

RCM**7000/8000 Series Liquid/Gas/Steam Flow Meter***Differential Pressure Type, 1/4" to 8" Pipe, Alarm, Freq. & Analog Outputs***DESCRIPTION**

Use the 7000/8000 series flow meters for measuring the flow rate of liquids, gases, compressed air or steam in closed pipes. Flow switch and flow transmitters options for process monitoring and control are standardly available. The meters feature a large easy to read analog dial with 270 degree pointer movement or a digital display where both rate and total measurements displayed.

The 7000/8000 series measures flow based on a pressure differential created across a built-in calibrated nozzle. The meter is self-contained and complete. It does not require external power connections, separate orifices, or blocking, purging or equalizing valves.



7000/8000 series are suitable for measuring water, oil and most other low viscosity liquids which do not deposit out and which are compatible with the materials of construction. The flow meters are also suitable for measuring compressed air, oxygen, carbon dioxide and many other non-toxic compressed gases (Specify Option I). Saturated steam can also be measured up to 120 psig (Option K).

Models can be fitted with a transmitter with current or frequency outputs for remote indication or totalization, or with reed switch contacts for signaling high or low flows.

Typical applications include: lube oil monitoring, blending processes, cooling water, reverse osmosis systems and compressed air measurement.

SPECIFICATIONS**GENERAL**

Accuracy: $\pm 3\%$ F.S.

Repeatability: $\pm 1\%$ F.S.

Pipe Sizes: 1/4" to 8"

Mechanical Dial: 270°, see Dial & Scales Table

Optional Digital Flow Display/Totalizer: Loop powered 4-20 mA, two-wire, 4 1/2 digit flow display, 8 digits for totalization, includes square root extraction.

Flow Range Turn Down Ratio: 6 to 1

Flow Ranges: See flow tables (Full scale ranges from 4 GPH to 3000 GPM liquid, 40 SCFH to 20,000 SCFM gas)

Pressure, max: 180 psig (12.6 kg/cm²); 400 psig optional

Pressure, min: 10 psig (0.67 kg/cm²)

Temperature, max: 212°F (100°C); 350°F (177°C) optional

Temperature, min: -30°F (-34°C); -80°F (-62°C) optional

Viscosity, max: 5 centipoise (to 500 cps optionally available)

