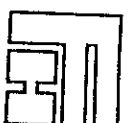


TZN FLOWMETER MANUAL FOR LIQUIDS

TABLE OF CONTENTS

	Page
GENERAL INFORMATION.....	3
DESCRIPTION.....	3
FLOWMETER BODY.....	3
COMPLETE NOZZLE.....	3
ROTOR.....	4
BEARING SUPPORT CROSS PIECES AND BEARINGS.....	4
CONNECTION AND PICK-UP COIL.....	4
FLOW STRAIGHTENER.....	5
ASSOCIATED ELECTRONICS.....	5
PREPARATIVES BEFORE USE.....	6
INSTALLATION RECOMMENDATIONS.....	7
INSTALLATION INSTRUCTIONS.....	7
Preliminary checks.....	9
Flowmeter installation.....	9
Electrical connection.....	9
MAINTENANCE.....	9
SERVICING.....	10
REMOVAL - DISASSEMBLY.....	10
Removal of flowmeter.....	11
Disassembly of pick-up coil.....	11
Disassembly of preamplifier.....	12
Removal of bearing support cross pieces and rotor.....	12
Disassembly of rotor and bearings.....	12
REASSEMBLY.....	13
Reassembly of pick-up coil.....	13
Reassembly of preamplifier.....	13
Reassembly of rotor and bearing support cross pieces.....	14
Setting of bearings.....	14
Installation of flowmeter.....	15
STORAGE.....	16
GENERAL INFORMATION.....	17
FLOWMETER STORAGE.....	17
FLOWMETER STORAGE.....	17



TZN FLOWMETER MANUAL FOR LIQUIDS

1 - GENERAL INFORMATION

The FAURE HERMAN flowmeters of TZN type consist of a helicoidal rotor revolving freely between bearings fitted within a cylindrical conduit.

The detection of rotation is provided by detecting the variations of magnetic field which is created by integrated magnets of the rotor by means of pick-up coils in the turbine meter body.

At each revolution, the magnet generates an electrical signal, which is delivered to the terminals of each pick-up coil (according to versions, 1 or 2 simple or double pick-up coils).

2 - DESCRIPTION

The flowmeter mainly comprises :

- A - A body
- B - A nozzle (removable measuring conduit)
- C - A rotor
- D - Two bearing support cross pieces with bearings
- E - One or two pick-up coils provided with bearings
- F - In option, one flow straightener
- G - In option, one pick-up coil preamplifier

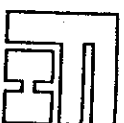
According to types (see figure 1), the connection to the pipe lines of the installation is achieved by means of flanges (type 1 assembly), of screwed end-fittings (type 2 assembly) or by tightening the flowmeter between the installation flanges (type 3 assembly).

A - FLOWMETER BODY (figure 2)

Generally made of stainless and internally-machined steel or other non magnetic materials, the body (1) is fitted with a removable measuring chamber or nozzle (2).

- The body is fitted with one or several welded coil wells (or bosses) (10) and assembled so as to avoid that the pulses generated by two pick-up coils are in phase. Such detectors are replaced on some models by assemblies secured by screws to the turbine body.

- Each well receives a single or dual coil (15) and a connection box (16).



TZN FLOWMETER MANUAL FOR LIQUIDS

Upon the outside of the body :

- One arrow is provided to indicate the liquid flow direction,
- One identification plate is provided to identify the equipment.

B. COMPLETE NOZZLE (figure 2)

The nozzle (2) forms the measuring chamber.

The nozzle holds in the body by the tightening of a ring (3) upstream of the nozzle.

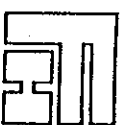
Upon the outside of the nozzle, one arrow is provided to indicate the flow direction.

C. ROTOR (figure 2)

The rotor comprises :

- one rotor element (4) made of stainless steel 316L, titanium or light metal (other materials are possible),
 - Force mounted end-fittings or by internal mounting screws to the hub of rotor element. They secure the bearings points (5) or the shafts of the rotor (see modification figure 2),
 - A magnet (26) is located in the hub of rotor element; on some models, the magnet is replaced by magnets mounted on the ends of some blades.
- One arrow on the rotor element is provided to indicate the flow direction.

The rotor revolves freely between end bearings (24) or between bearings (see modification figure 2) according to the bearing type of the model.



