



VML

**Safety solenoid valves for gas
Slow opening and fast closing type
DN10 ... DN80**

VML

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Contents

Description	2
Features	2
Functioning and application	3
Special versions and optionals	4
Technical specifications	4
Gas flow chart (pressure drop)	6
Ordering information	8
Standards and approvals	9
Installation, adjustment and servicing	10

Description

The VML type valve is a slow opening single-stage solenoid valve, normally closed (open when energized). This type of device is suitable for air or gas blocking and releasing controls, required in gas power burners, atmospheric gas boilers, industrial kilns and others gas consuming appliances.

Features

The valves are made of aluminum alloy die-cast, with a wide range for inlet/outlet connections from DN10 up to DN80.

Pipe connections meet group 2 and backpressure sealing is compliant with class A, according to EN161 requirements.

Suitable for use with air and non-aggressive gases included in the 1, 2 and 3 families (EN 437).

The valve is open only when energized: if, for any reason, power supply goes down, the valve closes immediately (intrinsic safe).

Suitable for cycle operation and qualified for continuous service (100% ED).

Equipped with flow rate adjustment.

An incorporated fine mesh filter protects the valve seat and disc as well as downstream components and prevents dirty contamination.

Provided with G1/4 pressure gauge on two sides in the inlet chamber, to connect manometers, pressure switches, leakage tester or other gas equipments. Flanged models are provided with gauges also in the outlet chamber.

The coils are provided with terminal box or with ISO 4400 plug (optional). Both systems are provided with suitable cable gland to avoid water and dirty contamination.

All components are designed to withstand any mechanical, chemical and thermal condition occurring during typical service. Effective impregnation and surface treatments have been used to improve mechanical sturdiness, sealing and resistance to corrosion of the components.

Valves are 100% tested by computerized testing machineries and are fully warranted.



WARNING

This control must be installed in compliance with the rules in force.

Functioning and application

The VML type valve is a safety shutting device using auxiliary power supply. When it is de-energized, the spring pushes on the seal disc, keeping the gas passage closed. Now, the inlet chamber is under the gas line pressure, and it forces on the disc too, improving the seal.

When the coil is powered the valve opens slowly because of the hydraulic brake, against the strength of the spring and gas pressure. The rapid stroke may be adjusted using the regulating screw on the top (see the *Installation, adjustment and servicing* section), to adjust the initial gas flow. Main flow and opening time can be adjusted also.

If the power supply is shut off, the valve rapidly closes, interrupting the gas flow.

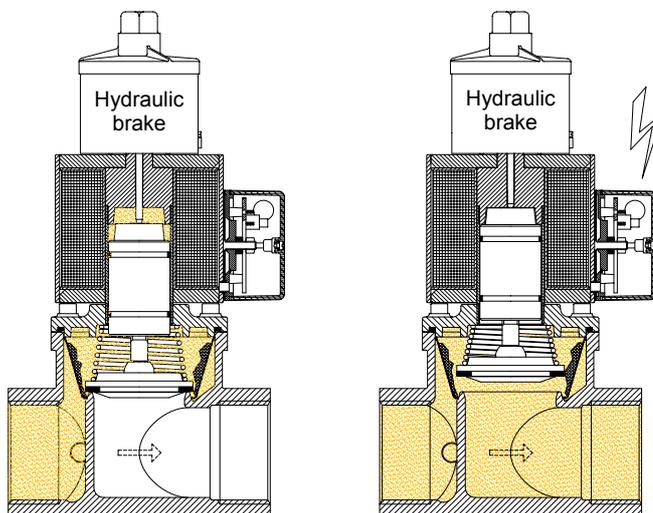


Fig.1

This kind of valve is normally installed as safety and regulating device in gas trains, for industrial applications and gas firing systems.

Figure 2 shows an example of installation.

