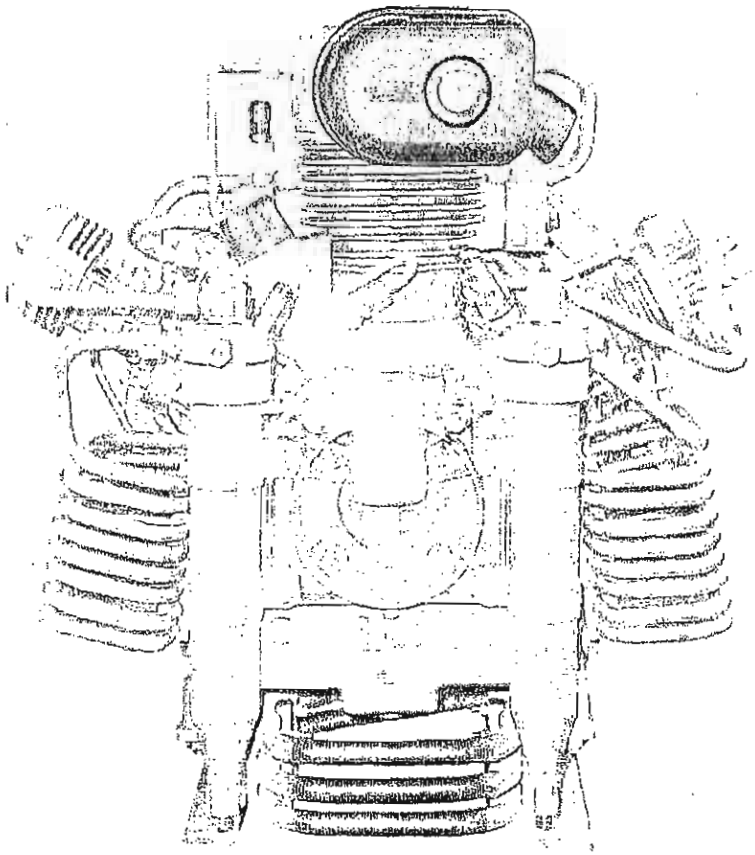
BAUER
POSEIDON
KOMPRESSOREN

INSTRUCTION MANUAL AND SPARE PARTS CATALOGUE

HIGH PRESSURE COMPRESSOR BLOCK

IK12.14 II (90 - 420 bar)



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INTRODUCTION

This manual contains operating instructions and maintenance schedules for the high pressure compressor block

IK12.14 II

manufactured by Bauer Kompressoren GmbH, Munich, Germany.

WARNING

! Pneumatic high pressure system !

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

This compressor has been built in accordance with the EC machine regulations 89/392 EWG. Specifications on the noise level in accordance with the 3rd rule of the machine safety law as of 18.01.91 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 or gas as specified in this manual. Other use is strictly prohibited. The manufacturer and the supplier void all responsibility for damage or injury resulting from failure to follow these instructions.

Edition June 2004

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Drawings	Dwg. no.
IK12.14 II	78648

Lists:	List no.
Lubricating oil list	KB 70851

Parts lists:	Code
consisting of	
Compressor block	A17.4
Oil and water separator	B25
Automatic condensate drain	C67

Change notice

Changes which differ from the previous edition are marked with a vertical line.

Change No.	Change date
0	Basic edition mod. 4 Juny 2004

1. GENERAL

1.1. PURPOSE AND SHORT DESCRIPTION

The design of the compressor block is shown in Fig. 1. For the mode of operation refer to the flow diagram, Fig. 2.

The compressor block **IK12.14 II** is used to compress air up to 420 bar.

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.

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 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.