TZN FLOWMETER MANUAL FOR LIQUIDS

D . BEARING SUPPORT CROSS PIECES AND BEARINGS (figure 2)

Each bearing support cross piece (6 et 7) is provided with a hub center section to receive the bearings. The upstream bearing support cross piece (6) receives a fixed bearing (24) and the downstream bearing support cross piece (7) receives an adjustable bearing (25). The bearing support cross pieces are attached by heels carried in the nozzle slots. They are secured by the tightening of a ring upstream of the nozzle, they are supported on a stop machined upstream of the body. According to models, the ring is threaded and screwed directly on the nozzle, they rest on a machined stop downstream of the body. According to models, the ring is threaded and screwed directly on the nozzle or tightened by lock screws.

The bearing support cross pieces hold in the nozzle, during storage, assembly and disassembly operations, by means of two O-rings.

E . CONNECTION AND PICK-UP COIL (FIGURE 2)

Each machined boss, welded upon the flowmeter body, is used to secure the connection box or an optional associated electronics.

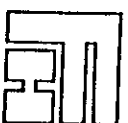
The connection box (16) is fitted laterally with a gland (17) for passage of the electrical connection cable.

Within the connection box, an insulated mount (18) secured by two screws and washers, carries two or four screw-type terminals (19).

Two or four terminal lugs provide means of connecting the leads of pick-up coil (15). The latter is secured by means of a retaining ring (20).

The braided shielding of the connection cable is grounded by means of a screw.

A cover (21), with a seal (22) and secured by screws and washers, is used to seal the connection box (this assembly is of the explosion-proof or water-tight type according to the type of gland used).



TZN FLOWMETER MANUAL FOR LIQUIDS

F . FLOW STRAIGHTENER (in option - figure 2)

Installed upstream of the flowmeter, and adapted to match the flowmeter characteristics, the flow straightener (8) is designed to regularize the fluid flow and to minimize any disturbances produced by elbow fittings and other particular elements upstream of the turbine.

It provides means of improving and confirming the accuracy of the flow rate measurement.

The flow straightener consists of a cylindrical conduit with coupling flanges or threading provides means of attachment to the flowmeter and to the installation piping.

Upon the outside of the flow straightener body, one arrow (11) is provided to indicate the fluid flow direction.

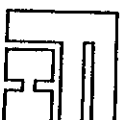
One identification plate (12) is provided to identify the equipment.

Within the flow straightener, a set of cross planes or of tubes regularizes the fluid flow stream.

According to official regulation of the French Department of Metrology for custody transfer application, the fixing bolts are machined to receive an official seal.

G . ASSOCIATED ELECTRONICS (in option - figure 2)

According to models, they are installed instead of the terminal board in the box (16), or are attached to the bosses (10).

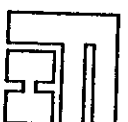


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PREPARATIVES BEFORE USE

1 - INSTALLATION RECOMMENDATIONS

- The flowmeter is capable of operating in all positions provided that the flow direction, indicated by arrows on the flowmeter body is observed.
Nevertheless, if the flowmeter is installed in a sloping or vertical pipeline, it is preferable that flow should take place in an upward direction.
- In order to avoid flow disturbance, the flowmeter should not be installed in pipeline sections possessing abrupt sectional variations, sharp-bend elbow fittings or in the vicinity of valves, filters and other flow disturbing elements.
- To obtain satisfactory measurements, it is recommended that a straight pipeline section of length at least 10 times the nominal flowmeter diameter, should be installed upstream of the flowmeter, together with a section of length five times nominal diameter in the downstream position.
- For satisfactory operation of the flowmeter in all cases, ensure that the measurement section is completely full of liquid, even at standstill.
- When flow is controlled by a valve, it is recommended that this valve should be installed downstream of the flowmeter.
- As far as possible, the flowmeter must be installed remote from any electro-magnetic fields capable of producing electromagnetic interference.
- Connection of the flowmeter to the electronic converter must be achieved using an insulated shielded double wire cable. The earthing is only possible at one end of the shielding, the other end of the shielding being carefully insulated. The shielding and strip of the cable must be connected without intermediate connection, either on the side of the flowmeter by an earth connection of the shielding and strip, or on the side of electronics by a ground connection of the shielding and earth connection of the strip. The ground connection is achieved on the one device with the lowest earthing resistance.

