KH-32033-15		KH-32034-15		KH-32035-15	
60 LPM	C	KH-32030-16		KH-32031-16		KH-32032-16		KH-32033-16		KH-32034-16		KH-32035-16	
2.5 scfh	C	KH-32000-16		KH-32001-16		KH-32002-16		KH-32003-16		KH-32004-16		KH-32005-16	
8.25 scfh	G	KH-32000-18		KH-32001-18		KH-32002-18		KH-32003-18		KH-32004-18		KH-32005-18	
16.5 scfh	SS	KH-32000-20		KH-32001-20		KH-32002-20		KH-32003-20		KH-32004-20		KH-32005-20	
23.0 scfh	C	KH-32000-22		KH-32001-22		KH-32002-22		KH-32003-22		KH-32004-22		KH-32005-22	
50.0 scfh	G	KH-32000-24		KH-32001-24		KH-32002-24		KH-32003-24		KH-32004-24		KH-32005-24	
94.0 scfh	SS	—	—	—	—	—	—	KH-32003-26		KH-32004-26		KH-32005-26	
1.5 scfm	SS	—	—	—	—	—	—	KH-32033-27		KH-32034-27		—	—
For water													
10 mL/min	Sa	KH-32000-28		KH-32001-28		KH-32002-28		KH-32003-28		KH-32004-28		KH-32005-28	
20 mL/min	SS	KH-32000-30		KH-32001-30		KH-32002-30		KH-32003-30		KH-32004-30		KH-32005-30	
50 mL/min	G	KH-32000-32		KH-32001-32		KH-32002-32		KH-32003-32		KH-32004-32		KH-32005-32	
100 mL/min	G	KH-32000-34		KH-32001-34		KH-32002-34		KH-32003-34		KH-32004-34		KH-32005-34	
200 mL/min	C	KH-32000-36		KH-32001-36		KH-32002-36		KH-32003-36		KH-32004-36		KH-32005-36	
500 mL/min	SS	KH-32000-38		KH-32001-38		KH-32002-38		KH-32003-38		KH-32004-38		KH-32005-38	
1.2 LPM	SS	KH-32030-40		KH-32031-40		KH-32032-40		KH-32033-40		KH-32034-40		KH-32035-40	
2.0 LPM	T	—	—	—	—	—	—	KH-32033-42		KH-32034-42		KH-32035-42	

*See our specification table (on page 562) for a complete listing of wetted parts. †Sa = sapphire, C = carboloy, SS = 316 stainless steel, G = glass, and T = tantalum

FL Flowmeters

Variable-Area, Direct Reading

GO to ColeParmer.com

For pressure drop information for the flowmeters on this page, simply click on the Catalog Number and go to the "More Info" sidebar.

2" flowmeter 32457-00 shown with tripod base 32462-50

4" flowmeter 32458-26

Cole-Parmer® Acrylic Flowmeters for Bench or Panel Mount

Durable single-piece body withstands severe shock and vibration

- Ideal for process plant applications on air sampling equipment, gas analyzers and chemical feed systems for water treatment
- Flexible design allows for panel or bench mounting

Machined from solid acrylic blocks, these meters have integral metering tubes that provide precise readings even in aggressive plant environments. The meters' inlet/outlet ports and mounting studs are extended for easy panel installation. An alternate option is a tripod base (sold separately below) which allows for mobility from bench to bench.

Note: There are many additional types of acrylic flowmeters not listed here. Contact our Application Specialists for quotes on acrylic meters with special requirements.

For LIQUIDS For GASES

Specifications

Accuracy
2" and 50-mm flowmeters: ±5% full-scale
4" and 100-mm flowmeters: ±3% full-scale
5" and 127-mm flowmeters: ±2% full-scale

Repeatability: ±0.5% full-scale

Maximum pressure: 100 psi

Maximum temperature: 150°F (65°C)

Connections
2", 4", 50-mm, and 100-mm flowmeters: ⅛" NPT(F)*
5" and 127-mm flowmeters: 1" NPT(F)

Dimensions
2" and 50-mm flowmeters: 1"W x 4"H x 2⅛"D
4" and 100-mm flowmeters: 1⅜"W x 6½"H x 2⅛"D
5" and 127-mm flowmeters: 1¾"W x 10⅞"H x 4¾"D

Materials of Construction

Part	2" and 50 mm	4" and 100 mm	5" and 127 mm
Body	Acrylic		
Fittings	Brass		PVC
Valve	Brass		
O-rings	Buna N		
Float (for air)	Black glass (BG)	316 SS (SS)	

Ordering Information for English-Unit Scales

For liquid applications				For air applications		
Cat. no.	**Float†**	**Flow range**	**Price**	**Cat. no.**	**Flow range**	**Price**
Flowmeters with 2" scale						
KH-32457-00	BG	0.2 to 2 GPH		KH-32457-10	0.1 to 1 scfh	
KH-32457-02	SS	0.4 to 5 GPH		KH-32457-12	0.2 to 2 scfh	
KH-32457-04	BG	1 to 10 GPH		KH-32457-14	0.4 to 5 scfh	
KH-32457-06	SS	2 to 20 GPH		KH-32457-16	0.5 to 10 scfh	
KH-32457-08	SS	4 to 40 GPH		KH-32457-18	2 to 20 scfh	
—	—	—	—	KH-32457-20	3 to 30 scfh	
—	—	—	—	KH-32457-22	4 to 50 scfh	
—	—	—	—	KH-32457-24	10 to 100 scfh	
—	—	—	—	KH-32457-26	20 to 200 scfh	
Flowmeters with 4" scale						
KH-32458-00	SS	1 to 10 GPH		KH-32458-10	0.4 to 5 scfh	
KH-32458-02	SS	2 to 25 GPH		KH-32458-12	1 to 10 scfh	
KH-32458-04	SS	4 to 50 GPH		KH-32458-14	2 to 20 scfh	
KH-32458-06	SS	6 to 60 GPH		KH-32458-16	4 to 40 scfh	
KH-32458-07*	SS	0.2 to 2.5 GPM		KH-32458-18	10 to 100 scfh	
KH-32458-08*	SS	0.4 to 5 GPM		KH-32458-20	14 to 150 scfh	
—	—	—	—	KH-32458-22	20 to 200 scfh	
—	—	—	—	KH-32458-24*	0.5 to 5 scfm	
—	—	—	—	KH-32458-26*	1 to 10 scfm	
Flowmeters with 5" scale						
KH-32462-00	SS	0.4 to 5 GPM		KH-32462-10	3 to 25 scfm	
KH-32462-02	SS	1 to 10 GPM		KH-32462-12	4 to 50 scfm	
KH-32462-04	SS	2 to 20 GPM		KH-32462-14	10 to 100 scfm	

*These models have dual scale: GPM/GPH, scfm/scfh, LPM/LPH; they also have ¼" NPT(F) connections and use tripod base 32462-60 sold at right.

†Float material key: BG=black glass, SS=stainless steel

Ordering Information for Metric-Unit Scales

For liquid applications				For air applications		
Cat. no.	**Float†**	**Flow range**	**Price**	**Cat. no.**	**Flow range**	**Price**
Flowmeters with 50-mm scale						
KH-32457-30	BG	5 to 50 mL/min		KH-32457-40	0.04 to 0.5 LPM	
KH-32457-32	BG	10 to 100 mL/min		KH-32457-42	0.1 to 1 LPM	
KH-32457-34	SS	20 to 240 mL/min		KH-32457-44	0.4 to 5 LPM	
—	—	—	—	KH-32457-46	1 to 10 LPM	
—	—	—	—	KH-32457-48	2 to 25 LPM	
—	—	—	—	KH-32457-50	4 to 50 LPM	
—	—	—	—	KH-32457-52	10 to 100 LPM	
Flowmeters with 100-mm scale						
KH-32458-30	BG	4 to 50 mL/min		KH-32458-50	0.4 to 5 LPM	
KH-32458-32	SS	10 to 120 mL/min		KH-32458-52	1 to 10 LPM	
KH-32458-34	BG	25 to 225 mL/min		KH-32458-54	2 to 20 LPM	
KH-32458-36	SS	40 to 400 mL/min		KH-32458-56	3 to 30 LPM	
KH-32458-38	SS	40 to 660 mL/min		KH-32458-58	4 to 50 LPM	
KH-32458-40	SS	100 to 1500 mL/min		KH-32458-60	10 to 100 LPM	
KH-32458-42	SS	200 to 3000 mL/min		KH-32458-62*	14 to 140 LPM	
KH-32458-44*	SS	0.8 to 9 LPM		KH-32458-64*	30 to 280 LPM	
KH-32458-46*	SS	1.5 to 20 LPM		KH-32458-65*	80 to 560 LPM	
Flowmeters with 127-mm scale						
KH-32462-20	SS	1 to 15 LPM		KH-32462-30	100 to 700 LPM	
KH-32462-22	SS	4 to 36 LPM		KH-32462-32	100 to 1400 LPM	
KH-32462-24	SS	5 to 75 LPM		KH-32462-34	400 to 4000 LPM	

Tripod Bases

Durable acrylic base with three leveling screws and spirit level.

Catalog number	Description	Price
EK-32462-50	For one flowmeter with 2" or 50-mm scale	
EK-32462-55	For one flowmeter with 4" or 100-mm scale	
EK-32462-60	For one flowmeter with ¼" connections	

Cole-Parmer® Valved Acrylic Flowmeters for Bench or Panel Mount

Meter with valve provides flow control through a highly durable meter body

- Ideal for process plant applications on air sampling equipment, gas analyzers and chemical feed systems for water treatment
- Integrated precision valve allows precise manual flow across the full scale
- The flexible design allows for panel or bench mounting

Machined from solid acrylic blocks, these meters have integral metering tubes that provide precise readings even in aggressive plant environments. The meters' inlet/outlet ports and mounting studs are extended for easy panel installation. An alternate option is a tripod base (sold separately below) which allows for mobility from bench to bench.

Note: There are many additional types of acrylic flowmeters not listed here. Contact our Application Specialists for quotes on acrylic meters with special requirements.

2" Flowmeter 32460-18 shown with tripod base 32462-50

32461-08

GO to page(s) 487–546

For our selection of barbed and compression fittings.

Specifications

For LIQUIDS For GASES

Accuracy
2" and 50-mm flowmeters: ±5% full-scale
4" and 100-mm flowmeters: ±3% full-scale
5" and 127-mm flowmeters: ±2% full-scale

Repeatability: ±0.5% full-scale

Media type: liquids or gases

Connections
2", 4", 50-mm, and 100-mm flowmeters: ⅛" NPT(F)*
5" and 127-mm flowmeters: 1" NPT(F)

Maximum pressure: 100 psi

Max operating temp: 150°F (65°C)

Dimensions (not including valve stem):
2" and 50-mm flowmeters: 1"W x 4"H x 2⅛"D
4" and 100-mm flowmeters: 1⅜"W x 6½"H x 2⅛"D
5" and 127-mm flowmeters: 1¾"W x 10⅞"H x 4¾"D

Materials of Construction

Part	2" and 50 mm	4" and 100 mm	5" and 127 mm
Body	Acrylic		
Fittings	Brass		PVC
Valve	Brass		
O-rings	Buna N		
Float (for air)	Glass (BG)	316 SS (SS)	

Ordering Information for English-Unit Scales

For liquid applications				For air applications		
Cat. no.	Float†	Flow range	Price	Cat. no.	Flow range	Price
Flowmeters with 2" scale						
KH-32460-00	BG	0.2 to 2 GPH		KH-32460-10	0.1 to 1 scfh	
KH-32460-02	SS	0.4 to 5 GPH		KH-32460-12	0.2 to 2 scfh	
KH-32460-04	BG	1 to 10 GPH		KH-32460-14	0.4 to 5 scfh	
KH-32460-06	SS	2 to 20 GPH		KH-32460-16	0.5 to 10 scfh	
KH-32460-08	SS	4 to 40 GPH		KH-32460-18	2 to 20 scfh	
—	—	—	—	KH-32460-20	3 to 30 scfh	
—	—	—	—	KH-32460-22	4 to 50 scfh	
—	—	—	—	KH-32460-24	10 to 100 scfh	
—	—	—	—	KH-32460-26	20 to 200 scfh	
Flowmeters with 4" scale						
KH-32461-00	SS	1 to 10 GPH		KH-32461-10	0.4 to 5 scfh	
KH-32461-02	SS	2 to 25 GPH		KH-32461-12	1 to 10 scfh	
KH-32461-04	SS	4 to 50 GPH		KH-32461-14	2 to 20 scfh	
KH-32461-06	SS	6 to 60 GPH		KH-32461-16	4 to 40 scfh	
KH-32461-07*	SS	0.2 to 2.5 GPM		KH-32461-18	10 to 100 scfh	
KH-32461-08*	SS	0.4 to 5 GPM		KH-32461-20	14 to 150 scfh	
—	—	—	—	KH-32461-22	20 to 200 scfh	
—	—	—	—	KH-32461-24*	0.5 to 5 scfm	
—	—	—	—	KH-32461-26*	1 to 10 scfm	
Flowmeters with 5" scale						
KH-32466-50	SS	1 to 10 GPM		KH-32466-60	3 to 25 scfm	
KH-32466-52	SS	2 to 20 GPM		KH-32466-62	4 to 50 scfm	
—	—	—	—	KH-32466-64	10 to 100 scfm	

*These models have dual scale: GPM/GPH, scfm/scfh, LPM/LPH; they also have ¼" NPT(F) connections and use tripod base 32462-60 sold at right.

†Float material key: BG=black glass, SS=stainless steel

Ordering Information for Metric-Unit Scales

For liquid applications				For air applications		
Cat. no.	Float†	Flow range	Price	Cat. no.	Flow range	Price
Flowmeters with 50-mm scale						
KH-32460-30	BG	5 to 50 mL/min		KH-32460-40	0.04 to 0.5 LPM	
KH-32460-32	SS	10 to 100 mL/min		KH-32460-42	0.1 to 1 LPM	
KH-32460-34	SS	20 to 240 mL/min		KH-32460-44	0.4 to 5 LPM	
—	—	—	—	KH-32460-46	1 to 10 LPM	
—	—	—	—	KH-32460-48	2 to 25 LPM	
—	—	—	—	KH-32460-50	4 to 50 LPM	
—	—	—	—	KH-32460-52	10 to 100 LPM	
Flowmeters with 100-mm scale						
KH-32461-30	SS	4 to 50 mL/min		KH-32461-50	0.4 to 5 LPM	
KH-32461-32	SS	10 to 120 mL/min		KH-32461-52	1 to 10 LPM	
KH-32461-34	BG	25 to 225 mL/min		KH-32461-54	2 to 20 LPM	
KH-32461-36	SS	40 to 400 mL/min		KH-32461-56	3 to 30 LPM	
KH-32461-38	SS	40 to 660 mL/min		KH-32461-58	4 to 50 LPM	
KH-32461-40	SS	100 to 1500 mL/min		KH-32461-60	10 to 100 LPM	
KH-32461-42	SS	200 to 3000 mL/min		KH-32461-62*	14 to 140 LPM	
KH-32461-44*	SS	0.8 to 9 LPM		KH-32461-64*	30 to 280 LPM	
KH-32461-46*	SS	1.5 to 20 LPM		—	—	—
Flowmeters with 127-mm scale						
KH-32466-54	SS	4 to 36 LPM		KH-32466-66	100 to 700 LPM	
KH-32466-56	SS	5 to 75 LPM		KH-32466-68	100 to 1400 LPM	
—	—	—	—	KH-32466-70	400 to 3400 LPM	

Tripod Bases

Durable acrylic base with three leveling screws and spirit level.

Catalog number	Description	Price
EK-32462-50	For one flowmeter with 2" or 50-mm scale	
EK-32462-55	For one flowmeter with 4" or 100-mm scale	
EK-32462-60	For one flowmeter with ¼" connections	

FL Flowmeters

Variable-Area, Direct Reading

Cole-Parmer® Dual-Media Flowmeters with Dual Scale

Highly flexible design allows a single meter to be used in numerous applications

- Rotate the flow tube to select water or air scale in either English or metric units
- In-line and panel-mount options to suit most system designs
- Ideal for busy process areas—heavy-walled flowtube with metal housing

Specifications & Ordering Information

Accuracy: ±5% full-scale
Max pressure:
150 psi at 200°F (93°C)
Max temp:
250°F (121°C)
Connections: ⅜" NPT(F)

Dimensions
In-line: 2"W x 13¼"H
Panel-mount: 2"W x 10⅜"H x 1⅞"D; valve protrudes 1½" from face. Space between inlet and outlet is 9"

Materials of Construction

Part	Brass	316 SS
Flowtube	Borosilicate glass	
Fittings, valves	Brass	316 SS
O-rings	Viton®	
Float	316 SS	
Frame	Aluminum	

Maximum flow rate				Flowmeters without valve				Flowmeters with valve			
Water		Air		Brass fittings		316 SS fittings		Brass fittings		316 SS fittings	
GPM	LPM	scfm	LPM	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price
In-line flowmeters											
1.2	4.0	5	140	KH-32060-00		KH-32061-00		KH-32060-10		KH-32061-10	
2.0	8.0	10	280	KH-32060-01		KH-32061-01		KH-32060-11		KH-32061-11	
3.0	11.5	15	425	KH-32060-02		KH-32061-02		KH-32060-12		KH-32061-12	
4.0	15.0	20	575	KH-32060-03		KH-32061-03		KH-32060-13		KH-32061-13	
5.0	20.0	30	900	—	—	—	—	KH-32060-14		KH-32061-14	
Panel-mount flowmeters											
1.2	4.0	5	140	KH-32062-00		KH-32062-20		KH-32062-10		KH-32062-30	
2.0	8.0	10	280	KH-32062-02		KH-32062-22		KH-32062-12		KH-32062-32	
3.0	11.5	15	425	—	—	—	—	KH-32062-14		KH-32062-34	
4.0	15.0	20	575	—	—	—	—	KH-32062-16		KH-32062-36	
5.0	20.0	30	900	—	—	—	—	KH-32062-18		KH-32062-38	

Rotate scale around flowtube to select water or air scale.

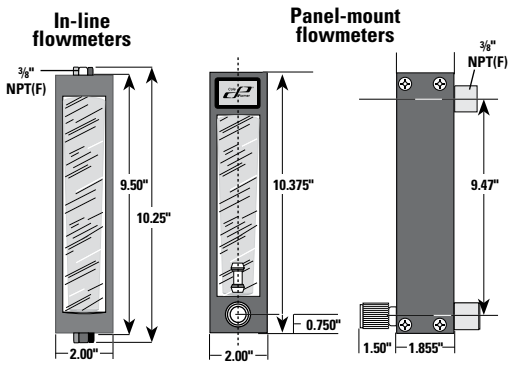
Cole-Parmer® Dual-Scale/Dual-Media PTFE Flowmeters

Use one of these safe-design meters in multiple aggressive chemical applications

- Scale rotates to display rates for either air-like or water-like fluids
- Breakaway back plate protects user in case of pressure surge blowout
- Valved units offer both control and indication of flowrate

These meters have been designed to measure aggressive water-like liquid solutions and aggressive air-like gas mixtures. The dual-scale for liquids measures in GPM and LPM; the dual-scale for gases shows flow rate in scfm and LPM.

32053-26



Front view, without valve | Front view, with valve | Side view, with valve

ISO 9001:2000 SUPPLIER CERTIFIED

Specifications

Accuracy: ±5% full-scale
Maximum pressure: 100 psi
Maximum temp: 150°F (65°C)
Connections: ⅜" NPT(F)
Leak integrity: Each flowmeter is individually leak-tested to 1 x 10^{-7} sccs of helium or better

Materials of Construction

Part	Material
Flowtube	Borosilicate glass
Fittings, valves	PTFE/PCTFE
O-rings	PTFE
Float	PTFE
Frame	Aluminum

Ordering Information

Maximum flow rate				Flowmeters without valve		Flowmeters with valve	
Water		Air					
GPM	LPM	scfm	LPM	Cat. no.	Price	Cat. no.	Price
In-line flowmeters							
0.8	3.0	3.5	100	KH-32053-00		KH-32053-20	
1.5	5.75	7.0	200	KH-32053-02		KH-32053-22	
2.2	8.25	10.5	300	KH-32053-04		KH-32053-24	
2.9	11.0	14.0	400	KH-32053-06		KH-32053-26	
4.1	15.75	22.0	625	—	—	KH-32053-30	
Panel-mount flowmeters							
0.8	3.0	3.5	100	KH-32053-40		KH-32053-60	
1.5	5.75	7.0	200	KH-32053-42		KH-32053-62	
2.2	8.25	10.5	300	KH-32053-44		KH-32053-64	
4.1	15.75	22.5	625	—	—	KH-32053-70	

Cole-Parmer® Acrylic In-Line Flowmeters

A highly durable compact design

- Block body with brass-reinforced connections—virtually unbreakable
- Large scale on a flat surface is easy to read
- Many versions have dual time-unit scales

Designed for rough-duty installations, a built-in guide rod stabilizes the float for easier reading. These are suitable for most general process fluids (brass reinforcing the connection does not come in contact with the fluid). Common applications are for RO systems, air-sampling skids and chemical feed systems in water treatment.

Flowmeter for air 32445-08

Flowmeter for air 32445-00

Specifications

For LIQUIDS | For GASES

Connection	Accuracy	Dimensions (W x H x D)
¼" NPT(M)	±5%	1" x 5 11/32" x 1⅛"
½" NPT(F)	±3%	1½" x 9¼" x 1⅝"
¾" NPT(F)		1½" x 11¼" x 1⅝"

Media type: water or air

Maximum pressure: 100 psig

Max operating temperature: 150°F (65°C)

Materials of Construction

Body	Acrylic
Fittings	PVC
Float	316 SS
O-rings	Buna N
Guide rod	SS

Ordering Information

Cat. no.	Flow range	Connections	Price
For water			
KH-32445-50	1 to 12 GPH	¼" NPT(M)	
KH-32445-52	4 to 25 GPH		
KH-32445-54	6 to 60 GPH		
KH-32445-56	30 to 150 GPH/0.5 to 2.5 GPM	½" NPT(F)	
KH-32445-58	24 to 300 GPH/0.4 to 5 GPM		
KH-32445-60	60 to 600 GPH/1 to 10 GPM	¾" NPT(F)	
KH-32445-62	90 to 900 GPH/1.5 to 15 GPM		
KH-32445-64	120 to 1200 GPH/2 to 20 GPM		
KH-32445-66	4 to 50 LPH	¼" NPT(M)	
KH-32445-68	15 to 100 LPH		
KH-32445-70	30 to 230 LPH		
KH-32445-72	120 to 600 LPH/2 to 10 LPM	½" NPT(F)	
KH-32445-74	120 to 1200 LPH/2 to 20 LPM		
KH-32445-76	240 to 2400 LPH/4 to 40 LPM		
KH-32445-78	360 to 3600 LPH/6 to 60 LPM	¾" NPT(F)	
KH-32445-80	480 to 4200 LPH/8 to 70 LPM		
For air			
KH-32445-00	6 to 60 scfh	¼" NPT(M)	
KH-32445-02	15 to 100 scfh		
KH-32445-04	25 to 300 scfh		
KH-32445-06	180 to 720 scfh/3 to 12 scfm	½" NPT(F)	
KH-32445-08	180 to 1500 scfh/3 to 25 scfm		
KH-32445-10	300 to 3000 scfh/5 to 50 scfm		
KH-32445-11	600 to 4800 scfh /10 to 80 scfm	¾" NPT(F)	
KH-32445-12	200 to 1700 LPH	¼" NPT(M)	
KH-32445-14	500 to 3000 LPH		
KH-32445-16	1000 to 8500 LPH		
KH-32445-18	4800 to 20,400 LPH/80 to 340 LPM	½" NPT(F)	
KH-32445-20	6000 to 42,000 LPH/100 to 700 LPM		
KH-32445-22	9000 to 90,000 LPH/150 to 1500 LPM		
KH-32445-23	12,000 to 13,2000 LPH/200 to 2200 LPM	¾" NPT(F)	

Cole-Parmer® High-Flow Acrylic In-Line Flowmeters

Durable design includes union ends for easy installation and maintenance

The one-piece clear acrylic construction is ideal for damp or corrosive process environments. The stainless steel float moves on a guide rod to help provide a steady read. Scales printed right on the flow tube make accurate readings easier in tough conditions or for dirty fluids.

