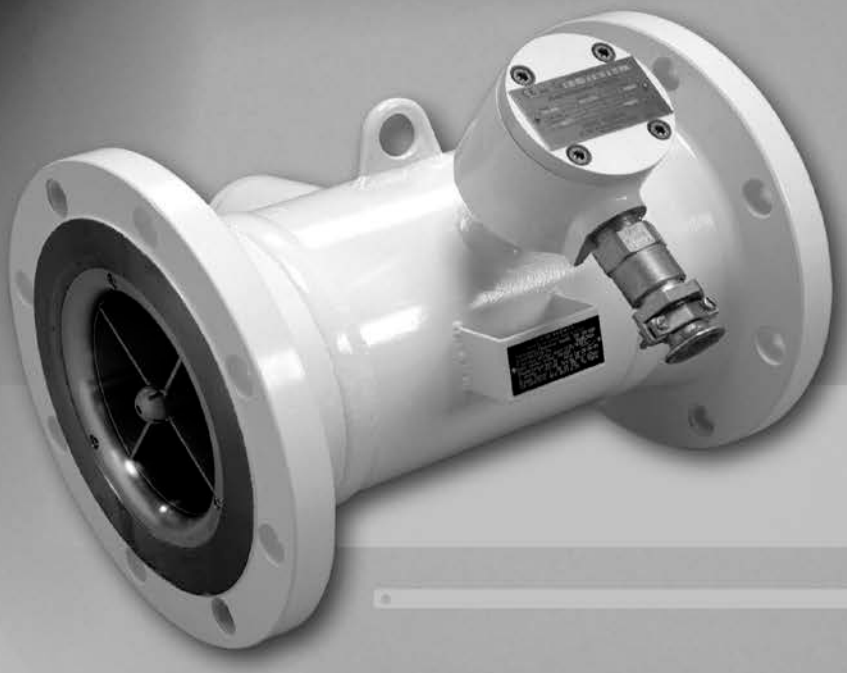
HELIFLU™ TZN

User's Manual



FAURE HERMAN
Mastering the Flow

IDEX
LIQUID CONTROLS GROUP

Faure Herman

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Attention!

This manual contains important instructions and important warnings. It is essential to read and apply it before commencing installation, connection, and commissioning work.

Failure to observe these instructions and warnings may damage the flowmeter and endanger persons.

Qualification and training of the personnel

The flowmeter must be installed and maintained by personnel trained and qualified for this work.

Hazards arising from failure to observe the instructions and warnings

Failure to observe these instructions and warnings may:

- Endanger personnel as a result of mechanical, electrical, or chemical problems,
- Damage the flowmeter,
- Pollute the environment by releasing hazardous substances.

Safety at work

The safety instructions appearing in this manual must be observed, as must all accident prevention and occupational safety regulations in force in the country of installation.

Safety instructions

Disconnect the power supply and depressurize the flowmeter before servicing (prevention of electrical hazards and hazards created by pressurized equipment).

Conditions of operation

The reliability of the flowmeter is guaranteed only if it is installed and used as described in this manual. The extreme conditions of use indicated on the data plate must not be exceeded.

Reconditioning, repair, modifications

Reconditioning, repair, or modification are allowed only after Faure Herman has been consulted. The use of parts and accessories approved by Faure Herman avoids compromising safety. If any other parts are used, Faure Herman cannot be held liable for the consequences.

Transport, handling, and storage

The flowmeter must be handled with care so as to avoid damage.

Transport and handling must be performed using resources appropriate to the weight and bulk of the flowmeter.

When the flowmeter has lifting rings, they must be used. The flowmeter must in no case be handled or secured by the electrical boxes.

The use of end caps serves to protect the flanges during transport and handling.

Unpacking

The flowmeter must be checked and inspected in order to make sure that it has not been damaged and that nothing is missing. Protections and devices (such as screws) placed to immobilize moving parts must be withdrawn before installation.

Storage

If the flowmeter is not installed as soon as it is received, it must be suitably stored in a dry place, protected from the elements and from large temperature swings. For prolonged storage, arrangements to protect from damp may be necessary.

Return

Before any return, contact Faure Herman. 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.

FAURE HERMAN

Mastering the Flow

www.faureherman.com

General contents

Note: The detailed contents are inserted on the end of manual

ATEX Recommendations

FR

Recommandations ATEX

Cet équipement est certifié ATEX et conforme aux exigences essentielles en ce qui concerne la sécurité et la santé pour la conception et la construction d'appareils destinés à être utilisés en atmosphères explosibles (Directive 94/9/CE).

Pour une utilisation en toute sécurité, assurez-vous que l'équipement est utilisé conformément aux indications définies dans le certificat ATEX et la plaque d'identification, et respectez les manuels d'utilisation, d'installation et de maintenance de l'équipement et des sous ensembles qui le composent.

L'installation, l'utilisation et la maintenance doivent être réalisées par un personnel formé et spécialisé comprenant l'une des langues du manuel.

S'il vous manque un manuel ou pour toute information, contactez le service Après-vente de FAURE HERMAN :

FAURE HERMAN
Route de Bonnétable – 72400 LA FERTE BERNARD
☎ +33 (0)2 43 60 28 80 - 🖷 +33 (0)2 43 60 28 89
✍ fhservices@idexcorp.com

EN

ATEX recommendations

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 (94/9/EC Directive).

On safety grounds, 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 and the various parts used in this device.

This item of equipment must be installed and serviced by trained, specialist staff who understand one of the languages used in the manual.

If you require a manual or any additional information, please contact the FAURE HERMAN After Sales team:

FAURE HERMAN
Route de Bonnétable – 72400 LA FERTE BERNARD
☎ +33 (0)2 43 60 28 80 - 🖷 +33 (0)2 43 60 28 89
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ES

Recomendaciones ATEX

Este equipo certificado ATEX cumple con los requisitos esenciales relativos a la seguridad y la salud en el diseño y la construcción del material utilizable en atmósferas potencialmente explosivas (Directiva 94/9/CE).

Para un uso seguro, compruebe que el equipo se utiliza según las indicaciones descritas en el certificado ATEX y la placa de identificación, y respete los manuales de utilización, de instalación y de mantenimiento del equipo y de los elementos que lo componen.

La instalación, utilización y el mantenimiento deben efectuarse por un personal cualificado que entienda por lo menos uno de los idiomas del manual.

Si le falta un manual o para cualquier información, contacte con el servicio de postventa de FAURE HERMAN:

FAURE HERMAN
Route de Bonnétable – 72400 LA FERTE BERNARD
☎ +33 (0)2 43 60 28 80 - 🖷 +33 (0)2 43 60 28 89
✍ fhservices@idexcorp.com

IT

Raccomandazioni ATEX

La presente apparecchiatura è certificata ATEX e conforme alle esigenze essenziali nell'ambito della sicurezza e la salute per la concezione e la costruzione d'apparecchi destinati a essere utilizzati in atmosfere potenzialmente esplosive (Direttiva 94/9/CE).

Per un utilizzo altamente sicuro, accertatevi che l'apparecchiatura sia usata conformemente alle indicazioni fornite nel certificato ATEX e nella piastra d'identificazione; rispettate i manuali d'utilizzo, installazione e manutenzione dell'apparecchiatura e dei sottoinsiemi che la compongono.

L'installazione, l'utilizzo e la manutenzione vanno effettuati da un personale formato e specializzato, edotto di una delle lingue del manuale.

