HELIFLU™ TZN

User's Manual

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Chapter 1: Introduction to TZN Meters (STD & CUS)

The simple, rugged construction of TZN turbine meters provides excellent accuracy and measurement repeatability for a wide range of industrial applications. All TZN flow meters, both STD and CUS, are designed to provide high quality liquid volume measurement across a wide range of viscosities (0.3 to >1,000 cSt).

The TZN CUS model was specifically developed to measure fluids containing fibers, paraffin, or DRA (Drag Reducing Agents). The patented TZN CUS shaft and bearing system minimizes negative impacts of these substances on measurement accuracy.

The removable measurement sub assembly (also referred to as 'cartridge') design allows pressure to be equalized between the cartridge and meter body, thus eliminating sensitivity to fluid pressure variations. Additional benefits of this design enables factory calibration of the cartridge, independent of the meter body, which allows rotation of cartridges in challenging operational environments (remote installations, limited access of onsite site provers, high pressure applications, etc.), as well as selecting a different cartridge to meet changes in operational flow rates (within calibrated flow parameters). This can significantly reduce operational downtime and maintenance costs.

Generation of Signal

The operating principle of helical turbine flow meters is based on the electromagnetic field generated by the rotational velocity of magnets imbedded in blades of the helical rotor passing by a pick-up coil positioned in the flowmeter body.

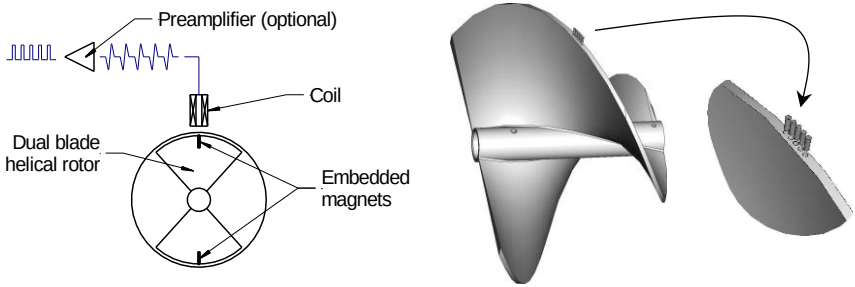


Figure 1. Mechanics of Signal Generation of Helical Turbines

Measuring the electrical signal generated allows calculation of the liquid flow rate flowing into the pipe through the following expression: $Q = \frac{F}{Kf} \times 3{,}600$, and the transferred volume through: $V = \frac{N}{Kf}$.

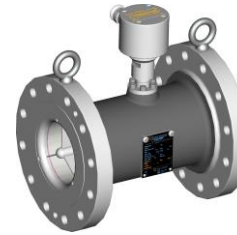
With Q Instantaneous flow rate in m^3/h [*l/min, GPM, BPH …*]
F Output signal frequency in Hz
Kf Measurement cartridge Kfactor in pulses/m^3 [*p/l, p/USG, p/bbl …*]
Kfactor is established during measurement cartridge calibration.
V Volume in m^3 [*litres, Gallons, Bbls*]
N Number of pulses

Chapter 2: Meter Components by Meter Size

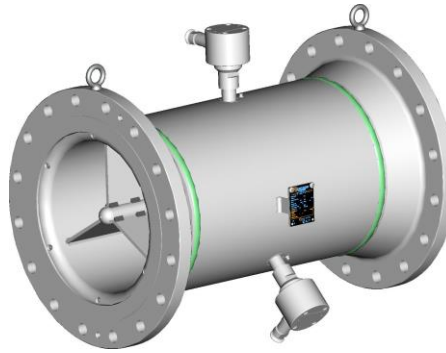
TZN flowmeters include the following components:

1. Body
2. Measuring sub-assembly / cartridge
3. Inlet ring
4. Detection sub-assembly / Electronics enclosure
5. Flow conditioner (Optional)

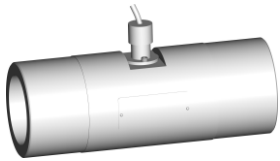
½ to 3” TZN



4 to 14” TZN



16 to 20” TZN



Threaded type TZN (Size ≤ 2”)

Wafer style (Size ≤ 2”)

Figure 2. Meter body types by size

Meter Body

The meter body is most commonly made of carbon steel or stainless steel (AISI 316/316L or equivalent); other materials are available upon request (Duplex, Hastelloy …).

The meter body contains a removable cartridge. Depending upon meter size and operational preferences, the body can be fitted with one, two or three bosses, allowing generation of single or dual pulse signals to flow computer, as well as the addition of a localized readout via a totalizer if desired. The position of the electronic enclosures is arranged so that pulse trains delivered by the 2 coils are 90° out of phase.

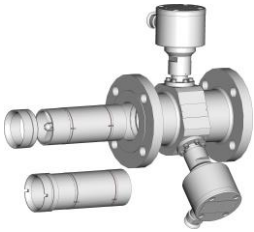
The meter body will contain the following markings:

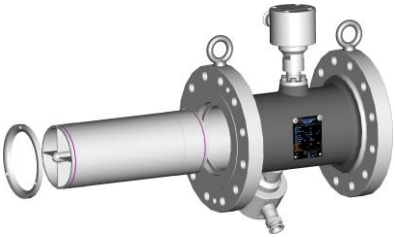
- An arrow indicating the direction of fluid flow
- A manufacturer's nameplate with specific equipment identification

NOTE: TZN CUS cartridges are distinguished from TZN STD versions by their specific fixed rotor shaft and the presence of bearing supports in the crosspieces.

Measurement Cartridge Types by Size

Nominal sizes ≤ 3" The cartridge is centered and fastened into the body by means of an upstream stainless steel threaded ring. NOTE: on older models, the ring is part of the cartridge.





Nominal sizes 4" ≤ 14" The cartridge is centered and fastened into the body by means of an upstream stainless steel ring fixed with screws.

Nominal sizes ≥ 16" The 3 piece cartridge is centered and fastened into the body by means of upstream and downstream stainless steel cross pieces containing the rotor. The outer rings are fixed into the meter body to hold the cartridge in place with screws.

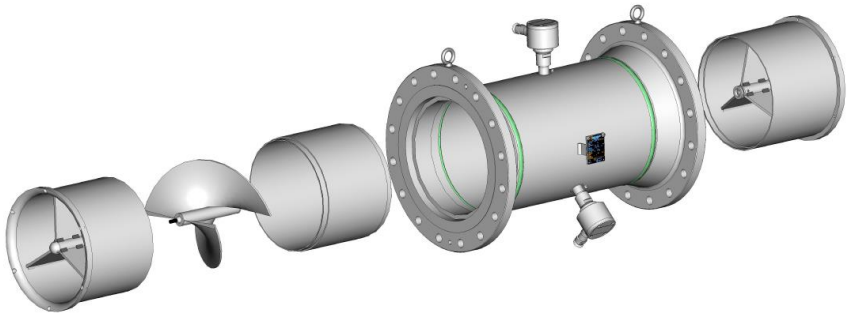


Figure 3. Cartridge types by size

Detection Sub-assembly / Electronic Enclosure

The detection sub-assembly is housed in a flame-proof box which permits the use of the flowmeter in electrically classified areas (UL/cUL Class 1 Div 1 Group C & D; ATEX/IECEx II1G – IIC T6). The electronic enclosure integrates the following elements:

- A pick up coil housed in the bottom of each boss and kept in position by means of a ring
- A coil/pre-amplifier connection cable
- An optional pre-amplifier which allows operators to significantly increase the maximum distance between the flowmeter and the electronic display and/or flow computer (up to 5,000 meters/16,000 ft)

Flow Conditioning

According to API MPMS Chapter 5.3 and ISO 2715, "The performance of turbine meters is affected by swirl and non-uniform velocity profiles that are induced by upstream and downstream piping configurations, valves, strainers, pumps, fittings, joint misalignment, protruding gaskets, welding projections, or other obstructions. Flow conditioning shall be used to overcome the adverse effects of swirl and non-uniform velocity profiles on turbine meter performance."

Faure Herman can supply the flow conditioning assembly which integrates upstream piping, flow conditioning element (plate, straightening vanes, etc.) and downstream piping (to be utilized at time of meter calibration).

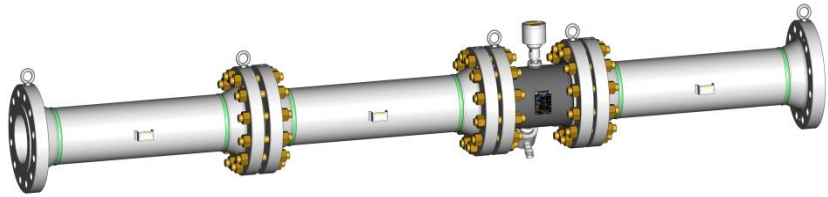


Figure 4. Complete Meter run with upstream/downstream spool pieces and flow conditioner

Chapter 3: Equipment Receipt, Storage and Handling

Upon receipt of the TZN turbine meter, inspect the packing case for any shipping damage. The meter must be carefully removed from the packing case and inspected for potential damage or missing parts (including documentation)

Before installation, the unit should remain stored in its original packing, protected against adverse weather conditions, and maintained at temperatures between -20 /+70 °C (-4 /+158 °F).