For LIQUIDS | For GASES

Specifications & Ordering Information

Accuracy: ±5% full-scale

Media type: liquids or gases

Maximum pressure:
100 psig (6.9 bar)

Operating temperature:
150°F (65°C) max

Dimensions
Meters with 1½" connection:
3½"W x 13⅜"H x 3½"D
Meters with 2" connection:
4⅛"W x 13⅝"H x 4⅛"D

Materials of Construction

Body	Acrylic	
Fittings	PVC	SS
O-rings	Buna N	
Float	Aluminum or SS	
Guide rod	SS	

Flow range	Connections	PVC fittings		SS fittings	
		Catalog number	Price	Catalog number	Price
For water					
3 to 30 GPM	1½" NPT(F)	KH-32448-00		KH-32448-04	
4 to 40 GPM		KH-32448-06		KH-32448-10	
5 to 50 GPM		KH-32448-12		KH-32448-16	
6 to 60 GPM	2" NPT(F)	KH-32448-20		KH-32448-24	
8 to 80 GPM		KH-32448-26		KH-32448-30	
10 to 100 GPM		KH-32448-32		KH-32448-36	
For air					
20 to 240 scfm	2" NPT(F)	KH-32448-50		KH-32448-54	

Flowmeter 32448-16 with stainless steel fittings

Flowmeter 32448-32 with PVC fittings

FL Flowmeters

Variable-Area, Direct Reading

Easy-View Acrylic In-Line Flowmeters

Highly durable meters provide an unobstructed 360° view

- Flow ranges up to 50 GPM (200 LPM) with dual-unit scales for flexibility
- Machined from high-quality acrylic rod stock—extremely durable
- The one-piece, in-line body consumes less space for a clean installation

These meters are designed for use in more aggressive process environments. In addition to the machined acrylic bodies, the design utilizes SS float guides. The combination is a meter suitable for high-vibration, high-fluctuation process applications. Some versions include polypropylene end fittings reinforced with aluminum stress rings for added strength to the meters' design.

Models for liquids have direct-reading scales in English and metric units; models for air have direct-reading scales in English.

Specifications for all Flowmeters

Accuracy: ±5% of reading

Max pressure: 150 psi (10.3 bar); 130 psig (8.8 bar) for large-body models

Max temperature: 150°F (65°C); 130°F (54°C) for large-body models

Dimensions

Models with flow rates up to 5 GPM: 8 3/16"H x 1¼" dia

Models with flow rates from 10 to 20 GPM: 11"H x 1¾" dia

Large-body models: 12"H x 2" dia

Materials of Construction

Part	General-purpose	Large-body	With alarm
Body	Acrylic		
Fittings	PP*	PVC	PP*
O-rings	Viton®		
Float	316 SS		
Guide	316 SS		

*Reinforced with aluminum stress rings.

Ordering Information for General-Purpose Flowmeters

Cat. no.	Flow range	Float	Connections	Price
For liquids				
KH-32477-00 KH-32477-02	0.025 to 0.25 GPM/0.1 to 1 LPM	PVC	¼" NPT(F) ⅜" NPT(F)	
KH-32477-04 KH-32477-06	0.1 to 1 GPM/0.4 to 4 LPM	PVC	⅜" NPT(F) ½" NPT(F)	
KH-32477-08 KH-32477-10	0.2 to 2 GPM/1 to 7.5 LPM	316 SS	⅜" NPT(F) ½" NPT(F)	
KH-32477-12 KH-32477-14	0.3 to 3 GPM/1.5 to 11.1 LPM	316 SS	⅜" NPT(F) ½" NPT(F)	
KH-32477-16 KH-32477-18	0.5 to 5 GPM/2.0 to 20 LPM	316 SS	⅜" NPT(F) ½" NPT(F)	
KH-32477-20 KH-32477-22	1 to 10 GPM/4 to 38 LPM	316 SS	¾" NPT(F) 1" NPT(F)	
KH-32477-24 KH-32477-26	1 to 17 GPM/4 to 64 LPM	316 SS	¾" NPT(F) 1" NPT(F)	
KH-32477-28 KH-32477-30	2 to 20 GPM/8 to 80 LPM	316 SS	¾" NPT(F) 1" NPT(F)	
For air				
KH-32477-70 KH-32477-72	0.75 to 7.5 scfm	316 SS	⅜" NPT (F) ½" NPT (F)	
KH-32477-74 KH-32477-76	4.0 to 45 scfm	316 SS	¾" NPT (F) 1" NPT (F)	

Ordering Information for Large-Body Flowmeters

Cat. no.	Flow range	Float	Connections	Price
For liquids				
KH-32477-78 KH-32477-80 KH-32477-82	5 to 25 GPM (20 to 100 LPM) 8 to 40 GPM (30 to 150 LPM) 10 to 50 GPM (40 to 200 LPM)	316 SS	1½" NPT (M)	

General-purpose flowmeter for liquids 32477-26

General-purpose flowmeter for air 32477-76

Large-body flowmeter for liquids 32477-82

Polysulfone In-Line Flowmeters

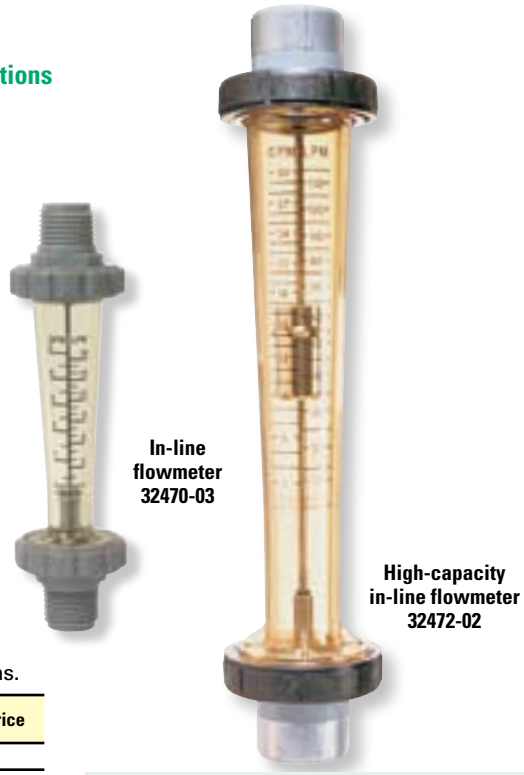
Better than acrylics for aggressive fluids or high temperature and pressure applications

- Flow ranges from less than 0.1 GPM to over 130 GPM and less than 1 scfm to over 230 scfm
- Models with all plastic wetted parts are ideal for ultrapure and deionized water applications

All meters include union connections—installing the meter and cleaning the internals is much easier. The unions also allow simple rotation of the sight-tube for easier reading all while keeping a tight thread seal on the fittings to contain aggressive fluids. With an O-ring seal, a tight seal is assured with O-ring replacement.

Most meters feature dual scales (English or metric) to reduce the need for stocking separate units for shipping to the U.S. or elsewhere. The back-side of the meter body is molded with an opaque surface to make reading easier.

Note: Polysulfone is not suited for direct exposure to sunlight.



In-line flowmeter 32470-03

High-capacity in-line flowmeter 32472-02

Specifications for all Flowmeters

Accuracy:
High capacity: 3% of full-scale
Ultrapure: 2½% of full-scale
Std in-line and panel mount: 5% of full-scale

Max pressure drop: 2 psi

In-Line Flowmeters

This design is the standard and fits well into the piping line for confined or high-traffic areas.

Catalog number	Flow range	Float material	Connections	Dimensions	Maximum temp/pressure	Price
Standard in-line flowmeters for water						
KH-32470-00	0.025 to 0.25 GPM/0.1 to 1.0 LPM	PVC			212°F 150 psig	
KH-32470-01	0.1 to 1.0 GPM/0.4 to 4.0 LPM	316 SS	½" NPT(M)	6 3/16"L x 1 1/16" dia		
KH-32470-02	0.2 to 2.0 GPM /0.75 to 7.5 LPM	316 SS				
KH-32470-03	0.5 to 5.0 GPM /1.8 to 18 LPM	316 SS				
KH-32470-04	1.0 to 10.0 GPM /5.0 to 37.5 LPM	316 SS	¾" NPT(M)	7½"L x 1⅞" dia		
Standard in-line flowmeters for air						
KH-32470-05	1 to 12 scfm	316 SS	½" NPT(M)	8⅞"L x 1⅞" dia	212°F 150 psig	
KH-32470-06	4 to 48 scfm		¾" NPT(M)	10"L x 1⅞" dia		
High-capacity in-line flowmeters for water						
KH-32472-00	1.0 to 10 GPM/3.0 to 38 LPM	316 SS	1" NPT(F)	14½"L x 3 3/16" dia	212°F 150 psig	
KH-32472-01	2.0 to 20 GPM/7.5 to 75 LPM					
KH-32472-02	3.0 to 30 GPM/12 to 115 LPM					
KH-32472-03	4.0 to 40 GPM/15 to 155 LPM					
KH-32473-01	6.0 to 60 GPM/30 to 230 LPM		2" NPT(F)	18⅞"L x 4½" dia	150°F 130 psig	
KH-32473-02	10 to 80 GPM/40 to 300 LPM					
KH-32473-04	15 to 130 GPM/60 to 500 LPM					
High-capacity in-line flowmeters for air						
KH-32473-10	8 to 80 scfm	316 SS	1" NPT(F)	14½"L x 3 3/16" dia	212°F/150 psig	
KH-32473-11	30 to 230 scfm		2" NPT(F)	18⅞"L x 4½" dia	150°F/130 psig	

Ultrapure In-Line Flowmeters

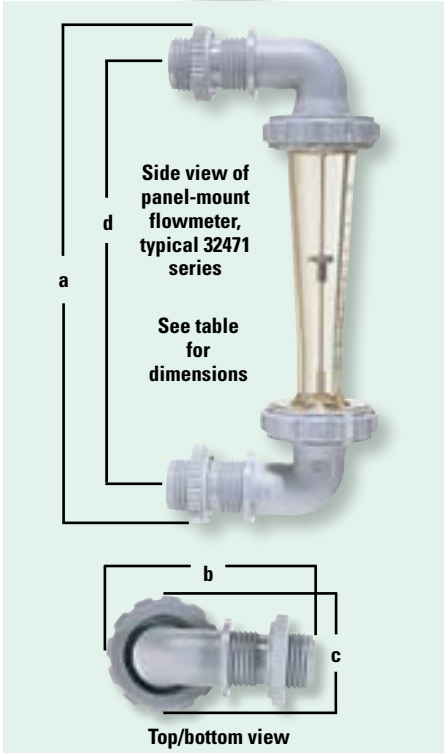
These designs use a fluted meter body instead of a metallic float guide in the other units. There is no metal in the fluid path with these meters.

Catalog number	Flow range	Float material	Connections	Dimensions	Maximum temp/pressure	Price
KH-32475-10	0.1 to 1.2 GPM/0.4 to 4.4 LPM	PTFE	½" NPT(F)	10"L x 1¾" dia	130°F 150 psig	
KH-32475-14	0.2 to 2.0 GPM/0.3 to 8.0 LPM					
KH-32475-22	0.5 to 5.0 GPM/2.0 to 20 LPM					

Panel-Mount Flowmeters

Meters include 90° PVC elbow fittings for panel mounting. Models for air include a valve for control of inlet flow into meter; contact Applications for lower cost air models without a valve.

Catalog number	Flow rate	Float material	Connections	Dimensions (a x b x c, d)	Maximum temp/press	Price
Panel-mount flowmeters for water						
KH-32471-00	0.025 to 0.250 GPM/0.1 to 1.0 LPM	PVC	½" NPT(M)	7⅛" x 3⅛" x 1 1/16", 6"	212°F 150 psig	
KH-32471-01	0.1 to 1.0 GPM/0.4 to 4.0 LPM	316 SS				
KH-32471-02	0.2 to 2.0 GPM/0.75 to 7.5 LPM	316 SS				
KH-32471-03	0.5 to 5.0 GPM/1.8 to 18 LPM	316 SS				
KH-32471-04	1.0 to 10.0 GPM/5.0 to 37.5 LPM	316 SS	¾" NPT(M)	8⅛" x 3 3/16" x 2", 6¾"		
Panel-mount flowmeters for air						
KH-32471-05	1 to 12 scfm	316 SS	½" NPT(M)	9⅞" x 4¼" x 2", 8⅝"	212°F 150 psig	
KH-32471-06	4 to 48 scfm		¾" NPT(M)	10⅝" x 4¼" x 2", 9⅛"		



Side view of panel-mount flowmeter, typical 32471 series

See table for dimensions

Top/bottom view

GO to ColeParmer.com

Click Here

For pressure drop information for flowmeters on this page, enter the Catalog Number into the online "Catalog Search" box and click "Go" then click on "More Info".

FL Flowmeters

Variable-Area, Direct Reading

Cole-Parmer® Stainless Steel Shielded Flowmeters

For the most aggressive process applications

- Flowmeters enclosed in brushed 304 SS case
- Ideal for applications with flow rates up to 116 GPM and 250 scfm

Detachable, clear 3/16"-thick polycarbonate front shield provides protection at maximum rated temperature and pressure. Easily read the graduated direct-reading scale. The interchangeable transparent scale plates mount directly on the front of the flowtube.

Unique float stops allow easy cleaning—remove and replace the float without disturbing either the flowtube or the shield. Tube sizes 3, 4, and 5 are fluted; tube sizes 6, 8, and 9 are tapered with a stainless steel guide rod.

32447-54

Specifications & Ordering Information

Accuracy: ±3% of full-scale
Repeatability: ±0.5% full-scale
Minimum flow rate: approx 10% of max flow rate (see table below)

Max pressure (at 200°F)
Tube sizes 3, 4, 5, and 6: 200 psi
Tube sizes 8, and 9: 125 psi
Max operating temp: 200°F (93°C)

Materials of Construction

Flowtube	Borosilicate glass
Fittings	316 SS
O-rings	Viton®
Float, rod	316 SS
Shield	Polycarbonate

Catalog number	Max flow rate Water (GPM)	Max flow rate Air (scfm)	Float type*	Tube size	Pressure drop (" of H_2O)	Connections	Dimensions (W x H x D)	Price
KH-32447-00	0.25	1.0	LP		—			
KH-32447-02	0.36	1.5	SL	3	2	½" NPT(F)	2½" x 11⅞" x 2⁹⁄₁₆"	
KH-32447-10	0.74	3.0	SL		5			
KH-32447-20	1.0	4.2	LP	4	6		2½" x 11⅞" x 2⁹⁄₁₆"	
KH-32447-32	1.5	6.0	LP	5	—	½" NPT(F)	3⅜" x 13¾" x 3⅞"	
KH-32447-30	2.0	8.2	SL	4	10		2½" x 11⅞" x 2⁹⁄₁₆"	
KH-32447-34	3.8	16	GS	5	10			
KH-32447-40	5.0	21.5	SL	5	14	1" NPT(F)	3⅜" x 13¾" x 3⅞"	
KH-32447-42	6.0	25.5	GV	6	5			
KH-32447-44	7.4	30	GV		6			
KH-32447-50	9.6	40	GS	6	10	1" NPT(F)	3⅜" x 13¾" x 3⅞"	
KH-32447-52	11	45	GS		13			
KH-32447-54	14	62	GS	6	24	1" NPT(F)	3⅜" x 13¾" x 3⅞"	
KH-32447-60	20	90	SL	6	39	1" NPT(F)	3⅜" x 13¾" x 3⅞"	
KH-32447-64	22	90	GV	8	16	2" NPT(F)	5⁵⁄₁₆" x 16" x 5⅜"	
KH-32447-62	26	—†	SL	6	70	1" NPT(F)	3⅜" x 13¾" x 3⅞"	
KH-32447-74	41	160	GV	9	5	2" NPT(F)	5⁵⁄₁₆" x 16" x 5⅜"	
KH-32447-70	44	180	SL	8	30	2" NPT(F)	5⁵⁄₁₆" x 16" x 5⅜"	
KH-32447-80	60	245	GS	9	16	2" NPT(F)	5⁵⁄₁₆" x 16" x 5⅜"	
KH-32447-82	86	—†	SL	9	25			

*LP floats have the lowest pressure loss, GV floats are accurate at higher viscosities, GS floats are accurate at lower viscosities than GV and have a higher flow rate, SL floats have the highest flow rate.
†Flowmeters are for direct reading of water only.

Flowmeter 03231-41 shown with limit switch 03231-80

Flowmeter 03231-41

Spring-Loaded In-Line Flowmeters

Provides accurate readings while mounted in any position

- Rugged design resists shock and vibration
- Control pumps or valves with an optional limit switch

These economical flowmeters are built with a spring-retained piston for direct, accurate readings regardless of the position you mount them. Use them to monitor hydraulic systems or chemical processes; the meters also work well to check pump and control valve performance.

Note: Polysulfone is not suited for direct contact with sunlight.

Specifications

Accuracy: ±5% of full scale
Repeatability: ±1%
Operating pressure: 325 psi (22.4 bar)
Operating temperature: 250°F (121°C)

Dimensions
½" units: 7.75" (197 mm) L
¾" units: 8.25" (210 mm) L
1" units: 5.25" (134 mm) L

Materials of Construction

Part	½" units	¾" & 1" units
Body	Polysulfone	
Fittings	Brass	Polysulfone
Indicator ring/seals	Buna N	
Spring	316 stainless steel	

Ordering Information

Flow range U.S. units	Flow range Metric units	Pressure drop	Water, ½" NPT(F)* Cat. no.	Price	Water, ¾" NPT(M)* Cat. no.	Price	Water, 1" NPT(M)* Cat. no.	Price	Oil, 1" NPT(M)† Cat. no.	Price
0.5 to 4 GPM	2 to 15 LPM	1 psid at 3 GPM	KH-03231-01		KH-03231-21		KH-03231-41		KH-03231-61	
1 to 7 GPM	4 to 26 LPM	2 psid at 6 GPM	KH-03231-03		KH-03231-23		KH-03231-43		—	—
1 to 10 GPM	4 to 35 LPM	3 psid at 9 GPM	KH-03231-07		KH-03231-27		KH-03231-45		—	—
1 to 16 GPM	5 to 60 LPM	7.5 psid at 12 GPM	KH-03231-09		KH-03231-29		KH-03231-47		KH-03231-67	
3 to 18 GPM	15 to 65 LPM	3 psid at 12 GPM	—	—	KH-03231-31		KH-03231-49		—	—
4 to 28 GPM	20 to 100 LPM	7 psid at 21 GPM	—	—	KH-03231-33		KH-03231-51		KH-03231-71	

*Water flowmeters are calibrated for specific gravity = 1.00. †Oil flowmeters are calibrated for specific gravity = 0.876.

Limit switches. Use to provide an output signal at a setpoint anywhere between 0 to 100% of full-scale. Use to control small pumps, valves, or alarms or to interface with a PLC.

KH-03231-80 **AC switch;** 115 VAC ±10%; 0.5 A max
KH-03231-85 **DC switch;** 10 to 30 VDC, 1 A max

Cole-Parmer® Easy-View Correlated Flowmeters

Perfect for large and small bench-scale or lab systems

- Wide 180° viewing angle—view flow tube and float from either front or side
- Rotating shield magnifies tube for precise readings
- Dual-float models have higher flow rates and allow a better than 20:1 turndown ratio

All meters include correlation charts for water and air. Correlation charts for oxygen, nitrogen, hydrogen, carbon dioxide, and helium are available from our Application Specialists upon request. Inlet and outlet ports are located on the back of the flowmeter to keep tubing out of the way. Mount flowmeters vertically on a control panel or bench mount with tripod base (order separately below). Valve included to control flow.

These are Ideal for measuring and regulating flow rates for analytical instruments or industrial chemical processes. Common applications include blending, mixing, and gas purging.

Dual-float flowmeters have a turndown ratio better than 20:1

150-mm flowmeter 32464-12

65-mm flowmeter 32463-50 shown with tripod base 32465-50

Tripod Base

EK-32465-50 **Tripod base** mounts one flowmeter. Includes mounting bracket, leveling screws, and spirit level

Call our Application Specialists for for more information on direct reading versions of this meter.

847-549-7600

Specifications

Media type: water, air, or gases

Accuracy
65-mm flowmeters: ±5% full-scale
150-mm flowmeters: ±3% full-scale

Max operating temperature: 200°F (93°C)

Maximum pressure: 200 psi

Connections: ⅛" NPT(F)

Dimensions
65-mm flowmeters: 1¼"W x 5½"H x 2⅜"D
150-mm flowmeters: 1¼"W x 9 13/16"H x 2⅜"D

Materials of Construction

Part	Aluminum	316 SS
Frame, fittings, valves	Aluminum	316 SS
O-rings	Buna N	Viton®
Flowtube	Borosilicate glass	

Ordering Information for 65-mm Flowmeters

Max flow rate (mL/min)*							Float(s)†	Aluminum		316 SS	
H_2O	Air	O_2	N_2	H_2	He	CO_2		Cat. no.	Price	Cat. no.	Price
Single-float flowmeters											
0.54	50	49	53	102	49	61	G	KH-32463-00		KH-32463-02	
1.23	100	91	106	254	97	115	G	KH-32463-08		KH-32463-10	
1.28	150	136	159	381	145	172	S	KH-32463-12		KH-32463-14	
6.00	400	368	420	1080	440	408	G	KH-32463-20		KH-32463-22	
11	545	501	560	1553	665	512	S	KH-32463-24		KH-32463-26	
30	1175	1116	1210	3748	1997	1046	S	KH-32463-32		KH-32463-34	
55	2500	2375	2550	9525	6725	2025	G	KH-32463-40		KH-32463-42	
146	5000	4750	5100	19,050	13,450	4050	SS	KH-32463-48		KH-32463-50	
240	10,000	9500	10,200	38,100	26,900	8100	G	KH-32463-56		KH-32463-58	
545	20,000	19,000	20,400	96,200	53,800	16,200	S	KH-32463-64		KH-32463-66	
1380	44,425	42,204	45,313	169,259	119,503	35,984	SS	KH-32463-72		KH-32463-74	
Dual-float flowmeters											
2.35	132	120	138	290	128	155	G/SS	KH-32465-00		KH-32465-02	
4.50	265	235	265	580	255	275	G/SS	KH-32465-04		KH-32465-06	
20	800	740	810	2000	1240	710	G/SS	KH-32465-08		KH-32465-10	
46	1675	1580	1700	5025	3400	1460	G/SS	KH-32465-12		KH-32465-14	

Ordering Information for 150-mm Flowmeters

Max flow rate (mL/min)*							Float(s)†	Aluminum		316 SS	
H_2O	Air	O_2	N_2	H_2	He	CO_2		Cat. no.	Price	Cat. no.	Price
Single-float flowmeters											
0.55	50	48	53	102	48	61	G	KH-32464-00		KH-32464-02	
2.15	155	141	164	393	150	178	S	KH-32464-12		KH-32464-14	
5.4	295	271	312	776	310	312	SS	KH-32464-16		KH-32464-18	
23	850	807	867	2584	1334	782	SS	KH-32464-24		KH-32464-26	
27.7	1150	1092	1173	3680	1955	1023	S	KH-32464-28		KH-32464-30	
75	2950	2802	3009	11,239	7935	2389	S	KH-32464-36		KH-32464-38	
126	4550	4322	4641	17,335	12,239	3685	S	KH-32464-40		KH-32464-42	
210	6800	6460	6936	25,908	18,292	5508	SS	KH-32464-44		KH-32464-46	
565	19,050	18,097	19,431	72,580	51,244	15,430	SS	KH-32464-52		KH-32464-54	
1415	46,200	43,890	47,124	176,022	124,278	37,422	SS	KH-32464-60		KH-32464-62	
2200	72,600	68,970	74,052	276,606	195,294	58,806	T	KH-32464-64		KH-32464-66	
Dual-float flowmeters											
2.5	152	142	156	340	153	167	G/SS	KH-32466-00		KH-32466-02	
5.4	290	260	300	640	290	300	G/SS	KH-32466-04		KH-32466-06	
22.2	870	820	895	2175	1435	790	G/SS	KH-32466-08		KH-32466-10	
47.5	1700	1610	1745	5100	3535	1490	G/SS	KH-32466-12		KH-32466-14	
125	4430	4170	4500	15,060	9600	3800	G/SS	KH-32466-16		KH-32466-18	
188	6500	6150	6650	23,400	14,600	5600	G/SS	KH-32466-20		KH-32466-22	
500	17,000	16,000	17,250	64,250	38,600	14,200	G/SS	KH-32466-24		KH-32466-26	

*Minimum flow rate is approximately 10% of the maximum flow rate using a single-float and 5% using a dual-float.
†Float material key: G = glass, S = sapphire, SS = stainless steel, and T = tantalum.

