POSEIDON Edition
BAUER KOMPRESSOREN

Instruction Manual

High Pressure Breathing Air Compressors

PE 320-VE
PE 500-VE
PE 680-VE

INTRODUCTION

This manual contains operating instructions and maintenance schedules for the breathing air compressor units of the model range

PE-VE Verticus 5

Model: _____

Serial no.: _____

WARNING

! Pneumatic high pressure system !

The breathing air produced with the compressor units described in this manual is subject to strict quality standards. Ignoring the operating and maintenance instructions can lead to severe injury or death.

The machine has been built in accordance with the EC machine regulations 2006/42/EG. Specifications on the noise level in accordance with the machine and product safety law as of 01.05.2004 and the EC machine regulations, chapt. I, section 1.7.4. The machine has been built according to the highest standard of technology and the generally acknowledged safety standards. Nevertheless, operation could still cause danger for the operating personnel or third parties, or result in damage to the machine and other values. The machine may only be used to produce compressed air as specified in this manual. Other use is strictly prohibited.

PE–VE/10/09

Edition January 2010

INTRODUCTION

NOTICE

Layout and use of instruction manuals

Working with pneumatic high pressure systems cannot always be considered safe and one should possess a minimum knowledge of how to operate them. For this reason, please read this instruction manual before operating your unit, to get to know the components and processes.

This instruction manual is made up according to the building block principle. It is divided into 7 sections, whose content varies according to the type of unit, standard or special and of course the accustomized extras, which are available for all our units in large numbers. With this kind of subdivision system, all sections should be in existence, in order to give a complete picture. In other words: even if one particular component is not part of the unit, the relative section will still be kept, although only a notice may be printed there. On the other hand, other sections could be represented more than once if certain units require this. In such a case one only has to refer to the applicable section, all superfluous ones can be removed. This is quite simple due to the ring binding system.

Please note that the circuit diagrams in section F, unless otherwise stated, are the standard circuit diagrams for your specific unit. So please always refer to the circuit diagram enclosed in the compressor unit control box, in which any possible changes are registered.

The same thing applies for the spare parts lists in section G. To avoid misunderstanding when ordering spare parts, we advise you to remove the parts that are not applicable. The spare parts lists that apply to the relative unit are listed in the section Index.

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Dear Customer

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You can contacts us Mondays to Thursdays from 08^{00} to 16^{30}, Fridays from 08^{00} to 15^{00} on phone no. (089) 78049-0.

If you call the following extensions directly, it will save you time.

Do you want to order spare parts?
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Do you need further information regarding your unit, accessories, prices etc.?
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A. DESCRIPTION

1. GENERAL

1.1. PURPOSE AND SHORT DESCRIPTION

This instruction manual describes the breathing air compressor units of the **PE-VE VERTICUS 5** model range.

The compressor units are complete units for filling tanks in the pressure range 225 bar (3,200 psi) and/or 330 bar (4,700 psi), or 420 bar (6,000 psi), respectively. They are used mainly to compress air for breathing as required in diving and fire fighting applications.

The breathing air compressor units are available in two housing types:

The **PE** series mounted in the **open housing**

The **PE** series mounted in the **Super-Silent housing**

PE 320-VE
PE 500-VE
PE 680-VE
PE 320-VE-420
PE 500-VE-420
PE 600-VE-420

The open units can be upgraded to a Super-Silent version at any time.

The noise level of the Super-Silent units is 69 dB(A) ±2 dB(A) in 1 m distance (according to DIN 45635).

All units are equipped as standard with TÜV approved **final pressure safety valve** and **automatic condensate drain unit** with 10 l. condensate collector.

PE 320 and PE 500 units are equipped as standard with filter system **P41**, PE 600 and PE 680 with filter system **P61**.

All units are equipped as standard with filter system **P41** (except KAP and V 600 F-420), **SECURUS** monitoring system for the filter system, TÜV approved **final pressure safety valve** and **automatic condensate drain unit** with 10 l. condensate collector.

Optionally, as described in the following chapters, the units can be delivered with **external filling panels** for one or two pressure ranges, with **SECURUS** monitoring system for the filter system,, and with **40 l. condensate collector**.

1.2. DESIGN AND MODE OF OPERATION

Design

The compressor unit comprises the following major assemblies:

- Compressor block
- Drive motor
- Frame and housing assembly with instrument panel
- Filter set
- Automatic condensate drain
- Filling panel[a)]
- Electric control and electronic monitoring system

The design of the compressors is shown in Fig. 1 and Fig. 2. For special equipment according to order see figures and parts lists in the annex.

Mode of operation; flow diagram

The path of the air through the compressor system is shown in the flow diagram. For flow diagram refer to section F of this manual.

a) optional extra according to order

Fig. 1 Compressor unit, PE-VE series; with open housing

1 Hourmeter
2 Oil pressure warning lamp
3 Condensate collector, 10 ltrs.
4 Operation switch ON-OFF
5 Main switch

Fig. 2 Compressor unit, PE-VE series with super-silent housing

1 Hourmeter
2 Oil pressure warning lamp
3 Condensate collector, 10 ltrs.
4 Operation switch ON-OFF
5 Main switch

Compressor block

General

The compressor blocks are particularly suitable for continuous operation because of their rugged design and the corrosion resistant intermediate filter and cooler assemblies. Smooth running is a particular feature of this **BAUER** design. The balance of masses of the 1st rank is zero. The moving parts of the driving gear are all equally balanced. This results in a vibration-free running.

The driving gear is fitted with energy saving cylinder roller bearings. The upper and lower connecting rod bearings are also roller bearings. This allows for an even longer life which lasts at least 30,000 operating hours.

Compressor block IK12.14

The compressor block **IK12.14** is used to compress air in the high pressure range up to 420 bar (6,100 psi).

The compressor block is of a four stage, three cylinder design. The cylinders are arranged in a W form, the 1st/2nd stage vertical stepped cylinder in the centre, 3rd stage on the right, and 4th stage on the left side looking from the filter side.

The design of the compressor block is shown in Fig. 3. For the mode of operation refer to the flow diagram in sec. F.

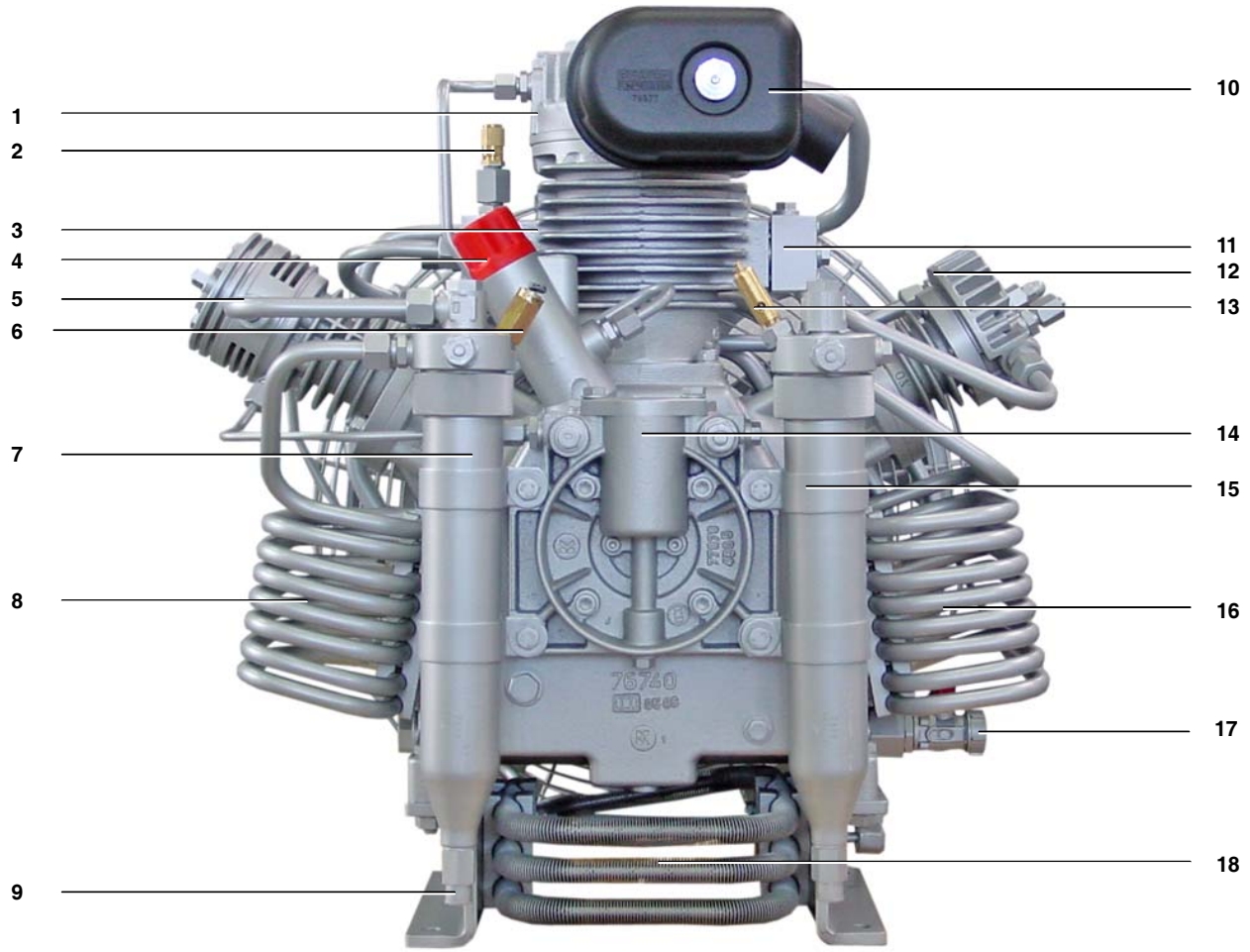


Fig. 3 Compressor block IK12.14

1 Valve head, 1st stage
2 Safety valve, 1st stage
3 Intake manifold, 2nd stage
4 Oil filler neck
5 Cylinder, 4th stage
6 Safety valve, 3rd stage
7 Intermediate separator, 3rd stage
8 Inter-cooler, 3rd stage
9 Condensate drain connector
10 Intake filter
11 Outlet manifold, 2nd stage
12 Cylinder, 3rd stage
13 Safety valve, 2nd stage
14 Oil filter housing
15 Intermediate separator, 2nd stage
16 Inter-cooler, 2nd stage
17 Oil drain tap
18 After-cooler, 4th stage

Compressor blocks IK150, IK180 and IK18.1

The compressor blocks **IK150** and **IK180** are used to compress air in the high pressure ranges PN200 and PN300 for breathing air application, for industrial application up to 350 bar (5,000 psi). The max. allowable operating pressure (adjustment of final pressure safety valve) is 225 bar (3,200 psi) or 330 bar (4,700 psi).

Compressor block **IK18.1** is used to compress air in the high pressure range PN420 (6,100 psi). The max. allowable operating pressure (adjustment of final pressure safety valve) is 435 bar (6,300 psi).

All compressor blocks except the IK18.1 are of a four stage, four cylinder design. The four cylinders are arranged at an angle of 90° to each other, 1st and 2nd stage, and 3rd and 4th stage opposite to each other. The 4th stage cylinder is lubricated by means of the force-feed lubrication system, the other cylinders are splash-lubricated.

These compressor blocks are particularly suitable for continuous operation because of their rugged design and the corrosion resistant intermediate filter and cooler assemblies. Smooth running is a particular feature of this **BAUER** design. The balance of masses of the 1st rank is zero. The moving parts of the driving gear are all equally balanced. This results in a vibration-free running.

The driving gear is fitted with three bearings. It is here that the energy saving cylinder roller bearings are put to use. The upper and lower connecting rod bearings are also roller bearings. This allows for an even longer life which lasts at least 30,000 operating hours. All valves have free access for time saving maintenance. There is no need for dismantling of pipes or pressure gauges.

The design of the compressor block is shown in Fig. 4.to Fig. 6. For the mode of operation refer to the flow diagram in sec. F.

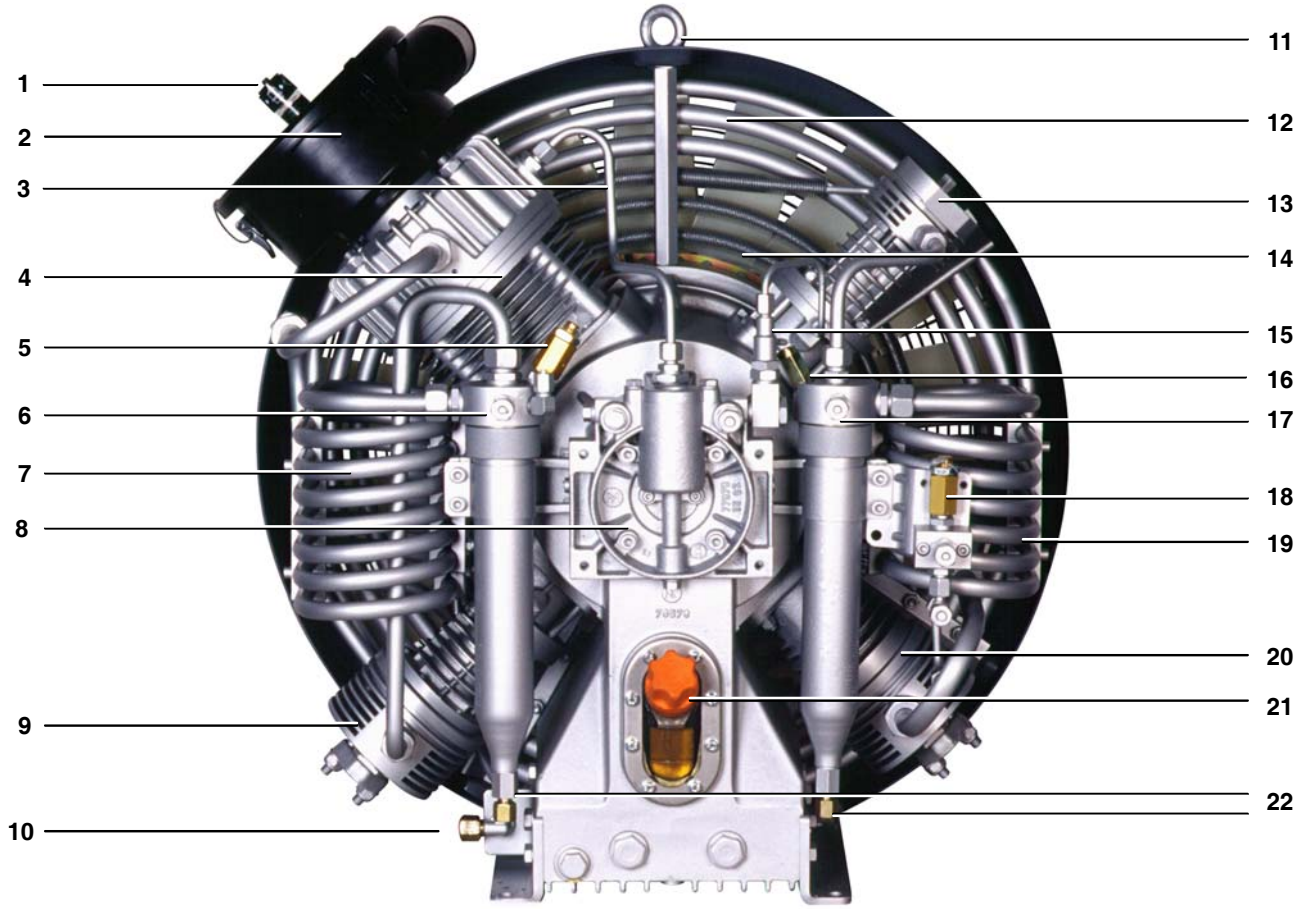


Fig. 4 Compressor block IK150, front view

1 Service indicator
2 Intake filter
3 Crankcase vent feedback line
4 Cylinder, 1st stage
5 Intermediate pressure safety valve, 2nd/3rd stage
6 Intermediate separator, 2nd stage
7 Inter-cooler, 2nd stage
8 Oil pump housing
9 Cylinder 3rd stage
10 Compressed air outlet
11 Lifting eyebolt
12 Inter-cooler 1st stage
13 Cylinder, 4th stage
14 After-cooler 4th stage
15 Oil pressure regulating valve
16 Intermediate pressure safety valve,
17 Intermediate separator, 3rd stage
18 Intermediate pressure safety valve 1st/2nd stage
19 Inter-cooler 3rd stage
20 Cylinder 2nd stage
21 Oil filler with sight glass
22 Condensate outlet

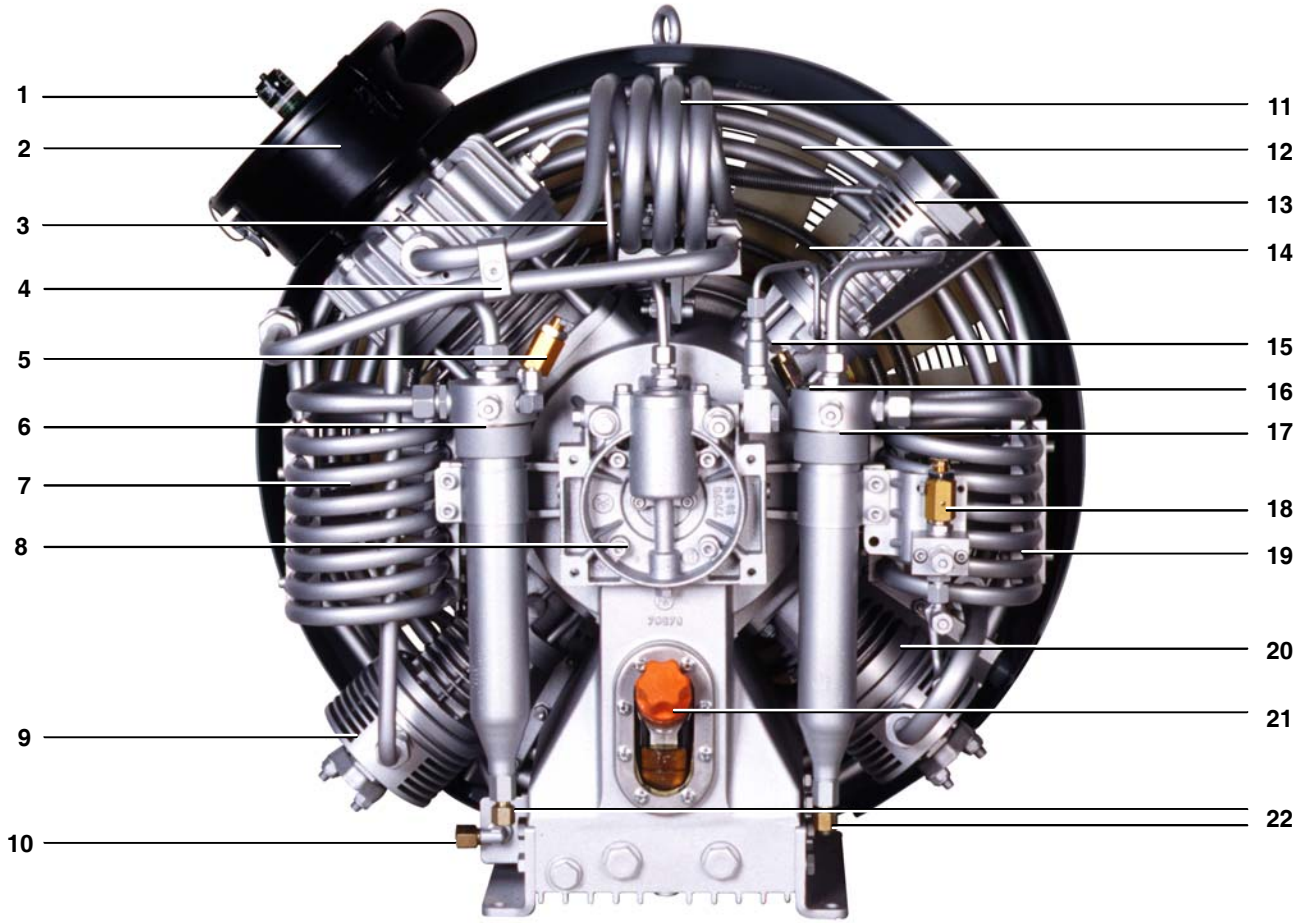


Fig. 5 Compressor block IK180, front view

1 Service indicator
2 Intake filter
3 Crankcase vent feedback line
4 Cylinder, 1st stage
5 Intermediate pressure safety valve, 2nd/3rd stage
6 Intermediate separator, 2nd stage
7 Inter-cooler, 2nd stage
8 Oil pump housing
9 Cylinder 3rd stage
10 Compressed air outlet
11 Auxiliary cooler 1st stage
12 Inter-cooler 1st stage
13 Cylinder, 4th stage
14 After-cooler 4th stage
15 Oil pressure regulating valve
16 Intermediate pressure safety valve,
17 Intermediate separator, 3rd stage
18 Intermediate pressure safety valve 1st/2nd stage
19 Inter-cooler 3rd stage
20 Cylinder 2nd stage
21 Oil filler with sight glass
22 Condensate outlet

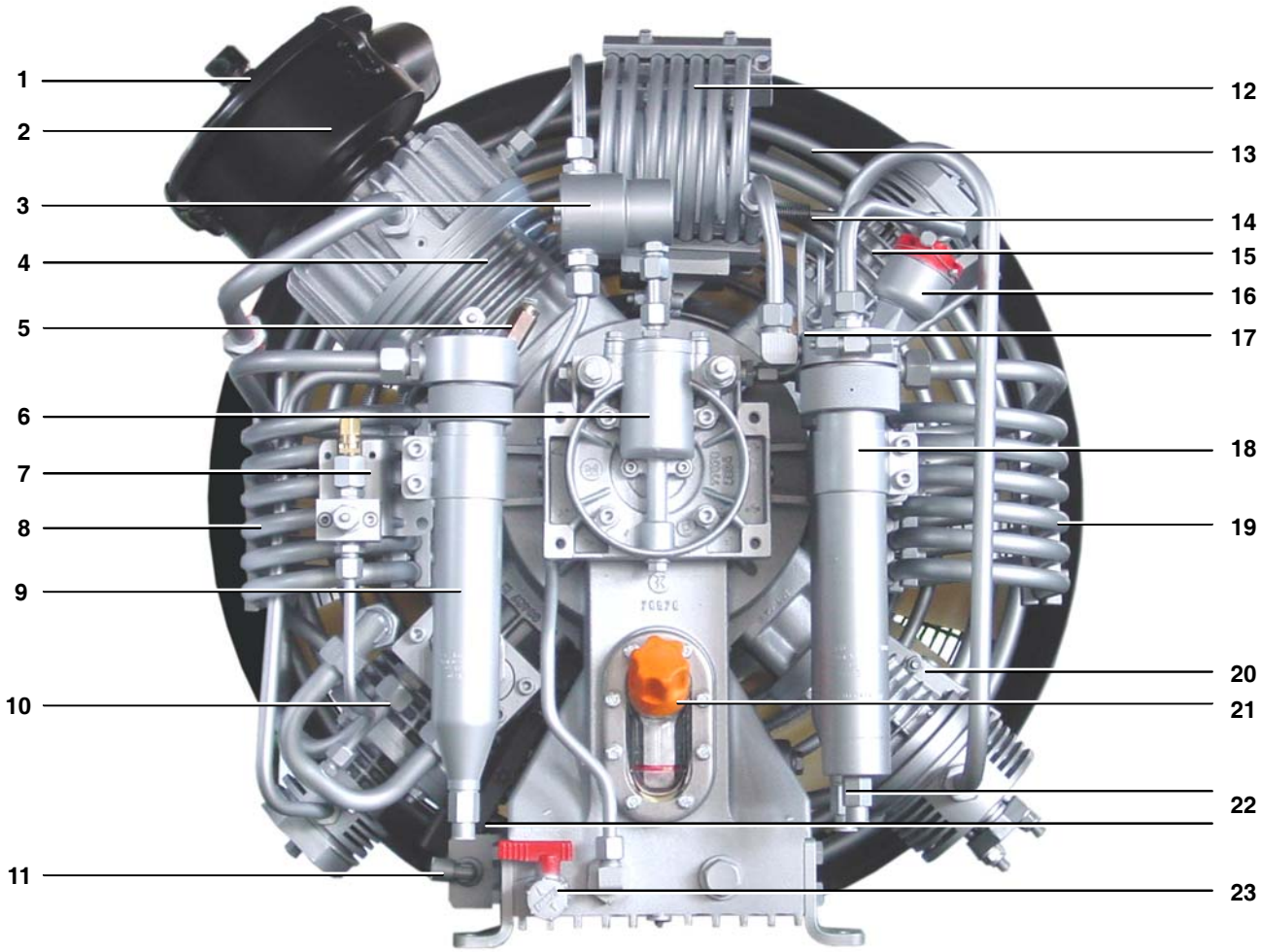


Fig. 6 Compressor block IK18.1, front view

1 Service indicator
2 Intake filter
3 Oil separator, crankcase vent feedback line
4 Cylinder, 1st stage
5 Intermediate pressure safety valve, 3rd stage
6 Oil pump housing
7 Intermediate pressure safety valve, 1st stage
8 Inter-cooler, 3rd stage
9 Intermediate separator, 3rd stage
10 Cylinder 2nd/4th stage
11 Compressed air outlet
12 Inter-cooler 4th stage
13 Inter-cooler 1st stage
14 After-cooler 5th stage
15 Cylinder, 5th stage
16 Intermediate pressure safety valve, 4th stage
17 Intermediate pressure safety valve, 3rd stage
18 Intermediate separator, 4th stage
19 Inter-cooler 2nd stage
20 Cylinder 3rd stage
21 Oil filler with sight glass
22 Condensate outlet
23 Oil drain tap

1.3. TECHNICAL DATA

1.3.1. Compressor Units

To minimize multiple quotations, the common features are listed under General, all compressor block and motor data are listed in 1.3.2. and 1.3.3., respectively.

