Item	Description	MP015	MP025	MP040	MP050
		Part Numbers			
1	**Piston**				
	PEEK 60°C	* SA1514	* SA2514	* SA4014	* SA5014
	PEEK 120°C	* SA1515	* SA2515	* SA4015	* SA5015
	PEEK 150°C	* SA1528	* SA2528	* SA4028	* SA5028
	CFT 60°C	* SA1516	* SA2516	* SA4016	* SA5016
	CFT 120°C	* SA1517	* SA2517	* SA4017	* SA5017
2	**Partition**				
	ceramic	MC1516	MC2516	MC4016	MC5016
	stainless steel	SA1519	SA2519	SA4019	SA5019
3	**Manifold bearing**				
	PEEK BG	MC1510	MC2510	MC4010	MC5010
	CFT	MC1511	MC2511	MC4011	MC5011
4	**Manifold O-ring**				
	viton	SC1514	SC2514	SC4014	SC5014
	EPR	SC1515	SC2515	SC4015	SC5015
	teflon	SC1516	SC2516	SC4016	SC5016
	buna-N	SC1513	SC2513	SC4013	SC5013
5	**Pulse output board**				
	stainless / aluminum	* SA1505	* SA2505	* SA4005	* SA5005
	High pressure	* SA1506	* SA2506	* SA4006	-
	High temp. 150°C (Hall)	* SA1503	* SA2503	* SA4003	* SA5003
6	**Output board screw**	SC0002	SC0002	SC0002	SC0002
7	**Terminal cover**				
	stainless steel	SA0001	SA0001	SA0001	SA5001
	aluminium	SA0002	SA0002	SA0002	SA5002
	GRN glass re-inforced	SA0003	SA0003	SA0003	SA5003
8	**Terminal cover screw**				
	stainless / aluminum	SC0001	SC0001	SC0001	SC0001
9	**Terminal cover O-ring**				
	for SS & alum. covers	SC0012	SC0012	SC0012	SC0012
	for GRN covers	SC0013	SC0013	SC0013	SC0013
10	**Body**				
	stainless steel	SA1510	SA2510	SA4010	SA5010
	high pressure stainless	SA1511	SA2511	SA4011	-
	aluminum	SA1512	SA2512	SA4012	SA5012
11	**Body screw**				
	stainless / aluminum	SC0003	SC0003	SC4003	SC5003
	high pressure	SC0020	SC0020	SC4020	-
12	**Manifold**				
	stainless (BSP)	SA1520	SA2520	SA4020	SA5020
	stainless (NPT)	SA1521	SA2521	SA4021	SA5021
	aluminium (BSP)	SA1524	SA2524	SA4024	SA5024
	aluminium (NPT)	SA1525	SA2525	SA4025	SA5025

RECOMMENDED SPARES

* Add the suffix "Q" to the appropriate part number for Quadrature output spares, this applies only to flowmeters supplied with Bi-directional flow output parts.

CONTENTS **Page**

1.0 OVERVIEW

The Multipulse flow meter is a precision machined positive displacement flow meter capable of measuring a wide range of liquid flows and viscosities irrespective of their chemical or physical properties.

Each flow meter is manufactured from 316L stainless steel, suitable for a broad selection of chemicals. Aluminium flow meters are available for specific applications.

A flameproof option is available on all the stainless steel and aluminium models.

The Multipulse can also be used within hazardous areas when connections are made across the reed switch output in conjunction with an approved electrical safety barrier.

Typical I.S. barriers include:

- MTL Model 3011 or 3012
- P & F Model KHD2-OT1-Ex1

4.0 MAINTENANCE

4.1 Dismantling

The Multipulse has been constructed in such a way that the flow meter manifold need not be disturbed when servicing the flow meter in-situ.

Isolate the flow meter from its source of supply and allow any excess liquid to drain out. Remove the cap screws located around the flow meter body and gently lever the body off the manifold at the slots provided on either side.

Caution: Lever action needs to be even on both sides so as to avoid 'walking' the body from side to side. This inturn could damage the ceramic partition or piston spigot, for this reason ceramic partitions are not covered by warranty.