FL Flowmeters

Variable-Area, Correlated

Cole-Parmer® 65-mm Flowmeters

Clear polycarbonate front shield magnifies scale 16% for easier reading

- A vertical tangential locator line ensures hairline accuracy in reading float position
- Ceramic millimeter scale is fused directly to flowtube
- 16-turn high-precision valve features a "nonrising stem" to more accurately set your desired flow point

Each flowmeter consists of a heavy-walled glass flowtube mounted in a frame with white acrylic back plate (⅛" thick). **Aluminum** flowmeters are economical and good for general use with noncorrosive gases and liquids. **Brass** flowmeters are economical and good for use with water.

316 stainless steel flowmeters feature excellent chemical compatibility. Select a flowmeter with a high-precision valve for superior flow rate control—ideal for low-flow applications or for any application where you need precise flow control. All flowmeters come with correlation data sheets for water and air at standard temperature and pressure (STP). We can also supply calibration data for oxygen, nitrogen, hydrogen, helium, CO_2, argon, other liquids and gases, and for conditions other than STP—call our Application Specialists for more information.

GO to ColeParmer.com

For pressure drop information for the flowmeters on this page, simply click on the Catalog Number and go to the "More Info" sidebar.

Brass flowmeter
03268-64

Front shield magnifies the scale 16% for easy reading

ISO9001:2000 SUPPLIER CERTIFIED | For LIQUIDS | For GASES

Specifications

Accuracy: ±2% full-scale
Repeatability: ±0.25% full-scale
Operating temperature: –15 to 250°F (–26 to 121°C)
Maximum pressure: 200 psi
Connections: ⅛" NPT(F)

Materials of Construction

Part	Aluminum	Brass	SS
Flowtube	Borosilicate glass		
Fittings, valves	Aluminum	Chrome-plated brass	316 SS
O-rings	Buna N		Viton®
Float	Glass, 316 SS, or carboloy		
Shield	Polycarbonate		
Frame	Aluminum/acrylic		

Ordering Information

Maximum flow rate (mL/min)†								Float‡	Correlated meters without valves		
									Aluminum	Brass	316 SS
H_2O*	Air*	O_2	N_2	H_2	He	CO_2	Ar		Cat. no.	Cat. no.	Cat. no.
0.065	5.8	5.1	5.6	14	5.5	6.6	4.3	G	KH-03266-00	KH-03268-50	KH-03268-01
0.283	16.7	15.3	17.6	32	15.8	20.2	14.2	SS	KH-03266-02	KH-03268-52	KH-03268-03
0.55	48.7	46	51	99	47	59.2	38	G	KH-03266-04	KH-03268-54	KH-03268-05
1.75	104	94	113	284	99	122	86	G	KH-03266-08	KH-03268-58	KH-03268-09
2.38	145	132	149	314	146	160	122	SS	KH-03266-06	KH-03268-56	KH-03268-07
2.6	202.1	189	215	502	211	221	174.2	G	KH-03266-15	KH-03268-62	KH-03268-18
7.74	299	268	312	828	313	310	246	SS	KH-03266-09	KH-03268-60	KH-03268-16
12	522	480	530	1488	636	489	429	SS	KH-03266-17	KH-03268-64	KH-03268-15
20.5	992	970	1015	3218	1903	883	829	G	KH-03266-19	KH-03268-65	KH-03268-20
27	1249	1165	1293	3923	1990	1110	1065	G	KH-03266-16	KH-03268-66	KH-03268-17
39.7	2040	1928	2091	6359	3470	1794	1784	G	KH-03266-20	KH-03268-70	KH-03268-21
52	2678	2323	2624	9410	4853	2237	2171	G	KH-03266-24	KH-03268-74	KH-03268-25
55.5	1946	1842	1983	6598	4128	1699	1645	SS	KH-03266-21	KH-03268-67	KH-03268-22
70.7	2520	2360	2610	8602	4970	2190	2124	SS	KH-03266-18	KH-03268-68	KH-03268-19
108.3	3990	3761	4097	13,600	8699	3449	3388	SS	KH-03266-22	KH-03268-72	KH-03268-23
147	6318	5880	6380	21,712	13,750	5470	5290	G	KH-03266-28	KH-03268-78	KH-03268-29
150	4922	4733	5026	17,966	10,947	4225	4172	SS	KH-03266-26	KH-03268-76	KH-03268-27
309	13,153	12,341	13,412	47,100	29,762	11,156	11,125	G	KH-03266-32	KH-03268-82	KH-03268-33
364	12,058	11,250	12,200	42,040	27,300	10,150	10,175	SS	KH-03266-30	KH-03268-80	KH-03268-31
745	24,680	23,322	25,311	90,323	58,472	20,798	21,116	SS	KH-03266-34	KH-03268-84	KH-03268-35
								Price			
High-flow flowmeters											
522	23,169	21,686	23,506	80,752	51,380	19,379	19,817	G	KH-03266-36	KH-03268-86	KH-03268-37
1261	42,094	40,053	43,487	154,750	104,600	35,100	37,441	SS	KH-03266-38	KH-03268-88	KH-03268-39
1866	58,500	55,539	60,618	220,500	148,114	47,950	50,200	C	KH-03266-40	KH-03268-90	KH-03268-41
								Price			

*Correlation data sheets for water and air are included with flowmeters.
†Flow rates are at standard temperature and pressure (70°F and 14.7 psi). Minimum flow rate is approx 10% of the maximum flow rate.
‡Float material key: G = glass, SS = 316 stainless steel, C = carboloy

Add *these options*

- Fittings..... 487-546
- Tubing..... 1845-1882

Flowmeters FL

Variable-Area, Correlated

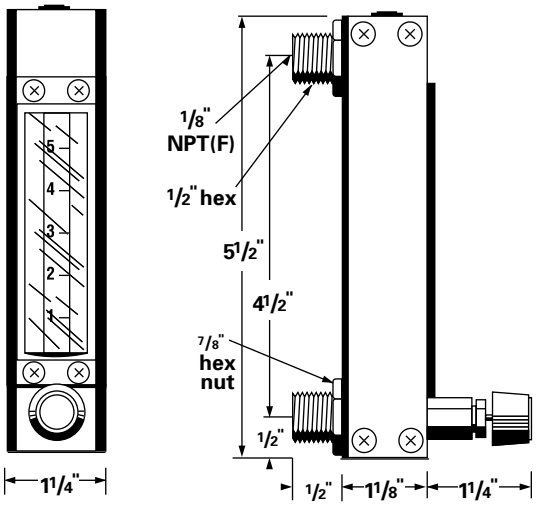
GO to page(s) 585–594

Calibration of each meter is done with fluid at 14.7 psi and 70°F. If fluid pressure or temperature will fluctuate significantly from these values (±10% or more), Cole-Parmer recommends using the meter with a pressure-compensating flow controller listed on either page 592 or page 596.

For fully automated flow metering or control under fluctuating conditions, please see our selection of devices on pages 705–714.

To Panel Mount

Drill two holes to fit the inlet and outlet according to the diagrams below. Face width is 1¼". Secure flowmeter with the two retaining nuts (included).



Aluminum flowmeter with valve 03216-00

Aluminum flowmeter with high-resolution valve 32044-00

Ordering Information

	Correlated meters with valves			Correlated meters with high-resolution valves		
	Aluminum	Brass	316 SS	Aluminum	Brass	316 SS
	Cat. no.	Cat. no.	Cat. no.	Cat. no.	Cat. no.	Cat. no.
	KH-03216-00	KH-03293-00	KH-03218-01	KH-32044-00	KH-32045-00	KH-32046-01
	KH-03216-02	KH-03293-02	KH-03218-03	KH-32044-02	KH-32045-02	KH-32046-03
	KH-03216-04	KH-03293-04	KH-03218-05	KH-32044-04	KH-32045-04	KH-32046-05
	KH-03216-08	KH-03293-08	KH-03218-09	KH-32044-08	KH-32045-08	KH-32046-09
	KH-03216-06	KH-03293-06	KH-03218-07	KH-32044-06	KH-32045-06	KH-32046-07
	KH-03216-12	KH-03293-12	KH-03218-13	KH-32044-12	KH-32045-12	KH-32046-13
	KH-03216-10	KH-03293-10	KH-03218-11	KH-32044-10	KH-32045-10	KH-32046-11
	KH-03216-14	KH-03293-14	KH-03218-15	KH-32044-14	KH-32045-14	KH-32046-15
	KH-03216-15	KH-03293-15	KH-03218-16	KH-32044-15	KH-32045-15	KH-32046-16
	KH-03216-16	KH-03293-16	KH-03218-17	KH-32044-16	KH-32045-16	KH-32046-17
	KH-03216-20	KH-03293-20	KH-03218-21	KH-32044-20	KH-32045-20	KH-32046-21
	KH-03216-24	KH-03293-24	KH-03218-25	KH-32044-24	KH-32045-24	KH-32046-25
	KH-03216-17	KH-03293-17	KH-03218-18	KH-32044-17	KH-32045-17	KH-32046-18
	KH-03216-18	KH-03293-18	KH-03218-19	KH-32044-18	KH-32045-18	KH-32046-19
	KH-03216-22	KH-03293-22	KH-03218-23	KH-32044-22	KH-32045-22	KH-32046-23
	KH-03216-28	KH-03293-28	KH-03218-29	KH-32044-28	KH-32045-28	KH-32046-29
	KH-03216-26	KH-03293-26	KH-03218-27	KH-32044-26	KH-32045-26	KH-32046-27
	KH-03216-32	KH-03293-32	KH-03218-33	KH-32044-32	KH-32045-32	KH-32046-33
	KH-03216-30	KH-03293-30	KH-03218-31	KH-32044-30	KH-32045-30	KH-32046-31
	KH-03216-34	KH-03293-34	KH-03218-35	KH-32044-34	KH-32045-34	KH-32046-35
	High-flow flowmeters					
	KH-03216-36	KH-03293-36	KH-03218-37	KH-32044-36	KH-32045-36	KH-32046-37
	KH-03216-38	KH-03293-38	KH-03218-39	KH-32044-38	KH-32045-38	KH-32046-39
	KH-03216-40	KH-03293-40	KH-03218-41	KH-32044-40	KH-32045-40	KH-32046-41

INNOCAL®

INNOVATIVE CALIBRATION SOLUTIONS

NIST TRACEABLE

Service includes a NIST-traceable calibration certificate with before and after test data at five- to seven points across range (0.1 to 60 LPM, 1 to 60,000 sccm).

EK-17080-00 NIST-traceable certificate for air/gas flowmeter

EK-17080-10 NIST-traceable certificate for mass flowmeter

Tripod Bases

Securely stand up to three flowmeters in any combination. Three leveling screws and spirit level are built into a clear acrylic base.

Catalog number	Number of meters held	Price
EK-03226-10	1	
EK-03226-30	1, 2, or 3	

FL Flowmeters

Variable-Area, Correlated

Cole-Parmer® 150-mm Flowmeters

Longer 150-mm scale makes these flowmeters perfect for applications demanding high resolution

Aluminum flowmeter without valve 03267-00

- Ceramic millimeter scale is fused directly to flowtube
- A vertical tangential locator line ensures hairline accuracy in reading float position
- 16-turn high-precision valve features a "nonrising stem" to more accurately set your desired flow point

Each flowmeter consists of a heavy-walled glass flowtube mounted in a frame with white acrylic back plate (⅛" thick). Aluminum flowmeters are economical and good for general use with noncorrosive gases and liquids. Brass flowmeters are economical and good for use with water.

The 316 stainless steel flowmeters feature excellent chemical compatibility. Select a flowmeter with a high-precision valve for superior flow rate control—ideal for low-flow applications, for metering samples, and calibration gases for gas analyzers.

All flowmeters come with correlation data sheets for water and air at standard temperature and pressure (STP). We can also supply calibration data for oxygen, nitrogen, hydrogen, helium, CO_2, argon, other liquids and gases, and for conditions other than STP—call our Application Specialists for more information.

Front shield magnifies the scale 16% for easy reading

GO to ColeParmer.com

For pressure drop information for the flowmeters on this page, simply click on the Catalog Number and go to the "More Info" sidebar.

ISO9001:2000 SUPPLIER CERTIFIED

For LIQUIDS

For GASES

Specifications

Accuracy: ±2% full-scale
Repeatability: ±0.25% full-scale
Operating temperature: –15 to 250°F (–26 to 121°C)
Maximum pressure: 200 psi
Connections: ⅛" NPT(F)

Materials of Construction

Part	Aluminum	Brass	SS
Flowtube	Borosilicate glass		
Fittings, valves	Aluminum	Chrome-plated brass	316 SS
O-rings	Buna N		Viton®
Float	Glass, 316 SS, or carboloy		
Shield	Polycarbonate		
Frame	Aluminum/acrylic		

Ordering Information

Maximum flow rate (mL/min)†								Float‡	Correlated meters without valves		
									Aluminum	Brass	316 SS
H_2O*	Air*	O_2	N_2	H_2	He	CO_2	Ar		Cat. no.	Cat. no.	Cat. no.
0.19	18.7	17	20	37	16	23.6	15.4	G	KH-03267-00	KH-03269-50	KH-03269-01
0.53	49.1	42	48	94	46.2	56.4	43.5	G	KH-03267-04	KH-03269-54	KH-03269-05
0.85	92	81	92	208	90.1	103.1	75.6	G	KH-03267-08	KH-03269-58	KH-03269-09
0.94	73.1	54	62	123	53	72	49	SS	KH-03267-02	KH-03269-52	KH-03269-03
2.45	137	131	143	301	133	150	113	SS	KH-03267-06	KH-03269-56	KH-03269-07
4.74	264	233	271	627	283	281	218	SS	KH-03267-09	KH-03269-60	KH-03269-16
5.5	374	340	382	1021	450	355	305	G	KH-03267-15	KH-03269-62	KH-03269-18
16.5	825	772	827	2620	1490	725	687	G	KH-03267-16	KH-03269-66	KH-03269-17
20.4	817.1	753	824	2496	1290	728	676	SS	KH-03267-17	KH-03269-64	KH-03269-15
46	1682	1545	1662	5547	3397	1420	1380	SS	KH-03267-18	KH-03269-68	KH-03269-19
53.5	2313	2169	2395	7817	4880	2048	1949	G	KH-03267-20	KH-03269-70	KH-03269-21
84	3807	3485	3868	13,105	7803	3374	3151	G	KH-03267-24	KH-03269-74	KH-03269-25
130.4	4562	4341	4685	15,855	9770	3990	3903	SS	KH-03267-22	KH-03269-72	KH-03269-23
210	8678	8269	8916	29,840	19,426	7485	7366	G	KH-03267-28	KH-03269-78	KH-03269-29
217	7590	6992	7722	27,804	15,960	6308	6384	SS	KH-03267-26	KH-03269-76	KH-03269-27
506	16,737	15,710	17,021	59,996	38,576	14,051	14,131	SS	KH-03267-30	KH-03269-80	KH-03269-31
								Price			
High-flow flowmeters											
541	22,586	22,263	33,920	85,812	54,586	19,654	20,035	G	KH-03267-32	KH-03269-82	KH-03269-33
1288	41,512	39,567	43,000	159,699	113,034	36,788	37,550	SS	KH-03267-34	KH-03269-84	KH-03269-35
1881	59,494	54,902	59,580	221,872	146,500	54,163	56,044	C	KH-03267-36	KH-03269-86	KH-03269-37
								Price			

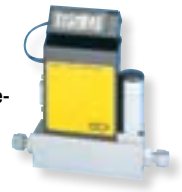
*Correlation data sheets for water and air are included with flowmeters.
†Flow rates are at standard temperature and pressure (70°F and 14.7 psi). Minimum flow rate is approx 10% of the maximum flow rate.
‡Float material key: G = glass, SS = 316 stainless steel, C = carboloy

Flowmeters FL

Variable-Area, Correlated

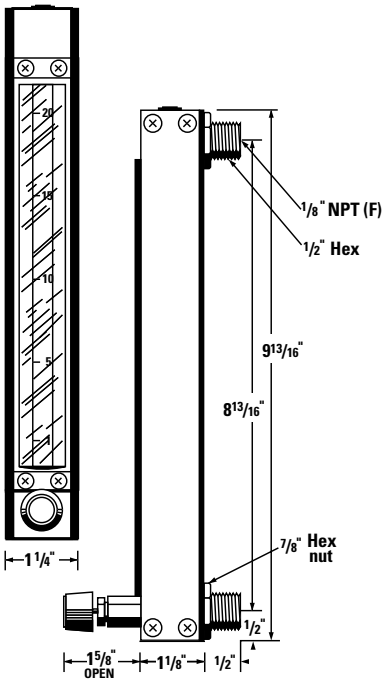
GO to page(s) 585–594

Calibration of each meter is done with fluid at 14.7 psi and 70°F. If fluid pressure or temperature will fluctuate significantly from these values (±10% or more), Cole-Parmer recommends using the meter with a pressure-compensating flow controller listed on either page 592 or page 596. For fully automated flow metering or control under fluctuating conditions, please see our selection of devices on pages 585–594.



To Panel Mount

Drill two holes to fit inlet and outlet according to the diagrams below. Face width is 1¼". Secure flowmeter with the two retaining hex nuts (included).



Tripod Bases

Securely bench mount up to three flowmeters in any combination. Three leveling screws and spirit level are built into a clear acrylic base.

Catalog number	Number of meters held	Price
EK-03226-10	1	
EK-03226-30	1, 2, or 3	

316 SS flowmeter with high-resolution valve 03229-01

Brass flowmeter with valve 03294-16

Ordering Information

	Correlated meters with valves			Correlated meters with high-resolution valves		
	Aluminum	Brass	316 SS	Aluminum	Brass	316 SS
	Cat. no.	Cat. no.	Cat. no.	Cat. no.	Cat. no.	Cat. no.
	KH-03217-00	KH-03294-00	KH-03219-01	KH-03227-00	KH-03295-00	KH-03229-01
	KH-03217-04	KH-03294-04	KH-03219-05	KH-03227-04	KH-03295-04	KH-03229-05
	KH-03217-08	KH-03294-08	KH-03219-09	KH-03227-08	KH-03295-08	KH-03229-09
	KH-03217-02	KH-03294-02	KH-03219-03	KH-03227-02	KH-03295-02	KH-03229-03
	KH-03217-06	KH-03294-06	KH-03219-07	KH-03227-06	KH-03295-06	KH-03229-07
	KH-03217-10	KH-03294-10	KH-03219-11	KH-03227-10	KH-03295-10	KH-03229-11
	KH-03217-12	KH-03294-12	KH-03219-13	KH-03227-12	KH-03295-12	KH-03229-13
	KH-03217-16	KH-03294-16	KH-03219-17	KH-03227-16	KH-03295-16	KH-03229-17
	KH-03217-14	KH-03294-14	KH-03219-15	KH-03227-14	KH-03295-14	KH-03229-15
	KH-03217-18	KH-03294-18	KH-03219-19	KH-03227-18	KH-03295-18	KH-03229-19
	KH-03217-20	KH-03294-20	KH-03219-21	KH-03227-20	KH-03295-20	KH-03229-21
	KH-03217-24	KH-03294-24	KH-03219-25	KH-03227-24	KH-03295-24	KH-03229-25
	KH-03217-22	KH-03294-22	KH-03219-23	KH-03227-22	KH-03295-22	KH-03229-23
	KH-03217-28	KH-03294-28	KH-03219-29	KH-03227-28	KH-03295-28	KH-03229-29
	KH-03217-26	KH-03294-26	KH-03219-27	KH-03227-26	KH-03295-26	KH-03229-27
	KH-03217-30	KH-03294-30	KH-03219-31	KH-03227-30	KH-03295-30	KH-03229-31
	High-flow flowmeters					
	KH-03217-32	KH-03294-32	KH-03219-33	KH-03227-32	KH-03295-32	KH-03229-33
	KH-03217-34	KH-03294-34	KH-03219-35	KH-03227-34	KH-03295-34	KH-03229-35
	KH-03217-36	KH-03294-36	KH-03219-37	KH-03227-36	KH-03295-36	KH-03229-37

INNOCAL® INNOVATIVE CALIBRATION SOLUTIONS

NIST TRACEABLE

Service includes a NIST-traceable calibration certificate with before and after test data at five- to seven points across range (0.1 to 60 LPM, 1 to 60,000 sccm).

EK-17080-00 **NIST-traceable certificate for air/gas flowmeter**

EK-17080-10 **NIST-traceable certificate for mass flowmeter**

FL Flowmeters

Variable-Area, Correlated

Cole-Parmer® 65-mm Flowmeters with PTFE

Designed for high-purity applications with flexibility for a broad array of gases

- Compact design is ideal for small panels or cramped workspaces
- High turndown—minimum flow rate is less than one-tenth of maximum flow
- High-precision valve option allows monitoring and control

Front shield magnifies the scale 16% for easy reading

The substitution of metal fittings with PTFE eliminates a potential contamination source for high-purity applications. The glass tube utilizes a fused ceramic scale for a precise, permanent measuring guide. In addition, a vertical-tangential locator line provides readings with hairline accuracy. Further improving readability is a front shield that magnifies the scale 16%. An anodized aluminum frame protects the heavy-walled glass flowtube; a white acrylic backplate protects and enhances viewing in the protective frame.

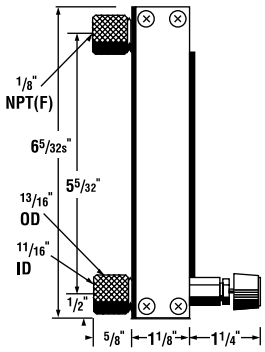
Select a flowmeter with a valve for flow rate control. The standard valve is suitable where high resolution metering is not essential. The high precision valve features a fine-adjust 16-turn "non-rising stem" to more accurately set your desired flow rate.

All flowmeters come with correlation data sheets for water and numerous gases (listed below) at standard temperature and pressure (STP).

65-mm PTFE flowmeter with valve 03216-50

To Panel Mount

Drill two holes to fit the inlet and outlet according to the diagram at left. Face width is 1¼". Secure flowmeter with the two retaining nuts (included).



