MT-196-E

ENGLISH

PRESSURE REGULATOR

Norval 608

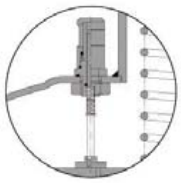
TECHNICAL MANUAL

INSTALLATION ,COMMISSIONING
AND MAINTENANCE ISTRUCTIONS

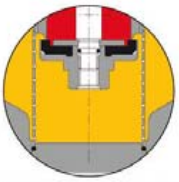
Pietro Fiorentini®

Norval 608

Pressure **Regulator**



Stroke indicator



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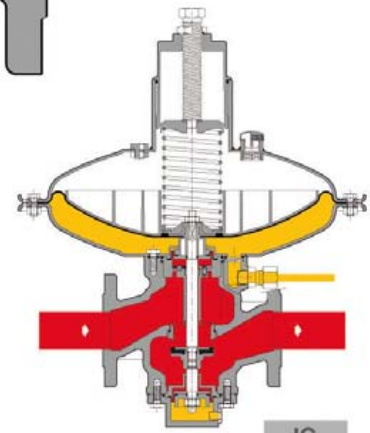


IC

INLET PRESSURE

OUTLET PRESSURE

PRECAUTION

GENERAL PRECAUTION

The apparatus described in this manual is a device subject to pressure installed in systems under pressure;
The apparatus in question is normally installed in systems for transporting flammable gases (natural gas, for example).

PRECAUTION FOR THE OPERATORS

- Before proceeding with installation, commissioning or maintenance, operators must:
- Examine the **safety provisions** applicable to the installation in which they must work;
- Obtain the **authorisations** necessary for working when required;
- Use the necessary means of **individual protection** (helmet, goggles, etc.);
- Ensure that the area in which they operate is fitted with the means of **collective protection** envisaged and with the necessary **safety indications**.

HANDLING

The handling of the apparatus and of its components must only be carried out after ensuring that the lifting gear is adequate for the **loads to lift** (lifting capacity and functionality). The apparatus must be handled using the **lifting points** provided on the apparatus itself.
Motorised means must only be used by the persons in charge of them.

PACKING

The packing for transportation of equipment and of relevant spare parts are designed and shaped to avoid damage to any part during transportation, warehousing and handling activities. Therefore the equipment and spare parts shall be kept into their packing until their installation in the final site. After packing is open, check that no damage occurred to any goods. If damage occurred inform the supplier and keep packing for any verification.

INSTALLATION

The installation of the pressure regulator has to occur in compliance with the provisions (laws or standards) in force in the place of installation.
In detail, natural gas plants have to show features in compliance with the law provisions and standard requirements in force in the place of installation or at lease in compliance with standards EN 12186 or EN 12279; in detail, it is necessary to meet the provisions of paragraphs 6.2, 7.5.2, 7.7, 9.3 of the standard EN 12186 and 6.2, 7.4, 7.6, 9.3 of the EN 12279 standard. The installation in compliance with such standards minimizes the risk of fire hazard and the formation of potentially explosive atmospheres.
The valve is not equipped with external pressure limitation devices; therefore, it has to be installed making sure that the operating pressure of the assembly on which it is installed does not exceed the maximum allowable pressure (PS).
Therefore, the user, as deemed necessary by the same, shall install on the assembly suitable pressure limitation systems, as well as provide the plant with suitable relief or drain systems in order to discharge the pressure and fluid contained in the plant before proceeding with any inspection and maintenance activity.
If the installation of the apparatus requires the application of **compression fittings** in the field, these must be installed following the **instructions of the manufacturer** of the fittings themselves. The choice of the fitting must be compatible with the use specified for the apparatus and with the specifications of the system when envisaged.

COMMISSIONING

Commissioning must be carried out by **adequately trained personnel.**
During the commissioning activities, the personnel not strictly necessary must be ordered away and the no-go area must be properly signalled (signs, barriers, etc.).
Check that the settings of the apparatus are those requested; if necessary, reset them to the required values in accordance with the procedures indicated in the manual.
When commissioning, the risks associated with any discharges into the atmosphere of flammable or noxious gases must be assessed.
In installations in natural gas distribution networks, the risk of the formation of explosive mixtures (gas/air) inside the piping must be considered.

CONFORMITY TO DIRECTIVE 97/23/EC (PED)

Pressure regulator **Norval 608** is classified as **pressure accessory** according to directive 97/23/EC (PED).
The pressure regulator **Norval 608** with embedded block device, with pressure switch for tripping in case of maximum pressure, is defined as a safety accessory according to PED Directive and, therefore, it can be used both as a pressure accessory and a safety accessory, always according to the PED Directive.
The configuration of the regulating pressure regulator plus in line monitor regulator is defined as safety accessory according to the PED Directive.
In this case the user shall verify that the maximum allowable pressure (PS) of pressure equipment to be protected is consistent with setting and closing class **(SG**) of monitor regulator; the pressure inside pressure equipment shall be lower than 110% of **PS**.
Conformity with Directive 97/23/EC and CE marking of pressure regulator and relevant accessory require installation in the system with minimum requirements according to EN 12186).

- INDEX -.

1.0 INTRODUCTION

The scope of this manual is to provide the essential information for the installation, commissioning, disassembly, re-assembly and maintenance of **NORVAL 608** regulators.
It is also appropriate to provide a brief illustration of the main features of the regulator and of its accessories.

1.1 MAIN FEATURES

The **NORVAL 608** pressure regulator is a pressure regulator for previously cleaned gaseous fluids and is suitable for medium and low pressures.
The **NORVAL 608** is a normally open regulator and consequently opens in the event of:
- Breakage of the main diaphragm;
- No regulated pressure signal.

The main specifications of this regulator are:
- Design pressure **PS**: 6 bar
- Operating Temperature range: -20 °C to + 60 °C;
- Ambient Temperature range: -20 °C ÷ + 60 °C;
- Inlet pressure range **bpu**: da 0,2 to 6 bar
- Possible regulation range **Wd**: from 15 to 200 mbar
- Minimum differential pressure: 0,1 bar;
- Accuracy class **AC**: up to 5 (according to the output pressure field);
- Lockup pressure class **SG**: up to 10 (according to the output pressure field)

1.2 OPERATION OF THE PRESSURE REGULATOR NORVAL 608 (fig. 1)

NORVAL 608 series regulators (Fig.1) are spring activated devices with control of the downstream pressure Pd by means of an external sensing line.
In absence of pressure, the obturator **83** is maintained in the open position by the spring.
The outlet pressure **Pd** is checked through the comparison between the load of the spring **41** and the impulse of the outlet pressure on the membrane **12**.
In this comparison are involved also the weight of the mobile equipment and the dynamic thrusts on the obturator.
Upstream pressure **Pu**, though variable, has no influence on the balance of obturator **83** as counter-influenced by the balancing device.
The movement of membrane **12** is transmitted from the shaft **80** to the obturator **83** which moves perpendicularly vs. the gas flow direction.
The obturator **83** is fitted with a vulcanized rubber gasket **82** to ensure perfect tightness with zero flow rate demand.
If, during operation, the downstream pressure drops **Pd**, the force it exerts on the diaphragm **12** becomes lower than the load of the spring **41**. The diaphragm **12** gets therefore lower, getting, through the shaft **80**, the obturator **83** to get away from the valve seat **31**. The gas flow, therefore, increases until the initial pressure set-point is restored.
If, on the other hand, the downstream pressure begins to increase, the force exerted on the diaphragm **12** exceeds the load the spring **41**. The obturator is therefore displaced towards the closed position, returning the downstream pressure the set-point.
In normal working conditions, the obturator **83** is positioned in such a way as to maintain the pressure **Pd** around the selected set-point **Pds**.

For the regulation of the Setting Pressure **Pds** you can rotate the regulation screw **1**, clockwise to increase and anti-clockwise to decrease.
The regulator has 2 anti-pumping devices **10**, formed by 2 little valves, and **23**, formed by a little valve, which must decrease the incoming and outcoming flow of gas/air in the regulator's head in the transitory phases, to eliminate possible fluctuations of the regulated pressure **Pds.**

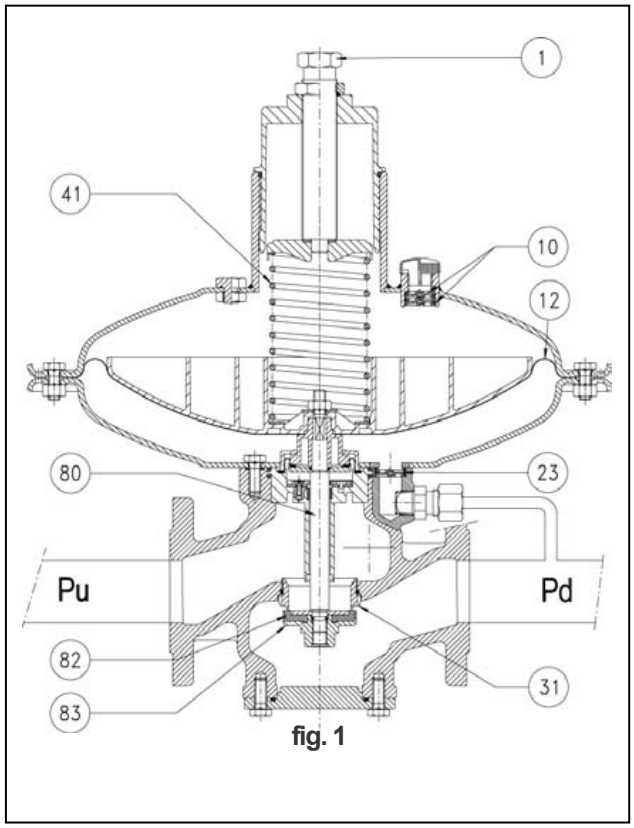


fig. 1

1.3 Tab. 1 SETTING SPRING

Table 1 shows the calibration fields of the different foreseen springs

SPRINGS CHARACTERISTICS					NORVAL 608
Code	Color	De	Lo	d	Setting range (mbar)
2701966	**BROWM**	85	350	4,8	15 ÷ 21
2702205	**GREEN**		350	5	18 ÷ 26
2702385	**BLACK**		350	5,5	23 ÷ 33
2702565	**BLUE**		350	6	30 ÷ 42
2702755	**WHITE**		300	6,5	39 ÷ 57
2702975	**YELLOW**		300	7	54 ÷ 72
2703175	**ORANGE**		300	7,5	69 ÷ 107
2703525	**GREEN**		300	8,5	104 ÷ 142
2703745	**BLACK**		300	9	139 ÷ 202

