SATAM

ZC 17-80, ZC 17-150, ZC 17-250 & ZC 17- 330 METERS

Description – Installation – Operation – Servicing

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ZC 17-80, ZC 17-150, ZC 17-250 & ZC 17-330 METERS

SUMMARY

1. GENERAL

This chapter contains information relating to the reception and assembly of the ZC 17-80, ZC 17-150, ZC 17-250 & ZC 17-330 METERS.

2. RECEPTION

The Meters are packed in cardboard packing designed for and adapted to protect the meter during transport.

However if, on arrival, the packaging appears to have been damaged, the customer should notify the carrier of the damage and inform SATAM.

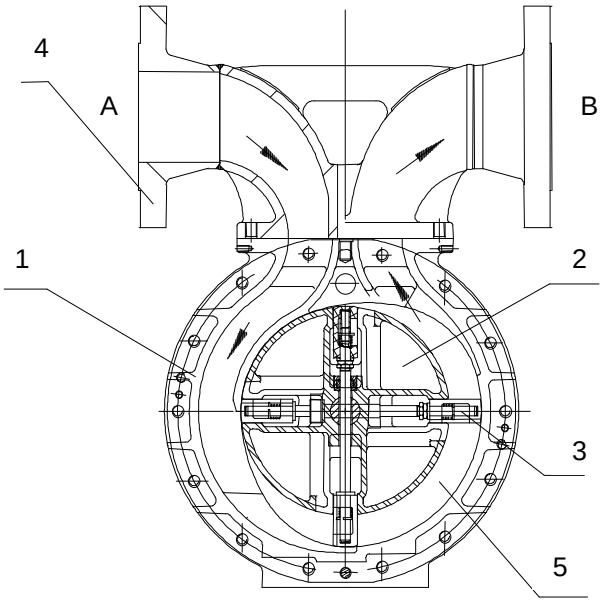
3. OPERATING PRINCIPLE

The liquid enters the metering unit in the direction indicated by the arrows (A) The rotor assembly is set in motion under the pressure of the liquid on the blades (3). A certain amount of liquid (5) is captured between two consecutive blades and measured on the part of the curve corresponding to the biggest of the 2 radii of the stator, and then pushed towards the outlet manifold (B). The quantity of liquid measured at each revolution (i.e. the cyclical volume) is therefore equal to four times the quantity measured.

Accuracy is obtained though the very small clearance between the rotor (2) and the stator (1), the blades (3) and the covers.

The curved design of the manifolds and rotor ensures a steady, non-fluctuating flow of product, resulting in very small head loss. The rotor is supported on stainless steel bearings.

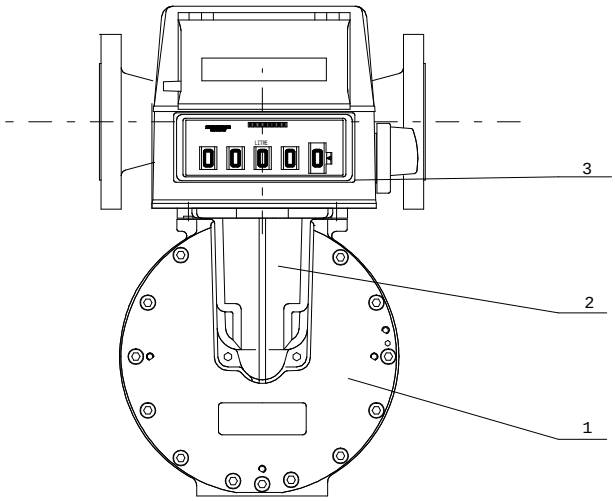
A transmission system mounted on the front of the measuring chamber transmits the rotor's movement to a steeples calibrating mechanism enabling meter adjustment without gear replacement. The meter register is mounted on the calibrating mechanism.



4. COMPONENTS

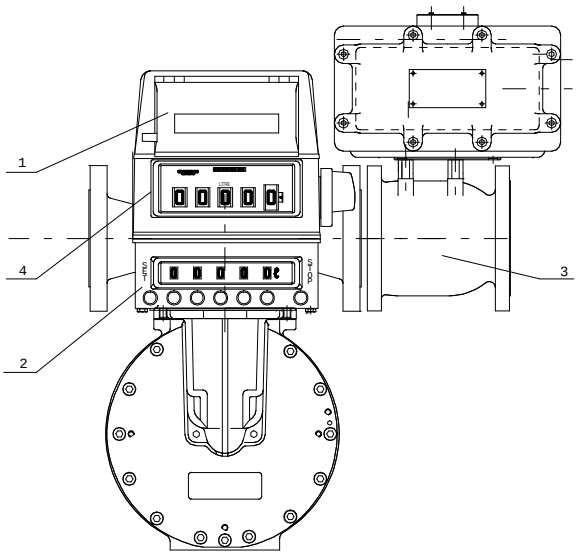
After removing the meter from its packaging, you will find it is composed of the following elements :