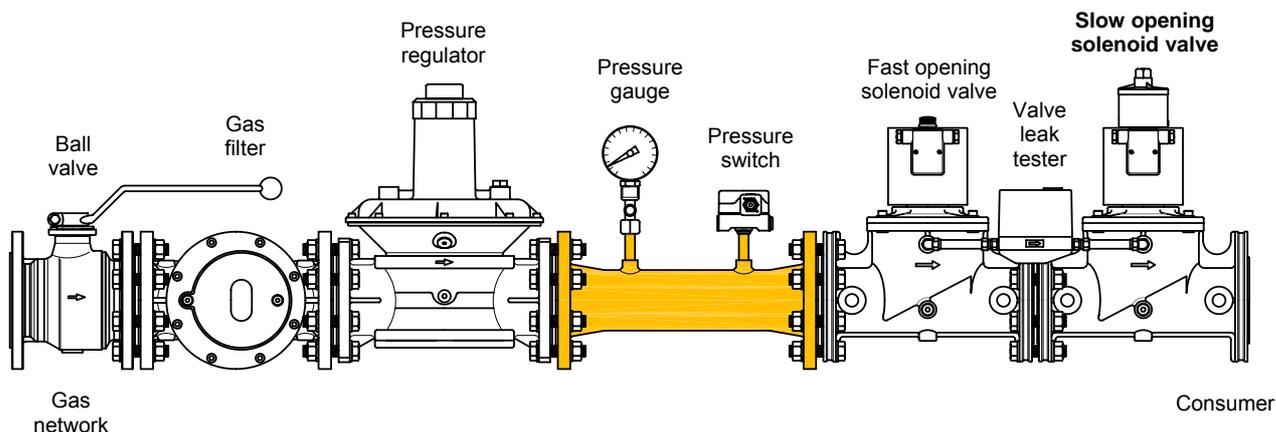


Fig.2



WARNING

Location and mode of installation must be in compliance with local rules in force.

Special versions and optionals

The sizes 1"¼, 1"½ and 2" can be provided with G1/4 gauges also in the outlet chamber.

A closed position indicator micro-switch (CPI) can be installed. Models from DN65 to DN80 are provided with G1/8 connection on the bottom for these facilities (on request from 3/4" to 2"). To install the micro-switch the adapting kit must be required.

Protection class can be increased up to IP65. The valves will be provided with a sealed terminal box and cable set.

Whole range can be provided with Ex-proof marking for use in Zone 2, according to 94/9/EC Directive (ATEX).

Whole range can be provided with electrical connection made by standard plug ISO 4400.

The threaded models Rp11/2 and Rp2 can be provided with flanged connections using an optional kit.

Whole range can be supplied in the special version suitable for aggressive gases (i.e. biogas, COG). This version is free of nonferrous metals and equipped with special seals.

Technical specifications

Tab. 1

Connections	Gas threaded ISO 7/1 from Rp3/8 to Rp2 Flanged PN16 – ISO 7005 from DN40 to DN80
Voltage rating	230 VAC 50/60 Hz 110 VAC 50/60 Hz 24 VAC/DC
Voltage tolerance	-15% / +10%
Power consumption	see charts
Ambient temperature	-15°C / +60°C
Max. operating pressure	200 mbar (20 kPa) 360 mbar (36 kPa)
Flow capacity	see charts
Closing time	< 1 second
Opening time	Adjustable up to 25 seconds
Filter	600 µm, metal mesh
Protection class	IP54 (EN 60529) (optional IP65)
Cable gland	ISO 16 (EN 50262) for terminal box PG 9 for standard plug
Coil winding insulation	Class H (200°C)
Coil thermal resistance	Class F (155°C)
Materials in contact with gas	Aluminium alloy Brass Stainless steel Plated steel Anaerobic adhesive Nitrile rubber (NBR) Fluoro elastomer (FPM) Polytetrafluoroethylene (PTFE)

