

Bulletin **E384B**

3/2-Way Double Valves with **CROSSMIRROR®** Monitoring

Size 4 and 8



ROSS Air Control Products



ROSS safety-related technology has a long tradition...

For almost 40 years ROSS has been developing double valves which have made a significant contribution to the operating safety of pneumatically controlled presses. During this period our range of double valves has been developed continuously in response to the needs of press manufacturers and users. Monitoring devices have also been offered in a variety of designs to satisfy different requirements.

The range of double valves in 3/2-way configuration featuring the all-new CROSSMIRROR® monitoring system presented in this catalogue incorporates all our experience and represents the state-of-the-art in ROSS double valves.

Selecting the double valve best suited to each application requires considerable technical knowledge. If you need further information or technical advice, please contact ROSS or your nearest ROSS distributor or sales office.

CAUTION: *On mechanical presses and other hazardous machines with pneumatically operated clutches and brakes double valves at least should be used. Double valves without self-monitoring should be used only if current regulations permit.*

If the valves are used on presses in Germany, the "Safety Regulations For Control Systems On Power-driven Presses for Metalworking zH 1/457" must be observed.

For applications not covered by standard valves, please consult ROSS. We reserve the right to make technical modifications in the course of further product development.

ROSS 3/2 Double Valve with CROSSMIRROR® Monitoring

The ROSS CROSSMIRROR® 3/2 double valves combine the benefits of dynamic monitoring with the well-known safety features of the patented SERPAR® Crossflow double valves. The CROSSMIRROR® valve consists of two main valve systems and two pilot valve systems in a single body. The valve elements are connected by internal "Crossflow" air passages so that each system controls both the pilot air supply and the main inward air flow of the other. Exhaust air flows directly from work port 2 to exhaust port 3 via large exhaust poppets operating in parallel. The valve is base-mounted for easy installation and maintenance, and is available in port sizes G 1/2 through G 1.

The ROSS CROSSMIRROR® valve has BG approval and is therefore of considerable importance to users of presses and press brakes which need to meet the requirements of the latest press safety standards. When used to control the clutch/brake units of metal forming presses, the valve fully meets the requirements of **EN 692:1996**, sections 5.4.1.3 and 5.4.2.3.

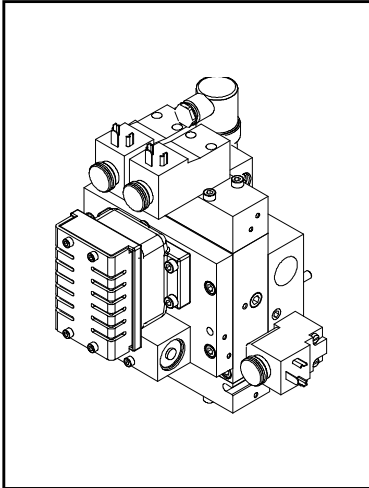
The CROSSMIRROR® valve monitors its operation pneumatically on every opening and closing movement of the valve elements. The monitoring system is dynamic as defined by **EN 692**. The valve switches to a lock out condition if either the valve elements shift asynchronously or main air pressure is lost. The valve will remain locked out until reset by an externally generated momentary signal in accordance with **EN 692** section 5.4.2.3 f.

When the valve is fitted with a pressure switch unit, this may be used to provide a signal to the press control system that the valve has switched to a lock out condition.

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3/2-Way Double Valves with CROSSMIRROR® Monitoring

Size 4



SPECIFICATIONS

Design: 3/2-way-main valve elements in poppet design. Viton-seals air operated and air pressure return. Inlet sealing elements spring return.

Actuation: solenoid operated 3/2-way-air pilot valves.

Medium: compressed air dehydrated, filtered (5 µm) lubricated or unlubricated (mineral oils acc. to DIN 51519, viscosity classes VG 32 - VG 46 acc. to ISO 3448).

Operating pressure: 3 to 8 bar.

Ambient temperature: 4° C to 50° C.

Media temperature: 4° C to 80° C.

Mounting orientation: preferably vertically.

Monitoring: dynamic, cyclic, internal - during each actuating movement and in any condition.

Pilot solenoid: according to VDE 0580. Enclosure rating according to DIN 400 50 IP 65. Connector socket according to DIN 43650 Form A.

Rated for **continuous duty**.

Standard voltages:

24 V DC 110 V DC
24 V 50 Hz, 110 V 50 Hz, 230 V 50 Hz;
24 V 60 Hz, 110 V 60 Hz, 240 V 60 Hz.
When ordering the valve, specify AC or DC voltage and frequency for operating the pilot solenoids (see Specifications on this page).