General:

Medium	air
Intake pressure	atmospheric
Operating pressure PE 320 VE, PE 500 VE, PE 680 VE	225 to 330 bar
Operating pressure PE 320 VE-420, PE 500 VE-420, PE 600 VE-420	225 to 420 bar
Adjustment, final pressure safety valve 200 bar units	max. 225 bar
Adjustment, final pressure safety valve 300 bar units	max. 330 bar
Adjustment, final pressure safety valve 400 bar units	max. 420 bar
Max. ambient temperature	+5 to +45 °C
Allowable altitude	0 ... 2000 m above sea level
Max. inclination of compressor[a)]	15°
Sound pressure level, Super-Silent unit	72 ±2 dB(A)
Oil type	refer to oil list
Operating voltage	380-440 V, 50-60 Hz
Control voltage	24 V, 50-60 Hz
Type of motor	3 phase squirrel cage motor
Type of construction	B3
Protection class	IP55

Compressor unit	**PE 320-7.5-5-VE-F02**	**PE 500-11-5-VE-F02**	**PE 680-15-5-VE-F02**
Compressor block	IK12.14-F06	IK150-F11	IK180-F6
Delivery[b)]	320 l/min	500 l/min	680 l/min
	11.2 cfm	18.9 cfm	23.8 cfm
Pressure setting, pressure switch		according to order	
Pressure setting, final pressure safety valve		according to order	
Speed	1,470 min^{-1}	1,230 min^{-1}	1,400 min^{-1}
Drive input	6.9 kW	10.3 kW	14.5 kW
Drive motor power	7.5 kW	11 kW	15 kW
Weight[c)], approx.	305 kg	345 kg	360 kg

Compressor unit	**PE 320-7.5-5-VE-420-F02**	**PE 500-11-5-VE-420-F02**	**V 600-15-5-VE-420-F02**
Compressor block	IK12.14-F06	IK18.1-F6	IK18.1-F6
Delivery[b)]	320 l/min	500 l/min	600 l/min
	11.2 cfm	18 cfm	21 cfm
Pressure setting, pressure switch		according to order	
Pressure setting, final pressure safety valve		according to order	
Speed	1,470 min^{-1}	1,170 min^{-1}	1,320 min^{-1}
Drive input	6.9 kW	10.3 kW	14.5 kW
Drive motor power	7.5 kW	11 kW	15 kW
Weight, approx.[c)]	305 kg	345 kg	360 kg

a) These values are valid only if the oil level of the compressor in normal position corresponds to the upper mark of the oil sight glass and may not be exceeded.

b) Free air delivered at tank filling from 0 to 200 bar ± 5% or 300 bar ± 5% for 420 bar units.

c) KAP unit, V unit approx. +100kg

TECHNICAL DATA (Cont.)

1.3.2. Compressor blocks

Compressor block	**IK12.14-F06**
No. of stages	4
No. of cylinders	3
Cylinder bore 1st stage	105 mm
Cylinder bore 2nd stage	105/88 mm
Cylinder bore 3rd stage	28 mm
Cylinder bore 4th stage	12 mm
Piston stroke	40 mm
Intermediate pressure 1st stage	3,4 ... 4,2bar
Intermediate pressure 2nd stage	14 ... 18 bar
Intermediate pressure 3rd stage	53 ... 82 bar
Compressor block oil capacity	2.8 l
Oil pressure	4.5 bar ±1,5 bar
Direction of rotation (viewing at flywheel)	counter-clockwise

Compressor block	**IK150-F11**
No. of stages	4
No. of cylinders	4
Cylinder bore 1st stage	120 mm
Cylinder bore 2nd stage	60 mm
Cylinder bore 3rd stage	32 mm
Cylinder bore 4th stage	14 mm
Piston stroke	50 mm
Intermediate pressure 1st stage	2 ... 3 bar
Intermediate pressure 2nd stage	14 ... 16 bar
Intermediate pressure 3rd stage	65 ... 70 bar
Compressor block oil capacity	5 l
Oil pressure	4.5 bar ±1,5 bar
Direction of rotation (viewing at flywheel)	counter-clockwise

Compressor block	**IK180-F06**
No. of stages	4
No. of cylinders	4
Cylinder bore 1st stage	130 mm
Cylinder bore 2nd stage	60 mm
Cylinder bore 3rd stage	32 mm
Cylinder bore 4th stage	14 mm
Piston stroke	50 mm
Intermediate pressure 1st stage	2,5 ... 4 bar
Intermediate pressure 2nd stage	16 ... 18 bar
Intermediate pressure 3rd stage	70 ... 80 bar
Compressor block oil capacity	5 l
Oil pressure	4.5 bar ±1,5 bar
Direction of rotation (viewing at flywheel)	counter-clockwise4

Subject to change without prior notice

TECHNICAL DATA (Cont.)

Compressor block	**IK18.1-F06**
No. of stages	5
No. of cylinders	4
Cylinder bore 1st stage	130 mm
Cylinder bore 2nd stage	88/60 mm
Cylinder bore 3rd stage	32 mm
Cylinder bore 4th stage	18 mm
Cylinder bore 5th stage	10 mm
Piston stroke	50 mm
Intermediate pressure 1st stage	2,9 ... 4,3 bar
Intermediate pressure 2nd stage	13 ... 15 bar
Intermediate pressure 3rd stage	42 ... 48 bar
Intermediate pressure 4th stage	121 ... 168 bar
Compressor block oil capacity	5 l
Oil pressure	4.5 bar ± 1,5 bar
Direction of rotation (viewing at flywheel)	counter-clockwise

1.3.3. Drive motors

All motors:

Model	3 phase squirrel cage motor
Operating voltage	380-440 V, 50-60 Hz
Control voltage	24 V, 50-60 Hz
Type of construction	B3
Protection class	IP55

Drive motor 7.5 kW

Power	7.5 kW
Speed	2,850 min^{-1}
Size	132 M

Drive motor 11 kW

Power	11 kW
Speed	2,920 min^{-1}
Size	160 M

Drive motor 15 kW

Power	15 kW
Speed	2,900 min^{-1}
Size	160 M

TECHNICAL DATA (Cont.)

1.3.4. Filter system

a. General

Service pressure, standard	225/330/420 bar (3,200/4,500/6,000 psi)
Service pressure, max.	420 bar (6,000 psi)
Flow rate	P41: max. 500 l/min P61: max. 680 l/min
Regenerated volume of air, referenced to 1 bar abs, 20°C, flow rate 200 l/min against p = 200 bar (2,900 psi)	P41: 1,500 m^3 P61: 2,200 m^3
Operating temperature range	+5 ... +50°C (41 ... 122°F)
Residual water contents	< 10 mg/m^3
Residual oil vapour contents	< 0.1 mg/m^3
Residual CO contents	< 5 ppm_V
Residual CO_2 contents	< 500 ppm_V
Pressure dew point	-20 °C, 3 mg/m^3 at 300 bar

b. High pressure filter assemblies

Oil and water separator (filter base):

Dimensions (L x W x H)	100 x 100 x 140 mm
Tube connections (intake and outlet)	G3/8"
Max. load cycle number	refer to pressure vessels instruction manual

Purifier:

External diameter	100 mm
Water volume	P41: 2,1 l, P61: 3,0 l
Weight	P41: 10.7 kg, P61:12.9 kg
Max. load cycle number	refer to pressure vessels instruction manual

Electrical specifications

Assemblies used	1 SECURUS indicator
	1 Filter housing with pressure resistant conductor bushing
	1 Sensor inside the SECURUS cartridge
Operating voltages of the **SECURUS** indicator unit	190 ... 250 V, 50 ... 60 Hz or
	110 ... 127 V, 50 ... 60 Hz or
	12 ... 24 V DC
Power consumption of the **SECURUS** indicator unit	AC version 3 VA
	DC version 2 W
Contact components	3 N/O contacts for preliminary warning and for compressor shut-off
Contacts switching current	6 Amps/250 Volts
Protection class for	IP65
SECURUS indicator unit	
Dimensions of the **SECURUS** indicator unit	120 x 120 x 55 mm (L x W x H)
Mains connections and switching outputs via terminals	

2. LUBRICATION SYSTEM

2.1. FUNCTIONAL DESCRIPTION

2.1.1. Compressor Block IK12.14

The compressor is provided with a low pressure lubrication system. The oil pressure is produced by a low reving gear pump. The oil pressure is approximately **4.5 bar (3 to 6 bar)**.

This oil pump will operate in the correct sense of rotation, only. Otherwise, no oil pressure will be built up resulting in damage of the compressor block.

The oil pump (1, Fig. 7) is coupled to and driven by the crankshaft. It pumps oil from the oil sump (5) through the oil fine filter (2) and a minimum pressure valve (3) to the last stage cylinder. The oil is then distributed by the guide piston (4) and lubricates all moving parts of the compressor block.

The minimum pressure valve allows for oil pressure indication at a pressure gauge and electronic oil pressure monitoring.

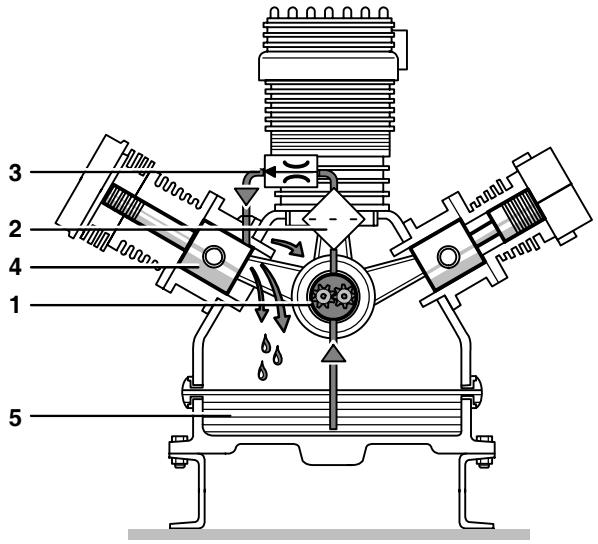


Fig. 7 Lube oil circuit, IK12.14

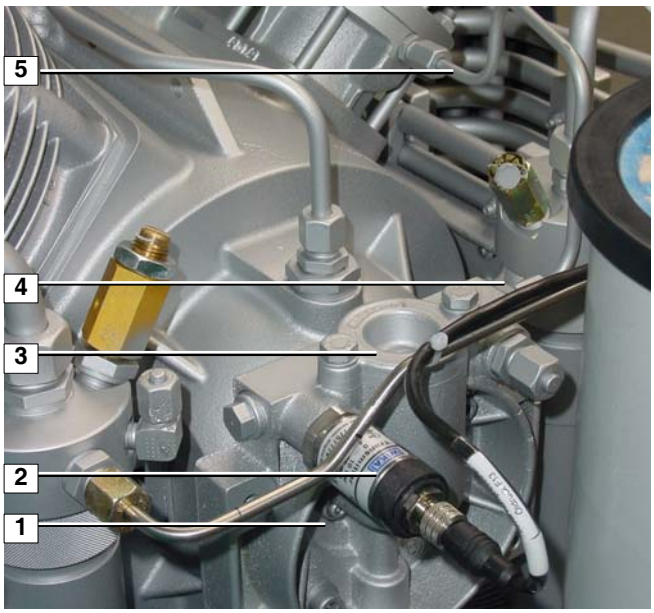
2.1.2. Compressor Blocks IK150, IK180, IK18.1

The compressor is provided with a forced-feed lubrication (Fig. 8). The oil pressure is produced by a low reving gear pump. The oil pressure is approximately **4.5 bar (3 to 6 bar)**.

This oil pump will operate in the correct sense of rotation, only. Otherwise, no oil pressure will be built up resulting in damage of the compressor block.

The oil pump (1, Fig. 8) is coupled to and driven by the crankshaft. It pumps oil from the crankcase through an oil fine filter (2) and a minimum pressure valve (4) to the last stage cylinder. The oil is then distributed by the guide piston of the last stage and lubricates all moving parts of the compressor block.

The minimum pressure valve allows for oil pressure indication at a pressure gauge and electronic oil pressure monitoring.



1 Oil pump housing
2 Oil pressure sensor
3 Oil filter housing
4 Oil pressure regulating valve
5 Injection line to cylinder last stage

Fig. 8 Lube oil system IK150 to IK18.1

2.2. TYPE OF OIL

For proper care and maintenance of the compressor, using the correct oil is of vital importance. Depending on the application of the compressor the requirements placed on the oil are:

- low deposits
- no carbonizing effect, especially in the valves
- good anti-corrosive properties
- emulsification of the condensate in the crankcase
- for breathing air application, also physiological and toxicological suitability.

Due to the thermal load on the compressor only high quality oil should be used. You are recommended to restrict oils to those which have been approved by us and are listed in our lubricating oil list.

The current oil list is provided in section F. Order this list regularly through the BAUER Technical Service Department.

For operation under difficult conditions such as continuous running and/or high ambient temperatures we recommend the use of BAUER high performance compressor oils, only, according to the oil list. These oils are tested in our compressors

and have proved excellent quality under ambient temperatures between +5 °C (41 °F) and +45 °C (113 °F). For lower temperatures, a heating device is required which is capable of pre-heating the crankcase up to +5 °C (41 °F).

All our compressor units are delivered ex-works with lubricating oil N28355.

For operation under less severe conditions we can also recommend mineral compressor oils which are suitable for operation under ambient temperatures between +5 °C (41 °F) and +35 °C (95 °F). Here also, pre-heating is required for lower temperatures.

2.2.1. Changing the oil type

To avoid severe damage to the compressor unit when changing the oil type, follow the measures given in section D-2.

3. INTAKE FILTER

3.1. FUNCTIONAL DESCRIPTION

3.1.1. IK12.14

A dry micronic filter is used to filter intake air, see Fig. 9. It is fitted with a replaceable filter cartridge (1). The intake pipe is connected to a plastic hose drawing the air from the cooling air duct.

3.1.2. Intake manifold

As standard, the air is taken in through the cooling air duct and a plastic hose. Optionally, an intake manifold can be mounted on top of the unit. This allows the intake air to be taken from an external source or the surroundings. Refer to the compressor unit drawing in section F.

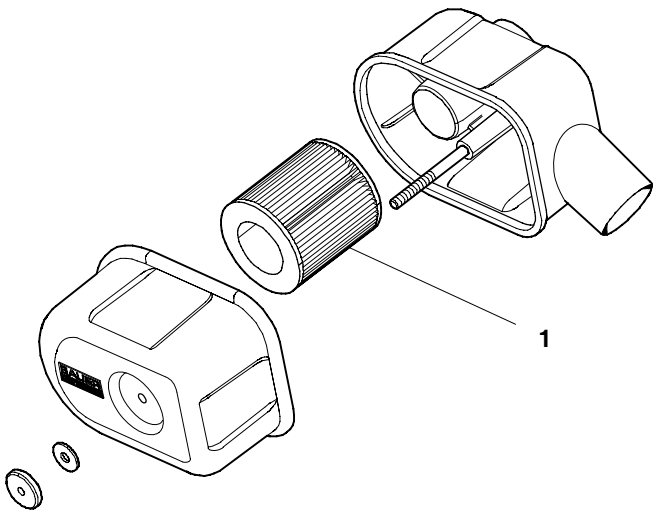
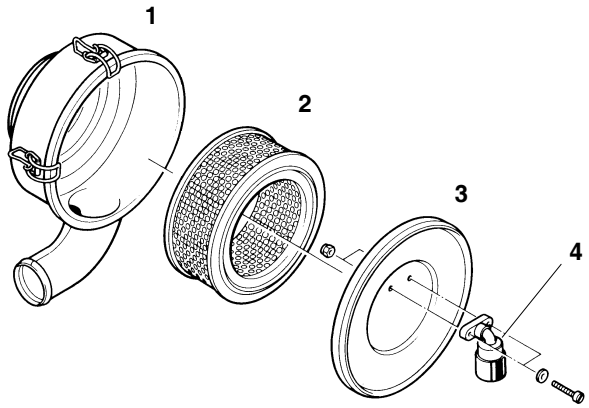


Fig. 9 Intake filter, IK12.14

3.1.3. IK150, IK180, IK18.1

A dry micronic filter as shown in Fig. 10 is used to filter intake air. It is fitted with a replaceable filter cartridge. The service indicator changes colour from green to red when the cartridge is clogged.



1 Filter housing
2 Filter element
3 Cover
4 Service indicator

Fig. 10 Intake filter, IK150, IK180, IK18.1

4. INTERMEDIATE SEPARATORS

4.1. FUNCTIONAL DESCRIPTION

Intermediate separators are mounted after 2nd and 3rd stage and at five stage compressor IK18.1 also after the 4th stage. The separators are designed to remove water and oil accumulating due to cooling the air down after the compression process.

Separation is achieved by means of the centrifugal action provided by a vortex plate.

4.2. 1ST STAGE SEPARATOR (OPTION)

For severe environmental conditions, especially high temperatures and humidity, an additional separator after the 1st stage can be provided. Refer to flow diagram in chapter F. This separator is similar to the separators as described above.

5. FINAL SEPARATOR / FILTER SYSTEM

5.1. GENERAL

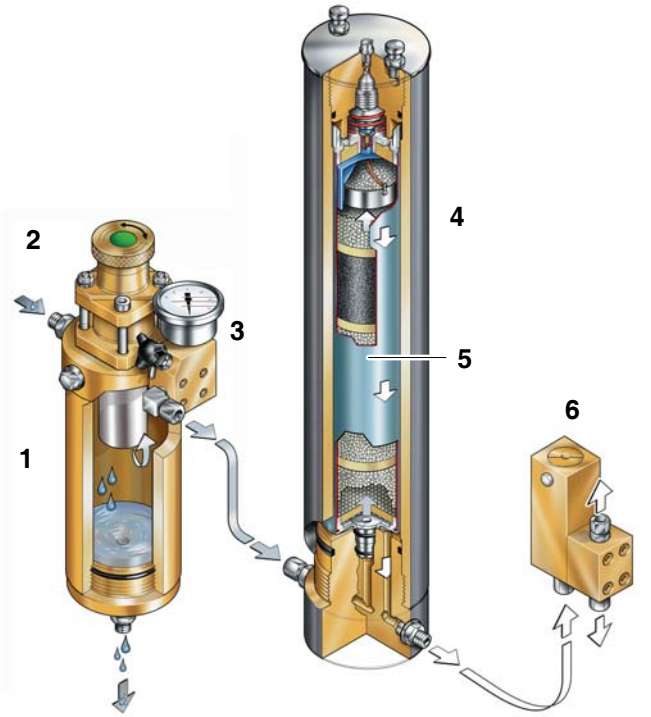
The Verticus 5-PE units compressor units are fitted with filter system P41 or optionally with P61. The function of both is the same, but filter system P61 has a longer cartridge lifetime.

Filter system **P41/P61** (Fig.9) consists of:

- Separator with final pressure safety valve
- Non-return valve between separator and purifier
- High pressure purifier
- **SECURUS** sensor head

- Venting valve with pressure gauge
- Pressure maintaining/non-return valve

The system is integrated into the compressor unit, i.e. the filters and other components are mounted on the frame, the pressure maintaining valve is situated at the filling panel. If the **SECURUS** monitoring system is provided, the breathing air regeneration process and the degree of dryness of the air are continuously monitored during the regeneration process by measuring the cartridge saturation within the filter cartridge.



1 Separator
2 Final pressure Safety valve
3 Non-return valve and pressure gauge
4 Purifier
5 Filter cartridge
6 Non-return valve

Fig. 11 Filtersystem

5.2. FUNCTION

5.2.1. General

Unlike other filter systems the **SECURUS** filter system ensures continuous monitoring of the breathing air purification parameters while the air is still in the regeneration process. The influences of

- ambient temperature
- ambient humidity
- temperatures of the compressor and regeneration system are taken into consideration.

The exchangeable **SECURUS** cartridges are designed for

- drying of air
- adsorption of aromatic components (aerosols)
- partial conversion of CO into CO_2
- partial adsorption of CO_2

The quality of the breathing air produced conforms to the national and international

- DIN EN 12021
- STANAG 1079 MW
- British Standard 4001
- US CGA Spec. G.7.1
- Canada CSA Standard Z 180.1
- Australian Army Standard 5017

It is impossible to exceed the cartridge utilization time since a preliminary warning message indicates the approaching saturation of the cartridge. Depending on the size of compressor used, the prewarning message will appear between 1 and 7 hours prior to cartridge saturation. If the cartridge is not replaced after indication of the preliminary warning message, the **SECURUS** filter system will automatically shut down the compressor as soon as the cartridge has been exhausted. The compressor cannot be turned on as long as no cartridge has been inserted.

The **SECURUS** filter system operates in the FAIL-SAFE mode: the compressor will be shut down if the circuit between the control unit and the sensor is interrupted.

As soon as the preliminary warning message appears or, at the latest, after the SECURUS monitoring unit has shut down the system, the cartridges of all filters within the systems must be changed according to D-5.2.2.

5.2.2. Final Separator

The air leaving the final stage is cooled in the after-cooler to approx.10 to 15 °C (18-27 °F) above ambient temperature and then enters the oil and water separator (Fig. 11). The oil and water separator is standard for all industrial compressors and part of the breathing air purification system of the breathing air compressor units. It works by means of a sintered filter micro-cartridge (1), reliably separating liquid oil and water particles from the compressed air.

The oil and water separator is subject to dynamic load. It is designed to withstand a certain no. of load cycles. (1 load cycle = 1 pressurization, 1 depressurization.) at the specified pressure range. The oil and water separator must be replaced when the maximum permissible no. of load cycles has been reached. Refer to the pressure vessel operating manual delivered with the unit.

The maximum recommended amount of four load cycles per hour should not be exceeded. If it is possible to regulate the operation of the unit to such a degree as to achieve four load

cycles per hour, in our opinion this would be an optimum between usage and actual life.

