

Vacuum Pumps

Instrumentation

Fittings and Valves



LEYBOLD VACUUM

GA 06.215/2.02

**Right Angle Valves with
Electropneumatic Actuator
DN 250 to DN 630 ISO-K**

Cat. No.
281 04/05/06/13/14
281 84
172 90

Operating instructions

1 Description of the Valves

1.1 Application

The ISO-K valves DN 250 to DN 630 from Leybold are isolating valves for pipes used in vacuum systems.

Concerning the type of valve seal used, there are two different sealing types which are employed in different applications,

- bellows-sealed valves
- elastomer-sealed valves.

Depending on the vacuum pressure during a process, bellows-sealed valves are designed for pressures down to $1 \cdot 10^{-9}$ mbar whereas elastomer-sealed valves are designed for pressures down to $1 \cdot 10^{-7}$ mbar.

Caution When planning to expose the valves to radioactive radiation, please contact us first.

All parts within the valve which come into contact with the medium passing through the valve must be protected against aggressive or corrosive gases and condensate.

Warning



Even in the case of explosion-like pressure bursts the max. permissible operating pressure must not be exceeded. The entire system must be protected against explosions and detonations in a professional manner.

1.2 General

The DN 250 to DN 630 ISO-K valves from Leybold are right angle valves having ISO-K flanges of a nominal diameter from 250 mm to 630 mm and pneumatic actuation.

The double-action piston (2/5) transfers the occurring forces and thus the resulting motion via the piston rod (2/7) to the valve disc (2/9).

The pneumatic actuator of the piston is controlled by a 5/2-way pilot valve (2/4).

The pilot valves are described in Section 2. The required solenoid coils for the different supply voltages must also be selected on the basis of the information provided in this Section.

For vibration sensitive processes the upper limit stop of the valve piston and the lower limit stop of the valve plate at its seat is considerably dampened by elastic components.

1.3 Design and Function

1.3.1 Bellows-Sealed Valves

The operation of bellows-sealed valves from Leybold does in no way involve and hydrocarbons since the piston rod is fully sealed off against the atmosphere by the bellows. A borehole (2/1) which is provided on the pneumatic actuator is used to equalise the pressure in the atmospheric section of the bellows and it also serves as a sniffer hole during helium leak testing.

Due to the screwed connections at the valve plate and the casing, the bellows and the entire inner section are easily accessible.

1.3.2 Elastomer-Sealed Valves

In the case of elastomer-sealed (O-ring sealed) valves from Leybold the piston rod is sealed off radially against the vacuum side by special seals which are filled with grease and a wiping plate. The lateral borehole on the compressed air cylinder (3/1) is used for helium leak testing purposes.

1.4 Supplied Equipment

The following parts are included with every DN 250 to DN 630 valve from Leybold:

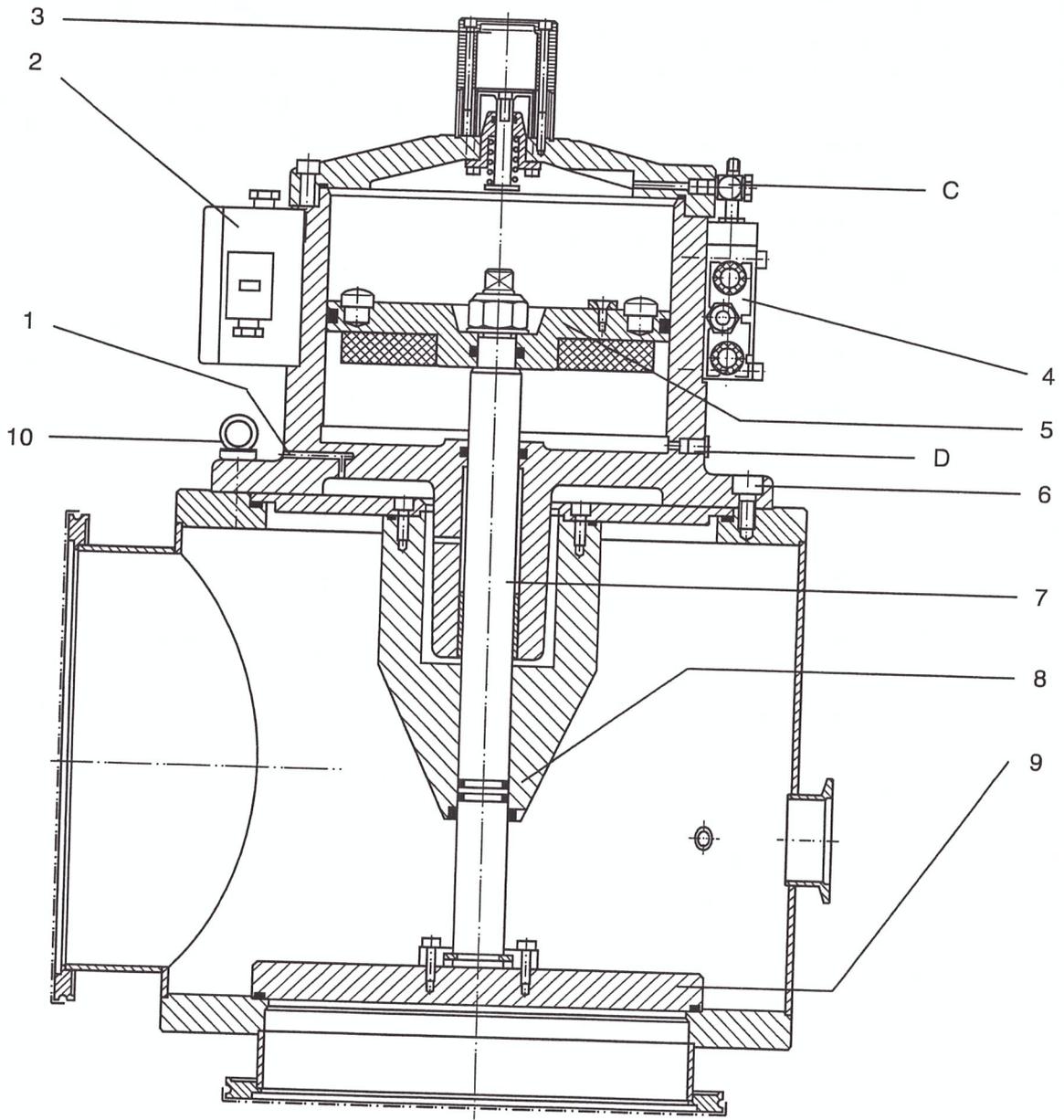
- Right angle valve, complete, with pilot valve, but without solenoid coil (exception: DN 350 valve, Cat. No. 172 90).
- Casing equipped with protection caps up to DN 350, from DN 400 with protection flanges.
- **at bypass 1:** up to DN 250, KF blank flange (aluminium) with centering ring and Pneurop clamping ring, from DN 320, ISO-K blank flange (galvanised steel) with centering ring and four clamping screws,
- **at bypass 2:** KF blank flange (aluminium) with centering ring and Pneurop clamping ring,
- **at bypass 3** (measurement connection): KF blank flange (aluminium) with centering ring and Pneurop clamping ring,
- Operating Instructions (GA)
- Spare Parts List (ET)

ISO-K right angle valve		DN 250 ISO-K	DN 250 ISO-K	DN 320 ISO-K	DN 320 ISO-K	DN 350 ISO-K	DN 400 ISO-K	DN 500 ISO-K	DN 630 ISO-K	
Required compressed air quality		1. dry, 2. non-oiled, 3. filtered, 4. oiled compressed air; the compressed air quality which is used for the first time on a valve must be maintained, except when moving from dry to 2., 3. and 4.								
Manual actuation		Yes, at the pilot valve								
Position of the valve when no voltage is applied		Closed (can be converted to "normally open", see Section 3.9)								
Emergency actuation of the pilot valve		Solenoid valve with manual auxiliary operation								
Hose for connection of compressed air	mm	6x1								
Position indicator: optical		Signal knob on the pneumatic actuator								
Position indicator: electrical	optional	2 stop position switches (non-contact via ring magnet under the piston) Connection via plug (Fig 6/2 and 7/2)								
Voltage range AC / DC	V	min: 4.8 – max: 230								
Max. current rating for the stop position switches	A	1.5								
Cylinder volume / stroke	l	2.1	2.1	2.7	2.7	10.6	3.3	4.2	5.2	
Installation orientation		any					vertical installation, compressed air cylinder at the top			
Actuation times:										
Opening time	s	6	6	7	7	19	8	9	11	
Closing time	s	6	6	7	7	19	8	9	11	
Max. stroke frequency	1·min ⁻¹	3	3	2.5	2.5	1	2	2	1.5	
MTBF*) / number of actuations		1·10 ⁶	1·10 ⁶	1·10 ⁶	1·10 ⁶	1·10 ⁵	8·10 ⁵	8·10 ⁵	6·10 ⁵	
Max. degassing temperature	°C	80								
Pressure differential at the valve disc	mbar	1000	1000	1000	1000	1000	1000	1000	1000	
Pressure difference upon opening	mbar	1000	1000	1000	1000	1000	1000	500	250	
Leak rate: belows-sealed casing with respect to the atmosphere	mbl / s	< 1·10 ⁻⁹								
Leak rate: elastomer-sealed guided rod during operation	mbl / s	< 1·10 ⁻⁸								
Weight	kg	66	65	128	125	139	148	180	310	
Cat. Nos.		281 84	281 13	281 04	281 14		281 05	281 06	upon request	
Design with 220 V pilot valve (permanently fitted, model to be discontinued)						172 90				