Power consumption:

DC solenoids - 11 W
AC solenoids - 16 VA holding
30 VA inrush

The double valves listed have been approved by the following testing and certificating authority:
BG-Fachausschüsse Eisen und Metall III und Hebezeuge II, Germany: Certificate No. 99082

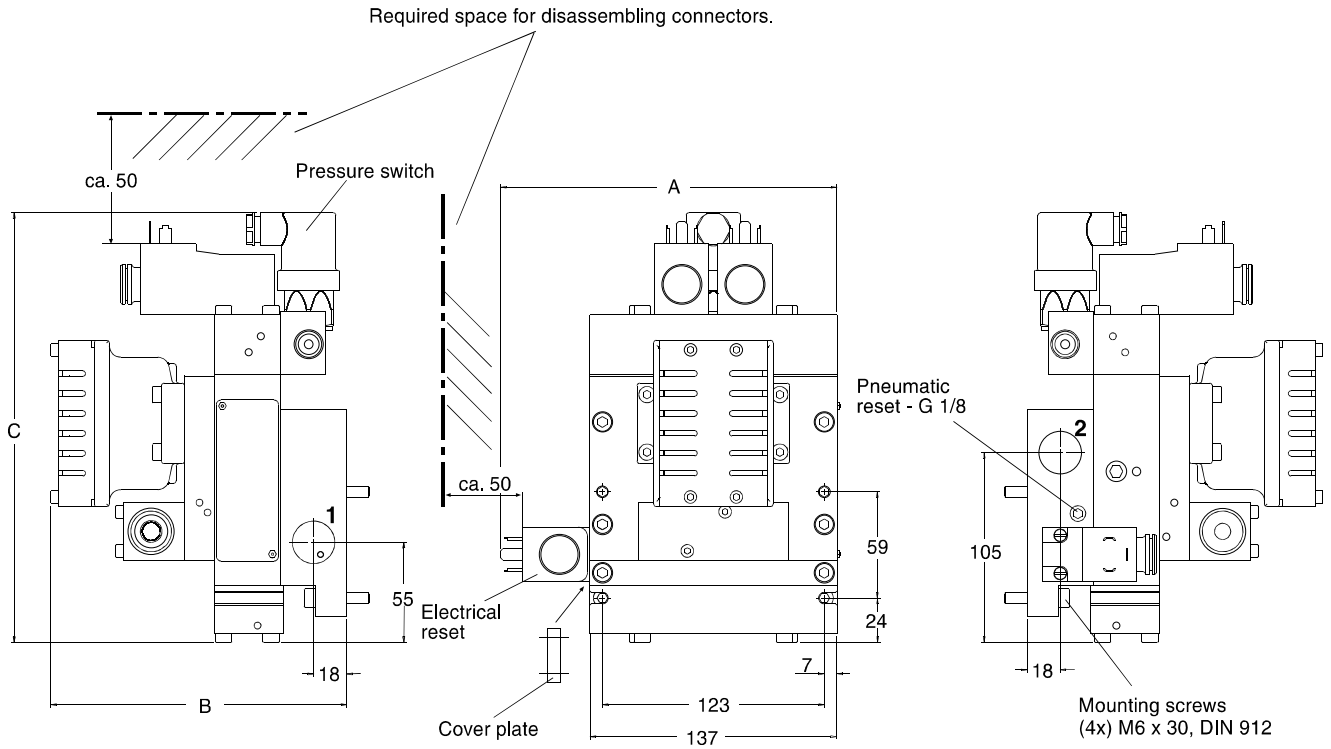
Size	Type ¹⁾ of Double Valve	ND	Valve Model Number (with Sub-base)	Valve Model Number (without Sub-base)	Weight Valve	Sub-base Model Number	Weight Sub-base
4	Without pressure switch, pneumatic reset	G 1/2	D7773A4505	7773A4400	5.0 kg	D1321C91	1.0 kg
		G 3/4	D7773A5505	7773A4400	5.5 kg	D1219C91	1.5 kg
	Without pressure switch, electrical reset	G 1/2	D7773A4507	7773A4400	5.0 kg	D1322C91	1.0 kg
		G 3/4	D7773A5507	7773A4400	5.5 kg	D1220C91	1.5 kg
With pressure switch, pneumatic reset	G 1/2	D7773A4506	7773A4401	5.0 kg	D1321C91	1.0 kg	
	G 3/4	D7773A5506	7773A4401	5.5 kg	D1219C91	1.5 kg	
With pressure switch, electrical reset	G 1/2	D7773A4508	7773A4401	5.0 kg	D1322C91	1.0 kg	
	G 3/4	D7773A5508	7773A4401	5.5 kg	D1220C91	1.5 kg	

1) Optionally, the valve can be equipped with a pressure switch. The pressure switch will only switch from „actuated“ to „de-actuated“ in case of a malfunction or an energy failure. Therefore the pressure switch may not be integrated as an element into the safety circuit.