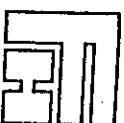


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- On the side of the flowmeter, the ground connection is achieved by a screw located within the connection box.
- On the side of the converter, the ground connection is achieved by back terminals provided.
- The distance between the flowmeter and the converter may be as much as 1000 meters, without preamplifier, unless risks of interferences on the line.

Forme n° :



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2. INSTALLATION INSTRUCTIONS

A. Preliminary checking operations

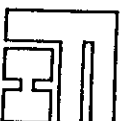
- If applicable, remove protection components installed on the connecting flanges and check the coupling joint surfaces.
- Ensure that the measuring chamber is free from foreign bodies and is free from any trace of erosion.
- Check that the rotor turns freely between its bearings without excessive clearance.

B. Installation of the flowmeter

- Offer up the flowmeter, fitted with its seals between the coupling flanges of the pipeline and secure by means of bolts and washers. The flowmeters fitted with screwed connections, are connected to adapted end-fittings, the flowmeters without flanges are installed as standard flowmeters, replacing bolts by threaded stems of sufficient length so as to connect both coupling flanges.
- Moderately tighten the bolts to avoid applying a tractive load upon the flanges.

C. Connection of the flowmeter (figure 2)

- Unscrew the four screws from the cover, remove the washers and detach cover (21) providing access to the terminal board (18).
- Check the good condition of the cable sleeve and the seals (22).
- Connect the cable leads to screw-type terminals (19) in accordance with the wiring diagram supplied with the equipment.
- If necessary, ground the cable shielding braid by using the screw provided.
- Reassembly the cover (21).



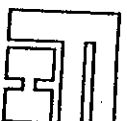
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MAINTENANCE

1. SERVICING

- The flowmeters are designed to operate with clean fluids. If such is not the case, provide a suitable strainer upstream of the flowmeter.
 - Regular inspection of the flowmeter is recommended at intervals of 4000 operating hours (or every 6 months).
 - The condition of the bearings and the freedom from moisture in the pick-up coils must be carefully checked.
 - The frequency of maintenance inspections must be increased if the flowmeter is operated with a fluid which is contaminated to some extent with solid particles. It is true to state that certain contaminating elements in suspension in the fluid are capable of producing rapid erosion and wear of moving components.
 - Deposits that may possibly be found upon the measuring components may provide a false indication. It is therefore necessary to undertake periodical cleaning operations in accordance with the accumulation of these deposits.
 - After removal of the flowmeter (see paragraph 2-A), check freedom from traces of erosion or chocking.
 - Clean all sections in contact with the fluid, if necessary, using a solvent and dry in surrounding air.
- CAUTION : THE USE OF STEAM OR COMPRESSED AIR FOR DRYING THE FLOWMETER IS PROHIBITED TO AVOID THE RISK OF DRIVING THE ROTOR AT A SPEED FOR WHICH IT IS NOT DESIGNED AND WHICH MAY PRODUCE PREMATURE BEARING WEAR OR DESTRUCTION.
- Check that the rotor turns freely without excessive end clearance. If excessive, reduce this end clearance by means of the adjustable bearing.



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2 - REMOVAL - DISASSEMBLY

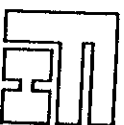
WARNING :

BEFORE UNDERTAKING REMOVAL, ENSURE THAT THE POWER IS NOT ON.

IDENTIFICATION OF COMPONENTS NECESSARY TO FACILITATE REASSEMBLY.

A . Removal of the flowmeter

- Remove cover from the connection box.
- Slacken the grounding screw and free the grounding braid of the cable shielding.
- Identify the connecting cable leads and disconnect them.
- Type assembly 1 (figure 1) :
 - Unscrew the coupling bolts.
 - Spread apart the pipeline flanges and remove the flowmeter, taking care to avoid impacts.
- Type assembly 2 (figure 1) :
 - Unscrew the adapted end-fittings.
- Remove the flowmeter taking care to avoid impacts.
- Type assembly 3 (figure 1) :
 - Unscrew the coupling bolts from each end of threaded stems.
 - Spread apart the installation flanges and remove the flowmeter taking care to avoid impacts.