Specifications

Accuracy:
±2% full-scale

Repeatability:
±0.25% full-scale

Operating temp:
–15 to 150°F
(–26 to 65°C)

Maximum pressure:
100 psi

Connections:
⅛" NPT(F)

Materials of Construction

Part	Material
Flowtube	Borosilicate glass
Fittings, valves	PTFE/PCTFE
O-rings	PTFE
Float	PTFE
Frame	Aluminum

ISO9001:2000 SUPPLIER CERTIFIED

For LIQUIDS

For GASES

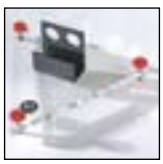
Ordering Information

Maximum flow rate (mL/min)†								Float‡	Flowmeters without valves	Flowmeters with valves	Flowmeters with high-resolution valves
H_2O*	Air*	O_2	N_2	H_2	He	CO_2	Ar		Catalog number	Catalog number	Catalog number
0.084	8.3	7.1	8.5	15.3	7.9	10	7.7	Sa	KH-03266-50	KH-03216-50	KH-32044-50
0.55	48.7	46	51	99	47	59.2	38	G	KH-03266-52	KH-03216-52	KH-32044-52
0.98	72.3	72	78	150	71	90	63	Sa	KH-03266-55	KH-03216-55	KH-32044-55
1.75	104	94	113	284	99	122	86	G	KH-03266-57	KH-03216-57	KH-32044-57
3.44	159	147	167	435	157	181	131	Sa	KH-03266-60	KH-03216-60	KH-32044-60
2.6	202.1	189	215	502	211	221	174.2	G	KH-03266-62	KH-03216-62	KH-32044-62
4.7	300	279	312	788	327	307	257	Sa	KH-03266-65	KH-03216-65	KH-32044-65
20.5	986	970	1015	3218	1903	883	829	G	KH-03266-67	KH-03216-67	KH-32044-67
34	1299	1217	1321	4215	2606	1143	1095	Sa	KH-03266-70	KH-03216-70	KH-32044-70
36.7	1623	1575	1710	5470	2950	1500	1395	Sa	KH-03266-75	KH-03216-75	KH-32044-75
39.7	2040	1928	2091	6359	3470	1794	1784	G	KH-03266-77	KH-03216-77	KH-32044-77
61	2704	2522	2859	9130	4932	2314	2279	Sa	KH-03266-80	KH-03216-80	KH-32044-80
147	6318	5880	6380	21,712	13,750	5470	5290	G	KH-03266-82	KH-03216-82	KH-32044-82
217	8145	7640	8280	28,211	18,500	6980	6900	Sa	KH-03266-85	KH-03216-85	KH-32044-85
309	13,153	12,341	13,412	47,100	29,762	11,156	11,125	G	KH-03266-87	KH-03216-87	KH-32044-87
								Price			
High-flow flowmeters											
522	23,169	21,686	23,506	80,752	51,380	19,379	19,817	G	KH-03266-88	KH-03216-88	KH-32044-88
798	29,218	27,901	30,337	106,000	67,754	24,630	24,597	Sa	KH-03266-90	KH-03216-90	KH-32044-90
								Price			

*Correlation data sheets for water and air are included with flowmeters.
†Flow rates are at standard temperature and pressure (70°F and 14.7 psi). Minimum flow rate is approx 10% of the maximum flow rate.
‡Float material key: G = glass, Sa = sapphire

Tripod Bases

Securely stand up to three flowmeters in any combination. Three leveling screws and spirit level are built into a clear acrylic base.



Catalog number	Number of meters held	Price
EK-03226-10	1	
EK-03226-30	1, 2, or 3	

GO to page(s) 596

For air control applications involving line temperature and pressure fluctuations, we recommend placing an all-mechanical flow controller upstream of your variable area meter. See page 596 for specifications and ordering information.

GO to ColeParmer.com

For pressure drop information for the flowmeters on this page, simply click on the Catalog Number and go to the "More Info" sidebar.

Cole-Parmer 150-mm Flowmeters with PTFE

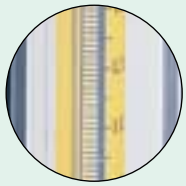
Designed for high-purity applications with flexibility for a broad array of gases

- Longer scale improves control resolution and readability for critical applications
- High turndown—minimum flow rate is less than one-tenth of maximum flow
- High-precision valve option allows monitoring and control

The substitution of metal fittings with PTFE eliminates a potential contamination source for high-purity applications. The glass tube utilizes a fused ceramic scale for a precise, permanent measuring guide. In addition, a vertical tangential locator line provides readings with hairline accuracy. Further improving readability is a front shield that magnifies the scale 16%. An anodized aluminum frame protects the heavy-walled glass flowtube; a white acrylic backplate protects and enhances viewing in the protective frame.

Select a flowmeter with a valve for flow rate control. The standard valve is suitable where high resolution metering is not essential. The high precision valve features a fine-adjust 16-turn "non-rising stem" to more accurately set your desired flow rate.

All flowmeters come with correlation data sheets for water and numerous gases (listed below) at standard temperature and pressure (STP).

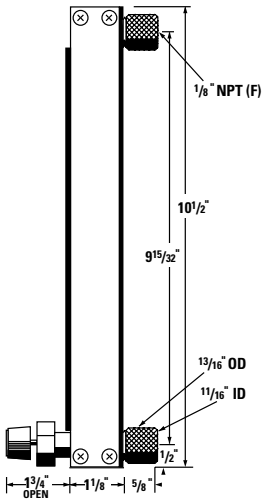


Front shield magnifies the scale 16% for easy reading

150-mm PTFE flowmeter with valve 03217-55

To Panel Mount

Drill two holes to fit the inlet and outlet according to the diagram at right. Face width is 1¼". Secure flowmeter with the two retaining nuts (included).



ISO 9001:2000 SUPPLIER CERTIFIED

For LIQUIDS

For GASES

Specifications

Accuracy: ±2% full-scale
Repeatability: ±0.25% full-scale
Operating temperature: –15 to 150°F (–26 to 65°C)
Maximum pressure: 100 psi
Connections: ⅛" NPT(F)

Materials of Construction

Flowtube	Borosilicate glass
Fittings, valves	PTFE/PTCFE
O-rings	PTFE
Float	Glass or sapphire
Shield	Polycarbonate
Frame	Aluminum/acrylic

Ordering Information

Maximum flow rate (mL/min)†								Float‡	Flowmeters without valves	Flowmeters with valves	Flowmeters with high-resolution valves
H_2O*	Air*	O_2	N_2	H_2	He	CO_2	Ar		Cat. no.	Cat. no.	Cat. no.
0.39	30	27	31	59	26	36.8	24.5	Sa	KH-03267-50	KH-03217-50	KH-03217-52
0.53	49	49	56	100	47	56.8	43.5	G	KH-03267-52	KH-03217-51	KH-03217-53
0.85	92	81	92	208	90.1	103.1	75.6	G	KH-03267-57	KH-03217-56	KH-03217-58
0.99	73	70	76	149	69	84	60.1	Sa	KH-03267-55	KH-03217-55	KH-03217-57
1.92	140	121	139	322	142	157	110.9	Sa	KH-03267-60	KH-03217-60	KH-03217-62
5.5	374	340	382	1021	450	355	305	G	KH-03267-62	KH-03217-61	KH-03217-63
9.9	513	472	520	1497	681	472	429	Sa	KH-03267-65	KH-03217-65	KH-03217-67
16.5	825	772	827	2620	1490	725	687	G	KH-03267-67	KH-03217-66	KH-03217-68
26.1	1093	1024	1110	3546	2059	944	910	Sa	KH-03267-70	KH-03217-70	KH-03217-72
53.5	2313	2169	2395	7817	4880	2048	1949	G	KH-03267-72	KH-03217-71	KH-03217-79
77.8	3079	2860	3142	10,455	6458	2620	2605	Sa	KH-03267-75	KH-03217-75	KH-03217-73
84	3807	3485	3868	13,105	7803	3374	3151	G	KH-03267-77	KH-03217-77	KH-03217-83
126	5005	4652	5090	16,108	10,336	4388	4175	Sa	KH-03267-80	KH-03217-80	KH-03217-74
210	8678	8269	8916	29,840	19,426	7485	7366	G	KH-03267-82	KH-03217-81	KH-03227-84
306	11,356	10,706	11,524	40,006	25,400	9557	9539	Sa	KH-03267-85	KH-03217-85	KH-03217-76
High-flow flowmeters											
541	22,536	21,350	23,512	85,812	53,100	18,989	19,761	G	KH-03267-87	KH-03217-87	KH-03227-87
806	29,560	27,181	29,930	110,101	70,100	23,855	24,563	Sa	KH-03267-90	KH-03217-90	KH-03217-78
								Price	-	-	-

*Correlation data sheets for water and air are included with flowmeters.
†Flow rates are at standard temperature and pressure (70°F and 14.7 psi). Minimum flow rate is approx 10% of the maximum flow rate.
‡Float material key: G = glass, Sa = sapphire

INNOCAL® INNOVATIVE CALIBRATION SOLUTIONS

NIST TRACEABLE

Service includes a NIST-traceable calibration certificate with before and after test data at five- to seven points across range (0.1 to 60 LPM, 1 to 60,000 sccm).

EK-17080-00 **NIST-traceable certificate for air/gas flowmeter**
EK-17080-10 **NIST-traceable certificate for mass flowmeter**

Add *these options*

- Fittings.....487–546
- Tubing..... 1845-1882

FL Flowmeters

Variable-Area, Direct Reading

Cole-Parmer® Heavy-Duty PTFE/PFA Flowmeters

Unique combination of rugged frame and chemically inert wetted materials

- The rigid aluminum frame is PFA coated to resist ambient corrosives
- Available in a 75-mm compact design or a 125-mm full-size for higher flows
- Ideal for etchants and high-purity water

Also included is a polycarbonate front shield that magnifies readings 16%. Within the tube is a guide rod to stabilize the float for better readings in extreme high/low flow or fluctuating flow conditions.

These meters are available with valves to control flow or without to simply monitor flow.

Each flowmeter is individually tested on a mass spectrometer leak detector and certified to a leak integrity rating of $1x10^{-7}$ sccs helium. All models come with correlation charts for water.

Flowmeter without valve 32050-10

Flowmeter with valve 32051-10

ISO9001:2000 SUPPLIER CERTIFIED

For LIQUIDS

Specifications & Ordering Information

Accuracy: ±5% full-scale
Operating temp.: 32 to 250°F (0 to 120°C)
Maximum pressure: 100 psi
Dimensions
Low-range models: 75-mm scale
1¼"W x 6⅝₂"H x 3¼"D
High-range models: 125-mm scale
2"W x 10¹³⁄₃₂"H x 4"D

Materials of Construction

Flowtube	PTFE
Fittings, valves	PTFE
Float	PTFE or sapphire
Shield	Polycarbonate
Frame	PFA-clad aluminum

Flow range*	Float†	Connections	Flowmeters without valve		Flowmeters with valve	
			Cat. no.	Price	Cat. no.	Price
Low-range flowmeters						
5 to 75 mL/min	Sa	¼" NPT(F)	KH-32050-00		KH-32051-00	
5 to 250 mL/min	PTFE	¼" NPT(F)	KH-32050-02		KH-32051-02	
50 to 400 mL/min			KH-32050-04		KH-32051-04	
90 to 500 mL/min			KH-32050-06		KH-32051-06	
100 to 1000 mL/min			KH-32050-08		KH-32051-08	
350 to 2000 mL/min	PTFE	⅜" NPT(F)	KH-32050-10		KH-32051-10	
800 to 2500 mL/min			KH-32050-12		KH-32051-12	
1250 to 3000 mL/min			KH-32050-14		KH-32051-14	
1750 to 5000 mL/min			KH-32050-16		KH-32051-16	
High-range flowmeters						
0.75 to 13 LPM	PTFE	½" NPT(F)	—	—	KH-32051-18	
2 to 20 LPM			—	—	KH-32051-20	
3 to 30 LPM	PTFE	¾" NPT(F)	—	—	KH-32051-22	
4 to 40 LPM			—	—	KH-32051-24	
4 to 45 LPM			—	—	KH-32051-26	

*Correlation data sheets for water is included with flowmeters.
†Float material key: Sa = sapphire

Cole-Parmer® Safe-Design PTFE/PFA Flowmeters

Flowmeter with valve 32057-08

Economical design includes safety features for metering the most aggressive fluids

- Includes a removable polycarbonate shield for added safety
- Individually leak tested with certified leak-proof integrity*
- Sight tube guide rod prevents float oscillation in dynamic systems

Ideal for use in applications requiring the high purity/high temperature suitability that fluoropolymer materials are capable of. Common applications include those with acids, caustics, solvents, and high purity liquids. The solid PTFE float is designed to maximize each meter's flow range so that many models provide an outstanding turn-down ratio. Choose from models with a valve to both monitor and control your flow or without a valve to simply monitor flow. Flowmeters are calibrated and come with correlation charts for water.

ISO9001:2000 SUPPLIER CERTIFIED

For LIQUIDS

Specifications & Ordering Information

Accuracy: ±5% full-scale
Maximum temperature: 250°F (121°C)
Maximum pressure: 100 psi
Dimensions (150-mm scale)
Low-range models: 5¹¹⁄₁₆"L x 1¼" OD
High-range models: 10½"L x 2" OD

Materials of Construction

Fittings, valves	PTFE/PCTFE
Shield	Polycarbonate
Flowtube	PTFE/PFA
Float	PTFE

Flow range	Connection	Flowmeters without valve		Flowmeters with valve	
		Catalog number	Price	Catalog number	Price
Low-range flowmeters					
10 to 125 mL/min	¼" NPT(F)	KH-32056-00		KH-32057-00	
5 to 250 mL/min		KH-32056-02		KH-32057-02	
50 to 400 mL/min		KH-32056-04		KH-32057-04	
90 to 500 mL/min		KH-32056-06		KH-32057-06	
100 to 1000 mL/min		KH-32056-08		KH-32057-08	
350 to 2000 mL/min	⅜" NPT(F)	KH-32056-10		KH-32057-10	
800 to 2500 mL/min		KH-32056-12		KH-32057-12	
1250 to 3000 mL/min		KH-32056-14		KH-32057-14	
1750 to 5000 mL/min		KH-32056-16		KH-32057-16	
High-range flowmeters					
0.75 to 13 LPM	½" NPT(F)	KH-32056-18		KH-32057-18	
2 to 20 LPM		KH-32056-20		KH-32057-20	
3 to 30 LPM		KH-32056-22		KH-32057-22	
4 to 40 LPM	¾" NPT(F)	—	—	KH-32057-24	

*Leak integrity rating of 1 x 10^{-7} sccs Helium or better.

GILMONT® accucal® Flowmeters

Use correlated or direct-reading scales—one meter for many applications

- Direct reading scales in metric or English units—customize the meter for each application
- Turn-down ratio of greater than 25:1 for outstanding monitoring and control
- Rugged body with protective shield—ideal for industrial and laboratory use

Each flowmeter package includes correlation charts plus two direct-reading scales. Attach either of the interchangeable direct reading scales for water or air; you may also use the air and water correlation charts along with readings off the flow tube to determine flow rates.

Excellent accuracy is achieved using second-generation correlation techniques along with factory calibration of the tube. This allows for accuracy to be expressed as a percent of reading—not of full-scale! See details below. In addition, all flowtubes are serial numbered for traceability calibration, accuracy, and manufacturing data.

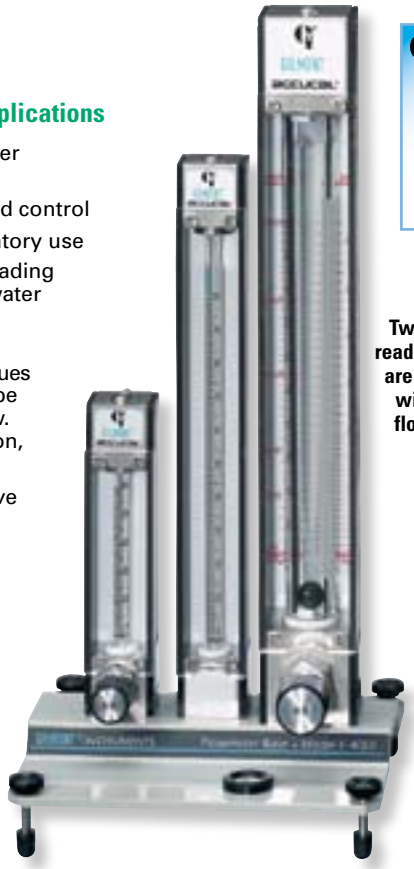
Meters are available in 65-mm and 150-mm scale lengths so users have a choice of either a compact installation or a larger, more precise and readable scale. The polycarbonate shield wraps around 150° of the flowmeter for better viewing. Models with valves feature a 15-turn shallow taper plug design for precise control across 80-plus % of the scaled range.

Meters are designed for easy flowtube exchange or replacement. Along with a snap-off shield, the end stop has a large diameter bore for centering the flowtube more quickly and accurately than other flowmeter designs. All flowtubes are interchangeable within the same frame size.

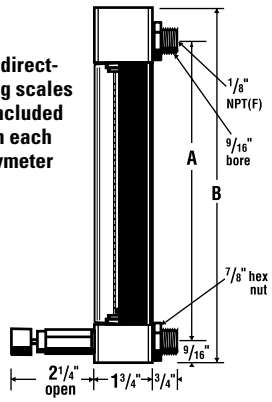
These meters are suitable for panel or bench mounting on a stand.

GO to page(s) 596

To monitor air flow independent of upstream and downstream temperature and pressure changes, install a 32505-series flow controller upstream of your flowmeter.



Two direct-reading scales are included with each flowmeter



Flowmeters shown mounted onto optional base 03198-10

Specifications

Accuracy: the greater of ±2% of reading or ±1 scale division (correlated use); the greater of ±5% of reading or ±3 mm of scale (direct-reading use)

Repeatability: ±1% of reading or ±0.5 scale division, whichever is greater

Turn-down ratio: better than 25:1

Maximum pressure: 200 psi

Max operating temperature: 250°F (121°C)

Dimensions

Tube sizes	Connections	Height	
		A	B
100 to 135	⅛" NPT(F)	4½"	5 15/16"
200 to 235	⅛" NPT(F)	8 13/16"	10¼"
240 to 250	¼" NPT(F)	11"	12⅞"

Materials of Construction

Flowtube	Borosilicate glass
Fittings, valves	316 SS
End blocks	316 SS
O-rings	Viton®
Float	Glass or 316 SS
Shield	Polycarbonate
Frame	316 SS

Ordering Information for 65-mm Flowmeters

Max flow rate (mL/min)		Float	Tube size	Without valve		With valve	
Air	Water			Catalog number	Price	Catalog number	Price
100 250	1.3 5.4	Glass SS	100	KH-32121-52		KH-32121-00	
270 600	3.7 14	Glass SS	110	KH-32121-54		KH-32121-02	
1000 2100	18 57	Glass SS	115	KH-32121-56		KH-32121-04	
2000 3900	39 110	Glass SS	120	KH-32121-58		KH-32121-06	
6500 12,000	140 360	Glass SS	125	KH-32121-60		KH-32121-08	
14,000 26,000	320 790	Glass SS	130	KH-32121-62		KH-32121-10	
26,000 48,000	610 1500	Glass SS	135	KH-32121-64		KH-32121-12	

Ordering Information for 150-mm Flowmeters

Max flow rate (mL/min)		Float	Tube size	Without valve		With valve	
Air	Water			Catalog number	Price	Catalog number	Price
100 250	1.3 5.4	Glass SS	200	KH-32121-66		KH-32121-14	
270 600	3.7 14	Glass SS	210	KH-32121-68		KH-32121-16	
1000 2100	18 57	Glass SS	215	KH-32121-70		KH-32121-18	
2000 3900	39 110	Glass SS	220	KH-32121-72		KH-32121-20	
6500 12,000	140 360	Glass SS	225	KH-32121-74		KH-32121-22	
14,000 26,000	320 790	Glass SS	230	KH-32121-76		KH-32121-24	
26,000 48,000	610 1500	Glass SS	235	KH-32121-78		KH-32121-26	
41,000 73,000	960 2300	Glass SS	240	KH-32121-80		KH-32121-28	
84,000 150,000	2000 4700	Glass SS	250	KH-32121-82		KH-32121-30	

Accessories

KH-03198-10 **Flowmeter base** accepts up to three flowmeters, mounted directly. Aluminum, with built-in bubble level

KH-32120-10 **Flow rate analysis software** runs on Windows® 95/98/NT computers; CD-ROM. Generates accurate flow rate tables specific to your fluid, temperature, pressure, density, and viscosity using factory calibration data for the specific Gilmont flowtube used

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For our wide selection of barbed and compression fittings.

FL Flowmeters

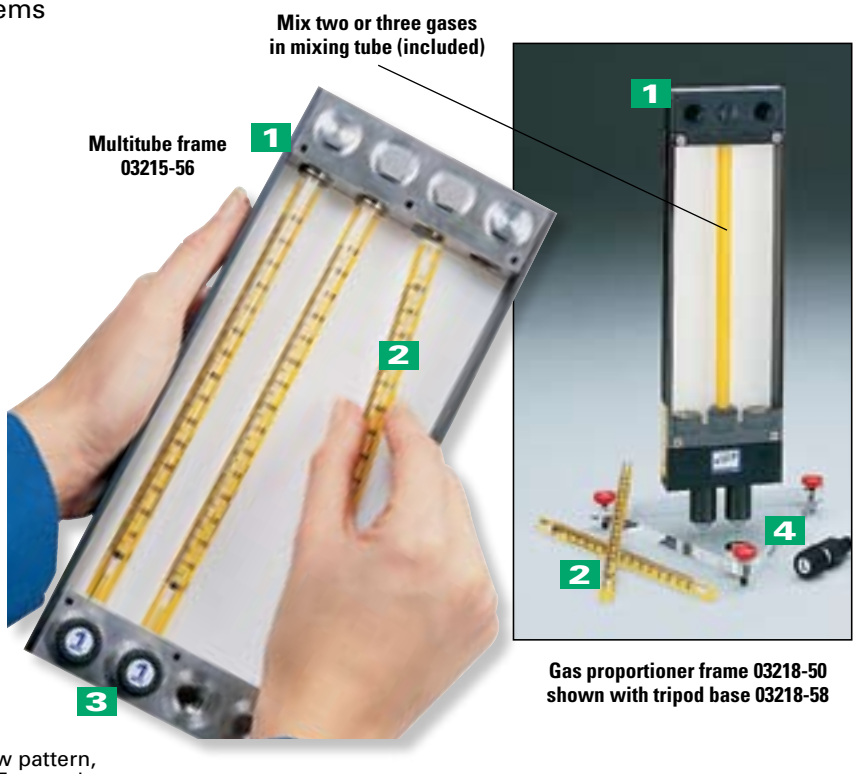
Variable-Area, Component Systems

Cole-Parmer® Single and Multitube Flowmeter Systems

Create your own multitube or gas proportioner systems for complete flexibility

Design a flow system to meet your multi-channel metering, mixing, or monitoring applications. We offer a variety of frames and flowtubes so that you can create the system to meet your exact needs. If you need assistance in putting together a system, call our Application Specialists.

Required *System* *Components*



Gas proportioner frame 03218-50 shown with tripod base 03218-58

1 Frames

Chose a frame depending on the flowtube capacity, flow pattern, and wetted parts that you require. For frames with PTFE wetted parts, call our Application Specialists for information. Single and multitube frames accept both direct-reading and correlated flowtubes; gas proportioner frames accept only correlated flowtubes. All frames include an instruction manual.

ISO9001:2000 SUPPLIER CERTIFIED — For GASES — For LIQUIDS

Specifications

Minimum flow rate: approx 10% of max flow rate of flowtube

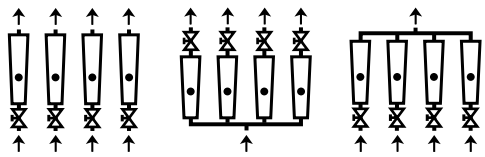
Operating temperature: –15 to 250°F (–26 to 121°C)

Maximum pressure: 200 psi

Connections: ⅛" NPT(F)

Materials of construction
Side panels: black anodized aluminum
Front shield: ⅛"-thick polycarbonate
Back plate: ⅛"-thick acrylic
O-rings and packing: Buna N for aluminum models, Viton® for 316 SS models

Multitube Flow Patterns



Single-Tube Frames

Choose a frame with valve port if you plan on adding a valve cartridge (page 582) to control flow.

