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

HART COMMUNICATION PROTOCOL

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

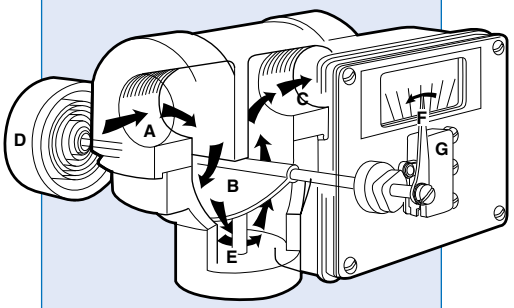
All flow meters are individually calibrated for fluids with the viscosity you specify (up to 3000 SSU/650 Centistokes). We also compensate for your fluid's specific gravity. For NIST Traceability please consult factory.

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**.

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

EXAMPLE: MN - B I 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**	SN only
Brass with nylon flow chamber	Water	=	**B**	
Aluminum	Lube oil	=	**D**	SN or SM/SH
Brass	Water	=	**F**	
Stainless steel (316)	Chemicals, corrosives	=	**I**	SM or SN
Carbon steel	Oil	=	**M**	

INTERNAL MOVING PARTS			
Stainless steel (316 series)	Chemicals and corrosives	=	**I**
Titanium	Sea water	=	**T**

SEAL MATERIAL			
Buna N	Water, oil	=	**B**
Viton	Acids, some caustics synthetic oil	=	**F**
Kalrez (dynamic) and Viton (static)	Specialty	=	**K**

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**
	No Dual Scales on LCD's		

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 Female	SAE	BSPP	BSPT	Max Flow 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**	**20T**	**2ØBP**	**2ØBT**	**70**
1 1/2	**12**	**24T**	**24BP**	**24BT**	**100**
2	**16**		**32BP**	**32BP**	**160**

FLANGED

Ex: 4FTCS150RF = 1/2" threaded, 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"				
10	= 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 - 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 (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

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. Consult factory for settings out of flow range. **1ØD**

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, L and Z small control box in the following configurations and materials:	A Box Polysulfone	L Box Aluminum	Z Box 316 SS
4-20 mA transmitter (Intrinsically safe with approved barriers)	AXØ	LXØ	ZXØ
HART with programmable switch points	AHØ	LHØ	ZHØ
Display only	AØ	LØ	ZØ
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	RØ
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)	RXØ
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	RHØ
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) 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.

LCD readout, 4-20mA with 2 open collectors: No dual scales on LCD	
No switches	TXLØ
One SPDT (3 wire)	TXL1
One SPDT (4 wire)	TXL3
One SPDT (3 wire) high temperature	TXL61

Pointer, scale and 4-20 mA:	
No switches	TXØ
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	
HART & 4-20mA output only	THØ
One SPDT (3 wire)	TH1
Two SPDT (3 wire)	TH2
One SPDT (4 wire)	TH3
Two SPDT (4 wire)	TH4

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 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.

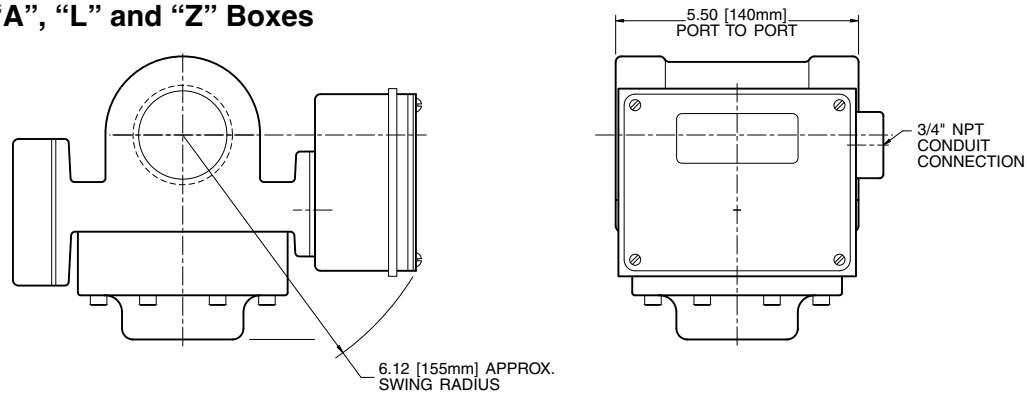
Safety Glass window: (option **TG**) replaces the standard window with "Laminated Safety Glass" ANSI Z97.1 and CPSC 1601 CFR 1201.

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.

