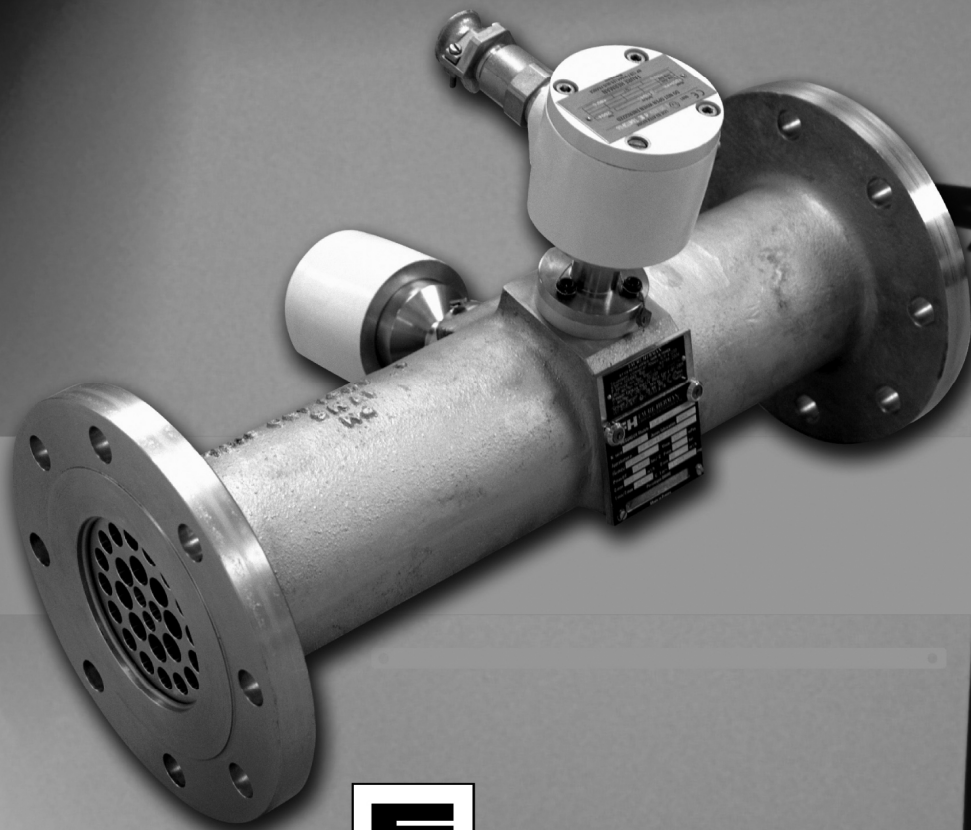




HELIFLU™ TLM/TLM-C

User's Manual



FAURE HERMAN

Mastering the Flow

*Part of the Liquid Controls Group
A Unit of IDEX Corporation*

IDEX

IDEX CORPORATION

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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 modifications 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.

General contents

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

ATEX recommendations	7
Chapter 1: Introduction	15
Chapter 2: Description and codification	17
Chapter 3: Equipment reception –storage and handling	21
Chapter 4: Installation conditions	23
Chapter 5: Commissioning	27
Chapter 6: Maintenance	29
Chapter 7: Dysfunction	31
Chapter 8: Repair	33
Chapter 9: Analysis of pressure related risks	35
Appendix 1	37



Appendix 2	38
Appendix 3	39
Appendix 4	42
Detailed contents	44
Personal notes	47

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.

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.

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.

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.

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.

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.



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.

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:

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.

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.

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

FI

ATEX-Suosituksset

Tämä laite on ATEX-varmennettu ja vastaa turvallisutta ja terveyttä koskevia oleellisia vaatimuksia koskien räjähdysvaarallisissa tiloissa käytettäviksi 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.

ATEX recommendations

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 εκρηξιμείς 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 υποσυστημάτων που αποτελούν τον εξοπλισμό αυτό.