Se vi manca un manuale o per qualsiasi informazione, contattate il Servizio Clientela di FAURE HERMAN:

FAURE HERMAN
Route de Bonnétable – 72400 LA FERTE BERNARD
☎ +33 (0)2 43 60 28 80 - 🖷 +33 (0)2 43 60 28 89
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DA

ATEX anbefalinger

Dette udstyr er ATEX-certificeret og overholder de væsentlige sundheds- og sikkerhedsmæssige krav til design og konstruktion af apparater, der er beregnet til anvendelse i eksplosive atmosfærer (Direktiv 94/9/EF).

For en sikker anvendelse bør De sørge for, at udstyret anvendes i henhold til de forskrifter, der er defineret i ATEX-certifikatet og på identifikationsskiltet, og at bruger-, installations- og vedligeholdelsesvejledningerne for udstyret og de underenheder, det er sammensat af, overholdes.

Installationen, anvendelsen og vedligeholdelsen skal foretages af specialuddannet personale, som forstår et af de sprog, manualerne er udfærdiget på.

Hvis De mangler en manual eller for enhver anden information, kontakt venligst FAURE HERMAN's Serviceafdeling:

FAURE HERMAN
Route de Bonnétable – 72400 LA FERTE BERNARD
☎ +33 (0)2 43 60 28 80 - 🖷 +33 (0)2 43 60 28 89
✍ fhservices@idexcorp.com

SV

ATEX rekommendationer

Denna utrustning är certifierad enligt ATEX och uppfyller de väsentliga kraven i fråga om säkerhet och hälsa vid utformning och tillverkning av apparater som är avsedda för användning i explosionsfarliga omgivningar (Direktiv 94/9/EG).

För en fullt säker användning, se till att utrustningen används i överensstämmelse med de anvisningar som figurerar i ATEX-certifikatet samt på identifikationsskylten, och följ instruktionsböckerna för användning, installation och underhåll av utrustningen och dess ingående underenheter.

Installationen, användningen och underhållet skall utföras av personal som är utbildad, specialiserad och som förstår något av instruktionsbokens språk.

Om du saknar någon av instruktionsböckerna eller för all annan information, kontakta FAURE HERMANs kundservice:

FAURE HERMAN
Route de Bonnétable – 72400 LA FERTE BERNARD
☎ +33 (0)2 43 60 28 80 - 🖷 +33 (0)2 43 60 28 89
✍ fhservices@idexcorp.com

NO ATEX anbefalinger

Dette utstyret er ATEX-sertifisert og oppfyller hovedkravene når det gjelder hensyn til sikkerhet og helse ved utforming og konstruksjon av utstyr til bruk i eksplosjonsfarlige omgivelser (Europaparlaments- og Rådsdirektiv 94/9/EF).

For full sikkerhet må det kontrolleres at utstyret benyttes i samsvar med anvisningene i ATEX-sertifikatet og på merkeplaten. Instruksjonene i brukerhåndbøker samt installasjons- og vedlikeholdsanvisninger for utstyret og delene det består av, må følges omhyggelig.

Installasjon, bruk og vedlikehold må utføres av spesialisert, faglært personell som forstår et av språkene i håndbøkene.

Hvis det mangler en håndbok eller hvis du trenger ytterligere opplysninger, vennligst ta kontakt med serviceavdelingen i FAURE HERMAN:

FAURE HERMAN
Route de Bonnétable – 72400 LA FERTE BERNARD
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NL ATEX richtlijnen

Deze apparatuur heeft de ATEX certificering en beantwoordt aan de essentiële eisen inzake veiligheid en gezondheid voor het ontwerp en de bouw van apparaten bedoeld voor gebruik op plaatsen waar ontploffingsgevaar kan heersen (Richtlijn 94/9/EG).

Voor een veilig gebruik dient u te controleren of de apparatuur gebruikt wordt volgens de in het ATEX certificaat vermelde aanwijzingen en op het kenplaatje en de gebruiks-, installatie- en onderhoudshandleidingen van de apparatuur en de samenstellende onderdelen in acht te nemen.

De apparatuur moet geïnstalleerd, gebruikt en onderhouden worden door speciaal hiervoor opgeleid personeel dat minstens één van de talen van de handleiding begrijpt.

Indien een handleiding ontbreekt of u aanvullende informatie nodig heeft, neem dan contact op met de servicedienst van FAURE HERMAN:

FAURE HERMAN
Route de Bonnétable – 72400 LA FERTE BERNARD
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PL Zalecenia ATEX

Niniejsze wyposażenie posiada certyfikat ATEX i jest zgodne z podstawowymi wymaganiami dotyczącymi bezpieczeństwa i higieny odnoszącymi się do projektu i budowy urządzeń przeznaczonych do użytkowania w przestrzeniach zagrożonych wybuchem (Dyrektywa 94/9/WE).

W celu zapewnienia bezpiecznego użytkowania, należy upewnić się, że wyposażenie jest używane zgodnie z zaleceniami podanymi w certyfikacie ATEX i na tabliczce znamionowej oraz należy przestrzegać zaleceń instrukcji obsługi, instalacji i konserwacji wyposażenia i jego podzespołów.

Instalacja, użytkowanie i konserwacja muszą być realizowane przez przeszkolony i wyspecjalizowany personel korzystający z dokumentacji przygotowanej w języku, jakim się posługuje.

W przypadku braku dostępu do danego podręcznika lub informacji, prosimy o skontaktowanie się z działem obsługi po sprzedaży FAURE HERMAN:

FAURE HERMAN
Route de Bonnétable – 72400 LA FERTE BERNARD
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✍ fhservices@idexcorp.com

DE ATEX Empfehlungen

Dieses Gerät ist ATEX-zertifiziert und entspricht den grundlegenden Sicherheits- und Gesundheitsanforderungen an Konstruktion und Bau für Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen (Richtlinie 94/9/EG).

Für eine sichere Anwendung muss das Gerät gemäß den Angaben im ATEX-Zertifikat und dem Typenschild verwendet werden. Berücksichtigen Sie die Gebrauchs-, Installations- und Wartungshandbücher des Geräts und dessen Komponenten.

Installation, Gebrauch und Wartung müssen von spezialisiertem Fachpersonal durchgeführt werden, die eine der Handbuchsprachen verstehen.

Wenn Sie ein Handbuch oder weitere Informationen benötigen, wenden Sie sich bitte an den FAURE HERMAN-Kundendienst

FAURE HERMAN
Route de Bonnétable – 72400 LA FERTE BERNARD
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PT Recomendações ATEX

Este equipamento é certificado ATEX e está conforme às exigências essenciais no que concerne a segurança e a saúde para a concepção e a construção de aparelhos destinados a serem utilizados em atmosferas potencialmente explosivas. (Directiva 94/9/CE).

Para uma utilização com total segurança, assegure-se de que o equipamento é utilizado de acordo com as indicações definidas no certificado ATEX e na placa de identificação, e respeite os manuais de utilização, de instalação e de manutenção do equipamento e dos subconjuntos que o compõem.

A instalação, a utilização e a manutenção devem ser realizadas por um pessoal formado e especializado que compreenda uma das línguas do manual.

Se faltar-lhe um manual ou para quaisquer informações, entre em contacto com o Serviço Após-Venda da FAURE HERMAN:

FAURE HERMAN
Route de Bonnétable – 72400 LA FERTE BERNARD
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FI ATEX-Suositukset

Tämä laite on ATEX-varmennettu ja vastaa turvallisuutta ja terveyttä koskevia oleellisia vaatimuksia koskien räjähdysvaarallisissa tiloissa käytettäväksi tarkoitettujen laitteiden suunnittelua ja valmistusta (Direktiivi 94/9/EY).

