TQM Manual
(Inc. Ethanol Grades)

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Tokheim shall not be liable for damage to the product, nor for personal or third party injury, caused by incorrect use of the product or by attempts to maintain or to repair the product by parties other than those fully trained by Tokheim or by its accredited third party representatives.

Please contact your nearest service department, at the relevant address printed on the back cover of this manual, should any aspect of this manual be unclear.

REVISION RECORD

Date	Revision	Page	Reason
05/07/2007	1	All	Original Issue
29/02/2009			New front cover TQM graphic
	2	3	Main Contents updated
	2	5-1 to 5-10	All drawings updated to include ethanol, TC & EC compliant parts; repagination
	2	5-11,5-12	New pages inserted; repagination
	2	7-2,7-3	Updated new label & screws added
		(Section)	
	2	2.4	Piston Meter Operation
	2	3.1	Front View Drawing updated
	2	3.2	Plan View Drawing Updated
	2	3.3	Correct Sealing Application (W&M) Drawing Updated
	2	3.5	Mechanical Adjustment Drawing Updated
	2	5.1	Pistom Meter Exploded View Drawing Updated
	2	5.2	TQM Meter Assemblies Drawing Updated
	2	5.3	Pulsar Exploded View Drawing Updated
	2	5.3	Prt nos change Cylinder Cover and Captive Nuts
	2	5.4	Cylinder Cover Assembly Drawing Updated
	2	5.6	Piston Assembly (Part no changes)
	2	5.7	Crankshaft Assembly Drawing Updated
25/10/2010	3		New corporate standard front & back cover New TQM photo on front cover
		Page 1 (Section)	Main contents updated
		1.6	Changes to standards & certificates to add MPE or MPL
		2.1	Changes to Functional description to add MPL or MPC-TC
		2.5	Removal of MPT1 from Magnetic disc paragraph
		3.1	New front view graphic
		3.2	New plan view graphic
		3.3	New TQM photo
		3.4	Added word MPT1
		3.5	New front view graphic
		3.6	Added information. Flushing and Calibration instructions.
		3.6.1	Added Flushing and Calibration flowchart
		5.1	Piston meter. New graphic and parts list
		5.2	TQM meter. New graphic and parts list
		5.3	Cylinder cover assemblies. New graphic and parts list
		5.4	Collector assembly.New graphic and parts list
		5.5	Piston assembly. New graphic and parts list
		5.6	Crankshaft assembly. New graphic and parts list

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1 INTRODUCTION

1.1 How to Use this Manual

It is recommended that all relevant persons familiarise themselves with the contents of this manual prior to carrying out any operations or procedures.

This manual is divided into sections which are described as follows: -

Section 1 - Introduction

This section contains information on how to use the manual, the scope of equipment covered, recommendations on qualified technicians and contact information. It also includes relevant health and safety information required for the safe installation of the product.

Section 2 - Product Information

This section contains the system descriptions and operating principles of Tokheim's TQM metering unit.

Section 3 - Mounting, Connecting & Adjusting the TQM

This section provides the information on mounting, connecting and adjusting the TQM.

Section 4 - Troubleshooting

This section gives information on troubleshooting problems with the TQM.

Section 5 - Spare Parts

Section 5 lists the assembly drawings and part identification lists for the TQM.

1.2 Product Scope

This manual is designed to cover the TQM metering unit in Quantium 10 series dispensers.

1.3 Authorised Technicians

Only qualified technicians familiar with the contents of this manual should carry out the procedures contained herein.

WARNING : ANY ATTEMPTS TO CARRY OUT THE PROCEDURES OF THIS MANUAL, BY UNQUALIFIED OR UNAUTHORISED PERSONS, MAY RESULT IN SERIOUS INJURY OR LOSS OF LIFE.

NOTE : THIS MANUAL IS NOT INTENDED TO REPLACE THE SERVICES OF A FULLY QUALIFIED TECHNICIAN.

1.4 Contact Information

For information relating to the contents of this manual please contact: -

Technical Author
Tokheim UK Ltd.
Dundee, Scotland

For technical assistance please contact the appropriate service division listed on the back cover of this manual.

1.5 Health & Safety

1.5.1 SAFETY CHECKLIST

- It is obligatory that this checklist be fully complied with during all work at the petrol station, particularly construction or repair work.
- It is the duty of the contractor to ensure that all workers employed by him obey each and all of the relevant laws, directives and other regulations.

Areas where special caution is required

- The insides of tanks, tubes, dome shafts, filling shafts, change over shafts, vessels and dispensers.
- All areas in which fuel vapour that is heavier than air can accumulate, e.g. fuel separator, draining shafts, low located rooms, cellars, excavations, pipe trenches etc.
- The areas around the outlets of tank ventilation pipes, especially during the filling phase.
- All areas near dispensers, tanker lorries and other vehicles while they are being tanked up, and particularly when there is a lack of wind.
- A radius of 1.0 metres around petrol carrying pipes, as well as pipes that are not vapour free.
- Silt traps.

1.5.2 DUTIES OF THE EMPLOYEES

- To ensure optimal accident prevention in our company, in addition to general rules applying to worker's protection, it is necessary to take into account all the national protection of workers legislation and to actively support all measures which enhance safety standards.
- It is an employee's duty to follow all company directives regarding the prevention of accidents, unless such directives can be proved to be unfounded.
- Employees should not follow any instructions that go against safety standards.
- Employees are only permitted to use equipment for its original purpose, and this is defined by the company alone.
- If an employee detects equipment that is deficient in terms of safety, he shall eliminate this deficiency immediately. If such safety rectification is not part of his defined area of activities, or if his knowledge is insufficient to carry out such work he must immediately inform his superior about the detected safety deficiency.

This equally applies to:

1) **Work Materials** which have not been correctly packed or correctly marked in order to meet safety requirements.
2) **Work Methods** or work processes which have not been correctly coordinated or controlled in order to meet safety requirements.
3) **Where dangerous activities are carried out by several persons**, the need for a permanent faultless communication between them in order to avoid dangerous events shall require the appointing of one person in order to carry out overall supervision.

1.5.3 HAZARDS

Prior to starting work, the dispenser must be isolated (i.e. entirely disconnected from the mains supply) and the mains supply switch locked in the OFF position. The submerged pump (if applicable) and control signals from the dispenser must also be isolated. This is done to provide safety for the technician. As a further precaution, switch off the mains supply in the service station shop and place a clear notice on the switch to avoid it being turned on again inadvertently.

WARNING : THE CONNECTION AND DISCONNECTION OF ELECTRICAL CONNECTIONS MAY ONLY BE CARRIED OUT BY QUALIFIED PERSONNEL AUTHORISED FOR SUCH ACTIVITIES. WORK IN DANGEROUS AREAS MUST BE MADE SAFE BY OBSERVING ALL THE NATIONAL SAFETY REQUIREMENTS IN FORCE.

It is not permitted to put a fuel dispenser into operation before an authorised official has inspected it and released it. This depends upon the national regulations in force.

Dismantled packaging and cladding must be stored in such a way as to avoid damage to components or injuries to persons. Covers that can be opened, such as the calculator housing, should be handled with care. Ensure that the retaining catch is placed in the correct position to prevent the cover falling onto the head of the service engineer or other persons in the area.

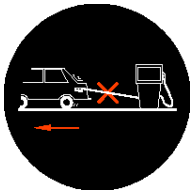
At unattended service stations, every end-user should be able to read the User Instructions. They should be visible on a notice board or integrated into the DIT and should be sufficiently well lit so that they can be read at night.

At unattended service stations break away couplings must always be used to reduce the danger caused by a motorist driving off with the nozzle still in the tank.

1.5.4 WARNING SIGNS

The following warning signs are fitted as standard, on the dispenser, however they may vary according to individual country requirements or customer specifications.

SIGN	MEANING	POSITION
	Do not use mobile phones	Visible from both sides of dispenser
	No naked flames	Visible from both sides of dispenser

	Do not spill fuel on the ground	Visible from both sides of dispenser
	Smoking forbidden	Visible from both sides of dispenser
	Stop vehicle engine	Visible from both sides of dispenser
	Trucks only	At Diesel high speed dispensers near the nozzle boots
	Do not drive away with nozzle in tank	Visible from both sides of dispenser
		Next to User Instructions near the nozzle boot

1.5.5 PERSONAL PROTECTIVE EQUIPMENT (PPE)

PROTECTIVE CLOTHING

The following clothing should be worn **at all times** during installation and maintenance procedures:-

- Protective helmet.
- Protective shoes (conductive).
- Protective gloves and/or protective hand cream.
- Anti static clothing.
- Eye protection.

SAFETY EQUIPMENT FOR WORKING IN HAZARDOUS AREAS

The following safety equipment is required for working in hazardous areas:-

- Only spark free tools are permitted for work on dispensers.
- Work on bearings is only permitted using the standard workshop tools authorised for this kind of work.
- The use of all electrical tools is strictly prohibited.
- Only the use of explosion protected work lights is permitted.
- The use of telecommunications equipment in hazardous areas is strictly prohibited.

SAFETY INSTRUCTIONS

The following safety instructions must be adhered to during installation and maintenance procedures:-

- Inhalation of petrol vapour must be avoided. Suitable precautions must be taken and where necessary respirators used.
- Avoid direct contact of fuel with the skin.
- Use suitable protective clothing, protective gloves and/or protective hand cream.
- Avoid fuel spills.
- No smoking, no naked flames are permitted.
- Long hair and ties can get caught in moving parts. Hair must be suitably covered.

1.6 Standards & Certificates

The TQM is a measurement transducer for use in a measuring instrument for liquids other than water. As such it is tested and certified in conformity with the requirements of all the applicable European Directives (Machinery 2006/42/EC; EMC 89/336/EEC; ATEX 94/9/EC).

The TQM, MID cert TC7188 fulfills the requirements as mentioned in Annex 1 and Annex MI-005 of the Directive 2004/22/EC.