➥ **Standard Meter**



- Positive displacement measuring chamber model MA 21(1)
- AB 21 Calibrating Mechanism (2)
- An indicator or an electronic computer electronic computer expressed, according to the request of the customer, in liter or gallon (3)
- The adjusting device AB 21 (2) is replaced by a standard transmitter of impulses AC for the meters equipped with an electronic computer electronic computer.

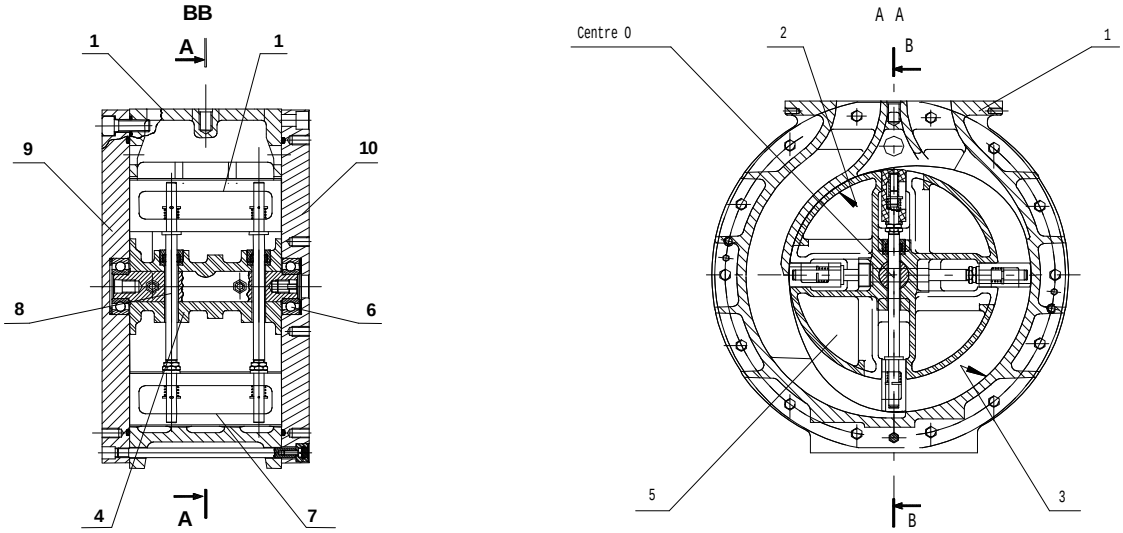
➥ **A wide range of accessories**



- ticket printer (1) : accumulative model or O-start model
- A preset (2) with mechanically or electrically operated XAD 36 (4") or XAD 37 (3") preset control valve (3), for the ZC 17 80/80 and ZC 17 80/150
- XAD 41 Additive Injection Pump
- A rate of flow indicator reading in l/min, m3/h, UKGPM, USGPM (4)
- Flow Governors
- Strainers
- Air Eliminators or Air Separators