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B . Disassembly of pick-up coils (figure 2)

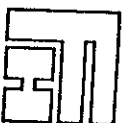
- Remove cover from the connection box.
- Disconnect the cable leads and the shielding from the connecting cable (see foregoing paragraph 2-A).
- Unscrew the two screws securing terminal board (18) on the connection box (16).
- Remove the retaining ring (20) and simultaneously remove the pick-up coil (15) and terminal board (18).

C . Disassembly of preamplifier

Process as described for disassembly of pick-up coil, if the preamplifier is integrated in the terminal box.

D . Removal of bearing support cross pieces and rotor (figure 2)

- Remove the flowmeter (see paragraph 2-A).
- Remove the lock screws of the nozzle or the threaded ring according to models.
- Remove the ring upstream of the nozzle.
- Identify the position of upstream (6) and downstream (7) bearing support cross pieces relative to flowmeter body (1).
- Withdraw the measuring set (nozzle, bearing support cross pieces, rotor element), the bearing support cross pieces are carried in the nozzle by a snap ring (23).
- Remove the upstream bearing support cross piece by drawing it outside of the nozzle, after removing the retaining ring (23).
- Remove the rotor assembly.
- Remove the downstream bearing support cross piece in a similar way as the upstream bearing support cross piece.



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E : Disassembly of rotor and bearings (figure 2)

IMPORTANT NOTE : These operations must be carried out with the greatest care to avoid damaging the bearings.

(1) Disassembly of rotor

According to models :

- Withdraw the force mounted end-fittings of rotor element in the hub by means of sharp nose pliers.

- Unscrew the end-fittings of rotor element by means of hook spanners.

Do not tighten the rotor element in a vice to avoid blade distortion.

(2) Disassembly of bearings

- Unscrew the chek nut (27) upon the downstream bearing support cross piece and remove the washer in order to withdraw the adjustable bearing (25) fitted with bearings, which is screwed on the bearing support cross piece hub.

- Withdraw the upstream bearing (24) by means of a puller, using the machine groove in the bearing body.

3 . REASSEMBLY

A . Reassembly of the pick-up coil (figure 2)

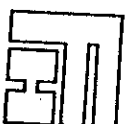
- Connect the terminal lugs to terminals in accordance with the identification marks made during disassembly.

- Introduce the pick-up coil (15) wether or not fitted with the spacer, according to assembly, into the boss (10) of the body and secure it by means of a retaining ring (20).

- Secure the terminal board (18) on the connection box (16) by means of screws and washers.

- Connect the connection cable (see preparatives for use, paragraph 2-C).

- Check the condition of cable and seal (22) and secure cover (21).



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B. Reassembly of preamplifier

Proceed as described for installation of pick-up coil.

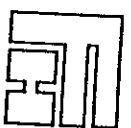
C. Reassembly of rotor and bearing support cross pieces
(Figure 2)

- Check the good condition of end-fittings of rotor element, and if necessary replace them.
Force mounted end-fittings :

- Offer up a new end-fitting at an end of the hub.
- Force mount the end-fitting in the hub, protecting adequately the pivot on the one hand, and the free end if the hub on the other hand.
- Mount similarly the second end-fitting, protecting both pivots.

Screwed end-fittings :

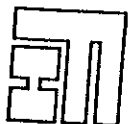
- Tighten an end-fitting of a rotor element on the brace rod.
- Introduce the end-fitting of the hub fitted with the brace rod into a bore of the rotor element hub. The assembly is slide fit.
- Screw progressively the second end-fitting up to stop.
- Tighten using hook spanners. The rotor element must not be tightened in a vice to avoid blades distortion.
- Check that the end-fittings flanges rest on the ends of the rotor element hub.
- Press mount new bearings.
- Reassemble the upstream bearing support cross piece (6) fitted with bearing (24) into body, in accordance with the identification marks made during disassembly with the flow direction identified on the nozzle by an arrow.
- Install the retaining ring (23).