The TQM with the pulser MP-T1(CW), MPE or MPL is constructed for use in fuel dispensers in a Zone 1 area. All components used within the TQM are selected in accordance with the European Standard EN BS 60079-0 (Electrical Apparatus for explosive gas atmospheres) and the supplementary Standards listed therein.

TQM metering units are incorporated into Tokheim fuel dispensers which conform to the essential requirements of the Machinery Directive 98/37/EC.

The production and end test is controlled through the Quality Assurance systems within the Tokheim Manufacturing Centres, and has received Quality Assurance Notification from a Notified Body.

No modification to the component may be performed without express permission from Tokheim and must always use original components or Tokheim retrofit kits. Failure to comply with the above will invalidate product conformance with the relevant European Directives and Tokheim will no longer accept product liability.

CONTENTS

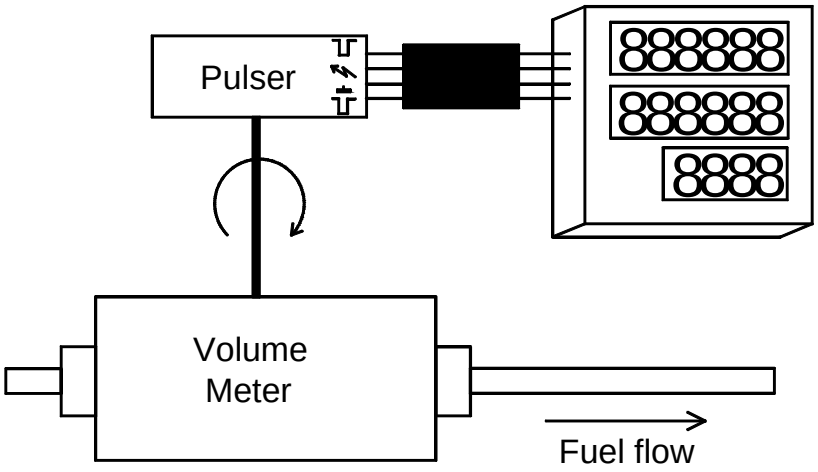
2 PRODUCT INFORMATION

2.1 Functional Description

The TQM consists of two parts as follows:

- The piston meter - transforms the delivered volume into a rotation of the shaft
- The pulser (MP-T1(CW), MPE-EC, MPE-TC, MPL or MPC-TC) - converts this rotation into pulses for the calculator

The following diagram shows the parts of the measurement transducer:-



2.2 The Piston Meter

The TQM is a twin piston meter. The pistons are activated by the flow of fuel from the pumping unit (suction or submersible type) and are mounted in parallel cylinder bores.

Both pistons transmit their reciprocating movement to separate crank shafts mounted perpendicular to the piston stroke. The two crank shafts are linked through a set of gears to a common drive shaft, onto which the electronic subsystem (the pulser) is mounted. The pulser is integrated in the top cover of the meter. The pulser converts the rotational movement of the drive shaft into a highly precise stream of electronic signals, allowing subsequent calculation of the exact volume of fuel displaced through the TQM.

Fuel entering the TQM flows alternately into one or two chambers (to the front and back of each piston). The flows are carried out through a sequence of four phases piloted by the control valve mounted on the drive shaft.

Each of the four chambers has a capacity of 125 millilitres. The TQM delivers 500 ml per cycle. A PTFE lip seal on each piston prevents leakage between opposite chambers. Calibration of the volume measurement of the TQM is possible by equal adjustment to both of the calibration screws. These screws are sealed following calibration by Weights and Measures officials.

2.3 The Pulser

2.3.1 MECHANICAL DESCRIPTION

The pulser is mounted in the pressure moulded TQM control housing, which has three integrated chambers:

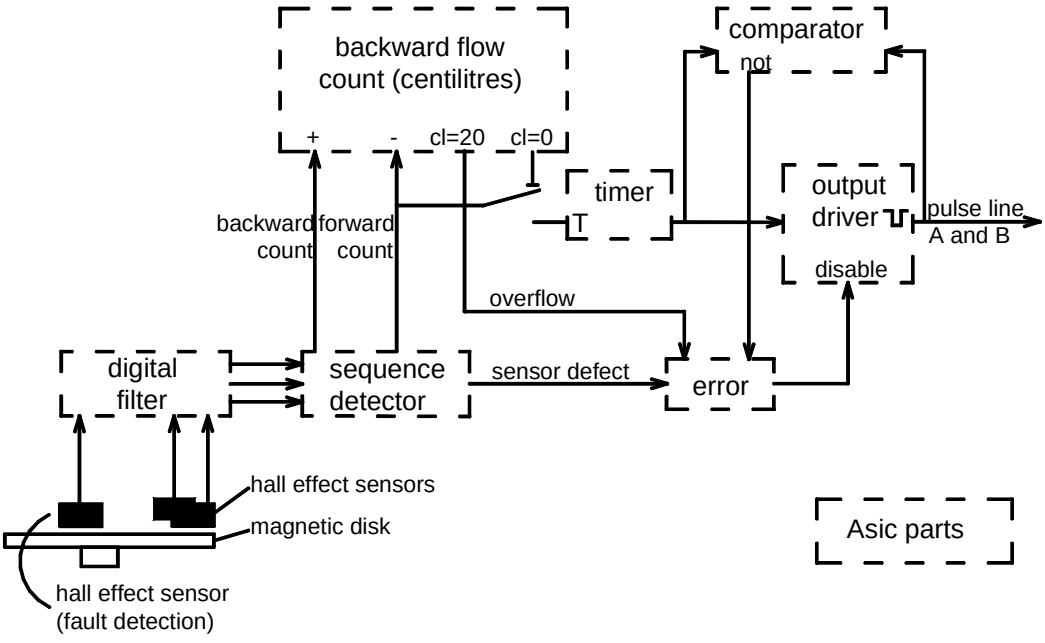
- Control Valve Chamber - the control valve opens and closes the four chambers for the piston movement
- Gear Chamber - the rotational movement is transmitted to an optical mechanical totaliser by a worm-driven shaft and to the magnetic wheel of the pulser
- Electronic Chamber - mechanical rotation is transformed into electrical information

The piston movement is transformed by the two crank shafts and three gear wheels into a rotation of the main drive shaft. A gear wheel is mounted on the top end of this shaft. This gear drives both the magnetic wheel shaft and the totaliser shaft. A mechanical totaliser can be connected directly or via a flexible cable on each end of the totaliser shaft. The mechanical totaliser counts 0.5 litres per revolution of the meter. The opposite side (or both sides) of this totaliser shaft can be closed by a plug, which can be sealed. The totaliser shaft is rotated with a constant ratio of 1:0.05.

The magnetic wheel shaft is driven with a ratio of 1:2.5. A sensor is assembled, next to the magnetic wheel, to transform the rotation into an electrical signal, which is transferred to the dispenser calculator. One pulse of this sensor represents one centilitre (1 cl) i.e. 100 pulses per litre.

2.3.2 ELECTRICAL DESCRIPTION

The pulser electronics translate the magnetic field changes into proper “cl” pulses required by the calculator. The pulser electronics can be divided into the several functional blocks. The functions of the different blocks are described in this section. All digital functions of the pulser electronics are integrated in an Asic. The pulser has an operating voltage of 24V dc.



HALL EFFECT SENSORS (DIRECTION)

Two sensors (sensors A and B) are placed above the outer ring of the disc. They are used to indicate the direction of the disc. The diagram above indicates the output of the two sensors when the disc rotates clockwise. Each transition of the signal coming from sensor B represents 0.5 cl.

This block checks the input and output of the output driver during the 400 microsecond pulse. If the output line is high (idle state) while the input of the driver is activated, it will send a “not equal” signal to the error block.

The inputs of the comparator used for monitoring lines A and B are provided with a digital filter which will remove glitches of less than 32 microseconds from these two signals.

HALL EFFECT SENSOR (FAULT DETECTION)

A third sensor (sensor C) is placed above the inner ring of the disc. As this ring contains 10 north and 10 south polarised magnetic parts, the output frequency of this sensor will be the half of the frequency coming from the two other sensors. This difference in frequency makes it possible to distinguish normal operation from sensor defects or disc oscillations.

DIGITAL FILTER

This part will remove glitches shorter than 8 microseconds from the sensor signals.

SEQUENCE DETECTOR

The sequence detector identifies the different movements of the disc by evaluating the three sensor signals.

BACKWARD FLOW COUNT (CENTILITRES)

When the disc turns counter-clockwise, the sequence detector generates backward count pulses. The backward flow count buffer keeps up with the amount of backward count pulses. When the buffer reaches 20 cl (40 pulses), it generates an overflow message. If the disc turns clockwise, the sequence detector generates forward count pulses. The backward flow count buffer will decrease with the amount of forward count pulses until it reaches 0 cl. At this point, the buffer will not decrease any more and the switch is closed so that the timer receives forward count pulses on its trigger input.

TIMER (400 µS)

A pulse on the trigger input of the timer will start the one-shot 400 microsecond timer. During the 400 microseconds, the timer will activate the output driver for line A (or B). Every 0.5 cl, the timer alternates between lines A and B. Therefore if there was a pulse on output line A, then 0.5 cl later, it will be followed by a pulse on output line B and vice versa.

OUTPUT DRIVER

The output driver is required to supply the current needed for the inputs of the calculator. It also delays the low-to-high transition of the cl pulses on the output lines A and B. This delay is designed to prevent cross-talk between the two pulse lines and interference on other lines.

MAGNETIC DISC

The magnetic disc contains one outer ring (divided into 20 north and 20 south polarised magnetic parts) and one inner ring (divided into 10 north and 10 south polarised magnetic parts). The disc is driven by the volume meter. A liquid flow in the forward direction (once the liquid has left the measurement transducer) will result in a clockwise movement of the disc. A backward liquid flow will cause the disc to rotate counter-clockwise.

The disc can have small movements (oscillations) in both directions, caused by vibrations of the pulser. These oscillations will not result in centilitre pulses on the output of the pulser.

COMPARATOR

This block checks the input and output of the output driver during the 400 microsecond pulse. If the output line is high (idle state) while the input of the driver is activated, it will send a “not equal” signal to the error block.