Number of flowtubes held	Valve port	Aluminum wetted parts Cat. no.	Price	316 SS wetted parts Cat. no.	Price
Single-tube frames for 65-mm flowtubes					
One	No	KH-03220-00		KH-03220-40	
	Yes	KH-03220-08		KH-03220-44	
Single-tube frames for 150-mm flowtubes					
One	No	KH-03220-06		KH-03220-42	
	Yes	KH-03220-10		KH-03220-46	

Multitubes Frames

These frames have valve ports which accept valve cartridges to control flow. A tripod base is required to use the multitube frame with the common inlet flow pattern; all other multitube frames are designed for panel and tripod mounting.

Number of flowtubes held	Flow pattern	Aluminum wetted parts Cat. no.	Price	316 SS wetted parts Cat. no.	Price
Multitube frames for 65-mm flowtubes					
Two	Isolated	KH-03214-10		KH-03214-16	
	Common	KH-03214-12		KH-03214-18	
Three	Isolated	KH-03214-28		KH-03214-34	
	Common	KH-03214-30		KH-03214-36	
Four	Isolated	KH-03214-46		KH-03214-52	
	Common	KH-03214-50		KH-03214-56	
Five	Isolated	KH-03214-62		KH-03214-66	
	Common	KH-03214-64		KH-03214-68	
Six	Isolated	KH-03214-74		KH-03214-78	
	Common	KH-03214-76		KH-03214-80	
Multitube frames for 150-mm flowtubes					
Two	Isolated	KH-03215-10		KH-03215-16	
	Common	KH-03215-12		KH-03215-18	
Three	Isolated	KH-03215-28		KH-03215-34	
	Common	KH-03215-30		KH-03215-36	
Four	Isolated	KH-03215-46		KH-03215-52	
	Common	KH-03215-50		KH-03215-56	
Five	Isolated	KH-03215-62		KH-03215-66	
	Common	KH-03215-64		KH-03215-68	
Six	Isolated	KH-03215-74		KH-03215-78	
	Common	KH-03215-76		KH-03215-80	

Gas Proportioner Multitube Frames

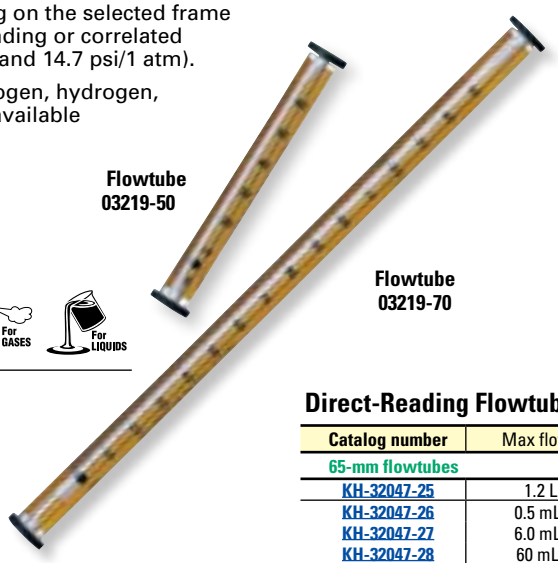
These multitube frames with valves allow you to increase or decrease gas concentrations accurately at any time during an experiment—blend two or three gases at the exact concentration you require. Frames include a installation tool and mixing tube. **Note:** use only with the correlated flowtubes on page 581.

Number of flowtubes held	Flow pattern	Aluminum wetted parts Cat. no.	Price	316 SS wetted parts Cat. no.	Price
Gas proportioner frames for 150-mm correlated flowtubes					
Two	—	KH-03218-50		KH-03218-52	
Three	—	KH-03218-54		KH-03218-56	

2A Flowtubes for Air and Water

Choose 65- or 150-mm flowtubes depending on the selected frame size. Flowtubes are calibrated for direct-reading or correlated reading of air or water at STP (70°F/21.1°C and 14.7 psi/1 atm).

Flowtubes for specialty gases—argon, nitrogen, hydrogen, helium, carbon dioxide, and oxygen—are available on the next page.



ISO9001:2000 SUPPLIER CERTIFIED

For GASES

For LIQUIDS

Specifications

Accuracy: ±2% of full-scale

Repeatability: ±0.25% of full-scale

Minimum flow rate: approx 10% of max flow rate

Materials of construction

Flowtube: heavy-walled borosilicate glass

Float: glass, stainless steel (SS), carboloy, sapphire, or tantalum

Required *System Components*

1. Frame
2. Flowtube(s)
3. Valve cartridge(s)
4. Tripod base

Direct-Reading Flowtubes for Air

Catalog number	Max flow rate	Float	Price
65-mm flowtubes			
KH-32047-00	2.2 scfh	Glass	
KH-32047-01	6.0 scfh	Glass	
KH-32047-02	10 scfh	SS	
KH-32047-04	25 scfh	SS	
KH-32047-05	50 scfh	SS	
KH-32047-06	90 scfh	SS	
KH-32047-07	0.6 scfm	Carboloy	
KH-32047-08	1.9 scfm	SS	
KH-32047-09	1.0 LPM	Glass	
KH-32047-10	1.15 LPM	Glass	
KH-32047-11	2.0 LPM	SS	
KH-32047-12	4.0 LPM	SS	
KH-32047-13	5.0 LPM	Glass	
KH-32047-14	10 LPM	SS	
KH-32047-15	16 LPM	SS	
KH-32047-16	25 LPM	SS	
KH-32047-17	40 LPM	SS	
KH-32047-18	7 mL/min	Glass	
KH-32047-19	50 mL/min	SS	
KH-32047-20	75 mL/min	SS	
KH-32047-21	100 mL/min	Glass	
KH-32047-22	250 mL/min	Carboloy	
KH-32047-23	500 mL/min	Carboloy	
150-mm flowtubes			
KH-32047-50	2.5 scfh	Carboloy	
KH-32047-51	5 scfh	Glass	
KH-32047-53	10 scfh	SS	
KH-32047-55	23 scfh	Carboloy	
KH-32047-56	50 scfh	Glass	
KH-32047-57	90 scfh	SS	
KH-32047-58	94 scfh	SS	
KH-32047-59	1.5 scfm	SS	
KH-32047-60	1.25 LPM	Carboloy	
KH-32047-61	2.5 LPM	Glass	
KH-32047-62	4.0 LPM	Glass	
KH-32047-63	4.5 LPM	Sapphire	
KH-32047-64	5.0 LPM	Sapphire	
KH-32047-65	10 LPM	Carboloy	
KH-32047-67	23 LPM	Glass	
KH-32047-68	42 LPM	SS	
KH-32047-69	60 LPM	Carboloy	
KH-32047-70	25 mL/min	Sapphire	
KH-32047-71	50 mL/min	Sapphire	
KH-32047-72	75 mL/min	Carboloy	
KH-32047-73	100 mL/min	Sapphire	
KH-32047-74	200 mL/min	SS	
KH-32047-76	500 mL/min	Sapphire	
KH-32047-77	800 mL/min	Glass	

Direct-Reading Flowtubes for Water

Catalog number	Max flow rate	Float	Price
65-mm flowtubes			
KH-32047-25	1.2 LPM	SS	
KH-32047-26	0.5 mL/min	Glass	
KH-32047-27	6.0 mL/min	SS	
KH-32047-28	60 mL/min	SS	
KH-32047-29	115 mL/min	SS	
KH-32047-31	250 mL/min	Glass	
KH-32047-32	500 mL/min	Glass	
KH-32047-33	750 mL/min	SS	
150-mm flowtubes			
KH-32047-79	0.215 GPM	Sapphire	
KH-32047-81	1.2 LPM	SS	
KH-32047-82	2.0 LPM	Tantalum	
KH-32047-83	1.0 mL/min	Sapphire	
KH-32047-84	10 mL/min	Sapphire	
KH-32047-85	20 mL/min	SS	
KH-32047-86	50 mL/min	Glass	
KH-32047-87	60 mL/min	Glass	
KH-32047-88	100 mL/min	Glass	
KH-32047-89	200 mL/min	Carboloy	
KH-32047-90	500 mL/min	SS	

Correlated Flowtubes for Air and Water

Catalog number	Max flow rate			Float	Price
	Air	Air (50 psi)	Water		
65-mm flowtubes					
KH-03219-50	5.8 mL/min	—	0.065 mL/min	Glass	
KH-03219-51	16.7 mL/min	—	0.283 mL/min	SS	
KH-03219-52	48.7 mL/min	—	0.55 mL/min	Glass	
KH-03219-53	145 mL/min	—	2.38 mL/min	SS	
KH-03219-54	202.1 mL/min	—	2.6 mL/min	Glass	
KH-03219-55	522 mL/min	—	12 mL/min	SS	
KH-03219-56	1249 mL/min	—	27 mL/min	Glass	
KH-03219-58	2040 mL/min	—	39.7 mL/min	Glass	
KH-03219-57	2520 mL/min	—	70.7 mL/min	SS	
KH-03219-59	3990 mL/min	—	108.3 mL/min	SS	
KH-03219-60	6318 mL/min	—	147 mL/min	Glass	
KH-03219-61	12,058 mL/min	—	364 mL/min	SS	
KH-03219-62	23,169 mL/min	—	522 mL/min	Glass	
KH-03219-64	42,094 mL/min	—	1261 mL/min	SS	
KH-03219-66	58,500 mL/min	—	1866 mL/min	Carboloy	
150-mm flowtubes					
KH-03219-70	18.9 mL/min	83 mL/min	0.19 mL/min	Glass	
KH-03217-05	49.1 mL/min	191.6 mL/min	0.49 mL/min	Glass	
KH-03217-07	60.6 mL/min	242 mL/min	0.945 mL/min	SS	
KH-03217-09	92 mL/min	324 mL/min	0.85 mL/min	Glass	
KH-03217-11	137 mL/min	460 mL/min	2.34 mL/min	SS	
KH-03217-15	264 mL/min	825 mL/min	4.74 mL/min	SS	
KH-03217-13	374 mL/min	1086 mL/min	5.5 mL/min	Glass	
KH-03217-17	814 mL/min	2024 mL/min	20.4 mL/min	SS	
KH-03217-21	2313 mL/min	5528 mL/min	53.5 mL/min	Glass	
KH-03217-19	4562 mL/min	10,813 mL/min	130.4 mL/min	SS	
KH-03217-29	8678 mL/min	19,767 mL/min	210 mL/min	Glass	
KH-03217-23	16,737 mL/min	38,995 mL/min	506 mL/min	SS	
KH-03217-33	22,536 mL/min	49,374 mL/min	541 mL/min	Glass	
KH-03219-72	41,512 mL/min	89,880 mL/min	1288 mL/min	SS	
KH-03219-74	59,494 mL/min	123,846 mL/min	1881 mL/min	Carboloy	

FL Flowmeters

Variable-Area, Component Systems

2B Direct Reading Flowtubes for Specialty Gases

Choose 65- or 150-mm flowtubes, depending on the selected frame size. Flowtubes read directly in argon, nitrogen, hydrogen, helium, carbon dioxide, or oxygen at STP (70°F/21°C and 14.7 psi/1 atm).

ISO9001:2000 SUPPLIER CERTIFIED

For GASES

Specifications

Accuracy: ±2% of full-scale

Repeatability: ±0.25% of full-scale

Minimum flow rate: approx 10% of maximum flow rate

Materials of construction
Flowtube: heavy-walled borosilicate glass
Float: glass, stainless steel (SS), carboloy, or sapphire

Flowtubes 32048-07 and 32048-62

Required *System Components*

1. Frame
2. Flowtube(s)
3. Valve cartridge(s)
4. Tripod base

Direct-Reading, Carbon Dioxide

Cat. no.	Max flow rate	Float	Price
65-mm flowtubes			
KH-32048-04	1.0 LPM	Glass	
KH-32048-05	6.0 LPM	Glass	
KH-32048-06	10 LPM	SS	
KH-32048-07	20 mL/min	SS	
KH-32048-08	55 mL/min	Glass	
KH-32048-09	220 mL/min	Sapphire	

Direct-Reading, Nitrogen

Cat. no.	Max flow rate	Float	Price
65-mm flowtubes			
KH-32048-20	12 LPM	SS	
KH-32048-21	6 mL/min	Glass	
KH-32048-22	50 mL/min	SS	
KH-32048-23	60 mL/min	Sapphire	
KH-32048-24	120 mL/min	Glass	
KH-32048-25	200 mL/min	Sapphire	
150-mm flowtubes			
KH-32048-58	1.6 scfm	SS	
KH-32048-59	2.0 LPM	Glass	
KH-32048-60	100 mL/min	Glass	
KH-32048-61	200 mL/min	Carboloy	
KH-32048-62	300 mL/min	Carboloy	
KH-32048-63	500 mL/min	Sapphire	

Direct-Reading, Hydrogen

Cat. no.	Max flow rate	Float	Price
65-mm flowtubes			
KH-32048-12	1.5 LPM	Carboloy	
KH-32048-13	3.5 LPM	Glass	
KH-32048-14	6.0 LPM	Glass	
KH-32048-15	42 LPM	SS	
KH-32048-16	35 mL/min	Glass	
KH-32048-17	100 mL/min	SS	
KH-32048-18	150 mL/min	Sapphire	
KH-32048-19	600 mL/min	Glass	

Direct-Reading, Helium

Cat. no.	Max flow rate	Float	Price
65-mm flowtubes			
KH-32048-10	65 mL/min	Sapphire	
KH-32048-11	120 mL/min	Glass	
150-mm flowtubes			
KH-32048-52	1.25 scfh	Sapphire	
KH-32048-53	5.0 LPM	Carboloy	
KH-32048-54	40 LPM	SS	
KH-32048-55	100 mL/min	Sapphire	
KH-32048-56	500 mL/min	Carboloy	
KH-32048-57	1500 mL/min	Glass	

Direct-Reading, Argon

Cat. no.	Max flow rate	Float	Price
65-mm flowtubes			
KH-32048-00	2.5 scfh	Glass	
KH-32048-01	10 scfh	SS	
KH-32048-02	22 scfh	SS	
KH-32048-03	50 scfh	Glass	
150-mm flowtubes			
KH-32048-50	15 LPM	SS	
KH-32048-51	33 mL/min	SS	

Direct-Reading, Oxygen

Cat. no.	Max flow rate	Float	Price
65-mm flowtubes			
KH-32048-26	1.0 LPM	Glass	
KH-32048-27	4.0 LPM	SS	
KH-32048-28	8.0 LPM	SS	
KH-32048-29	15 LPM	SS	
KH-32048-30	50 mL/min	Glass	
KH-32048-31	300 mL/min	SS	
KH-32048-32	500 mL/min	SS	
150-mm flowtubes			
KH-32048-64	5.0 LPM	Sapphire	
KH-32048-65	16.5 LPM	SS	
KH-32048-66	58 LPM	Carboloy	
KH-32048-67	250 mL/min	SS	
KH-32048-68	400 mL/min	Sapphire	

3 Valve Cartridges

Use these metering needle valve cartridges to control flow rate. Simply insert into the valve port on the flowmeter frame. Select a valve cartridge compatible with your frame material: aluminum or stainless steel (SS). Choose a high-resolution metering valve cartridge for greater precision of flow rate.

If your flowtube is in units other than mL/min, convert them to mL/min and choose a valve within that flow range from the table below. See pages 2046-2060 in the back of this catalog for conversion factors.

03217-92

03218-74

Specifications & Ordering Information

Materials of Construction

Frame	Aluminum	316 SS
Standard		
Body	Aluminum	316 SS
Needle	316 SS	
Orifice	PTFE	
O-rings	Buna N	Viton®
High-resolution		
Body	Brass	316 SS
Needle	316 SS	
Orifice	PTFE	
O-rings	Buna N	Viton

Flow ranges (mL/min)*		Aluminum frame		316 SS frame	
For air and gases	For water	Cat. no.	Price	Cat. no.	Price
Standard valve cartridges, 10 turn					
0 to 5000	0 to 125	KH-03217-92		KH-03217-82	
5001 to 10,000	126 to 325	KH-03217-88		KH-03217-84	
≥ 10,001	≥326	KH-03217-96		KH-03217-86	
High-resolution valve cartridges, 16 turn					
0 to 200	0 to 3	KH-03218-72		KH-03218-74	
201 to 1000	3.1 to 25	KH-03218-61		KH-03218-67	
1001 to 2500	26 to 70	KH-03218-62		KH-03218-68	
2501 to 6200	71 to 140	KH-03218-63		KH-03218-69	
≥ 6201	≥141	KH-03218-64		KH-03218-70	

*If your flowtube is in units other than mL/min, convert them to mL/min and choose a valve within that flow range. See pages 2046-2060 (back of catalog) for conversion factors.

4 Tripod Bases

Use base for benchtop applications. Three leveling screws and spirit level are built into a clear acrylic base.

Note: a tripod base is required to use the multitube frame with the common inlet flow pattern; all other multitube frames are designed for panel and tripod mounting.

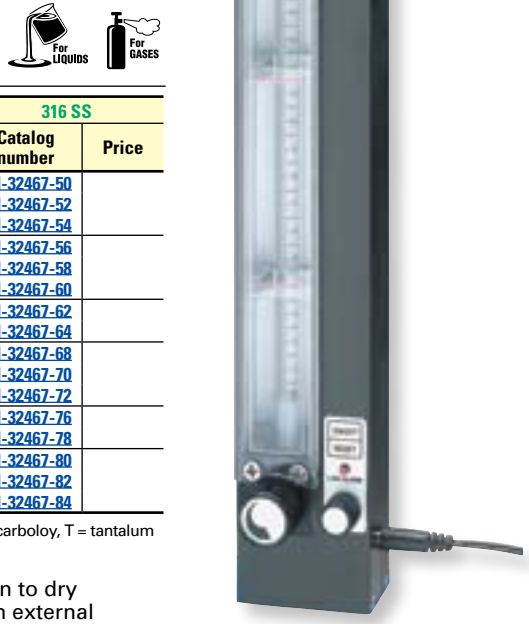
Tripod base 03226-50

Catalog number	Use with	Price
For multitube frames		
KH-03226-50	2-, 4-, or 6-tube models; or isolated models	
KH-03226-40	3- or 5-tube models; or common inlet models	
For gas proportioner frames		
KH-03218-58	Models 03218-50, -52	
KH-03218-59	Models 03218-54, -56	

Cole-Parmer 150-mm Dual-Alarm Flowmeters

Monitor flow rates within a band of high/low or simply below or above a set point

This is an active flow monitoring system with optical flow sensors and a manually controlled valve. The easy-to-use manual set-point controls allow monitoring of flow between two set points or above/below a single set-point. A built-in 90-dB audible alarm and visual LED signal an out-of-range condition. Use the optional output connector to connect the flowmeter to a switch, PC or datalogger.



Aluminum flowmeter
32467-18

Specifications

Accuracy: ±3% of full-scale
Repeatability: ±0.5% of full-scale
Maximum pressure: 200 psig
Operating temperature: 32 to 158°F (0 to 70°C)
Output signal: dry contact NO/NC; 175 V maximum, 0.25 A maximum
Power supply adapter (included)**:** 120 VAC to 12 VDC
Input power: 12 VDC
Alarm: 90 dB audible and visual LED
Connections: ⅛" NPT(F)
Dimensions: 2"W x 10 13/16"H x 2 5/16"D

Materials of Construction

Part	Aluminum	316 SS
Flowtube	Borosilicate glass	
Fittings, valves	Aluminum	316 SS
O-rings	Buna N	Viton®
End block	Aluminum	316 SS
Float	Glass, sapphire, stainless steel, carboloy, or tantalum	

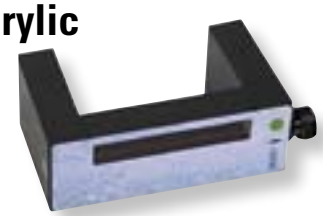
Ordering Information

Max flow rate		Float*	Aluminum		316 SS	
Air (mL/min)	Water (mL/min)		Catalog number	Price	Catalog number	Price
50	0.6	G	KH-32467-00		KH-32467-50	
78	1.01	Sa	KH-32467-02		KH-32467-52	
152	2.5	SS	KH-32467-04		KH-32467-54	
281	5.3	C	KH-32467-06		KH-32467-56	
497	10.1	C	KH-32467-08		KH-32467-58	
870	22.2	SS	KH-32467-10		KH-32467-60	
1300	36.2	C	KH-32467-12		KH-32467-62	
1710	47.5	SS	KH-32467-14		KH-32467-64	
2980	75	Sa	KH-32467-18		KH-32467-68	
4480	125	SS	KH-32467-20		KH-32467-70	
6475	190	C	KH-32467-22		KH-32467-72	
11,990	315	Sa	KH-32467-26		KH-32467-76	
17,810	515	SS	KH-32467-28		KH-32467-78	
23,740	565	G	KH-32467-30		KH-32467-80	
44,050	1335	SS	KH-32467-32		KH-32467-82	
66,370	2080	T	KH-32467-34		KH-32467-84	

*Float material: G = glass, Sa = sapphire, SS = stainless steel, C = carboloy, T = tantalum

KH-32467-92 **Output connector** allows connection to dry contact output. Use to connect flowmeter to an external alarm circuit or on/off monitor. Three-foot DIN connector to pigtail ends

Alarm for Block-Acrylic Flowmeters



Convert standard acrylic flowmeters from passive to active monitors!

- Local visual indication through red and green LEDs
- Audible alarm with 90-dB volume for noisy environments
- Low-level digital output option for remote monitoring and indication

Utilize this alarm with any of the block acrylic flowmeters on pages 564, 565, or 567. The non-contact infrared optical sensor is not affected by contaminants in the flow stream and is enclosed in a rugged splash-resistant enclosure. Install the alarm without removing the meter from the system or even taking the process down. Multiple alarms may be installed on a single meter. The design offers mobility from meter to meter because of a RJ-11 phone-plug style connector. With multiple operating modes, the user can select a continuous alarm that must be manually reset or an alarm that automatically resets when flow returns to acceptable levels. For a 0 to 5 V digital output signal, order the advanced power supply listed below.

Specifications & Ordering Information

Operating temperature: 32 to 160°F (0 to 70°C)
Input power: 250 mA @ 5 VDC, regulated
Cable length: 12"
Body material: ABS

Catalog number	Description	Price
KH-32462-80	Alarm for acrylic flowmeters	

KH-32462-87 **Basic power supply,** 120 VAC to 5 VDC
KH-32462-89 **Advanced power supply,** universal input for international power outlets, battery back-up, logic output

FL Flowmeters

Variable-Area, Alarms

Easy-View Acrylic Flowmeters with High/Low Alarms

New

Highly durable for use in aggressive media applications

- Acceptable for direct-sunlight applications
- Flow calibrations range from 0.2 to 20 GPM (0.1 to 80 LPM)

Flowmeters are machined of high-quality acrylic and are annealed for added strength and chemical resistance. Features include corrosion- and wear-resistant internal parts, sturdy well-built adapters, and Viton® O-ring seals. Permanent scales are screen printed onto the meter body, directly in front of the float. A white back reflector enables easy scale reading by the user. Alarm is mounted on an adjustable aluminum bezel clamp. Enclosed within the clamp is a normally open one-watt reed switch; the switch includes a 25-ft, two-wire cable for one-piece wiring within many systems.

