

RotorFlow® Visual Indicators with Switch or Continuous Output Options

ROTOR & TURBINE

The Gems Sensors generation of rotorflow indicators offer high performance and durability, all at an affordable cost.
 Three distinct options are available, all boasting broad chemical, pressure and temperature capabilities.

RFI RotorFlow Indicators

Simple visual confirmation of flow, the RFI indicator provides the low cost answer.

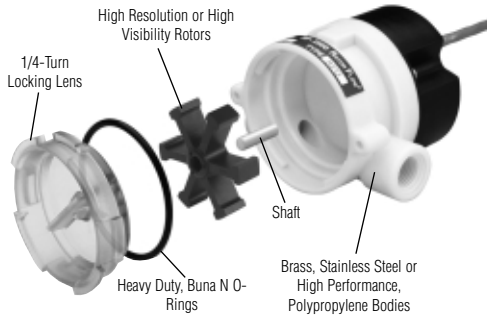
RFS RotorFlow Indicator and Switch

Visual indication plus switch, adjustable over the required flow rate. High reliable system guarding against jamming or false actuation.

RFO RotorFlow Indicator and Output

Visual indicator plus continuous output. Pulse or analogue DC voltage output proportional to the flow rate. Easy integration into all digital logic families.

Construction



- ▶ Flow range from 0.4 to 225 l/min
- ▶ Bright, visual indication
- ▶ Choice of pulsed analogue DC output or adjustable 1 amp switched output
- ▶ Available in high performance plastic, brass or Stainless Steel housing



Operating Principle

VISUAL ONLY

As liquid passes through the RotorFlow body, the rotor spins at a rate proportional to the flow.

OUTPUT VERSIONS

1. As liquid passes through the RotorFlow body the magnetic rotor spins at a rate proportional to flow. This causes a series of magnetic fields (the rotor vanes) to excite the Hall Effect sensor, producing a series of voltage pulses.
2. The output pulses are at the same voltage level as the input (4.5 – 24 Vd.c.) with a frequency proportional to the flow rate. The output signal can be utilised by digital rate meters, totalisers or other electronic controllers.

SWITCH

1. RFS Type switches incorporate state-of-the-art circuitry to compare the frequency of incoming pulses to an adjustable, preset frequency. When the pulse rate meets or exceeds the preset value, the SPDT relay closes. When the pulse rate falls below the preset value, the output relay opens. This unique design eliminates the possibility of a RotorFlow switch from remaining in a 'switch actuated' mode, if the rotor jams accidentally.
2. RotorFlow Indicators may be mounted with flow entering either port. Performance is optimised by positioning ports at the top of the unit, in a horizontal plane.

How to Order

Description	Part No.
DM21 Rate Meter/Totaliser	DM2150000
DM21 Rate Meter/Totaliser + 2nd Relay	DM2151000
DM21 Rate Meter/Totaliser + 2nd Relay + Analog Output	DM2151300

DM21 Series - 1/8 DIN Rate Meter/Totalizer

- ▶ Large 18mm high digits (LED)
- ▶ Programmable colour change display based on an event (red/green)
- ▶ Display configurable for update time, minimum number of pulses, and forced zero time
- ▶ Optional linear analog output relative to rate
- ▶ Standard outputs: two NPN transistors and one relay (2nd relay optional)
- ▶ CE Approved
- ▶ Standard 1.8 DIN size (92mmx45mm cutout)
- ▶ Easy programming
- ▶ Include output 1 and 2 status annunciators

Specifications

Supply voltage	90-264 VAC, 50/60 Hz, 4 watts
Sensor Power Supply	9-15 Vdc, Unregulated
Output	NPN Open Collector, 30 VDC Max, 100 mA Max
Relay	SPDT, 5A Resistive @ 110 VAC
Analog Output	0-20 mA, 4-20 mA, 0-10 V, 2-10 V, 0-5V, 1-5V



FLOW SWITCHES

www.gems-sensors.co.uk

RotorFlow - RFI-Types, Visual Indicators

Applications - Visual only - RFI

There are varied applications, but some of the more common are:

- ▶ Plastic injection moulding equipment
- ▶ Visual flow on heat exchangers

Applications - Switch/Analogue Output - RFO & RFA

- ▶ Lasers
- ▶ Medical Equipment
- ▶ X-Ray Tubes
- ▶ Computers
- ▶ Robotic Welding Equipment
- ▶ Water Purification/Dispensing Systems
- ▶ Chemical Metering Equipment
- ▶ Water Sampling
- ▶ Ice Making Machinery
- ▶ Water Injection Systems
- ▶ Proof of Delivery Systems

OEMS

Specialist designs are available based on your requirements. Please contact Sales Office for further details on options such as potable water, enhanced chemical capabilities or 4-20mA loop powered units.

This is RotorFlow in its most basic form – a **BRIGHT ORANGE ROTOR** turning with fluid flow. Simple, direct and reliable.

Flow rate is estimated, or simply confirmed, by viewing the speed of the turning rotor. Either port may be used for incoming flow, and new bayonet mounting lens is easily removed for quick cleanout. RFI Type RotorFlow sensors are easy to see, easy to install and easy to afford.

Specifications

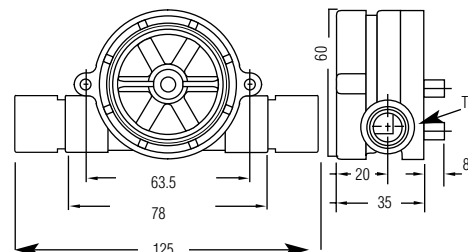
Wetted Materials	
Body	Polypropylene (Hydrolytically Stable, Glass Reinforced), SS or Brass
Rotor pin	Ceramic
Rotor	Moulded Nylon, Colour: High Visibility Orange
Lens	Polysulfone
O-Ring	Buna N (Metal body = Viton)
Adaptor	Acetal (Polypropylene body only)
Max. operating pressure	Polypropylene Body: 7 bar Metal Body: 14 bar
Max. operating temperature	Polypropylene Body: 80°C Metal Body: 100°C
Typical pressure drop	See Graph (Page 68)

How to Order

Body Material	Port Size	Flow Ranges (l/min)		Order Number	
		Low Range*	Standard Range	BSP	NPT
Polypropylene	1/4"	0.4 to 4.0	2.0 to 20.0	155420BSPP	155420
	1/2"	6.0 to 45.0	15.0 to 75.0	155480BSPP	155480
Brass	1/4"	0.4 to 4.0	2.0 to 20.0	142541BSPP	142541
	1/2"	6.0 to 45.0	15.0 to 75.0	142542BSPP	142542
	3/4"	---	20 to 112.5	180392BSPP	180392
	1"	---	30 to 225	181681BSPP	181681
Stainless Steel	9/16 x 18 UNF	0.4 to 4.0	2.0 to 20.0	N/A	174596
	1/2"	6 to 45	15.0 to 75.0	173138BSPP	173138
	3/4"	---	20 to 112.5	181682BSPP	181682
	1"	---	30 to 225	181683BSPP	181683

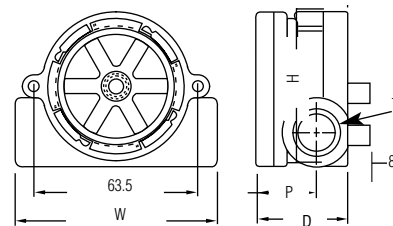
* With use of low flow adaptor supplied

Polypropylene Bodies



Adaptors, See Note 1

Metal Bodies



T	W	H	D	P
1/4	77	60	35	20
1/2	77	60	35	22
3/4	100	66	51	27
1	100	66	51	27

Notes:

1. Adaptors are supplied fitted to plastic units, sealed using Teflon (PTFE) tape.
2. If NPT thread is required for plastic units discard adaptor.
3. For pressure drop curves see RFS page.

RotorFlow - RFO and RFA Types

ROTOR & TURBINE

4.5 - 24 VDC Pulsed Output - RFO 0 - 10 V, RFA

Gems Sensors popularised the Rotor-Flow's paddlewheel design by combining high visibility rotors with solid-state electronics that are packaged into compact, panel mounting housings. They provide accurate flow rate output with integral visual confirmation ... all with an unprecedented price/performance ratio.



Hall-Effect-Sensor sends a voltage pulse with each pass of magnetic field

High Resolution Black Rotor

Ryton composite. Each of the six rotor arms are magnetized.



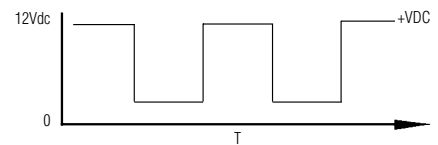
Signal Output

Output signal for RFO Types is an on/off pulse of the DC voltage supplied to the unit, it is compatible with all digital logic families. Input voltage range is 4.5 to 24 Vd.c.

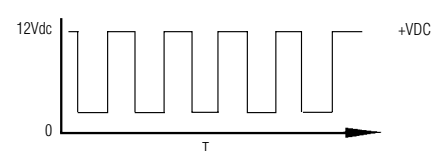
Frequency of the output pulse is proportional to the flow rate and ranges from approximately 25 Hz at low flow to 225 Hz at high flow. See order number for more information.

Following examples are at 12Vdc supply

Low Flow



HighFlow



* With use of Low-Flow-Adapter supplied.

See page 70 for more information.

For dimensions see page RFS

Please consult factory for detailed flow rate / frequency curves.

Specifications

Wetted materials	Polypropylene (Hydrolytically Stable, Glass Reinforced), Stainless Steel or Brass	
Body	Ceramic	
Rotor pin	Ryton Composite, Colour: Black	
Rotor	Polysulfone	
Lens	Buna N (Metal body = Viton)	
O-Ring		
Max. operating pressure	Polypropylene Body:	7 bar
	Metal Body:	14 bar
Max. operating temperature	Polypropylene Body:	80 °C
	Metal:	100 °C
Electronics (both bodies)	65 °C Ambient	
Max. viscosity	45 cSt	
Input power	4.5 to 24 Vdc, (24Vdc Regulated Supply for RFA models)	
Output signal	4.5 to 24 Vdc Pulse, Pulse Rate dependent on Flow Rate, Port Size and Range 0 to 10 V, available (RFA model), consult Sales Office	
Max. current source output	70 mA	
Frequency output range	25 Hz (Low Flow) to 225 Hz (High Flow)	
Electrical termination	AWG 22 PVC-Jacketed Cable, Length 60 cm Colour Code: Red = + Vdc, Black = Ground, White = Signal output	
Typical pressure drop	See Graphs	

How to Order

Body Material	Port Size	Flow Ranges (l/min)		Output (Hz) Approximate	RFO		RFA
		Low Range*	Standard Range		BSP	NPT	
Polypropylene	1/4"	0.4 to 4.0 (±7%)	2.0 to 20.0 (±7%)	15-180	155421BSPP	155421	Consult Factory
	1/2"	6.0 to 45.0 (±7%)	15.0 to 75.0 (±15%)	20-190	155481BSPP	155481	
Brass	1/4"	0.4 to 4.0 (±7%)	2.0 to 20.0 (±7%)	15-180	156261BSPP	156261	Consult Factory
	1/2"	6.0 to 45.0 (±7%)	15.0 to 75.0 (±15%)	20-190	156262BSPP	156262	
	3/4"	---	20 to 112.5 (±15%)	25-210	194761BSPP	194761	
	1"	---	30 to 225 (±15%)	15-180	194762BSPP	194762	
Stainless Steel	9/16 - 18 UNF	0.4 to 4 (±7%)	2 to 20.0 (±7%)	15-180	N/A	165071	Consult Factory
	1/2"	6 to 45 (±7%)	15.0 to 75.0 (±15%)	20-190	165075BSPP	165075	
	3/4"	---	20 to 112.5 (±15%)	25-210	194763BSPP	194763	
	1"	---	30 to 225 (±15%)	15-180	194764BSPP	194764	

* With use of Low-Flow-Adapter supplied

Standard Products in **bold**

FLOW SWITCHES

RotorFlow - RFS Types Flow Setpoint Switching

RotorFlow Switches build an extra level of reliability and protection into your equipment. By principle of operation, the rotor cannot be deceived into indicating a positive flow situation when no flow actually exists. Once set to a desired actuation point, RotorFlow will switch to a 'no-flow' condition should the rotor stop for any reason.

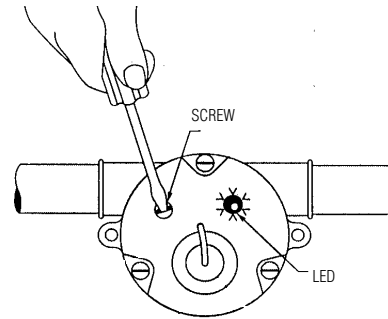
Specifications

Wetted Materials	Polypropylene, Brass, S Steel (Hydrolytically Stable, Glass Reinforced)	
Body	Ceramic	
Rotor Pin	Ryton Composite, Colour: Black	
Rotor	Polysulfone	
Lens	Buna N (Metal Body = Viton)	
O-Ring		
Max. Operating Pressure	Polypropylene Body:	7 bar
	Metal Body:	14 bar
Max. Operating Temperature	Polypropylene Body:	80 °C
	Metal Body:	100 °C
Electronics	65°C Ambient	
Max. Viscosity	45 cst	
Input Power	24 Vd.c. or 110 Va.c.	
Relay Contact Ratings (SPDT)	1A, 24 Vd.c. Resistive 0,5 A, 110 Va.c. (230 V a.c. on request)	
Repeatability	2% max. Deviation	
Set Point Accuracy (Factory Set)	± 5%	
Hysteresis	max. 15%	
Electrical Termination	22 AWG PVC-Jacketed Cable, Length 60 cm, Colour Code: Red = +Va.c./Vd.c., Black = Ground, White = N.O., Brown = N.C., Green = Common	
Typical Pressure Drop:	See Graphs	

Switch Set Point Calibration With LED Signal (RFS Type)

With the unit installed in the line and power supplied, complete the following steps to calibrate switch actuation point with proper flow rate. A small flat-blade screwdriver is the only tool required.

1. Adjust liquid flow in the line to the rate at which switch actuation is desired.
2. Insert screwdriver into opening on backside of housing and fit blade into the potentiometer adjustment screw inside.
3. If LED is not illuminated, slowly turn screwdriver counterclockwise and stop as soon as LED illuminates.
4. If LED is illuminated, turn screwdriver clockwise until LED light goes out. Then, slowly turn screwdriver counterclockwise and stop as soon as LED illuminates.



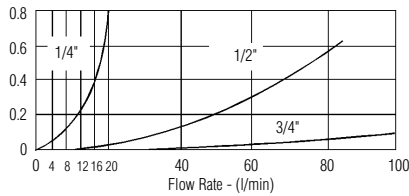
How to Order

Body Material	Port Size	Flow Ranges (l/min)		Input Power	Order Number	
		Low Range*	Standard Range		BSP	NPT
Polypropylene	1/4"	0.4 to 4.0	2.0 to 20.0	24 VDC 110 VAC	155425BSPP 155876BSPP	155425 155876
	1/2"	6.0 to 45.0	15.0 to 75.0	24 VDC 110 VAC	155485BSPP 155886BSPP	155485 155886
Brass	1/4"	0.4 to 4.0	2.0 to 20.0	24 VDC 110 VAC	156265BSPP 156266BSPP	156265 156266
	1/2"	6.0 to 45.0	15.0 to 75.0	24 VDC 110 VAC	156268BSPP 156269BSPP	156268 156269
	3/4"	---	20 to 112.5	24 VDC 110 VAC	180395BSPP 180396BSPP	180395 180396
	1"	---	30 to 225	24 VDC 110 VAC	181688BSPP 181689BSPP	181688 181689
Stainless Steel	9/16" - 18UNF	0.4 to 4	2.0 to 20.0	24 VDC 110 VAC	N/A N/A	165073 165074
	1/2"	6 to 45	15.0 to 75.0	24 VDC 110VAC	165077BSPP 165078BSPP	165077 165078
	3/4"	---	20 to 112.5	24 VDC 110 VAC	181691BSPP 181692BSPP	181691 181692
	1"	---	30 to 225	24 VDC 110 VAC	181693BSPP 181694BSPP	181693 181694

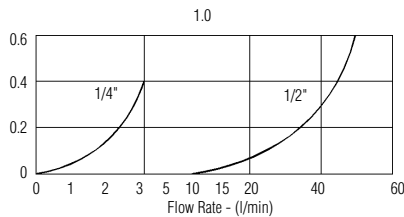
* With use of Low-Flow-Adapter supplied,

Pressure Drop Typical throughout all options

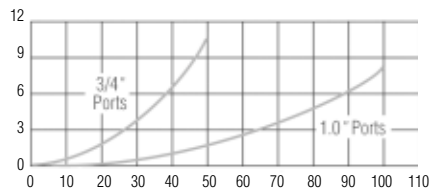
Standard Flow Range Units



Low Flow Range Units

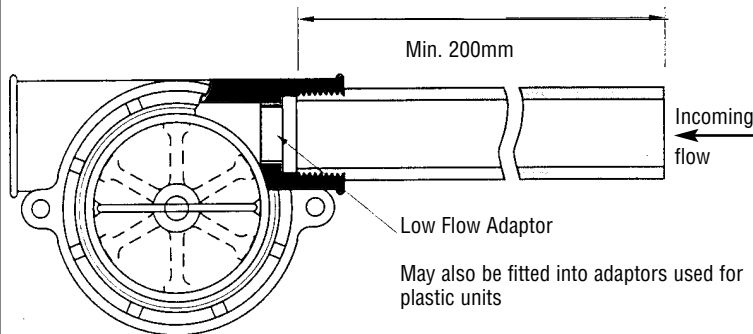


High Flow Units



Installation and Maintenance

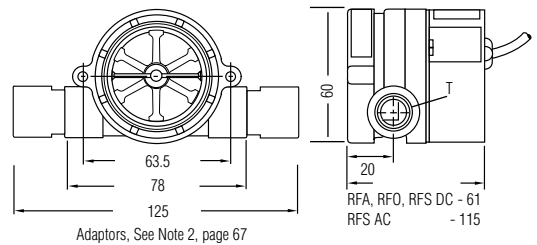
A proper installation will enhance RotorFlow sensor performance. Install using standard pipe fitting tools; horizontal fluid lines are recommended. For further installation and maintenance recommendations, refer to one of the following instruction bulletins: RFO Types - Part Number 157258; RFI Types - Part Number 157259; RFS Types - Part Number 157261. Since their function is to monitor dynamic fluid flow, naturally the rotor will react to turbulence, pulsation, entrained air, and other flow anomalies induced in the flow stream by other process hardware. For optimum performance, install RotorFlow units where nominal flow conditions exist with ports located at the top. Incoming flow may be placed to either port; a minimum of 20 cm of straight pipe on the inlet side is required. When operating in the low flow range, the supplied Low Flow Adapter must be installed in the incoming port.



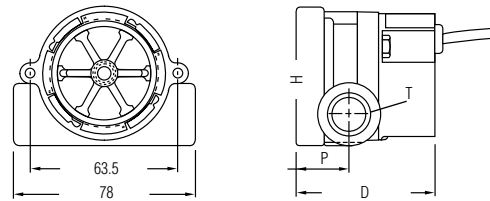
RotorFlow sensors connect to piping via NPT mating thread forms. The use of an appropriate thread sealant is necessary to assure a leak-tight connection. Permatex "No More Leaks" or 2 wraps of Teflon tape are the only sealants recommended for GEMS flow sensors. 150 micron filtration is recommended. However, should foreign particles enter RotorFlow sensor, accumulation is easily cleared by removing the lens from the body. The lens is removed by turning its centre rib 45° counter-clockwise, and then pulling it out. To reinstall the lens, simply reverse the process.

Dimensions (in mm)

**RFA, RFO, RFS
Polypropylene Bodies**



Metal Bodies



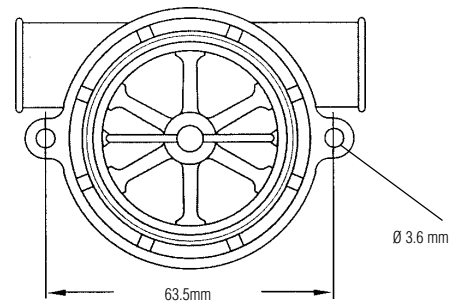
T	W	H	D DC models	D AC models	P
1/4	77	60	61	114	20
1/2	77	60	61	114	22
3/4	100	66	75	121	27
1	100	66	75	121	27

Panel Mounting

Any RotorFlow sensors may be panel mounted using holes integrated into the bodies.

Two (2) mountings ears are provided at the body centre line to receive 3.5mm ϕ self tapping screws (e.g. DIN 7971-B 3, 5 x 19) to accommodate panel mounting of the plastic RotorFlow units.

Note: ANSI T type 23 self-tapping screw are recommended. They may be replaced with standard machine screws if reinstallation should be required.



Important: In either case, pressure must be relieved from the system prior to sensor clean-out.

Low Flow Applications

A low flow adaptor is supplied with all Rotorflow units. It is used to produce accurate response at low flow rates. Install the adaptor, as shown above, in the port selected for incoming flow.