If it is possible to regulate the operation of the unit to such a degree as to achieve four load cycles per hour, in our opinion this would be an optimum between usage and actual life.

5.2.3. Purifier

The filter housing consists of an anodized aluminium alloy pipe with 100 mm external diameter. Both ends are provided with fine threads on the inside.

The screw-in filter bottom contains inlet and outlet. For connector threads see specifications.

The upper screw connection contains a pressure resistant bushing for the electrical connections. The coaxial cable which leads from the sensor to the control unit is connected to the BNC connector located there.

For description of the electrical operation refer to para. 5.2.5.

5.2.4. Filter cartridges

The cartridge tube is made of aluminium. Cover and bottom consist of pressure diecast aluminium. The cartridge cover contains the sensor for the monitoring function and the clip to facilitate changing of the cartridge.

Different cartridges are available depending on the required air quality. See specifications, and parts list. (5, Fig. 11) and the following table show the internal construction of the filter cartridges.

Part no.	Filter system	Cartridge contents a)	SECURUS sensor	Length mm	Elimination
062565	P41	MS/MS/AC/MS	---	503	H_2O/Oil
061686	P41	MS/MS/AC/MS	●	513	H_2O/Oil
061687	P41	MS/MS/AC/MS/HP	●	513	H_2O/Oil/CO
058826	P61	MS/MS/AC/MS	---	705	H_2O/Oil
060036	P61	MS/MS/AC/MS	●	705	H_2O/Oil
060037	P61	MS/MS/AC/MS/HP	●	705	H_2O/Oil/CO

5.2.5. SECURUS indicator unit

Function

The **SECURUS** indicator unit (Fig. 7) receives signals concerning the condition of the drying agent inside the filter cartridge from the attached sensors and furnishes appropriate control signals whenever the preset threshold values have been reached.

The four operating conditions of the **SECURUS** system are reported by three relays (normally open contacts). Simultaneously with the closing of the relay contacts, built-in luminescent diodes illuminate:

Conditions of Securus-System	Cartridge conditions and Plant conditions
1. Continuous green	Unit in operation
2.Flashing yellow	Cartridge change pre-warining
3. Flashing red	Compressor shut-down because cartridge is used up
4. Continuous red	Compressor shut-down because of missing cartridge or cable failure

If yellow diode is flashing, the green diode will continue to illuminate because unit is still operational with the yellow light on. If no lamp is on, which means that no relay contact is closed, the **SECURUS** indicator unit is receiving no operating voltage or the electronics within the unit have failed.

After applying operating voltage to the unit it will take about 0.5 seconds to close the respective relay contact and to light the applicable diode. During this time the status of the cartridge is being checked.

a) MS = Molecular Sieve, AC = Activated Charcoal, HP = Hopcalite

6. PRESSURE MAINTAINING / NON-RETURN VALVE

6.1. COMPRESSOR UNITS UP TO 350 BAR

A pressure maintaining and a non-return valve are provided downstream of the filter system. Refer to flow diagram in section F. Depending on the model, the combined pressure maintaining/non-return valve is mounted on the frame of the compressor unit, or on the outside of the housing. For the compressor block it is delivered separately.

The pressure maintaining valve ensures that pressure is built up in the filters even from the start of delivery, thus achieving a constant, optimum filtration. It will also guarantee proper working conditions for the final stage cylinder.

The pressure maintaining valve is adjusted to **150 ±10 bar (2,175 psi).**

On units equipped with a filter system, an additional non-return valve is mounted after the oil and water separator - flanged directly to the filter head. It prevents already filtered medium from flowing back from the downstream filters when draining condensate from the oil and water separator.

6.2. COMPRESSOR UNITS UP TO 420 BAR

On units with a maximum final pressure of up to 420 bar (7,250 psi) the pressure maintaining/non-return valve KB 068275 (staninless steel) is mounted.

This pressure maintaining valve is adjusted to **280 ±10 bar (4,060 psi).**

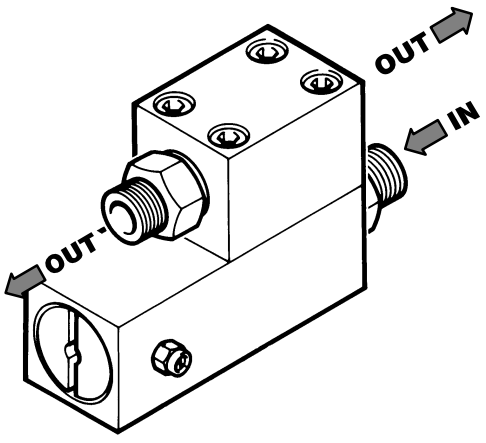


Fig. 12 Pressure maintaining/non-return valve, 350 bar

7. SAFETY VALVES

All compressor stages are protected by safety valves.

The adjustment of the safety valves is as follows:

The safety valves are adjusted to the corresponding pressure and sealed at the factory.

The safety valve for protection of the **last stage** is adjusted according to order, see 1.3, Technical Data, but maximally to the values given above.

Compressor block	1st stage	2nd stage	3rd stage	4th stage	5th stage
IK12.14	5 bar	24 bar	95 bar	450 bar	---
IK150	5.5 bar	24 bar	80 bar	350 bar	---
IK180	5.5 bar	24 bar	95 bar	350 bar	---
IK18.1	5.5 bar	24 bar	80 bar	180 bar	500 bar

8. PRESSURE GAUGES

8.1. INTERMEDIATE PRESSURE GAUGES

Optional extra. The correct values are given in chapter A-1.3., Technical Data.

8.2. FINAL PRESSURE GAUGE

The final pressure gauge shows a mark indicating the maximum operating pressure.

8.3. OIL PRESSURE GAUGE

Correct oil pressure indication should read approx. **4.5 bar (3 to 6 bar)** .

If not, check the lube oil circuit or adjust the oil pressure. See chapter D-2.

For oil pressure monitoring, see chapter A-11.

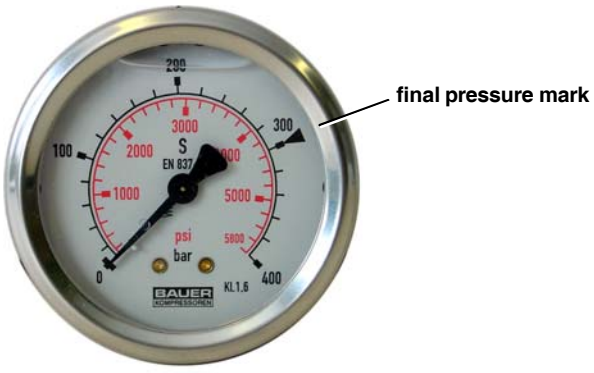


Fig. 13 Final pressure gauge

9. VALVES

The valve heads of the individual stages form the top part of the cylinders. The intake and pressure valves are fitted inside the valve heads.

Note that the valves are operated by the flow of the medium. On the suction stroke, the intake valves open and the medium flows into the cylinders. At the start of the compression stroke the intake valve closes and the medium opens the pressure valve, Fig. 14.

Intake and pressure valve of the 1st stage is a combined plate valve under the valve head (Fig. 15). Different valve types are used as shown.

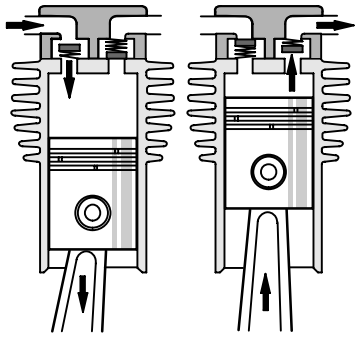
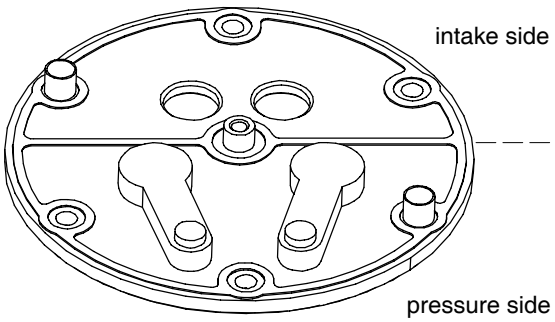


Fig. 14 Valve operation

Top view, IK12.14



Top view, IK150 , IK180 , IK18.1

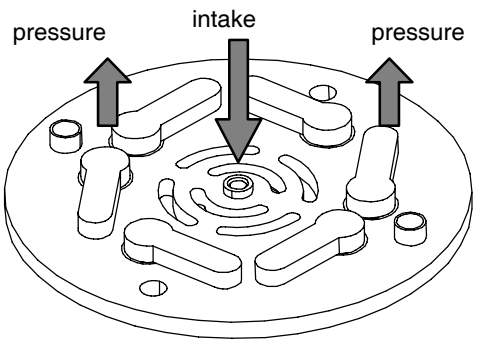


Fig. 15 Valve head 1st stage

10. AUTOMATIC CONDENSATE DRAIN

10.1. COMPRESSOR BLOCKS IK12.14, IK150, IK180

Description

The automatic condensate drain unit (Fig. 16) drains the intermediate separators after the 2nd and 3rd stage, and the final separator after the 4th stage every 15 minutes during operation.

In addition, the automatic condensate drain is designed to drain these filters after shut-down of the compressor unit, and to unload the compressor during the starting phase, see paras. 10.3. and 10.4.

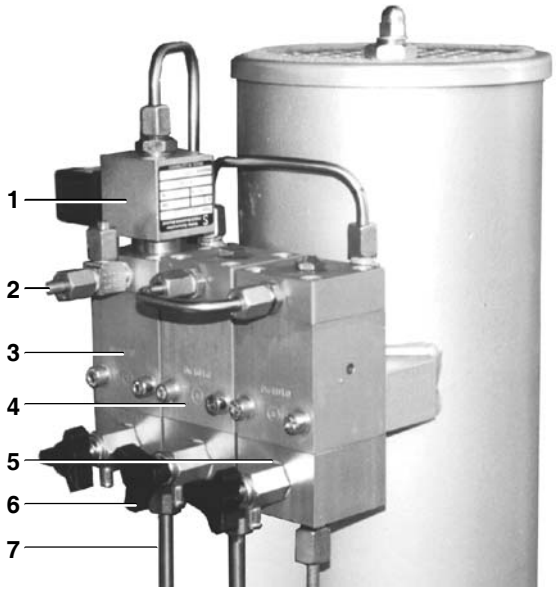


Fig. 16 Automatic condensate drain unit

1 3/2-way solenoid valve
2 Control medium connection
3 Condensate drain valve 2nd stage
4 Condensate drain valve 3rd stage
5 Condensate drain valve, oil and water separator 4th stage
6 Manual condensate drain tap
7 Condensate inlet connection (tube connector)

The automatic condensate drain system operates electropneumatically and comprises the following main items:

- Three pneumatically operated condensate drain valves, one each for the intermediate separators after 2nd and 3rd stage and one for the oil and water separator after the last stage. The condensate drain valves are of the normally open type, i.e. they are closed by applying control pressure.
- A solenoid valve for control air, normally closed type, mounted on top of the condensate drain valve for the 2nd stage.
- A condensate manifold.
- A condensate separator/silencer.

- A condensate tank.
- A bracket for mounting the drain unit on the compressor block or on the unit.
- An electrical timer. The timer is mounted in the compressor control box on all units fitted with this optional extra, or in a housing mounted on the unit or delivered separately with bare compressor blocks.

Operation

The condensate drain valves are operated pneumatically via a normally closed 3-way solenoid valve by an electrical signal.

The required control air applied to the solenoid valve is taken from the intermediate separator after the second stage.

At compressor start, condensate drain valves (5), (6) and (7) are open.

At start-up of the compressor, 3/2-way solenoid valve (4) is energized and opens. Now control pressure is applied to the condensate drain valves. The servo-pistons (8) are pressed onto valve seats (9) and the condensate drain valves close.

The compressor delivers compressed medium to the connected systems.

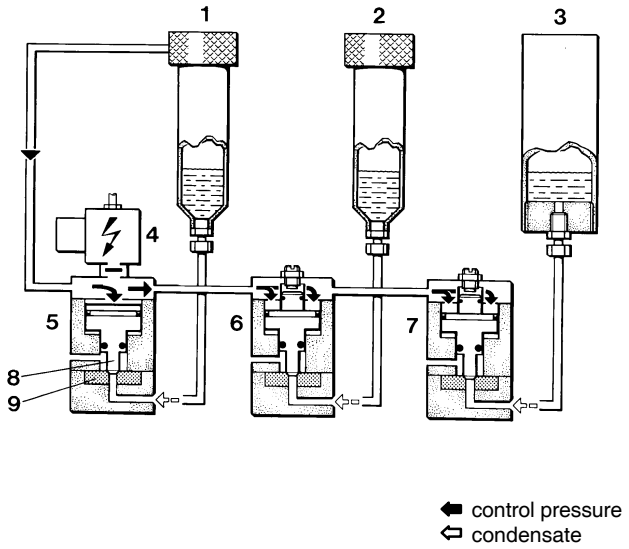


Fig. 17 Normal operation

1 Intermediate separator 2nd/3rd stage
2 Intermediate separator 3rd/4th stage
3 Oil and water separator after 4th stage
4 3/2-way solenoid valve
5 Condensate drain valve 2nd stage
6 Condensate drain valve 3rd stage
7 Condensate drain valve 4th stage
8 Servo piston
9 Valve seat

Condensate drain

Every 15 minutes, 3/2-way solenoid valve (4) is deenergized for approx. 6 seconds by the timer and closes. The control pressure is relieved from the servo-pistons (8) of the condensate drain valves and the pistons are raised from the valve seats (9) by the 2nd stage pressure. The condensate from the separators is drained.

After 6 seconds, the solenoid valve opens again and opens the control air path from the 2nd stage separator again. The servo-pistons of the condensate drain valves are pressed down again and the valves close.

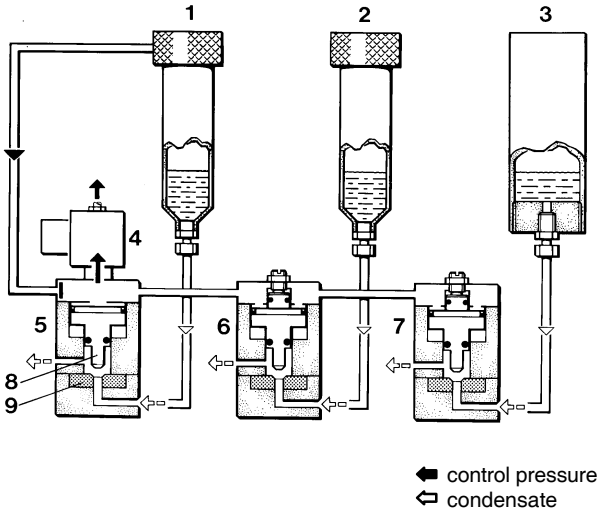


Fig. 18 Condensate drain

1 Intermediate separator 2nd/3rd stage
2 Intermediate separator 3rd/4th stage
3 Oil and water separator after 4th stage
4 3/2-way solenoid valve
5 Condensate drain valve 2nd stage
6 Condensate drain valve 3rd stage
7 Condensate drain valve 4th stage
8 Servo piston
9 Valve seat

10.2. COMPRESSOR BLOCK IK18.1

The automatic condensate drain unit (Fig. 16) drains the intermediate separators after the 2nd, 3rd and 4th stages and the oil and water separator after the 5th stage every 15 minutes during operation. In addition, the automatic condensate drain is designed to drain these separators after shut-down of the compressor unit, and to unload the compressor during the starting phase, see paras. 10.3. and 10.4.

The automatic condensate drain system operates electro-pneumatically and comprises the following main items:

- Four drain valves, one each for the intermediate separators after 2nd, 3rd and 4th stages and one for the oil and water separator after the 5th stage. The condensate drain valve for the intermediate separators after the 2nd, 3rd and 4th stage are the normally open type and those for the oil and water separator after the last stage are closed without control medium being applied.
- Two solenoid valves for control medium, normally closed type, mounted on top of the condensate drain valves for the 3rd and 5th stage drain valves.
- A condensate manifold.
- A condensate separator/silencer.
- A condensate tank.
- Three electrical timers (part of the compressor control or built in a separate housing for units without compressor control).

The solenoid valve for the the second stage is controlled by timer K10.1, condensate drain valves of the intermediate separators after the 3rd and 4th stages is controlled by timer K10.2, the solenoid valve for the condensate drain valves after the 5th stage is controlled by timer K10.3.

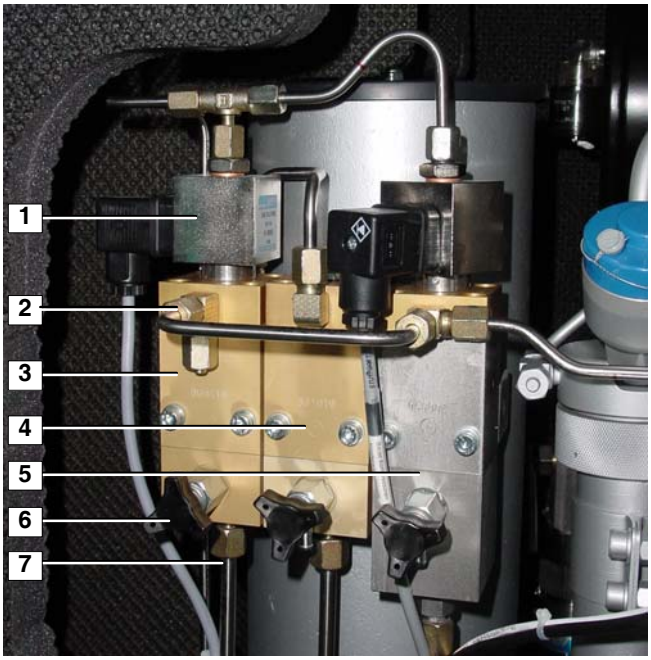


Fig. 19 Automatic condensate drain unit

1 3/2-way solenoid valve
2 Control medium connection
3 Condensate drain valve 3rd stage
4 Condensate drain valve 4th stage
5 Condensate drain valve, oil and water separator 5th stage
6 Manual condensate drain tap
7 Condensate inlet connection (tube connector)

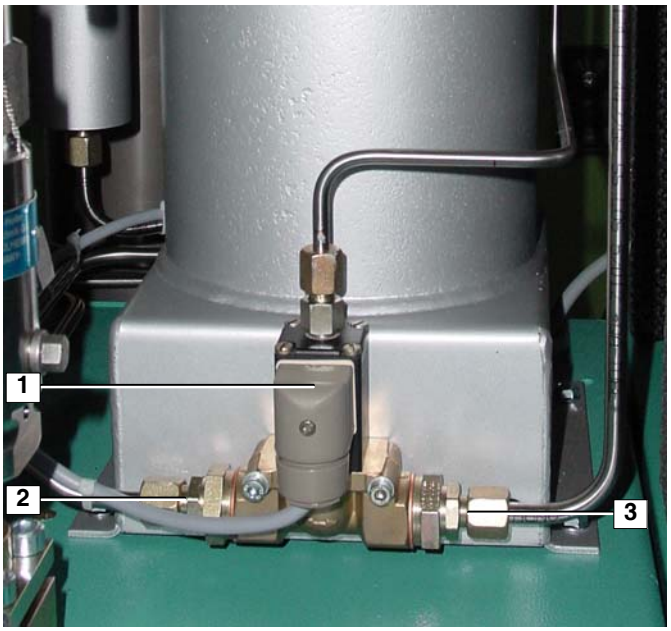


Fig. 20 Drain valve 2nd stage separator

1 Condensate drain valve 2nd stage
2 Condensate inlet from separator
3 Condensate outlet to collector

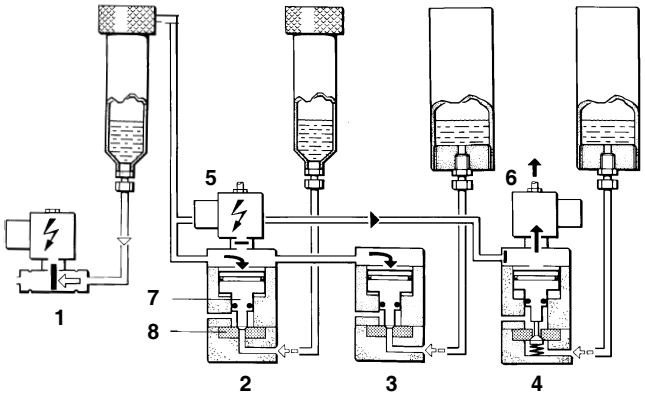
Operation

The condensate drain valve for the 2nd stage (1, Fig. 7) is a normally open 2-way solenoid valve; the drain valves for the 3rd, 4th, and 5th stage are operated pneumatically via normally closed 3/2-way solenoid valves (5) and (6). All solenoid valves are controlled by electrical signals from the compressor control system. The required control medium for solenoid valves (5) and (6) is taken from the intermediate separator after the second stage.

Before compressor start, condensate drain valves (1), (2) and (3) are open, (4) is closed by spring pressure.

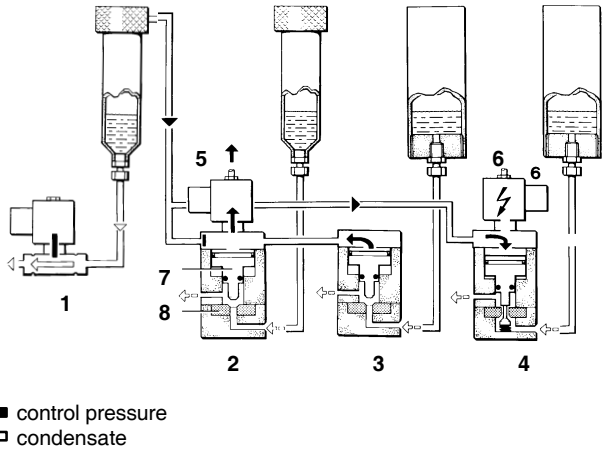
At start-up of the compressor, solenoid valve (1) is energized and closes, (5) is energized and opens, whereas 3/2-way solenoid valve (6) is not energized and remains closed. Control pressure builds up and is applied to condensate drain valves (2) and (3). The servo-pistons (7) are pressed onto valve seats (8) and the condensate drain valves close.

The condensate drain valve (4) is not pressurized by the control medium and remains closed by spring pressure and the pressure build-up of the compressor. The compressor delivers compressed medium to the connected systems.



1 Condensate drain valve 2nd stage
2 Condensate drain valve 3rd stage
3 Condensate drain valve 4th stage
4 Condensate drain valve 5th stage
5 3/2-way solenoid valve 3rd/4th stage
6 3/2-way solenoid valve 5th stage
7 Servo piston
8 Valve seat

Fig. 21 Normal operation



1 Condensate drain valve 2nd stage
2 Condensate drain valve 3rd stage
3 Condensate drain valve 4th stage
4 Condensate drain valve 5th stage
5 3/2-way solenoid valve 3rd/4th stage
6 3/2-way solenoid valve 5th stage
7 Servo piston
8 Valve seat

Fig. 22 Condensate drain

Condensate drain

Every 15 minutes, 2-way solenoid valve (1) and 3/2-way solenoid valve (5) are deenergized for approx. 6 seconds by the timer and close. The control pressure is relieved from the servo-pistons (7) of the condensate drain valves (2) and (3) and the pistons are raised from the valve seats (8) by the 2nd stage pressure. The condensate from the intermediate separators after 2nd, 3rd and 4th stage is drained. After 6 seconds, the solenoid valves are de-energized, and the system returns to normal operation.

Also every 15 minutes, but independently from solenoid valves (1) and (5), 3/2-way solenoid valve (6) is energized for approx. 3 seconds by the timer and opens. The control pressure pushes down the servo-pistons of the condensate drain valve (4), the piston is raised from the valve seat (8) and the condensate from the oil and water separator after last stage is drained. After 3 seconds, the solenoid valve closes again and shuts off the control medium path from the 2nd stage separator and the valve closes due to spring pressure. Pressure is built-up from the compressor.