*) MTBF = Mean Time Between Failure = service interval

1.6 Accessories

ISO-K right angle valve		DN 250 ISO-K	DN 250 ISO-K	DN 320 ISO-K	DN 320 ISO-K	DN 350 ISO-K	DN 400 ISO-K	DN 500 ISO-K	DN 630 ISO-K
Centering ring AI / NBR		268 17	268 17	268 18	268 18	268 13	268 14	268 15	
Centering ring stainless steel / FPM		887 08	887 08	887 10	887 10				
Centering ring bypass AI / NBR									
16	DN	183 26							
40	DN	183 28							
50	DN	183 25							
63	DN					268 07			
100	DN								
Blank flange								268 08	
16 AL	DN	184 46							
40 AL	DN	184 48							
50 AL	DN	184 45							
63 steel – nickel plated	DN								
100 steel – nickel plated	DN					269 47			
Clamping screws (4 pcs.) galvanised. M 10 x 24		267 01						269 48	
Casing seal		239 50 740		239 50 148	239 50 151	239 50 151	239 70 160	239 50 747	
Dimensions		265 x 5		385 x 5	415 x 5	415 x 5	530 x 5	800 x 5	
Clamping screws (3 pcs.) galvanised M 16 x 24									
Interference suppression adapter for the coil at pilot valve 24 V (see 2.3.3)						267 10			
Solenoid coils for pilot valve						200 07 859			
Adapting flange, steel – nickel plated						See Section 2.2			
Screws M 12 x 40	Qty: 24					DN 320 ISO - F / DN 350 ISO - F 269 18			
						201 023 81			