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TZN FLOWMETER MANUAL FOR LIQUIDS

- Engage the rotor support cross piece of the upstream bearing locate correctly the rotor element so as to direct the arrow point downstream .
 - Install the body (1) vertically with the upstream bearing support cross piece downwards.
 - Recede to a maximum the adjustable bearing (25) from the downstream bearing support cross piece to give the maximum clearance to the rotor element.
 - Reassembly the downstream bearing support cross piece (7), following the same procedure as for the upstream bearing support cross piece, making sure that the end of the rotor engages correctly and without binding into the adjustable bearing (25).
 - If the downstream bearing is not engaged, unscrew very slightly the downstream bearing (25) before trying again the assembly.
 - Install the retaining ring (23) of downstream bearing support cross piece.
 - Introduce the nozzle, without forcing, into the turbine body in accordance with the flow direction.
 - Install the input ring
 - Tighten (but not excessively) the attaching screws of the ring.
 - Check that the rotor turns freely, blowing in the bore of the body.
- D . Setting of bearings (figure 2)
- Position the body (1) vertically with adjustable bearing directed upwards.
 - Assess the clearance play of rotor element, reduce it very progressively by setting the downstream bearing up to maximum 0,05 mm for a cone assembly and up to maximum 0,2 mm for an axial assembly.
