

MXL-INST
Rev 14
06/2022



# MX SERIES OVAL GEAR FLOWMETER

## INSTRUCTION MANUAL



### To the Owner

Please read and retain this instruction manual to assist you in the operation and maintenance of this product.

The manual contains operating and maintenance instructions for the MX-Series Flow Meters. This covers port sizes from 1/4" to 4".

Refer to separate instruction manual for information on operating modes and features of LCD displays. Contact local representative or distributor for further assistance.

This Flow Meter has incorporated the oval gear principle into its design. Exceptional repeatability and high accuracy over a wide range of fluid viscosities and flow rates are features of the oval gear design.

With a low pressure drop and high pressure rating oval gear flow meters are suitable for both gravity and (in-line) pump applications.



A John M. Ellsworth Company

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**FLUID COMPATIBILITY:** Before use, confirm the fluid (liquid) to be used is compatible with the meter. Refer to industry fluid compatibility charts or consult your local representative or distributor for advice.



**FLOWMETER USAGE:** The flow meter shall be used exclusively with liquids. No gases permitted to flow. Presence of gases could create severe hazard and damage



**STRAINER:** To prevent damage from dirt or foreign matter, it is recommended that a Y type or Basket type mesh strainer be installed as close as possible to the inlet side of the meter.

- Meter 1/4"            74 micron / 200 mesh
- Meter 1/2" - 2"    250 micron / 60 mesh
- Meter 3" - 4"       420 micron / 40 mesh

When a strainer is installed it should be regularly inspected and cleaned. Failure to keep the strainer clean will dramatically effect flow meter performance. Contact your local representative for advice.



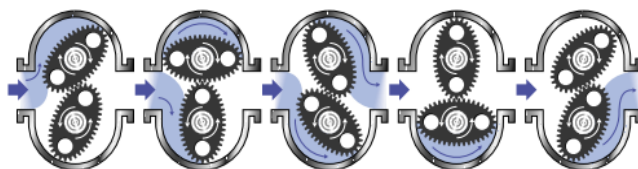
**AIR PURGE / LINE PRESSURE:** To prevent damage caused by air purge, slowly fill the meter with fluid. To reduce pressure build-up turn off the pump at the end of each day.

## OPERATING PRINCIPLE

Fluid passing through the meter causes the rotors to turn, as shown below. One of the rotors (the active rotor) is fitted with magnets.

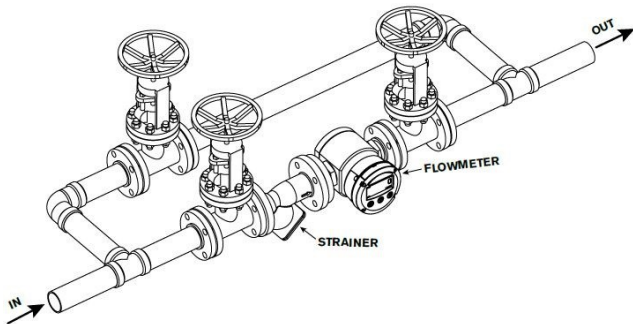
The passing of the magnets are picked up by the electronic sensor. The excitation of this switch provides a 'Raw Pulse Output' which relates to the K-Factor. (e.g. KF 36 = 36 pulses per litre of fluid passed)

This Pulse Output Signal can either be fed to an external receiving element (e.g. Data Logger or PLC) or alternatively to an LC Display which conditions the Pulse signal to display volume of fluid passed. (e.g. Display 1 Litre per for every 36 pulses received)



## INSTALLATION PROCEDURE

1. It is recommended that a bypass line be included in the design. This provides the facility for a meter to be removed for maintenance without interrupting production. (see figure)



2. Use a thread sealant on all pipe threads. Thread tape must not enter flow meter as this could stop flow meters operation.
3. For pump applications ensure pipe work and meter have the appropriate working pressure rating to match the pressure output of the pump. Refer to meter specifications section for further details. (Page 7)
4. Install a Y type or basket type mesh strainer as close as possible to the inlet side of the meter.

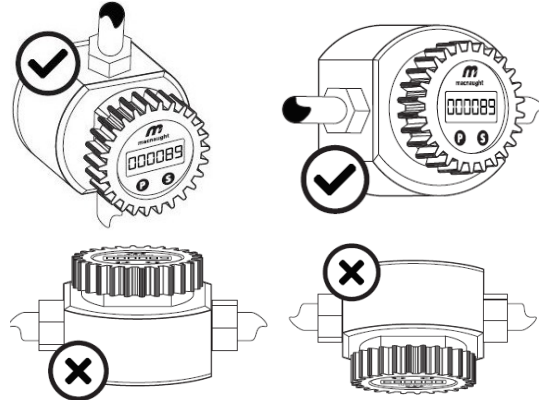
<b>Meter 1/4"</b>	<b>74 micron / 200 mesh</b>
<b>Meter 1/2" - 2"</b>	<b>250 micron / 60 mesh</b>
<b>Meter 3" - 4"</b>	<b>420 micron / 40 mesh</b>



The flow meter can accept flow in any direction.

5. The meter can be installed in any orientation as long as the meter shafts are in a horizontal plane as per the picture.

Incorrect installation can cause premature wear of meter components.



Do not over tighten meter connections.

7. It is important after initial installation to fill the line slowly, high speed air purge could cause damage to the rotors.
8. Test the system for leaks. Do not continue use if meter is leaking.
9. Check the strainer for swarf or foreign material, after the first 200 litres, check periodically, particularly if the flow rate is noted to be decreasing.

## MAINTENANCE PROCEDURE



Inspection and maintenance should only be carried out by experienced personnel.

## DIS-ASSEMBLY



When maintenance to any part of the flow meter is required, it must be isolated and line pressure released. It must be removed from the line if required. Use non sparking tools to accomplish the job.



It is advisable to mark all components with a marker pen before disassembly, to ensure all the components are replaced to their correct position during the reassembly process.

1. Remove the meter cap by loosening the bolts on the underside of the meter body. (see FIG 1, Page 6)
2. Remove the O-Ring from the O-Ring groove. Clean it nicely and store in clean place.
3. Remove rotors from the cap and shaft assembly. The shafts are fixed to the cap for sizes 1/4" - 2" and to the body for 3" and 4" sizes. No need to take them off.



Do not remove shafts from their location.

1. Before reassembling, check the condition of flow meter parts (rotors, body, cap, seal O-ring and shafts). Replace if necessary. Contact Macnaught to check for spare parts availability.
2. One of the rotors is active (have magnets) and other one is neutral. The active rotor can be identified by running a metal object over the face of the rotor. Place both the rotors at 90° to each other onto the shafts. Spin them to check if they move freely. If not, repeat the process.

- **Active Rotor Placement into Flow meter:**

- **MX06 - MX09 Meters:**

- The active rotor is positioned nearest to 'dimple' on the meter cap (see FIG 2, Page 6)

- The smooth side of rotor showing up, grub screw will face downwards.

- The chamfered side of the rotor stays upward when placed on to the shaft (see FIG 6, Page 6)

- **MX12 - MX50 Meters:**

- The active rotor is positioned nearest to 'dimple' on the meter cap (see FIG 2, Page 6)

- Meter cap dimple must face towards the flow meter body dimple (see FIG 2 & 3, Page 6)

- The magnet side face upward when placed on the cap

- **For MX75 - MX100 meters:**

- Active rotor is positioned on to the shaft away from the flow meter foot. (see FIG 7, Page 6)

- The magnet side of the active rotor face upward when placed inside the flow meter body.

3. Smear the O-ring with light film of grease and placed into the Groove (see FIG 3, Page 6)
4. Place the meter Cap on the meter Body.  
Meter cap dimple must face towards the flow meter body dimple (MX06-MX50 Meters) (see FIG 2 & 3, Page 6)
5. Insert the cap head screws and tighten in a diagonal sequence 1, 5, 7, 3, etc.

**Bolts Torque Ratings:**

MX06-MX12 (6.5 Nm)

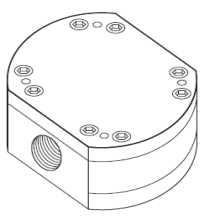
MX19-MX25 (15 Nm)

MX40-MX100 (33 Nm)

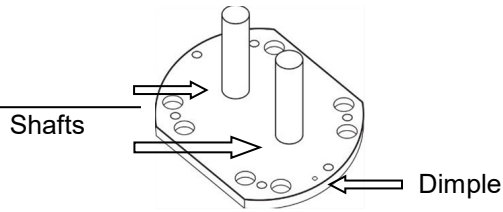
6. Test the meter by turning the rotors with a finger or by applying very low air pressure (no more than a good breath) to one end of the meter, before returning the meter to service.

# PICTORIAL REPRESENTATION OF FLOWMETER AND DISASSEMBLED PARTS

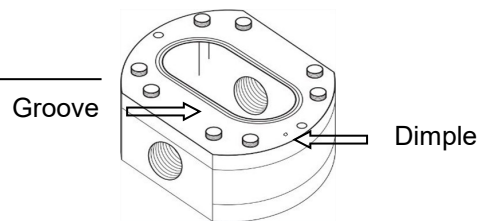
**Flow meter  
FIG 1**



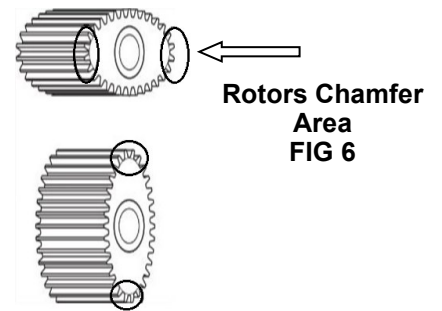
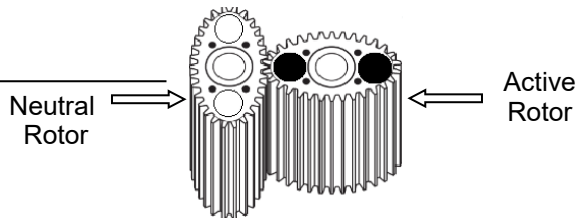
**Flow Meter Cap  
FIG 2**



**Flow meter Body  
FIG 3**



**Rotors (At 90°)  
FIG 4**



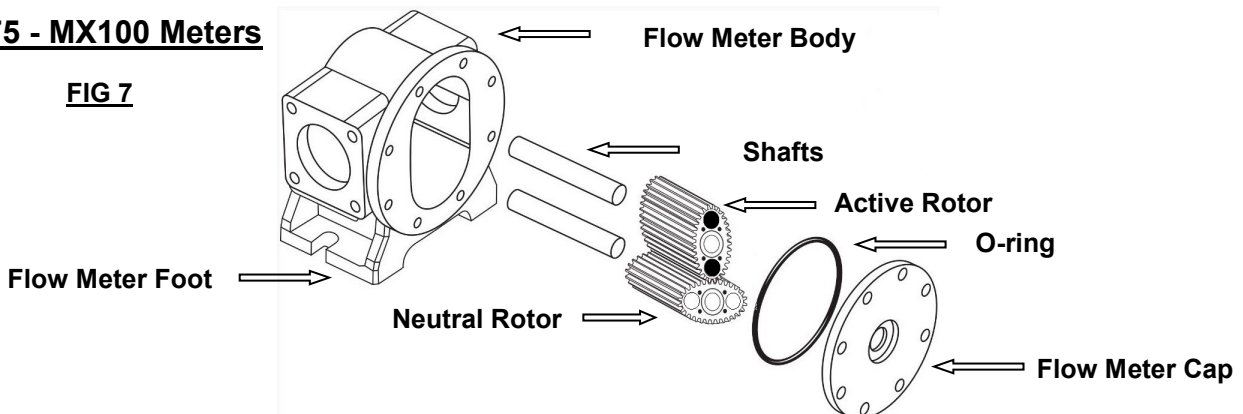
**O-ring  
FIG 5**



**Note !** For MX06 and MX09 meters, the flat side of rotors with chamfer on edges face upward when placed on cap and shaft assembly of meter