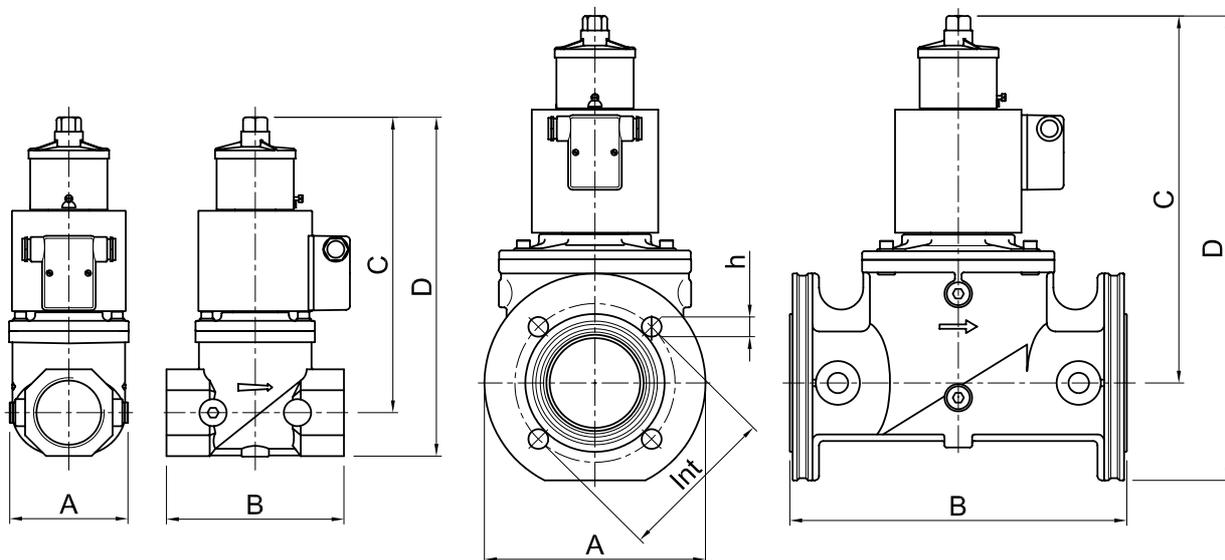


Fig.3

Tab. 2

Material and connections	Power consumption @230VAC [W]	Flow factor Kvs [m ³ /h]	Overall dimensions [mm]						Weight [Kg]
			A	B	C	D	Int	h	
AISI									
Rp 3/8	20	2,9	88	77	180	196	-	-	1,8
Rp 1/2	20	6,0	88	77	180	196	-	-	1,8
Rp 3/4	45	9,5	88	96	200	222	-	-	2,7
Rp 1	45	12,0	88	96	200	222	-	-	2,7
Rp 1 1/4	45/180 ⁽²⁾	20,0	120	153	261	294	-	-	6
Rp 1 1/2	45/180 ⁽²⁾	26,0	120	153	261	294	-	-	6
Rp 2	45/180 ⁽²⁾	40,0	106	156	265	304	-	-	6,3
DN 40 ⁽¹⁾	45/180 ⁽²⁾	26,0	150	193	261	336	110	4x18	7,7
DN 50 ⁽¹⁾	45/180 ⁽²⁾	40,0	165	196	265	348	125	4x18	8,3
DN 65	60/240 ⁽²⁾	63,0	200	305	335	424	145	4x18	14,5
DN 80	60/240 ⁽²⁾	80,0	200	305	335	424	160	8x18	14,5

⁽¹⁾ Optional Kit ⁽²⁾ Working/Opening

Gas flow chart
(Pressure drop)