Turvallisuussyistä teidän tulee varmistaa, että laitetta käytetään ATEX-sertifikaatissa ja tunnistuslaatassa määriteltyjen ohjeiden mukaisesti ja teidän tulee noudattaa laitteen käyttö-, asentamis- ja huolto-ohjeita sekä laitteen että sen muodostamien osien ollessa kyseessä.

Asentamisen, käytön ja huollon saa toteuttaa ainoastaan koulutettu ja erikoistunut henkilökunta, joka ymmärtää jotain käyttöohjeissa käytettyä kieltä.

Jos teillä ei ole käyttöohjeita tai haluatte lisätietoja, ottakaa yhteyttä myynninjälkeishuoltoon FAURE HERMAN:

FAURE HERMAN
Route de Bonnétable – 72400 LA FERTE BERNARD
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EL

Συστάσεις περί ATEX

Ο παρών εξοπλισμός έχει πιστοποιηθεί ως ATEX και συμμορφώνεται με τις βασικές απαιτήσεις για την ασφάλεια και την υγεία σχετικά με το σχεδιασμό και την κατασκευή συσκευών που προορίζονται για χρήση σε εκρήξιμες ατμόσφαιρες (Οδηγία 94/9/ΕΚ).

Για λόγους ασφαλείας, βεβαιωθείτε ότι ο εξοπλισμός χρησιμοποιείται σύμφωνα με τις οδηγίες που δίνονται στο πιστοποιητικό ATEX και την πλακέτα αναγνώρισης και τηρήστε τις οδηγίες των εγχειριδίων χρήσης, εγκατάστασης και συντήρησης του εξοπλισμού και των υποσυνόλων που αποτελούν τον εξοπλισμό αυτό.

Η εγκατάσταση, η χρήση και η συντήρηση πρέπει να πραγματοποιούνται από καταρτισμένο και ειδικευμένο προσωπικό που κατανοεί μία από τις γλώσσες του εγχειριδίου.

Εάν χρειάζεστε κάποιο εγχειρίδιο ή για οποιαδήποτε άλλη πληροφορία, επικοινωνήστε με το Τμήμα Εξυπηρέτησης μετά την Πώληση της εταιρείας FAURE HERMAN:

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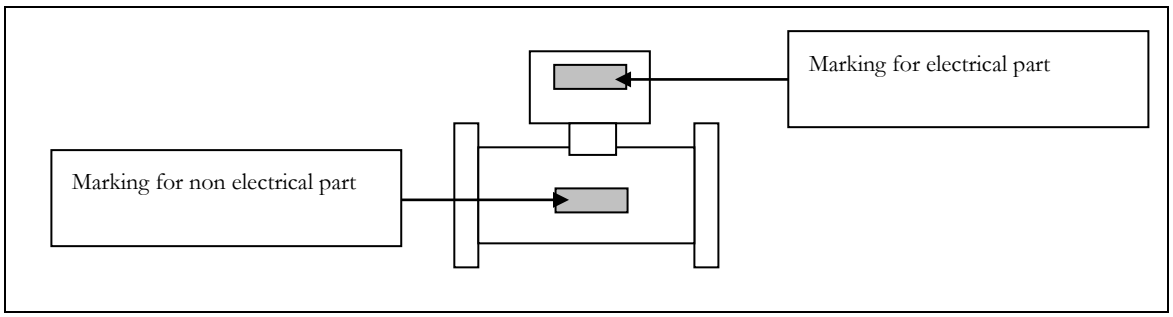
This equipment is an assembly of a non electrical part and an electrical part which are both ATEX certified relating to the design and construction of equipment intended for use in potentially explosive atmospheres (94/9/CE directive).

General:

For a safety utilization, be sure that you use this equipment in totally compliance with its ATEX certificate and nameplates indications, and respect the installation, maintenance and user's manuals of the equipment and its different parts.



This equipment is suitable in hazardous area complying with its protection system and the indications specified on its nameplates.

Electrical power must be "OFF" before and during Installation and Maintenance.

This equipment shall be handled with the greatest care and mounted in a location to avoid possible shocks.

Installation and Maintenance operation shall be done by means of suitable tools. Never use a hammer, impact wrench or any tools which can make sparks or damage the equipment protection system.

If this equipment is supposed to be connected to other devices, verify that the protection systems are compatible.

ATEX Recommendations

Installation, maintenance and repairs of this equipment shall be carried out by suitably trained personnel and the spare parts shall be approved by FAURE HERMAN.

No operations or repairs which can affect the protective system could be done on this equipment without FAURE HERMAN agreement.

For specifically installation and maintenance advices, contact FAURE HERMAN After Sales Department

FAURE HERMAN
Route de Bonnétable
72400 LA FERTE BERNARD
Tel : +33 (0)2 43 60 28 80
Fax: +33 (0)2 43 60 28 70
E-mail: fhservices@idexcorp.com

For any contacts, **Don't forget to give us your equipment serial number.**

Non electrical part protective system:

The Turbine meter certification as a non electrical part is defined under the certificate number ***LCIE 05 ATEX 6035X***. This equipment is manufactured with a construction protective system in accordance with the European standards NF EN 13463-1 and NF EN 13463-5.

This equipment can be used in an II 2 G potentially explosive atmospheres (gas on surface in a zone 1).

Marking of the non electrical part of the equipment shall include the following ATEX indications:

Marking	Description
FAURE HERMAN	**Company name**
BP20154 - 72406 La Ferté Bernard	**Company address**
Made in France	
Equipment :	**Model**
S/N…	**Serial number**
Year	**Manufacturing year**
CE	**CE Logo**
T° min/max (Ts): According to application	**Fluid Temperature**
LCIE 05 ATEX 6035 X	**ATEX agreement number**
	**ATEX marking**
II 2 G	**Equipment category**
c	**Protection type**
T6 to T1 (according to fluid temperature)	**Temperature classification**

The equipment can also carry the usual marking required by the manufacturing standards applying to such equipments.

For a safety utilization of the equipment, fluid temperature must be contained between -50°C and +350 °C.

The temperature classification is following:

T6 if -50°C ≤ Tfluide ≤ +80°C
T5 if +80°C ≤ Tfluide ≤ +95°C
T4 if +95°C ≤ Tfluide ≤ +130°C
T3 if +130°C ≤ Tfluide ≤ +195°C
T2 if +195°C ≤ Tfluide ≤ +290°C
T1 if +290°C ≤ Tfluide ≤ +350°C

Warning: For models containing aluminum parts (Body, Impeller…) the fluid temperature is limited from -50°C to +100°C.

Electrical part protective system:

For the certification and the protective system of the electrical parts associated with this equipment, please refer to their own utilization, installation and maintenance manuals supplied with the equipment.

HERMAN reserves its right to change or modify procedures, specifications and products for their improvement.

The legal responsibility of FAURE HERMAN applies only to the French text of the documents.

FAURE HERMAN

Mastering the Flow

www.faureherman.com

Chapter 1: Introduction

TZN family

Flowmeters of the TZN family are designed to measure volumes of liquids of low to high viscosity (from 0.3 to 350 cSt), with possible applications for liquids with a viscosity greater than 700 cSt on large diameters.

Enhanced design of TZN CUS has been developed to measure liquids containing fibbers, wax or mixed with Drag Reducing Agent.

Their simple and rugged construction allows to warrant a very good accuracy and excellent measurement repeatability for a wide range of industrial applications.

The use of an autonomous measuring sub-assembly that can be calibrated in the factory independently from the body used in line allows to extend the operating field and to reduce very significantly the maintenance costs.

