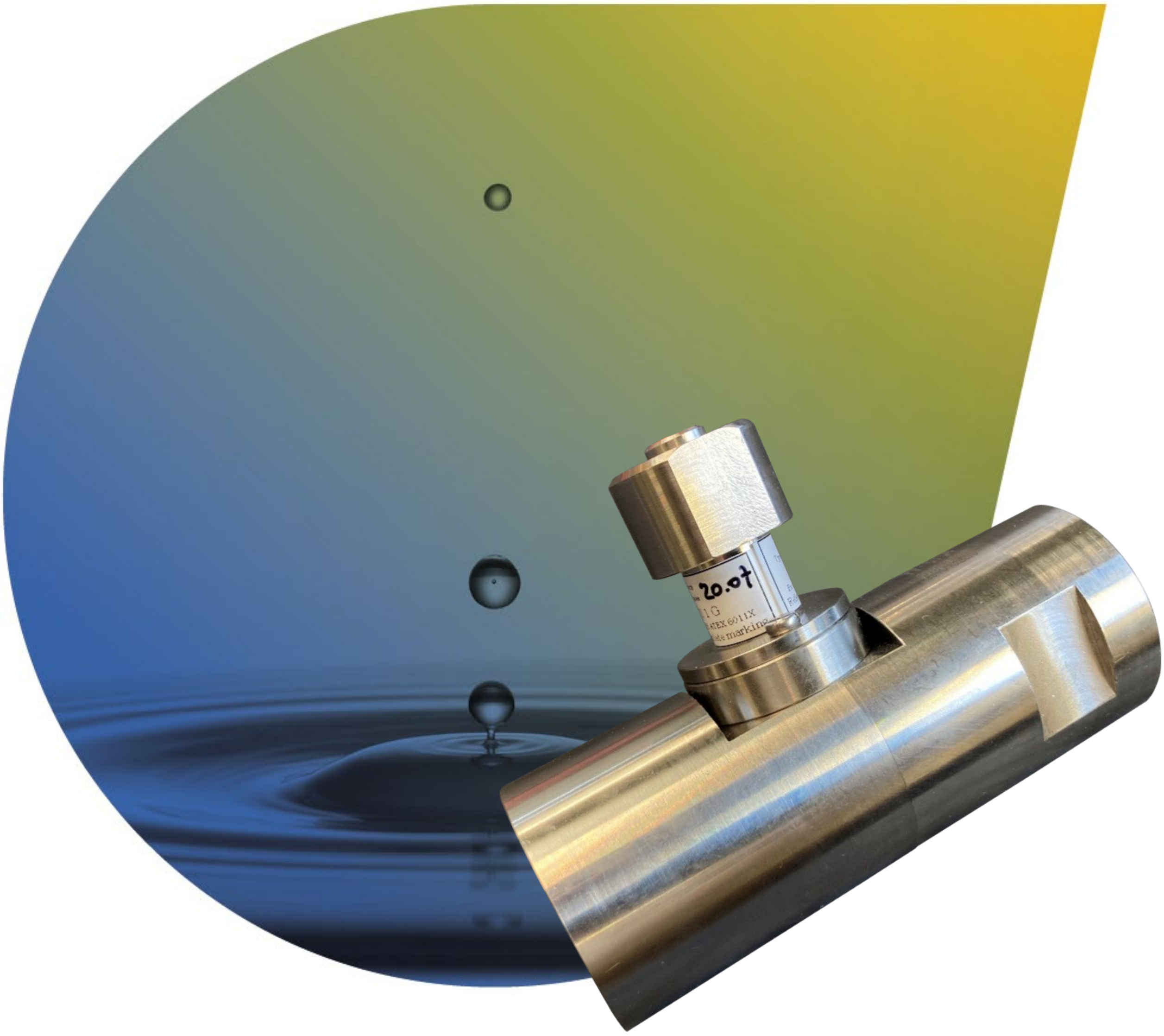
Faure Herman

Counting every drop



HELIFLU™ TZN-T

Threaded

Operating Manual

Contents

Chapter 1: Introduction to Threaded TZN

The threaded TZN Turbine Meters are designed for accurate and reliable volume measurements of Group 1 and 2 liquids and liquefied gases, as defined by PED Directive 2014/68/EU. These measurements are performed on liquid phases covering a wide range of viscosity. Their simple and robust construction guarantees very good accuracy and excellent repeatability of measurements for a wide range of industrial applications.
The removable measuring subassembly (also called a cartridge), which can be calibrated independently of the measuring body used in line, makes it possible to make measurements completely independent of variations in the pressure of the liquid, to extend the range of use by proposing different cartridges per size and thus to reduce maintenance costs very significantly.

