MASTER METER

(HORIZONTAL VERSION)

MOD. 110 - 112

INSTALLATION OPERATION AND MAINTENANCE

PETROL INSTRUMENTS S.r.l. - 04011 APRILIA (LT) - ITALY
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General

The “PETROL” Master Meter is a very reliable and repeatable flow meter giving reproducible results, to be used to prove another meters as alternative to tank provers of special capacity

“PETROL” Master Meter is instruments capable of measuring the volume of flowing liquids with a standard accuracy of ± 0,1% of reading.

“PETROL” Master Meter must not be mechanically compensated for gravity or temperature, its readout must indicate units of volume without corrections and must have a direct output from the measuring element to the pulse generator or the register.

“PETROL” Master Meter will be supplied complete with sealing to prevent unauthorized adjustment.

“PETROL” Master Meter calibration certificate has to be renewed every 100 calibration and in any case every 2 years.

This manual has been prepared for people responsible of their installation and, at the same time, for people responsible of their maintenance and service.

INVOLVED PERSONNEL ARE KINDLY REQUESTED TO READ THROUGHLY THE PRESCRIPTIONS CONTAINED IN THIS MANUAL, Specially THOSE RELEVANT TO MASTER METER INSTALLATION BEFORE THEIR START-UP.
2 Construction

Master Meters are mainly composed of the measuring unit ass’y and of the indicator unit (see dwg.1).

The indicator unit, available in different models, is that required for the specific application.

The measuring unit ass’y is composed of three main sub-ass’y, namely:

- the outer housing;
- the inner housing ass’y;
- the coupling ass’y.

The outer housing is the part that withstands the liquid pressure and its construction is in accordance to max. expected pressure of flowing liquid.

The inner housing ass’y is the part through which the flowing liquid volume is accurately metered through the revolutions of the rotors. (roots type mechanism).

The coupling ass’y is the part through which the number of rotors revolutions is transmitted to the indicator unit where are displayed the volumes metered.
Application Limits

Master Meter must be used only within the limits specified in the name-plate, i.e. only for the liquid, the flowrate, the temperature, the max pressure and the viscosity specified in the name-plate (see dwg. 1) and in the relevant certificate.

If it is in portable service, it should be protected against damage during transportation, installation and handling.

IT IS THEREFORE REQUESTED TO ACCURATELY CHECK THE NAME-PLATE BEFORE FLOWMETER START-UP.
Installation Instruction

PRECAUTIONS

The majority of Master Meters failures are caused by infiltration of solid particles from the outer housing flanges during "inoperative conditions". It is therefore very important:

- to remove the flanges protections only immediately before the instrument installation;
- to absolutely prevent the entering of solid particles into the measuring unit ass’y during installation.

INSTRUCTIONS

1. During Master Meter installation avoid that deformation and/or stresses are induced into the outer housing from the connecting pipes. IF THE PD FLOWMETER IS EQUIPPED WITH ANCHORING PLATES, BOLT THEM STRONGLY TO AVOID VIBRATIONS.

2. Check that actual flow direction is the same indicated by the arrow on the flowmeter outer housing and/or in accordance to the "in" and "out" name-plates attached to the inlet and outlet flanges of the flowmeter.

3. The Master Meter must be mounted with the rotor shafts in horizontal position and the counter dial must be in a vertical position (see dwg. 1a). In any case, on the glass of the counter is glued a label which clearly show the correct mounting position of the Master Meter. In case the counter dial is required to be positioned horizontally or inclined at 45°, the Master Meter will be equipped with a proper 90° or 45° angle adaptor.
4. It is recommended to provide enough space on the rear side of Master Meter (i.e. on the opposite side of the reading unit) for rear-cover removal as well as for inner housing assembly removal.

5. The same accessories that are connected when the “Petrol Instruments Master Meter” is proved must be connected when it is used to prove another meter.
dwg.2 - Installation Examples
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Start-up and Operating Instruction

1. To start-up Master Meter open first the inlet valve and then open slowly the outlet valve.

AVOID TOO HIGH FLOW RATES AS WELL AS TOO SHORT OPENING AND/OR CLOSING CYCLES.
Failure Analysis

Failures of the Master Meter reading unit may be caused by:

1. Solid particles inside the inner housing ass’y;

2. Rotors interference due to excessive wear of bearings and of timing gears;

3. Failure of coupling ass’y due to excessive wear of fork-type coupling.

4. Failure of reading unit.

In case of Master Meter reading unit failure it is necessary to inspect the instrument following step by step the maintenance procedures, replacing, where needed, damaged parts with new parts.
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Inspection Procedures

To check the inner housing ass’y it is at first necessary to control whether the rotation of timing gears is regular or not. It is therefore necessary to remove the front cover of PD flowmeter outer housing (see dwg. 1) un-screwing the relevant fixing bolts and nuts. The front cover of the outer housing may be removed together with the counter unit. During such an operation particular care must be used to avoid any damage of the "fork type" coupling system existing between the inner housing ass’y and counter unit itself.

Once removed the front cover, the timing gears of the inner housing ass’y may be inspected and their rotation may be checked by hands or with an adequate wrench.

- Should the rotors rotation be normal or uniform it is necessary to check the movement transmission system between inner housing ass’y and counter unit. The transmission system components are integrally mounted with the front cover and in the actual situation may be easily inspected without particular instructions.

- Should the rotors rotation be not normal or uniform it is necessary to pull-out the inner housing ass’y from the outer housing to proceed to relevant inspection and maintenance.
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Inner Housing Ass’y Maintenance

The inner housing ass’y is shown in dwg. 2 as an ass’y and in dwg. 6 as exploded view.

The numbers printed in the two (2) above mentioned drawings, are those identifying the components listed in the legenda of drawing 6.
To disassembly the rotors it is recommended to proceed in the following way.