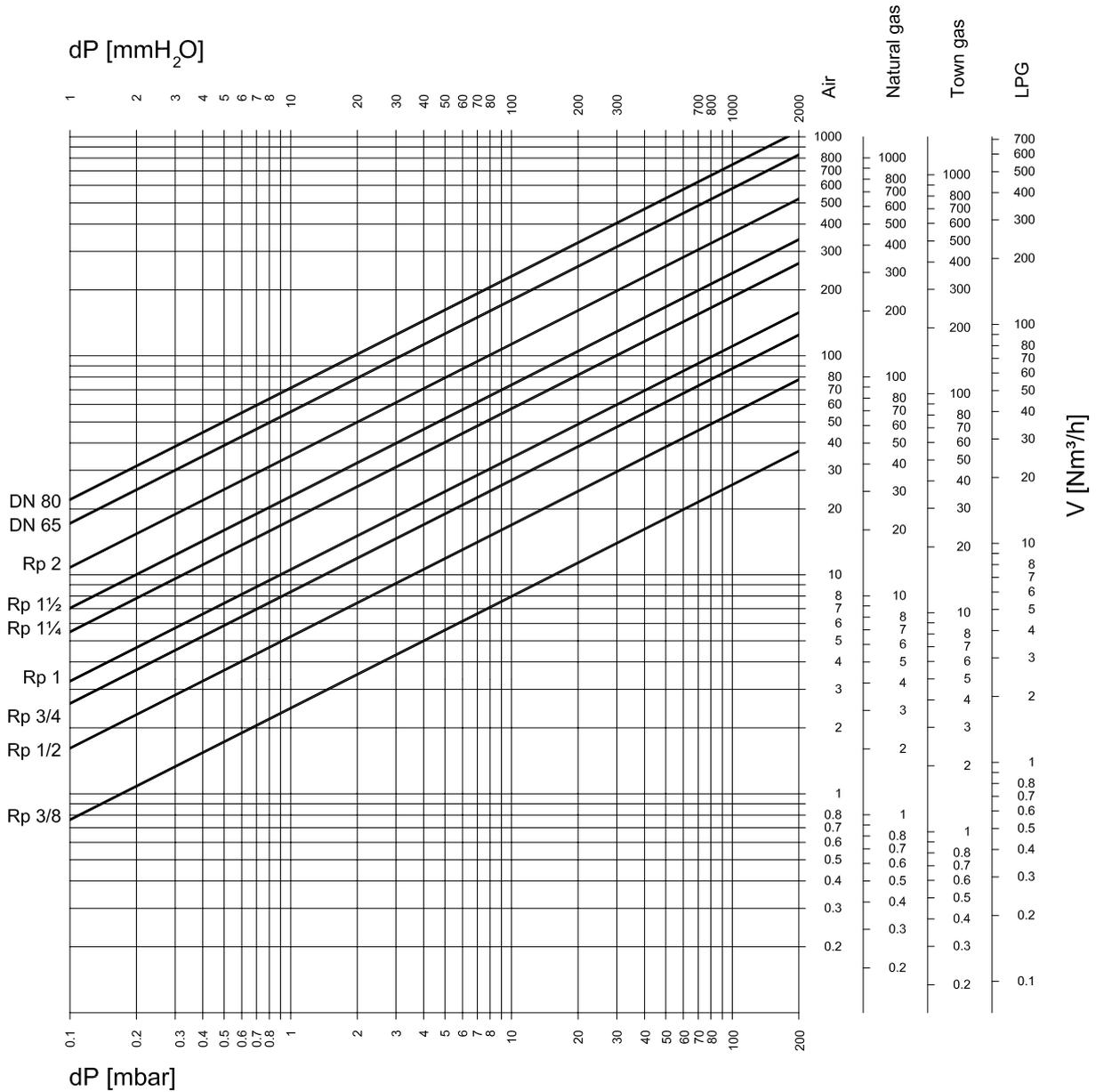


Fig. 4

**Formula of conversion
from air to other gases**

$$V_{GAS} = k \cdot V_{AIR}$$

Tab. 3

Gas type	Specific gravity ρ [Kg/m³]	$k = \sqrt{\frac{1,25}{\rho_{GAS}}}$
Air	1,25	1,00
Natural gas	0,80	1,25
Town gas	0,57	1,48
LPG	2,08	0,77

15°C, 1013 mbar, dry

When the flow read on the diagram is referred to operating pressure instead of standard conditions, the pressure drop Δp read on the diagram must be multiplied for the factor: (1+ relative pressure in bar)

Example:

In the 2" solenoid valve with an air flow of 80 Nm³/h there is a pressure drop $\Delta p = 5$ mbar. If we consider that 80 m³/h is the flow at 200 mbar of inlet pressure, then the pressure drop to be consider is:

$$\Delta p = 5 \times (1 + 0,2) = 6 \text{ mbar}$$

Normally, pressure drop and flow rate for the valves are read from the gas flow diagram. However, the valves can also be chosen in accordance with the characteristic "Kvs value" which is shown in table 2.

The selection of the valve requires the calculation of the Kv under the operating conditions.