The operating principle for this flowmeter type rests on the rotational velocity of a helical bladed impeller, positioned at the middle point of the piping, by means of an assembly made of magnets (fitted in the flowmeter body) and a coil (positioned in the flowmeter body).

Measuring the electrical signal generated allows to calculate the liquid flow rate flowing into the pipe by means of the following expression:

$$Q = \frac{F}{K} \times 3600$$

With: Q Instantaneous flow rate (m^3/h)

F Signal frequency (Hz)

K Measuring sub-assembly related factor, determined and recorded during factory calibration or on site (p/m^3) (refer to Appendix 2)

Metering pulses generated by the coil enables to calculate the volume flowed between two given periodic times by means of the following expression:

$$V = \frac{N}{K}$$

with: V Volume (m^3)

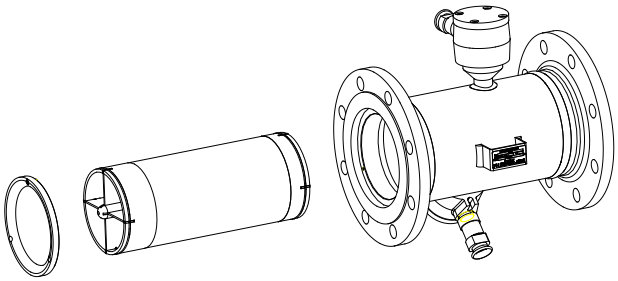
N Totalized pulse number

K Measuring sub-assembly related factor, determined and recorded during a factory calibration or on site (p/m^3) (refer to Appendix 2)

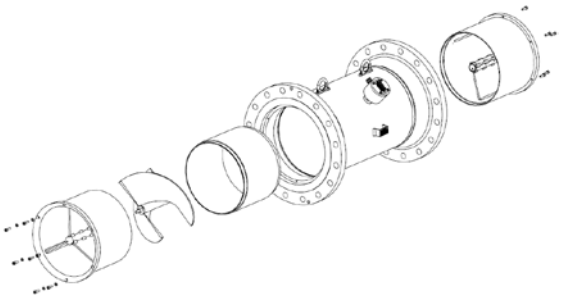
Chapter 2: Description and codification

Flowmeters of the TZN family are designed according to the same principle and include the following main elements (Appendix 1):

- Flanged body (1)[1]
- Measuring sub-assembly (2)
- Inlet ring (3)[2]
- Detection sub-assembly (10)
- As an option, pre-amplifier (FH 710)
- As an option, flow straightener (8)



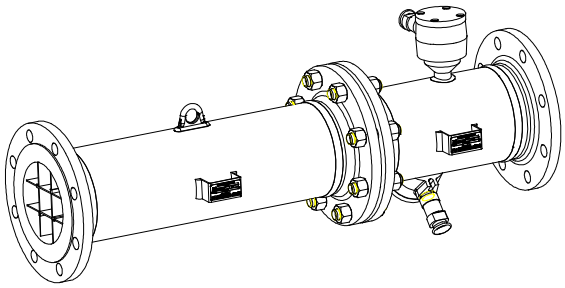
Nominal Size ≤ 14"



Nominal Size ≥ 16"

[1] *According to models, the connection to the installation pipes can be performed by means of screw-type end fittings or by tightening the flowmeter between the installation flanges.*

[2] *The inlet ring can also be incorporated into the measuring sub-assembly.*



TZN with optional FLOWSTRAIGHTENER assembly

Body

Made of carbon steel or stainless steel (AISI 316 L or equivalent) (other materials according to options) and internally machined, the body (1) receives a removable detection sub-assembly (2).

It is fitted with one or several boss (10), allowing to implement the simple or dual detection coil (15) and the positioning of the interface electrical enclosure receiving the pre-amplifier. Position of the bosses is such that pulses delivered by 2 coils are not in phase.

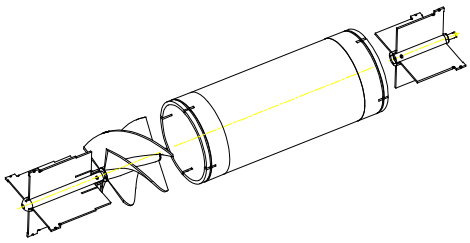
Upon the outside of the body:

- An arrow indicates the fluid flow direction,
- A manufacturer's nameplate allows the equipment identification.

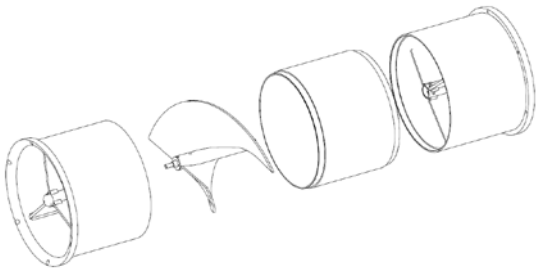
Measuring sub-assembly

The sub-assembly includes the totality of elements contributing to the correct operation of the measuring element (impeller) and can be calibrated independently from the flowmeter body. It includes the following elements:

- The nozzle (2), made of stainless steel (AISI 316L or equivalent) receives the other elements of the measuring sub-assembly. Outside from the nozzle, an engraved arrow indicates the flow direction.
- The upstream (6) and downstream (7) bearing support cross pieces also made of stainless steel (AISI 316L or equivalent) receive the bearings, respectively fixed (24) and adjustable (25). The latter enable the impeller centring and their tightening is ensured by means of a screw at the end of each bearing support cross piece hub.
- The helicoidal dual or four-blade impeller (4) made of either light alloy or titanium (other materials according to option) and fitted with shafts (5) and magnets (26). The latter enable the generation of electrical pulses through the detection coil. On some models, these magnets may be fitted in the impeller hub. An arrow engraved on the impeller indicates the flow direction.



Nominal Size ≤ 14"



Nominal Size ≥ 16"

The sub-assemblies of TZN CUS are distinguished by their specific rotor shaft and the presence of bearing supports in the crosspieces.

For nominal size ≤ 14", the measuring sub-assembly is centred and fastened into the body by means of a ring[3] upstream. The ring[3], made of stainless steel (AISI 316L or equivalent) maintains the measuring sub-assembly by screwing into the body.

For nominal size ≥ 16", the measuring sub-assembly is centred and fastened into the body by means of cross piece upstream and downstream. The cross pieces, made of stainless steel (AISI 316L or equivalent) maintains the measuring sub-assembly by screwing into the body.

Flowstraightener assembly (as an option)

Positioned upstream from the flowmeter and associated to the latter, the purpose of the flow straightener (8) is to straighten the fluid flow and to limit the upstream disturbances derived from elbows or any other seldom elements.

It enables to improve and warrant the measurement accuracy.

It includes a cylindrical channel with channels enabling its assembly with the flowmeter and the installation pipe.

Outside from the flow straightener body, an arrow (11) indicates the fluid flow direction. A manufacturer's nameplate (12) allows identification.

Inside, a set of cross tubes regularizes the fluid flow stream.

[3] *The inlet ring can be also integrated into the measuring sub-assembly.*

To enable the control sealing by the official metrological authorities (in the event of a custody transfer application), tightening threaded rods are machined.

Detection sub-assembly

The detection sub-assembly comprises the following elements:

- A coil (15) housed in the bottom of each boss and kept in position by means of a ring (20),
- A coil/pre-amplifier connection cable
- As an option, a pre-amplifier enabling to increase significantly the maximum distance between the flowmeter and the electronic display and/or calculation (up to 5000 meters),
- An explosion-proof box (16) allowing to use the flowmeter in dangerous area.