If the meter isn't installed within a month, FH recommends maintaining the metering assembly in an inerted atmosphere (nitrogen) or fluid filled state (light hydrocarbons). Please check applicable regulation to ensure that all calibration requirements have been met.

Prior to installing the TZN, visually inspect the turbine meter; pay particular attention to name plate (check for serial number, process conditions, direction of flow …), flange rating and general conditions. Should the product be damaged or documents missing, please contact the Faure Herman Worldwide Customer Support & Service via phone, email or website:

Hotlines:	+1 713 597 4827 (North America)
	+33 2 43 60 28 55
Email:	support@faureherman.zendesk.com
Online Assistance website:	https://faureherman.zendesk.com/hc/en-us

Handling recommendations: Meter sizes ≥ 6"(DN 150) or weighing > 30 kg [66 lbs]

The TZN must be carefully handled with lifting rings (when applicable) or with straps on both sides of the body.

Electronic detection system enclosures must not be used for lifting.

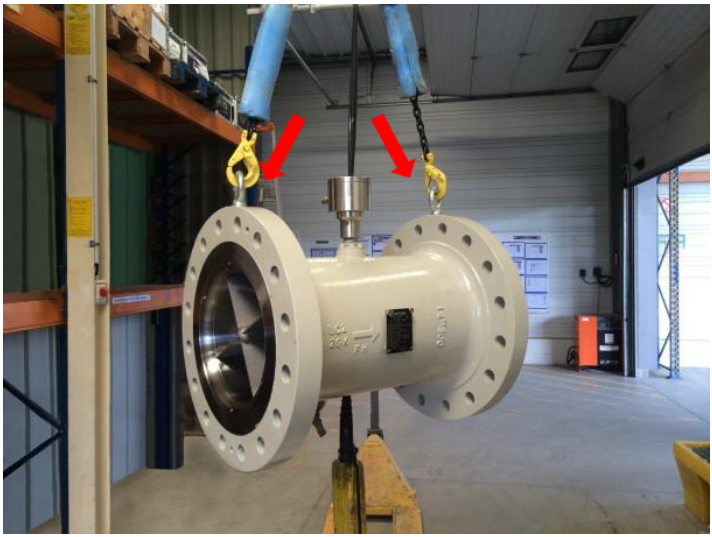


Figure 5. Proper lifting technique for meters > 6 inches

Chapter 4: Installation and Operation

TZN turbine flowmeters can be installed horizontally or vertically (ascending flow) provided the flow direction indicated on the cartridge and meter body are followed.

For custody transfer applications, turbine flowmeters require the integration of a minimum upstream pipe length at least equal to 10 times the pipe diameter and at least equal to 5 times the pipe diameter downstream.

Mechanical Preparation of Pipe Prior to Meter Installation

Prior to flowmeter installation on the pipe, check the following to ensure proper operation:

- Cleanliness of the pipe upstream from the flowmeter
- Flow direction indicated by an arrow on the nameplate
- Correspondence between flanges and joint faces, on pipe and flowmeter sides
- Flowmeter alignment with upstream and downstream pipes and absence of obstacles preventing the correct liquid flow (gaskets, …)
- Follow recommended tightening torques in Appendix IV when bolting flanges
- Position of electrical connections to avoid binding

As a measuring instrument, turbine flowmeters must be handled with care.

Meter installation

Before installation, keep the equipment in its original packing, sheltered from bad weather and possible impacts.

The meter should be installed in the measurement line with proper alignment of upstream and downstream flanges so that stress on the equipment body is avoided.

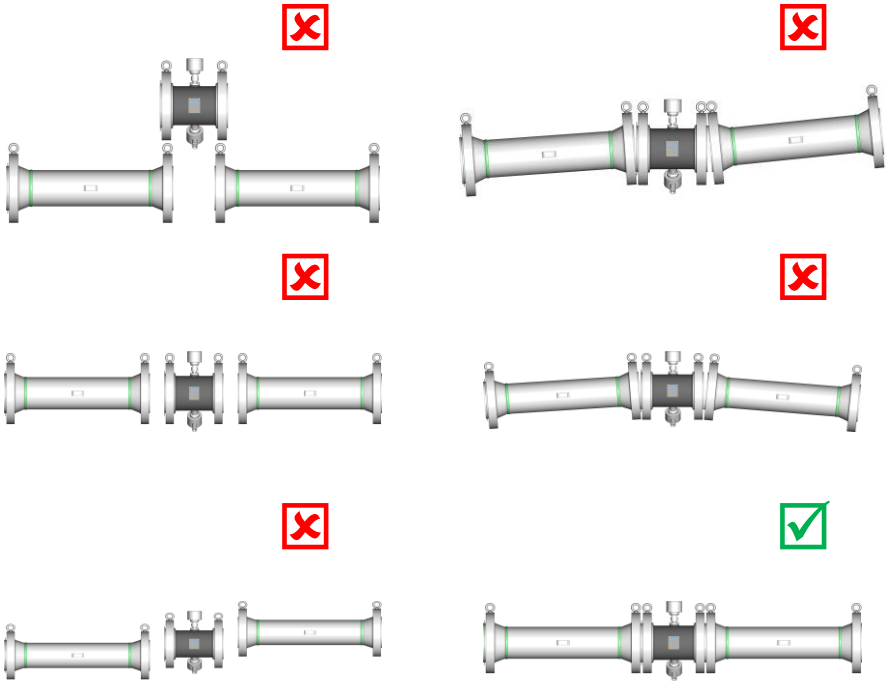


Figure 6. Proper pipe alignment for meter installation

The equipment must be installed by using the proper tools (wrenches):

- Never use a hammer
- Use impact wrenches with caution; pay attention to torque recommendations
- Specific tools can be used, when necessary, for the spacing between flanges.

If used, leave lift mechanisms in place until all bolts have been tightened.

Gaskets

Check to ensure that the proper gaskets are installed according to flange type: ASME B16.20 and ASME B16.21 or NF EN 1514 and NF EN 12560 standards.

NOTE: Spiral wound gaskets are forbidden for flanges rated below class 300 or PN 63.

Never reuse gaskets.

Flange bolts

The material of flange bolts shall be chosen in ASTM A 193 B7 (bolts) and ASTM A 194 2H (nuts) according to ASME B16.5 standard for temperature between -45°C and +480°C.

Tightening torque

If the flowmeter is equipped with a flow straightener, the bolts must be checked and retightened before commissioning. A label affixed to the flanges calls attention to this requirement.

Bolt size and tightening torque – non coated				Bolt size and tightening torque - coated			
M	N.m	NPS	ft-lb	M	N.m	NPS	ft-lb
14	110	1/2	60	14	85	1/2	45
16	160	5/8	120	16	130	5/8	90
20	350	3/4	210	20	250	3/4	160
24	550	7/8	350	24	450	7/8	250
27	800	1	500	27	650	1	400
30	1,150	1 1/8	750	30	900	1 1/8	550
33	1,550	1 ¼	1,050	33	1,200	1 ¼	800
36	2,040	1 ⅜	1,400	36	1,600	1 ⅜	1,050
39	2,650	1 ½	1,800	39	2,050	1 ½	1,400
42	3,350	1 ⅝	2,350	42	2,550	1 ⅝	1,800

Figure 7. Recommended tightening torque for Klingersil gasket type

Condition of Liquids Measured

Flowmeter life duration and measurement reliability can be seriously impacted by the presence of gas and/or solid particles in the flowing liquid.

The presence of gas, in the form of bubbles or emulsions, can cause serious degradation of measurement performance. Gas "pockets" between two liquid sections can destroy the rotor bearings, leading to serious measurement errors and/or damage to the cartridge assembly.

To ensure accurate measurement and minimize possibility of damage, FH recommends eliminating the possibility of gas injection upstream from the measurement point and providing, when required, a draining or degassing system upstream from the flowmeter. We recommend positioning the flowmeter to minimize the possibility of gas pocket formation resulting from contraction of volumes during an interruption of flow.

The presence of small-sized solid particles within the flowing liquid may result in a gradual deterioration of the flowmeter fixed or mobile elements (bearing support cross pieces, bearing, rotor), which can lead to a gradual deterioration of performance. Larger solids can cause significant damage requiring replacement of these parts (bearing support cross pieces, bearing, and/or rotor).

Recommended Strainer Size by Meter

Protection of turbine meter (and associated instrumentation) can be critical during new installations start-up and when a system is restarted after heavy work upstream of the meter run.

