Processautomatic Turbine Flow Meters

Technical manual and operating instructions

PROCESS AUTOMATIC
Swedish Quality in Flow metering

CONTENTS

1 CONTACT INFORMATION:

If you need further help or assistance with your product, you may contact **ProcessAutomatic** by the following means:

Telephone: +46 (0)156 10480
E-Mail: pasweden@processautomatic.com
Postal address: P.O. Box 128
610 70 Vagnhärad
SWEDEN.

2 WAVER:

For printing errors, please contact your nearest **ProcessAutomatic** reseller or our head office. Please note, **ProcessAutomatic** will not assume any responsibility for printing errors (E&OE). Please make sure that you always have the latest product manual available. The latest manual can always be downloaded directly from Processautomatic's web site **www.processautomatic.com** or obtained thru request by contacting **ProcessAutomatic** or your nearest **ProcessAutomatic** Reseller.

3 SAFETY:

This product should only be used by persons familiar with the product or persons that have read and understood this manual in full. Any persons not familiar with this product should refrain from any use until they have read and understood the manual in its entirety.

4 CAUTION:

Misuse of this product or use outside of what is recommended in this manual, may result in personal injury as well as damage to the product and other system installations.

Reference to safe use and handling of this product will be made throughout this manual.

5 TRADEMARKS:

Proper reference is and will be given to used trademark products. All such reference is given where these trademarks are mentioned.

6 THE PURPOSE OF THIS MANUAL:

This manual is designed to guide all users of **Processautomatic Turbine Flow Meters** to safe and proper handling. It is only thru safe and proper handling that the end user will get the most out of this product.

The goal of this manual is to inform the user about the product, how it works and of how to use it. It is important that the end user is well accustomed to the product, as such, should there be a need for any additional information, please contact your nearest **ProcessAutomatic** reseller or our head office to forward your requirements.

7 SCOPE OF THIS MANUAL:

This manual covers the installation, use and maintenance as well as function of **Processautomatic Turbine Flow Meters** only.

8 WHO SHOULD READ THIS MANUAL:

All persons intending to or that are intended to use **Processautomatic Turbine Flow Meters** should read this manual in its entirety. If after reading, any aspect of the use of this product is unclear or not understood, then please contact your nearest ProcessAutomatic reseller or our head office for further support.

9 WHERE TO KEEP THIS MANUAL:

This manual should be kept near or at the location of the **Processautomatic Turbine Flow Meter.** It should be readily accessible to all users of this product. Laminated versions of this manual can be purchased directly from ProcessAutomatic or any of its resellers. Digital copies are readily available for downloading from Processautomatic's web site **www.processautomatic.com.**

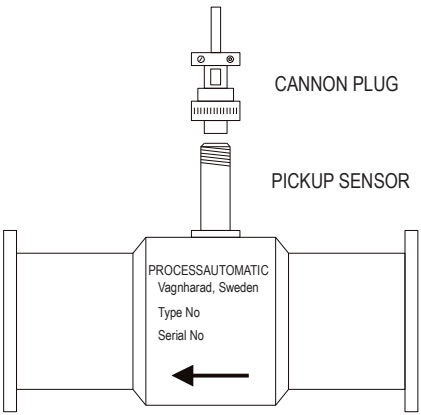
NOTE: It is recommended to file this manual at a location readily accessible by personnel using or intending to use Processautomatic Turbine Flow Meters. Paper copies should be kept dry and away from all forms of moisture, chemicals, corrosive substances or sharp objects.

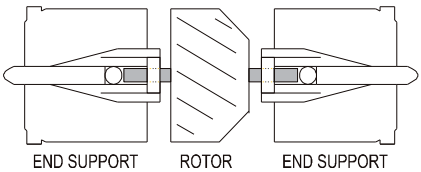
10 CONSTRUCTION:

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





11 APPLICATIONS AND SPECIFICATIONS:

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.

12 RESPONSE TIME:

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

13 STANDARD TEMPERATURE RANGE:

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

OTHER OPTIONS ARE AVAILABLE!