Housing: Super ABS, UV stabilized; Epoxy coated aluminum optional

Flowmeter Body: Bronze; Monel or 316 SS optional

Bellows: Bronze; Monel or 316 SS optional

Seals: Buna-N; Viton, EPR, Teflon optional

Crystal: Polycarbonate

Gear Movement: Bronze; 316 SS optional

Pressure Drop: Bronze, max 5 psig; SS & Monel, max 7 psig

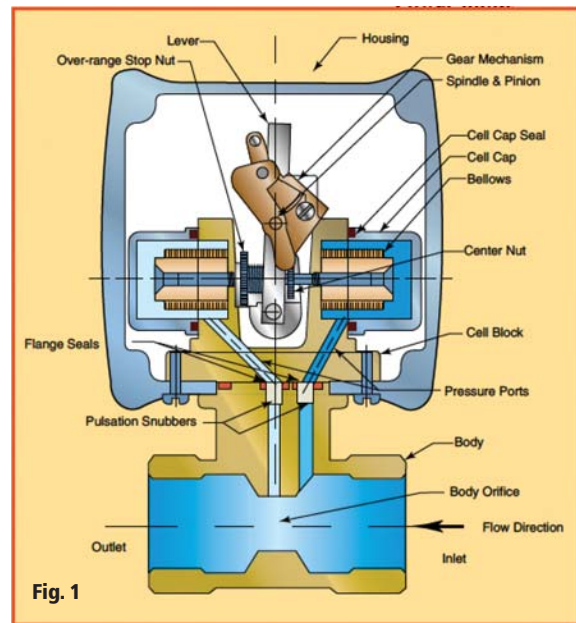


Fig. 1

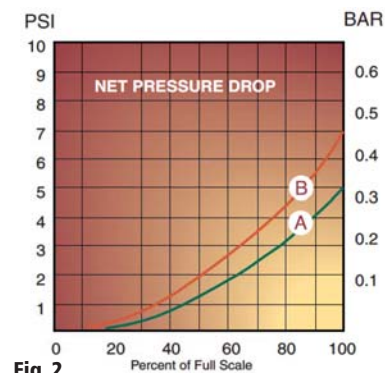
7000 Series Cutaway View

Fig. 2

Pressure Drop Characteristics

Bronze Meters- Curve A

Monel & SS Meters- Curve B

Option H (400 psig)- Curve B

FLOW TABLES

Size		Liquid		Gas		Steam
Inches	mm	GPM	LPM	SCFM	Nm ³ /h	#/h
1/4	08	2	8	10	15	40
1/4	08	3	15	20	30	60
1/4	08	4	25	30	50	80
1/2	15	2	8	10	15	40
1/2	15	3	10	20	30	60
1/2	15	4	15	30	50	80
1/2	15	6	25	40	80	120
1/2	15	10	40	60	100	200
3/4	20	6	25	60	100	120
3/4	20	10	40	100	150	200
3/4	20	15	60	150	200	300
3/4	20	20	80	200	300	400
1	25	15	60	150	250	300
1	25	20	80	200	400	400
1	25	30	120	300	500	600
1	25	40	150	400	600	800
1-1/2	40	30	120	300	500	600
1-1/2	40	40	150	400	600	800
1-1/2	40	60	240	600	1000	1000
1-1/2	40	100	400	800	1200	2000
2	50	40	150	400	600	800
2	50	60	240	600	1000	1000
2	50	100	400	800	1200	2000
2	50	150	600	1000	1500	3000
2	50	200	800	1200	2000	4000
3	80	200	800	1000	1500	4000
3	80	300	1000	2000	3000	6000
3	80	400	1500	3000	5000	8000
3	80	500	2000	4000	6000	10000

Size		Liquid			Gas	
Inches	mm	GPH	LPM	cc/m	SCFH	Nm ³ /h
1/2	15	4	15	200	40	1
1/2	15	6	20	300	60	2
1/2	15	10	40	400	100	3
1/2	15	15	60	600	150	4
1/2	15	20	80	1000	200	6
1/2	15	30	120	2000	300	8
1/2	15	40	150	3000	400	10
1/2	15	60	240	4000	-	-
1/2	15	100	400	6000	-	-

Size		Liquid		Gas		Steam
Inches	mm	GPM	LPM	SCFM	Nm ³ /h	#/h
2-1/2	65	80	240	600	1000	1000
2-1/2	65	100	400	800	1200	2000
2-1/2	65	150	600	1000	1500	3000
2-1/2	65	200	800	1200	2000	4000
4	100	300	1000	1500	50	6000
4	100	400	1500	3000	100	8000
4	100	600	2400	5000	150	10000
4	100	800	3000	6000	200	15000
5	125	300	1000	1500	50	6000
5	125	400	1500	3000	100	8000
5	125	600	2400	5000	150	10000
5	125	800	3000	6000	200	15000
6	150	600	2400	3000	100	10000
6	150	800	3000	5000	150	15000
6	150	1000	4000	8000	250	20000
6	150	2000	8000	15000	400	40000
8	200	600	2400	5000	150	10000
8	200	1000	4000	8000	250	20000
8	200	2000	8000	15000	400	40000
8	200	3000	12000	20000	600	60000



7000 Series



8000 Series



7000 Series (VUL Orientation)

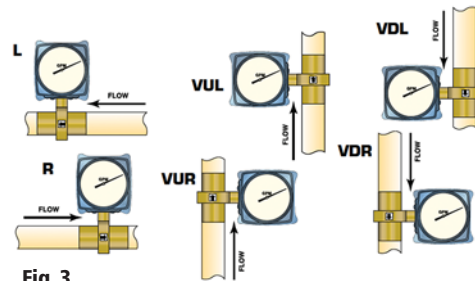


Fig. 3 Meter Housing & Indicator Orientation Choices & Designations

Range		Smallest Increment	Range		Smallest Increment
Max	Min		Max	Min	
1	0.15	0.01	100	15	1
2	0.30	0.05	120	15	1
3	0.40	0.05	150	20	2
4	0.50	0.10	200	30	2
6	0.50	0.10	240	30	2
8	1.0	0.10	250	30	5
10	1.5	0.10	300	40	5
15	2.0	0.20	400	50	10
20	3.0	0.50	600	50	10
25	3.0	0.50	800	100	10
30	4.0	0.50	1000	150	10
40	5.0	1.0	1500	200	20
50	6.0	1.0	2000	300	20
60	5.0	1.0	3000	400	50
80	10.0	1.0	4000	500	100