5. DESCRIPTION

5.1. Blade-type positive displacement measuring chamber

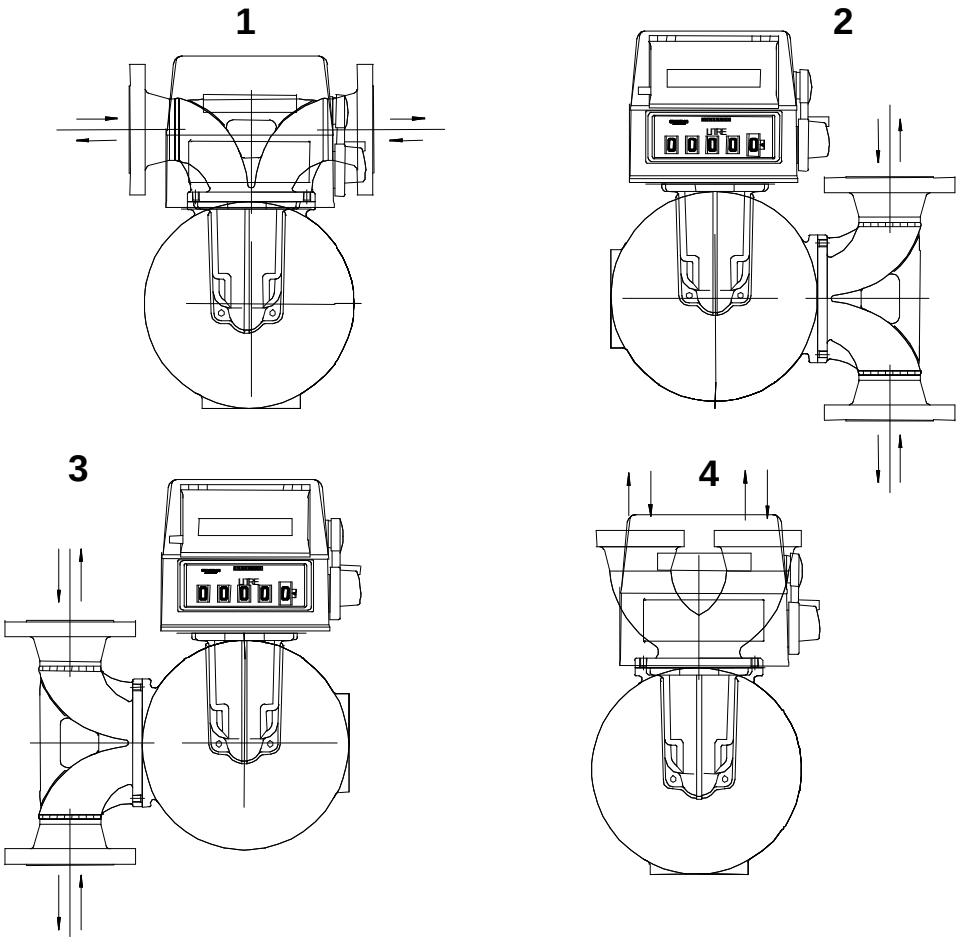


The measuring chamber consists of :

- a body (1) in ni-resist cast iron, made up of 2 cylindrical parts (2) and (3) of different radii, connected via curves in such a way that the sum of the distances from centre point O to two points opposite each other on the stator is constant.

- A moving part (4) composed of :
  . A rotor turning on stainless steel ball bearings (6)
  . Carbon blades (7) linked to each other by rods (8)
  . 2 steel covers (9) and (10).

5.2. A manifold



The manifold is mounted on the measuring chamber. Different types of flanges are available according to the meter :

ZC 17-80 Meter. **(manifold 3'')**

Horizontal or Vertical manifold
- in steel. Flanges ANSI B 16-5 (ASA 150 RF-SF) or PN16 (1, 2 & 3)
- in aluminium. Flanges ANSI B 16-5 (ASA 150 RF-SF) or TW1 (1, 2 & 3)

Manifold with inlet and outlet at the top
- in aluminium. Flanges TW1 (4)

ZC 17-150 Meter. **(manifold 4'')**

Horizontal or Vertical manifold
- in steel. Flanges ANSI B 16-5 (ASA 150 RF-SF) or PN16 (1, 2 & 3)
- in aluminium. Flanges ANSI B 16-5 (ASA 150 RF-SF) or TW 3 (1, 2 & 3)

Manifold with inlet and outlet at the top
- in aluminium. Flanges TW3 (4)

