

OVAL GEAR FLOWMETER ELECTRONIC MODEL 012 - 1/2"

INSTRUCTION MANUAL



To the Owner

**PLEASE READ THIS SAFETY INFORMATION
CAREFULLY BEFORE USE.**

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

If you have any problems with the meter, refer to the maintenance and trouble shooting sections of this manual.

This manual contains connection and operating instructions for meters with Pulse outputs.

Models with a Liquid Crystal Display have an additional LCD instruction manual supplied. If you need further assistance, contact your local representative or distributor for advice.

This Flow Meter has incorporated the oval rotor principal into its design. This has proven to be a reliable and highly accurate method of measuring flow.

Exceptional repeatability and high accuracy over a wide range of fluid viscosities and flow rates are features of the oval rotor design. With a low pressure drop and high pressure rating oval rotor flow meters are suitable for both gravity and pump (in line) applications.

This instruction manual covers pulse meters constructed in Aluminium or Stainless Steel. Also included are the high pressure versions of this model.

Important Information



WARNING

Before use, confirm the fluid to be used is compatible with the meter. Refer to Industry fluid compatibility charts or consult your local representative for advice.

To prevent damage from dirt or foreign matter it is recommended that a Y or Basket type 60 mesh strainer be installed as close as possible to the inlet side of the meter. Contact your local representative for advice.



CAUTION

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



CAUTION

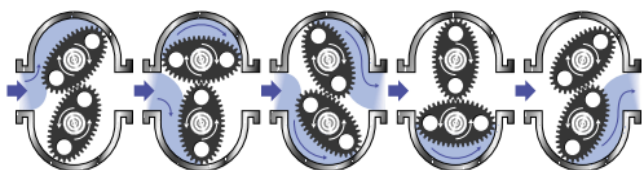
To prevent damage caused by air purge slowly fill the meter with fluid. To reduce pressure build up turn off the pump at the end of each day.

Maintenance can be carried out to the liquid crystal displays and pulse units without removing or isolating the meter from the line. When maintenance to any other part of the meter is required, the meter must be isolated and the line pressure reduced.

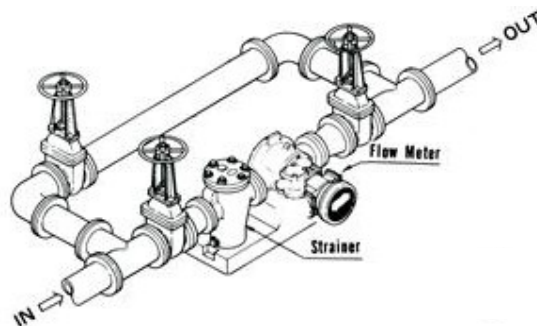
The reed switch pulse unit can cause inaccurate rate counts when used with high speed counters. It is advised that a debounce circuit be used. Contact your meter distributor for further information.

Operating Principle

When fluid passes through the meter the rotors turn, as shown below. The magnets which are located in the rotors will pass across the pulser circuit board (containing either Reed switches or Hall Effect sensors). A signal is generated which is then sent by the Pulse Circuit Board (PCB) to the relevant LC display or receiving instrument..



Installation Procedure



- 1) It is recommended that when setting up pipe work for meter installations 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 above)
- 2) Use thread sealant on all pipe threads.
- 3) For pump applications ensure pipe work has the appropriate working pressure rating to match the pressure output of the pump. See Meter Specifications section for further details.
- 4) Install a wire mesh strainer, Y or basket type 60 mesh (250 micron), as close as possible to the inlet side of the meter.
- 5) Ensure that the meter is installed so that the flow of the liquid is in the direction of the arrows embossed on the meter body.
- 6) The meter can be installed in any orientation as long as the meter shafts are in a horizontal plane. (Refer to figures to the right for correct installation) The register assembly may be orientated to suit the individual.
Note: Incorrect installation can cause premature wear of meter components.
- 7) Do not over tighten meter connections. Note: Incorrect installation can cause premature wear of meter components.
- 8) It is important that after initial installation you fill the line slowly, high speed air purge could cause damage to the rotors.
- 9) Test the system for leaks.
- 10) Check the strainer for swarf or foreign material, after the first 200 litres check periodically, particularly if the flow rate decreases.