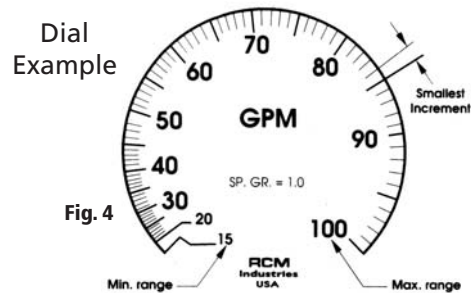


Fig. 4

OPTIONS

Table 5 Options	
Option	Description
A	Viton seals
B	EPR seals
B2	Teflon seals
C	Calibrate for Specific Gravity
D	Gasketed case (NEMA-4X, IP-66)
DR-1	Remote Digital Display, Rate/Total/Accum. Total
E	Non-standard flow rate
ES	Low flow rate (below 2GPM)
F	Aluminum housing with plastic dial crystal
F2	Aluminum housing with glass dial crystal
G	Custom scale/dial
H	High pressure service (400 psig/Inconel bellows)
I	Compressed gas service
J	Peak flow indicator (second pointer w/reset)
K	Saturated steam service
N	Ammonia service

Table 5 Options Continued	
Option	Description
P	Panel mount (1/4 & 1/2")
R2	Remote readout, Bronze
R3	Remote readout, 316 SS
T	Expanded Temperature Range
V	High Viscosity (5-500 cps- specify)
W	4-20 mA (linear)
W2	4-20 mA w/local mechanical indicator, (requires external square root extractor)
W3	4-20 mA (same as W2 but no indicator)
X	Hi/Lo alarm relays
Y	Frequency Output
-EM	European Labeling
-IS	Intrinsic Safety for W2 & W3 (consult factory for details)
-1S2	1 single throw double pole reed switch
-2S2	2 single throw double pole reed switches

OUTPUT OPTIONS (W, X,Y, Z, W2, W3, Y, IS, 1S2, 2S2)

Table 6

Transmitter 4-20 mA Output	4-Wire (Order Options W,X,Y,Z)	2-Wire (Order Options W2 & W3)
Accuracy Horizontal Flow	±3% F.S. above 30% F.S.	
Accuracy Vertical Flow	±5% F.S. above 30% F.S.	±3% F.S. above 30% F.S.
Ambient Temp Limit	120o F (50° C)	
Current Output	4-20 mA into 800 ohms max.	4-20 mA into 650 ohms max. (350 ohms with option R)
Hi/Lo Alarm (Option X) Contact Rating	3.0 A @24V, 1A@117V, 0.5A@ 230V	N/A
Frequency Output (Option Y)	1000 Hz F.S. 5 V peak, 270 µs on time	N/A
Electrical Rating	General Purpose	Option IS: Intrinsic safety for Class I Div I Groups A,B,C,D; Class II Div I Groups E,F,G; EEx ia IIC T3 25mA, 24 Vdc per meter.
Power Input	100mA, 24 VDC	25mA, 24 VDC
Reed Switches (Options 1S2 & 2S2)		
Setability	±5% F.S.	
Repeatability	±1% F.S.	
Hysteresis	7-13% F.S.	
Contact Rating	10 watts	
Voltage	175 VDC Max., 125 VAC Max.	
Current	350 mA Max.Switching	