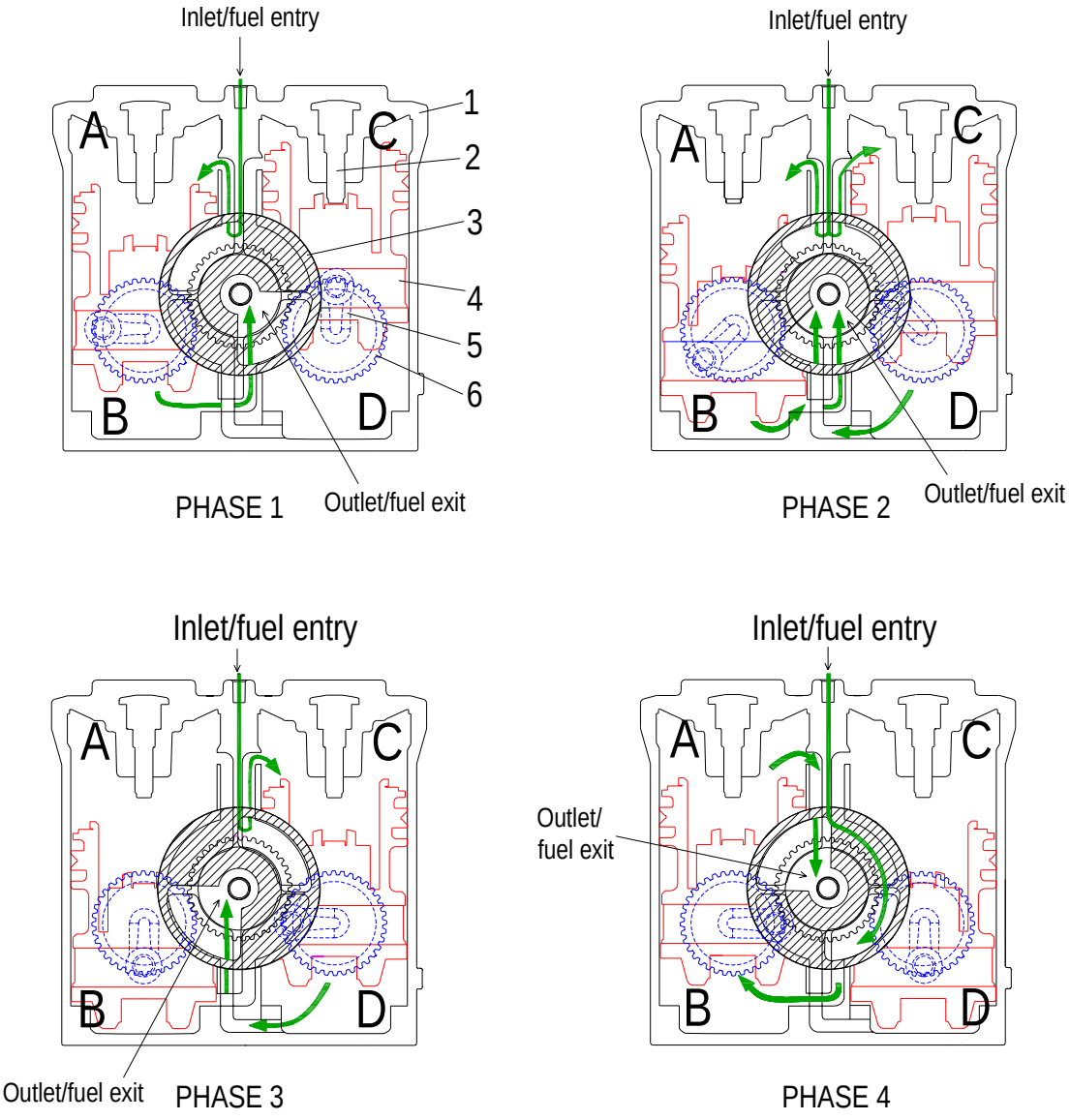
The inputs of the comparator used for monitoring lines A and B are provided with a digital filter which will remove glitches of less than 32 microseconds from these two signals.

ERROR

The signals “overflow”, “sensor defect” and “not equal” are collected here. When one or more signals are active, the error signal will be activated. This signal can only be deactivated by switching off the pulser power. When the error signal is activated, the output driver is disabled, so the output lines become low.

2.4 Piston Meter Operation

The following phases of the piston meter can be identified as shown in the following diagram:-



KEY:-

1 = Crank Housing
2 = Adjustable Front Stop
3 = Control Valve
4 = Piston
5 = Crankshaft
6 = Gear

Phase 1:

- The right hand (RH) piston is against the front stop
- The channels to chamber C and D are closed by the control valve
- The fuel flows into chamber A
- The left hand (LH) piston moves towards chamber B
- The fuel flows out of chamber B to the exit side

Phase 2:

- The channels to the chambers A, B, C and D are opened by the control valve
- The fuel flows into chambers A and C
- The pistons move towards chambers B and D
- The fuel flows from chambers B and D to the exit side

Phase 3:

- The LH piston is against the rear stop
- The channels to chambers A and B are closed by the control valve
- The fuel flows into chamber C
- The RH piston moves towards chamber D
- The fuel flows from chamber D to the exit side

Phase 4:

- The RH piston is against the rear stop
- The channels to chambers C and D are closed by the control valve
- The fuel flows into chamber B
- The LH piston moves towards chamber A
- The fuel flows from chamber A to the exit side

After phase 4, the LH and RH pistons reach the front stops one after the other and phase 1 starts again. The pistons' movements can be adjusted at the front stops to achieve exact values in accordance with the approval. Please refer to section 4 for the adjustment instructions.

2.5 Dimensions

Width x height x length		169 x 201 x 184 mm
Entrance flange - adjustment		By 30°
Drive shaft diameter		10 mm
Piston	- quantity	2
	- diameter	65 mm
	- stroke	39 mm
Direction of drive shaft rotation:		Clockwise (facing the drive shaft)

2.6 Hydraulic Performance Ranges and Tolerances

Liquid viscosity	Fuels with viscosity lower than 10^{-4} m²/s
Inlet/outlet nominal diameter (ND)	30 mm
Cyclic volume	0.5 l/rev
Minimum flow rate	1.6 l/min
Maximum flow rate	80 l/min
Maximum error	+/- 0.3% (1.6 l/min to 80 l/min)
Maximum pressure	4 bar
Torque during delivery	2.5 Nm
Pressure difference without torque	1.6 l/min - < 0.25 bar 5 l/min - 0.25 bar 40 l/min - 0.35 bar 80 l/min - 0.65 bar
Adjustment graduation	0.05% (if the error is greater than 0.05% then balance the error by adjusting both screws equally).

2.7 Environmental Conditions

Climate	Marine, tropical, industrial and polar
Ambient temperature range	-40°C to +55°C
Temperature of liquid	-40°C to +55°C
Atmosphere	In accordance with climate

CONTENTS

3 MOUNTING, CONNECTING & ADJUSTING THE TQM

The piston meter must be mounted inside the dispenser in such a way to allow unrestricted access to the adjustment devices and seals.

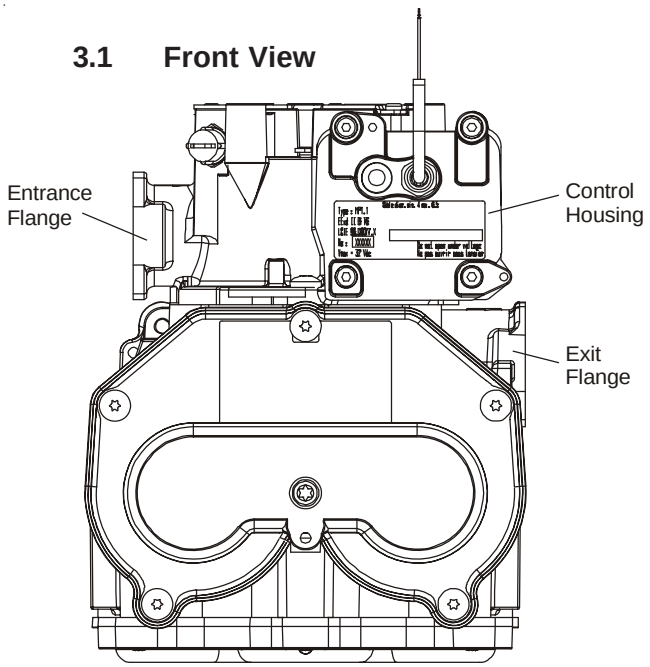
NOTE : To allow the flamepath to function correctly there must be a minimum clearance of 300mm around the pulser housing.

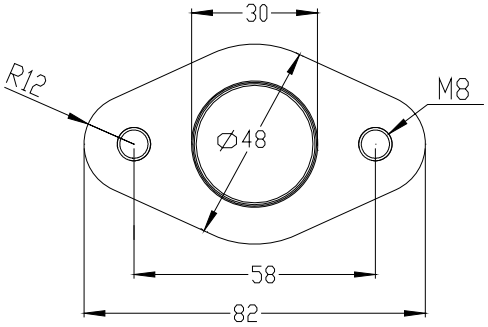
The piston meter is fixed on its inlet flange by two M8 screws and, at the control head inside the dispenser, by three M6 screws. The screws are evenly spaced, thus allowing three possible mounting positions offset by 120°.

The entrance and exit flanges of the piston meter are indicated by arrows in the diagram below. The measurements are according to DIN 5434; ND30.

The control housing (entrance flange) can be moved by 30° increments, in relation to the crank housing (exit flange). This enables a universal arrangement of the piston meters in the dispenser.