## MX75 - MX100 Meters

**FIG 7**



# PRODUCT IDENTIFICATION SYSTEM

Series	MX						
MX Port Size	06	1/4"					
	09	1/4"					
	12	1/2"					
	19	3/4"					
	25	1"					
	40	1 1/2"					
	50	2"					
	75	3"					
	100	4"					
	Category	F	AL/PPS/FKM	MX06-MX50			
AL/AL/FKM			MX75-MX100				
P		SS/PPS/FEP	MX06-MX50				
S		AL/SS/FEP	MX06 - MX25				
		AL/AL/FEP	MX40 - MX100				
-	-						
Port Connection	-	-	1	G threads	MX06-MX100		
			2	NPT threads	3" BSP and NPT port connection for MX100		
			3	ANSI 150# Flanges	MX25 - MX100		
			4	JIS 10k Flanges			
			5	DIN PN 16k Flanges			
			6	BSP (Rc) Threads			
Rotor Type	-	-	-	S	Standard	MX06-MX100	
				H	Standard (High Viscosity)	MX06F-MX50F MX06P-MX50P (PPS only)	
				P	PEEK (Standard)	MX19S-MX50S MX19P-MX50P	
				T	SS	MX06P-MX50P	
				V	High Viscosity	MX09S-MX100S MX09P-MX50P	
Output Type	-	-	-	-	-	X	No Output
						A	Standard Pulse (1 x hal effect switch + 1 x reed switch)
						D	PR (LCD 12 mm Display)
						E	PRA (LCD 12 mm Display) with outputs
						F	ER (LCD 17 mm Display)
						G	ERA (LCD 17 mm Display) with outputs
						H	ERB (LCD 17 mm Display) Batch Controller
						I	Standard Pulse (2 x reed switches)
						J	Standard Pulse (2 x hall effect switches)
						K	High Resolution sensor (Omni polar)
						M	PRM (4-20 mA) Output
						T	High Temperature Sensor (NPN)
Example	MX	06	P	-	2	T	A

## FLOWMETER SPECIFICATIONS

Flow Meter Series	Flow Range (Viscosity < 5 cP)		Flow Range (Viscosity > 5 cP)	
	Metric	US	Metric	US
<b>MX06</b>	2 to 100 LPH	0.5 to 26 GPH	0.5 to 100 LPH	0.13 to 26.4 GPH
<b>MX09</b>	25 to 500 LPH	6.6 to 132 GPH	15 to 500 LPH	4 to 132 GPH
<b>MX12</b>	3 to 25 LPM	0.8 to 6.6 GPM	2 to 30 LPM	0.5 to 8 GPM
<b>MX19</b>	8 to 70 LPM	2 to 18.5 GPM	3 to 80 LPM	0.8 to 21 GPM
<b>MX25</b>	10 to 100 LPM	2.6 to 26 GPM	6 to 120 LPM	1.6 to 32 GPM
<b>MX40</b>	15 to 235 LPM	4 to 62 GPM	10 to 250 LPM	2.6 to 66 GPM
<b>MX50</b>	15 to 500 LPM	4 to 130 GPM	15 to 500 LPM	4 to 130 GPM
<b>MX75</b>	60 to 600 LPM	17 to 170 GPM	20 to 733 LPM	5 to 194 GPM
<b>MX100</b>	220 to 1000 LPM	60 to 250 GPM	120 to 1200 LPM	30 to 300 GPM



Note !

Ensure the Flow meter is fitted with 'High Viscosity Rotors' if the fluid being metered is 1000 cP or above.

Flow Meter Series	Temperature Range
Temperature Range (MX06P - MX50P)	-40°C - 150°C <sup>1</sup>
Temperature Range (MX06S - MX100S)	-40°C - 120°C <sup>1</sup>
Temperature Range (MX06F - MX50F)	-40°C - 80°C <sup>2</sup>
Temperature Range (MX75F - MX100F)	-40°C - 120°C <sup>1</sup>
Accuracy (MX06 - MX100)	±0.5% of reading



Note !

- 1 Flow meter process temperature range may be limited to sensor temperature classification.
- 2 Flow meter process temperature range is limited due to PPS rotors.

Flow Meter Series	Maximum Operating Pressure* (Flow meter <b>Threaded</b> )		Maximum Operating Pressure* (Flow meter <b>Flanged**</b> )	
	kPa	psi	kPa	psi
<b>MX06</b>	6895	1000	-	-
<b>MX09</b>	6895	1000	-	-
<b>MX12</b>	13790	2000	-	-
<b>MX19</b>	13790	2000	-	-
<b>MX25</b>	13790	2000	1250	181
<b>MX40</b>	10342	1500	1250	181
<b>MX50</b>	8274	1200	1250	181
<b>MX75</b>	1200	175	1200	175
<b>MX100</b>	1200	175	1200	175



Note !

- \* Conforms to Directive 2014/68/EU
- \*\* Flanges Standard (ASME B16.5, Group 2-2.3 Materials)

## Flow meter Output Types

Pulse output		
<b>A</b>	1 x Hall Effect Switch & 1 x Reed Switch	MXD-AS
<b>I</b>	Dual Reed Switches	MXD-IS
<b>J</b>	Dual Hall Effect Switches - Quadrature Pulse	MXD-JS
<b>K</b>	High Resolution Sensor	MXD-KS
<b>T</b>	High Temperature Sensor	MXD-TS
Local Digital Display		
<b>D</b>	<b>PR</b> (LCD 12 mm Display)	MXD-DS
<b>E</b>	<b>PRA *</b> (LCD 12 mm Display)	MXD-ES
<b>F</b>	<b>ER</b> (LCD 17 mm Display)	MXD-FS
<b>G</b>	<b>ERA *</b> (LCD 17 mm Display)	MXD-GS
<b>H</b>	<b>ERB</b> (LCD 17 mm Display)	MXD-HS
<b>M</b>	<b>PRM *</b> (LCD Blind 4 - 20 mA Display)	MXD-MS



Note !

**Reed Switch:** Reed Switch is a 2-wire device which triggers by magnet inside the rotors as they spin. To maximise the life of the reed switch, the pulse board comes equipped with a 1k8 $\Omega$  current limiting resistor in series.

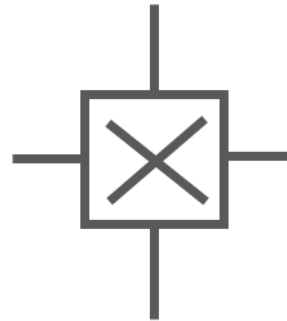
Reed Switch



Note !

**Hall Effect Switch:** Hall Effect switch is a 3-wire device which triggers by south pole of the magnet inside the rotors as they spin. This switch is NPN type. The switch circuit is equipped with a 4k7 $\Omega$  pull-up resistor between signal and supply.

Hall Effect Switch



Note !

\* **Analogue outputs** are available as an auxiliary display signal by including ERA, PRA and PRM with the flow meter. PRA and ERA display also output scalable pulse.



Note !

**Instruction manual for local displays to be seen separately. Part numbers as under:**

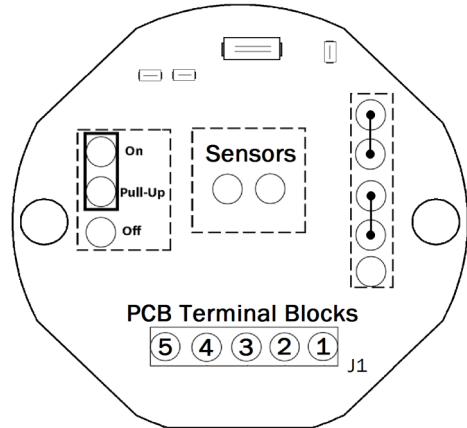
Display	MXD-DS	MXD-ES	MXD-FS	MXD-GS	MXD-HS	MXD-MS
<b>Instruction Manual</b>	MXL-INSTPR	MXL-INSTPRA	MS574	MS476	MS392	MXL-INSTPRM

Standard Pulse Cap incorporates the M-LOCK (1/4" turn) mounting system. The housing is made up of polypropylene with PCB fitted inside.

Standard Pulse Cap



PCB



Terminal	Wire Colour	MXD-A (Reed/Hall)		MXD-I (Reed/Reed)	
1	White	Hall		Reed 2	
2	Yellow/Brown	Reed		Reed 1	
3	Red	Hall	+	N/C	
4	Black	Hall		N/C	
5	Green	Reed	-	Reed 1 and 2	-

Terminal	Wire Colour	MXD-J * (Hall/Hall)		MXD-K ** (Double pulse)	
1	White	Hall 2		Hall	
2	Yellow/Brown	Hall 1		N/C	
3	Red	Hall 1 and 2	+	Hall	+
4	Black	Hall 1 and 2		Hall	
5	Green	N/C		N/C	

**Legends:**

- Reed: Reed Switch
- Hall: Hall Effect sensor
- Reed Switch common
- Signal output
- + Power supply for Hall

- Ground
- N/C: No connection
- Local display is connected to Reed1
- Terminal 1 is the right most terminal



Note !

- Standard Pulse Cap Temperature (-40 °C -120 °C)  
 - IP 67

## Standard Pulse Cap

## Output types A, I, J, K

Ordering Code				
MXD	MX Series Cap			
	-	Separator		
		A	1 x reed and 1 x Hall Effect Sensors	
		I	2 x Reed Sensors	
		J	2 x Hall Effect Sensors	
		K	High Resolution Sensor	
		S	Sub-Assembly kit	
Example	MXD	-	A	S
Example	MXD	-	J	S

### Standard Pulse Cap Part Numbers

MXD-AS	MXD-JS
MXD-IS	MXD-KS



\* MXD-JS generate Quadrature Pulse Output



\*\* MXD-KS has one hall effect high resolution sensor.

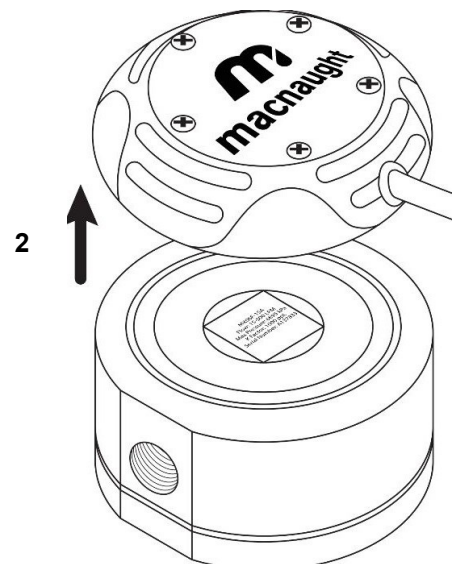
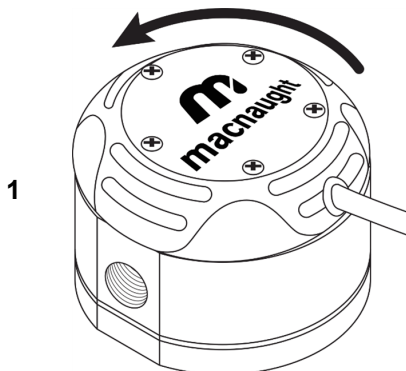
### Illustration

Standard Pulse Cap fitted to 1" meter



### Assembly/Disassembly

1. Rotate the pulse cap 90° anticlockwise to disassemble
2. Pull the cap away from body



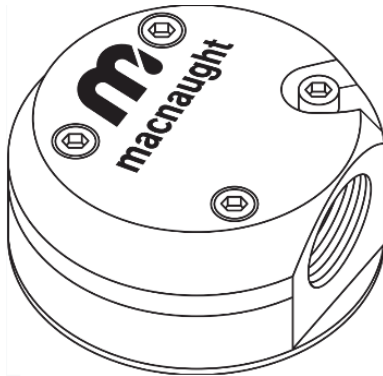
Place pulse cap onto the body and rotate 90° clockwise to reassemble



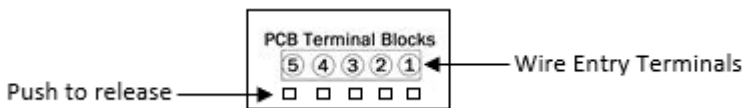
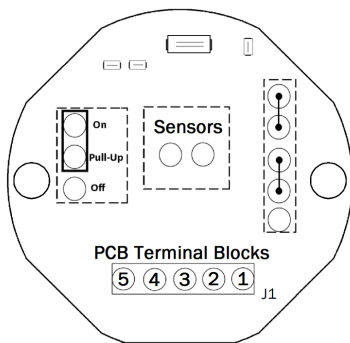
No Tool required to assemble/disassemble

**Industrial Pulse Cap** is fixed to the flow meter and does not incorporate M-lock feature. It comes with Conduit Entry to facilitate customers for own wiring.

**Illustration**



**PCB**



\* MXD-xCx-HH generate Quadrature Pulse Output



- Industrial Pulse Cap Temperature (-25 °C -120 °C)  
- IP 67

Terminal	MXD-xCx-RH (or Reed/ Hall PCB)	
1	Hall	
2	Reed	
3	Hall	+
4	Hall	
5	Reed	-

Terminal	MXD-xCx-RR (or Reed/ Reed PCB)	
1	Reed 2	
2	Reed 1	
3	N/C	
4	N/C	
5	Reed 1 and 2	-

Terminal	MXD-xCx-HH * (or Hall/ Hall PCB)	
1	Hall 2	
2	Hall 1	
3	Hall 1 and 2	+
4	Hall 1 and 2	
5	N/C	

**Legends:**

- Reed: Reed Switch
- Hall: Hall Effect sensor
- Reed Switch common
- Signal output
- +
- Ground
- N/C: No connection

Terminal 1 is the right most terminal

**Cable Specifications for Standard/Industrial Pulse Cap**

Minimal cable specification recommended for wire:

- 5 core, 24 AWG each
- drain wire AND shielding/ copper braiding
- Temperature rating: -20 - 80 °C
- Voltage rating: 300 V



- Maximum cable length should not exceed 60 metres.
- If cable is extended and/or longer than 10m, it is highly recommended to use 24V power supply for Hall Switch and reed switch.