**OPTION W3 2 WIRE FLOW TRANSMITTER
NO DISPLAY**

OPTION DESCRIPTIONS

Table 7

Option	Description
A & B	O-Ring Seals: Viton* (option A), EPR (option B) or Teflon* (PTFE) (option B2) O-rings may be supplied in lieu of the standard Buna-N O-ring.
C	Calibration for Specific Gravity: All flow meters are normally calibrated for water with a specific gravity of 1.0 (density of 62.4 lbs./ft.3). This option provides a custom sized orifice to accommodate the actual specific gravity of the measured liquid.
D	Gasketed Meter Housing: If the meter is to be exposed to the weather, marine service, splashing liquids, corrosive vapors, or extreme humidity or dusty conditions, then a gasketed meter housing is recommended. Gaskets are installed at the body flange, back cover plate and under the dial crystal to
DR-1	Remote digital display (rate & total):DR-1 displays instantaneous flow rate, total and accumulated total. A scaled pulse output is according to accumulated total is standard.
E	Non-Standard Flow Rates: Various fullscale flow rates are available for each pipe size as indicated in the charts of "Standard Flow Rates and Body Sizes". Special orifices can be furnished for smaller flows. Consult factory if this option is desired.
ES	Low Flow Rates: A low flow meter is available with 1/2" female NPT connections for measuring the flow of liquids as low as 1 GPH and gases as low as 10 SCFH.

OPTION DESCRIPTIONS CONTINUED

Option	Description
G	Custom Scales & Dials: Non-standard flow rates and custom dial patterns require preparation of special artwork. A one-time charge is made for each custom dial pattern or non-standard scale.
H	400 PSIG Service: Meters equipped with bellows made of Inconel 718 TM are available with service ratings to 400 psig and may be used where service conditions permit use of stainless steel. A slight increase in pressure drop across the meter results when these bellows are used. (See Pressure Drop Characteristic table)
I	Compressed Gas Service: Meters intended for compressed gas service require individual sizing of meter orifices to suit the desired flow rate, gas composition, line pressure and temperature. Dials are marked with type of gas, specific gravity, line pressure and temperature.
J	Peak Flow Indicator: A second pointer is provided with a reset knob to provide an indication of the maximum flow rate achieved since reset.
K	Saturated Steam Service: The steam service option includes EPR seals, SS bellows and an inverted aluminum housing. Steam pressures are limited to 120# saturated unless remote mounted (Option R2 & R3)
N	Ammonia Service: This option includes brass free construction throughout, EPR seals, a stainless gear movement and gasketed case, Price includes calibration for specific gravity, pressure and temperature. This option is available for stainless steel models only.
P	Panel Mount: The meter may be mounted behind a panel for pipe sizes 1 1/2" and smaller
R2 & R3	Remote Readout: Adapters and 3-way equalizing valve provide extended temperature ranges or remote mount for more convenient viewing,
T	Extended Temperature Range: Materials suitable for a range of 80°F to 350°F are provided, Higher temperatures available in combination with option R2 and R3. Consult factory.
V	Calibration for High Viscosity Liquids: Liquids having a high viscosity cause flow meters to read high; however, this effect is slight for liquids having viscosities less than 5 centipoises. Heavy lubricating and fuel oils with viscosities up to 500 cps require special sizing of the flow meter orifice.
W	Current Output: The flow meters are available with 4-20 mA output for interfacing with remote indicators, controllers, computers and alarms. Option W uses a solid state sensor (Hall Effect) to detect the position of the pointer lever mechanism. Low flow cutoff drives the output to 4 mA when flow drops below approximately 30% of full scale. Output is linear with flow rate.
W2 & W3	Current Output: Options W2 and W3 use a solid state strain-gauge to sense the differential pressure directly. Option W2 includes a mechanical flow indicator. Option W3 does not. Conditions which could cause the mechanical movement zero to shift will not affect the output from this transmitter. This transmitter provides improved rangeability at low flow rate and accordingly, does not include a low flow cutoff. Output is proportional to flow rate squared (r ²). Square root extraction is required in the receiving device.
X	Limit Switches: A pair of limit switches can be ordered to provide high and low limit signals. Relay contacts (N.O.) provide simple connection to electrical interlock circuits or alarm indicators. Potentiometers are provided for adjusting set points. Red and green LEDs indicate relay operation.
Y	Frequency Output: A 0- 1000 Hz frequency output is available to drive batch controllers or scaled electronic counters. The frequency output becomes 0
Z	Combination: This option combines option W, X and Y in the same unit.

