



MAX FLOW SIZES
FROM 5 GPH to 20 GPM
(20 LPH TO 75 LPM)

MAX LIQUID PRESSURE 300 PSI (20.69 BAR)
MAX LIQUID PRESSURE 500 PSI (34.48 BAR)
MAX LIQUID PRESSURE 1500 PSI (103.45 BAR)

LL SERIES
LP SERIES
LH SERIES

Flow meters, Flow switches and Flow transmitters

A piston design for
low flows of liquids



LL Series, with standard scale and pointer (control box A).



NIST Traceable Calibration
Certificate Available

DESCRIPTION

These variable-area meters position an orifice over a tapered shaft to establish flow rate. Mounting is in-line and in any position. Straight pipe runs before or after this monitor are not required. The all-mechanical sensing system directly drives the pointer, switches and transmitters.

READOUTS

The flowmeter has outputs both visual and electronic. Visual displays are either pointer (with inscribed scale) or numeric (digital LCD). Electronic outputs can be mechanical switch closure, 4-20 mA analog, HART or some combination of switches with electronic outputs (for signal redundancy). The switches can be general purpose or rated for hazardous locations (all classes, groups and divisions).

CALIBRATION

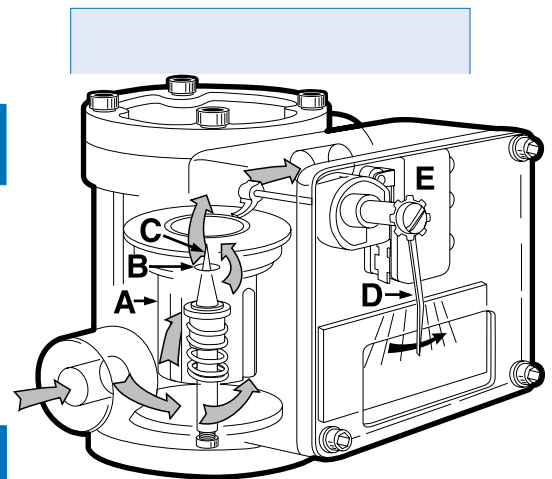
All flow meters are individually calibrated for fluids with the viscosity you specify (up to 3000 SSU/650 Centistokes). We also compensate for your fluid's specific gravity. For NIST Traceability please consult factory.

CONSTRUCTION MATERIALS

Housings and seals are offered in a variety of materials to suit a wide range of applications, such as: water, oil, coolants, paint, solvents and some corrosive fluids. See selections in the "How to Order" section.

LINE CONNECTION

Ports can be threaded or flanged. See selections in the "How to Order" section.



Fluid flow causes a spring-loaded piston **A** having a circular opening at its center **B** to move along the axis of a precision-tapered shaft **C**. This creates a variable orifice in direct proportion to the flow rate. The piston is mechanically linked to the readout pointer **D** and actuates switch **E** or a transmitter (not shown).

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HOW TO ORDER Select appropriate symbols and build a model code number, as in example shown:

EXAMPLE: LL - B Z P S B 15GH- 4 U- 32ØV.9 -

SERIES BY PRESSURE RATING

Normal pressure (150 or 300 PSI)	=	LL
Medium pressure (500 PSI)	=	LP
High pressure (1500 PSI)	=	LH

HOUSING MATERIAL WHERE USED

Aluminum	Lube oil	=	A
Cast iron, nickel plated	Water, oil with exterior corrosion protection	=	N
Brass	Water	=	B
Cast iron	Oil	=	C
Carbon steel	Oil	=	M
Carbon steel, nickel plated	Water, oil with exterior corrosion protection	=	J
Stainless steel (316)	Chemicals, corrosives	=	Z

PISTON MATERIAL

Brass	Water, oil	=	B
Stainless steel (316)	Corrosives, chemicals	=	Z

CAP MATERIAL

Metal (same as housing) use matches housing (300 PSI)	=	M
Polysulfone (150 PSI) (Not available for 10 GPH and below)	=	P (LL only)

INTERNAL MOVING PARTS

Stainless steel (300 series)	Standard for oil	=	S
Stainless steel (316 series)	Water, chemicals and corrosives	=	Z

SEAL MATERIAL

Buna N	Water, oil	=	B
EPR	Hot water, caustics	=	E
Viton	Acids, some caustics	=	F
Kalrez	Corrosives, solvents	=	J
Kalrez (dynamic) & Buna N (static)	Specialty	=	A
Kalrez (dynamic) and EPR (static)	Specialty	=	H
Kalrez (dynamic) and Viton (static)	Specialty	=	K
Kalrez (dynamic) and Teflon (static)	Corrosives, solvents	=	T