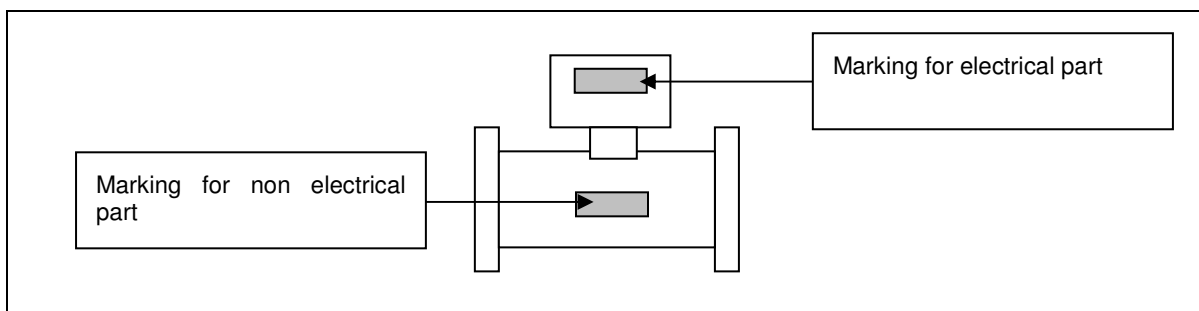
Η εγκατάσταση, η χρήση και η συντήρηση πρέπει να πραγματοποιούνται από καταρτισμένο και ειδικευμένο προσωπικό που κατανόει μία από τις γλώσσες του εγχειριδίου.

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

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.

ATEX recommendations

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

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

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*** for TLM turbine meter and ***LCIE 05 ATEX 6042X*** for TLM-C turbine meter. 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:

TLM Turbine meter:

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

TLM-C Turbine meter:

Marking	Description
FAURE HERMAN BP20154 - 72406 La Ferté Bernard Made in France Equipment : S/N... Year CE T° min/max (Ts): According to application LCIE 05 ATEX 6042 X  II 2 G c T6 to T4 (according to fluid temperature)	Company name Company address Model Serial number Manufacturing year CE Logo Fluid Temperature ATEX agreement number ATEX marking Equipment category Protection type Temperature classification

ATEX recommendations

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 $-50^{\circ}\text{C} \leq T_{\text{fluide}} \leq +80^{\circ}\text{C}$
T5 if $+80^{\circ}\text{C} \leq T_{\text{fluide}} \leq +95^{\circ}\text{C}$
T4 if $+95^{\circ}\text{C} \leq T_{\text{fluide}} \leq +130^{\circ}\text{C}$
T3 if $+130^{\circ}\text{C} \leq T_{\text{fluide}} \leq +195^{\circ}\text{C}$
T2 if $+195^{\circ}\text{C} \leq T_{\text{fluide}} \leq +290^{\circ}\text{C}$
T1 if $+290^{\circ}\text{C} \leq T_{\text{fluide}} \leq +350^{\circ}\text{C}$

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

For TLM-C turbine meter, as the body material is aluminium, the fluid temperature must be contained between -50°C and +100°C and the temperature classification is following.

T6 if $-50^{\circ}\text{C} \leq T_{\text{fluide}} \leq +80^{\circ}\text{C}$
T5 if $+80^{\circ}\text{C} \leq T_{\text{fluide}} \leq +95^{\circ}\text{C}$
T4 if $+95^{\circ}\text{C} \leq T_{\text{fluide}} \leq +100^{\circ}\text{C}$

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.

Chapter 1: Introduction

TLM family

Turbine flowmeters type TLM are dedicated to accurate volume measurement of medium viscosity liquids (less or equal to 20 cSt) especially for loading/offloading applications.

Their simple and rugged construction allows to warrant a very high accuracy and an excellent repeatability of measurements for numerous industrial applications.

The use of an autonomous measuring sub-assembly that can be calibrated in factory without the body used in line allows to extend the field of application and to reduce significantly the maintenance cost.

The operating principle of this flowmeter type rests on the measurement of the rotation velocity of a helical impeller positioned in the middle of the pipe, by means of an assembly : magnets (positioned in the blades) – coil (positioned into the flowmeter body).