TO ORDER:

A-BC-D-E-FGHI

Example: 3/4"-71-B-20-AD1S2 (3/4" NPT Series 7000 meter of bronze construction, flow direction from left to right, flow range of 20 GPM full scale, equipped with optional seals of Viton, optional gasketed case and one single-pole double throw reed switch).

Table 8

A Size	B Flow Meter Series	C Body Material	D Flow Direction	E *Full Scale Flow Range (GPM)	F, G, H, I Options
Select from tables 1, 2 & 3	7= 7000 Series (NPT Thread) 8= 8000 Series (Wafer Mount)	1= Bronze 2= Monel 3= 316 Stainless Steel	See Fig. 3 L= Right to left R= Left to right VUL=Vertical up, meter left VUR=Vertical up, meter right VDL=Vertical down, meter left VDR= Vertical down, meter right	Select from Tables 1, 2 & 3	Select from table 5
*Call us for gas and steam service as operating conditions must be known for proper calibration & marking of the product. For low flow rates (Table 2) specify F.S. flow rate in GPH followed by Option ES. For example 1/2"-71-B-4-ES					

ACCESSORIES

Table 9

Accessory P/N	Description
SK-1	Compressed Air Survey Kit
DR-1	Remote Digital Readout (requires transmitter)
PS-24	Power Supply, 115 Vac in 24 Vdc out, 100 mA
KT-1	Brass fittings for connecting remote readout option R2. Includes 2 -1/4" shutoff valves and selection of compression fittings.
KT-3	Stainless Steel fittings for connecting remote readout option R3. Includes 2 -1/4" shutoff valves and selection of compression fittings.
SS	Stainless steel tag, permanently affixed
CT	Cardboard Tag



SK-1 Compressed Air Survey Kit

- Includes:
- Series 7000 Flow meter w/3 1/2" dial
 - Light weight aluminum body
 - Selection of 5 range orifices
 - 4" pressure gage for field recalibration
 - Quick change aluminum pipe adaptors
 - Orifice change tool
 - Rugged carry case & manual and pressure & temperature correction factors

Accuracy: ±3% F.S.
Pipe Size: 1/2 or 3"
Dial Indication: 100%
Flow Ranges: 5 customer selected (max 400, 2000, 4000 SCFM for 1", 2", 3" respectively)
Calibrated Pressure/Temperature: 100 psig/80°F
Pressure Gage Accuracy: ±1% F.S



DR-1 Remote Digital Display

DR-1 displays instantaneous flow rate, total and accumulated total. A scaled pulse output is according to accumulated total is standard. DR-1 is a very compact design, loop powered display with optional backlighting green/amber.

The DR-1 digital display can be connected as a remote display to our 4-wire transmitter output option W (4-20mA linear output signal), 2-wire loop powered transmitter option W2 or W3 (4-20mA loop powered signal) where output is proportional to flow rate squared. A 4-20 mA loop powered flowmeter (RW3) that integrates the DR-1 display is available, contact us for details. Refer to the Installation & Programming Manual for details.

Numeric password protection prevents unauthorized access to menu. The easy to read menu prompts make the digital display so easy to program. An isolated scaled pulse output is available for

hook up to a remote totalizer or batch controller. Requires 24Vdc power supply not included (option PS-24).

GENERAL

Power Input:

- 100mA, 24Vdc power supply (optional accessory)
- Input loop powered from sensor signal 4-20mA

Display:

- High intensity reflective numeric and alpha numeric LCD, UV resistant
- 7 and 11 digits, various symbols & measuring units

LCD Update: 8 times per sec. to 30 sec.

