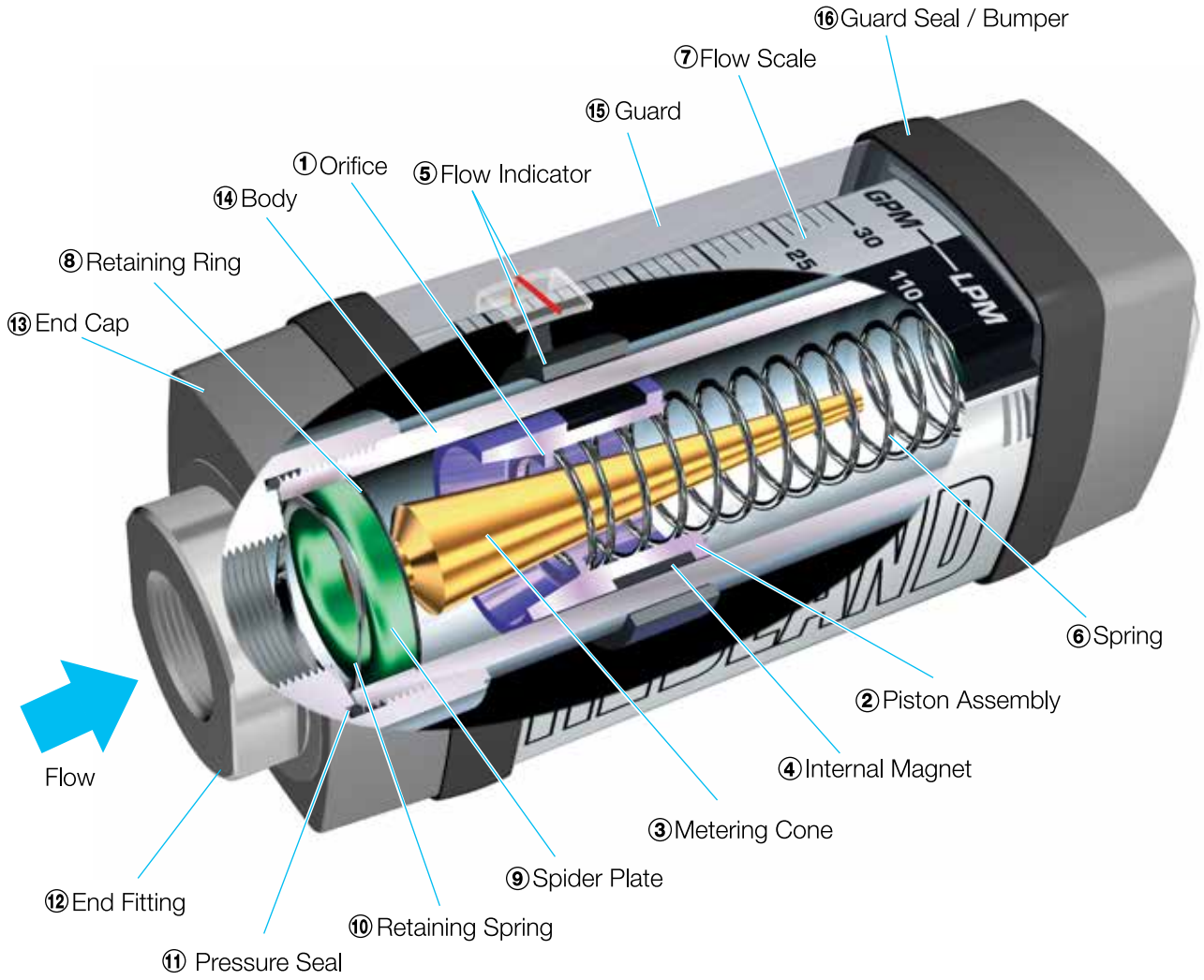
Product Catalog

Badger Meter

Variable Area Flow Meters and Flow Switches

Hedland®
Variable Area Flow Meters

General Design Features



OPERATING PRINCIPLE

The Hedland flow meter is a variable area instrument. A precision machined, sharp-edged Orifice ① located within the Piston Assembly ②, forms an annular opening with the contoured Metering Cone ③. The Piston Assembly carries a cylindrical PPS/Ceramic Magnet ④ that is magnetically coupled to an external Flow Indicator ⑤ that moves precisely, in direct response to movement of the Piston. A calibrated Spring ⑥ opposes flow in the forward direction. This spring decreases viscosity sensitivity and allows the flow meter to be used in any position, including inverted.

Bi-directional flow capability: If required, a reverse flow by-pass option is available and is depicted on individual product pages. Note that flow is measured in the forward direction only.

Operates in any position: The Hedland in-line flow meter's unique spring-loaded variable area design allows meters to be installed in any position without affecting accuracy. An optional inverted flow scale is also available.

Easier to read linear scale: This flow meter is the most readable product in its class. Brightly colored indicators move over the graduated, linear Flow Scale ⑦ which contains bold, easy-to-read numerals and gauge marks. This enhanced resolution virtually eliminates parallax problems associated with competitive, direct reading flow meters.

360° Rotatable guard/scale: Hedland's unique design allows the meter to be installed in any orientation without regard to scale direction. Once the meter is permanently installed, the guard/scale can be rotated 360° to optimize readability.

Rugged construction: Flow meters are available in anodized aluminum, brass, T303 and T316 stainless steel, with SAE, NPTF, BSPP, and Code 61 and Code 62 4-bolt flanged ports. This easy-to-read flow meter is a reliable and trouble-free flow rate indicator, monitoring a variety of liquids and gases (including aggressive chemicals), under a wide range of pressures, temperatures and rigorous conditions encountered in industrial applications.

No flow straighteners or special piping: The Hedland design does not require special plumbing or accessories to stabilize turbulent flow. Flow meters can be installed immediately adjacent to 90-degree elbows or other components to provide greatest system design flexibility, while saving installation time and money.

Relatively insensitive to shock and vibration: This unique design is inherently less sensitive to shock and vibration than other variable area flow meters. The new, improved coupling forces between the internal and external magnets greatly reduce the chance of decoupling the flow indicator under high flow and pressure transients. The magnetic coupling also eliminates the need for mechanical linkages that wear, loosen and leak over the functional life of competitive meters.

Technical Information

Liquid & Gas Flow Meters

REPEATABILITY WITHIN ±1%:
Flow meter repeatability is within ±1%. This is particularly important in cyclical applications, which require consistent readings.

OPERATING TEMPERATURE:
Standard operating temperature range is -20 to +240 °F (-29 to +116 °C). High Temperature flow meter range is -20 to +400 °F (-29 to +204 °C) continuous, and +400 to +500 °F (+204 to +260 °C) intermittent. Maximum operating pressure of aluminum and brass body flow meters is reduced for temperatures over 240 °F (116 °C). Stainless steel flow meters do not require derating. Refer to pressure derating charts in the High Temperature flow meter section.