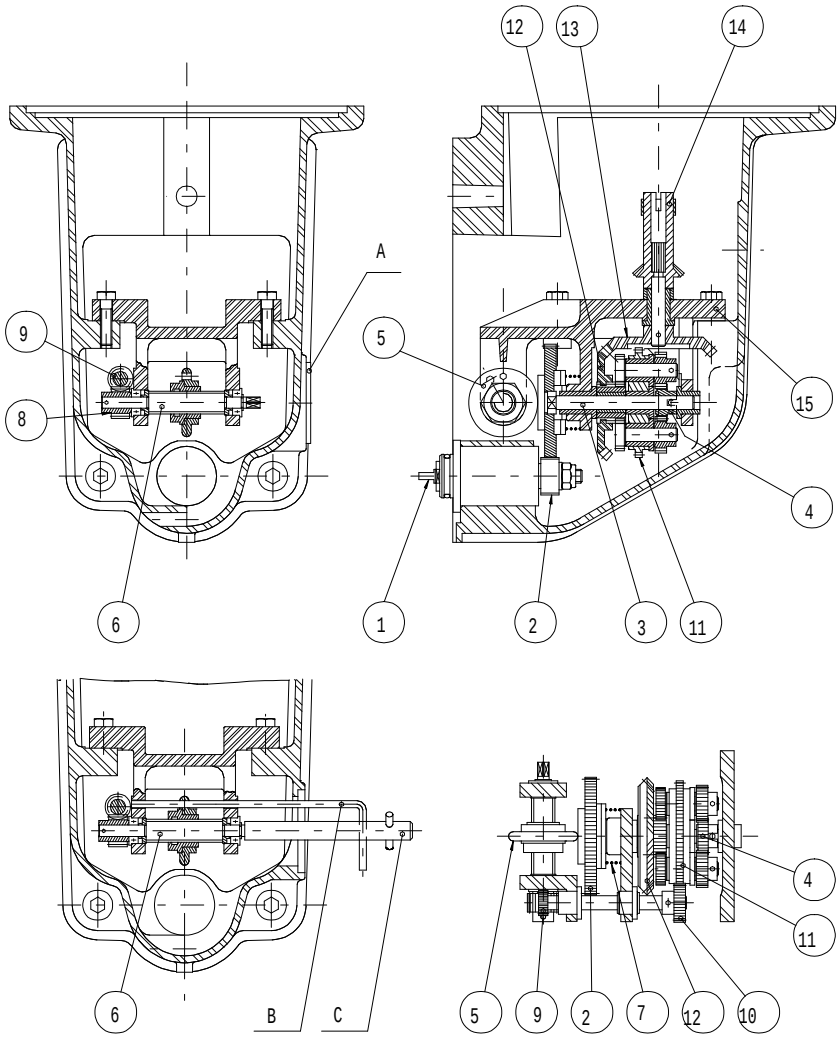
ZC 17-250 Meter. **(manifold 6'')**

Horizontal or Vertical manifold
- in steel. Flanges ANSI B 16-5 (SA 150 RF-SF) (1, 2 & 3)

ZC 17-330 Meter. **(manifold 8'')**

Horizontal or Vertical manifold
- in steel. Flanges ANSI B 16-5 (SA 150 RF-SF) (1, 2 & 3)

AB 21 Calibrating Mechanism



Operation

The AB 21 Calibrating Device is housed in an aluminium box on the outlet of the meter rotor shaft.

The movement of the meter, via the complete gasket (1), drives the wheel (2) which in turn drives the disk shaft (3). Gear (4) is fixed onto this shaft.

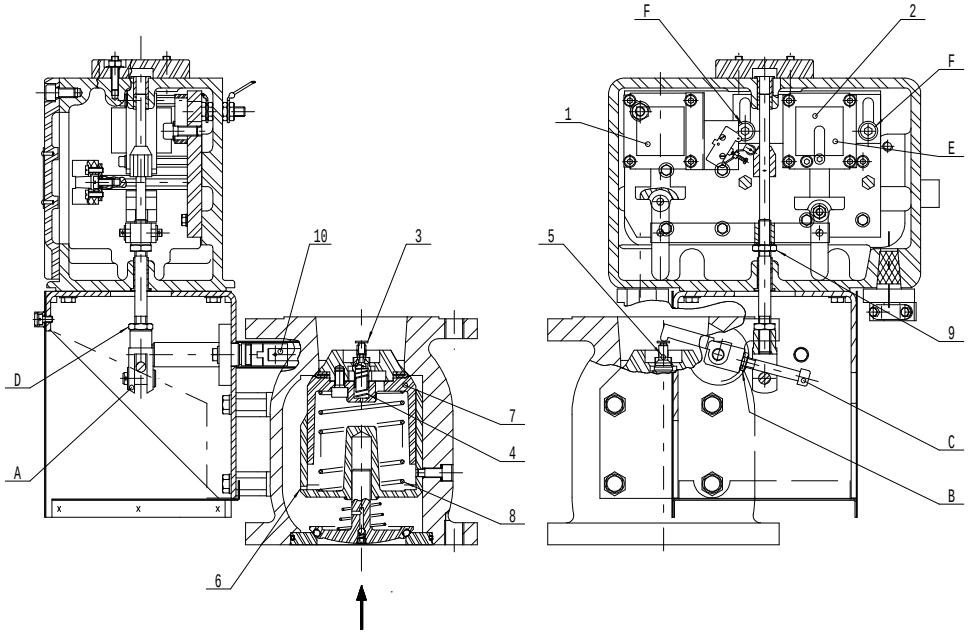
The disk shaft (3) drives the roller (5) by friction. Its position in relation to the centre of the disk is set by adjusting screw (6) using a "C" spanner (cf Chapter "Meter Adjustment"). The disk is kept in contact with the roller by the pressure exerted by the spring (7).

The direction and speed of the roller (5) affects the movement ratio of wheel (8) and screw (9). The pinion (10), integral with the screw, gears into the satellite support (11). (Herein lies basic principle of "micro-adjustment" which provides very high accuracy thanks to the principle of differentials).

