MAX FLOW SIZES FROM
10 TO 160 GPM
(60 TO 600 LPM)

MAX LIQUID PRESSURE 300 PSI	(20.69 BAR)	**MN SERIES**
MAX LIQUID PRESSURE 500 PSI	(34.48 BAR)	**MM SERIES**
MAX LIQUID PRESSURE 2000 PSI	(137.93 BAR)	**MH SERIES**

Flow meters, Flow switches and Flow transmitters

A Medium Vane-Style For Liquids

MN Series, "A" style control box

CSA Certified NRTL/C

CE Marked (as noted)

NIST Traceable Calibration Certificate Available

DESCRIPTION

These are variable area meters with a spring biased semi-circular vane that opens wider with more flow. They are installed in-line in any position. Straight pipe runs before or after the meter are not required. The simple mechanical connection directly drives pointers, 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 or both (for signal redundancy). The switches can be general purpose or rated for hazardous locations (all classes, groups and divisions). The 4-20 mA transmitters are Intrinsically Safe if used with approved barriers.

CALIBRATION

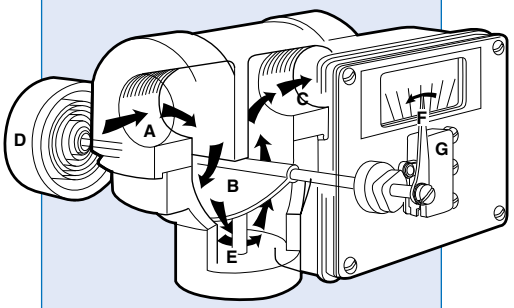
All flow meters are individually calibrated for fluids with the viscosity you specify (up to 3000 SSU/650 Centistokes). We also compensate for your fluid's specific gravity. For NIST Traceability please consult factory.

CONSTRUCTION MATERIALS

The meter body, internal moving parts, and seals are offered in a variety of materials to suit a wide range of applications, such as: water, synthetic and petroleum based oils, paint, corrosives and solvents. 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 enters at **A**, passes around the semi-circular vane **B**, exits at outlet **C**. The vane resists the flow because of the spring **D**. The further the vane is pushed the larger the passageway **E** becomes. This minimizes the pressure drop. The vane shaft turns to operate the pointer **F** and remote signal devices such as the switch **G**.

Viton® and Kalrez are registered trademarks for DuPont Performance Elastomers.

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

EXAMPLE: MN - B S B 7ØGM - 8 - 32ØV.9 -

SERIES BY PRESSURE RATING		
Normal pressure (300 PSI)	=	**MN**
Medium pressure (500 PSI)	=	**MM**
High pressure (2000 PSI)	=	**MH**

HOUSING MATERIAL	WHERE USED			
Aluminum with nylon flow chamber	Lube oil	=	**A**	MN only
Brass with nylon flow chamber	Water	=	**B**	
Naval bronze with nylon flow chamber	Specialty	=	**W**	
Aluminum	Lube oil	=	**D**	MN or MM
Aluminum (hard coated)	Lube oil with exterior corrosion protection	=	**E**	
Brass	Water	=	**F**	
Naval bronze	Sea water	=	**U**	
Stainless steel (316)	Chemicals, corrosives	=	**I**	MH, MM or MN
Cast iron	Oil	=	**C**	
Cast iron, nickel plated	Water, oil with exterior corrosion protection	=	**N**	
Carbon steel	Oil	=	**M**	
Carbon steel, nickel plated	Water, oil with exterior corrosion protection	=	**J**	

INTERNAL MOVING PARTS			
Stainless steel (300 series)	Standard for water, oil	=	**S**
Stainless steel (316 series)	Chemicals and corrosives	=	**I**
Titanium	Sea water	=	**T**
Monel	Corrosives	=	**L**

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		
	Not available with A, B or W "Housing Materials"	=	**T**

MAX FLOW RATE LIQUIDS			
GPM	1Ø, 15, 2Ø, 3Ø, 4Ø, 5Ø, 6Ø, **7Ø**, 8Ø, 9Ø, 1ØØ, 11Ø, 12Ø, 13Ø, 14Ø, 15Ø, 16Ø	=	**GM**
LPM	4Ø, 5Ø, 6Ø, 7Ø, 8Ø, 9Ø, 1ØØ, 15Ø, 2ØØ, 25Ø, 3ØØ, 35Ø, 4ØØ, 5ØØ, 6ØØ	=	**LM**
CMH	2.25, 2.5, 3, 4, 5, 6, 7, 8, 9, 1Ø, 15, 2Ø, 25, 3Ø	=	**CMH**