1. remove the front cover (50), side timing gears, taking-out the relevant fixing screws (66).
2. remove the shaped rotors plate (48) taking-out the relevant fixing screws (64).
3. mark the relative position of timing gears by making a recognizing sign on them. Such marking is necessary for the correct re-assembly of rotors.
4. pull-out the rotors from inner housing ass’y, using the timing gears as pullers.
Inner Housing Ass’y Maintenance

Once rotors have been removed the actual conditions of the rotors themselves and the wear conditions of the timing gears and of the bearings may be properly evaluated. It is just the case to mention that the rear cover is disassembled following the same procedures mentioned under item 1).

- **TIMING GEARS**
  The purpose of timing gears is to synchronize the rotors and their relative position is established by the centering pins (34). Should timing gears be replaced, it is recommended to use particular care in the re-positioning of the new gears. The timing gears are removed by unscrewing the relevant fixing screws (37).

- **BEARINGS**
  Should be necessary to replace the bearings (22, 59), those must be removed from relevant covers together with the bearing holders (23, 60). To facilitate such an operation it is recommended to mount a screw on the threaded holes of the bearing holders and to use them to remove the system bearing/bearing-holder.

Inner housing unit re-assembly procedures are just the reverse of rotors disassembling procedures above mentioned. However the utmost care and attention must be placed to the following points.
Inner Housing Ass’y Maintenance

1) check that the "clearances", i.e., the distance between the rotors and the distance between the rotors and the inner unit body are uniform;

2) check that rotor position is that corresponding to the recognizing marks previously made on the timing gears.

The PD flowmeter re-assembly procedures are just the reverse of disassembly procedures above mentioned for inner unit ass’y check.
The utmost care must however be placed in re-mounting the front cover to avoid damages to the "fork type" coupling (43, 44, 45) between inner unit ass’y and counter.
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Spare Parts

To order spare parts make reference to the attached exploded-view drawing.

When placing the order please specify:

a) flowmeter model, printed on name-plate (see dwg. 1)

b) flowmeter serial number, printed on name-plate (see dwg. 1)

c) item number and description of parts as specified in the attached exploded-view drawing
Master Meter are normally supplied packed inside wooden cases that may be easily handled without damaging the instruments.

For cases handling all types of motor machinery and/or hand machinery generally available at storage houses may be used.

It is however recommended to avoid the superimposing of cases except in case of equal dimensions and similar gross weight.

No special precautions have to be taken for short periods of storage. It is however recommended that cases are possibly stored in a closed warehouse and anyway not left in open areas exposed to rain, sand and wind.

In case of long periods of storage, cases must be stored in a closed warehouse. In addition, Master Meter maintenance procedures must be strictly followed immediately after equipment unpacking and/or immediately before their installation and/or start-up.

It is in any case imperative that at least the measuring unit is removed from the outer housing and duly checked according to its specific maintenance procedures, before PD flowmeter start-up.
### Troubleshooting Table

**FAILURES FOR PD FLOWMETERS WITH MECHANICAL COUNTER**

<table>
<thead>
<tr>
<th>FAILURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The liquid flows regularly but the PD flowmeter does not count</td>
</tr>
<tr>
<td>The liquid does not flow through the PD flowmeter</td>
</tr>
<tr>
<td>The liquid leaks from the junction between the front cover and / or rear and the body</td>
</tr>
<tr>
<td>Lack of accuracy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical counter failure</td>
<td>Check the correct operation of the mechanical counter</td>
</tr>
<tr>
<td>Connection between magnetic transmission and mechanical counter</td>
<td>Check the correct operation of the reduction gear assembly</td>
</tr>
<tr>
<td>Connection between PD flowmeter and reduction gear assembly</td>
<td>Check the correct operation of the magnetic transmission</td>
</tr>
<tr>
<td>Rotors failure</td>
<td>Disassemble and inspect the rotors</td>
</tr>
<tr>
<td>Foreign bodies stuck between the surfaces of the rotors</td>
<td>Remove foreign bodies and restore the surface of the rotors.</td>
</tr>
<tr>
<td>Timing gears blocked</td>
<td>Check the correct operation of the timing gears</td>
</tr>
<tr>
<td>Strainer clogged</td>
<td>Clean the strainer</td>
</tr>
<tr>
<td>O-ring damaged; cover screws not properly screwed</td>
<td>Replace the O-ring and tighten the screws of the covers</td>
</tr>
<tr>
<td>Bushings and / or timing gears worn</td>
<td>Replace the bushings and / or timing gears</td>
</tr>
</tbody>
</table>
# FAILURES FOR PD FLOWMETERS WITH ELECTRONIC COUNTER

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<th>FAILURE</th>
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<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>The liquid flows regularly but the PD flowmeter does not count</td>
<td>Electronic counter failure</td>
<td>Check the correct operation of the mechanical counter</td>
</tr>
<tr>
<td></td>
<td>Connection between magnetic transmission and mechanical counter</td>
<td>Check the correct operation of the pulse transmitter</td>
</tr>
<tr>
<td></td>
<td>Connection between PD flowmeter and reduction gear assembly</td>
<td>Check the correct operation of the magnetic transmission</td>
</tr>
<tr>
<td>The liquid does not flow through the PD flowmeter</td>
<td>Rotors failure</td>
<td>Disassemble and inspect the rotors</td>
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<tr>
<td>The liquid leaks from the junction between the front cover and / or rear and the body</td>
<td>O-ring damaged; cover screws not properly screwed</td>
<td>Replace the O-ring and tighten the screws of the covers</td>
</tr>
<tr>
<td>Lack of accuracy</td>
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Drawings

Drawing n.1
Drawing n.2
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"A" Spare Parts List

models 110-112