SPRINGS CHARACTERISTICS					NORVAL 608 UPSIDE-DOWN
Code	Color	De	Lo	d	Setting range (mbar)
2702205	**GREEN**	85	350	5	14 ÷ 22
2702385	**BLACK**		350	5,5	19 ÷ 28
2702565	**BLUE**		350	6	25 ÷ 37
2702755	**WHITE**		300	6,5	34 ÷ 52
2702975	**YELLOW**		300	7	49 ÷ 67
2703175	**ORANGE**		300	7,5	64 ÷ 107
2703525	**GREEN**		300	8,5	104 ÷ 142
2703745	**BLACK**		300	9	139 ÷ 202

De = external diameter **d** = wire diameter **Lo** = length

2.0 INSTALLATION

2.1 GENERAL

Before installing the regulator it is necessary to ensure that:
- The regulator can be inserted in the space provided and that subsequent maintenance operations will be sufficiently practicable (see overall dimensions in table 2a ;
- Inlet and outlet pipings must be at the same level and able to carry the weight of the regulator (see table 2b);
- The inlet/outlet flanges of the piping are parallel;
- The inlet/outlet flanges of the regulator are clean and the regulator itself has not been subject to damage during transport;
- The piping upstream has been cleaned to expel residual impurities such as welding scale, sand, paint residues, water, etc.

The usually foreseen arrangement is the one indicated in figure 2; for other possible set-up see fig.3

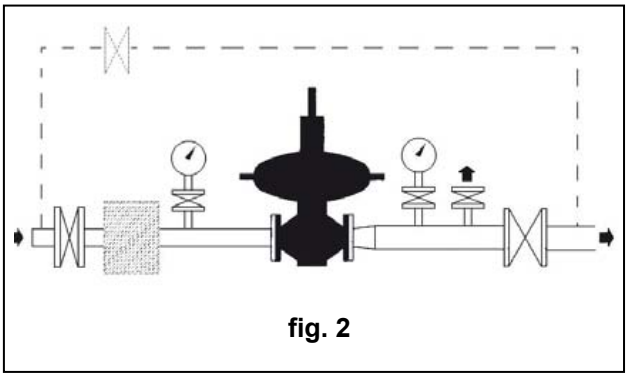


fig. 2

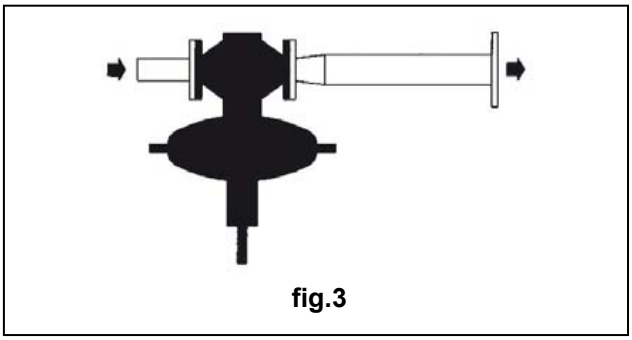
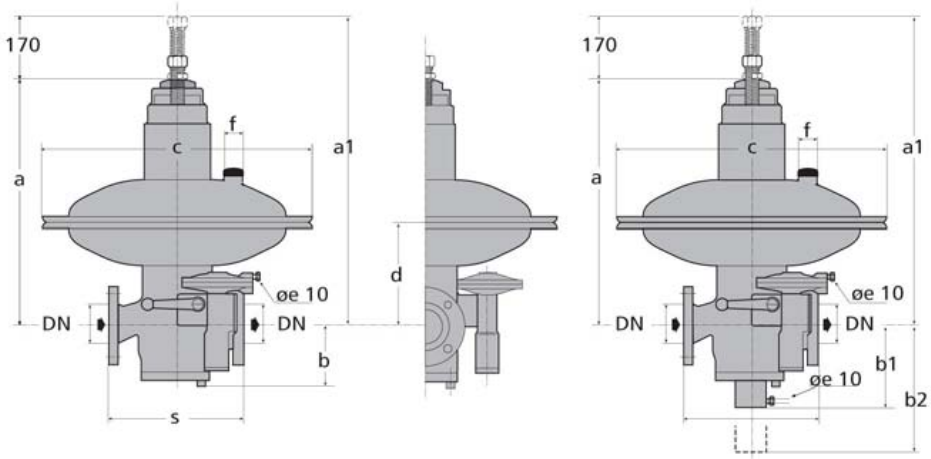


fig.3



Tab. 2a Overall dimensions

Size. (mm)	**50**	**80**
Inches	**2”**	**3”**
a	420	425
a1	590	595
b	106	132
b1	136	162
b2	136	212
c	495	495
d	162	187
f	R ½”	R ½”
s	254	298

Tab. 2b Weights in KGF.

Size. (mm)	**50**	**80**
Inches	**2”**	**3”**
Norval 608	38	53
Norval 608 with slam shuth SN 608	40	55
Norval 608 with monitor IC	39,5	59,5
Norval 608 with slam shuth SN 608 and monitor IC	41,5	61,5

2.2 CONNECTING THE DEVICES

The connections between the apparatus and the main piping must be made using stainless steel or cooper pipe with minimum internal diameter of 12 mm.

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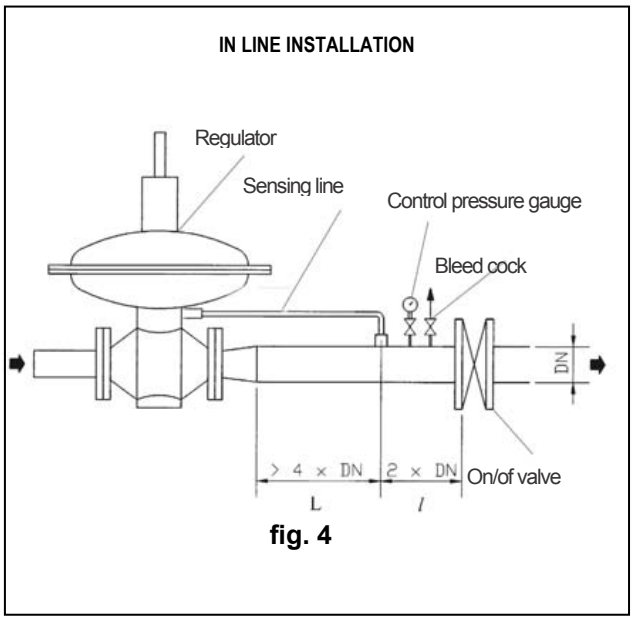

fig. 4

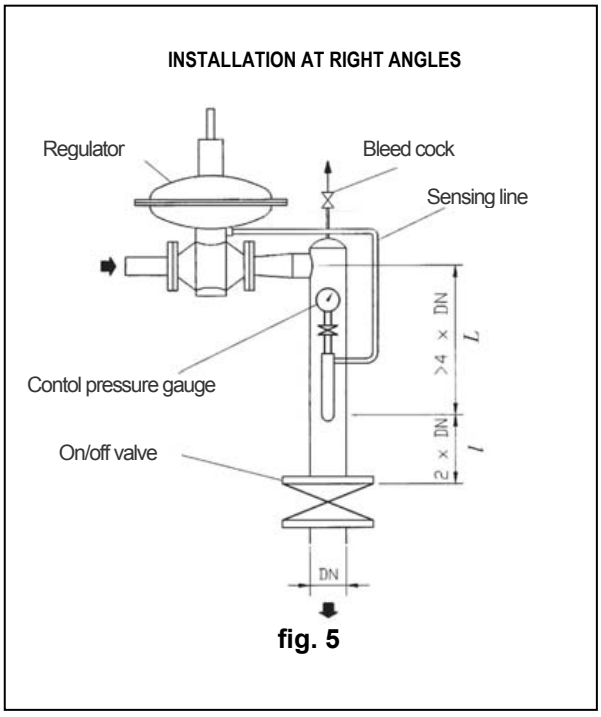

fig. 5

Tab.3: ***Detail of multiple take-off***

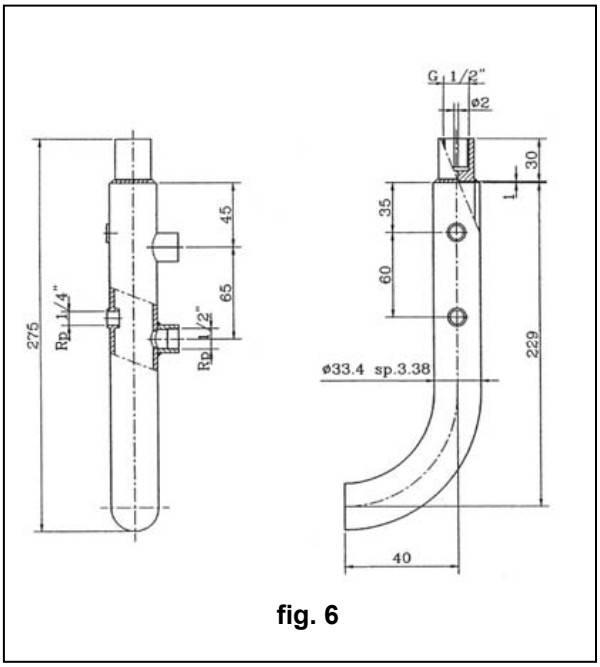

fig. 6

The installation of a multiple plug on a plant has its aim in in taking from a single point all the pressure impulse signals that go to the different reduction- safety devices and to their accessories.