For LIQUIDS

Specifications & Ordering Information

Accuracy: 5% of reading
Media type: liquids or air
Maximum pressure: 150 psi (10.3 bar)
Maximum fluid temperature
316 SS Hastelloy floats: 150˚F (65˚C)
PVC floats: 120˚F (49˚C)

Dimensions (not including fittings)
General-purpose models: 11"H x 1¾" dia
Corrosive-enviroment models: 14"H x 3" dia
Alarm output: normally open one-watt reed switch

Catalog number	Flow range GPM	Flow range LPM	Float	Connection	Price
General purpose flowmeters					
KH-32477-34 KH-32477-36	0.2 to 2.0	1 to 7.5	PVC	¾" NPT (F) 1" NPT (F)	
KH-32477-50 KH-32477-52	0.5 to 5.0	2 to 20	PVC	¾" NPT (F) 1" NPT (F)	
KH-32477-38 KH-32477-40	1 to 10	4 to 38	316 SS	¾" NPT (F) 1" NPT (F)	
KH-32477-54 KH-32477-56	2 to 20	8 to 80	316 SS	¾" NPT (F) 1" NPT (F)	
Corrosive-environment flowmeters					
KH-32477-42 KH-32477-44	1 to 10	4 to 38	Hastelloy	¾" NPT (F) 1" NPT (F)	
KH-32477-46 KH-32477-48	1 to 17	4 to 64	Hastelloy	¾" NPT (F) 1" NPT (F)	
KH-32477-58 KH-32477-60	2 to 20	8 to 80	Hastelloy	¾" NPT (F) 1" NPT (F)	

Materials of Construction

Part	General purpose	Corrosive environment
Body	Acrylic	
Float	PVC or 316 SS	Hastelloy
Fittings	PP	PVC
O-rings	Viton®	
Guides	316 SS	Hastelloy

Male NPT Pipe Adapters

These threaded-to-barbed adapters make connection between your flowmeter and fluid line easy and efficient. Adapters listed here are available in high-density polyethylene (HDPE), nylon, or 316 stainless steel; for a more complete offering in other materials and sizes, please refer to our "Fittings" section on pages 487–546.

NPT thread x tubing I.D.	Material	Catalog number	Qty/pk	Price/pk
¾" x ¾"	HDPE	EK-30621-12	10	
¾" x ¾"	316 SS	EK-31210-44	1	
¾" x 1"	HDPE	EK-30621-14	10	
¾" x 1"	316 SS	EK-31210-45	1	
1" x ¾"	Nylon	EK-06478-07	10	
1" x ¾"	316 SS	EK-31210-50	1	
1" x 1"	Nylon	EK-06478-08	10	
1" x 1"	316 SS	EK-31210-51	1	

Compact Gas Mass Flow Sensors/Transmitters

Precisely measure and transmit flow rates

- Proven design uses metal body components for added durability
- Meter can be calibrated to any of 256 different gases*
- Includes NIST-traceable certificate

These flowmeters feature an advanced straight-tube sensor that ensures accurate and repeatable results. Gas flow measurements are unaffected by moderate temperature and pressure variations at the inlet. The meter also allows a four-point calibration across the flow range to improve meter linearity.

Output data from the meter can be sent via a 0 to 5 VDC or 4 to 20 mA signal; an analog-to-RS converter is also available for data collection and analysis on your PC.

The meter is protected from polarity reversal or short circuit by a built-in resettable fuse. Aluminum models have wetted materials of anodized aluminum, brass, and Viton®; stainless steel (SS) models have wetted materials of SS and Viton.

*Contact an Application Specialist to discuss calibration to gases other than air.

Aluminum gas mass flow transmitter 32658-00

GO to page(s) 590–594

For flowmeters with proportional control capabilities, see pages 590–594.

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Specifications & Ordering Info

Max particulate size: 5 µm

Accuracy
Models ≤15 sL/min: ±1% full-scale
Models >15 sL/min: ±1.5% full-scale (see below for details)

Accuracy coefficient, temperature: ±0.15%/°C full-scale

Accuracy coefficient, pressure: ±0.01%/psi ful-scale

Repeatability: ±0.5% full scale

Response time: 2 seconds (typical) to within ±2% of actual flow rate from 25 to 100% of full-scale

Operating temperature: 32 to 122°F (0 to 50°C)

Max system pressure: 500 psi

Leak integrity: 1 x 10^{-7} sccs He (max)

Transducer input power: 12 VDC, 200 mA max, polarity protected

Output signal: linear 0 to 5 VDC (1000 Ω minimum load), 4 to 20 mA (50 to 250 Ω loop resistance)

Connections (included)
Models ≤50 sL/min:
1/4" compression fittings
100 sL/min models:
3/8" compression fittings
500 sL/min models:
1/2" compression fittings

Dimensions (not including fittings)
Models ≤15 sL/min:
3"W x 5"H x 1"D
20 to 100 sL/min models:
4"W x 6"H x 1 1/4"D
500 sL/min models:
12"W x 10"H x 3 1/2"D

Flow rate	Aluminum bodies		316 stainless steel bodies	
	Catalog number	Price	Catalog number	Price
0 to 10 sccm	KH-32658-00		KH-32658-20	
0 to 20 sccm	KH-32658-01		KH-32658-21	
0 to 50 sccm	KH-32658-02		KH-32658-22	
0 to 100 sccm	KH-32658-03		KH-32658-23	
0 to 200 sccm	KH-32658-04		KH-32658-24	
0 to 500 sccm	KH-32658-05		KH-32658-25	
0 to 1 sL/min	KH-32658-06		KH-32658-26	
0 to 2 sL/min	KH-32658-07		KH-32658-27	
0 to 5 sL/min	KH-32658-08		KH-32658-28	
0 to 10 sL/min	KH-32658-09		KH-32658-29	
0 to 20 sL/min	KH-32658-11		KH-32658-31	
0 to 50 sL/min	KH-32658-14		KH-32658-34	
0 to 100 sL/min	KH-32658-17		KH-32658-37	
0 to 500 sL/min	KH-32658-18		KH-32658-38	

Accuracy

These precalibrated flow transmitters operate at inlet pressures between 5 and 60 psi and at gas temperatures between 59 and 77°F (15 to 25°C) while maintaining the stated percentage of full-scale accuracy and linearity. When operating beyond 5 to 60 psi, add 0.01%/psi full-scale; if operating beyond 59 to 77°F (15 to 25°C), add ±0.15%/°C full-scale.

Accessories

Analog Signal-to-RS Converters for collection and analysis of data on a PC. Include software, a bidirectional A/D and D/A signal conditioner with switch for 0 to 5 VDC or 4 to 20 mA input, and 110 V power supply; use screw terminal connections.

KH-03277-70 **Analog signal-to-RS-232 converter**
KH-03277-75 **Analog signal-to-RS-485 converter**

Output Cables make it easy to connect your flowmeter to other instruments. Three-foot long cables feature DB9(F) connectors.

KH-32650-60 **Output cable** for 4 to 20 mA signal
KH-32650-65 **Output cable** for 0 to 5 VDC signal

Power Supply allows flowmeters to be powered by AC voltage.

KH-03277-00 **Power supply,** 110 VAC
KH-03277-05 **Power supply,** 220 VAC

Rechargeable Battery Kit makes your flow transmitters portable. Use transmitters for more than 40 hours without recharging. Batteries can be recharged a minimum of 200 times. Kit contains batteries, charger, output cable, and carrying case with shoulder strap.

KH-03276-50 **Rechargeable battery kit,** 110 VAC
KH-03276-55 **Rechargeable battery kit,** 220 VAC

INNOCAL® INNOVATIVE CALIBRATION SOLUTIONS NIST TRACEABLE

EK-17080-00 **NIST-traceable certificate** for air/gas flowmeter, with test data at five to seven test points across range
EK-17080-10 **NIST-traceable certificate** for mass flowmeter, with test data at five to seven test points across range

FL Flowmeters

Thermal Dispersion / Gas Mass

Compact Gas Mass Flowmeters

Precisely measure flow rates and totals

- Proven design uses metal body components for added durability
- Accumulated flow can be logged using an optional totalizer
- Includes NIST-traceable certificate

These flowmeters feature an advanced straight-tube sensor that ensures accurate and repeatable results. Gas flow measurements are unaffected by moderate temperature and pressure variations at the inlet. The meter also allows a four-point calibration across the flow range to improve meter linearity. Output data from the meter can be sent via a 0 to 5 VDC or 4 to 20 mA signal; an analog-to-RS converter is available for data collection and analysis on your PC.

All meters include a detachable 3½-digit LCD that can be tilted up to 90° for easy reading. Remotely mount the display up to three feet using extension cable 32662-70. The optional totalizer 32650-70 displays accumulated flow. The meter is protected from polarity reversal or short circuit by a built-in resettable fuse. Aluminum models have wetted materials of anodized aluminum, brass, and Viton®; stainless steel (SS) models have wetted materials of SS and Viton.

Flowmeter 32648-00 with optional totalizer 32650-70

Specifications & Ordering Information

Maximum particulate size: 5 microns

Accuracy (including linearity)
Models up to 15 sL/min: ±1% full-scale
All other models: ±1.5% full-scale
(see below for details)

Accuracy coefficient, temperature:
±0.15%/°C full-scale

Accuracy coefficient, pressure:
±0.01%/psi full-scale

Repeatability: ±0.5% full-scale

Response time: 2 seconds (typical) to within ±2% of actual flow rate from 25 to 100% of full-scale

Operating temp: 32 to 122°F (0 to 50°C)

Maximum system pressure: 500 psi

Leak integrity: 1 x 10^{-7} sccs He (max)

Transducer input power: 12 VDC, 200 mA max; polarity protected

Output: linear 0 to 5 VDC (1000 Ω minimum load), 4 to 20 mA (50 to 250 Ω loop resistance)

Connections (included)
Models up to 50 sL/min: ¼" compression fittings
100 and 200 sL/min models: ⅜" compression fittings
500 sL/min models: ½" compression fittings
1000 sL/min models: ¾" NPT(F) fittings

Dimensions (not including fittings)
Models up to 5 sL/min: 3"W x 5½"H x 1"D
15 to 100 sL/min models: 3⅝"W x 6"H x 1¼"D
200 sL/min models: 12"W x 9"H x 2½"D
500 sL/min models: 12"W x 10"H x 3½"D
1000 sL/min models: 12"W x 11½"H x 5"D

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Flow rate	Pressure drop (max flow)	Aluminum bodies				Price	316 stainless steel bodies				Price
		Air/N_2	O_2	H_2	Ar		Air/N_2	O_2	H_2	Ar	
		Cat. no.	Cat. no.	Cat. no.	Cat. no.		Cat. no.	Cat. no.	Cat. no.	Cat. no.	
0 to 10 sccm	0.04 psi	KH-32648-00	KH-32649-00	KH-32654-00	KH-32657-00		KH-32648-50	KH-32649-50	KH-32654-50	KH-32657-50	
0 to 20 sccm		KH-32648-02	KH-32649-02	KH-32654-02	KH-32657-02		KH-32648-52	KH-32649-52	KH-32654-52	KH-32657-52	
0 to 50 sccm		KH-32648-04	KH-32649-04	KH-32654-04	KH-32657-04		KH-32648-54	KH-32649-54	KH-32654-54	KH-32657-54	
0 to 100 sccm	0.04 psi	KH-32648-06	KH-32649-06	KH-32654-06	KH-32657-06		KH-32648-56	KH-32649-56	KH-32654-56	KH-32657-56	
0 to 200 sccm		KH-32648-08	KH-32649-08	KH-32654-08	KH-32657-08		KH-32648-58	KH-32649-58	KH-32654-58	KH-32657-58	
0 to 500 sccm		KH-32648-10	KH-32649-10	KH-32654-10	KH-32657-10		KH-32648-60	KH-32649-60	KH-32654-60	KH-32657-60	
0 to 1 sL/min	0.04 psi	KH-32648-12	KH-32649-12	KH-32654-12	KH-32657-12		KH-32648-62	KH-32649-62	KH-32654-62	KH-32657-62	
0 to 2 sL/min		KH-32648-14	KH-32649-14	KH-32654-14	KH-32657-14		KH-32648-64	KH-32649-64	KH-32654-64	KH-32657-64	
0 to 5 sL/min		KH-32648-16	KH-32649-16	KH-32654-16	KH-32657-16		KH-32648-66	KH-32649-66	KH-32654-66	KH-32657-66	
0 to 15 sL/min	0.09 psi	KH-32648-19	KH-32649-19	KH-32654-19	KH-32657-19		KH-32648-68	KH-32649-68	KH-32654-68	KH-32657-68	
0 to 30 sL/min	1.2 psi	KH-32648-34	KH-32649-34	KH-32654-34	KH-32657-34		KH-32648-84	KH-32649-84	KH-32654-84	KH-32657-84	
0 to 50 sL/min	3.3 psi	KH-32648-36	KH-32649-36	KH-32654-36	KH-32657-36		KH-32648-86	KH-32649-86	KH-32654-86	KH-32657-86	
0 to 100 sL/min	8.1 psi	KH-32648-42	KH-32649-42	KH-32654-42	KH-32657-42		KH-32648-92	KH-32649-92	KH-32654-92	KH-32657-92	
0 to 200 sL/min	4 psi	KH-32648-43	KH-32649-43	KH-32654-43	KH-32657-43		KH-32659-00	KH-32659-02	KH-32659-04	KH-32659-06	
0 to 500 sL/min	6 psi	KH-32648-44	KH-32649-44	KH-32654-44	KH-32657-44		KH-32659-10	KH-32659-12	KH-32659-14	KH-32659-16	
0 to 1000 sL/min	10 psi	KH-32648-45	KH-32649-45	KH-32654-45	KH-32657-45		KH-32659-20	KH-32659-22	KH-32659-24	KH-32659-26	

Accuracy

These precalibrated flowmeters operate at inlet pressures between 5 and 60 psi and at gas temperatures between 59 to 77°F (15 to 25°C) while maintaining the stated percent full-scale accuracy and linearity. When operating beyond 5 to 60 psi, add ±0.01%/psi full scale; if operating beyond 59 to 77°F (15 to 25°C), add ±0.15%/°C full-scale.

Accessories

KH-32650-70 **Flow Totalizer** provides accumulated flow using the controller's 0 to 5 VDC output signal. Display to seven digits. Must order with meter for factory setup

Analog Signal-to-RS Converters for collection and analysis of data on a PC. Include software, a bidirectional A/D and D/A signal conditioner with switch for 0 to 5 VDC 4 to 20 mA input and 110 V power supply; use screw terminal connections.

KH-03277-70 **Analog signal-to-RS-232 converter**

KH-03277-75 **Analog signal-to-RS-485 converter**

Extension Cable lets you extend display up to three feet away for remote reading.

KH-32662-70 **Extension cable**

Output Cables make it easy to connect your flowmeter to other instruments. Features DB9(F) connectors. Cables are three feet long.

KH-32650-60 **Output cable,** for 4 to 20 mA signal

KH-32650-65 **Output cable,** for 0 to 5 VDC signal

Power Supply allows flowmeters to be powered by AC voltage.

KH-03277-00 **Power supply,** 110 VAC

KH-03277-05 **Power supply,** 220 VAC

Cole-Parmer® Low-Cost Flowmeters/Flow Transmitters

Miniature coil design for fast performance

- All meters feature 0 to 5 VDC output signal for datalogging or controlling other instruments

These low-cost flowmeters use a thermal gas flow sensing technique that results in highly accurate readings and repeatability. See "How they work" on pages 557–558 for more information on mass flowmeter operation. All units are calibrated to air/nitrogen—call our Application Specialists for meters calibrated to other gases or gas mixtures. Meters feature a cable hub connector for a quick connection to a power supply and 0 to 5 VDC output cable; order power supplies/cables under "Accessories" below right. Flowmeters are available without display or with 3½-digit LCD. Display tilts up to 90° for easy viewing.

Flowmeters have low pressure drop across the sensor. The output signal can connect to a remote display, recorder, or any instrument that accepts a 0 to 5 VDC signal. Compact size makes it easy to carry around. Order rechargeable battery kit under "Accessories."

Wetted materials are anodized aluminum, 316 stainless steel, Viton® O-rings, and brass fittings (316 stainless steel fittings on models 32711-36 to -52 and 32712-36 to -52). Each meter includes two Swagelok® compression fittings and a 24" long cable with hub connector. All have metric-reading scales.

Flowmeter
32707-08

Flowmeter with display
32707-20

Specifications & Ordering Information

CE For GASES

Max particulate size: 20 microns

Accuracy: ±1.5% full-scale including linearity (see below for details)

Accuracy coefficient, temperature: ±0.15% per °C full-scale

Accuracy coefficient, pressure: ±0.02% per psi full-scale

Repeatability: ±0.5% full scale

Response time: 2 seconds (typical) to within ±2% of actual flow rate from 25 to 100% of full scale

Operating temperature: 50 to 122°F (10 to 50°C)

Maximum system pressure: 150 psi

Leak integrity: 1 x 10^{-4} sccs He (max)

Transducer input power: 12 to 15 VDC; 100 mA max

Output signal: linear 0 to 5 VDC (2500 Ω minimum load)

Connection fittings
Models 32707-00 to -10 and 32707-20 to -30: ⅛" Swagelok compression fittings
Models 32707-12 , -14 and 32707-32, -34: ¼" Swagelok compression fittings
Models 32707-16, -36, 32711-36, and -40, and 32712-36, and -40: ⅜" Swagelok compression fittings
Models 32711-44 to -52 and 32712-44 to -52: ½" Swagelok compression fittings

Dimensions (not including fittings)
Models 32707-00 to -36: 1⅞"W x 3½"H* x 1"D;
Models 32711-36 to -44 and 32712-36 to -44: 4½"W x 4"H* x 1¼"D
Models 32711-52 and 32712-52: 5 13/16"W x 6"H* x 3"D

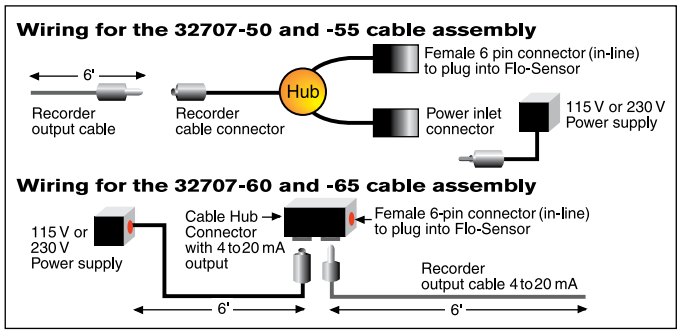
*Add 1½" to the height of models with display

Flow rate	Pressure drop (max flow)	Without display Cat. no.‡	Price	With 3½-digit LCD† Cat. no.‡	Price
Flowmeters with acetal fittings					
0 to 20 sccm	1" H_2O	KH-32707-00		KH-32707-20	
0 to 50 sccm	1" H_2O	KH-32707-02		KH-32707-22	
0 to 100 sccm	2" H_2O	KH-32707-04		KH-32707-24	
0 to 200 sccm	2" H_2O	KH-32707-06		KH-32707-26	
0 to 500 sccm	2" H_2O	KH-32707-08		KH-32707-28	
0 to 1000 sccm	3" H_2O	KH-32707-10		KH-32707-30	
0 to 2 sL/min	3" H_2O	KH-32707-12		KH-32707-32	
0 to 5 sL/min	3" H_2O	KH-32707-14		KH-32707-34	
0 to 10 sL/min	10" H_2O	KH-32707-16		KH-32707-36	
Flowmeters with stainless steel fittings					
0 to 20 sL/min	3" H_2O	KH-32711-36		KH-32712-36	
0 to 50 sL/min	10" H_2O	KH-32711-40		KH-32712-40	
0 to 100 sL/min	10" H_2O	KH-32711-44		KH-32712-44	
0 to 500 sL/min	50" H_2O	KH-32711-52		KH-32712-52	

†Meters with 3½"-digit display come with a NIST-traceable certificate.
‡Power supplies/connectors must be ordered at right

Accuracy: These precalibrated flowmeters operate at inlet pressures between 5 and 40 psi and at gas temperatures between 64 and 77°F (18 to 25°C) while maintaining the stated ±1.5% full scale accuracy and linearity. When operating beyond 5 to 40 psi, add ±0.02%/psi full-scale; if operating beyond 64 to 77°F (18 to 25°C), add ±0.15%/°C full-scale.

Power Supply/Output Cables (required). The cables provide AC voltage as well as transmit output signals. Select a power supply/output cable for 0 to 5 VDC output signal or for 4 to 20 mA output signal. Both power supply cable and output cable are six feet long. Order from table below.



Rechargeable Battery Kit makes your flowmeters portable. Use flow meters for more than 8 hours without recharging. Batteries can be recharged at least 500 times. Kit contains batteries, charger, output cable, and carrying case with shoulder strap. Order from table below.

Description	115 VAC models Cat. no.	Price	230 VAC models Cat. no.	Price
Power supply and output cable (0 to 5 VDC output)	KH-32707-50		KH-32707-55	
Power supply and output cable (4 to 20 mA output)	KH-32707-60		KH-32707-65	
Rechargeable battery kit	KH-32707-70		KH-32707-75	

Accessories

KH-03277-70 **Analog signal-to-RS converter** for collection and analysis of data on a PC. Includes software, a bidirectional A/D and D/A signal conditioner with switch for 0 to 5 VDC or 4 to 20 mA input, and 110 VAC, power supply; uses screw terminal connections

KH-32707-80 **Extension cable** lengthens flowmeter cable by six additional feet

FL Flowmeters

Thermal Dispersion / Gas Mass

Compact Gas Mass Flow Controllers

Precisely control flow rates with a built-in valve

- Proven design uses metal body components for added durability
- Accumulated flow can be logged using an optional totalizer
- Includes NIST-traceable certificate

These controllers feature an advanced straight-tube sensor that ensures accurate and repeatable results. Gas flow measurements are unaffected by moderate temperature and pressure variations at the inlet. The meter also allows a four-point calibration across the flow range to improve meter linearity.

The flow rate set point can be established by either a local potentiometer or by a remote 4 to 20 mA or 0 to 5 VDC signal. Output data is sent via a 0 to 5 VDC or 4 to 20 mA signal; an analog-to-RS converter is also available for data collection and analysis on your PC.

All controllers include a detachable 3½-digit LCD that can be tilted up to 90° for easy reading. The display is remote mountable to three feet using extension cable 32662-70. The totalizer option 32650-70 will display total accumulated flow.

The controller is protected from polarity reversal or short circuit by a built-in resettable fuse. Aluminum models have wetted materials of anodized aluminum, brass, and Viton®; stainless steel (SS) models have wetted materials of SS and Viton.

Controller 32661-06 shown with totalizer 32650-70

Adjust flow rate locally with the built-in set point potentiometer.

32666-10

Accuracy

These precalibrated flow controllers operate at inlet pressures between 5 and 60 psi and at gas temperatures between 59 and 77°F (15 to 25°C) while maintaining the stated percent full-scale accuracy and linearity. When operating beyond 5 to 60 psi, add ±0.01%/psi full-scale; if operating beyond 59 to 77°F (15 to 25°C), add ±0.15%/°C full-scale.