Hand operated globe valve integral to flowmeter body (MN series only)		
No Valve	=	**No Symbol**
Valve (brass)	=	**V**
Not available on carbon steel or stainless steel housings.		
Restricted to port sizes to 1-inch and flows to 30 GPM (50 GPM in 1-1/2-inch port housings)		

THREADED ATTACHMENT

Pipe size and attachment method

Pipe Size In Inches	NPT	SAE	BSPP	BSPT In GPM	Max Flow
1/2	**4**	**8T**	**8BP**	**8BT**	**25**
3/4	**6**	**12T**	**12BP**	**12BT**	**50**
1	**8**	**16T**	**16BP**	**16BT**	**70**
1 1/4	**1Ø**	**20T**	**2ØBP**	**2ØBT**	**70**
1 1/2	**12**	**24T**	**24BP**	**24BT**	**100**
2	**16**			**160**	

FLANGED

Ex: 4CS150RF = 1/2", Carbon Steel, Class 150, Raised Face flange

Pipe Size In Inches		Attachment	Material	Class	Style
4	= 1/2"	FW=Welded FT=Threaded	**CS**=Carbon Steel	**15Ø**	**RF**=Ansi raised face
6	= 3/4"		**S**=316 Stainless	**3ØØ**	
8	= 1"			**6ØØ**	
10	= 11/4"				
12	= 11/2"				
16	= 2"				

FLUID CHARACTERISTICS

Viscosity number followed by a 'V' (for SSU), 'C' (for centipoise), or 'CS' (for centistokes) followed by the specific gravity. Example: **32ØV.9** would indicate a fluid with a viscosity of 320 SSU with a specific gravity of .9. For dual viscosities (where there is a start up viscosity or where there may be a range) put in both values with a slash. Example: 32Ø/15ØV.9.

A1 W L - E - 1ØD

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		
High-temp- 400°F for A & R Box, 300°F for transmitter options	=	**HT**
Stainless steel ID tag for customer supplied information	=	**ST**
Pin connector (See explanation for special options.)	=	**PCxM** or **PCx**
CSA enclosure / PVC window	=	**C**
Tempered glass window	=	**TG**
Manual override (Required for field change of set point for switch)	=	**E**
Dual spring	=	**DS**
Clearance vane for ≥ 16 GPM	=	**Z86**
316 SS external bolts on MH-I but limits pressure max to 1500 PSI	=	**Z67MH**

SWITCH SETTING

No symbol = Lowest possible setting (usually 10% of maximum flow)

Desired set point is assumed to be in flow units already selected (GPM). Give flow rate followed by a "D" for flow going down (flow failure) or a "U" for flow going up. Example, 1ØD indicates a setting of 10 GPM in declining flow. **1ØD**

