



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

MAX LIQUID PRESSURE 300 PSI (20.69 BAR)
MAX LIQUID PRESSURE 500 PSI (34.48 BAR)
MAX LIQUID PRESSURE 2000 PSI (137.93 BAR)

MN SERIES
MM SERIES
MH SERIES

Flow meters, Flow switches and Flow transmitters

A Medium Vane-Style For Liquids



MN Series, "A" style control box



**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, 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

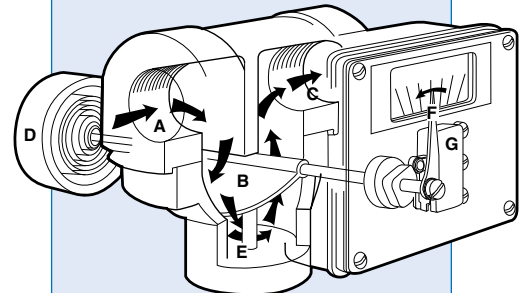
All flow meters are individually calibrated for fluids with the viscosity you specify (up to 3000 SSU/650 Centistokes). We also compensate for your fluid's specific gravity. For NIST Traceability please consult factory.

CONSTRUCTION MATERIALS

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**.

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

CHOOSE FROM THE MAXIMUM FLOW RATES SHOWN HERE

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
	This is a dual scale that has both the gallons per minute and liters per minute scales	=	GLM
	This option has two scales for two viscosities with flow shown in GPM	=	DGM

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	NPT	SAE	BSPP	BSPT	Max Flow
	Inches	Female				In GPM
1/2		4	8T	8BP	8BT	25
3/4		6	12T	12BP	12BT	50
1		8	16T	16BP	16BT	70
1 1/4		1Ø	2ØT	2ØBP	2ØBT	70
1 1/2		12	24T	24BP	24BT	1ØØ
2		16		32BP	32BP	16Ø

FLANGED

Ex: 4FTCS15ØRF = 1/2" threaded, Carbon Steel, Class 15Ø, 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	
1Ø = 1 1/4"				
12 = 1 1/2"				
16 = 2"				

NOTE: Manual Override Option (E) is required (by UFM manufacturing) on welded medium flanged vane meters.

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 - 10D

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
Stainless steel ID tag for customer supplied information	=	ST
Safety Glass window ref. page 4	=	TG
Manual override ref. page 4	=	E
Dual spring for reading lower flow rates on high flow units (see "Flow and pressure drop" section page 4)	=	DS
Clearance vane for ≥ 16 GPM (for better particulate tolerance)	=	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, 10D indicates a setting of 10 GPM in declining flow.

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
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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

T Box

"T" Box

"T" box always has a transmitter (4-20 mA) 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.

NOTE: The 4-20mA transmitter with or without the LCD and with NO switches is Intrinsically safe with approved barriers.



Pointer, scale and 4-20 mA:

No switches	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

Flow rate display, HART & 4-20mA output:

HART protocol is not intrinsically safe	TH0
HART & 4-20mA output only	TH1
One SPDT (3 wire)	TH2
Two SPDT (3 wire)	TH3
One SPDT (4 wire)	TH4
Two SPDT (4 wire)	TH5



LCD readout, 4-20mA with 2 open

collectors:	
No switches	TXL0
One SPDT (3 wire)	TXL1
One SPDT (4 wire)	TXL3
One SPDT (3 wire) high temperature	TXL61

"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:

One SPDT hazardous location	R7
One DPDT hazardous location	R17
Two SPDT hazardous location	R18
Two DPDT hazardous location	R19

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

Display and transmitter only (Intrinsically safe with no switch options 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 & 4-20mA output:

Hart protocol is not intrinsically safe	
HART & 4-20mA output only	RH0
One SPDT (3 wire)	RH1
Two SPDT (3 wire)	RH2
One SPDT (4 wire)	RH3
Two SPDT (4 wire)	RH4

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 bypass (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		DUAL SPRING*	
	Minimum Flow GPM/LPM	Max Pressure Drop PSI	Minimum Flow GPM/LPM	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.

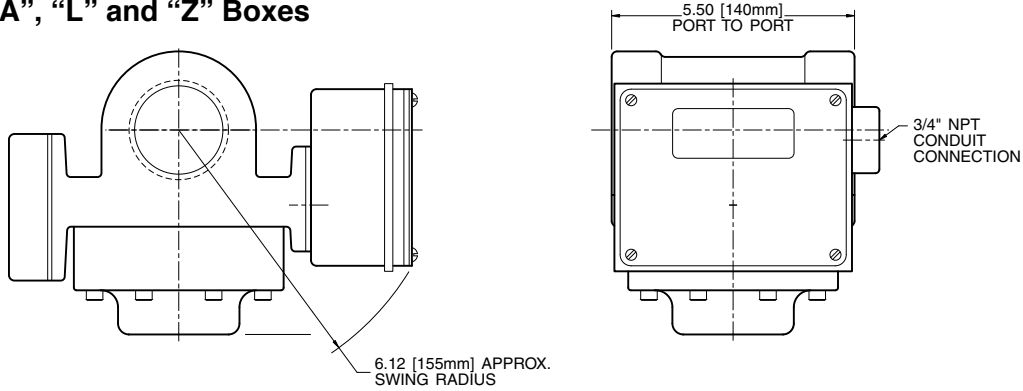
Safety Glass window: (option **TG**) replaces the standard window with "Laminated Safety Glass" ANSI Z97.1 and CPSC 1601 CFR 1201.

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 provide 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.

