Modular Liquid Flow Rate Sensor Systems

System design is flexible to suit a wide range of applications

- Brass sensors for high pressure; PTFE sensors for high-purity systems; Ryton® sensors for aggressive liquids
- Dual signal outputs to monitor and record flow rates and totals

Use these modular flow sensors and totalizers for any type of process or laboratory application. The flow sensors measure low viscosity liquids from 13 mL/min up to 10 L/min. For a complete system, order a flow sensor, power supply, and flow display/totalizer.

Ryton sensor
32704-02

Brass sensor
32704-20

PTFE sensor
32705-00

Required *System Components*

1. Flow sensor
2. Power supply/adapter
3. Flow display/totalizer

1 Flow Sensors

These sensors use an optical beam, turbine wheel, and photodiode translator to generate a 7.5 V pulse output that is proportional to the flow rate. Sensors also provide a highly linear 0 to 5 VDC output signal for control or data logging purposes. **Note:** Due to the optical pick-up, the sensors should not be used with opaque liquids.

Ryton sensors have wetted materials of polyphenylene sulfide (Ryton), glass, sapphire, and Viton®. Brass sensors have wetted materials of brass, glass, and Viton. PTFE sensors have wetted materials of PTFE, sapphire, and Kalrez.

A separate power supply is required for these flow sensors—order separately below. If a Ryton or brass sensor is being used with an existing power supply, order cable assembly 32704-52 from below (PTFE models already include their own cable assembly).

Specifications for Sensors

Fluid type: low viscosity (less than 10 cSt), clear to lightly colored liquids
Max particulate size: 10 microns
Accuracy: ±3% full-scale
Linearity: ±3% full-scale
Repeatability: ±0.2% full-scale
Max operating temp: 122°F (50°C)
Max pressure
Ryton models: 100 psi
Brass models: 500 psi
PTFE models: 60 psi
Output signal: 0 to 7.5 V pulse, 0 to 5 VDC
Input power
Ryton and brass models: 12.5 ±2 VDC, 30 mA
PTFE models: regulated 12 VDC, 15 mA
Dimensions
Ryton and brass models:
Up to 5 L/min: 2 3/8"L x 1 5/8"W x 1 1/2"H
1 to 10 L/min: 4 1/2"L x 5"W x 1 1/2"H
PTFE models: 2 1/4"L x 1 7/8"W x 1 3/4"H

Flow rate	Connections (tubing OD)	Ryton® sensors		Brass sensors		PTFE sensors*	
		Cat. no.	Price	Cat. no.	Price	Cat. no.	Price
13 to 100 mL/min	1/8"	KH-32704-00		KH-32704-12		KH-32705-00	
50 to 500 mL/min	1/4"	KH-32704-02		KH-32704-14		KH-32705-02	
60 to 1000 mL/min	1/4"	KH-32704-04		KH-32704-16		KH-32705-04	
0.1 to 2 L/min	1/4"	KH-32704-06		KH-32704-18		KH-32705-06	
0.2 to 5 L/min	3/8"	KH-32704-08		KH-32704-20		KH-32705-08	
1 to 10 L/min	3/8"	KH-32704-10		KH-32704-22		—	—

*The PTFE models include 30"L cable assembly.

KH-32704-52 **Power cable assembly** for Ryton and brass sensors only. Measures 30" long. For use with an existing power supply

2 Power Supply/Adapter

A power supply will be required to power the sensors listed above.

Description	120 VAC, 60 Hz		240 VAC, 50 Hz	
	Cat. no.	Price	Cat. no.	Price
For Ryton and brass sensors	KH-32704-55		KH-32704-56	
For PTFE sensors	KH-32706-50		KH-32706-55	

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 VAC power supply; uses screw terminal connections.

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

3 Flow Display/Totalizer

This display/totalizer is compact so that it can be mounted almost anywhere. View flow rate or flow total—front-panel button lets you easily toggle between flow rate and total flow display. The totalizer can be reset either remotely or with the local reset button. Meter displays flow rate up to four digits, flow total up to eight digits.

Input pulses are translated using a scaling factor in the range of 0.001 to 9999. Select the scaling factor so that displayed flow rate and total are in your preferred engineering units: mL/min, GPM, or any other unit combination. Program the totalizer decimal point in one of five different positions. Operates on one 3 V lithium battery (included).

KH-32704-40 **Flow display/totalizer.**
Use only with the flow sensors above
KH-32704-50 **Replacement battery,** 3 V lithium

32704-40

Specifications for display/totalizer

Input signal: pulse
Accuracy: ±0.2%
Type: up counting
Input impedance: 27 kΩ at 3 VDC
Display: 8-digit LCD, 7/16"H
Update time: 0.7 seconds
Operating temp: 131°F (55°C) max
Power: internal battery, 3 V lithium (included)
Battery life: five years
Dimensions: 2 15/16"W x 1 9/16"H x 1 1/4"D
Panel cutout: 2 11/16"W x 1 5/16"H

FL Flowmeters

Turbine, Pelton Wheel

Economical Modular Flow Rate Sensor Systems

Ryton® materials for use in more aggressive gas or liquid systems

- A range of available configurations to suit most applications
- Voltage output to monitor and record flow rates and totals

32700-00

Required System Components

1. Flow sensor
2. Power supply/adapter
3. Flow rate indicator

1 Flow Sensors

These sensors are ideal for low-flow applications involving mildly acidic or slightly corrosive gases and liquids. Economically designed, sensors provide a single 0 to 5 VDC output signal. This single signal is ideal for simple, low-cost flow rate measurement or for integration of the sensor into an existing central control system.

Ryton sensors are ideal for liquids or air. Sensors for liquids can be used with a wide variety of transparent, low-viscosity liquids under 10 cSt. Sensors measure a wide flow range from 20 mL/min to 500 L/min.

The wetted materials are glass-filled polyphenylene sulfide (Ryton), glass, stainless steel, sapphire, and Viton®.

A power supply is required for these flow sensors—order separately below. If using an existing power supply, order cable assembly 32700-80 (below table).

32700-12

32700-18

GO to page(s) 597

Need a digital signal? Order an analog signal- to-RS converter to convert the VDC output signal to a digital signal.

Specifications & Ordering Information

Max particulate size
For liquids: 7 microns
For gases: 25 microns

Accuracy: ±3% full-scale including linearity

Accuracy coefficient, temperature: ±0.2% per °C

Accuracy coefficient, pressure: ±0.07% per mm Hg (for air at 1 to 3 atm)

Repeatability: ±1% full-scale

Operating temp: 122°F (50°C) max

Max system pressure
For liquids: 100 psi at 20°C
For gases: 40 psi at 20°C

Output signal: 0 to 5 VDC

Input power:
10 to 15 VDC, 30 mA

Dimensions: (excluding fittings)
2 3/8"L x 1 5/8"W x 1 1/2"H

Flow rates	Connections (tube OD)	Pressure drop (max flow)	Catalog number	Price
Ryton sensors for liquids*				
13 to 100 mL /min	1/8"	10 psi	KH-32703-50	
50 to 500 mL /min	1/4"	10 psi	KH-32703-52	
60 to 1000 mL /min	1/4"	5 psi	KH-32703-54	
0.1 to 2 LPM	1/4"	6 psi	KH-32703-55	
0.2 to 5 LPM	3/8"	6 psi	KH-32703-56	
1 to 10 LPM	3/8"	6 psi	KH-32703-58	
Ryton sensors for air				
20 to 100 mL /min	1/8"	20" H_2O	KH-32700-00	
40 to 200 mL /min	1/4"	11" H_2O	KH-32700-02	
100 to 500 mL /min	1/4"	3" H_2O	KH-32700-04	
0.2 to 1 LPM	1/4"	2" H_2O	KH-32700-06	
0.4 to 2 LPM	1/4"	2" H_2O	KH-32700-08	
1 to 5 LPM	1/4"	2" H_2O	KH-32700-10	
2 to 10 LPM	3/8"	3" H_2O	KH-32700-12	
4 to 20 LPM	3/8"	3" H_2O	KH-32700-14	
10 to 50 LPM	3/8"	3" H_2O	KH-32700-16	
20 to 100 LPM	3/8"	2.8" H_2O	KH-32700-18	
40 to 200 LPM	1/2"	5" H_2O	KH-32700-20	
100 to 500 LPM	1/2"	20" H_2O	KH-32700-22	

*Flow rates given are for water and other low-viscosity fluids less than 10 centistokes

KH-32700-80 **Power cable assembly, 36".**
Required when using an existing power supply

2 Power Supply/Adapters

A power supply will be required for the sensors listed above.

KH-32700-50 **Power supply;** 120 VAC, 60 Hz
KH-32700-55 **Power supply;** 240 VAC, 50/60 Hz

3 Flow Rate Indicators

32706-72

Miniature 3 1/2-Digit LCD. This low-power device operates from an existing 5 to 24 VDC source—like the supply for the flow sensor; no additional power supplies are required. View the 0.4" high digits in any flow unit combination to which the sensor output signal is scaled. Panel cutout is 1.665"L x 0.915"H (x 1.00"D). The input signal is 0 to 5 VDC.

KH-32706-72 **DC-powered display**

Cole-Parmer Universal Rate/Totalizer/Batch Controllers. For display of flow rates and totals plus options for doing batch process control. Displays in any engineering unit through a 1/8-DIN face. See page 597 for detailed information and other available models.

Description (relays and/or outputs)	115 VAC, 50/60 Hz Cat. no.	115 VAC, 50/60 Hz Price	230 VAC, 50/60 Hz Cat. no.	230 VAC, 50/60 Hz Price
None	KH-94787-00		KH-94787-05	
Two relays	KH-94787-40		KH-94787-45	
Two relays and 4 to 20 mA output	KH-94787-50		KH-94787-55	

KH-05656-55 **Benchtop stand** accepts 1/8-DIN meters. Tilt-back angle allows easy reading. Features nonslip rubber feet

KH-50001-00 **Line cord** with U.S. standard plug, 6-ft L.
For 120 VAC operation

High-Accuracy Stainless Steel Flowmeters / Transmitters

Economical design with an outstanding ±1.0 % full-scale accuracy

- A wide range of outputs options for integration into any system
- NIST-traceable calibration certificate included with non-display units

Required *System* Components

1. Flow meter/transmitter
2. Power supply adapter
3. Flow rate indicator (for units without built-in display)

1 Flow Meters / Transmitters

Select these flow meters and transmitters for extremely low flow-rate applications or for higher flow rate measurements and yet maintain a full-scale accuracy of ±1% or better. All units feature a stainless steel housing and come standard with stainless steel compression fittings.

Choose transmitters with a 0 to 5 VDC or 4 to 20 mA output for control or datalogging purposes. Models 32718-00 to -09 also feature a pulse output that is proportional to flow rate. Models 32718-20 to -32 offer a single output (0 to 5 VDC) along with a built-in 3½-digit display.

The flow meters/transmitters can be used with a wide variety of transparent, low-viscosity (under 10 cSt) corrosive or neutral liquids and solvents.

A power supply is required for each meter/transmitter and may be ordered at right. If using an existing power supply, order cable assembly 32704-52 below the table.

Transmitter 32718-00

Flowmeter with output 32718-20

Transmitter 32718-40

GO to page(s) 597

Order an analog signal converter to convert the VDC output signal to an RS-232 signal.

Specifications & Ordering Information

Max particulate size: 25 µm
Accuracy: ±1% full-scale including linearity
Accuracy coefficient, temperature: ±0.2% per °C
Repeatability: ±0.2% full-scale
Operating temp: 131°F (55°C)
Max system pressure: 500 psi at 20°C
Wetted parts: 316L stainless steel, glass-filled polyphenylene sulfide (Ryton®), glass, sapphire, epoxy and Viton®
Output signal
Models 32718-00 to -09: 0 to 5 VDC, plus pulse output
Models 32718-20 to -32: 0 to 5 VDC,
Models 32718-40 to -52: 4 to 20 mA

Input power
Models 32718-00 to -32: 12 VDC, 35 mA
Models 32718-40 to -52: 24 VDC, 50 mA

Dimensions
Models 32718-00 to -09: 2⅜"L x 1⅝"W x 1½"H
Models 32718-20 to -32: 2⁹⁄₁₀"L x 3"W x 1¾"H
Models 32718-40 to -52: 2⅜"L x 1⅝"W x 2⅓"H

Flow range	Connections (tube OD)	Pressure drop (max flow)	Catalog number	Price
Transmitters with 0 to 5 VDC and pulse output				
13 to 100 mL/min	⅛"	10 psi	KH-32718-00	
20 to 200 mL/min	¼"	10 psi	KH-32718-02	
50 to 500 mL/min	¼"	10 psi	KH-32718-04	
0.1 to 1 LPM	¼"	6 psi	KH-32718-06	
0.2 to 2 LPM	¼"	10 psi	KH-32718-07	
0.4 to 5 LPM	⅜"	10 psi	KH-32718-08	
1 to 10 LPM	⅜"	12 psi	KH-32718-09	
Flowmeters with a 3½-digit display and 0 to 5 VDC output				
13 to 100 mL/min	⅛"	10 psi	KH-32718-20	
20 to 200 mL/min	¼"	10 psi	KH-32718-22	
50 to 500 mL/min	¼"	10 psi	KH-32718-24	
0.1 to 1 LPM	¼"	6 psi	KH-32718-26	
0.2 to 2 LPM	¼"	10 psi	KH-32718-28	
0.4 to 5 LPM	⅜"	10 psi	KH-32718-30	
1 to 10 LPM	⅜"	12 psi	KH-32718-32	
Transmitters with 4 to 20 mA output				
13 to 100 mL/min	⅛"	10 psi	KH-32718-40	
20 to 200 mL/min	¼"	10 psi	KH-32718-42	
50 to 500 mL/min	¼"	10 psi	KH-32718-44	
0.1 to 1 LPM	¼"	6 psi	KH-32718-46	
0.2 to 2 LPM	¼"	10 psi	KH-32718-48	
0.4 to 5 LPM	⅜"	10 psi	KH-32718-50	
1 to 10 LPM	⅜"	12 psi	KH-32718-52	

KH-32704-52 **Cable assembly** for sensors; 30"L. Required when using your own power supply

2a Power Supplies (Transmitters 32718-00 to -09 and meters 32718-20 to -32)

A power supply is required for each meter/transmitter.

KH-32704-50 **Power supply;** 120 VAC, 60 Hz to 12 VDC.
KH-32704-55 **Power supply;** 240 VAC, 50 Hz to 12 VDC

2b Power Supply (Transmitters 32718-40 to -52)

Power supply is required for each transmitter.

KH-32704-90 **Power supply;** 120 VAC, 60 Hz to 24 VDC

3 Displays

Select a flow rate/total display for use with the transmitters listed at left. Note the signal-input requirements for each. See page 597 for displays/controllers to pair with units 32718-40 to -52.

Miniature 3½-Digit LCD Display. This low-power device operates from and existing 5 to 24 VDC source—like the supply for the flow transmitter; no additional power supplies are required. View the 0.4" high digits in any flow unit combination to which the transmitter output signal is scaled. Panel cutout is 1.67"L x 0.92"H (x 1.00"D). The input signal is 0 to 5 VDC.

32706-72

KH-32706-72 **DC-powered display**

Flow Display/Totalizer shows flow rate up to four digits and total flow up to eight digits; select a scaling factor to display rates and totals in any desired engineering unit. Operates on one 3 V lithium battery (included). Panel cutout is 2½"L x 1¼"H (x 1¼"D). Input signal is pulse.

32704-40

See page 597 for more details.

KH-32704-40 **Flow indicator/totalizer**
KH-32704-50 **Replacement battery,** 3 V lithium

FL Flowmeters

Turbine, Pelton Wheel

Liquid or Gas Turbine Flowmeters/Transmitters

Output signal lets you connect to a remote display, datalogger, or recorder for continuous monitoring

- The 3½-digit LCD provides direct flow rate readings

These low-flow liquid and air flowmeters are ideal for industrial, commercial, laboratory, or OEM applications. They are compact and offer excellent liquid or air measurements. All models provide direct flow rate readings in mL/min or L/min and a 0 to 5 VDC linear output.

Choose from Ryton® or brass flowmeters. Ryton meters are an economical alternative to brass models. Order brass meters for high-pressure applications—meters withstand up to 500 psi. Use flowmeters for liquids with a wide variety of transparent, low viscosity (below 10 cSt) liquids. Flowmeters for air cover flow rates from 10 mL/min to 20 L/min.

Wetted materials are glass-filled polyphenylene sulphide (Ryton), glass, stainless steel, sapphire, Viton®, and acetal (for Ryton flowmeters) or brass (for brass flowmeters).

Order base plate 32709-90 under "Accessories" below to allow Ryton flowmeters (except 32709-16) stand on their own. Power flowmeters with an AC adapter or a rechargeable battery kit; battery kit provides up to 20 hours of portability. If your application requires a remote display, see page 627 for our universal rate/totalizer/batch controllers.

Ryton flowmeter 32709-16

Ryton flowmeter 32709-08

Brass flowmeter 32709-28

Specifications & Ordering Information

Flow rates*	Connections (tube OD)	Pressure drop (max flow)	Ryton flowmeters		Brass flowmeters	
			Catalog number	Price	Catalog number	Price
Flowmeters for transparent liquids						
13 to 100 mL/min	⅛"	10 psi	KH-32709-50		KH-32709-70	
20 to 200 mL/min	¼"	7 psi	KH-32709-52		KH-32709-72	
50 to 500 mL/min	¼"	6 psi	KH-32709-54		KH-32709-74	
0.06 to 1 L/min	¼"	5 psi	KH-32709-56		KH-32709-76	
0.1 to 2 L/min	¼"	6 psi	KH-32709-58		KH-32709-78	
0.2 to 5 L/min	⅜"	6 psi	KH-32709-60		KH-32709-80	
Flowmeters for air						
20 to 100 mL/min	⅛"	20" H_2O	KH-32709-02		KH-32709-22	
40 to 200 mL/min	⅛"	8" H_2O	KH-32709-04		KH-32709-24	
100 to 500 mL/min	⅛"	2" H_2O	KH-32709-06		KH-32709-26	
0.2 to 1 L/min	⅛"	2" H_2O	KH-32709-08		KH-32709-28	
0.4 to 2 L/min	¼"	2" H_2O	KH-32709-10		KH-32709-30	
1 to 5 L/min	¼"	2" H_2O	KH-32709-12		KH-32709-32	
2 to 10 L/min	¼"	3" H_2O	KH-32709-14		KH-32709-34	
4 to 20 L/min	⅜"	3" H_2O	KH-32709-16		KH-32709-36	

*Flow rates for air are given at 760 mm Hg and 23°C. Flow rates for liquids are given for water at 23°C.

Max particulate size: 10 microns
Accuracy: ±3% full-scale including linearity
Accuracy coefficient, temperature: ±0.2% per °C
Repeatability
Meters for liquids: ±0.2%, full-scale (20 to 100%)
Meters for air: ±0.5%, full-scale (50 to 100%)
Operating temp: 0 to 50°C (32 to 122°F)
Max system pressure
Ryton: 100 psi (meters for liquids), 40 psi (meters for air)
Brass: 500 psi
Display: 3½-digit LCD, ⅞"H
Output signal: 0 to 5 VDC
Input power: 12 VDC
Dimensions:
1⅞"W x 3"H x 1¾"D (for models up to 5 L/min)

Accessories

KH-32709-90 **Base plate** for Ryton flowmeters (except 32709-16) above. Allows meter to stand by itself. Base plate includes mounting screws

KH-32709-92 **AC adapter;** 115 VAC, 50/60 Hz. Adapter includes signal output cable

KH-32709-94 **AC adapter;** 230 VAC, 50/60 Hz. Adapter includes signal output cable

KH-32709-96 **Rechargeable battery kit,** 115 VAC. Provides up to 20 hours of portable operation. Battery kit includes charger, cables, and carrying case

Rechargeable battery kit 32709-96 shown with flowmeter 32709-28

Analog Signal-to-RS Converters 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-03277-70 **Analog signal-to-RS-232 converter**

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

Cole-Parmer® Ultra High-Accuracy Turbine Flowmeters/Transmitters

Provides ±0.5% full scale accuracy in a compact, in-line liquid flowmeter

Brass flowmeter 32714-26

Select from economical Ryton® construction, rugged brass to withstand up to 500 psi, or metal-free Ryton/Kynar® models! Flowmeters simultaneously display flow rate plus provide a signal output for datalogging or control. Power flowmeters with optional AC adapter sold at right.

What's included: an NIST-traceable calibration certificate.

Specifications & Ordering Information

Max viscosity: 10 cSt
Max particulate size: 10 microns
Accuracy: ±0.5% full-scale
Accuracy coefficient, temperature: ±0.2% per °C
Repeatability: ±0.2% full-scale
Operating temp: 5 to 50°C (41 to 122°F)
Max system pressure
Ryton and Ryton/Kynar: 100 psi
Brass: 500 psi

Wetted parts
All models: glass; Viton®; epoxy paint; sapphire
32714-00 to -16: Ryton, SS, acetal tube fittings
32715-00 to -16: Ryton, PCTFE, Kynar tube fittings
32714-20 to -36: brass, SS, brass tube fittings
Display: 3½-digit LCD, ⅞"H
Output signal: 0 to 5 VDC
Input power: 12 VDC, 35 mA max
Dimensions: 1⅞"W x 3"H x 1¾"D

Flow rates	Connections (Tube OD)	Press. drop (max flow)	Ryton models		Ryton/Kynar models		Brass models	
			Cat. no.	Price	Cat. no.	Price	Cat. no.	Price
13 to 100 mL/min	⅛"	10	KH-32714-00		KH-32715-00		KH-32714-20	
20 to 200 mL/min	¼"	10	KH-32714-02		KH-32715-02		KH-32714-22	
50 to 500 mL/min	¼"	10	KH-32714-04		KH-32715-04		KH-32714-24	
0.06 to 1 LPM	¼"	6	KH-32714-06		KH-32715-06		KH-32714-26	
0.1 to 2 LPM	¼"	10	KH-32714-08		KH-32715-08		KH-32714-28	
0.2 to 5 LPM	⅜"	10	KH-32714-10		KH-32715-10		KH-32714-30	
1 to 10 GPH	¼"	10	KH-32714-14		KH-32715-14		KH-32714-34	
4 to 100 GPH	⅜"	10	KH-32714-16		KH-32715-16		KH-32714-36	

KH-32709-92 **AC adapter;** 115 VAC, 50/60 Hz. Includes signal output cable
KH-32709-94 **AC adapter;** 230 VAC, 50/60 Hz. Includes signal output cable

Liquid Flow Control Systems

An automated system designed for low-flow applications

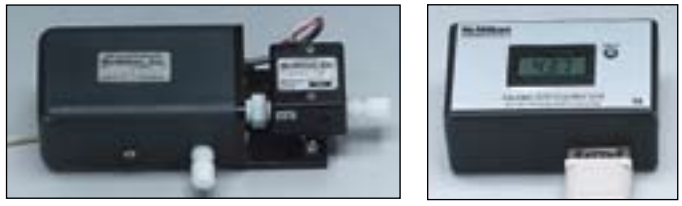
- Superior turbine design offers no zero drift and excellent repeatability
- Users may select from several display and control/monitoring options
- NIST-traceable certificate is included

These compact flowmeters are excellent for laboratory and bench-scale applications. Each system includes a turbine flowmeter and an automated sapphire needle valve that uses a stepper-motor to control flow through the unit. View flow rate or flow set point on the display. The display can be mounted remotely from the flow meter/control unit.

Select between local setpoint entry through the display or from an external potentiometer using the optional input/output cable. An LED indicates when the flow setpoint cannot be reached because of low pressure (low flow condition at valve 100% open).

All meters are calibrated using deionized water but can also work well with non-viscous oils and aqueous solutions. Wetted parts are PTFE, Ryton®, acetal, stainless steel, sapphire, glass, epoxy with Viton® O-rings. Optional EPDM O-rings are available—contact our Application Specialists for details.

What's included: flow controller with built-in needle valve, remote-mountable display, 3-ft connecting cable and power adapter.



32717-00 System includes flow sensor/controller, display module, and 3-ft connector cable.