OPERATING PRESSURE:
Liquids: Maximum operating pressure of aluminum and brass flow meters is 3,500 psi (241 bar) in ¼ to 1½ inch sizes and 800 psi (55 bar) for 3 inch meters. Type 303 and 316 stainless steel flow meters have a 6,000 psi (414 bar) maximum operating pressure in ¼ and ½ inch models and 5,000 psi (345 bar) maximum operating pressure in ¾ to 1½ inch models. All liquid flow meters are designed with a 3:1 safety factor. High temperature affects maximum operating pressure. Refer to pressure derating charts in the High Temperature flow meter section.

Air/Gases: Maximum operating pressure of aluminum and brass flow meters is 1,000 psi (69 bar) in ¼ to 1½ inch sizes and 250 psi (17 bar) for 3 inch meters. Type 303 and 316 stainless steel flow meters have a 1,500 psi (103 bar) maximum operating pressure. All air/gas flow meters are designed with a 10:1 safety factor. All pneumatic test kits are limited to a maximum operating pressure of 600 psi (41 bar) by the control valve pressure rating. Consult factory for high pressure use.

Fatigue Rating: per NFPA T2.6.1R1-1991 - C/90 (see page 7 for further details).

PRESSURE DROP (ΔP):
Refer to pages 61 to 66 for Flow vs. Pressure Drop data for oil, phosphate ester, water-based fluids, water, and air.

FILTRATION:
Although Hedland flow meters are more contamination tolerant than most fluid system components, 200 mesh (74 micron) or better filtration is required to ensure reliable performance.

CALIBRATION:
Oil, PE and WBF flow meters are calibrated with 0.876 specific gravity, 140 SUS (32cSt) hydraulic oil, irrespective of final fluid use. After calibration, PE and WBF flow meters are computer corrected for 1.18 s.g. and 1.0 s.g. respectively. Water meters are calibrated with water at 1.0 specific gravity. Air and gas meters are calibrated with air at 1.0 specific gravity (70 °F at 100 psi).

FLOW METER CERTIFICATION
There are three (3) types of certificates available with the Hedland Flow Meter:
1. Certificate of Conformance
2. Calibration Certificate
3. Certified Drawing

Certificate of Conformance: This document states that the specified Hedland Flow Meter meets the performance standards indicated in the Hedland Catalog. The certificate is signed by the Corporate Quality Assurance Manager or authorized delegate and should meet most needs for performance certification.

Calibration Certificate: This document contains the actual flow vs. indicated flow of a specific flow meter. It documents the error of each flow point relative to the stated tolerance limit.The master meters used to calibrate flow meters are traceable to the National Institute for Standards and Testing (NIST).

Meter Type	Traceable Range
Petroleum-based	0.02 to 400 GPM/0.08 to 1514 LPM
Water-based	0.02 to 325 GPM/0.08 to 1230 LPM
Air/gas	0.5 to 1000 SCFM/0.24 to 472 LPS

Certified Drawings: Certified assembly prints are available and contain:
1. Final meter assembly with part number and dimensions
2. Parts list by part number and description
3. Authorized drawing signatures

Reproducible ANSI A-D size drawings are available on standard bond paper. Large size drawings can also be reduced to ANSI A or B sizes. ACAD R13 and 2000 drawings can be sent by electronic format when requested.

Certificate of Origin and Flow Meter Tags also available upon request.

Liquid Flow Meter
Application Information

STANDARD FLOW SCALES:
Standard liquid flow scales are calibrated in gpm and lpm at 0.876 specific gravity for petroleum-based fluids, 1.18 s.g. for phosphate ester based fluids and 1.0 s.g. for water and water-based fluids. For field conversion of the standard scale to other fluids, see liquid propane example below.

SPECIAL FLOW SCALES:
Special scales are available for liquids and gases in any measurement unit, and other fluid viscosities and/or specific gravities.

VISCOSITY EFFECT (SUS/cSt):
Hedland's design utilizes a precision machined, sharp-edged orifice and biasing calibration spring that ensures operating stability and accuracy over the wide viscosity range common to many fluids. Generally, high flow models of each meter size provide good accuracy over a viscosity range of 40 to 500 SUS (4.2 to 108 cSt).

DENSITY EFFECT (specific gravity):
Any fluid density change from stated standards has a proportional effect on meter accuracy. Special scales can be supplied if actual specific gravity decreases accuracy beyond application limits.

Corrections for more or less dense fluids can be made to standard scales using the following correction factor:

$\sqrt{1.0 / \text{specific gravity}}$, for water/water-based meters

$\sqrt{0.876 / \text{specific gravity}}$, for petroleum-based meters

Example: Measuring liquid propane with petroleum meter
Fluid ~ Liquid Propane (LPG)
Scale Measured Flow ~ 28.5 gpm

1. Select (LPG) specific gravity from the Fluid Selection Chart = 0.51
2. Since petroleum meter is utilized, select petroleum formula
3. Divide 0.876 by 0.51 = 1.72
4. Take square root of 1.72 = 1.31 (correction factor)
5. Multiply scale reading by 1.31, 28.5 (indicated flow) × 1.31(correction factor) = 37.3 gpm (actual flow of liquid propane)

This correction may be ignored for petroleum-based hydraulic fluids.

Fluid Selection Chart

		Correction Factor of Standard Scale		Internal Body Material				External Press. Seals		Dust Guard		
Fluid	Specific Gravity	Oil	Water	Aluminum	Brass	T316 SST	T303 SST	Vitron®	EPR	Polycarbonate	Nylon	Pyex®
Acetic Acid (Air Free)	1.06	0.909	0.971	C	N	R	R	R	R	C	N	R
Acetone	0.79	1.053	1.125	R	R	R	R	N	R	N	R	R
Alcohol Butyl (Butanol)	0.83	1.027	1.098	C	C	R	R	C	R	R	R	R
Alcohol Ethyl (Ethanol)	0.83	1.027	1.098	C	C	R	R	C	R	R	N	R
Ammonia	0.89	0.992	1.060	R	C	R	R	N	R	N	C	R
Benzene	0.69	1.127	1.204	C	R	R	C	R	N	N	R	R
Carbon Disulphide	1.26	0.834	0.891	R	N	R	R	R	N	N	R	R
Castor Oil	0.97	0.950	1.015	C	R	R	C	R	N	C	C	R
Cotton Seed Oil	0.93	0.970	1.037	C	R	R	R	R	N	R	R	R
Ethylene Glycol 50/50	1.12	0.884	0.945	R	R	R	R	R	R	R	C	R
Freon II	1.46	0.774	0.828	R	R	R	R	R	N	R	R	R
Gasoline	0.70	1.119	1.195	R	R	R	R	R	N	C	R	R
Glycerin	1.26	0.834	0.891	R	R	R	R	R	R	R	C	R
Kerosene	0.82	1.033	1.104	R	R	R	R	R	N	R	R	R
Liquid Propane (LPG)	0.51	1.310	1.400	R	R	R	R	R	N	N	R	R
Mineral Oil	0.92	0.976	1.042	R	N	R	R	R	N	R	R	R
Naphtha	0.76	1.074	1.147	R	N	R	R	R	N	C	R	R
Perchloroethylene	1.62	0.735	0.786	C	N	R	R	R	N	N	N	R
Petroleum Oil	0.876	1.000	1.068	R	R	R	R	R	N	R	R	R
Phosphate Ester	1.18	0.862	0.921	R	R	R	R	N	R	N	R	R
Phosphate Ester Base	1.26	0.833	0.891	R	R	R	R	N	R	N	R	R
Phosphoric Acid (Air Free)	1.78	0.701	0.749	N	N	R	N	R	N	R	N	R
Sea Water	1.03	0.922	0.985	N	N	C	C	N	R	R	R	R
Synthetic Petroleum Base	1.00	0.936	1.000	R	C	R	R	R	N	R	R	R
Water	1.00	0.936	1.000	N	R	R	R	N	R	R	R	R
Water Glycol 50/50	1.07	0.905	0.967	R	R	R	R	R	N	R	R	R
Water-in-oil	0.93	0.970	1.037	R	R	R	R	N	R	R	R	R