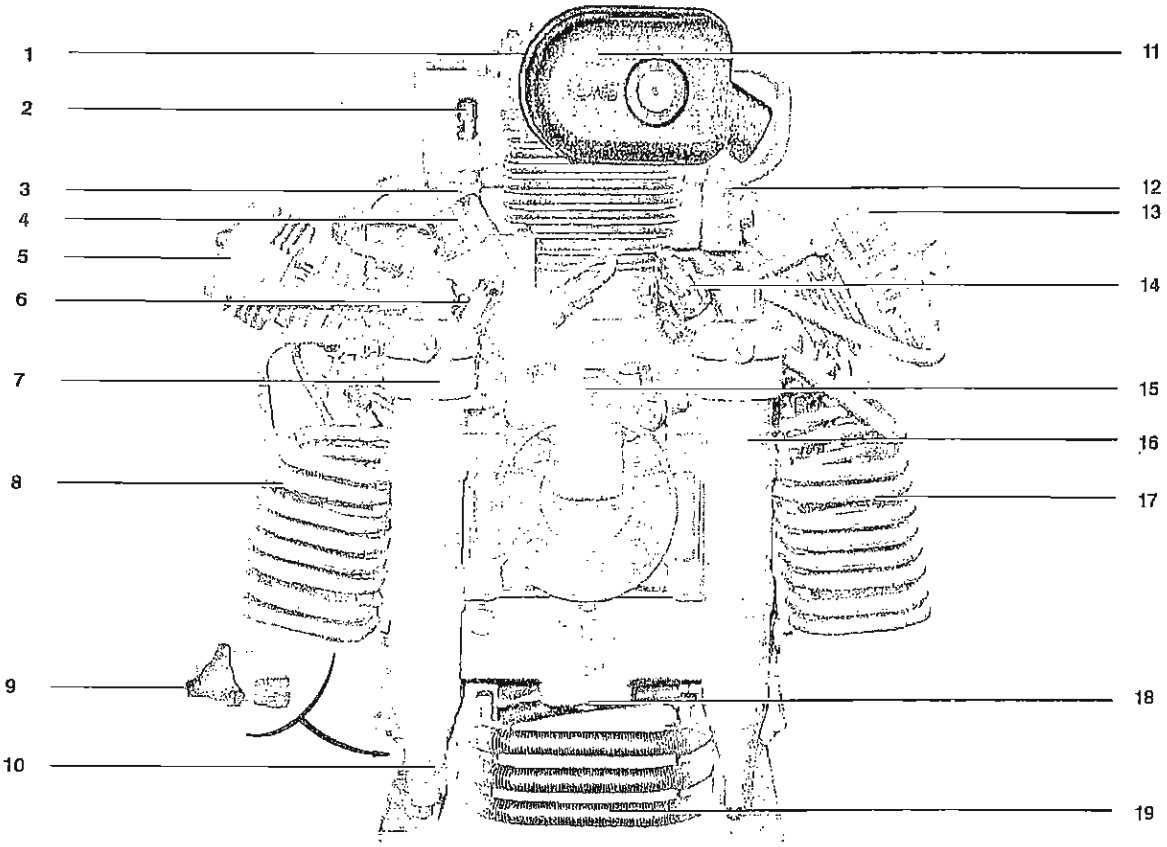


Fig. 1 Compressor block, front view

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

a) optional

1.2. MODE OF OPERATION; AIR FLOW DIAGRAM

For the mode of operation refer to the flow diagram, Fig. 2.

The air is drawn in through intake filter -5, compressed to final pressure in cylinders -1, -2,-3, and -4 and recooled by inter-coolers -6, -7, -8 and after-cooler -9. The compressed air is purified by interfilters -10 and -11, and final separator -12. The safety valves -13, -14, -15 and -16 protect the pressure of the single stages. The interfilters and the final separator are drained by condensate drain valves -18. Pressure maintaining valve -17 keeps the pressure constant within the filters.

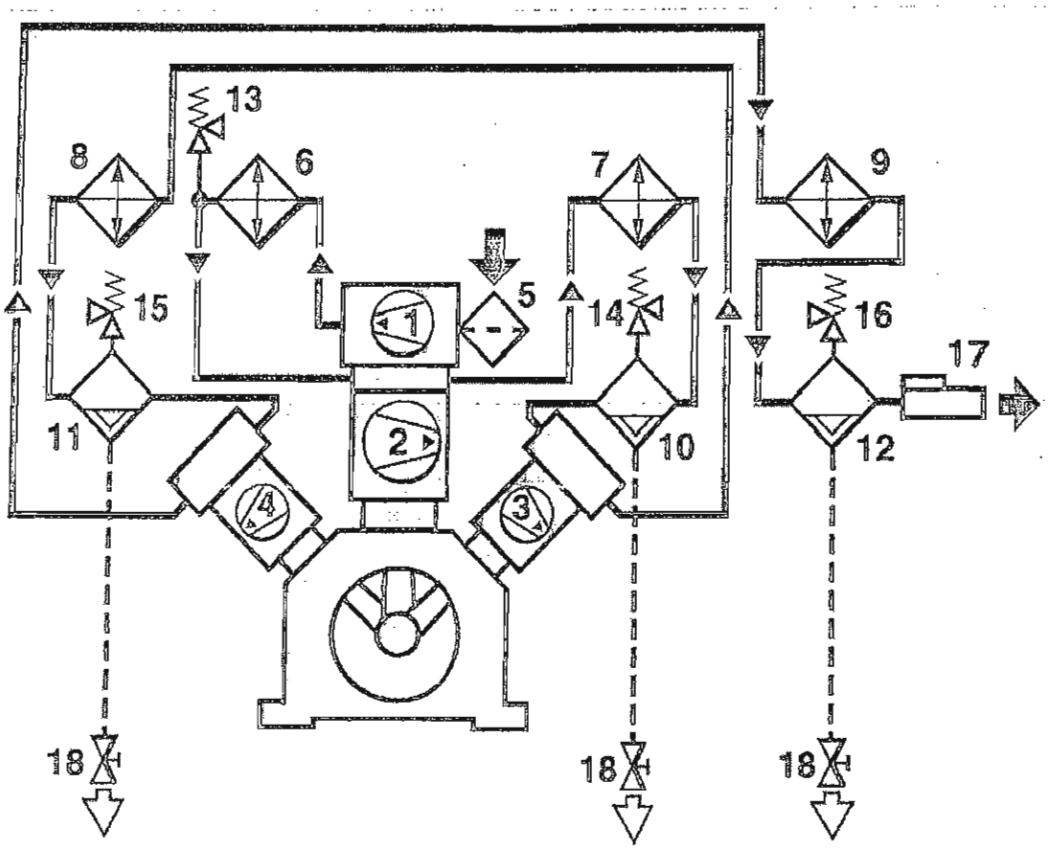


Fig. 2 Air flow diagram

1 Cylinder 1st stage
2 Cylinder 2nd stage
3 Cylinder 3rd stage
4 Cylinder 4th stage
5 Intake filter
6 Inter-cooler 1st stage
7 Inter-cooler 2nd stage
8 Inter-cooler 3rd stage
9 After-cooler 4th stage
10 Intermediate separator after 2nd stage
11 Intermediate separator after 3rd stage
12 Oil and water separator
13 Safety valve, 1st stage
14 Safety valve, 2nd stage
15 Safety valve, 3rd stage
16 Safety valve, 4th stage (final pressure)
17 Pressure maintaining/non-return valve
18 Condensate drain valve