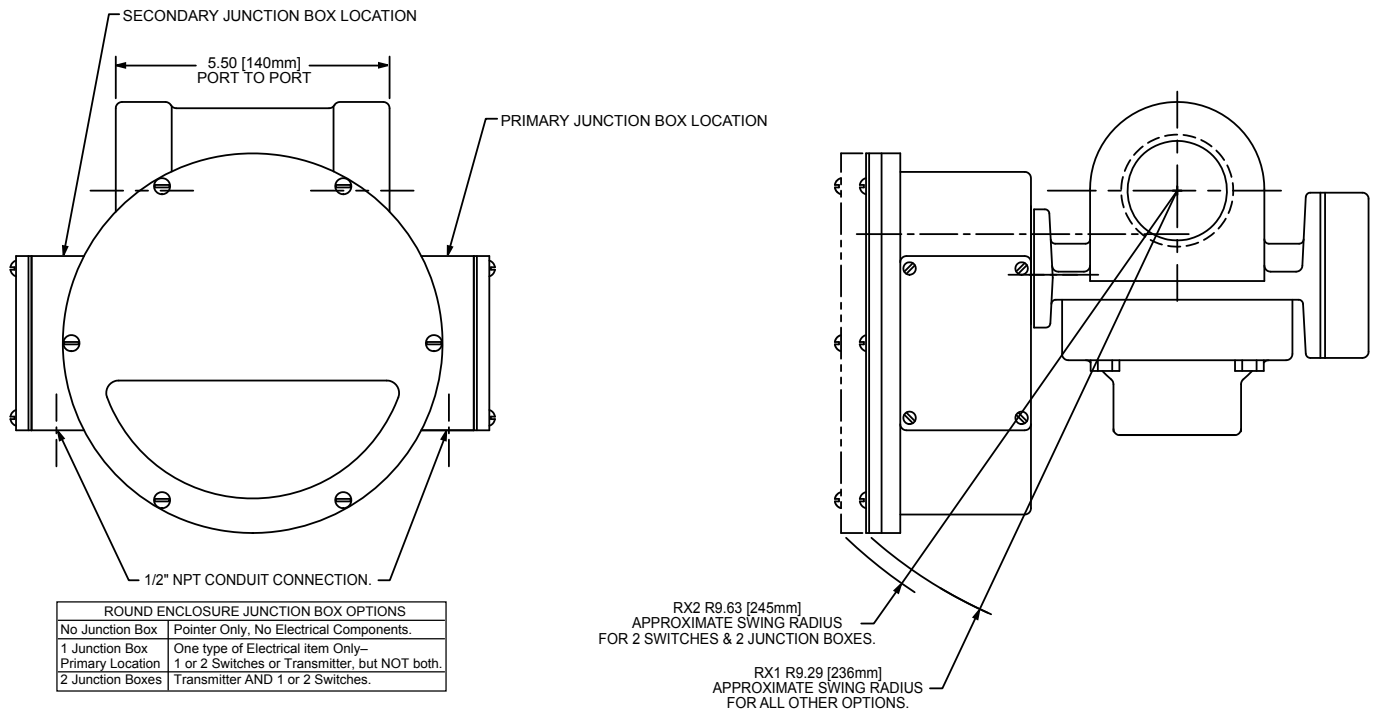
CONTROL BOX INSTALLATION DRAWINGS

“A”, “L” and “Z” Boxes



Maximum installation dimensions

“R” Box

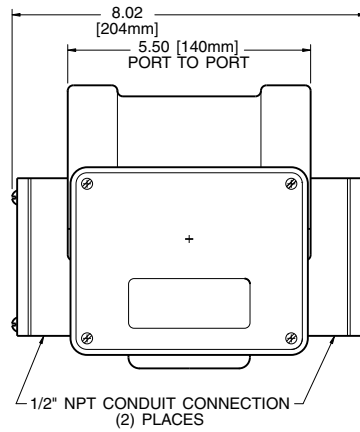
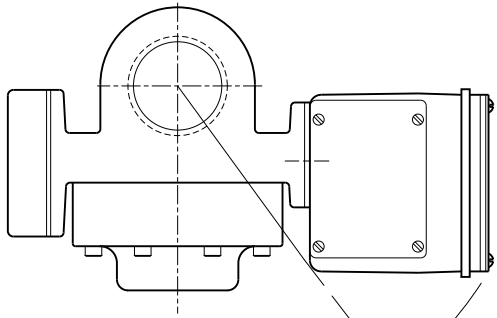


ROUND ENCLOSURE JUNCTION BOX OPTIONS	
No Junction Box	Pointer Only, No Electrical Components.
1 Junction Box Primary Location	One type of Electrical item Only— 1 or 2 Switches or Transmitter, but NOT both.
2 Junction Boxes	Transmitter AND 1 or 2 Switches.

Maximum installation dimensions

CONTROL BOX INSTALLATION DRAWINGS

“T” Box

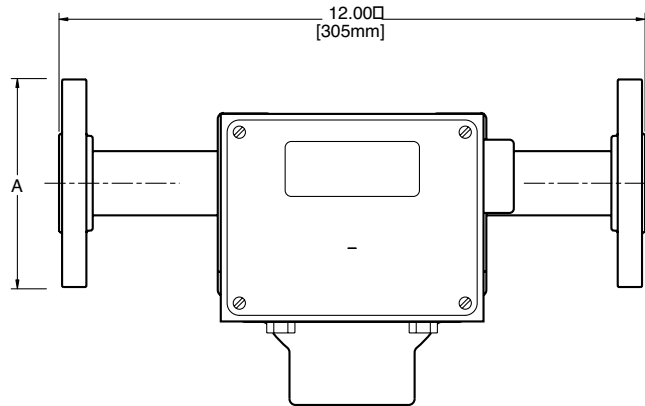


Maximum installation dimensions

8.20 [208mm] APPROX. SWING RADIUS

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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