The bevel gear (12) drives the bevel gear (13) integral to the drive shaft (14). This forms the basis of the Register's recording.

5.3. Preset with XAD 36 or XAD 37 Stop Valve

- **Mechanically operated**
- **Electrically operated**



Operation

The power supply to the electromagnets (1 & 2) is switched off. The pilot (3) is kept in a closed position by the spring (4) and blocks the piston opening (5). In these conditions, liquid pressure upstream of the valve is transferred inside the chamber through the inlet hole (6).

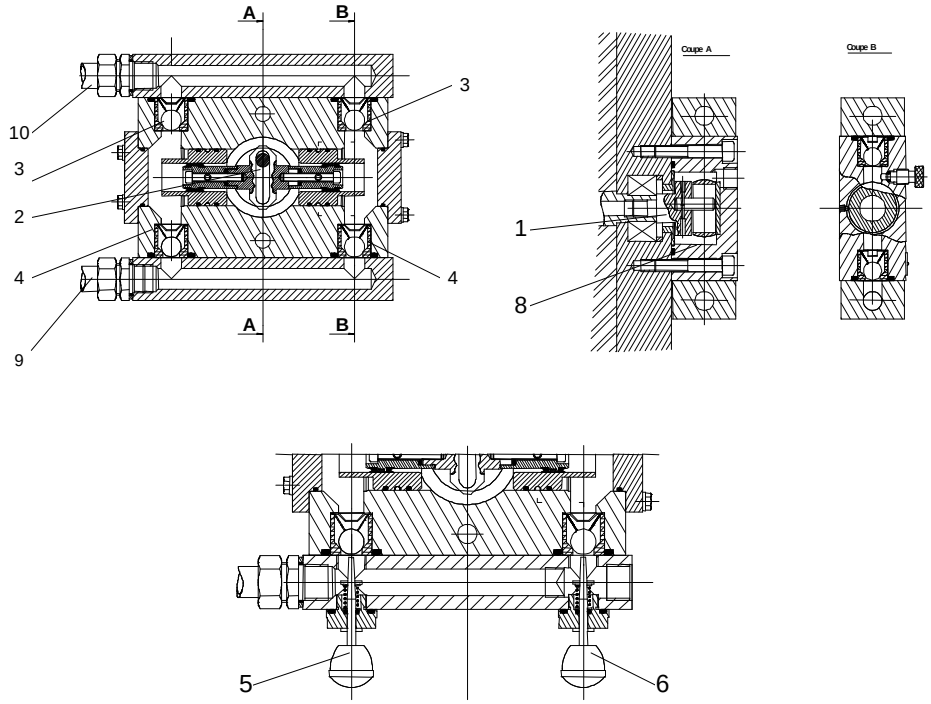
The mobile assembly (7) is kept closed by liquid pressure exerted on the piston and by the spring (8). With the valve closed, if an electrical current is applied to the electromagnets (1 & 2) , they change position, forcing the beam (9) up. This movement acts on lever (10) resulting in the pilot opening which in turns opens the inlet circuit connecting the piston chamber with the installation downstream.
The piston chamber is thus practically at downstream pressure.

The inlet hole (6) for the XAD valve is smaller than the outlet hole. The resulting fall in pressure in the piston chamber relative to upstream pressure leads to the moving part (7) opening, causing the piston to fall, thereby freeing the lateral holes and allowing liquid to flow.

The mobile part (7) remains in open position due to pressure difference upstream and downstream acting on the piston surface.

Transfer from high to low flow : this occurs after switching off the high flow electromagnet (2) and maintaining the low flow electromagnet (1) , resulting in the partial closure of the piston.
Valve closure : this occurs after disconnecting the low flow electromagnet (1).

5.4. Additive Injector model XAD 41



The XAD 41 Additive Injection Pump consists of :

- a connection for installation on the measuring chamber
- a shaft group (2) which coverts the measuring chamber's rotational movement into piston plunger movement
- a set of 2 output valves (3)
- a set of 2 input valves (4)
- a by-pass mechanism consisting of 2 push buttons (5 & 6)
- a duct linked to the installation or the measuring chamber, transferring pressure into the piston chamber (8)
- an inlet (9) and outlet (10) duct.

Operation

The Additive Injector works as a complete unit with 2 single action piston pumps.

When the two push buttons (5 & 6) are pressed, the valve bearings open and the volume pushed by the pistons is displaced into a closed circuit. The volume drawn in equals the volume dispelled.

The outlet valves are adjusted to 0.5 bar to prevent continuous flow of the additive, which should also be under pressure on the injector but with a pressure of less than 0.5 bar.