1.3. TECHNICAL DATA

Compressor block	**IK12.14 II, mod.4**
Medium	Air
Delivery[a]	
at 1,120 min^{-1}	230 l/min (8 c.f.m.)
at 1,390 min^{-1}	300 l/min (10.6 c.f.m.)
Intake Pressure	atmospheric
Operating pressure	90 to 420 bar
Pressure setting, final pressure safety valve	____ bar[b]
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
Required drive input	4.6 to 7.0 kW
Intermediate pressure 1st stage	2.5 to 3,5 bar
Safety valve setting 1st stage	5 bar
Intermediate pressure 2nd stage	14 to 18 bar
Safety valve setting 2nd stage	24 bar
Intermediate pressure 3rd stage	55 to 85 bar
Safety valve setting 3rd stage	95 bar
Direction of rotation viewed from fanwheel side	counterclockwise
Compressor block oil capacity	approx. 2.8 ltrs.
Oil pressure	3 to 6 bar
Oil type	see oil list in chapter 21.
Max. ambient temperature	+5 ... +45 °C (+43...+113 °F)
Max. permissible inclination of compressor[c]	15°
Weight	approx. 59 kg (130 lbs.)

Subject to change without prior notice

a) Measured with flow meter at 80 percent of max. final pressure

b) Setting is according to order, but max. 365 bar

c) This value is valid only if the oil level of the compressor in normal position corresponds to the upper mark of the oil sight gauge and may not be exceeded.

2. LUBRICATION SYSTEM

2.1. FUNCTIONAL DESCRIPTION

The compressor is provided with a forced-feed lubrication (Fig. 3). The oil pressure is produced by a low reving gear pump (1). The oil pressure is approximately **5 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) is coupled to and driven by the crankshaft. It pumps oil from tahe crankcase (5) through oil fine filter (2) and a minimum pressure valve (3) to the 4th stage cylinder. The oil is then distributed by the guide piston of the 4th stage (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.

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 the annex, chapter 21. Order this list regularly through the BAUER Technical Service Department.

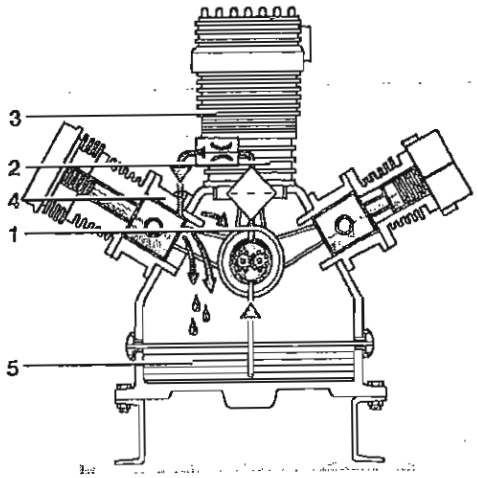
For operation under difficult conditions such as continuous running and/or high ambient temperatures we recommend the use of BAUER high performance compressor oils, only, according to the oil list. These oils are tested in our compressors and have proved excellent quality under ambient temperatures between +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 N22138 (filled into the crankcase or as consignment, depending on the model).

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.

2.3. OIL LEVEL CHECK

Check oil level at sight gauge on either side of compressor block every day prior to putting compressor into operation. Oil level must be between minimum and maximum notches, see Fig. 4. Oil level must never be below minimum mark as this will cause severe damages due to lack of lubrication. Oil level must also not exceed maximum as this will cause excessive lubrication of compressor and result in valves sooting up.



1 Oil pump
2 Oil filter
3 Min. pressure valve
4 Guide piston
5 Oil sump

Fig. 3 Lube oil system

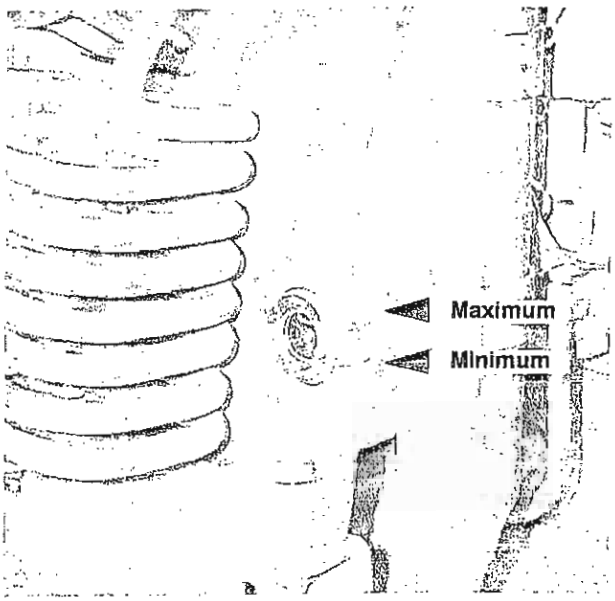


Fig. 4 Oil sight gauge

2.4. OIL CHANGE INTERVALS

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

2.5. OIL CAPACITY

Oil capacity	approx. 2.8 liters

2.6. OIL PACKAGES

BAUER compressor oil is available in various quantities, refer to oil list in chapter 21.