Signal Generation

The operating principle of these meters is based on the measurement of the rotation speed (instantaneous flow) and the number of revolutions (quantity) of a helical blade propeller positioned in the center of the pipe, by means of magnet(s) inserted in the hub or in the thickness of the blades / solenoid (positioned in the meter body)

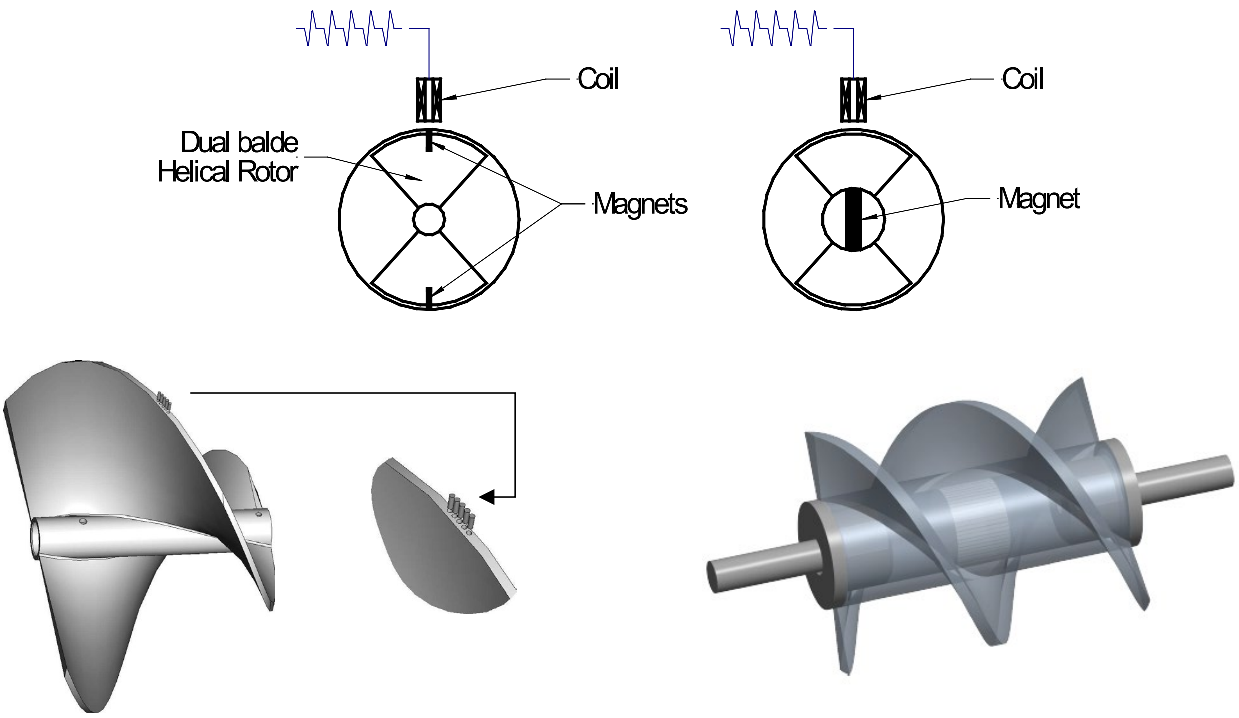


Figure 1. Mechanics of Signal Generation

Measuring the electrical signal generated allows calculation of the liquid flow rate flowing into the pipe through the following expression: $Q = \frac{F}{Kf} x3600$
and the transferred volume through: $V = \frac{N}{Kf}$

With	Q	Instantaneous flow rate in m^3/h [*l/min, GPM, …*]
	F	Output signal frequency Hz
	Kf	Measurement cartridge K factor in pulses/m^3 [*p/l, p/USG, …*]
	V	Volume in m^3 [*litres, Gallons*]
	N	Numbers of pulses

Chapter 2: Meter Components

Threaded TZN turbine meters include the following sub-assemblies:

- Body
- Cartridge / Measurement Sub-assembly
- Inlet ring
- Detection Sub-assembly

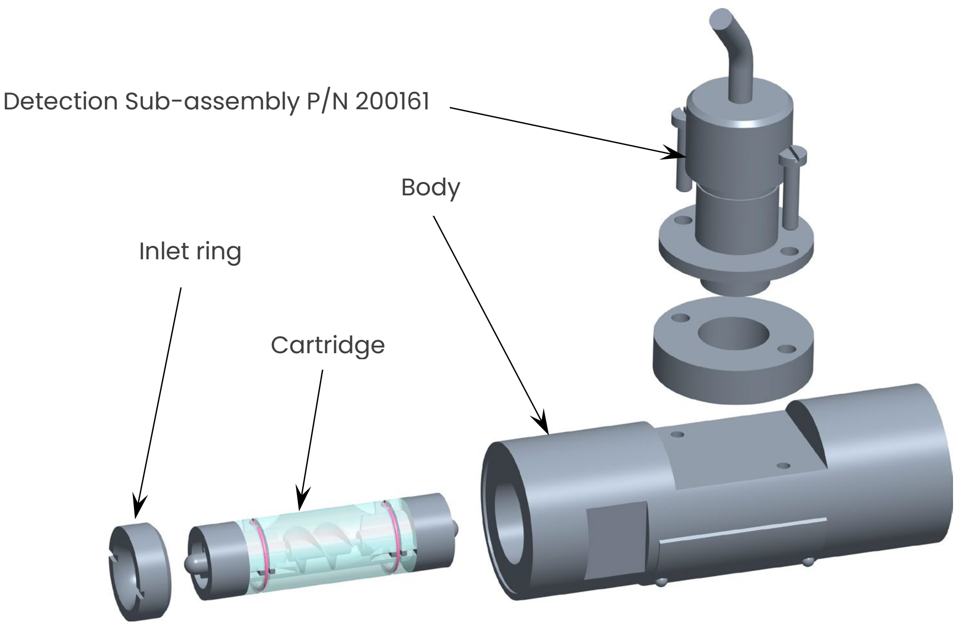


Figure 2. Meter Constitution

Meter Body

Made of stainless steel (AISI 316 or equivalent), the body is machined to receive the functional sub-assemblies (measurement and signal generation).
The body integrates the removable measurement sub-assembly, the electrical sub-assembly for signal generation (coil).
The body also integrates, on the external parts:

- An arrow indicating the flow direction
- The manufacturer's plate allowing the identification of the equipment

Measurement Cartridge

The measuring sub-assembly (or cartridge) contains all the elements for measuring the quantities of liquid passing through the meter and can be calibrated independently of the meter body.
The cartridge integrates in particular:

- A shell made of stainless steel (AIS 316L or equivalent), which groups all the other elements
- The upstream and downstream crosspieces, made of stainless steel (AIS 316L or equivalent) and integrating the bearings ensuring the positioning and the free rotation of the rotor in the center of the nozzle.
- The helical blade rotor, made of aluminum or titanium alloy, integrating the magnet(s) allowing the generation of pulses during each passage in front of the coil located in the meter body.

Detection Sub-assembly

The electrical sub-assembly allowing signal generation is screwed to the body with two screws.
It integrates a coated solenoid housed in a stainless-steel body. A cable (25 m) is integrated into the assembly by means of a cable clamp.
The detection sub-assembly has its own nameplate indicating its ATEX certification level, Ex ia IIC T6 to T3.

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, paying particular attention to the information on the product name plate. Verify serial number, process conditions, direction of flow, flange rating and general conditions of the meter are as ordered.

Should the product be damaged, documents missing, or not as ordered, please contact:

Customer support	
Hotline:	+33 (0)2 43 60 28 55 +1 713 623 0808 (USA)
Email:	services@faureherman.com
Website:	https://faureherman.com/

Chapter 4: Installation

The TZN turbine meters can be installed horizontally or vertically (upward flow) respecting the flow direction indicated on the nameplate.
For applications subject to legal metrology control, and more generally to obtain reliable measurements, the equipment must be inserted between two straight sections of pipe of the same nominal diameter as the equipment and of a length greater than or equal to 10 x DN upstream and 5 x DN downstream.