Measurement of the electrical signal frequency generated allows to calculate the liquid flow rate flowing through the pipe by means of the following formula:

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

- where
- Q Instantaneous flow rate (m³/h)
 - F Signal frequency (Hz)
 - K Measuring sub-assembly relevant coefficient, determined and recorded during factory or site calibration (p/m³) (refer to Appendix 2)



Metering pulses generated by the coil allows to calculate the volume flowed between two given periods of times by means of the following formula:

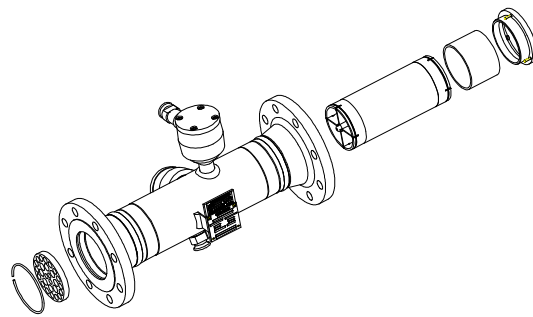
$$V = \frac{N}{K}$$

- Where
- V Volume (m³)
 - N Number of totalized pulses
 - K Measuring sub-assembly relevant coefficient, determined and recorded during factory or site calibration (p/m³) (refer to Appendix 2)

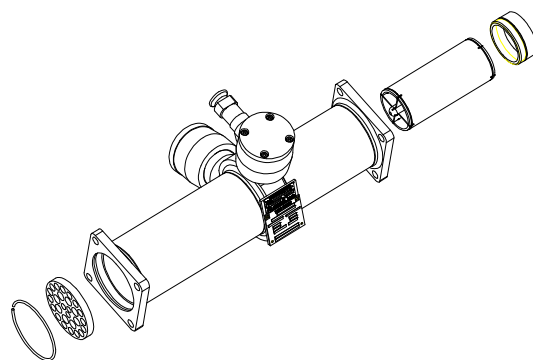
Chapter 2: Description and codification

Turbine flowmeters type TLM are designed according to the same principle and consist of the following main elements:

- Flanged body
- Measuring sub-assembly
- Flowstraightener
- Detection sub-assembly



TLM



TLM-C

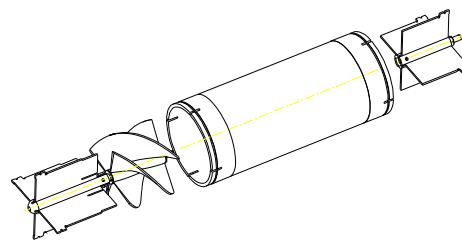
Body

The flowmeter body is engineered in stainless steel for the basic version, and in Aluminium alloy for model C. Welded or screwed boss (es) to the flowmeter body allows to fit the detection coil and to position the electrical interfacing box receiving the pre-amplifier.

Measuring sub-assembly

This measuring sub-assembly incorporates 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 stainless steel nozzle (AISI 316L or equivalent) receives all the other elements of the measuring sub-assembly.
- Stainless steel upstream and downstream bearing supports cross pieces (AISI 316L or equivalent) receive the bearings allowing the impeller centering.
- The helical impeller, fitted with shafts and magnets allowing to generate electrical pulses through the detection coil.



Chapter 2: Description and codification

Flowstraightener

The flowstraightener, plate type, allows to minimize the effect of the upstream flow disturbances. The plate is secured by means of a ring (stainless steel) centred into a body groove.

Detection sub-assembly

The detection sub-assembly comprises the following elements:

- A coil secured by means of a ring and fitted with a 2-pin connector.
- A coil/pre-amplifier connection cable
- A pre-amplifier allowing to increase significantly the maximum distance between the flowmeter and the electronic display and/or calculation unit (up to 5000 metres).
- An explosion-proof enclosure allowing the use of the flowmeter in hazardous area.

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:

**По вопросам продаж и поддержки обращайтесь:
Тел./факс: +7(843)206-01-48 (факс доб.0)
fhm@nt-rt.ru
www.faureherman.nt-rt.ru**

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 / $+70^{\circ}\text{C}$.

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

General installation conditions of turbine flowmeters type TLM, shall meet some principles, in order to confirm the equipment reliability and guarantee long-term accurate repeatable and stable results.

TLM turbine flowmeters can be installed on a horizontal or vertical plane provided the flowrate is downstream.