The regulator must be installed in the line **with the arrow on the body pointing in the gas flow direction**.

It is indispensable for good regulation for the position of the downstream pressure take-offs and the speed of the gas at the take-off point respect the value given in table 4.
The regulator, when used in gas pressure reduction stations, has to be installed at least according to the requirements set forth by the standards EN 12186 or EN 12279. All points for possible gas relief due to possible breaks of sensors/diaphragms are to be conveyed according to standards EN 12186 or EN 12279.

The following is recommended so as to prevent the accumulation of impurities and condensate in the lines of the pressure take-off.

a) The lines themselves must slope down towards the downstream piping with a slope of about 5-10%;
b) The connectors on the piping must always be welded on the top of the piping itself and there must be o burr or inward protrusions in the hole in the piping.

N.B. WE RECOMMEND NOT TO PUT ON/OFF VALVES ON THE IMPULSE TAKE-OFFS

Tab.4

The speed of the gas must not exceed the following values in the piping down-stream from the regulator
Vmax = 15 m/s for Pd ≤ 0,5 bar

Pressure regulator does not require any supplementary upstream safety accessory for protection against overpressure compared with its design pressure **PS**, when upstream reducing station is sized for a max downstream incidental pressure **MI Pd ≤ 1,1 PS**.

2.3 DOWNSTREAM VOLUME REQUIRED FOR INSTALLATION

In the case of a service regulator of the ON-OFF type (stopping or starting of burners), you should remember that though the **NORVAL 608** apparatus is classified as being of the fast reaction type, it requires an appropriately dimensioned volume of gas between the apparatus itself and the burner so as to partly absorb the pressure swings caused by fast flow rate variations

3.0 MODULARITY

The modular-type conception of **NORVAL 608** regulators means that it is also possible to fit the slam-shut incorporated with the body itself even after the installation of the regulator .

3.1 SN 608 INCORPORATED SLAM SHUT

This is a device (fig. 7and 8) which immediately blocks the gas flow if, because of some failure, the downstream pressure reaches the point set for its intervention, or if it is actuated manually.
Wait the **NORVAL 608** pressure regulator, the slam-shut be incorporated on both the service regulator or on the in-line monitor.

The main features of the slam-shut device are as follows:

- Design pressure **PS**: 6 bar;
- Intervention for pressure increase and/or decrease;
- Intervention accuracy **AG**: ± 5% of the set point for pressure increase (based on setting-pressure);
  ± 15% of the set point for pressure drop (based on setting-pressure);
- internal by-pass device;
- manual button-operated actuating device.

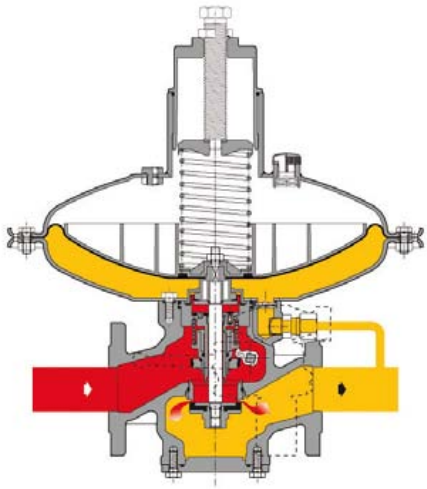

fig. 7

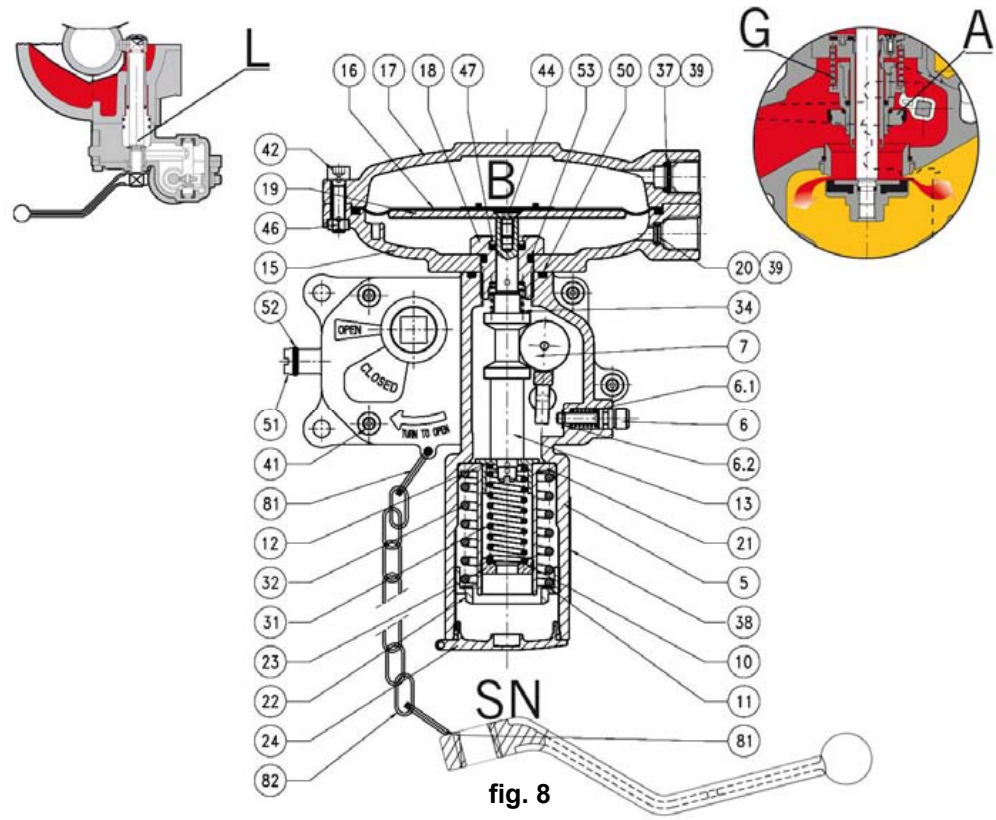

fig. 8

The slam-shut mechanism consists of:

- a mobile obturator A with sealing gaskets subject to the load of the closing spring **G**;
- a lever assembly L whose rotation causes the movement of the obturator **A**;
- a pressure switch device I-N whose internal motion determines the open or closed position of the obturator **A**.

The pressure switch device (fig. 8) comprises a control head **B** in which the pressure to control **Pd** acts on the diaphragm 16 which is integral with the shaft with cams **13**.

The load of the pressure **Pd** on the diaphragm is contrasted by the springs **31** and **32**, which respectively determine intervention for a pressure increase or decrease.

The slam-shut device is set by adjusting the rings **23** and **22**.

The intervention value is increased by turning the rings clockwise and vice versa when turned anticlockwise.

In the case of intervention for pressure increase, when the Pd exceeds the set-point, the load on the diaphragm **21** of the control head **B** increases until it overcomes the resistance of the spring **32** .

This provokes the downward displacement of the shaft **13** which shifts the feeler **7** and releases the lever mechanism.

Intervention for a pressure decrease takes place as follows.

As long as the value of Pd stays above the set load of the spring **31**, the spring support **12** rests on support **21**.

If the pressure Pd drops below the set-point, the support of spring **21** stops its stroke on the beat of the body **15** and the spring **31** displaces the support **12** upwards and the shaft **13** as a result. The cam **24** then shifts the feeler **7** and causes the release of the lever mechanism.

Intervention of the slam-shut device can also be provoked manually by means of the release button. The slam shut is reset by tuning the lever up.

During the first phase wait until the upstream pressure throught the internal by-pass passes downstream from the obturator to rebalance it.

The connection between the control head **B** and the Pd control point can be made with the interposition of a device (Push) which makes it easy to control the operation of the pressure control device.

ATTENTION

Take off the lever once terminated the recovery Intervention

Table number 5 shows the intervention range of the available pressure-switch.

3.2 Tab. 5 SN 608 SLAM-SHUT SETTING SPRINGS

Spring characteristics					SLAM-SHUT SN 608
Code	**Colour**	**De**	**Lo**	**d**	**SETTING RANGE in mbar**
					Intervention for max. pressure
2700680	**BROWN**	35	60	2,3	25 ÷ 35
2700830	**RED/BLACK**			2,5	36 ÷ 70
2700920	**WHITE/YELLOW**			2,8	71 ÷ 95
2701040	**WHITE/ORANGE**			3	96 ÷ 160
2701260	**WHITE**			3,5	161 ÷ 290
2701530	**YELLOW**			4	291 ÷ 500
					Intervention for min. pressure
2700338	**WHITE**	15	40	1,3	10 ÷ 20
2700377	**YELLOW**			1,5	21 ÷ 40
2700464	**ORANGE**			1,7	41 ÷ 90
2700513	**RED**			2	91 ÷ 125
2700713	**GREEN**			2,3	126 ÷ 200

De = Ø external diameter **d** = Ø wire diameter **Lo** = Length

3.3 NORVAL 608 – INCREASED CAPACITY

By the implementation of a dynamic control system for the valveposition, regulator **Norval 608** is available also in version: "Increased Capacity", characterized by a dynamic booster located at the bottom of the control system.
The **IC-Version Regulator** has a **capacity even double if comparedwith standard version**, without any impact on regulation accuracy or on reaction time.