Do Not Install Meter This Way

Maintenance Procedures

Disassembly

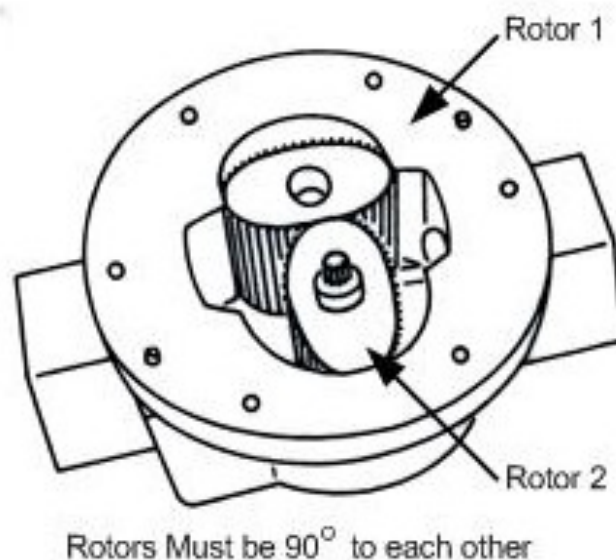
Ensure that the fluid supply to the meter is disconnected, and the line pressure is released before disassembly, with the exception for repair or maintenance to the LC Display or PCB where there is no necessity to isolate the meter from flow. Refer to the exploded parts diagram on subsequent pages for item numbers.

- 1) Pulse Caps Models: Undo the conduit connector, remove pulse cap (item 9) and remove the wires from the pulse terminal board (item 5).
- 2) Standard LC Display: Mark the display orientation with a marking pen, unscrew the four large screws on top of the LC Display. Carefully separate the LC Display from the plastic housing and disconnect the wires from the pulse terminal block. (Refer to additional LCD instruction manual accompanying these instructions). Remove the mounting adaptor plate and gasket.
- 3) Loosen the cap head screws (Item 7) that hold down the meter cap (Item 4), remove the screws, washers and lift off the cap.
- 4) Remove the o-ring (Assembly Item 2) from the o-ring groove in the meter cap (Assembly Item 4).
- 5) Remove rotors (Item 3).

Reassembly

- 1) Before reassembling check the condition of the rotors (replace if necessary).
- 2) Check that the smooth side of the rotors (not the plug side) is facing you when inserting the rotors, the smooth side of the rotor is the magnet side. There is no difference between rotor one or rotor two.
- 3) Replace the rotors (Item 3) onto the shafts at 90 degrees to each other (refer Fig) and check their operation by turning either of the rotors. If the rotors are not in mesh correctly or do not move freely, remove one of the rotors and replace correctly at 90 degrees to the other rotor.
- 4) Re-check the operation of the rotors
- 5) Replace the o-ring (Item 2) into groove in the meter cap, if the o-ring has grown or is damaged in any way replace it with a new part.
- 6) Replace the meter cap making sure that the locating pin in the body lines up with the hole in the meter cap.

- 7) Insert the cap head screws (Item 7) and tighten in a diagonal sequence 1, 3, 2, 4, etc.
- 8) The replacement of cables and connectors are a reversal of the disassembly procedure, replace conduit fitting if required.
When replacing the Standard LC Display confirm the orientation marks made on disassembly are aligned then screw the register into place.
- 9) 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 the line.



Flowmeter

		Metric	US
Flow Range	Below 5 cP	3 to 25 L/min	0.8 to 6.6 G/min
	5 to 1000 cP	2 to 30 L/min	0.5 to 8 G/min
K-Factor (Sensor Pulses per Unit of Measure)		Refer to Flowmeter Data Plate	
Operating Temperature - Types M, MH, F - Type S		-40 - 80°C	-40 - 176°F
		-40 - 120°C	-40 - 248°F
Maximum Operating Pressure ¹ - Types S,M,F		5500 kPa	800 psi
Accuracy of Reading		±0.5%	

1. Conforms to Directive 97/23/EC—Cat 1

High Specification Flowmeters

The following specifications apply when high temperature, high pressure or high viscosity options are used.