10.3. START UNLOADING

The unloading during the starting phase of the compressor is effected due to the lack of control air/gas immediately after switching on the unit. After the compressor has attained nominal speed, control air/gas flows to the condensate drain valves which close and the compressor starts delivering to the consuming device.

10.4. STANDSTILL DRAINAGE

At compressor shut-down, solenoid valves are deenergized and open.

The servo pistons are raised by the residual pressure within the separators. The valves open, and the separators are drained at standstill of the compressor unit.

10.5. CONDENSATE COLLECTOR 10 ltrs.

BAUER Verticus 5 units are equipped as standard with a 10 liter condensate collector which can be mounted at the front or the left side as required.

10.6. CONDENSATE COLLECTOR 40 ltrs. (OPTIONAL)

Optionally, **BAUER** Verticus 5 units can be fitted with a 40 liter condensate collecting system (Fig. 23). It serves as a central collector of the accumulated condensate and separates the condensate from the air.

The condensate collecting tank is equipped with a mechanical level indicator for optical pre-warning for exchange

when due. In addition, an alarm system provided by the customer can be activated. The separated air is passed through activated charcoal so that only clean and odourless air is delivered, in accordance with TRG regulations.

The system comprises 2 collecting tanks: One is in use. When it is full, the 2nd tank is connected so that the 1st can be emptied.

The condensate tank is fitted to the condensate outlet connector through by hose. The G 3/4" inlet connector is used for Verticus compressor units. Refer to drawing in the annex.

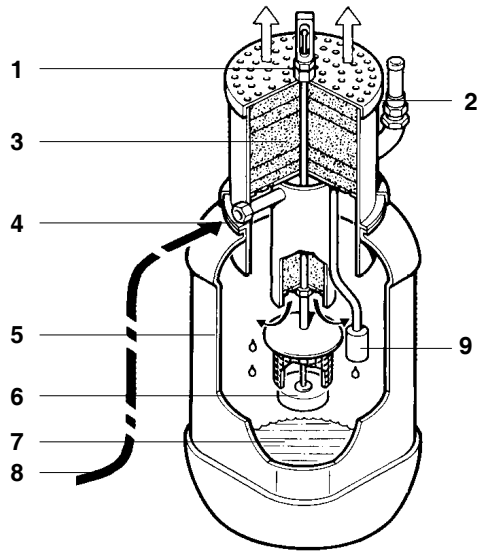


Fig. 23 Condensate collector, 40 ltrs.

1 Level indicator
2 Safety valve
3 Activated charcoal filling
4 Condensate inlet
5 Plastic tank
6 Float
7 Condensate
8 Hose from compressor unit
9 Level switch

Electrical connection

When mounting the switch coil (1, Fig. 24), observe the symbols on the upper and lower switch surfaces. On one side there is an open switch symbol (3), on the other side a closed one (2), see Fig. 24.

Contact function can be changed by mounting the switch coil upside down.

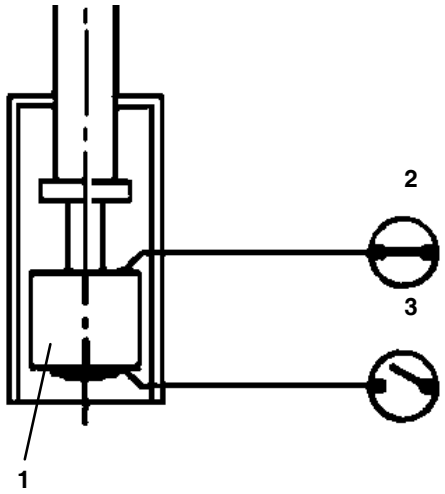


Fig. 24 Float switch orientation

Function

The condensate is drained by the automatic condensate drain unit and passed to the outlet connector at the frame. The hose of the collecting system is connected there.

The condensate enters the system at connector (1, Fig. 25) and is routed through pipe (2) down into the collecting vessel (3). This pipe is filled with steel wool (4). The air entering together with the condensate, passes through the activated charcoal filling (5) in filter head (6) into the open air. The charcoal is covered with layers of fleece (7). Tank and filter head are connected to each other by a clamp (8). The system is protected by a safety valve (9) if pressure rises above 0.2 bar for any reason. The condensate level is indicated by a sight gauge (11) and can be monitored electrically by float switch (10).

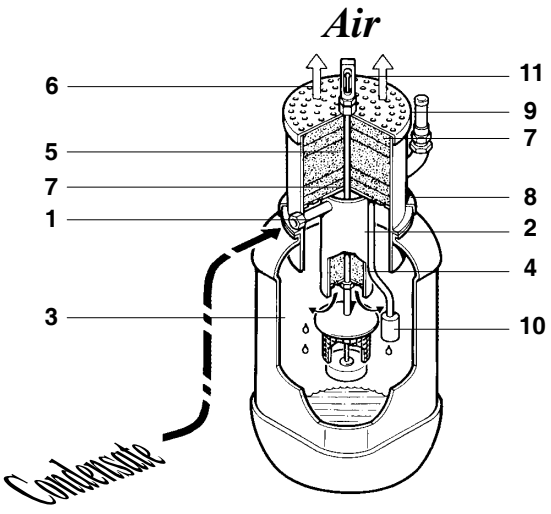


Fig. 25 Condensate collector, function

Technical data

Tank capacity:	approx. 60 litres
Condensate capacity:	approx. 40 litres
Activated charcoal contents:	3,700 g
Connecting hose length:	1,150 mm
Dimensions:	approx. 410 mm x 330 mm x 1,000 mm (W x D x H)

For details refer to drawing 072288-342.

10.7. CONDENSATE DISPOSAL

Condensate must be disposed of according to applicable regulations (in Germany: special waste disposal no. 54405).

Due care must be taken to ensure that any oil which may be drained with the condensate will not pollute the environment. For example, the drain pipe can be directed into a collecting vessel or into drain facilities incorporating oil separators.

11. ELECTRICAL SYSTEM

11.1. GENERAL

This section describes the standard electric control and electronic monitoring system of the compressor unit. The electric control unit is an optional extra for all compressor units, i.e. the amount of built-in components varies depending on order.

For schematic diagrams, see section F.

The electrical equipment of the compressor unit consists of:

- drive motor M1
- electric control system

To start the electric motor and enable the functioning of the controls as well as the monitors, the following components are essential:

- main switch Q1 and
- main fuse, both to be installed by the customer.

11.2. EMERGENCY SHUTDOWN

Every unit has an "Emergency Shutdown" push button. Pressing this push button interrupts the control voltage and the unit shuts down.

11.3. COMPRESSOR CONTROL UNIT B-CONTROL HW

11.3.1. General

This section describes the optional electric control system **B-Control HW**, i.e. without the programmable B-Control module. Since the electric control unit is an optional extra for all compressor units, the amount of built-in components varies depending on order.

For schematic diagrams, see section F.

The electrical equipment of the compressor unit consists of:

- drive motor M1
- electric control system, containing:
  - final pressure switch F16
  - switch box containing air break contactor K1 or star-delta contactor K1-K3 with time relay K4 for drive motor
  - timer(s) K10 for automatic condensate drain
  - service switch S3
  - cycle counter P14

To start the electric motor and enable the functioning of the controls as well as the monitors, the following components are essential:

- main switch Q1 and
- main fuse, both to be installed by the customer.

11.3.2. Semi-automatic compressor control

Unit switches off automatically when the final pressure is reached in the pressure system connected to the compressor. Restart the unit manually by pressing operation button 1 on the control and monitoring unit.

11.3.3. Fully automatic compressor control

Unit switches off automatically when the final pressure is reached in the pressure system connected to the compressor. Restart of the unit is performed automatically if pressure drops to the lower set value. Operation switch S2.1 and main switch S0 must be switched on.

11.3.4. Pressure switch F16

Switching **on** and/or **off** of the compressor unit is controlled by pressure switch F16. The upper threshold value is adjustable as follows.

OFF max. = 350 bar[a)] **OFF min. = 220 bar**

11.3.5. Service switch

The switch is labelled S3. It is mounted on the switch box. In position "0" the compressor operates normally, i.e. the unit

a) Maximum possible operating pressure; for maximum allowable operating pressure, refer to Technical Data, 1. 3.

is switched OFF automatically by the pressure switch. In position "1" the pressure switch F16 is overridden.

Use this switch position for servicing purposes only, e.g. checking the blow-off pressure of the safety valves. The unit will not shut off automatically when switch is in this position.

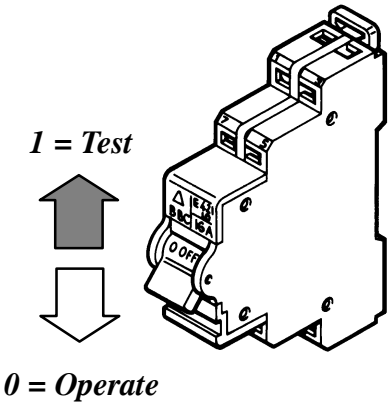


Fig. 26 Service switch

11.3.6. Cycle counter

The cycle counter is also mounted in the switch box and labelled P14. It counts the electrical control pulses for the automatic condensate drain solenoid valve and hence the accumulated amount of load cycles of the installed oil and water separator after the last compressor stage.

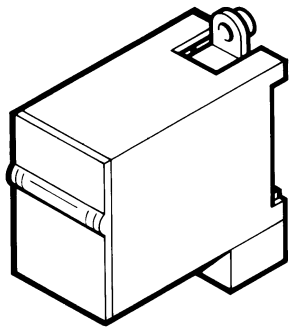


Fig. 27 Cycle counter

1 count corresponds to 1 load cycle
(1 pressurization, 1 depressurization).

11.3.7. Timer(s) for automatic condensate drain unit

Depending on the type of condensate drain unit, one or more timers K10 are fitted. For functional description refer to chapter A.10.

12. COMPRESSOR DRIVE SYSTEM

As standard, the compressor is driven by the drive motor through V-belts. Direction of rotation is left, looking at the cooling fan, i.e. clockwise standing in front of the unit. Observe arrow on compressor.

V-belt tension is adjusted automatically by the weight of the motor. The motor is mounted on a hinged motor plate.

13. COOLING SYSTEM

The cylinders of the compressor block, the intermediate coolers and the after-cooler are air-cooled. For this purpose, the compressor is equipped with a fanwheel which draws the cooling air through the fanwheel cover from the surroundings. The fanwheel is driven by the drive motor V-belt and is also used as the flywheel.

The cooling air outlet can be selected by removing and remounting the cover plate as required.

For installation of the unit ensure sufficient cooling air supply. Refer to section B.

For maximum ambient temperature, see Technical Data, chapter 1.3.

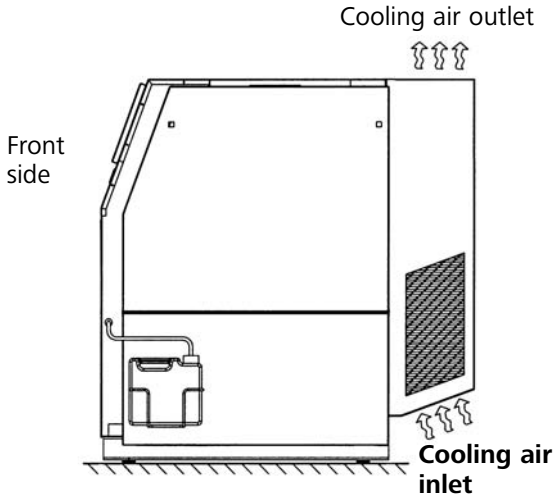


Fig. 28 Cooling air flow

PE–VE/10/09

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B. INSTALLATION, OPERATION

1. INSTALLATION

The compressor frame is isolated with regard to the base frame of the compressor unit by anti-vibration mounts and thus a machine base or special means of securing the compressor are not necessary.

For installation observe the following:

1.1. COMPRESSOR ROOM CONDITIONS

- The compressor room must be clean, dust-free, dry and as cool as possible.
- Avoid direct exposure to sunlight; if possible, choose north side of building.
- Additional heat producing units or line systems should not be installed in the same room or should be well isolated.
- The floor must be capable of taking the load of the system weight.
- Locate the unit level; refer to technical data for max. allowable inclination.
- Ensure adequate ventilation. Remember: room temperature = cooling air temperature ! Min. = +5 °C, max. = +45 °C. Fig. 29.

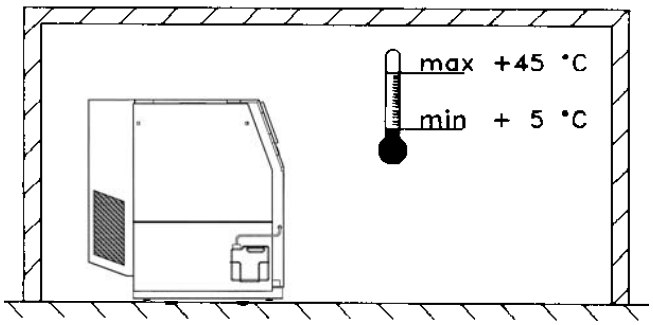


Fig. 29 Room temperature

1.2. LOCATING THE UNIT

- If possible install unit in such a manner that the compressor fan can draw fresh air from outside, for instance through an opening in the wall as low as possible.
- Ensure that an adequate exhaust air opening is provided, as high as possible.
- Locate compressor as close to the air intake opening as possible.
- Locate unit so as to absolutely avoid intake of warm or hot cooling air.
- Observe the minimum distances as listed in the table overleaf.

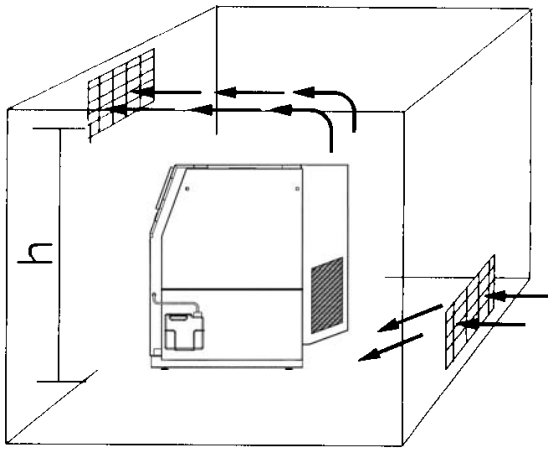


Fig. 30 Locating the unit

1.3. NATURAL VENTILATION

Natural ventilation is the most simple and commonly used. It is created by convection and is sufficient if no thermal overload is expected, i.e. for units with small drive motors, for intermittent operation or in moderate climates this is the ideal method of cooling the compressor unit.

The inlet and outlet air openings are dependent on:

- the power of the electric motor
- the height difference between air intake and outlet openings
- the air volume of the compressor room.

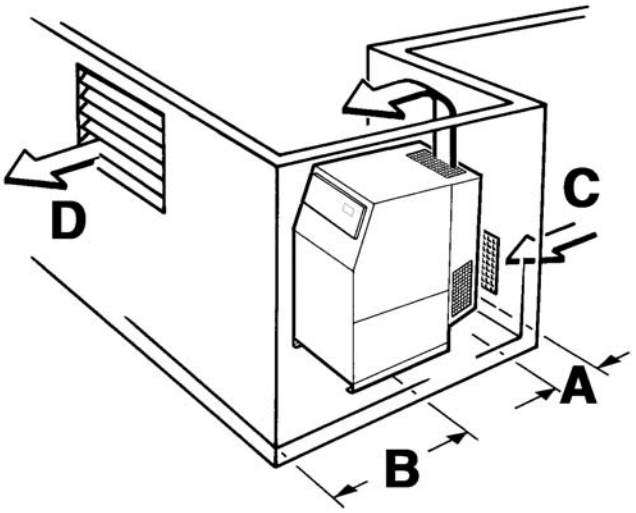


Fig. 31 Installation (natural ventilation)

A Minimum distance from wall, intake side:
Standard unit (KAP): 0.5 m
Super silent unit (V-): 0 m

B Minimum distance from wall, exhaust side: 0.75 m (may be ignored if locating the unit in front of an opening)

C Intake opening: refer to Tab. 1

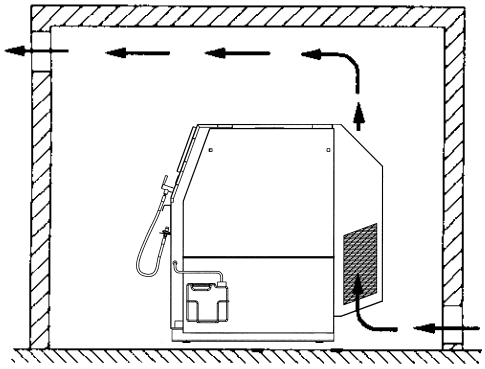
D Exhaust opening: refer to Tab. 1

Table 1 shows some significant values. If the indicated values cannot be obtained, artificial ventilation will be necessary, see chapter 1.4.

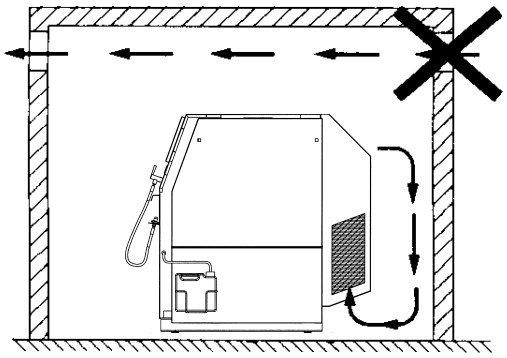
Power (kW)	Room volume / Height difference					
	$V = 50\ m^3$ $\Delta h = 2\ m$		$V = 100\ m^3$ $\Delta h = 3\ m$		$V = 200\ m^3$ $\Delta h = 4\ m$	
	Intake	Outlet	Intake	Outlet	Intake	Outlet
5.5	0.42 m^2	0.35 m^2	0.24 m^2	0.20 m^2	0.12 m^2	0.10 m^2
7.5	0.90 m^2	0.75 m^2	0.60 m^2	0.50 m^2	0.24 m^2	0.20 m^2
11	1.38 m^2	1.15 m^2	0.90 m^2	0.75 m^2	0.54 m^2	0.45 m^2
15	1.92 m^2	1.60 m^2	1.45 m^2	1.20 m^2	0.90 m^2	0.75 m^2

Tab. 1 Air intake and outlet openings

Fig. 32 to Fig. 34 show installation examples with natural ventilation:

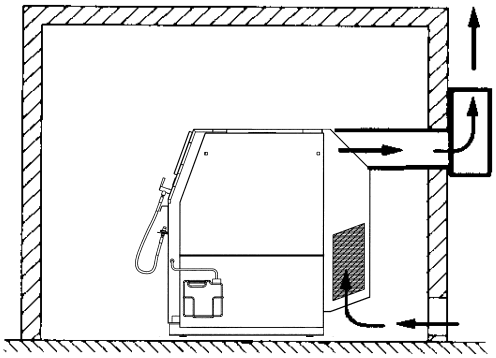


Correct: Air intake low, cooling air flows though unit

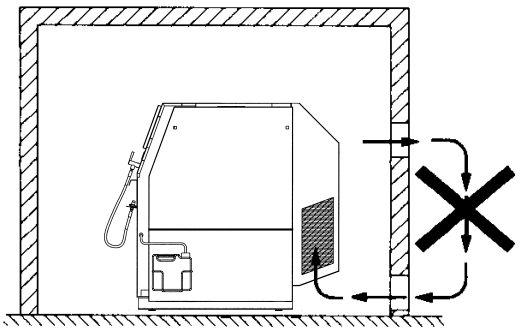


Incorrect: Air intake high, cooling air does not reach unit

Fig. 32 Installation with natural ventilation, example 1

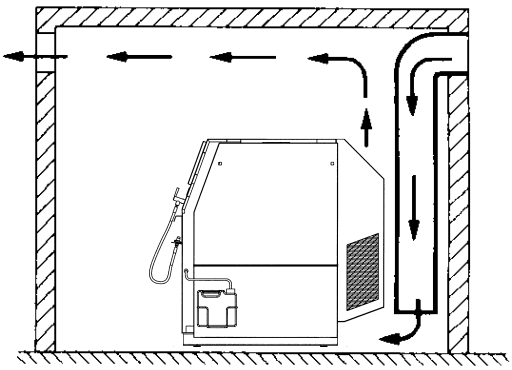


Correct: Air outlet duct upwards, cooling air circulation impossible

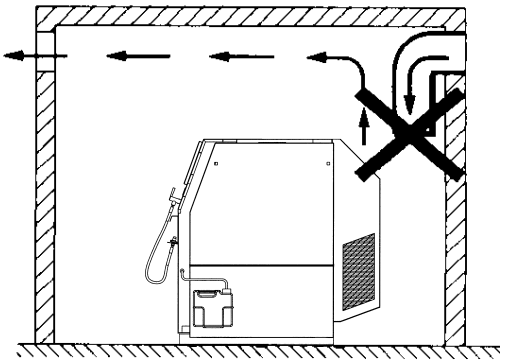


Incorrect: Warm air is not taken away, but circulates and will be taken in again

Fig. 33 Installation with natural ventilation, example 2



Correct: Cooling air led directly to unit



Incorrect: Cooling air does not reach intake opening, intake air duct too short

Fig. 34 Installation with natural ventilation, example 3

1.4. ARTIFICIAL VENTILATION

For drive powers above 11 kW natural ventilation may not be sufficient. Under certain circumstances this can also apply for smaller power ratings, e.g.:

- when locating the compressor in small rooms,
- if ventilation openings cannot be large enough,
- when other systems with high heat radiation are operating in the same room or
- when two or more compressors are operating in the same room.

The principle is: forced ventilation is obligatory if room temperature exceeds the allowed ambient temperature stated in the Technical Data section, A-1.3.

If it is not possible to follow the recommended guide lines for natural ventilation (e.g. installation of several compressor blocks within a very small operating room), the operating room must be ventilated artificially.

Cooling air flow

The necessary cooling air flow is calculated to an approximate value by using the following formula:

Required min. cooling air volume [m^3/h] = 360 x drive pow

For calculation of the cooling air duct cross section the following formula can be used:

$$\text{Cooling air duct } [m^2] = \frac{\text{Cooling air volume } [m^3/h]}{\text{Cooling air flow } [m/s] \times 3{,}600}$$

The recommended cooling air flow is approx. 3 to 5 m/s, but max. 10 m/s.

Example: Verticus 5, drive power 11 kW:

Cooling air volume = 360 x 11 = 3,960 m^3/h
Cross section =3,960 / (5 x 3,600) = 0.22 m^2

Ventilation methods

There are several types of artificial ventilation:

- Free air flow effected by a blower
- ventilation by means of an air channel with or without additional blower[a)]
- ventilation by means of an air circulating flap with or without additional blower[a)]

If installed correctly, the free air flow cooling method should be sufficient for all VERTICUS compressor units.