14 ACCURACY & REPEATIBILITY:

The flowmeter accuracy is +/- 0.5% of reading within the stated flow range for a viscosity of 1 cSt. Repeatability is 0.1% - though typical repeatability is better than 0,05.
Repeatability is defined as the maximum difference between two readings sampled within the stated flow range under the same conditions and flow rate

15 PRESSURE RATING:

The pressure rating is based on the limitation for the end connection or type of clamp used. For example, Tri-Clover is generally limited to 10 Bar (150 PSI) – however – with appropriate clamps, a higher-pressure rating can be achieved.
The maximum permissible pressure is 500 Bar.

15.1 PRESSURE DROP:

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

15.2 PED:

All Processautomatic's Turbine flow meters meet the requirements of the PED Directive (2014/68/EU).

16 CONSTRUCTION AND MATERIALS:

16.1 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 directly from **ProcessAutomatic**.

16.2 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. 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.

16.3 PICK-UP SENSOR:

The pickup sensor type PA95 is universal for all standard types and sizes. For further information – please refer to sections 20.3 & 23.7.

16.4 MATERIALS:

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

17 TYPES, SIZES AND FLOWRANGES:

17.1 TYPES:

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

The standard types are:

PATC Tri-Clover end connections.
PAT Threaded male end connections.
PAH BSM-threaded male end connections.
PAF Flanged end connections.

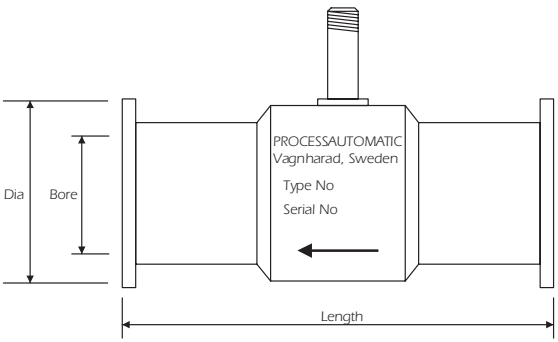
Please note that standards for different connections may vary between countries and regions.

17.2 SIZES & FLOW RANGES:

The flow range defines the minimum and maximum flow rate for the flow meter that allows a permissible inaccuracy of no more than 0,5% over the full range. The Flow meters work at lower flow ranges – however, at other than specified flow ranges, the accuracy is different than specified in the data sheet. For applications requiring lower than specified flow ranges, please contact **ProcessAutomatic** directly for correct flow range information.

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

18 DIMENSIONS:



FLOW METER DIMENSIONS:

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

18.1 PATC Dimensions:

Model (mm)	**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

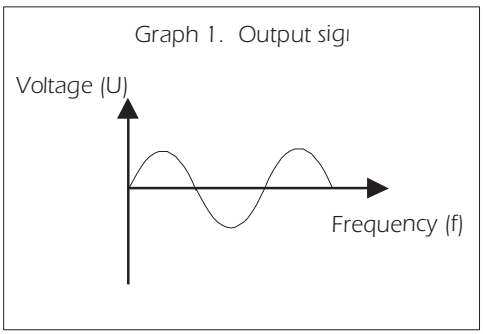
18.2 PAT Dimensions:

Modell (mm)	**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

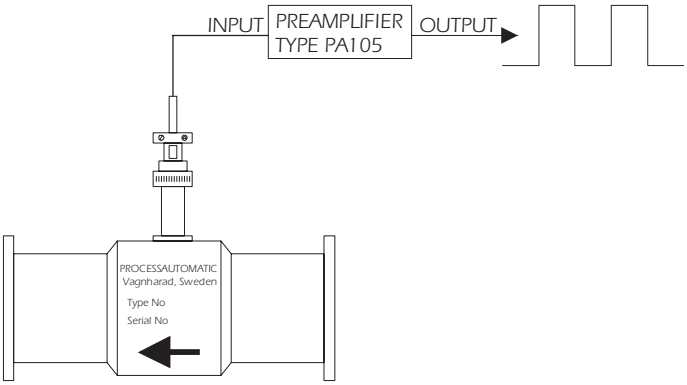
19 ELECTRICAL CONNECTION:

19.1 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 PA105 or PA106, between the flowmeter and the receiving instrument.