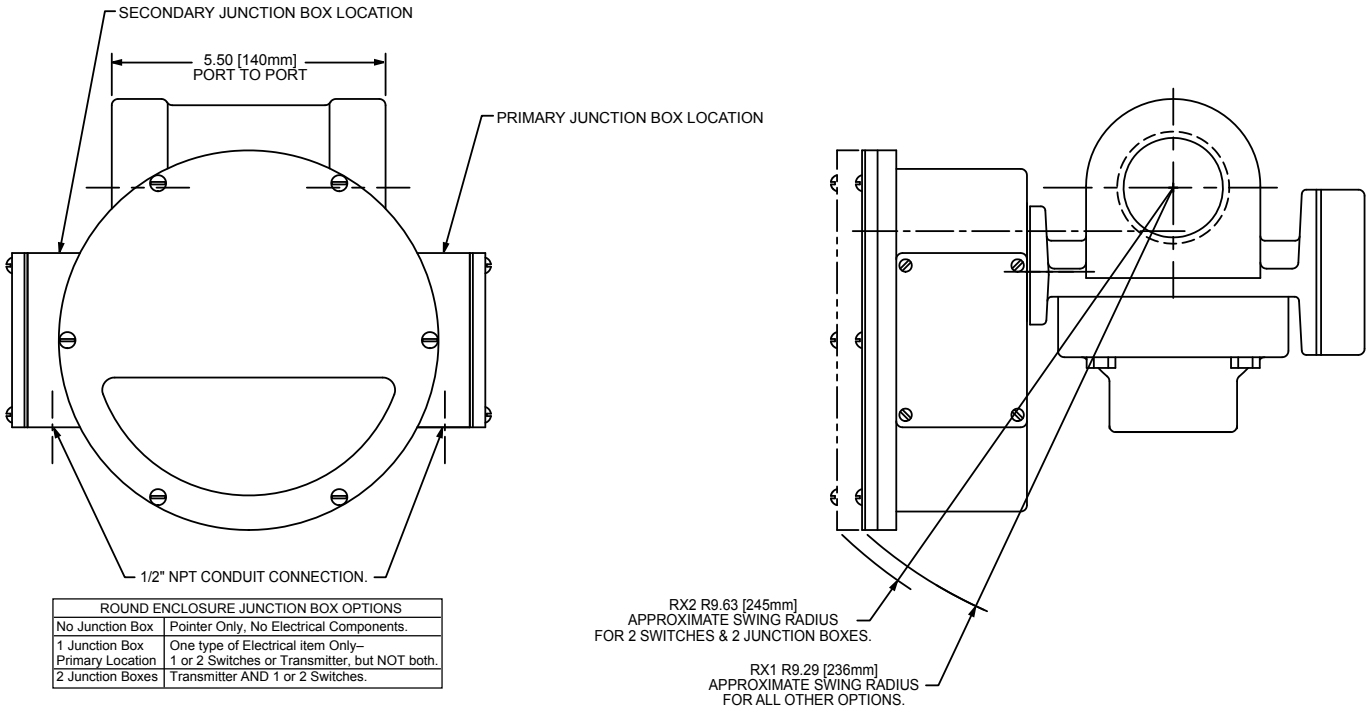
CONTROL BOX INSTALLATION DRAWINGS

“A”, “L” and “Z” Boxes



Maximum installation dimensions

“R” Box

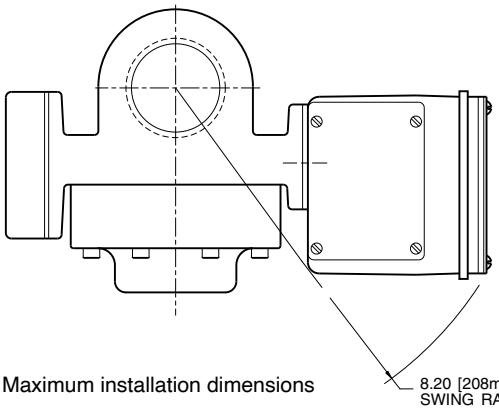


ROUND ENCLOSURE JUNCTION BOX OPTIONS	
No Junction Box	Pointer Only, No Electrical Components.
1 Junction Box Primary Location	One type of Electrical item Only– 1 or 2 Switches or Transmitter, but NOT both.
2 Junction Boxes	Transmitter AND 1 or 2 Switches.

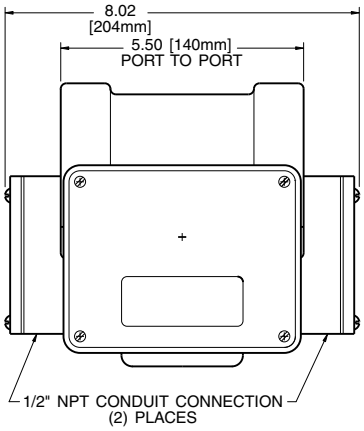
Maximum installation dimensions

CONTROL BOX INSTALLATION DRAWINGS

"T" Box

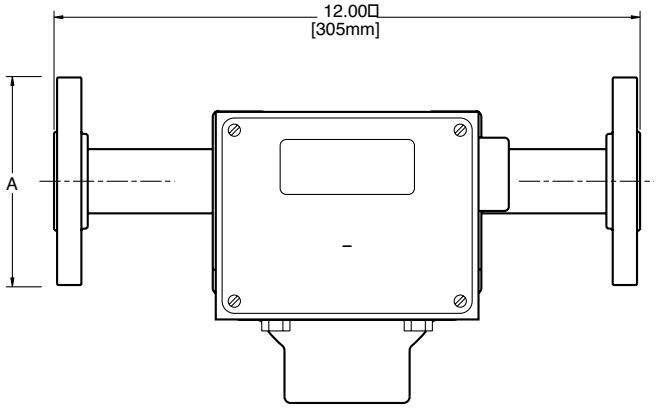


Maximum installation dimensions



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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