Illustration

Industrial Pulse Cap fitted to 1" meter

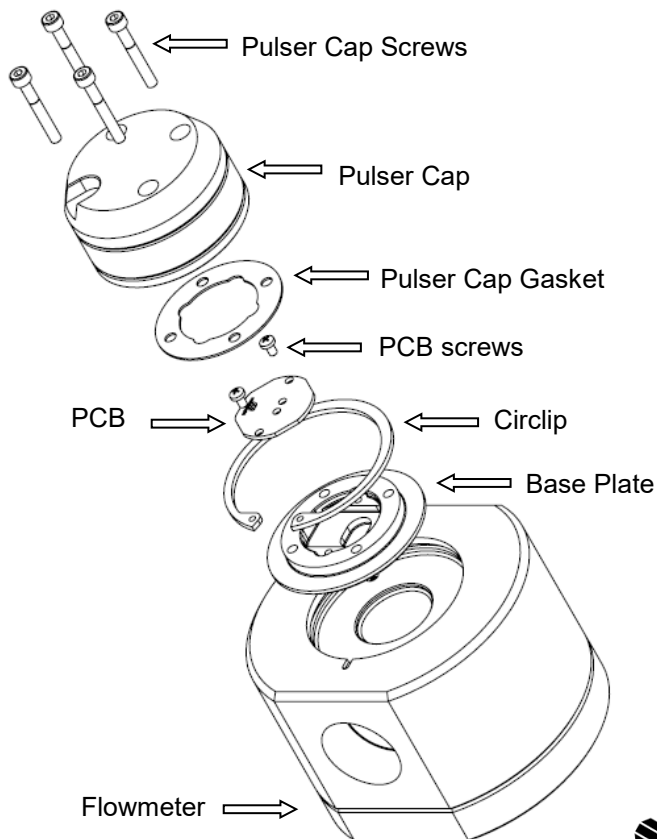


Ordering Code						
MXD	MX Series Cap					
	-	Separator				
	A*	Housing Material: Aluminum 6061				
	S*	Housing Material: SS 316				
	CM	Conduit size: M20 X 1.5 (Gland Entry)				
	CN	Conduit size: 1/2" NPT (Gland Entry)				
	-	Separator				
	RH	1 x reed and 1 x Hall Effect Sensors				
	RR	2 x Reed Sensors				
	HH	2 x Hall Effect Sensors				
Example	MXD	-	S	CM	-	RH
Example	MXD	-	A	CM	-	RR

\* Industrial Pulse Cap Housing material "Aluminium" to be fitted to flow meter having Aluminium Body

\* Industrial Pulse Cap Housing material "SS 316" to be fitted to flow meter having SS 316 Body

Industrial Pulse Cap Part Numbers	
MXD-ACM-RH	MXD-SCM-RH
MXD-ACM-RR	MXD-SCM-RR
MXD-ACM-HH	MXD-SCM-HH
MXD-ACN-RH	MXD-SCN-RH
MXD-ACN-RR	MXD-SCN-RR
MXD-ACN-HH	MXD-SCN-HH



The Industrial Pulse Cap comprises of 3 major components.

1. Industrial Pulse Cap
2. PCB (sensor board)
3. Secure Base Plate

In order to access the PCB, or for the removal/replacement of the complete Pulser Module, the Following procedure applies.

**Disassembly/Reassembly**

- Remove the 4 socket head cap screws holding the Industrial Pulse Cap to the Base Plate. Take care not to lose the gasket.
- Lift the Pulse Cap to expose the terminal block for the connection/disconnection of the signal cables.
- The PCB can be removed by loosening the two screws securing it to the Base Plate.  
**Note:** It is not necessary to remove the PCB if the objective is to remove the complete base plate (see next step)
- To separate the Base Plate from the Flow meter body, remove the stainless steel Circlip.



Reassemble by reversing the above sequence.

## DIN Compact Pulse Module

## Output Type (MXD-xx)

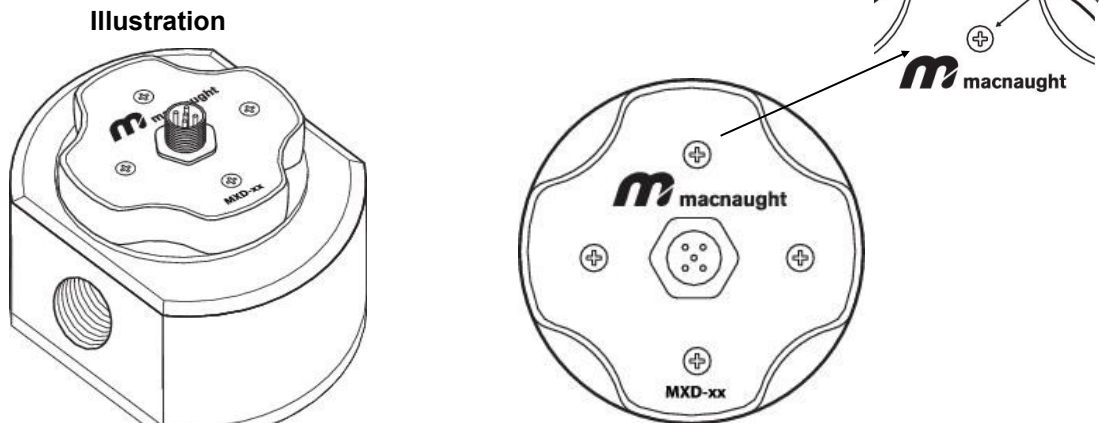
**DIN Compact Pulse Module** incorporates the M-LOCK (¼ turn) mounting system. It provides a locking facility for added security against unauthorised removal. A locking screw is supplied with DIN compact pulse cap to accomplish the job by fitting module to the flow meter using M-lock feature and replacing the existing screw with locking screw.



**Note !** During initial installation of the locking screw, the screw **will need to pierce** the bottom of the pulser.

The available options are:

- DIN Module with 1 x Reed and 1 x Hall effect sensor (**MXD-RH**)
- DIN Module with Dual Hall Effect sensors (**MXD-HH**)
- DIN Module with Dual Reed Switches (**MXD-RR**)



Ordering Code			
<b>MXD</b>	<b>MX Series Cap</b>		
	-	Separator	
		<b>RH</b>	1 x reed and 1 x Hall Effect Sensors
		<b>RR</b>	2 x Reed Sensors
		<b>HH</b>	2 x Hall Effect Sensors
<b>Example</b>	<b>MXD</b>	<b>-</b>	<b>RH</b>
<b>Example</b>	<b>MXD</b>	<b>-</b>	<b>HH</b>

DIN Connector Pulse Module Part Numbers
MXD-RH
MXD-RR
MXD-HH

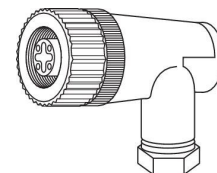
The DIN Compact Pulse Modules accommodates the choice of either a field mountable connector facility, or a fixed (M12) connection cable.

- M12 DIN plug and socket complete with 5 core cable.
- Field attachable socket with 5 position screw terminals

M12 DIN cable



Field attachable socket/connector

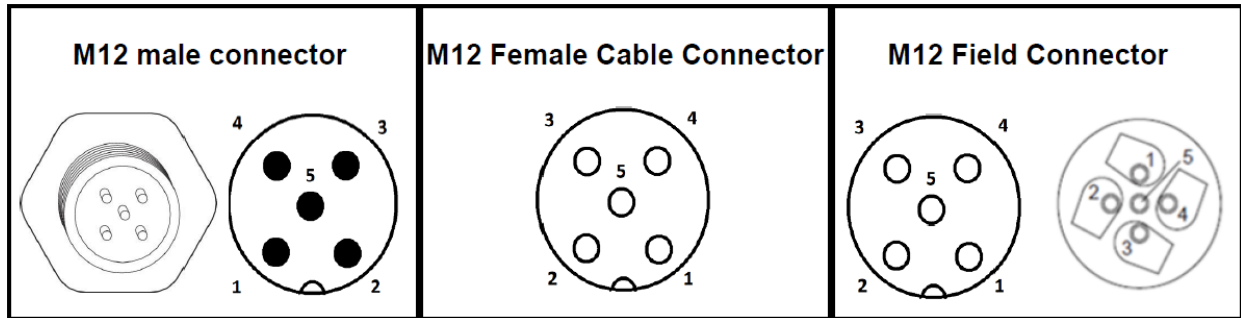


Part number: **MXD-CF**

Cable Length	Part Number
1.5 Meters	<b>MXD-C1.5</b>
5 Meters	<b>MXD-C5</b>
10 Meters	<b>MXD-C10</b>



- DIN Pulse Cap Temperature (-25 °C -120 °C)  
 - IP 67



	Cable Colour	Reed / Hall Module	Dual Reed Module	Dual Hall Module
1	Brown	HE Supply (VCC)	N/A	HE Supply (VCC)
2	White	HE Signal (V out)	Reed Signal 1	HE Signal 1 (V out)
3	Blue	HE Ground	Reed Ground 1	HE Ground
4	Black	Reed (Signal)	Reed Signal 2	HE Signal 2 (V out)
5	Green-Yellow	Reed (Ground)	Reed Ground 2	N/A

**M12 DIN Female Cable Connector**

General	
Connector	M12 (right angle)
Standards / regulations	IEC 61076-2-101
Technical Specifications (Plug and socket)	
Number of positions	5
Protection	IP67
Material of body	TPU (thermoplastic polyurethane)
Rated voltage / current	60v / 4A
Contact resistance	Max 5 mΩ
Ambient temperature (plug and socket)	-25°C - 90°C
Technical Specifications (cable)	
Core Number	5 core
Core colours	brown, white, blue, black, green-yellow
Cable material	PUR (polyurethane)
Conductor cross section	5 x 0.34mm <sup>2</sup> (signal lines)
Rated voltage / current	60v / 4A
Ambient Temperature (operation)	-25°C - 80°C (cable, fixed installation)
Cable resistant to	acids, alkaline solutions and salt water

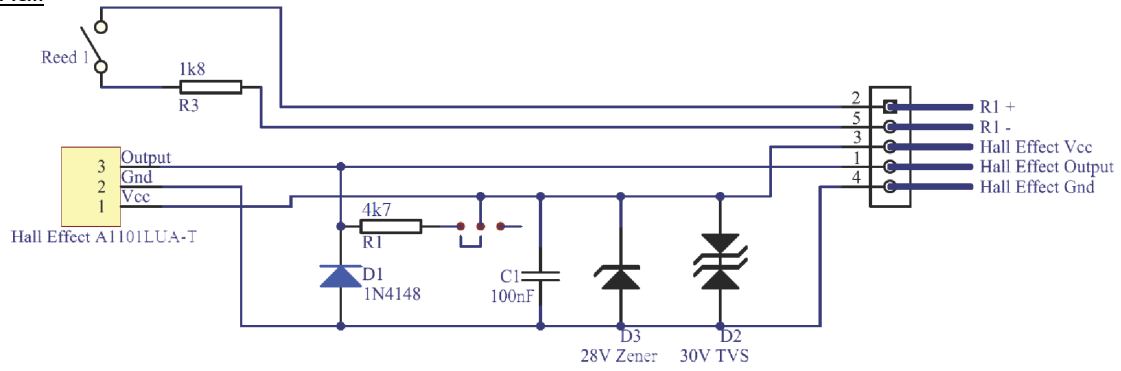
**M12 Field Connector**

General	
Connector	M12
Standards / regulations	IEC 61076-2-101
Technical Specifications	
Number of positions	5
Protection	IP67
Conductor cross section	0.25mm <sup>2</sup> - 0.75mm <sup>2</sup>
Material of body	PTB
Sealing material	NBR (nitrile rubber)
Ambient temperature	-25°C - 85°C (plug and socket)
Rated voltage / current	60v / 4A

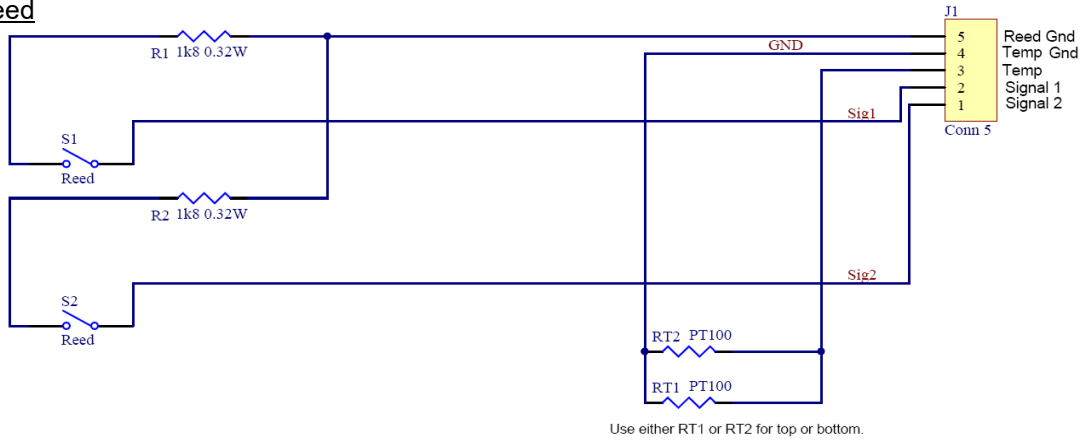
Output Signals	Standard Pulse Meter		2 x Digital (Square Wave)
Reed Switch (Mechanical Sensor)	Current	Maximum	500mA
	Voltage	Maximum	30V DC
	Contact Rating	Maximum <sup>1</sup>	10W
Hall Effect Switch (Electronic Sensor)	Maximum Supply Current		7.5mA
	Maximum Output Current		25mA
	Operating Voltage		4.5V to 24V DC
	Output Type		Open-Collector NPN

1.Contact rating maximum is 10W. Neither current nor voltage maximums should be exceeded in achieving this.