Available only in metal "Cap Material" (option M) = **T**

MAX FLOW RATE LIQUIDS

GPH: 5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 80, 90, 100, 120, 150, 200, 250 & 300	=	GH
GPM: 0.25, 0.5, 0.75, 1, 1.5, 2, 2.5, 3, 4, 5, 6, 7, 8, 9, 10, 15 & 20	=	GM
LPH: 20, 30, 40, 50, 60, 70, 80, 90, 100, 200, 300, 400, 500, 600, 700, 800, 900 & 1000	=	LH
LPM: 5, 10, 15, 20, 25, 30, 35, 40, 50, 60, 70 & 75	=	LM
CMH: 1, 2, 3 & 4	=	CMH
GLM: Dual scale - gallons & liters per minute	=	GLM

SCALES

THREADED ATTACHMENT

Pipe size and attachment method	Pipe Size	NPT	SAE	BSPP	BSPT	Max Flow
	In Inches	Female				In GPM
1/8	1	2T	2BP	2BT	2	
1/4	2	4T	4BP	4BT	5	
3/8	3	6T	6BP	6BT	10	
1/2	4	8T	8BP	8BT	15	
5/8	10T	10BP	10BT	15		
3/4	6	12T	12BP	12BT	20	

FLANGED

Ex: 2FWCS150RF = 1/4", Welded, Carbon steel, Class 150, Raised Face flange

Pipe Size In Inches	Attachment	Material	Class	Style
2 = 1/4"	FW =Welded	CS =Carbon Steel	150	RF =Ansi raised face
3 = 3/8"	FT =Threaded	S =316 Stainless	300	
4 = 1/2"			600	
6 = 3/4"				
8 = 1"				

INLET PORT POSITION

Upper inline (max. 2 GPM)	=	U
Lower offset	=	L

FLUID CHARACTERISTICS

Viscosity number followed by a 'V' (for SSU), 'C' (for centipoise), or 'CS' (for centistokes) followed by the specific gravity. Example: **320V.9** would indicate a fluid with a viscosity of 320 SSU with a specific gravity of .9.

A1

W L -

C - 5D

SERVICE

Oil and dust tight (Type 12) Available on "A", "L" and "Z" only = N
 Weatherproof (Type 4) Available on all boxes = W
 Weatherproof, corrosion proof (Type 4X) Available on all boxes = X

FLOW DIRECTION

Left to right = R
 Right to left = L
 Up = U
 Down = D

SPECIAL OPTIONS (See explanations below)

High-temp- 400°F (300°F for transmitter options) = HT
 High accuracy (+/-3%) ref. page 4 = HA
 Stainless steel ID tag = ST
 Safety Glass window ref. page 4 = TG
 Wall mounting bracket ref. page 4 = W
 Foot mounting bracket ref. page 4 = F

SWITCH SETTING

No symbol = Lowest possible setting (usually 10% of maximum flow)
 Desired set point is assumed to be in flow units already selected (GPH). Give flow rate followed by a "D" for flow going down (flow failure) or a "U" for flow going up.
 Example, 5D indicates a setting of 5 GPH in declining flow.

5D

CONTROL BOX & READOUT



"A", "L" and "Z" Boxes

"A", "L" and "Z" boxes are small, simple and cost effective. Available with analog display, mechanical switches or transmitters (HART or 4-20mA).

A Box L Box Z Box

A, L and Z small control box in the following configurations and materials: Polysulfone Aluminum 316 SS

	A Box	L Box	Z Box
4-20 mA transmitter (Intrinsically safe with approved barriers)	AX0	LX0	ZX0
HART with programmable switch points	AH0	LH0	ZH0
Display only	A0	L0	Z0
One SPDT (3 wire)	A1	L1	Z1
One high vibration SPDT (3 wire)	A1B	L1B	Z1B
Two SPDT (3 wire)	A2	L2	Z2
Two high vibration SPDT (3 wire)	A2B	L2B	Z2B
One SPDT (4 wire)	A3	L3	Z3
Two SPDT (4 wire)	A4	L4	Z4
One SPDT (3 wire) high temperature	A61	L61	Z61
Two SPDT (3 wire) high temperature	A62	L62	Z62
One SPDT (3 wire) gold contact	A71	L71	Z71
Two SPDT (3 wire) gold contact	A72	L72	Z72
One SPDT (3 wire) hermetically sealed	A53	L53	Z53
Two SPDT (3 wire) hermetically sealed	A54	L54	Z54



"R" Box

"R" box is selected for greater visual resolution. It holds switches (general purpose and hazardous location all classes, groups and divisions) and transmitters (HART or 4-20 mA). Switch (standard service) and transmitter are offered in this control box together when signal redundancy is desired.