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Chapter 3: Equipment reception –storage and handling

On equipment reception and storage, check the correct condition of packing, in order to identify without delay possible damages inflicted during transportation.

Withdraw the flowmeter from its packing and check its correct condition, make sure the user's manual and the calibration certificate are included. Should the product be damaged and documents be omitted, please contact the FAURE HERMAN After-Sales Department:

Plant La Ferté Bernard
Route de Bonnétable
BP 20154
72406 LA FERTE BERNARD Cedex
Tel: +33 (0)2 43 60 28 80
Fax: +33 (0)2 43 60 28 89
E-mail: fhservices@idexcorp.com

The flanges of the flowmeter are equipped with protection covers which must be removed only during its installation on the pipe.

Before installing the equipment, it is highly recommended to preserve it in its original packing, protected against severe climatic conditions and possible shocks.

The equipment shall be stored in a clean and dry room, the measuring channel being protected, and at a temperature ranging from –20°C / +70°C.

The handling must be done as follows:

- With lifting rings fitted on the flowmeter body, for equipments with a nominal size ≥ 6" (DN 150) or with a weight > 35 kilos
- Or with straps on both sides of the flowmeter body when there are no lifting rings

In the event of extended storage (longer than 1 year), we recommend to verify the equipment in factory before its commissioning.

Chapter 4: Installation conditions

TZN flowmeter general installation conditions shall adhere to a certain number principles, to ensure the equipment reliability and to warrant long-term accurate, repeatable and stable measurements.

TZN turbine flowmeters can be installed horizontally or vertically, providing the flow rate is upstream and the flow direction indicated on the arrows is respected.

For custody transfer applications, TZN flowmeter installation conditions are defined in the type approval and provide upstream a part of pipe at least equal to 10 times the flowmeter inlet diameter and five times the outlet diameter downstream.

The flowmeter life time and the measurement reliability can be seriously reduced by the presence of gas and/or solid particles in the flowing liquid.

Presence of gas, in the form of bubbles or emulsion would involve a significant deterioration of performances, whereas the passage of gas "pockets" between two liquid sections could involve the destruction of the impeller pivot system, leading to serious measurement errors.

Therefore it is recommended to make sure there is no risk of gas injection upstream from the measurement point and to provide, when required, a draining or degassing system upstream from the flowmeter. For an elevated installation, we recommend to avoid positioning the flowmeter in an "elevated" area inside of which a gas pocket may be shaped under the gravity effect and contraction of volumes during an interruption.

Presence of small-sized solid particles within the liquid flow may involve a gradual deterioration of the flowmeter fixed or mobile elements (bearing support cross pieces, impeller), which would involve a gradual deterioration of performances, whereas the passage of larger solid elements would inflict definitive damages on these same elements.

We recommend therefore to make sure there is no risk of solid particle injection upstream from the measurement point and install a filter whose mesh can be dimensioned by means of the below table:

TZN Type	Recommended filtration (mm)	US MESH
16-012/025/036	0.088	170
20-05/1	0.21	70
25-2/3/5	0.4	40
32-8/12/15/20	0.707	25
40/8/12/15/20	0.707	25
50-30/50/70	0.841	20
80-70/110/140/200	1.19	16
100-200/300	1.68	12
150-400/600	1.68	12
200-800/1000	2.38	12
250-1200/2000	2.38	8
300-2400/3000	2.38	8
350-3500	2.38	8
400-4000	4	5
450-4800 / 5500	4.76	4
500-6000	4.76	4

Should a filter and degassing system be used simultaneously, positioning the deaerator as close as possible from the flowmeter is recommended.

In order to avoid any risk of liquid cavitation at the level of the measurement point, which would involve erratic measurements, we recommend to maintain a minimum pressure level downstream from the measurement point. This minimum value can be determined by means of the following formula for stable and liquids at air pressure:

$$P_{min} = 2 \times \Delta P + 1.25 \times P_V$$

with

P_{min}	Minimum pressure downstream from the flowmeter
Δ	Flowmeter pressure drop in the operating conditions
P_V	Vapour pressure of the liquid measured in the operating conditions.

For LPG, this minimum pressure can be set at P_V + 1 bar.

Mechanical installation

During the flowmeter installation on the pipe, check:

- The cleanliness of the pipe upstream from the flowmeter,
- The flow direction indicated by an arrow on the manufacturer's nameplate,
- The correspondence between flanges and joint faces, on the pipe side and flowmeter side,
- The flowmeter alignment with the upstream and downstream pipes and the absence of obstacle preventing the correct liquid flow (joint, …),
- The absence of excessive efforts supplied by the compensation of misalignments of upstream and downstream pipes by the flange tightening,
- The tightening torques recommended in Appendix IV are applied to flange bolting
- The electrical connection position to avoid the cabling traction.

Do not forget that as for any measuring instrument, a turbine flowmeter shall be handled with the greatest care.

Electrical installation

TZN flowmeters are equipped with detection systems including a coil and as an option a pre-amplifier positioned either in the coil well head, or inside of an explosion-proof enclosure or a weather-proof enclosure (the enclosure can be or cannot be connected to the boss).

The use of the coil alone enables the transmission of signals delivered over a maximum distance of about 200 metres providing shielded cables in areas of low electromagnetic interferences.

When delivered, the flowmeter can be equipped (according to option) with the complete system, incorporating the pre-amplifier. The coil / pre-amplifier connection is completed in factory and the flowmeter connection to the site cabling system is achieved as described in the pre-amplifier specific technical manual.

The use of 2 or 3-conductor shielded instrumentation cables is recommended

Example: 01 IT 09 EG (NF M 87-202)

- 01 One unit
- IT 3 conductor-instrumentation
- 09 Unit section 0.9 mm^2

For an installation in hazardous area, these cables shall meet the applicable specific requirements.

Chapter 5: Commissioning

On completion of the flowmeter installation on the pipe and on completion of the electrical connection of pulse emitter, proceed with the installation filling.

During this operation, check the purging of gas present in the pipes, by means of available draining systems or through the flowmeter at very low flow rate.

Avoid sudden flowmeter filling, so as to prevent rapid flow of gas "pockets", which would damage the impeller pivot system.

Avoid the flowmeter extended use beyond the specified operating maximum flow rate.

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Chapter 6: Maintenance

The TZN flowmeter does not require any particular maintenance, as its use remains in its operating limits.

However, it is recommended to proceed to a verification of the measuring sub-assembly, at least every three years. This verification can be a replacement in workshops of the pivot system (shafts, bearings and thrusts).

The TZN flowmeter may remain full of liquid, provided the liquid consistency does not change significantly in time.

In the event of extended interruption, it is recommended to keep the flowmeter full of liquid, so as to avoid sealing of pivots, except when the liquid may crystallize or solidify.

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Chapter 7: Dysfunction

Problem	Possible cause
The flowmeter overrates	1 – 2 – 5 - 7 – 8 – 9 – 10 – 11
The 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

Possible cause		Corrections
1	Disturbing pulses	Check the wiring (shielding) Check and replace when required the coil and/or the pre-amplifier.
2	Coil and/or pre-amp. defect	Check the pre-amp. adjustment and/or configuration. Replace the coil and/or pre-amp.
3	Magnetization loss	Replace the measuring sub-assembly.
4	Damaged pivot system	Replace the measuring sub-assembly.
5	Damaged impeller	Replace the measuring sub-assembly.
6	Blocked impeller	Clean the measuring sub-assembly. Replace the measuring sub-assembly.
7	Deposits on the internal walls	Clean the measuring sub-assembly. Check the installation conditions. Check the totality of upstream elements. Replace the measuring sub-assembly.
8	Deformation of the flow profile	Check the installation conditions. Check the totality of upstream elements. Repair / clean the flowstraightener. Clean the measuring sub-assembly.