The installation conditions of TLM flowmeters are defined in the type approval and detailed below:

TLM Type	Straight length (x DN)	
	Upstream	Downstream
3-30/50/70	0	0
3-110/150	0	0
4-70/110	0	0
4-150	0	0
4-200	3	0
4-300	3	0

These installation conditions are applicable to the basic model and to model « C ».

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



Presence of gas in the form of bubbles or emulsion would involve a significant deterioration of performances, whereas gas pockets admission between two liquid sections may inflict damages to the impeller pivot system, involving thus serious measurement errors.

It is recommended to check there is no risk of gas injection upstream from the measurement and to provide, when required, a purge device or air eliminator upstream from the flowmeter. For an elevated installation, positioning the flowmeter in a "high" area is proscribed, inside of which a gas pocket may be generated under the effect of gravity and volume contraction during an interruption.

Small-sized solid particles in the liquid flow may involve a progressive deterioration of the flowmeter fixed or moving elements (bearing support cross pieces, impeller), which would damage progressively performances, whereas the admission of larger solid elements would cause ultimate damages on these same elements.

It is recommended to check there is no risk of solid particle injection upstream from the flowmeter and to provide a strainer whose mesh may be dimensioned by means of the table below:

TLM Type	Recommended filtration (mm)	US MESH
3-30/50/70	0.841	20
3-110/150	1.00	18
4-70/110	1.00	18
4-150	1.00	18
4-200/300	1.41	14

Should a strainer together with an air eliminator system be used, positioning the air eliminator as close as possible to the flowmeter is recommended.

To prevent any risk of liquid cavitation, which would generate erratic results, it is recommended to keep a minimum pressure

Chapter 4: Installation conditions

level downstream from the measurement. This minimum value can be set by means of the following formula for stable liquids at air pressure:

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

with

P_{\min}	Minimum pressure downstream from the flowmeter
ΔP	Flowmeter pressure drop in the operating conditions (Appendix 1)
P_V	Steam 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, represented by an arrow on the nameplate.
- The correspondence between flanges and faces, on the pipe side and flowmeter side.
- The flowmeter alignment with the upstream and downstream pipes and the absence of obstruction to the liquid flow (gasket ...).
- The absence of excessive stress involved by the compensation of misalignments of upstream and downstream pipes by flange tightening.
- The positioning of electrical connection to avoid any risk of wiring traction.

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

Electrical installation

TLM flowmeters are equipped with detection systems consisting of a coil and a pre-amplifier located in an explosion-proof enclosure.

The use of the coil alone allows the transmission of signals delivered on a maximum distance of about 200 metres (660 ft) provided shielded cables are used in areas with low electromagnetic interferences.

When delivered, the flowmeter is equipped with a comprehensive system, incorporating the pre-amplifier. The coil / pre-amplifier connection is completed in our workshops and connection between flowmeter and site wiring is performed as described in the pre-amplifier specific user's manual.

It is recommended to use instrumentation cables, 2 or 3 shielded connectors.

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

- 01 One unit
- IT 3 connectors instrumentation
- 09 Unit section 0.9 mm²

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

Chapter 5: Commissioning

On completion of the flowmeter mechanical installation on the piping and of the electrical connection of the pulse generator assembly, 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.

Chapter 6: Maintenance

The TLM 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 TLM 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

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

Remedy	Corrections
1 Disturb pulses	Check cabling Verify and replace when required the coil and/or pre-amplifier
2 Coil and/or pre-amp. defect	Verify the adjustment and/or the pre-amp. configuration. Replace the coil and/or the pre-amp.
3 Loss of magnets	Replace the measuring sub-assembly
4 Damaged bearing system	Replace the measuring sub-assembly
5 Damaged impeller	Replace the measuring sub-assembly
6 Blocked impeller	Clean the measuring assembly Replace the measuring sub-assembly
7 Depots on 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	Verify the installation conditions Verify the totality of upstream elements Repair / clean the flowstraightener Clean the measuring sub-assembly
9 Presence of gas in flow	Eliminate the source



		Verify the totality of upstream elements Install a deaerator
10	Cavitation	Verify the installation conditions Verify the totality of upstream elements Repair / clean the flowstraightener Increase the line pressure
11	Calibration problem	Replace the measuring sub-assembly

Chapter 8: Repair

Pre-amplifier replacement

This operation is performed out of the dangerous area and when the instrument is de-energized.