If the additive reservoir is empty, air injection cannot take place. The air sucked in by the pistons is then compressed, but the resulting pressure is not sufficient to open the adjusted outlet valves. When the pistons come back, the air expands, preventing further intake of air.

An pressure duct to the chamber (8) reduces the injector's resisting torque.

6. Installation

The following recommendations are given for reference purpose only, as installation conditions are always subject to local metrological regulations.

All meters should be installed in such a way as to prevent air or vapour entering the measuring chamber. If these conditions are not met, an air separator with an air elimination device must be installed.

All meters should be protected upstream by a strainer;

Filtration for Gasoline, Premium, Super, Jet A1 : 50 microns
Filtration for diesel oil, gas oil, FOD : 200 microns

If an air separator is necessary, it should be installed between the strainer and the meter. If products with a high flash point are used, the air separator should be installed directly on the meter.

If the flow rate of the installation is higher than the maximum flow rate of the meter, a flow governor must be installed downstream of the meter.

If a delivery valve is to be used, it must be installed downstream of the meter.

NB : The following Rules must be strictly observed : "Institute of Petroleum 209/63 – American Petroleum Institute 1011 and International Standards Organisation", particularly the recommendation stipulating that "in any installation where liquid can be imprisoned between 2 valves, it is necessary to install a decompression device".

7. OPERATION

Once all hydraulic and electrical connections have been completed and checked, the metering unit can be put into operation (commissioning).

Optimal conditions for commissioning require :

- clean product without any particles
- clean pipes, thoroughly rinsed and free of water.

Important
Do not under any circumstances let rinse water into the metering unit.

AFTER MAKING SURE THAT THE ABOVE CONDITIONS HAVE BEEN FULFILLED, COMMISSIONING MAY BEGIN.

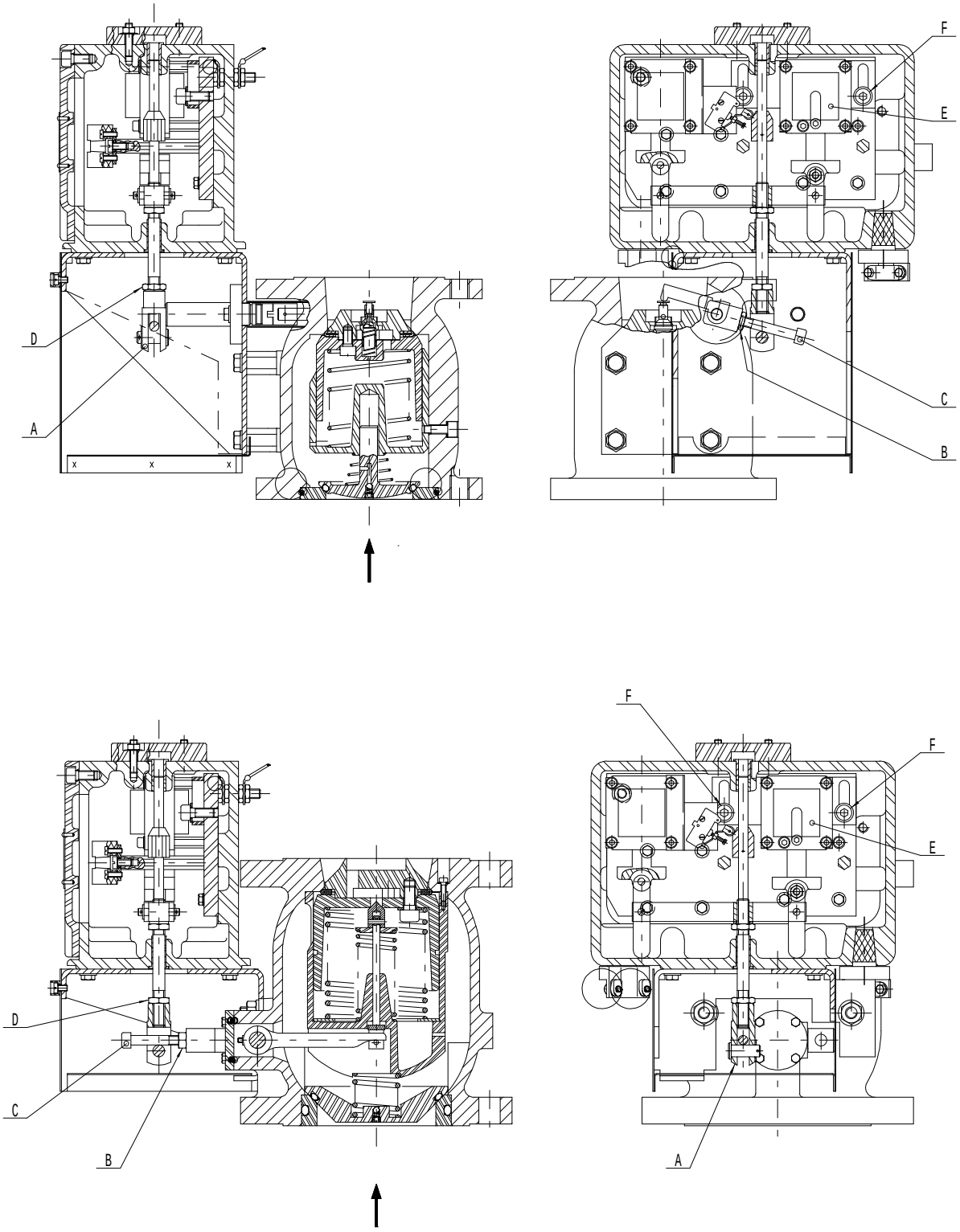
- Carefully open the isolating valve, taking care to evacuate any compressed air trapped inside the piping. Once regular, smooth product flow is achieved, without any pressure surges, the valve can be fully opened.