R - Recommended N - Not Recommended C - Consult Factory

3500/6000 PSI Flow Meters

For Petroleum Fluids

- Direct reading
- Install in any position
- 360° rotatable guard/scale
- Easier-to-read linear scale
- No flow straighteners or special piping required
- Relatively insensitive to shock and vibration
- Good viscosity stability
- Temperature up to 240 °F
- Accuracy ±2% full scale
- Repeatability ±1%
- Special scales available
- Calibrated for .876 S.G.

SPECIFICATIONS:

MATERIALS:

2024 - T351 Anodized aluminum body, piston and cone
C360 Brass body, piston and cone①
T303 Stainless body, 2024 - T351 Anodized aluminum piston and cone

COMMON PARTS:
Spider Plate: T316 SS
Spring: T302 SS
Fasteners: T303 SS
Pressure Seals: Viton®
Guard: Polycarbonate
Retaining Ring: SAE 1070/1090 Carbon Steel
Retaining Spring: SAE 1070/1090 Carbon Steel
Indicator and Internal Magnet: PPS / Ceramic
Guard Seal / Bumper: Buna N
Scale Support: 6063 - T6 Aluminum
End Caps: Nylon ST

THREADS: SAE J1926-1*, **NPTF** ANSI B2.2, **BSPP** ISO1179, **Code 61** and **Code 62: SAE**J518

TEMPERATURE RANGE: -20 to +240 °F (-29 to +116 °C) for higher temp. meters, see page 13

PRESSURE RATING:

Aluminum / Brass Operating: 3,500 psi/241 bar max. (800 psi/55 bar max. for 3" series) with a 3:1 safety factor.
For High Cycle Applications: See page 7

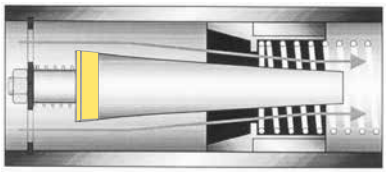
Stainless Steel Operating: 6,000 psi/414 bar max. (5,000 psi/345 bar max. for ¾" to 1½" series and 4,000 psi/276 bar max. for code 62 flange) with a 3:1 safety factor.
For High Cycle Applications: See page 7

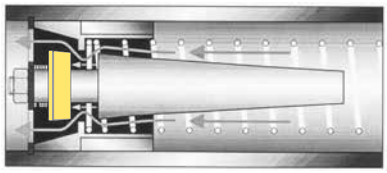
PRESSURE DROP: See Ordering Information Table, page 10.
For detailed differential pressure charts, see page 55.

ACCURACY: ±2% of full scale, ±7% of full scale for ¼" meters **REPEATABILITY:** ±1%

* SAE ports will accept both light-duty (SAE J1926-3) and heavy-duty (SAE J1926-2) stud ends, except 1/4 (SAE 6) size, which will accept only light-duty (SAE J1926-3) studs ends.

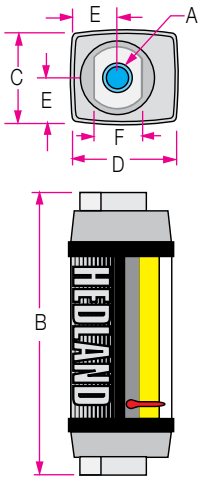
REVERSE FLOW BY-PASS OPTION: Features a two-piece cone that responds to flow in the primary flow direction in the same manner as the standard design. Flow in the reverse direction causes the lower cone shuttle to shift, moving it below the sharp-edged piston orifice. This shift creates a gap which allows the fluid to flow freely in the reverse direction.


Normal Flow Direction


Reverse Flow By-Pass

DIMENSIONS:

A	B	C	D	E	F
NOMINAL PORT SIZE	LENGTH in (mm)	WIDTH in (mm)	DEPTH in (mm)	OFFSET in (mm)	FLATS in (mm)
¼ (SAE 6)	4.8 (122)	1.68 (43)	1.90 (48)	.84 (21)	.88 (22)
½ (SAE 10)	6.6 (168)	2.07 (53)	2.40 (61)	1.04 (26)	1.25 (32)
¾ (SAE 12)	7.2 (183)	2.48 (63)	2.85 (72)	1.24 (32)	1.50 (38)
1 (SAE 16)	7.2 (183)	2.48 (63)	2.85 (72)	1.24 (32)	1.75 (44)
1¼ (SAE 20)	12.2 (310)	4.12 (105)	4.72 (120)	2.06 (52)	2.75 (70)
1½ (SAE 24)	12.2 (310)	4.12 (105)	4.72 (120)	2.06 (52)	2.75 (70)



NOTE: Dimensions for 1½" Code 62, 3" and 3" Code 61 can be found on page 78. Weights for all sizes can be found on page 79.

① 3 inch models have Celcon® piston/piston ring

Celcon is a registered trademark of Hoechst Celanese Corp. Viton is a registered trademark of DuPont Dow Elastomers

Hedland®

3500/6000 PSI Flow Meters

For Petroleum Fluids

ORDERING INFORMATION:

NOMINAL PORT SIZE②	FLOW RANGE		PRESSURE DROP			MODEL NUMBER (see example below)			MATERIAL			OPTIONS
	GPM	LPM	50% FLOW PSI (BAR)	100% FLOW PSI (BAR)	REVERSE 100% FLOW PSI (BAR)	SAE	NPTF	BSPP③	ALUMINUM 3500 PSI	BRASS 3500 PSI	STAINLESS	REVERSE FLOW
¼" SAE 6	.02 - 0.2 .05 - 0.5 0.1 - 1.0 0.2 - 2.0	0.1 - 0.75 0.2 - 1.9 0.5 - 3.75 1 - 7.5	3.5 (.24) 3.0 (.21) 4.0 (.28) 6.0 (.41)	4.0 (.28) 5.0 (.35) 9.0 (.62) 13 (.90)		H200 ✱ - 002 - † H200 ✱ - 005 - † H200 ✱ - 010 - † H200 ✱ - 020 - †	H201 ✱ - 002 - † H201 ✱ - 005 - † H201 ✱ - 010 - † H201 ✱ - 020 - †	H202 ✱-002 - † H202 ✱-005 - † H202 ✱-010 - † H202 ✱-020 - †	A	B	6000 PSI S	Not Available
½" SAE 10	0.1 - 1.0 0.2 - 2.0 0.5 - 5.0 1 - 10 1 - 15	0.5 - 3.75 1 - 7.5 2 - 19 5 - 38 4 - 56	2.0 (.14) 2.0 (.14) 3.0 (.21) 4.0 (.28) 6.5 (.45)	2.75 (.19) 3.0 (.21) 6.0 (.41) 9.5 (.66) 18.5 (1.3)	5.2 (.36) 9.6 (.66) 4.8 (.33) 23.0 (1.6) 55.2 (3.8)	H600 ✱ - 001 - † H600 ✱ - 002 - † H600 ✱ - 005 - † H600 ✱ - 010 - † H600 ✱ - 015 - †	H601 ✱ - 001 - † H601 ✱ - 002 - † H601 ✱ - 005 - † H601 ✱ - 010 - † H601 ✱ - 015 - †	H602 ✱-001 - † H602 ✱-002 - † H602 ✱-005 - † H602 ✱-010 - † H602 ✱-015 - †	A	B	6000 PSI S	RF
¾" SAE 12	0.2 - 2.0 0.5 - 5.0 1 - 10 2 - 20 3 - 30	1 - 7.5 2 - 19 5 - 38 10 - 76 10 - 115	1.0 (.07) 2.5 (.17) 3.5 (.24) 4.0 (.28) 7.0 (.48)	2.0 (.14) 3.5 (.24) 9.0 (.62) 9.0 (.62) 16.5 (1.1)	2.9 (.20) 5.3 (.37) 8.8 (.61) 18.0 (1.24) 45.1 (3.11)	H700 ✱ - 002 - † H700 ✱ - 005 - † H700 ✱ - 010 - † H700 ✱ - 020 - † H700 ✱ - 030 - †	H701 ✱ - 002 - † H701 ✱ - 005 - † H701 ✱ - 010 - † H701 ✱ - 020 - † H701 ✱ - 030 - †	H702 ✱-002 - † H702 ✱-005 - † H702 ✱-010 - † H702 ✱-020 - † H702 ✱-030 - †	A	B	5000 PSI S	RF
1" SAE 16	0.2 - 2.0 0.5 - 5.0 1 - 10 2 - 20 3 - 30 4 - 40 5 - 50	1 - 7.5 2 - 19 5 - 38 10 - 76 10 - 115 15 - 150 20 - 190	1.0 (.07) 2.5 (.17) 3.5 (.24) 4.0 (.28) 7.0 (.48) 9.0 (.62) 12.5 (.86)	2.0 (.14) 3.5 (.24) 9.0 (.62) 9.0 (.62) 16.5 (1.1) 24 (1.7) 34 (2.3)	2.9 (.20) 5.3 (.37) 8.8 (.61) 18.0 (1.24) 45.1 (3.11) 87.5 (6.04) 150 (10.4)	H760 ✱ - 002 - † H760 ✱ - 005 - † H760 ✱ - 010 - † H760 ✱ - 020 - † H760 ✱ - 030 - † H760 ✱ - 040 - † H760 ✱ - 050 - †	H761 ✱ - 002 - † H761 ✱ - 005 - † H761 ✱ - 010 - † H761 ✱ - 020 - † H761 ✱ - 030 - † H761 ✱ - 040 - † H761 ✱ - 050 - †	H762 ✱-002 - † H762 ✱-005 - † H762 ✱-010 - † H762 ✱-020 - † H762 ✱-030 - † H762 ✱-040 - † H762 ✱-050 - †	A	B	5000 PSI S	RF
1¼" SAE 20	3 - 30 5 - 50 10 - 75 10 - 100 10 - 150	10 - 110 20 - 190 40 - 280 50 - 380 50 - 560	3.0 (.21) 3.5 (.24) 5.0 (.35) 6.5 (.45) 10.5 (.72)	4.0 (.28) 7.0 (.48) 10.5 (.72) 15 (1.0) 27.5 (1.9)	4.8 (.33) 12.5 (.86) 31.9 (2.2) 39.0 (2.7) 110 (7.6)	H800 ✱ - 030 - † H800 ✱ - 050 - † H800 ✱ - 075 - † H800 ✱ - 100 - † H800 ✱ - 150 - †	H801 ✱ - 030 - † H801 ✱ - 050 - † H801 ✱ - 075 - † H801 ✱ - 100 - † H801 ✱ - 150 - †	H802 ✱-030 - † H802 ✱-050 - † H802 ✱-075 - † H802 ✱-100 - † H802 ✱-150 - †	A	B	5000 PSI S	RF
1½" SAE 24	3 - 30 5 - 50 10 - 75 10 - 100 10 - 150	10 - 110 20 - 190 40 - 280 50 - 380 50 - 560	3.0 (.21) 3.5 (.24) 5.0 (.35) 6.5 (.45) 10.5 (.72)	4.0 (.28) 7.0 (.48) 10.5 (.72) 15.0 (1.0) 27.5 (1.9)	4.8 (.33) 12.5 (.86) 31.9 (2.2) 39.0 (2.7) 110 (7.6)	H860 ✱ - 030 - † H860 ✱ - 050 - † H860 ✱ - 075 - † H860 ✱ - 100 - † H860 ✱ - 150 - †	H861 ✱ - 030 - † H861 ✱ - 050 - † H861 ✱ - 075 - † H861 ✱ - 100 - † H861 ✱ - 150 - †	H862 ✱-030 - † H862 ✱-050 - † H862 ✱-075 - † H862 ✱-100 - † H862 ✱-150 - †	A	B	5000 PSI S	RF
1½" Code 62	3 - 30 5 - 50 10 - 75 10 - 100 10 - 150	10 - 110 20 - 190 40 - 280 50 - 380 50 - 560	3.0 (.21) 3.5 (.24) 5.0 (.35) 6.5 (.45) 10.5 (.72)	4.0 (.28) 7.0 (.48) 10.5 (.72) 15 (1.0) 27.5 (1.9)	4.8 (.33) 12.5 (.86) 31.9 (2.2) 39.0 (2.7) 110 (7.6)	H808 ✱ - 030 - † H808 ✱ - 050 - † H808 ✱ - 075 - † H808 ✱ - 100 - † H808 ✱ - 150 - †			A	B	4000 PSI S	RF
3"	10 - 200 20 - 300	50 - 750 100 - 1100	11 (.76) 11 (.76)	17 (1.1) 18 (1.2)		Not Available	H901 ✱ - 200 H901 ✱ - 300	H902 ✱-200 H902 ✱-300	800 PS A	800 PS B	Not Available	
3" Code 61	10 - 200 20 - 300	50 - 750 100 - 1100	11 (.76) 11 (.76)	17 (1.1) 18 (1.2)		H909 ✱ - 200 H909 ✱ - 300			800 PS A	800 PS B	Not Available	

NOTE: RF option is not available with standard brass flow meters.

② Fractional sizes apply to NPTF and BSPP.