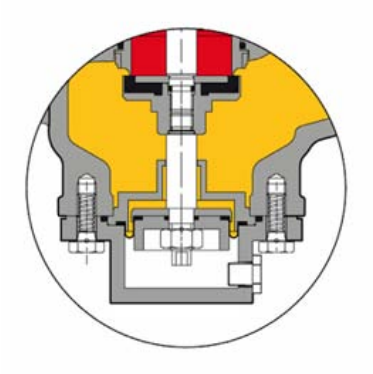

fig. 9

3.4 NORVAL 608 IC FUNCTIONING AS A MONITOR

The monitor is an emergency regulator whose function is to come into service instead of the main regulator when failure of the latter causes the downstream pressure to reach the point set for monitor intervention.
NORVAL 608 IC s a regolator which, connecting the pressure lines downstream, can be used like regolator monitor.
It is possible to convert an already-installed **Norval 608** regulator into a **Norval 608 IC** with monitor option, using a proper **IC** transformation KIT.

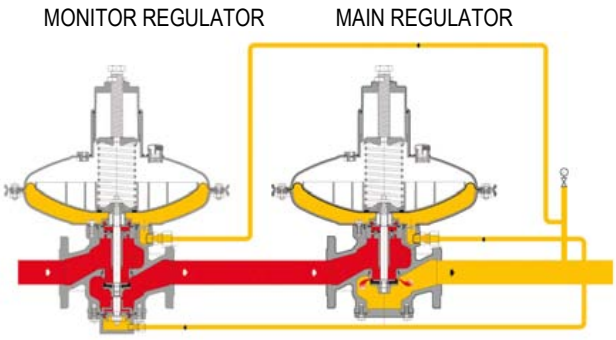

fig. 10

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3.4.1 CONSTRUCTIVE CHARACTERISTICS

The **Norval 608 IC** with monitor functions is a regulator which, compared with the normal version, has a further mobile assembly balancing device insuring higher accuracy of regulated pressure and at the same time an accurate take over pressure without risk of interference with main regulator.
In this configuration, the monitor regulator has a construction variation which is illustrated in fig. 11.

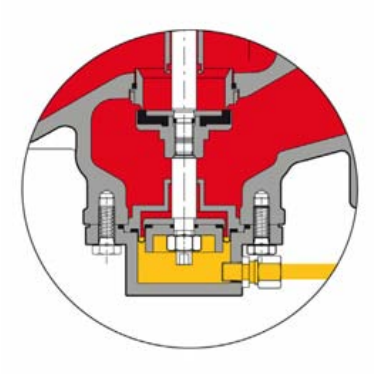

fig. 11

3.5 INTEGRATED SILENCER

This device allows a strong noise decrease caused by the reduction of gas pressure., when this condition is required by particular environmental conditions.
Pressure Regulator **Norval 608** can have an integrated silencer both in the normal version and in the version having block valve or on-line monitor.
Given the modular conception of the regulator, the silencer can be assembled on any kind of of Regulator **Norval 608** already installed, without having to modify incoming and outgoing pipings. The pressure reduction and regulation method is the same as the base-version-regulator

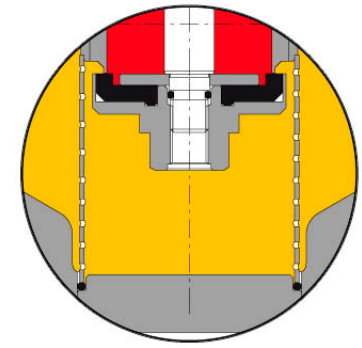

fig. 12

4.0 ACCESSORIES

4.1 RELIEF VALVE

The relief valve is a safety device which releases a certain quality of gas to the exterior when the pressure at the control point exceeds the set-point as a result of short-lasting events such as, for example, the very fast closing of the on/off valves and/or overheating of the gas with zero flow rate demand. The release of the gas to the exterior can, for example, delay or block the intervention of the slam-shut valves for transitory reasons deriving from damage to the regulator.
Obviously the quantity of gas released depends on the extent of the overpressure with respect to the set-point.
The different models of relief valves available are all based on the same operating principle which is illustrated below with reference to the valve **VS/AM 65 (fig. 13)**. It is based on the contrast between the thrust on the diaphragm **24** deriving from the pressure of the gas to control and the thrust from the setting spring **20**. The weight of the mobile assembly, the static thrust and the residual dynamic thrust on the obturator **4** also contribute to this contrast. When the thrust deriving from the pressure of the gas exceeds that of the setting spring, the obturator **4** is raised and a certain quality of gas is released as a result.
As soon as the pressure drops below the set-point, the obturator returns to the closed position.
Proceed as indicated below to control and adjust intervention of the relief valve.

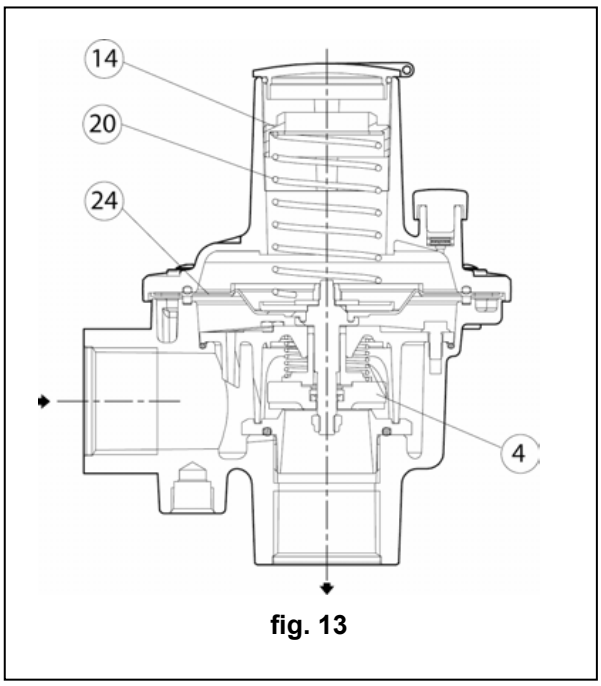

fig. 13

4.1.1 DIRECT INSTALLATION IN THE LINE (fig. 14).

When the relief valves fitted directly in the line that is, without the interposition of an on/off valve, we recommend proceeding as follows:

1) Ensure that the downstream on/off valve **V2** and the bled cock 6 are closed;
2) Connect to the cock **6** a controlled auxiliary pressure and stabilize it to the wished tripping value of the relief valve. Open the bleed cock **6** with a following increase in the pressure of the downstream section;
3) Check intervention of the relief valve and ad just it if necessary by turning the internal adjustment ring **14** appropriately (clockwise to increase the set-point, anticlockwise to reduce it).

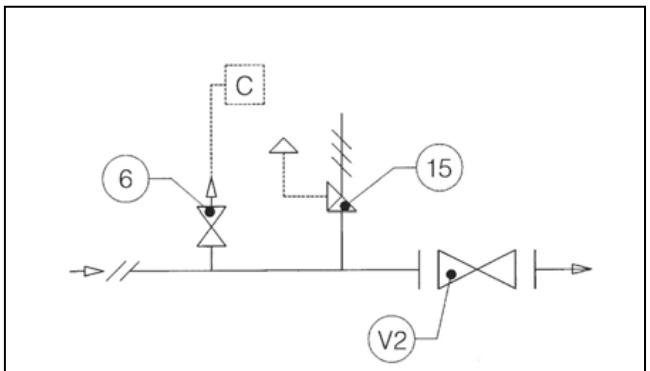

fig. 14

4.1.2 INSTALLATION WITH ON/OFF VALVE (fig. 14)

1) Close the on/off valve **16**;
2) Connect a controlled auxiliary pressure to the take-off valve **17** and increase it slowly to the envisaged intervention value;
3) Check intervention of the relief valve and ad just it if necessary by turning the interna adjustment ring **14** appropriately (clockwise to increase the set-point, anticlockwise to reduce it).

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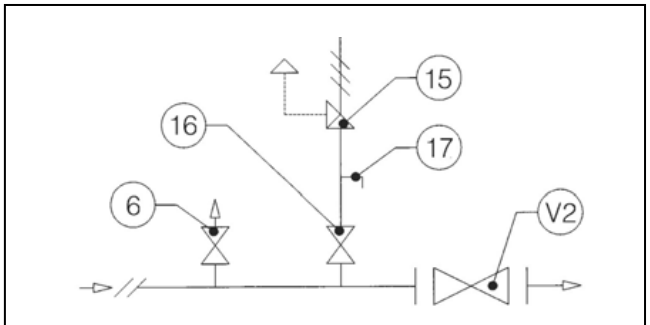


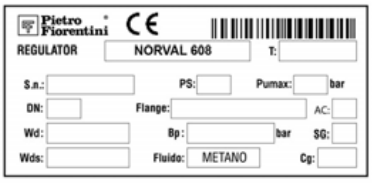
fig. 15

5.0 START UP

5.1 GENERAL

After installation, check that the inlet/outlet on/off valves, any by-pass and the bleed cock are closet.
Before commissioning, you must ensure that the conditions of use comply with the characteristics of the apparatuses.
These characteristics are recalled by the symbols on the specification plates applied to each apparatus.
We recommend actuating the opening and closing valves very slowly.
The regulator could be damaged by operations which are too fast.

APPARATUS SPECIFICATION PLATES .



The list of symbols used and their meanings are listed below:

CE = According to 97/23/CE PED Directive

Pumax= maximum operating pressure at the inlet of the apparatus.

bpu= range of variability of the inlet pressure of the pressure regulator in normal operating conditions.