19.2 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.

19.3 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.

20 INSTALLATION:

20.1 LOCATION / PLACEMENT:

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.

20.2 FILTERS:

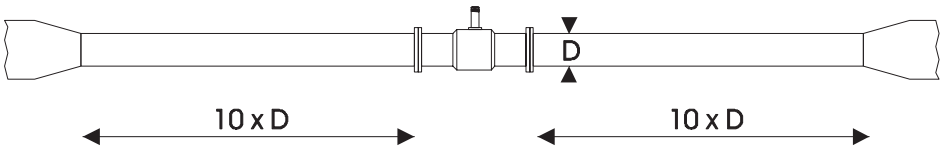
Coarse filters should be inserted upstream in case solid particles may be present in the liquid.

20.3 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.

20.4 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.



21 IMPORTANT CONSIDERATIONS:

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

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.

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.

When measuring hazardous liquids or chemicals – there should always be a back-up system that ensures safety should the flow meter fail to register actual flow. Such measures should include overfilling and flooding sensors.

22 MAINTENANCE:

22.1 HOW TO REMOVE & INSTALL AN INTERNAL (REPAIR-KIT):

This instruction will cover both removal and installation of a Processautomatic Turbine Flow Meter (TBFM) Internals. The replacement Internals is often referred to as a repair-kit. This instruction assumes that the handler is holding a flow meter which is not installed in a system and that is clean from any harmful residue, chemicals or other liquids.

The Processautomatic 2-turn circlips (snap-rings) are modified to be easily removed for maintenance or for replacement of the Internals (repair-kit). The 2-turn circlip is shaped like and functions similarly to a coiled spring. Also, one end is flat and pointy, whilst the other end has been bent perpendicularly to the rest of the circlip.

Repair-kits are not supplied with new Circlips unless specifically requested. The Circlips do not ware like the moving parts of the Turbine Flow Meter.

NOTE: Do not discard or throw away the installed Circlips when replacing already installed Internals with a repair-kit.

22.2 REMOVING AN ALREADY INSTALLED INTERNALS:

To remove an already existing Internals from a Processautomatic Turbine Flow Meter, please follow the following steps:

1. Use a pair of pointy and flat pair of plyers. Do not use standard snap-ring plyers.
2. Look into the INPUT-END end of the TBFM. 3-wings from the end supports (part of the Internals) will be visible.
3. Just in front of where these 3 wings are installed, there is a thin groove in which the Circlip is installed. It looks like a ring. If you look along the edge of this ring at an angle, you will see that one end of the circlip has been bent perpendicularly and is pointing axially along the TBFM.
4. With the OUTPUT-END of the flow tube FACING DOWN and the INPUT-END facing up - on the INPUT-END, grab the available end of the circlip with the plyers (described above). First pull this pin (circlip end) inwards towards the centre of the TBFM, then pull straight out. Place somewhere safely for re-use.
5. Pull the INPUT-END End-support straight out.
6. Pull the Rotor by the rotor shaft straight out.
7. Turn the TBFM over so that the INPUT-END is facing down, and the OUTPUT-END is facing up.
8. Look into the OUTPUT-END end of the TBFM. 3-wings from the end supports (part of the Internals) will be visible.
9. Just in front of where these 3 wings are installed, there is a thin groove in which the 2ND Circlip is installed. It will look similar to a ring. If you look along the edge of this ring at an angle, you will see that one end of the circlip has been bent perpendicularly and is pointing axially along the TBFM.
10. Grab the available end of the circlip with the plyers (described above). First pull this pin (circlip end) inwards towards the centre of the TBFM, then pull straight out.
11. Pull the OUT-PUT END END-SUPPORT straight out.
12. The TBFM housing will now be empty.

22.3 INSTALLING A REPAIR-KIT:

Before installing the repair-kit, make sure that the initial Internals and circlip rings have been properly removed. Else – please refer to separate instruction.
Before Installing the repair-kit into the TBFM flow tube – make sure that the Flow Tube has been properly cleaned.