 - Blow lightly to rotate slowly the rotor.
 - Tighten the check-nut (27) by holding the bearing in this position.

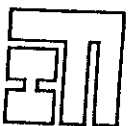


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E . Installation of the flowmeter

- For this operation, refer to paragraph 2, PREPARATIVES BEFORE USE.
- Nevertheless, systematically replace the seals of the coupling flanges, locating them so as to avoid obstructing the pipeline channel.
- Connect the connecting cable leads in accordance with the marks made during disassembly.



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STORAGE

1 • GENERAL INFORMATION

The flowmeter is supplied in packing having been subjected to a suitable preservation process for shipping in accordance with the relevant climatic conditions.

2 • FLOWMETER STORAGE

Upon reception, the flowmeter must be handled with care to avoid inflicting impact damage.

Whilst awaiting use, the flowmeter must be kept in its original packing and stocked in clean, dry, dust-free premises.

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8, rue de la Croix-Martin
91120 PALAISEAU

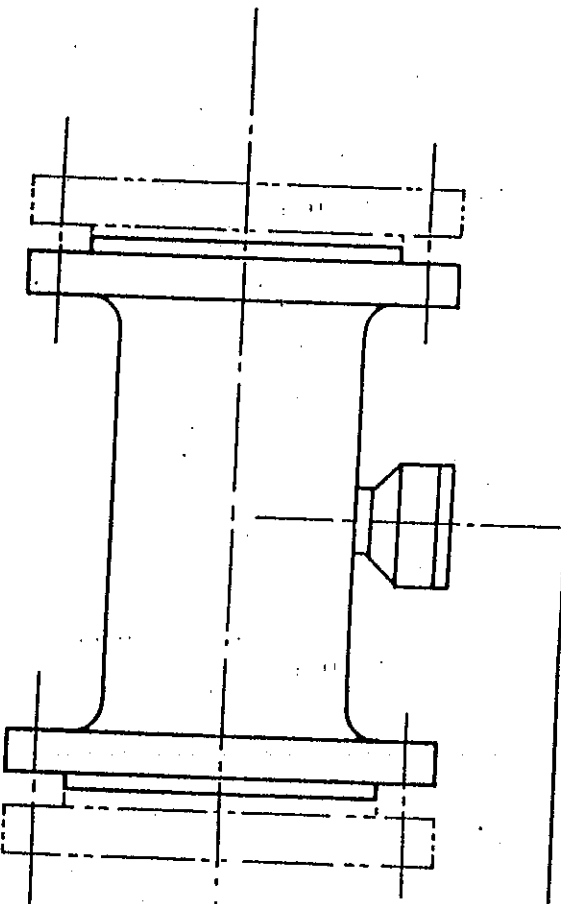
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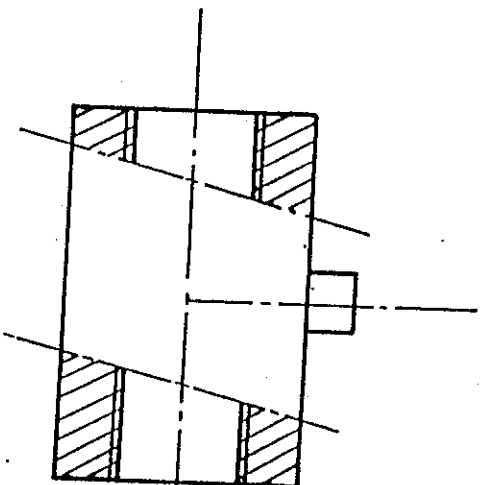
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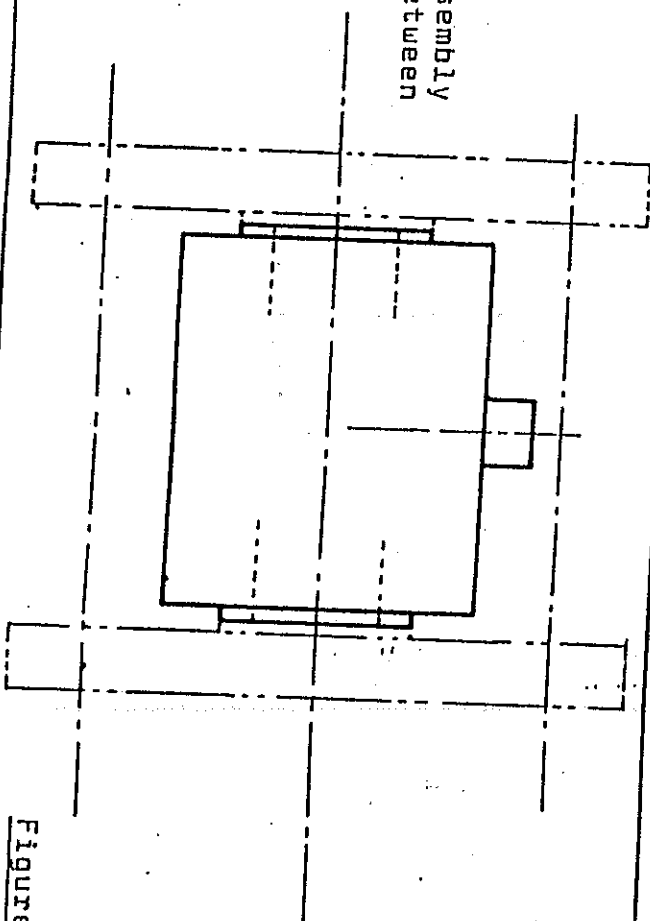
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Type 1 : Assembly flange connection