PS= maximum pressure for which the body and its inner metallic partition walls are designed in accordance with the strength requirements in this document.

Wds= setting range of the pressure regulator which can be obtain using the parts and the setting spring fitted at the moment of testing (that is without changing any components of the apparatus.

Wd= setting range of the pressure regulator which can be obtain using the setting springs indicated in the associated tables and also by changing some other part of the apparatus (reinforced gasket, diaphragm, etc.).

Cg and KG = experimental coefficient of critical flow.
AC= regulation class.
SG= closing pressure class.
AG= intervention accuracy.

Wdso= range of intervention for the over pressure of slam-shut which can be obtain using the setting spring fitted at the moment of testing.

Wdo= range of intervention for the over pressure of slam-shut which can be obtain using the setting springs indicated in the tables.

Wdsu= range of intervention for pressure decrease of slam-shut which can be obtain using the setting spring fitted at the moment of testing.

Wdu= range of intervention for pressure decrease of slam-shut which can be obtain using the setting springs indicated in the tables.

5.2 GAS INPUT, CONTROL OF EXTERNAL TIGHTNESS AND SETTING

The pressurization of the equipment shall be performed very slowly. Should not any stabilization procedure be carried out, it is recommended to keep gas speed in the feeding piping at a value equal to 5 m/sec during pressurization.
To protect the apparatus from damage, the following operations must never be carried out:

- Pressurization through a valve located downstream from the apparatus itself.
- Depressurization through a valve located upstream from the apparatus itself.

External tightness is guaranteed if no bubbles form when a foam medium is applied on the element under pressure.
The regulator and any other apparatuses (slam-shut, monitor) are normally supplied already set for the desired set-point. It is possible for various reasons (e.g., vibration during transport) for the settings to be changed while remaining within the values permitted by the springs used.
We therefore recommend checking the settings using the procedures illustrated below.
Tables **6** and **7** give the recommended set-point for the apparatuses in the various installation arrangements. The figures in these tables can be useful both when checking existing set-point and for modifying them should this become necessary later.
In installation consisting of two lines, we suggest commissioning one line at a time, starting from the one with the lover set-point, known as the “reserve” line. The set-point of the apparatuses in the line will obviously deviate from those specified in the tables **6** and **7**.
Before commissioning the regulator you must check that all the on/off valves (inlet, outlet, any by-pass) are closet and that the gas is at a temperature which will not lead to malfunction.

5.3 COMMISSIONING THE REGULATOR

If there is also a relief valve in the line, refer to par. 4.1 to check it.

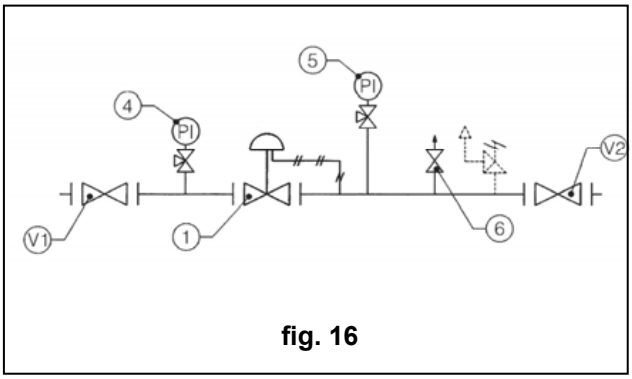


fig. 16

1) partially open the downstream bleed cock **6**;
2) very slowly open the inlet on/off valve **V1**;
3) stabilize pressure upstream and downstream; through the pressure gauge **5** check that the downstream pressure shows the wished calibration value. Otherwise, adjust the calibration acting on the regulation screw (fig. 1), rotating it clockwise to increase and counter-clockwise to decrease;
4) close the bleed cock **6** and verify the tightness of the regulator and the value of its closing overpressure;
5) check the tightness of all the joints between the on/off valves **V1** and **V2** using a foam Solution;
6) very slowly open the downstream on /off valve **V2**, until the line is completely filled.

5.4 COMMISSIONING THE REGULATOR WITH INCORPORED SN 608 SLAM-SHUT

If there is also a relief valve in the line, refer to par. 4.1 to check it.

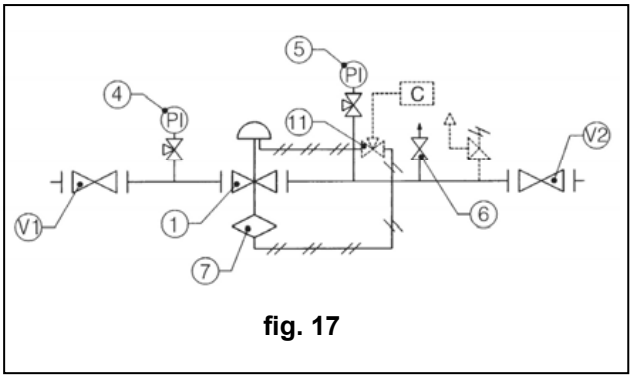


fig. 17

Check and adjust the intervention of the slam-shut 7 as follows:

A) For slam-shut connected to the downstream piping by a three-ways deviator "push" valve **11**, (fig 18) proceed as follows:
- connect a controlled auxiliary pressure to path **C**;
- stabilise this pressure at the set point established for the regulator;
- press knob 1 of the three-way "push" valve completely;
- reset the slam-shut device rotating properly the lever;
- keep the knob **1** pressed and:
  - for safety devices which intervene for maximum pressure: slowly increase the auxiliary pressure and check the intervention value. If necessary, increase the intervention value by turning the adjustment ring **22** clockwise, or anticlockwise to reduce the intervention value.
  - for safety devices which intervene for pressure increase and reduction: slowly increase the auxiliary pressure and record the intervention value. Restore the pressure to the set point established for the regulator, and carry out slam-shut reset operation.
  - Check intervention for pressure reduction by slowly reducing the auxiliary pressure. If necessary, increase the ntervention values for pressure increase or decrease by respectively turning the rings **22** and **23** clockwise and vice-versa to reduce them.
  - **check proper operation by repeating the operations at least 2-3 times.**

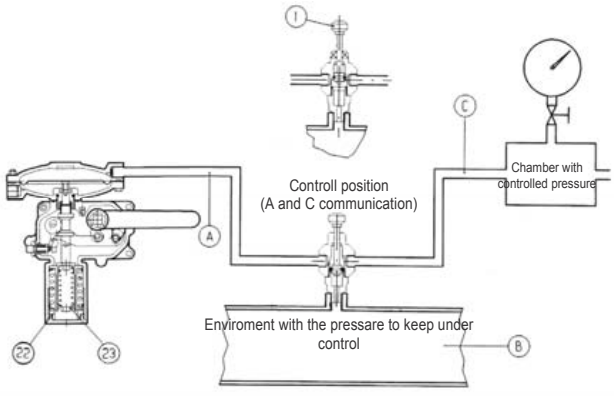


fig. 18

B) On devices without the "push" valve (fig. 19) we recommend connecting the control head separately to a controlled auxiliary pressure and repeating the operations described above
.

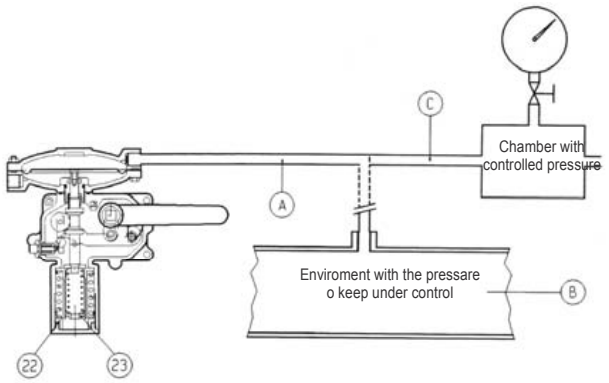


fig. 19

ATTENTION

At the end of the operation, reconnect the control head to the downstream pressure take-off

N.B.: The intervention tests should be repeated at last every months.

At the end of the slam-shut check, proceed as follows:

1) Make sure the block is on closing-position;
2) Open the inlet block valve **V1**;
3) Open very slowly the block-valve, rotating properly the lever;
4) Partially open the relief faucet 6 placed on the outlet piping;
5) Check, through pressure gauge **5**, that the outlet pressure has the gauging value indicated by the regulator.
   If not, it is then necessary to adjust the gauging value, acting properly on the regulation screw, rotating it clockwise to increase and anti-clockwise to decrease;
6) Close the relief faucet **6** and check the value of the closure pressure;
7) Using a foaming agent, check the capacity of all the joints placed between block valves **V1** and **V2**;
8) Open very slowly the outlet block valve **V2**, until the piping gets completely full;
9) It is advisable to check that, activating the block valve manually, the line capacity gets stopped.
10) è consigliabile controllare che, facendo intervenire manualmente la valvola di blocco, la portata della linea si arresti.

Tab. 6 — Setting of on-line apparatuses consisting of regulators Norval 608 + Slam-shut + Relief valves

Regulator set-point (Pds) mbar	Relief Valve	Slam-shut Max	Slam-shut Min
10<Pds≤15	Pds x 1.7	Pds x 2	Slam-shut not available
15<Pds≤19			10 mbar
19<Pds≤24			Pds x 0.56
24<Pds≤35	Pds x 1.55	Pds x 1.77	Pds x 0.57
35<Pds≤40		Pds x 1.7	Pds x 0.6
40<Pds≤70	Pds x 1.4	Pds x 1.52	
70<Pds≤80	Pds x 1.3		
80<Pds≤100		Pds x 1.4	
100<Pds≤200		Pds x 1.46	

5.5 COMMISSIONING THE REGULATOR PLUS NORVAL 608 IN LINE MONITOR WITH INCORPORATED SN 608 SLAM-SHUT VALVE

If there is also a relief valve in the line, refer to par. 4.1 to check it.