Considering only subcritical pressure drops:

$$\Delta p < \frac{p_1}{2}$$

Kv can be calculated with the formula:

$$Kv = \frac{V}{514} \sqrt{\frac{\rho(t + 273)}{\Delta p \cdot p_2}}$$

where

- V = flow rate [Nm³/h]
- Kv = flow factor [m³/h]
- ρ = density [Kg/m³]
- p₁ = absolute inlet pressure [bar]
- p₂ = absolute outlet pressure [bar]
- Δp = differential pressure p₁-p₂ [bar]
- t = media temperature [°C]

To the Kv value calculated from operating conditions we add an allowance of 20%, to obtain the minimum Kvs value which the valve should have:

$$Kvs > 1,2 Kv$$



Valve must be selected considering the following:

- Pressure drops $\Delta p \leq 0,1 p_1$ are recommended and $\Delta p > p_1/2$ are always undesirable
- Flow velocities $w \leq 15$ m/s are recommended and $w > 50$ m/s are always undesirable.

Ordering information

Tab.4

Material and Connections		230V		110V		24V	
	AISI	200 mbar	360 mbar	200 mbar	360 mbar	200 mbar	
Threaded	Rp 3/8		VML0		VML0.B	VML02.C	
	Rp 1/2		VML1		VML1.B	VML12.C	
	Rp 3/4		VML2		VML2.B	VML22.C	
	Rp 1		VML3		VML3.B	VML32.C	
	Rp 1 1/4		VML35		VML35.B	VML352.C	
	Rp 1 1/2		VML4		VML4.B	VML42.C	
	Rp 2		VML6		VML6.B	VML62.C	
Flanged	DN 40 ¹		VML4F		VML4F.B	VML42F.C	
	DN 50 ¹		VML6F		VML6F.B	VML62F.C	
	DN 65	VML72	VML7	VML72.B	VML7.B		
	DN 80	VML82	VML8	VML82.B	VML8.B		

(¹) Optional kit



- The versions with inlet pressure $p_1 \leq 200$ mbar (20 kPa) may be order inserting the digit "2" in to the designation.
- Different voltage than 230V may be order adding to the standard designation the additional code as shown above.
- The special version suitable for aggressive gases may be order adding to the standard designation the additional code "K".
- Other optionals (i.e. standard plug, IP65 version) must be order with their ordering code.

Examples:

VML72.B for a valve with DN65 flanged connections, 110VAC, 200 mbar

VML3.K for a valve with Rp1 threaded connections, 230VAC, 360 mbar, suitable for aggressive gases



Manufacturer reserves the right to update or make technical changes without prior notice.

Standards and approvals

The valve design meets current European approval requirements regarding safety shut-off functions on gaseous fuels.

These products conform with the Gas Appliances Directive (90/396/EEC) and the certification has been issued by the notified body:

GASTEC CERTIFICATION B.V.
Wilmersdorf, 50
NL-7323 AC Apeldoorn



CE Reg.-Nr. 0063AQ1350

The following standards/technical specifications have been fulfilled:

- Electromagnetic Compatibility (2004/108/EC)
- Low Voltage Directive (2006/95/EC)

Quality Management System is certified according to UNI EN ISO 9001 and the monitoring is carried out by the notified body:

Kiwa Gastec Italia Spa
Via Treviso, 32/34
I- 31020 San Vendemiano (TV)



Installation, adjustment and servicing

To assure a proper and safe operation, as well as a long life of the valve, the installation procedure and a periodical servicing are very important topics and the following instructions should be always fulfilled.

IMPORTANT: before proceeding with the installation, ensure that all the features of your system are comply with the specifications of the valve (gas type, operating pressure, flow rate, ambient temperature, electrical voltage, etc.).



CAUTION

Shut off the gas supply at the main manual shut-off valve and disconnect electrical power to the valve before proceeding installation or servicing.

PIPING CONNECTION

- Check correspondence of flow direction with arrow printed on valve body.
- Check correct alignment of connecting pipes.
- Ensure that installing area is protected from rain and water splashes or drops.
- Remove the end caps and make sure no foreign body is entered into the valve during handling.