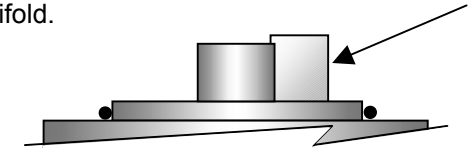
4.2 Inspecting

Lift the piston out of the flow meter and inspect for signs of wear or damage. Ensure that no particles are impinged into the piston walls and remove any foreign material inside the flow meter. Inspect the O-ring and centre bearing for damage. Replace any suspect parts.

4.3 Re-assembling

Replace the piston and rotate it by hand to ensure freedom of movement.

Align the slot in the body with the partition plate and firmly press the body evenly onto the manifold. A smear of lubricant on the O-Ring will assist. CAUTION, the partition plate is rectangular on all models & must be assembled with the long face to the centre boss of the manifold.



5.0 CLEANING IN-SITU

When a system is to be cleaned in place (CIP), sterilised or purged without removal of the flow meter, it is advisable to provide a by-pass around the flow meter to avoid damaging the piston unless the following recommendations are adhered to.

1) The cleaning fluid must be compatible with the piston and O-ring materials.
2) During steam sterilising ensure the steam temperature does not exceed the maximum operating temperature of the flow meter.
3) The velocity of the steam must be carefully restricted to ensure the velocity of the piston does not exceed the equivalent of maximum flow rate.

The same restrictions apply when purging with air or gas.

3.5 Hazardous area wiring

If the flow meter has been supplied with the "explosion proof option" Exd IIB T6, then the following points must be observed:

1) Wiring techniques are to be in accordance with the rules, regulations and requirements applying to the territory in which the flow meter is being installed.

   The units should only be connected and set up by qualified staff. The qualified staff must have knowledge of protection classes, regulations and provisions for the apparatus in hazardous areas.

2) When using shielded cable do not use the shield as an electrical earthing conductor. Be sure to isolate the shield / screen from any contact with the flow meter. The shield / screen is to be connected to the instrument earth only to protect the transmitted signal from mutual inductive interference.

   Electrical earthing lugs are located within the terminal housing cover & on the underside of the manifold . Use a separate earth within the cable making sure that the earth conductor does not come in electrical contact with the cable shield / screen.

3) Use only high temperature cable at the flow meter if the unit is being used to measure process liquids above 85°C.

4) For Exd explosion proof versions only, the output board has been assembled into the flow meter terminal housing using a small amount of potting solution.

   If the output board is to be replaced in an Exd version, remove the two securing screws and then the output board (force will be needed to break the PC board away from the potting solution). Clear away all remaining potting solution.

   To fit the new output board first fill the recesses in the bottom of the terminal housing with a small amount of flexible potting solution (approximately 2ml) so that there is about 2mm depth of coverage within the recess slots then fit new output board and allow time for potting solution to set. Use 3M Scotch guard 2130 potting solution or similar.

1.1 Model number designation

Size

MP	015	1/2"	(15mm)	10~600 l/hr (0.04~2.7 USGM)
	025	1"	(25mm)	120~3000 l/hr (0.5~13.2 USGM)
	040	1 1/2"	(40mm)	250~8000 l/hr (1.1~35 USGM)
	050	2"	(50mm)	700~20000 l/hr (3~88 USGM)

Body material

S	316L Stainless Steel
A	Aluminium
H	High Pressure 316SS

Piston material

2	PEEK *(polyetheretherkeytone - 150°C max.)*
3	CFT *(carbon filled teflon - 120°C max.)*

Partition material

1	Ceramic - *for abrasive or low lubricity liquids*
2	316L Stainless Steel

O-ring material

1	Viton *(standard - 150°C max.)*
2	EPR - *(Ethylene Propylene Rubber - 150°C max.)*
3	Teflon encapsulated viton *(150°C max.)*
4	Buna-N *(Nitrile - 120°C max.)*

Temperature limits

-	1	- 40 to 60ºC
-	2	120ºC max. *(no integral cooling fin)*
-	3	150ºC max. *(Peek piston & Hall Effect output only)*
-	5	120ºC max. *(includes integral cooling fin)*