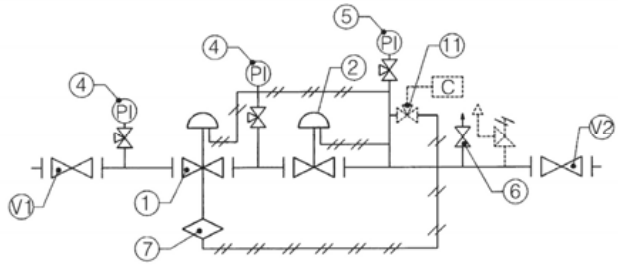


fig. 20

Check and adjust the intervention of the slam-shut 7 as follows:

A) For slam-shuts connected to the downstream piping by a three-ways deviator "push valve **11**, proceed as follows (fig. 18):
- connect a controlled auxiliary pressure to path **C**;
- stabilise this pressure at the set point established for the regulator;
- press knob **1** of the three-way "push" valve completely;
- reset the slam-shut device rotating properly the lever;
- keep the knob **1** pressed and:
  - for safety devices which intervene for maximum pressure: slowly increase the auxiliary pressure and check the intervention value. If necessary, increase the intervention value by turning the adjustment ring **22** clockwise, or anticlockwise to reduce the intervention value.
  - for safety devices which intervene for pressure increase and reduction: slowly increase the auxiliary pressure and record the intervention value. Restore the pressure to the setpoint established for the regulator, and carry out slam-shut reset operation. Check intervention for pressure reduction by slowly reducing the auxiliary pressure. If necessary, increase the intervention values for pressure increase or decrease by respectively turning the rings **22** and **23** clockwise and vice-versa to reduce them.

- **check proper operation by repeating the operations at least 2-3 times.**

B) On devices without the "push" valve (fig. 19) we recommend connecting the control head eparately to a controlled auxiliary pressure and repeating the operations described above.

ATTENTION

At the end of the operation, reconnect the control head to the downstream pressure take-off

N.B.: The intervention tests should be repeated at last every months..

At the end of the slam-shut check, proceed as follows:

1) Make sure the block is on closing-position;
2) Partially open the relief faucet **6** placed on the outlet piping;
3) Unplug the impluse plug of the main regulator **2** and tamp the fitting on the outlet shaft;
4) Open very slowly the block valve **V1**;
5) Open very slowly the on-off valve rotating properly the lever;
6) Check, through pressure gauge **5**, that the outlet pressure has the fixed gauging value for the regulator monitor **1**. If not, adjust the gauging value operating on the internal clamp, rotating it clockwise to increase and anti-clockwise to decrease;
7) Close the relief faucet and check the closing pressure value of the regulator monitor **1**;
8) Activate manually the block valve and partially open the relief faucet **6**;
9) Plug in the impulse plug of the main regulator;
10) Open very slowly the block valve, by pulling the compass;
11) Check, through pressure gauge **5**, that the outlet pressure has the gauging value fixed for the main regulator **2**. If not, adjust the gauging value operating on the internal clamp, rotating it clockwise to increase and anti-clockwise to decrease;
12) Close the relief faucet and check the outlet pressure value of the main regulator **2**;
13) Using a foaming agent, check the capacity of all the joints placed between block vales **V1** and **V2**;
14) Open very slowly the outlet block valve **V2**, until the piping gets completely full;
15) It is advisable to check, that activating manually the block valve, the line capacity gets stopped.

Tab. 7 — Setting of on-line apparatuses consisting of regulator Norval 608 + Monitor + Slam-shut + Relief valve

Regulator set-point (Pds) mbar	MONITOR	RELIEF VALVE	SLAM SHUT Max	SLAM-SHUT Min
10<Pds≤15	Pds + 5 mbar	Pds x 1.7	Pds x 2	Slam-shut not available
15<Pds≤19				10 mbar
19<Pds≤24				Pds x 0.56
24<Pds≤35		Pds x 1.55	Pds x 1.77	Pds x 0.57
35<Pds≤40			Pds x 1.7	Pds x 0.6
40<Pds≤70		Pds x 1.4	Pds x 1.52	
70<Pds≤80		Pds x 1.3		
80<Pds≤100	Pds x 1.15		Pds x 1.4	
100<Pds≤200			Pds x 1.46	

6.0 TROUBLE-SHOOTING

The problems of various kinds which could arise over time are highlighted below. They derive from phenomena associated with the conditions of the gas as well, of course, as with the natural ageing and wear of the materials.La manomissione delle apparecchiature da parte
It must be remembered hat all operations on the apparatuses must be carried out by highly qualified personnel with appropriate knowledge of the subject. **Tampering with the apparatuses by unsuitable personnel relieves us from all responsibility of any kind.**
You must therefore train your maintenance personnel or avail yourself of the service centres officially authorised by us.

6.1 Tab. 8 NORVAL 608 REGOLATOR (fig. 21)

PROBLEM	POSSIBLE CAUSES	REMEDY
No tightness at Q=0	Reinforced gasket [82] damaged	Replace
	Valve seat [31] damaged	Replace
	Dirt on the reinforced basket [82]	Clean
	O-ring [30] damaged	Replace
	O-ring [25] l damaged	Replace
	Diaphragm [16] damaged	Replace
	Balanced diaphragm fixed incorrectness [16]	Fix
Pumping	Dirt	Clean
	Antipumping valves blockage	Clean and, if necessary, replace
	Balanced diaphragm [16] damaged	Replace
	Wrong setting spring	Make the setting again
	Reduced downstream volumes	Increase volume
	Incorrectly sensing line position	Change position
Increase of Pd with Q>0	Reinforced gasket [82] damaged	Replace
	Shaft blocked in opening-position by crustifications	Clean and check the filtration
	Diaphragm ruptured [12]	Replace
	Diaphragm ruptured [16]	Replace
	Lack of signal from the sensing line	Check
Pressure decrease	Request higher than the regulator's flow	Change regulator
	Lack of pressure at the Regulator's entrance	Check the possible filtration

6.2 Tab. 9 SLAM-SHUTH SN 608 (fig. 21b - 23)

PROBLEM	POSSIBLE CAUSES	REMEDY
Slam-shut obturator does not close	Control head diaphragm [16] broken	Change diaphragm
Leakage from slam-shut obturator	Obturator seal [103] deteriorated	Change seal
	Ring [102] damaged	Replace
	Seat of obturator [31] eroded or fitted	Change the seal
Incorrect intervention pressure	Wrong max. and/or min. spring setting	Make the seting again by means of the rings [22] and/or [23]
	Friction in the lever mechanism	Change the box containing the whole assembly
Resetting not possible	Persistence of the cause of the increase or decrease of the downstream pressure	Decrease or increase the downstream pressure
	Lever mechanism broken or cracked	Change the standard box containing whole assembly

N.B. If the slam-shut has intervened, close the inlet and outlet valve (**V1** and **V2**) in the line and discharge the pressure before carrying out any operation.
Eliminate the causes which gave rise to intervention before reactivating it.

In the event of operating problems when personnel qualified for a specific operation are not available, call the service centre nearest to you.
For further information contact our SATRI service centre at our Arcugnano (Vicenza) works

7.0 MAINTENANCE

7.1 GENERAL

Periodical inspection and maintenance shall be carried out according to the regulations in force (kind and frequencies). Before carrying out any operation it is important to ascertain that the regulator has been cut off both upstream the regulator and the on/off valves. The maintenance operations are closely associated with the quality of the gas transported (impurities, humidity, gasoline, corrosive substances) and with the efficiency of the filtering.
Preventive maintenance should be carried out at intervals which, if not established by regulation in force, depend on:

- The quality of the gas transported;
- The cleanliness and conservation of the piping upstream from the regulator: in general, for example, when starting the equipment for the first time, more frequent maintenance is required because the precarious state of cleanliness inside the piping;
- The level of reliability required from the regulation system.

Before starting the disassembly operations on the apparatus you should check that:

- A set of recommended spares is available. The spares must be original **Fiorentini** ones, bearing in mind that the more important ones such as diaphragms are marked;
- A set of wrenches is available as specified in table 10.

For a proper maintenance the recommended spare arts are unequivocally identified by labels indicating:

- The No of assembly drawing SR of the apparatus for which the spare parts are suitable;
- The position showed in the assembly drawing SR of the apparatus.
- We advise to replace all rubber-made parts, that are marked with an asterisk in the components list attached to the SR.

N.B. Pietro Fiorentini S.p.A. is in no case responsible, in case of use of non-original replacements.

Before starting disassembling the equipment, it is also necessary to make sure that the plant section on which one is working is not operating upstream or downstream, as well as that the pressure in the involved piping section has been discharged.
The depressurization manoeuvre has to be carried out paying attention to discharge the bleed cocks to the drains in a safe area. To avoid the risk of generating sparks due to bumps of impurity particles within the discharge lines, it is recommended to keep the fluid speed lower than 5 m/sec.
Moreover, it is suggested to perform reference marks, before disassembling the equipment, on the parts that may show problems of mutual orientation or positioning during re-assembly.
Finally, it shall be underlined that the O-rings and the mechanical sliding parts (stems, etc.) must be lubricated, before re-assembling them, with a thin layer of silicone grease. Before commissioning, the external tightness of the equipment has to be tested at a suitable pressure in order to assure the absence of external leaks.
The internal tightness of the block devices and of the monitors, when these are used as safety accessories according to the PED Directive, has to be tested at a suitable pressure in order to assure the internal tightness at maximum foreseen operating pressure. Such tests are essential to assure the safe use under the foreseen operating conditions. They have in any case to comply with the national regulations in force.