ISO 9001:2000 CERTIFIED SUPPLIER | NIST TRACEABLE | CE | For GASES

Specifications & Ordering Information

Maximum particulate size: 5 microns

Accuracy (including linearity)
Models up to 10 sL/min: ±1% full-scale
All other models: ±1.5% full-scale
(see above for details)

Accuracy coefficient, temperature: ±0.15%/°C full-scale

Accuracy coefficient, pressure: ±0.01%/psi full-scale

Repeatability: ±0.5% full-scale

Response time: 2 seconds (typical) to within ±2% of actual flow rate from 25 to 100% of full-scale

Operating temperature: 32 to 122°F (0 to 50°C)

Maximum system pressure: 500 psi

Leak integrity: 1 x 10^{-7} sccs He (max)

Transducer input power: 12 VDC, 1100 mA max; polarity protected

Output signal: linear 0 to 5 VDC (1000 Ω minimum load), 4 to 20 mA (50 to 500 Ω loop resistance)

Connections (included)
Models up to 50 sL/min:
¼" compression fittings
200 sL/min models:
⅜" compression fittings
500 sL/min models:
½" compression fittings
1000 sL/min models: ¾" NPT(F) fittings

Dimensions (not including the fittings)
Models up to 5 sL/min:
4¾"W x 5⅝"H x 1"D
15 to 100 sL/min models:
5¼"W x 6"H x 1¼"D

Flow rate	Pressure drop (max flow)	Aluminum bodies					316 stainless steel bodies				
		Air/N_2	O_2	H_2	Ar	Price	Air/N_2	O_2	H_2	Ar	Price
		Cat. no.	Cat. no.	Cat. no.	Cat. no.		Cat. no.	Cat. no.	Cat. no.	Cat. no.	
0 to 10 sccm	1.06 psi	KH-32660-00	KH-32660-26	KH-32660-52	KH-32660-78		KH-32661-00	KH-32661-26	KH-32661-52	KH-32661-78	
0 to 20 sccm		KH-32660-02	KH-32660-28	KH-32660-54	KH-32660-80		KH-32661-02	KH-32661-28	KH-32661-54	KH-32661-80	
0 to 50 sccm		KH-32660-04	KH-32660-30	KH-32660-56	KH-32660-82		KH-32661-04	KH-32661-30	KH-32661-56	KH-32661-82	
0 to 100 sccm	1.06 psi	KH-32660-06	KH-32660-32	KH-32660-58	KH-32660-84		KH-32661-06	KH-32661-32	KH-32661-58	KH-32661-84	
0 to 200 sccm		KH-32660-08	KH-32660-34	KH-32660-60	KH-32660-86		KH-32661-08	KH-32661-34	KH-32661-60	KH-32661-86	
0 to 500 sccm		KH-32660-10	KH-32660-36	KH-32660-62	KH-32660-88		KH-32661-10	KH-32661-36	KH-32661-62	KH-32661-88	
0 to 1 sL/min	1.06 psi	KH-32660-12	KH-32660-38	KH-32660-64	KH-32660-90		KH-32661-12	KH-32661-38	KH-32661-64	KH-32661-90	
0 to 2 sL/min		KH-32660-14	KH-32660-40	KH-32660-66	KH-32660-92		KH-32661-14	KH-32661-40	KH-32661-66	KH-32661-92	
0 to 5 sL/min		KH-32660-16	KH-32660-42	KH-32660-68	KH-32660-94		KH-32661-16	KH-32661-42	KH-32661-68	KH-32661-94	
0 to 15 sL/min	3.87 psi	KH-32660-19	KH-32660-45	KH-32660-71	KH-32660-95		KH-32661-19	KH-32661-45	KH-32661-71	KH-32661-95	
0 to 30 sL/min	3.50 psi	KH-32660-20	KH-32660-46	KH-32660-72	KH-32660-97		KH-32661-20	KH-32661-46	KH-32661-72	KH-32661-97	
0 to 50 sL/min	11 psi	KH-32660-22	KH-32660-48	KH-32660-74	KH-32660-98		KH-32661-22	—	—	—	
0 to 100 sL/min	20 psi	KH-32660-24	KH-32660-50	KH-32660-76	KH-32660-99		KH-32661-24	—	—	—	
0 to 500 sL/min	47 psi	KH-32665-00	—	—	—		KH-32666-00	—	—	—	
0 to 1000 sL/min		KH-32665-10	—	—	—		KH-32666-10	—	—	—	

Accessories

KH-32650-70 Flow totalizer provides accumulated flow using the controller's 0 to 5 VDC output signal. Displays to seven digits. Must order with meter for factory setup

Analog Signal-to-RS Converters for collection and analysis of data on a PC. Include software, a bidirectional A/D and D/A signal conditioner with switch for 0 to 5 VDC or 4 to 20 mA input, and 110 V, power supply; use screw terminal connections.

KH-03277-70 **Analog signal-to-RS-232 converter**
KH-03277-75 **Analog signal-to-RS-485 converter**

KH-32662-65 **Cable,** 8-ft L for connecting flowmeters/controllers to any instrument that accepts analog input signals. DB15(F) connector with bare wire ends
KH-32662-70 **Extension cable,** for remote placement of display up to three feet away..

Power Supplies for operation by AC voltage.

KH-32662-50 **Power supply;** U.S. plug, 110 VAC.
KH-32662-55 **Power supply;** Euro plug, 220 VAC
KH-32662-60 **Power supply;** U.K. plug, 240 VAC

Network-Ready Flow Controllers with DSP

Control and monitor up to 256 devices on a single bus network

- Stores NIST-traceable calibration data for up to 10 gases, eliminating the need for multiple controllers on systems running diverse batch processes
- Controllers feature exceptional repeatability that reduces quality deviations in any process that requires multiple devices
- The flexible design also functions in traditional analog mode with 0 to 5 VDC signals

Through the use of digital signal processing, this design offers outstanding functionality and performance. Using a PC-based RS-485 interface, all parameters are easily programmed and updated for this device. For those users with systems operating on traditional signals, the various calibration benefits of this design can still be utilized through the unit's capability to operate with traditional 0 to 5 VDC analog signals.

The flowmeter element of these controllers features an advanced straight-tube sensor that ensures accurate and repeatable results. Gas flow measurements are unaffected by moderate temperature and pressure variations at the inlet. To further improve accuracy, each of the 10 different NIST-traceable calibrations* can be linearized around a 10-point curve. For less critical applications that can tolerate accuracies of ±3% full-scale, users may select from any one of 256 mathematically determined calibration factors to match the particular gas being controlled.

Once calibrated, an auto zero feature utilizes an automatic balancing circuit that eliminates zero and span drift. Enhancing performance of the PID control function, the device incorporates an adaptive PID feature through its autotune capability. This automatically sets the control response to the specific process without the user having to go through the lengthy process of determining the PID parameters. Further improving the unit's performance is the use of local internal memory for control calculations. This feature improves the controller's response time and reduces data loading on the control network.

For control of external devices, these controllers have two SPDT relays (user settable for normally open or normally closed). The relays can be programmed to switch based on a full range of flow or totalizer set points. Other control features include a programmable cycle function that can be set to run up to 12 independent steps; the cycle can also be set to operate in a loop for repeating processes.

Wetted parts include 316 stainless steel (SS), 416 SS, and Viton®. Buna-N, neoprene and Kalrez O-rings are available as an option. A 40-micron inlet screen for particulate is included.

*One NIST-traceable calibration certificate is included with each device. Additional calibrations may be ordered as an option.

32682-00

Mount up to 256 flow controllers up to 4000 feet away from your control point.

Accuracy

These controllers operate and maintain the stated full-scale accuracy and linearity at inlet pressures between 10 and 60 psi (0.70 to 4.10 bars) and gas temperatures between 59 and 77°F (15 to 25°C). If operating outside 10 to 60 psi, add ±0.01%/psi full-scale (±0.145%/bar); if operating outside 59 to 77°F, add ±0.08%/°F full-scale (±0.15%/°C).

Specifications & Ordering Information

ISO 9001:2000 CERTIFIED SUPPLIER NIST TRACEABLE CE For GASES

Accuracy: ±1% full scale including linearity (see at right for details)

Accuracy coefficient, temperature: 0.05%/°C full-scale

Accuracy coefficient, pressure: 0.01% psi full-scale

Repeatability: ±0.15% full-scale

Response time: 0.6 to 1.0 second to within ±2% of set point

Operating temp: 41 to 122°F (5 to 50°C)

Maximum system pressure: 500 psi

Maximum operating differential: 40 psid

Leak integrity: 1 x 10^{-9} sccs He (max)

Transducer input power: 15 ±5% VDC; 450 mA max

Output/input signals: 0 to 5 VDC (2000 Ω minimum)

Connections

100 L/min models: 3/8" compression fittings
All other models: 1/4" compression fittings

Dimensions

10 sccm to 5 sL/min models: 5 1/2"W x 5 3/4"H x 1 1/2"D
30 to 100 sL/min models: 6 1/2"W x 6"H x 1 7/8"D

Flow rate†	Pressure drop (max flow)	Air	O_2	H_2	He	CO_2	Ar	Price
		Catalog number	Catalog number	Catalog number	Catalog number	Catalog number	Catalog number	
0 to 10 sccm	0.04 psi	KH-32680-00	KH-32682-00	KH-32683-00	KH-32684-00	KH-32685-00	KH-32686-00	
0 to 20 sccm		KH-32680-02	KH-32682-02	KH-32683-02	KH-32684-02	KH-32685-02	KH-32686-02	
0 to 50 sccm		KH-32680-04	KH-32682-04	KH-32683-04	KH-32684-04	KH-32685-04	KH-32686-04	
0 to 100 sccm	0.5 psi	KH-32680-06	KH-32682-06	KH-32683-06	KH-32684-06	KH-32685-06	KH-32686-06	
0 to 200 sccm		KH-32680-08	KH-32682-08	KH-32683-08	KH-32684-08	KH-32685-08	KH-32686-08	
0 to 500 sccm		KH-32680-10	KH-32682-10	KH-32683-10	KH-32684-10	KH-32685-10	KH-32686-10	
0 to 1 sL/min	1.06 psi	KH-32680-12	KH-32682-12	KH-32683-12	KH-32684-12	KH-32685-12	KH-32686-12	
0 to 2 sL/min		KH-32680-14	KH-32682-14	KH-32683-14	KH-32684-14	KH-32685-14	KH-32686-14	
0 to 5 sL/min		KH-32680-16	KH-32682-16	KH-32683-16	KH-32684-16	KH-32685-16	KH-32686-16	
0 to 30 sL/min	3.5 psi	KH-32680-20	KH-32682-20	KH-32683-20	KH-32684-20	KH-32685-20	KH-32686-20	
0 to 50 sL/min	8.0 psi	KH-32680-22	KH-32682-22	KH-32683-22	KH-32684-22	KH-32685-22	KH-32686-22	
0 to 100 sL/min	18.9 psi	KH-32680-24	KH-32682-24	KH-32683-24	KH-32684-24	KH-32685-24	KH-32686-24	

†Meters can report the following units of measure: % of full scale, mL/min, mL/hr, scfm, scfh, sL/min, sL/hr, and one user defined unit of measure.

Accessories

These controllers operate on ±15 VDC (±5%). To reduce power consumption on a network, the current requirements for the positive and negative power supplies are balanced so that the current in the power supply common connection is minimized. Max power consumption is 6.75 watts.

KH-32686-50 **Power supply,** 115 VAC to ±15 VDC. Includes a DB25(M) connector and cable for easy connection

KH-32686-55 **Power supply,** 230 VAC to ±15 VDC. Includes a DB25(M) connector and cable for easy connection

KH-32686-60 **Panel meter,** 15 VDC power input. For digital display of flow rate

KH-32686-62 **Power supply/connection cable,** 110 VAC to +15 VDC. Allows 32686-60 panel meter to be powered by 110 VAC and provides connection to flowmeter

FL Flowmeters

Thermal Dispersion / Gas Mass

Cole-Parmer® Low-Cost Flow Controllers

Integrated valve allows precise flow control

- Use the triple-calibrated models for multiple gas applications

These low-cost mass controllers use a thermal gas flow sensing technique that results in highly accurate readings and repeatability. Models 32708-32 through 32708-42 are calibrated for air, helium (He), and argon (Ar) only. Models 32708-00 through 32708-30 are calibrated for air and nitrogen (N_2) only; models 32708-20 through 32708-30 can be custom calibrated for up to three different gases at an additional charge. Call our Application Specialists for more information.

All models accept a 0 to 5 VDC input signal for remote valve control. Controllers with display also feature a potentiometer for manual valve control. Display is a 3½-digit LCD and tilts up to 90° for easy viewing. Front panel dip switch lets you select one of the factory programmed gases: air, nitrogen, helium, or argon.

32708-04

32708-26

Digital display models include NIST-traceable certificate.

All controllers require a combined power supply/input/output cable. This cable combines three functions into one unit: power source, plus input or output of 0 to 5 VDC signals. Use the input signal for remote valve control; use the output signal for datalogging or controlling other instruments. Order the power supply/input/output cable separately at right.

Wetted materials are anodized aluminum, 316 stainless steel, brass, Viton®, and acetal. Maximum pressure drop across the unit is 15 psi at maximum flow. Differential pressure for controllers up to and including 1 sL/min should not exceed 40 psi; 45 psi for models greater than 2 sL/min.

What's included: Two acetal compression fittings and a 24"L cable with hub connector.

Specifications & Ordering Information

NIST TRACEABLE CE For GASES

Max particulate size: 20 microns

Accuracy: ±1.5% full-scale including linearity (see below for details)

Accuracy coefficient, temperature: ±0.15%/°C full-scale

Accuracy coefficient, pressure: ±0.02%/psi full-scale

Repeatability: ±0.5% full-scale

Response time: 2 seconds (typical) to within ±2% of actual flow rate from 25 to 100% of full-scale

Operating ambient: 50 to 122°F (10 to 50°C)

Maximum system pressure: 150 psi

Leak integrity: 1 x 10^{-4} sccs He (max)

Transducer input power: 12 to 15 VDC; 100 mA max for flowmeters, 250 mA max for controllers

Output signal: linear, 0 to 5 VDC (2500 Ω minimum load)

Connections (included)
Models up to 1 sL/min:
⅛" acetal compression fittings
Models from 5 and 10 sL/min:
¼" acetal compression fittings

Dimensions (not including fittings)
Without display: 3⅛"W x 3¾"H x 1"D
With display: 3⅛"W x 5¼"H x 1"D

Flow rate*	Without display		With 3½-digit LCD†			
	Calibrated for air and N_2		Calibrated for air and N_2		Calibrated for air, He, and Ar	
	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price
0 to 50 sccm	KH-32708-00		KH-32708-20	-	KH-32708-32	
0 to 100 sccm	KH-32708-02		KH-32708-22	-	KH-32708-34	
0 to 500 sccm	KH-32708-04		KH-32708-24	-	KH-32708-36	
0 to 1 sL/min	KH-32708-06		KH-32708-26	-	KH-32708-38	
0 to 5 sL/min	KH-32708-08		KH-32708-28	-	KH-32708-40	
0 to 10 sL/min	KH-32708-10		KH-32708-30	-	KH-32708-42	

*Typical inlet pressure †Flowmeters with display include NIST-traceable certificate.

Accuracy

These precalibrated flowmeters operate at inlet pressures between 5 and 40 psi and at gas temperatures between 64 and 77°F (18 to 25°C) while maintaining the stated ±1.5% full-scale accuracy and linearity. When operating beyond 5 to 40 psi, add ±0.02%/psi full-scale; if operating beyond 64 to 77°F (18 to 25°C), add ±0.15%/°C full-scale.

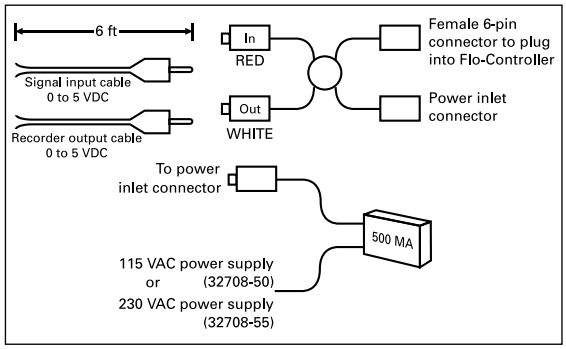
Power Supply/Input/Output Cable

To power the controller, and to transmit 0 to 5 VDC input and output signals. Comes with everything shown in the diagram below—no extra wires or cables are needed.

KH-32708-50 Power supply/input/output cable, 6 ft, 115 VAC

KH-32708-55 Power supply/input/output cable, 6 ft, 230 VAC

Wiring with 32708-50 or -55 Power Supply/Input/Output Cable



Accessories

KH-32707-80 Extension cable adds six feet to the length of power supply/input/output cable 32708-50 or -55

Analog Signal-to-RS Converter for collection and analysis of data on a PC. Includes software, a bidirectional A/D and D/A signal conditioner with switch for 0 to 5 VDC or 4 to 20 mA input, and 110 V, power supply; uses screw terminal connections.

KH-03277-70 Analog signal-to-RS-232 converter

Cole-Parmer® Flowmeters and Proportional Controllers for Gases

Versatility and high accuracy from a laminar-based mass flowmeter

- Accuracy of ±0.8% of reading, ±0.2% full-scale; repeatability of ±0.2%
- Measure 17 standard gases—user selectable from display
- 100 to 1 turndown with ranges of 0.5 SCCM full-scale up to 1500 SLPM

These meters measure flow via pressure drop across a laminar flow element (LFE). Because the flow element makes the flow stream laminar, placement in the process does not require straight pipe runs upstream or downstream of the meter, greatly simplifying installation. As compared to thermal mass technologies, the LFE design provides an ultrafast response within 10 milliseconds and offers "instant on" with no warm-up time.

An integrated keypad around the display is all that is required to program the unit for service. The 0 to 5 VDC output allows transmission of the flow value to a remote display, recorder, or controller regulating a valve or pump.

Flow controllers feature an integrated PID to direct the unit's response to process changes. Flow set point is established with keypad, the optional set point control module, a 0 to 5 V signal, or an RS-232 input signal. Order set point control modules separately from the table. For portable flow metering applications, order the battery pack listed below table.

What's included: flowmeters include the integrated sensor, display, and transmitter; controllers also include the valve assembly. All models include a 120 VAC power adapter; 220 VAC European adapters may be ordered separately below.

Mass flowmeter 32908-59 shown with optional battery pack 32929-50

Flow controller 32907-11

Meters and controllers feature a dynamic display that simultaneously shows flow rate, line pressure, fluid temperature, and (for controllers) the set point. For the units shown, both power and input/output signals are transmitted through a single multi-pin connector.

NIST TRACEABLE CE For GASES

Specifications & Ordering Information

Max particulate size
Up to 1 LPM: 20 µm
>1 LPM to 1000 LPM: 50 µm

Accuracy: ±0.8% of reading; ±0.2% full-scale

Repeatability: ±0.2%

Response time
Flowmeters: 10 msec
Flow controllers: 100 msec

Operating temperature:
14 to 122°F (–10 to 50°C)

Max pressure: 125 psig

Pressure drop: 0.8 psig (flowmeter)

Output signal: 0 to 5 VDC, RS-232

Input signal: 0 to 5 VDC, RS-232

Wetted materials
Flowmeters: 302 and 303 SS, Viton®, silicone RTV, and glass-reinforced nylon
Flow controllers: 302, 303, 304, 410 SS; Viton, silicone RTV, glass-reinforced nylon, nickel, brass, Delrin®, and Loctite® adhesives 326, 401, and 609

Power
Flowmeters: 7 to 30 VDC at 30 mA
Flow controllers
Models ≤10 LPM: 12 to 25 VDC at 250 mA
Models ≤50 LPM: 24 to 30 VDC at 750 mA

Display type: four-digit, seven-line LCD; ¼"H flow display

Connections
≤ 10 mL/min: 10-32 UNF
50 mL/min to 10 LPM: ⅛" NPT(F)
50 to 100 LPM: ¼" NPT(F)
100 and 250 LPM: ½" NPT(F)
500 and 1000 LPM: ¾" NPT(F)

Dimensions	Flowmeters/controllers*
Models ≤50 mL/min	2⅜"L x 3⅞"H x 1¼"D
Models 100 mL/min to 10 LPM	2⅜"L x 4¼"H x 1¼"D
Models 50 LPM to 100 LPM	4"L x 4⅜"H x 1⅝"D
Models 250 LPM to 1000 LPM	4"L x 5½"H x 1⅝"D
Set point module	2⅜"W x 2"H x 1"D

* Dimensions do not include control valve.

Flow range	Mass flowmeters		Mass flow controllers		Volumetric flowmeters		Volumetric flow controllers		Set point modules†	
	Catalog number	Price	Catalog number	Price	Catalog number	Price	Catalog number	Price	Catalog number	Price
0.01 to 1 mL/min	KH-32908-51		KH-32907-51		KH-32908-01		KH-32907-01		KH-32907-83	
0.05 to 5 mL/min	KH-32908-53		KH-32907-53		KH-32908-03		KH-32907-03		KH-32907-85	
0.1 to 10 mL/min	KH-32908-55		KH-32907-55		KH-32908-05		KH-32907-05		KH-32907-87	
0.5 to 50 mL/min	KH-32908-57		KH-32907-57		KH-32908-07		KH-32907-07		KH-32907-89	
1 to 100 mL/min	KH-32908-59		KH-32907-59		KH-32908-09		KH-32907-09		KH-32907-91	
2 to 200 mL/min	KH-32908-61		KH-32907-61		KH-32908-11		KH-32907-11		KH-32907-93	
5 to 500 mL/min	KH-32908-63		KH-32907-63		KH-32908-13		KH-32907-13		KH-32907-97	
0.01 to 1 LPM	KH-32908-67		KH-32907-67		KH-32908-17		KH-32907-17		KH-32907-83	
0.05 to 5 LPM	KH-32908-69		KH-32907-69		KH-32908-19		KH-32907-19		KH-32907-85	
0.1 to 10 LPM	KH-32908-71		KH-32907-71		KH-32908-21		KH-32907-21		KH-32907-87	
0.5 to 50 LPM	KH-32908-73		KH-32907-73		KH-32908-23		KH-32907-23		KH-32907-89	
1 to 100 LPM	KH-32908-75		KH-32907-75		KH-32908-25		KH-32907-25		KH-32907-91	
2.5 to 250 LPM	KH-32908-77		KH-32907-77		KH-32908-27		KH-32907-27		KH-32907-95	
5 to 500 LPM	KH-32908-79		KH-32907-79		KH-32908-29		KH-32907-29		KH-32907-97	
10 to 1000 LPM	KH-32908-81		KH-32907-81		KH-32908-31		—	—	KH-32907-99	

†May be ordered as an option.

KH-32916-57 **Power adapter,** 220 VAC; for all flowmeters or controllers 10 LPM or less, European plug included

KH-32916-58 **Power adapter,** 220 VAC; for controllers 50 LPM and greater, European plug included

KH-32929-50 **Battery pack,** for portable operation of mass or volumetric flowmeter only

KH-32929-89 **Connection cable,** 8-DIN to stripped ends

FL Flowmeters

Thermal Dispersion / Gas Mass

Universal Mass Flow Control Systems

Modular system works with any mass flow meter or controller*

- Configure and direct the operation of up to four controllers either locally, via an RS-232 interface, or via the internet
- Use the integrated batch, totalizer, or timer functions with up to eight relays to control external system devices or alarms
- Controllers feature exceptional repeatability that reduces quality deviations in any process that relies on multiple devices

This design has a well-established standing in the control industry because of the flexibility and features that are inherent in what is a durable product. The unit is modular and control functions are set through a user-friendly programming tree. The use of universally interchangeable components allows users to configure a gas flow control system that can be integrated into a wide range of processes.

Required *System Components*

1. Mass Flow Command Module
2. Mass Flow Controller

2 **Mass flow controller 32668-04**

1 **Microprocessor command module 32681-25 accepts up to four controllers and communicates via Ethernet.**

Technical info

These controllers operate and maintain the stated full-scale accuracy and linearity at inlet pressures between 10 and 60 psi (0.68 to 4.10 bars) and gas temperatures between 59 and 77°F (15 to 25°C). If operating outside 10 to 60 psi, add ±0.01%/psi full-scale (±0.145%/bar); if operating outside 59 to 77°F, add ±0.08%/°F full-scale (±0.15%/°C).

1 Mass Flow Command Modules

Use these command modules in conjunction with any analog or digital flow meter or controller that has a 0 to 5 VDC analog input/output.* Different gas calibrations for each channel are available for all models. Models feature full menu-driven software for programming parameters. Without the use of an additional programmer module or external software, four buttons on the unit's face can be used to program and control all functions.

A primary benefit of this design is the flexibility with which the process control parameters can be set and monitored. The backlit LCD readout shows flows/totals in any of 13 different mass or volume flow units; up to four controller flow rates are shown in a single view. The local display is capable of displaying flow rate, set point, valve and alarm status along with totalizer data. An exceptionally crisp, bright vacuum fluorescent display can be ordered as an option; contact our Application Specialists for details.

For basic process monitoring or control, each controller channel has two normally open (NO) or normally closed (NC) relays available. Program totalizer to activate alarms or actuate devices based on preset volumes. For more advanced control, several programmable functions are included within the module's software—a batch program allows you to execute a custom program of up to 16 steps and a timer program can direct flow control through a user-defined series of up to 96 steps.