R Box

Flow rate display plus:

Display only	R0
One SPDT (3 wire)	R1
One high vibration SPDT (3 wire)	R1B
Two SPDT (3 wire)	R2
Two high vibration SPDT (3 wire)	R2B
One SPDT (4 wire)	R3
Two SPDT (4 wire)	R4
One SPDT (3 wire) high temperature	R61
Two SPDT (3 wire) high temperature	R62
One SPDT (3 wire) gold contact	R71
Two SPDT (3 wire) gold contact	R72

Flow rate display, Hazardous location switches as follows:

For > 5 amp circuits	
One SPDT hazardous location	R7
One DPDT hazardous location	R17
Two SPDT hazardous location	R18
Two DPDT hazardous location	R19
For < 1 amp circuits	
One SPDT hazardous location	R20
One DPDT hazardous location	R21
Two SPDT hazardous location	R22
Two DPDT hazardous location	R23
One SPST hazardous location proximity	R30
Two SPST hazardous location proximity	R31

Flow rate display, 4-20 mA transmitter plus options as follows:

Display and transmitter only	
(Intrinsically safe with approved barriers)	RX0
One SPDT (3 wire)	RX1
Two SPDT (3 wire)	RX2
One SPDT (4 wire)	RX3
Two SPDT (4 wire)	RX4
One SPDT (3 wire) high temperature	RX61

Flow rate display, HART output plus options as follows:

HART output only	RH0
One SPDT (3 wire)	RH1
Two SPDT (3 wire)	RH2
One SPDT (4 wire)	RH3
Two SPDT (4 wire)	RH4

T Box

"T" Box

"T" box always has a transmitter (4-20 mA or HART) and can be in combination with a mechanical switch for redundancy. It has two junction boxes to separate wiring for switches and transmitters. The display can be analog or digital LCD.



Pointer, scale and 4-20 mA plus option:

No switches (Intrinsically safe with approved barriers) TX0
 One SPDT (3 wire) TX1
 Two SPDT (3 wire) TX2
 One SPDT (4 wire) TX3
 Two SPDT (4 wire) TX4
 One SPDT (3 wire) high temperature TX61

HART, pointer, scale plus option:

Two programmable HART switches TH0
 One SPDT (3 wire) TH1
 Two SPDT (3 wire) TH2
 One SPDT (4 wire) TH3
 Two SPDT (4 wire) TH4
 One SPDT (3 wire) high temperature TH61



LCD readout, 4-20mA with 2 open collectors:

No switches (Intrinsically safe with approved barriers) TXL0
 One SPDT (3 wire) TXL1
 One SPDT (4 wire) TXL3
 One SPDT (3 wire) high temperature TXL61

ENGINEERING DATA

Maximum fluid temperature: 200°F (93°C)

Optional max. fluid temperatures: 300 & 400°F (148 & 204°C) (option HT)

Maximum ambient temp: 150°F (65°C) CSA listed only to 105°F (41°C)

Series LL max. operating pressures:

With plastic cap: (3:1 safety factor): 150 PSI (10.34 BAR)

With metal cap: (3:1 safety factor): 300 PSI (20.69 BAR)

Series LP max. operating pressures: (2:1 safety factor): 500 PSI (34.48 BAR)

Series LH max. operating pressures: (2:1 safety factor): 1500 PSI (103.45 BAR)

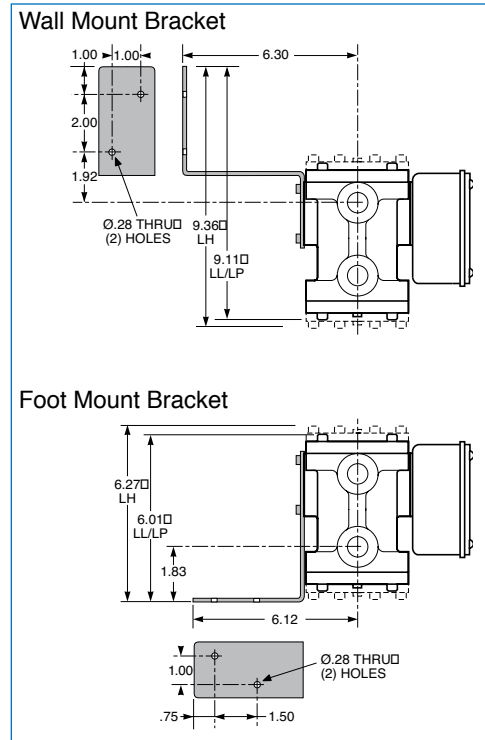
Pressure drop: 5 PSI (.35 BAR) at full scale