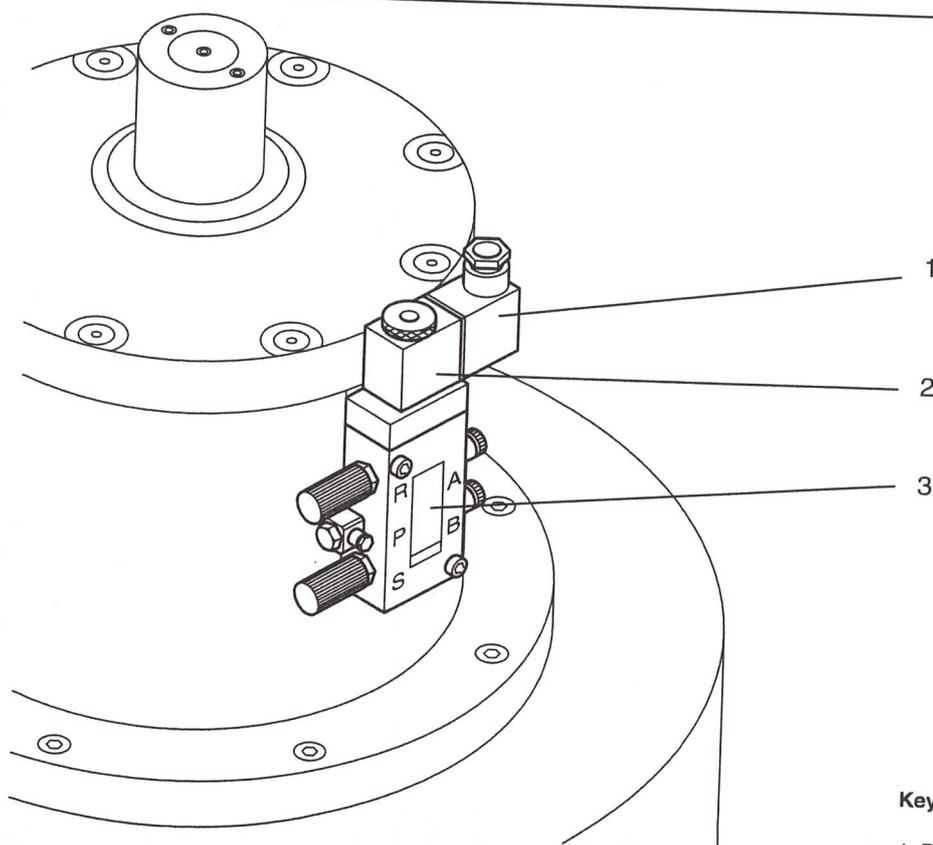
Key to Fig. 3

- 1 Borehole for sniffer
 - 2 Electrical supply assy.
 - 3 Optical position indicator
 - 4 Pilot valve
 - 5 Piston
 - 6 Casing screws
 - 7 Piston rod
 - 8 O-ring seal
 - 9 Valve disc
 - 10 Crane eyes (2, diagonally arranged)
- C Compressed air connection "Close"
 D Compressed air connection "Open"

Fig. 3 Fully assembled right angle valve, O-ring sealed

2.3 Technical Data of the Solenoid Coils

Design Data	DC	AC	Ex. protection, DC	Ex. protection, AC
Type	DC solenoid coil	AC solenoid coil	DC solenoid coil	AC solenoid coil
Voltage	12/24 V DC	24/110/230 V AC 50/60 Hz	24 V DC	230 V AC 50/60 Hz
Permissible voltage variations	± 10 %	± 10 % at rated frequency	± 10 %	± 10 % at rated frequency
Permissible frequency variations	-	± 10 % at rated frequency	-	± 5 % at rated frequency
Power consumption at rated voltage	4.1 W at 12 V 4.5 W at 24 V	Actuation: 7.5 VA Holding: 6 VA	4.5 W	7.5 VA
Operating factor	100 %			
Protection to DIN 40 050	IP 65			
Cable connection	Pg 9		Moulded cable, 5 m long	
Insulation class to VDE 0580	F			
Protection to VDE 0170/0171	-		Ex s G4	
Test mark	VDE		VDE / PTB No. III B/E-25858	
Ambient temperature	-5 °C to + 40 °C			
Max. operating time	10 ms		20 ms	
Weight	0.065 kg	0.055 kg	0.175 kg	0.170 kg
Torque for the knurled screw min./max.	100 Ncm / 150 Ncm			



Key to Fig. 4

- 1 Plug for solenoid coil
- 2 Solenoid coil
- 3 Pilot valve

Fig. 4 Fitted pilot valve with solenoid coil

3.3 Compressed Air Connection

For the lines carrying compressed air we recommend the use of plastic pressure lines having an outside diameter of 6 mm and an inside diameter of 4 mm.

The compressed air connections from the pilot valve leading to the right angle valve have already been installed.

Caution The compressed air supply from the customer is connected to connection "P" (5/14) on the pilot valve.

For this connection the union nut of the quick-coupling for compressed air (5/14) is removed and pushed over the compressed air hose. The end of the hose is pushed over the hose nozzle and secured against slipping off by the union nut.

The union nut is only tightened manually.

When applying compressed air to connection "A", the right angle valve opens. When applying compressed air to connection "B", the right angle valve closes.

Warning The compressed air hoses are pressurised at times and they must be protected against damage of any kind.



If required the connections may be leak tested with soap solution when pressurised.

3.4 Opening and Closing the Valve Manually

The pilot valve (5/10) is equipped with a screw (Fig. 10/item x) for manual operation of the valve, should this be at all required.

With the aid of a screwdriver it is possible to turn this screw and manually operate the valve, provided compressed air is applied to the pilot valve.

There are two positions:

Position 0 = Normal position
(for solenoid actuation). The valve is closed in this position.

Position 1 = The valve is open.

3.5 Electrical Connection

Warning During all electrical work ensure that the power supply lines have reliably been switched off. The electrical connections may only be made by an electrician as defined by VDE 0105 in accordance with the VDE 0100 guidelines.
Before providing the electrical connections observe the maximum power ratings for any connected switches!