To minimize the risk of solid particle injection upstream from the measurement point, we recommend installation of a strainer with mesh sizes as listed in the table below:

TZN Model (CUS & STD)					**Recommended Filtration**	
TZN Model	mm	m^3/h (max)	inches	BPH (max)	(mm)	MESH
TZN 16-012 TZN 16-025	16	0.12 0.25	1/2	0.75 1.5	0.15	100
TZN 20-05 TZN 20-01	20	0.5 1	3/4	3.1 6.3	0.355	45
TZN 25-2 TZN 25-3 TZN 25-5 TZN 25-10	25	2 3 5 10	1	13 20 30 63	0.425	40
TZN 32-8 TZN 32-12 TZN 32-15 TZN 32-20	32	8 12 15 20	1 1/4	50 75 94 126	0.5	35
TZN 40-8 TZN 40-12 TZN 40-15 TZN 40-20 TZN 40-40	40	8 12 15 20 40	1 1/2	50 75 94 126 250		
TZN 50-30 TZN 50-50 TZN 50-70	50	30 50 70	2	190 320 440	0.85	20
TZN 80-70 TZN 80-110 TZN 80-150	80	70 110 150	3	440 690 943	1.4	14
TZN 100-200 TZN 100-300	100	200 300	4	1,260 1,890	1.7	12
TZN 150-400 TZN 150-600	150	400 600	6	2,520 3,770	2.36	8
TZN 200-800 TZN 200-1000 TZN 200-1200	200	800 1,000 1,200	8	5,030 6,290 7,550	2.8	7
TZN 250-1200 TZN 250-2000	250	1,200 2,000	10	7,550 12,600	3.35	6
TZN 300-2400 TZN 300-3000	300	2,400 3,000	12	15,100 18,900		
TZN 350-3500	350	3,500	14	22,000	4	5
TZN 400-4000 TZN 400-4500	400	4,000 4,500	16	25,200 28,300		
TZN 450-4800 TZN 450-5500	450	4,800 5,500	18	30,200 34,600		
TZN 500-6000	500	6,000	20	37,800	4.75	4

IMPORTANT: After a period of critical monitoring, the filtration degree can be relaxed to reduce strainer maintenance and pressure losses, e.g. MESH 6 to MESH 4 on a 12" meter (consult manufacturer).

Should a filter and air elimination system be used simultaneously, we recommend placing the air eliminator as the last device upstream of flow conditioning.

In order to avoid erratic measurements caused by liquid cavitation, minimum back pressure must remain greater than P_{min} according to the expression: $P_{min} > 2 \times \Delta P + 1.25 \times P_v$

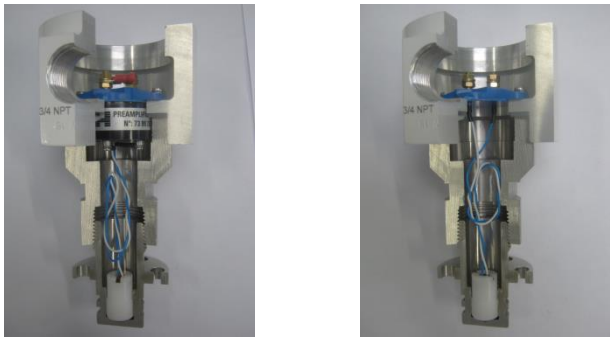
with P_{min} Minimum back pressure in bar [*psi*]
ΔP Meter pressure at flowing conditions in bar [*psi*]
P_v Liquid vapor pressure at flowing conditions in bar [*psi*]

Note: For LPG, minimum back pressure should be set at P_v + 1 bar [*+ 14.5 psi*]

Electrical Installation

TZN turbine meters integrate two (or three) detection systems allowing generation of two out of phase pulse trains. An integrated preamplifier FH71 (required for distance between meter and control room greater than 600 ft) receives low level signals from the pick-up coil, and converts these into positive square wave signals for long distance transmission (greater than 600 ft). Preamplifiers are available in either a 2-wire (Intrinsically Safe versions) or 3-wire (non IS) configuration.

Connection between the coil and preamplifier (or terminal) is completed in factory.



2 or 3 wire preamp No preamp

Figure 8. Factory wiring of pickup coil: with and without preamp

Hazardous area classification must be checked prior to connection (refer to ATEX or UL plate).

Depending on preamplifier type (2 wire Standard, NAMUR or 3 wire Open Collector); connect the field shielded wire according to figures below.

2 wire preamp
(Standard / NAMUR)

3 wire preamp
(Open Collector)

Figure 9. Types of preamplifiers

Wiring diagrams

Electrical connection to site (flow computer) depends on:

- Protection type (Intrinsic Safety, Explosion Proof)
- Flow Computer inputs characteristics (Impedance, Current or Tension signal …)
- Connection wire characteristics (resistance, inductance, capacity …) …

Wiring diagrams (below) can be used as 'typical'. Additional configurations available on FH web site (https://faureherman.zendesk.com).

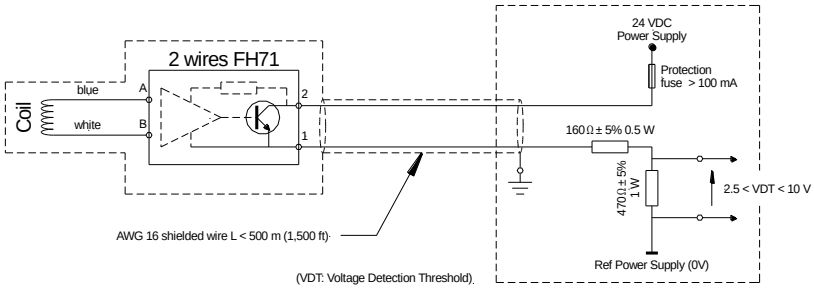


Figure 10. Typical wiring diagram for 2 wires FH71with Input Impedance greater than 10 kΩ

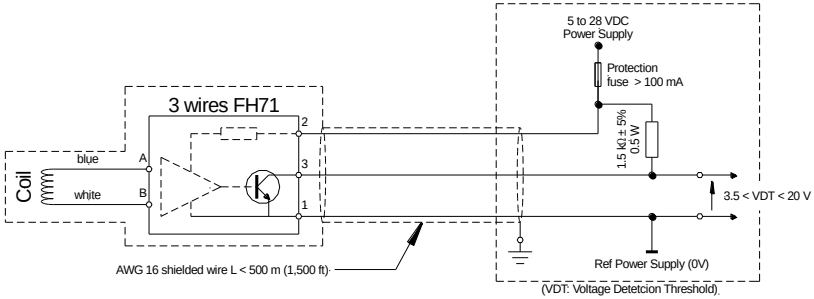


Figure 11. Typical wiring diagram for 3 wires FH71 (Open Collector)

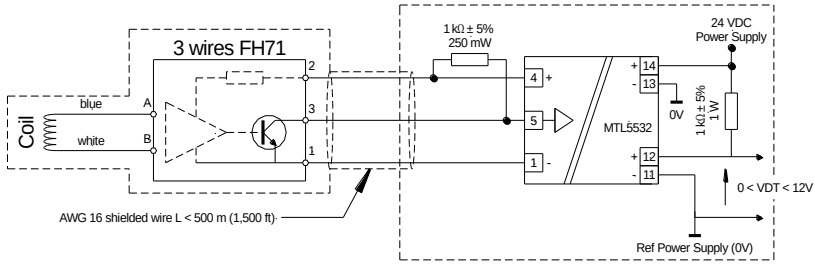


Figure 12. Example wiring diagram for 3 wires FH71 (Open Collector) with isolator

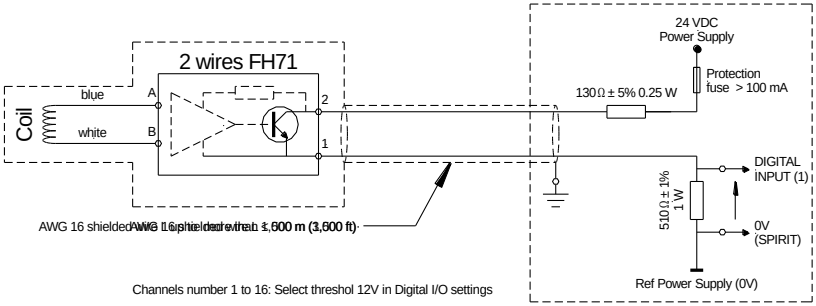


Figure 13. Typical 2 wires FH71 connection to SPIRIT Flow-X Flow Computer

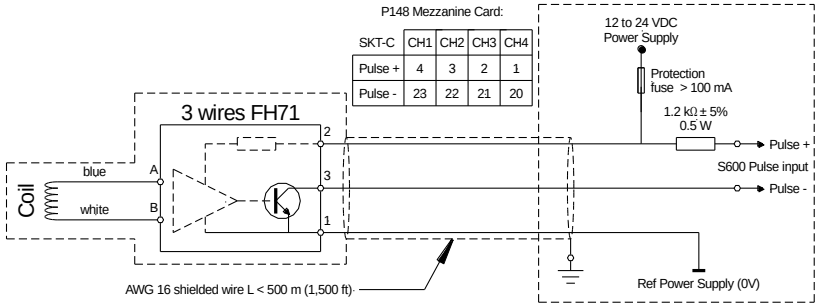


Figure 14. Typical 3 wires FH71 connection to Emerson S600 FloBoss Flow Computer

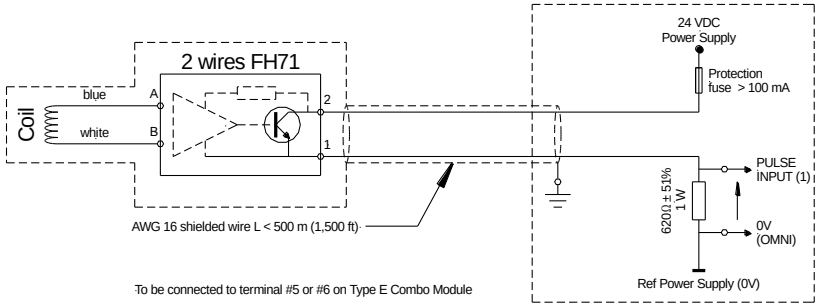


Figure 15. Typical 2 wires FH71 connection to OMNI 3000/6000 Flow Computer

Chapter 5: Commissioning

After meter installation on pipe and completion of electrical connections, proceed with filling of the pipe with liquid.