2.7. OIL CHANGE

- Run compressor warm.
- Remove red cap (1, Fig. 5) from oil filler neck.
- 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. 6) with a 13 mm spanner. Remove cover (2).
- Remove oil filter (1, Fig. 7) 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.

2.8. 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. 2.4.
- Refill compressor with same oil, only.

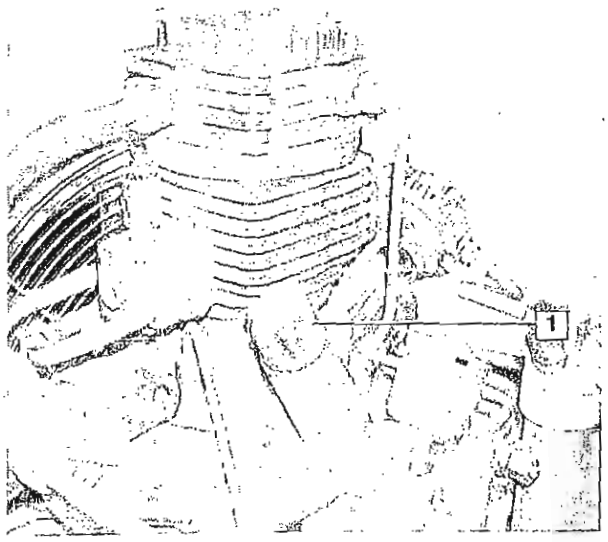


Fig. 5 Oil filler neck

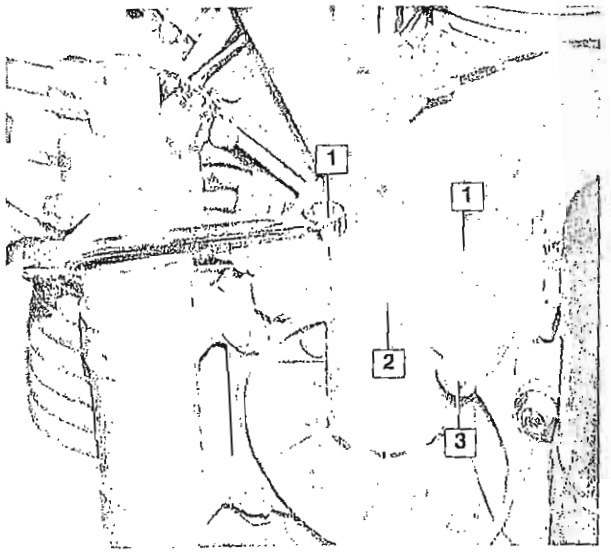


Fig. 6 Removing the cover

Fig. 7 Replacing the oil filter

2.9. 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. 6) and wait until oil pours out free of air bubbles. Retighten plug and cap nut.

3. INTAKE FILTER

3.1. DESCRIPTION

A dry micronic filter is used to filter intake air, see Fig. 8.

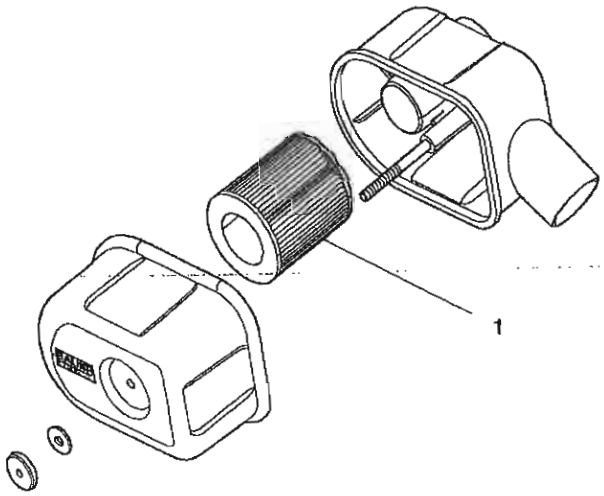


Fig. 8 Intake filter

3.2. INTAKE FILTER MAINTENANCE

Filter cartridge must be changed at regular intervals according to maintenance schedule in chapter 16.

To clean, remove micronic filter cartridge (1) and clean with brush or by blowing air inside out. Turn cartridge through 90° when replacing. Replace dirty cartridge once it has been turned three times and thus used on all sides.

Clean filter housing inside with a damp cloth. Take care to prevent dust from entering intake pipe. Replace O-ring if necessary. When changing cartridge make sure spring on top cover is installed properly.

4. INTERMEDIATE SEPARATOR

4.1. DESCRIPTION

Intermediate separators are mounted on the compressor between 2nd and 3rd stage, and between 3rd and 4th stage. Separation is achieved by means of centrifugal action provided by a vortex plate.

The pressure vessels are subject to dynamic load. They are designed to withstand a certain no. of load cycles. (1 load cycle = 1 pressurization, 1 depressurization.) at the specified pressure range. Thepressure vessel 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.

4.2. MAINTENANCE

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

4.2.1. Condensate drain

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

5. FINAL STAGE SEPARATOR

5.1. DESCRIPTION

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. 9). The oil and water separator works by means of a sintered filter micro-cartridge (1), reliably separating liquid oil and water particles from the compressed air.