Specifications & Ordering Information

Fluid type: corrosive fluids, ultra-pure water and process chemicals with a viscosity of less than 10 cSt
Accuracy: ±2% of full-scale
Repeatability: ±0.2% of full-scale
Operating temp: 41 to 120°F (5 to 50°C)
Max system pressure: 100 psi
Differential pressure requirement: 12 to 30 psig

Wetted parts: PTFE, Ryton®, Viton®, sapphire, 316 stainless steel, glass, epoxy, acetal fittings
Display: 3½-digit LCD, ⅞"H
Output signal: 0 to 5 VDC with cable 32717-52
Input power: 115 VAC (60 Hz) or 230 VAC (50 Hz)
Dimensions
Valve unit: 7"W x 2½"H x 2"D
Display unit: 4"W x 2½"H x 1¾"D

Flow rate (mL/min)	Connections	Catalog number	
		115 VAC	230 VAC
20 to 200 50 to 500	¼" compression fitting	KH-32717-10 KH-32717-20	KH-32717-15 KH-32717-25
100 to 1000 200 to 2000	¼" compression fitting	KH-32717-30 KH-32717-40	KH-32717-35 KH-32717-45
Price			

Accessories

KH-32717-50 **Extension cable,** 6-ft.
For use between valve and display

KH-32717-52 **Input/output cable,** 0 to 5 VDC. Provides either input or output for interface with computer, datalogger, or other electronic device. For both input and output, order two cables

FL Flowmeters

Turbine

Patented PVDF Infrared Flow Sensors

Place in any orientation without flow straighteners

These infrared sensors feature a unique turbine design that prevents air or gas bubbles from being trapped in the measuring chamber leading to improved accuracy and repeatability. The design also utilizes a fluid bearing and operates virtually friction free minimizing component wear. The rotor assembly is removable for cleaning or replacement of the flow tube. For protection from particulate, models 32250-12 through -52 include a 100 µm filter screen; additional screening may be required for -02 and -12 models, see specifications. See additional filters on page 461 of the "Filtration" section, if necessary.

Note: these sensors cannot be used with opaque fluids.

Flowmeter 32250-12

Specifications

Fluid type: clear or translucent fluids capable of transmitting IR light; 1 to 15 cSt viscosity
Max particulate size
Model 32250-02: 35 microns
Model 32250-12: 50 microns
All other models: 100 microns
Accuracy: ±1% of reading
Linearity: ±1%
Repeatability: ±0.1%
Operating temp: –40 to 185°F (–40 to 85°C)
Max system pressure: 150 psi at 185°F (85°C)
Wetted materials: PVDF, PFA, Viton®

Output signal: square wave pulse, open collector
Input power: 8 to 24 VDC; 6 to 24 mA
Cable length: 3 meters

Ordering Information

Flow range (GPM)	Frequency range (Hz)	Connections (hose barb)	Pressure drop at 50% flow	Sensor length	Catalog number	Price
0.03 to 0.53	60 to 1200	¼"	6.4 psi	3¾"	KH-32250-02	
0.08 to 2.38	40 to 1200	⅜"		4⅜"	KH-32250-12	
0.13 to 3.96	26.7 to 800	7/16"		4½"	KH-32250-22	
0.26 to 7.93	20 to 600	⅝"	6.4 psi	5⅜"	KH-32250-32	
0.66 to 19.8	18.8 to 562	¾"		5¼"	KH-32250-42	
1.06 to 32.0	15 to 450	⅞"		5¼"	KH-32250-52	

PVDF Turbine Flowmeters/Totalizers

Ideal for use with many strong oxidizers and acids*

- Battery-powered to eliminate the need for expensive wiring
- Two totalizers allow for process or period-specific volume monitoring
- Enclosure is FM-approved for Class I, Division I environments

These in-line flowmeters/totalizers display flow rate and accumulated flow in GPM or LPM. The NEMA 4 enclosure is suitable for indoor/outdoor use in dusty, dirty, and wet environments and the PVDF body is resistant to ultraviolet radiation and weathering.

All flowmeters measure linearly across a range and record a cumulative volume plus a resettable volume. Meters are factory-calibrated using water but can store two application-specific K-factors determined in-process. To conserve power, the six-digit display automatically turns on with flow and then turns off four minutes after flow ceases.

Wetted components are PVDF housing, rotor and supports, and ceramic shaft and bearings. The limited internal parts are simple to replace for easy maintenance—contact our Application Specialists for details.

Meters operate on two lithium batteries. Remote installation of the flowmeter body is possible using the optional remote installation kit (order separately below). Replacement battery kits and calibration containers can be ordered from "Accessories" at right.

See the section introduction on pages 556–558 for details on installing this flow technology.

*Check chemical compatibility chart on pages 2061–2069 for specific details.

Flowmeter/totalizer 05610-12

Specifications & Ordering Information

Repeatability: ±0.3% of reading
Operating temp: 14 to 140°F (–10 to 60°C)
Max system pressure: 150 psi
Wetted materials: PVDF retainers, ceramic bearings, ceramic shafts, PVDF rotor and supports, Viton® O-rings, PVDF housing.

Display: 6-digit LCD, 1/2"H (with floating decimal)
Input power: two 3 V lithium batteries
Battery life: 9000 hours nominal
Dimensions: 8"L x 2¾"W x 3"H

Flow ranges Linear	Flow ranges Maximum	Connections	Accuracy	Pressure drop (linear range)	Catalog number	Price
1.2 to 12.0 GPM (4.5 to 45.4 LPM)	15.0 GPM (56.8 LPM)	½" NPT(F)	±2% of reading	10 psi	KH-05610-11	
5 to 50.0 GPM (18.9 to 190.0 LPM)	75.0 GPM (284.0 LPM)	1" NPT(F)	±1.5% of reading	6 psi	KH-05610-12	

Accessories

KH-05610-70 **Calibration container,** HDPE, 5-gallon capacity
KH-05610-71 **Calibration container,** HDPE, 5-liter capacity
KH-05610-96 **Repl. battery kit**

Remote Installation Kit. Mount display up to 100 feet from the sensor—ideal for measuring flow in hot pipes (up to 250°F/121°C) or in inaccessible areas. Kit includes a sensor cover with 10-ft cable, remote display housing, and installation hardware. FM-approved.

KH-05609-93 **Remote installation kit**

Heavy-Duty Flowmeters/Totalizers

Battery power eliminates the need for expensive wiring

- Two totalizers allow for process or period-specific volume monitoring
- FM-approved for Class I, Division I environments

These heavy-duty in-line flowmeters/totalizers display flow rate and accumulated flow in GPM or LPM. The compact, yet robust design makes them ideal for use in manufacturing, pilot-plant, or quality control areas.

All flowmeters measure linearly across a range and record a cumulative volume plus a resettable volume. Meters are factory-calibrated using water but can store two application-specific K-factors determined in process. To conserve power, the six-digit display automatically turns on with flow and then turns off four minutes after flow ceases. The internal parts are simple to replace for easy maintenance—contact our Application Specialists for details.

Meters operate on two lithium batteries (included). Remote installation of the flowmeter body is possible using the optional remote installation kit 05609-93 (order separately below). Calibration containers and replacement battery kits can be ordered from "Accessories" below.

Flowmeter 05609-19 with LPM display and ANSI flange connection

Flowmeter 05609-17 with LPM display and sanitary Tri-Clover® connection

Flowmeter 05609-23 with GPM display and NPT(F) connection

Specifications & Ordering Information

Repeatability: ±0.1% of reading

Maximum pressure: 1500 psi
Aluminum: 300 psig (21 bar);
NPT SS: 1500 psig 105 (bar);
Tri -Clover SS: 450 psig (31 bar);
Flanged SS: 285 psig 19 (bar)

Operating temp: 14 to 140°F (–10 to 60°C)

Wetted materials: 316 SS or aluminum housing, PVDF rotor and supports, tungsten carbide shaft, 316 SS retainers, and ceramic bearings

Maximum particulate size
Models with ≤50 GPM or 190 LPM max flow rate: 125 µm
Models with >50 GPM or 190 LPM max flow rate: 500 µm

Display: 6-digit LCD, 1/2"H (with floating decimal)

Input power: two 3 V lithium batteries (included)

Battery life: 9000 hours nominal

Flow range	Connections	Body material	Accuracy	Dimensions	Catalog number	Price
1 to 10 GPM (3.8 to 37.9 LPM)	½" NPT(F) ½" NPT(F) ¾" Tri-Clover*	Aluminum 316 SS 316 SS	±2% of rdg	4½"W x 2"H x 1⅞"D 4½"W x 2"H x 1⅞"D 5"W x 2"H x 1⅞"D	KH-05609-01 KH-05609-03 KH-05609-05	
2 to 20 GPM (7.6 to 75.7 LPM)	¾" NPT(F) ¾" NPT(F) 1" Tri-Clover*	Aluminum 316 SS 316 SS	±2.0% of rdg	4⅜"W x 2"H x 2"D 4⅜"W x 2"H x 2"D 5"W x 2"H x 2"D	KH-05609-07 KH-05609-09 KH-05609-11	
5 to 50 GPM (18.9 to 190 LPM)	1" NPT(F) 1" NPT(F) 1½" Tri-Clover* 1" ANSI†	Aluminum 316 SS 316 SS 316 SS	±1.5% of rdg	4½"W x 2"H x 2¼"D 4½"W x 2"H x 2¼"D 5½"W x 2"H x 2¼"D 4¾"W x 4¼"H x 4¼"D	KH-05609-13 KH-05609-15 KH-05609-17 KH-05609-19	
10 to 100 GPM (38 to 380 LPM)	1½" NPT(F) 1½" NPT(F) 2" Tri-Clover* 1½" ANSI†	Aluminum 316 SS 316 SS 316 SS	±1% of rdg	5⅜"W x 2¾"H x 2⅞"D 5⅜"W x 2¾"H x 2⅞"D 6½"W x 2¾"H x 2⅞"D 8"W x 5"H x 5"D	KH-05609-21 KH-05609-23 KH-05609-25 KH-05609-27	
20 to 200 GPM (6 to 760 LPM)	2" NPT(F) 2" NPT(F) 2½" Tri-Clover* 2" ANSI†	Aluminum 316 SS 316 SS 316 SS	±1% of rdg	6⅜"W x 3⅜"H x 3¼"D 6⅜"W x 3⅜"H x 3¼"D 7"W x 3⅜"H x 3¼"D 9½"W x 6"H x 6"D	KH-05609-29 KH-05609-31 KH-05609-33 KH-05609-35	

*Sanitary flange †150# ANSI flange

Remote Installation Kit

Mount display up to 100 feet from the sensor—ideal for measuring flow in hot pipes (up to 250°F/121°C) or in inaccessible areas. Kit includes a sensor cover with 10-ft cable, remote display housing, and installation hardware. FM-approved.

KH-05609-93 **Remote installation kit**

Accessories

KH-05610-70 **Calibration container;** HDPE, 5-gallon capacity
KH-05610-71 **Calibration container;** HDPE, 5-liter capacity
KH-05610-96 **Replacement battery kit**

FL Flowmeters

Turbine

Prewired Remote-Mount Flowmeters/Transmitters

Prepackaged solution for remote flow monitoring

- Options for sensor or transmitter mounted flow display
- Adjustable and spannable 4 to 20 mA output signal
- Wide range of meter materials to suit compatibility requirements

This highly flexible design makes for easy integration into complex system layouts. These flowmeters provide a 4 to 20 mA output through a remote module in addition to offering a local flow display on the turbine sensor or on the remote transmitter. The 4 to 20 mA output signal is adjustable for tuning of high and low endpoints to specific process parameters, including a minimum or maximum anticipated flow. The electronics have been designed for low power consumption and the output signal is loop powered, simplifying wiring requirements at installation.

All meters measure flows linearly across the range. The display shows flows in GPM or LPM, in addition to showing both permanent and resettable totals. A six-digit display automatically turns on when flow starts then turns off four minutes after flow ceases. Flowmeters are ideal for use in manufacturing plants, research and development facilities, or quality control facilities.

Install meters in either a vertical or horizontal position. For best results, install within a straight run of pipe at least ten pipe diameters long on inlet side and five on the outlet side. Wetted materials are the user-selected housing, PVDF rotor and supports, tungsten carbide shaft, 316 SS retainers, and ceramic bearings. We recommend an inlet filter or screen to reduce impurities from incoming fluids. See page 480 of the "Filtration" section.

All flowmeters come with a 20-ft pre-attached cable between the flow sensor and the 4 to 20 mA output module. Other cable lengths may be ordered—contact our Application Specialists for details.

Remote display flow transmitter 05608-79

Flowmeter with sanitary flange and meter-mounted display 05608-09

Flowmeter with meter-mounted display 05608-17

Specifications & Ordering Information

Maximum particulate size
Models with ≤50 GPM or 190 LPM max flow rate: 125 µm
Models with >50 GPM or 190 LPM max flow rate: 500 µm

Repeatability: ±0.1% of reading

Display type: six-digit LCD, ½"H (with floating decimal)

Operating temperature
Meter-mounted display: 14 to 140°F (–10 to 60°C)
Remote display: 14 to 140°F (–10 to 60°C)
PVC: 32 to 140°F (0 to 60°C)
PVDF: 20 to 180°F (–28 to 82°C)
Metal: –40 to 250°F (–40 to 121°C)

Dimensions
Without mounting bracket: 4¼"W x 4¾"H x 2½"D
With mounting bracket: 5¾"W x 5¾"H x 2½"D

Flow rate	Connections	Sensor housing	Max system pressure	Accuracy	Meter-mounted display flowmeters		Remote display flowmeters	
					Catalog number	Price	Catalog number	Price
1 to 10 GPM 3.8 to 37.9 LPM	½" NPT(F)	PVC	150 psi	±2% of rdg	KH-05608-01		KH-05608-51	
	½" NPT(F)	PVDF	150 psi		KH-05608-03		KH-05608-53	
	½" NPT(F)	Aluminum	300 psi		KH-05608-05		KH-05608-55	
	½" NPT(F)	316 SS	1500 psi		KH-05608-07		KH-05608-57	
	¾" sanitary flange	316 SS	450 psi		KH-05608-09		KH-05608-59	
2 to 20 GPM 7.6 to 75.7 LPM	¾" NPT(F)	Aluminum	300 psi	±1.5% of rdg	KH-05608-11		KH-05608-61	
	¾" NPT(F)	316 SS	1500 psi		KH-05608-13		KH-05608-63	
	1" sanitary flange	316 SS	450 psi		KH-05608-15		KH-05608-65	
5 to 50 GPM 18.9 to 190 LPM	1" NPT(F)	PVC	150 psi	±1.5% of rdg	KH-05608-17		KH-05608-67	
	1" NPT(F)	PVDF	150 psi		KH-05608-19		KH-05608-69	
	1" NPT(F)	Aluminum	300 psi		KH-05608-21		KH-05608-71	
	1" NPT(F)	316 SS	1500 psi		KH-05608-23		KH-05608-73	
	1½" sanitary flange	316 SS	450 psi		KH-05608-25		KH-05608-75	
	1" 150# ANSI flange	316 SS	285 psi		KH-05608-27		KH-05608-77	
10 to 100 GPM 38 to 380 LPM	1½" NPT(F)	Aluminum	300 psi	±1% of rdg	KH-05608-29		KH-05608-79	
	1½" NPT(F)	316 SS	1500 psi		KH-05608-31		KH-05608-81	
	2" sanitary flange	316 SS	450 psi		KH-05608-33		KH-05608-83	
	1½" 150# ANSI flange	316 SS	285 psi		KH-05608-35		KH-05608-85	
20 to 200 GPM 76 to 760 LPM	2" NPT(F)	Aluminum	300 psi	±1% of rdg	KH-05608-37		KH-05608-87	
	2" NPT(F)	316 SS	1500 psi		KH-05608-39		KH-05608-89	
	2½" sanitary flange	316 SS	450 psi		KH-05608-41		KH-05608-91	
	2" 150# ANSI flange	316 SS	285 psi		KH-05608-43		KH-05608-93	

Low-Flow Impeller Flow Sensors and Controllers

Impeller design minimizes wear for long sensor life

These low-flow sensors measure flow rates in pipe sizes from 3/8" to 1" NPT(F). Sensors generate a square wave pulse output that can be sent to flow controllers to display flow rate and total flow.

Flow Sensors

Select polypropylene (PP) sensors for general-purpose applications. Use TFE sensors for high-purity applications. Both PP and TFE sensors provide a 6 to 24 VDC pulse output. For best results, install sensors within a straight run of tubing or pipe (five pipe diameters long on the inlet side). Sensors can be mounted in any orientation.

Sensor 33110-05

Wetted materials for PP sensors are PP, acrylic, PVDF, nickel, tungsten carbide, ruby, and EPDM. TFE sensors have TFE, PVDF, zirconia ceramic, and Viton® as wetted parts. Order controllers and power supply separately at right; or use sensors with any device that accepts a 6 to 24 VDC pulse input.

Specifications & Ordering Information

Viscosity range: 30 cp max
Accuracy: ±1% full-scale
Linearity: ±1% full-scale
Repeatability: ±0.5% full-scale
Operating temperature: 160°F (71°C)
Operating pressure: 150 psi (10 bar)
Input power: 6 to 24 VDC, 2 mA
Output signal: 6 to 24 VDC pulse
Cable length: 18 ft (5.5 m)
Dimensions: 4 1/8"L x 2 1/4"W x 2 1/8"H

Flow rate (GPM)	Connections	Pressure drop at max flow	PP sensors		TFE sensors	
			Cat. no.	Price	Cat. no.	Price
0.07 to 5	3/8" NPT(F)	15 psi	KH-33110-00		KH-33110-05	
0.1 to 10	1/2" NPT(F)	14 psi	KH-33110-10		KH-33110-15	
0.2 to 20	3/4" NPT(F)	24 psi	KH-33110-20		KH-33110-25	
0.5 to 40	1" NPT(F)	24 psi	KH-33110-30		KH-33110-35	

Flow Controllers

Controllers display flow rate and total (resettable) simultaneously on a two-line 8-digit LCD. Push-button keys and menu prompts make it easy to program the controller. The 4 to 20 mA output lets you send data to a recorder or datalogger. Nonvolatile memory stores flow total in the event of power failure.

Panel-mount controller 33110-60

Panel-mount model 33110-60 features a gasketed front panel, membrane switches, and NEMA 12 (IP52) enclosure. Wall-mount model 33110-70 has a clear cover and splashproof NEMA 4X (IP56) enclosure. Both models include a 2 1/2-ft L cable with stripped ends.

Specifications & Ordering Information

2 year warranty

Operating temp: 32 to 158°F (0 to 80°C)
Input power: 12 or 32 VDC, 4 mA loop powered
Display type: two-line, 8-digit LCD, 7/16"H
Input signal: pulse frequency 5 VDC 200 Hz max
Output signal: 4 to 20 mA (loop) scaled pulse, open collector; sensor pulse pass through high/low alarm (through pulse output)
Panel cutout: 3 9/16"W x 3 9/16"H x 2"D
Dimensions
Panel-mount model: 3 3/4"W x 3 3/4"H x 2"D
Wall-mount model: 3 7/8"W x 3 7/8"H x 2 7/8"D

Catalog number	Description	Price
KH-33110-60	Panel mount	
KH-33110-70	Wall mount	

KH-26900-00 **Power supply** for 110 VAC operation; screw terminal connections

Commercial Grade Flowmeters/Totalizers

Superb accuracy for low-flow applications

- Battery-powered to eliminate the need for expensive wiring
- Two totalizers allow for process or period-specific volume monitoring

These general purpose in-line flowmeters/totalizers display flow rate and accumulated flow in GPM or LPM. The NEMA enclosure is suitable for indoor/outdoor use in dusty, dirty, and wet environments. The compact design makes them ideal for use in light manufacturing, pilot-plant, or quality control areas.

All flowmeters measure linearly across a range and record a cumulative volume plus a resettable volume. Meters are factory-calibrated using water but can store two application-specific K-factors determined in-process. To conserve power, the six-digit display automatically turns on with flow and then turns off four minutes after flow ceases. Meters operate on two lithium batteries.

Wetted components are the nylon or aluminum housing, nylon rotor, tungsten carbide shaft, 316 SS rings, and ceramic bearings.

Flowmeter/totalizer 05610-04

Specifications

Accuracy: ±1.5% of reading
Operating temp: 14 to 140°F (–10 to 60°C)
Display type: 6-digit LCD, 1/2"H (with floating decimal)
Input power: two 3 V lithium batteries
Battery life: 9000 hours nominal
Dimensions: 4"L x 2"W x 2 1/2"H

Ordering Information

Flow rates	Connections	Housing material	Maximum pressure	Repeatability	Pressure drop at max flow	Maximum particulate size	Flowmeters/totalizers	
							Catalog number	Price
0.3 to 3.0 GPM 1 to 10 LPM	1" NPT(F)	Nylon	150 psi	±1%	8 psig	125 microns	KH-05610-01	
		Aluminum	300 psi				KH-05610-02	
3 to 50 GPM 10 to 190 LPM	1" NPT(F)	Nylon	150 psi	±0.2%	5 psig	500 microns	KH-05610-04	
		Aluminum	300 psi				KH-05610-06	
30 to 300 GPM 100 to 1000 LPM	2" NPT(F)	Aluminum	300 psi	±0.2%	4 psig	500 microns	KH-05610-08	

KH-05610-70 **Calibration container;** HDPE, 5-gal. capacity
KH-05610-71 **Calibration container;** HDPE, 5-liter capacity
KH-05610-96 **Replacement battery kit**

Cole-Parmer® Insertion Sensors/Flowmeters

Choose flow sensors with a premounted flow rate/totalizer display or order a batch controller separately

Flow Sensors

Sensors are ideal for chemical proportioning applications. Send a pulse-type square wave output up to 2000 ft without a transmitter. Choose sensors alone to connect to the flow rate/totalizer display 33112-50, batch controller 33112-52, PLC, counter, or computer. Select sensors with display 33112-50 premounted for battery operation—provides rate and total flow display on site. **Note:** Flow sensors require special fittings to ensure correct depth placement in the pipe—order separately below.

33112-02

33112-00

Specifications for Flow Sensors

For Liquids

Accuracy: ±1.5% full-scale

Maximum temperature (at 0 psi)
Polypropylene: 130°F (55°C)
316 SS: 200°F (93°C)

Maximum pressure (at 75°F)
Polypropylene: 175 psi, 12 bar
316 SS: 250 psi, 17 bar

Wetted materials: polypropylene (PP) or 316 stainless steel (SS) body, PP rotor, nickel-bound tungsten carbide shaft, ruby ring bearings with sapphire endstone

Input power: 6 to 24 VDC, 8 mA

Cable length: 18 ft, 5.5 m

Output signal: 12 VDC current sinking pulse

Ordering Information for Flow Sensors

Pipe size	Flow rate (GPM)	Turbine flow sensor				Turbine flow sensor with pre-mounted display (33112-50 type)			
		Polypropylene		Stainless steel		Polypropylene		Stainless steel	
		Catalog number	Price	Catalog number	Price	Catalog number	Price	Catalog number	Price
1" to 3"	0.8 to 691	KH-33112-00		KH-33112-02		KH-33112-10		KH-33112-12	
4" to 8"	12 to 4700	KH-33112-04		KH-33112-06		KH-33112-14		KH-33112-16	

Flow Rate/Totalizer Display

Battery-operated flow rate/totalizer display has a three to five year battery life. The two-line LCD provides 6-digit rate and 8-digit total display simultaneously—units are user-selectable. Flow display has simple, three-button operation: enter the K-factor, pulse output scaling, and the decimal point. Includes a wall-mountable NEMA 4X enclosure.

33112-50

Specifications & Ordering Information for Flow Rate/Totalizer Display

Sensor input: square wave, 20 mV to 6 V peak to peak

Output: 0.1 second open collector pulse, scalable 0.1 to 200,000 units/pulse

Power: lithium C cell battery, 3 V

Dimensions: 3⅞"W x 3⅞"H x 2⅞"D

Operating temperature: 32 to158°F (0 to 70°C)

Catalog number	Description	Price
KH-33112-50	Flow rate/totalizer display	

Batch Controller

Controller provides batch output control through two relays for controlling multiple devices. Dual pulse outputs allow proportional feed with pulse-responsive metering pumps. Connect the analog output to a recorder or datalogger to create permanent records of flow rate. Features backlit 5-digit flow rate and 8-digit totalizer displays—volume and time units are user-selectable. NEMA 4X enclosure can be wall or panel mounted.