	Metric	US
High Temperature	120°C	248°F
High Pressure (Type MH)	20000 kPa	3000 psi
High Viscosity	Above 1000 Centipoise	

Pulser Board/Sensor Specifications

There are 2 pulse board options with all Macnaught pulse flowmeters:

Standard Option 1 - 1x Reed Switch 1x Hall Effect Output

Hazardous Option 2 - 2x Reed Switch Output

Output Signals	Standard Pulse Meter		2x Digital (Square Wave)
Reed Switch ² (Mechanical Sensor)	Current	Maximum	500mA
	Voltage	Maximum	30V DC
	Contact Rating	Maximum ³	10W
Hall Effect IC ² (Electronic Sensor)	Maximum Current		7.5mA
	Operating Voltage		4.5V to 24V DC
	Transistor Type		Open-Collector NPN

2. Voltage & current specifications apply per sensor (not combined).

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

Analogue Output (4-20mA)

Analogue outputs are available as an auxilliary display signal by including either of the following LCD displays with your flowmeter. These may be fitted to the meter or remote (wall mount) types.

DRA Small display with analogue output module

ERA Large display with analogue output module

Pulser Wiring Diagram



Please read this information carefully before installation

Hall Effect:

Hall effect sensors require an external pull up resistor to be fitted by the installer for correct operation. Powering a Hall effect sensor without a resistor wired between the supply voltage and the signal line will result in damage to the sensor.

Reed Switch:

In order to protect the reed switch from over current, and to maximise life expectancy, we recommend limiting the current through the switch by fitting a series resistor in between the signal leg and the PLC/signal sensing device.

Standard. Option 1	Hazardous. Option 2
<p>1 V1+ 2 V1- 3 GND 4 SIG2 5 Vcc</p> <p>Series Res Ω^{**} Pull up Res Ω^{*}</p> <p>Reed Switch Hall Effect</p>	<p>1 V1+ 2 V1- 3 V2+ 4 V2- 5 NOT USED</p> <p>Series Res Ω^{**} Series Res Ω^{**}</p> <p>Reed Switch 1 Reed Switch 2</p> <p>Note: Reed Switches are not polarity sensitive.</p>
<p>* Macnaught pulser boards are <u>not fitted</u> with a pull up resistor. Consult sensor specifications on page 4 for selection of appropriate resistance.</p>	
<p>** Macnaught pulser boards are <u>not fitted</u> with a current limiting resistor. For 12VDC we recommend a 1kΩ resistor. For 24VDC, we recommend a 1.8k-2.2kΩ resistor.</p>	