Prior to meter installation

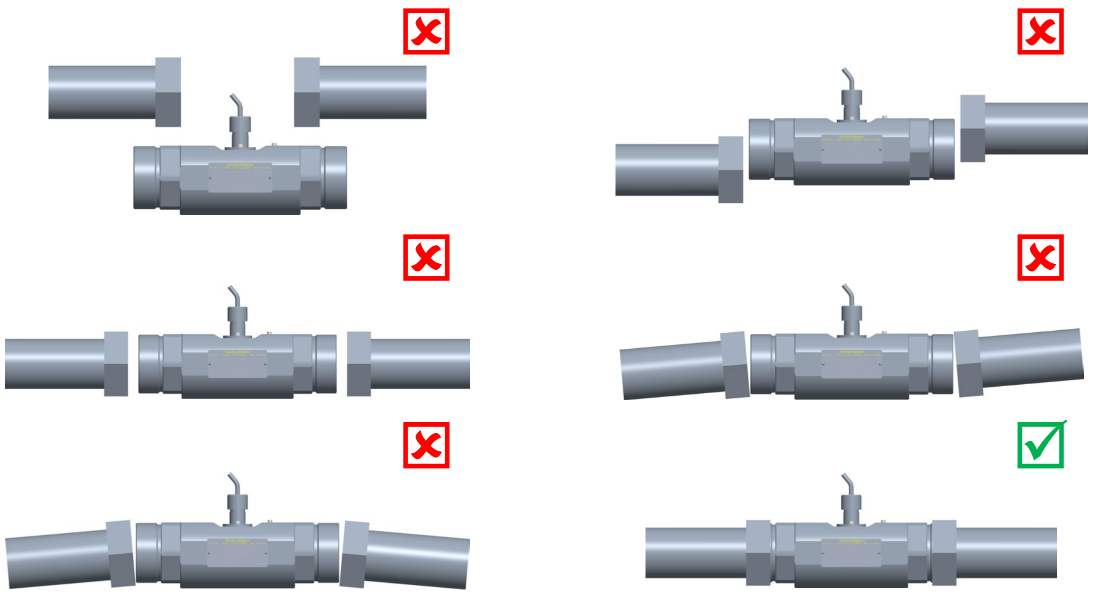
Before integrating the meter into the measuring line, check the following points:

- Absence of deposits or significant pollution in the upstream pipe section.
- Respect of flow direction (indicator plate).
- Correspondence of the dimensions of the mechanical interfaces between the upstream/downstream pipes and the equipment.
- Alignment of the meter with the upstream/downstream pipes and absence of obstacles to the flow (gaskets).
- Position of the signal outlet.

⚠ **AS A PRECISION MEASURING INSTRUMENT, turbine flowmeters must be handled with care.**

Installation

Before installing the meter, it is recommended to keep it in its original packaging, protected from severe weather conditions and possible shocks.
The equipment will be inserted on the measuring line after checking and correcting the alignment of the pipes in order to avoid any stress when applying the tightening torque (if applicable).
The equipment should only be installed using suitable tools. Never use a hammer



Gasket

Be sure to use only gaskets that are suitable for the mechanical interface of the meter.
⚠ **Never re-use a gasket**

Condition of measured liquid

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 filtration

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:

Threaded TZN Model					Recommended Filtration	
Model	mm	m^3/h (max)	Inches (")	GPM (max)	(mm)	MESH
TZN 1/2 - 055 TZN 1/2 - 110	16	0,12 0,25	1/2	0,55 1,10	0,15	100
TZN 3/4 - 220 TZN 3/4 - 440	20	0,5 1	3/4	2,2 4,4	0,355	45
TZN 1 - 880 TZN 1 - 1320 TZN 1 - 2200 TZN 1 - 4400 TZN 1 - 6600	25	2 3 5 10 15	1	8,8 13,2 22 44 66	0,425	40
TZN 1 1/4 - 3500 TZN 1 1/4 - 5300 TZN 1 1/4 - 6600 TZN 1 1/4 - 8800 TZN 1 1/4 - 13200	32	8 12 15 20 30	1 1/4	35 53 66 88 132	0,5	35
TZN 1 1/2 - 13200 TZN 1 1/2 - 176000 TZN 1 1/2 - 19800	40	30 40 45	1 1/2	132 176 198		
TZN 2 - 13200 TZN 2 - 22000 TZN 2 - 30800	50	30 50 70	2	132 220 308	0,85	20

In order to avoid erratic measurements caused by liquid cavitation, minimum back pressure must remain greater than P_{min} according to the expression:

$$2 \times \Delta P + 1{,}25 \times P_v$$

With ΔP Meter pressure drop 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 + 100 kPa [+ 14.5 psi]

Electric Installation

Threaded TZN turbine meters integrate, in standard version, a detection sub-assembly allowing the generation of pulses (pseudo sinusoidal).