33112-52

Specifications for Batch Controller

Sensor input: open collector current sink; 1000 Hz max

Output power, sensor: 12 VDC, 10 mA

Relay output: two SPDT relay, 115 VAC, 5 A max, NO or NC

Pulse output: two, 100 mA at 60 VDC, max

Analog output: 4 to 20 mA, or 0 to 10 VDC, or 0 to 5 V

Operating temperature: 32 to 130°F (0 to 55°C)

Input power: 115/220 VAC, 50/60 Hz or 12 to 24 VDC

Auxiliary input: batch start/stop/resume

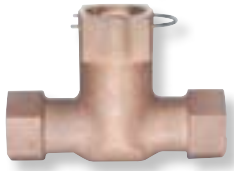
Catalog number	Description	Dimensions	Price
KH-33112-52	Batch controller	6 7/16"W x 6 7/16"H x 4 5/8"D	

Fittings

Fittings are required to ensure correct depth placement in the pipe.

33112-60

33112-67



33112-64

33112-70

Ordering Information for Fittings

Pipe size	PVC		304 stainless steel		Carbon steel		Polypropylene	
	Catalog number	Price	Catalog number	Price	Catalog number	Price	Catalog number	Price
Tee fittings; PVC fittings have male stub ends, 304 SS and carbon steel fittings have NPT(F) ends								
1"	KH-33112-60		—	—	—	—	—	—
1½"	KH-33112-61		KH-33112-67		KH-33112-64		—	—
2"	KH-33112-62		KH-33112-68		KH-33112-65		—	—
Saddle fittings; 304 SS fittings are weld-on/braze-on style								
3"	KH-33112-70		KH-33112-78		—	—	KH-33112-74	
4"	KH-33112-71		KH-33112-79		—	—	KH-33112-75	
6"	KH-33112-72		KH-33112-80		—	—	KH-33112-76	
8"	KH-33112-73		KH-33112-81		—	—	KH-33112-77	

33112-74

33112-78

Signet Flowmeter Systems

Sensors, monitors, controllers, and installation fittings— the guide at right can direct you to a full array of Signet components that are designed to work seamlessly in any custom arrangement that you choose. The example (below right) highlights a common system application for numerous industries. This is only the beginning, there are an infinite number of component combinations to match your needs.

Reference the table below for suitable flow ranges of each sensor type. The guide at right lists the location of additional components to complete a system. As always, please feel free to contact an Application Specialist for additional technical support.

ISO 9001:2000 CERTIFIED SUPPLIER

Flow Ranges for flow sensors on page 608.

Pipe ID	Flow ranges (gpm)		
	Low-flow Rotor-X™	Standard Rotor-X™	Metalex™
½"	0.3 to 19	1 to 19	1.6 to 19
¾"	0.5 to 34	1.7 to 34	2.7 to 34
1"	0.8 to 54	2.7 to 54	4.4 to 54
1¼"	1.4 to 94	4.7 to 94	7.4 to 94
1½"	1.9 to 127	6.4 to 127	10.1 to 127
2"	3.2 to 210	10.6 to 210	16.8 to 210
2½"	4.5 to 300	15 to 300	24 to 300
3"	7 to 461	24 to 461	37 to 461
4"	12 to 794	40 to 794	63 to 794
5"	19 to 1247	63 to 1247	100 to 1247
6"	27 to 1801	91 to 1801	144 to 1801
8"	47 to 3119	156 to 3119	250 to 3119
10"	74 to 4915	246 to 4915	393 to 4915
12"	105 to 6977	349 to 6977	559 to 6977

Call our Application Specialists for assistance designing a complete system for your application.

847-549-7600

1 Flow sensors—page 608

2 Installation fittings—page 609

3 Monitors and controllers—pages 628–629

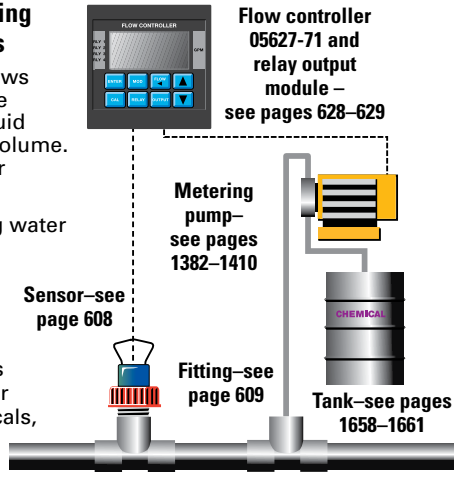
Required *System Components*

1. Flow sensor.....608
2. Installation fitting.....609
3. Monitor or controller..... 628–629

Example of a chemical proportioning system using Signet Flow Systems

Chemical Proportioning System allows for an accurate volumetric ratio to be maintained between the process liquid volume and the chemical injection volume. Real applications include injection or introduction of:

- Vitamins into farm animal drinking water
- Sodium hypochlorite disinfectant into water
- Fertilizer into irrigation water
- Bio-engineered organisms into liquids for manufacturing products such as man-made snow, soaps for large laundries, defoaming chemicals, and insecticides.

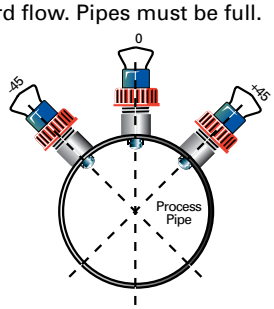


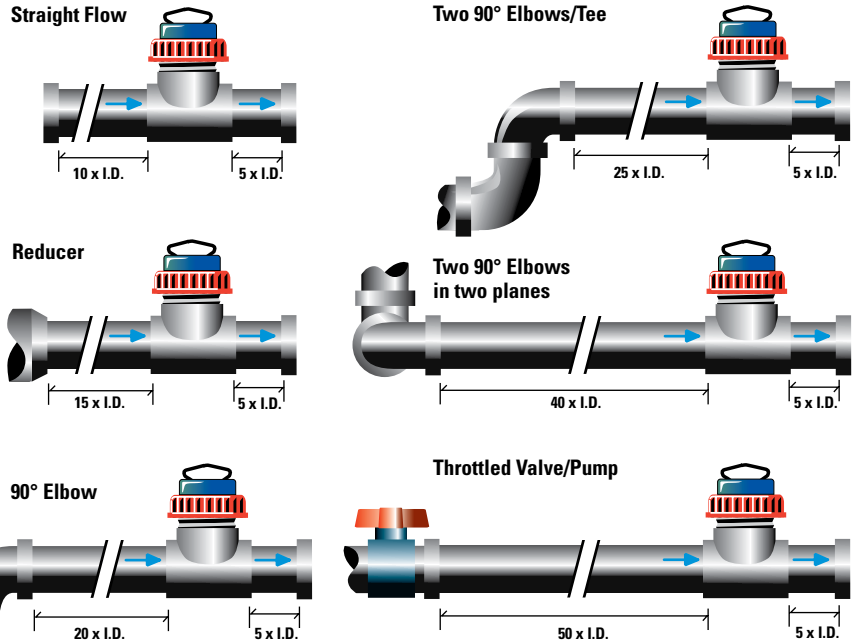
Installing Your Flow Sensor

For best results, allow a straight run of pipe before and after the sensor after any bends, valves, or flow restrictions.

Stated accuracy is not guaranteed unless the Signet installation fittings on page 609 are used. The installation fitting ensures proper paddle depth and orientation.

In horizontal pipe runs with no air pockets or sediments present, mount the sensor/fitting in the 12 o'clock or 6 o'clock position. If sediment or air pockets are present, tilt the sensor/fitting at a maximum angle of 45° to avoid these obstacles. Vertical runs require upward flow. Pipes must be full.





FL Flowmeters

Paddle Wheel, Sensors

Low-Flow Rotor-X™ Sensors

Measure low flow rates with better resolution

Measure a wider flow range with these high-quality designs. The rotor has an open core design to eliminate cavitation, to reduce drag on the paddle and to minimize pressure drop within the system. Less refined products in the market will use solid paddlewheels that can produce a non-linear and non-repeatable signal.

The design is suitable for measuring flow from 0.3 to 20 feet/second. Unlike basic paddle designs, this sensor includes a magnet in each paddle—4 total—for much higher resolution throughout the linear measuring range. Without amplification, the output signal can be transmitted up to 1000 feet.

This sensor is offered in materials to resist most chemicals. There is a glass-filled polypropylene version or one in natural PVDF. All sensors have a PVDF rotor and Viton® O-ring. An integrated 25-foot signal cable is included for wiring the sensor into most systems.

These sensors may be mounted in any pipe that is compatible with the installation fittings on the following page. Rotor-X low-flow sensors are compatible with all of the line-powered displays, totalizers and controllers listed on pages 628–629.

Specifications & Ordering Information

Flow velocity: 0.3 to 20 ft/sec (0.1 to 6 m/sec)
Output: open collector, sinking
Linearity: ±1% full-scale
Repeatability: ±0.5% full-scale
Max temp: 185°F (85°C) at 25 psi
Max pressure (at 68°F/20°C)
PP body: 180 psi
PVDF body: 200 psi
Input power: 3.3 to 24 VDC (supplied by a flow monitor/controller)

ISO9001:2000 CERTIFIED SUPPLIER

CE For Liquids

Catalog number	Pipe ID	Sensor length	Price
Sensors with polypropylene body; titanium shaft			
KH-32500-00	½" to 4"	4⅛"	
KH-32500-02	5" to 8"	5⅜"	
Sensors with PVDF body; Hastelloy C® shaft			
KH-32500-10	½" to 4"	4⅛"	

Rotor-X™ Sensors

Economical version of a proven design

This sensor's rotor has an open core design to eliminate cavitation, to reduce drag on the paddle and to minimize pressure drop within the system. Less refined products in the market will use solid paddlewheels that can produce a non-linear and non-repeatable signal.

The design is suitable for measuring flow from 1 to 20 feet/second. This paddle design includes a magnet in two opposite paddles for good resolution throughout the measuring range. Without amplification, the output signal can be transmitted up to 200 feet. As a FM-approved device, this sensor may be installed in hazardous locations.

This sensor is offered in materials to resist most chemicals. There is a glass-filled polypropylene version or one in natural PVDF. All sensors have a PVDF rotor and Viton® O-ring. An integrated 25-foot signal cable is included for wiring the sensor into most systems.

These sensors may be mounted in any pipe that is compatible with the installation fittings on the following page. Rotor-X sensors are compatible with all of the line-powered displays, totalizers and controllers listed on pages 628–629.

Specifications & Ordering Information

Flow velocity: 1 to 20 ft/sec (0.3 to 6 m/sec)
Output: 1 V peak-to-peak per ft/sec; 8 kΩ source impedance, nominal frequency of 6 Hz per ft/sec
Linearity: ±1% full-scale
Repeatability: ±0.5% full-scale
Max temp
PP body: 194°F (90°C)
PVDF body: 212°F (100°C)
Max pressure (at 68°F/20°C)
PP body: 180 psi
PVDF body: 200 psi

ISO9001:2000 CERTIFIED SUPPLIER

CE FM APPROVED

For Liquids

Catalog number	Pipe ID	Sensor length	Price
Sensors with polypropylene body; titanium shaft			
KH-05618-10	½" to 4"	4⅛"	
KH-05618-11	5" to 8"	5⅜"	
Sensors with PVDF body; Hastelloy C® shaft			
KH-05618-13	½" to 4"	4⅛"	

Required *System* Components

1. Flow sensor ..... below
2. Installation fitting ..... page 609
3. Monitor or controller ..... pages 628–629

Metalex™ Sensors

Stainless steel body withstands high pressures and temperatures

This design was specifically developed to handle aggressive flow applications such as liquid ammonia and steam condensate. Like all +GF+ Signet designs, the rotor has an open core design to eliminate cavitation, to reduce drag on the paddle and to minimize pressure drop within the system.

The design is suitable for measuring flow from 1.6 to 20 feet/second. Without amplification, the output signal can be transmitted up to 200 feet. As a FM-Approved device, this sensor may be installed in hazardous locations.

The sensor body is 316 SS. Other components are a CD4MCu SS rotor, Fluoroloy B® rotor bearing and KLINGER®sil O-ring. An integrated 25-foot signal cable is included for wiring the sensor into most systems.

These sensors may be mounted in any pipe that is compatible with the Metalex-specific installation fittings on the following page. Metalex sensors are compatible with all of the line-powered displays, totalizers and controllers listed on pages 628–629.

Specifications & Ordering Information

Flow velocity: 1.6 to 20 ft/sec (0.5 to 6 m/sec)
Output: sine wave, 12-kΩ source impedance; nominal frequency of 12 Hz per ft/second
Linearity: ±1% full-scale
Repeatability: ±0.5% full-scale
Max temp
Mini-tap fitting: 300°F (149°C)
Saddle fitting: 150°F (66°C)
Max pressure
Mini-tap fitting: 1500 psi
Saddle fitting: 300 psi

ISO9001:2000 CERTIFIED SUPPLIER

SP CE

FM APPROVED

For Liquids

Catalog number	Pipe ID	Sensor length	Price
Use with mini-tap fitting			
KH-05618-60	½" to 1"	1½"	
KH-05618-64	1¼" to 12"	2½"	
Use with saddle fitting			
KH-05618-80	2" to 12"	4½"	

More info

Mounting is critical to flow measurement accuracy. The fitting places the sensor at the proper height in the flow stream to achieve the maximum accuracy. To ensure proper paddle-wheel alignment, order an installation fitting from the next page.

Signet Installation Fittings

Fittings are precision crafted to ensure proper sensor insertion depth and accurate flow measurement. Pipe fitting sizes range from ½" to 12" in diameter. See our chemical resistance charts (go to www.coleparmer.com/techinfo) to select a fitting material compatible with your fluid. Order dummy plugs (key letter K) to use pipelines while sensors are removed.

Required *System Components*

1 Flow sensor 608
2 Installation fitting ..... this page
3 Monitor or controller 628–629

A PVDF Tees with true union socket connectors. For pipes up to 2" in diameter.

B Polypropylene Tees for pipes up to 2" in diameter. True union socket connectors.

C PVC Tees for PVC 80 pipes up to 4" in diameter and CPVC 80 pipes up to 1½" in diameter. Slip on ends (no threads).

D Metal Tees for copper, 316 stainless steel (SS), carbon steel (CS), and galvanized iron (schedule 40) pipes up to 2" in diameter. SS, CS, and galvanized iron fittings include PVDF insert for all sizes and NPT(F) threads at each end. Copper tee fittings include PVDF insert for pipe ID over 1" and feature sweat-on ends.

E 316 SS Socket-Weld Mini-Tap Fittings for Metalex™ sensors only. Include a dummy plug.

F 316 SS Weld-On Mini-Tap Fittings for Metalex sensors only. Include a dummy plug.

G PVC Saddles for PVC 40 pipes from 2" to 4" in diameter; PVC 80 pipes from 6" to 8" in diameter. Specify schedule of pipe when ordering.

H 316 SS Strap-On Saddles for Metalex sensors only. Include a dummy plug.

I Galvanized Iron (Schedule 80) Saddles for pipes from 2½" to 4" in diameter. Specify schedule of pipe when ordering.

J Weldolet Fittings weld directly onto hole cut in pipe. For stainless steel pipes from 2½" to 4" in diameter and carbon steel pipes 2½" to 12" in diameter. Specify schedule of pipe when ordering.

K Dummy Plugs. Insert a plug in place of the sensor when it has been removed for inspection or service. **Note:** Not for use with Metalex sensors.

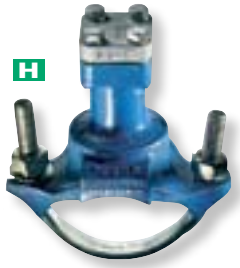
KH-05614-29 **Polypropylene plug**

KH-05614-30 **PVDF plug**

Pipe ID	Catalog number	Material	Fitting type	Price
½"	KH-05619-51	PVDF	A	
	KH-05619-61	Polypropylene	B	
	KH-05620-21	PVC 80	C	
	KH-05620-31	CPVC 80	C	
	KH-05620-41	316 SS	D	
	KH-05620-71	Copper	D	
	KH-05618-61	316 SS socket-weld	E	
¾"	KH-05619-52	PVDF	A	
	KH-05619-62	Polypropylene	B	
	KH-05620-22	PVC 80	C	
	KH-05620-32	CPVC 80	C	
	KH-05620-42	316 SS	D	
	KH-05620-72	Copper	D	
	KH-05618-62	316 SS socket-weld	E	
1"	KH-05620-23	PVC 80	C	
	KH-05620-33	CPVC 80	C	
	KH-05620-53	Galvanized iron (40)	D	
	KH-05620-43	316 SS	D	
	KH-05620-73	Copper	D	
	KH-05618-63	316 SS socket-weld	E	
1¼"	KH-05619-53*	PVDF	A	
	KH-05619-54	PVDF	A	
	KH-05619-64	Polypropylene	B	
	KH-05620-24	PVC 80	C	
	KH-05620-34	CPVC 80	C	
	KH-05620-54	Galvanized iron (40)	D	
	KH-05620-44	316 SS	D	
	KH-05620-74	Copper	D	
	KH-05618-65	316 SS weld-on	R	
1½"	KH-05619-55	PVDF	A	
	KH-05619-65	Polypropylene	B	
	KH-05620-25	PVC 80	C	
	KH-05620-35	CPVC 80	C	
	KH-05620-55	Galvanized iron (40)	D	
	KH-05620-45	316 SS	D	
	KH-05620-75	Copper	D	
	KH-05618-66	316 SS weld-on	F	

*Fittings are metric size with a 32 mm (1.2598") pipe ID, not 1¼".

Pipe ID	Catalog number	Material	Fitting type	Price
2"	KH-05619-56	PVDF	A	
	KH-05619-66	Polypropylene	B	
	KH-05620-26	PVC 80	C	
	KH-05620-56	Galvanized iron (40)	D	
	KH-05620-46	316 SS	D	
	KH-05620-76	Copper	D	
	KH-05620-16	PVC 40	G	
	KH-05618-81	316 SS strap-on	H	
	KH-05618-70	316 SS weld-on	F	
2½"	KH-05620-27	PVC 80	C	
	KH-05620-17	PVC 40	G	
	KH-05620-57	Galvanized iron (80)	I	
3"	KH-05620-28	PVC 80	C	
	KH-05620-18	PVC 40	G	
	KH-05620-58	Galvanized iron (80)	I	
	KH-05615-23	Carbon steel	J	
	KH-05620-48	316 SS	J	
	KH-05618-72	316 SS weld-on	F	
4"	KH-05620-29	PVC 80	C	
	KH-05620-19	PVC 40	G	
	KH-05620-59	Galvanized iron (80)	I	
	KH-05615-24	Carbon steel	J	
	KH-05618-84	316 SS strap-on	H	
	KH-05618-73	316 SS weld-on	F	
6"	KH-05620-83	PVC 80	G	
	KH-05615-26	Carbon steel	J	
	KH-05618-75	316 SS weld-on	F	
8"	KH-05620-84	PVC 80	G	
	KH-05615-27	Carbon steel	J	
10"	KH-05615-28	Carbon steel	J	
12"	KH-05615-29	Carbon steel	J	



Flowmeters, Transmitters, and Batch Controllers

Unique fitting isolates the electronics from the fluid—no leaks!

- Battery-powered units offer incredible flexibility—use one meter to spot check multiple fitting locations
- Multiple output options to suit any monitoring or control application

1 Sensor-Mounted Display Modules

These modules quarter-turn twist-lock onto sensor fittings—see the box below. The design keeps the electronics completely isolated from the fluid. Each electronics head is programmed with the 3-button key pad; set-up is completed in minutes working through a user-friendly programming tree.

To improve accuracy, each unit includes a "TEACH-IN" function for system-specific determination of the K-factor (a lab-determined standard K-factor is typically used in every type of paddle wheel meter). Improving installation is the "SIMULATION" function which allows users to perform a "dry run" of the system by selecting and generating output signals manually.

Transmitter Modules are ideal for more complex monitoring and control applications. Units provide main and daily flow totalization along with analog output; relay outputs are also available. Users can scroll through flow, output current and totalized flow on the main display.

Switch Module displays flow and provides two programmable relays for discrete control.

Batch Controller has the same housing (as pictured) but utilizes a unique programming sequence designed for batch control operations. The unit can be preprogrammed for up to 9 different batches. Batch initiation can be done locally, via binary input, or via PLC (time proportional). Relays and an output are included to alarm on flow (output) and to control valves and/or pumps (two relays). A unique auto-correction feature adjusts programmed batch volumes for overfill (when the unit commands flow to stop but flow is still detected, like from a downstream pipe leg draining). Users can scroll through flow, dosing amount, dosing mode and totalized flow on the main display.

Battery-Powered Flowmeter is ideal where no wired power is feasible, such as portable skid systems. Some users have reduced flow-monitoring costs in their systems by utilizing one module on numerous sensor fittings placed throughout the process. Users can scroll through flow and totalized flow on the main display. Operates on a 9 V battery.

2 Sensors/Fittings

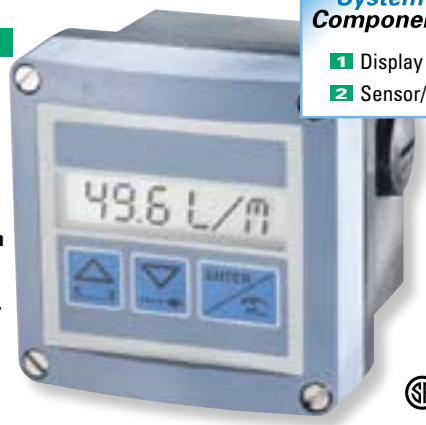
These fittings make installation simple—no holes to drill or special tools to use. Fitting are designed to contain the process, so they can be installed into a system that must operate whether the electronics module is present or not.

Wetted parts are the material of the sensor body selected, PVDF paddle, ceramic rotor and bearing, and Viton® O-rings.

Required System Components

1 Display module
2 Sensor/fitting

1



33118-52

The scroll-through display shows flow, totalized volume plus other unit-specific information

ISO 9001:2000 CERTIFIED SUPPLIER

Specifications & Ordering Information

Fluid type: water-like fluids
Accuracy: ±1.5% of full-scale (at 12 ft/sec)
Linearity: ±0.5% of full-scale
Repeatability: 0.4% of reading
Velocity range: 1.0 to 32.8 ft/sec (0.3 to 10 m/s)
Operating temperature
Ambient: 32 to 140°F (0 to 60°C)
Fluid (PVC fitting): 122°F (50°C) max
Fluid (brass/SS fitting): 212°F (100°C) max
Input power: 12 to 30 VDC
Battery life: 1 to 2 years
Electrical connection: 1/2" conduit entry
Enclosure rating: NEMA 4/IP65
Display type: 8-digit alphanumeric LCD, 3/8"H
Special indicators: (2) LED, for relay outputs
Input signal (batch controller): (4) inputs, 5 to 30 VDC
Output signal (see order table): 4 to 20 mA; open collector pulse, NPN or PNP, 0 to 30 V 100 mA
Relay type (see order table): 3 A at 230 V, freely programmable
Dimensions (module only): 3.5" x 3.5" x 5"H

1 Display Modules

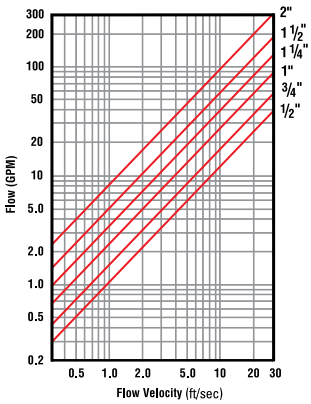
Type	Output	Relays	Totalizers	Catalog number	Price
Transmitter	4 to 20 mA, pulse	—	2	KH-33118-50	
Transmitter	4 to 20 mA, pulse	2	2	KH-33118-52	
Switch	—	2	—	KH-33118-54	
Batch controller	Open collector	2	2	KH-33118-56	
Battery-powered flowmeter	—	—	2	KH-33118-58	

KH-26900-10 **Power supply** for all modules on this page except 33118-58; 12 VDC @ 625 mA

2 Sensor/Fittings

Fitting size	Catalog number	Price
PVC sensor/fittings; 140 psi max (at 70°F)		
1/2" true union	KH-33117-00	
3/4" true union	KH-33117-15	
1" true union	KH-33117-30	
1 1/4" true union	KH-33117-45	
1 1/2" true union	KH-33117-60	
2" true union	KH-33117-75	
Brass sensor/fittings; 230 psi max (at 212°F)		
1/2" NPT(F)	KH-33117-05	
3/4" NPT(F)	KH-33117-20	
1" NPT(F)	KH-33117-35	
1 1/4" NPT(F)	KH-33117-50	
1 1/2" NPT(F)	KH-33117-65	
2" NPT(F)	KH-33117-80	
SS sensor/fittings; 230 psi max (at 212°F)		
1/2" NPT(F)	KH-33117-10	
3/4" NPT(F)	KH-33117-25	
1" NPT(F)	KH-33117-40	
1 1/4" NPT(F)	KH-33117-55	
1 1/2" NPT(F)	KH-33117-70	
2" NPT(F)	KH-33117-85	

Flow Curves



2

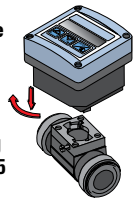
33117-00

33117-20

33117-25

Display module 33118-50 to -58 (above)

Sensor/fitting 33117-00 to -85 (at left)



Easily mount the module on the sensor/fitting with a quick quarter turn.