CONTROL BOX & READOUT

Basic Features	Additional Options	Standard resolution pointer and inscribed scale "A", "L" and "Z" Box Materials of Construction: Polysulfone	Standard resolution pointer and inscribed scale "A", "L" and "Z" Box Materials of Construction: Aluminum	Standard resolution pointer and inscribed scale "A", "L" and "Z" Box Materials of Construction: 316 Stainless	High resolution pointer and inscribed scale "R" Box Materials of Construction: Aluminum	Separate junction boxes (with terminal strips) for switch & transmitter "T" Box Materials of Construction: Aluminum
These options all include inscribed scale and pointer plus one of the standard (non hazardous location) switches selected to the right.	No switch	**AØ**	**LØ**	**ZØ**	**RØ**	
	One SPDT (3 wire), CE	**A1**	**L1**	**Z1**	**R1**	
	One high vibration SPDT (3 wire), CE	**A1B**	**L1B**	**Z1B**	**R1B**	
	Two SPDT (3 wire), CE	**A2**	**L2**	**Z2**	**R2**	
	Two high vibration SPDT (3 wire), CE	**A2B**	**L2B**	**Z2B**	**R2B**	
	One SPDT (4 wire)	**A3**	**L3**	**Z3**	**R3**	
	Two SPDT (4 wire)	**A4**	**L4**	**Z4**	**R4**	
	One SPDT (3 wire) high temperature	**A61**	**L61**	**Z61**	**R61**	
	Two SPDT (3 wire) high temperature	**A62**	**L62**	**Z62**	**R62**	
	One SPDT (3 wire) gold contact	**A71**	**L71**	**Z71**	**R71**	
	Two SPDT (3 wire) gold contact	**A72**	**L72**	**Z72**	**R72**	
These options all contain inscribed scale with pointer plus hazardous location switches selected to the right. Note that the box is not rated, only the switches.	One SPDT hazardous location (all classes, groups and divisions)				**R7**	
	One DPDT hazardous location (all classes, groups and divisions)				**R17**	
	Two SPDT hazardous location (all classes, groups and divisions)				**R18**	
	Two DPDT hazardous location (all classes, groups and divisions)				**R19**	
	One SPST hazardous location proximity (all classes, groups and divisions)				**R3Ø**	
	Two SPST hazardous location proximity (all classes, groups and divisions)				**R31**	
	One SPDT (3 wire) hermetically sealed	**A53**	**L53**	**Z53**		
	Two SPDT (3 wire) hermetically sealed	**A54**	**L54**	**Z54**		
These options all contain a 4-20 mA transmitter and one of the selections to the right.	No switches (Instrinsically safe with barrier)	**AXØ**	**LXØ**	**ZXØ**	**RXØ**	**TXØ**
	One SPDT (3 wire), CE				**RX1**	**TX1**
	Two SPDT (3 wire), CE				**RX2**	**TX2**
	One SPDT (4 wire)				**RX3**	**TX3**
	Two SPDT (4 wire)				**RX4**	**TX4**
	One SPDT (3 wire) high temperature				**RX61**	**TX61**
These options all include a 4-20 mA transmitter with a digital LCD display plus one of the selections to the right.	No switches					**TXLØ**
	One SPDT (3 wire), CE					**TXL1**
	One SPDT (4 wire)					**TXL3**
	One SPDT (3 wire) high temperature					**TXL61**

ENGINEERING DATA

Maximum fluid temperature: 200°F (95°C)
Optional max. fluid temperature: 300 & 400°F (150 & 205°C) (option **HT**)
Maximum ambient temperature: 150°F (65°C)
Readout accuracy, full scale: ±2%
Series MN max. operating pressures: (3:1 safety factor): 300 PSI (20.69 BAR)
Series MM max. operating pressures: (3:1 safety factor): 500 PSI (34.48 BAR)
Series MH max. operating pressures: (3:1 safety factor): 2,000 PSI (137.93 BAR)
Repeatability of switches 1% of actual flow rate

FLOW & PRESSURE DROP

Units with max flows to 80 GPM (300 LPM) impose a pressure drop that increases with flow from 1.9 to 3.8 PSI. Higher flow-rated models are made possible by having either a partial by-pass (which raises minimum indicated flow), dual springs (which raises the pressure drop), or both. The table shows minimum flow rates and pressure drops (PSI) (at max flow rates) for models rated from 100 to 160 GPM.

MAX FLOW RATE GPM/LPM	BYPASS ONLY Minimum Flow GPM/LPM	BYPASS ONLY Max Pressure Drop PSI	DUAL SPRING* Minimum Flow GPM/LPM	DUAL SPRING* Max Pressure Drop PSI
90/340	20/75	4.5	10/40	6.0
100/380	30/100	4.5	10/50	8.0
110/400	30/100	5.0	20/90	6.8
120/450	40/150	5.8	20/90	6.8
130/500	40/150	5.8	20/90	6.8
140/550	50/170	6.5	20/90	6.8
150/570	50/170	6.5	30/100	6.8
160/600	50/170	6.5	30/100	7.5

*When dual-spring is ordered you must specify special option **DS.** Some dual-spring units also have partial bypass to achieve high flow ranges.

SPECIAL OPTIONS

High temperature: (option **HT**) requires all-metal construction of housing/orifice cover 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.

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

Multi-pin connector: Pin connectors (option **PC**) are available for rapid field installation. Meters are provided with the male half of either a micro or a mini pin connector. Check the chart below for the number of pins required for your control box selection and current type. Insert the number of pins in the code PC__ for a mini connector or PC__M for a micro connector. For example, a PC5 would be a 5 pin mini and PC5M would be a 5 pin Micro. (See table below for number of pins required for each option.)

