RPFS ROTA PULSE FLOW SENSOR
(Slip Insertion Paddlewheel)

DATASHEET

FEATURES

- **± 2.5% accuracy @ velocity range 0.5 to 8.5 m/sec.**
- **± 1 % accuracy over linear range 0.7 to 7.0 m/sec.**
- **Repeatability of ±0.6%.**
- **NPN inductive pulse with internal amplification.**
- **Square wave output with short circuit protection.**
- **Inductive coil pulse option for low current applications.**
- **High Pressure options to 2000kpa**
- **50°C or 120°C temperature models.**
- **Simple installation and maintenance.**
- **Large range of pipe adapter fittings in sizes 20 to 110mm.**
  (Larger pipe sizes to 500mm using "Long Stem" –LS version)
- **Stainless Steel 17-4PH paddlewheel rotor without magnets.**
- **Australian made since 1984. (Now with new high speed bush option).**

RPFS-P

DESCRIPTION

The Rota Pulse Flow Sensor (RPFS) paddlewheel insertion type flowmeter uses a proven principle of flow measurement, which is used worldwide. The RPFS comes in four model variants:

- **RPFS-P** for liquids up to 50°C (plug-in cable)
- **RPFS-H** for liquids up to 120°C
- **RPFS-L** for liquids up to 120°C (Inductive pulse)
- **RPFS-LO** for liquids up to 120°C (built in OP Amp offers ultra low current inductive pulse)

All model variants insert directly into a large range of pipe adapter fittings available in PVC, Galvanized Iron, Brass, Stainless Steel or Polypipe materials, covering pipe sizes 20 to 110mm (standard sizes). This makes the RPFS suitable for a wide range of liquid flow measurement, monitoring and batching applications. Using the BSPB & BSPSS fittings adaption to larger size pipes is possible depending on pipe wall thickness, alternatively the Long Stem (-LS) versions with adaptors are then used.

With only one moving part and limited intrusion into the pipe, and combined with its flow-through design, the RPFS allows accurate measurement of liquid flows with virtually no head losses.

Each of the 4 blades of the rotor (paddlewheel) extends approximately one centimetre into the flowing liquid. The RPFS-P sensor generates a square wave pulse with the frequency output proportional to flow velocity and proportional to pipe diameter. The RPFS-P incorporates internal amplification, allowing pulse transmission up to 1000 metres to the receiver device. The RPFS-P model is specially constructed with a metal shielding jacket making it immune to electrical interference.

Magnets are not used in the RPFS models, thereby eliminating iron particles jamming the rotor. The alloy rotor used also makes the RPFS less susceptible to interference from turbulence and particles hitting the rotor, thereby giving superior flow results.

SPECIFICATIONS

	Model		
	RPFS-P	**RPFS-H**	**RPFS-L and RPFS-LO**
Supply voltage	5-30VDC	5-30VDC	Inductive coil 260 ohms.
Output signal	NPN open collector 50% duty cycle pulse	NPN open collector 50% duty cycle pulse	Inductive sine wave pulse 50% duty cycle pulse
Current draw @ 5VDC / 24VDC	2.5mA / 10mA	2.5mA / 10mA	negligible
Max. switching current	200 Ma (at 24VDC)	200 mA (at 24VDC)	30mA (at 5VDC)
Cable length	5 metres, plug-in cable 3-core (3 wire)	2 metres cable 2-core shielded (3 wire)	2 metres cable 2-core shielded (3 wire)
Fluid temperature	50 °C max.	120 °C max.	120 °C max.
Weather rating	IP67	IP65	IP65
Pressure rating	200psi	400psi	150psi
Accuracy	± 2.5% for 0.5 to 8.5 m/s, ±1% for 0.7 to 7.0 m/s, Repeatability ± 0.6%		
For Pipe Sizes	15 to 110mm standard, Larger pipes via BSPB-LS special adaptor or saddle clamps.		