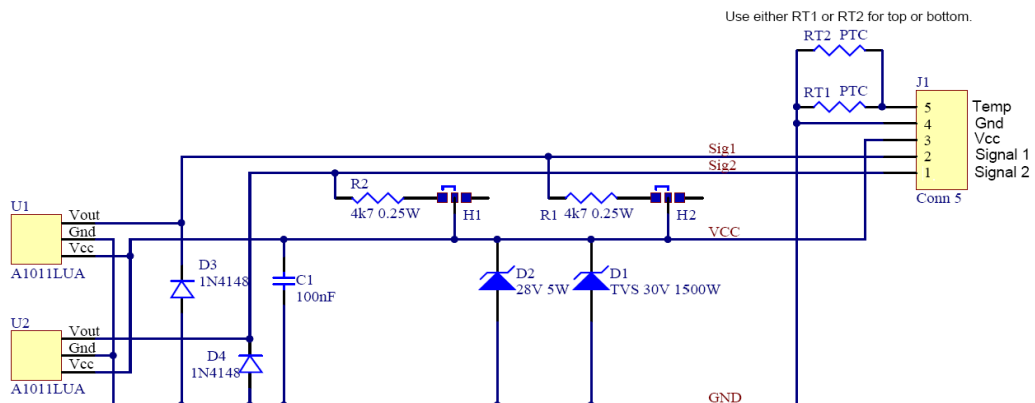
Reed/ Hall



Reed/ Reed



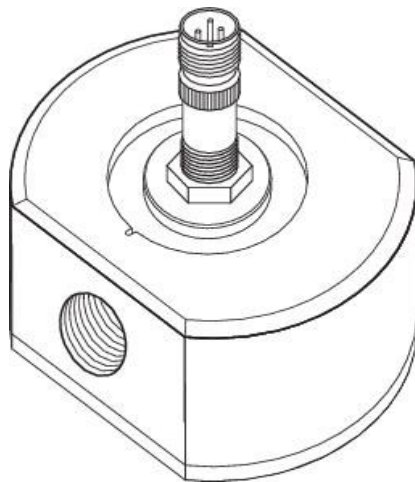
Hall/ Hall



SENSOR TYPE	OMNI POLAR	NPN with internal 3 k-Ohm pull-up resistor	
SPECIFICATIONS	Construction	Stainless Steel Housing (Barrel)	
	Connector Cable Length	2 meters	
	Operating Voltage	4.5 to 30V DC	
	Maximum Supply Current	18mA	
	Temperature Range		-40 - 150°C
			-40 - 302°F

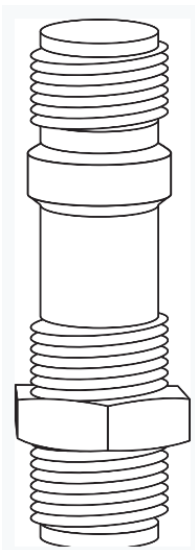
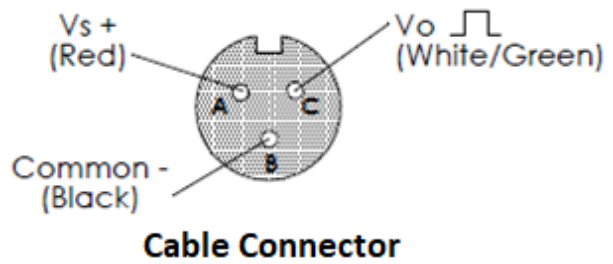
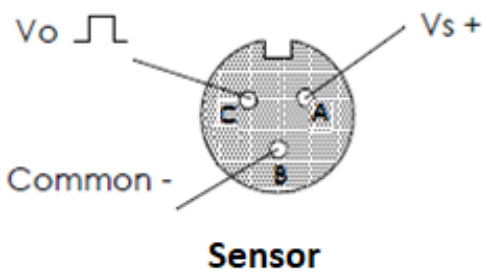
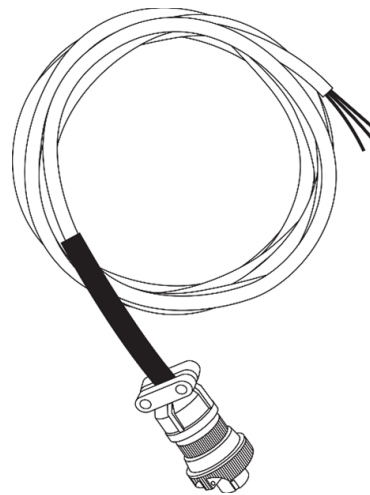
**Illustration**

Sensor fitted to meter

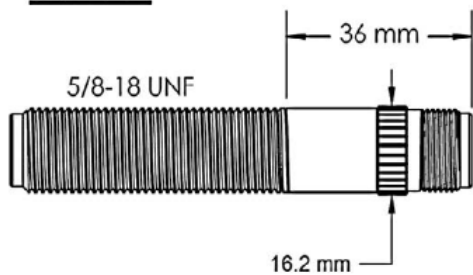


**Illustration**

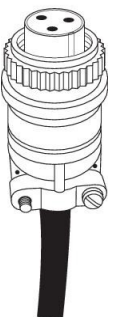
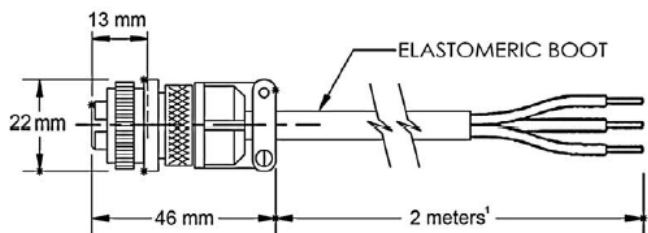
Cable Connector



**Sensor**



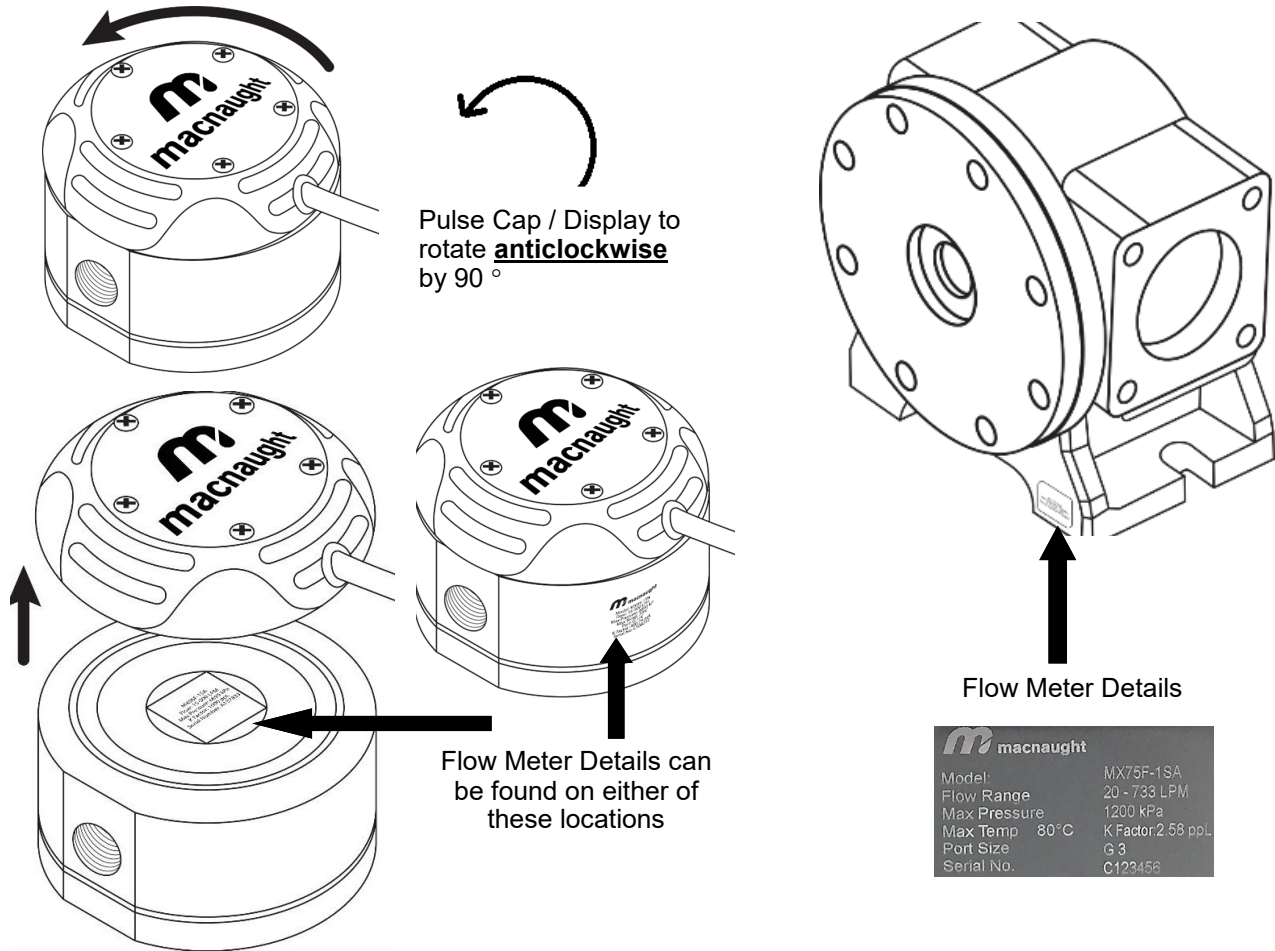
**Cable**



## Flow meter Specs / Data Plate

**MX06-MX50:** Serial number, Model number, k-factor, flow rate range and temperature details are engraved on meter body. See below FIG

**MX75-MX100:** Serial number, Model number, k-factor, flow rate range and temperature details are engraved on data plate. See below FIG



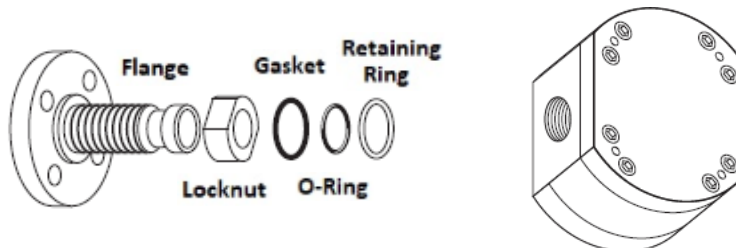
## INSTALLATION OF FLANGES ON MX25, MX40 AND MX50 METERS

1. The locknut, gasket, O-ring and retaining ring to be fitted as shown in the below picture. (Make sure that the O-rings and gaskets must not have any damages)
2. Both flanges to be equally screwed to the meter body meeting end to end dimensions and bolt pattern on the flange face
3. The lock nuts to be tightened to a specified torque as mentioned in the below table



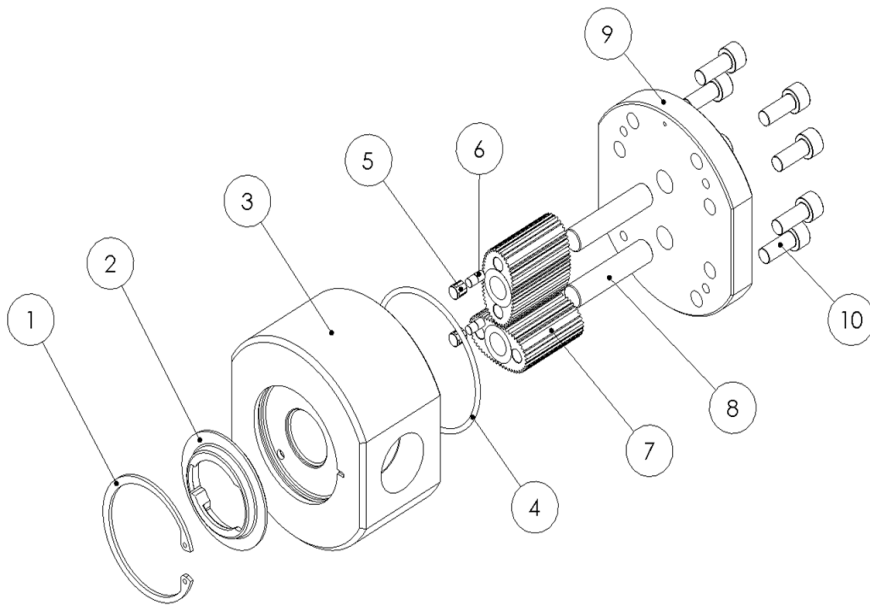
Note !