Select from models with RS-232 interface or ethernet interface. In addition to the comprehensive local display, an RS-232 port allows for the download of data to a computer for analysis. Modules with converter 03277-70 can be ordered for communication via the Internet or TelNet. These features greatly enhance your ability to monitor data in real time and, in the case of internet capability, to change controller settings from anywhere internet access is available. Command modules operate from any 85 to 240 VAC, 50/60 Hz power source. Order at right.

Specifications & Ordering Information

ISO 9001:2000 CERTIFIED SUPPLIER CE

Number of controller inputs	RS-232 interface		Ethernet interface	
	Catalog number	Price	Catalog number	Price
1	KH-32681-02		KH-32681-05	
2	KH-32681-12		KH-32681-15	
4	KH-32681-22		KH-32681-25	

Accessories

for Mass Flow Controllers

Analog Signal-to-RS Converter for collection and analysis of data on a PC. Includes software, a bidirectional A/D and D/A signal conditioner with switch for 0 to 5 VDC or 4 to 20 mA input, power supply; uses screw terminal connections (multipin D Sub connectors for PC and flow controller must be ordered separately).

KH-03277-70 Analog signal-to-RS-232 converter

KH-03277-75 Analog signal-to-RS-485 converter

Technical info

The cabling distance between the command module and controllers should not exceed 9¾ feet (3 m).

More info

***For configuration of command module to a controller(s) other than those on page 593, please contact our Application Specialists with technical information regarding the controller(s) that will be used.**

2 Mass Flow Controllers

The controller element includes both a flowmeter element and electromagnetically actuated control valve. The flowmeter design features an advanced straight-tube thermal dispersion sensor that ensures accurate and repeatable results. Gas flow measurements are unaffected by moderate temperature and pressure variations at the inlet. The meter allows for a four-point calibration across the flow range to improve meter linearity. An NIST-traceable calibration certificate is included for each controller unit.

Each controller is factory calibrated for use with a specific gas. One key benefit of this design is its strong repeatability characteristics, making it ideal for use in applications where the variability of multiple controllers can affect the quality of a process.

Controller is easily connected to the command module using an 8-ft long flat cable with integrated multipin D-sub connector (included).

To protect from wiring errors, each controller is protected from shorting or polarity reversal by a resettable fuse.

Wetted parts for the controller are 316 SS and Viton® O-rings. Buna N, Kalrez® or Neoprene O-rings are available upon request.

2
Mass flow controller
32668-04

Specifications & Ordering Information

ISO9001:2000 CERTIFIED SUPPLIER CE NIST TRACEABLE For GASES

Max particulate size: 100 microns
Accuracy: ±1% full-scale including linearity
Accuracy coefficient, temperature: 0.1%/°C full-scale
Accuracy coefficient, pressure: 0.01%/psi full-scale
Repeatability: ±0.2% full-scale

Response time: 2 seconds (typical) to within ±2% of actual flow rate from 25 to 100% of full-scale
Operating temp: 41 to 122°F (5 to 50°C)
Maximum system pressure: 500 psi
Optimum differential pressure: 25 psi
Maximum differential pressure: 40 psi
Leak integrity: 1 x 10^{-9} sccs He maximum

Output signal: 0 to 5 VDC (2000 Ω minimum load)
Connections: ¼" compression fittings
Display type: 24" x 2" LCD dot matrix with backlight
Dimensions
10 sccm to 5 sL/min models: 5½"W x 5¾"H x 1½"D
15 to 30 sL/min models: 6½"W x 6"H x 1⅞"D

Flow rate	Pressure drop (max flow)	Air/N_2/CO	O_2	H_2	He	CO_2	Ar	Price
		Catalog number	Catalog number	Catalog number	Catalog number	Catalog number	Catalog number	
0 to 10 sccm	1.0 psi	KH-32668-00	KH-32669-00	KH-32676-00	KH-32677-00	KH-32678-00	KH-32679-00	
0 to 50 sccm		KH-32668-04	KH-32669-04	KH-32676-04	KH-32677-04	KH-32678-04	KH-32679-04	
0 to 100 sccm		KH-32668-06	KH-32669-06	KH-32676-06	KH-32677-06	KH-32678-06	KH-32679-06	
0 to 200 sccm		KH-32668-08	KH-32669-08	KH-32676-08	KH-32677-08	KH-32678-08	KH-32679-08	
0 to 500 sccm		KH-32668-10	KH-32669-10	KH-32676-10	KH-32677-10	KH-32678-10	KH-32679-10	
0 to 1 sL/min		KH-32668-12	KH-32669-12	KH-32676-12	KH-32677-12	KH-32678-12	KH-32679-12	
0 to 2 sL/min		KH-32668-14	KH-32669-14	KH-32676-14	KH-32677-14	KH-32678-14	KH-32679-14	
0 to 5 sL/min	1.1 psi	KH-32668-16	KH-32669-16	KH-32676-16	KH-32677-16	KH-32678-16	KH-32679-16	
0 to 15 sL/min	2.2 psi	KH-32668-20	KH-32669-20	KH-32676-20	KH-32677-20	KH-32678-20	KH-32679-20	
0 to 30 sL/min	3.5 psi	KH-32668-26	KH-32669-26	KH-32676-26	KH-32677-26	KH-32678-26	KH-32679-26	

Pressure-Regulating Flow Controllers

Patented technology provides an ultrafast and highly accurate control response with immunity to pressure fluctuations

- User-selectable array of inputs and outputs provides full communications capability within any system
- Display provides flow, temperature, and pressure data through a local switch

This patented "Constant Volume Control" system uses an internal dual-stage pressure regulator in conjunction with a pressure feedback loop. The solely mechanical nature of the design means that output response is typically within 200 milliseconds; many electromechanical volumetric and mass flow controllers can require as much as 3 seconds to respond to input pressure and flow changes.

The local display can be switched to indicate flow, pressure, temperature, or flow deviation from set point; two LEDs provide error and status indication. Numerous analog input and output signals are available and user selectable. Serial communication is possible by utilizing the unit's RS-485 capabilities. This technology is ideal for a wide range of applications.

32505-64

Specifications & Ordering Information

For GASES For LIQUIDS

Fluid type: clean gases or water-like liquids
Accuracy: ±1% full-scale
Accuracy coefficient, pressure: 0.005% full-scale/psi
Repeatability: ±0.25% full-scale
Turndown ratio: 50:1
Operating temperature: 32 to 158°F (0 to 70°C)
Wetted materials: 316L SS Ti-6Al-4V titanium alloy, PCTFE, Viton®
Connections: ¼" NPT(F)
Input power: 7 to 28 VDC, 2 W nominal (9 W peak)
Display: 4-digit LED for flow rate
Special indicators: two LEDs for error and status indication
Input signals, user selectable: 0 to 5 or 10 V, 1 to 5 or 11 V, 0 or 4 to 20 mA
Output signals, user selectable: 0 to 5 or 10 V, 1 to 5 or 11 V
Digital communications: RS-485, half-duplex

Catalog number	Fluid type	Flow range	Max pressure	Price
KH-32505-60	Gas	0 to 100 mL/min	1500 psi	
KH-32505-62		0 to 500 mL/min	1500 psi	
KH-32505-64		0 to 2 L/min	1500 psi	
KH-32505-66		0 to 15 L/min	500 psi	
KH-32505-68		0 to 30 L/min	500 psi	
KH-32505-80	Liquid	0 to 10 mL/min	500 psi	
KH-32505-82		0 to 50 mL/min	500 psi	
KH-32505-84		0 to 200 mL/min	500 psi	
KH-32505-86		0 to 500 mL/min	500 psi	
KH-32505-88		0 to 1 L/min	500 psi	

FL Flowmeters

Differential Pressure

Cole-Parmer® Flowmeters and Controllers for Liquids

Achieve accurate, ultrafast volumetric measurement and control

- Technology allows for installation without typical inlet/outlet straight-run requirements
- Units provide data on multiple fluid parameters: flow, pressure and temperature
- All functions are user-programmable through an integrated keypad

These meters measure flow via pressure drop across a laminar flow element (LFE). Because the flow element makes the flow stream laminar, placement in the process does not require straight pipe runs upstream or downstream of the meter, greatly simplifying installation. The LFEs also provide an outstanding turndown ratio of 50:1 giving the meter a very broad and accurate measuring range. The design provides an ultrafast response at start-up or input change–often within 100 milliseconds.

The 0 to 5 VDC output allows transmission of the flow value to a remote display, recorder, or controller regulating a valve or pump.

For the flow controllers, an integrated PID controller directs the unit's response to process changes. Set the P and D parameters to tailor the unit's response. Flow setpoint is established with the optional set point control module, a 0 to 5 V signal, or an RS-232 input signal. See the table below to select the optional set point module. For portable flow metering (not controlling) applications, order the battery pack listed below. Units can be mounted via threaded taps in the meter body.

What's included: Integrated sensor, display, and transmitter; controllers add the valve assembly. All models include a 120 VAC power adapter; 220 VAC European adapters may be ordered separately below.

Set point module 32907-91

Flow controller 32907-45

Flowmeter 32908-41 shown with optional battery pack 32929-50

Specifications & Ordering Information

Max particulate size:
Up to 50 mL/min: 20 µm
100 mL/min to 10 LPM: 50 µm

Accuracy: ±2% full-scale

Repeatability: ±2% of full-scale

Response time
Flowmeters: 20 msec
Flow controllers: 100 msec

Turndown ratio: 50:1

Operating temp: 50 to 122°F (10 to 50°C)

Max system pressure: 100 psig

Pressure drop: 0.8 psig (flowmeter element)

Wetted materials
Flowmeters: 303 SS (stainless steel), Viton®, silicone RTV, polyethermide
Flow controllers: 302 SS, 303 SS, Viton, silicone RTV, polyethermide, and brass

Input power
Flowmeters: 7 to 30 VDC, 30 mA
Flow controllers: 12 to 25 VDC, 250 mA

Electrical connection: 8-pin circular mini DIN

Display type: four-digit, seven-line LCD; 1/4" H flow display

Output signal: 0 to 5 VDC, RS-232

Input signal: 0 to 5 VDC, RS-232 (controllers only)

Connections
1 mL/min: 10-32 UNF
5 mL/min to 10 LPM: 1/8" NPT(F)

Dimensions	Flowmeters/Controllers*
Models up to 500 mL/min	2 3/8"L x 4 5/8"H x 1 1/8"D
Models 1 LPM to 10 LPM	2 5/8"L x 4 3/4"H x 1 1/8"D
Set point modules	2 3/8"W x 2"H x 1"D

*Dimensions do not include control valve

Flow rate	Flowmeters		Flow controllers		Set point modules*	
	Catalog number	Price	Catalog number	Price	Catalog number	Price
0 to 1 mL/min	KH-32908-40		—	—	—	—
0 to 5 mL/min	KH-32908-41		—	—	—	—
0 to 10 mL/min	KH-32908-42		—	—	—	—
0 to 50 mL/min	KH-32908-43		KH-32907-43		KH-32907-89	
0 to 100 mL/min	KH-32908-44		KH-32907-44		KH-32907-91	
0 to 200 mL/min	KH-32908-45		KH-32907-45		KH-32907-93	
0 to 500 mL/min	KH-32908-46		KH-32907-46		KH-32907-97	
0 to 1 LPM	KH-32908-47		—	—	—	—
0 to 5 LPM	KH-32908-48		—	—	—	—
0 to 10 LPM	KH-32908-49		—	—	—	—

*May be ordered as an option.

KH-32916-57 **Power adapter,** 220 VAC, for all flowmeters or controllers 10 LPM or less, Euro plug included

KH-32916-58 **Power adapter,** 220 VAC, for controllers 50 LPM and greater, Euro plug included

KH-32929-50 **Battery pack,** for portable flow/mass measurement

KH-32929-89 **Connection cable,** 8-DIN to stripped ends

Meters and controllers feature dynamic display that simultaneously shows flow rate, line pressure, fluid temperature, and (for controllers) the set point. For the units shown, both power and input/output signals are transmitted through a single multi-pin connector.

Technical info

This technology relies on fluid viscosity to determine flowrate. Using these devices with pure water is the ideal application. For fluids with viscosities different from water, accuracy is a 1:1 proportion for the fluid's viscosity with water, i.e. 5% viscosity deviation, results in a 5% error in reported flow.

For additional information about this technology, including a schematic of the linear flow elements, please refer to our Introduction on pages 556-558.

Cole-Parmer® Economical Gas Flowmeters

Great for use when only flow rate is required

- Install in any orientation without affecting the flow rate
- An RS-232 option for integrating into more complex systems
- No moving parts ensure a long, dependable service life

This relatively low-cost volumetric flowmeter is great when only a basic flowmeter is required. The flow rate is determined by measuring the pressure differential across a stack of stainless steel laminar flow plates, a technology that is more tolerant of pressure variations in the flow stream. This design has no moving parts making it more dependable. Models are available with an analog output (0 to 5 VDC or 4 to 20 mA) or voltage output (0 to 5 VDC) and with RS-232 communication capability.

32446-01

Specifications & Ordering Information

Max particle size
Up to 100 sccm: 20 µm
>100 sccm to 50 sL/min: 50 µm
Accuracy: ±2% full-scale
Repeatability: ±1% full-scale
Response time: <5 msec
Operating temperature:
32 to 122°F (0 to 50°C)
Max pressure: 100 psig
Output: 4 to 20 mA, 0 to 5 VDC

Pressure drop at max flow: <0.75 psi
Wetted materials: aluminum, brass, and Buna N
Connections: ¼" compression
Input power: 5.3 to 26 VDC, 3 mA
Display type: 3½-digit LCD, ⅜"H
Dimensions
Models up to 5 sL/min: 4¼"W x 3½"H x 1"D
20 sL/min models: 4¼"W x 3¾"H x 1"D
50 sL/min models: 4¼"W x 3⅛"H x 1"D

Flow rate	With analog output		With voltage output and RS-232 port	
	Catalog number	Price	Catalog number	Price
1 to 50 sccm	KH-32446-01		KH-32446-21	
2 to 100 sccm	KH-32446-03		KH-32446-23	
4 to 200 sccm	KH-32446-05		KH-32446-25	
10 to 500 sccm	KH-32446-07		KH-32446-27	
0.02 to 1 sL/min	KH-32446-09		KH-32446-29	
0.4 to 2 sL/min	KH-32446-11		KH-32446-31	
0.1 to 5 sL/min	KH-32446-13		KH-32446-33	
0.4 to 20 sL/min	KH-32446-15		KH-32446-35	
1 to 50 sL/min	KH-32446-17		KH-32446-37	

KH-32446-50 **Power adapter** for 110 VAC supply
KH-32446-52 **Power adapter** for 220 VAC supply
KH-32446-54 **RS-232 communications cable,** 6-ft ribbon style

Easy-Read Heavy-Duty Flowmeters/Flow Transmitters

A compact, intelligent design built around a time-tested process technology

- Device accuracy is unaffected by pressure fluctuations
- Display is compact yet large enough to read when imbedded in large systems
- Powerful 5 A relays and analog output offer a range of control possibilities

The measuring bellows used in this meter has minimal moving parts to wear and includes a meter housing that can withstand harsh process environments. Choose between models with a bronze or 316-Ti stainless steel (SS) flow body. Meters with the digital display feature two SPDT relays capable of a robust 5 A output based on programmable set points and a 4 to 20 mA analog output for use with a flow control system or to log process flow.

Installation note: To maintain accuracy, include a minimum of 10 diameters of straight piping at the inlet and 5 diameters of piping at the outlet. The inlet/outlet piping should have the same diameter as the flowmeter body.

32883-06

Specifications & Ordering Information

Max particulate size: 50 microns
Accuracy: ±3% full-scale
Repeatability: ±1% full-scale
Max temperature
Analog display: 212°F (100°C)
LED display: 176°F (80°C)
Max pressure: 580 psi
Max pressure drop: 5 psi

Display type
Analog: 3" dial
Digital: 4-digit ½"H LED with 270° bar graph
Indicator housing: epoxy-coated aluminum and polycarbonate, NEMA 4X

Wetted parts
Bronze models: bronze, 316-Ti SS and Buna N
316-Ti SS models: 316-Ti SS and Viton®
Output signal (digital units)
Relays: (2) SPDT 5 A @ 230 VAC
Analog: 4 to 20 mA
Input power: 24 VDC, 5 W max

Technical info

Before ordering this product, users must visit www.coleparmer.com/562 to complete an application sheet that will assist the factory in the calibration of the meter.

Flow rate (GPM)	Connections	Dimensions (W x H x D)	Analog display				Digital display with output/relays			
			Bronze flow body		316-Ti SS flow body		Bronze flow body		316-Ti SS flow body	
			Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price
1 to 7	½" NPT(F)	3" x 7½" x 5"	KH-32883-01		KH-32883-17		KH-32883-51		KH-32883-67	
2 to 11	½" NPT(F)	3" x 7½" x 5"	KH-32883-03		KH-32883-19		KH-32883-53		KH-32883-69	
3 to 22	¾" NPT(F)	3" x 7½" x 5"	KH-32883-07		KH-32883-23		KH-32883-57		KH-32883-73	
5 to 30	1" NPT(F)	3" x 7½" x 5"	KH-32883-09		KH-32883-25		KH-32883-59		KH-32883-75	
5 to 44	1" NPT(F)	3" x 7½" x 5"	KH-32883-11		KH-32883-27		KH-32883-61		KH-32883-77	
20 to 180	2" NPT(F)	3" x 8" x 5"	KH-32883-15		KH-32883-29		KH-32883-63		KH-32883-79	
50 to 400	3" NPT(F)	4" x 8 1/16" x 5"	KH-32883-19		KH-32883-31		KH-32883-65		KH-32883-81	

KH-26900-00 **Power supply,** 24 VDC, features current limit protection, to prevent damage to the meter from short circuits.

Cole-Parmer® Pressure-Regulating Flow Controllers

Patented design reduces equipment cost by integrating pressure and flow control

- Internal mechanism stabilizes flow output in less than 100 milliseconds
- Unpowered and fully mechanical—ideal for hazardous environments

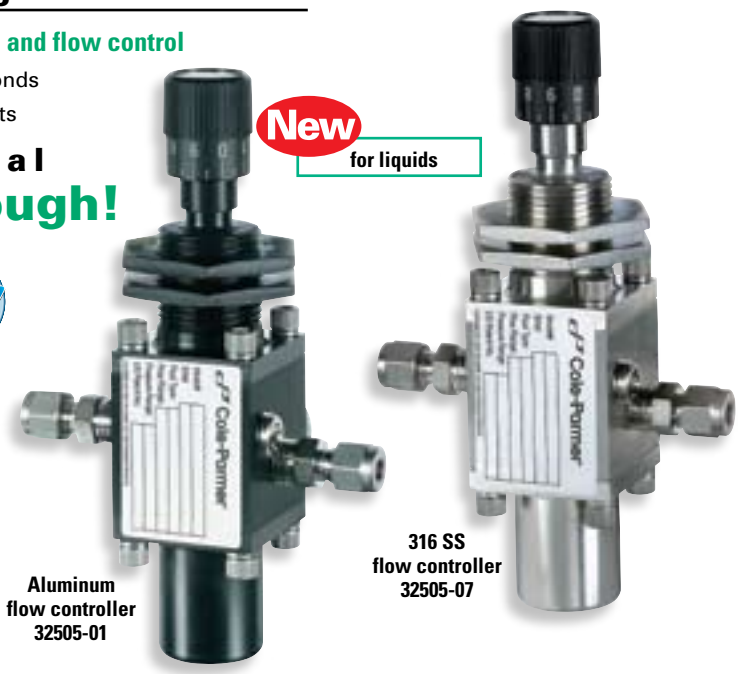
Technological Breakthrough!

To maintain accuracy through fluctuating process conditions, most flow control installations must include independent pressure regulators and measurement instruments installed upstream and downstream of the controller. Most electronic flow controllers, such as thermal mass meters, can only meet stated accuracy when operating within a narrow spectrum of inlet and outlet pressures. These controllers eliminate the need for external pressure regulation by integrating pressure and flow control into a single device.

These revolutionary flow controllers are designed to control flow rate at a constant set point (once established through the use of an external flowmeter or other feedback device). Upon setting the controller, it automatically maintains a constant pressure across the control orifice to provide highly accurate volumetric flow control.

The all-mechanical design stabilizes output as fast as system pressure fluctuates, typically between 20 and 100 milliseconds.

Mount the controller in any position. No power is required, making operation intrinsically safe.



Specifications & Ordering Information

Maximum particulate size: 5 microns

Accuracy: ±1% of set point

Repeatability: ±0.75% of set point

Response time: <100 msec

Operating temperature: –40 to 350°F (–40 to 177°C)

Leak integrity: 1 x 10^{-6} sccs He (max)

Connections: ¼" NPT(F)

Wetted materials: aluminum or 316L SS body, Kel-F® seat, Viton® diaphragm, Monel® K-500 alloy stem, and Viton/PTFE seals/O-ring

Catalog number	Flow range	Body material	Max pressure	Price
For gases				
KH-32505-01 KH-32505-03 KH-32505-05	0 to 250 mL/min 0 to 2 L/min 0 to 50 L/min	Aluminum	500 psi	
KH-32505-07 KH-32505-09 KH-32505-11	0 to 250 mL/min 0 to 2 L/min 0 to 50 L/min	316SS	500 psi	
KH-32505-13 KH-32505-15 KH-32505-17	0 to 250 mL/min 0 to 2 L/min 0 to 20 L/min	316SS	2500 psi	
For liquids				
KH-32505-30 KH-32505-32 KH-32505-34	0 to 25 mL/min 0 to 200 mL/min 0 to 5 L/min	Aluminum	500 psi	
KH-32505-36 KH-32505-38 KH-32505-40	0 to 25 mL/min 0 to 200 mL/min 0 to 5 L/min	316SS	500 psi	
KH-32505-42 KH-32505-44 KH-32505-46	0 to 25 mL/min 0 to 200 mL/min 0 to 2 L/min	316SS	3000 psi	

Accessories

KH-32505-51 **Vertical mounting bracket**

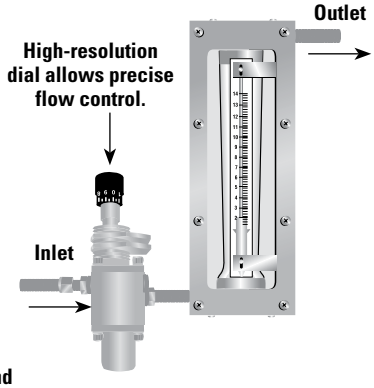
KH-32505-53 **Horizontal mounting bracket**

Call our Application Specialists for help selecting your flowmeter.

847-549-7600

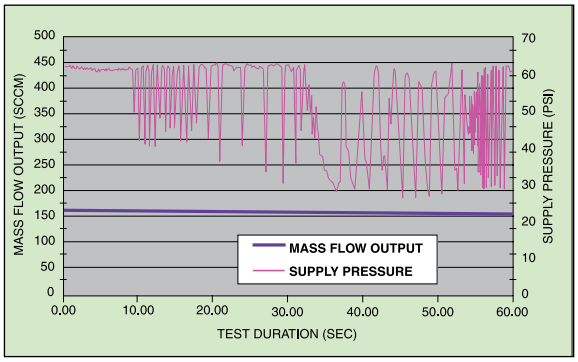
Technical info

Typical Application



By placing the flowmeter upstream of any variable-area flowmeters, you have created a volumetric flow controller that is now independent of pressure and temperature fluctuations both upstream and downstream of the variable-area meter. This means that the float on the variable-area meter will remain the same even though line pressures and temperatures may be fluctuating. Additionally, if the downstream pressure is constant in the process, the flow can be considered in mass flow units in addition to volumetric flow.

Performance Characteristics



Mass flow output remains constant even with large inlet pressure fluctuations. Flow output is stable with a maximum deviation of ±0.75% of the set point through pressure pulses. With a constant downstream pressure, mass flow is controlled. With fluctuating downstream pressure, control will be volumetric.