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## 1. General

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Prior to start up, we recommend to read these operating instructions carefully as we do not assume any liability for damages and operating troubles which result from the nonobservance of these operating instructions!

Any use beyond the applications described in these operating instructions is considered to be not in accordance with the product's intended purposes. The manufacturer is not to be held responsible for any damages resulting from this: the user alone bears the corresponding risk.

As to figures and indications in these operating instructions we reserve the right to make technical changes which might become necessary for improvements.

The copyright on these operating instructions is kept reserved to the company DELIMON. These operating instructions are intended for the erecting, the operating and supervising personnel. They contain regulations and drawings a technical nature which must not – completely or partially - be distributed nor used nor communicated to others without authorization for competition purposes.

### Company address, spare parts and service address

DELIMON

Arminstraße 15

D-40277 Düsseldorf

Phone : +49 211 77 74-0

Fax : +49 211 77 74-210

Branch office

Am Bockwald 4

D-08344 Grünhain-Beierfeld

E-mail : kontakt@bijurdelimon.com

www.bijurdelimon.com

## 2. Safety

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These operating instructions contain fundamental instructions which are to be observed during erection, operation and maintenance. Therefore it is absolutely necessary for the fitter and the competent qualified staff/user to read these operating instructions before installation and start-up. The operating instructions must be available at all times at the place of use of the machine/system.

Not only the general safety instructions stated under this main point "safety" are to be observed, but also the other specific safety instructions stated under the other main points.

### 2.1 Identification of safety warnings in the operating instructions

The safety warnings contained in these operating instructions which, if not observed, may cause dangers to people, are specially marked with general danger symbols



safety sign according to DIN 4844, warning about a danger spot ,

in case of warning about electric voltage with



safety sign according to DIN 4844, warning about dangerous electric voltage.

In case of safety instructions which, if not observed, may cause damage to the machine and its function, the word

**ATTENTION**

is inserted.

Instructions that are directly attached to the machine, as for example

- rotational direction arrow
- identifications for fluid connections

must be observed at all events and maintained in a fully legible condition.

- Note: There is an increased skid risk in case of spilled/leaked out lubricants. They are to be removed at once properly.



Safety sign according to DIN 4844, warning about skid risk.

## 2. Safety (continuation)

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### 2.2 Personnel qualification and training

The operating, maintaining, inspecting and erecting personnel must have the appropriate qualification for such work. Area of responsibility, competence and supervision of the personnel have to be regulated by the user. If the personnel do not have the necessary knowledge, they have to be trained and given instructions. This can be effected, if necessary, by the manufacturer/supplier on behalf of the user of the machine. Furthermore, the user has to make sure that the contents of the operating instructions are fully understood by the personnel.

### 2.3 Dangers in case of nonobservance of the safety instructions

The nonobservance of the safety instructions may result in hazards to persons, to the environment and to the machine. The nonobservance of the safety instructions may lead to the loss of any claims for damages. In detail, the nonobservance may for instance lead to the following hazards:

- Failure of important functions of the machine/system
- Failure of prescribed methods for maintenance and repair
- Hazard to persons by electrical, mechanical and chemical influences
- Hazard to the environment by the leakage of dangerous substances

### 2.4 Safety conscious working

The safety instructions stated in these operating instructions, the existing national regulations as to the accident prevention as well as possible internal working, operating and safety rules of the user are to be observed.

### 2.5 Safety instructions for the user/operator

- If hot or cold machine parts lead to dangers, these parts have to be protected against touch.
- Protection against touch for moving parts (e. g. coupling) must not be removed when the machine is in operation.
- Leakages (e. g. from the shaft seal) of hazardous goods to be delivered (e. g. explosive, toxic, hot) are to be removed in such a way that there is no danger to persons and environment. Legal rules are to be observed.
- Hazards caused by electrical power are to be excluded (for details please refer for instance to the rules of the VDE and the local power supply companies).

### 2.6 Safety instructions for maintenance, inspection and installation work

The user has to take care that all the maintenance, inspection and installation work is executed by authorized and qualified skilled personnel who have informed themselves adequately by thoroughly studying the operating instructions.

Basically, work on the machine is only to be carried out during shut-down. It is obligatory to observe the shut-down procedure described in the operating instructions.

Pumps or pump aggregates that deliver media being hazardous to health have to be decontaminated. Immediately after completion of the work, all safety and protective equipments have to be reinstalled and/or reactivated.

- Advice: When working with compressed air, do wear glasses.



(DIN 4844 – Use breathing mask)

- Advice: Observe EC-Safety Data Sheet for materials of consumption and additives used and use personal protective equipment.



(DIN 4844 – Use breathing mask)

Before recommissioning, observe the points stated in section “initial start-up”.

## **2. Safety** (continuation)

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### **2.7 Unauthorized conversion and manufacture of spare parts**

Conversion or modifications to the machine are only permitted when agreed with the manufacturer. Original spare parts and accessories authorized by the manufacturer serve to ensure safety. The use of other parts may render the liability for consequential losses null and void.

### **2.8 Unacceptable modes of operation**

The operational reliability of the machine supplied is only guaranteed if the machine is used in accordance with its intended purposes as per section 1 - General - of the operating instructions. The limiting values specified in the data sheet must on no account be exceeded.

### **2.9 Guidelines & standards**

1., 2. and 3. guideline (see data sheet: R&N\_2009\_1\_GB)

### **3.0 Notes on environmental protection and waste disposal**

In correct operation with lubricants, the components are subject to the special requirements set by environmental legislation.

The general requirements for lubricants are specified in the respective safety data sheets.

Used lubricants are hazardous forms of waste and therefore require special supervision in the sense of § 41 paragraph 1 sentence 1 and paragraph 3 no. 1 of KrW-/AbfG (Closed-Loop Waste Management Act).

Used oils must be handled in compliance with AltölV (Waste Oil Ordinance).

The devices or components contaminated with lubricant must be disposed of by a certified waste management company.

Records of proper waste management must be filed in conformance to NachwV (Ordinance on Waste Recovery and Disposal Records).

## **GENERAL PRODUCT CHARACTERISTICS**

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- Function 3/2-way
- Pneumatic actuation
- with pressure regulation and pressure control function
- Lubricant oil, grease

### **A. VALVE TYPE SAE**

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### **B. WORKING PRESSURE**

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max. 400 bar

### C. REVISION

Status A

### D. ACCESSORIES

without

## 3. Application

Versatile application as pneumatically controlled 3/2-way valve, 2/2-way valve, directional control valve with pressure controlling and pressure relief valve. Usable for all types of lubricating systems but particularly suited for hydraulic applications. Any lubricating groups with different pressures can be connected.

Any use beyond these applications is considered to be not in accordance with the product's intended purposes, and the manufacturer will not be liable for damages resulting from this. The user alone bears the corresponding risk.

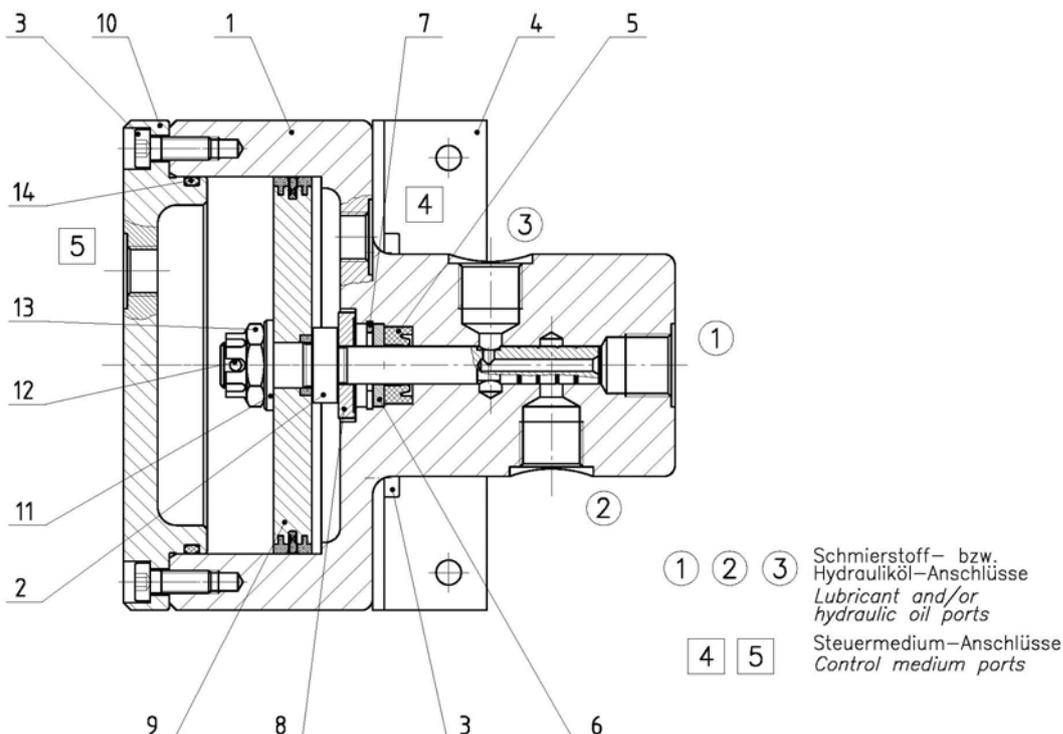
## 4. Design

The design of the 3/2-way valve SA-E is identical for all kinds of application. Through a varying connection of the pressure, the return, the main and the control lines, the two main functions of the valve are utilized individually or in any combination desired.

The 3/2-way valve SA-E comprises a valve box (item no. 1) with a metallic sealing piston (item no. 2). The piston (item no. 2) is connected with the control piston (item no. 9). The two piston areas of the step piston (item nos. 2 and 9) have an area ratio of 1 : 100.

The hydraulic side of the 3/2-way valve SA-E is sealed against the pneumatic side with the help of a groove ring (item no. 5).

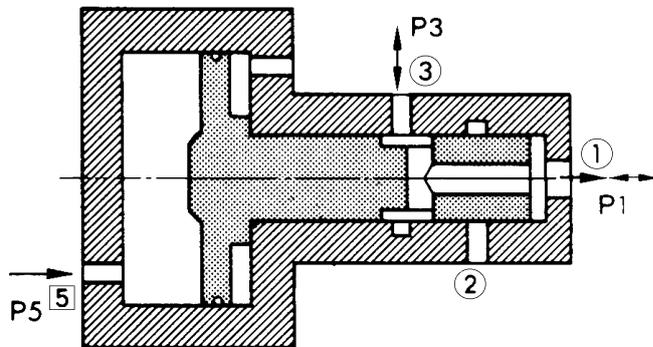
The box (item no. 1) is provided with the lubricant and/or hydraulic ports 1, 2 and 3 as well as with the control medium port 4. In the lid (item no. 10), there is the second control medium port 5.



## 5. Principle of operation

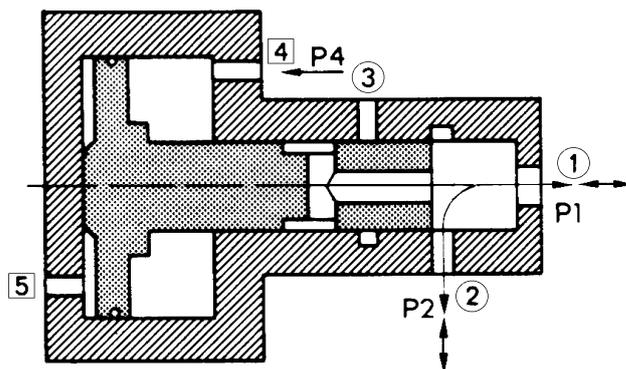
The 3/2-way valve SA-E is pneumatically controlled and has an additional pressure control and pressure limiting function.

### Valve position 1



If a control pressure  $P_5 = >$  at 0.01 from  $P_1$  is applied to the port 5 (valve position 1), port 1 and port 3 are connected with each other. Port 2 is blocked

### Valve position 2



The change-over in valve position 2 assumes that the control pressure  $P_5$  is removed and is effected either by the pressure of the medium against port 1 or a control pressure  $P_4$  at port 4. Port 1 and port 2 are now connected and port 3 is closed.

Though the piston area ratio 1 : 100, pressure  $P_5$  and  $P_1$  act at a ratio of 1 : 100. By setting a control pressure  $P_5$ , the connection of port 1 and port 3 or 1 and 2 can be controlled as a function of pressure.

- ① ② ③ Lubricant and/or hydraulic oil ports
- ④ ⑤ Control medium ports

## 6. Specification

Permissible pressures:

Working pressure Port 1 and 3 ..... max. 400 bar

Working pressure Port 2 ..... max. 100 bar

Control pressure Port 4 and 5 ..... max. 6 bar

Suitable media: ..... all lubricating greases on a mineral base up to NLGI-class, DIN 51818  
all lubricating and hydraulic oils on a mineral base

Control media : ..... compression-air and non-aggressive gases

Control volume: ..... 0.15 l

Piston area ratio: ..... 1 : 100

Output volume per stroke when used as pressure booster pump: ..... 1.5 cm<sup>3</sup>

Ports 1, 2 and 3 for the lubricant and/or hydraulic oil: ..... G 3/8

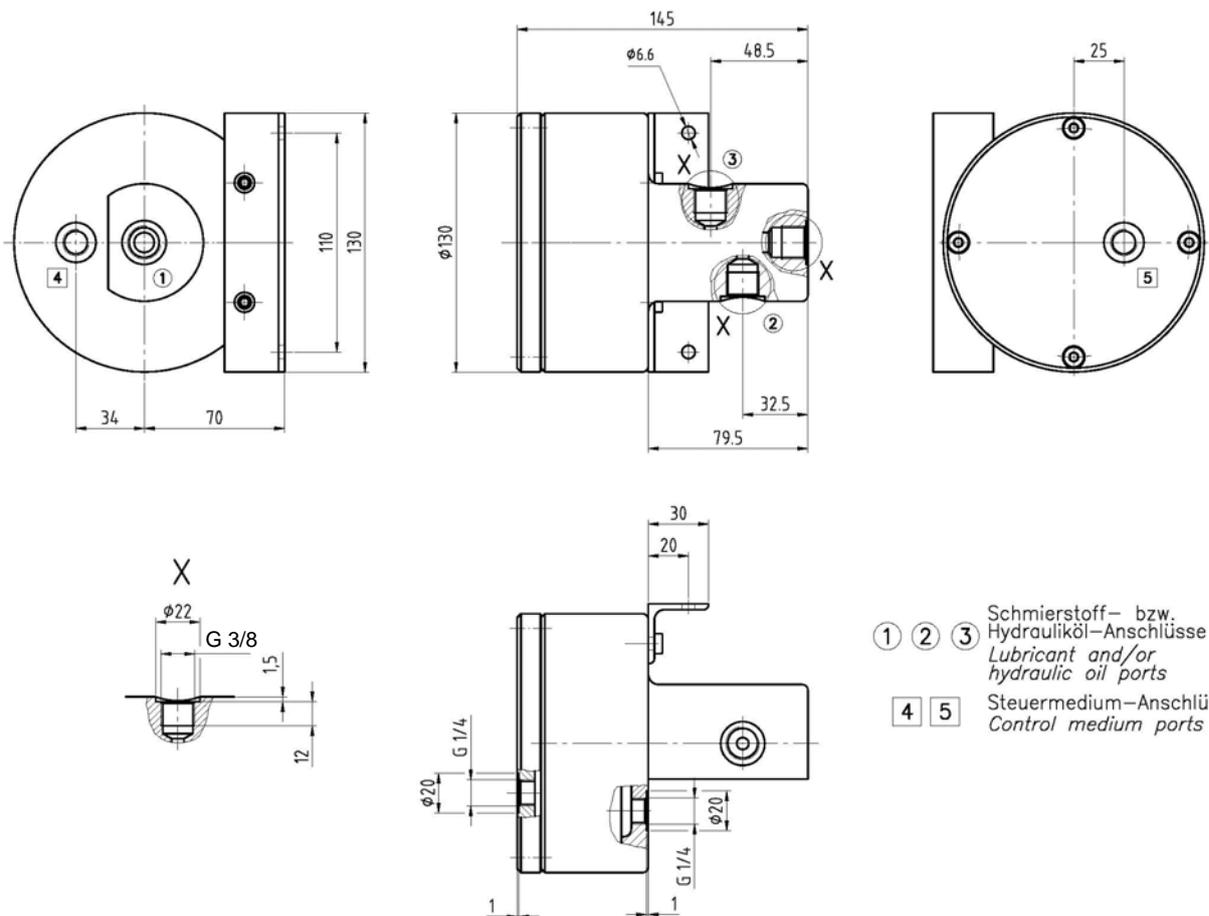
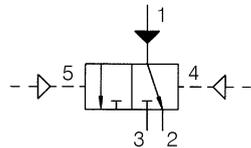
Port 4 and 5 for the control medium: ..... G 1/4

Service temperature: ..... - 20°C up to + 80°C

Position of installation: ..... optional

Weight: ..... 8 kg

Switching diagram:



## 7. Installation and Start-up

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The 3/2-way valve SA-E should be installed at a central place being easily accessible in order to obtain optimal line lengths to the friction points. It can be mounted in any position desired and is fixed with 2 screws M 6.



- For pipelines and olive screw joints consider the pressure load capacity.
- Do not use fittings and screw joints with conical screw-in stud for the connection of the pipelines.

**ATTENTION**

- When installing the lines, take care that they are clean and free from chips or other impurities. Prefill the lines with clean lubricant and/or hydraulic oil by means of a grease gun.



- The electrical connection to the solenoid valves for the control of the control medium and to the electrical control unit for the actuation of the 3/2-way valve has to be effected by qualified staff only and not under voltage. The electrical rules are to be observed.



- During commissioning take care that the allowed working and control pressures are not exceeded.  
Lubricant and/or hydraulic oil port 1 and 3, working pressure max. 400 bars.  
Lubricant and/or hydraulic port 2, working pressure max. 100 bars.  
Control medium ports 3 and 4, working pressure max. 6 bars.

**ATTENTION**

- Operate the 3/2-way valve with clean lubricant and/or hydraulic oil only and avoid any kind of impurities. Dirt particles are the most frequent cause for failures and damages.

## 8. Disassembly and Assembly

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(For item nos., please refer to the drawing on page 5)

The user has to take care that all kinds of maintenance inspectional and assembly works are carried out by authorized and qualified specialists who have informed themselves sufficiently by studying the operating instructions thoroughly.



For all kinds of works to be carried out at the machine or system, the machine or system must imperatively be out of operation. The procedure for stopping the machine or system described in the operating instructions must by all means be observed.

During disassembly and assembly of the 3/2-way valve SA-E, take at all events care for cleanliness because dirt particles might cause failures and damages.



- Shut down machine or system according to the relevant instructions.



- Protect machine or system against unintended switching on and cut off electricity by qualified staff.



- Make all lubricant and/or hydraulic and control lines pressureless.
- Remove 3/2-way valve from the machine and/or from the system.
- Remove screws (item no. 3) from lid (item no. 10).
- Take off lid (item no. 10) and remove O-ring (item no. 14).
- Squeeze piston (item no. 2) with the complete piston (item no. 9) out of the box (item no. 1) with the help of a mandrel.
- Remove disk (item no. 8).
- Dismantle locking ring (item no. 7) with the help of locking-ring circlip pliers.
- Remove disk (item no. 6) and groove ring (item no. 5).
- If the complete piston (item no. 9) is damaged, clamp piston (item no. 2) carefully in a vise with protective aluminium cheeks and knock-out clamping pin (item no. 12) with the help of a mandrel.
- Remove castellated nut (item no. 13).
- Remove disk (Pos. 11) and complete piston (item no. 9).
- Clean parts in Naphtha or petroleum ether.
- Remove cleansing agent again and blow out bores with compressed air.
- Check parts for damages. Slight running traces on the piston (item no. 2) and on the piston bore surface of the box (item no. 1) have no influence on the functioning.  
In case of scores, the 3/2-way valve is to be replaced by a new one.
- Lubricate piston (item no. 2) and piston bore of the box (item no. 1).

### ATTENTION

The piston (item no. 2) has been made fit and must not be mixed up with any pistons of other 3/2- way valves.

- Push piston (item no. 2) into the piston bore.

### ATTENTION

When doing this, prevent at all events the piston (item no. 2) from being tilted in order to avoid damages.

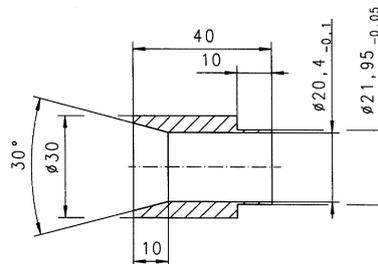
- Check whether the piston (item no. 2) can be easily moved in the piston bore.
- Replace damaged parts and old seals by new ones.

## 8. Disassembly and Assembly (continuation)

### ATTENTION

It is absolutely necessary to insert a new groove ring (item no. 5) as the sealing lip of the groove ring (item no. 5) gets damaged when the piston (item no. 2) is dismantled.

- Reinstall 3/2-way valve in reverse order. For the insertion of the groove ring (item no. 5) use an auxiliary tool.



### ATTENTION

When the piston (item no. 2) has once been pushed through the groove ring (item no. 5), do not pull the same back any more because this would damage the sealing lip of the groove ring (item no. 5).

- Reinstall 3/2-way valve to the machine and/or into the system.



- Make the electrical connection of the machine or system by qualified staff and remove protection against unintended switching on.



- Dispose of remnants of oil and grease as per the corresponding regulation.

## 9. Maintenance

(For item nos., please refer to the drawing on page 5)

The 3/2-way valve does not require much maintenance, and there are no further measures required to maintain the readiness for operation of the 3/2-way valve.

The following points should be observed:

- Operate the 3/2-way valve SA-E only with clean lubricant and/or hydraulic oil. Avoid any kind of impurities as dirt particles are the most frequent cause for failures and damages.
- Different kinds of lubricant and/or hydraulic oil must not be mixed.
- Do not use aggressive agents to clean the 3/2-way valve, use Naphtha or petroleum ether only.

All parts of the 3/2-way valve, except the box (item no. 1) and the piston (item no. 2) are replaceable and can be ordered individually and exchanged by the customer himself.

The adaptation of a new piston (item no. 2) can only be made in manufacturer's works.

## 10. Fault finding

(For item nos., please refer to the drawing on page 5)

Failure	Possible cause	Repair
3/2-way valve does not switch over.	Complete piston (item no. 9) does not work. Sealing lip is worn out.	Exchange complete piston (item no. 9), see point 8 "disassembly and assembly".
	Control medium is missing.	Check functioning of solenoid valve for the control of the control medium.
	Pressure of control medium is too low.	Check working pressure of the control medium network.
	Piston (item no. 2) is sticking as a result of impurities.	Dismount 3/2-way valve and clean it, see point 8 "disassembly and assembly"
Lubricant and/or hydraulic oil is in the control lines	Sealing lip of groove ring (item no. 5) is worn out.	Exchange groove ring (item no. 5), see point 8 „disassembly and assembly“.
Lubricant and/or hydraulic oil escapes without control.	Piston (item no. 2) is worn out.	Install a new 3/2-way valve into the system.

## 11. Plates

Type plate



Type

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