⚠ During initial filling of system, make sure any gas present in the pipe is purged by utilizing available venting systems or by passing through the flowmeter at very low flow rate.

⚠ Avoid sudden filling of the flowmeter; this helps prevent formation of gas “pockets”, which can damage the rotor and / or bearing system.

⚠ Avoid extended use of the flowmeter beyond the specified operating maximum flow rates.

Chapter 6: Maintenance

The design of TZN flowmeter requires minimal maintenance when used within its operating limits. A general recommendation is to replace the shaft and bearing assembly every three to five years depending on process conditions such as continuous measurement, start and stop …

In the event of extended operational interruption, it is recommended to keep the flowmeter full of liquid to keep the bearings from seizing, except when the liquid may crystallize or solidify.

Chapter 7: Troubleshooting

Problem		Potential Cause(s)
Flowmeter overrates		1 – 2 – 5 - 7 – 8 – 9 – 10 – 11
Flowmeter underrates		1 – 2 – 3 - 4 – 5 – 6 – 8 – 9 – 10 – 11
Erratic indications		1 – 2 – 8 – 9 – 10 – 11
No signal		2 – 3 – 4 – 6
Underlying Issue		Possible Solution(s)
1	Erratic pulses	Check cable shield and connection Check for proper resistor selection (refer to wiring diagram) Inspect pickup coil and/or preamplifier; replace if necessary.
2	Coil and/or preamp. defect	Check for proper wiring and resistor selection Check for preamp type selection (N, S, CO) Replace coil and/or preamp.
3	Loss of magnets	Replace the rotor
4	Damaged shaft or bearings	Replace bearing and/or shaft Depending upon damage, possibly replace rotor and/or crosspieces.
5	Damaged rotor	Replace the rotor
6	Blocked rotor	Inspect and clean bearing system, crosspieces and cartridge Replace the cartridge if necessary
7	Deposits on internal walls	Clean all the cartridge components Check installation conditions Check/Inspect upstream elements such as strainer, flow conditioner … Replace the cartridge if appropriate
8	Flow profile deformation	Clean all the cartridge components Check installation conditions Check/Inspect upstream elements such as strainer, flow conditioner … Replace the cartridge if appropriate
9	Presence of gas in the flow	Eliminate the source of gas Check installation conditions Install a deaerator
10	Cavitation	Check installation conditions Check/Inspect upstream elements (strainer, flow conditioner) Increase line pressure
11	Performances	Recalibrate Replace the cartridge if appropriate

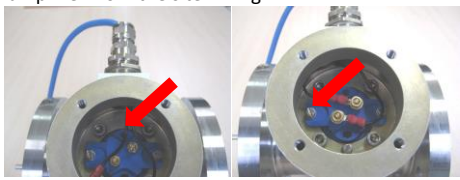
Chapter 8: Replacement – Repair

Preamplifier replacement

This operation is performed when the equipment is de-energized. Refer to magnetic sensors manual:

- Cut the sealing system (if any)
- Unscrew the explosion-proof enclosure cover (4 screws)

- Disconnect the pre-amplifier from the site wiring



- Remove both fastening screws from the pre-amplifier in the enclosure
- Remove the pre-amplifier from enclosure; take care to avoid stressing the coil connection wiring
- Disconnect the coil / pre-amplifier connection wiring

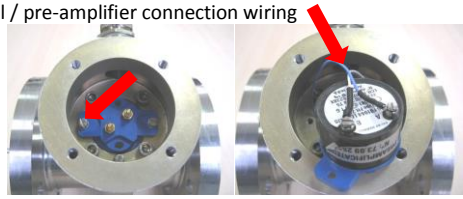


Figure 16. Illustration of Preamplifier Replacement

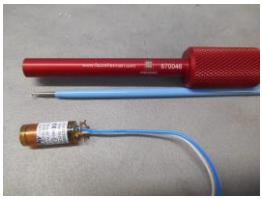
- Perform above in the reverse order to install the new pre-amplifier
- Re-position and screw the enclosure cover. Reposition and tighten the screws to a 6 Nm [*4.4 ft.lb*] torque.
- Replace the sealing system (if required).

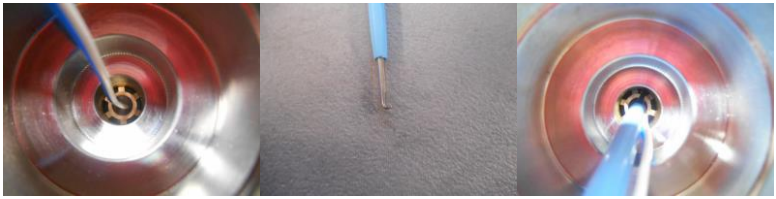
Coil replacement

Metal Retaining Ring

This operation can only be performed after removal of the pre-amplifier (if present):

- Disconnect the coil / pre-amplifier connection wire
- Withdraw the coil while removing the retaining ring using specific tool (ref 870046)





- Insert the new coil and retaining ring and push in place using the other part of the tool kit (ref 870046).

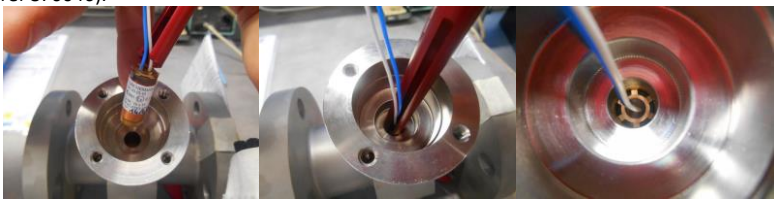


Figure 17. Illustration of Removal of Metal Ring type pickup coil

Engineered Polymer Retaining Ring

This operation can only be performed after removal of the pre-amplifier (if present):
Disconnect the coil / pre-amplifier connection wire

- Insert tool (ref 870045) into the boss, taking care not to damage the wires, until the adapter connects, and then unscrew the adapter.
- Place the new coil in the polymer ring with wires coming through the top of ring
- NOTE: Make sure the coil wires aren't crimped when inserting the new coil into the base of enclosure.

- Holding the coil wires, insert the ring in bottom of enclosure and screw into the base of well, taking care to avoid crimping the wires or stripping the polymer threads, and then remove the tool.

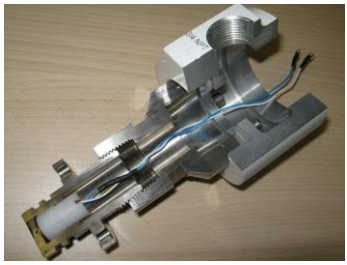


Figure 18. Illustration of Removal of Engineered Polymer Ring type pickup coil

Measurement cartridge replacement

For nominal size equal or lower than 3", the cartridge is centered and fastened into the body by means of an upstream stainless steel threaded ring.

Unscrew the inlet threaded ring and push the cartridge from the downstream direction to remove it.

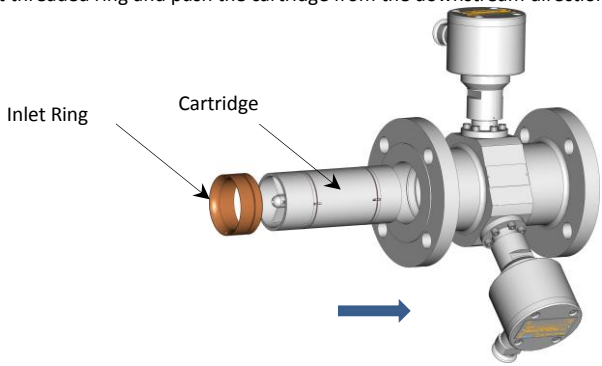


Figure 19. Cartridge replacement – meters <3''

Note the direction of engraved arrow on the outer surface before inserting the cartridge into the body and re-fitting and tightening the inlet ring. The cartridge upstream face must be on inlet ring side.

For 4 to 14" nominal size, the cartridge is centred and fastened into the body by means of an upstream stainless steel ring fixed with screws.

Remove the retaining screws from the inlet ring before pushing the cartridge out of the body.