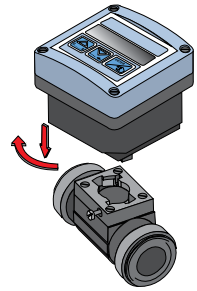
Compact Flow Control Systems

The simplest, most economical proportional flow control system available

- Control valve, flow sensor and PI controller all in one package
- Large display and integrated keypad keep programming easy
- Add a second flow sensor to create a flow controller for mixing/blending

As part of providing the most advanced solutions for our customers, Cole-Parmer, working with Burkert, has assembled some of Burkert's most innovative flow control products into an easy-to-use, easy-to-order system. After reading the component descriptions below, you will find that the features and performance of this system are unmatched.

What's included: valve-mounted PI controller, flow sensor, proportional solenoid valve, a 6.6 ft (2 m) sensor cable with M8 connector and a 16.4 ft (5 m) power/communications cable with M12 connector.



The included display module mounts directly to the sensor/fitting module with a simple quarter-turn twist.

Ordering Information

ISO9001:2000 CERTIFIED SUPPLIER

Line size*	Cv factor†	Max flow rate	Catalog number	Price
½"	2.9	30 GPM	KH-98643-46	
¾"	5.8	40 GPM	KH-98643-48	
1"	5.8	70 GPM	KH-98643-50	

*Fitting size applies to both the flow sensor and the valve.
†C_v is the flow rate (in GPM) through the valve at 1 psi pressure drop.

Each Continuous Control System Includes:

Typical packaged system, including all interconnect cables (sensor not shown connected to the controller)

1 PI Flow Controller with Display

The proportional-integral (PI) controller is the heart of this unique arrangement. The unit can be programmed in minutes using the integrated keypad and user-friendly programming tree. Users select the PI parameters to control the valve's response to changes in flow rate. The device can accept up to two frequency inputs for flow, allowing this flow control system to be converted into a controller for mixing two streams (Contact our Application Specialists to order a second flow sensor).

Users may establish the flow set point either locally at the controller or via an external input signal from a central control source such as a PLC. The display can be programmed to show flow rate in any of 9 different units. The valve coil's DIN plug serves as the mounting fixture for the controller. The controller uses multi-pin wire connectors for ease of installation.

Specifications for Flow Controller

Operating temp: maximum 140°F (60°C)
Display type: 4½-digit, 7-segment LCD
Housing: NEMA 4 (IP65)
Input signal: (2) frequency, 1000 Hz max; (1) analog, set point, 4 to 20 mA or 0 to 10 V
Output signals: pulse width modulated 24 V, 1.0 A max
Input power: 24 VDC, 1.5 W max
Dimensions: 2"W x 2"H x 3"D

2 Flow Sensor

The sensor module quarter-turns to twist-lock onto the brass fittings—see the box at right. The design keeps the electronics completely isolated from the fluid. The brass fitting makes installation simple because it installs like any other pipe fitting in a system—no holes to drill or special tools to use. Unlike other fitting styles, these are inherently designed to contain the process, so they can be installed into a system that must operate whether the sensor output module is present or not.

Wetted parts are brass, PVDF paddle, ceramic rotor and bearing, and Viton® O-rings.

Specifications for Flow Sensor

Accuracy: <1% within 1.6 to 32.8 fps; <5% within 1.0 to 1.6 fps
Repeatability: ±0.4% of reading
Velocity range: 1.0 to 33 fps
Operating temp: 32 to 140°F (0 to 60°C)
Fluid temperature range: 32 to 212°F (0 to 100°C)
Operating pressure: 230 psi
Max solids content: 1% by volume
Connections: NPT(F), brass
Dimensions, models with
½" fittings: 3⅜"L x 3½"W x 4⅞"H
¾" fittings: 3¾"L x 3½"W x 4¾"H
1" fittings: 4⅛"L x 3½"W x 4¾"H

3 Continuous Control Solenoid Valve

Most solenoid valves operate in ON-OFF mode, leading to premature wear and providing an oscillatory response when used in a continuous control application. These valves eliminate that problem by modulating from 0 to 100% open depending on the signal from the PI controller. The design inherently offers low hysteresis, high repeatability and high responsiveness. The valve is designed "normally closed" (with lack of power).

Wetted parts are brass, Viton, PTFE, PPS, stainless steel, and polyamide.

Note: Because the valve is internally piloted, a 7-psi pressure differential is required across the valve.

Specifications for Continuous Control Solenoid Valve

Operating temp: 131°F (55°C)
Fluid temperature range: 14 to 194°F (–10 to 90°C)
Operating pressure: 7 to 140 psi
Max viscosity: 21 cSt
Connections: NPT(F), brass
Enclosure rating with mounted plug-on module: NEMA 4 (IP65)
Duty cycle: 100% continuously rated
Dimensions, models with
½" fittings: 2⅜"L x 4¼"H x 2"D
¾" fittings: 3¼"L x 6"H x 2"D
1" fittings: 3¼"L x 6"H x 2"D

FL Flowmeters

Paddle Wheel

Cole-Parmer®

Battery-Powered In-Line Flowmeters

Battery-powered meters are perfect for remote locations

- Polypropylene (PP) in-line fittings feature NPT(F) true-union connections for simple installation on existing pipe
- Factory-calibrated for GPM or LPM
- Corrosion-resistant polyvinylidene fluoride (PVDF) sensor features a NEMA 4X enclosure acceptable for outdoor use
- Simple operation with nothing to program
- Accurate measurement with virtually zero pressure drop

Specifications & Ordering Information

Fluid type: water-like, less than 1% solids
Accuracy: ±2% full scale
Operating temperature: 200°F (93°C) max
Operating pressure: 300 psi
Wetted materials: polypropylene, PVDF, Hastelloy-C, Viton®
Input power: two AAA batteries (included)
Battery life: one year minimum
Enclosure rating: NEMA 4X
Display type: 6-digit LCD, ⅜"H
Display update: 1.5 seconds
Dimensions: 3"W x 5"H x 2"D

Pipe size NPT (M)	English scale			Metric scale		
	Flow range (GPM)	Catalog number	Price	Flow range (LPM)	Catalog number	Price
Flowmeters						
⅜"	0.4 to 4	KH-32555-00		1 to 10	KH-32555-02	
⅜"	0.8 to 8	KH-32555-04		3 to 30	KH-32555-06	
½"	2 to 20	KH-32555-08		7 to 70	KH-32555-10	
¾"	4 to 40	KH-32555-12		15 to 150	KH-32555-14	
1"	6 to 60	KH-32555-16		25 to 250	KH-32555-18	
1½"	10 to 100	KH-32555-20		40 to 400	KH-32555-22	
1½"	15 to 150	KH-32555-24		60 to 600	KH-32555-26	
2"	30 to 300	KH-32555-28		100 to 1000	KH-32555-30	
Flowmeters with totalizers						
⅜"	0.4 to 4	KH-32555-50		1 to 10	KH-32555-52	
⅜"	0.8 to 8	KH-32555-54		3 to 30	KH-32555-56	
½"	2 to 20	KH-32555-58		7 to 70	KH-32555-60	
¾"	4 to 40	KH-32555-62		15 to 150	KH-32555-64	
1"	6 to 60	KH-32555-66		25 to 250	KH-32555-68	
1½"	10 to 100	KH-32555-70		40 to 400	KH-32555-72	
1½"	15 to 150	KH-32555-74		60 to 600	KH-32555-76	
2"	30 to 300	KH-32555-78		100 to 1000	KH-32555-80	

KH-09376-00 **Replacement batteries;** 1.5 V, AAA. Pack of 12

Cole-Parmer®

Economical In-Line Flowmeters

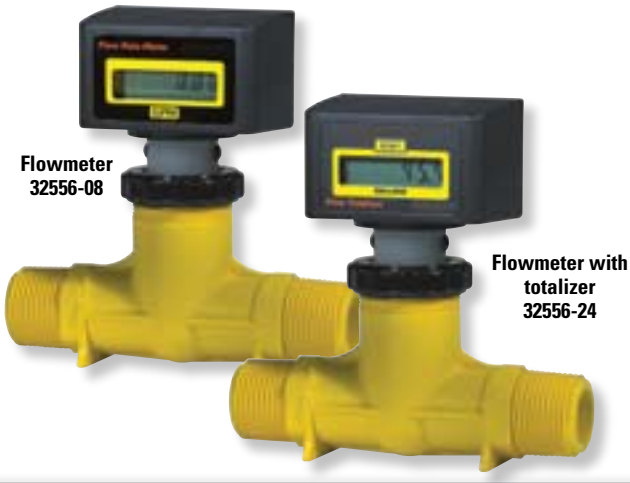
New

Accurate measurement with virtually zero pressure drop

- Simple operation with nothing to program
- Factory-calibrated for GPM or LPM

These injection-molded in-line flowmeters are battery powered (two AAA batteries included) and thus perfect for remote locations. Enclosure is rated NEMA 4X and can be used in outdoor locations. Sensor is constructed of corrosion-resistant PVDF; in-line NPT(M) fittings are of PP.

What's included: two AAA batteries.



Specifications & Ordering Information

Fluid type: water-like, less than 1% solids
Accuracy: ±1% full-scale
Operating temperature: 200°F (93°C) max
Operating pressure: 300 psi
Wetted materials: PP, PVDF, Viton®
Input power: two AAA batteries (included)
Battery life: one year minimum
Enclosure rating: NEMA 4X
Display type: 6-digit LCD, ⅜"H
Display update: 1.5 seconds (10 second average)
Dimensions: 3"W x 5"H x 2"D

Fitting size NPT (M)	English scale			Metric scale		
	Flow range (GPM)	Catalog number	Price	Flow range (LPM)	Catalog number	Price
Rate only flowmeters						
⅜"	0.4 to 4	KH-32556-00		1 to 10	KH-32556-32	
⅜"	0.8 to 8	KH-32556-02		3 to 30	KH-32556-34	
½"	2. to 20	KH-32556-04		7 to 70	KH-32556-36	
¾"	4. to 40	KH-32556-06		15 to 150	KH-32556-38	
1"	6 to 60	KH-32556-08		25 to 250	KH-32556-40	
1½"	10 to 100	KH-32556-10		40 to 400	KH-32556-42	
1½"	15 to 150	KH-32556-12		60 to 600	KH-32556-44	
2"	30 to 300	KH-32556-14		100 to 1000	KH-32556-46	
Rate and totalizer flowmeters						
⅜"	0.4 to 4	KH-32556-16		1 to 10	KH-32556-48	
⅜"	0.8 to 8	KH-32556-18		3 to 30	KH-32556-50	
½"	2. to 20	KH-32556-20		7 to 70	KH-32556-52	
¾"	4. to 40	KH-32556-22		15 to 150	KH-32556-54	
1"	6 to 60	KH-32556-24		25 to 250	KH-32556-56	
1½"	10 to 100	KH-32556-26		40 to 400	KH-32556-58	
1½"	15 to 150	KH-32556-28		60 to 600	KH-32556-60	
2"	30 to 300	KH-32556-30		100 to 1000	KH-32556-62	

KH-09376-00 **Replacement batteries;** 1.5 V, AAA. Pack of 12

Cole-Parmer® Micro-Flo Rate and Total Meters

Economical low-flow ranges

New

- Displays flow rate and total
- Preset factory calibrations or custom field-calibrated

These economical meters are capable of very low flow rates. The display is programmable for preselected factory settings or can be field calibrated for high accuracy in a specific application. Displays units in milliliters, ounces, liters, or gallons; displays time in minutes, hours, or days. Display can be programmed for up to four decimal places. All units are supplied with a 115 VAC/DC power supply.

32550-01

Specifications & Ordering Information

Accuracy: 6% full-scale
Maximum fluid temperature: 200°F (93°C)
Maximum working pressure: 200 psi
Materials of contstruction:
PVDF body, paddle, axle, tubing connections; PVC NPT connections and lens; Viton® O-rings
Power: 115 VAC/DC plug-in transformer

Flow range (mL/min)	1/4" NPT(F) pipe connection		1/4" ID x 3/8" OD tubing connection	
	Catalog number	Price	Catalog number	Price
30 to 300	KH-32550-01		KH-32550-13	
100 to 1000	KH-32550-03		KH-32550-15	
200 to 2000	KH-32550-05		KH-32550-17	
300 to 3000	KH-32550-07		KH-32550-19	
500 to 5000	KH-32550-09		KH-32550-21	
700 to 7000	KH-32550-11		KH-32550-23	

Cole-Parmer® Remote Mount Control Flowmeters

Simple proportional feed, batch processing, and analog output

New

- Base model displays flow rate and total
- Optional proportional feed control and 4 to 20 mA analog output
- In-line and saddle fittings to suit a wide range of pipe sizes
- Display mounts in a ¼-DIN panel opening

These meters have been traditionally popular for water/wastewater treatment, chemical system and agricultural applications. The display is programmable for selecting decimal placement, display units, K-factor editing and includes a security lockout to prevent unauthorized reprogramming.

Rate and Total Meters can be operated by batteries or AC/DC plug-in transformer.

Proportional Feed Meters display rate and total and also include an 8-amp relay for turning on and off external equipment, such as metering pumps and solenoid valves. This allows simple batch processing, proportional chemical feed, or high/low level alarm functions. Meters are supplied with a 115 VAC/DC power supply.

Analog Output Meters provide a programmable analog 4 to 20 mA or 0 to 10 VDC output signal that is proportional to the flow.

Optional pipe fitting kits are available separately below.

32555-01

Control meter shown with optional saddle mount kit 32555-99

Specifications & Ordering Information

Fluid type: water-like, less than 1% solids
Accuracy: ±1% full-scale
Max operating temperature
In-line, polypropylene: 200°F (93°C)
Saddle-mount, PVDF (up to 3"): 200°F (93°C)
Operating pressure: 300 psig

Wetted materials
In-line, polypropylene: PP, PVDF, Viton®
Saddle-mount, PVDF (up to 3"): PVDF, Viton
Input power
Battery-operated units: four AA batteries (included)
AC-operated units: 115 VAC/DC plug-in transformer
Battery life: one year minimum

Enclosure rating: NEMA 4X
Display type: 8-digit LCD, ⅜" H
Display update: 1.5 seconds (10 second average)
Display dimensions: 4" x 4" x 3¼"H
Remote mount cable: 25-ft shielded (included)

Fitting size	Flow range (GPM)	Pipe fitting type and material	Rate and Total meters				Proportional feed meters		Analog output meters	
			Battery operated		AC operated		AC operated		AC operated	
			Catalog number	Price	Catalog number	Price	Catalog number	Price	Catalog number	Price
⅜"	0.4 to 4	In-line PP	KH-32555-01		KH-32555-25		KH-32555-49		KH-32555-73	
⅜"	0.8 to 8	In-line PP	KH-32555-03		KH-32555-27		KH-32555-51		KH-32555-75	
½"	0.5 to 5	In-line PP	KH-32555-05		KH-32555-29		KH-32555-53		KH-32555-77	
½"	2. to 20	In-line PP	KH-32555-07		KH-32555-31		KH-32555-55		KH-32555-79	
¾"	0.8 to 8	In-line PP	KH-32555-09		KH-32555-33		KH-32555-57		KH-32555-81	
¾"	4. to 40	In-line PP	KH-32555-11		KH-32555-35		KH-32555-59		KH-32555-83	
1"	2. to 20	In-line PP	KH-32555-13		KH-32555-37		KH-32555-61		KH-32555-85	
1"	6 to 60	In-line PP	KH-32555-15		KH-32555-39		KH-32555-63		KH-32555-87	
1½"	15 to 150	Saddle PVDF	KH-32555-17		KH-32555-41		KH-32555-65		KH-32555-89	
2"	30 to 300	Saddle PVDF	KH-32555-19		KH-32555-43		KH-32555-67		KH-32555-91	
2½"	40 to 400	Saddle PVC	KH-32555-21		KH-32555-45		KH-32555-69		KH-32555-93	
3"	60 to 600	Saddle PVDF	KH-32555-23		KH-32555-47		KH-32555-71		KH-32555-95	

KH-32555-97 **Pipe mounting kit,** for pipe up to 1½" dia

KH-32555-99 **Pipe mounting kit,** for pipe up to 3" dia

FL Flowmeters

Paddle Wheel / Turboprop, Environmental

Turbo-Prop Open-Channel Flowmeters

Measure the flow velocity of streams, rivers, and canals

- Flow velocity display is switch selectable for ft/sec or m/sec
- Meter averages measured velocity for better accuracy

Measure water velocity at depths down to 15 feet with these turbo-prop open-channel flowmeters. The display sits on top of the handle for easy viewing; also functions as a stopwatch and clock.

Lightweight aluminum handle is adjustable from 3 to 6 feet for model 32922-00; adjustable from 5 to 15 feet for model 32922-10. The sensor is housed inside a 2" diameter PVC housing. The turbo-prop rotates freely on a bearing shaft for minimal friction.

Models operate on two 1.5 V batteries (included); and include a durable Mylar®-coated staff gauge (graduated in both ft and cm) and a padded carrying case.

Meters feature an easy-to-read LCD.

Specs & Ordering Information

Fluid type: water
Accuracy: ±0.1 ft/sec (average velocity)
Display type: LCD
Display: running average; 1 reading/sec
Flow range: 0.3 to 25 ft/sec
Operating temp, max: 120°F (48.9°C)
Power: two 1.5 V batteries (included)
Battery life: one year
Dimensions
Sensor housing: 3"L x 2" dia
Handle: expandable up to 6 or 15 ft

Catalog number	Handle length	Price
KH-32922-00	3 to 6 ft	
KH-32922-10	5 to 15 ft	

KH-09376-12 Replacement batteries, 1.5 V. Pack of six

Master Meter® Low-Volume Multi-Jet Meters

Cold or hot water bronze meters available for water management

- Measure low volumes with an accuracy of ±1½% reading
- Perfect for use in water/wastewater treatment facilities
- Meets American Water Works Association (AWWA) C-708 standards
- Basket strainer (included) protects meters from particulate damage
- Mechanical display of totalized flow with odometer reading in U.S. gallons

Electrical output meters produce a closed contact electrical pulse output via reed switch for remote display of total flow. Following AWWA installation guidelines, install meter in a horizontal straight run of pipe (at least twice the pipe diameters long on the inlet and the outlet).

ISO 9001:2000 SUPPLIER CERTIFIED

Specifications & Ordering Information

Fluid type: relatively clean water
Accuracy: ±1½% of reading
Repeatability: ±¼%

Max temperature
Cold water meters: 100°F (37°C)
Hot water meters: 194°F (90°C)
Max pressure: 150 psi

Wetted materials: bronze, sapphire, glass-filled Noryl®, and polybutylene terephthalate
Max particulate size: 1/16"

Power: (for meters with electrical output only) 6 to 32 VDC or VAC; 500 mA max

Flow rate*	Pressure drop at max flow	Connections	Sensor length	Meters with display		Meters with display and electrical output		
				Catalog number	Price	Catalog number	Pulse output	Price
Cold water meters								
1 to 20 GPM	8 psi	¾" NPT(M)†	7½"	KH-33320-00		KH-33320-02	1 pulse/gallon	
2 to 30 GPM	11 psi	¾" NPT(M)	9"	KH-33320-04		KH-33320-06	1 pulse/gallon	
3 to 50 GPM	11 psi	1" NPT(M)	10¼"	KH-33320-08		KH-33320-10	1 pulse/gallon	
5 to 100 GPM	13 psi	1½" NPT(M)	12½"	KH-33320-12		KH-33320-14	1 pulse/10 gallon	
8 to 160 GPM	13 psi	2" NPT(M)	15¼"	KH-33320-16		KH-33320-18	1 pulse/10 gallon	
Hot water meters								
1 to 20 GPM	8 psi	¾" NPT(M)†	7½"	KH-33320-20		KH-33320-22	1 pulse/gallon	
2 to 30 GPM	11 psi	¾" NPT(M)	9"	KH-33320-24		KH-33320-26	1 pulse/gallon	
3 to 50 GPM	11 psi	1" NPT(M)	10¾"	KH-33320-28		KH-33320-30	1 pulse/gallon	
5 to 90 GPM	13 psi	1½" NPT(M)	12½"	KH-33320-32		KH-33320-34	1 pulse/10 gallon	
8 to 130 GPM	13 psi	2" NPT(M)	15¼"	KH-33320-36		KH-33320-38	1 pulse/10 gallon	

*Flow rates listed give min and max flow through the meter. The meters themselves only indicate the total flow accumulation, not the actual flow rate.
†These meters have a line diameter of ⅝".

Aluminum/Stainless Steel Gear Flow Sensors/Transmitters

Flowmeters with ±0.5% accuracy for flow rates up to 60 GPM

- High-strength aluminum or stainless steel body withstands pressures up to 5000 psi
- Choose models with pulse output, 4 to 20 mA signal output, or integral digital display

Precisely measured gear teeth deliver consistent ±0.5% accuracy even when measuring high-viscosity fluids—ideal for measuring the flow of oils, grease, fuels, solvents, and other nonabrasive lubricating liquids. These positive displacement flowmeters are solidly built to provide excellent dynamic response for use in high-pressure applications. Gears and bearings withstand bidirectional flow without damage. Two 6-mm mounting holes let you secure the meter on a base plate, panel, or manifold. Available with a high-strength aluminum or 303 SS body.

Flowmeters with Pulse Output provide a NPN sourcing square wave pulse that is proportional to the flow rate. The peak-to-peak voltage of this square wave is the supply voltage provided minus two volts.

Flowmeters with Analog Output provide a scalable 4 to 20-mA signal output proportional to the flow rate. For panel-mount displays that accept 4 to 20-mA input see page 627.

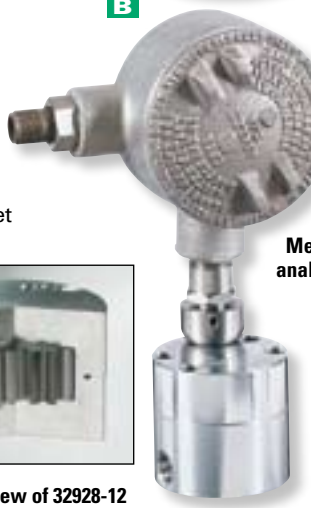
Flowmeters with Meter-Mounted Display instantaneous flow rate or total readings on a large 6-digit LCD. Display is fully programmable and allows you to switch between rate and flow total as well as reset totalization by using an attached magnet sensor—no need to open up the weather-tight enclosure. Portable and battery-operated, includes a battery pack that lasts up to four years.

Note: These flowmeters are not recommended for water, for fluids with abrasives such as paint and sealants, or for strong acids and bases. Please read maximum particle size in the specifications list below.