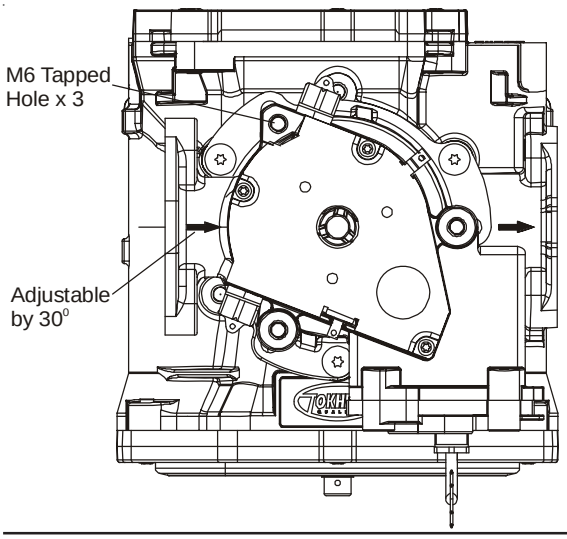
3.1 Front View



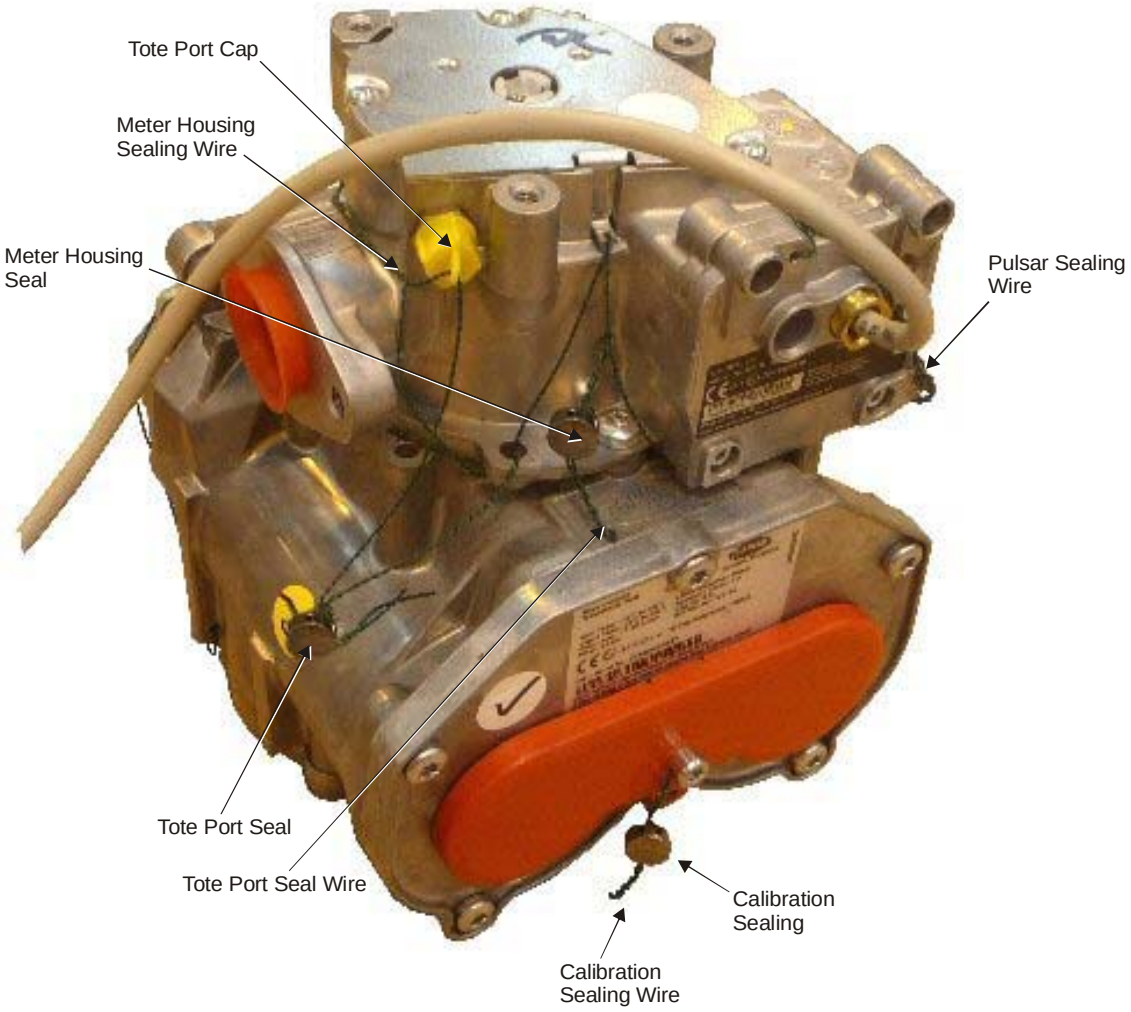


Entrance and exit flange ND 30

3.2 Plan View



3.3 Correct Sealing Application (W&M)



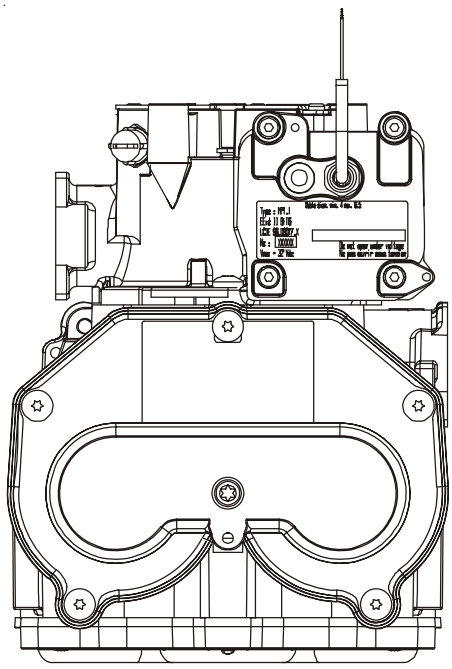
3.4 Pulser Connections (MPT1)

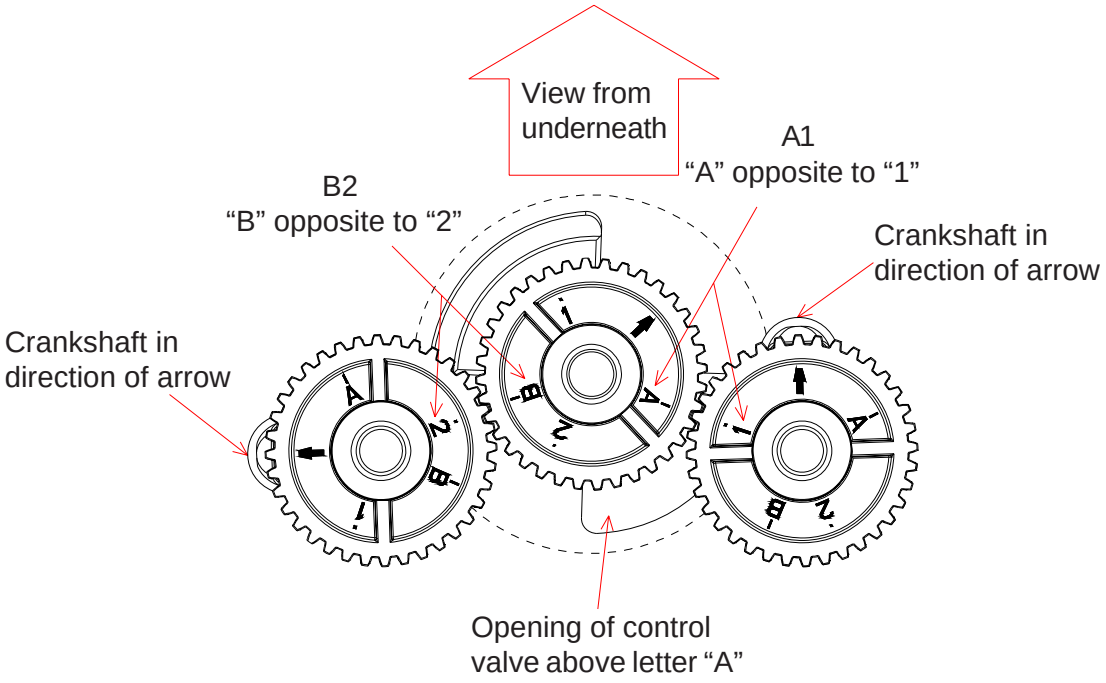
- Brown = 0V
- White = Channel A
- Green = Channel B
- Yellow = Supply (25V typ.)

3.5 Mechanical Adjustment

For the TQM meter to function correctly, the control valve must fill the front and rear chambers in a specific sequence in relation to the pistons. This is dependent upon the position of the control valve relative to the crank shafts.

The correct positioning of the control valve, gears and crank shafts are shown below:-





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3.6 Flushing and Calibration Instructions (Non MID Dispensers)

Tokheim dispensers are accurately calibrated before leaving the factory using a test liquid with viscosity and density properties between diesel and gasoline. Any meter error caused by these viscosity and density differences is minimal, however during initial field calibration, meter errors can go above the acceptable limits and would therefore require a meter adjustment. These errors are more likely to be caused by another source such as insufficient flushing of the hydraulic system and not by a wrong adjustment in the factory.

To prevent erroneous meter adjustments, the following flushing guidelines should be observed:

1) Run each filling position of the dispenser until fuel comes out of the nozzle.

2) It is recommended that pump and nozzle filter(s) are cleaned.
For submerged pumps, close the under pump safety valve before attempting to clean the filter.

3) Flush each dispenser filling position with 40 liters (e.g. 2 x 20 L cans) to remove any construction and installation dirt and /or air.
(Point 1 must be carried out first then flush with the 2x20 liters cans).
The flushing process must be carried out at the maximum flow rate of each nozzle. (36 LPM minimum. At lower flow-rates the evacuation of air in the hydraulic system will take longer therefore the stability of measurements will take longer).

4) Test each filling position of the dispenser. The calibration of the meter for the filling position is completed when the result is within acceptable tolerance limits.
(Depending on the market, this could be either “strike” or below “strike” = less in the can than on the display)

5) If the calibration result is out of the tolerance limits, re-test until two consecutive calibrations show similar results or the meter error is within the acceptable tolerance limits. (See point 4)

6) Adjust the meter when it is still out of the tolerance limits but showing similar results after two consecutive calibrations.