Type 2 : Assembly screwed end-fitting connection

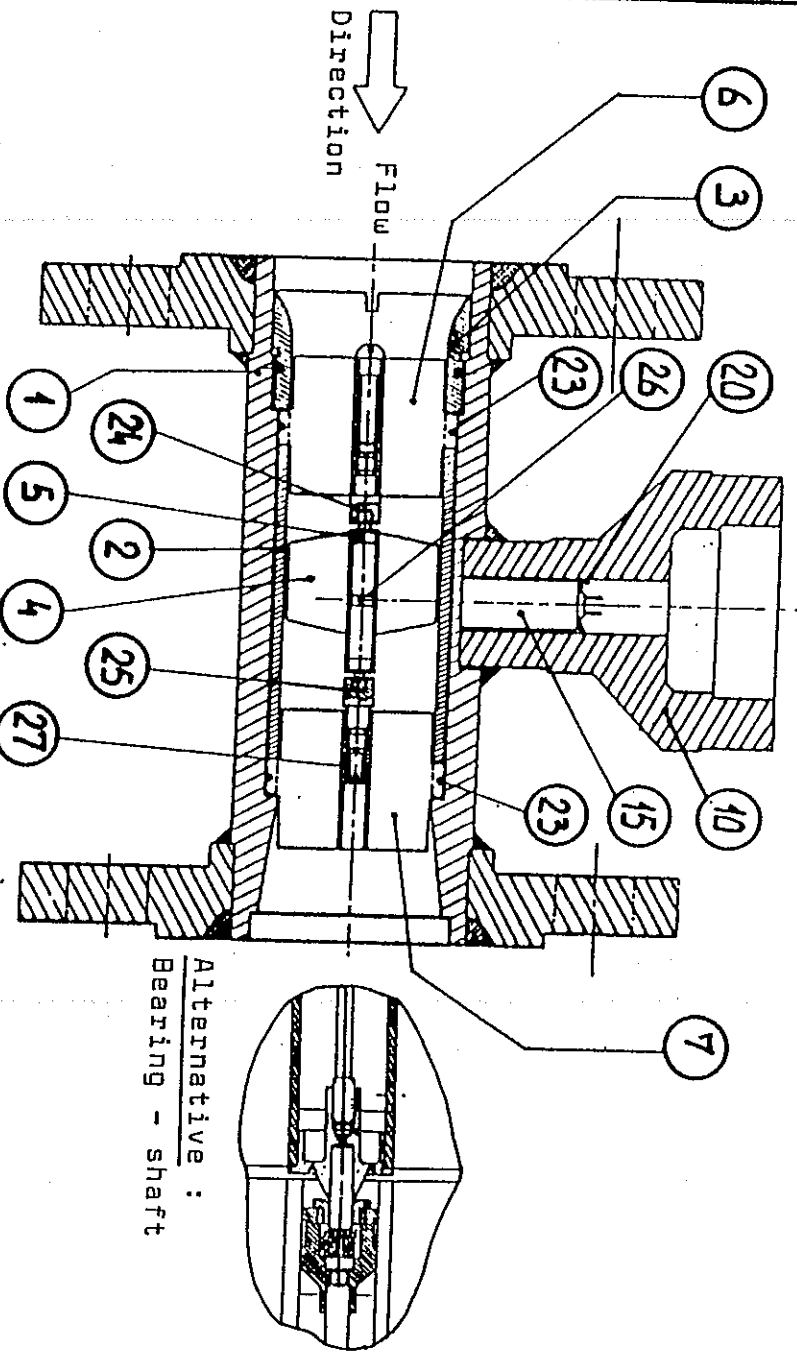
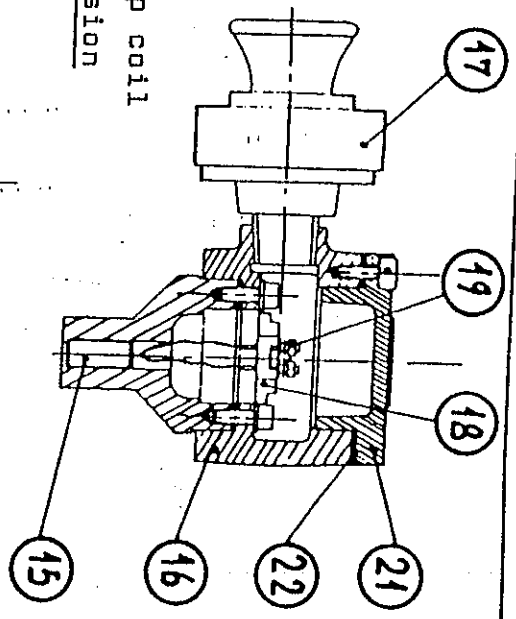


Type 3 : assembly connection between flanges

Figure : 1

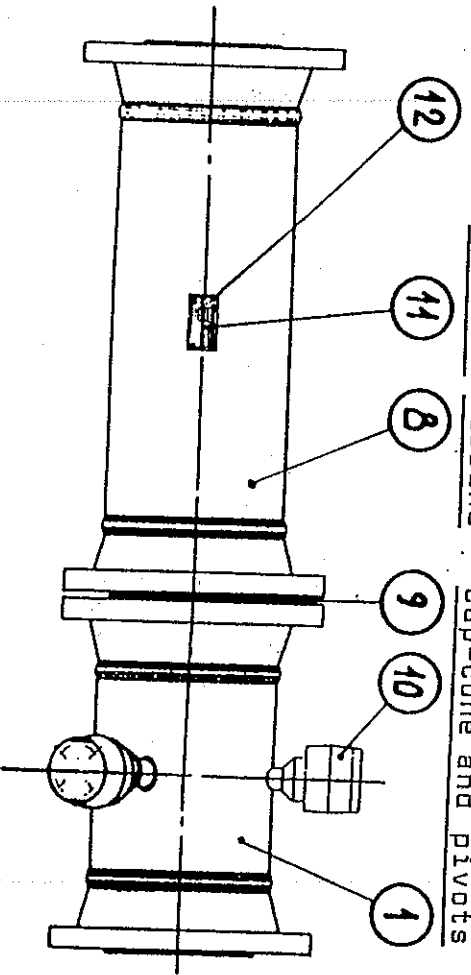
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Connection and pick-up coil
 Explosion-proof - Version



Alternative :
 Bearing - shaft

Standard Turbine - cup-cone and pivots



Option with flow straightener

Figure : 2