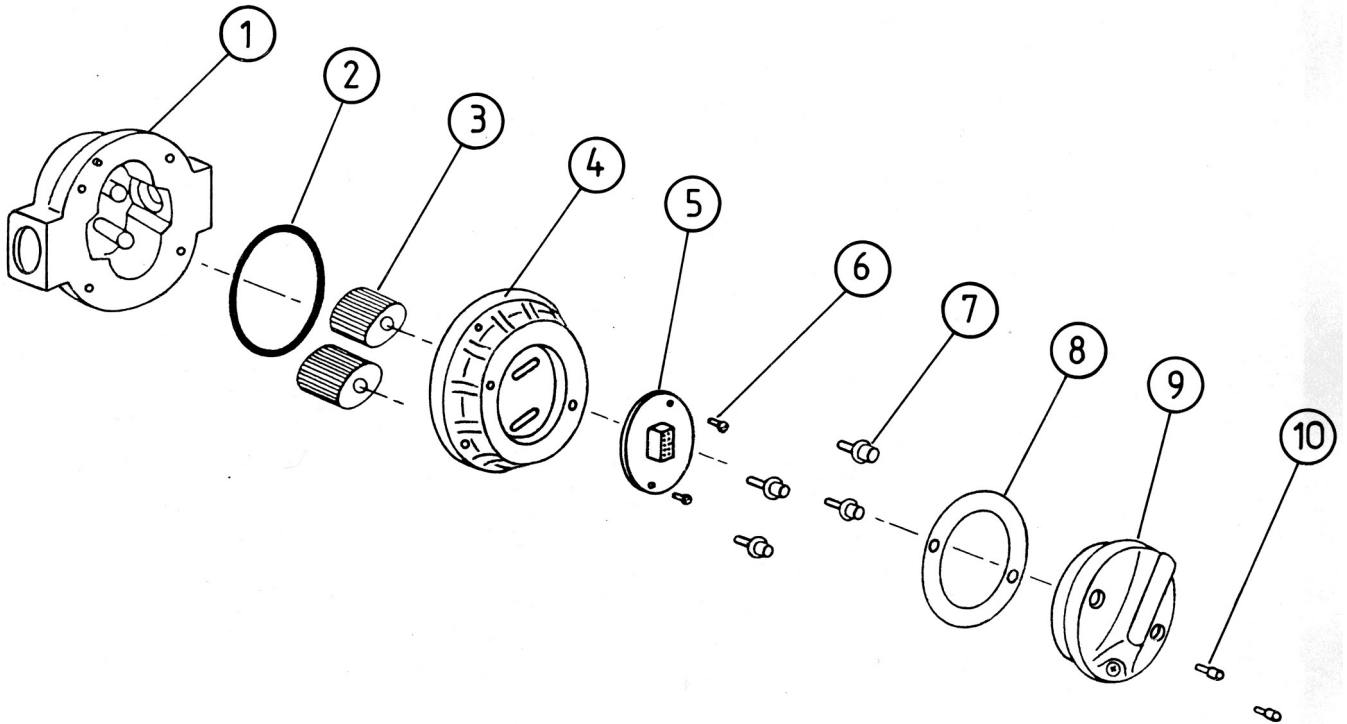
Note: Consult the following instruction sheets if the flow meter is fitted with an LCD Display.

Display Part Number:	DR	DRA	ER	ERB	ERA	ERS
Instruction Sheet:	DR013	DR014	MS574	MS392	MS476	MS351

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 sensor 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

Exploded Diagram



Parts Identification

Item No.	Part Description
1	Meter Body
2	Meter Cap O-Ring
3	Rotors
4	Meter Cap
5	Printed Circuit Board
6	PCB Mounting Screws
7	Meter Cap Screws
8	Pulser Cap Gasket
9	Pulser Cap
10	Pulser Cap Screws

Spare Parts Kits

There are 3 **Spare Kit** options available for the purchase of replacement components:

- Pulser Kit (PKit) - Replacement PCB.
- Rotor Kit (RKit) - Complete Rotor assembly
- Seal Kit (SKit) - Complete set of O-Rings/Gaskets

Spare Kit Coding Procedure.

1. Determine what type of Spare Parts Kit is required (e.g. Rotor Kit)
2. Use the 'Coding Sequence' to construct a part number according to the meter type.

Pulser Kit - (P Kit)

Customer Model Number

F	012	—	1	S	2
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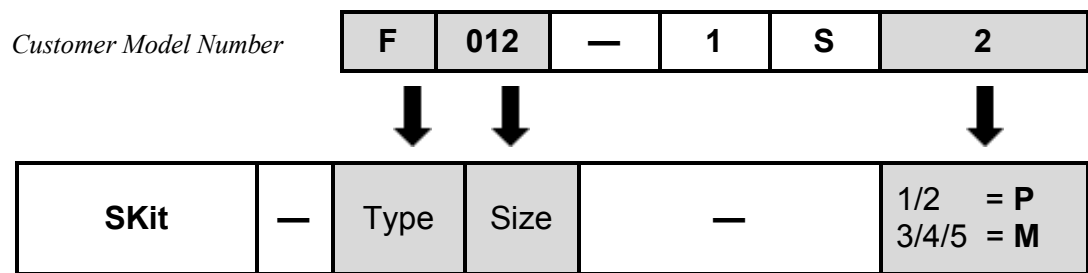
Coding Sequence

PKit	—	Size	—	1 (Reed/Hall) 2 (Reed/Reed)
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Kit Components

Order Number	Components	Qty	Items
e.g PKit – 012 – 2	PCB	1	5
	Mounting Screws	2	6