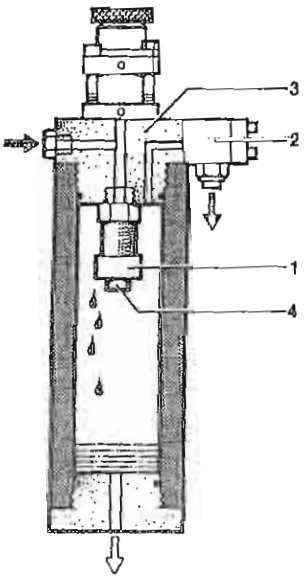


Fig. 9 Oil and water separator

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.) 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.

5.1.1. Final Separator Maintenance

The sinter-filter micro-cartridge requires periodic maintenance. Maintenance intervals see section 16.

To remove the sintered filter element proceed as follows:

- Remove tube connected to non-return valve (2).
- Screw off filter head (3) and remove.
- Unscrew micro-cartridge (1) from filter head (3).
- Remove center-screw (4) to remove filter elements.
- Clean sintered filter elements using hot soapy water and blow dry with clean compressed air.

5.1.2. 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 dvery 30 minutes, at high humidity every 15 minutes.

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

6. PRESSURE MAINTAINING / NON-RETURN VALVE

6.1. DESCRIPTION

A pressure maintaining and a non-return valve are provided downstream of the filter system. Refer to flow diagram in the annex, chapter 21. 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 bare compressor block it is available as optional extra.

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).**

6.2. MAINTENANCE

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. 10) and set screw (3). Adjust screw (1) to the required pressure using a suitable screwdriver.

Clockwise = increase pressure
Counter-clockwise = decrease pressure

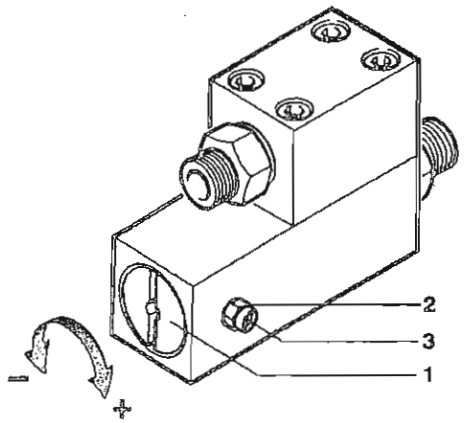


Fig. 10 Pressure maintaining/non-return valve

7. SAFETY VALVES

7.1. FUNCTIONAL DESCRIPTION

All compressor stages are protected by safety valves as follows:

Compressor block	IK12.14 II
1st stage	5 bar (80 psi)
2nd stage	24 bar (350 psi)
3rd stage	95 bar (1,375 psi)

The safety valve for protection of the last stage is adjusted according to order, see chapter 1, Technical Data, but max. to

4th stage	**max. 450 bar (6,500 psi)**

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

7.2. MAINTENANCE

The final pressure safety valve has to be checked regularly. See chapter 16. For this purpose the safety valve can be vented manually.

7.2.1. Operating check

Turn knurled knob on top of the valve clockwise until valve blows off (Fig. 11). We recommend that a final pressure setting of 80 % should not be exceeded, to avoid damaging the safety valve.

This just ensures that the valve is functional and will release pressure in case of a malfunction. To check the blow-off pressure value refer to 7.2.2.

7.2.2. Blow-off pressure check

Check blow-off pressure of the final pressure safety valve regularly, see maintenance schedule chapter 16. 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.

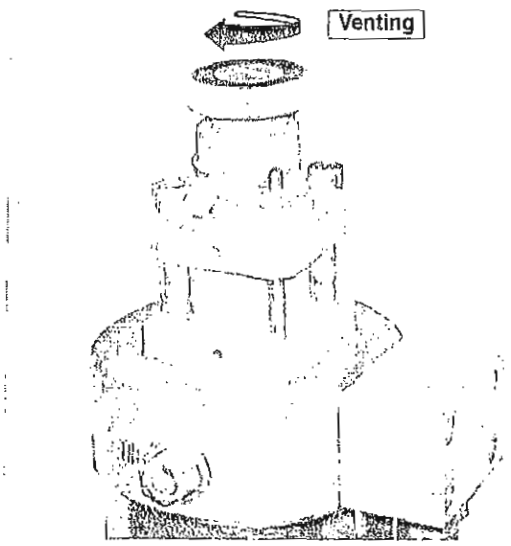


Fig. 11 Final pressure safety valve

8. PRESSURE GAUGES

8.1. DESCRIPTION

The pressure in the compressor stages can be monitored by means of the intermediate and the final pressure gauges. They can be connected to the provided tube connectors at the compressor block.

Pressure gauges are not part of the compressor block delivery scope and have to be ordered separately.

8.1.1. Intermediate pressure gauges

If mounted as an optional extra, the intermediate pressure values listed in chapter 1.3, Technical Data, must be indicated.

8.1.2. Final pressure gauge

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

8.1.3. Oil pressure gauge

Correct oil pressure indication should read **between 3 and 6 bar (43 and 87 psi)**. If not, check the lube oil circuit or adjust the oil pressure. See section 2.

For oil pressure monitoring see chapter 11.

8.2. MAINTENANCE

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.

Slight deviations during operation are normal and can be ignored. Excessive inaccuracy will require the pressure gauge to be readjusted or sent back for repair.

9. VALVES

9.1. FUNCTIONAL DESCRIPTION

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. 12.

Intake and pressure valve of the 1st stage of the compressor block IK120 is a combined plate valve under the valve head (Fig. 13).