The Hazardous Area classification must be verified before the meter is connected to the site (see ATEX Plate).

Chapter 5: Startup

After mechanical installation of the equipment on the measuring line and the electrical connection, fill the line.

⚠ **During this filling operation, ensure that the gas present in the pipes is eliminated by means of existing purging systems or through the meter, circulating at a very low flow rate.**

⚠ **Avoid sudden filling of the meter, which may result in the rapid passage of a pocket of gas that could damage the bearing system.**

⚠ **Avoid prolonged use of the meter beyond the maximum flow rate (see Indicator Plate).**

Chapter 6: Maintenance

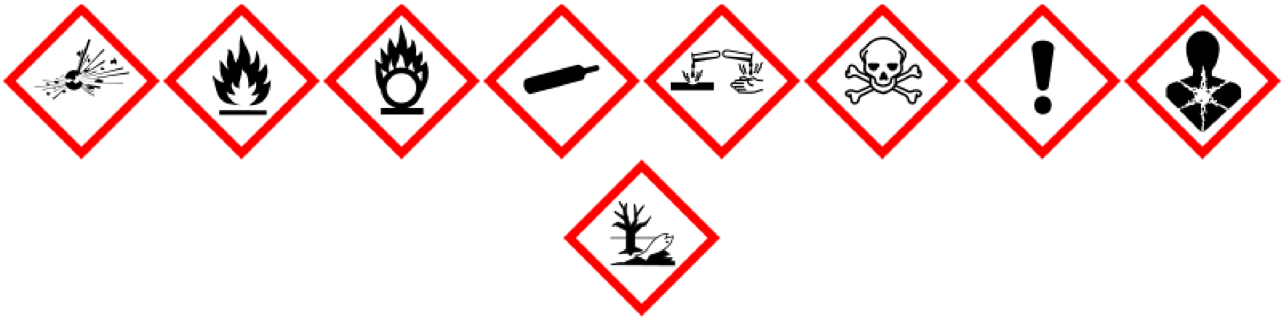
TZN turbine meters do not require any special maintenance as long as they are used within the operating limits of the type.
However, for an application not subject to periodic verification, it is recommended that the measuring subassembly be checked at least every three years. This check may involve replacing the pivot system (pins, bearings and stops) at the factory.
The TZN meters can remain loaded (full of liquid) as long as the liquid does not change significantly in consistency over time.
In case of prolonged stop, it is recommended to leave the meter full to avoid clogging of the pivots, unless the liquid can 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 Signal detector; replace if necessary.
2	Coil defect	Check for proper wiring Replace detector.
3	Loss of magnets	Replace the cartridge
4	Damaged shaft or bearings	Replace the cartridge
5	Damaged rotor	Replace the cartridge
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 Check installation conditions Check/Inspect upstream elements such as strainer, … Replace the cartridge if appropriate
8	Flow profile deformation	Check/Inspect upstream pipe length
9	Presence of gas in the flow	Eliminate the source of gas Check installation condition Insert a deaerator
10	Cavitation	Increase line pressure
11	Performances	Recalibrate Replace the cartridge if appropriate

Chapter 8: Equipment removal

The equipment is designed to operate under pressure and must be depressurized and drained before being removed from the measuring line (complete disassembly or intervention on an internal component).



⚠ **Make sure that the line is perfectly depressurized before proceeding to the loosening of the connections, and that the liquid will be completely collected in a retention tank (or equivalent).**

Chapter 9: Repairs

Signal Sensor replacement

This operation must be performed outside the hazardous area after disconnecting the cable associated with the sensor.
Refer to the Sensor Operating Manual (TEC 17-01-12) if necessary.