7.2 NORVAL 608 REGULATOR MAINTENANCE PROCEDURE

PROGRAMMED PREVENTIVE MAINTENANCE

Procedure for the disassembly, complete replacement of the spare parts and reassembly of the **NORVAL 608** pressure regulator + IC +SN 608

PRELIMINARY OPERATION

A. Render the regulator safe;

B. Ensure that the pressure upstream and downstream from it is 0.

DISASSEMBLY AND RE-ASSEMBLY

7.3 NORVAL 608 PRESSURE REGULATOR (fig. 21)

1) Loosen the fixing screws (**35**) of the lower blind flange;

2) Take out the lower blind flange (**84**);

3) Take out the seal of the obturator (**82**) removing the support of the seal (**83**);

4) Loosen the blocking screw-nut (**2**);
Loosen the regulation screw (**1**) until it gets out;

5) Unscrew and take out the pushing-spring-tap (**4**);
Take out the regulation spring (**41**) together with the support of the higher spring (**7**);

6) Loosen and take out the fixing screws (**35**);

7) Take out the upper cover (**6**);

8) Loosen the blocking-screw (**45**) and take this out;
Take out the protection disc of the membrane (**11**) and membrane (**12**) ;

9) Remove from the lower part of the regulator's body the shaft (**80**); .

10) Loosen and take out the fixing screws (**35**) of the lower cover;

11) Take out the lower cover (**19**);

12) Remove the nut (**15**) and the support of the membrane (**14**);

13) Remove the balancing membrane (**16**);

14) Remove the intermediate flange guiding the shaft (**66**);

15) Unscrew (**61**) and remove the disc (**62**)

16) Unscrew and remove the valve seat (**31**) paying attention not to damage the holding borders.

17) Unscrew and remove the plug (**86**)

18) Check and clean the inner part of the regulator's body;
19) Check carefully the good conditions of the valve-seat pos. **31**;
20) Replace of the parts of the spare-parts-kit.

RE-ASSEMBLY

Remember that the o-rings and the mechanic parts of the sliding system (shafts, etc...) must be slightly lubricated, before installing them again, with a thin layer of silicone-fat, while the static parts need fat to get softer and mainly to get held in the holes:

To re-assemble the regulator, you can execute the other way round all the operations described for disassembling.

Before remounting the sealing elements (o-rings, membranes, etc…), it is necessary to check its integrity and possibly replace them. It is important to make sure that the membrane (**12**) is perfectly placed in its seat, and that the movement of the group shaft-obturator does not show any obstacle.

Please be again extremely careful when working in the valve seat (**31**), not to damage the holding rims
N.B. The anti-pumping valves (**10** e **23**) do not usually need to be dismantled, this of course unless they show functioning problems.

7.4 REPLACEMENT OF ANTI-PUMPING VALVE

1) **Downstream pressure side**

Remove the anti-pumping valve

2) **Atmospheric pressure side**

- Take out the anti-pumping valve from the cover, operating on the front side of the cover
-

- Pour 3 drops of Loctite 945 on the basement of the seat of the cover for the new antipumping valve.

- Place and insert the new anti-pumping valve in the seat of the cover with the two holes, present on one side of the anti-pumping valve, headed inwards.
  Force the inserting.

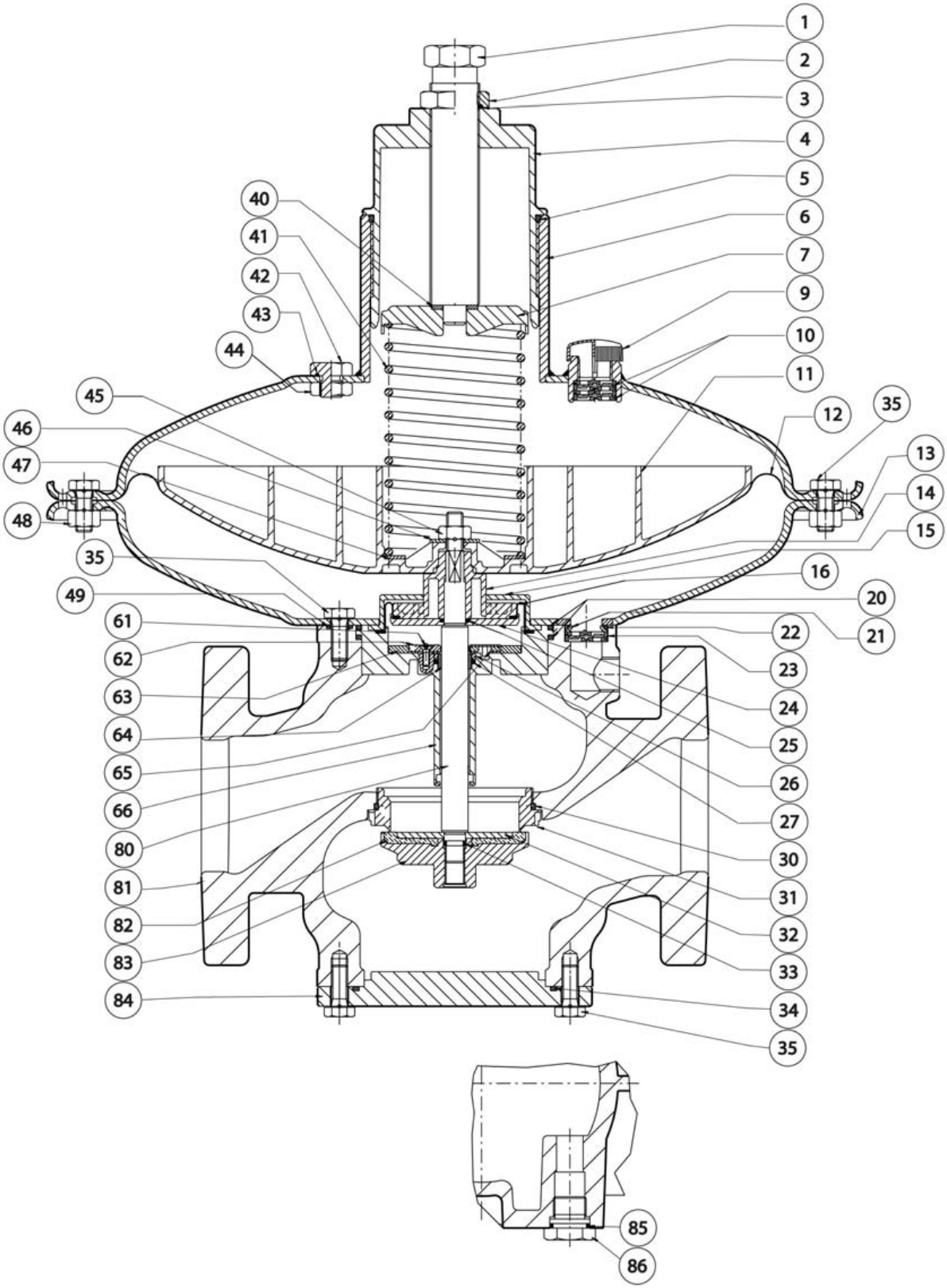

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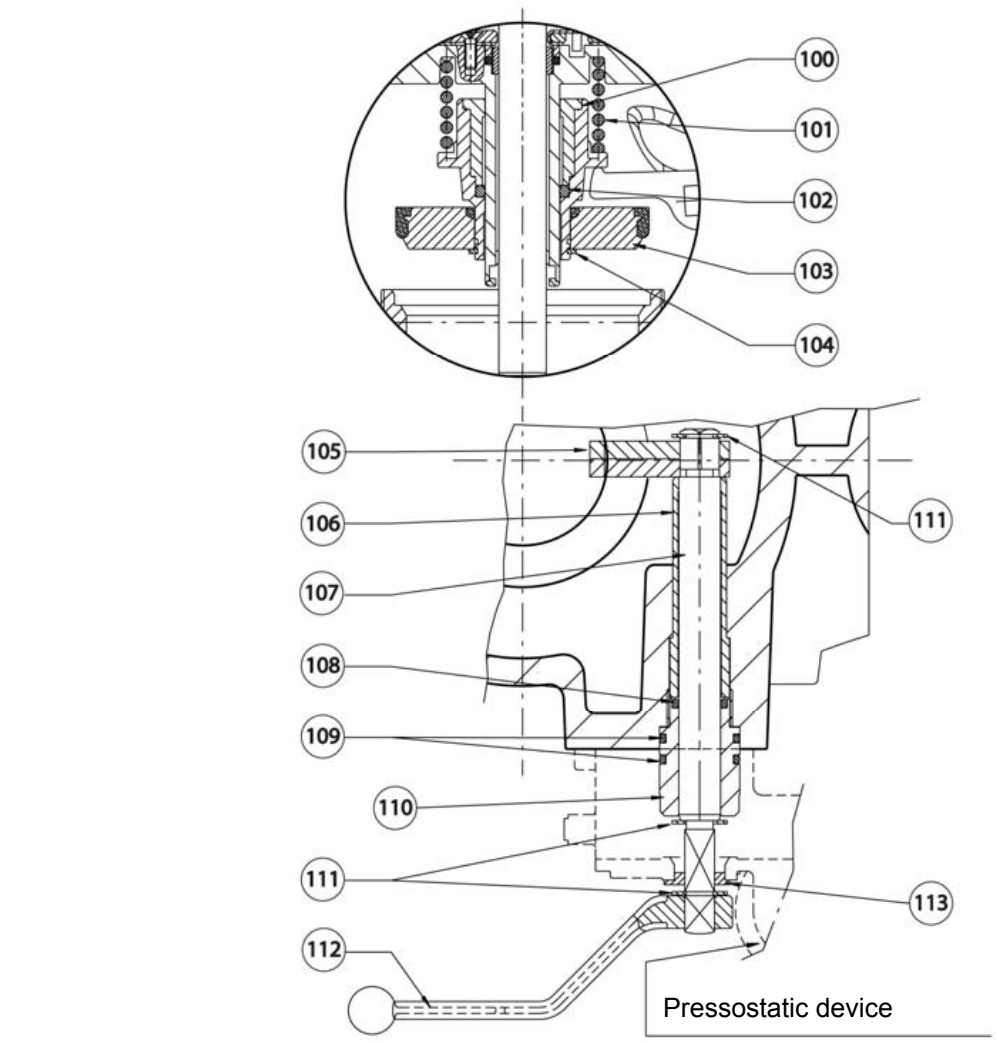
Fig. 21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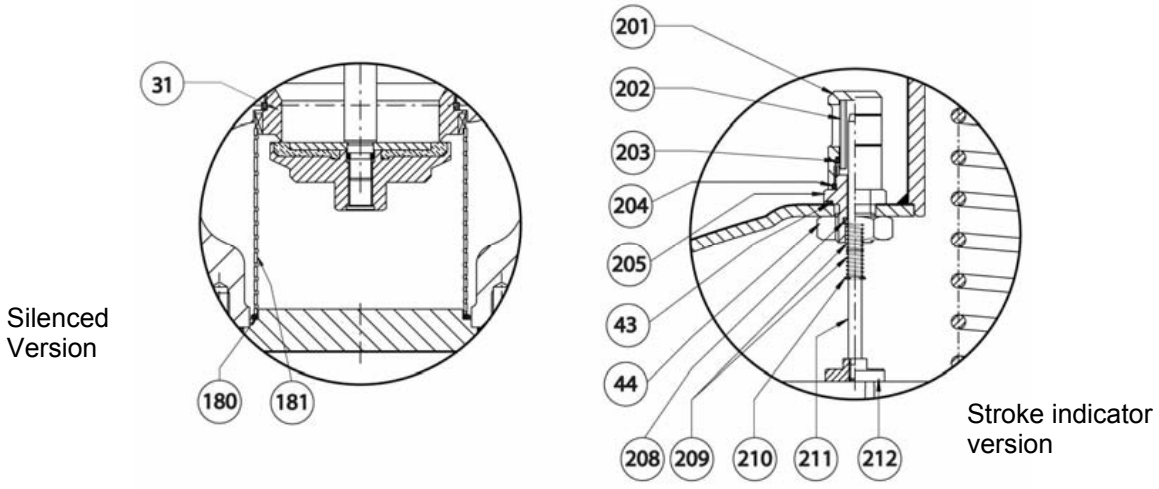
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Fig. 21b