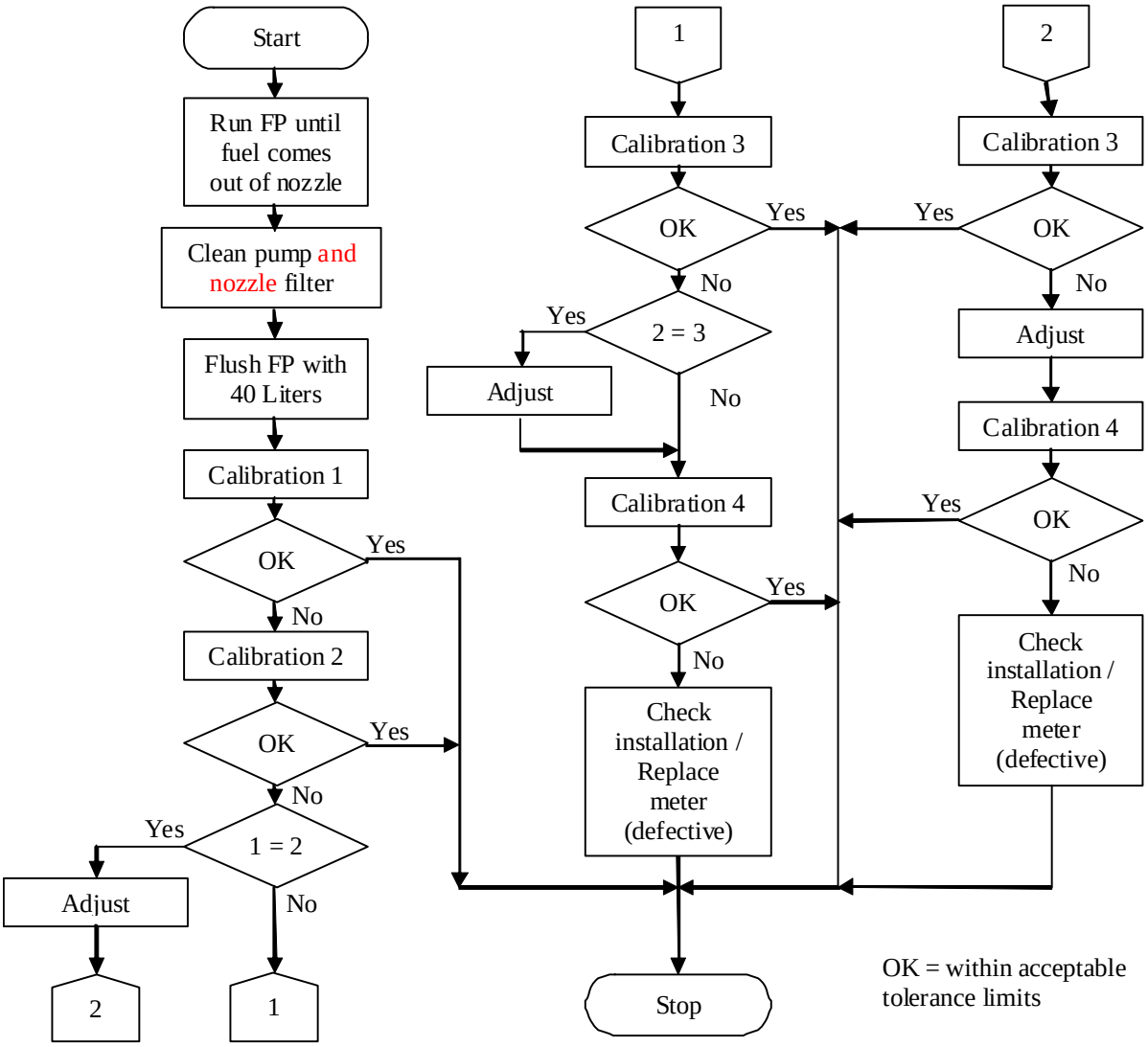
7) Re-test to confirm that the meter error is within the tolerance limit.

8) If the meter error is still not within tolerance limits or stable after 4 consecutive calibrations, either the installation or the meter can be the cause.
(Decision to replace taken after 40 L to flush and 80 L for the calibrations).

9) Check the installation. If the meter on the opposite filling position with the same product is OK then the fault is probably with the meter. Replace the meter if no failures can be found on the installation.

3.6.1 FLUSHING AND CALIBRATION FLOWCHART.

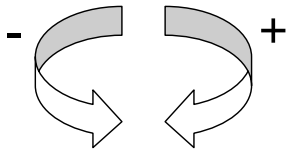
The flowchart below illustrates the flushing and calibration instructions.

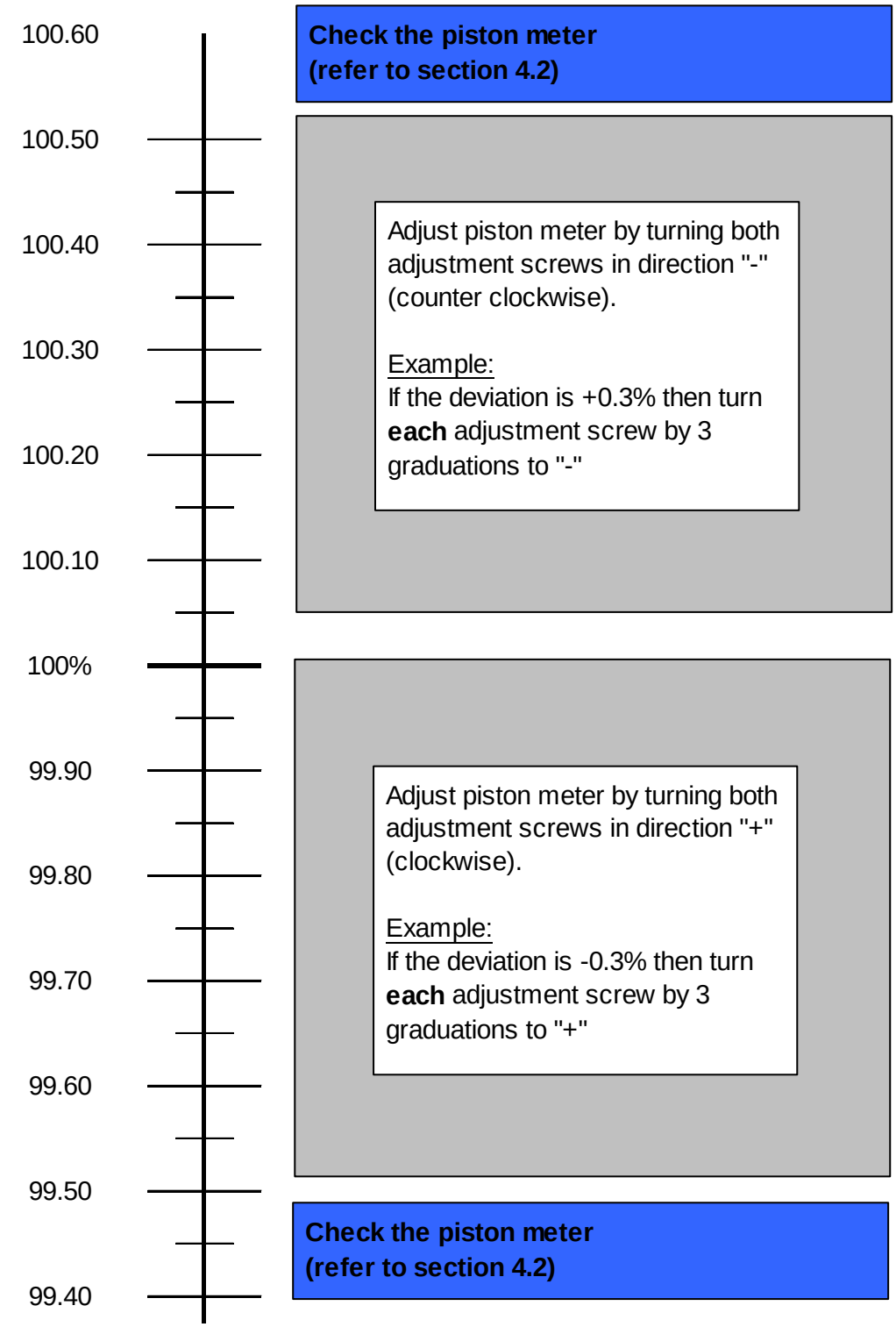


3.7 Metrological Adjustment

The scale is based upon 100% of the metering gauge.

The deviation (+ and -) is related to the calculator display.