Use a good quality grease for Gasket & O-ring and a good quality anti-crease on flange threads



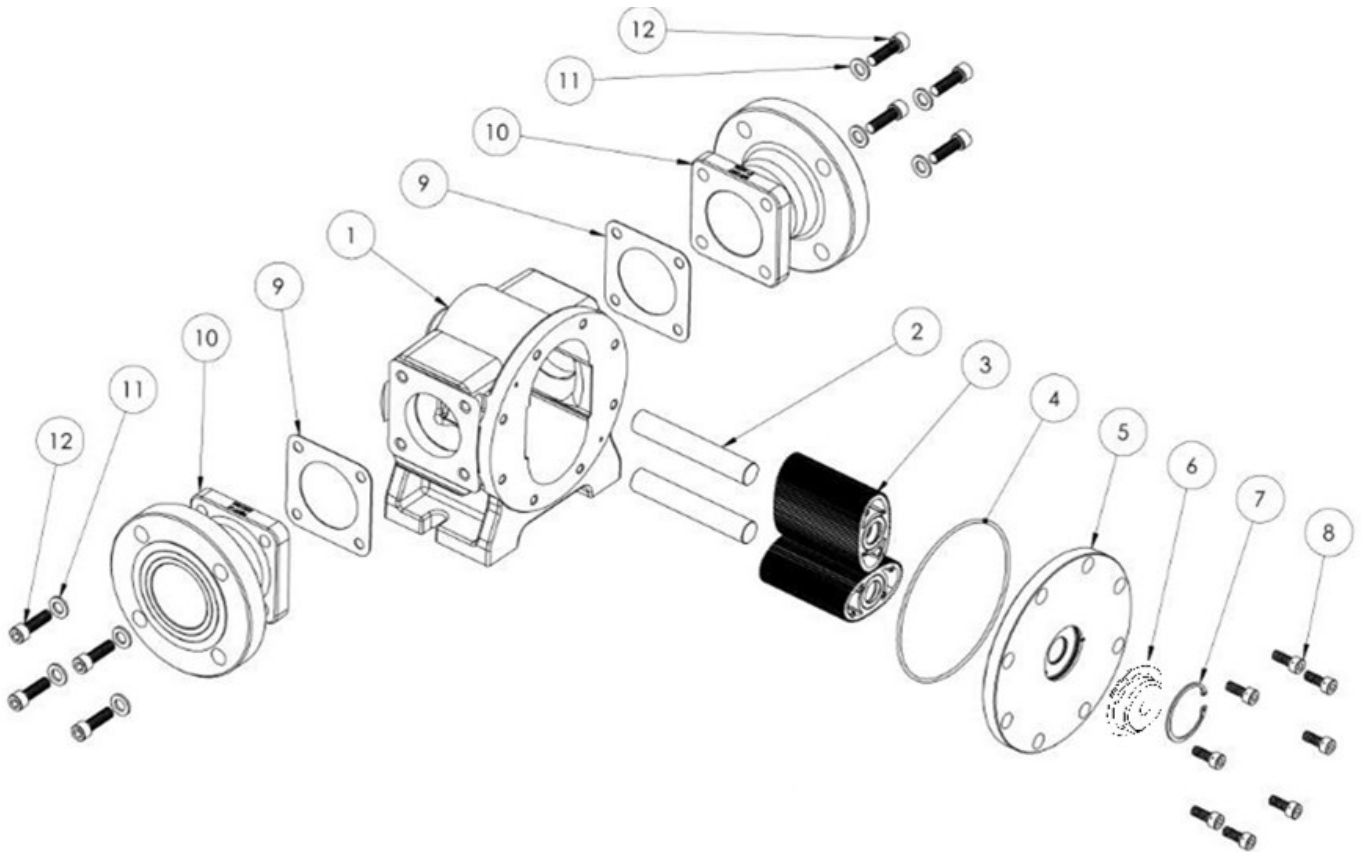
Meter	Lock Nut Torque	ANSI / ASTM	DIN	JIS	End to End
MX25	20 Nm	1" 150 LB B16.5	DN25 PN 16 EN1092-1	25A 10K JIS B 2220	240 mm
MX40	30 Nm	1.5" 150 LB B16.5	DN40 PN 16 EN1092-1	40A 10K JIS B 2220	240 mm
MX50	40 Nm	2" 150 LB B16.5	DN50 PN 16 EN1092-1	50A 10K JIS B 2220	264 mm

**EXPLODED DIAGRAM models MX06-MX50**



METER COMPONENTS	ITEM NO
CIRCLIP	1
CAM	2
METER BODY	3
METER CAP O-RING	4
MAGNET HOUSING	5
MAGNETS	6
ROTOR SHAFTS	7
LOCATING PIN	8
METER CAP	9
METER CAP SCREWS	10

**EXPLODED DIAGRAM models MX75-MX100**



METER COMPONENTS	ITEM NO	METER COMPONENTS	ITEM NO
METER BODY	1	CIRCLIP	7
ROTOR SHAFTS	2	METER CAP BOLTS	8
ROTORS	3	FLANGE SEALS	9
METER CAP O-RING	4	PROCESS CONNECTION (FLANGED OR THREADED)	10
METER CAP	5	FLANGE WASHERS	11
CAM	6	FLANGE BOLTS	12

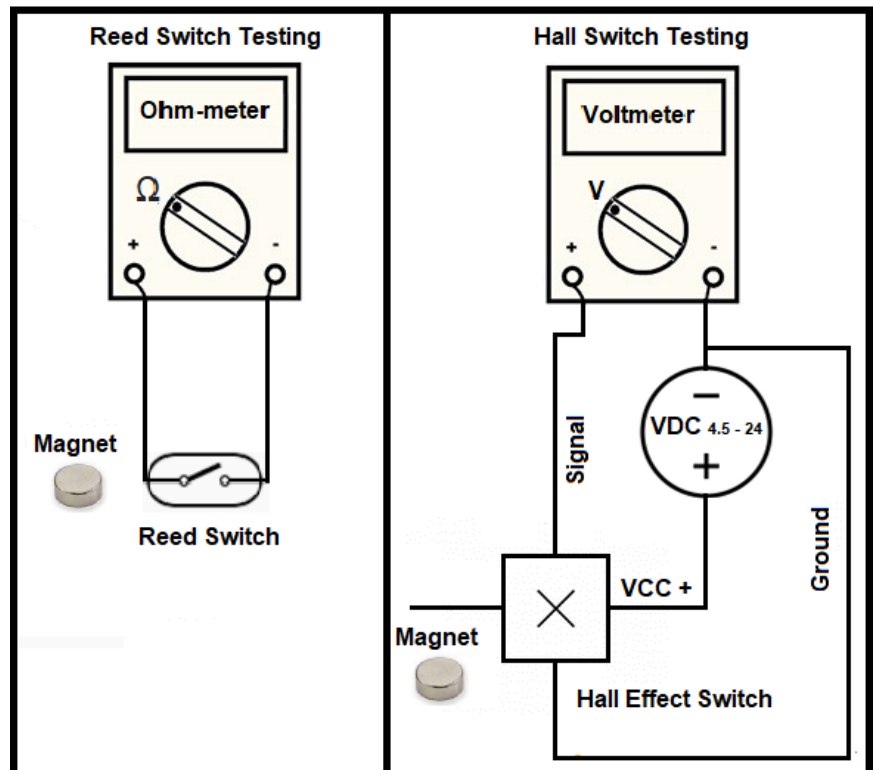
## TROUBLESHOOTING GUIDE

Problem	Cause	Remedy
Fluid will not flow through meter	a) Foreign matter blocking rotors b) Line strainer blocked c) Damaged rotors d) Meter connections over tightened e) Fluid is too viscous	a) Dismantle meter, clean rotors (strainer must be fitted in line) b) Clean strainer c) Replace rotors (Strainer must be fitted in line) d) Re-adjust connections e) See specifications for maximum viscosity
Reduced flow through meter	a) Strainer is partially blocked b) Fluid is too viscous	a) Clean strainer b) See specifications for maximum viscosity
Meter reading inaccurate	a) Fluid flow rate is too high or too low b) Air in fluid c) Excess wear caused by incorrect installation	a) See specifications for minimum and maximum flow rates b) Bleed air from system c) Check meter body and rotors. Replace as required. Refer to installation instructions
Meter not giving a pulse signal	a) Faulty hall effect switch b) Faulty reed switch c) Magnets failed	a) Replace PCB Board b) Replace PCB Board c) Replace magnets
LCD register not working	a) Battery not connected properly b) Battery flat c) Faulty wiring connections d) Faulty LC Display e) Faulty connection from LC Display	a) Check battery connections b) Replace battery c) Check wiring for loose or faulty connections d) Replace LC Display e) Check wiring connections

## TESTING REED / HALL SWITCHES

Testing of **Reed Switch** requires Neodymium magnet (at least 220 Gauss) and Macnaught display/PLC/FMS/Ohmmeter/Multimeter. If changes in reading are seen by waiving magnet near the reed switch, means it is working fine. Otherwise, the reed switch is faulty.

Testing **Hall Effect Switch** requires Neodymium magnet (at least 220 Gauss), Power Supply/Battery (4.5 - 24 V DC) and Multimeter/Voltmeter. Correct wiring is shown in the picture. Check if only one of the magnet poles changes the signal reading on the voltmeter. It is a clear indication that the switch is working perfectly. If hall switch signal is not changing then Hall switch is faulty.



## MAINTAINENCE VIDEOS

Macnaught provides an comprehensive set of 'Maintenance Videos' to assist the end user in all aspects of service and / or repair of the flow meter range.

This web based resource can be accessed by scanning the QR.



## SPARE PARTS KITS

- **Rotor Kit** (Rotor assembly (includes Meter Cap bolts and O-Ring))
- **Seal Kit** (O-Rings seal (includes Meter Cap Bolts))

Category "F"	ROTOR KIT			SEAL KIT
	Standard	High Viscosity (Standard)	PEEK	
<b>MX06F</b>	MXS-06F-ROTOR	-	-	MXS-06F-SEAL
<b>MX09F</b>	MXS-09F-ROTOR	MXS-09F-HVPROTOR	-	MXS-09F-SEAL
<b>MX12F</b>	MXS-12F-ROTOR	MXS-12F-HVPROTOR	-	MXS-12F-SEAL
<b>MX19F</b>	MXS-19F-ROTOR	MXS-19F-HVPROTOR	MXS-19F-PROTOR	MXS-19F-SEAL
<b>MX25F</b>	MXS-25F-ROTOR	MXS-25F-HVPROTOR	MXS-25F-PROTOR	MXS-25F-SEAL
<b>MX40F</b>	MXS-40F-ROTOR	MXS-40F-HVPROTOR	MXS-40F-PROTOR	MXS-40F-SEAL
<b>MX50F</b>	MXS-50F-ROTOR	MXS-50F-HVPROTOR	MXS-50F-PROTOR	MXS-50F-SEAL
<b>MX75F</b>	MXS-75F-ROTOR	-	-	MXS-75F-SEAL
<b>MX100F</b>	MXS-100F-ROTOR	-	-	MXS-100F-SEAL

Category "S"	ROTOR KIT			SEAL KIT
	Standard	High Viscosity (Standard)	PEEK	
<b>MX06S</b>	MXS-06S-ROTOR	-	-	MXS-06S-SEAL
<b>MX09S</b>	MXS-09S-ROTOR	MXS-09S-HVROTOR	-	MXS-09S-SEAL
<b>MX12S</b>	MXS-12S-ROTOR	MXS-12S-HVROTOR	-	MXS-12S-SEAL
<b>MX19S</b>	MXS-19S-ROTOR	MXS-19S-HVROTOR	MXS-19S-PROTOR	MXS-19S-SEAL
<b>MX25S</b>	MXS-25S-ROTOR	MXS-25S-HVROTOR	MXS-25S-PROTOR	MXS-25S-SEAL
<b>MX40S</b>	MXS-40S-ROTOR	MXS-40S-HVROTOR	MXS-40S-PROTOR	MXS-40S-SEAL
<b>MX50S</b>	MXS-50S-ROTOR	MXS-50S-HVROTOR	MXS-50S-PROTOR	MXS-50S-SEAL
<b>MX75S</b>	MXS-75S-ROTOR	MXS-75S-HVROTOR	-	MXS-75S-SEAL
<b>MX100S</b>	MXS-100S-ROTOR	MXS-100S-HVROTOR	-	MXS-100S-SEAL