A

Flowmeter with pulse output 32928-10

B



Meter-mounted analog flowmeter 32928-20

C

for display only

FM APPROVED for display only

Meter-mounted digital flowmeter with integral display 32928-38

Cut away view of 32928-12

Specifications & Ordering Information

ISO 9001:2000 CERTIFIED SUPPLIER

For LIQUIDS

Viscosity range: 1 to 100,000 cp

Accuracy: ±0.5% of reading

Repeatability: ±0.1% of reading

Maximum temp
Aluminum body: 185°F (85°C)
Stainless steel body: 400°F (205°C)

Output signals
Pulse models: square wave, 10 to 24 VDC
Other models: 4 to 20 mA

Maximum pressure: 5000 psi

Materials: 17-4 PH SS gears, 440 SS bearings, PTFE O-rings, aluminum or 303 SS body

Maximum particle size
0.003 to 0.5 GPM models: 30 µm
0.01 to 2 GPM models: 30 µm
0.05 to 20 GPM models: 30 µm
0.5 to 60 GPM models: 120 µm

Power requirements: 10 to 24 VDC at 25 mA

Flowmeter dimensions
0.003 to 0.5 GPM models: 1½"H x 2" dia
0.01 to 2 GPM models: 2¼"H x 2½" dia
0.05 to 20 GPM models: 4½"H x 3" dia
0.5 to 60 GPM models: 5½"H x 7⅞" dia

Flow rates (GPM)	Pressure drop (max flow)	Connections NPT(F)	Aluminum body Catalog number	Aluminum body Price	303 SS body Catalog number	303 SS body Price
A Flowmeters with pulse output						
0.003 to 0.5	45 psi at 100 cSt	¼"	KH-32928-01		KH-32928-11	
0.01 to 2	10 psi at 100 cSt	¼"	KH-32928-00		KH-32928-10	
0.05 to 20	45 psi at 100 cSt	½"	KH-32928-02		KH-32928-12	
B Meter-mounted analog flowmeters with 4 to 20 mA output						
0.003 to 0.5	45 psi at 100 cSt	¼"	KH-32928-19		KH-32928-25	
0.01 to 2	10 psi at 100 cSt	¼"	KH-32928-20		KH-32928-26	
0.05 to 20	45 psi at 100 cSt	½"	KH-32928-22		KH-32928-28	
C Meter-mounted digital flowmeters with integral display						
0.01 to 2	10 psi at 100 cSt	¼"	KH-32928-30		KH-32928-36	
0.05 to 20	45 psi at 100 cSt	½"	KH-32928-32		KH-32928-38	
0.5 to 60	40 psi at 100 cSt	1¼"	KH-32928-34		KH-32928-40	

Flow Monitors and Accessories

Monitor both flow rate and total flow from pulse output flowmeters in any engineering unit with a push of a button. Programmable, compact, and easy-to-use. Input square wave, sine, or sawtooth frequency. Back-up totalizer lock-out feature prevents accidental erasure. High-speed microprocessor ensures fast and accurate reporting—includes a 4 to 20-mA output for recording or datalogging.

Flow monitor (32928-75 and -76) for pulse output flowmeters 32928-01 to -12

KH-32928-75 **Flow monitor,** 110 VAC; face panel measures 7"W x 3"H x 5"D

KH-32928-76 **Flow monitor**, 110 VAC; face panel measures 7"W x 3"H x 5"D

KH-32928-60 **Cable,** 10-ft connection for flow monitor 32928-75 and -76

KH-50001-00 **Line cord;** 120 VAC, 6-ft L U.S. standard plug, for use with flow monitors 32928-75 and -76

FL Flowmeters

Gear Meters

High-Viscosity Oval Gear Flow Sensors

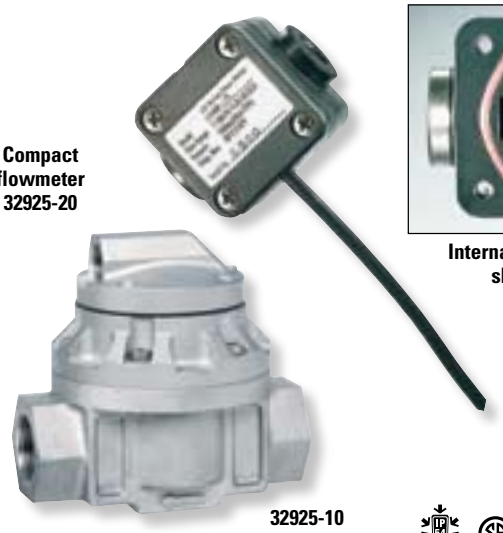
Robust design does not require flow conditioning

These oval gear flowmeters for high accuracy are ideal for use in food, petroleum, pharmaceutical, or waste treatment applications. They can handle a wide range of fluid viscosities with exceptional accuracy and durability, without the need to recalibrate. Low pressure drop even allows for gravity flow application. Meter design minimizes the number of wearable and replaceable parts, extending product life. All models have NEMA 13 (IP54) enclosures.

Wetted parts for all flowmeters include: polyphenylene sulfide (PPS), aluminum, or 316 stainless steel body; PPS rotor; 316 SS shaft; and Viton® or nitrile O-ring. **Note:** Flow rates in the table below assume a fluid viscosity of 5 cp or greater.

Flowmeters with Reed Switches produce a proportioning contact closure output for sending data to a computer or monitor. These meters do not require input power.

Flowmeters with Hall Effect Switches produce a pulse output via an NPN open collector and require a 4.5 to 24 VDC input.



Compact flowmeter 32925-20

Internal view of 32925-20 showing gears

32925-10

Specifications & Ordering Information

Viscosity range: 5 to 1000 cp
Maximum temp: 176°F (80°C)
Pressure drop: 9.3 psi at 100 cp

Output signals
32925-20 to -32: Reed switch pulse
32925-50 to -62: NPN open collector

Input power
Flowmeters with Reed switches: none
Flowmeters with NPN open collectors: 4.5 to 24 VDC

Flow rate*	Connections	Body material	Accuracy (% of reading)	Max pressure	Pulse output	Maximum particulate size	Dimensions	Reed switch output		Hall effect output†	
								Cat. no.	Price	Cat. no.	Price
0.53 to 26.4 GPH	¼" NPT(F)	PPS 316 SS	±1%	75 psi 150 psi	3785.4/gal.	127 microns	2"L x 2"W x 2⅝"H	KH-32925-20 KH-32925-22		KH-32925-50 KH-32925-52	
4 to 132 GPH	¼" NPT(F)	PPS 316 SS	±1%	75 psi 150 psi	1514.2/gal.	127 microns	2"L x 2"W x 2⅝"H	KH-32925-24 KH-32925-26		KH-32925-54 KH-32925-56	
0.26 to 8 GPM	½" NPT(F)	Aluminum 316 SS	±0.5%	800 psi	848/gal.	280 microns	5"H x 4⅜" dia	KH-32925-28 KH-32925-30		KH-32925-58 KH-32925-60	
0.8 to 21 GPM	1" NPT(F)	PPS	±0.5%	150 psi	394/gal.	280 microns	4¼"L x 4¼"W x 4¾"H	KH-32925-32		KH-32925-62	

*Flow rates listed are for fluids with viscosity above 5 centipose. †Require external DC power of 4.5 to 24 VDC; order power supply listed below.

KH-26900-00 **Power supply** for models with Hall effect switch output

High-Viscosity Oval Gear Flowmeters with Digital Display

No external power source required

Oval gear flowmeters with digital display allow easy toggling between flow rate, resettable total, and nonresettable total displays with the push of a button. Six-digit LCD reads up to 999,999. Meters feature a proportioning contact closure output via reed switches for sending data to a recorder or a datalogger. Flowmeters accurately handle a wide range of fluid viscosities without the need to recalibrate. **Note:** Flow rates listed in the table assume a liquid viscosity of 5 cp or greater. Flowmeters (except models 32927-05 and -07) have NEMA 13 (IP54) enclosure.

Wetted parts: polyphenylene sulfide (PPS), aluminum, or 316 stainless steel body; 316 SS rotor; and Viton® or nitrile O-ring.

What's included: a 9 V lithium battery.

32927-07

32927-07 Side view

Specifications & Ordering Information

Viscosity range: 5 to 1000 cp **Maximum temp:** 176°F (80°C) **Pressure drop at max flow:** 9.3 psi at 100 cp **Output:** reed switch pulse

Flow rates*	Connections	Body material	Max pressure	Accuracy (% of reading)	Pulse output (gal.)	Maximum particulate size	Dimensions	Catalog number	Price
0.53 to 26.4 GPH 4 to 132 GPH	¼" NPT(F)	PPS	75 psi	±1%	3785 1514	127 microns	2"L x 2"W x 2⅝"H	KH-32927-05 KH-32927-07	
0.26 to 6.6 GPM	½" NPT(F)	Aluminum 316 SS	800 psi	±0.5%	424	280 microns	5"H x 4⅜" dia	KH-32927-09 KH-32927-11	

*Flow rates listed are for fluids with viscosity above 5 centipoise

Portable Doppler Flowmeters


Compact sensor takes on-the-spot, noninvasive readings.

Ideal for measuring flow rates of dirty or particulate ridden fluids—sensor does not contact the fluid so there is no contamination

- Programmable models 05613-60 and -65 display velocity in ft/sec, m/sec; flow rate in GPM, cu ft/sec, GPD, MGPD, and L/sec

Monitor flow rates of slurries and dirty fluids that can foul in-line sensors. These flowmeters are convenient to use both in the plant and in the field. Simply clamp or hold the sensor onto the outside of your pipe*—no specialized installation fittings needed. Dual-hinged sensor automatically aligns itself, ensuring proper placement for measurement. An LED indicator lets you know if there is a sufficient amount of reflective material in the liquid to monitor velocity. Adjustable velocity calibration control ensures accurate readings.

Standard Models measure fluid velocity or flow rate for pipe sizes from 1" to 30" ID. Models 05613-10, -15, -20, and -25 have a switch-selectable display in either ft/sec or m/sec. Select models 05613-30 or -35 to read in ft/sec or GPM. Models 05613-41 and -46 display both instantaneous velocity and accumulated flow values and are field calibratable. Order models with 4 to 20 mA output to connect to a recorder or datalogger for keeping a permanent record.

Programmable Model provides fluid velocity and flow rate for pipe sizes from 1" to 30" ID. Units feature a 16-character display for viewing velocity in ft/sec or m/sec; flow rate in GPM, cubic ft/sec, GPD, MGPD, or L/sec; and accumulated flow to seven digits in gallons or liters. Programmable model also features a 4 to 20 mA output, a digital filter for data smoothing, and an adjustable response time of 0 to 99 seconds.

All models are battery operated—simply use the included charger/power supply to recharge battery for use up to four hours. All models except 05613-10, -15, -30, and -35 also operate on 115 or 220 VAC power for long-term monitoring using the charger/power supply.

What's included: sensor with 1-meter long cable, battery charger/power supply, couplant, and nylon carrying case with shoulder strap.

*Not recommended for use with transit (clay), cast iron, concrete, or fiberglass pipes.


Lightweight, portable flowmeters are ideal for use in the field.

05613-30


05613-60

Specifications & Ordering Information

Fluid type: fluids with particulates or bubbles; 100 ppm, 100 µm or larger

Accuracy: ±2.0 LSD

Repeatability: ±0.2% full-scale

Operating temperature
Models 05613-10 through -46:
Meter: –13 to 185°F (–25 to 85°C)
Sensor: –40 to 240°F (–40 to 115°C)
Models 05613-60 and -65: 23 to 158°F (–5 to 70°C)

Display: 3½-digit LCD, ½"H

Dimensions
Models 05613-10 through -35: 7¼"W x 4⅛"H x 2"D
Models 05613-40 through -46: 6"W x 6½"H x 4½"D
Models 05613-60 and -65: 4⅛"W x 7¼"H x 2"D

Velocity rates	Resolution	Totalizer	Output	115 VAC, 60 Hz models		220 VAC, 50 Hz models	
				Catalog number	Price	Catalog number	Price
Standard models							
0.5 to 20 ft/sec; 0.3 to 6 m/sec	0.1 ft/sec; 0.1 m/sec	No	None	KH-05613-10		KH-05613-15	
0.5 to 20 ft/sec; 0.3 to 6 m/sec	0.1 ft/sec; 0.1 m/sec	No	4 to 20 mA	KH-05613-20		KH-05613-25	
0.5 to 20 ft/sec†	0.1 ft/sec; 1 GPM	No	None	KH-05613-30		KH-05613-35	
0.5 to 20 ft/sec; 0.3 to 6 m/sec	0.1 ft/sec; 0.1 m/sec	Yes	4 to 20 mA	KH-05613-41		KH-05613-46	
Programmable model							
0.5 to 20 ft/sec; 0.3 to 6 m/sec†	0.1 ft/sec; 0.1 m/sec; 1 L/sec; 1 cu ft/sec; 1GPM; 1 GPD; 1 MGPD	Yes	4 to 20 mA	KH-05613-60		KH-05613-65	

†Meters also read flow rates. To figure out the maximum flow rate the meter can read, use the equation in the "Technical info" box (below).

Accessories

KH-03277-70 **Analog signal-to-RS-232 converter** 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-05612-60 **Replacement transducer couplant** for all models; use for increased sensitivity

Technical info

Convert velocity into flow units:
GPM = 2.45 x (ID in inches)² x (velocity in ft/sec)
L/sec = 0.08 x (ID in cm)² x (velocity in m/sec)

Cole-Parmer® Handheld Doppler Flowmeter

Portable and flexible for diagnosing flow profiles throughout a process

- Unit uses advanced signal processing to measure flow in pipe sized 1" to 60" in diameter

This noninvasive design is uniquely suited for measuring slurries and dirty fluids. The chemical industry, construction, mining, food processing, and sewage/water treatment plants use this technology extensively.

Install sensor on dense-material pipes (not typically transit/clay, concrete or fiberglass). View flow velocity in feet/sec or m/sec (switch selectable) on a large character 4-digit LCD; also displayed is signal strength and low-battery condition. The unit's power management capabilities extend battery life to 30 continuous hours.

What's included: case, sensor with 6-ft cable, tube of transducer couplant, and four AA batteries.

32986-00

Specifications & Ordering Information

Range: 0.30 to 30 ft/sec (0.1 to 9 m/sec)
Accuracy: ±2% full-scale
Repeatability: ±1% full-scale
Display: single-line 4-digit LCD
Liquid type: fluids with particulates or bubbles; 100 ppm, 100 microns, or larger
Operating temperature: –28 to 140°F (–20 to 60°C)
Power: four alkaline AA batteries (included)
Dimensions: 4"W x 7¾"H x 1½"D

Catalog number	Description	Price
KH-32986-00	Handheld Doppler flowmeter	

KH-09376-01 **Replacement batteries,** AA. Pack of four

Technical info

Please refer to the intro pages of this section on pages 556–558 for details about how this technology works.

Portable Enhanced-Doppler Flowmeter

Enhanced signal processing for use on relatively clean fluids

- Weatherproof, portable design for monitoring or troubleshooting in almost any environment

This flowmeter's signal processing algorithm allows for use with fluids that are cleaner than most Doppler meters can operate with. In addition, accuracy is improved with a microprocessor that automatically frequency tracks and linearizes the Doppler signal for turbulent or asymmetric flows. The transducers should be mounted to dense-material pipes (not typically transit/clay, concrete or fiberglass) and work with pipe sizes from ¼" to 20" in diameter. They are nonfouling to prevent permanent coating with grease, paraffin, and coupling materials.

Measure flow velocity in feet/sec or flow rate in GPM or MGD; a totalizer, registering in gallons is also included. A 4 to 20 mA output signal is available for monitoring or recording flow data. The rechargeable battery lasts 8 hours and nonvolatile memory saves parameters when the battery needs recharging. See the section introduction for details on using this flow technology. If planning to use this unit in a clean fluid application, place the sensors 1 to 3 pipe diameters downstream from a 90° elbow.

What's included: heavy-duty NEMA 4X carrying case, two sensors with 20-ft cable for each, sensor mounting straps, transducer couplant, output cable, and rechargeable battery with charger.

The ultrasonic transducers can be quickly and easily secured.

32986-10

Specifications & Ordering Information

Range: 0.5 to 20 ft/sec; programmable in GPM or MGD (million gallons/day)
Accuracy: ±2% full-scale
Repeatability: ±1% full-scale
Output: 4 to 20 mA
Display: 6-digit LCD
Liquid type: virtually all types of liquids
Operating temp: –40 to 250°F (–40 to 121°C)
Power: rechargeable battery for 120 VAC operation (included)
Dimensions: 17"L x 11"W x 8"H

Catalog number	Description	Price
KH-32986-10	Portable enhanced-Doppler flowmeter	

Portable Transit-Time Flowmeters

A noninvasive, portable technology for any clean, ultra-pure, or petroleum-based fluid

Unlike Doppler flowmeters, these transit time flowmeters are designed to work with fluids that have minimal solids or bubbles. Using digital signal processing (DSP), digital cross-correlation and a proprietary time expansion algorithm, meters measure with outstanding accuracy regardless of the Reynolds-number flow regime. With the single transducer set, flow can be measured in a broad range of pipe sizes and materials. This technology is leak-free and produces zero pressure drop or fouling—unlike other quick-install flowmeter technologies.

Systems are suitable for survey work in remote process locations. A waterproof enclosure protects the transmitter from accidental immersion or splashes. When wired power is not available, the meters will operate for up to 24 hours on an integrated, rechargeable battery. Systems also include a keypad lockout to prevent unauthorized users from tampering with the unit settings.

If used in a wired installation, a 4-to-20 mA output can be used for continuous monitoring of flow rate. Available as an option for wired or wireless installations is a field-swappable 200,000-event datalogger that can be unplugged for data download without disrupting operation of the meter.

Operating parameters can be programmed using the integrated keypad. In cases where a PC or laptop is available, the included Windows®-based ULTRALINK utility program can be used as a configuration interface. Communication from this interface is done through a real-time infrared communications adapter (included) which allows wireless communication from up to 10 feet (3 meters) away.

What's included: waterproof carrying case; transducer set with 20-ft (6-m) cord, acoustic couplant, pipe-mount rack for transducers, AC power converter; automotive-style 12 VDC power adapter, ULTRALINK™ software utility, infrared adapter for wireless PC communication with the flowmeter, 4 to 20 mA interface cable.

Typical installation (see "What's included" for provided items
32989-15

Specifications & Ordering Information

Accuracy: ±0.5% of rdg when > 1 fps
Sensitivity: 0.001 fps
Repeatability: ±0.01% of rdg
Response time: 0.3 to 30 sec, user settable
Velocity range: –40 to 40 fps (–12 to 12 mps)
Operating temperature
Transducer:
–40 to 250°F (–40 to 121°C)
Transmitter:
–40 to 185°F (–40 to 85°C)
Pipe size: 2" to 100"
Input power: 115 VAC or 230 VAC, plus 12 VDC adapter

Enclosure rating: NEMA 6/IP68 (closed case)
Cable length (transducers): 20 ft (6.09 m) standard; extendable to 990 ft (300 m)
Display type: 128 x 64 pixel LCD; 8-digit rate, 8-digit totalizer, user-selectable font in 0.35" or 0.2"
Special indicators: on/off and low battery LEDs
Output signal
Standard: 4 to 20 mA, active or passive
Optional: 200,000-event datalogger, RS-232, 57.6 k data transfer
Dimensions: 14"W x 6"H x 10½"D

4 to 20 mA analog output			4 to 20 mA analog output with datalogger		
Cat. no.	Power	Price	Cat. no.	Power	Price
KH-32989-10 KH-32989-20	115 VAC, 50/60 Hz 230 VAC, 50/60 Hz		KH-32989-15 KH-32989-25	115 VAC, 50/60 Hz 230 VAC, 50/60 Hz	

Compact Transit-Time Flowmeters/Transmitters

Transducers, display, and transmitter in a single noninvasive device

- Integrated design mounts in minutes; wiring is simple, through a single cable

Monitor flow in systems by simply clamping this meter on piping and running cabling to the appropriate control location. Unlike other quick-install flowmeter technologies, this technology is leak-free and produces zero pressure drop or fouling within the system.

The meter's operating parameters are pre-programmed from the factory, further simplifying installation. Available as an option is a Windows®-based ULTRALINK utility program that allows users to adjust numerous operating parameters for the meter. Contact an Applications Specialist to order this software utility.

32989-54

Specifications

Fluid type: clean, pure fluids, with solids or aeration
Accuracy: ±1% of rdg when 1 fps
Response time: 0.3 to 30 sec, user settable
Velocity range: 0.1 to 40 fps (0.03 to 12.4 mps)
Operating temperature: 0 to 185°F (–20 to 85°C)
Input power: 11 to 30 VDC at 0.25 A
Enclosure rating: NEMA 3
Display type: 2-line x 8-character LCD; top line (rate) 0.70", bottom line (totalizer) 0.35"
Output signals
Analog: 4 to 20 mA
Pulse: 1000 Hz max, 100 mV peak-to-peak at 5 VDC
Dimensions: 6¾"W x 3¼"H x 2½"D

Technical info

Before ordering this product, you must visit www.coleparmer.com/563 to complete an application sheet that will assist the factory in the meter calibration and programming of functions.

Ordering Information

Pipe size	Flow range		Pipe style					
			ANSI pipe		Copper tube		OD tubing	
	GPM	LPM	Catalog number	Price	Catalog number	Price	Catalog number	Price
½"	0.5 to 25	2.0 to 100	KH-32989-50		KH-32989-60		KH-32989-70	
¾"	1.0 to 55	4.0 to 200	KH-32989-52		KH-32989-62		KH-32989-72	
1"	2.0 to 100	8.0 to 375	KH-32989-54		KH-32989-64		KH-32989-74	
1½"	5.0 to 220	15 to 570	KH-32989-56		KH-32989-66		KH-32989-76	
2"	8.0 to 400	30 to 1500	KH-32989-58		KH-32989-68		KH-32989-78	

FL Flowmeters

Magnetic

Low-Flow Magnetic Flowmeters

High-accuracy design for lab and pilot-scale systems

- Capable of measuring and totalizing steady or pulsating liquid flow
- Kynar® PVDF body, Viton® seals, and platinum plated titanium electrodes provide aggressive chemical compatibility
- No moving parts to wear or create additional pressure drop

This meter can operate unsecured on a bench for temporary applications, or be permanently mounted through the unit's base. The meter body can be mounted in any convenient orientation.

The separate display (included) features a 2-line, 16-character alphanumeric readout. The unit simultaneously displays the flow rate and totalized flow in units of milliliters, liters, or gallons. A relay is provided with a user-settable high/low flow set point. Frequency, 4 to 20 mA, and 0 to 5 V outputs are included in the design for external recording or monitoring. Simple and quick setup of all basic flow parameters is done through the tactile keypad on the display face.

The magnetic flowmeter system comes with the magnetic sensor, the display, and a 6-ft connection cable.

Specifications & Ordering Information

Flowmeter

Minimum fluid conductivity: 20 µS/cm
Accuracy: ±1% of reading
Operating temp: 200°F (93°C)
Operating pressure: 150 psi at 75°F
Connections: ⅜" NPT(M)

Wetted materials
Body: Kynar PVDF
Electrodes: titanium with platinum plating
Seals: Viton
Dimensions: 4.4"L x 4.4"W x 3.8"D

Control Housing

Display: 16 character, 2-line alphanumeric LCD
Output: 4 to 20 mA, 0 to 5 V, pulse (up to 9,999 pulses per gallon)
Dimensions: 4.9"L x 4.9"W x 2.9 D
Power: 115 VAC or 220 VAC

Flow range		115 VAC, 60 Hz		220 VAC, 50 Hz	
GPM	LPM	Catalog number	Price	Catalog number	Price
0.1 to 1.0	0.38 to 3.78	KH-33109-00		KH-33109-01	
0.3 to 3.0	1.14 to 11.0	KH-33109-02		KH-33109-03	
0.8 to 8.0	3.0 to 30.0	KH-33109-04		KH-33109-05	

Cole-Parmer® Low-Flow Magnetic Flowmeters

A superb meter for verification of low-flow chemical metering

- Not affected by varying viscosities
- Can be used for chemical and fertilizer injection

These "blind unit" meters are a great economical alternative when only an output to a PLC or a computer is needed. Meters use bipolar DC technology at a frequency high enough to allow for measurement of pulsating flows from diaphragm-type chemical metering pumps. All electronics are contained in a single, compact, chemical-resistant ABS housing. This configuration, combined with standard pulse and analog outputs, makes these meters well suited for OEM applications. Other applications include remote monitoring of chemical volume or rate using a computer or PLC.

What's included: 6-ft, six-conductor control cable and a 12-ft long grounding wire with lugs.

Specifications & Ordering Information

Fluid conductivity: 20 µS/cm
Accuracy:
1% from 10 to 100% scale
3% from 0 to 10% scale
Maximum fluid temperature: 185°F (85°C)
Operating pressure: 150 psi

Wetted materials
Body: Kynar PVDF
Electrodes: titanium with platinum plating
Seals: Viton
Power:
12 to 24 V DC, 180 mA

Output:
Pulse and 4 to 20 mA
Dimensions:
2"L x 3¾"W x 5¾"H

Catalog number	Fitting size NPT(M)	Flow range		Price
		GPM	LPM	
KH-33111-50	⅜"	0.1 to 1.0	0.38 to 3.78	
KH-33111-55	⅜"	0.3 to 3.0	1.14 to 11.0	
KH-33111-60	½"	0.8 to 8.0	3.0 to 30.0	

Insertion Flowmeter/Transmitter with Display

Magmeter electrode contains no moving parts and is made of PVDF and 316L SS.