Process connections

1	BSP-RP female threaded
2	NPT female threaded
3	Tri-clamp ferrules *(ferrules are 1/2" larger than meter size)*
4	ANSI-150 RF flanges
5	ANSI-300 RF flanges
6	PN16 DIN flanges
7	PN40 DIN flanges
X	Customer nominated *(covered under SB option below)*

Cable entries

1	M20 x 1.5mm
2	1/2" NPT

Integral options

AL	Aluminium terminal cover	[note 1]
SS	Stainless Steel terminal cover	[note 1]
QP	Quadrature pulse output *(Hall only)*	
EX	Explosion proof ~ Exd *(120°C max.)*	
B0	BT10 Totaliser with reset Total	[note 2]
B1	BT11 *(BT10 + scaleable pulse output)*	[note 2]
R1	RT11 Flow Rate Totaliser	[note 2]
R2	RT12 *(RT11+ alarms & 4~ 20mA output)*	[note 2]
E0	Ecobatch dc batch controller	[note 2]
SB	Special build requirement *(ref. factory for details)*	

Model No. Example

MP	015	S	2	2	1	-	5	1	1	R2	**Special Build No. : SB**

Quote special build & serial No's when ordering spares

Notes:

1) Standard meters are supplied with a GRN terminal cover *(glass re-inforced nylon)* .

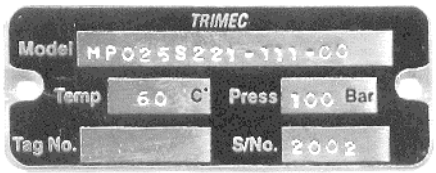
2) P/No. ACF cooling fin is to be included with integral registers when temp.exceeds 80ºC *(120ºC max.)*.

1.2 Specifications

Basic Model No.	MP015	MP025	MP040	MP050
Size mm (inches)	15mm (½ ")	25mm (1 ")	40mm (1.5 ")	50mm (2 ")
Process connections	BSPP or NPT female, flanged or Hygienic connections			
*Flow range Litres / hr (US gal / min)	10 ~ 600 (0.04 ~ 2.17) see data sheet	120 ~ 3000 (0.5 ~ 13.2)	250 ~ 8000 (1.1 ~ 35)	700 ~ 20000 (3 ~ 88)
Accuracy & Repeatability	+/- 0.5% of rate, +/- 0.03% repeatability typical with steady flows			
Max. Pressure -316L SS - Aluminium - High pressure 316 SS	100 bar (1500psi) 30 bar (440psi) 350 bar (5150psi)	100 bar (1500psi) 80 bar (1200psi) 170 bar (2500psi)	100 bar (1500psi) 80 bar (1200psi) 250 bar (3700psi)	38 bar (560psi) 20 bar (300psi) 100 bar (1500psi)
Temperature range	-40ºC ~ +150ºC (-40ºF ~ + 300ºF)			
Meter Materials	316L Stainless Steel or Aluminium			
Piston materials	PEEK (polyethylethylkeytone) or Carbon Filled Teflon			
O-ring materials	Viton (Std), EPR, Teflon or Buna-N (nitrile)			
Reed Switch output	24Vdc max. / 50mA max. (current limited)			
Pulses / litre (nominal) (Pulses / Usgal nom.)	200 & 400 reed 2 (760 & 1520)	20 (76)	7.3 (28)	2.5 (9.5)
Square Wave output	5~24Vdc max. / 20mA max. sink current (3 wire NPN open collector)			
Pulses / litre (nominal) (Pulses / Usgal)	400 (1520)	100 (380)	44 (167)	20 (76)
Protection class	IP66 (NEMA4X) - Optional, Explosionproof Exd IIB T4 (class 1, Div.1)			
Conduit entry port	M20 x 1.5mm female threaded, Optional, 1/2"NPT, PG13.5 (via adaptor)			
Suggested filtering (mesh)	150 micron (100)	250 microns (50)	250 microns (50)	500 microns (25)