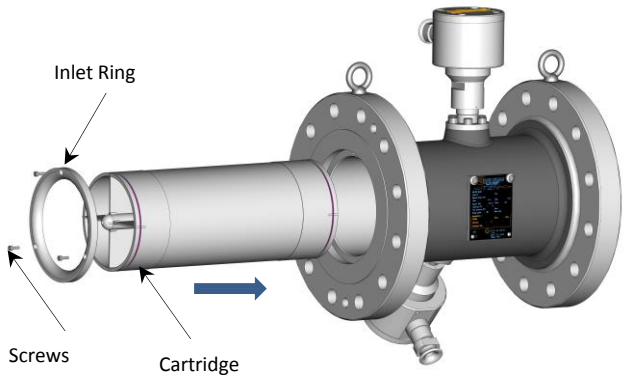


Figure 20. Cartridge replacement for meters 4'' - 14''

Note the direction of engraved arrow on the outer surface before inserting the cartridge into the body and re-fitting and tightening the inlet ring. The cartridge upstream face must be on inlet ring side.

IMPORTANT: For meters greater than 4", it is strongly recommended to remove the cartridge with the meter in a vertical position.

For meters equal or greater than 16", the cartridge is centered and fastened into the body by means of an upstream and downstream stainless steel cross pieces integrating the cartridge parts. Outer rings are fixed into the meter body to hold the cartridge in place with screws.

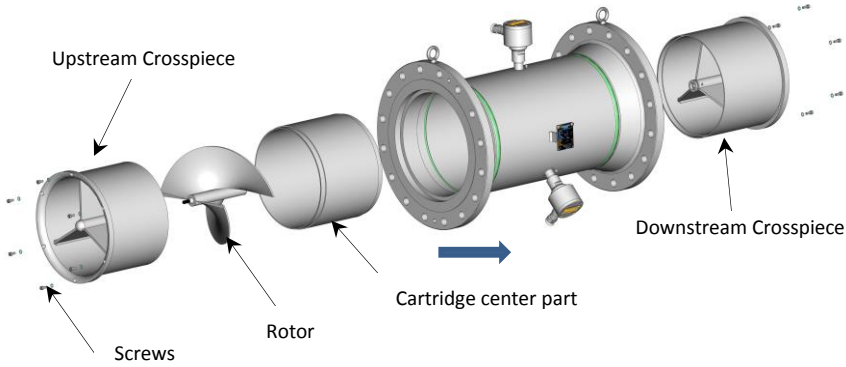


Figure 21. Cartridge replacement – meters >16''

For STD bearing design, place the turbine in a vertical position with the upstream crosspiece facing up, unscrew the screws holding the upstream crosspiece and remove the crosspiece. Remove the rotor and the center part of the cartridge. Once all other components are removed, turn the meter body over, remove the screws and the downstream crosspiece.

For CUS bearing design, place the entire turbine assembly in a vertical position with the downstream face up, remove the brake pin and axle nut. Remove the center pieces. Unscrew the screws holding the downstream crosspiece and remove the crosspiece. Remove the rotor, the center part of the cartridge and the shaft. Turn the turbine over before disassembling the upstream crosspiece.

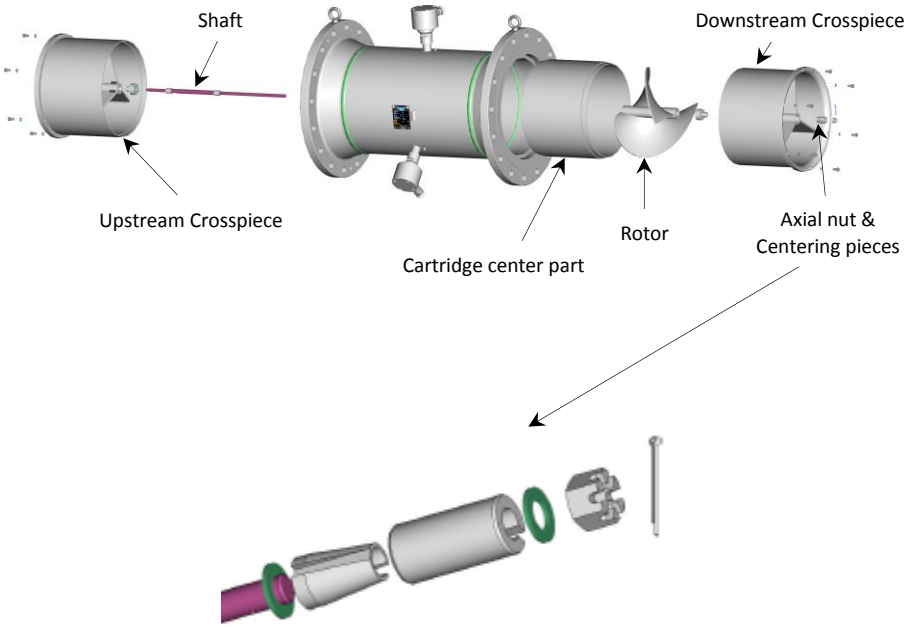


Figure 22. CUS Cartridge removal

Chapter 9: Equipment removal

The equipment is designed to operate under pressure and must be depressurized and drained before removal (complete disassembly or removal of a component under pressure).

If the bolts must be loosened to drain liquid into a recovery tank, make sure the line is completely depressurized prior to loosening bolts.

Appendix 1 – Alternative configurations

Figure 23. TZN with local totalizer

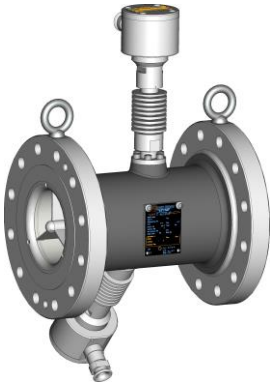


Figure 24. TZN with thermal extensions

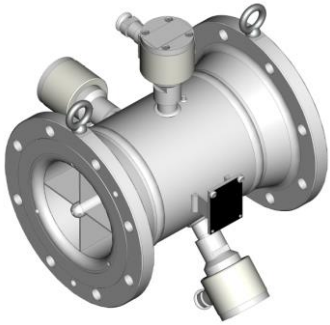
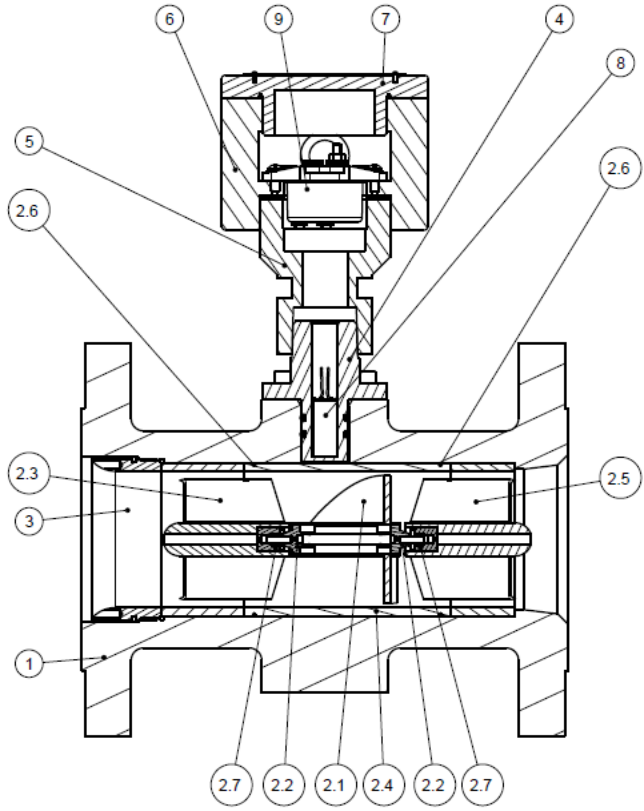


Figure 25. TZN with 3 pulse outputs

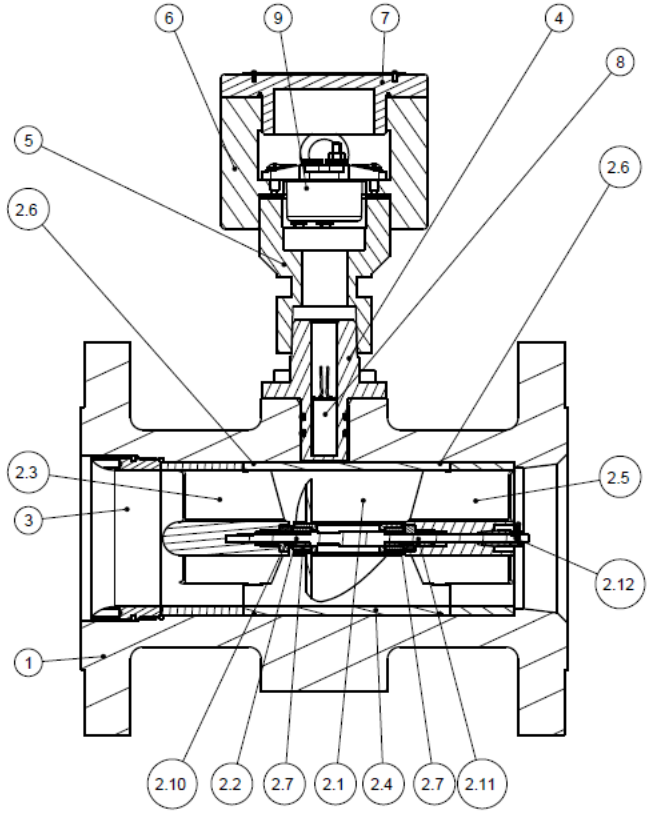
Appendix 2 – Meter drawings by size and type