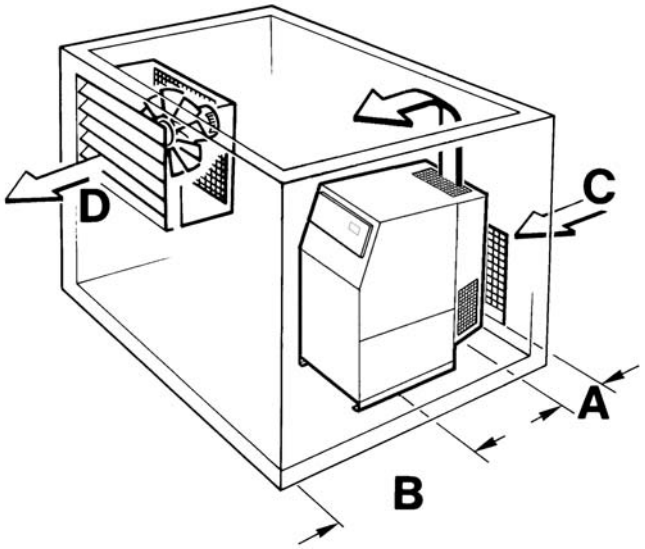


Fig. 35 Installation (artificial ventilation)

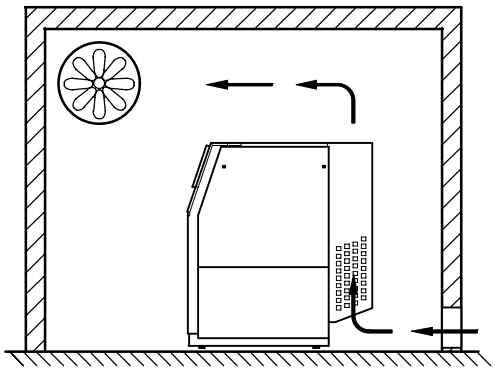
A Minimum distance from wall, intake side:
Standard unit (KAP): 0.5 m
Super silent unit (V-): 0 m

B Minimum distance from wall, exhaust side: 0.75 m (may be ignored if locating the unit in front of an opening)

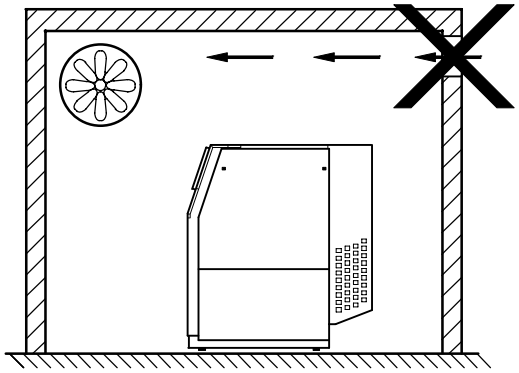
a) ATTENTION: Ensure that the max. counter-pressure in the intake and outlet channels Δ_p = 0.5 mbar = 5 mm W.G. (measured at a distance of 1 m) is not exceeded.

C Intake opening
D Exhaust opening

Fig. 36 and Fig. 37 show installation examples with artificial ventilation:

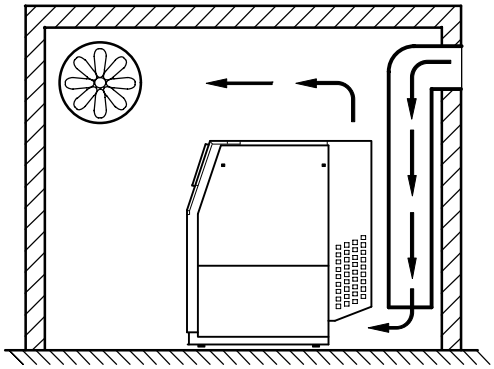


Correct: Air flows along an imaginary streamline through the compressor

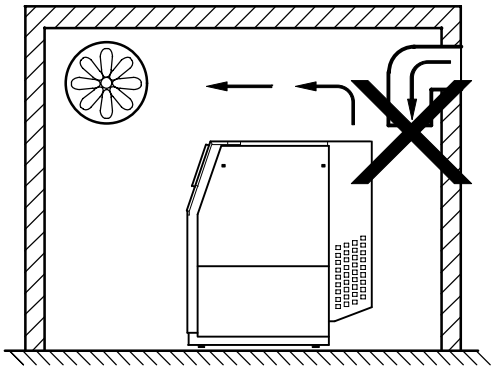


Incorrect: Cooling air does not reach unit

Fig. 36 Installation with artificial ventilation, example 1



Correct: cooling air led directly to unit



Incorrect: cooling air duct does not reach intake opening, intake duct too short

Fig. 37 Installation with artificial ventilation, example 2

2. ELECTRICAL INSTALLATION

For installation of electrical equipment observe the following:

- In section F. you will find the standard schematic diagrams valid for the respective compressor unit. To connect the compressor control system, use only the diagram contained in the control box of the unit, because any deviations from the standard diagrams according to order are marked there.
- Observe regulations of local electricity supply company.
- Connection should be carried out by an expert only.
- Ensure correct installation of protective conductor.
- Check conformity of motor and control device tension and frequency with those of electric network.
- The necessary cabling, main fuse and a main switch (load-break switch) are to be provided by the customer. Ensure that the main switch is for one unit only and is clearly and immediately recognizable. Fusing must be according to the electricity supply company's regulations. For units not connected through a plug, but permanently installed, a main switch must be provided which has a contact gap of 3 mm minimum on each pole.
- Adjust motor protection, thermal overload relay. For start over contactor adjust to motor amperage rating. For start via star-delta contactor adjust to motor amperage rating x 0.58.
  For example: motor amperage rating = 10 Amp.:
  Adjust relay to 10 x 0.58 = 5.8 Amp.
- Fuse motor correctly (see table below; use slow-blow fuses, only).

FUSE TABLE

Motor type	V	125	230	240	**400**	415	440	500	600	660
3-phase, 7,5 kW (star-delta starting)	A	50	35	35	**20**	16	16	16	16	10
3-phase, 7,5 kW (direct starting)	A	63	35	35	**25**	25	25	20	16	16
3-phase, 11 kW (star-delta starting)	A	--	50	50	**25**	25	25	20	20	16
3-phase, 11 kW (direct starting)	A	--	63	50	**35**	35	35	25	25	25
3-phase, 15 kW (star-delta starting)	A	--	63	63	**35**	35	35	25	25	20
3-phase, 15 kW (direct starting)	A	--	80	80	**50**	35	35	35	35	25

3. CONNECTING EXTERNAL FILLING PANELS (OPTIONAL)

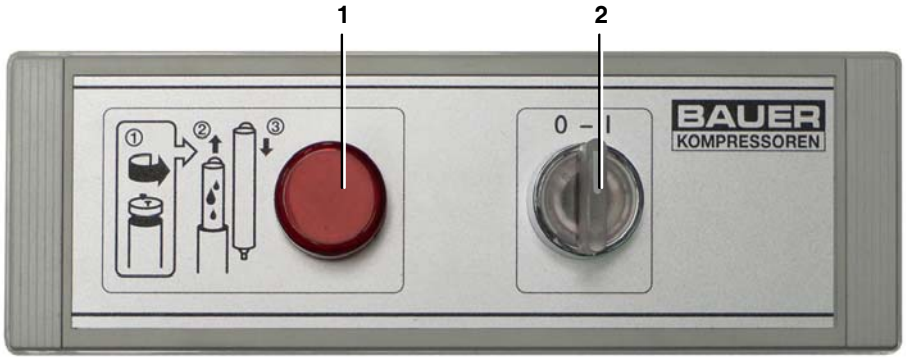
Breathing air compressor units can be delivered optionally with separate filling panels. For connection of those observe the following.

3.1. Control unit

From the control unit the compressor unit can be switched ON and OFF. For the service with compressors with installed SECURUS-monitoring system, the control unit can be equiped with a warning light wich indicates the saturation of the filter cartridge i.e. when the cartridge has to be changed.

3.1.1. Electrical connection

Connection of the control panel for the compressor control should be carried out in accordance with the wiring diagram and configuration plan for the compressor control which is part of the compressor unit.



1 SECURUS warning light
2 ON-OFF button

Fig. 38 B-CONTROL®-HW Control unit

4. CONNECTING STORAGE BOTTLES (OPTIONAL)

Compressor units with factory installed storage bottle(s) on a common base frame (see drawing 073314 or 073791, respectively in section F.). The pressure outlet of the compressor unit is already routed to the storage bottle. The customer's pressure system will then be connected directly to the storage bottle.

The pressure connection is situated on the upper bottle connector at the T connector suitable to connect tubes with an outer diameter of 10 mm. A detachable adaptor ∅ 8/10 mm enables connection of either ∅ 8mm as well as ∅ 10 mm tubes. The adaptor is standard delivery scope.

Note that the upper tube connectors are sealed for transportation with plugs to protect the storage bottles from humidity and soil. Remove the plugs to connect the pressure line system to either connector.

The storage bottles are fitted with a condensate drain valve mounted at the lower console.

Do not connect the lower bottle connection (condensate drain outlet) to the pressure line system! This connector is not suitable for high pressure and severe damage or injuries may occur if connected to the high pressure system.

5. TAKING INTO OPERATION

5.1. PREPARATION FOR OPERATION

All compressor units are tested prior to delivery to the customer, so after correct installation of the unit there should be no problem putting it into operation, observing the following points:

- Prior to **first** operation read Instruction Manual carefully. Make sure that all persons handling the compressor and the filling station are familiar with the function of all controls and monitors. Observe the WARNINGs in chapter C-1.1.
- Depending on the model range, some compressor units are delivered **without** oil in the crankcase. In this case, the first filling quantity is delivered separately in the consignment. Prior to **first** operation fill with oil according to chapter D-2. After taking unit into operation after a standstill period of 2 years or more change compressor oil. When using a mineral oil change oil after one year.
- Prior to **each** operation check the oil level according to chapter D-2 and determine whether maintenance is necessary in accordance with chapter D-1.
- Prior to **first** operation or operation subsequent to maintenance or repairwork, turn the compressor manually using the flywheel to ensure that all parts are turning free. Check that all fastening bolts and threaded pipes are secure and sealed, if necessary tighten them to the correct torque value.
- **Immediately** after switching on the system for the first time check the direction of rotation of the motor for compliance with the arrow on the unit. If motor turns in the wrong direction, the phases are not connected properly. Shut down unit immediately and interchange two of the three phase leads in the switch box. **Never** change leads at the **motor** terminal board.

The oil pump of compressor block will operate in the correct sense of rotation, only. Otherwise, no oil pressure will be built up resulting in damage of the compressor block.

- Prior to **first** operation or operation subsequent to repair work operate unit for at least 10 minutes with open condensate valves (pressureless) to ensure proper lubrication of all parts before pressure is built up. To keep drain valves open, loosen screw (3, Fig. 39) on coil (1) and pull plug (2) from solenoid valve.
- Open the outlet valve, this must be open during operation. Close only for servicing the compressor to avoid gas escaping from connected receivers.
- **Every time** the unit is started up check all systems for proper operation. If any malfunction is observed stop unit **immediately** and find the cause of the fault or call the service department.

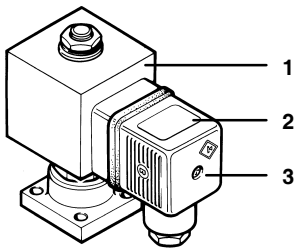


Fig. 39 Solenoid valve

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C. OPERATION

1. SAFETY MEASURES

1.1. NOTES AND WARNING SIGNS

Notes and warning signs displayed on compressors according to model, application or equipment.

WARNING

Hot surfaces, do not touch!

Danger of burning by touching cylinders, cylinder heads and pressure lines of individual compressor stages.

WARNING

High voltage!

Life threatening danger of electric shock. Maintenance work on electric units or operating equipment may only be carried out by a qualified electrician or by a person instructed and supervised by a qualified electrician according to electrical regulations.

WARNING

Automatic compressor control, unit may start-up without warning!

Before carrying out maintenance and repair work, switch off at the main switch or disconnect from the mains and ensure unit will not restart.

MANDATORY

Instructions must be read by persons operating the machinery!

The instruction manual supplied and all other applicable instructions, regulations etc. must be read and understood by operating personnel before using the machine.

MANDATORY

Hearing protectors must be worn!

Hearing protectors must be worn when working on a machine which is running.

NOTE

Ensure correct direction of rotation!

When switching on the machine, check the arrow to ensure correct direction of rotation of the drive motor.

1.2. IDENTIFYING THE SAFETY NOTICES

Important instructions concerning the endangerment of personnel, technical safety and operating safety will be specially emphasized by placing the following signs before the instructions.

This notice is used with maintenance work and operating procedures and must be adhered to exactly in order to avoid endangering personnel.

This notice must be complied with in order to avoid damage to or destruction of the machine or its equipment.

This notice advises of technical requirements which the operator must take particular note of.

1.3. FUNDAMENTAL SAFETY NOTICES

1.3.1. Authorized use

- The machine / unit is built according to state of the art technology and established safety technical regulations. Nevertheless, its use can cause danger to life and limb of the operator or third parties or damage to the machine and other equipment.
- Operate the machine / unit only in technically perfect condition in accordance with regulations and safety and danger notices detailed in the instruction manual! In particular, immediately correct faults (or have them corrected) which can impair safety!
- The machine / unit is exclusively for the compression of mediums (air/gas) specified in section A, chapter 1.3. “Technical data”. Any other medium or use outside that specified is not authorized. The manufacturer / supplier is not liable for damage resulting from this. The user alone is responsible for this risk. Authorization for use is also under the condition that the instruction manual is complied with and inspection and maintenance requirements are enforced.

1.3.2. Organizational measures

- Keep the instruction manual to hand near the machine / unit at all times in the relevant holder.
- In addition to the instruction manual, observe and comply with universally valid legal and other obligatory regulations regarding accident prevention and environment protection. See chapter 1.4. This can involve, for example, contact with hazardous substances or the provision / wearing of personal protective equipment.
- In addition to the instruction manual, provide supplementary instructions for supervision and monitoring duties taking into consideration exceptional factors e.g. with regard to organization of work, production, personnel employed.

- Personnel engaged to operate the machine must have read the instruction manual before beginning work, especially the safety notices chapter. When work is already underway it is too late. This is particularly relevant for temporary personnel, e.g. maintenance personnel.
- At the very least, supervise temporary personnel's work in accordance with the instruction manual, taking into account safety and danger factors.
- Personnel may not wear long hair loose, loose clothing or jewellery, including rings. There is a danger of injury through, for example, these getting caught or being pulled into the equipment.
- As far as necessary or according to regulations, use personal protective equipment.
- Observe all safety and danger notices on the machine / unit.
- Keep all safety and danger notices on the machine / unit complete and in readable condition.
- If there are any modifications to the machine / unit or operating conditions which may affect safety, stop the machine / unit immediately and inform the department / person responsible of the fault.
- No modifications may be made to the machine / unit which could impair safety without first obtaining permission from the suppliers. This is also the case with regard to installation and adjustment of safety devices and valves as well as welding of piping and reservoirs.
- Spare parts must always comply with the technical requirements specified by the manufacturer. This is always guaranteed with original spare parts.
- Do not carry out programme changes (software) to the programmable control system.
- Piping must be thoroughly checked (pressure and visual inspection) by the operator at appropriate time intervals, even if no safety related faults have been noticed.
- Intervals stipulated or given in the instruction manual for recurring checks / inspections must be adhered to.
- It is absolutely essential that the workplace is appropriately equipped for maintenance measures.
- Make sure location and operation of fire extinguishers is known.
- Pay attention to fire warning and fire fighting procedures.

1.3.3. Qualifications, fundamental duties

- Work on / with the machine / unit may only be carried out by reliable personnel. Observe the legal minimum age permissible.
- Only employ trained personnel, clearly establish responsibility of personnel for operation, maintenance and repairwork.
- Ensure that only trained personnel work with the machine.
- Establish the responsibilities of the machine operator and establish a procedure for him to inform a third person of unfavourable safety conditions.
- People who are being trained or introduced to the job should only be allowed to work with the machine / unit under constant supervision of an experienced person.
- Work on the electrical equipment of the machine / unit may only be carried out by a qualified electrician or by an instructed person under the direction and supervision of a qualified electrician according to electrotechnical regulations.
- Work on gas equipment may only be carried out by qualified personnel.

1.3.4. Safety notices for operation

- Do not carry out any work if safety is questionable.
- Meet all requirements demanding that the machine / unit is only operated in safe and good working order. Only operate the machine if all protective and safety equipment, e.g. all detachable protective equipment, emergency shut-down devices, soundproofing is provided and in good working order.
- At least once every day, check the machine / unit externally for damage and faults. Inform the department / person responsible immediately if anything is not as is should be (including operation). If necessary, shut the machine down immediately and make it safe.
- If there are any malfunctions, shut the machine / unit down immediately and make it safe. Correct faults immediately (or have them corrected).
- Observe switching on and off processes and monitoring indications according to the instruction manual.
- Before switching on / starting up the machine / unit, ensure that no one can be put at risk through running the machine / unit.
- Carry out the setting, maintenance and inspection processes at the intervals specified in the instruction manual, including replacement of parts / equipment. This work may only be carried out by qualified personnel.
- Before carrying out any exceptional work or repairwork, operating personnel should be informed. Call the supervisor.
- For all work concerning operation, change in production, conversion or regulating of the machine / unit and its safety measures such as inspection, maintenance and repairwork, observe the switching on and off processes in the instruction manual and the notices for maintenance work.
- Clear and make the maintenance area safe as far as necessary.

- If the machine / unit is completely switched off for maintenance and repairwork, ensure that it is protected from unexpected start-up. Turn off main control device and remove the key and / or display a warning sign on the main switch.
- When replacing individual parts and larger assembly groups, they must be carefully fastened to the lifting device so that there is no risk of danger. Use only suitable and technically perfect lifting devices and equipment with sufficient lifting power and strength. Do not linger or work under suspended loads.
- Only entrust an experienced person with the fixing of loads and guiding of crane drivers. The person guiding must remain within sight or in contact with the operator.
- For assembly work above body height, use appropriate safety approved equipment, e.g. ladders and platforms. Do not climb on machine parts. For maintenance work at high levels, wear a safety harness.
- Clean oil, fuel or care products from the machine, in particular the connections and screw joints, before carrying out maintenance / repairwork. Do not use aggressive cleaning fluid. Use a fibre-free cleaning cloth.
- Before cleaning the machine with water or jet of steam (high pressure cleaner) or detergent, cover / seal all openings which for safety and/or operating reasons no water / steam / detergent may penetrate. Electric motor and switch cabinets are particularly at risk.
- When cleaning the operating room, ensure that the temperature sensors of the fire alarm and sprinkler system do not come into contact with hot cleaning fluid, in order to avoid triggering the sprinkler system.
- Completely remove all covers / seals after cleaning.
- After cleaning, check all pressure lines for leaks, loose connections, wear and damage. Immediately eliminate any faults.
- Always retighten any screw connections loosened for maintenance or repairwork.
- If it is necessary to remove safety devices for maintenance and repairwork, these must be replaced and checked immediately after completion of the maintenance or repairwork.
- Ensure safe and environmentally friendly disposal of consumables and old parts.

1.3.5. Particular areas of danger

- Use only original fuses with specified current rating. If there is a failure in the electric energy supply, shut the machine / unit down immediately.
- Work on electric units or operating equipment may only be carried out by a qualified electrician or by a person under the instruction and supervision of a qualified electrician according to electric technical regulations.
- Machines and unit parts which must undergo inspection, maintenance and repairwork, must be disconnected from the mains supply, if specified. Parts which have been disconnected must first be checked for voltage, then earthed and short-circuited and isolated from live neighbouring parts.
- The electrical equipment of a machine / unit must be regularly checked. Defects, such as loose screw connections or burnt wires, must be rectified immediately.
- If work is to be carried out on live parts, work with a second person who can operate the emergency off switch or the main switch in the case of an emergency. Close off the work area with a red and white safety chain and a warning sign. Only use voltage isolated tools.
- Only carry out welding, burning and grinding work on the machine / unit when specifically approved. There can, for example, be a risk of fire or explosion.
- Before carrying out welding, burning or grinding work, clean the machine / unit and surrounding area from dust and flammable material and ensure there is adequate ventilation (danger of explosion!).
- When working in small rooms, observe any national regulations.
- Only personnel with particular knowledge and experience with pneumatics may carry out work on pneumatic equipment.
- Check all pressure lines, hoses and screw connections regularly for leaks and visible damage. Immediately repair any damage. Escaping air or gas under pressure can cause injury and fire.
- Depressurize system and pressure lines before commencing repairwork.
- Pressurized air lines must be laid and mounted by qualified personnel. Connections must not be mixed up. Fittings, length and quality of the piping must correspond to requirements.
- Soundproofing equipment on the machine / unit must be in place and functional during operation.
- The stipulated hearing protectors must be worn.
- With regard to oil, grease and other chemical substances, observe the relevant safety regulations for the product.
- For loading, only use lifting device and equipment with sufficient lifting power and strength.
- Appoint trained guide personnel for lifting operations.
- Machines may only be lifted with a lifting device and by trained personnel according to instructions in the instruction manual (fixing points for fixing equipment etc.).
- Use only suitable transporters with sufficient carrying power.

Secure the load properly. Use suitable fixing points.

- If necessary, provide machine / unit with transportation brackets. Display the appropriate notice. Remove transportation brackets in the correct manner before taking into operation.

- Parts which need to be dismantled for transport purposes must be carefully replaced and secured before taking into operation.
- Even when moving the machine / unit only slightly, the machine / unit must be disconnected from all external energy sources. Before putting into use again, reconnect the machine to the mains according to regulations.
- When taking back into operation, proceed according to the instruction manual.

1.3.6. Notices of danger regarding pressure vessels

- Never open or loosen pressure vessel lids or pipe connection parts under pressure; always depressurise the vessel or the unit.
- Never exceed the permissible operating pressure of the vessels!
- Never heat the vessels or any of their parts above the stated, maximum operating pressure.
- Always exchange damaged pressure vessels completely. Individual parts that are subject to pressure loads cannot be purchased as spare parts, since the vessels are tested as a complete part and the documentation considers them as a whole (see pressure vessel documentation, serial-numbers!).
- Always pay attention to the permissible operating mode of the pressure vessels.

  We differentiate:

  - vessels for static load

  - vessels for dynamic load

  <u>Vessels for static load:</u>

  These pressure vessels are permanently under virtually constant operating pressure; the fluctuations of pressure are very small.

  Vessels for this type of load are not marked in a particular way and may be used as long as the vessel inspections, carried out regularly, do not uncover any safety-relevant deficiencies.

  We recommend that aluminium vessels should be exchanged after 15 years at the latest.

  <u>Vessels for dynamic load:</u>

  These pressure vessels may also be used under conditions of changing operating pressure. The pressure may vary between the atmospheric and the maximum admissible operating pressure.

  The pressure vessel documentation and the appropriate notes in the operating manual particularly characterise vessels of this type as being adequate for dynamic loads. In the technical information for these vessels you will find specifications concerning their permissible operating period.

  Due to the variation of the operating pressure, these vessels are subject to a so-called dynamic load, which puts the vessels under great stress. The change between two different pressures is called a load change or cycle. In the technical information for these vessels you will find specifications concerning the permissible number of cycles depending on the fluctuation of the operating pressure.

  Having reached half the permissible number of cycles, the vessel has to be submitted to an internal check, in which the critically stressed areas of the vessels are examined by means of suitable testing methods, in order to ensure the operating safety.

  After having reached the total permissible number of load cycles, the vessel must be exchanged and scrapped.

  Record the number of load cycles in writing if you do not have an automatic cycle-counter.

  We recommend that aluminium vessels should be exchanged after 15 years at the latest.

  Please pay attention to and follow these measures, for your own safety and that of you employees and customers!

  In order not to unnecessarily load the pressure vessels additionally, the non-return valves, that are meant to avoid a drop in pressure, and also the pressure maintaining valves, which should reduce big pressure fluctuations as well, should be checked regularly for internal and external tightness and functionality.
- Check the pressure vessels regularly on the inside and outside for damage from corrosion.
- Be particularly careful with second-hand pressure vessels, when their previous operating mode is not specifically clarified.

1.4. SAFETY REGULATIONS (EC; partly Germany, only)

A compressor is identified by German law as being a filling system if pressure cylinders are filled by the system, especially when these cylinders are made available for third parties. The start-up and operation of compressor systems for use as filling stations is governed by the following regulations:

a- Pressure vessel directive (Directive 97/23/EC) of 29.05.1997

b- Operating safety regulations (BetrSichV) of 27.09.2002

c- Machine safety law (GSG) of 11.05.2001

d- 14th regulation to machine safety law (14. GSGV - pressure vessel regulation) of 03.10.2002

e- Technical regulations for pressure gases (TRG 400, 401, 402, 730).