3.5.1 Power Supply Connection

Caution A 3 core mains cable (3 x 1 mm² / 2x + protective ground conductor) is recommended for the power supply connection.

The connection is made at the central power supply assembly (2/2 and Fig. 7) located at the compressed air cylinder.

Unscrew the four screws (7/3) and pull off the lid.

Lead the connection cable through the feedthrough (7/1) and connect as indicated in the wiring diagram (Fig. 8).

Provide a strain-relief by tightening the clamping screw (PG feedthrough) (7/1) and attach the lid.

3.5.2 Connection of the Stop Position Switches

The electrical signals from the stop position switches are available at plugs (7/2 and 8/2) for further processing.

Unlock the plug via its roll bar, unplug and disassemble.

The plug must be wired as shown in Fig. 8 and 8a.

Then reassemble the plug and attach it firmly once more.

The contacts are floating.

Caution The max. current rating is 1.5 A
Switching capacity: DC = 24 W
AC = 30 VA

3.5.3 Optical Position Indicator

The optical position indicator is located on top of the compressed air cylinder (2/3).

When the valve is open, a red indicator pin indicates the "OPEN" position.

3.5.4 Interference Suppression Adapter

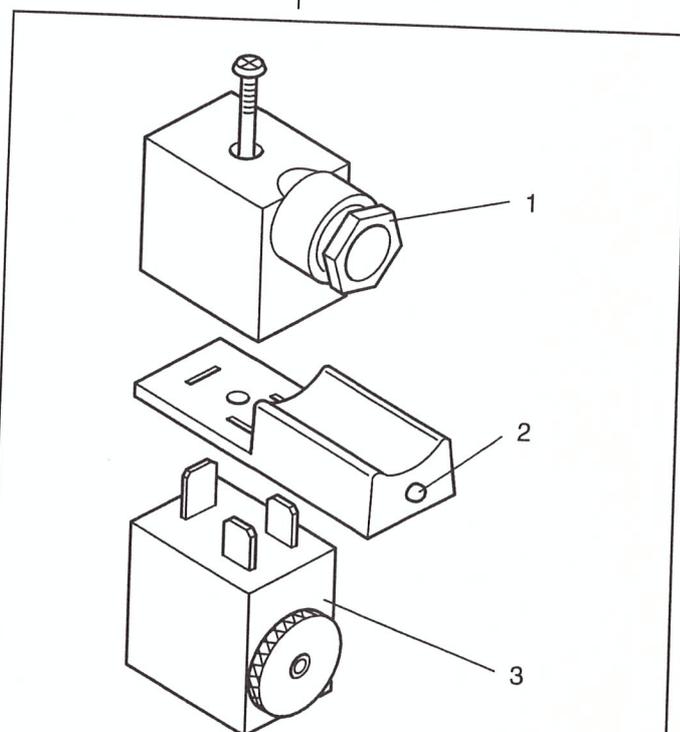
An interference suppression adapter (Fig. 6) is available from Leybold as an option for the purpose of interference suppression and for the suppression of undesirably high voltages at the pilot valve.

The interference suppression adapter is connected between connection plug and solenoid coil.

Caution When operating the valves without an interference suppression adapter a seal (5/8) is installed between connection plug and solenoid coil. **This seal must be removed before fitting the interference suppression adapter.**

Technical data for the interference suppression adapter

Supply voltage	24 V DC
Contact material	Bronze, silver-plated
Housing material	Polyamide, hardly inflammable
Operating temperature	-20 °C to +60 °C
Protection	IP 65
Operating indicator	LED, yellow
Ref. No.	200 07 859



Key to Fig. 6

- 1 Plug for solenoid coil
- 2 Interference suppression adapter
- 3 Solenoid coil

Fig. 6 Interference suppression adapter

3.6 Notes Concerning Operation

Treat the sealing surfaces with care. It is recommended that the valve be only handled and moved with the protective caps in place.

Warning The valve must only be installed when no voltage is applied.



During operation of the valve you must ensure that no part of the body can come into contact with the space inside the valve, in particular when the valve is operated at the end of a line (open).

Remove the protection caps before installing the valve.

The sealing surfaces and the centering rings must be cleaned with a solvent (acetone or alcohol).

Caution Do not use any aggressive cleaning agents.