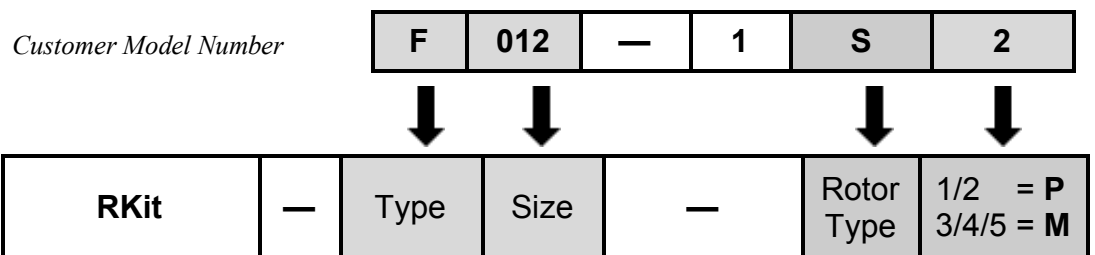
Seal Kit - (S Kit)



Kit Components

Order Number	Components	Qty	Items
e.g SKit – F012 – P	Pulser Cap Gasket	1	8
	Meter Body O-Ring	1	2

Rotor Kit - (R Kit)



Kit Components

Order Number	Components	Qty	Items
e.g RKit – F012 – SP	Complete Rotor Assembly	1 set	3
	Meter Body O-Rings	1	2
	Meter Cap Screws	4	7

Wetted Parts

Component	Type 'F'	Type 'S'	Type 'M'	Type 'MH'
Meter Body	Al	Al	SS	SS
Meter Cap	Al	Al	SS	SS
Rotor Shafts	SS	SS	SS	SS
Rotors - Standard	PPS	SS	PPS	PPS
- High Temp.	-	-	SS	SS
- High Viscosity.	PPS	SS	SS	PPS
Rotor Bushes	-	CA	CA	CA
O-Rings	FKM	K	K	K