Category "P"	ROTOR KIT					SEAL KIT
	Standard PPS	High Viscosity (Standard) PPS	High Temperature (SS 316)	High Viscosity (High Temp) SS 316	PEEK	
<b>MX06P</b>	MXS-06P-ROTOR	-	MXS-06P-HTROTOR	-	-	MXS-06P-SEAL
<b>MX09P</b>	MXS-09P-ROTOR	MXS-09P-HVPROTOR	MXS-09P-HTROTOR	MXS-09P-HVROTOR	-	MXS-09P-SEAL
<b>MX12P</b>	MXS-12P-ROTOR	MXS-12P-HVPROTOR	MXS-12P-HTROTOR	MXS-12P-HVROTOR	-	MXS-12P-SEAL
<b>MX19P</b>	MXS-19P-ROTOR	MXS-19P-HVPROTOR	MXS-19P-HTROTOR	MXS-19P-HVROTOR	MXS-19P-PROTOR	MXS-19P-SEAL
<b>MX25P</b>	MXS-25P-ROTOR	MXS-25P-HVPROTOR	MXS-25P-HTROTOR	MXS-25P-HVROTOR	MXS-25P-PROTOR	MXS-25P-SEAL
<b>MX40P</b>	MXS-40P-ROTOR	MXS-40P-HVPROTOR	MXS-40P-HTROTOR	MXS-40P-HVROTOR	MXS-40P-PROTOR	MXS-40P-SEAL
<b>MX50P</b>	MXS-50P-ROTOR	MXS-50P-HVPROTOR	MXS-50P-HTROTOR	MXS-50P-HVROTOR	MXS-50P-PROTOR	MXS-50P-SEAL
<b>MX75P</b>	-	-	-	-	-	-
<b>MX100P</b>	-	-	-	-	-	-

## SPARE PARTS KITS

SPARE KITS – DISPLAY AND PULSE CAP MODULE				
Output Type	Description	Display / Pulse Complete	PCB Kit	Battery Kit
Type A	Standard Pulse Cap (Reed/Hall)	MXD-AS	MXS-PCB-RH	-
Type D	PR Digital Register	MXD-DS	MXS-PCB-RH	DR012S
Type E	PRA Digital Register	MXD-ES	MXS-PCB-RH	DR012S
Type F	ER Digital Register	MXD-FS	MXS-PCB-RH	MS493S
Type G	ERA Digital Register	MXD-GS	MXS-PCB-RH	MS493S
Type H	ERB Batch Controller	MXD-HS	MXS-PCB-RH	MS493S
Type I	Standard Pulse Cap (Reed/Reed)	MXD-IS	MXS-PCB-RR	-
Type J	Standard Pulse Cap (Hall/Hall)	MXD-JS	MXS-PCB-HH	-
Type K	Standard Pulse Cap (High Resolution Sensor)	MXD-KS	-	-
Type M	PRM Digital 4-20 mA Blind Register	MXD-MS	MXS-PCB-RH	-
Type T	High Temperature Sensor	MXD-TS	-	-

## WETTED PARTS

Category “F”	MX06F	MX09F - MX12F	MX19F - MX50F	MX75F - MX100F
METER BODY	AL	AL	AL	AL
METER CAP	AL	AL	AL	AL
ROTORS	PPS	PPS	PPS/PEEK**	AL
HV ROTORS	-	PPS	PPS	AL
ROTOR SHAFTS	SS 316	SS 316	SS 316	SS 316
ROTOR BUSHES	-	-	-	CARBON
O-RINGS	FKM	FKM	FKM	FKM

Category “P”	MX06P	MX09P - MX12P	MX19P - MX50P	MX75P - MX100P
METER BODY	SS 316	SS 316	SS 316	*
METER CAP	SS 316	SS 316	SS 316	*
ROTORS	SS 316 / PPS**	SS 316 / PPS**	SS 316 / PPS / PEEK**	*
HV ROTORS	-	SS 316 / PPS**	SS 316 / PPS**	*
ROTOR SHAFTS	SS 316	SS 316	SS 316	*
ROTOR BUSHES	CARBON	CARBON	CARBON	*
O-RINGS	FEP	FEP	FEP	*

Category “S”	MX06S	MX09S - MX12S	MX19S - MX25S	MX40S - MX50S	MX40S - MX100S
METER BODY	AL	AL	AL	AL	AL
METER CAP	AL	AL	AL	AL	AL
ROTORS	SS 316	SS 316	SS 316/PEEK **	AL / PEEK **	AL
HVROTORS	-	SS 316	SS 316	AL	AL
ROTOR SHAFTS	SS 316	SS 316	SS 316	SS 316	SS 316
ROTOR BUSHES	CARBON	CARBON	CARBON	CARBON	CARBON
O-RINGS	FEP	FEP	FEP	FEP	FEP

FEP - PTFE Encapsulated

SS 316 - Stainless Steel 316

AL - Aluminium Alloy

FKM - Viton ®

PPS - Polyphenylene Sulphide (PPS Resin)

PEEK - Polyether ether ketone

\* Currently Unavailable

\*\* SS 316 rotors are assembled with carbon bushes.  
PPS and PEEK rotors do not have carbon bushes.

# PRESSURE DROP vs VISCOSITY

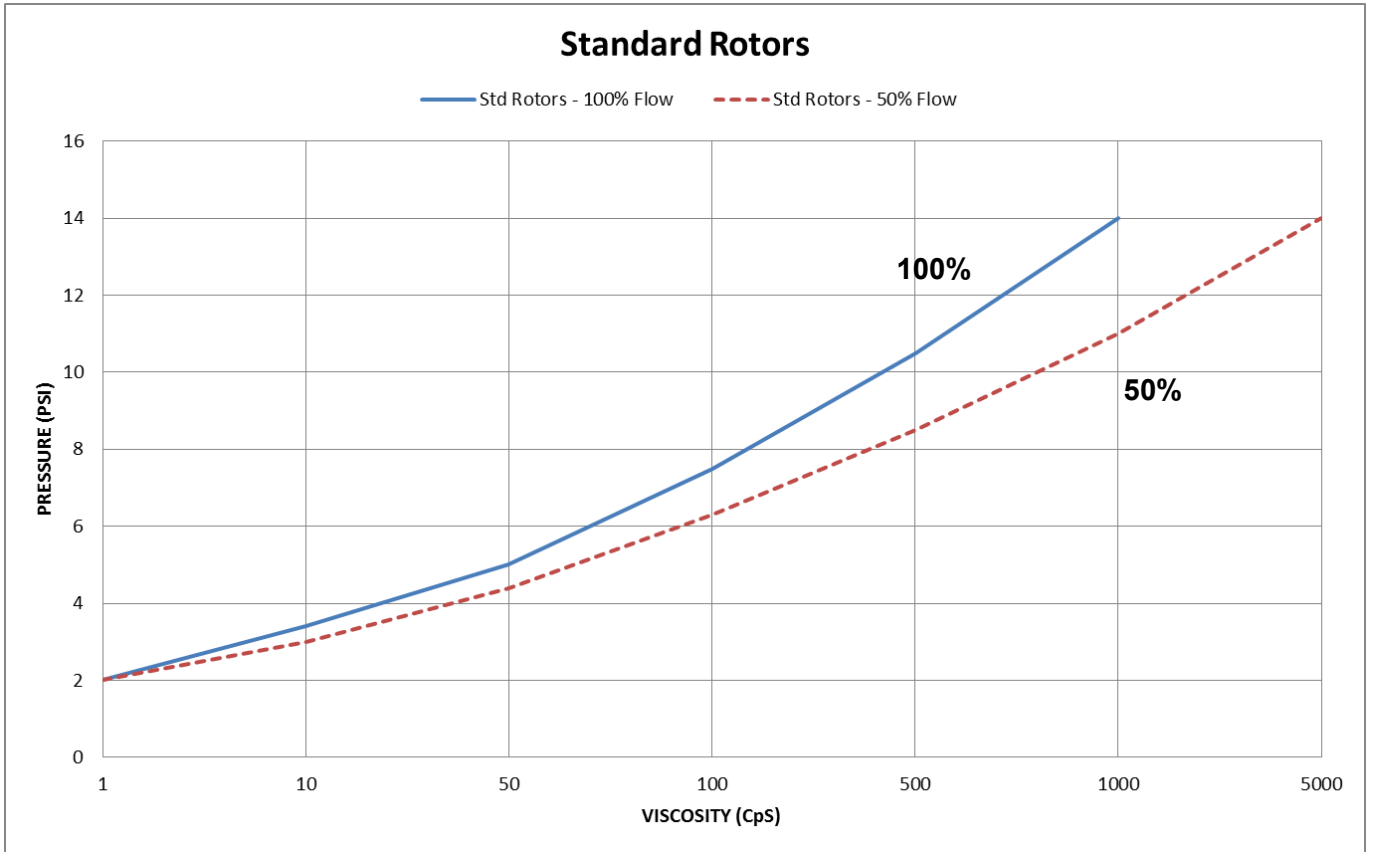
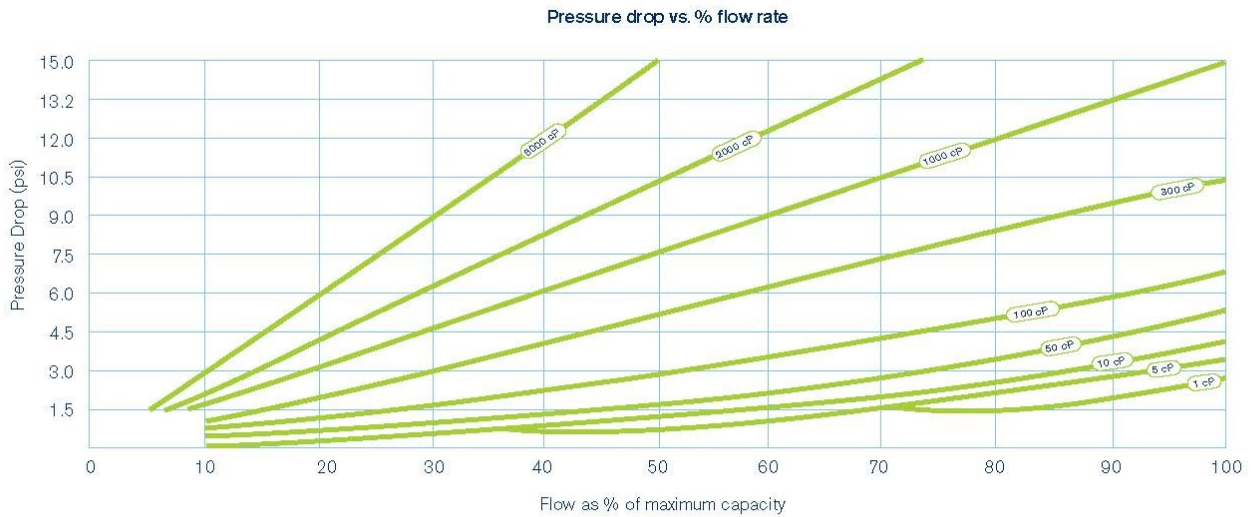


