

PETROL INSTRUMENTS S.r.l. - ITALY

P D F L O W M E T E R S

PRODUCTION QUALITY CONTROL

1. GENERALITY

- 1.1. "PETROL" PD flowmeters are entirely manufactured in the factory of Aprilia (LT), Italy.
- 1.2. Up to 1980 the manufacturing "know-how" was based on a technical agreement with Hitachi Group.
- 1.3. Technology acquired during the years, through the measurement of the more different liquids, is an our exclusive property continuously passed into our products for their up-to-dating and optimization.
- 1.4. The manufacture of our PD flowmeters foresees the underdetailed steps:
 - 1.4.1. parts machining,
 - 1.4.2. parts assembling,
 - 1.4.3. hydraulic test,
 - 1.4.4. performance test,
 - 1.4.5. painting,
 - 1.4.6. packing/shipment.

which are described from a production quality control stand-point in the next sections.

2. PARTS MACHINING

PD flowmeters of our standard construction are composed of four (4) main sub-assemblies:

- 2.1. outer housing, flanged, to be considered as the "container" of the measuring unit;
- 2.2. measuring unit;
- 2.3. movement transmission system, between measuring unit and counter (magnetic transmission);
- 2.4. reduction gear assembly and counter.

2.1. Outer housing

Is composed of three (3) parts, called respectively flanged outer body, front outer cover and rear outer cover.

Raw materials are carbon steel castings or stainless steel castings, in the various grades available.

Castings are purchased periodically taking into consideration both costumers and factory stock needs.

- Each lot of casting delivered is accompanied by his own analysis certificate released by the foundry.
- The delivered castings are coded by us in order to recognize their supplying lot when machined.
- Some pieces of the casting lots are periodically sent to specialized laboratories for an our check of their quality.

Castings are machined on center lathes and then on column drilling machines on the basis of specific drawings issued for turning and drilling.

Machining drawings are duly marked "for working". Defects eventually encountered on castings are evidenced to the production manager who has the responsibility to decide whether the piece has to be refused or to be repaired. At the end of machining each piece is smoothed using a tumbling barrel machine. Once smoothed, all pieces are inspected and then stocked.

- A factory inspection report for each lot inspected is drawn-up.

2.2. Measuring unit

Is composed by the underdetailed items:

2.2.1. Five (5) parts, respectively called inner housing, inner front cover, inner rear cover, "a" rotor, "b" rotor. For each of them are applied the same procedures of production quality control listed under item 1a.

2.2.2. Four (4) carbon bearings.

Such parts are purchased by qualified sub-supplier.

All bearings are dimensionally checked at factory when received;

- material quality is certified by sub-supplier;
- hardness check is periodically carried-out by our laboratory.

2.2.3. Two (2) rotor's shafts.

Raw materials are semi-finished bars in the various grades of stainless steel; they are also periodically purchased taking into consideration both customers and factory stock needs.

- Each lot of delivered semi-finished bars is accompanied by its own analysis certificate released by the sub-supplier.
- Some bars pieces are periodically sent to specialized laboratories for an our check of their quality.

Bars are machined on a center type lathe equipped with an hydraulic copy device, on the basis of specific drawings for turning.

- Machining drawings are duly marked "for working".
- At the end of machining all the shafts are inspected and stocked.

2.2.4. Two (2) timing gears and one (1) rotor gear.

Raw materials are semi-finished bars in the various grades of stainless steel, which are periodically purchased taking into consideration both customers and factory stock needs.

- Each lot of delivered raw materials is accompanied by its own analysis certificate which is released by the sub-supplier.
- Some bars pieces are periodically sent to specialized laboratories for an our check of material quality.

Bars are machined on center type lathes and then on gear hobbing machine on the basis of specific drawings for turning and for gear cutting.

- Machining drawings are duly marked "for working".
The pieces are inspected and checked at the end of the lathe machining.
The gears are inspected and stocked after the gear cutting.
- A factory inspection report for each lot of produced gears is drawn-up.

2.2.5. Eight (8) exagonal head screws and two (2) block-nuts.

Such parts are purchased from qualified sub-supplier.

- Material quality is certified by the sub-supplier.

2.3. Movement transmission system. (Magnetic Transmission)

Is mainly composed either of parts machined from semi-finished bars of stainless steel in the various grades available, either of brass.

- Same quality control procedures foreseen for rotor's shafts (item 2.2.3) are carried-out.

2.4. Reduction gear assembly and counter.

They are mainly composed of parts machined from semi-finished bars of brass, bronze, aluminum, iron for automatic machines and of stainless steel in the various grades available.

- The same quality control procedures foreseen for the semi-finished bars of rotor's shafts and pilot/rotor gears (item 2.2.3 and 2.2.4) are carried-out.

3. ASSEMBLING

The sub-assemblies 2.2, 2.3 and 2.4 are assembled as separate components.

Each sub-assembly is inspected and checked at the end of its assembly.

- A factory inspection report is drawn-up for each measuring unit (item 2.2) evidencing the specific "clearances".

4. HYDRAULIC TEST

The sub-assembly 2.1 is assembled and hydraulically tested at not less than 1,5 times the max. operating pressure for a period of five (5) minutes.

Due to "double case" type construction of our PD flowmeters, outer housing is the sole sub-assembly subject to the line operating pressure.

- A factory inspection certificate is drawn-up for each hydraulic test.

5. PERFORMANCE TEST

Performance test is carried-out using the test stations available at our factory.

Test liquid used is water added with some percentage of oil for the further protection of cast iron/steel parts of PD flowmeters C5 and C8 versions.

Test stations are of "closed cycle" type with stainless steel reservoirs, except for the 25.000 litres test station where reservoir is in carbon steel, and calibrated tanks sealed by Italian Metric Office.

Test runs are performed at maximum specified flow-rate, at average specified flow-rate, and at minimum specified flow-rate.

The minimum length of each test run is not less than one (1) minute.

The operator has available the "working order" relevant to the specific supply.

- A factory inspection certificate is drawn-up for each performance test.

6. PAINTING

Before painting the parts composing the PD flowmeter have been already subject to underdetailed treatments:

- sandblasting at foundry;
- smoothing, by means of tumbling barrel machine, after machining.

A spray type painting is therefore carried-out using a polyurethane varnish produced by "Mirodur" which, in accordance to specific needs, may be also applied on an epoxidic priming.

7. PACKING/SHIPMENT

PD flowmeters are normally packed inside 20 mm. thick wooden cases and firmly anchored to the case's walls. Packing includes the PD flowmeters installation, operation and maintenance manual as well as the other documents related to the specific supply.

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