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SENSOR CONSTRUCTION

Model	RPFS-P	RPFS-H	RPFS-L	RPFS-LO
Body	Delron (Acetal)	Brass	Delron	Delron
O-rings x 2	Neoprene	Viton	Neoprene	Neoprene
Rotor	Stainless Steel 17-4PH			
Bushes	Delron			
Axle	Tungsten Carbide			
Lockcap	PVDF	Brass	PVDF	PVDF
Dimensions Overall (approx.)	130L x 30W mm	150L x 30W mm	135L x 30W mm	135L x 30W mm

RPFS-L **RPFS-H**

ORDERING CODES:-

NOTE: All RPFS sensors are supplied with a screw-down LC locking cap

Item	Description	
RPFS-P	NPN transistor 5-25VDC sinking pulse, liquid temperature to 50°C	
RPFS-H	NPN transistor 5-25VDC sinking pulse, liquid temperature to 120°C	
RPFS-L	Inductive coil pulse signal for amplified inputs, liquid temperature to 120°C	
RPFS-LO	Inductive coil pulse signal with built in OP Amp. liquid temperature to 120°C	

(See page 5, for pipe installation adapter fittings)

APPLICATIONS

Since the RPFS Flow Sensor was first manufactured in 1984, over 30,000+ units are now in use worldwide. They are used in a large variety of applications, including measurement of fresh and recycled water in concrete batch plants, measurement of water irrigation, salt water, chlorinated water and countless other low viscosity liquid measurement processes (Note: is not suitable for pulsating flows).

RPFS-P and RPFS-H sensors can be connected direct to PLCs, ManuFlo ME995 preset batch controllers or FRT303 Flowrate/Totalisers, or just about any other process controller/indicator device (up to 1000m away –use shielded cable).

The ManuFlo UIC universal pulse scaler card allows conversion of the output pulse to individual requirements – ideal for PLC inputs of DC NPN/PNP or AC 'triac' types.
Pulses can be scaled down or factored to a desired engineering unit, to cater for slow counting PLCs.

The RPFS-L & RPFS-LO inductive coil sensors are energy misers suitable for low current requirements and are ideal for battery powered applications using FRT303 or ME5 or other battery powered Indicators (up to 150m away). The RPFS-LO has a built in OP AMP & is ideal for inputs to remote data loggers with their ultra low current draw.

RPFS-type flow sensors are designed to operate with ManuFlo equipment (our equipment has internal pull-up resistors at the inputs). If using an RPFS with non-ManuFlo equipment and pulses are not being detected, then fit a resistor of value 1.5K - 3.3K across the Pulse and (+) positive input to act as pull-up resistor (the exact resistor value should be determined by the current draw to suit your equipment).

SPARE PARTS:-

Order Code	Description		Order Code	Description	
PW-N	Paddlewheel, with bush		**PC5**	Plug-in cable for RPFS-P	
PWAH	Axle for paddlewheel				
BS020	Neoprene O-ring				
LC	Locking Cap				

Adapter Tee keyway fittings are available in:

1. PVC Class 18 Cat. 19 Slip tees (F-glue-ends) pressure pipe
   Sizes: 20, 25, 32, 40, 50, 65, 80 & 100 mm.
   PVC high pressure saddle clamps: 40, 50, 80 and 100mm.
2. Galvanized Iron threaded connections:
   BSP (F): pipe sizes 25, 32, 40 & 50 mm;
   BSP (M) pipe sizes 80 & 100mm.
3. Gunmetal BSP(m) threaded connection end pipe tube tees 20 mm.
4. Polypipe saddle clamps in pipe sizes 40, 50, 63, 75, 90, 110 mm
5. PVC saddles 40, 50, 80 and 100mm.
6. Stainless steel 25, 32, 40 & 50mm, larger sizes fabricated on request.
7. FOR PIPE SIZES 110mm and larger refer to the RPFS-LS model