All of the functionality of more expensive full-bore magmeters

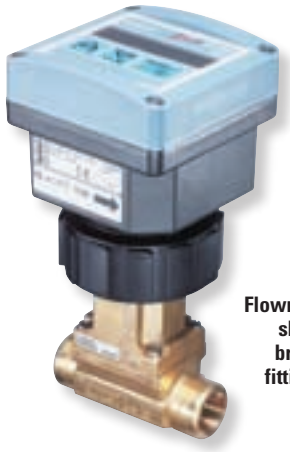
- Unit is extremely simple to install, program and use—an integrated keypad and display are used for setting all functions
- Multiple output options: analog signal, pulse and (2) relays

Insertion magmeter technology offers many of the benefits of full-bore magmeters—no moving parts, low pressure drop, and good repeatable accuracy—but without the higher price. The further benefit of this design is the integrated keypad and large 8-digit display.

From the operating display, users can scroll through flow rate, (2) totalizer values, and the analog output (current). Using the same display and key-pad the unit is easily programmed for all functionalities. Some of these functionalities include relay activation settings, signal filters, output span and zero adjustment, unit selection and language selection. Many of these features can only be found on more expensive magmeter devices.

To optimize the accuracy of the meter, a "Teach-in" function is included. This allows you to calibrate the installed meter to the specific process, getting a more accurate K-factor than those developed under laboratory conditions. Also included is a "Simulation" function that allows you to manually step through the range of flow values to test the analog output; this can be done before starting up the system.

Before ordering this meter, please note that the fluid conductivity requirement must be greater than 20 µS. For aggressive process applications, choose a full-bore magmeter from page 623.



Flowmeter 33124-10 shown with brass in-line fitting 33124-50

Specifications and Ordering Information

Fluid conductivity: must be greater than 20 µS
Accuracy: ±2% of reading
Linearity: ±1% of reading + 0.1% of full-scale
Repeatability: ±0.25% of reading
Operating temp: 32 to 140°F (0 to 60°C)
Maximum fluid temperature
PVC: 32 to 122°F (0 to 50°C)
PP, PVDF, brass, stainless steel: 32 to 176°F (0 to 80°C)
Wetted parts: PDVF and 316L SS
Enclosure rating: IP65, NEMA 4

Materials of construction: polycarbonate housing, polyester front plate foil, PVDF sensor body, 316L SS sensor electrodes, and FPM standard O-rings
Transmitter
Power supply: 18 to 32 VDC, three wire
Output signal: 4 to 20 mA
Pulse output: open collector NPN and PNP, 0 to 30 V, 100 mA, protected
Relay output: two relays, freely programmable, 3 A, 230 V
Maximum load: 900 Ω at 30 VDC; 500 Ω at 24 VDC; 100 Ω at 15 VDC
Display: 8-digit, alphanumeric LCD, ½"H

Catalog number	Velocity range	Fitting size range	Price
KH-33124-10	0.16 to 33 ft/sec (0.05 to 10 m/sec)	½" to 2" (order below)	

In-Line Fittings

To properly install a Burkert Insertion Magmeter, choose a fitting from the table below. PVC fittings are the lowest-cost option for general applications; they also include true-union connections for easy installation and removal of the meter fitting. Brass is suitable for neutral-fluid systems in more aggressive installations and SS offers the same benefits but with broader chemical compatibility. While this meter design is NOT typically considered sanitary, the stainless steel (SS) Tri-Clamp® fitting integrates well into auxiliary systems in food, beverage and pharmaceutical facilities.

PVC true union fitting 33120-52 allows for easy installation/removal.

Fitting size	PVC, true union		Brass, NPT(F)		SS, NPT(F)		SS, Tri-Clamp	
	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price
½"	KH-33120-50		KH-33124-50		KH-33120-62		—	—
¾"	KH-33120-52		KH-33124-52		KH-33120-64		KH-33120-82	
1"	KH-33120-54		KH-33124-54		KH-33120-66		KH-33120-84	
1¼"	KH-33120-56		KH-33124-56		KH-33120-68		—	—
1½"	KH-33120-58		KH-33124-58		KH-33120-70		KH-33120-88	
2"	KH-33120-60		KH-33124-60		KH-33120-72		KH-33120-90	

Stainless steel NPT(F) fitting 33120-64

GO to ColeParmer.com

Click Here

Go online to see other versions of this Burkert meter—featuring integrated display covers and stainless steel insertion elements that are suitable for CIP conditions.

FL Flowmeters

Magnetic, Sanitary

Sanitary Magnetic Flowmeters

Specifically designed for food, beverage and other high-purity applications

- Microprocessor-based with pulsed DC excitation to provide long-term accuracy and zero-point stability
- Converter is easily configurable with integral push buttons or through magnetic coupling
- The remote-mount converter is easily integrated into any process up to a 415 ft distance from the meter

These flowmeters offer outstanding accuracy, a no-moving-part design and minimal pressure loss. In addition, the materials of construction have been selected to withstand the caustic washdowns and high-temperature CIP processes that are required in food, beverage and pharmaceutical applications. Not only are these meters suited for measuring single-phase liquids, they are also suited to measuring process slurries as well.

Users familiar with this magnetic technology will recognize the low conductivity requirement of the meter, an indication of the high quality of the electronic design for dealing with weaker fields and higher levels of electronic noise. This meter uses the pulsed DC method of magnetic field generation, which has several advantages over the traditional AC method. The primary advantage for pulsed DC is the zero stability and the reduction of zero shift. Pulsed DC also consumes less power and is more accurate across the flow range. It is capable of measuring 100% of a change in flow in less than one second. Combined with digital signal processing, this technology can measure from an empty pipe condition to a given flow rate in approximately one second.

Programming of the converter is easily done through integral pushbuttons. For re-programming of the unit while in the field, a magnetic wand may be used so that the converter cover does not have to be opened.

A primary benefit of this design is its ability to record flow rates/totals for forward and reverse flow. Users may also select units displayed, languages, fluid parameters such as density along with various alarm settings. To better understand the full capabilities of this meter, contact an Application Specialist to discuss the use of this device for a specific application.

Sanitary flow monitoring system 33162-52

Specifications & Ordering Information

Fluid conductivity: minimum 5 µS/cm
Accuracy: ±0.5% of flow rate
Operating temperature: –40 to 266°F (–40 to 130°C)
Ambient temperature: –13 to 140°F (–25 to 60°C)
Max pressure: 145 psig at 266°F (130°C)
Wetted materials: PFA; 316 SS
Non wetted materials: 304 SS body, connections and sensor electronics housing; aluminum converter housing
Connections: U.S. Tri-Clamp®
Electrical connection
Sensor: ½" NPT conduit seal
Converter: (5) ½" NPT conduit seals
Enclosure rating
Sensor: NEMA 4X/IP67 for accidental submergence
Converter: NEMA 4X/IP65

ISO9001:2000 CERTIFIED SUPPLIER · For Liquids · FM APPROVED

Electrical classification, converter:
FM-Approved non-incendive Class I, Div. 2, Group A-D
FM Approved dust ignition proof Class I, Div. 1, group. E-G
Cable length: 30 ft (10 m)
Display type: Illuminated LCD, 5 x 7 dot matrix, 2 lines x 16 alphanumeric character
Input signal: optocoupler
Output signals: 4 to 20 mA, 6 scaling options; optocoupler
Dimensions, converter:
(W x H x D): 7⅞" x 10½" x 5½"
(198 mm x 265 mm x 140 mm)

Fitting size	Flow range (gpm)	Flow range (LPM)	115 VAC 50/60 Hz		230 VAC 50/60 Hz	
			Catalog number	Price	Catalog number	Price
½"	1.33 to 26.4	5 to 100	KH-33162-02		KH-33162-07	
1"	2.65 to 52.8	10 to 200	KH-33162-12		KH-33162-17	
1½"	7.93 to 158	30 to 600	KH-33162-22		KH-33162-27	
2"	13.3 to 264	50 to 1,000	KH-33162-32		KH-33162-37	
3"	39.7 to 792	150 to 3,000	KH-33162-42		KH-33162-47	
4"	52.9 to 1,056	200 to 4,000	KH-33162-52		KH-33162-57	

More info

Please refer to the Flowmeters Introduction on pages 556–558 for more information on how these flowmeters work.

Contact an Application Specialist to discuss how the following options can be incorporated into this design:

- Wafer-style body
- PTFE liner
- RS-232/RS-485 communications
- Scaled pulse outputs for forward and reverse flow
- HART Communications protocol
- 24 VDC power

847-549-7600

Sanitary Process Products

Cole-Parmer offers a full array of sanitary process products, including filters, fittings and valves. Pages 471–486 include sanitary filtration products. Visit the Sanitary Fitting section on pages 487–546 to select from fittings meeting 3A and ASME BPE 2002 standards. Available are various configurations, materials and sizes up to 4" Tri-clamp®. Sanitary Ball Valves; See our Valves section on pages 1937–1963 for Sanitary Diaphragm Valves are also available and meet USDA and 3A requirements.

SS concentric reducer 30509-01

Process liquid filter 29584-06

Sanitary ball valve 30530-01

Heavy-Duty Mag Meters

Smart technology housed in a heavy-duty Class I, Div 2 NEMA 4X enclosure*

- Digital signal processing and pulsed DC excitation provide long-term accuracy and zero-point stability
- Microprocessor-based converter is field configurable with integral push buttons or through magnetic coupling
- Outstanding viewability—rotate transmitter 90° to view any of 42 different flow units

These flowmeters offer outstanding accuracy, a no-moving-part design and minimal pressure loss. In addition, the materials of construction have been selected to offer resistance to abrasion and chemical corrosion. Not only are these meters suited for measuring single-phase liquids, they are also suited to measuring process slurries as well.

This meter uses the pulsed DC method of magnetic field generation, which has several advantages over the traditional AC method. The primary advantage for pulsed DC is the zero stability and the reduction of zero shift. Pulsed DC also consumes less power and is more accurate across the flow range. It is capable of measuring 100% of a change in flow in less than one second. Combined with digital signal processing, this technology can measure from an empty pipe condition to a given flow rate in approximately one second. Programming of the converter is easily done through integral pushbuttons. For re-programming of the unit while in the field, a magnetic wand may be used so that the converter cover does not have to be opened.

A primary benefit of this design is its ability to record flow rates/totals for forward and reverse flow. Users may also select units displayed, languages, fluid parameters such as density along with various alarm settings.

Important: Note minimum conductivity requirements before selecting this meter.

Wafer-Style Flowmeters mount inside the pipe flange bolt circle and are compatible with both flat and raised ANSI Class 150 flanges. Each wafer-style meter includes two flange gaskets and connecting bolts to ensure proper installation.

Flange-Style Flowmeters include integral ANSI Class 150 flange connections.

Grounding Rings eliminate stray voltage in piping. Ideal for non-conductive piping, the rings provide liquid-to-metal contact to ground out static electricity. One ring is used on each side of the flowmeter to ensure no static electricity enters the meter.

Specifications & Ordering Information

Power	
Wafer-style	Flange-style
115 VAC, 50/60 Hz	

ISO 9001:2000 CERTIFIED SUPPLIER · For LIQUIDS · UL · SA · CE · FM APPROVED · 2 year warranty

Fluid conductivity: minimum 20 µS/cm

Accuracy: ±0.5% of flow rate

Operating temperature†
Wafer-style: –13 to 250°F (–25 to 121°C)
Flanged: –13 to 266°F (–25 to 130°C)

Ambient temperature: –4 to 131°F (–20 to 55°C)

Max operating pressure: 740 psi at 100°F (38°C)

Wetted materials: PTFE; Hastelloy C

Non wetted materials: epoxy-coated carbon steel body; aluminum electronics housing

Electrical connection: cage clamp terminals; 1/2 NPT(F) conduit fittings

Enclosure rating
Wafer-style: NEMA 4X/IP65
Flanged: NEMA 4X/IP67

Electrical classifications
Wafer-style: FM Approved Class I, Div. 2, Groups A-D, outdoor hazardous locations
Flanged: general purpose

Display type: Illuminated LCD, 5 x 7 dot matrix, 2 lines x 16 alphanumeric character

Output signals: two total; 0/4 to 20 mA, selectable; scaled pulse (passive)

Technical info

This flowmeter's converter has a wide range of capabilities. We recommend that you contact an Application Specialist for a copy of the mag meter's programming tree.

Fitting size	Flow range (GPM)	Dimensions		Wafer-style flowmeters		Flange-style flowmeters		Grounding rings	
		Water-style flowmeters W x H x D	Flange-style flowmeters W x H x D	Catalog number	Price	Catalog number	Price	Catalog number	Price/ pk of 2
1/10"	0.05 to 1.06	2 5/32" x 8 31/32" x 8 9/16"	—	KH-33160-02		—	—	KH-33161-50	
5/32"	0.11 to 2.12			KH-33160-12		—	—	KH-33161-52	
1/4"	0.26 to 5.28			KH-33160-22		—	—	KH-33161-54	
3/8"	0.6 to 11.9			KH-33160-32		—	—	KH-33161-56	
1/2"	1.33 to 26.4	2 5/32" x 8 31/32" x 8 9/16"	7 1/8" x 12 1/4" x 8 9/16"	KH-33160-42		KH-33161-01		KH-33161-58	
1"	2.65 to 52.8	2 5/32" x 9 11/32" x 8 9/16"	7 1/8" x 12 1/4" x 8 9/16"	KH-33160-52		KH-33161-05		KH-33161-60	
1 1/2"	7.93 to 158	2 3/4" x 9 23/32" x 8 9/16"	7 1/8" x 12 1/4" x 8 9/16"	KH-33160-61		KH-33161-09		KH-33161-62	
2"	13.3 to 264	3 11/32" x 10 1/32" x 8 9/16"	7 1/8" x 12 15/16" x 8 9/16"	KH-33160-65		KH-33161-13		KH-33161-64	
3"	39.7 to 792	4 23/32" x 10 21/32" x 8 9/16"	7 1/8" x 14 7/32" x 8 9/16"	KH-33160-72		KH-33161-17		KH-33161-66	

*Only wafer design is FM-Approved for hazardous locations.
†The combined process and ambient temperatures may not exceed 248°F (120°C)

FL Flowmeters

Vortex

Signet Transmitters with Display Options

Injection-molded design is ideal for wet or corrosive process applications

- Choose from 4 to 20 mA analog signal or analog/pulse output options

These flow transmitters offer a full range of control options. For basic flow measurement, a 4 to 20 mA output version is listed. For more advanced monitoring, a full-function display version is available with numerous programmable output options.

The display versions offer two totalizers, one permanent and one resettable. The open collector output can be programmed to signal high or low flow (with a hysteresis option); it can also be programmed to pulse on flow rate. Using the sealed four-key silicone keypad, users can tune the output loop for span and zero along adjusting the display contrast and value resolution. The device also offers an output simulation feature to fully test new installations before running start up process.

Each transmitter includes a PVC installation fitting with union connections. This meter is also available with polypropylene and PVDF fittings—contact Application Specialists to order.

Flow sensor with display and 1" PVC union fitting (included). 32501-24

ISO 9001:2000 CERTIFIED SUPPLIER

Specifications & Ordering Information

Fluid type: low viscosity, water-like fluids
Accuracy: ±1% of reading
Linearity: ±1% of reading
Repeatability: ±0.5% of reading
Operating temperature: 32 to 149°F (0 to 65°C)
Operating pressure: 232 psi up to 68°F; 54 psi at 140°F

Wetted materials: PVC, EPDM
Input power
Models without display: 7 to 30 VDC, 20 mA max
Models with display: 11 to 26 VDC, 61 mA max
Electrical connection: ½" NPT(F) conduit port
Enclosure rating: NEMA 4X (IP65)
Display type: 2-Line, 16-digit LCD; 1 second update

Output signal
Models without display: 4 to 20 mA
Models with display: 4 to 20 mA; open collector 50 mA max sink @ 30 V DC max
Pulse frequency (display version): 300 pulses/min max

Connection	Flow range		Transmitters		Transmitters with display	
	GPM	LPM	Catalog number	Price	Catalog number	Price
½"	1.1 to 8.4	4.3 to 31.9	KH-32501-00		KH-32501-20	
¾"	2.0 to 15.2	7.6 to 57.7	KH-32501-02		KH-32501-22	
1"	2.6 to 25.2	10.0 to 95.4	KH-32501-04		KH-32501-24	
1¼"	4.9 to 47.9	18.7 to 181.1	KH-32501-06		KH-32501-26	
1½"	5.1 to 66.3	19.4 to 251.1	KH-32501-08		KH-32501-28	
2"	8.6 to 112.3	32.6 to 425.3	KH-32501-10		KH-32501-30	

Technical info

See the technical information on pages 556–558 for more about this technology.

Pilot-Scale Vortex Flowmeters/Transmitters

Ideal for ultrapure and aggressive fluids with minimal solids or conductivity

- Simple body design ensures no contamination of the process
- No moving parts to wear out, maintain, or dislodge into the system

The one-piece meter body is molded in PFA (perfluoroalkoxy), which is a high-purity, chemically inert fluoropolymer much like PTFE or FEP. The electronics housing is made of durable, chemically resistant PBT resin for placement in aggressive environments. A 16½-ft (5-m) cable allows for one-piece wiring within most systems.

The large 8-digit display can easily be changed to read totalized value, flow rate per hour or flow rate per minute. To reduce part to wear and to better seal the meter case, the display is changed by moving a magnet (included) over the face.

Transmitter 32996-80 with display

Specifications & Ordering Information

Fluid type: ultrapure water; water-like solutions
Accuracy: ±3% of full-scale (add ±1 digit for display units)
Repeatability: ±0.2%
Response time: 3 sec (63% resp.)
Operating temperature: –4 to 212°F (–20 to 100°C)
Operating pressure: 0 to 75 psig (0.52 MPa)

Wetted materials: PFA, PF elastomer
Connection: PFA tube end (3" lead)
Input power: 12 to 24 VDC, 50 mA
Electrical classifications: IP65
Cable length: 16.25 ft (5 m)
Display type: 8-digit LED
Special indicators: 2-LED (alarms)

Output signals
Pulse: unscaled, open collector, 50 mA @ 30VDC
Current: 4 to 20 mA, 0 to 600 ohms @ 24 VDC
Pulse frequency (max): 1 pulse/gal.
Relay type: open collector, 50 mA at 30 VDC
Dimensions (body only): 3.3"L x 2.6"W x 3.0"H

Flow range (display resolution)	Connections (tube OD)	Catalog number	Price
0.8 to 18.0 GPM	¾"	KH-32996-80	
3.0 to 70.0 L/min	¾"	KH-32996-85	

Vortex Flowmeters for Liquids, Gases, and Steam

No moving parts to wear out and high accuracy in one meter

- FM approved for use in hazardous areas
- A full range of sizes for pilot plant and process area applications
- An advanced processor provides numerous monitoring and control options

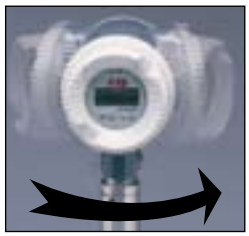
The use of vortex flowmeters has increased due to the high reliability and accuracy of vortex technology. With a robust design and digital signal processing, these meters provide all of the best benefits of vortex technology.

The body, shedder, and sensor are all 316L SS for added durability. The converter housing is a NEMA 4X (IP67) rated, epoxy-coated aluminum that can withstand harsh process environments.

Just as important to the performance of the flowmeter is the design of the converter. All the programming can be done either through the integrated three-button keypad or by using the ABB Magnet Stick and select parameters from the programming menu without opening the converter housing.

When programming the unit, you can set transmitter parameters for the analog output and a limit alarm output for flowrate or pulse output. The electronics allow for filtering and/or a low flow cutoff of the output to limit control disruptions in the event of fluctuating flow conditions. All programmed parameters are stored in an isolated EEPROM for up to 10 years without power.

33164-47



Display rotates for easy viewing.

The menu driven display makes it easy to program all parameters. The display will show both flow rate and flow total in the flow units of your choice.

Specifications & Ordering Information

FM APPROVED · For LIQUIDS · For GASES · For STEAM · 2 year warranty · IP67

Viscosity range (liquids, max): 7.5 cp
Accuracy: ±0.75% of flow rate (liquid) ±1% of flow rate (gas and steam)
Repeatability: ±0.2% of flow rate
Turndown ratio: 20:1
Operating temperature: –67 to 536°F (–55 to 280°C)
Operating pressure: 275 psi at 100°F
Wetted materials: 316L SS, Kalrez®
Input power: loop powered 14 to 46 VDC (EEX < 28 V), < 1 W

Electrical connection: screw terminals; ½" NPT(F) conduit connector
Enclosure rating: NEMA 4X (IP67)
Electrical classifications
Explosion-proof: FM Appr. Class I, Div. 1, Groups B-D
Intrinsically safe: FM Appr. Class I, Div. 1, Groups A-D
Display type: High contrast LCD, 2-line, 8-character
Output signals: 4 to 20 mA; contact output for limit alarm or pulse, 100 Hz max

Line size	Flange-style flowmeters						Wafer-style flowmeters					
	For liquids		For steam		For gases		For liquids		For steam		For gases	
	Catalog number	Price	Catalog number	Price	Catalog number	Price	Catalog number	Price	Catalog number	Price	Catalog number	Price
½"	KH-33164-01		KH-33164-21		KH-33164-41		—	—	—	—	—	—
1"	KH-33164-03		KH-33164-23		KH-33164-43		KH-33163-03		KH-33163-23		KH-33163-43	
1½"	KH-33164-05		KH-33164-25		KH-33164-45		KH-33163-05		KH-33163-25		KH-33163-45	
2"	KH-33164-07		KH-33164-27		KH-33164-47		KH-33163-07		KH-33163-27		KH-33163-47	

Meter size	Liquids*	Gases* (scfh)	Steam† (lb/hr)
½"	2.2 to 24	177 to 1453	15 to 60
1"	7.1 to 96	424 to 5755	30 to 210
1½"	11 to 211	742 to 12,680	55 to 865
2"	13 to 291	1519 to 17,435	110 to 1145

*70°F; 14.7 psig; liquid = 8.34 lb/gal., gas = 0.0745 lb/ft³
†Steam at 15 psig

Call our Application Specialists to discuss adding the following options to any of these flowmeters:
- **Remote-mount transmitters**
- **An integrated temperature sensor with output**
- **Profibus PA or Foundation Fieldbus communications capability**

847-549-7600

Technical info

Designers should remember that vortex technology requires a positive back pressure to prevent cavitation. For help setting up the unit, as well as with assistance confirming the proper size and determining the pressure drop for the flowmeter, contact our Application Specialists.

Cole-Parmer® Flow Display Panel Meters

Accept 0 to 20 mA and 0 to 10 VDC flowmeter sensor inputs

- Specifically designed for flow and process applications
- Programs and minimum/maximum readings are stored in nonvolatile memory
- Programs and settings are protected from accidental changes by a user-definable security password
- Front panel meets NEMA 4X/IP65 standards
- Choose RS-232 or RS-422/485 for serial communication
- Transfer meter settings from one meter to another with the copy function
- Turn your panel meter into a datalogger and trend analyzer with the optional MeterView software

93284-02

Specifications & Ordering Info

c UL us CE 3 year warranty

Operating ambient
Temperature: 32 to 149°F (0 to 65°C)
RH: 0 to 90% noncondensing

Inputs signal: 0 to 20 mA and 0 to 10 VDC (field selectable)

Accuracy: ±0.05% of calibrated span ±1 count

Resolution: up to three decimal places

Output signals: 24 VDC at 200 mA max (for powering a flow sensor)

Alarm: program and alarm for high or low trip point

Transmitter power supply: 24 VDC ±10% at 200 mA max

Relay output
Resistive load: 3 A at 250 VAC
Inductive load: 1/4 hp at 125/250 VAC

Relay operation: automatic (non-latching), latching, or pump alternation control

Sensor break detection: open circuit indicated on display and all relays and alarms go into alarm state

Serial communication compatibility: EIMM-232 or EIMM-422 and EIMM-485

Serial communication connections: RS-232, RS-422/485, and RJ11

Display: 0.56"H, four-digit, high-efficiency LED

Update rate: 4 seconds nominal

Housing: 1/8-DIN high impact plastic, NEMA 4X (IP65)

Connections
Power and signal: 12 to 26 AWG removable screw terminal blocks
Serial: RJ11 header

Dimensions: 4 11/16"W x 2 7/16"H x 3 11/16"D

Description	Power	Catalog number	Price
Panel meter	85 to 265 VAC	KH-93284-02	
Panel meter with two relays		KH-93284-06	

KH-93284-20 RS-232 serial adapter
KH-93284-22 RS-422/458 serial adapter
KH-93284-24 Standard modular cable, 7-ft long

MeterView Software

Use software as a convenient way to set up and program all parameters for each meter from your PC and to collect and store all meter data. Save setup parameters for future reference or transfer to other meters. Set logging and storage intervals to collect only the data you want. Data is written to an ASCII file for easy import into spreadsheets or other applications.