Tempered-glass window: (option **TG**) replaces the standard window. A tempered-glass window is employed where airborne solvents or high-ambient temperatures are common.

Manual override: (option **E**) provides an extended shaft you can manipulate to clear debris, simulate flow, adjust switch settings, etc. Same material as internals specified.

Clearance vane: (option **Z86**) the swing vane is modified to pro-vide extra clearance for liquids that contain particulate. Available for maximum flow range of 16 GPM or greater, this reduces the turndown to a minimum of 4 GPM.

Number of pins required for various combinations of current type, box type and switch option.

	AC switch options			**1, 1B, 61, 71**		**3**		**53**
	DC switch options	**0**	**1, 1B, 61, 71**	**3**	**2, 2B, 54, 62, 72**		**53**	
Box	A		3	4	6	5	3	4
	R		3	4	6	5	3	4
	RX	3						
	TX	3	3	4			3	4
	TXL	3	3	4			3	4

*This box allows micro pin connectors only. Eg. PC3M or PC5M.

CONTROL BOX SELECTION GUIDE

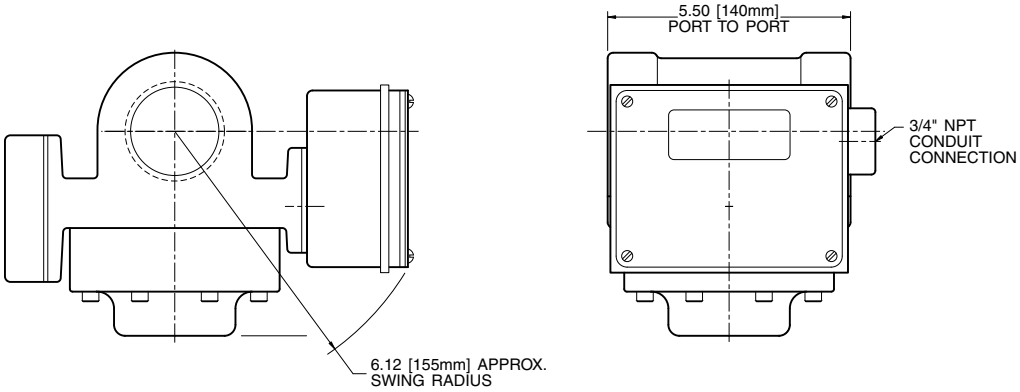
“A”, “L” and “Z” Boxes

“A” box is selected for price and simplicity.

It holds switches (general purpose and hermetically sealed) or 4-20mA transmitter.

You get this control box when you order any CONTROL BOX & READOUT starting with an “A” (see "How to Order" page). Examples: A1WR is a one switch, weatherproof box with flow from left to right.

This control box is made of Polysulfone (standard low cost “A”) with options for aluminum (“L”) or 316 stainless steel (“Z”).