- Cut the sealing wire (if applicable).
- Remove the screws securing the sensor to the body (2 screws).
- Remove the sensor from its housing and replace by a new sensor.
- Proceed to the installation of a new sealing wire (if applicable).

Cartridge replacement

The cartridge is held in position by a ring screwed into the body.
Unscrew the inlet ring and push the cartridge (from downstream to upstream) to remove it from the body.

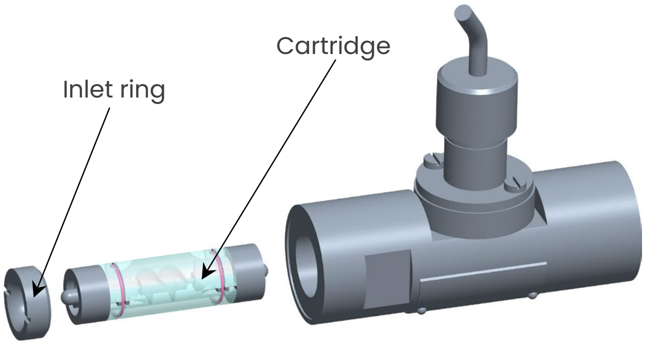
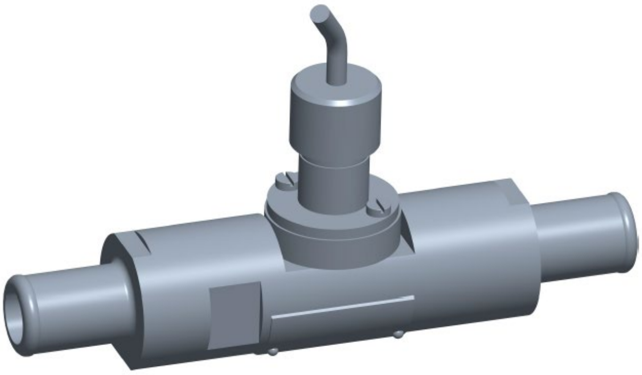


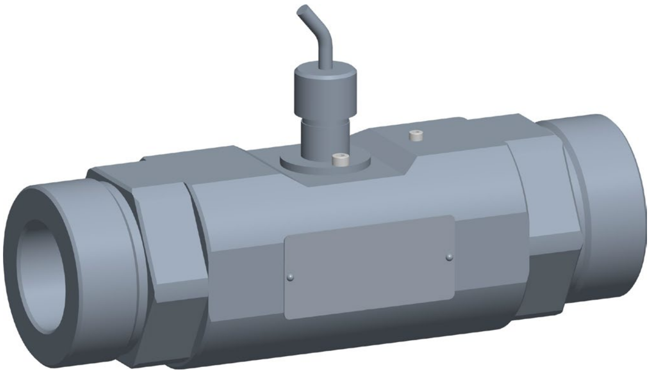
Figure 3. Cartridge replacement

Note the direction of flow (arrow engraved on the outside of the cartridge) before inserting the new subassembly into the body and screw the inlet ring back on. The upstream side of the cartridge must be in contact with the inlet ring.