Size 4

**3/2-Way Double Valves
with CROSSMIRROR® Monitoring**

**Valve with sub-base and pressure switch
Main dimensions - mm**



Size	Type of Double Valve	ND	Valve Model Number (with Sub-base)	Dimensions mm		
				A	B	C
4	Without pressure switch, pneumatic reset	G 1/2 G 3/4	D7773A4505 D7773A5505	147	164	232
	Without pressure switch, electrical reset	G 1/2 G 3/4	D7773A4507 D7773A5507			
	With pressure switch, pneumatic reset	G 1/2 G 3/4	D7773A4506 D7773A5506	186	164	248
	With pressure switch, electrical reset	G 1/2 G 3/4	D7773A4508 D7773A5508			

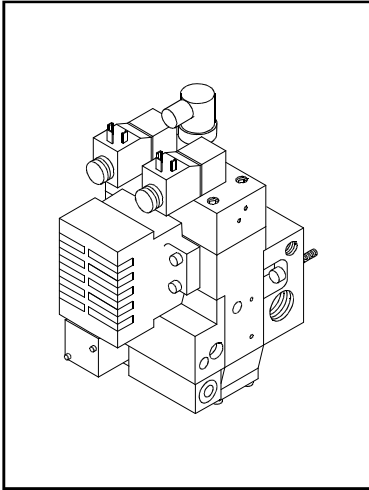
Description	Model Number
Body kit	1791K77
Seal kit*	1790K77

*Included in body kit



3/2-Way Double Valves with CROSSMIRROR® Monitoring

Size 8



SPECIFICATIONS

Design: 3/2-way-main valve elements in poppet design. Viton-seals air operated and air pressure return. Inlet sealing elements spring return.

Actuation: solenoid operated 3/2-way-air pilot valves.

Medium: compressed air dehydrated, filtered (5 µm) lubricated or unlubricated (mineral oils acc. to DIN 51519, viscosity classes VG 32 - VG 46 acc. to ISO 3448).

Operating pressure: 3 to 8 bar.

Ambient temperature: 4° C to 50° C.

Media temperature: 4° C to 80° C.

Mounting orientation: preferably vertically.

Monitoring: dynamic, cyclic, internal - during each actuating movement and in any condition.

Pilot solenoid: according to VDE 0580. Enclosure rating according to DIN 400 50 IP 65. Connector socket according to DIN 43650 Form A.

Rated for **continuous duty**.

Standard voltages:

24 V DC 110 V DC

24 V 50 Hz, 110 V 50 Hz, 230 V 50 Hz;

24 V 60 Hz, 110 V 60 Hz, 240 V 60 Hz.

When ordering the valve, specify AC or DC voltage and frequency for operating the pilot solenoids (see Specifications on this page).

Power consumption:

DC solenoids - 11 W

AC solenoids - 16 VA holding

30 VA inrush

The double valves listed have been approved by the following testing and certifying authority:
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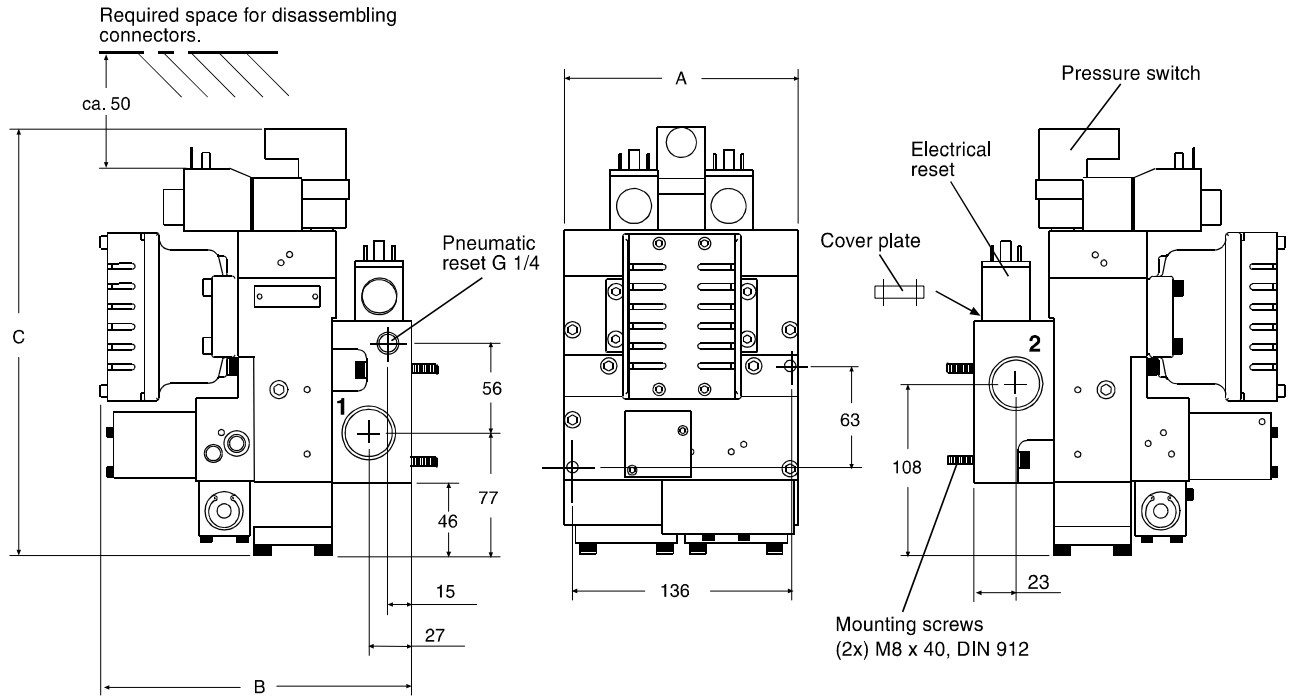
Size	Type ¹⁾ of Double Valve	ND	Valve Model Number (with Sub-base)	Valve Model Number (without Sub-base)	Weight Valve	Sub-base Model Number	Weight Sub-base
8	Without pressure switch, pneumatic reset	G 3/4 G 1	D7773A5501 D7773A6501	7773A6400 7773A6400	7.2 kg 7.8 kg	D1207C91 D1044C91	1.5 kg 2.1 kg
	Without pressure switch, electrical reset	G 3/4 G 1	D7773A5503 D7773A6503	7773A6400 7773A6400	7.2 kg 7.8 kg	D1208C91 D1205C91	1.5 kg 2.1 kg
	With pressure switch, pneumatic reset	G 3/4 G 1	D7773A5502 D7773A6502	7773A6401 7773A6401	7.2 kg 7.8 kg	D1207C91 D1044C91	1.5 kg 2.1 kg
	With pressure switch, electrical reset	G 3/4 G 1	D7773A5504 D7773A6504	7773A6401 7773A6401	7.2 kg 7.8 kg	D1208C91 D1205C91	1.5 kg 2.1 kg

1) Optionally, the valve can be equipped with a pressure switch. The pressure switch will only switch from „actuated“ to „de-actuated“ in case of a malfunction or an energy failure. Therefore the pressure switch may not be integrated as an element into the safety circuit.

Size 8

**3/2-Way Double Valves
with CROSSMIRROR® Monitoring**

**Valve with sub-base and pressure switch
Main dimensions - mm**



Size	Type of Double Valve	ND	Valve Model Number (with Sub-base)	Dimensions mm		
				A	B	C
8	Without pressure switch, pneumatic reset	G 3/4 G 1	D7773A5501 D7773A6501	147	196	259
	Without pressure switch, electrical reset	G 3/4 G 1	D7773A5503 D7773A6503			
	With pressure switch, pneumatic reset	G 3/4 G 1	D7773A5502 D7773A6502	147	196	272
	With pressure switch, electrical reset	G 3/4 G 1	D7773A5504 D7773A6504			

Description	Model Number
Body kit	1710K77
Seal kit*	1711K77

*Included in body kit



3/2-Way Double Valves with CROSSMIRROR® Monitoring

Size 4 – Valve response times

Filling and exhausting times in milliseconds¹⁾ at 7 bar

Volume ltr.	Function normal		Side A abnormal 2-3	Side B abnormal 2-3
	1-2	2-3		
0.5	63	47	60	60
1.0	92	62	80	82
1.5	120	75	100	104
2.0	149	88	121	126
2.5	177	103	142	148

1) Filling times measured from energizing of electric contact to 90% buildup of test pressure.
Exhausting times measured from de-energizing of electric contact to 90% exhaust of test pressure.

Size 8 – Valve response times

Filling and exhausting times in milliseconds¹⁾ at 7 bar

Volume ltr.	Function normal		Side A abnormal 2-3	Side B abnormal 2-3
	1-2	2-3		
0.5	55	46	59	59
1.0	77	59	77	77
1.5	101	72	96	97
2.0	123	84	114	116
2.5	145	95	132	135
3.0	167	107	150	154
3.5	188	120	156	160
4.0	220	132	183	188

1) Filling times measured from energizing of electric contact to 90% buildup of test pressure.
Exhausting times measured from de-energizing of electric contact to 90% exhaust of test pressure.

3/2-Way Double Valves with CROSSMIRROR® Monitoring

ESSENTIAL FEATURES OF THE CROSSMIRROR® VALVE OPERATION

- On first operation or after the main air supply has been removed, the pilot valve supply circuit and inherent monitoring elements must be pressurised by a momentary signal to the reset valve. The valve will then be ready for operation.
- The air supply to each pilot valve is controlled by a special concentrically grooved poppet on each main valve element. In the ready for operation position these poppets are held on their seats and maintain pilot air flow. During shifting of the valve elements the poppets momentarily move off seat and allow pilot air to escape to exhaust. If either valve element fails to operate correctly, the pilot supply to the other valve element will remain connected to exhaust causing the valve to lock out.
- The monitoring system will lock out the valve if the time difference between both elements shifting fully is longer than 200ms. This timing is pre-set by restricting orifices and chambers in the pilot air circuit.
- The main airflow from port 1 to port 2 is via Crossflow passages between both main valves, so that both valve elements must be fully shifted before port 2 is pressurised.
- If the valve locks out, further operation is prevented until the valve has been reset. Reset is by a momentary pneumatic signal activated by secure means, supplied either from the built in solenoid valve or a remote valve.
- The CROSSMIRROR® valve is completely self-contained and does not need an external monitoring system. An optional pressure switch unit can be used to signal a valve lock out to an electrical or electronic control system. Properly wired into the circuit the pressure switch can inhibit power supply to the valve solenoids until the fault has been identified and corrected.

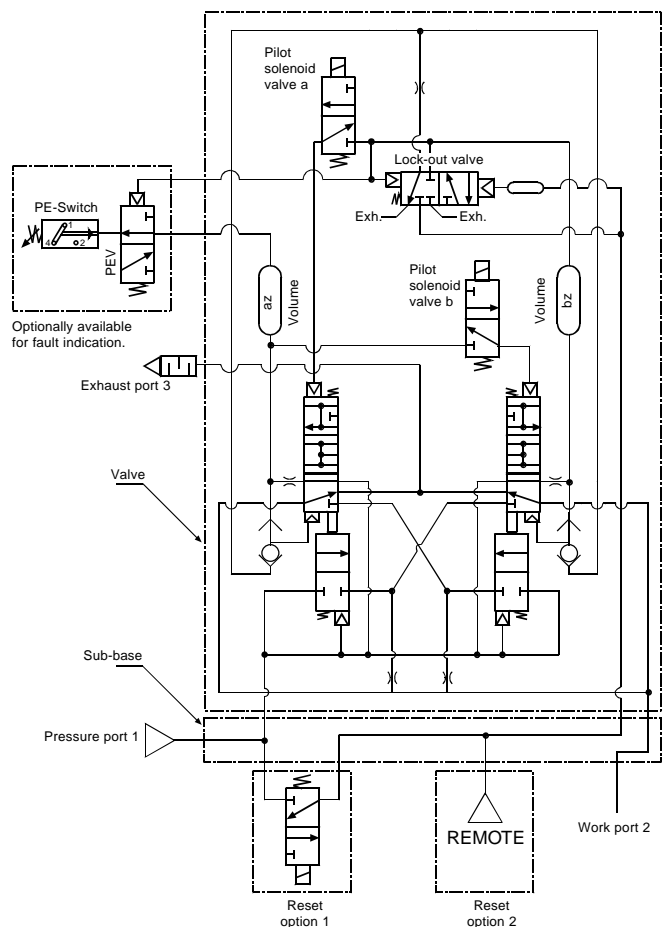
APPLICATION NOTES

The CROSSMIRROR® valve design provides a high level of safety and can help to meet the safety requirements of EN 983:1996⁽¹⁾ and other application specific safety legislation and standards.

The valve is designed primarily to control pneumatic clutch-and-brake units on presses, where it fully meets the requirements of EN 692:1996⁽²⁾. However it can also be used without additional monitoring systems in applications where a risk assessment indicates that the requirements of Category 4 of EN 954-1:1996⁽³⁾ apply.

If the CROSSMIRROR® valve is operated using a two-hand control device, this device must be in accordance with the standard EN 574:1996⁽⁴⁾. The selection and installation of the two-handed control must be in accordance with the manufacturer's instructions.

- (1) Safety of Machinery - Safety requirements for fluid power systems and their components - Pneumatics
- (2) Mechanical Presses - Safety
- (3) Safety of Machinery - Safety related parts of control systems - Part 1 General principles of design
- (4) Safety of Machinery - Two handed control device



**Schematic
(Valve in the de-actuated position)**

3/2-Way Double Valves with CROSSMIRROR® Monitoring

CAUTIONS

Installation

The 3/2-Way-CROSSMIRROR® press safety valve should be installed only by persons trained and experienced in the installation of such equipment.

Lines

Air supply directed through air preparation units and pressure regulator to pressure port 1 requires minimum flow capacity of pressure port 1.

Lines and line connections must be in accordance with relevant safety regulations.

Air preparation

An efficient filter unit (at least 5 µm) must be mounted before the valve. Use of a lubricator is not necessary if the work element is designed for non-lube operation.

Silencer

The CROSSMIRROR® valve is fitted with a specifically designed silencer which complies with EN 692:1996. The silencer is resistant to clogging and has a flow capacity larger than the valve. Do not operate the valve with the silencer removed. Do not restrict the silencer in any way as this will adversely affect the valve's performance. The

silencer should be replaced only with a ROSS silencer of similar design.

Piloting

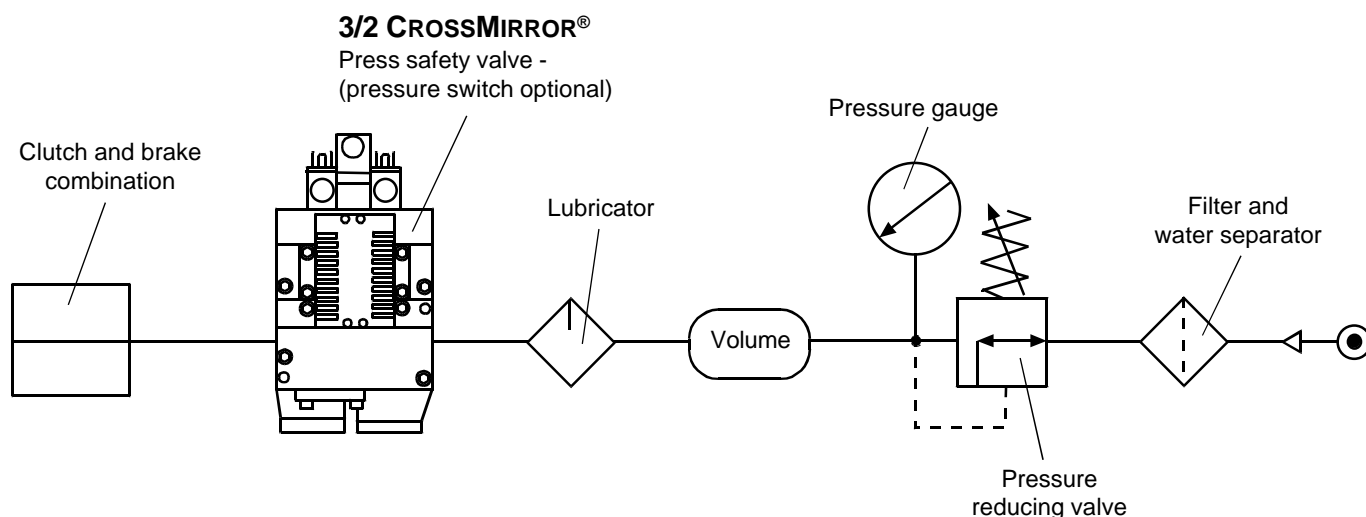
Electrical piloting of the double valve must be in accordance with the relevant (application specific) safety regulations.

The reset valve may only be actuated momentarily.

SAFETY RELEVANT CAUTIONS:

- The use of surge suppressors in the solenoid circuits may slow down the de-energization of the solenoid coils and thereby may delay response of the valve elements which may increase exhaust time.
- Depending on the application, the electrical connection with the valve may have to be secured separately.
- In case of machine vibration > 25g a suitable shock absorbing mounting device has to be provided for the valve.

Installation example



3/2-Way Double Valves with CROSSMIRROR® Monitoring

OPERATING INSTRUCTIONS

Start-up

Before start-up, the installation must be checked thoroughly by persons trained and experienced in the operation of pneumatic equipment. Make sure that specifications given on the valve label (e.g. max. operating pressure) will be in accordance with the operating specifications of the press. When operating pressure is applied, the reset valve must be actuated in order to move the valve into the stand-by condition.

If the valve is equipped with a pressure switch and a related fault indication as well as a stand-by indication, the fault indication extinguishes, and the stand-by indication is illuminated. The valve is now ready for normal operation.

Functional test

Test	Result
1. Solenoid a actuated	Valve moves into malfunction mode, slight leakage at exhaust port 3
2. Solenoid b actuated	see solenoid a
3. Solenoids a and b actuated within $\Delta t < 200$ ms	Valve operates properly
4. Solenoids a and b with $\Delta t > 200$ ms	Valve moves into malfunction mode, slight leakage at exhaust port 3
5. After malfunction, permanent signal on reset valve - solenoids a and b or only a / only b actuated	Valve cannot be moved into stand-by mode

Pressure failure test

After a valve malfunction the double valve must be moved into the stand-by position by using the reset valve.

In order to make sure that the reset valve is not kept actuated permanently (in case of recurring malfunctions), a 2-way valve has been built into the pilot line to solenoid a. This 2-way valve will close if a permanent signal is applied to the reset valve thereby ensuring that no pilot air will be directed to pilot solenoid a. If the solenoid is energized in this condition, main valve element B will immediately exhaust the entire pilot system, and the valve will be in the malfunction mode. In case of a compressor-related pressure drop the valve will also move into the malfunction state and must be restored to the stand-by condition through a momentary signal to the reset valve.

Malfunctions

Any work pressure differences between both pilot lines a and b > 200 ms will result in a shutdown of the valve. This can be due to various causes, as for instance:

- faulty piston seals

- delayed response of the main valve elements due to dirt or varnished lubricant

Maintenance, Testing

Maintenance and testing procedures must follow the rules and guidelines set by the respective national work-safety institutions. These procedures should only be performed by persons trained and experienced in the use of pneumatic equipment. It is recommended that maintenance and test procedures be performed at least once a year, unless otherwise specified.

Repair

It is recommended that double valves which need to be serviced be handed over to a ROSS service point. Customers maintaining their own repair service have to make sure that only original spare parts (as specified in the ROSS parts lists) be used. Pneumatic equipment should be repaired only by persons trained and experienced in the repairing of such equipment, guided by these operating instructions. Information about valve repair and/or the exchange of a valve must be written down in the machine operation documentation.



3/2-Way Double Valves with CROSSMIRROR® Monitoring

Cautions

PRE-INSTALLATION or SERVICE

1. Before servicing a valve or other pneumatic component, be sure that all sources of energy are turned off, the entire pneumatic system is shut off and exhausted, and all power sources are locked out (ref: EN 1037).
2. All ROSS products, including service kits and parts, should be installed and/or serviced only by persons having training and experience with pneumatic equipment. Because any installation can be tampered with or need servicing after installation, persons responsible for the safety of others or the care of equipment must check every installation on a regular basis and perform all necessary maintenance.
3. All applicable instructions should be read and complied with before using any fluid power system in order to prevent harm to persons and/or equipment. In addition, overhauled or serviced valves must be functionally tested prior to installation and use.
4. Each ROSS product should be used within its specification limits. In addition, use only ROSS parts to repair ROSS products. Failure to follow these directions can adversely affect the performance of the product or result in the potential for human injury.

FILTRATION and LUBRICATION

5. Dirt, scale, moisture, etc. are present in virtually every air system. Although some valves are more tolerant of these contaminants than others, best performance will be realized if a filter is installed to clean the air supply, thus preventing contaminants from interfering with the proper performance of the equipment. ROSS recommends a filter with a 5-micron rating for normal applications.
6. All standard ROSS filters and lubricators with polycarbonate plastic bowls are designed for compressed air applications only. Do not fail to use the metal bowl guard, where provided, to minimize danger from high pressure fragmentation in the event of bowl failure. Do not expose these products to certain fluids, such as alcohol or liquified petroleum gas, as they can cause bowls to rupture, creating a combustible condition, hazardous leakage, and the potential for human injury. Immediately replace a crazed, cracked or deteriorated bowl. When the bowl gets dirty,

replace it or wipe it with clean dry cloth.