③ 3 inch models have BSPT (BS21) threads

(example) **H 701 A - 030 - RF**

3500/6000 PSI Test Kits

For Petroleum Fluids

- Direct reading
- Install in any position
- 360° rotatable guard/scale
- Easier-to-read linear scale
- No flow straighteners or special piping required
- Relatively insensitive to shock and vibration
- Good viscosity stability
- Temperature up to 240 °F
- Accuracy ±2% full scale
- Repeatability ±1%
- Special scales available
- Calibrated for .876 S.G.

SPECIFICATIONS:

MATERIALS:
2024 – T351 Anodized aluminum body, piston and cone
C360 Brass body, piston and cone
T303 Stainless body, 2024 – T351 Anodized aluminum piston and cone

COMMON PARTS:
Spider Plate: T316 SS
Spring: T302 SS
Fasteners: T303 SS
Pressure Seals: Viton®
Guard: Polycarbonate
Retaining Ring: SAE 1070/1090 Carbon Steel
Retaining Spring: SAE 1070/1090 Carbon Steel
Indicator and Internal Magnet: PPS / Ceramic
Guard Seal / Bumper: Buna N
Scale Support: 6063 - T6 Aluminum
End Caps: Nylon ST

THREADS: SAE J1926/1, **NPTF** ANSI B2.2, **BSPP** ISO1179

TEMPERATURE RANGE: -20 to +240 °F (-29 to +116 °C)

PRESSURE RATING:
Aluminum / Brass Operating: 3,500 psi/241 bar max. with a 3:1 safety factor.
For High Cycle Applications: See page 7
Stainless Steel Operating: 6,000 psi/414 bar max. (5,000 psi/345 bar max. for ¾" and 1" series) with a 3:1 safety factor.
For High Cycle Applications: See page 7

PRESSURE DROP: See Ordering Information Table, page 12.
For detailed differential pressure charts, see page 55.

ACCURACY: ±2% of full scale **REPEATABILITY:** ±1%

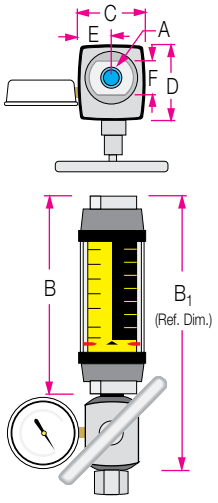
PRESSURE GAUGE: Glycerin dampened, 0 - 3,500 psi / 0 - 240 bar pressure range available on aluminum and brass test kits.
Glycerin dampened, 0 - 6,000 psi / 0 - 400 bar pressure range available on stainless steel test kits.

LOAD VALVE: ½", ¾" and 1" series - needle valve;
Produce ΔP up to 3,500 psi/241 bar PSID and 6,000 psi/414 bar PSID.

DIMENSIONS:

A	B	B_1	C	D	E	F
NOMINAL PORT SIZE	LENGTH in (mm)	LENGTH in (mm)	WIDTH in (mm)	DEPTH in (mm)	OFFSET in (mm)	FLATS in (mm)
½ (SAE 10)	6.6 (168)	10.3 (262)	2.07 (53)	2.40 (61)	1.04 (26)	1.25 (32)
¾ (SAE 12)	7.2 (183)	11.3 (287)	2.48 (63)	2.85 (72)	1.24 (32)	1.50 (38)
1 (SAE 16)	7.2 (183)	11.3 (287)	2.48 (63)	2.85 (72)	1.24 (32)	1.75 (44)

NOTE: Weights for all sizes can be found on page 79.
SAE and BSPP Test Kits include inlet adapter.



Viton is a registered trademark of DuPont Dow Elastomers

3500/6000 PSI Test Kits

For Petroleum Fluids

ORDERING INFORMATION:

NOMINAL PORT SIZE①	FLOW RANGE		PRESSURE DROP			MODEL NUMBER (see example below)			MATERIAL			OPTIONS
	GPM	LPM	50% FLOW PSI (BAR)	100% FLOW PSI (BAR)	REVERSE 100% FLOW PSI (BAR)	SAE	NPTF	BSPP	ALUMINUM 3500 PSI	BRASS 3500 PSI	STAINLESS	REVERSE FLOW
½" SAE 10	0.1 - 1.0	0.5 - 3.75	3.0 (.21)	4.75 (.33)	7.2 (.50)	H600 * - 001 - TK	H601 * - 001 - TK	H602 * - 001 - TK	A	B	6000 PSI S	RT
	0.2 - 2.0	1 - 7.5	5.0 (.34)	9.0 (.62)	15.6 (1.1)	H600 * - 002 - TK	H601 * - 002 - TK	H602 * - 002 - TK				
	0.5 - 5.0	2 - 19	10.0 (.69)	26.0 (1.8)	24.8 (1.7)	H600 * - 005 - TK	H601 * - 005 - TK	H602 * - 005 - TK				
	1 - 10	5 - 38	24.0 (1.7)	71.5 (4.9)	85 (5.9	H600 * - 010 - TK	H601 * - 010 - TK	H602 * - 010 - TK				
	1 - 15	4 - 56	39.0 (2.7)	155 (10.7)	210 (14.5)	H600 * - 015 - TK	H601 * - 015 - TK	H602 * - 015 - TK				
¾" SAE 12	0.2 - 2.0	1 - 7.5	1.5 (.10)	3.0 (.21)	3.9 (.27)	H700 * - 002 - TK	H701 * - 002 - TK	H702 * - 002 - TK	A	B	5000 PSI S	RT
	0.5 - 5.0	2 - 19	4.0 (.28)	6.5 (.45)	8.3 (.57)	H700 * - 005 - TK	H701 * - 005 - TK	H702 * - 005 - TK				
	1 - 10	5 - 38	6.5 (.45)	16.0 (1.1)	15.8 (1.1)	H700 * - 010 - TK	H701 * - 010 - TK	H702 * - 010 - TK				
	2 - 20	10 - 76	11.0 (.76)	26.0 (1.8)	35.0 (2.4)	H700 * - 020 - TK	H701 * - 020 - TK	H702 * - 020 - TK				
	3 - 30	10 - 115	18.0 (1.2)	47.5 (3.3)	76.1 (5.2)	H700 * - 030 - TK	H701 * - 030 - TK	H702 * - 030 - TK				
1" SAE 16	0.2 - 2.0	1 - 7.5	1.5 (.10)	3.0 (.21)	3.9 (.27)	H760 * - 002 - TK	H761 * - 002 - TK	H762 * - 002 - TK	A	B	5000 PSI S	RT
	0.5 - 5.0	2 - 19	4.0 (.28)	6.5 (.45)	8.3 (.57)	H760 * - 005 - TK	H761 * - 005 - TK	H762 * - 005 - TK				
	1 - 10	5 - 38	6.5 (.45)	16.0 (1.1)	15.8 (1.1)	H760 * - 010 - TK	H761 * - 010 - TK	H762 * - 010 - TK				
	2 - 20	10 - 76	11.0 (.76)	26.0 (1.8)	35.0 (2.4)	H760 * - 020 - TK	H761 * - 020 - TK	H762 * - 020 - TK				
	3 - 30	10 - 115	18.0 (1.2)	47.5 (3.3)	76.1 (5.2)	H760 * - 030 - TK	H761 * - 030 - TK	H762 * - 030 - TK				
	4 - 40	15 - 150	26.0 (1.8)	75.0 - (5.2)	139 (9.6)	H760 * - 040 - TK	H761 * - 040 - TK	H762 * - 040 - TK				
	5 - 50	20 - 190	63.5 (4.4)	114 (7.9)	230 (15.9)	H760 * - 050 - TK	H761 * - 050 - TK	H762 * - 050 - TK				

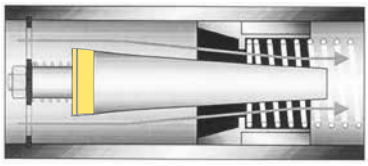
①Fractional sizes apply to NPTF and BSPP.