If a high pressure compressor is used for filling pressure vessels or for the supply of pneumatic systems, the following regulations apply:

f- Accident Prevention Regulations (UVV):

- **BGV A1 of 01. January 2004**

Copies of the above regulations are available through the usual outlets, e.g. in Germany from:

Carl Heymanns Verlag
Luxemburger Str. 449
50939 Köln

Beuth-Vertrieb GmbH
Burggrafenstr. 4 - 7
10787 Berlin

The manufacturer has complied with all applicable regulations and the unit is prepared accordingly. If desired, we offer at our Munich site a partial acceptance test according to § 14 BetrSichV. Please contact our Technical Service Department with regard to this. They can also supply our leaflet ¿**IMPORTANT NOTES FOR CERTIFICATION"**.

According to the operation safety regulations (BetrSichV), all compressor units which will be used as filling stations must undergo an acceptance test by a professional at their location before bringing them into service. If pressure vessels (bottles) are to be filled by the compressor for a third party then the appropriate permission must be obtained from the responsible authority before the acceptance test. As a rule, this is the factory inspectorate. The procedure for obtaining permission is according to TRG 730, guidelines for permission to set up and operate filling stations. The test certificates and documents delivered with the compressor are important and may be requested during the procedure for obtaining permission. In addition, the documents belonging to the unit are important for recurrent inspections and should therefore be carefully kept.

Inspections in accordance with the regulations for prevention of accidents will be carried out by the manufacturer or by a specialist.

No guarantees whatsoever are valid for damage caused or favoured by the non-consideration of these directions for use.

We strongly emphasize these regulations.

2. OPERATION

2.1. PREPARATION FOR OPERATION

WARNING **The compressors described in this manual are not suitable for compression of oxygen. EXPLOSION occurs if an oil lubricated compressor is operated with pure oxygen or gases with an oxygen content of more than 21%!**

- Make sure that all persons handling the compressor and the filling station are familiar with the function of all controls and monitors. In particular, observe the safety warnings in chapter C-1.
- Prior to **each** operation check the oil level according to chapter D-2 and determine whether additional maintenance is necessary in accordance with section D.
- **Every time** the unit is started up check all systems for proper operation. If any malfunction is observed stop unit **immediately** and find the cause of the fault or call the service department.

During operation the shut-off valve must be open. Close valve only for maintenance work on the unit to avoid loss of air or gas from connected systems.

2.2. STARTING THE UNIT

- Place main switch to 1.
- To start the compressor unit, press the green ON button.

2.3. FILLING PROCEDURE

2.3.1. General

WARNING **Ensure intake air is free from noxious gas (CO), exhaust fumes and solvent vapour. When operating the unit in areas with possibly high CO contents, the CO removal filter cartridge is recommended. Note that for CO contents of more than 25 ppmV in the intake air the allowed limits cannot be guaranteed even with a CO removal filter cartridge, resulting in a life-threatening CO concentration! Also, due to chemical reaction of CO with hopcalite, warming up of the cartridge and danger of fire may result.**

WARNING **Filling hoses must be in satisfactory condition and threads undamaged. Pay particular attention to damage on the interface from hose fitting to hose. If the casing is scored, hose must be discarded otherwise water can enter and attack wire gauze causing it to rust and thus endangering pressure tightness.**

The filling valve connection is of the manual type and permits connection to air tanks without using tools. An O-ring is provided for self-sealing by internal overpressure.

Compressed air tank filling valves for a pressure in excess of 200 bar are standardized (DIN 477, sheet 5) and connectors for 200 and 300 bar are different and cannot be mixed up. **The use of adapters is not allowed!** To ensure safe air tank removal after filling, the valve has an integral venting bore. Therefore always close tank valve first before closing filling valve.

During filling procedure bottles will warm up due to recompression. After removing, allow to cool down, bottles may then be reconnected and topped up to the appropriate maximum filling pressure.

WARNING **To meet the CO_2 maximum rating value in breathing air bottles, please observe the two following chapters "Intake air quality" and "Scavenging the compressor unit".**

2.3.2. Intake air quality

At routine tests, CO_2 values beyond the permissible values are noted from time to time. Closer investigations often show that the compressed air is taken from rooms in which one or more persons are working. At insufficient ventilation, the CO_2 value in the surrounding air can increase quite fast because of the exhaling of CO_2. CO_2 values from 1,000 to 5,000 ppm_V in workrooms are not unusual (MAK-value (max. workroom concentration) is 5,000 ppm_V). Another additional increase is caused by cigarette smoking, producing approx. 2g CO_2 ($\approx$ 2,000 ppm_V) per cigarette. These pollutions add up to the basic pollution of approx. 400 ppm_V. The technically caused excessive increase of CO_2 during the filling process and the CO_2 peak at taking the unit into operation. **Because of the reasons stated above and for your own security, the filling of breathing air bottles is not allowed in rooms used as workrooms.**

2.3.3. Scavenging the compressor unit

CO_2 is present in the atmosphere with a natural amount of 350 - 400 ppm_V. The molecular sieve used in the purifiers for drying the breathing air is, as well as other capabilities, able to adsorb CO_2 which is accumulated in the cartridge. After shutdown of the compressor, adsorbed CO_2 may be desorbed again due to the partial pressure decrease. The now free CO_2 gets washed out of the cartridge when the compressor is started again.

To avoid increased CO_2 contents in the compressed breathing air, we recommend scavenging the compressor unit **before connecting** and filling the air bottles, i.e. let the compressed air escape into the open air by opening the scavenging valve (1, Fig. 40).

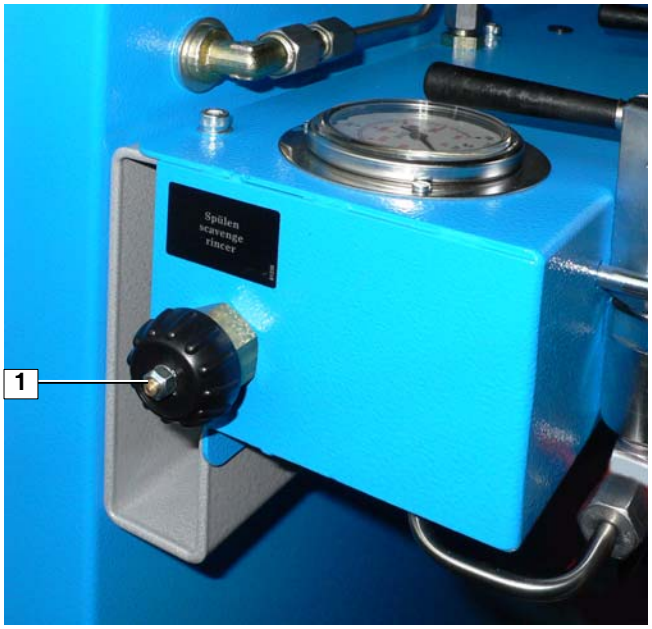


Fig. 40 Scavenging valve

2.3.4. Switch-over valve

Filling panels for 2 pressure ranges (PN 200 / PN 300) and with a switch-over valve, with which it is possible to switch between two pressure ranges, can only be used for one pressure range at a time. The 200 bar side is opened by means of the shut-off valve. The 300 bar filling valves remain pressurized but can only be used up to a pressure of 200 bar. It is impossible to connect 200 bar bottles to the 300 bar filling connections (right hand side).

<u>Before</u> switching from 300 bar to 200 bar, i.e. to the lower pressure range, it is <u>essential</u> to open the venting valve and to reduce the 300 bar line to at least 200 bar. Otherwise, the pressure gauge could be damaged or destroyed.

WARNING **Open the switch-over valve slowly in order to avoid a pressure surge! Filling hoses which are not in use must be hung in the holders on the bottom of the filling panel, so that should a filling valve be inadvertently opened, the pressurized air outstream cannot cause the hose to whip and cause serious injury.**

2.3.5. Pressure reducer

Filling panels for 2 pressure ranges (PN 200 / PN 300) and with a pressure reducer, can be used for filling bottles simultaneously at two pressures, i.e. simultaneous filling of 200 bar and 300 bar bottles is possible!

The pressure reducer used in the filling panel is adjustable to a high precision.

Max. inlet pressure	420 bar
Secondary pressure (range of adjustment)	0.1 to 280 bar
Temperature range	-10 °C to +100 °C
Normal delivery	32 m^3.

A 20 µm particle filter is installed at the pressure reducer inlet.

2.3.6. Connecting the bottles

- Connect air bottle to filling valve (see Fig. 41).

On models of 300 bar rated filling pressure do not attach bottles unless rated for this pressure (note pressure stamped on tank neck).

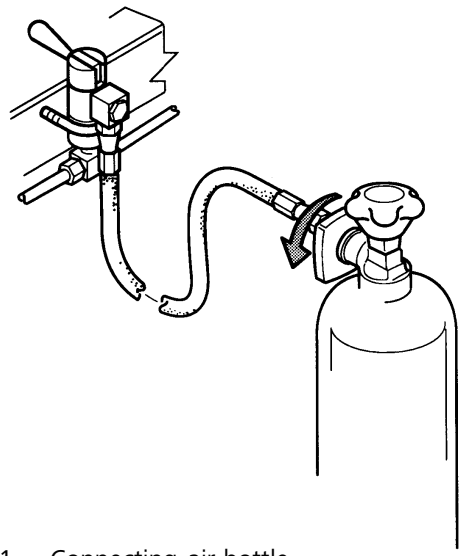


Fig. 41 Connecting air bottle

- Air bottles with international filling connector can be connected with filling adaptor (PN 08487-635) to the German filling connector or with filling adaptor (PN 03147-635) directly to the filling hose (see Fig. 42).

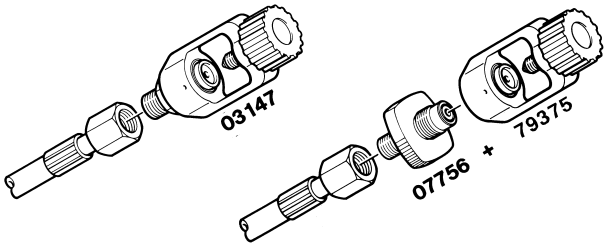


Fig. 42 International filling connector

The international connector is not permitted in Germany. In other countries it is allowed only for pressures up to 200 bar (2,850 psi). This filling connector cannot be used on 300 bar (4,350 psi) models due to constructive measures.

2.3.7. Filling the bottles

- Set filling valve handle to filling position (1, Fig. 43).
- Open bottle valve (2) - bottle will be filled. Drain condensate regularly during filling. On units with automatic condensate drain check that condensate is drained regularly.

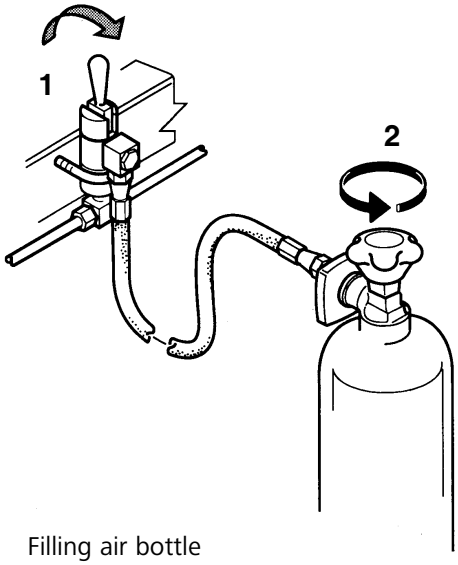


Fig. 43 Filling air bottle

2.3.8. Removing the bottles

- Upon reaching final bottle pressure **close bottle valve first, then filling valve** by returning handle to closed position (see Fig. 44).
- Remove compressed air bottle.

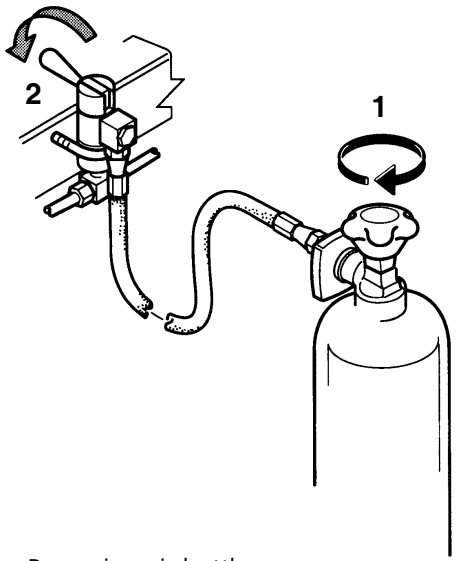


Fig. 44 Removing air bottle

Section A
Description

Section B
Installation, Taking into operation

Section C
Operation

Section D
Maintenance, Repair

Section E
Storage, Preservation

Section F
Diagrams, Drawings

Section G
Spare Parts Catalogue

D. MAINTENANCE, REPAIR

1. GENERAL

1.1. MAINTENANCE RECORD

We recommend that all maintenance work is recorded in the service booklet delivered with every compressor unit, showing the date and details of the work carried out. This will help to avoid expensive repairwork caused by missed maintenance work. If it is necessary to claim against the warranty, it will help to have proof that regular maintenance work has been carried out and that the damage has not been caused by insufficient maintenance. Please refer to section 23 of our general terms and conditions.

1.2. MAINTENANCE WORK

WARNING **Always shut down and decompress the complete system prior to carrying out any work on the compressor.**

WARNING **Always disconnect the system from mains supply prior to carrying out any work on compressor systems with electric drive motor.**

WARNING **Never repair pressure lines by soldering or welding.**

Check the complete system for leakage from time to time by brushing all fittings and couplings with soapy water or spraying with leak test spray. Repair any leakage.

Only use original spare parts for maintenance or repair work.

For filter cartridge change intervals refer to chapter D-5 !

The used cartridge must be disposed of according to local regulations.

1.3. MAINTENANCE INTERVALS

All maintenance intervals refer to normal operating conditions. Operating the compressor under extreme conditions like high temperatures, humidity, continuous operation may shorten the intervals significantly. If in doubt, please contact our service dept.

The maintenance schedule is contained in the service manual delivered with every compressor unit.

2. LUBRICATION SYSTEM

2.1. OIL LEVEL CHECK

Check oil level at oil sight gauge every day prior to putting compressor into operation.

Oil level should be between minimum and maximum notches, see Fig. 45 and Fig. 46. Oil level must not decrease below min. mark but also not exceed max. mark as this will cause excessive lubrication of compressor and result in valves sooting up.

At each oil change unscrew and remove the oil sight glass (Fig. 45) and clean the prism inside. Check gasket and screw in the oil sight glass again. (Torque approx. 10 Nm)

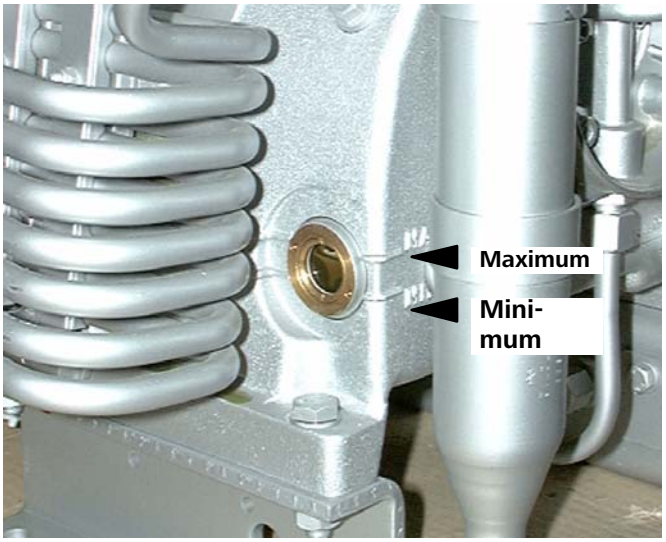


Fig. 45 Oil sight gauge IK12.14

Fig. 46 Oil sight gauge IK150, IK180, IK18.1

2.2. OIL CHANGE INTERVALS

Mineral oils	every 1,000 operating hours, at least annually
Synthetic oils	every 2,000 operating hours, at least biennially

2.3. OIL CAPACITY

Oil capacity, IK12.14	approx. 2.8 liters
Oil capacity, IK150, IK180, IK18.1	approx. 5.0 liters

2.4. OIL PACKAGES

BAUER compressor oil is available in various quantities, refer to oil list in section F.

2.5. OIL CHANGE

- Run compressor warm.
- Remove red cap from oil filler neck (1, Fig. 47).
- Drain oil while still warm by means of oil drain plug. On units equipped with oil drain hose remove hose union nut from coupling at hose bracket. Collect oil in a suitable container. Exchange gasket and reinstall plug.

Replace oil filter with every oil change, otherwise the bypass valve would open if filter is clogged, and the oil would circulate without being filtered!

- Remove two screws (1, Fig. 49) with a 13 mm spanner. Remove cover (2).
- Remove oil filter (1, Fig. 50) from rubber gasket at cover.
- Mount a new filter element (P/N N25326) and replace and fasten cover.
- Fill new oil through filler neck to Max.- mark at sight gauge.
- Pour oil in slowly, wait a few minutes, then put unit into operation.

2.6. CHANGING THE OIL TYPE

To avoid severe damage to the compressor unit when changing the oil type, the following measures should be strictly adhered to:

- Drain oil completely while still warm.
- Check valves, coolers, separators, purifiers, and all pneumatic tubes and hoses for deposits.

If deposits are detected, perform the following:

- Change or clean valves, coolers, separators, purifiers, and all pneumatic tubes and hoses from deposits.
- Fill compressor with the new oil.
- After approx. 100 operating hours check lubricating oil for degree of contamination, and change oil again if necessary.
- Perform subsequent oil changes according to para. 2.2.
- Refill compressor with same oil, only.

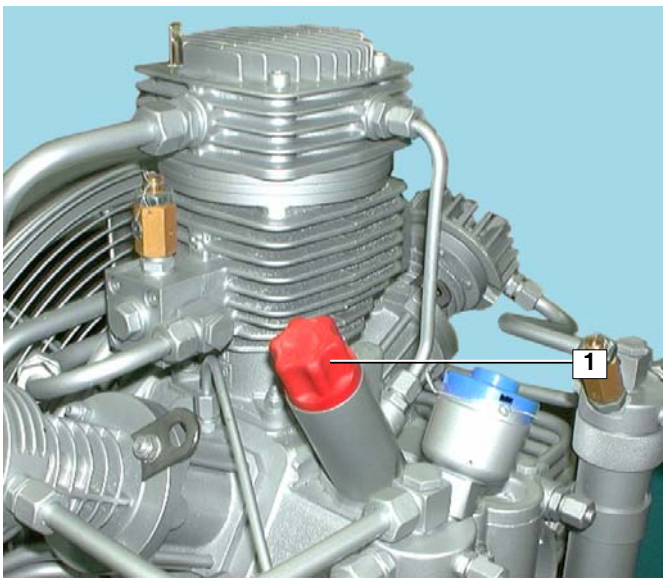


Fig. 47 Oil filler, IK12.14

Fig. 48 Oil filler, IK150, IK180, IK18.1

2.7. VENTING OIL PUMP

If no or low oil pressure builds up after starting the unit- especially after maintenance or repair work, or if the unit should have been running in the wrong direction due to a wrong phase sequence - venting of the oil pump may be necessary. Proceed as follows:

- With the compressor running and all condensate drain valves open to avoid pressure being built up during this procedure, unscrew screw cap and plug (3, Fig. 49) three turns and wait until oil pours out free of air bubbles. Retighten plug and cap nut.

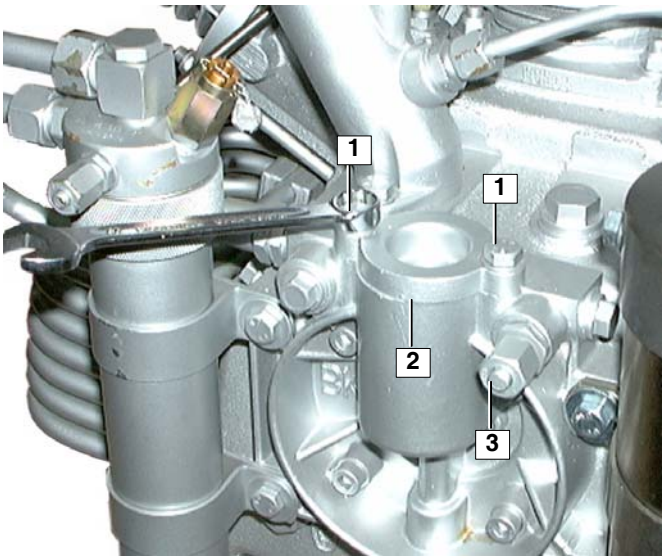


Fig. 49 Removing the cover

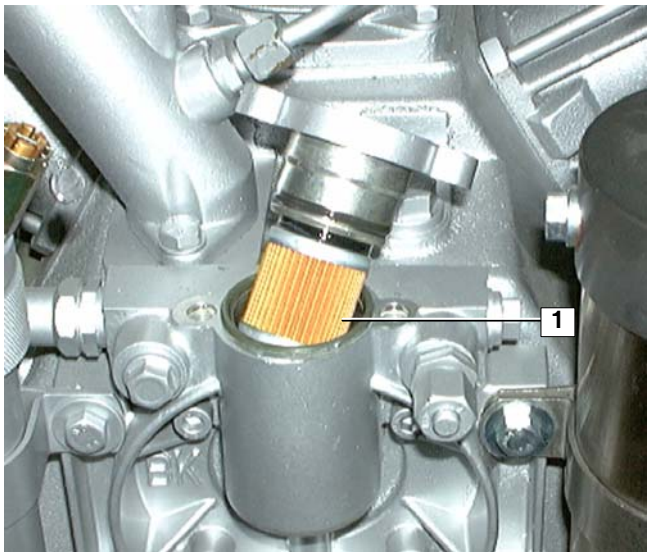


Fig. 50 Replacing the oil filter

3. INTAKE FILTER

3.1. MAINTENANCE

The filter cartridge must be cleaned or changed at regular intervals. The intervals depend on the air taken in by the compressor. In heavy dust conditions monthly or even weekly servicing can be necessary. In all conditions, observe the minimum intervals according to maintenance schedule in chapter D-1.

3.1.1. IK12.14

- Remove knurled nut and remove cover.
- Remove filter element (1).
- Clean the inside of the filter housing with a damp cloth, take care to prevent any dust entering the intake manifold.
- Mount new filter element.
- Mount cover .

3.1.2. IK150, IK180, IK18.1

The underpressure in the intake filter is monitored by service indicator (4). As soon as the max. allowable underpressure is reached, indication will change from green to red. A clogged filter may also lead to shut-down of the compressor by the min./max. pressure sensors, if provided! Refer to chapter A.11. In this case change filter element (2) as follows:

- Open clips and remove cover (3).
- Remove filter element (2).
- Clean the inside of the filter housing with a damp cloth, take care to prevent any dust entering the intake manifold.
- Replace the filter element.
- Mount cover and fasten with the clips.
- Reset vacuum gauge by pressing the button.