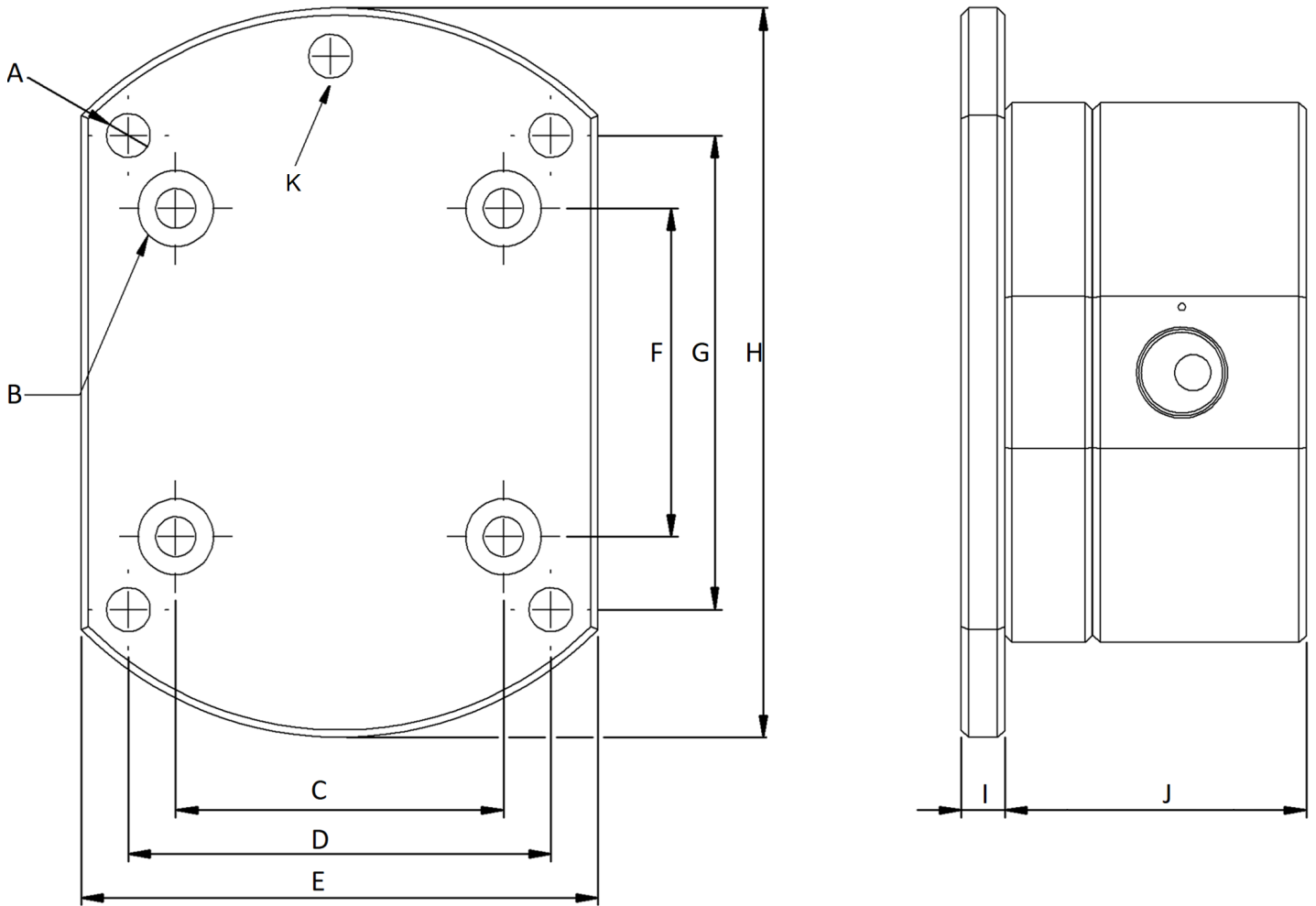
Figure 7: Impact of viscosity on pressure loss for a range of flow rates



Note: For viscosities greater than 1000 cPs High Viscosity rotors are required

## WALL MOUNT ADAPTOR (MX06 - MX25)

 **Note !** Wall Mount Adaptor Bracket is used to mount flow meter to the wall



Dimensions	A (Ø mm)	B (Ø mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (Ø mm)	I (mm)	J (mm)	K (Ø mm)
MX06 - MX09	6	5.5	45	58	71	45	65	100	6	42	M5x0.8
MX12	6	5.5	47	69	81	47	73	113	6	49	M5x0.8
MX19	7	6.6	61	85	100	61	95	143	6	62	M6x1.0
MX25	7	6.6	61	85	100	61	95	143	6	75	M6x1.0

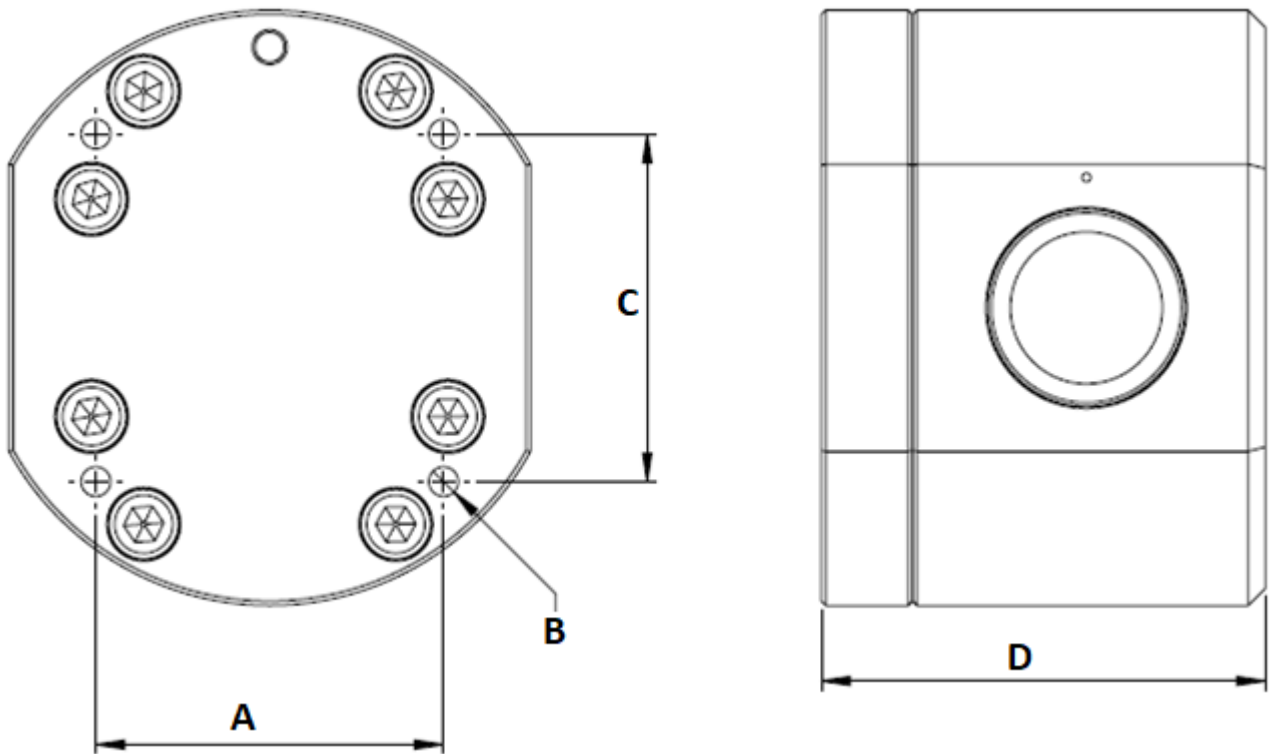
A Wall Mount Holes (4)

B SS Countersunk screws to be supplied with the wall mount bracket  
 5 mm in diameter and 16 mm in length for MX06 - MX12 meters  
 6 mm in diameter and 20 mm in length for MX19 - MX25 meters

K Earthing Point

 **Note !**

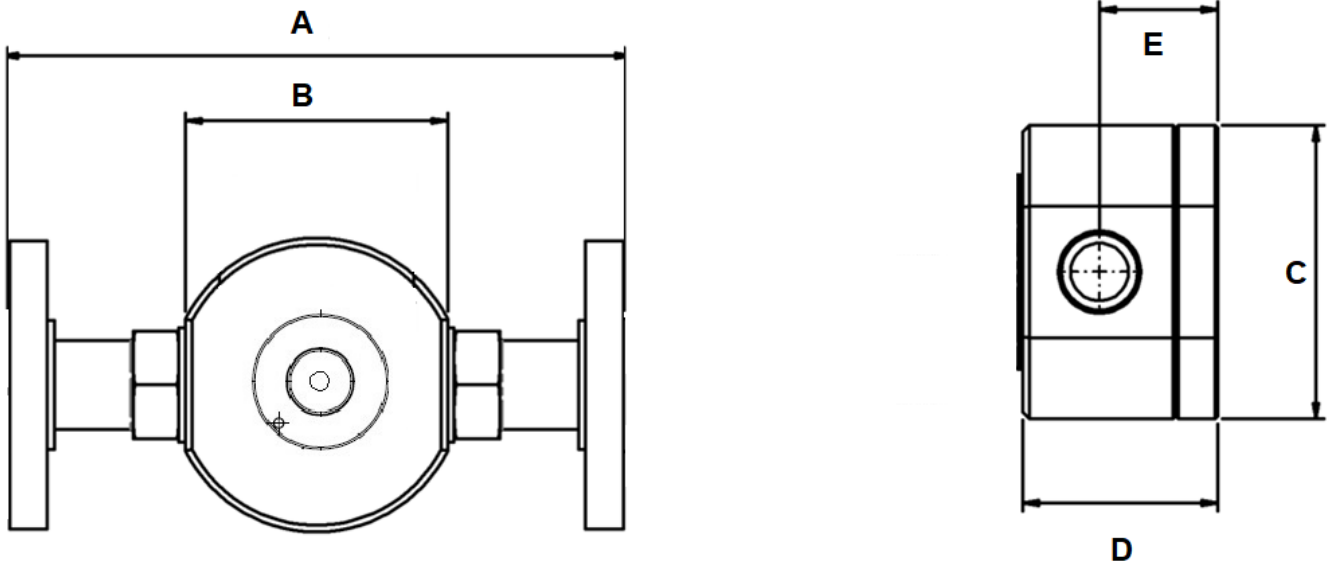
## WALL MOUNT THREAD POSITION ON FLOWMETER'S CAP (MX06 - MX50)



	A	B	C	D
<b>MX06</b>	45	M5 x 0.80	45	42
<b>MX09</b>	45	M5 x 0.80	45	42
<b>MX12</b>	47	M5 x 0.80	47	49
<b>MX19</b>	61	M6 x 1.00	61	62
<b>MX25</b>	61	M6 x 1.00	61	75
<b>MX40</b>	80	M8 x 1.25	80	102
<b>MX50</b>	80	M8 x 1.25	100	123



**B** Mounting Holes x 4  
Earthing Points x 4 (Any of them can be used)

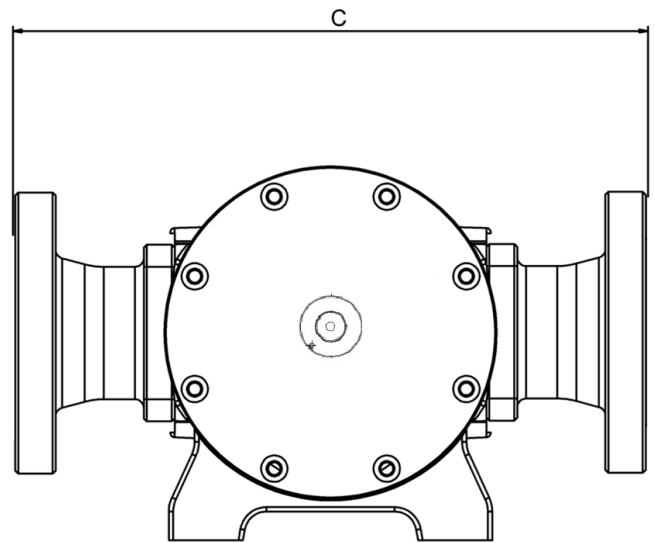
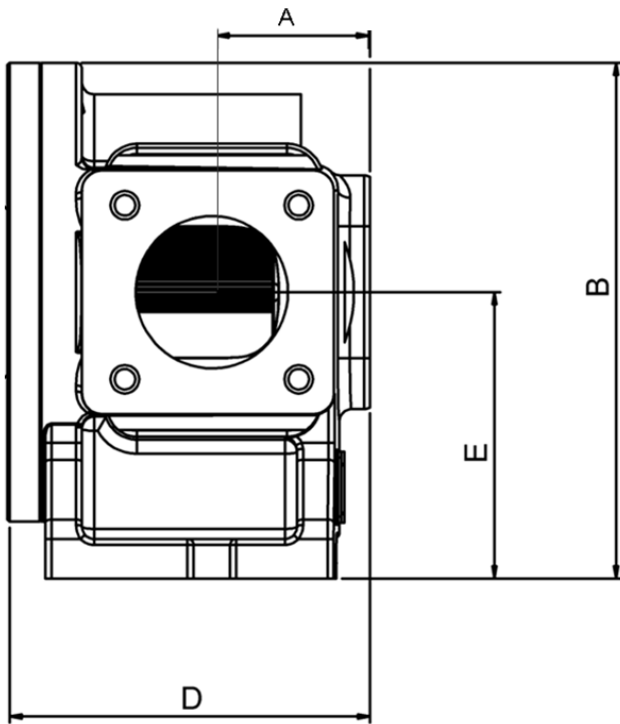


Model	METER and FLANGE DIMENSIONS					
	Port Size	A	B	C	D	E
<b>MX06</b>	1/4"	-	71	74	42	25
<b>MX09</b>	1/4"	-	71	74	42	25
<b>MX12</b>	1/2"	-	81	87	49	28
<b>MX19</b>	3/4"	-	100	112	62	37
<b>MX25</b>	1"	240	100	112	75	45
<b>MX40</b>	1 1/2"	240	120	137	103	61
<b>MX50</b>	2"	264	140	163	124	72



Note !