When receiving the valves from Leybold they are in the closed position, i.e. the valve disc rests on the valve seat.

Venting and bypass flanges are fitted with blank flanges.

The Leybold valves are supplied with a pilot valve, but **without the solenoid coil**.

The solenoid coils may be selected depending on the supply voltage requirements in each case (see Section 2.2).

Installation of the solenoid coils is described in Section 3.2.

The electrical connection is described in Section 3.5.

In the event of a supply voltage failure or compressed air failure, the valve is closed automatically. Therefore these valves are of the "normally closed" type.

The valves may be converted for "normally open" operation. This is described in Section 3.9.

The pilot valve (5/10) is equipped with means for auxiliary manual operation (see Section 3.4). In the event of a supply voltage failure the valve may then be operated manually, provided compressed air is available at the pilot valve.

3.7 Operating Temperatures/ Degassing Temperatures

The ambient temperature range for the complete valve is $-5\text{ }^{\circ}\text{C}$ to $+40\text{ }^{\circ}\text{C}$.

The valve **without the pilot valve** and **without the solenoid coil** may be heated to $80\text{ }^{\circ}\text{C}$ max.

The temperature for the compressed air should also remain in the temperature range from $-5\text{ }^{\circ}\text{C}$ to $+40\text{ }^{\circ}\text{C}$.

3.8 Operation

Caution First check the available supply voltage against the ordering data for the pilot valve. Determine whether or not the supply voltage is actually present at the Leybold valve.

You must ensure that the pilot valve is supplied with compressed air and that this compressed air is of the quality as described in Section 3.1.

If these conditions are met, you may then open the Leybold valve via the pilot valve or activate it through the central control system.

The "OPEN" position of the valve is indicated by the red signal pin (optical position indicator – 2/3) at the compressed air cylinder.

4 Maintenance

4.1 Leybold Right Angle Valve

Leybold right angle valves are either of the bellows-sealed or elastomer-sealed type and will not require any maintenance within the MTBF (see Section 1.5). All movable parts are lubricated with a special grease. After disassembly of the actuator the lubrication should be renewed (special grease, Ref. No. 070 27 009).

4.1.1 Cleaning of the Inner Space

Warning Before opening the valve, all electrical connections made to the valve must be disconnected. The compressed air connection must also be released.



In the case of substances which may represent a health hazard, determine the kind of hazard first and observe the applicable safety regulations. If the hazard still persists, the valve must be decontaminated before starting any maintenance work on the valve.

For proper decontamination we recommend our LH service.

Unscrew screws (2/6).

Lift out the compressed air cylinder together with the complete inner section using a suitable lifting device attached to the crane eyes (2/10 or 3/10) provided for this purpose.

The inner space of the valve and the components may then be cleaned.

Caution All sealing surfaces, the bellows (2/8) as well as the piston rod (2/7 or 3/7) must be protected against damage. Use only commercially available cleaning agents.

The sealing rings, also those in the compressed air cylinder, must only be exchanged by suitably qualified and trained personnel.

The Ref. No. for the housing seal is given in Section 1.6.

4.1.2 Electrical Connection of a Connection Plug for the Pilot Valve which has not already been Wired-Up

The DN 250 ISO-K to DN 630 ISO-K right angle valves from Leybold are supplied with a fully wired-up connection plug (4/1).

When wanting to install a connection plug which has not already been wired-up, proceed as follows:

After having loosened the screw (5/5) pull the connection plug off from the solenoid coil.

Use a small screwdriver to force the plug insert (5/7) out from the dent of the fixing screw.

The terminals (8/1) are marked as follows:

"1" and "2" = phase, the third connection is for the ground wire and marked with the ground symbol.

Lead the 3-core cable from the valve (3x1 mm²) through the feedthrough /PG feedthrough (5/4) and connect it to the terminals.

Fit the plug insert into the housing (5/6) until it snaps in. Provide the strain-relief for the cable at the feedthrough/PG feedthrough by tightening the clamping screw (5/4).

Attach the complete connection plug and secure it in place by tightening screw (5/5).

Don't forget seal (5/8).

4.2 Pilot Valve

Leybold pilot valves do not require any maintenance.

However, during regular maintenance work, torque of the knurled nut (5/2) and the seating of the connection plug should be checked.

The time between two service intervals (MTBF) exceeds the time for the right angle valves from Leybold as stated in Section 1.5.