(example) **H 701 A - 030 - RT**

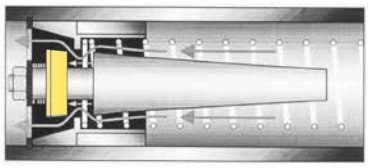
NOTE: TK suffix represents standard test kit configuration. For reverse flow by-pass test kit, replace TK suffix with RT suffix.

NOTE: RT option is not available with standard brass flow meters.

REVERSE FLOW BY-PASS OPTION: Features a two-piece cone that responds to flow in the primary flow direction in the same manner as the standard design. Flow in the reverse direction causes the lower cone shuttle to shift, moving it below the sharp-edged piston orifice. This shift creates a gap which allows the fluid to flow freely in the reverse direction.



Normal Flow Direction



Reverse Flow By-Pass

3500/5000 PSI Test Kits

For Petroleum Fluids (1-1/4" and 1-1/2")

- Direct reading
- Install in any position
- 360° rotatable guard/scale
- Easier-to-read linear scale
- No flow straighteners or special piping required
- Relatively insensitive to shock and vibration
- Good viscosity stability
- Temperature up to 240 °F
- Accuracy ±2% full scale
- Repeatability ±1%
- Special scales available
- Calibrated for .876 S.G.

SPECIFICATIONS:

MATERIALS:
2024 – T351 Anodized aluminum body, piston and cone
T303 Stainless body, 2024 – T351 Anodized aluminum piston and cone

COMMON PARTS:
Spider Plate: T316 SS
Spring: T302 SS
Fasteners: T303 SS
Pressure Seals: Viton®
Guard: Polycarbonate
Retaining Ring: SAE 1070/1090 Carbon Steel
Retaining Spring: SAE 1070/1090 Carbon Steel
Indicator and Internal Magnet: PPS / Ceramic
Guard Seal / Bumper: Buna N
Scale Support: 6063 - T6 Aluminum
End Caps: Nylon ST

THREADS: NPT

TEMPERATURE RANGE: -20 to +240 °F (-29 to +116 °C)

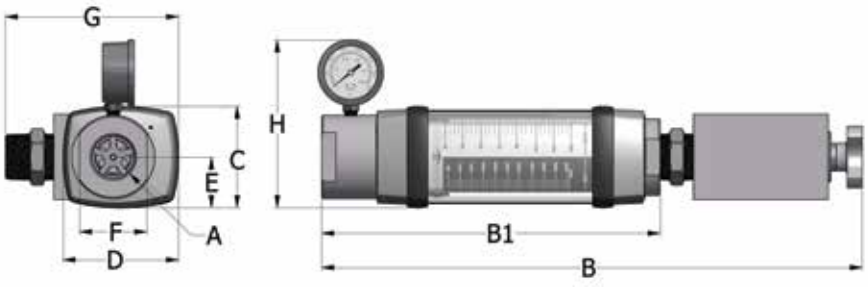
PRESSURE RATING:
Aluminum: 3,500 psi/241 bar max. with a 3:1 safety factor.
For High Cycle Applications: See page 7
Stainless Steel Operating: 5,000 psi/345 bar max.with a 3:1 safety factor.
For High Cycle Applications: See page 7

PRESSURE DROP: See Ordering Information Table, page 14.
For detailed differential pressure charts, see page 61.

ACCURACY: ±2% of full scale **REPEATABILITY:** ±1%

PRESSURE GAUGE: Glycerin dampened, 0 - 3,500 psi / 0 - 240 bar pressure range available on aluminum test kits.
Glycerin dampened, 0 - 6,000 psi / 0 - 400 bar pressure range available on stainless steel test kits.

LOAD VALVE: Produce ΔP up to 3,500 psi/241 bar PSID and 5,000 psi/345 bar PSID.



DIMENSIONS:

A	B	B_1	C	D	E	F	G	H
NOMINAL PORT SIZE	LENGTH in (mm)	LENGTH in (mm)	WIDTH in (mm)	DEPTH in (mm)	OFFSET in (mm)	FLATS in (mm)	DEPTH in (mm)	WIDTH in (mm)
1-1/4	22.1 (561)	13.9 (353)	4.15 (105)	4.75 (121)	2.08 (53)	2.75 (70)	7.1 (180)	6.9 (175)
1-1/2	22.1 (561)	13.9 (353)	4.15 (105)	4.75 (121)	2.08 (53)	2.75 (70)	7.1 (180)	6.9 (175)

NOTE: Weights for all sizes can be found on page 79.
Pressures above 7500 PSI will pop the rupture disc allowing fluid flow to continue. This is a fail safe mechanism.

Viton is a registered trademark of DuPont Dow Elastomers

3500/5000 PSI Test Kits

For Petroleum Fluids

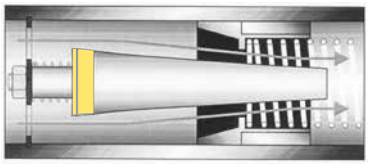
ORDERING INFORMATION:

NOMINAL PORT SIZE	FLOW RANGE		PRESSURE DROP			MODEL NUMBER (see example below)	MATERIAL		OPTIONS
	GPM	LPM	50% FLOW PSI (BAR)	100% FLOW PSI (BAR)	REVERSE 100% FLOW PSI (BAR)	NPT	ALUMINUM 3500 PSI	STAINLESS 5000 PSI	REVERSE FLOW
1¼"	3 - 30	10 - 110	3.4 (.23)	7.8 (.54)	5.6 (.39)	H TK 801 * - 030	A	S	RT
	5 - 50	20 - 190	4.3 (.30)	8.8 (6.1)	14.3 (.99)	H TK 801 * - 050			
	10 - 75	40 - 280	6.3 (.43)	14.3 (9.9)	35.7 (2.5)	H TK 801 * - 075			
	10 - 100	50 - 380	8.3 (.57)	21.3 (1.5)	45.3 (3.1)	H TK 801 * - 100			
	10 - 150	50 - 560	14.3 (.99)	41.3 (2.8)	124 (8.6)	H TK 801 * - 150			
1½"	3 - 30	10 - 110	3.4 (.23)	7.8 (.54)	5.6 (.39)	H TK 861 * - 030	A	S	RT
	5 - 50	20 - 190	4.3 (.30)	8.8 (6.1)	14.3 (.99)	H TK 861 * - 050			
	10 - 75	40 - 280	6.3 (.43)	14.3 (9.9)	35.7 (2.5)	H TK 861 * - 075			
	10 - 100	50 - 380	8.3 (.57)	21.3 (1.5)	45.3 (3.1)	H TK 861 * - 100			
	10 - 150	50 - 560	14.3 (.99)	41.3 (2.8)	124 (8.6	H TK 861 * - 150			

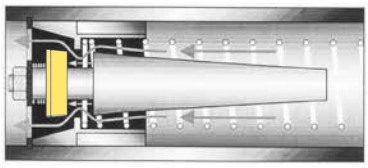
(example) **H RT 801 A - 030**

NOTE: TK suffix represents standard test kit configuration. For reverse flow by-pass test kit, replace TK suffix with RT suffix.