**FLANGE TYPES:** ANSI flanges 150 # and DIN PN 16 flanges are raised faced (RF) while JIS 10k flanges are flat faced (FF) by default. Contact Macnaught if a different configuration is required.



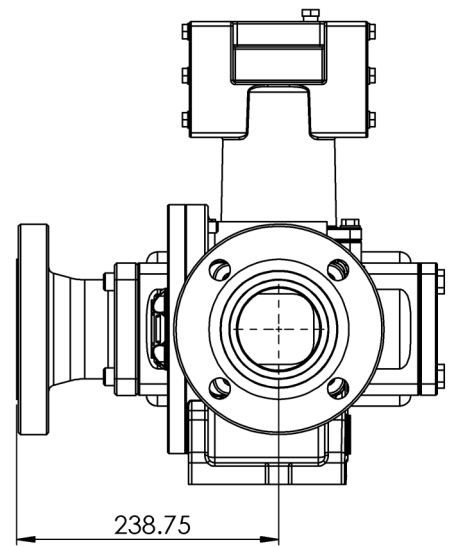
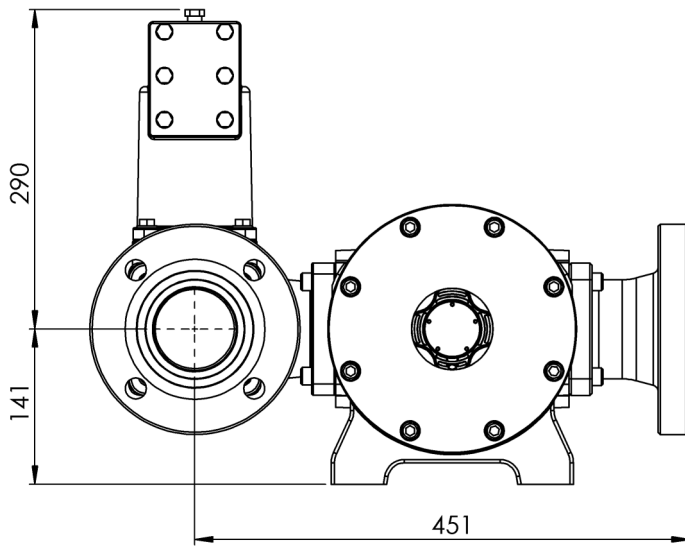
Model	METER and FLANGE DIMENSIONS						
	FLANGE TYPE	PORT SIZE	A	B	C	D	E
MX75 Aluminium	ANSI	3"	78	254	436	179	141
	DIN				436		
	JIS				436		
	Rp				302		
	NPT				302		



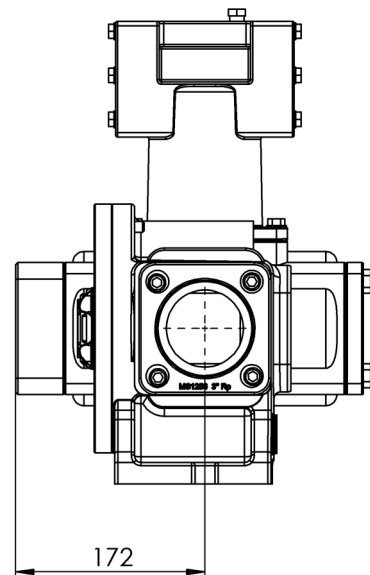
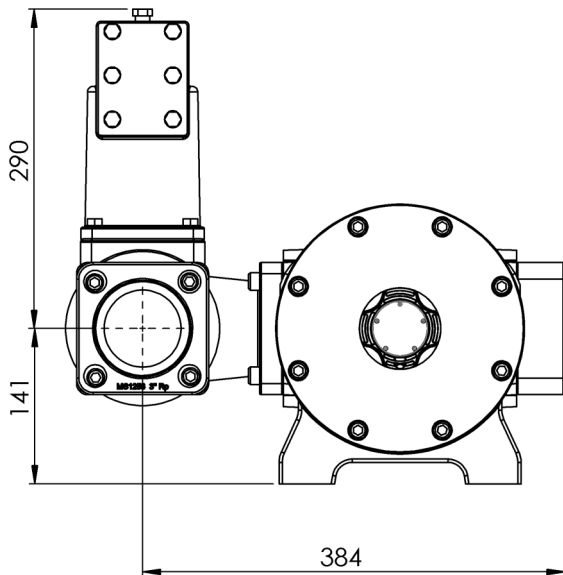
Note !

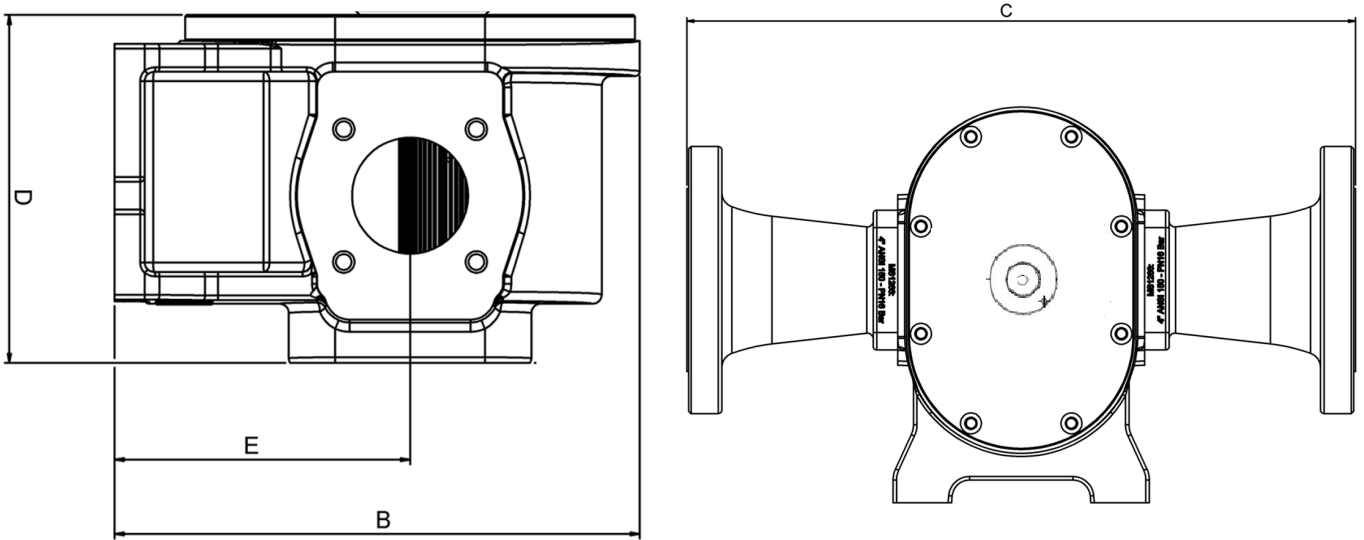
**FLANGE TYPES:** ANSI flanges 150 # and DIN PN 16 flanges are raised faced (RF) while JIS 10k flanges are flat faced (FF) by default. Contact Macnaught if a different configuration is required.

### 3" Flange




### 3" Threaded Connection

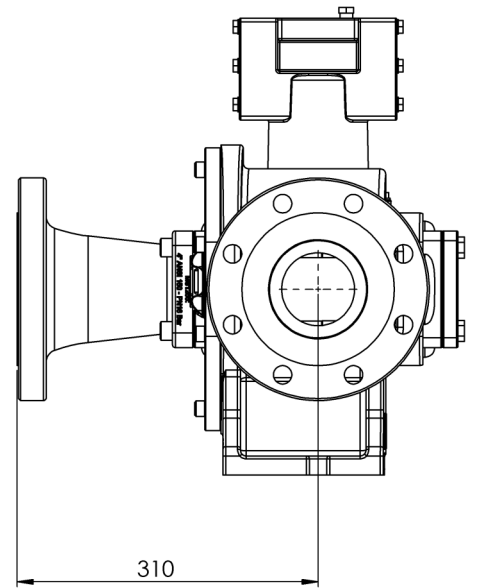
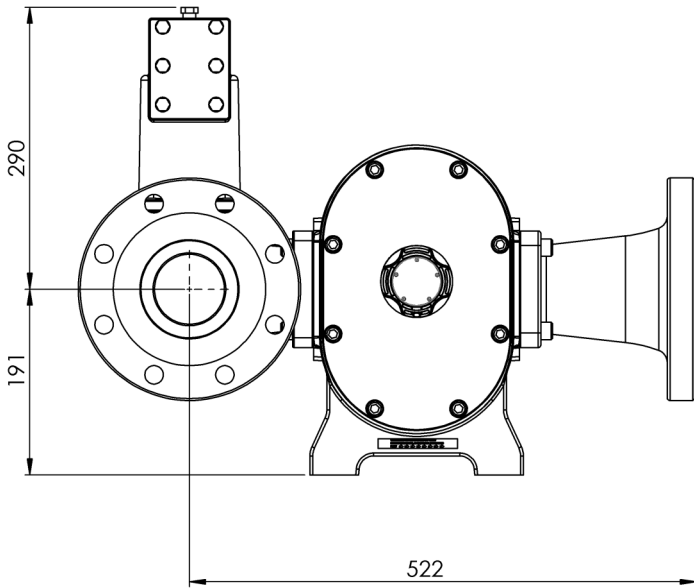




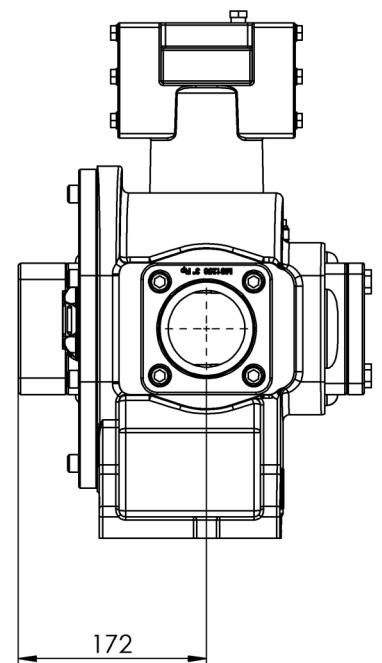
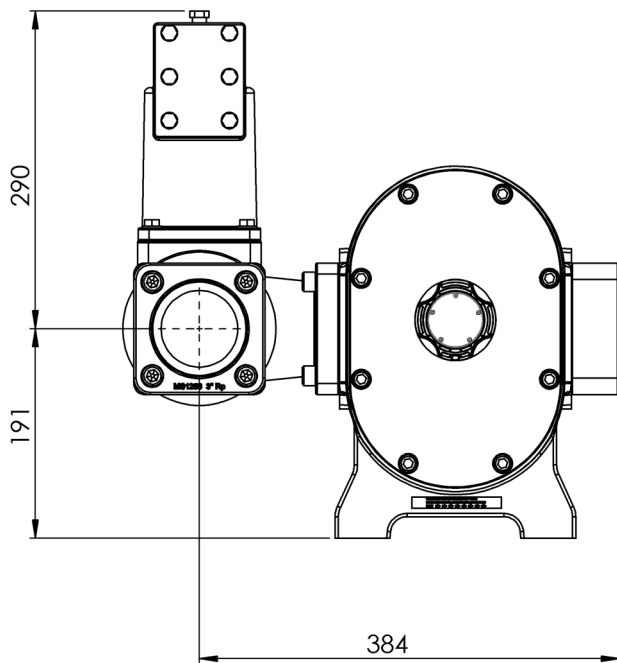
MODEL	METER and FLANGE DIMENSIONS					
	FLANGE TYPE	PORT SIZE	B	C	D	E
MX100 Aluminium	ANSI	4"	340	583	225	191
	DIN			583		
	JIS			583		
	Rp	3"		301		
	NPT			301		

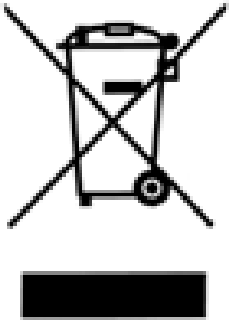
 **FLANGE TYPES:** ANSI flanges 150 # and DIN PN 16 flanges are raised faced (RF) while JIS 10k flanges are flat faced (FF) by default. Contact Macnaught if a different configuration is required.

### 4" Flange



### 3" Threaded Connection





The WEEE Directive requires the recycling of waste electrical and electronic equipment in the European Union.

Whilst the WEEE Directive does not apply to some of Macnaught's products, we support its policy and ask you to be aware of how to dispose of this product.

The crossed out wheeled bin symbol illustrated and found on our products signifies that this product should not be disposed of in general waste or landfill.

Please contact your local dealer national distributor or Macnaught Technical Services for information on product disposal.

**Note:**

This product should be disposed of according to all applicable local and national government environment regulations and guidelines.