Figure 26. Nominal Size STD ≤ 3''



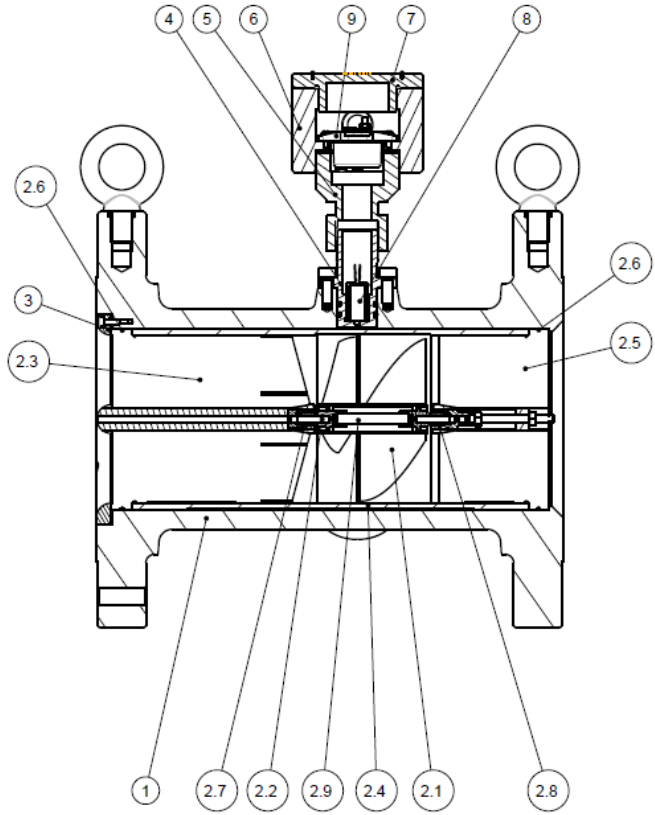
1	Flanged body	3	Retaining ring
2	Measurement cartridge	4	Boss
2.1	Rotor	5	Enclosure adapter
2.2	Shaft	6	Enclosure
2.3	Upstream crosspiece	7	Enclosure cover
2.4	Central section	8	Coil
2.5	Downstream crosspiece	9	Preamplifier or Terminal
2.6	Elastic ring		
2.7	Fixed bearing		

Figure 27. Nominal Size CUS ≤ 3"



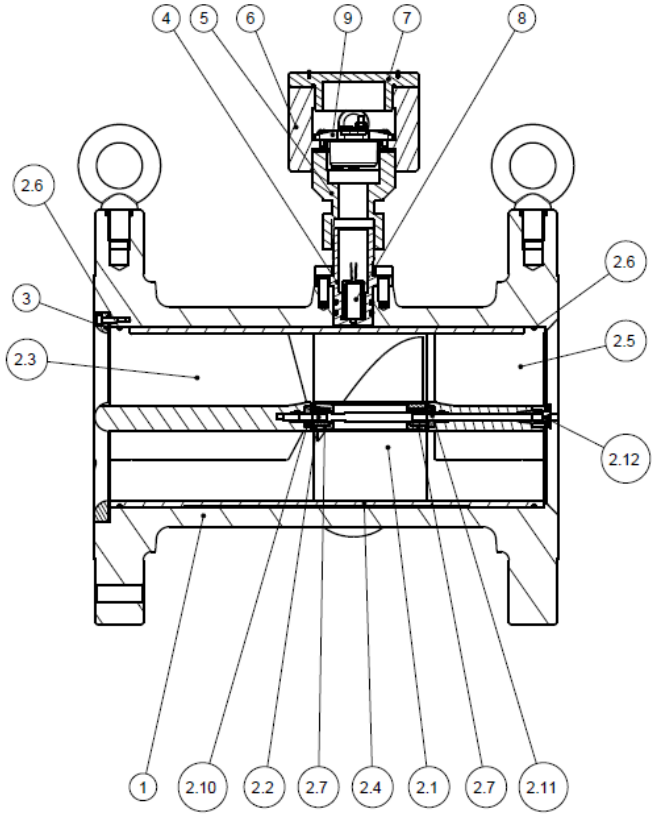
1	Flanged body	4	Boss
2	Measurement cartridge	5	Enclosure adapter
2.1	Rotor	6	Enclosure
2.2	Shaft	7	Enclosure cover
2.3	Upstream crosspiece	8	Coil
2.4	Central section	9	Preamplifier or Terminal
2.5	Downstream crosspiece		
2.7	Bearing		
2.10	Upstream thrust		
2.11	Downstream thrust		
2.12	Tightening set		

Figure 28. Nominal Size STD 4''-14''



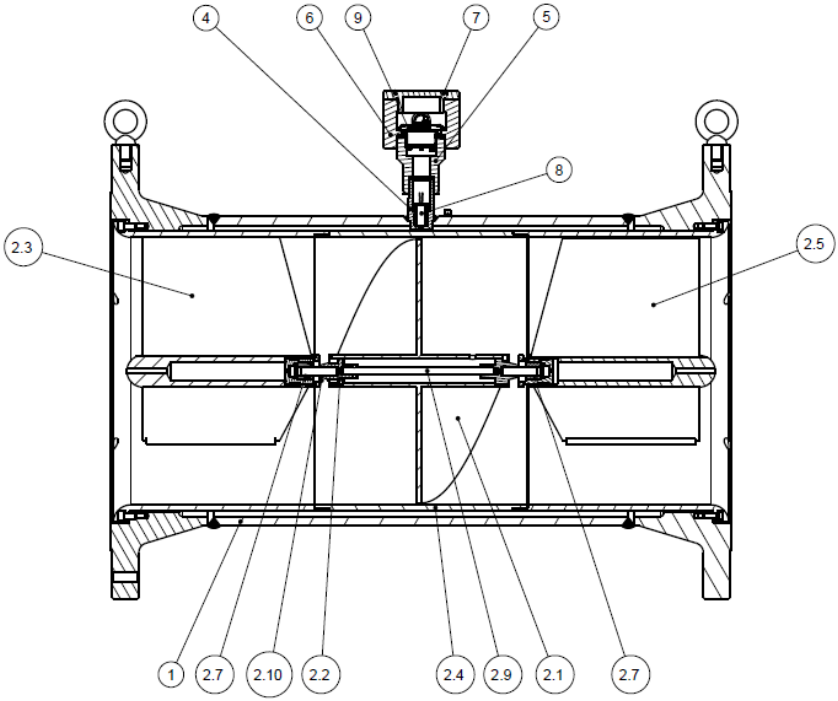
1	Flanged body	3	Retaining ring
2	Measurement cartridge	4	Boss
2.1	Rotor	5	Enclosure adapter
2.2	Shaft	6	Enclosure
2.3	Upstream crosspiece	7	Enclosure cover
2.4	Nozzle	8	Coil
2.5	Downstream crosspiece	9	Preamplifier or Terminal
2.6	Elastic ring		
2.7	Fixed bearing		
2.8	Adjustable bearing		
2.9	Bearing shaft		

Figure 29. Nominal Size CUS 4''-14''



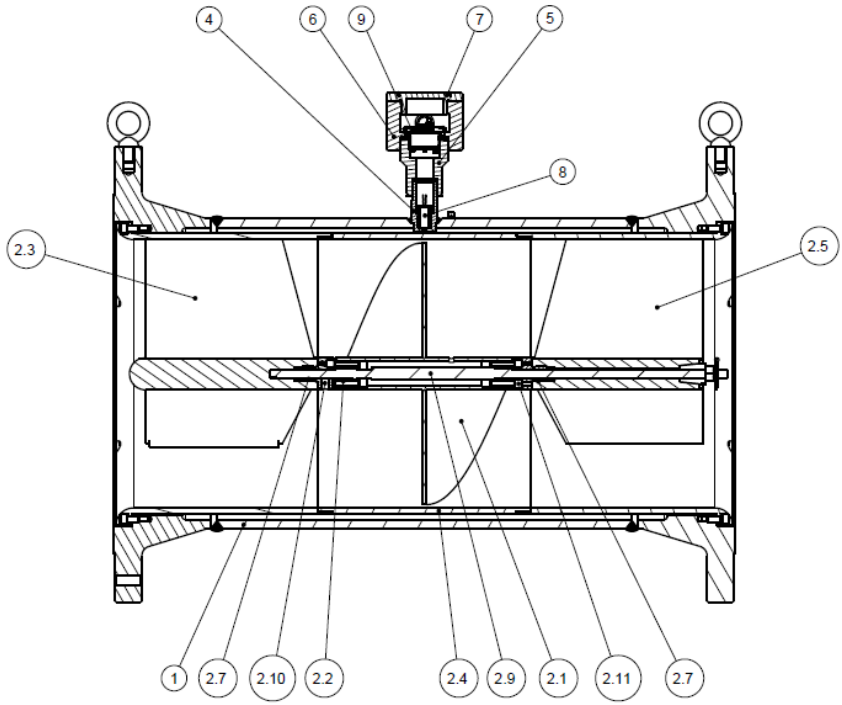
1	Flanged body	4	Boss
2	Measurement cartridge	5	Enclosure adapter
2.1	Rotor	6	Enclosure
2.2	Shaft	7	Enclosure cover
2.3	Upstream crosspiece	8	Coil
2.4	Nozzle	9	Preamplifier or Terminal
2.5	Downstream crosspiece		
2.7	Bearing		
2.10	Upstream thrust		
2.11	Downstream thrust		
2.12	Tightening set		