7.1. Use of the mechanical predeterminator

To display preset quantity required :
Stand in front of the preset. Press the “Set” button on the left to unlock the preset, then press each of the 5 push buttons until the quantity required is displayed in the windows. The quantity is indicated in litres. For emergency stop, press the right hand “Stop” button.

To open the Preset Valve
Pull the control lever towards yourself

7.2. Checking Preset initiation



For a ZC 17-80 Meter, the transfer from high to low flow is initiated at 100 L from the end of preset volume.
For a ZC 17-150 Meter, the transfer from high to low flow is initiated at 200 L from the end of preset volume.

7.3. Valve Closure Adjustment

This adjustment is made via a calibration screw .

1. Remove the seal shaft from the calibrating screw
2. a) Turn the calibration screw 1/8th of a turn clockwise to increase closure time.
   b) Turn the calibration screw 1/8th of a turn anticlockwise to decrease closure time.

CAUTION :
Carry out adjustment in increments of 1/8th of a turn maximum (= 45° angle maximum).

7.4. Adjustment of Valve Flow Rates

7.4.1 Low Flow Rate Adjustment

NB for XAD 37 Low flow : minimum 8m3/h, maximum 13m3/h
for XAD 36 Low flow : minimum 15 m3/h, maximum 20 m3/h

Adjustment is made via fork (A)

1. Unscrew lock nut (B) and remove valve drive axle (C).
2. Unscrew lock nut (D).
   2.1 Turn fork (A) clockwise to increase low flow rate.
   2.2 Turn fork (A) anticlockwise to decrease low flow rate.
3. Re-assemble the drive axle (C) with its lock nut (B) and tighten.
4. Tighten lock nut (D).

CAUTION : an excessively high setting of the low flow rate may lead to non-closure of the valve.

7.4.2 High Flow Rate Adjustment

NB for XAD 37 High flow : between 65 - 75 m3/h
for XAD 36 High flow : between 125 - 130 m3/h

Adjustment is made by positioning the high flow electromagnet (E) as required.

1. Unscrew the 2 screws (F) from the high flow electromagnet support plate(E).
   1.1 Move the support plate / Electromagnet E unit upwards to Increase high flow rate.
   1.2 Move the support plate / Electromagnet E unit downwards to decrease high flow rate.
2. Tighten screws (F) after adjustment.

7.5. METER CALIBRATION INSPECTION - Weights and Measures

Current French legislation stipulates :

- Metrological inspection of the meter at operation start-up.
- Thereafter, annual inspections.

If during gauging operations, the meter is found to lie outside the tolerated error, it may be adjusted through its AB 21 calibration box, for the meters equipped with a mechanical indicator and by means of the coefficient with correction for the electronic computer electronic computers (see appendix 2 of the note U513237 for the RUBIS, U511282 for SAPHIR and U516179 for the EQUALIS L version deposit, U516180 for the EQUALIS L version truck, U516324 for the EQUALIS L version aviation) and U516703 for the l'EQUALIS MPC.
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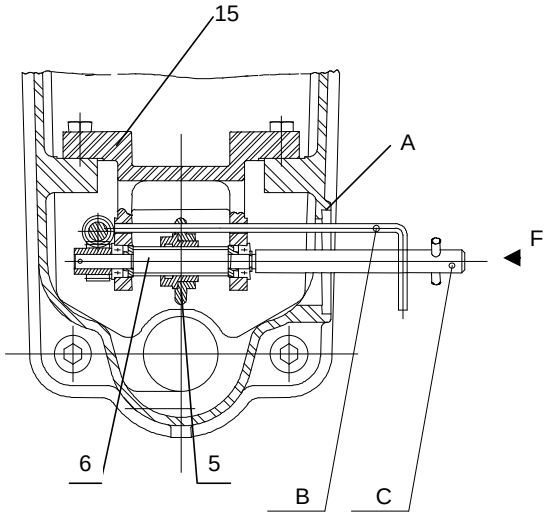
Adjustment Procedure with transmitter AB 21