7. Only use lubricants which are compatible with materials used in the valves and other components in the system. Normally, compatible lubricants are petroleum base oils with oxidation inhibitors, and an aniline point between 82°C and 104°C, and viscosity VG 32 according to IOS 3448 (32mm²/s at 40°C), or higher. Oils with phosphate type additives, such as zinc dithiophosphate, must be avoided because they can harm polyurethane valve components. The best oils to use in pneumatic systems are those specifically compounded for air line lubricator service.

AVOID INTAKE/EXHAUST RESTRICTION

8. Do not restrict the air flow in the supply line. To do so could reduce the pressure of the supply air below the minimum requirements for the valve and thereby cause erratic action.
9. Do not restrict a poppet valve's exhaust port as this can adversely affect its operation. Exhaust silencers must be resistant to clogging and have flow capacities at least as great as the exhaust capacities of the valves. Contamination of the silencer can result in reduced flow and increased back pressure. *ROSS expressly disclaims all warranties and responsibility for any unsatisfactory performance or injuries caused by the use of the wrong type, wrong size, or inadequately maintained silencer installed with a ROSS product.*

DOUBLE VALVES

10. Mechanical power presses and other potentially hazardous machinery using a pneumatically controlled clutch and brake mechanism must use a press control double valve with a monitoring device. A double valve without a self-contained monitoring device should be used only in conjunction with a control system which assures monitoring of the valve. All double valve installations involving hazardous applications should incorporate a monitoring system which inhibits further operation of the valve and machine in the event of a failure within the valve mechanism.

ENERGY ISOLATION/EMERGENCY STOP

11. Per specifications and regulations, ROSS L-O-X® and L-O-X®/EEZ-ON® products are defined as energy isolation devices, NOT AS EMERGENCY STOP DEVICES.

WARRANTY

Products manufactured by ROSS are warranted to be free of defects in material and workmanship for a period of one year from the date of purchase. ROSS' obligation under this warranty is limited to repair or replacement of the product or refund of the purchase price paid solely at the discretion of ROSS and provided such product is returned to ROSS freight prepaid and upon examination by ROSS is found to be defective. This warranty shall be void in the event that product has been subject to misuse, misapplication, improper maintenance, modification or tampering. The warranty expressed above is in lieu of and exclusive of all other warranties and ROSS expressly disclaims all other warranties either expressed or implied with respect to merchantability or fitness for a particular purpose. ROSS makes no warranty with respect to its products meeting the provisions of any governmental occupational safety and/or health laws or regulations. In no event shall ROSS be liable to purchaser, user, their employees or others for incidental or consequential damages which may result from a breach of the warranty described above or the use or misuse of the products. No statement of any representative or employee of ROSS shall extend the liability of ROSS as set forth herein.





ROSS EUROPA GmbH
Robert-Bosch-Strasse 2
D-63225 Langen / Germany
Phone: +49-6103-7597-0
Fax: +49-6103-74694
www.rosseuropa.com



ROSS CONTROLS®
P.O. Box 7015,
Troy, Michigan 48007 U.S.A.
Phone: +1-248-764-1800
Fax: +1-248-764-1850
www.rosscontrols.com

ROSS UK Ltd.
Calemore Road, Rowley Regis,
Warley, West Midlands, B65 0QW
United Kingdom
Phone: +44-121 559 4900
Fax: +44-121 559 5309
www.rossuk.com

ROSS ASIA K.K.
10209-5 Tana, Sagamihara-shi
Kanagawa-pref. 229-11, Japan
Phone: +81-427-78-7251
Fax: +81-427-78-7256
www.rossasia.co.jp

ROSS SOUTH AMERICA Ltda.
Rua Olavo Goncalves, 43/47 - Centro
Sao Bernardo do Campo - Sao Paulo
Brazil - CEP 09725-020
Phone: +55-11-4335-2200
Fax: +55-11-4335-3888

ROSS CONTROLS INDIA Pvt. Ltd.
Plot 113, Industrial Estate
Ambattur
Chennai 600 058, India
Phone: +91-44-8413136
Fax: +91-44-8413137
www.rossindia.com

ROSS ASIA K.K.-
CHINA LIAISON OFFICE
Room 701, Taiji Building,
No. 33.1249 Street
Xikang Road
Shanghai, China
Phone: +86-21-6296-5123
Fax: +86-21-6299-0529