Readout accuracy, full scale: ±5%

Switch repeatability is 1% of actual flow

INSTALLATION

Flow monitors mount in-line or offset and are typically supported by rigid pipe. For additional support when using tubing or flexible hose, order special options **W** (wall) or **F** (foot) mounting brackets.



SPECIAL OPTIONS

High temperature: (option HT) requires all-metal construction (M Cap material) with seals of Viton, EPR, Kalrez or Teflon (compatible with fluid). A thermal barrier (heat-resistant cloth) is added between the housing and the control box, which must be used with service option "W" (weatherproof) or "X" (corrosion resistant). A metal scale is provided.

High Accuracy: (option HA)

Modification of full scale to +/-3%. HA not available with transmitter or R7, R17, R18, R19 switch options. Requires flow rates of 1 GPM or greater.

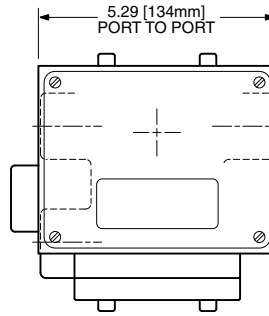
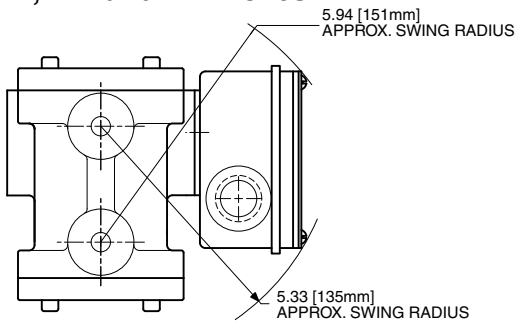
Identification tag: (option ST) customer-supplied information is stamped on a stainless steel tag that is attached to the nameplate.

Safety Glass window:

(option TG) replaces the standard window with "Laminated Safety Glass" ANSI Z97.1 and CPSC 1601 CFR 1201.