Annex 1 – Other Configurations

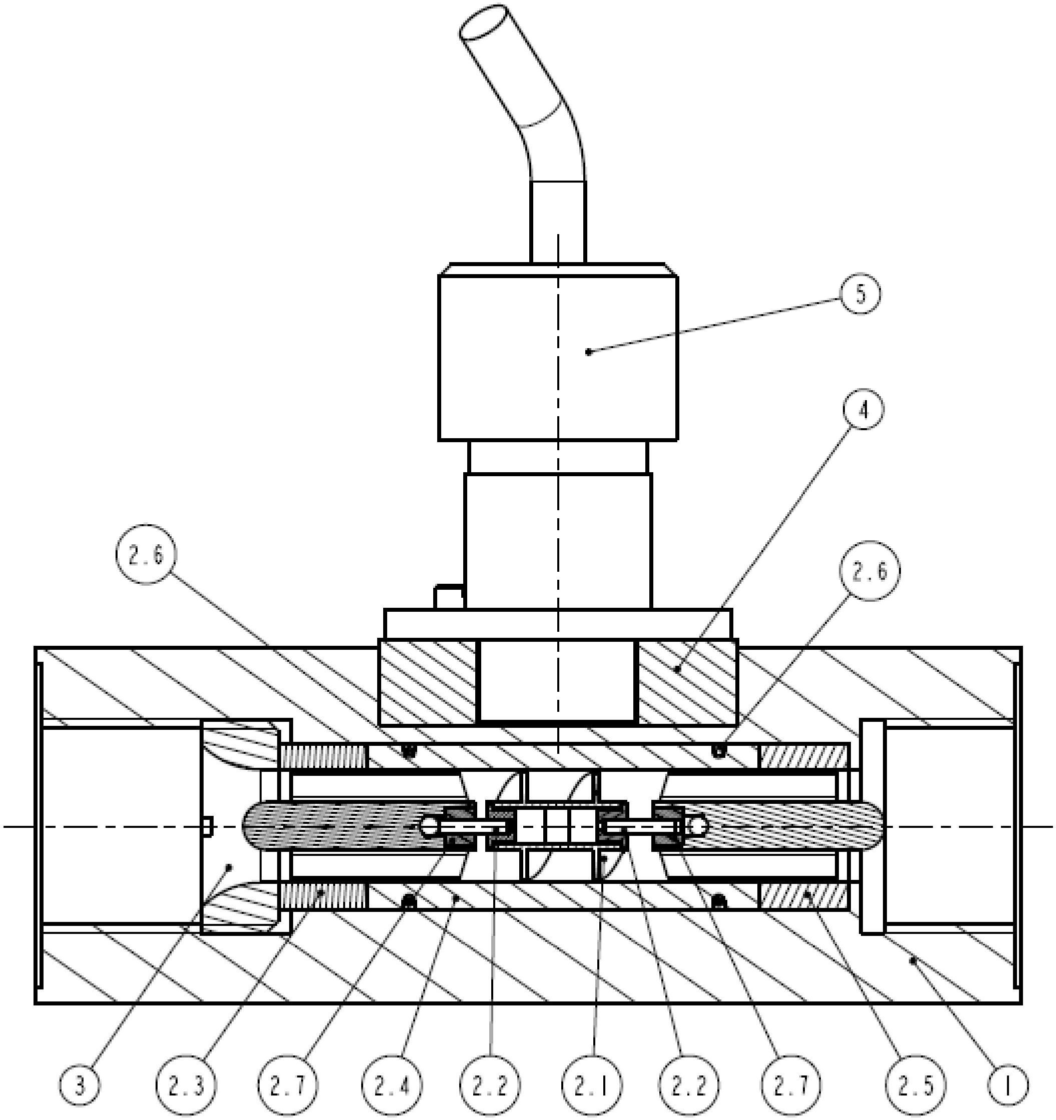


Theaded TZN-T equipped with hose nozzle



Threaded TZN-T with external thread

Annex 2 – Meter Composition



1	Body
2	Cartridge
2.1	Rotor
2.2	Shaft
2.3	Upstream crosspiece
2.4	Shell
2.5	Downstream crosspiece
2.6	Ring
2.7	Bearing
3	Inlet ring
4	Spacer
5	Signal sensor

Annex 3 – 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.

Safety Consideration

Important information to read before installation

This manual contains important safety instructions. It is essential that you read and understand the operations to be performed before installing, connecting and operating the equipment.
Failure to follow these instructions and warnings may result in damage to the equipment and/or danger to operating personnel.

Operator requirements

Ensure that operators and maintenance personnel have all safety equipment applicable to the area of operation (safety glasses, hearing protection, safety shoes, etc.) and are trained for the activities involved.
Unauthorized personnel must not have access to installation and/or maintenance operations on the equipment.

Risks resulting from failure to follow instructions and warnings

Failure to follow these instructions and warnings may:

- Expose personnel to mechanical, electrical and/or chemical hazards
- Damage the equipment (meter)
- Pollute the environment by releasing harmful or polluting substances

Safety instructions

The power supply must be disconnected, and the measuring line depressurized before any work is carried out to avoid electrical and pressure-related hazards.
The safety instructions in this manual as well as all safety regulations and specifications in force in the country of installation must be observed.

Operating conditions

The operating range indicated on the meter's nameplate must be strictly observed. The reliability and performance of the equipment are only guaranteed if it is installed and operated as specified in this manual.
Installation, operation and maintenance of the equipment must be carried out using the appropriate tools. Never use hammers or tools that may generate sparks or damage the electrical protection of the equipment.
Installation, service and maintenance of the equipment must be performed by qualified personnel.
All spare parts must be approved by FAURE HERMAN.