93284-26

KH-93284-26 MeterView software

Flow Rate/Totalizers and Batch Controllers

Rate and total functions along with multiple batching functions

- Real-time flow rate—configure high, low, and total

33114-00

Easily set up flow rate/totalizer or controller to monitor your flow rate, keep a cumulative total, or select batch control. Select a model that accepts a pulse or analog signal. Analog input models feature 15-point linearization and square root extraction to accommodate flow sensors that do not have linear outputs. Choose a model with the right output for your needs—none, relays, or analog output. Dual-relay models allow you to control valves, pumps, or other equipment to maintain desired flow, volume level, or dispensation. All models have a NEMA 4X front panel.

Batch controllers have all the features of the flow rate/totalizers, but also allow for single- or dual-valve configuration for more precise control and preventing overrun. Batch controllers include a batch counter, totalizer, and cycle counter. The batch counter resets at the beginning of each batch, the totalizer continues to count up. The cycle counter counts how many batches have been delivered.

Specifications & Ordering Information

c UL us CE

Input signal
Analog models: 4 to 20 mA, 0 to 5 V, or 0 to 10 V
Pulse models: 28 VDC max

Accuracy: ±0.1% of reading, ±1 digit

Input impedance limits:
100 Ω (current), 1.27 MΩ (voltage)

Output signal (where applicable):
4 to 20 mA, 0 to 10 V

Relay (relay models only):
two SPDT, 250 VAC, 5 A

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

Display:
six-digit, 1/2"H red LED

Power: 85 to 265 VAC, 50/60 Hz

Panel cutout: 3 5/8"W x 1 3/4"H

Dimensions: 4"W x 2 1/16"H x 3 7/8"D

Description	Pulse input		Analog input	
	Cat. no.	Price	Cat. no.	Price
Flow rate/totalizers				
None	KH-33114-00		KH-33114-10	
Two relays, analog output	KH-33114-02		KH-33114-12	
Batch controllers				
Two relays	KH-33114-06		KH-33114-16	

KH-50001-00 Line cord with U.S. standard plug, 6-ft L.
For 120 VAC operation

More info

Use these displays with any flow sensor that produces a voltage or current output. You can even use these with a flowmeter with display and output—use as a secondary remote display!

Cole-Parmer® Universal Rate/Totalizer/Batch Controllers

- Display flow rates in any engineering unit
- Easily scale and calibrate using a single button
- Use with any pulse- or analog-output flow sensor

These flow rate/totalizer/batch controllers display flow rate, total flow (resettable), and batch rate in any engineering unit. They can be used as simple automatic or manual batch controllers. Meters feature low-flow cutoff and nonvolatile memory that stores settings even after power turns off. Controllers with totalizer can be programmed so the display alternates between flow rate and total flow.

All controllers have sealed NEMA 4X front panel; high-impact plastic housing fits standard 1/8-DIN cutout. Include panel mounting hardware.

Loop-powered controller 94789-90 (flowmeter not included)

Line-powered controller 94788-00 (flowmeter not included)

Loop-Powered Controllers

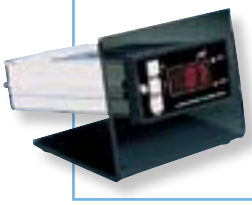
Loop-powered flow rate/totalizer controllers are an economical way to add a remote display. Meters are powered by the 4 to 20 mA output of your flowmeter. Therefore they do not require a separate power line—ideal for areas where line power is not available.

Meters feature a two-point calibration for flow rate (linear or square root) and K-factor for flow total (0.00001 to 999,999). Easily reset total via buttons on the front panel or via an external switch. Order controllers with backlit display for use in dimly lit areas.

Specifications & Ordering Information

Accuracy: ±0.1% of full-scale
Voltage drop: 5.6 V @ 20 mA;
7.4 V @ 20 mA with backlit display
Update rate: 1 second nominal
Input signal: 4 to 20 mA
Pulse output: open collector, 30 VDC @ 20 mA max
Display: 1/2"H LCD; may be programmed to alternate between rate and total every 10 second
Rate: 4 1/2-digit, 0 to 19,999
Total: 6-digit, 0 to 999,999
Operating temp: 32 to 149°F (0 to 65°C)
Dimensions: 4 1/4"W x 2 5/16"H x 4 1/2"D
Panel cutout: 3 5/8"W x 1 25/32"H x 6"D (1/8 DIN)

Catalog number	Backlit display feature	Price
KH-94789-90	No	
KH-94789-92	Yes	



Benchtop Stand

Accepts 1/8-DIN meters. Tilt-back angle allows easy reading. Features nonslip rubber feet.

EK-05656-55 Benchtop stand

More info

Use these controllers with any flow sensor on the previous pages that have either a 4 to 20 mA output or a frequency output. These controllers can also be used as a secondary display for flowmeters with a display.

Line-Powered Controllers

- Calibration bail-out with one touch
- Latching and non-latching relays
- Any relays programmable for rate or total
- Easy access to full diagnostic menu
- Time base in seconds, minutes, hours, or even days!
- Enhanced priority batch programming

Use these line-powered flow rate/totalizer/batch controllers to display flow rate and total flow as well as to provide simple batch control. Meters feature peak hold and batch programming that allows you to change the preset batch values without entering the main menu. Easily calibrate meter by selecting internal calibration mode or by using an external signal such as a calibrator. Linearization feature lets you enter up to 11 calibration points to handle non-linear input signals.

Controllers are available in analog or frequency input. Analog input models accept 4 to 20-mA, 0 to 5 V, or 0 to 10 V signals; provide 24 VDC @ 20 mA excitation output. Frequency input models are switch-selectable for pulse, open collector, switch closure, TTL, or square wave signals; provide 12 VDC @ 50 mA or 24 VDC @ 20 mA excitation output.

Select from controllers with two or four relays for on/off control of pumps, valves, or alarms. All relays can be programmed to act on either the rate or the total. For proportional control or to send data to a recorder, order controllers with 4 to 20 mA output. Controllers with four relays plus 4 to 20 mA output provide the most flexibility.

Specifications & Ordering Information

Accuracy: ±0.05% of calibrated span ±1 count
Operating temp: 32 to 149°F (0 to 65°C)
Input impedance limits: 300 KΩ; 100 Ω (current)
Update rate: 1 second nominal
Input signals
Analog models: 0 to 20 mA, 4 to 20 mA, 0 to 5 V, 1 to 5 V, and 0 to 10 V
Frequency models: 1 Hz to 30 KHz
Output signals
Analog models: 24 VDC, 20 mA max
Frequency models: 12 VDC @ 50 mA; 24 VDC @ 20 mA
Display type: six-digit, 9/16"H LED; may be programmed to alternate between rate and total every 10 seconds
Rate: 0 to 29,999(0) with selectable extra zero
Total: 0 to 999,999
Relay type (relay models only): two or four SPDT relays, 250 VAC or 30 VDC, 2 A max; resistive
Dimensions: 4.25"W x 2.3"H x 6.00"D
Panel cutout: 3.62"W x 1.77"H x 6.00"D

Description (relays and/or outputs)	115 VAC, 50/60 Hz Cat. no.	115 VAC, 50/60 Hz Price	230 VAC, 50/60 Hz Cat. no.	230 VAC, 50/60 Hz Price
Line-powered analog input controllers				
None	KH-94787-00		KH-94787-05	
Two relays	KH-94787-40		KH-94787-45	
4 to 20 mA output	KH-94787-11		KH-94787-16	
Two relays and 4 to 20 mA output	KH-94787-50		KH-94787-55	
Four relays and 4 to 20 mA output	KH-94787-20		KH-94787-25	
Line-powered frequency input controllers				
None	KH-94788-00		KH-94788-05	
Two relays	KH-94788-40		KH-94788-45	
4 to 20 mA output	KH-94788-11		KH-94788-16	
Two relays and 4 to 20 mA output	KH-94788-50		KH-94788-55	
Four relays and 4 to 20 mA output	KH-94788-20		KH-94788-25	

KH-50001-00 Line cord with U.S. standard plug, 6-ft L. For 120 VAC operation

Signet Flow Monitors and Controllers

GO to page(s) 608

For Signet flow sensors that are compatible with these monitors and controllers, see page 608.

A broad array of panel- and flowmeter-mounted products for monitoring and control

All models are made from durable ABS plastic with a NEMA 4X (IP65) splashproof, shatter-resistant acrylic front panel. Devices are 1/4-DIN size for panel mounting. Each features terminal strips on back of the meter to simplify wiring output connections. Enclosure and mounting kits are sold on page 629.

ISO 9001:2000 CERTIFIED SUPPLIER

A 05631-00

A Loop-Powered Digital Flow Transmitter

- 4-to-20 mA output allows long distance data transmission

View flow rate from 0.01 to 99,999; total from 0 to 99,999,999. Large pushbutton controls and 2 x 16 character LCD make this transmitter easy to read and use. Transmitter features permanent and resettable totalizers and scalable outputs. Self-healing polyurethane coated polycarbonate window is designed to survive harsh environments.

Use this transmitter only with the Rotor-X™ and Metalex™ flow sensors on page 608. The mounting kit 05631-50 must be ordered with the transmitter; this transmitter is not panel mountable*.

Specifications & Ordering Information

Accuracy: ±0.5 of reading
Input impedance limits: 50 Ω max at 12 V; 325 Ω max at 18 V; 600 Ω max at 24 V
Output signal: 4 to 20 mA, scalable
Input power: 12 to 24 VDC ± 10%, regulated
Wiring connections: 1/2" NPT(F) conduit
Dimensions: 3 3/4"W x 3 3/4"H x 4"D

Cat. no.	Description	Price
KH-05631-00	Loop-powered flow transmitter	
KH-05631-50	Transmitter mounting kit*	

*Kit is for pipe or wall mount. For sensor and panel mount options, call an Applications Specialist.

B 05629-22

B Battery-Powered Digital Flow Rate Monitor and Totalizer

- Use in areas where wired power is not readily available

Independently calibrate flow and totalizer readings. Monitor includes both fixed and resettable totalizers. Features a four-digit flow LCD, an eight-digit totalizer LCD, automatic contrast adjustment, and low-battery indication. Monitor includes unit/multiplier decals for field calibration.

Operates on two internal lithium batteries (included). Use monitor only with the Rotor-X and Metalex flow sensors on page 608 (not for use with the Rotor-X low-flow sensors).

Specifications & Ordering Information

Accuracy: ±0.5% of reading
Operating temp: 14 to 149°F (–10 to 65°C)
Input power: two internal 3.6 V lithium batteries (included), size AA
Battery life: four years nominal
Display type
Upper: 4-digit LCD Lower: 8-digit LCD
Dimensions: 3 7/8"W x 3 7/8"H x 3 7/8"D
Panel cutout: 3.62" x 3.62"

Cat. no.	Description	Price
KH-05629-22	Battery-powered flow rate monitor	

KH-05629-71 **Replacement battery,** 3.6 V lithium **/ea**

C 05629-40

C Line-Powered Analog/Digital Flow Controller

- Nonvolatile memory saves data in case of power failure

Monitor provides flow rate and total readings, current and pulse output, and two alarm relays. Includes both fixed and resettable totalizers. The front panel features a six-range analog dial, a microprocessor based alphanumeric two-line, 16-character backlit LCD, and two alarm LEDs. Monitor includes unit/multiplier decals allowing you to easily recalibrate your meter if your application or flow rate changes.

Operates on 12 to 24 VDC/VAC; order a power supply separately. Use monitor with all flow sensors on page 608.

Specifications & Ordering Information

Accuracy: ±0.5% of reading
Relay hysteresis: 2% of set point
Operating temp: 14 to 131°F (–10 to 55°C)
Display: analog and two-line, 16-character alphanumeric digital LCD
Display update time: 200 msec
Power: 12 to 24 VDC/VAC, 50/60 Hz
Output signal
Current: 4 to 20 mA, nonisolated
Pulse: open-collector transistor, optically isolated; 5 mA max sink
Relay type: two SPDTs, 125 VAC or 30 VDC at 5 A max
Dimensions: 3 1/2"W x 3 1/2"H x 3 1/2"D

Cat. no.	Description	Price
KH-05629-40	Line-powered flow controller	

KH-26900-10 **Industrial-grade power supply** with current limit protection. Converts 115 VAC to 24 VDC

Analog Signal-to-RS Converters

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. Use screw terminal connections.

Ordering Information

Cat. no.	Converter type	Price
KH-03277-70	To RS-232	
KH-03277-75	To RS-485	

D Multi-Parameter Controller for Flow, Temperature, Pressure and pH

- Customizable modular controller fits a wide range of applications
- Replacement for Signet flow-only controller
- Accepts inputs from flow sensors plus any other parameter sensor/transmitter input

This modular device includes card slots to accept various input and output cards to match the demands of almost any application. The base unit includes an I/O module to accept two inputs, either frequency or 4 to 20 mA (using the optional signal converter); cards for up to six inputs are available, call our Application Specialists for assistance.

The display is a two-line, 16-digit alphanumeric backlit LCD. Select from any of 30 different display units for flow, pressure, temperature, level, volume, pH, ORP, and conductivity; derived units with custom display labels are also available for many applications. For flow, a resettable and a nonresettable totalizer are available. All programming is done through the four-button keypad on the unit face.

By selecting from the optional output cards listed at right, numerous monitoring and control options are available. Up to two relay cards may be ordered for a total of four relay outputs. You may also add a dual analog output card (ordered below) with 4 to 20 mA or 0 to 5/0 to 10 V signals; instead of analog outputs the card slot may also be used with the RS-232 output card. Working with an Applications Specialist, the controller may ultimately be configured for (8) relay plus (4) analog outputs.

Specifications

Input signal
Frequency: 0 to 1500 Hz
Analog: 4 to 20 mA (with optional converter)
Output signal: see optional module table
Relay hysteresis: settable for high, low or window
Display resolution: user settable
Display update rate: one second
Wiring connections: screw clamp
Power consumption: AC is 24 VA max; DC is 0.7 A max
Operating temperature: 14 to 131°F (–10 to 55°C)
Accuracy: 0.5% of reading
Enclosure rating: NEMA 4X (IP65)
Dimensions: 3.8"H x 3.8"W x 5.6"D
Panel cutout: 3.6"H x 3.6"W

Ordering Information

Catalog number	Power	Price
KH-05627-71 KH-05627-73	85 to 264 VAC, 50/60 Hz 12 to 24 VDC ±10%	

KH-05660-68 **Input signal converter,** to convert a transmitter 4 to 20 mA output for input to the multi-parameter controller, for use with a single transmitter signal/ controller input

D 05627-71

Output Cards

Cat. no.	Output card type	Price
KH-05660-69	Dry-contact relays, SPDT, 5 A at 30 VDC or 250 VAC max*	
KH-05660-73	4 to 20 mA analog, (2) outputs/card†	
KH-05660-77	0 to 5/0 to 10 V analog (selectable), (2) outputs/card†	
KH-05660-78	RS-232 communications†	

*Controller accepts (2) card total; (2) outputs/card.
†Controller accepts (1) card total.

GO to page(s) 608

For Signet flow sensors that are compatible with these monitors and controllers, see page 608.

E Batch Controller

- Dual relays provide external control of pumps, valves, or alarms
- Remote start/stop/resume capabilities let you control system from your computer

Controller is specifically designed for simple, single-function batching system. User-selectable menu provides easy configuration of current and relay options. Use the 4 to 20 mA output signal to send data to a recorder or data acquisition system, or to proportionally control a valve. Relays provide a simple on/off control of alarms, pumps, or valves. Pulse output lets you start, stop, or resume controller from your computer.

Front panel features a reversible analog dial (0 to 100% or 100 to 0%); a microprocessor based alphanumeric LCD; and four-button keypad. Controller even features a backlit LCD for reading display in dimly lit areas. Security code access sequence protects your programmed settings from tampering; nonvolatile memory saves data in case of power failure.

Controller operates on 12 to 24 VDC/VAC—order AC power supply 26900-10 separately. Controller is compatible with all flow sensors on page 608. Unit includes mounting brackets, panel gaskets, and a self-adhesive template for easy mounting; see "Mounting Accessories" below for additional mounting options.

Specifications

Accuracy: ±0.5% of reading
Operating temp: 14 to 131°F (–10 to 55°C)
Input signal: 0.5 to 1000 Hz, optically isolated
Relays: two SPDT; 125 VAC or 30 VDC, 5 A max; resistive
Output signal
Current: 4 to 20 mA, nonisolated
EOB pulse: remote start, stop, resume
Power: 12 to 24 VDC/VAC, 50/60 Hz
Display: analog dial (0 to 100% or 100 to 0%); 2-line, 16-character alphanumeric LCD (0 to 999,999 batch size)
Dimensions: 3½"W x 3½"H x 3½"D

Ordering Information

Catalog number	Description	Price
KH-05628-00	Batch controller	

KH-26900-10 **Industrial-grade power supply** with current limit protection. Converts 115 VAC to 24 VDC

E 05628-00

Mounting Accessories for Flow Monitors and Controllers on pages 628–629

Use these accessories for mounting options other than the standard ¼-DIN panel mounting. For information on additional options, see our "Enclosures" section on pages 417–419.

KH-05629-50 **NEMA 4X (IP65) rear cover kit;** includes knock-out ports for cable access

KH-05629-60 **Surface-mount kit** for flat surface or pipe mounting; use with the NEMA 4X (IP56) rear cover kit 05629-50

KH-05629-55 **Liquid-tight connector kit.** Includes three watertight connectors to run sensor and/or controller wires to and from the NEMA 4X rear cover kit

Cole-Parmer® Visual Flow Indicators

Unique design features a cleaning mechanism for the internal surface of the sight tube

- 360° visibility of the colored rotor
- Stainless steel or nickel-plated brass connections
- Versions available for liquids and gases

For applications involving the detection of flow, these metal flow indicators will perform flawlessly. They feature a large colored rotor for quantitative flow indication. This internal colored rotor spins proportional to the flow rate of gas or liquid. Each flow indicator is equipped with an internal wiper blade for cleaning the inside of the glass slight tube. A simple twist of the tube will engage this wiper blade, clearing any condensation and/or debris. The flow indicator's rugged design is available in nickel-plated brass or stainless steel.

32443-00
Gas

32443-46
Liquid

Specifications & Ordering Information

Maximum temperature: 149°F (65°C) for gases, 212°F (100°C) for liquids

Maximum pressure: 232 psig

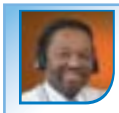
Pressure drop at max flow: 5 psig for gases, 3.6 psig for liquids

Body material: nickel plated brass or 316 stainless steel (SS); see ordering table below

Shield material: acrylic for gas models, glass for liquid models

Wiper/O-ring material: Buna N for nickel-plated brass models, Viton® for 316 stainless steel models

Fitting size	Visual flow indicators for gases					Visual flow indicators for liquids				
	Flow range	Nickel plated brass		316 stainless steel		Flow range	Nickel plated brass		316 stainless steel	
		Catalog number	Price	Catalog number	Price		Catalog number	Price	Catalog number	Price
¼"	18 to 60 LPM	KH-32443-00		KH-32443-14		0.7 to 4 LPM	KH-32443-28		KH-32443-42	
⅜"	20 to 150 LPM	KH-32443-02		KH-32443-16		0.8 to 8 LPM	KH-32443-30		KH-32443-44	
½"	25 to 250 LPM	KH-32443-04		KH-32443-18		1.4 to 12 LPM	KH-32443-32		KH-32443-46	
¾"	25 to 250 LPM	KH-32443-06		KH-32443-20		1.4 to 25 LPM	KH-32443-34		KH-32443-48	
1"	35 to 350 LPM	KH-32443-08		KH-32443-22		1.7 to 40 LPM	KH-32443-36		KH-32443-50	
1¼"	60 to 600 LPM	KH-32443-10		KH-32443-24		8.0 to 80 LPM	KH-32443-38		KH-32443-52	
1½"	70 to 700 LPM	KH-32443-12		KH-32443-26		8.0 to 100 LPM	KH-32443-40		KH-32443-54	



For extra chemical and corrosion resistance, order models with PTFE and Tefzel® liners; call our Application Specialists for specifications and ordering information.

847-549-7600

Penberthy® Industrial Sight Flow Indicators

Mount in any orientation.

Liquid sight flow indicators have a PTFE paddle wheel that spins to indicate flow in the pipe. Ideal for dark solutions where color contrast is easy to see, translucent liquids, and clear solutions. Use in any fluid application where there is enough liquid mass to rotate the paddle wheel; mount in any orientation.

Specifications & Ordering Information

Bronze models

Wetted parts: bronze body, neoprene gasket

Max temp: 300°F (149°C)

Max pressure: 225 psi

316 stainless steel models

Wetted parts: 316 SS body, PTFE gasket

Max temp: 500°F (260°C)

Max pressure: 275 psi

Connections NPT(F)	Dimensions		Bronze indicators		316 stainless steel indicators	
	Length	Width	Catalog number	Price	Catalog number	Price
¼"	3"	2 11/16"	KH-33153-00		KH-33153-20	
⅜"	3"	2 11/16"	KH-33153-02		KH-33153-22	
½"	3¾"	3 3/16"	KH-33153-04		KH-33153-24	
¾"	3¾"	3 3/16"	KH-33153-06		KH-33153-26	
1"	4¼"	4¼"	KH-33153-08		KH-33153-28	

33153-08

The white paddle wheel spins in relation to flow.

GO to ColeParmer.com

ColeParmer.com/FlowMeters

For the latest products, stock status technical data, and chemical compatibility.

Flow Switches and Controllers

Switches are ideal for pump/filter and process protection.

- Sensor, cable, and junction box are NEMA 4X rated—ideal for corrosive environments
- Short sensors can be used in pipe diameters from 3/4" to 1 1/2"; long sensors from 2" to 16"
- Sturdy sensor withstands high flow velocities
- Easily adjust set point with a single turn of the adjustment knob
- Switches with junction box have 1/2" NPT conduit connection
- FET switch output interfaces with PLC, SCADA, or alarms
- Switch state is selectable from normally open or normally closed

32756-12

Flow switch 32756-32 with sensor mounted junction box

Controller 32756-50

Flow Switches

Specifications & Ordering Information

Repeatability: ±5% of set point
Response time: 1 to 10 seconds
Set point drift: ±0.5% of set point
Viscosity range (liquid switches only): 1 to 300 cp
Supply voltage: 12 to 36 VDC
Output: FET; 36 VDC at 100 mA
Display: LED indicates flow status
Fluid temperature range: 32 to 140°F (0 to 60°C)
Pressure range: 150 psi at 25°C, derated at 1.667 psi per °C above 25°C
Mounting connection: 3/4" NPT
Mounting gasket: Viton®
Cable: 8 ft, three-wire, 22 gauge with ground and shield
Overall dimensions
Short (3/4"L) sensor: 3"L x 3/4" dia
Long (2 1/8"L) sensor: 4 1/2"L x 3/4" dia

Flow setting ft/sec (m/sec)	Sensor material	Sensor size	Flow switch Cat. no.	Flow switch Price	Switch & junction box Cat. no.	Switch & junction box Price
Flow switches for liquids						
0.4 to 3 (0.012 to 0.91)	PP/Ryton®	Short	KH-32756-08		KH-32756-28	
		Long	KH-32756-12		KH-32756-32	
0.4 to 3 (0.012 to 0.91)	PVDF	Short	KH-32756-10		KH-32756-30	
		Long	KH-32756-14		KH-32756-34	
Flow switches for gases						
1 to 90 (0.3 to 27)	PP/Ryton	Short	KH-32756-00		KH-32756-20	
		Long	KH-32756-04		KH-32756-24	
1 to 90 (0.3 to 27)	PVDF	Short	KH-32756-02		KH-32756-22	
		Long	KH-32756-06		KH-32756-26	

Pulse-Point Fittings dampen the pulsating flow associated with metering pumps and provide a small pipe or tubing interface for the flow switch.