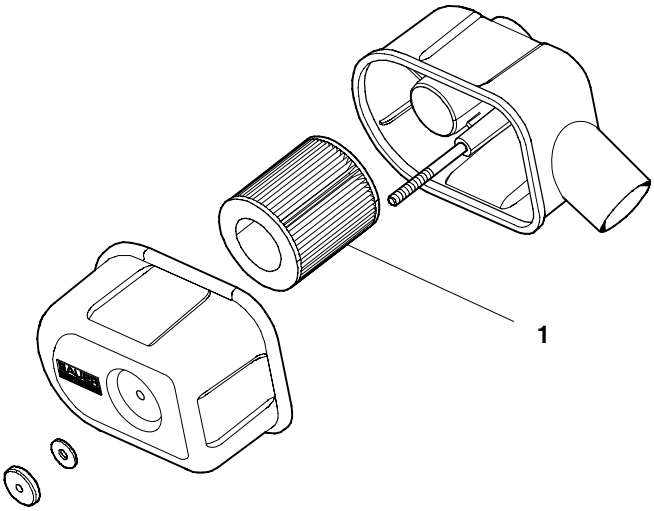
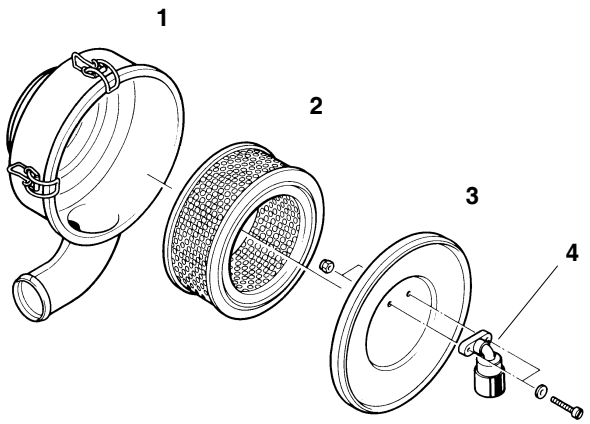


Fig. 51 Intake filter, IK12.14



1 Filter housing
2 Filter element
3 Cover
4 Service indicator

Fig. 52 Intake filter, IK150, IK180, IK18.1

4. INTERMEDIATE SEPARATORS

4.1. MAINTENANCE

Apart from the regular condensate drain the intermediate separators are maintenance-free.

4.1.1. Condensate drain

Drain condensate every 15 to 30 minutes from these separators or ensure that the automatic condensate drain unit drains regularly. See chapter 10.

5. FINAL SEPARATOR / FILTER SYSTEM

5.1. OIL AND WATER SEPARATOR

5.1.1. Lifetime

The oil and water separator is subject to dynamic load. It is designed to withstand a certain no. of load cycles. (1 load cycle = 1 pressurization, 1 depressurization) at the specified pressure range. The oil and water separator must be replaced when the maximum permissible no. of load cycles has been reached. Refer to the pressure vessel operating manual delivered with the unit.

The cycles are counted by the cycle counter of the compressor control unit. Refer to chapter A-11. After the max. number of load cycles have been reached, the separator must be exchanged.

5.1.2. Sintered metal element

The sintered filter micro-cartridge requires periodic maintenance. For maintenance intervals see section D-1.

- Remove tube connected to non-return valve (2, Fig. 53).
- Screw off filter head (3) and remove.
- Unscrew micro-cartridge (1) from filter head (3).
- Remove centre-screw (4) to remove filter elements.

Clean sintered filter elements using hot soapy water and blow dry with clean compressed air.

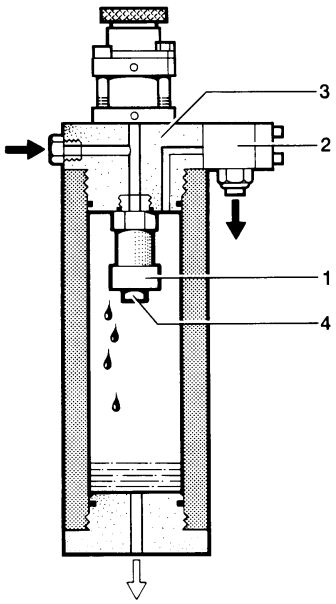


Fig. 53 Oil and water separator, 420 bar

5.1.3. Condensate drain

The condensate produced by the re-cooling after the compression process has to be drained regularly by means of the manual condensate drain valves

- before start-up of the compressor unit
- during operation every 30 minutes, at high humidity every 15 minutes.

For units equipped with an automatic condensate drain system refer to chapter D-10.

5.2. PURIFIER

5.2.1. General instructions

- **Depressurize** system before starting any maintenance work. The filter line can be vented manually with the venting valve, wait until the pressure gauge reads zero.
- **Dry** inside of filter housing with a clean cloth before installing new cartridge and check for corrosion.
- **Lubricate** threads and O-rings as well as end of cartridge with both o-rings with white petrolatum. Apply sparingly.
- **Observe** number of operating hours as indicated on hour meter to ensure exact attention to the maintenance intervals.
- **Change** cartridge before reactivating a compressor unit which has been out of service for more than 6 months.
- **Leave** cartridge in the filter as long as unit is out of service.
- **Keep** all condensate drain valves and shut-off valves closed. Keep a minimum pressure of approx. 50 to 80 bar (700 to 1,100 psig) within the system to prevent moisture entering the compressor piping and filter system.

5.2.2. Cartridge change

- unscrew nut and pull off **SECURUS** cable plug.
- Unscrew the filter head (1) with the special spanner (2) supplied with the unit.
- Pull out used cartridge by means of its clip (3).
- Remove new cartridge from packing and protective caps from both ends of cartridge.
- Insert new cartridge into housing and push down firmly.
- Replace filter head, screw in by hand and tighten with the special spanner.

5.2.3. Filter replacement intervals

The number of operating hours or the amount of possible bottle fillings per filter cartridge can be determined by the tables on the next pages aking into consideration the ambient temperature and the cartridge used.

On filter systems with SECURUS monitoring system the saturation of the cartridge is indicated by LED's at the monitor display.

These tables contain calculated cartridge lifetime data, that refer to defined and constant operating conditions. Tolerances at bottle fillings and different operating temperatures can lead to considerable divergences compared to data given, which therefore can only serve as reference values for the user.

The used cartridge must be disposed of according to local regulations.

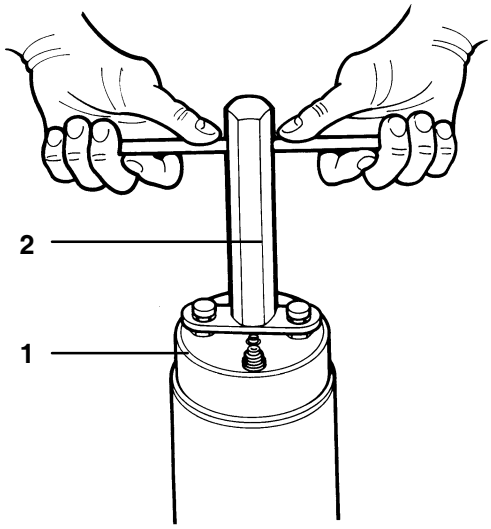


Fig. 54 Removing the filter head

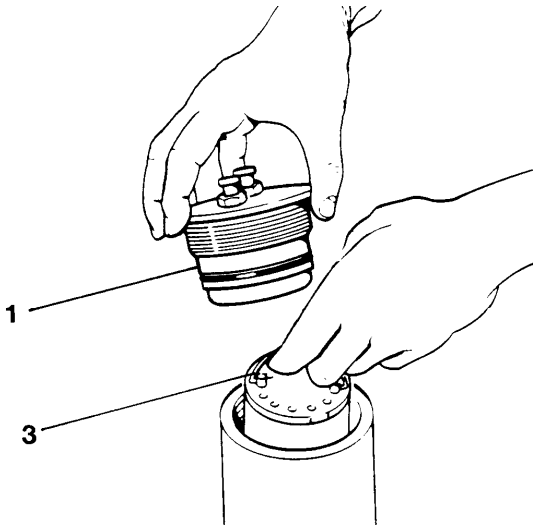


Fig. 55 Extracting the cartridge

1. Filter system P41; Filter cartridge 062565: Filter cartridge lifetime [hours]				
Filling pressure p = 200 bar		DeliveryQ [l/min]		
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	320	500	680
10	20 - 24	97-77	62-49	46-36
15	25 - 29	73-59	47-37	34-28
20	30 - 34	55-45	35-29	26-21
25	35 - 39	43-35	27-22	20-16
30	40 - 44	33-27	21-17	15-13
35	45 - 49	26-21	16-14	12-10
40	50 - 54	20-17	13-11	10-8
Filling pressure p = 300 bar		DeliveryQ [l/min]		
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	320	500	680
10	20 - 24	146-116	93-74	69-55
15	25 - 29	110-88	70-56	52-41
20	30 - 34	83-67	53-43	39-32
25	35 - 39	64-52	41-33	30-24
30	40 - 44	49-41	32-26	23-19
35	45 - 49	39-32	25-20	18-15
40	50 - 54	30-25	19-16	14-12

Filter cartridge 062565: Bottle fillings [number] mass of molecular sieve mMS [g] = 674							
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Moisture content of air, 100% satured X [g/m³]	Volume of processed air Va [m³] at pressure p [bar]		Number of bottle fillings n and bottle size		
			200	300	7 l	10 l	12 l
10	20 - 24	17,31-21,80	1869-1484	2804-2227	1335-1060	935-742	779-619
15	25 - 29	23,07-28,79	1403-1124	2104-1686	1002-803	701-562	584-468
20	30 - 34	30,4-37,63	1064-860	1597-1290	760-614	532-430	444-358
25	35 - 39	39,65-48,64	816-665	1224-998	583-475	408-333	340-277
30	40 - 44	51,21-62,41	632-519	948-778	451-370	316-259	263-216
35	45 - 49	65,52-79,28	494-408	741-612	353-292	247-204	206-170
40	50 - 54	83,08-99,85	390-324	584-486	278-231	195-162	162-135

Bottle filling volume VF [m³]		
Bottle size	at pressure p [bar]	
l [ltr.]	200	300
7	1,4	2,1
10	2	3
12	2,4	3,6

Number of bottle fillings n=
processed volume of air / bottle filling volume = Va / VF

Bottle filling volume: VF [m³] = p [bar] x l [l] / 1000 [l/m³]

Volume of air wich can be processed: Va [m³] = 0,2 x mMS [g] / (X [g/m³] / p [bar]) = 0,2 x p [bar] x mMS [g] / X [g/m³]

Lifetime of filter cartridge: tp [h] = Va [m³] / (Q [m³/min] x 60 [min/h])

2. Filter system P41; Filter cartridge 067224:: Filter cartridge lifetime [hours]				
Filling pressure p = 200 bar		DeliveryQ [l/min]		
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	320	500	680
10	20 - 24	81-64	52-41	38-30
15	25 - 29	61-49	39-31	29-23
20	30 - 34	46-37	30-24	22-18
25	35 - 39	35-29	23-18	17-14
30	40 - 44	27-22	18-14	13-11
35	45 - 49	21-18	14-11	10-8
40	50 - 54	17-14	11-9	8-7
Filling pressure p = 300 bar		DeliveryQ [l/min]		
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	320	500	680
10	20 - 24	122-97	78-62	57-45
15	25 - 29	91-73	58-47	43-34
20	30 - 34	69-56	44-36	33-26
25	35 - 39	53-43	34-28	25-20
30	40 - 44	41-34	26-22	19-16
35	45 - 49	32-27	21-17	15-13
40	50 - 54	25-21	16-14	12-10

Filter cartridge 067224: Bottle fillings [number] mass of molecular sieve mMS [g] = 1130							
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Moisture content of air, 100% satured X [g/m³]	Volume of processed air Va [m³] at pressure p [bar]		Number of bottle fillings n and bottle size		
			200	300	7 l	10 l	12 l
10	20 - 24	17,31-21,80	1557-1237	2336-1855	1112-883	779-618	649-515
15	25 - 29	23,07-28,79	1169-936	1753-1405	835-669	584-468	487-390
20	30 - 34	30,4-37,63	887-716	1330-1075	633-512	443-358	370-299
25	35 - 39	39,65-48,64	680-554	1020-831	486-396	340-277	283-231
30	40 - 44	51,21-62,41	526-432	790-648	376-309	263-216	219-180
35	45 - 49	65,52-79,28	411-340	617-510	294-243	206-170	171-142
40	50 - 54	83,08-99,85	325-270	487-405	232-193	162-135	135-113

Bottle filling volume VF [m³]		
Bottle size	at pressure p [bar]	
l [ltr.]	200	300
7	1,4	2,1
10	2	3
12	2,4	3,6

Number of bottle fillings n=
processed volume of air / bottle filling volume = Va / VF

Bottle filling volume: VF [m³] = p [bar] x l [l] / 1000 [l/m³]

Volume of air wich can be processed: Va [m³] = 0,2 x mMS [g] / (X [g/m³] / p [bar]) = 0,2 x p [bar] x mMS [g] / X [g/m³]

Lifetime of filter cartridge: tp [h] = Va [m³] / (Q [m³/min] x 60 [min/h])

3. Filter system P61; Filter cartridge 058826: Filter cartridge lifetime [hours]				
Filling pressure p = 200 bar		DeliveryQ [l/min]		
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	320	500	680
10	20 - 24	153-122	94-75	72-57
15	25 - 29	115-92	71-57	54-43
20	30 - 34	87-71	54-43	41-33
25	35 - 39	67-55	41-34	32-26
30	40 - 44	52-43	32-26	24-20
35	45 - 49	41-33	25-21	19-16
40	50 - 54	32-27	20-16	15-13
Filling pressure p = 300 bar		DeliveryQ [l/min]		
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	320	500	680
10	20 - 24	230-183	142-112	108-86
15	25 - 29	173-138	106-85	81-65
20	30 - 34	131-106	81-65	62-50
25	35 - 39	100-82	62-50	47-39
30	40 - 44	78-64	48-39	37-30
35	45 - 49	61-50	37-31	29-24
40	50 - 54	48-40	29-25	23-19

Filter cartridge 058826: Bottle fillings [number] mass of molecular sieve mMS [g] = 674							
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Moisture content of air, 100% satured X [g/m³]	Volume of processed air Va [m³] at pressure p [bar]		Number of bottle fillings n and bottle size		
			200	300	7 l	10 l	12 l
10	20 - 24	17,31 - 21,80	2944 - 2338	4416 - 3506	2103 - 1670	1472 - 1169	1227 - 974
15	25 - 29	23,07 - 28,79	2209 - 1770	3313 - 2655	1578 - 1264	1104 - 885	920 - 738
20	30 - 34	30,40 - 37,63	1676 - 1354	2514 - 1031	1197 - 967	838 - 677	698 - 564
25	35 - 39	39,65 - 48,64	1285 - 1048	1928 - 1572	918 - 748	643 - 524	536 - 437
30	40 - 44	51,21 - 62,41	995 - 817	1493 - 1225	711 - 583	498 - 408	415 - 430
35	45 - 49	65,52 - 79,28	778 - 643	1167 - 964	556 - 459	389 - 321	324 - 268
40	50 - 54	83,08 - 99,85	613 - 510	920 - 766	438 - 365	307 - 255	256 - 213

Bottle filling volume VF [m³]		
Bottle size	at pressure p [bar]	
l [ltr.]	200	300
7	1,4	2,1
10	2	3
12	2,4	3,6

Number of bottle fillings n=
processed volume of air / bottle filling volume = Va / VF

Bottle filling volume: VF [m³] = p [bar] x l [l] / 1000 [l/m³]

Volume of air wich can be processed: Va [m³] = 0,2 x mMS [g] / (X [g/m³] / p [bar]) = 0,2 x p [bar] x mMS [g] / X [g/m³]

Lifetime of filter cartridge: tp [h] = Va [m³] / (Q [m³/min] x 60 [min/h])

4. Filter system P61; Filter cartridge 058827: Filter cartridge lifetime [hours]				
Filling pressure p = 200 bar		DeliveryQ [l/min]		
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	320	500	680
10	20 - 24	136-108	84-66	64-51
15	25 - 29	102-82	63-50	48-38
20	30 - 34	77-63	48-38	36-29
25	35 - 39	59-48	37-30	28-23
30	40 - 44	46-38	28-23	22-18
35	45 - 49	36-30	22-18	17-14
40	50 - 54	28-24	17-15	13-11
Filling pressure p = 300 bar		DeliveryQ [l/min]		
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	320	500	680
10	20 - 24	204-162	126-100	96-76
15	25 - 29	153-123	94-75	72-58
20	30 - 34	116-94	71-58	55-44
25	35 - 39	89-73	55-45	42-34
30	40 - 44	69-57	42-35	32-27
35	45 - 49	54-45	33-27	25-21
40	50 - 54	43-35	26-22	20-17

Filter cartridge 058827: Bottle fillings [number] mass of molecular sieve mMS [g] = 674							
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Moisture content of air, 100% satured X [g/m³]	Volume of processed air Va [m³] at pressure p [bar]		Number of bottle fillings n and bottle size		
			200	300	7 l	10 l	12 l
10	20 - 24	17,31 - 21,80	2611 - 2073	3917 - 3110	1865 - 1481	1306 - 1037	1088 - 864
15	25 - 29	23,07 - 28,79	1959 - 1570	2939 - 2355	1399 - 1121	980 - 785	816 - 654
20	30 - 34	30,40 - 37,63	1487 - 1201	2230 - 1802	1062 - 858	743 - 601	620 - 500
25	35 - 39	39,65 - 48,64	1140 - 929	1710 - 1394	814 - 664	570 - 465	475 - 387
30	40 - 44	51,21 - 62,41	883 - 724	1324 - 1086	630 - 517	441 - 362	368 - 302
35	45 - 49	65,52 - 79,28	690 - 570	1035 - 855	493 - 407	345 - 285	287 - 238
40	50 - 54	83,08 - 99,85	544 - 453	816 - 679	389 - 323	272 - 226	227 - 189

Bottle filling volume VF [m³]		
Bottle size	at pressure p [bar]	
l [ltr.]	200	300
7	1,4	2,1
10	2	3
12	2,4	3,6

Number of bottle fillings n=
processed volume of air / bottle filling volume = Va / VF

Bottle filling volume: VF [m³] = p [bar] x l [l] / 1000 [l/m³]

Volume of air wich can be processed: Va [m³] = 0,2 x mMS [g] / (X [g/m³] / p [bar]) = 0,2 x p [bar] x mMS [g] / X [g/m³]

Lifetime of filter cartridge: tp [h] = Va [m³] / (Q [m³/min] x 60 [min/h])

6. PRESSURE MAINTAINING / NON-RETURN VALVE

6.1. COMPRESSORS UP TO 330 BAR

For pressure setting see chapter A-6.

The pressure maintaining valve is adjusted at the factory to the required pressure and normally does not require regular maintenance or readjustment. In case of readjustment becoming necessary, loosen jam nut (2, Fig. 56) and set screw (3). Adjust screw (1) to the required pressure using a suitable screwdriver.
Clockwise = increase pressure
Counter-clockwise = decrease pressure

6.2. COMPRESSORS UP TO 420 BAR

For pressure setting see chapter A-6.

For adjustment of this valve, see Fig. 57.

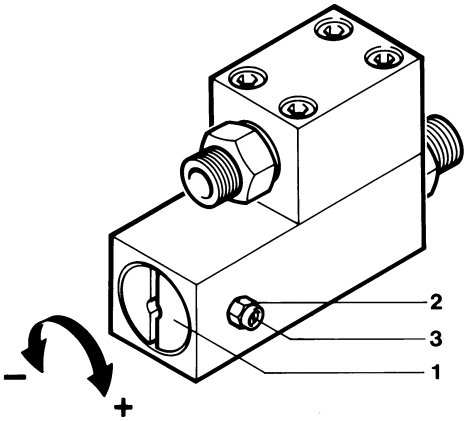


Fig. 56 Pressure maintaining/non-return valve 350 bar

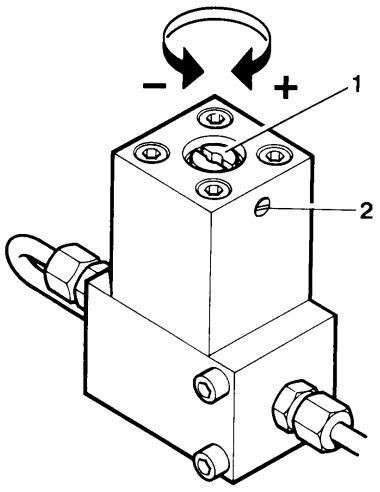


Fig. 57 Pressure maintaining/non-return valve 420 bar

7. SAFETY VALVES

7.1. OPERATING CHECK

The final pressure safety valve has to be checked regularly. See chapter D-1. For this purpose the safety valve can be vented manually. This just ensures that the valve works and will release pressure in case of a malfunction. To check the blow-off pressure value refer to 7.2.

7.1.1. 225 and 330 bar compressor units

The safety valve is mounted on top of the final separator. Turn knurled knob on top of the valve clockwise until valve blows off (Fig. 58).

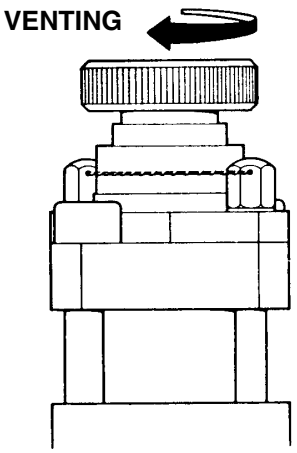


Fig. 58 Final pressure safety valve, 225 and 330 bar

7.1.2. 420 bar compressor units

The safety valve is mounted on a block next to the final separator. On this valve, lift the lever until valve blows off (Fig. 59). We recommend that a final pressure setting of 80 % should not be exceeded, to avoid damaging the safety valve.

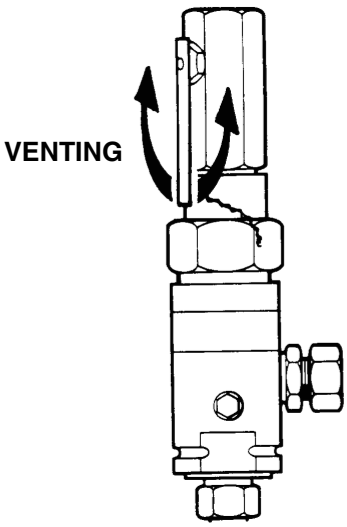


Fig. 59 Safety valve, 420 bar

7.2. BLOW-OFF PRESSURE CHECK

Check blow-off pressure of the final pressure safety valve regularly, see maintenance schedule chapter D-1. Pump unit to final pressure with shut-off valve closed until safety valve blows off. Check blow-off pressure of safety valve at pressure gauge.

Before starting the test, override final pressure switch by setting service switch S3 on position 1" (test). Refer to chapter A-11.

8. PRESSURE GAUGES

If the values listed in section A are exceeded and the safety valve of the corresponding stage blows off, this is an indication that the downstream compressor stage is not working properly. See section A-9.

We recommend that pressure gauges are checked from time to time. For this purpose we have developed a special test pressure gauge with an adaptor which immediately recognizes any deviations in readings.

See High Pressure Accessories Catalogue no. 8550/7.92.

Slight deviations during operation are normal and can be ignored. Excessive inaccuracy will require the pressure gauge to be replaced.

9. VALVES

9.1. GENERAL INSTRUCTIONS FOR CHANGING THE VALVES

- **Always replace** valves as a complete set.
- **Carefully clean** dirty valves. Never use a sharp tool for this purpose. Soak the valves in diesel oil or petroleum and clean with soft brush.
- **Lubricate** valves before installing with Weicon AS 040, order no. N19753, or equivalent.
- **Check** individual components for excessive wear. If the valve seat and valve disks are dented, replace the valves.
- **Valve head screws** must be tightened with a torque wrench (see tightening torque values chapter 17.).
- **Check** the valve space in the valve heads for dirt and clean, if necessary.
- **Use only** satisfactory gaskets and O-rings on reassembly.
- **Observe** the correct sequence when fitting together again.
- **After finishing** all maintenance work on the valves, turn the compressor manually using the flywheel and check whether all items have been correctly installed.
- **30 minutes after restarting** the compressor unit stop unit, let it cool down to ambient temperature and retighten valve studs and cap nuts. Otherwise valves could work loose due to setting of the gaskets.

9.2. CHANGING THE VALVES

9.3. VALVE CHANGE

Changing the valves should be performed by trained personnel, only.

Valve change is described in the workshop manual which is available through the **BAUER** technical service.