THREADED MODELS

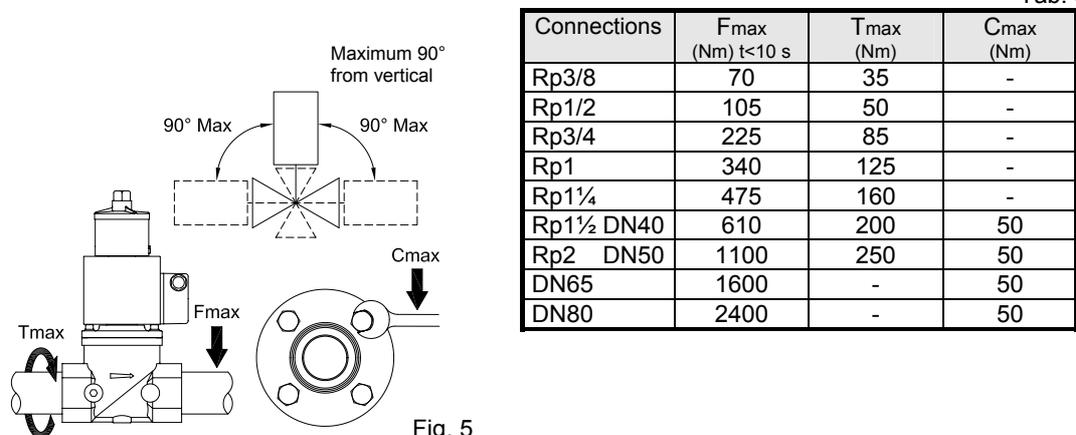
- Put sealing agent onto the pipe thread. Avoid excessive quantities which could enter in the valve and damage the seal seat.
- Screw the pipes using proper tools only. Do not use unit as lever because damage to the valve stem could result.

FLANGED MODELS

- Position the gasket or sealing agent on the flanges and insert the bolts with washers.
- Screw the nuts tightening them crosswise and using proper tools only. Avoid overtightening and mount tension free.

Following chart shows the maximum values of bending moment (F_{max}), torque (T_{max}) and screws driving torque (C_{max}), according to EN161.

Tab. 5



Valve may be mounted with coil in horizontal or vertical position. Coil may be oriented 360 degrees in any direction.

ELECTRICAL CONNECTION (IEC 730-1)

Valve is provided with terminal box or standard plug (see tab. 4) for the electrical connections. To connect the valve do the following:

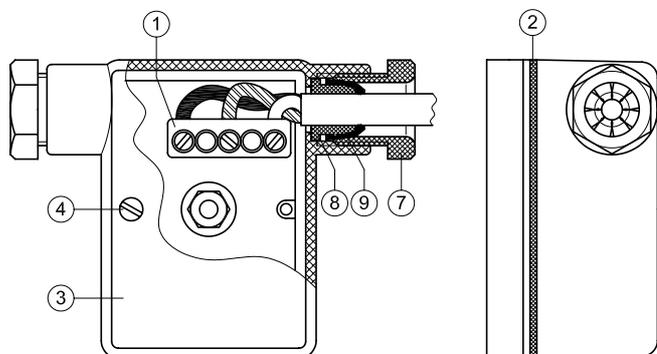


Fig. 6

Terminal box version:

- Using a screwdriver remove the box cover.
- Unscrew the gland-nut (7) and remove the retaining ring (9) and conical grommet (5).
- Insert the cable in to the gland-nut, retaining ring, grommet and then into its housing in the box cover.
- Connect power cables to the rectifier terminals (1) according to printed designation.
- Pull the cable and screw back the box cover, make sure the gasket (2) is properly used.
- Screw back the gland-nut, make sure that the grommet is locked on the cable.

Should cables pass through originally closed opening, use the rubber capsule placed underneath the cap to close any other opening.

Standard plug version (optional):

- Using a screwdriver remove the plug from the coil.
- Unscrew the gland-nut (7) and remove the washer (6) and grommet (5).
- To remove the terminal block (1) from the plug housing (3), remove the gasket (2) and extract the screw (4) completely, then insert a flat screwdriver into the slot located on edge and pull it.
- Insert the cable in to the gland-nut, washer, grommet and then into the plug housing.
- Connect power cables to the terminal block according to printed designation.
- Pull back the cable and insert the terminal block into the housing.
- Screw back the gland-nut, make sure that the grommet is locked on the cable.
- Insert the screw and gasket into the housing and screw back the plug on the coil.