**Further custom made fittings are available on request.

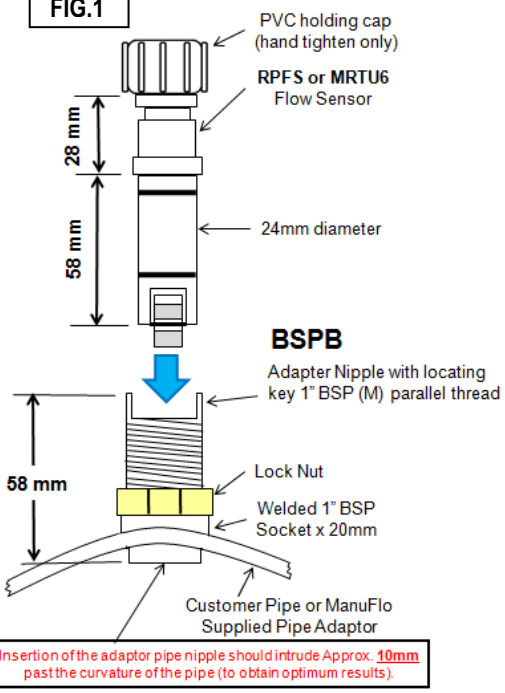
Use ManuFlo **BSPB, BSPB-LS** (Long Stem) Brass or **BSPSS** Stainless Steel pipe adapter keyway nipple - with locknut, which has a 1" OD BSP thread for screwed insertion into 1"(female BSP) half-sockets which can be welded directly to pipe, the BSPB fittings can be coupled to any 1" BSP female entries including saddle clamps.

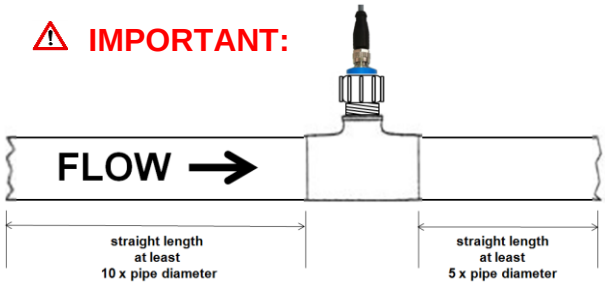
Installation Conditions

- **IMPORTANT**: A minimum of 10x pipe diameter before (upstream of) the sensor and at least 5x pipe diameter after sensor of straight pipe section must be fitted, with no bends, reductions, enlargements, restrictions, valves etc within this section. This will help eliminate flow turbulence to ensure optimum accuracy performance.
- The RPFS sensor must measure in a full pipe flow section.
- Can be installed in a horizontal, inclined or vertical pipe position.
  (Note: If mounted in horizontal or inclined pipe, make sure insertion position of sensor is at top or 45° from top, not on the underside).

Installing Into Existing Pipe Lines

FIG.1



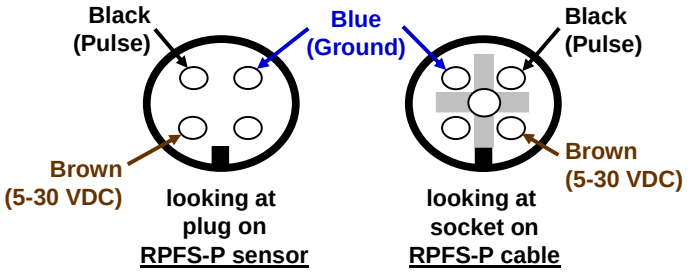


Selection of pipe diameter:
(For best results, use the table below):

Pipe size (mm)	Flowrange (Litres/min)		Pulses/Litre (approx.) (1)(2)
	Min	Max	
20	13	160	116
25	20	250	75
32	30	410	46
40	50	640	30
50	90	1000	20
63	132	1580	11.7
65	120	1690	12
75	180	2250	8.3
80	190	2560	7.3
90	244	3240	5.7
100	300	4005	4.6
110 (-LS)	343	4845	3.8
125 (-LS)	426	6255	3.0
140 (-LS)	516	7850	2.4
150 (-LS)	600	9010	2
160 (-LS)	650	10200	1.8
195 (-LS)	900	15200	1.22
200 (-LS)	950	16000	1.16
250 (-LS)	1480	25000	0.7
280 (-LS)	1850	31400	0.6
315 (-LS)	2280	39720	0.46

ELECTRICAL INSTALLATION/DATA Cable connection:

RPFS-P# Black = Pulse
Brown = + 5-30 VDC
Blue = O.V. ground/shield



RPFS-H# White = Pulse
Red = + 5-30 VDC
Shield = O.V. ground/shield

RPFS-L White = Signal 1 (from one side of inductive coil)
Red = Signal 2 (from the other side of inductive coil) } none Polarised
Shield = connect to signal/ground

If connecting to non-ManuFlo equipment, a 2K2 pull-up resistor may be required between (+) and Pulse.

For extra cable length, use shielded cable only!