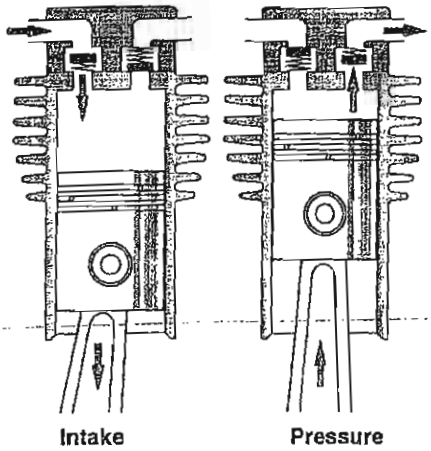


Fig. 12 Valve operation

9.2. 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 mounting with Weicon AS 040, part no. N19753, or equivalent.
- **Observe** the correct sequence when fitting together again.
- **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 section 20).
- **Check** the valve space in the valve heads for dirt and clean, if necessary.
- **Use only** satisfactory gaskets and O-rings on reassembly.
- **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.
- **Remove and check** the valves every **1000 operating hours.**
- **Replace** the valves every **2000 operating hours** to avoid fatigue failure.

Top view

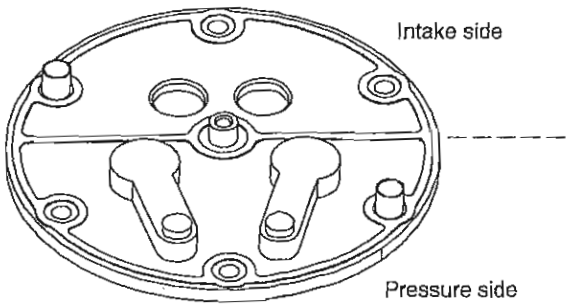


Fig. 13 Valve head 1st stage

9.3. CHANGING THE VALVES

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. DESCRIPTION

The automatic condensate drain unit is available as an optional extra and replaces the manual drain taps.

The automatic condensate drain unit (Fig. 14) 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.

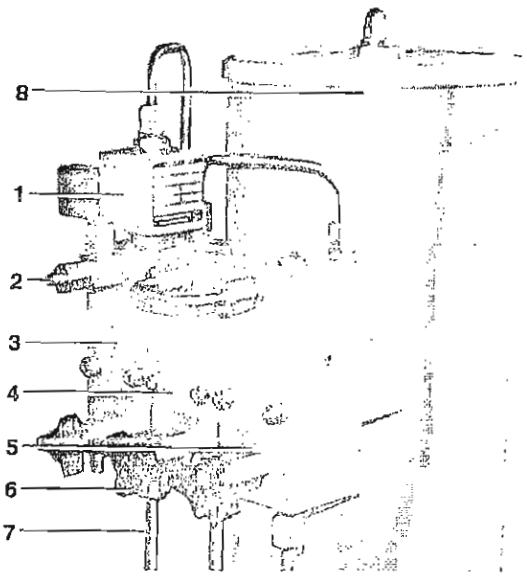


Fig. 14 Automatic condensate drain unit

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

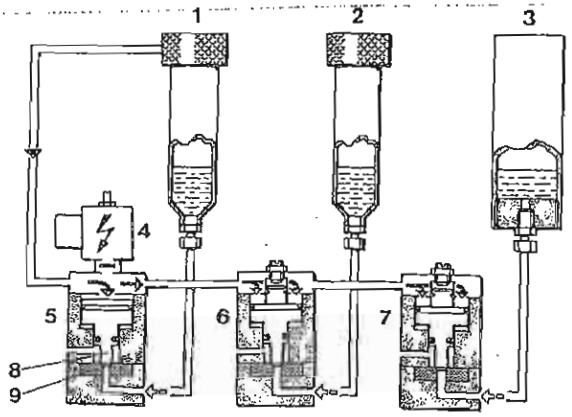
The automatic condensate drain system operates electropneumatically and comprises the following main items:

- 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 collector.
- 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.

10.2. 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.



⇐ control pressure
⇦ condensate

Fig. 15 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

At compressor start, condensate drain valve (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.

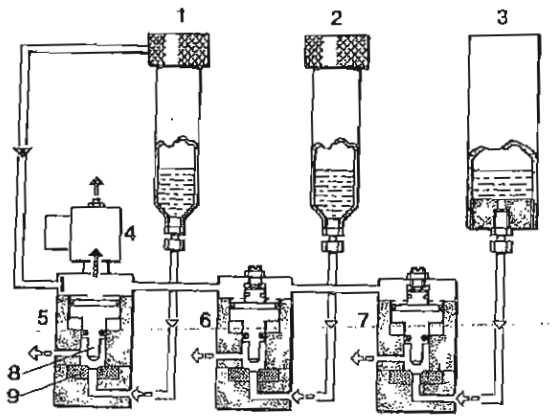
The compressor delivers compressed medium to the connected systems.

10.3. 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.



⇦ control pressure
⇦ condensate

Fig. 16 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

10.4. 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.

10.5. 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.

10.6. CONDENSATE COLLECTOR

The condensate collecting system serves as a central collector of the accumulated condensate and separates the condensate from the air.

The separated air is passed through activated charcoal so that only clean and odourless air is delivered, in accordance with TRG regulations.

The condensate is drained by the automatic condensate drain unit into the manifold welded to the collecting vessel. The condensate enters the collecting vessel. The air entering together with the condensate, passes through activated charcoal filling into the open air. The charcoal is covered with layers of fleece. Tank and filter head are connected to each other by a clamp.