K - FEP/PTFE Encapsulated

SS - Stainless Steel 316 /304

Al - Aluminium AA610

CA - Carbon

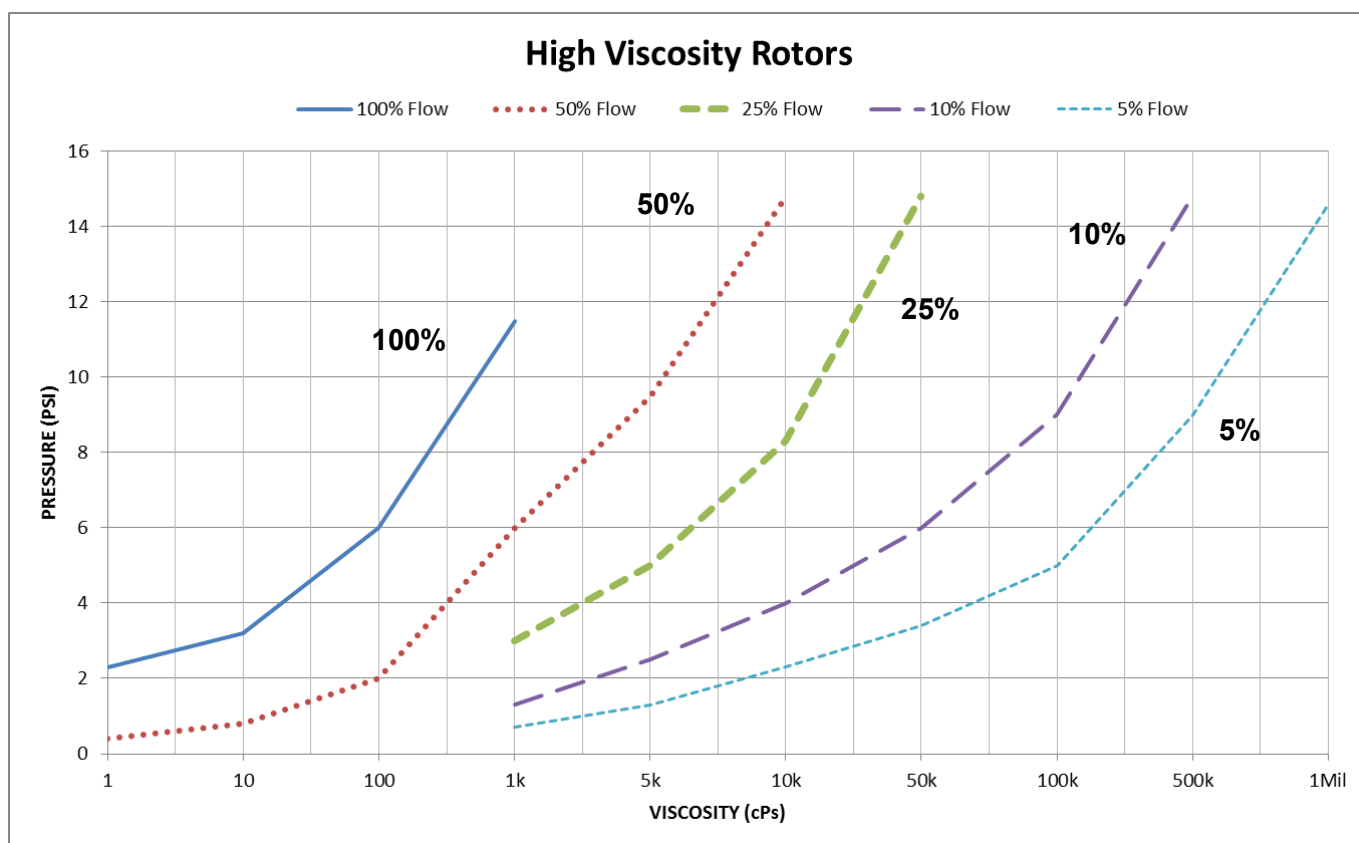
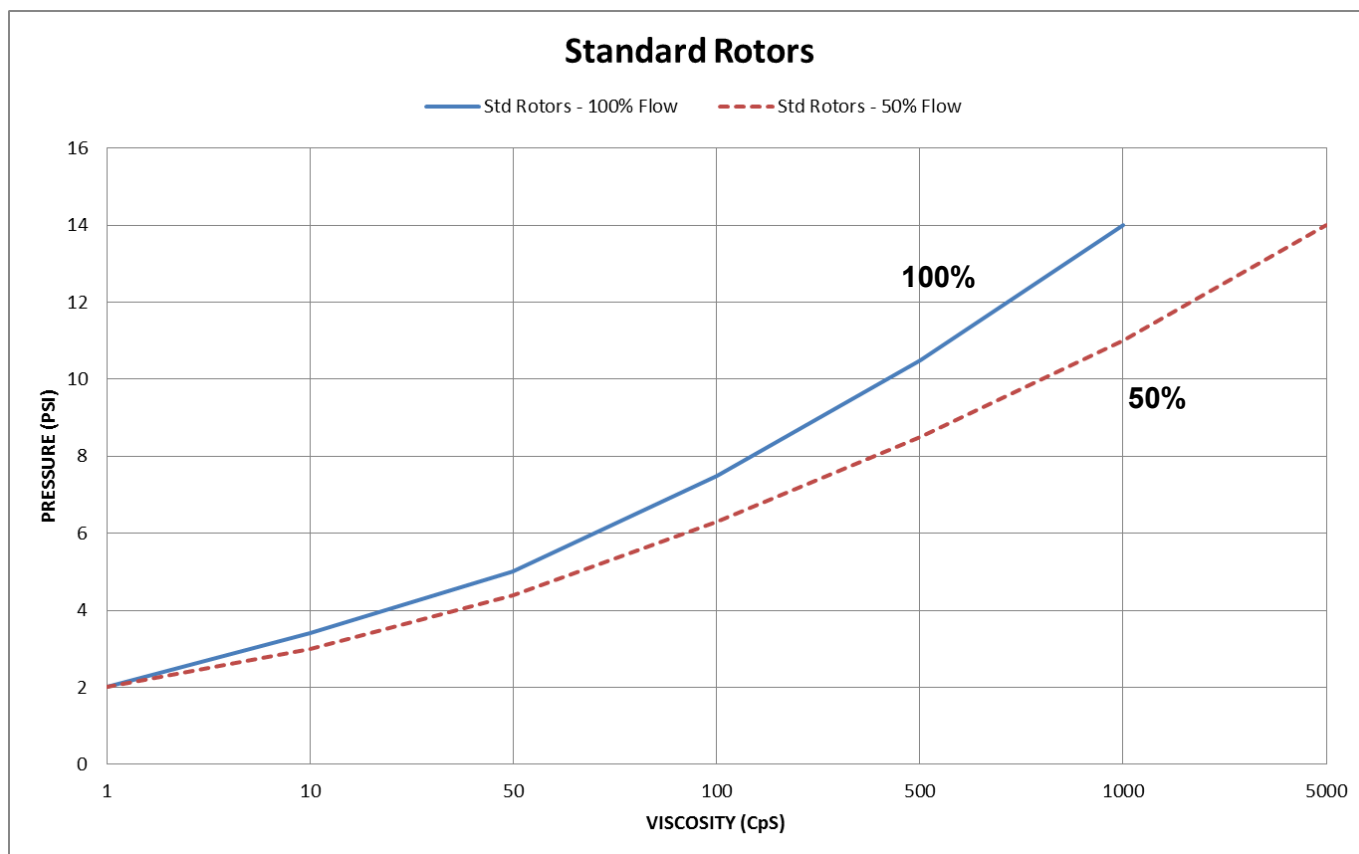
FKM - Viton ®