⚠ WARNING: To avoid electrical interference the RPFS-H and RPFS-L should not be installed within 30cm of any AC fields, otherwise 50Hz could be detected and create oscillations.

(1) For >315mm diameter pipes:
Pulses per Litre = 50273 / [(Pipe diameter in mm) $^{2.016}$]

(2) NOTE: Due to gravitational forces, the pulse output value can differ up to 6% between a vertical flow that is upwards or downwards. Where possible, perform a calbration check to determine pulse rate given the pipe diameter and flow conditions. Once calibrated, meter will give linear and repeatable results within the flow range

Recommended Periodic Checks:

With clean liquids, sensor check of the paddle wheel is recommended once every year. In applications with reclaimed or contaminated fluids, regular quarterly maintenance checks are recommended.

Removal of RPFS from Pipe adaptor Fitting 'Square' Keyway Type Nipple Adaptor:(see FIG 5)

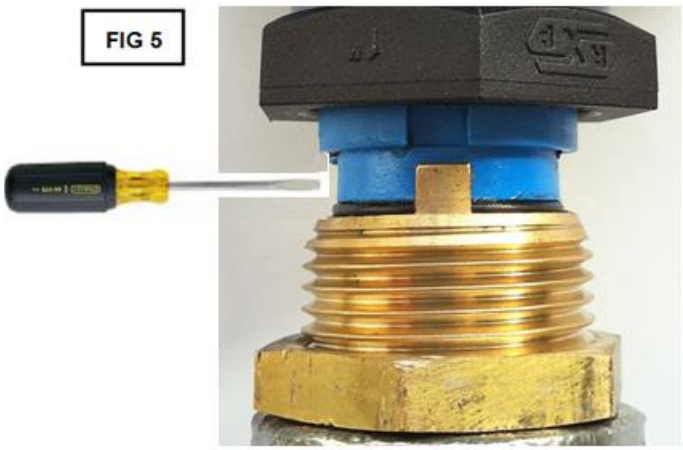
1 - Unscrew the black PVC locking cap (anti-clockwise).
2 - Place a small to medium sized flat thin bladed screwdriver in the join where the insertion sensor body meets the nipple adaptor (See FIG 4), twist the screw driver to prize the two apart till the slots clear the keyways, then pull or twist upwards until the sensor is released (never pull via the cable).

Removal of RPFS from Pipe adaptor Fitting 'Triangular' Keyway Type Nipple Adaptor:(see FIG 6)

1 - Unscrew the black PVC locking cap (anti-clockwise).
2 - Hold the neck of the Tee piece in your left hand, grasp the RPFS body with your right hand and turn slowly anti-clockwise until the sensor hydraulically raises out of slot then pull upwards out of the socket (never by the cable).

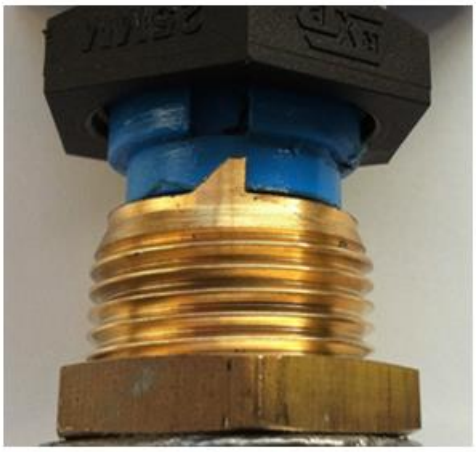
**When returning the sensor to nipple adaptor insert so the keyway and slots line up then then push down until they locate. Screw the black locking cap clockwise to hold the sensor in place (hand tightened only).

FIG 5



Standard fitting 'Square' Keyway

FIG 6



New 'Triangular' turn replace fitting

Cleaning:

1 - If the paddlewheel (rotor) and or sensor body is coated with scale, immerse the sensor section in diluted hydrochloric acid, scour gently if required.
2 - For ease of removal or refitting of sensor we strongly recommend to lubricate the body O-rings using petroleum jelly.
3 - If the paddlewheel requires servicing, push out the axle using a small hole punch or similar implement, remove the paddle wheel and service or replace rotor and/or axle as required (spare parts available from ManuFlo).