7.5 MONITOR IC (Fig. 22)

1) Disconnect the sensing line which connects the monitor to the. downstream piping, unscrewing the.taper seal connections. Lacken the fixing screws, pos. **35** in he bottom flange.

2) Remove the bottom flange, pos.**155**

3) Unscrew the nut, pos.**153** with a blow, remove the protection disc, pos.**154**, the balancing diaphragm, pos.**157** the lock ring, pos.**152** and the locking flange, pos.**151**

4 Unscrew the balancing stem, pos.**150** with a sharp blow.

During the re-assembly operations of the **Norval 608** Dn 80 check that the hole in the locking flange pos.**151** is positioned on the downstream side.

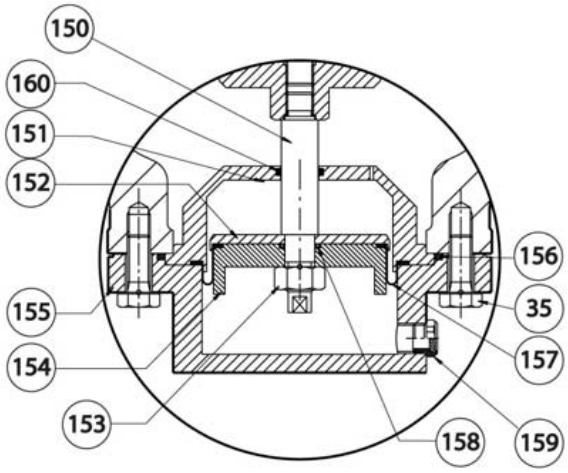

Fig. 22

7.6 SN 608 SLAM SHUTH VALVE (Fig.23)

1) Make sure that the slam-shut valve is in closed position;
2) Disconnect the fittings between the slam-shut valve and the downstream pressure connection;
3) Remove the screws tightening the slam-shut valve to the body;
4) Unscrew the tap (**24**) and the regulation clamps (**22**) e (**23**) , take out the setting spring (**31**) and (**32**) the spring supports (**10**) and (**11**);
5) Remove the screws(**42**) and take off the cover(**17**);
6) Take out from the body (**1**) the membrane group formed by the parts **16**, **19**, **64**, and to divide them unscrew the screw (**44**) from the shaft (**13**);
7) Take out from the lower part the shaft group (**13**);
8) Remove the screws (**40**) and disassemble the anchoring group formed by the parts **29**, **30**, **33**, **36**, **38**, **39** and **43**.

To reassemble the slam-shut it is possible to carry out the disassembly operations in the inverse order.
Before reassembling the sealing elements (O-rings, diaphragms, etc.), check their integrity and replace them if necessary.

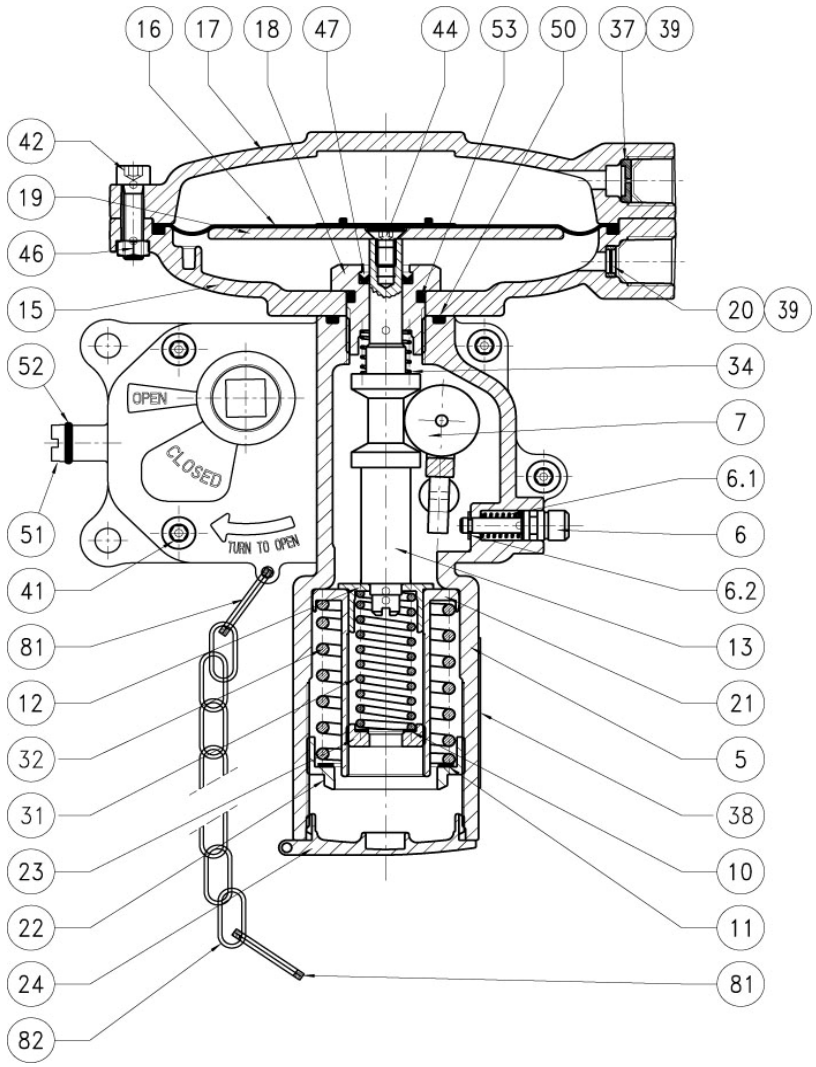

Fig. 23

8.0 FINAL OPERATION

8.1 CHECKING THE TIGHTNESSES

1) Very slowly open the on/off valve upstream from the regulator and using a foam solution or the like check:
   - the tightness of the external surfaces of the regulator;
   - the tightness of the slam-shut;
   - the tightness of the internal surfaces of the regulator;
   - the tightness of the fitting.
2) Operating very slowly, turn the reset lever of the slam-shut from the vertical position towards the horizontal position until only the internal by-pass is opened. Then raise the lever completely to the re-engage position;
3) Check the tightness of the reinforced gasket of the regulator;
4) Open a bleed cock downstream from the regulator to create a small gas flow;
5) Screw the external regulation-screw until you reach the wished setting-value;
6) Close the bleed cock to the atmosphere.

8.1 START-UP

1) Very slowly open the downstream on/off valve and, if necessary, ad just the regulator set-point by means of the regulation screw (**1**);
2) Fix the blocking nut (**2**).

Tab. 10 MAINTENANCE WRENCHES FOR NORVAL 608 (+SN 608) PRESSURE REGULATORS

		
Combination spanner	**Adiustable spanner**	**Compass pin wrench**
Ch. 8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-32-36	L. 30	Ch. 8-9-10-11-12-13-14-15-16-17-18-19-20-24-26-27
		
Hexagon or allen Key	**Philips screwdriver**	**Flat head screwdriver**
Ch. 3-4-5-6-7-8-19	Es.Ch PH 0 x 100 - PH 1x125 – PH 2x150	0,5x3x75 1,2x6,5x125
		
Circlip pliers		
Cod.10÷25 19÷60		

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