9	Presence of gas in the flow	Eliminate the source. Check the totality of upstream elements. Install a deaerator.
10	Cavitation	Check the installation conditions. Check the totality of upstream elements. Repair / clean the flow straightener. Increase the line pressure.
11	Calibration problem	Replace the measuring sub-assembly.

Chapter 8: Repair

Pre-amplifier replacement (as an option)

This operation is performed, when the equipment is energized. Refer to the TEC07.02.07 manual of the magnetic sensors :

- Unscrew the explosion-proof enclosure cover (21),
- Disconnect the pre-amplifier from the site cabling,
- Remove both fastening screws from the pre-amplifier in the enclosure,
- Withdraw the pre-amplifier enclosure while avoiding to generate stress on the coil connection cable,
- Disconnect the coil / pre-amplifier connection cable.
- Perform the same operations in the reverse order for the assembly of a new pre-amplifier

Coil replacement

This operation can only be performed after the pre-amplifier disassembly.

- Disconnect the coil / pre-amplifier connection cable ,
- Withdraw the coil (15) while removing the retaining ring (20),
- Position the new coil, while ensuring the contact at the bottom of the well,
- Install a new ring, a new coil/preamplifier connecting cable,
- Re-position and screw the enclosure cover. Reposition and tighten the screws to a torque of 6 Nm.

Measuring sub-assembly replacement when nominal size ≤ 14"

This operation requires the flowmeter disassembly.

- ❑ Drain the measuring line,
- ❑ Disconnect the detection sub-assembly from the site cabling,
- ❑ Disassemble the flowmeter and install it vertically, Downstream side above, on a stable and "clean" surface,
- ❑ Unscrew the upstream ring (3),
- ❑ Withdraw the measuring sub-assembly (2) vertically,
- ❑ Insert the new measuring sub-assembly, while checking :
  - the flow direction
  - The cleanliness of the body internal surfaces
- ❑ Reposition and tighten the upstream ring. Recommended screw tightening torque shall be 5Nm.

Measuring sub-assembly replacement when nominal size≥16"

This operation requires the flowmeter disassembly.

- ❑ Drain the measuring line,
- ❑ Disconnect the detection sub-assembly from the site cabling,
- ❑ Disassemble the flowmeter and install it vertically, downstream side above, on a stable and "clean" surface,
- ❑ Unscrew the warhead nut after having removed the locking pin (TZN CUS VERSION only),
- ❑ Unscrew the downstream cross piece (6),
- ❑ Withdraw the downstream cross piece (2) and the rotor,
- ❑ Install the flowmeter horizontally and unscrew the upstream cross piece
- ❑ Withdraw the upstream cross piece and the nozzle,

- ❑ Check cleanliness of the body internal surfaces.
- ❑ Put the nozzle and the upstream cross piece together,
- ❑ Insert the assembly in the body and screw the upstream cross piece. Recommended screw tightening torque shall be 21.4 Nm,
- ❑ Install the turbine vertically (downstream side above) and insert the rotor
- ❑ Insert the downstream cross piece and screw it. Recommended screw tightening torque shall be 21.4 Nm.
- ❑ Check :
- Alignment of arrows on upstream and downstream cross pieces with lifting rings
- the flow direction
- ❑ Screw the warhead nut and insert the locking pin (TZN CUS VERSION only),

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Chapter 9: Analysis of pressure related risks

The analysis of dangerous phenomena, derived from solicitations to which the equipment can be submitted when installed and used in reasonably foreseeable operating conditions, show the following points:

- There is no risk, in the sense of a dangerous phenomenon, related to the possible rupture of an internal element or component.
- The equipment design and overall dimensions comply with the state-of-the-art rules and equipment category calculation code (ASME). Within this framework, using the equipment in reasonably foreseeable operating conditions does not allow to contemplate any risk, in the sense of a dangerous phenomenon.
- The operating restrictions and specific installation and implementation recommendations enabling to guarantee this absence of risk are specified in Appendix 3.

> *Remark: Equipment disassembly*
> *By definition, the equipment is designed to operate under fluid pressure. Allowing for the potential danger these fluids represent, the equipment shall be imperatively and completely drained, before disassembling the equipment (complete disassembly or removal of a component under pressure).*