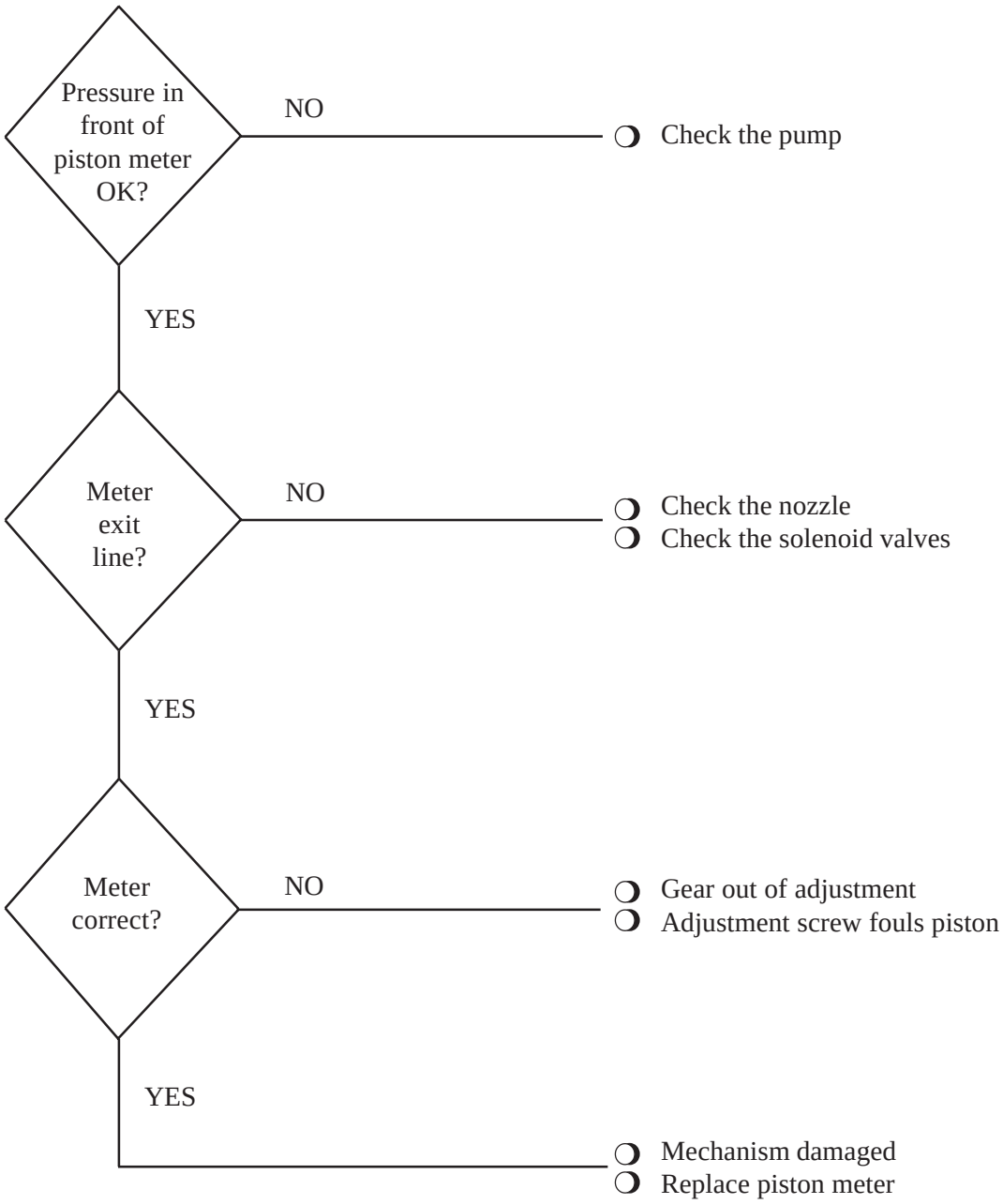




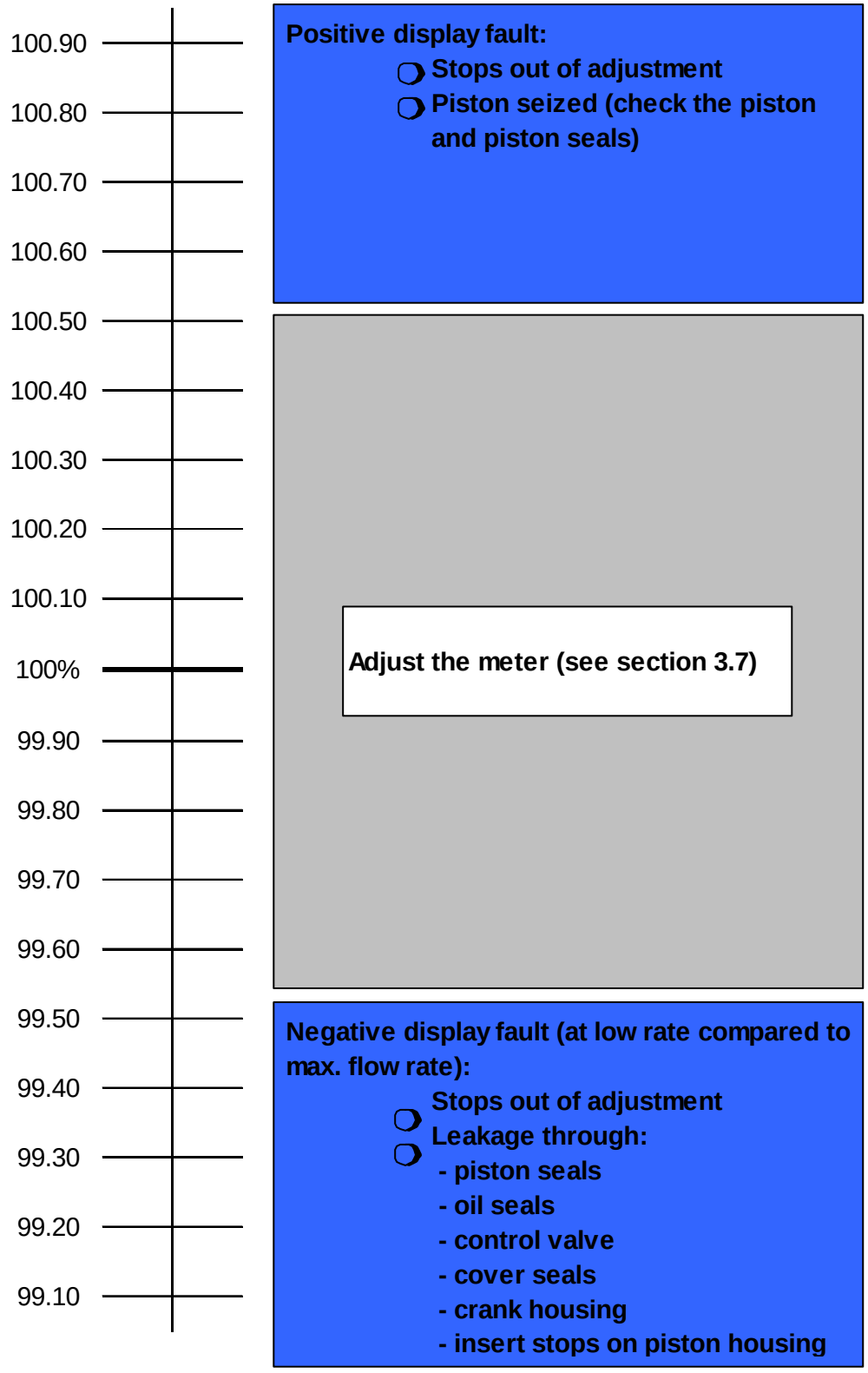
CONTENTS

4 TROUBLESHOOTING

4.1 Blocked Piston Meter



4.2 Display Faults



4.3 External Leakage

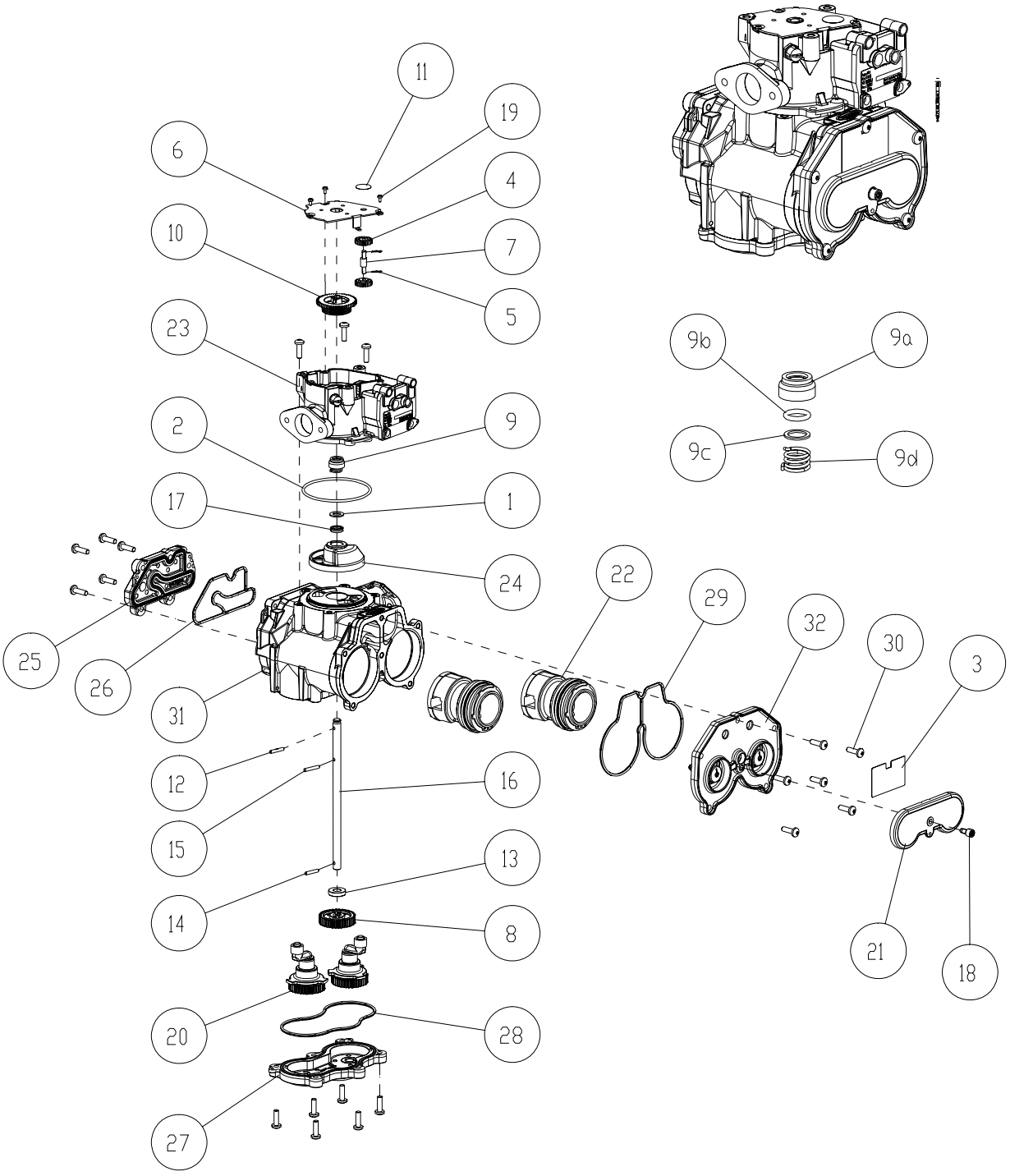
The following are common symptoms and possible solutions relating to external leakage problems:-