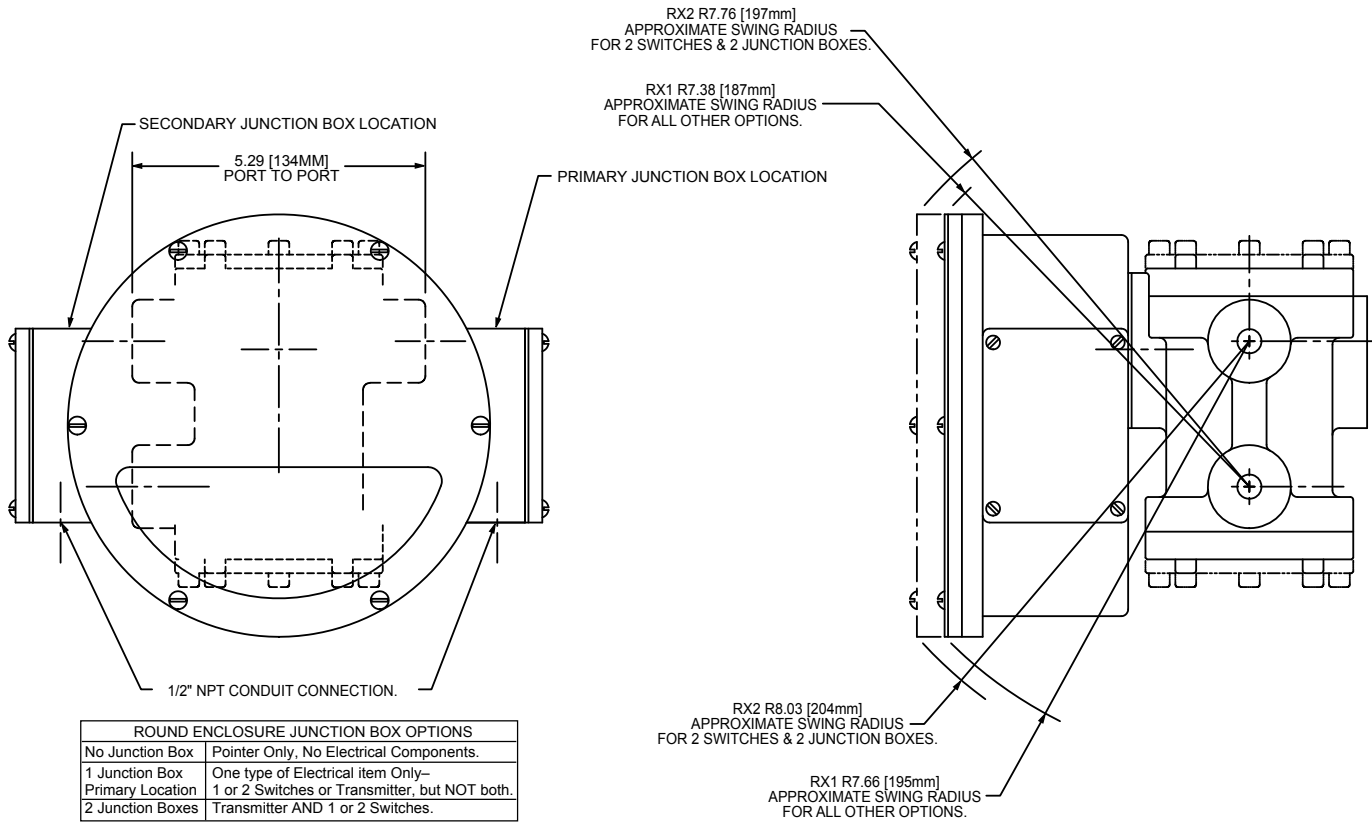
CONTROL BOX SELECTION GUIDE

“A”, “L” and “Z” Boxes



Maximum installation dimensions

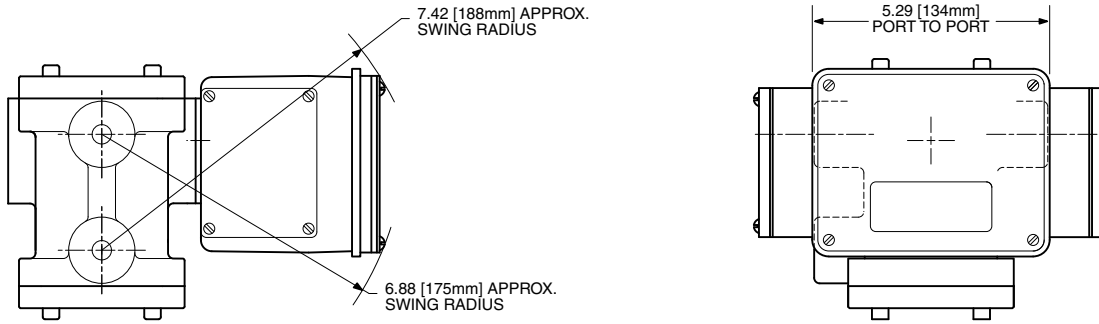
“R” Box



Maximum installation dimensions

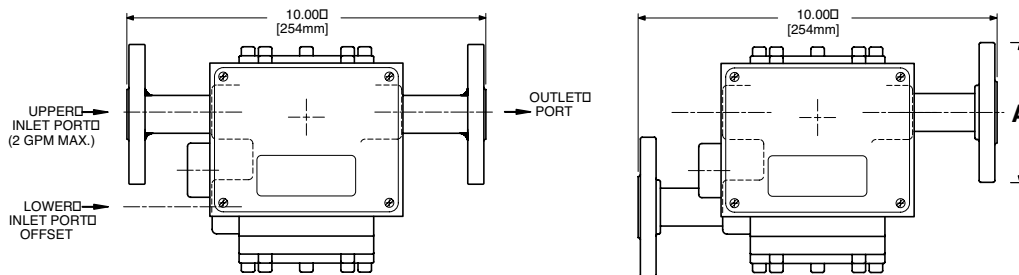
CONTROL BOX SELECTION GUIDE

“T” Box



Maximum installation dimensions

Flanged Face to Face Dimensions for In-Line and Offset Installation



With 150 lb R.F. flanges
(for other flanges consult factory)

Port Size (inches)	A (inches)
1/2	3.50
3/4	3.88
1	4.25



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