Figure 30. Nominal Size STD > 16"



1	Flanged body	3	Retaining ring
2	Measurement cartridge	4	Boss
2.1	Rotor	5	Enclosure adapter
2.2	Shaft	6	Enclosure
2.3	Upstream crosspiece	7	Enclosure cover
2.4	Central section	8	Coil
2.5	Downstream crosspiece	9	Preamplifier or Terminal
2.7	Fixed bearing		
2.9	Bearing shaft		

Figure 31. Nominal Size CUS > 16"



1	Flanged body	4	Boss
2	Measurement cartridge	5	Enclosure adapter
2.1	Rotor	6	Enclosure
2.2	Shaft	7	Enclosure cover
2.3	Upstream crosspiece	8	Coil
2.4	Central section	9	Preamplifier or Terminal
2.5	Downstream crosspiece		
2.7	Bearing		
2.10	Upstream thrust		
2.11	Downstream thrust		
2.12	Tightening set		

Appendix 3 - K-factor – Flowrate/Frequency

TZN Model		Min Kfactor		Linear Flow Range		Frequency Range
mm - m^3/h	Inches - BPH	p/m^3 (p/litre)	p/Bbl (p/USG)	m^3/h	BPH	~ Hz
16 – 012	0.5 – 0.75	(5,200)	(19,700)	0.012–0.12	0.075 – 0.75	17.5 – 175
16 – 025	0.5 – 1.5	(2,600)	(9,850)	0.025 – 0.25	0.157 – 1.57	18 – 180
20 – 05	0.75 – 3.1	(1,600)	(6,060)	0.05 – 0.5	0.314 – 3.14	22 – 220
20 – 1	0.75 – 6.3	(415)	(1,572)	0.1 – 1	0.63 – 6.3	11.5 – 115
25 – 2	1 – 13	(125)	(473)	0.2 – 2	1.3 – 13	7 – 70
25 – 3	1 – 20	(125)	(473)	0.3 – 3	2 – 20	10.5 – 105
25 – 5	1 – 30	(125)	(473)	0.5 – 5	3 – 30	17.5 – 175
25 – 10	1 – 63	(125)	(473)	1 – 10	6.3 – 63	35 – 350
32 – 8	1.25 – 50	(38)	(145)	0.8 – 8	5 – 50	8.5 – 85
32 – 12	1.25 – 75	(29)	(110)	1.2 – 12	7.5 – 75	9.5 – 5
32 – 15	1.25 – 94	(18)	(68)	1.5 – 15	9.4 – 94	7.5 – 75
32 – 20	1.25 – 126	(18)	(68)	2 – 20	12.6 – 126	10 – 100
40 – 8	1.5 – 50	(38)	(145)	0.8 – 8	5 – 50	8.5 – 85
40 – 12	1.5 – 75	(29)	(110)	1.2 – 12	7.5 – 75	9.5 – 95
40 – 15	1.5 – 94	(18)	(68)	1.5 – 15	9.4 – 94	7.5 – 75
40 – 20	1.5 – 126	(18)	(68)	2 – 20	12.6 – 126	10 – 100
40 – 40	1.5 – 250	(18)	(68)	4 – 40	25 – 250	20 – 200
50 – 30	2 – 190	(20)	(75)	3 – 30	19 – 190	16.5 – 165
50 – 50	2 – 320	(12)	(45)	5 – 50	32 – 320	16.5 – 165
50 – 70	2 – 440	(12)	(45)	7 – 70	44 – 440	23.5 – 235
80 – 70	3 – 440	5,000	795	7 – 70	44 – 440	9.5 – 95
80 – 110	3 – 690	5,000	795	11 – 110	69 – 690	15 – 150
80 – 150	3 – 945	5,000	795	15 – 150	94.5 – 945	21 – 210
100 – 200	4 – 1,260	2,050	326	20 – 200	126 – 1,260	11.5 – 115
100 – 300	4 – 1,890	1,600	254	30 - 300	189 – 1,890	13.5 – 135
150 – 400	6 – 2,520	900	143	40 – 400	252 – 2,520	10 – 100
150 – 600	6 – 3,770	650	103	60 – 600	377 – 3,770	11 – 110
200 – 800	8 – 5,030	380	60	80 – 800	503 – 5,030	8.5 – 85
200 – 1,000	8 – 6,290	380	60	100 – 1,000	629 – 6,290	10.5 – 105
200 – 1,200	8 – 7,550	380	60	120 – 1,200	755 – 7,550	12.5 – 125
250 – 1,200	10 – 7,550	150	23	120 – 1,200	755 – 7,550	5 – 50
250 – 2,000	10 – 12,600	150	23	200 – 2,000	1,26 12,600	8.5 – 85
300 – 2,400	12 – 15,100	90	13	240 – 2,400	1,510–15,100	6 – 60
300 – 3,000	12 – 18,900	90	13	300 – 3,000	1,890–18,900	7.5 – 75
350 – 3,500	14 – 22,000	70	11	350 – 3,500	2,200–22,000	7 – 70
400 – 4,000	16 – 25,200	50	8	400 – 4,000	2,520–25,200	5.5 – 55
400 – 4,500	16 – 28,300	50	8	450 – 4,500	2,830–28,300	6 – 60
450 – 4,800	18 – 30,200	40	6.5	480 – 4,800	3,020–30,200	5.5 – 55
450 – 5,500	18 – 34,600	40	6.5	550 – 5,500	3,460–34,600	6 – 60
500 – 6,000	20 – 37,800	30	5	600 – 6,000	3,780–37,800	5 – 50

Appendix 4 - Operating restrictions & Special recommendations

The nominal operating process envelope is specified on the nameplate. This envelope is mainly defined in terms of:

- Minimum / Maximum – Flowrate
- Maximum – Pressure
- Minimum / Maximum – Temperature

Flowrate restrictions specify the equipment optimal performance envelope (measurement accuracy and repeatability). The maximum value also sets the permissible continuous operating limit. The maximum limit may occasionally exceed 120 % of the set value without negative impacts.

The pressure and temperature restrictions involve exclusively the equipment mechanical sizing and define the authorized operating envelope.

Note: When operating temperature is higher than the indicated value, the maximum authorized pressure shall be reduced, in strict application of the ASME B16.5, NF EN 1759-1 or NF EN 1092-1 Standard.

Safety Consideration

Important Information Needed for Installation

This manual contains important instructions and safety information. It is essential to read and understand the operating procedures prior to installation, connection, and commissioning of the equipment.

Failure to observe these instructions and warnings may damage the flowmeter and/or endanger personnel.

Personnel Requirements

Make sure that operators and maintenance personnel have all safety equipment applicable to the area (safety glasses, protective headgear, safety shoes …) and are trained to operate the meter.

Unauthorized personnel should not have access to the operation of the meter.

Hazards arising from failure to observe the instructions and warnings

Failure to observe these instructions and warnings may:

- Expose personnel to mechanical, electrical, or chemical risk
- Damage the equipment (meter)
- Pollute the environment by releasing hazardous substances

Safety instructions

Power supply must be disconnected and flow meter must be depressurized before servicing to avoid electrical and/or pressure hazards. The safety instructions in this manual, as well as all accident prevention and occupational safety regulations in force in the country of installation, must be observed.

Conditions of operation

Conditions of use indicated on the data plate must be observed; equipment reliability is guaranteed only if it is installed and used as described in these manuals.

Installation and maintenance operation shall be done using the proper tools. Never use a hammer or any tools which can create sparks or damage the equipment's electrical protection (enclosure, cable gland, conduit …). If impact wrenches are used, pay attention to torque recommendations listed in TZN Manual.

Installation, maintenance and repair of the equipment shall be carried out by suitably trained personnel; all spare parts shall be approved by Faure Herman. No operation or repair which can affect the protective system can be done on this equipment without authorization by Faure Herman.

For specific installation and maintenance advice, contact the Faure Herman Worldwide Customer Support & Service via phone, email or website:

Hotline:	+1 713 597 4827 (North America)
	+33 2 43 60 28 55
Email:	support@faureherman.zendesk.com
Online Assistance website:	https://faureherman.zendesk.com/hc/en-us

Repair and maintenance

Repair, maintenance or potential modifications are allowed only after consultation with Faure Herman. If any parts other than those approved by Faure Herman are used, Faure Herman cannot be held liable for the consequences.