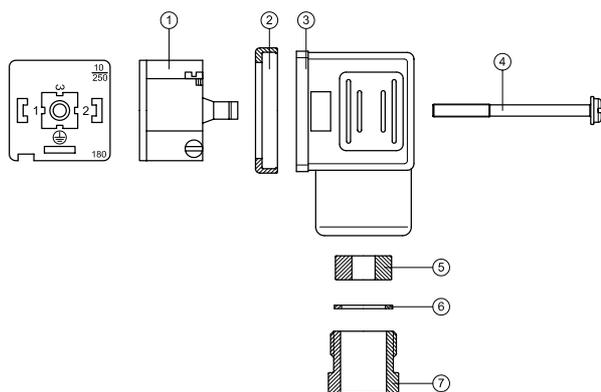


Fig. 7



The continuous service (100% ED) causes inevitable coil heating, depending of working environment. This situation is absolutely normal and has not to worry. To improve the coil cooling, install the valve allowing free air circulation.

**WARNING**

Make sure all gaskets are used properly.

Perform leak and functional tests after mounting (max. testing pressure 1500 mbar).

All works must be executed by qualified technicians only and in compliance with local and national codes.

FAST STROKE ADJUSTMENT (Vstart)

Fast flow section may be adjusted:

1. Remove plastic cap.
2. Using an hexagonal wrench, turn the outer screw clockwise to decrease or counter-clockwise to increase the initial fast stroke.
3. When adjustment is completed, screw back the plastic cap.

NOTE: in the DN65 and DN80 models the minimum adjustable stroke is 3mm.

FLOW RATE ADJUSTMENT (Vmax)

Flow rate may be adjusted from 0 cubic meters/h up to the maximum admitted:

1. Remove plastic cap.
2. Keeping the outer screw fixed, use a screw driver to turn the internal screw clockwise to decrease or counter-clockwise to increase flow rate (factory setting is max. flow rate).
3. When adjustment is completed, screw back the plastic cap.

NOTE: the flow rate regulation can not be lower than the fast flow section.

OPENING TIME ADJUSTMENT (T)

To regulate opening time, turn the screw located on the side of the brake. One fourth of a turn clockwise increases opening time by 2÷3 s, up to a maximum of about 25 s (slow run).

Factory setting is about 12÷14 s.

**WARNING**

Perform the fast stroke adjustment before of the flow rate adjustment.

Make sure that capacity adjustments are made while burner is working.

Check the regulation is not changed during reassembly.

Adjustments below 40% of capacity are inadvisable because they may cause turbulence.

COIL REPLACEMENT

Before to start with coil replacement, make sure it is the cause of failure.

To perform coil replacement do the following:

1. Make sure an identical one spare part is available.
2. Switch off power supply and remove the box cover.
3. Disconnect the wires from terminal board.
4. Unscrew the hydraulic brake.
5. Extract and replace coil.

Reassemble following the inverse sequence. Make sure that two O-ring below the brake are in their seat.



To maintain a good performance of the system, almost once a year, an external inspection of the valve is recommended.