Maximum installation dimensions

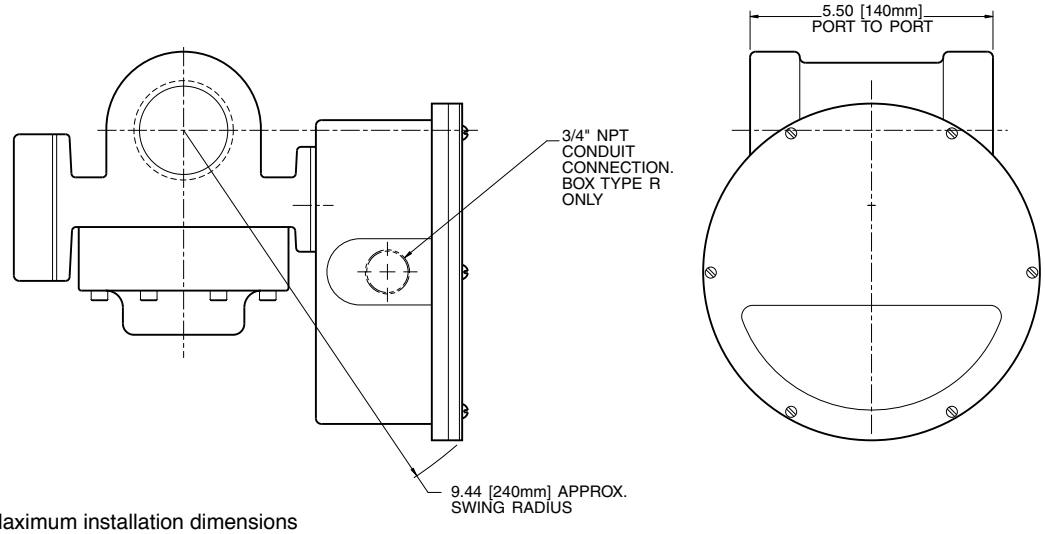
“R” Box

“R” box is selected for greater resolution (more increments on the inscribed scale).

It holds switches (general purpose and hazardous location all classes groups and divisions) and 4-20mA transmitter. Switch (standard service) and transmitter are offered in this control box together when signal redundancy is desired.

You get this control box when you order any CONTROL BOX & READOUT starting with an “R” (see "How to Order" page). Examples: R1WR is a one switch, weatherproof box with flow from left to right.

This control box is made from epoxy coated aluminum.



Maximum installation dimensions

CONTROL BOX SELECTION GUIDE

"T" Box

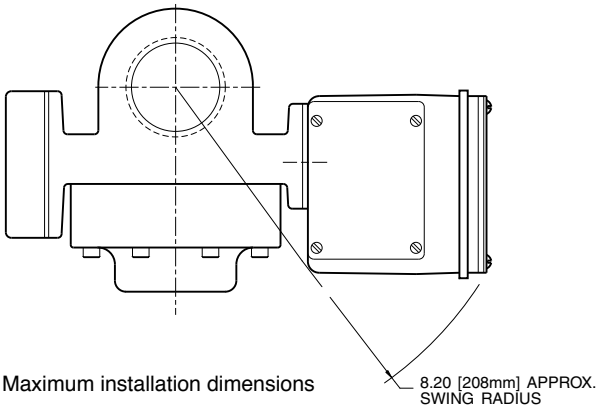
"T" box is selected for availability of two isolated junction boxes with terminal strips. This means that no direct wiring to switches or transmitters is required.

Digital LCD display of flow is optional ("TXL").

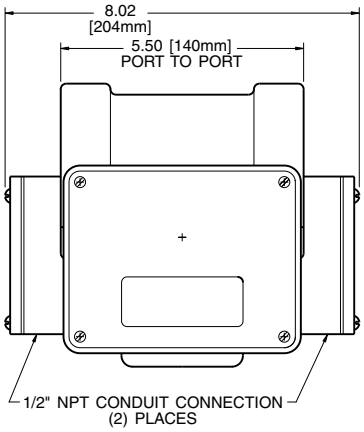
It holds switches (general purpose) and 4-20mA transmitter. Switch (standard service) and transmitter are offered in this control box together when signal redundancy is desired. These are wired to separate junction boxes for signal isolation.

You get this control box when you order any CONTROL BOX & READOUT starting with a "T" (see "How to Order" page). Examples: TX1WR is a one switch with 4-20mA transmitter, weatherproof box with flow from left to right.

This control box is made from epoxy coated aluminum.

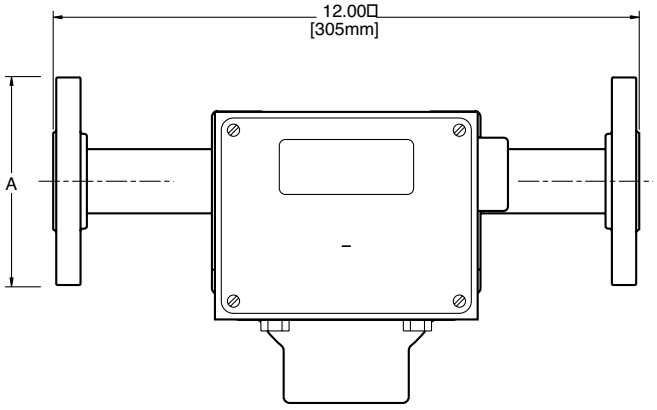


Maximum installation dimensions



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

Port Size (inches)	A
1/2	3-1/2
3/4	3-7/8
1	4-1/4
1-1/2	5
2	6



"Flow up" or "Flow down" dimensions are the same.
Scale numbers are turned 90° to be right reading.

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