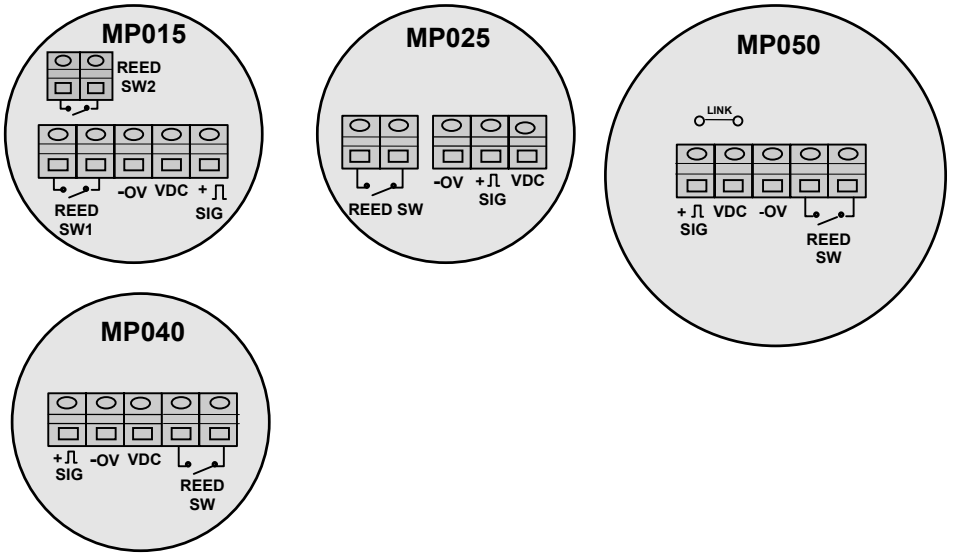
* 1) Maximum flowrate may be increased by 25% for short periods when used with low viscosity liquids with lubricating properties.

2) Accuracy levels for the MP015 are +/-1% within nominal flow spans. Accuracy over the full flow range is improved to within +/-0.5% when utilising the linearisation feature of the optional Trimec RT flow rate totaliser.

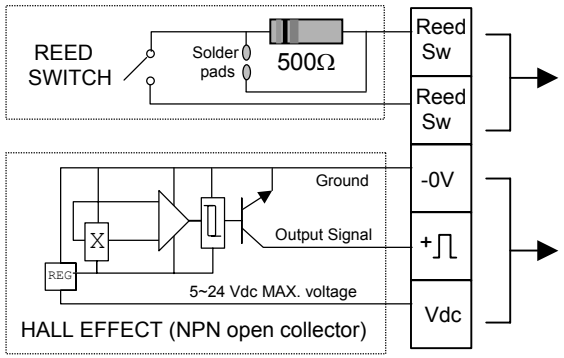


Flowmeter label
The label plate identifies the flowmeter model number, serial number, temperature & pressure ratings. Temperature & pressure ratings are maximum and must not be exceeded.

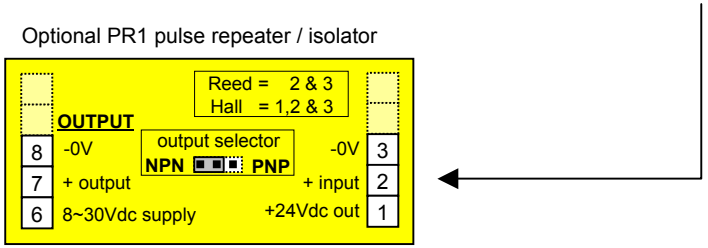
3.3 Pulse output boards



3.4 Output schematics



Optional PR1 pulse repeater / isolator



3.0 ELECTRICAL CONNECTIONS

3.1 Instrument cable

Twisted pair low capacitance shielded instrument cable 7 x 0.3mm (0.5mm²) should be used for electrical connection between the flow meter and the remote instrumentation. The screen should be earthed at the readout instrument end only to protect the transmitted signal from mutual inductive interference.