10.7. ELECTRICAL CONNECTION

For electrical connection of the automatic condensate drain system refer to the schematic diagrams in chapter 21., if applicable.

10.8. CONDENSATE DRAIN PIPING

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!

10.9. 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 chapter 19. "Trouble-shooting".

11. ELECTRICAL SYSTEM

11.1. GENERAL

For description and maintenance schedules for the electric controls and electronic monitors refer to applicable compressor unit instruction manual.

12. COMPRESSOR DRIVE SYSTEM

12.1. GENERAL

The compressor is driven by the drive motor through a V-belt which is not part of the compressor block delivery scope.

For description and maintenance schedules, refer to applicable compressor unit instruction manual.

Proper cooling action of the fanwheel is guaranteed in the correct sense of rotation, only.

The direction of rotation looking from the fanwheel side is **counterclockwise.**

The flywheel is fastened to the crankshaft by means of a Taper-lock bushing, see Fig. 17. To remove the flywheel, loosen the bushing (1) by removing two allen screws (2) and screw one of them into thread (3) until the bushing is free.

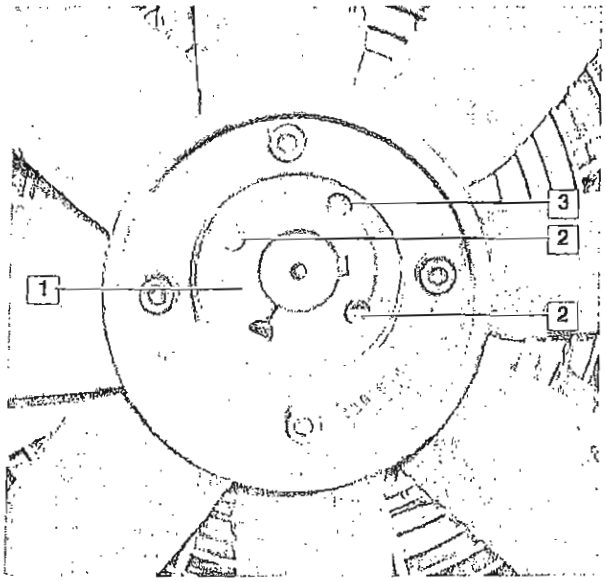


Fig. 17 Taper lock bushing

13. COOLING SYSTEM

13.1. GENERAL

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.

Proper cooling action of the fanwheel is guaranteed in the correct sense of rotation, only.

The direction of rotation looking from the fanwheel side is **counterclockwise.**

The fanwheel is driven by the drive motor V-belt and is also used as the flywheel.

Refer to chapter 15 of the compressor unit instruction manual for proper installation and cooling air supply.

For maximum ambient temperature, see Technical Data, in chapter 1.

14. SAFETY MEASURES

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.

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.

WARNING 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.

FUNDAMENTAL SAFETY NOTICES

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.

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. 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.

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.

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.

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.

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.

Vessels for dynamic load:

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.

SAFETY REGULATIONS (EU; partly only Germany)

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):

- UVV compressors (VBG 16).

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 TÜV acceptance test according to paragraph 28 (1). Please contact our Technical Service Department with regard to this. They can also supply our leaflet **"IMPORTANT NOTES FOR TÜV 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.

15. INSTALLATION, OPERATION

15.1. INSTALLATION

For pneumatic connections, dimensions and weight refer to the compressor block drawing in the annex, chapter 21.

15.2. PREPARATION FOR OPERATION

All compressor blocks 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.
- 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 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 **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.
- Prior to **each** operation check the oil level according to chapter 2. and determine whether maintenance is necessary in accordance with chapter 16.
- 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. 18) on coil (1) and pull plug (2) from solenoid valve.

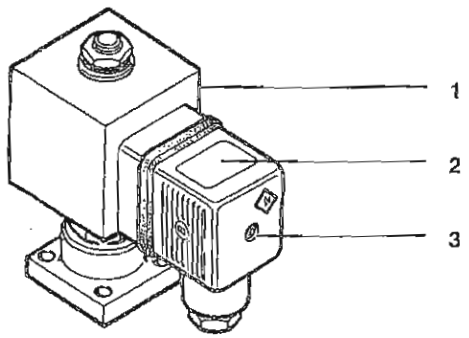


Fig. 18 Solenoid valve plug

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

- Open the outlet valve, this must be open during operation. Close only for servicing the compressor to avoid pressure loss from connected pressure systems.
- **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.

15.3. OPERATION

For operating procedures refer to applicable compressor unit instruction manual.

16. MAINTENANCE SCHEDULE

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.

Never repair pressure lines by soldering or welding.

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

WARNING

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

16.1. 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.

Interval	Maintenance work	Chapter
Daily before taking unit into operation	Check oil level Operate unit to final pressure and check function of final pressure switch	2. 7.
1/2 hour after start-up for first time operation or after maintenance work	Check screws for tight seat, all tube connectors for tightness.	---
25 operating hours after first time operation or maintenance/repair work	Tighten valve head bolts and pressure studs	9.
Weekly or as required	Check automatic condensate drain; open manual condensate drain taps	10.
500 operating hours	Check V-belt Service micronic intake filter Check all connections for leakage	12. 3. --
1,000 operating hours	Valve check Mineral oil change; oil filter change Clean sintered metal filter element(s)	9. 2. 4./5.
2,000 operating hours	Synthetic oil change; oil filter change Replace valves	2. 9.
3,000 operating hours or as required	Check pistons and piston rings	WSM[a)]
Annually	Mineral oil change, if run for less than 1,000 operating hours Check opening pressure of final safety valve Service micronic intake filter	2. 7. 3.
Annually or as required	Read cycle counter; replace oil and water separator if required	11./5.
Biennially	Synthetic oil change, if run for less than 2,000 operating hours	2.