KH-32756-60 **PP fitting** for installation of flow switches, 3/8" NPT inlet and outlet
KH-32756-62 **PVDF fitting** for installation of flow switches, 3/8" NPT inlet and outlet

Technical info

Flow switches with a junction box facilitate wiring and connection of the sensor output to other devices. Junction box features a 1/2" conduit connection for wiring the sensor and is NEMA 4X rated for corrosive environments. Compact box includes six-pole socket terminal strip and 300° swivel base for easy alignment.

Controllers

These relay controllers are ideal as a low-flow shut off for pump or process protection. Mount on 35-mm DIN rail or panel installation.

Specifications & Ordering Information

Power consumption: 5 watts
Sensor supply: 13.5 VDC at 100 mA
Relay rating: 250 VAC, 10 A, 1/2 hp
Relay mode: selectable NO or NC
Relay latch: on or off (models with two sensors)
Time delay: 0 to 60 seconds
Display: LED indicates sensor, relay, and power status
Operating temperature: –40 to 158°F (–40 to 70°C)
Dimensions: 4"L x 3 5/8"W x 2 3/4"H

Catalog number	Relay type	Power (50/60 Hz)	Price
Controller for one sensor			
KH-32756-50	SPDT	120 VAC	
KH-32756-52		240 VAC	
Controller for two sensors			
KH-32756-54	One SPDT and one latched SPDT	120 VAC	
KH-32756-56		240 VAC	

Flow Indicators for Liquids and Gases

Use model 06297-00 as a visual flow indicator for liquids and gases from 0.2 to 6.5 L/min. Indicator withstands fluid temperatures up to 122°F (50°C); pressures up to 25 psi. Constructed of polystyrene with polypropylene indicator ball. Use with 1/4" to 3/8" ID flexible tubing.

Model 06297-01 monitors gas or liquid flows from 0.3 to 5.7 L/min. Maximum fluid temperature is 150°F (65°C); maximum pressure is 10 psi. Use with noncorrosive media. Made of polypropylene. Use with 3/8" to 9/16" ID flexible tubing.

06297-00

06297-01

Catalog number	Description	Price/ea
KH-06297-00	Flow indicator, 0.2 to 6.5 L/min	
KH-06297-01	Flow indicator, 0.3 to 5.7 L/min	

Cole-Parmer® Flow Switches

A Compact Low-Flow Switches

These normally open switches are specifically designed for reliable operation in clean air and water applications. Select from gas or liquid flow switches. Use a 50 µm filter to protect your switch. Switches include 18"L leads.

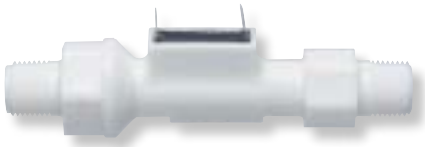
Specs & Ordering Info

Switch: SPST, NO, 20 VA
Max temperature: 212°F (100°C)
Max pressure: 150 psi at 70°F (21°C)
Wetted materials: Noryl®, 316 SS, and epoxy
Connections: 1/4" NPT(M)

Flow setting*	Catalog number	Price
Gas switches		
25 cfh/60 cfh	KH-32778-30	
1 cfm/2.6 cfm	KH-32778-32	
2.5 cfm/5.6 cfm	KH-32778-34	
5 cfm/12 cfm	KH-32778-36	
Liquid switches		
0.05 GPM	KH-32778-31	
0.25 GPM	KH-32778-33	
0.50 GPM	KH-32778-35	
1.00 GPM	KH-32778-37	

*Switch actuation set points are listed for 5 psi and 100 psi.

B Low Pressure-Drop Liquid Flow Switches



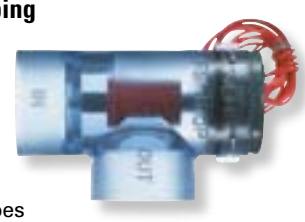
These SPST switches feature a unique, dual-diameter, internal bore and piston configuration to minimize flow constriction and provide low pressure drop. Use a 150 µm filter to protect your switch. Switches include 1/4" male quick connect terminals.

Specs & Ordering Info

Switch: SPST, 20 VA
Max temperature: 212°F (100°C)
Max pressure: 200 psi at 70°F (21°C)
Wetted materials: PP, Ryton®, Viton®, and 316 SS
Connections: 1/2" NPT(M)

Flow setting	Catalog number	Price
Normally open switches		
0.5 GPM	KH-32776-00	
1.0 GPM	KH-32776-01	
2.0 GPM	KH-32776-02	
3.0 GPM	KH-32776-03	
4.0 GPM	KH-32776-04	
5.0 GPM	KH-32776-05	
Normally closed switches		
0.5 GPM	KH-32776-20	
1.0 GPM	KH-32776-21	
2.0 GPM	KH-32776-22	
3.0 GPM	KH-32776-40	
4.0 GPM	KH-32776-42	
5.0 GPM	KH-32776-44	

C Liquid Flow Switches for Plastic Piping



Use these normally open switches with plastic pipes without threads. Switches are-available in gray or clear PVC housing. Use clear switches where visual flow confirmation is needed. Use a 150 µm filter to protect your switch. Switches include 24"L leads.

Specs & Ordering Info

Switch: SPST, NO, 20 VA
Max temperature
Clear switches: 120°F (50°C)
Gray switches: 140°F (60°C)
Max pressure
Clear switches: 120 psi at 70°F (21°C)
Gray switches: 150 psi at 70°F (21°C)
Wetted materials: PVC, Buna N, and epoxy

Connections	Flow setting	Catalog number	Price
Clear switches			
1/2" NPT†	0.5 GPM	KH-32777-00	
3/4" IPS	0.5 GPM	KH-32777-02	
1" IPS	2.0 GPM	KH-32777-03	
Gray switches			
1/2" NPT†	0.5 GPM	KH-32777-20	
3/4" IPS	0.5 GPM	KH-32777-22	
1" IPS	2.0 GPM	KH-32777-24	

†The 3/4" IPS model with 1/2" NPT port adapter installed.

D Liquid Flow Switches for Threaded Plastic Piping

These normally open switches have 3/4"-NPT(F) ports for a quick connection to threaded plastic piping. Polypropylene and stainless steel wetted parts offer excellent chemical resistance. The materials are also NSF and FDA approved for potable water treatment applications such as chlorinators, purifiers, and heaters. Switches include 24"L leads.

Specs & Ordering Info

Switch: SPST, NO, 20 VA
Operating temp: 212°F (100°C)
Operating pressure: 100 psi at 70°F (21°C)
Wetted materials: polypropylene, Viton®, 316 SS, and PH 15-7 Mo stainless steel
Connections: 3/4" NPT(F)

Flow setting	Catalog number	Price
0.25 GPM	KH-32774-60	
0.50 GPM	KH-32774-62	
1.00 GPM	KH-32774-64	
2.00 GPM	KH-32774-66	
2.50 GPM	KH-32774-68	
5.00 GPM	KH-32774-70	

E Liquid Flow Switches with 90° Ports

No need to cut a straight pipe to install your flow switch. These switches with 90° ports easily fit where a pipe elbow would be installed. Available in SPST or SPDT models. Use a 50 µm filter to protect your switch. Switches include 24"L leads.

Specifications

Switch: SPST or SPDT, 20 VA
Max temperature: 225°F (107°C)
Max pressure: 250 psi at 70°F (21°C)
Wetted materials: Ryton, Viton, 316 SS, and epoxy
Connections: 9/16-18 UNF

Ordering Information For E

Flow setting	Catalog number	Price
Normally open SPST switches		
0.1 GPM	KH-32774-00	
0.25 GPM	KH-32774-02	
0.5 GPM	KH-32774-04	
0.75 GPM	KH-32774-06	
1.0 GPM	KH-32774-08	
1.5 GPM	KH-32774-10	
Normally closed SPST switches		
0.1 GPM	KH-32774-12	
0.25 GPM	KH-32774-14	
0.5 GPM	KH-32774-16	
0.75 GPM	KH-32774-18	
1.0 GPM	KH-32774-20	
1.5 GPM	KH-32774-22	
SPDT switches		
0.1 GPM	KH-32775-00	
0.25 GPM	KH-32775-01	
0.5 GPM	KH-32775-02	
0.75 GPM	KH-32775-03	
1.0 GPM	KH-32775-04	
1.5 GPM	KH-32775-05	

Adapters

KH-32775-50 Adapter,
9/16-18 UNF x 1/8" NPT(F)

KH-32775-51 Adapter,
9/16-18 UNF x 1/4" NPT(F)

KH-32775-52 Adapter,
9/16-18 UNF x 1/2" hose barb

F Liquid Flow Switches for High In-line Pressures

The one-piece magnetic PPS composite piston makes these normally open switches ideal for high pressure applications. Switches withstand up to 1500 psi at 70°F (21°C)! Use a 100 µm filter to protect your switch. Switches include 24 to 26"L leads.

Specs & Ordering Information

Switch: SPST, NO, 20 VA
Max temperature: 275°F (135°C)
Max pressure: 1500 psi at 70°F (21°C)
Wetted materials: brass or SS, PPS composite, 316 SS, and fluorocarbon
Connections: 3/8" NPT(M)

Flow setting	Catalog number	Price
Brass switches		
0.25 GPM	KH-32774-30	
0.50 GPM	KH-32774-32	
1.00 GPM	KH-32774-34	
1.50 GPM	KH-32774-36	
2.00 GPM	KH-32774-38	
Stainless steel switches		
0.25 GPM	KH-32774-40	
0.50 GPM	KH-32774-42	
1.00 GPM	KH-32774-44	
1.50 GPM	KH-32774-46	
2.00 GPM	KH-32774-48	

G UL-Approved Liquid Flow Switches for High In-Line Pressures

These high-pressure SPDT switches withstand pressures up to 1000 psi at 225°F (107°C)! They provide reliable and consistent performance; ±1% repeatability. Switches are UL-listed for use in Class I, Division 2, Groups A, B, C, D hazardous environments. Use a 50 µm filter to protect your switch. Switches include 24"L leads.

Specs & Ordering Info

Switch: SPDT, 20 VA
Operating temp: 225°F (107°C)
Operating pressure: 1000 psi at 225°F (107°C)
Wetted materials: brass, polysulfone, 316 SS, Viton, and epoxy
Connections: 1/4" NPT(F)

Flow setting	Catalog number	Price
0.10 GPM	KH-32778-06	
0.25 GPM	KH-32778-08	
0.50 GPM	KH-32778-10	
0.75 GPM	KH-32778-12	
1.00 GPM	KH-32778-14	
1.50 GPM	KH-32778-16	

Adjustable Flow Switches for Liquids and Gases

Adjustable set points trigger SPST contacts rated for 70 VA

- Brass models handle pressures up to 1500 psi

As liquid or gas flows past the switch, it displaces a magnetic piston—this actuates a hermetically sealed reed switch. All flow switches have actuation points for air at 68°F and 14.7 psi with increasing flow. Withstand temperatures from –40 to 220°F. UL-recognized.

Mini Low-Flow Switches are configured to open the SPST contact when flow goes beyond the set point or stops. Typical applications include gas/liquid sampling, chemical injection, pollution control monitoring, atmospheric furnaces, and process systems.

32929-00

Specifications & Ordering Information

Repeatability: ±2%
Wetted materials
Model 32929-00: brass, epoxy, and Viton®
Model 32929-02: TFE

Connections	Flow range Air (scc/min)	Flow range Water (cc/min)	Max psi	Material	Catalog number	Price
1/8" NPT(F)	30.0 to 16,000	1.0 to 500	1500	Brass	KH-32929-00	
			80	TFE	KH-32929-02	

Standard Low-Flow Switches are normally closed (NC) but can be wired for normally open (NO). Typical applications include chemical process and vapor deposition systems, industrial gas lines, pollution control monitoring, and atmospheric furnaces.

32929-10

Specifications & Ordering Information

Repeatability: ±2%
Wetted materials
Models 32929-10, -14: brass, epoxy, and Viton
Models 32929-12, -16: TFE

Connections	Flow range Air (scc/min)	Flow range Water (cc/min)	Max psi	Material	Catalog number	Price
1/8" NPT(F)	100 to 20,000	3.0 to 500	1500	Brass	KH-32929-10	
			100	TFE	KH-32929-12	
1/8" NPT(F)	200 to 60,000	5.0 to 950	1500	Brass	KH-32929-14	
			100	TFE	KH-32929-16	

Industrial Flow Switches are normally closed (NC) but can be wired for normally open (NO). Typical applications include lubrication, process and fire control, cooling systems heat pumps hydraulic lifts and water treatment.

32929-22

Specifications & Ordering Information

Repeatability: ±2%
Wetted materials: brass, epoxy, and Viton
Back pressure: 5 psi required for gas applications

Connections	Flow range Air (scfm)	Flow range Water (GPM)	Max psi	Material	Catalog number	Price
1/4" NPT(F)	0.5 to 50.0	0.1 to 4.0	1500	Brass	KH-32929-20	
3/8" NPT(F)					KH-32929-22	
1/2" NPT(F)	1.0 to 75.0	0.5 to 10.0	1500	Brass	KH-32929-24	
3/4" NPT(F)	5.0 to 120	1.0 to 20.0			KH-32929-26	

GO to page(s) 445–470

We recommend a 50 to 150 micron filter in your line to protect the flow switch. See pages 445–470 for filters and strainers.

Dual-Point Flow Switches / Monitors

An advanced design with hysteresis or window control options*

Monitor or control your process within a range of flow values. The unit is completely programmable via the keypad display; switch points are also programmable externally via a 4 to 20 mA signal input for model 33113-02. Electrical connection is an M12 female cable connector for secure, fast installation.

The switch module quarter-turns to twist-lock onto the sensor fitting. This design completely isolates the electronics from the fluid. Because the fittings alone contain the process, they can be installed with or without the switch module present.

Specific flow rate data,specifications, and ordering information for PVC, brass, or SS fittings can be found on page 610. Fittings are sized up to 2".

*Hysteresis control is on (off) at one point with off (on) at a lower point; window control is on (off) between two points and off (on) outside the programmed points.

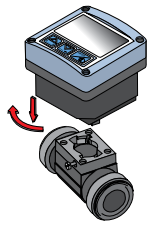
Flow switch with large format display 33113-00

Sensor/Fittings-order fittings from pg 610

PVC sensor with true union fitting 33117-00

Sensor/fitting 33117-00 to -99

Easily mount the module on the sensor/fitting with a quick quarter turn.



Specifications & Ordering Information

Flow setting: 0.6 to 30 ft/sec (0.2 to 9.0 m/sec)

Accuracy: ±1% of reading full-scale

Repeatability: ±0.4% full-scale

Wetted parts: PVDF, ceramic, and FPM

Operating temperature: 32 to 140°F (0 to 60°C)

Fluid temperature range: up to 212°F (see specific fitting data on page 732)

Max pressure: up to 230 psi

Outputs
Model 33113-00: open collector NPN or PNP, 5 to 30 V, 700 mA, protected
Model 33113-02: one relay, freely programmable, 3 A at 250 VAC or 30 VDC

External setpoint input (model 33113-02 only): 4 to 20 mA

Power: 12 to 30 VDC

Enclosure: IP65 with connector plugged in

Max viscosity: 10 cSt

Max particulate size: 40 microns

Catalog number	Description	Price
KH-33113-00	Flow switch display with NPN/PNP output	
KH-33113-02	Flow switch display with one relay	

Cole-Parmer® Flow Indicators for Liquids

Models with sensor or switch offer dual functionality

All flow indicators feature a paddle-wheel that spins at a rate proportional to the flow. Lens can be removed with a ¼ turn for easy cleaning. Use with fluids that have a viscosity less than 34 centipoise (150 µm filter is recommended for protection). Select from indicator, indicator/sensor, or indicator/switch.

Indicators feature a bright orange rotor that spins to provide visual verification.

Indicators/Sensors feature a Hall-effect sensor that produces a 4.5 to 24 VDC pulse output. Maximum current source output is 70 mA and frequency output range is approximately 25 Hz at low flow to 225 Hz at high flow. Indicator/sensor includes 24" PVC jacketed cable.

Indicators/Switches offer extra level of reliability and protection with a built-in switch. Each SPDT switch is rated for 1 amp, 24 VDC resistive or 0.3 amp, 110 VAC. Repeatability is ±2%; accuracy is ±5%. An LED lights when the set point is reached for easy field calibration. Indicator/switches include 24" PVC jacketed cable.

Polypropylene indicator 32779-00

Brass indicator 32779-04

Specifications & Ordering Information

Wetted materials: polypropylene (PP) or brass, ceramic, PPS, nylon, polysulfone, Buna N (PP models) or Viton® (brass models), and glass-reinforced PP.

Maximum temperature
Indicator/switches: 180°F (82°C)
All other models: 212°F (100°C)

Maximum pressure
PP models: 100 psi at 70°F (21°C)
Brass models: 200 psi at 70°F (21°C)

Body material	Port size	Flow range (GPM) Low*	Flow range (GPM) Standard	Indicators Cat. no.	Indicators Price	Indicator/sensors Cat. no.	Indicator/sensors Power	Indicator/sensors Price	Indicator/switches Cat. no.	Indicator/switches Power	Indicator/switches Price
Polypropylene	¼" NPT(F)	0.1 to 1.0	0.5 to 5.0	KH-32779-00		KH-32779-10	4.5 to 24 VDC		KH-32880-20 KH-32880-22	24 VDC 110 VAC	
	½" NPT(F)	1.5 to 12.0	4.0 to 20.0	KH-32779-02		KH-32779-12	4.5 to 24 VDC		KH-32880-32 KH-32880-34	24 VDC 110 VAC	
Brass	¼" NPT(F)	0.1 to 1.0	0.5 to 5.0	KH-32779-04		KH-32779-13	4.5 to 24 VDC		KH-32880-50 KH-32880-52	24 VDC 110 VAC	
	½" NPT(F)	1.5 to 12.0	4.0 to 20.0	KH-32779-06		KH-32779-14	4.5 to 24 VDC		KH-32880-54 KH-32880-56	24 VDC 110 VAC	
	¾" NPT(F)	—	3.0 to 30.0	KH-32779-08		KH-32779-15	4.5 to 24 VDC		KH-32880-58 KH-32880-60	24 VDC 110 VAC	
	1" NPT(F)	—	5.0 to 60.0	KH-32779-09		KH-32779-16	4.5 to 24 VDC		KH-32880-62 KH-32880-64	24 VDC 110 VAC	

*Using included low-flow adapter.

All-In-One Flowmeter Sensor Systems

Economic integration into mixing, dosing, water treatment, and osmosis systems

- Use with aggressive liqued media with less than 1% solids

In-line flow controllers and sensors offer options for many types of media. Choose from brass, stainless steel (SS), or PVC in-line fittings combined with their respective transmitter, sensor, switch, or controller. Brass is suitable for neutral-fluid systems in more aggressive installations. Stainless steel offers the same benefits as brass but with broader chemical compatibility. PVC fittings offer the lowest cost option for noncaustic general applications, such as water.

Type 8023 4 to 20 mA Compact Output Module, linked via a cable plug socket to the 8030 flow sensor, allows you to mass-install flow transmitters at a significant cost reduction. The type 8023 module converts the 8030's pulse output to a simple two wire 4 to 20 mA signal. The module consists of two components: the programmer and transmitter. After attaching the transmitter to a type 8030 sensor, program each transmitter component using the same program for any number of meters. Data input into each transmitter component includes K-factor and flow span (gallons/minute), which is saved via an EEPROM chip.

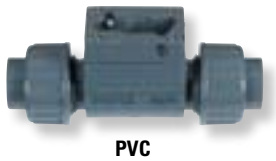
KH-32557-90 **Programmer** for type 8023 modules, required for operation

Type 8030 Digital Flow Sensor (PNP or NPN pulse) paddle-wheel flow for continuous flow measurement is especially designed for use in neutral, slightly aggressive, solid-free liquids. The sensor is made up of a compact fitting (S030) and an electronic module (SE30).

Type 8035 Digital Flow Transmitter for continuous flow measurement is designed for use in neutral and aggressive, solid-free liquids. The in-line transmitter is made of a compact fitting and an electronic module quickly and easily connected together by a bayonet connection. Menu-guided operating elements allow adjustment of all measuring parameters: multiple language, various engineering units, customized measuring ranges, teaching mode, and simulation mode. Flow transmitter has local flow display, two totalizers display, and two programmable switch points.

Type 8035 Digital Flow Batch Controller offers the pharmaceutical manufacturing industrycontinuous and highly accurate measurements, and is designed for neutral and aggressive solid-free liquids. Controller features a local flow display with seven pre-programmable batch points, two totalizers, overrun correction plus two dosing modes (manual or remote). Measuring range is 0.25 to 32.8 ft/sec, with linearity ≤ ±1% of full scale (from 1 to 33 ft/sec) and repeatability of 0.4% of operating range.

New

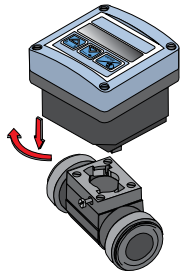


PVC

Brass

SS

Easily mount the module on the sensor/fitting with a quick quarter turn.



CE For LIQUIDS

32557-24

32557-48

32558-48

32559-24

Specifications & Ordering Information

Fluid type: water-like fluids
Accuracy: 1.5% full-scale (at 12 ft/sec)
Linearity: 0.5% full-scale (at 32.8 ft/sec)
Repeatability: 0.4% of reading

Operating temperature
Ambient fluid: 32 to 140°F (0 to 60°C)
Brass and SS: 32 to 212°F (0 to 100°C)
PVC: 32 to 122°F (0 to 50°C)

Input power: 12 to 30 VDC
Pipe size: ½" to 1½" dia

Fitting size	Flow range (GPM)	Flow range (LPM)	Brass Catalog number	Brass Price	Stainless steel Catalog number	Stainless steel Price	PVC Catalog number	PVC Price
Type 8023 Compact output module; 4 to 20 mA output *(requires programmer 32557-90)*								
½"	0.61 to 18	0.32 to 106	KH-32557-00		KH-32557-12		KH-32557-24	
¾"	1.5 to 41	0.57 to 188	KH-32557-02		KH-32557-14		KH-32557-26	
1"	2.5 to 74	0.88 to 294	KH-32557-04		KH-32557-16		KH-32557-28	
1¼"	4 to 114	1.45 to 482	KH-32557-06		KH-32557-18		KH-32557-30	
1½"	5.5 to 44	2.26 to 753	KH-32557-08		KH-32557-20		KH-32557-32	
Type 8030 Digital flow sensor; NPN/PNP pulse output								
½"	0.61 to 18	0.32 to 106	KH-32557-36		KH-32557-48		KH-32557-60	
¾"	1.5 to 41	0.57 to 188	KH-32557-38		KH-32557-50		KH-32557-62	
1"	2.5 to 74	0.88 to 294	KH-32557-40		KH-32557-52		KH-32557-64	
1¼"	4 to 114	1.45 to 482	KH-32557-42		KH-32557-54		KH-32557-66	
1½"	5.5 to 44	2.26 to 753	KH-32557-44		KH-32557-56		KH-32557-68	
Type 8035 Digital flow transmitter; 4 to 20 mA and transistor output, two 3-amp SPDT relay alarm contacts, two totalizers								
½"	0.61 to 18	0.32 to 106	KH-32558-36		KH-32558-48		KH-32558-60	
¾"	1.5 to 41	0.57 to 188	KH-32558-38		KH-32558-50		KH-32558-62	
1"	2.5 to 74	0.88 to 294	KH-32558-40		KH-32558-52		KH-32558-64	
1¼"	4 to 114	1.45 to 482	KH-32558-42		KH-32558-54		KH-32558-66	
1½"	5.5 to 44	2.26 to 753	KH-32558-44		KH-32558-56		KH-32558-68	
Type 8035 Digital flow batch controller; open collector transistor alarm contact, two totalizers, and two 3-amp SPDT relay batchers								
½"	0.61 to 18	0.32 to 106	KH-32559-00		KH-32559-12		KH-32559-24	
¾"	1.5 to 41	0.57 to 188	KH-32559-02		KH-32559-14		KH-32559-26	
1"	2.5 to 74	0.88 to 294	KH-32559-04		KH-32559-16		KH-32559-28	
1¼"	4 to 114	1.45 to 482	KH-32559-06		KH-32559-18		KH-32559-30	
1½"	5.5 to 44	2.26 to 753	KH-32559-08		KH-32559-20		KH-32559-32	