The cable should not be run in a common conduit or parallel with power and high inductive load carrying cables as power surges may induce erroneous noise transients onto the transmitted pulse signal or cause damage to the electronics. Run the cable in separate conduit or with other low energy instrument cables.

3.2 Pulse output selection

Each flow meter has two independent pulse output signals that are linearly proportional to volumetric flow. Pulse transmission can be up to 1000 metres providing that wiring runs are in accordance with good wiring practices (see 3.1).

Reed switch :
A voltage free contact closure output providing a regular frequency ideally suited for frequency to analog conversion & instantaneous flow rate indication. The Reed Switch is also used for integrating and batching applications & is connected into an approved intrinsically safe barrier when used in hazardous locations. Maximum load is 24Vdc, 50mA limited by an integral 500ohm current limiting resistor included in series with the reed switch.

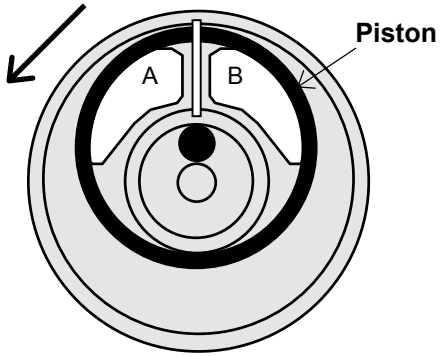
Hall Effect sensor :
A high resolution, solid state, 3 wire NPN open collector requiring 5~24 Vdc max. (20mA max.), produces a pre-shaped and amplified square wave more suited to small volume batching applications requiring high levels of repeatability. The square wave pulses are unevenly spaced due to the cyclic motion of the piston but like the reed switch each pulse is representative of an equal volume.

Pulse output resolution :
Each flow meter is individually calibrated and supplied with a calibration certificate showing the number of pulses per unit volume for the Hall sensor and the reed switch outputs. Nominal figures are shown below.

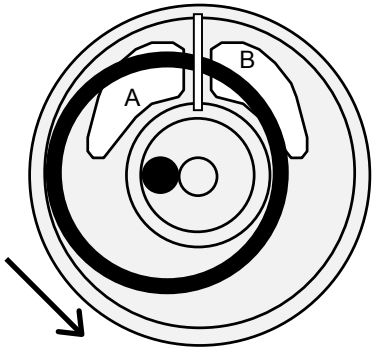
Model No.	**Hall Sensor** (pulses / USgal)	**Reed Switch & Quadrature Pulse** (pulses / USgal)	Reed Switch 2 (MP015S & 015A)
MP015	400 PPL (1520)	200 PPL (760)	400 PPL (1520)
MP025	100 PPL (380)	20 PPL (76)	-
MP040	44 PPL (166)	7.3 PPL (28)	-
MP050	20 PPL (76)	2.5 PPL (9.5)	-

1.3 OPERATING PRINCIPLE

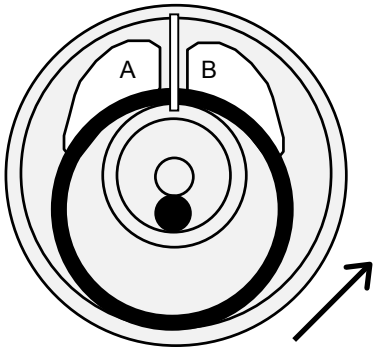
The Multipulse flow meter utilises the oscillating piston principle, where the passage of liquid causes a piston to oscillate smoothly in a circular motion inside a round measuring chamber. Each piston cycle displaces a known volume of liquid from the inlet port to the outlet port. Small high energy magnets located within the piston activate the integral electronics which in turn generate high resolution pulse outputs suitable for remote flow integration instruments, computers and PLC's .



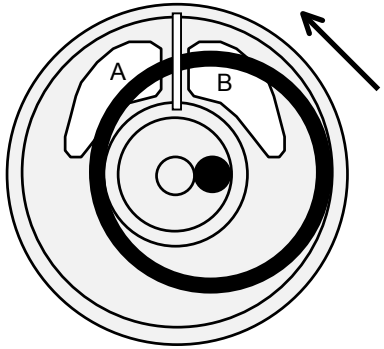
1) The liquid flows through inlet **A** into the inner area of the piston causing the piston to move in the direction of the arrow.