REVERSE FLOW BY-PASS OPTION: Features a two-piece cone that responds to flow in the primary flow direction in the same manner as the standard design. Flow in the reverse direction causes the lower cone shuttle to shift, moving it below the sharp-edged piston orifice. This shift creates a gap which allows the fluid to flow freely in the reverse direction.



Normal Flow Direction



Reverse Flow By-Pass

3500/6000 PSI High Temperature

Flow Meters For Petroleum Fluids

- Direct reading
- Install in any position
- 360° rotatable guard/scale
- Easier-to-read linear scale
- No flow straighteners or special piping required
- Relatively insensitive to shock and vibration
- Good viscosity stability
- Temperature up to 500 °F
- Accuracy ±2% full scale
- Repeatability ±1%
- Special scales available
- Calibrated for .876 S.G.

SPECIFICATIONS:

MATERIALS:
2024 - T351 Anodized aluminum body, piston and cone
C360 Brass body, piston and cone
T303 Stainless body, 2024 - T351 Anodized aluminum piston and cone

COMMON PARTS:
Spider Plate: T316 SS
Spring: T302 SS
Fasteners: T303 SS
Seals: Viton®
Scale Support: T316 SS
Scale: Polymide
Retaining Ring: SAE 1070/1090 Carbon Steel
Retaining Spring: SAE 1070/1090 Carbon Steel
Indicator: Nickel-plated Carbon Steel
Internal Magnet: Teflon® Coated Alnico 8
Bumper: 2011 - T3 Anodized Aluminum
Guard: Cylindrical Pyrex® Glass
End Caps: 2011 - T3 Anodized Aluminum

THREADS: SAE J1926/1, **NPTF** ANSI B2.2, **BSPP** ISO1179, **Code 62: SAE**J518

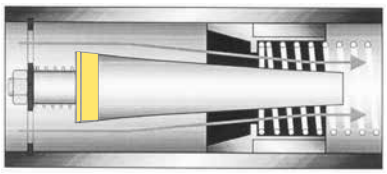
TEMPERATURE RANGE: -20 to +400 °F (-29 to +205 °C) Continuous
+400 to +500 °F (+205 to +260 °C) Intermittent
For detailed "Pressure vs. Temperature" correlation information, see page 14.

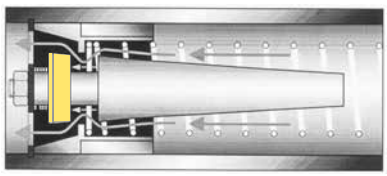
PRESSURE RATING:
Aluminum / Brass Operating: 3,500 psi/241 bar max. with a 3:1 safety factor.
For High Cycle Applications: See page 7
Stainless Steel Operating: 6,000 psi/414 bar max. (5,000 psi/345 bar max. for ¾" to 1½" series) with a 3:1 safety factor.
For High Cycle Applications: See page 7

PRESSURE DROP: See Ordering Information Table, page 14.
For detailed differential pressure charts, see page 55.

ACCURACY: ±2% of full scale **REPEATABILITY:** ±1%

REVERSE FLOW BY-PASS OPTION: Features a two-piece cone that responds to flow in the primary flow direction in the same manner as the standard design. Flow in the reverse direction causes the lower cone shuttle to shift, moving it below the sharp-edged piston orifice, which allows the fluid to flow freely in the reverse direction.

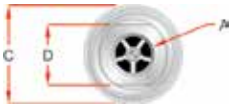

Normal Flow Direction

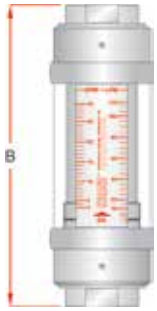

Reverse Flow By-Pass

DIMENSIONS:

A	B	C	D
NOMINAL PORT SIZE	LENGTH in (mm)	WIDTH in (mm)	FLATS in (mm)
¼ (SAE 6)	6.60 (168)	2.01 (53)	1.25 (32)
½ (SAE 10)	6.60 (168)	2.01 (53)	1.25 (32)
¾ (SAE 12)	7.20 (183)	2.48 (63)	1.50 (38)
1 (SAE 16)	7.20 (183)	2.48 (63)	1.75 (44)
1¼ (SAE 20)	12.20 (310)	4.20 (105)	2.75 (70)
1½ (SAE 24)	12.20 (310)	4.20 (105)	2.75 (70)

NOTE: Dimensions for 1½" Code 62 can be found on page 78.
Weights for all sizes can be found on page 79.





Pyrex is a registered trademark of Corning, Inc.
Teflon is a registered trademark of E.I. DuPont de Nemours & Co.
Viton is a registered trademark of DuPont Dow Elastomers

3500/6000 PSI High Temperature

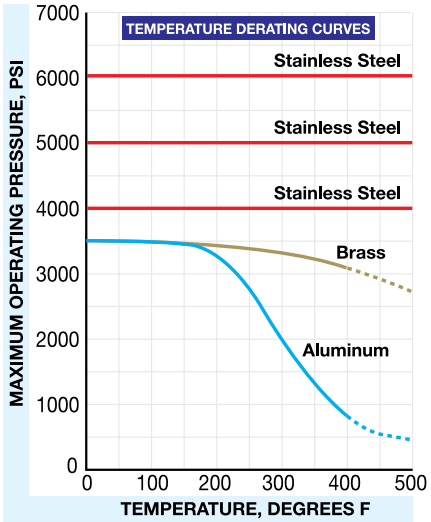
Flow Meters For Petroleum Fluids

ORDERING INFORMATION:

NOMINAL PORT SIZE①	FLOW RANGE		PRESSURE DROP			MODEL NUMBER (see example below)			MATERIAL			OPTIONS
	GPM	LPM	50% FLOW PSI (BAR)	100% FLOW PSI (BAR)	REVERSE 100% FLOW PSI (BAR)	SAE	NPTF	BSPP	ALUMINUM 3500 PSI	BRASS 3500 PSI	STAINLESS	REVERSE FLOW
¼" SAE 6	0.1 - 1.0 0.2 - 2.0	0.5 - 3.75 1.0 - 7.5	4.0 (.28) 6.0 (.41)	9.0 (.62) 13 (.90)		H200 ✱ - 010 - HT H200 ✱ - 020 - HT	H201 ✱ - 010 - HT H201 ✱ - 020 - HT	H202 ✱-010 - HT H202 ✱-020 - HT	A	B	6000 PSI S	Not Available
½" SAE 10	0.1 - 1.0 0.2 - 2.0 0.5 - 5.0 1 - 10 1 - 15	0.5 - 3.75 1.0 - 7.5 2 - 19 5 - 38 4 - 56	2.0 (.14) 2.0 (.14) 3.0 (.21) 4.0 (.28) 6.5 (.45)	2.75 (.19) 3.0 (.21) 6.0 (.41) 9.5 (.66) 18.5 (1.3)	5.2 (.36) 9.6 (.66) 4.8 (.33) 23.0 (1.6) 55.2 (3.8)	H600 ✱ - 001 - HT H600 ✱ - 002 - HT H600 ✱ - 005 - HT H600 ✱ - 010 - HT H600 ✱ - 015 - HT	H601 ✱ - 001 - HT H601 ✱ - 002 - HT H601 ✱ - 005 - HT H601 ✱ - 010 - HT H601 ✱ - 015 - HT	H602 ✱-001 - HT H602 ✱-002 - HT H602 ✱-005 - HT H602 ✱-010 - HT H602 ✱-015 - HT	A	B	6000 PSI S	HR
¾" SAE 12	0.2 - 2.0 0.5 - 5.0 1 - 10 2 - 20 3 - 30	1 - 7.5 2 - 19 5 - 38 10 - 76 10 - 115	1.0 (.07) 2.5 (.17) 3.5 (.24) 4.0 (.28) 7.0 (.48)	2.0 (.14) 3.5(.24) 9.0 (.62) 9.0 (.62) 16.5 (1.1)	2.9 (.20) 5.3 (.37) 8.8 (.61) 18.0 (1.24) 45.1 (3.11)	H700 ✱ - 002 - HT H700 ✱ - 005 - HT H700 ✱ - 010 - HT H700 ✱ - 020 - HT H700 ✱ - 030 - HT	H701 ✱ - 002 - HT H701 ✱ - 005 - HT H701 ✱ - 010 - HT H701 ✱ - 020 - HT H701 ✱ - 030 - HT	H702 ✱-002 - HT H702 ✱-005 - HT H702 ✱-010 - HT H702 ✱-020 - HT H702 ✱-030 - HT	A	B	5000 PSI S	HR
1" SAE 16	0.2 - 2.0 0.5 - 5.0 1 - 10 2 - 20 3 - 30 4 - 40 5 - 50	1 - 7.5 2 - 19 5 - 38 10 - 76 10 - 115 15 - 150 20 - 190	1.0 (.07) 2.5 (.17) 3.5 (.24) 4.0 (.28) 7.0 (.48) 9.0 (.62) 12.5 (.86)	2.0 (.14) 3.5(.24) 9.0 (.62) 9.0 (.62) 16.5 (1.1) 24.0 (1.7) 34.0 (2.3)	2.9 (.20) 5.3 (.37) 8.8 (.61) 18.0 (1.24) 45.1 (3.11) 87.5 (6.04) 150 (10.4)	H760 ✱ - 002 - HT H760 ✱ - 005 - HT H760 ✱ - 010 - HT H760 ✱ - 020 - HT H760 ✱ - 030 - HT H760 ✱ - 040 - HT H760 ✱ - 050 - HT	H761 ✱ - 002 - HT H761 ✱ - 005 - HT H761 ✱ - 010 - HT H761 ✱ - 020 - HT H761 ✱ - 030 - HT H761 ✱ - 040 - HT H761 ✱ - 050 - HT	H762 ✱ - 002 - HT H762 ✱ - 005 - HT H762 ✱ - 010 - HT H762 ✱ - 020 - HT H762 ✱ - 030 - HT H762 ✱ - 040 - HT H762 ✱ - 050 - HT	A	B	5000 PSI S	HR
1¼" SAE 20	3 - 30 5 - 50 10 - 75 10 - 100 10 - 150	10 - 110 20 - 190 40 - 280 50 - 380 50 - 560	3.0 (.21) 3.5 (.24) 5.0 (.35) 6.5 (.45) 10.5 (.72)	4.0 (.28) 7.0 (.48) 10.5 (.72) 15 (1.0) 27.5 (1.9)	4.8 (.33) 12.5 (.86) 31.9 (2.2) 39.0 (2.7) 110 (7.6)	H800 ✱ - 030 - HT H800 ✱ - 050 - HT H800 ✱ - 075 - HT H800 ✱ - 100 - HT H800 ✱ - 150 - HT	H801 ✱ - 030 - HT H801 ✱ - 050 - HT H801 ✱ - 075 - HT H801 ✱ - 100 - HT H801 ✱ - 150 - HT	H802 ✱ - 030 - HT H802 ✱ - 050 - HT H802 ✱ - 075 - HT H802 ✱ - 100 - HT H802 ✱ - 150 - HT	A	B	5000 PSI S	HR
1½" SAE 24	3 - 30 5 - 50 10 - 75 10 - 100 10 - 150	10 - 110 20 - 190 40 - 280 50 - 380 50 - 560	3.0 (.21) 3.5 (.24) 5.0 (.35) 6.5 (.45) 10.5 (.72	4.0 (.28) 7.0 (.48) 10.5 (.72) 15 (1.0) 27.5 (1.9)	4.8 (.33) 12.5 (.86) 31.9 (2.2) 39.0 (2.7) 110 (7.6)	H860 ✱ - 030 - HT H860 ✱ - 050 - HT H860 ✱ - 075 - HT H860 ✱ - 100 - HT H860 ✱ - 150 - HT	H861 ✱ - 030 - HT H861 ✱ - 050 - HT H861 ✱ - 075 - HT H861 ✱ - 100 - HT H861 ✱ - 150 - HT	H862 ✱ - 030 - HT H862 ✱ - 050 - HT H862 ✱ - 075 - HT H862 ✱ - 100 - HT H862 ✱ - 150 - HT	A	B	5000 PSI S	HR
1½" Code 62	3 - 30 5 - 50 10 - 75 10 - 100 10 - 150	10 - 110 20 - 190 40 - 280 50 - 380 50 - 560	3.0 (.21) 3.5 (.24) 5.0 (.35) 6.5 (.45) 10.5 (.72)	4.0 (.28) 7.0 (.48) 10.5 (.72) 15 (1.0) 27.5 (1.9)	4.8 (.33) 12.5 (.86) 31.9 (2.2) 39.0 (2.7) 110 (7.6)	H808 ✱ - 030 - HT H808 ✱ - 050 - HT H808 ✱ - 075 - HT H808 ✱ - 100 - HT H808 ✱ - 150 - HT			A	B	4000 PSI S	HR

①Fractional sizes apply to NPTF and BSPP.

(example) **H 701 A - 030 - HR**



NOTE: HT suffix represents standard high temperature configuration. For reverse flow high temperature, replace HT with HR suffix.

NOTE: HR option is not available with brass flow meters.