- Unseal and remove cover (A)
- Move roller (5) by turning screw (6) using spanner "C" until the roller hole is aligned with the 2 holes on the support (15)
- Insert pin (B) as shown on the diagram.
- Turn the screw right (clockwise) to increase the quantity of product in the gauge.
- Turn the screw left (anticlockwise) to decrease the quantity of product in the gauge.
- ONE TURN OF THE SCREW (6) = CORRECTION OF 1‰

Pin B = SATAM ref. 359809
Spanner C = SATAM ref. 359810



CAUTION : Do not omit to remove Pin "B" after adjustment.

Procedure of adjustment of an electronic computer electronic computer.

- To refer to the note of U513237 calibration for the RUBIS
- To refer to the note of U511282 calibration for the SAPHIR
- To refer to the note of U516179 programming for the EQUALIS L version deposit
- To refer to the note of U516180 programming for the EQUALIS L version truck
- To refer to the note of U516324 programming for the EQUALIS L version aviation
- To refer to the note of U516703 calibration for the EQUALIS MPC

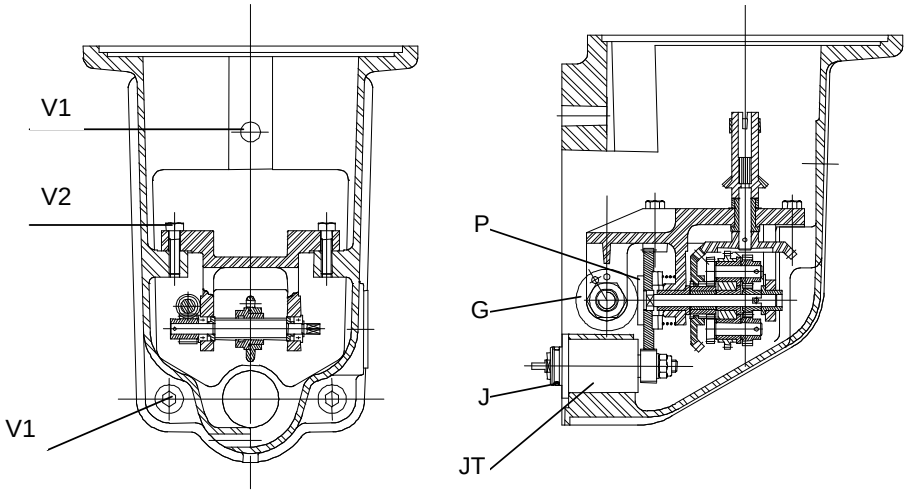
8. PERIODIC SERVICING

As a general rule, period maintenance at least once a year is recommended.
Service operations must be carried out by a Company approved by Weights & Measures.

8.1. Meter Head

See appropriate Maintenance Manual.

8.2. AB 21 Calibrating Mechanism



1. Remove the complete gasket (JT)
   - Clean this gasket.
   - Inspect its rotation (absence of oxidation ; smooth rotation essential. If necessary, replace the gasket.
   - Check the gasket (J) and replace if necessary.
2. Remove the AB 21 calibrating mechanism by unscrewing the 4 screws (V2).
3. Clean the inside of the box.
4. Thoroughly clean the mechanism.
5. Check the clearance of all the gears, and make sure there is no jamming :
   - clearance = 0.2 mm maximum.
6. Check the surface of plate (P) (should be smooth, no grooves. If worn, replace necessary parts).
7. Check the roller (G) (should have no worn, flat areas. If necessary, replace damaged parts).
8. Grease all the gears.
9. Re-mount the AB 21 mechanism and washers in the box.
10. Re-assemble the Complete gasket (JT).
11. Check manually that the unit functions correctly (smooth running, no jamming).
12. Re-assemble the calibrating mechanism on the measuring chamber.

CAUTION : It is strongly recommended not to use a high pressure jet to clean the meter as this could damage the unit.

8.3. REMARK VERY IMPORTANT

We strongly advise against the use of a high pressure water jet to clean the measuring unit, as this could seriously damage the metering unit.