IMPORTANT: For sizes up to 1" (PAXX25/16-AL) – the End-supports (Spiders) are the same. Either of the supplied spiders can be used on the OUTPUT-END or INPUT-END. HOWEVER – on sizes from 1 ¼" and above (PAXX31/24-A-AL) – the depth of the axial support on the spiders are deeper on the INPUT-END and shallower on the OUTPUT-END. If these are installed incorrectly – then the rotor will not be able to be installed correctly. Faulty installation can / will result in faulty reading.

IMPORTANT: Rotors for sizes PAXX12/1-AL, PAXX15/2-AL, INT12/1-AL and INT15/2-AL are dually symmetrical and have no specific direction in which they need to be installed. However, all other sizes have rotors which need to be installed in a specific direction. On all other rotor sizes, the rotor wings are angled on the INPUT-END – on the other side the rotor wings are straight and perpendicular to the rotor shaft and indicate the OUT-PUT END.

To install the repair-kit, please follow the following steps:

1. Hold the TBFM housing with the OUTPUT-END of the flow tube FACING DOWN and the INPUT-END facing up.
2. On. sizes from 1 ¼" and larger install the end support with the deeper axial support in the INPUT-END. One of the end-support wings must fall in between the 2 punch-marks on the supporting shoulder inside the flow tube. N.B. It is a "very" tight fit. No force may be used –the end-support must be installed perfectly straight into its seat in the TBFM body to fall into place.
3. Pull the circlip apart slightly.
4. Identify which end is flat and which end has been bent perpendicularly to the remaining circlip.
5. On the INPUT-END, with a rotating motion, thread the flat end of the circlip into the groove provided in the meter-body, positioned just in front of the spider (End-support). At the final stage of assembly, when the last part of the circlip springs into place – a small "click" will be heard.
6. Turn the TBFM over so that the INPUT-END is pointing down and the OUTPUT-END is pointing up. Insert the rotor. The rotor has 2 sides. On one side, the rotor wings are angled (INPUT-END) – on the other side the rotor wings are straight and perpendicular to the rotor shaft (OUT-PUT END). Insert the rotor with the INPUT-END pointing into the TBFM body. Align the rotor so that the shaft becomes inserted into the bushing on the end-support. N.B., It is a "very" tight fit. No force may be used –the rotor must be installed perfectly straight into its seat in the end support to fall into place.
7. On. sizes from 1 ¼" and larger install the end support with the shallower axial support in the OUTPUT-END. One of the end-support wings must fall in between the 2 punch-marks on the supporting shoulder inside the flow tube. Align the end-support so that the bushing threads over the shaft of the rotor. N.B. It is a "very" tight fit. No force may be used –the end-support must be installed perfectly straight into its seat in the TBFM body to fall into place.
8. On the OUTPUT-END, with a rotating motion, thread the flat end of the circlip into the groove provided in the meter-body, positioned just in front of the spider (End-support). At the final stage of assembly, when the last part of the circlip springs into place – a small "click" will be heard.
9. If properly installed - the rotor will rotate easily when blowing into the meter with the lung power, or very carefully with compressed air.

22.4 GENERAL SERVICE / EVERY 6-MONTHS:

Dismantle the flow meter to check for cleanliness of bearings and rotor.

Check that there is no significant ware or damage to the Rotor or bearing ball or its seat.

Ensure that the outer markings with identification information is clearly visible.

22.5 DISASSEMBLY INSTRUCTIONS:

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 to make sure that the rotor is re-fitted correctly regarding flow direction.

For further instructions – please refer to section "**Removing from & Installing an Internal (Repair-Kit) into a Processautomatic Turbine Flow Meter".**

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.

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.

The end supports and rotor must be replaced into the flow meter body in 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.

22.6 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.

22.7 PICKUP SENSOR / GENERAL:

If 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.

Thoroughly clean the threaded pickup hole in the flowmeter body with a dry cloth.

Screw in the pickup sensor gently by hand until it reaches the bottom of the hole.

Unscrew ¼ of a turn.

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

23 WARRANTY:

All 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.

Fyris-Tryck AB, Uppsala 2018

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