Transport, handling, and storage

The flowmeter must be handled with care to avoid damage. End caps are used to protect the flanges during transport and handling.

If the flowmeter is equipped with lifting rings, they must be used. The flowmeter must never be handled, lifted or secured by the electronic enclosures.

Unpacking

Upon receipt of the TZN turbine meter, inspect the packing case for any shipping damage. The meter must be carefully removed from the packing case and inspected for potential damage or missing parts (including documentation). Protective devices such as end caps must be removed prior to installation.

Storage

If the flowmeter is not installed as soon as it is received, it must be stored and protected from the elements. In case of extended storage (more than a year), check applicable regulation to ensure that all calibration requirements have been met.

Return

Contact Faure Herman prior to any return. If the flowmeter has been used with hazardous, corrosive, or toxic substances, the operator must make sure that it has been correctly rinsed, cleaned, and decontaminated before being returned to Faure Herman.

ATEX & IEC Ex Installation

This equipment is ATEX and IEC Ex certified and complies with the essential Health and Safety requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres (2014/34/EU Directive).

Please ensure this equipment is used in total compliance with the instructions given on the ATEX certificate and nameplate. Consult the user manuals, as well as equipment installation and maintenance manuals for this device to ensure safe operation of this equipment.

This equipment contains non-electrical and electrical components which are both ATEX certified relating to the design and construction of equipment intended for use in potentially explosive atmospheres (Directive 2014/34/UE).

General Safety Information

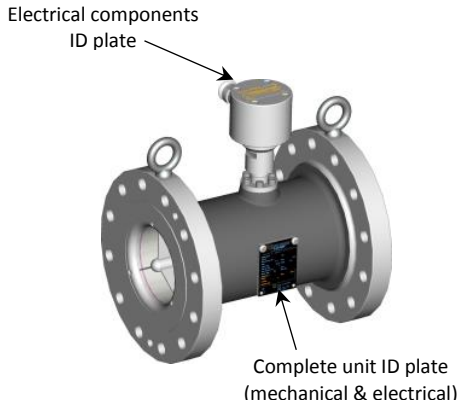
The meter must be de-energized for all installation and maintenance activities.

For safe operation, the equipment must be used in compliance with its' ATEX / IEC Ex certificate and nameplate criteria. Observe all instructions for equipment and component parts contained in user manual.

The equipment must be installed and operated only in areas complying with its hazardous protection rating as specified on the plate attached to the meter.

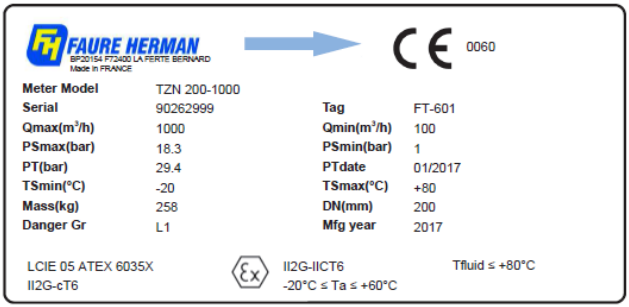
If the equipment is connected to ancillary devices, check to ensure the electrical protection systems are fully compatible.

According to ATEX Directive, turbine meter consists of both mechanical and electrical parts. Each component has its own certification which combines to provide the complete meter protection system and parameters.



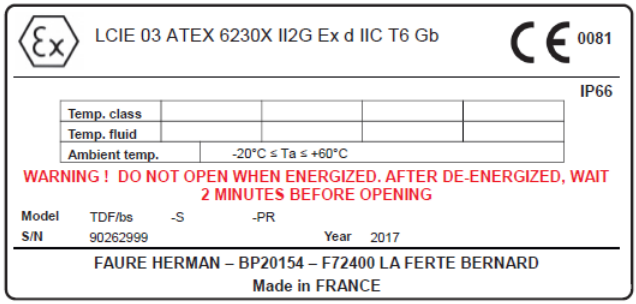
ATEX Non electrical certification and Tag Example

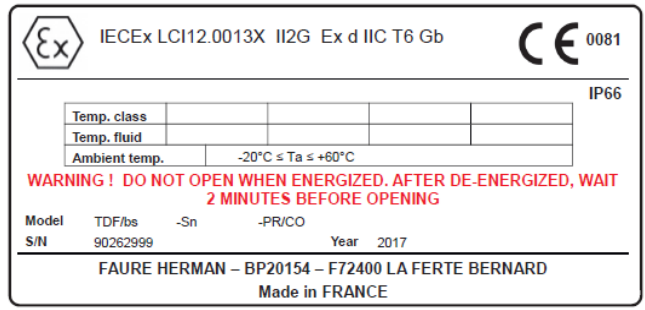
The mechanical part is a non-electrical part as defined under the certificate LCIE 05 ATEX 6035X.



ATEX & IEC Ex Electrical Component and Tag Example

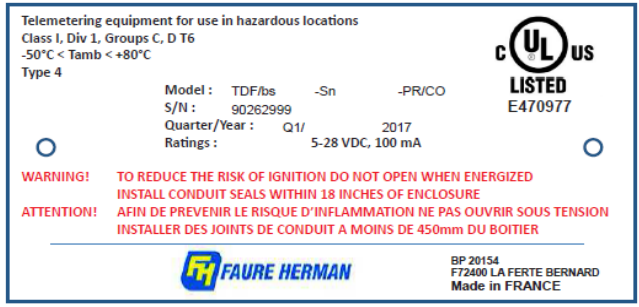
Electrical components are covered LCIE 03 ATEX 6230X and/or IEC Ex LCI 120013 X certification which allow use in intrinsically safe or flameproof applications.





UL & cUL Installation

Magnetic sensor assemblies are UL and cUL certified for use in Class I, Div 1, Groups C and D hazardous locations, with several combinations of coils and preamps.



Risk analysis according to Directive 2014/68/EU

Suitable resistance	Requirements
Excess temperature and pressure	Temperatures and pressure limits should be considered during the design phase. The limitations are indicated on the equipment; the user is responsible to set up equipment properly.
Wind / Snow influence	NA: Without influence considering the small surface areas
Earthquake	The equipment is not intended for use in a seismic zone. If operated as such, it is the responsibility of the user to provide adapted devices.
Support, binding and piping reaction	The equipment is designed to be joined to other piping; it does not have its own supports.
Thermal fatigue	Design choice of materials follows ASME B31.3.
Mechanical fatigue	This is metrological equipment; it is the user's responsibility to install properly to avoid mechanical stress.
Vibration	This is metrological equipment; it is the user's responsibility to install away from sources of vibration.
Handling and operation	**Comments**
Closing and opening	NA: the equipment does not have an aperture or closure.
Dangerous emissions from valves	NA: the equipment does not have a valve.
Access to the inside	NA: the equipment does not have access (inspection hatch, manhole).
Surface temperature	The user is responsible for indication of hot surfaces.
Decomposition of unstable fluid	NA: The equipment is used for the transfer of fluid not storage.
Handling	Equipment > 30kg is equipped with lifting rings for safe handling.
Draining and venting	**Comments**
Pressure wave	This is sensitive metrological equipment; it is the user's responsibility to install properly to avoid pressure waves.
Vacuum collapse	Minimal service pressure of 0 bar.g indicated on the plate. This equipment is not designed to work under vacuum.
Corrosion and chemical attack	**Comments**
Uniformly generalized	Consideration of corrosion thickness. Choose proper materials and application of painting systems adapted to the environment. It remains under user responsibility to periodically check the condition of its installation.
Selective	Choose proper materials
Galvanic	Choose proper materials and review compatibility of materials. It is the user's responsibility to set up adapted devices, grounding straps, cathodic protection…
By differential aeration	Choose proper materials – Maintain the equipment full of fluid.
By puncture, crevice, intergranular	Choose proper materials. Review compliance with NACE MR0175 requirements if applicable.
Ammonia	Choose proper materials
Under stress	Choose proper materials. Review compliance with NACE MR0175 requirements if applicable.

Wear	Comments
Corrosion erosion	Choose proper materials. Apply an additional corrosion thickness. Application of painting systems adapted to the environment.
Corrosion cavitation	Choose proper materials. This is metrological equipment, the user must set up devices to avoid cavitation.
Abrasion	Choose proper materials – Apply an additional corrosion thickness. It remains under user responsibility to periodically check the condition of the equipment.

ATEX Recommendations

When applicable, this equipment is ATEX certified and complies with the essential Health and Safety requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres (2014/34/EU Directive).
For safe operation, please ensure that this equipment is used in total compliance with the instructions given on the ATEX certificate and nameplate. Please consult the user manuals, equipment installation and maintenance manuals regarding the various parts used in this device. This equipment must be installed and serviced by trained, specialized staff who understand the languages used in the manual.
If you require a manual or any additional information, please contact the FAURE HERMAN Customer support team:

FAURE HERMAN - Route de Bonnétable – 72400 La Ferté Bernard – France
☎ +33 2 43 60 28 55 / +1 713 597 4827 (Amérique du Nord) - support@faureherman.zendesk.com


FAURE HERMAN