PPS - Polyphenylene Sulphide

PVDF - Polyvinylidene Flouride

FFKM - Perfluoro Elastomer

Hast C - Hastelloy C [™]



	A - Face to Face Length		
	F and S Series' (Al)	M Series (SS)	MH Series (SS HP)
RC/RP/NPT	100	100	95

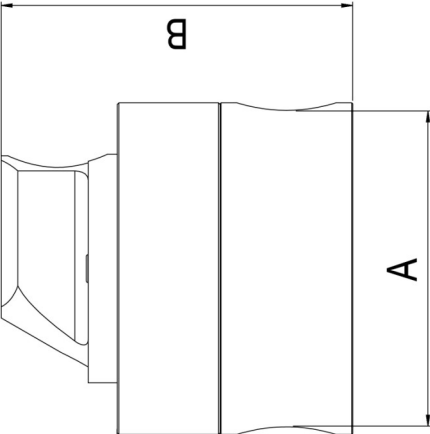
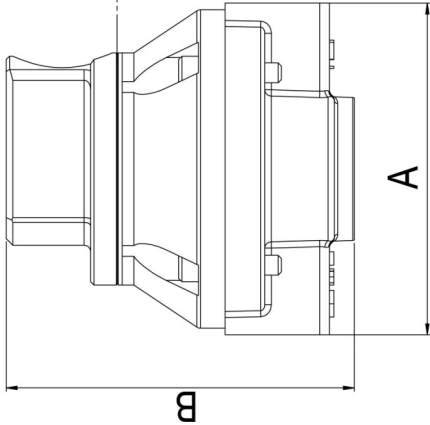
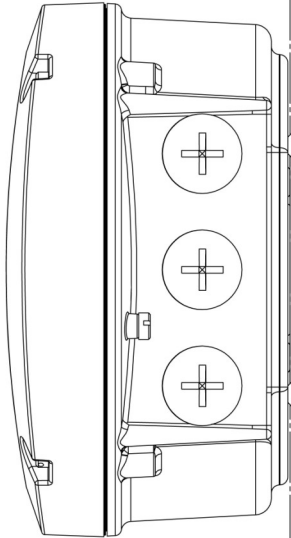
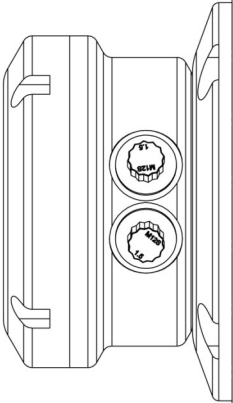
	B - Register Height			
	F Series (Al)	M Series (SS)	MH Series (SS HP)	S Series (Al)
Pulse	106	108	106	106
ER	156	158	156	156
DR	127	130	128	127

Pulse

DR

ER

Pulse



F, M and S Series'

MH Series

WEEE Directive - Waste Electrical and Electronic Equipment



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 wheelie 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.



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