For any additional information regarding the installation, use or maintenance of the equipment, please contact the Customer Support Department by phone or via the website:

Customer support	
Hotline:	+33 (0)2 43 60 28 55 +1 713 623 0808 (USA)
Email:	services@faureherman.com
Website:	https://faureherman.com/

Repair and maintenance

Repairs and modifications to the equipment are only possible after formal agreement from FAURE HERMAN. The use of spare parts not recognized by FAURE HERMAN releases FAURE HERMAN from its responsibility for all consequences linked to this original modification.

Transport, handling and storage

The meter must be handled with care to avoid damage. The interface protections must remain installed as long as possible.

Unpacking

On receipt of the meter, check the general condition of the packaging to identify any damage sustained during transport. Remove the equipment from its packaging and check its general condition and the presence of this manual and the calibration certificate.

Storage

If the meter is not installed quickly after receipt, it is recommended to keep it in its original packaging, protected from severe weather conditions and possible shocks. If the meter is stored for a long period of time (more than 1
2 months), check the validity of the calibration according to the applicable regulations.

Return

Contact FAURE HERMAN before returning the equipment to the factory.
If the meter has been used to measure dangerous, toxic or corrosive liquids, the operator must make sure that it has been properly rinsed and decontaminated before being returned to the factory.

Installation - ATEX

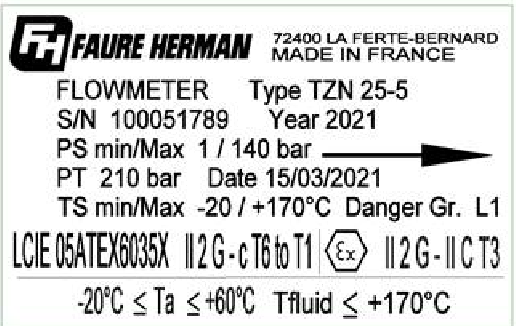
The TZN meter is ATEX certified and complies with the essential health and safety requirements for the design and construction of equipment intended for use in potentially explosive atmospheres (Directive 2014/34/EU).
Ensure that the equipment is used in full compliance with the instructions given in the ATEX certificate and the nameplate.
This equipment incorporates ATEX certified electrical, and non-electrical components relating to the design and construction of equipment for use in potentially explosive atmospheres (Directive 2014/34/EU).

General safety information

For safe operation, the equipment must be used in accordance with the criteria defined by the ATEX certificate and nameplate. Be sure to observe all instructions for the equipment and components contained in this manual.
The equipment must be installed and used only in areas that conform to its protection rating as specified on the nameplate.
If the equipment is connected to other electrical systems, check that the electrical protection systems are fully compatible.
According to the definition of the ATEX Directive, TZN turbine meters have both mechanical and electrical parts. The combination of the two certifications defines the protection system and the associated meter parameters.

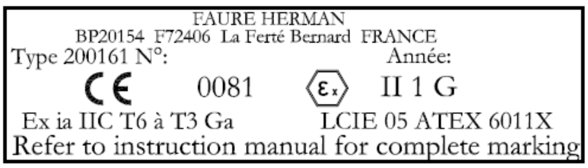
ATEX Non-Electrical Part - Example of marking

The "non-electrical" certification is developed in the LCIE 05 ATEX 6035X certificate.



ATEX - Electrical part - Example of marking

The electrical part is covered by the LCIE 05 ATEX 6011X certificate for Intrinsic Safety applications.



Risk Analysis (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	NA: Equipment mass < 30kg.
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 zero barg 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 Recommendation

If applicable, this equipment is ATEX certified and complies with the essential requirements regarding safety and health for the design and construction of equipment intended for use in potentially explosive atmospheres (Directive 2014/34/EU).
For safe use, ensure that the equipment is used in accordance with the indications defined by the ATEX certificate and the identification plate and observe the operating, installation and maintenance manuals for the equipment and its subassemblies.
Installation, operation and maintenance must be carried out by trained and specialized personnel who understand the language of this manual.

If you are missing a manual or for any other information, please contact Customer Support:

Customer support	
Hotline:	+33 (0)2 43 60 28 55 +1 713 623 0808 (USA)
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Counting every drop

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