- Leakage through drive shaft - replace drive shaft seal
- Leakage through adjustment screw - replace adjustment screw O-ring
- Leakage through cover - replace cover gasket
- Leakage through housing - check housing is not porous or damaged
- Leakage through mechanical seal

CONTENTS

5 SPARE PARTS

5.1 Piston Meter Exploded View

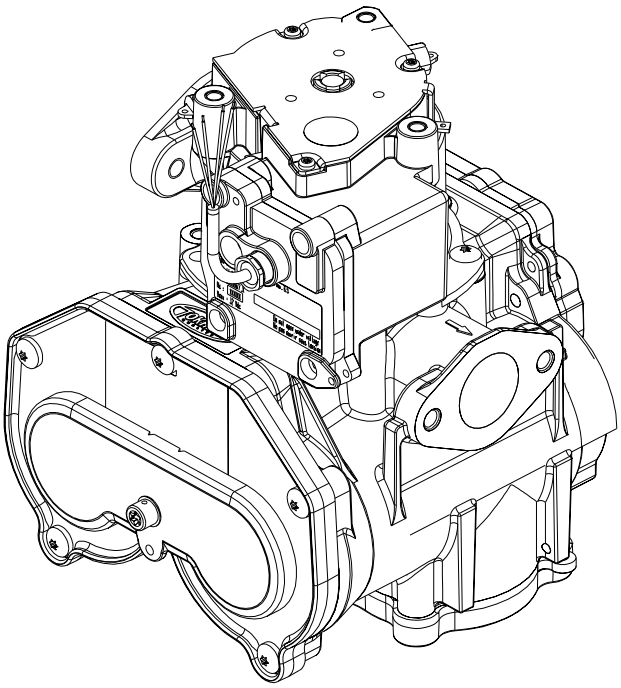


PISTON METER PARTS LIST

Item No	Description	Désignation Français	Part No	Comments
1	Washer Pl M10.5x18x1	Rondelle Pl M10.5x18x1	900008-039	
2	O-Ring 84 x 3	Joint Torique 84 x 3	900050-059	
3	MID Compliant Typeplate TQM	MID Conforme Etiquette TQM	901689-170	
	TQM Typeplate + Temp Comp	TQM plaque + Temp Comp	901689-220	Temp.Compensation
4	Gear Wheel 20T	Pignon 20 Dents	903220	
5	Special Beta Pin	Goupille Beta Speciale	903227	
6	Top Plate	Tole de Protection	907987	
7	Gear Wheel Shaft	Axe Entrainement Emetteur	908017	
8	Gear Wheel 36 Teeth	Pignon 36 Dents	908058	
9	Slide Ring Seal Asm incl:	Bague Tournante Asm inc:	908063	
9a	*Slide Ring Seal*	*Bague Tournante*	*908062*	
9b	*O-Ring*	*Joint Torique*	*900050-058*	
9c	*Slide Ring Washer*	*Rondelle Bague Tournante*	*908061*	
9d	*Spring*	*Ressort*	*908060*	
10	Drive Shaft Gear 50 Teeth	Pignon Sortie Mes.50 Dents	908064	
11	Top Plate Label D20	Etiquette Diametre 20	908067	
12	Grooved Pins 4x20	Goupille Cannel¨¦e G6 4x20	908079-001	
13	Plastic Spacer Washer	Entretoise Plastique	908166	
14	TQM Parallel Pin L=21mm	Goupille Paral L=21mm TQM	908720	
15	TQM Parallel Pin L=22.5mm	Goupil Paral L=22.5mm	908721	
16	Driveshaft Sst	Axe Entrainement Sst	908724	
17	Shaft Seal 10x16x4	Bague d'Etanch Eite 10x16x4	908984-001	
18	Screw Torx SF M6X12 Drilled	Vis Torx M6x12 Percée	908996	
19	Torx EJOT T10 d3x6	Vis Torx EJOT T10 d3x6	909903-001	
20	Crank Shaft TQM Assy	Vilebrequin TQM asm	940634	**
21	Adjustment Cover	Couvercle d'Ajustement	941121	
22	TQM Piston Assembly	TQM Piston Assemblé	942630	**
23	TQM Collector Bearing Asm	TQM Collecteur Bague	942633-001	**
24	Control Valve Lapped	Commande Valve Rod	943110	
25	Blind Cover TQM	Couvercle Arrière TQM	947264-001	
26	Blind Cover Seal TQM2	Couvercle Arrière Joint	947265	
27	Gear Cover	Couvercle de Pignon	947283-001	
28	Seal, Gear Cover	Joint, Couvercle de Pignon	947585	
29	Seal, Cylinder Cover	Joint, Couvercle Cylinder	947586	
30	Self Tapp. Screw Torx M6x20	Self Tapp. Screw Torx M6x20	948463	
31	Crank Casing TQM Comp. Lap.	Boitier Vilbrequin Comp. Rode	949188-001	
32	Cylinder Cover Assy TQM	Couvercle de Cylindre Asm	949191-001	**

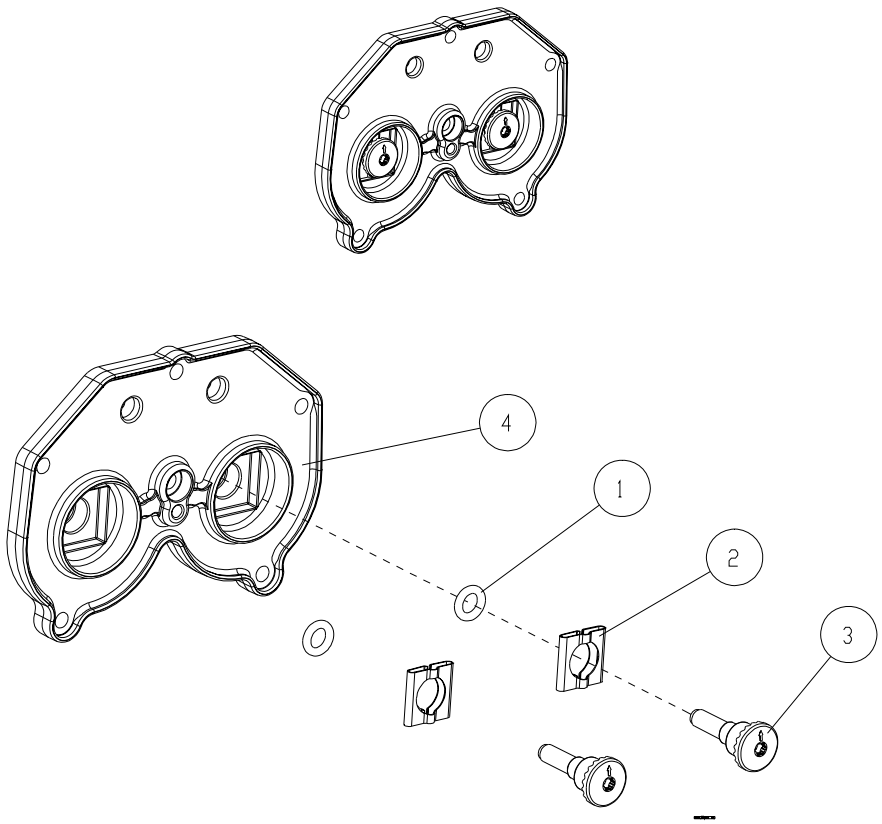
** = Refer to separate drawing

5.2 TQM Meter Assemblies



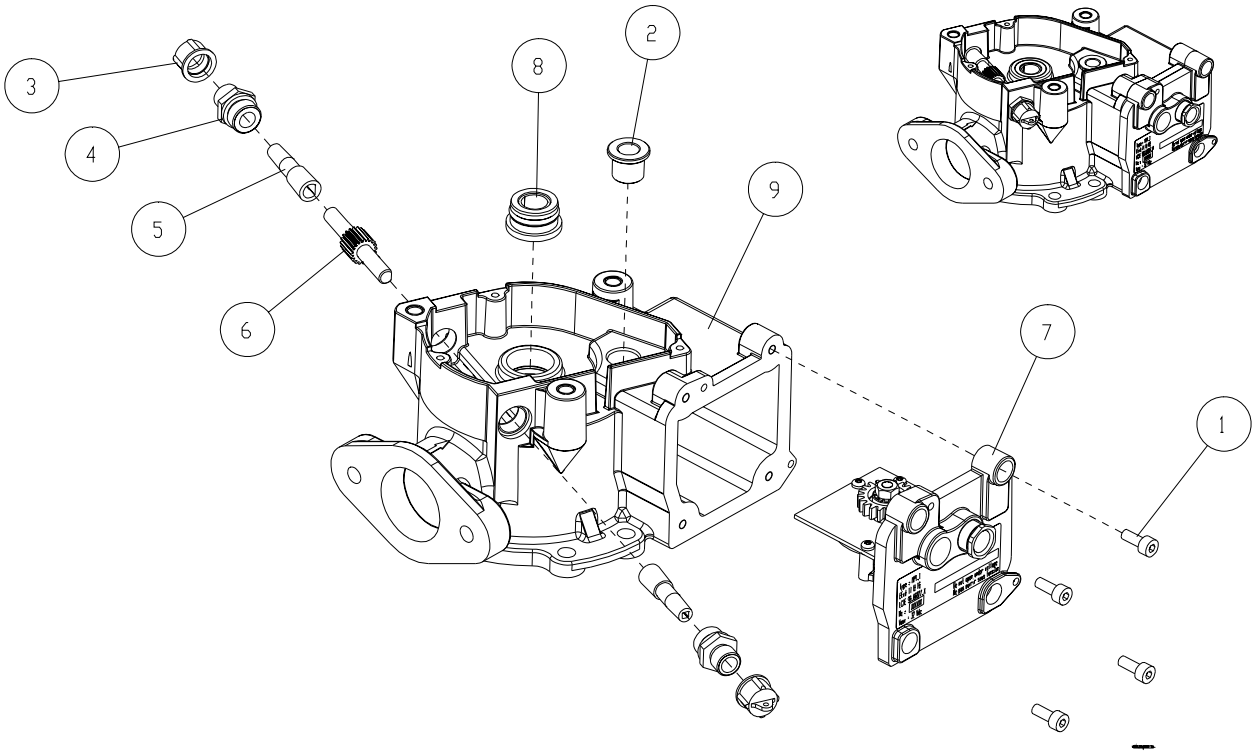
Part No	Description	Désignation Français
948475-001	Meter TQM MPT1 inline assy	Mes TQM MPT1 en ligne asm
948475-011	Meter TQM MPE-EC inline assy	Mes TQM MPE-EC en ligne asm
948475-021	Meter TQM MPE-TC in-line assy	Mes TQM MPE-TC en ligne asm
948475-024	Meter TQM MPE-TC TW in-line assy	Mes TQM MPE-TC TW en ligne asm
948475-031	Meter TQM MPL in-line assy	Mes TQM MPL en ligne asm
948475-041	Meter TQM MPC-TC in-line assy	Mes TQM MPC-TC en ligne asm
948475-044	Meter TQM MPC-TC TW in-line assy	Mes TQM MPC-TC TW en ligne asm
948475-071	Meter TQM CP1 in-line assy	Mes TQM CP1 en ligne asm