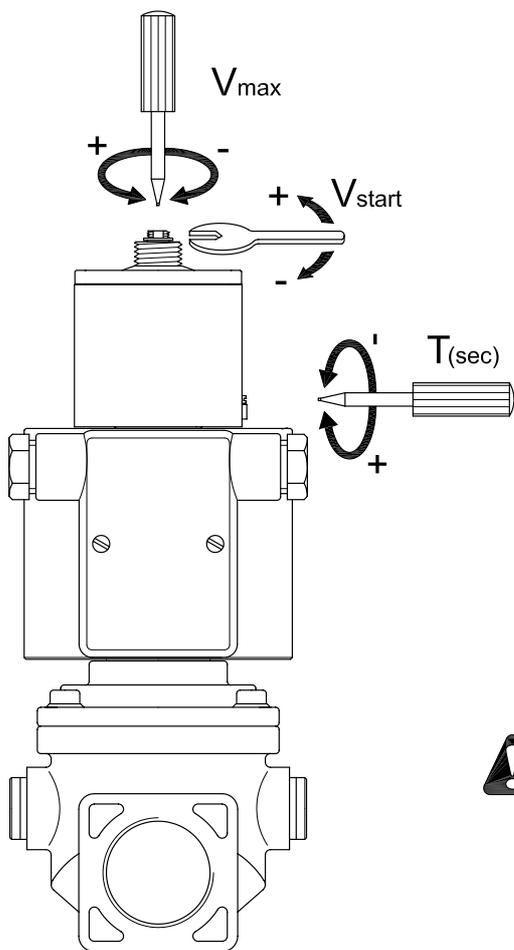


Fig. 8

EXTERNAL INSPECTION

- Turn off all power before servicing any part of the system.
- Check the conditions of the plug/box gasket. If gasket is deteriorated, replace it with a new one.
- Check the electrical connections are clean, dry and correctly tightened.
- Check the conditions of pipe connections: cover them with a soap solution and check for leakages.
- Check the proper operation of the valve: power the coil and verify that valve opens, then, turn off power and check the closing function.

INTERNAL INSPECTION

Make this inspection when the valve does not work properly only.

To make an internal inspection of the valve, do the following:

- Shut ball valve upstream the system and make sure no pressure is inside the valve.
- Remove the hydraulic brake (14) and coil (13) as described above.
- Check the O-ring (12) on the top of stem and, if it's necessary, replace it.
- Using an Allen key, remove the screws (10) on the upper flange (9), in cross way. The gas in the valve will come out during this step.
- Check the hydraulic brake is free of oil leakages (small leakages are admitted). If it's necessary, replace it with a new one.
- Check the main O-ring (8). If it's necessary, replace it with an identical one.
- Clean the internal side of the stem (11) with a clean cloth and compressed air.
- Remove the spring (7) and blow it with compressed air. Check the spring is corrosion free. Take attention to the assembly direction of the spring.
- Check the wear conditions of the sliding rings (6) and, if it's necessary, replace them.
- Clean the plunger assembly (4, 5, 6) with a clean cloth and compressed air.
- Check the conditions of the sealing gasket (4). If gasket is deteriorated, replace it with a new one.
- Clean the sealing lip with a clean cloth. Do not use tools, because a lip damage could result.
- Remove the filter (3) and blow it with compressed air.
- Reassemble the valve following the inverse sequence.

When reassembling, take attention to the correct position of the spring.

When the reassembly is finished, verify the correct sealing between the upper flange and the valve body:

- Open ball valve to restore pressure into the valve.
- Apply a soap solution between the upper flange and the valve body and check for leakages.
- Remove the soap solution with a clean cloth, before to reassemble the coil.

WARNING

To prevent product damage and dangerous situations, read the Installation and Service Instructions carefully.

Turn off all power before servicing any part of the system.

Do not disassemble or tamper the hydraulic brake.

Perform leak and functional tests after mounting.

Use all gaskets properly (void warranty).

All wiring must be in compliance with local and national codes.

Make sure all works are performed by qualified technicians only.

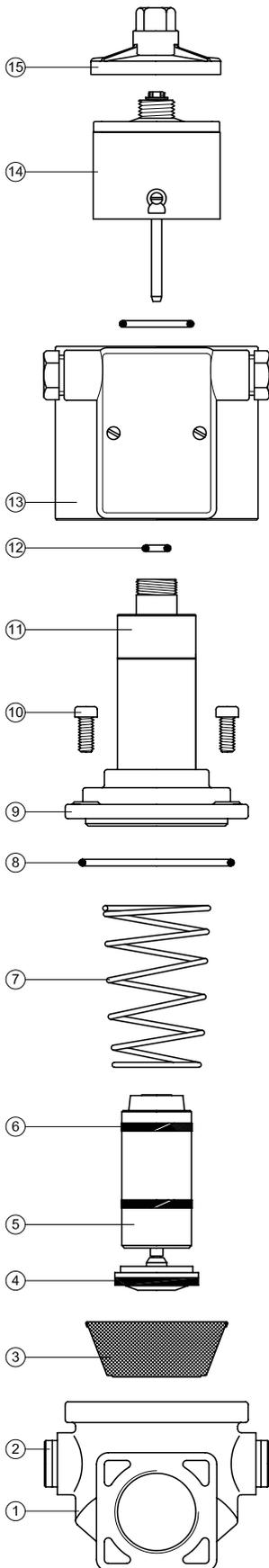


Fig. 9