Data Protection: EEPROM back up of totals every minute

Pass Code Protection

Optional:

- Backlighting Green / Amber (Requires 24Vdc Power Supply)

Environmental:

- Standard Unit: -40°F (-40°C) to +178°F (80°C)
- Intrinsically Safe: -40°F (-40°C) to +158°F (70°C)

Signal Inputs:

- Full Scale Range: 4 to 20 mA DC
- Voltage Drop: 2.6Vdc @ 20mA
- Update Time: 4 times / sec.
- Span: 0.001 / 999,999 with variable decimal position

Signal Output:

- Pulse output transmitting accumulated total
- One passive transistor output (NPN)
- Max. 500 Hz pulse length user definable between 1 msec up to 10 sec.

Listing:

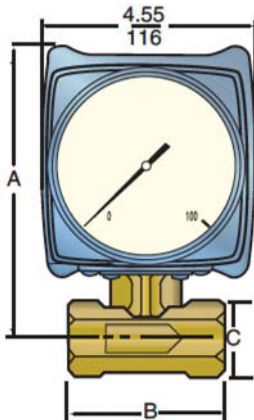
- Electromagnetic Compatibility: EN 61326 (1997), EN61010 - 1 (1993)

Accuracy:

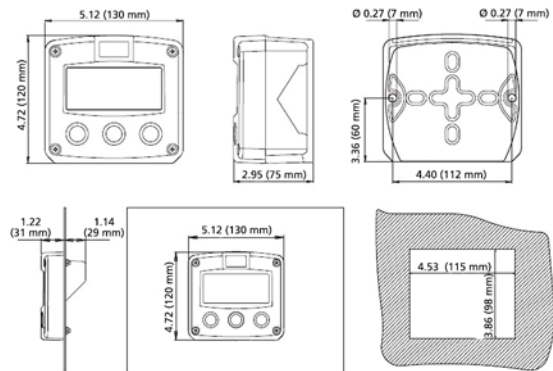
- Resolution 16 bit error < 0.01mA / ±0.05% F.S.
- Low level cut-off programmable

DIMENSIONS INCHES(MM)

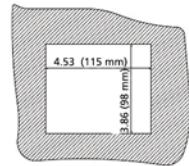
Table 10 Dimensions 7000 Series									
Size	A		B		C		D		E
	in.	mm	in.	mm	in.	mm	in. Hex	mm Hex	
1/4"	5.95	151	3.06	78	1.50	38	1.25	32	4 (2.3)
1/2"	5.95	151	3.06	78	1.50	38	1.25	32	4 (2.3)
3/4"	5.95	151	3.06	78	1.50	38	1.25	32	4 (2.3)
1"	6.07	154	3.06	78	1.75	44	1.50	38	5 (2.7)
1-1/2"	6.39	162	3.06	78	2.60	64	2.12	54	5 (2.7)
2"	6.80	172	3.19	81	3.19	81	2.75	70	7 (3.2)
3"	7.48	190	4.19	106	4.62	117	4.00	102	12 (5.5)