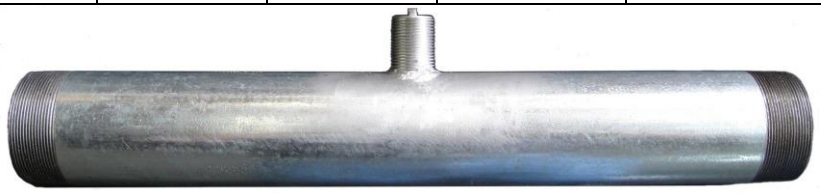
Fault Diagnosis & Rectification:

- If the RPFS sensor ceases to count, the paddlewheel may be blocked, remove inspect and clean as described above.
- If the RPFS pulses when there is no flow, a nearby 50Hz AC field is probably causing these false counts. Move the flow sensor away from the 50Hz field, or move the source of the field if practical.
- If the standard cable length supplied is not sufficient and needs extending contact ManuFlo for suitable 'screened' cable and never run extended cable across or near to other cables that are potential EMF sources.

ORDER CODES FOR PIPE ADAPTOR FITTINGS

RPFS

Material Type For	GAL T-Piece Gal pipe	PVC slip T-piece Pressure pipe	PVC Saddle Clamp Pressure pipe	Polypropylene Saddle Clamp Pressure pipe	Polypropylene Saddle Clamp Poly Pipe Black	STAINLESS T-Piece S/Steel pipe	BRASS T-piece Brass pipe	BRASS Socket
20 mm		PVC20					BRA20	
25 mm	GAL25 (-T2)	PVC25				SS25	BRA25	
32 mm	GAL32	PVC32				SS32		BSOC: 1" BSP Brass pipe socket adaptor for 25-100mm pipes also **BSPB** & **BSPSS** nipple adaptor
40 mm	GAL40	PVC40	PVC40SC	SCP40	SC40	SS40		
50 mm	GAL50	PVC50	PVC50SC	SCP50	SC50	SS50		
63 mm				SCPE63	SC63			
65 mm		PVC65		SCP65	SC75			
75 mm					SC75			
80 mm	GAL80	PVC80	PVC80SC	SCP80	SC90			
80 mm	GAL80-F *(Table D flanged)*							
90 mm				SCPE90	SC90			
100 mm	GAL100	PVC100	PVC100SC	SCP100	SC114			
100 mm	GAL100-F *(Table D flanged)*							
110 mm				SCPE110	SC110			BSOC: 1" BSP Brass pipe socket adaptor for 100-500 mm pipes also **BSPB-LS Long Stem nipple** adaptor
125 mm				SCPE125-LS	SC125-LS			
140 mm					SC140-LS			
150 mm			PVC150SC-LS	SCP150-LS	SC160-LS			
160 mm				SCPE160-LS	SC160-LS			
200 mm			PVC200SC-LS	SCP200-LS	SC200-LS			
225 mm				SCPE225-LS	SC225-LS			
250 mm				SCP250-LS	SC250-LS			
280 mm					SC280-LS			
300 mm			PVC300SC-LS	SCPE300-LS	SC315-LS			
315 mm					SC315-LS			
500 mm								
								
	Galvanised iron threaded ends BSP (female) 2000 kPa Note: 25mm can be supplied with straight pipe sections already fitted (Part GAL25-T2)	PVC T-piece Class 18 Cat 19 Glue-in (female) 1100 kPa	PVC 1400 kPa	PVC ≤ 150mm: 1600 kPa > 150mm: 1000 kPa	Poly-pipe agricultural Saddle Clamps ≤ 150mm: 1600 kPa > 150mm: 1000 kPa	Stainless Steel 316 T-piece. BSP (female) threaded entry 2000 kPa	Brass T-piece BSP (female) threaded entry 2000 kPa	1" BSP Brass pipe socket adaptor **& BSPB BSPB-LS BSPSS** nipple adaptors **(see Fig 1 Page 3)**



GAL80 - 80mm Galvanized Iron pipe adapter (80mm ϕ x 600mm long)

BSPSS Stainless Steel adapter nipple for 25-100mm pipes

BSPB brass adapter nipple for 25-100mm pipes

Due to continuous product improvement, specifications are subject to change without notice.

**** Pipe fitting options for the RPFS are as per the table however other fitting types may also be available on request****

NOTES: