	Processautomatic Ratex AB	Author: Stefan Björnmalm
	Turbine Flow Meter Manual	Issue: 4 Approval: Per-Johan Åkerlund Effective: 2016-04-19

PROCESSAUTOMATIC TURBINE FLOWMETERS

TECHNICAL MANUAL AND OPERATING INSTRUCTIONS

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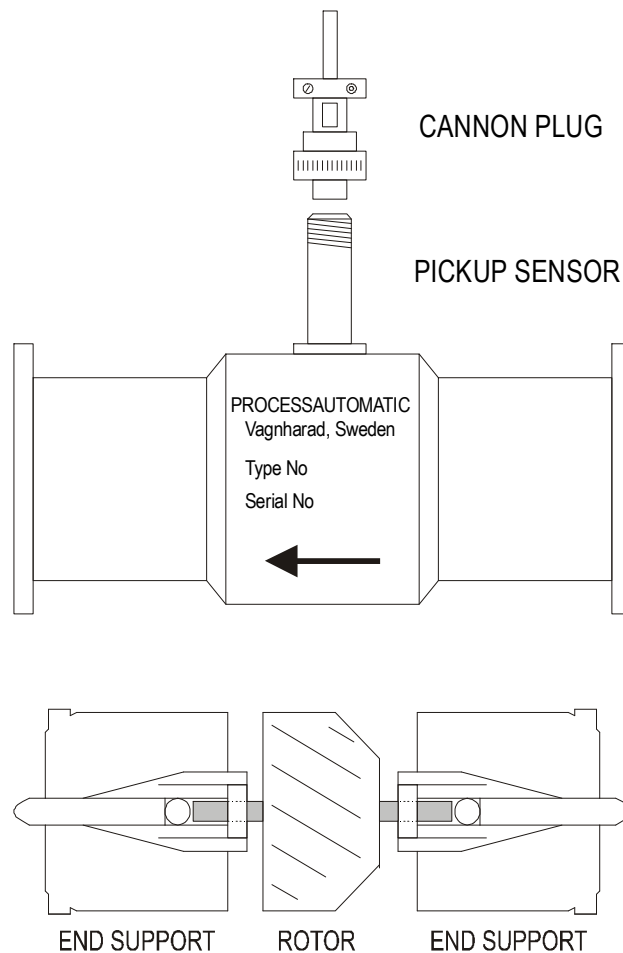
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GENERAL DESCRIPTION.

The PROCESSAUTOMATIC turbine flowmeter is made up from a stainless steel housing with a slightly magnetic, multi-blade, free-spinning rotor inside. The rotor is supported by two end supports.

A non-intrusive and removable pickup sensor detects the rotor blades and transmits a frequency which is proportional to the flow.

Each flowmeter is accurately calibrated in the factory before delivery and is shipped with a calibration certificate.



APPLICATIONS AND SPECIFICATIONS.

Applications: The turbine flowmeter is suitable for a wide range of applications measuring liquids with a low viscosity. It is not suitable for measuring liquids containing particles which may get caught in the moving parts.

The flowmeter is not suitable for measuring air or gases. Running the flowmeter dry, (i.e. pushing air or gases through it) may reduce the life of the unit due to lack of lubrication of the bearings.

Response time: It has a fast response time to changes in flow rate and can also be used for high-speed batching applications. Response time to a change in flow rate equivalent to 50% of the maximum flow rate is approx. 50 milliseconds.

Temperature: Max product temperature: + 125 degrees C.
Min product temperature: - 50 degrees C.

Accuracy & Repeatability: The flowmeter accuracy is +/- 0.5% of reading within the stated flow range for a viscosity of 1 cSt.

Repeatability is 0.1%.
Repeatability is defined as the maximum difference between two readings sampled within the stated flow range under the same conditions and flow rate.

Pressure rating: The pressure rating is based on the limitation for the end connection.
For example, Triclover is limited to 10 Bar (150 PSI).
Disregarding the pressure rating for the end connection, the flowmeter pressure rating is 250 Bar (3750 PSI).

Pressure drop: Approx. 0.27 Bar (4 PSI) at max stated flow rate for water.

CONSTRUCTION AND MATERIALS.

End Connections: The turbine flowmeters are available with different end fittings and connections. Standard end fittings include Triclover, BSP, BSM and flanges (DIN and ANSI).

There are sometimes variations in standards between different countries and regions and suitable matching welding connections are available through your local distributor or from the factory.

Internals: One set of internals includes a rotor and two corresponding end supports. The internals are locked inside the body by a circlip on each side.

The bearings are designed to allow the liquid to wash through the moving parts and this feature is particularly suitable for food and beverage applications.

The internals are interchangeable between flowmeters of the same size, regardless of end fittings.

Replacement internals can be ordered separately and are shipped already calibrated complete with a calibration certificate.

Pickup sensor: The pickup sensor type PA95 is universal for all standard types and sizes.

Materials:	Body:	Stainless steel.
	End supports:	Stainless steel.
	Rotor:	FV520.
	Bearings:	Stellite
	Pickup sensor:	Stainless steel.

TYPES, SIZES AND FLOWRANGES.

Types: The different types of flowmeters are defined by the end connection.

The two standard types are:

PATC Triclover end connections.

PAT Threaded male end connections.

The following two types are also available:

PAH BSM-threaded male end connections.

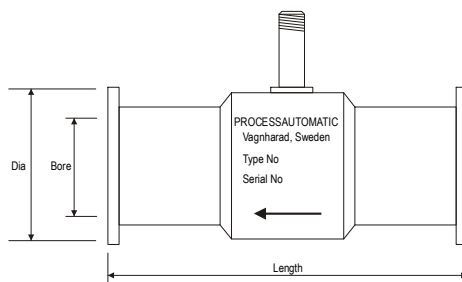
PAF Flanged end connections.

Please note that standards for different connections may vary between countries and regions.

Sizes and flow ranges: The flow range defines the minimum and maximum flow rate for the flowmeter.

Type	Size (mm)	Flow range (litres/minute)
---/12/1	12	2.3 - 14
---/15/2	15	4.5 - 34
---/15/4	15	9.0 - 68
---/18/8	18	18 - 140
---/25/16	25	27 - 270
---/31/24	31	41 - 410
---/37/42	37	70 - 700
---/50/66	50	110 - 1100

DIMENSIONS:



Flowmeter dimensions: The table below covers the PAT and PATC range.
Dimensions for other types are available on request.

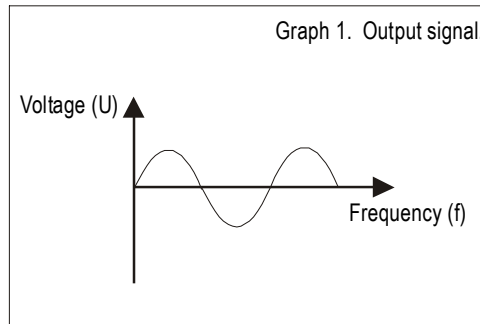
PATC Dimensions:	Model	Length (mm)	Bore (mm)	Dia (mm)
	PATC/12/1	62	9.6	50
	PATC/15/2	62	11.8	50
	PATC/15/4	62	11.8	50
	PATC/18/8	90.5	15.5	50
	PATC/25/16	90.5	21.5	50
	PATC/31/24	117	27.3	50
	PATC/37/42	108	33.5	50
	PATC/50/66	132	45.2	64

PAT Dimensions:	Modell	Length (mm)	Bore (mm)	Dia (mm)
	PAT/12/1	62	9.6	1/2
	PAT/15/2	62	11.8	5/8
	PAT/15/4	62	11.8	5/8
	PAT/18/8	82	15.5	3/4
	PAT/25/16	89	21.5	1
	PAT/31/24	98	27.3	1 1/4
	PAT/37/42	110	33.5	1 1/2
	PAT/50/66	132	45.2	2

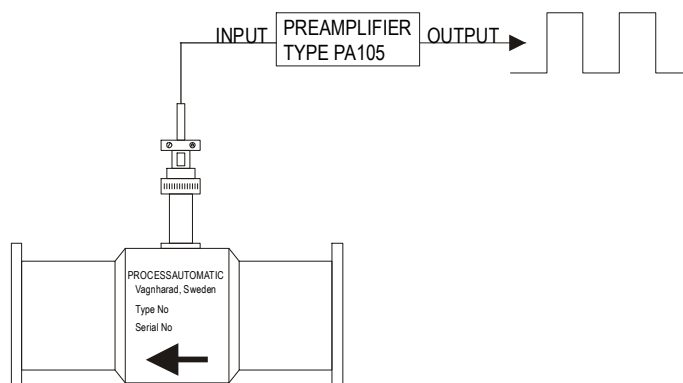
ELECTRICAL CONNECTION.

Output:

The output from the magnetic pickup sensor is a sine wave signal. The frequency is proportional to the flow. The amplitude also varies with flow and size of flowmeter. Minimum amplitude is 25 mV peak-peak.



Some receivers and instruments require the input signal to be a square wave signal with an amplitude of 5VDC - 24 VDC. In these instances, it is necessary to use a preamplifier, such as Processautomatic model 105 or PA106, between the flowmeter and the receiving instrument.



ELECTRICAL CONNECTION, (continued).

Wiring:

The preferred cable is a screened 2-core twisted copper cable. The screen should be earthed at the receiver end only.

The cable should run clear from high-voltage cables to avoid electrical interference from other devices.

Maximum cable length without transmitters or amplifiers is 100 metres.

The output signal is an AC signal and as such has no polarity.

Pickup sensor:

The pick-up sensor type **PA95** is universal for all standard types and sizes of the flowmeter. It consists of a stainless steel casing with a coil inside. Two pins allow for connection to a mating cannon connector.

It is possible to test the pickup sensor by measuring the electrical resistance between the two pins using a multi-meter. The resistance of a working pickup sensor is approximately 470 Ohms.

NB: The Pick-up sensor (regardless of type, make or model, should be checked on a regular basis. A faulty Pick-up sensor may not register actual flow. Please refer to Maintenance.

INSTALLATION

Location: The flowmeter can be installed horizontally, vertically or at an angle. For best results, ensure that the flowmeter is completely full of liquid at all times during operation as entrained air or air pockets will affect the accuracy.

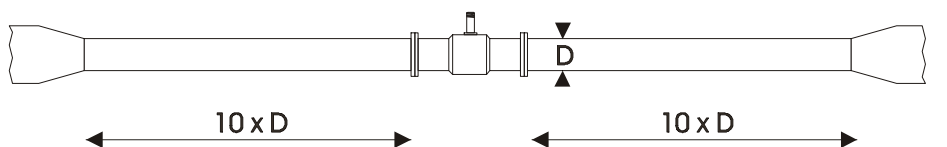
If mounted vertically or at an angle, flow direction should preferably be upwards to ensure a full pipe during operation.

The pickup sensor should normally be at the highest point where possible to avoid condensation from the pipe work draining onto it.

Filters: Coarse filters should be inserted upstream in case solid particles may be present in the liquid.

Flow straighteners: To optimize accuracy, the connecting pipe work should be of the same size as that of the flowmeter. Ten times the pipe diameter of straight pipe before and after the flowmeter is recommended. These pipe sections should be free from devices which may cause turbulence, such as valves and probes.

Flow direction: The flowmeter can be used to accurately measure flow in one direction only as indicated by the arrow on the flowmeter body. Reverse flow will not cause any damage.



Important Considerations:

- 1) Always make sure that the Pick-up sensor being used is functioning properly. A malfunctioning Pick-up may not provide any signal to indicate actual flow” – which can lead to overfilling or flooding.
- 2) Only use clean liquids with the Turbine Flow Meter. Small solids may cause the rotor to seize – leading to the Flow meter not providing a signal to indicate actual flow. This can in turn lead to overfilling and flooding.
- 3) Only use the Turbine Flow Meter within set flow range limits. Exceeding flow range limits by forcing a larger volume of gas or liquid thru the flowmeter than specified will cause the rotor to generate too much friction-induced heat on the axis, causing permanent damage to the rotor and end supports. The damage can be permanent structural damage to the flow meter and cause metal parts to become dislodged completely. Such damage can lead to the Flow meter not providing a signal to indicate actual flow. This can in turn lead to overfilling and flooding.
- 4) When measuring hazardous liquids or chemicals – there should always be a buck-up system that ensures safety should the flow meter fail to register actual flow. Such measures should include overfilling and flooding sensors.

MAINTENANCE

General / Every 6-Months:

- 1) Dismantle the flow meter to check for cleanliness of bearings and rotor.
- 2) Check that there is no significant wear or damage to the Rotor or bearing ball or its seat.
- 3) Ensure that the outer markings with identification information is clearly visible.

Disassembly Instructions:

- 1) Carefully note or mark the position of the end supports and mark the wings that are positioned between the punch marks (2 small indentations which are located on either side of one of the wings of each end support). When the end supports are refitted, it is very important that the same wings are refitted in their original location. Also carefully note the rotor configuration in respect of the flow direction.
- 2) Remove the two retaining circlips with a suitable pair of pliers by pulling the lip of each circlip so that the ring leaves the circlip groove. Withdraw both end supports (two) and rotor with shaft.
- 3) The rotor assembly can then be cleaned and replaced into the flow meter body and secured by replacing the circlips securely into the circlip grooves; located inside of the flow meter body.
- 4) The end supports and rotor must be replaced into the flow meter body in exactly the same direction as they were originally fitted. If the rotor assembly is refitted in the opposing direction, the flow meter accuracy will be seriously affected.

In-Line Cleaning:

The Turbine flow meter can be in-line cleaned by all chemical methods commonly used in the food industry. This includes 1% Nitric acid at 70°C followed by 1% NaOH at 70°C and water at 90°C. Continuous line temperature up to 125°C can be tolerated.

MAINTENANCE (Continued):

Pickup sensor / General: In the event that the pickup sensor is refitted or replaced, please follow the following steps. It is very important that the Pick-up sensor is mounted properly – else the flow meter may not provide a signal during actual flow.

- 1) Thoroughly clean the threaded pickup hole in the flowmeter body with a dry cloth.
- 2) Screw in the pickup sensor gently by hand until it reaches the bottom of the hole
- 3) Unscrew $\frac{1}{4}$ of a turn.
- 4) Tighten locknut

NB: Do a functional test of the Pick-up sensor being used with an oscilloscope – every 6 months!

NB: In the event of mechanical damage to the internals, a complete new set can be purchased from your local supplier or from Processautomatic.

WARRANTY.

All of the PROCESSAUTOMATIC “TURBINE” flowmeters are guaranteed by warranty for 60 months (5 years) from the date of dispatch against any defects arising from any material or manufacturing deficiencies. Please refer to General Conditions of Sale for further information.

It is important that the flowmeter is used within set flow range limits. Exceeding flow range limits by forcing a larger volume of gas or liquid thru the flowmeter than specified will cause the rotor to generate too much friction-induced heat on the axis, causing permanent damage to the rotor and end supports. **This phenomenon is also referred to as over speeding - and is not covered by warranty.**

It is the buyers' responsibility to ensure that used liquids are compatible with the materials of the flow meter. Exceeding material tolerances is not subject for warranty.

Buyer shall have fifteen (15) days upon receipt to inspect and test the Products (“Inspection Period”). If the buyer determines any unit of Products defective, the buyer shall promptly notify Processautomatic of such defects. Defective Products may be returned for re-test, evaluation and examination subject to Processautomatic’s Returned Material Authorization (“RMA”) procedure; provided, that such written notification and request for an RMA number must be received by Processautomatic during the Inspection Period. Returns must be prepaid by the buyer. When requesting a return authorization, the buyer must supply the buyers purchase order number and Processautomatic’s invoice number. Product description must include product serial number.

Exclusion. Processautomatic will inspect all Products returned pursuant to the foregoing RMA procedures, and Processautomatic will not replace products where the defect is due to misuse, neglect, alteration or improper storage.