2) The volume outside the piston, to the right, is displaced and exits through the opening **B**. Liquid also flows through the inlet **A** into the left- hand outer area.



3) The inner area of the piston is completely cut off. The liquid flowing through **A** into the outer area moves the piston further.



4) The volume within the piston flows through the outlet **B**.

2.0 INSTALLATION

2.1 Orientation

The flow meter can be mounted in any orientation. However, for optimum performance and ease of inspection, it is desirable to mount the flow meter in a horizontal section of pipe. This ensures the rotating piston is not influenced by gravity when at rest.

2.2 Meter location

The flow meter should be fitted upstream of any flow control or cut-off valve. This prevents free discharge from the flow meter and minimises the risk of drainage and air entrapment which may cause erroneous readings on start up.

The Multipulse positive displacement flow meter does not require any flow conditioning, therefore straight runs of pipe before and after the flow meter are not necessary.

The flow meter is not to be exposed to any form of hydraulic shock or over speeding as this could damage the internals.

2.3 By-pass Installation

It is our recommendation the flow meter be installed in a by-pass section of pipe with isolation valves to enable the flow meter to be isolated during pipeline purging. If a by-pass is impractical, flush the pipe work to purge out foreign matter such as rust, welding slag and sealing compound prior to installing the flow meter or temporarily remove the piston, partition and centre bearing to allow free passage of the foreign matter.

The by-pass configuration should also be used if the system is exposed to periodic steam or air purging. (See 5.0 Cleaning In-Situ)

2.4 Strainers

It is sound practice to locate a suitably sized strainer immediately upstream of the flow meter. Recommended strainer mesh sizes are;

Model No.	Mesh size	Microns
MP015	100	150
MP025 / MP040	50	250
MP050	25	500

A range of strainers are available to suit both the Multipulse PD and Turbopulse turbine meter range.

2.5 Commissioning

Immediately after installation or after long periods of shut down, the flow meter must be slowly purged of air. This can be achieved by allowing the liquid to flow through the flow meter at a slowly increasing rate until the air is released.

When metering liquids with a viscosity greater than that of water, the maximum flow rate must be reduced to a level that will produce a pressure drop across the flow meter of no more than 280 kPa (2.8 bar).

The flow meter is now ready to put into service and will accurately measure all liquids passing through it, provided it is not operated outside its specified limits.

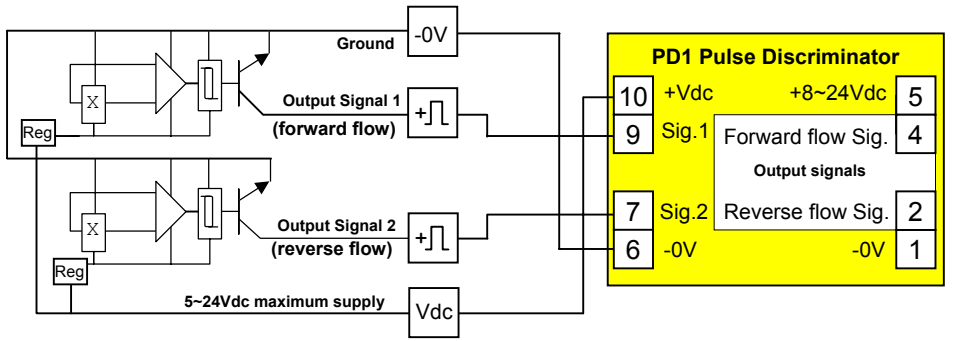
2.6 Reverse flow (bi-directional flow)

The flow meter is capable of accurately measuring flow in the reverse direction. Meters fitted with the QP output option (quadrature pulse output) may be interfaced with the Trimec Pulse Discriminator Module (PD1) to separate forward & reverse flow output pulses for input to the appropriate totalising registers or add and subtract counter input.