- ❑ Unscrew the explosion-proof enclosure cover
- ❑ Disconnect the pre-amplifier from the site cabling.
- ❑ Remove both fastening screws of pre-amplifier from the enclosure.
- ❑ Withdraw the pre-amplifier from the enclosure while taking care so that no stress is generated to the coil connection cable.
- ❑ Disconnect the coil / pre-amplifier connection cable.
- ❑ Perform the same operations in the reverse order to assemble a new pre-amplifier.

Coil replacement

This operation can be carried out only after disassembly of the pre-amplifier.

- ❑ Unscrew the explosion-proof enclosure fastening fitting.
- ❑ Withdraw the coil, while removing the retaining ring.
- ❑ Position the new coil while keeping the contact at the bottom of the well.
- ❑ Position a new ring.
- ❑ Re-install the coil / pre-amplifier connection cable.
- ❑ Re-position and tighten up the enclosure cover

Measuring sub-assembly replacement

This operation requires the flowmeter disassembly.

- ❑ Drain the measuring line.
- ❑ Disconnect the site wiring detection sub-assembly.

- Disassemble the flowmeter and position it on a vertical plane, upstream above, on a stable and « clean » surface
- Unscrew the measuring sub-assembly and withdraw it vertically
- Insert the new measurement sub-assembly, while taking care to check:
 - The positioning of the downstream washer
 - The flow direction
 - The cleanliness of the body internal surfaces
- Re-position and screw the measuring sub-assembly

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).



Appendix 1

Pressure drop

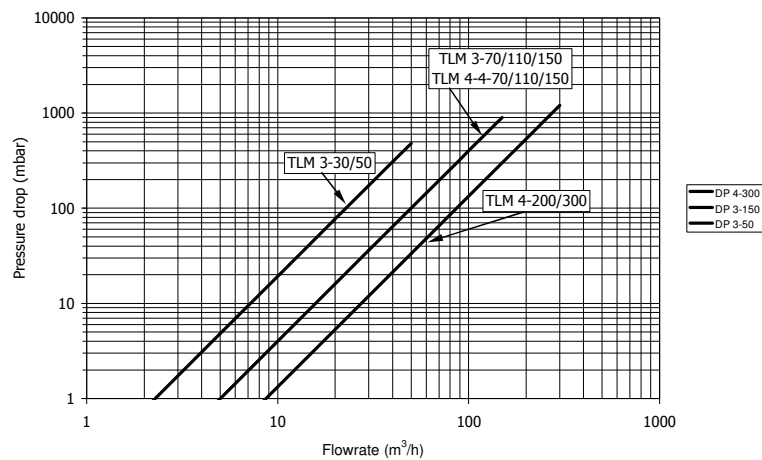
Pressure drops of the flowmeter alone are determined as represented below for a fluid whose viscosity is 1 cSt and specific gravity 1.

TLM	3-30	3-50	3-70	3-110	3-150	4-70	4-110	4-150	4-200	4-300
ΔP (mbar)	200	480	200	500	900	200	410	780	550	1200

In the event of metering application of a liquid with viscosity ν , and specific gravity d , the pressure drop can be assessed by means of the following formula:

$$\Delta P = \Delta P_{ref} \times d \times \nu^{0.2}$$

- with ΔP : Pressure drop in the flowmeter in the application conditions
 ΔP_{ref} : Reference pressure drop (refer to the graph above)
 d : Specific gravity of the liquid used
 ν : Kinematic Viscosity of the liquid used (cSt)



Appendix 2

K-factor – Flowrate / Frequency relationship

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

According to the performed adjustments, while taking into account especially the viscosity of the measured liquid, values indicated in the table below are given for information purposes only.