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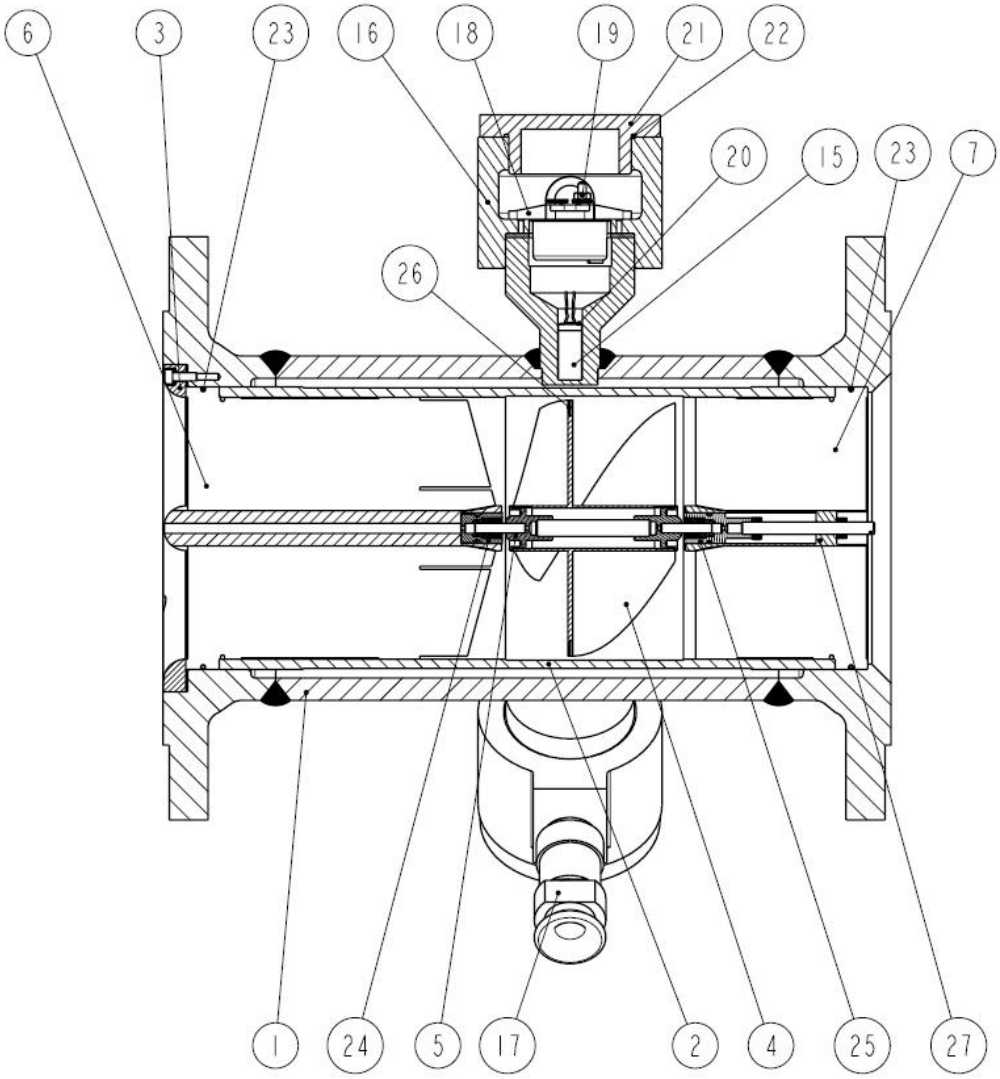
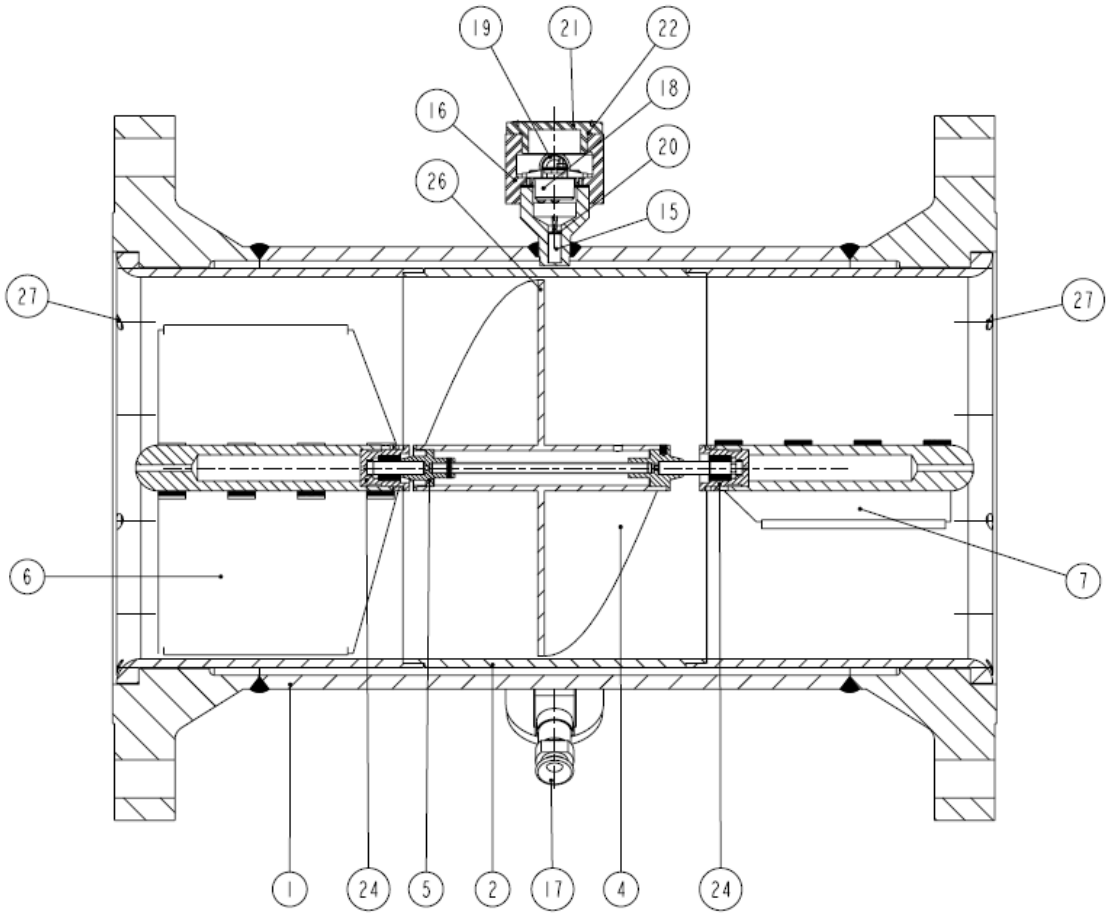
Appendix 1

Assembly drawing – Main elements

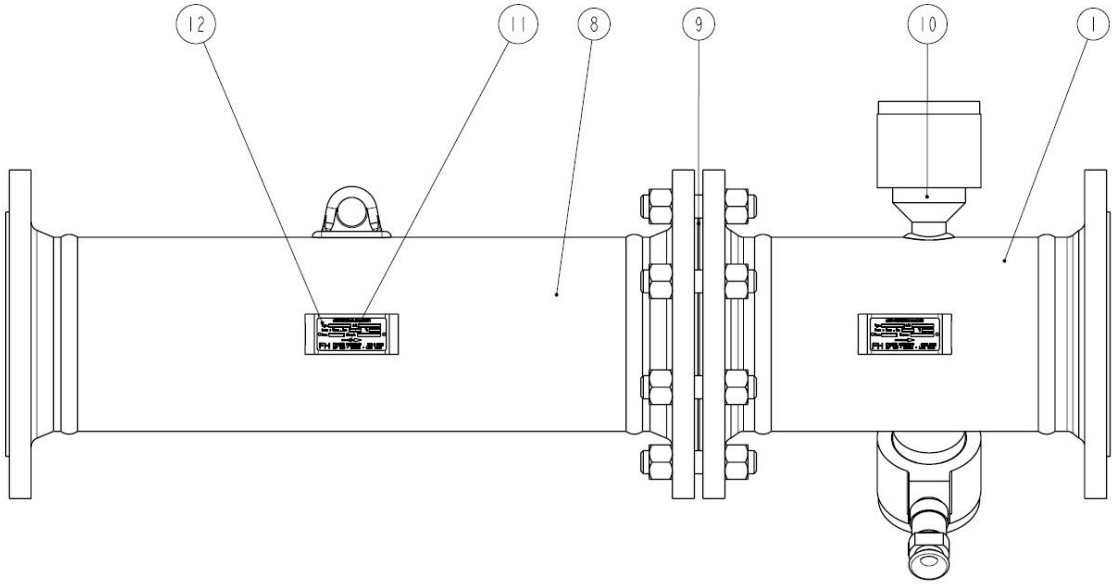
Nominal Size ≤ 14"



Nominal size ≥ 16"



Assembly drawing – Option with flowstraightener assembly



Main elements Nominal size ≤14"

1	Flanged body	8	Flow straightener	15	Coil	22	Seal
2	Measuring sub assembly	9	Facings	16	Explosion proof box	23	Vee-ring
3	Upstream ring	10	Coil wells	17	Cable gland	24	Fixed bearing
4	Impeller	11	Arrow	18	Preamplifier	25	Adjustable bearing
5	Shaft	12	Name plate	19	Cable gland	26	Magnets
6	Upstream support cross piece			20	Ring	27	Set-nut
7	Downstream support cross piece			21	Explosion proof enclosure		

Main elements Nominal size ≥16"

1	Flanged body	8	Flow straightener	15	Coil	22	Seal
2	Nozzle	9	Facings	16	Explosion proof box	23	Not applicable
3	Not applicable	10	Coil wells	17	Cable gland	24	Fixed bearing
4	Impeller	11	Arrow	18	Preamplifier	25	Not applicable
5	Shaft	12	Name plate	19	Cable gland	26	Magnets
6	Upstream support cross piece			20	Ring	27	Screws
7	Downstream support cross piece			21	Explosion proof enclosure		

Name plates

on the meter and flowstraightener	Are indicated: Builder address – Equipment – Model – Serial number – Year – Operating pressure – Flow range – Test pressure and date – Fluid Temperature range – Danger Group – Dimension – Faure Herman's ATEX agreement number – CE logo
on the Faure Herman 's enclosure	Are indicated: CE logo – Faure Herman's ATEX agreement number – ATEX Product number - the mention : Don not open when energized - Model – Serial number – Year – Ambient temperature range - Address

Appendix 2

K-factor – Flowrate / Frequency relationship

The K-factor, expressing the number of pulses delivered by the flowmeter per unit of volume is determined during calibration.