5.3 Cylinder Cover Assembly



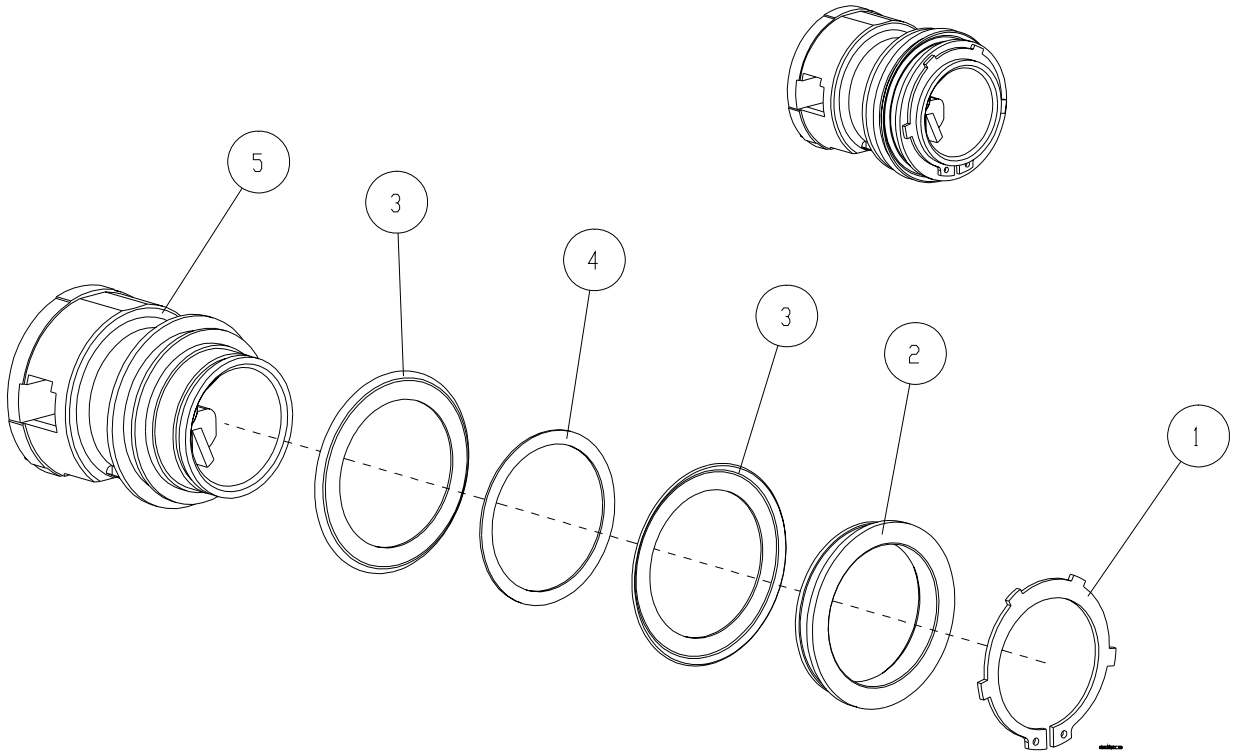
Item No	Description	Désignation Français	Part No	Comments
1	O-Ring 9.12 x 3.53	Joint Torique 9.12 x 3.53	900050-091	
2	Adjustment Spring	Ressort de Vis Relage	908165	
3	TQM Adjustment Bolt	Vis D'ajustement TQM	908719	
4	Cylinder Cover TQM	Cylindre Couverture TQM	947266-001	

5.4 Collector Assembly



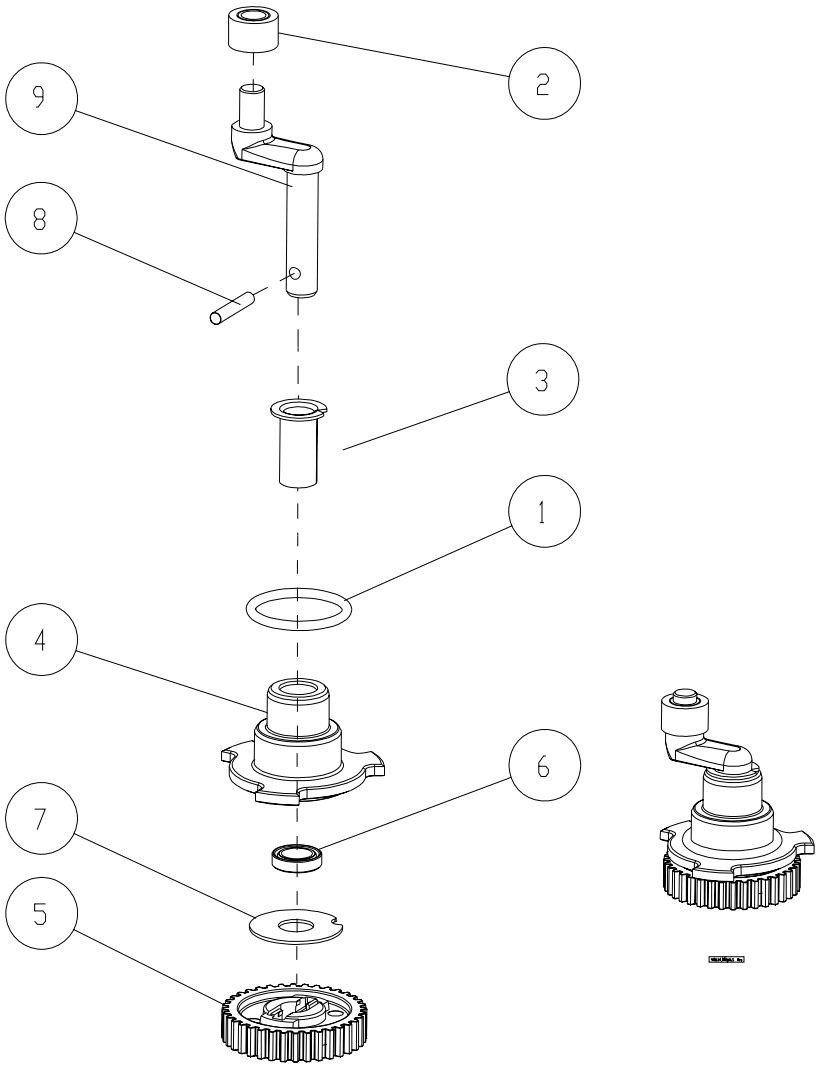
Item No	Description	Désignation Français	Part No	Comments
1	Screw HSHC M4x10	Vis CHC M4x10	900017-025	
2	Bush BB 061016 BP25	Bague BB 061016 BP25	902835-002	
3	Tote Plug Sealable SM80	Bouchon Plombage Totalisateu	908065	
4	Totaliser Bearing	Palier Totalisateur	908162	
5	Tote Drive Adaptator	Adaptateur Sortie Totalisateur	908163	
6	Totaliser Shaft	Axe de Totalisateur	908164	
7	Pulser MPT1 + Cable	Emetteur MPT1 + Cable	941210	
	Pulser MPE-EC + Cable	Emetteur MPE-EC + Cable	909648	
	Pulser MPE-TC + Cable	Emetteur MPE-TC + Cable	909684	
	Pulser MPL + Cable	Emetteur MPL + Cable	943358	
	Pulser MPC-TC + Cable	Emetteur MPC-TC + Cable	943360	
	Pulser CP1 + Cable	Emetteur CP1 + Cable	908702	
8	Bearing Bush Comp. Lapped	Bague Collecteur Asm - Rode	941519	
9	TQM Control Housing Machine	TQM Collecteur Usine	945701-001	

5.5 Piston Assembly



Item No	Description	Désignation Français	Part No	Comments
1	Circlip Seeger Type AL48	Segment Seeger type AL48	908169-001	
2	Holding Ring	Bague de Maintien Piston	941941	
3	Piston Seal TQM	Joint Piston TQM	942065	
4	Backing Ring TQM	Contre Anneau TQM	942066	
5	Piston with insert	Piston with insert	945697	

5.6 Crankshaft Assembly



Item No	Description	Désignation Français	Part No	Comments
1	O-Ring 28x3	Joint Torique 28x3	900050-057	
2	Roller assy	Gallet asm	908054	
	IGUS Bearing	Bague IGUS	909953-001	Ethanol
3	Iglidur X fl. Bush	Iglidur X fl. Bague	909954-002	
4	Crank Shaft Holder	Palier Vilebrequin	908056	
5	Gear Wheel 36 Teeth	Pignon 36 Dents	908058	
6	Lip Seal 10x16x4	Joint Zoggel	908077-001	
7	Disc Spring	Rondelle Ressort	908167	
8	TQM Parallel Pin L=22.5mm	Goupil Paral L=22.5mm	908721	
9	Crank Shaft TQM	Vilebrequin TQM	940635	

Key :-

TC = Temperature Compensation

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