	3-30	3-50	3-70	3-110	3-150	4-70	4-110	4-150	4-200	4-300
K (p/m ³)	13000	13000	22500	13000	13000	13000	13000	13000	4400	3600
Min. linear flowrate (m ³ /h)	3	5	7	11	15	7	11	15	20	30
• Min. linear Frequency (Hz)	11	18	44	40	55	25	40	55	25	30
Max. linear flowrate (m ³ /h)	30	50	70	110	150	70	110	150	200	300
• Max. linear Frequency (Hz)	110	180	440	400	550	250	400	550	250	300

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 NF EN 1092-1 and NF EN 1759-1 Standard.

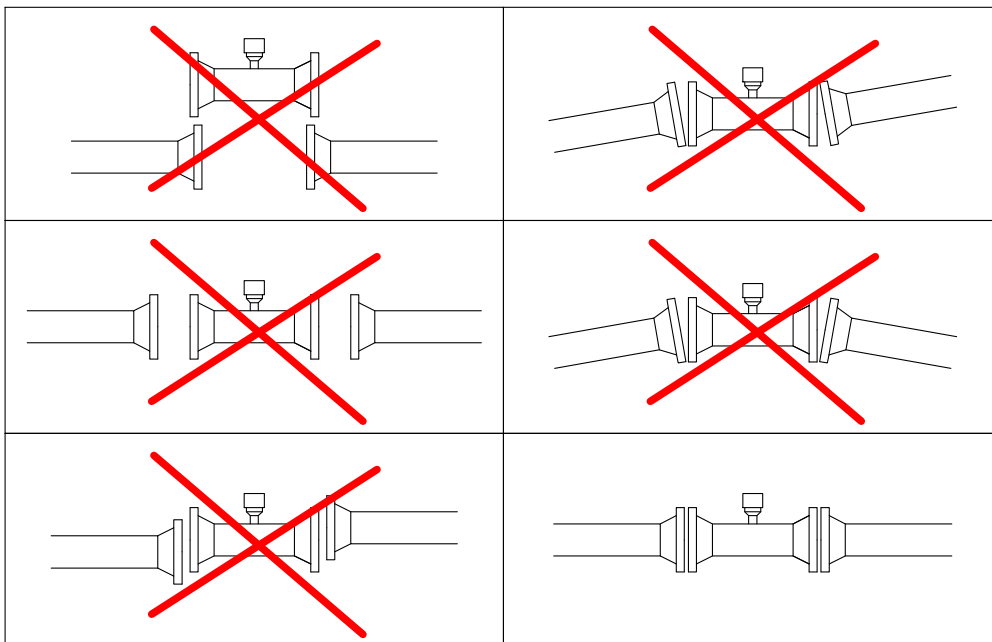
Equipment installation

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.

Appendix 3

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 ...) are 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.

Appendix 4

Gasket

The equipment shall be assembled with gaskets according to NF EN 1514 and NF EN 12560 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 EN ISO 898-1 standard for temperature between -45°C and +480°C.

Tightening torque

Approximative tightening torque for Klinger sil gasket type

Bolts size	Nm	Bolts size	Nm
M14	110	M16	170
M20	330	M24	570

Detailed contents

ATEX recommendations	7
Chapter 1: Introduction	15
TLM family	15
Chapter 2: Description and codification	17
Body	18
Measuring sub-assembly	18
Flowstraightener	19
Detection sub-assembly	19
Chapter 3: Equipment reception –storage and handling	21
Chapter 4: Installation conditions	23
Mechanical installation	25
Electrical installation	26
Chapter 5: Commissioning	27
Chapter 6: Maintenance	29
Chapter 7: Dysfunction	31
Chapter 8: Repair	33

Detailed contents

Pre-amplifier replacement	33
Coil replacement	33
Measuring sub-assembly replacement	33
Chapter 9: Analysis of pressure related risks	35
Appendix 1	37
Pressure drop	37
Appendix 2	38
K-factor – Flowrate / Frequency relationship	38
Appendix 3	39
Operating restrictions – Special recommendations	39
Equipment installation	39
Equipment disassembly	41
Appendix 4	42
Gasket	42
Flange bolting	42
Tightening torque	42
Approximative tightening torque for Klinger sil gasket type	42



Detailed contents

44

Personal notes

47

Personal notes

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