According to the adjustments performed, allowing especially for the viscosity of the liquid measured and the number of blades, the values of the below table are given for information purposes.

	16-012	16-025	20-05	20-1	25-2	25-3	25-5
K (p/m³)	5547000	2672000	1894000	512000	153000	153000	89000
Min. linear flowrate (m³/h)	0.012	0.025	0.05	0.1	0.2	0.3	0.5
• Min. linear frequency (Hz)	19	19	26	14	9	13	12
Max. linear flowrate (m³/h)	0.12	0.25	0.5	1	2	3	5
• Max. linear frequency (Hz)	190	190	260	140	90	130	120

	32-8	32-12	32-15	32-20	40-8	40-12	40-15	40-20
K (p/m³)	44000	33000	27000	21000	44000	33000	27000	21000
Min. linear flowrate (m³/h)	0.8	1.2	1.5	2	0.8	1.2	1.5	2
• Min. linear frequency (Hz)	10	11	11	12	10	11	11	12
Max. linear flowrate (m³/h)	8	12	15	20	8	12	15	20
• Max. linear frequency (Hz)	100	110	110	120	100	110	110	120

	50-30	50-50	50-70	80-70	80-110	80-150
K (p/m³)	25000	15000	10000	4400	4400	4400
Min. linear flowrate (m³/h)	3	5	7	7	11	14
• Min. linear frequency (Hz)	21	21	19	9	13	17
Max. linear flowrate (m³/h)	30	50	70	70	110	140
• Max. linear frequency (Hz)	210	210	190	90	130	170

	100-200	100-300	150-400	150-600	200-800	200-1000	250-1200
K (p/m³)	2250	1700	1650	700	450	450	240
Min. linear flowrate (m³/h)	20	30	40	60	80	100	120
• Min. linear frequency (Hz)	13	14	18	12	10	12	8
Max. linear flowrate (m³/h)	200	300	400	600	800	1000	1200
• Max. linear frequency (Hz)	130	140	180	120	100	120	80

	250-2000	300-2400	300-3000	350-3500	400-4000	450-4800	450-5500	500-6000
K (p/m³)	160	120	80	70	50	40	40	30
Min. linear flowrate (m³/h)	200	240	300	350	400	480	550	600
• Min. linear frequency (Hz)	9	8	7	7	6	5	6	5
Max. linear flowrate (m³/h)	2000	2400	3000	3500	4000	4800	5500	6000
• Max. linear frequency (Hz)	90	80	70	70	60	50	60	50

Appendix 3

Operating restrictions – Special recommendations

The equipment nominal operating field is specified on its nameplate. This field is mainly defined in terms of:

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

The flowrate restrictions specify the equipment optimal performance field (measurement accuracy and repeatability). The maximum value sets also the permissible continuous operating limit, without occasionally exceeding the 120 % of the set value.

The pressure and temperature restrictions involve exclusively the equipment mechanical dimensions and define the authorized operating field.

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

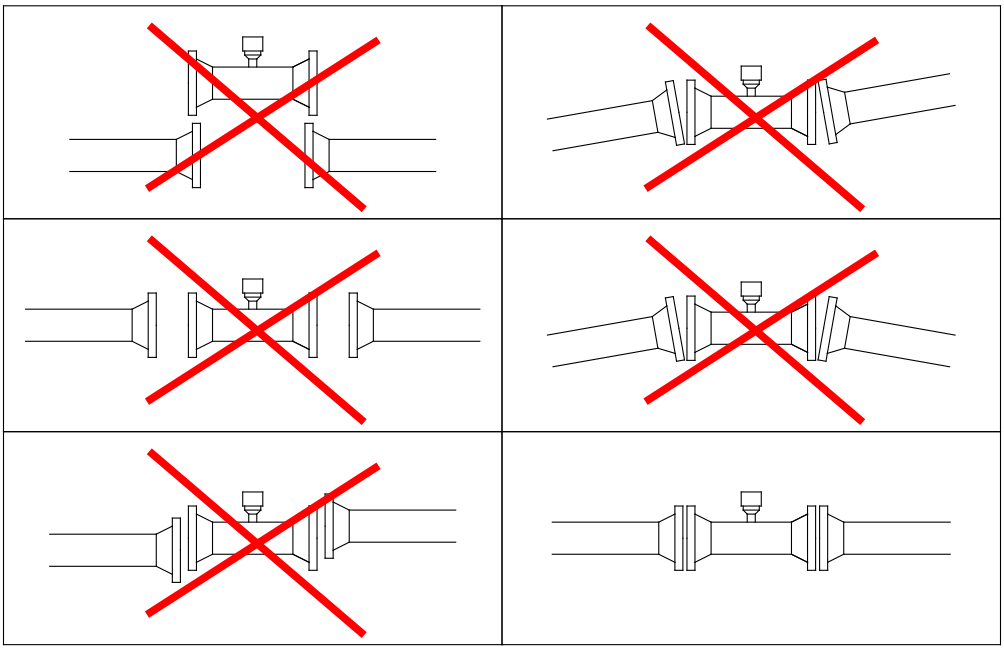
Equipment installation

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

The equipment mechanical installation on the measurement line shall not generate excessive stresses. Especially, the alignment of upstream and downstream flanges shall allow to avoid the transmission of stresses on the equipment body.

The equipment shall be installed by means of the suitable tools.

- Never use a hammer or impact wrench.
- No equipment element is designed to contribute to the tightening of connecting rods.
- Specific tools shall be used, when necessary, for the spacing between upstream and downstream flanges.



Lifting or pre-positioning means used, when necessary, shall be kept in place until installation achievement (tightening of all connecting rods).

Check the fitting of new gaskets, adapted to the application (material) and flange size.

Equipment disassembly

By definition, the equipment is designed to operate under fluid pressure. Allowing for the potential danger these fluids represent, the equipment shall be imperatively and completely drained, before disassembling the equipment (complete disassembly or removal of a component under pressure).

Should this draining need partial de-tightening of the equipment connecting rods, check the line is perfectly de-pressurized before de-tightening and implementation of the liquid recovery tank.

Flange gaskets shall not be re-used.

Remarks:
The equipment is a measuring instrument and shall be used as such.

The equipment body of the associated components (flowstraightener, bosses …) is designed to support stresses in reasonably foreseeable operating conditions. They are not designed to be used as supports, equipment carry means or step.
Any modification brought to the equipment, susceptible to affect the pressure resistance, after delivery, is STRICTLY PROHIBITED.

For any replacement of Electronic Board, the used Electronic Board is subjected to restrictive disposal according to the ROHS standard.

The disposal of the used Electronic Board should be either sent back to Faure Herman who will take care of its disposal, or dispose by the customer according to the EPA rules of its country.

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Appendix 4

Gasket

The equipment shall be assembled with gaskets according to NF EN 1514 and NF EN 12560 (or ASME B16.20 and ASME B16.21) standards and depending on flange type.

Spiral wound gaskets are forbidden for flanges rating below class 300 or PN 63.

Flange bolting

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

Tightening torque

Recommended tightening torque for Klingersil gasket type

Bolt size	Nm	Bolt size	Nm
M14	110	M30	1130
M16	170	M33	1520
M20	330	M36	1960
M24	570	M39	2525
M27	828	M42	3135

The link of a flowmeter equipped with a flow straightener is tightened at the factory but must be checked and retightened before commissioning. A label affixed to the flanges of this link calls attention to this requirement.

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Detailed contents

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