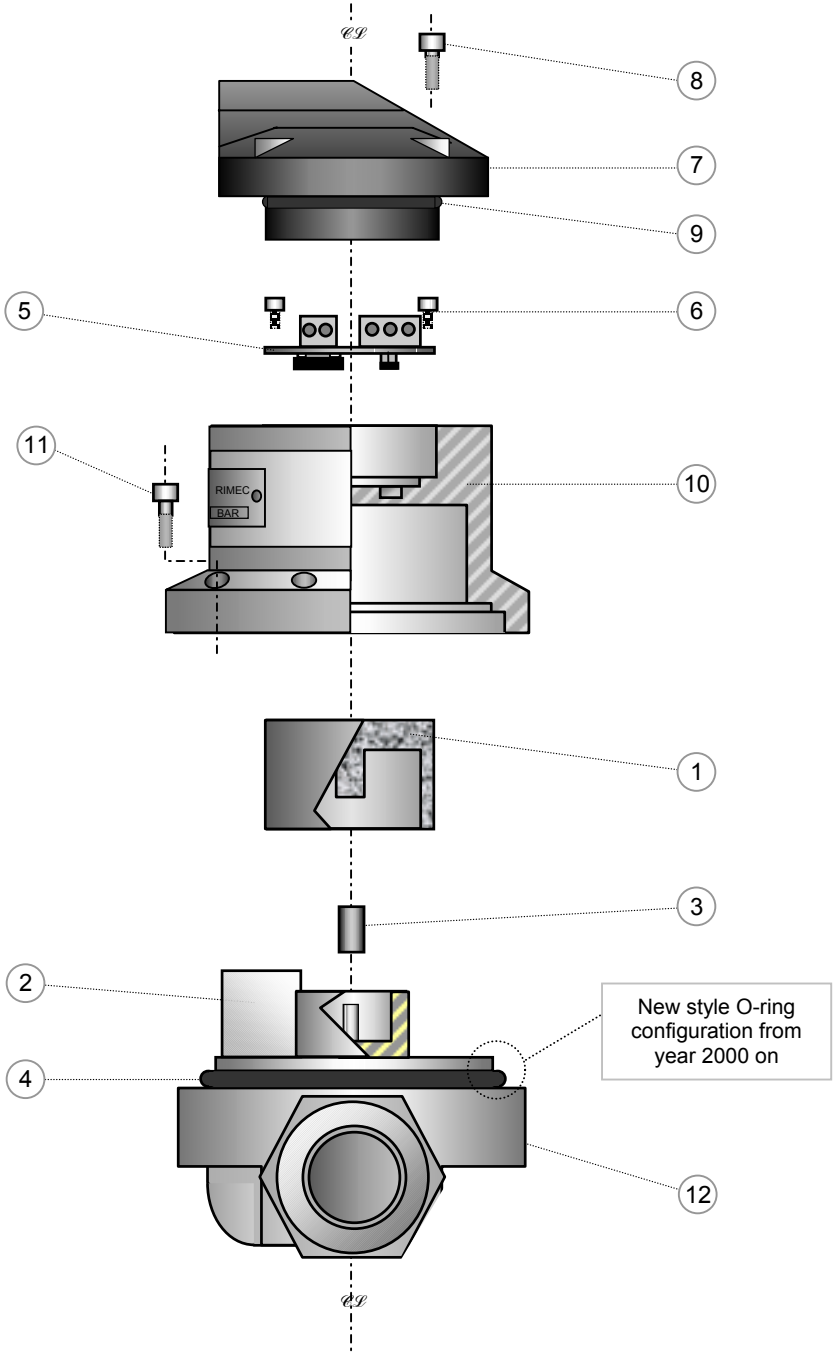
It is **important to note** that the Quadrature Pulse option has the same pulse resolution (pulses/unit volume) as that of the reed switch for each size Multipulse flowmeter.

Flowmeter with QP outputs

Where reverse flow is not to be registered it is wise to install a check valve upstream of the flow meter.



6.2 Spare parts diagram



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MULTIPULSE

Models **: MP015 MP025 MP040 MP050**

INSTRUCTION MANUAL