DR-1 Housing



DR-1 Panel Mount



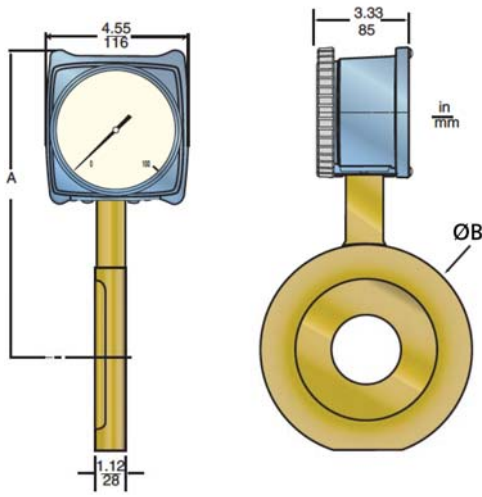
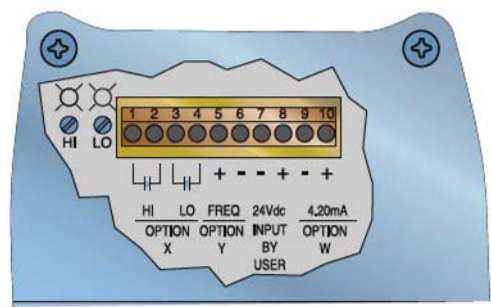
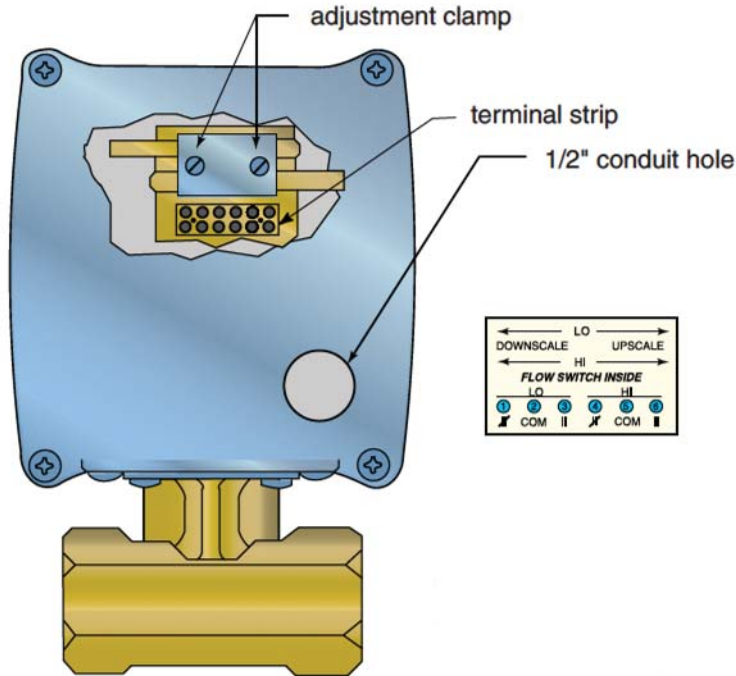


Table 11 Dimensions 8000 Series					
Size	*A		B		Weight
	in.	mm	in.	mm	lbs (kg)
1/2"	6.62	168	1.69	43	4 (1.8)
3/4"	7.06	179	2.00	51	5 (2.3)
1"	7.25	184	2.38	60	5 (2.3)
1-1/2"	7.81	198	3.12	79	7 (3.2)
2"	8.00	203	3.75	95	8 (3.6)
2-1/2"	8.54	217	4.25	108	9 (4.1)
3"	8.87	225	5.00	127	11 (5.0)
4"	9.95	252	6.13	156	15 (6.8)
5"	10.36	263	7.38	187	20 (9.1)
6"	11.05	280	8.38	213	24 (10)
8"	12.20	311	10.38	264	33 (15.0)

*Subtract 2.00 inches (51 mm) for option W3

CONNECTION DETAIL

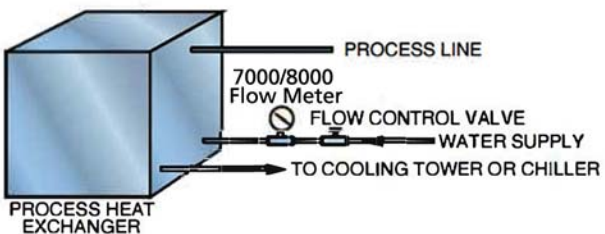


Options W, X, Y, Z

Reed Switch Options 1S2 & 2S2

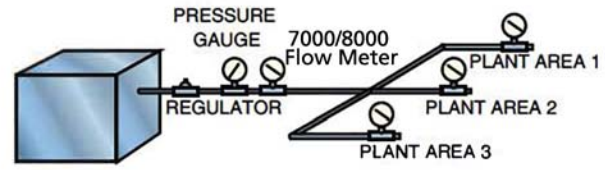
Refer to installation and operating manuals for detailed wiring and installation instructions.

TYPICAL APPLICATIONS



Process Control

Use 7000/8000 flow meter to measure the optimum flow rate for cooling water under various load conditions. The Flo-Gage can then be used to quickly set the most economical flow rate.



Compressed Air Monitoring For Energy Conservation

Mount a 7000/8000 flow meter downstream of a pressure regulator to monitor compressor operation and air utilization. Flow meters can be used at the compressor as well as at key distribution points. Reduction in wasted air can pay back installation cost in as little as a few weeks.