10. AUTOMATIC CONDENSATE DRAIN

10.1. GENERAL

Due care must be taken to ensure that any oil which may be drained with the condensate will not pollute the environment. For example, the drain pipe can be directed into a collecting vessel or into drain facilities incorporating oil separators.

Dispose of the condensate according to local regulations!

10.2. MAINTENANCE

The condensate drain valves for the intermediate separators and for the oil and water separator are provided with manual drain valves to check correct operation of the automatic system.

The automatic condensate drain system must be serviced as follows:

- Open all manual drain valves on the separators one after the other, once a week.

This must be carried out immediately after the automatic system has drained the condensate. Observe the drainage of condensate when opening the manual drain valves. If the system drains a lot of condensate this is a sign that the system or the corresponding condensate drain valves are not working properly. Find the fault and remedy accordingly. If hardly any condensate emerges, the automatic system is operating properly. For fault correction, see section D-16. Troubleshooting".

10.3. ACTIVATED CHARCOAL ELEMENT MAINTENANCE

Replace or clean and refill the charcoal filter of the condensate collecting tank according to maintenance schedule in D.1.

Item	Part no.	Qty. rq'd
Filter assy	075562	1
Activated charcoal	N65	185 g
Fleece	75654	5

10.4. ACTIVATED CHARCOAL MAINTENANCE

(Units with 40 ltrs. condensate collector, only)

Replace the activated charcoal in the condensate collecting tank according to maintenance schedule in D.1.

Item	Part no.	Qty. rq'd
Activated charcoal	N65	3700 g
Fleece	72207	4

10.5. FLOAT SWITCH MAINTENANCE

(40 ltrs. condensate collector, only)

The float switch should be cleaned at regular intervals to prevent sticking of the switch due to oil residues.

11. ELECTRICAL SYSTEM

11.1. DRIVE MOTOR

The compressor unit is driven by an electric motor by means of V-belts. Check the V-belts regularly for tension and wear. See sections D-1 and D-12.

Except for external cleaning, the drive motor requires no servicing. The motor bearings may need lubricating, depending on the model. Please observe the instructions written on the motor.

11.2. ELECTRIC CONTROL

On compressor units with factory-installed electric compressor control system, check all screw-type teminals regularly, at least annually, especially the power relay terminals.

All spring-loaded terminals are maintenance-free.

Besides that, the operator is responsible to ensure that all required safety checks acc. to BGV and DIN VDE are carried out.

11.3. ADJUSTMENT OF FINAL PRESSURE SWITCH

The pressure switch is adjusted to the required pressure acc. to order. If readjustment is necessary, open cover (2, Fig. 60) and adjust screw (1) with a 6 mm allen key to the required pressure.

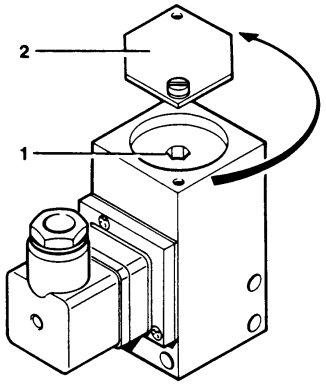


Fig. 60 Final pressure switch

12. COMPRESSOR DRIVE SYSTEM

12.1. ELECTRIC DRIVE MOTOR

The drive motor normally needs no servicing except outer cleaning from time to time. Depending on manufacturer and model, greasing of the bearings may be necessary. Observe respective notes on the motor.

12.2. V-BELTS

V-belt tension is adjusted automatically by the weight of the motor. The motor is mounted on a hinged motor plate.

- Check the V-belt regularly for damage and wear (see section D-1)
- Replace if necessary. If more than one V-belt is installed, always replace the complete set.

13. MAINTENANCE ON FILLING VALVES

Maintenance work on the filling panels includes merely cleaning and changing the filling valves as well as checking the safety valves.

Only carry out maintenance work on filling valves when the filling panel is depressurized.

Switch off the compressor and open filling valves. Then dismantle the filling valves.

13.1. CLEANING / CHANGING THE FILTER

See Fig. 61.

The sintered metal filter (1) is situated in the lower part of the filling valves. It separates small particles from the compressed air. We recommend that you clean it regularly. To do so, unscrew T connection on the filling valve. Remove sintered

metal filter with a screwdriver and clean filter in warm soapy water. Dry the filter and replace it. Tighten properly with the screwdriver. Replace the sintered metal filter if there are signs of damage.

13.2. REPLACING DAMAGED COMPONENTS

Certain components, such as piston and gaskets, can become dented during operation. In this case, they must be replaced.

- First of all remove the lower part from the upper part of the filling valve (unscrew).
- Remove and replace the sealing cone (3) in the lower part. Then remove and replace O-ring (4), valve seat (5) and piston (8) in the upper part. Ensure parts are correctly replaced.

Before mounting the piston (8), fill the groove between the two o-rings (7) with a special grease. Mount piston from the top.

- Screw the lower part of the filling valve onto the upper part, tighten properly.
- Control and, if necessary, change o-rings.

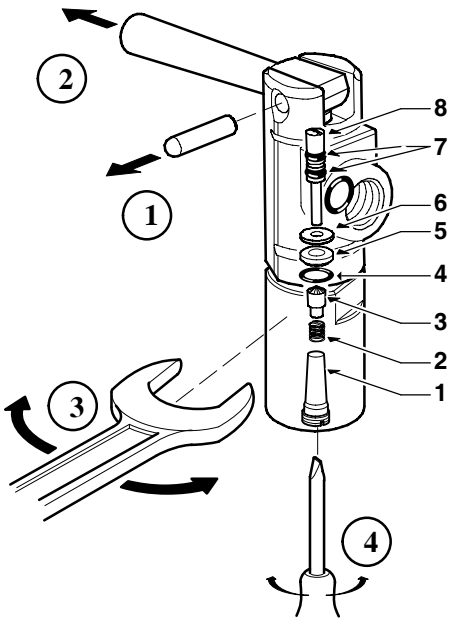


Fig. 61 Filling valve on external filling panel

14. MAINTENANCE OF STORAGE BOTTLES

14.1. LIFETIME

The storage bottles are subject to dynamic load.They are designed to withstand a certain no. of load cycles. (1 load cycle = 1 pressurization, 1 depressurization.) The storage bottles must be replaced when the maximum permissible no. of load cycles has been reached. Determine the number of cycles from the table below.

Pressure range	max. no. of load cycles
360 - 0 - 360	1.900
360 - 50 - 360	3.600
360 - 80 - 360	5.500
360 - 100 - 360	7.500
360 - 150 - 360	18.500
360 - 200 - 360	58.200
360 - 250 - 360	280.800
360 - 294 - 360	2,4 mio. (i.e. unlimited)

14.2. INSPECTIONS

The storage bottles have to be maintained at regular intervals. This results in inner inspections every 5 years, pressure tests every 10 years and outer inspections every 2 years, which have to be performed by the local authorities.

14.3. CONDENSATE DRAIN

Drain condensate at a regular basis. The amount of condensate depends on the condition of compressed medium, on the flow rate as well as on the ambient temperature, and should be determined individually for every single application.

15. REPAIR INSTRUCTIONS

Preventive maintenance usually involves replacing the valves, gaskets and sealing rings as well as carrying out the maintenance work according to the maintenance schedule in chapter D.1.

All further maintenance and repair work not contained in this manual have to be performed by an authorized technical service. It is particularly pointed out that

- **no repair should be carried out on the crankdrive nor on the bearings**
- **safety valves are not repaired but always replaced completely.**

16. TROUBLE-SHOOTING

Trouble	Cause	Remedy
Drive Motor (electric)		
Motor will not start	Electric circuitry faulty	Before attempting to make any repairs, check all fuses, terminal connections, wire leads, make sure that motor data complies with mains supply
Compressor Block		
No oil pressure	Air trapped in oil pump	Vent pump and line see D-2.
Compressor does not attain final pressure	Condensate drain valve(s) and/or fittings leaking	Tighten and reseal
	Premature opening of final safety valve	Clean final safety valve and readjust
	Piston rings worn	Replace
	Excessive piston clearance	Replace
Compressor output insufficient	Pipes leaking	Re-tighten
Safety valves between individual stages releasing pressure	Intermediate pressure too high	Check valves - see D-9. - Service and clean valves
	Valves not closing properly	
Compressor running too hot	Insufficient supply of fresh cooling air	Check location max. ambient temperature + 45 °C (110 °F)
	Intake or outlet valves not closing properly	Check and clean valves, replace as necessary
	Wrong direction of rotation	See arrow on compressor and remedy accordingly
Oil residue in delivered air	Improper maintenance of filters, filter cartridge saturated	Remedy filters, change filter cartridges
	Wrong oil type	Use correct oil (see oil list) and clean sooted valves

Trouble	Cause	Remedy
Electric Control System		
Control does not switch on	No control voltage	Check feed line
	Control fuse defective	Replace fuse, eliminate cause
	Control current line cut off, line or terminal loose	Tighten terminal
	Thermal overload triggered	Clear faults as described in the following
Thermal overload relay for drive motor triggered	Current consumption too high	Check compressor drive
	Overload relay set too low	Correct setting
Control does not switch off, final pressure safety valve blows off	Final pressure switch set too high	Correct setting
	Final pressure safety valve defective	Replace safety valve
Automatic Condensate Drain		
Drain valves do not close	No control air	Check control air line
	Drain valves leaking	Dismantle drain valve and clean
Drain valves do not open	Condensate drain valve piston jammed	Dismantle drain valve, clean or replace valve
Solenoid valve does not close	Solenoid valve faulty	Check solenoid valve and replace if necessary
	No electrical signal	Check for voltage from timer
Solenoid valve does not open	Solenoid valve faulty	Check solenoid valve and replace if necessary
	Continuous electrical signal	Check electrical control circuit and timer
Unsatisfactory drainage (lot of condensate from manual valves)	Nozzles in 3rd and 4th stage drain valves clogged	Remove nozzles, clean

17. TABLES

17.1. TIGHTENING TORQUE VALUES

Unless otherwise specified in text, the following torque values apply. All valve head screws require torque wrench tightening! The indicated torque values are valid for bolts in greased condition. Replace self-retaining nuts on reassembly.

Bolt or screw	Thread	Max. torque
Hex and allen head	M 6	10 Nm (7 ft.lbs)
Hex and allen head	M 8*	25 Nm* (18 ft.lbs)
Hex and allen head	M 10	45 Nm (32 ft.lbs)
Hex and allen head	M 12	75 Nm (53 ft.lbs)
Hex and allen head	M 14	120 Nm (85 ft.lbs)
Hex and allen head	M 16	200 Nm (141 ft.lbs)
Pipe connections (swivel nuts):		Finger-tight + 1/2 turn

17.2. TORQUE SEQUENCE

Tighten valve head and cylinder bolts/nuts equally in the sequence shown in Fig. 62.

Be sure to tighten all parts in **cold** condition only.

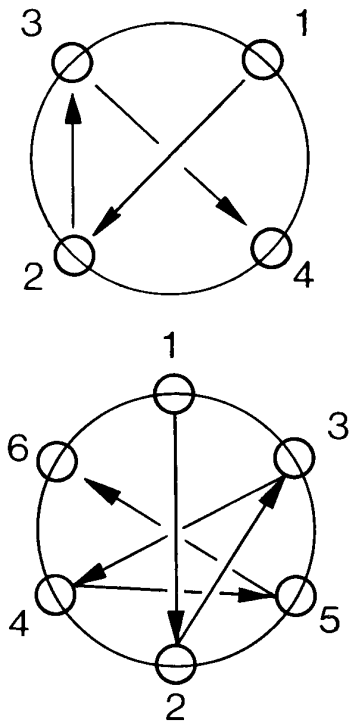


Fig. 62 Torque sequence

* Exception: mounting bolts of final pressure safety valve: 10 Nm

17.3. LUBRICATION CHART

Usage	Lubricants
Rubber and plastic parts, filter housing threads	WEICON WP 300 WHITE part no. N19752 or BAUER special lubricant P/N 072500
Sealing rings	BAUER special lubricant P/N 072500
Shaft seal (seal) Shaft seal (shaft)	BAUER special lubricant P/N 072500 Klüber SK 01-205
Screws, bolts, threads	WEICON ANTI-SEIZE AS 040 P part no. N19753 or equivalent compound with copper or MoS_2 additives

For all lubricating oils refer to chapter 2 or lubricating oil list available through **BAUER** Service Department.

17.4. ADHESIVE AND SEALANT CHART

Usage	Adhesives and Sealants
Screws, Studs	Loctite 2701
Seal for conical threads	Loctite 243
Metal - metal seals High temperature connections, e.g. valve heads, cylinders	Temperature resistant compound, e.g. WACKER E10, part no. N18247
Paper gaskets	Loctite FAG 2

17.5. TESTING AGENTS

Usage	Testing agents
Tube connectors, tubes	Leakage test spray, part no. FM0089

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E. STORAGE, PRESERVATION

1. GENERAL

If the compressor is put out of service for more than six months, the unit should be preserved in accordance with the following instructions:

Make sure the compressor is kept indoors in a dry, dust free room. Only cover the compressor with plastic if it is certain that no condensation will form under the sheet. Nevertheless, the sheet should be removed from time to time and the unit cleaned on the outside.

If this procedure cannot be followed and/or the compressor is going to be taken out of service for more than 2 years, please contact our Technical Service Department for special instructions.

2. PREPARATION

Before preserving the compressor unit, run it warm and when it reaches the specified service pressure, keep it running for approx. 10 minutes.

Then carry out the following:

- Check all pipes, filters and valves (also safety valves) for leakage.
- Tighten all couplings, as required.
- After 10 minutes, open the filling valves or the outlet valve and run the compressor at the set minimum pressure (pressure maintaining valve, see chapter 6) for approx. 5 minutes.
- After these 5 minutes, shut the system down. Drain condensate from separators. Depressurize unit. Shut filling valves/outlet valve.
- Open filters and grease threads.

On units equipped with a filter system please observe the following:

- **Ensure that filter cartridges remain in filters!**
  This will prevent oil entering filling lines as a result of preservation procedures.
- Remove intake filter from manifold and all intake lines from valve heads.
- Let compressor unit cool down.

3. PRESERVING THE COMPRESSOR

- Turn the compressor on and spray a small amount (approx. 10 cm^3 of compressor oil into the valve head inlet port while the compressor is running. Do not let the compressor warm up too much, to keep oil sticky.
- Shut compressor unit off.
- Close all valves.
- Place the dust cap onto the inlet port.

4. PRESERVING THE MOTOR/ENGINE

Preserve the motor/engine according to the instructions of the motor/engine manufacturer.

5. PREVENTIVE MAINTENANCE DURING STORAGE

Run the compressor **once every 6 months** as described in the following:

- Remove the dust cap from the inlet port and insert the intake filter.
- Open the filling valves or the outlet valve and let the unit run for approx. 10 minutes or until the pressure gauges indicate the correct values.
- Stop the compressor.
- Open condensate drain valves and release compressed air. Close condensate drain valves again.
- Carry out preservation procedure according to para.3.

5.1. CHANGING THE LUBE OIL FOR PRESERVING

- After prolonged storage, the oil will age in the compressor and engine. It should be drained after **2 years** at the latest and replaced with fresh oil.
- The stated period can only be attained when the crankcase is sealed during the preservation period in accordance with the preservation requirements.
- After changing the oil, turn the compressor and the engine or run them for the required period. See paras. 3. and 4.
- Check the lubrication of the compressor when putting the unit into operation once every six months or when turning the compressor.

The oil pump is functioning properly when oil can be seen flowing through the sight glass of the oil pressure regulator and if the oil pressure gauge indicates the prescribed pressure.

6. REACTIVATING THE COMPRESSOR UNIT

- Remove the dust cap from the inlet port and insert the intake filter.
- Check the oil level of the compressor.
- Check the motor/engine according to the manufacturer's instructions.
- Only applicable for units equipped with a filter system: open the purifier and change all filter cartridges.
- Run the compressor warm with open filling valves or outlet valve for approx. 10 minutes.
- Check the oil pressure on the pressure gauge or the oil flow in the sight glass. If there is any fault, check the lubrication of the compressor.

- After 10 minutes, close the filling valves or the outlet valve and run the unit up to final pressure until the final pressure safety valve blows. To do so, override the pressure switch by setting service switch S3 on position ⍰1" (test). Refer to chapter A.11.
- Check the inter-pressure safety valves for leakage.
- Establish cause of any fault from the trouble-shooting table, section D-16., and remedy.
- Stop the system when running properly, the compressor is then ready for operation.

7. TRANSPORTATION

- Packing and/or receptacle must be easy to handle and in such a condition as to protect their content during transportation.
- Loose parts as tools and accessories have to be packed in a suitable individual packing.
- Moving parts have to be fixed at the unit.
- Electric and electronic parts and their connections have to be protected against humidity and mechancial damage.

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F. DIAGRAMS, DRAWINGS

1. FLOW DIAGRAMS

Flow diagrams	No.
Flow diagram	acc. to order
Schematic parts list, valid for all flow diagrams	76360

2. SCHEMATIC DIAGRAMS

Schematic diagram	Dwg.-No.
Schematic diagrams	according to order
Electric parts list, valid for all schematic diagrams	76360

3. DRAWINGS

Drawing	No.
Compressor units with open housing	123646
Compressor units with Super-Silent housing	123645

4. LISTS

List	No.
Lubricating oil list, English	70851

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G. PARTS LISTS

1. COMPRESSOR UNITS UP TO 330 BAR

1.1. COMPRESSOR UNITS PE 320-VE

Applicable spare parts lists:	Code
Verticus 5 compressor units	TPEV-2/0
Compressor block	A17.6
Filter system	B33.1
Automatic condensate drain unit	C60.2-E
Frame and panelling	E26.3-E
Drive system	F14.3-E
Compressor control system	G59.2-E
Accessories[a)] :	
Storage batteries	G7
Filling panels	G14
40 l. condensate collector	G44
Intake system	G60.1-A

1.2. COMPRESSOR UNITS PE 500-VE

Applicable spare parts lists:	Code
Verticus 5 compressor units	TPEV-2/0
Compressor block	A3.11
Filter system	B33.1
Automatic condensate drain unit K150, K180	C60.2-E
Frame and panelling	E26.3-E
Drive system	F14.3-E
Compressor control system	G59.2-E
Accessories[a)] :	
Storage batteries	G7
Filling panels	G14
40 l. condensate collector	G44
Intake system	G60.1-A

a) According to order

1.3. COMPRESSOR UNITS PE 680-VE

Applicable spare parts lists:	Code
Verticus 5 compressor units	TPEV-2/0
Compressor block	A15.6
Filter system	B33.1
Automatic condensate drain unit K150, K180	C60.2-E
Frame and panelling	E26.3-E
Drive system	F14.3-E
Compressor control system	G59.2-E
Accessories[a] :	
Storage batteries	G7
Filling panels	G14
40 l. condensate collector	G44
Intake system	G60.1-A

2. COMPRESSOR UNITS UP TO 420 BAR

2.1. COMPRESSOR UNITS PE 320-VE-420

Applicable spare parts lists:	Code
Verticus 5 compressor units	TPEV-2/0
Compressor block	A17.6
Filter system	B33.1
Automatic condensate drain unit	C60.2-E
Frame and panelling	E26.3-E
Drive system	F14.3-E
Compressor control system	G59.2-E
Accessories[a] :	
Storage batteries	G7
Filling panels	G14
40 l. condensate collector	G44
Intake system	G60.1-A

a) According to order

2.2. COMPRESSOR UNITS PE 500-VE-420

Applicable spare parts lists:	Code
Verticus 5 compressor units	TPEV-2/0
Compressor block	A15.6
Filter system	B33.1
Automatic condensate drain unit K150, K180	C60.2-E
Frame and panelling	E26.3-E
Drive system	F14.3-E
Compressor control system	G59.2-E
Accessories[a)] :	
Storage batteries	G7
Filling panels	G14
40 l. condensate collector	G44
Intake system	G60.1-A

2.3. COMPRESSOR UNITS PE 600-VE-420

Applicable spare parts lists:	Code
Verticus 5 compressor units	TPEV-2/0
Compressor block	A15.6
Filter system	B33.1
Automatic condensate drain unit K150, K180	C60.2-E
Frame and panelling	E26.3-E
Drive system	F14.3-E
Compressor control system	G59.2-E
Accessories[a)] :	
Storage batteries	G7
Filling panels	G14
40 l. condensate collector	G44
Intake system	G60.1-A

Oil list • Breathing air compressors

GENERAL

After extensive tests with many different kinds of lubricants, we have decided to authorize the following brands of oil for use in **BAUER** compressors under the given operating conditions.

This list is up to date at the time of printing and will be reviewed continuously. Should your list or your instruction manual be older, please request the latest edition from **BAUER** Customer Services. When using any of the oils listed below, please follow the oil change intervals and the oil filling level described for the equivalent **BAUER** compressor oil in the instruction manual of your unit.

Oil type			Use		Ambient temperature
Brand name	**Designation**	**Type**	**A** **Breathing air**	**N** **Nitrox**	**+5 ...+45 °C**
BAUER KOMPRESSOREN	**Special Compressor oil Part no. N28355** **b) c)**	**S**	**+**	**+**	**+**
BAUER KOMPRESSOREN	**Special Compressor oil Part no. N22138** **a)**	**M**	**+**	**–**	**+**

Oil type

S	synthetic oil
M	mineral oil

Application

A	approved for breathing air application with **BAUER** air purification systems
N	approved for nitrox application (with **BAUER** membrane unit, only)
a)	oil change every 1000 operating hours
b)	oil change every 2000 operating hours
c)	oil change every 1000 operating hours in case of nitrox application

Suitability

+	= suitable
–	= not suitable

TYPE OF OIL

Due to the thermal load on the compressor only high quality oil should be used. You are recommended to restrict oils to those which have been approved by us and are listed in the instruction manual or in the lubricating list on page 1.

Our compressor units are delivered ex works with lubricating oil filled into the crankcase or as consignment, depending on the model, as follows:

Breathing air compressor units:	**BAUER Special Compressor oil, part no. N28355**
Nitrox compressor units:	**BAUER Special Compressor oil, part no. N28355**

For operation under difficult conditions, such as continuous running and/or high ambient temperatures, we only recommend the BAUER special synthetic compressor oils acc. to the list on the previous page. These have proved excellent quality under ambient temperatures between +5 °C and +45 °C. For lower temperatures a compressor heating device is required which is capable of pre−heating the unit up to +5 °C.

For operation under less severe conditions, and for intermittent operation, i.e. when the compressor is not used for longer periods between the operating periods, we also recommend the use of the mineral oil acc. to the list on the previous page. This oil is suitable for ambient temperatures between +5 °C and +45 °C. Here also, a pre−heating device will be required if ambient temperatures should fall below +5 °C.

Changing the Oil Type

To avoid severe damage to the compressor unit when changing to another oil type, the following measures should be strictly adhered to.

- Drain mineral oil while still warm.
- Check valves, coolers, separators, purifiers and all pneumatic tubes and hoses for deposits.

If deposits are present, perform the following steps:

- Remove deposits or change valves, coolers, separators, purifiers and all pneumatic tubes and hoses.
- Change oil filter, if applicable.
- Fill compressor with the new oil.
- After approx. 100 operating hours, replace oil filter again (if applicable). and change oil.
- Top up with same oil type.

OIL CHANGE

Mineral oil	every 1000 operating hours, at least annually
Synthetic oil	every 2000 operating hours, at least every two years
Oil change volume	see compressor unit operating manual

BAUER compressor oil is available in the following quantities:

Oil quantity ➧ Oil type ➧	**Synthetic oil N28355**	**Mineral oil N22138**
0.5 ltr. bottle	part no. N28355−0,5	part no. N22138−0,5
1 ltr. bottle	part no. N28355−1	part no. N22138−1
5 ltr. container	part no. N28355−5	part no. N22138−5
20 ltr. container	part no. N28355−20	part no. N22138−20