IK12.14_II /06/04

a) Workshop manual; available through BAUER customer service dept.

16.2. MAINTENANCE RECORD

We recommend that all maintenance work is recorded in a service book, showing the date and details of the work carried out. This will help to avoid expensive repairs 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.

For this purpose, the following maintenance control sheet is provided (copy as required). The grey boxes indicate when the maintenance work is due. Please mark the appropriate box(es) to show what maintenance work has been carried out and the number of hours of service, then sign and date.

Operating hours ⇩ / Work to be carried out ⇨	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	annually	biennially
Check drive V-belts														
Service micronic intake filter														
Check connections for leakage														
Valve check														
Oil change; mineral oil Oil filter change														
Clean sintered metal filter elements														
Oil change; synthetic oil Oil filter change														
Replace valves														
Check pistons and piston rings														
Check opening pressure final safety valve														
Check cycle counter														
Date/ Signature														

17. STORAGE, PRESERVATION

17.1. 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.

17.2. 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.

17.3. PRESERVING THE COMPRESSOR

- Turn the compressor on and spray a small amount (approx. 10 ccm/0.6 cu. in.) of compressor oil into the valve head inlet port (compressors with dual 1st stage: **each** of the inlet ports) 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.

17.4. PRESERVING THE MOTOR/ENGINE

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

17.5. 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.17.3.

17.5.1. 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. 17.3. and 17.4.
- 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 if the oil pressure gauge indicates the prescribed pressure.

17.6. 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. 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, if installed on the unit.
- Check the inter-pressure safety valves for leakage.
- Find cause of any fault from the trouble-shooting table, section 19, and remedy.
- Stop the system when running properly, the compressor is then ready for operation.

18. REPAIR INSTRUCTIONS

18.1. GENERAL

Preventive maintenance usually involves replacing the valves, gaskets and sealing rings as well as carry-ing out the maintenance work.

Repair work can be carried out on the compressor block to a certain extent but a certain experience and skill is necessary. It should be noted, however, that

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

For all further repair instructions refer to applicable workshop manual.

19. TROUBLE-SHOOTING

Trouble	Cause	Remedy
Compressor Block		
No oil pressure	Low oil level	Check oil level, see chapter 2
Oil foam in the crankcase	Last stage piston worn	Operate compressor with final stage valve head removed. If oil flows continuously out of cylinder, replace piston and liner
	Last stage outlet valve defective	Replace
Compressor output insufficient	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
	Pipes leaking	Re-tighten
Safety valves between individual stages releasing pressure	Intermediate pressure too high	Check valves - see chap. 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 right oil type (see oil list) and clean sooted valves
Automatic Condensate Drain		
Drain valve of 2nd stage does not open (drain)	Solenoid valve does not depressurize drain valve	Check valve, replace if necessary
	Solenoid valve receives no electrical signal	Check connections; check timer; replace if defective
	Plunger of drain valve sticking	Clean valve or replace
Drain valve of 2nd stage does not open (drain)	No control medium available	Check supply lines
	Solenoid valve sticking	Clean or replace
	Drain valve sticking in open position	Clean or replace
	Drain valve seat dirty	Clean or replace valve seat
Drain valve of 3rd stage does not open (drain)	No control medium	Check medium supply
	Solenoid valve inoperative, blocking the control medium to drain valve	Check valve, replace if necessary
	Solenoid valve not receiving electrical signal	Check connections; check timer; replace if defective
	Drain valve seat dirty	Clean or replace valve seat

20. TABLES

20.1. 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

20.2. TORQUE SEQUENCE

Tighten valve head and cylinder bolts/nuts equally in the sequence shown in Fig. 19.

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

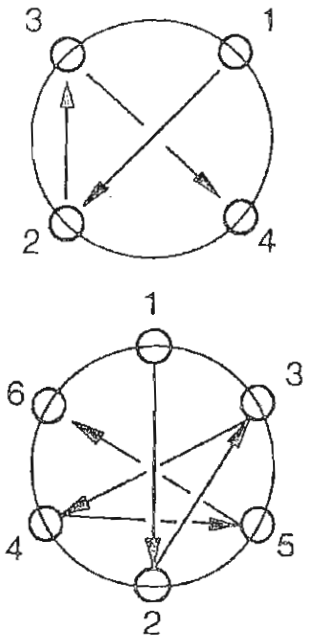


Fig. 19 Torque sequence

20.3. LUBRICATION CHART

Usage	Lubricants
Rubber and plastic parts, filter housing threads	WEICON WP 300 WHITE part no. N19752 or BAUER special grease part no. 072500
Sealing rings	BAUER special grease part no. 072500
Shaft seal (seal) Shaft seal (shaft)	BAUER special grease part no. 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 lubricating oil list available through **BAUER** Service Department.

20.4. ADHESIVE AND SEALANT CHART

Usage	Adhesives and Sealants
Screws	Loctite 2701
Seals for conical threads	Loctite 511
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

20.5. TESTING AGENTS

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

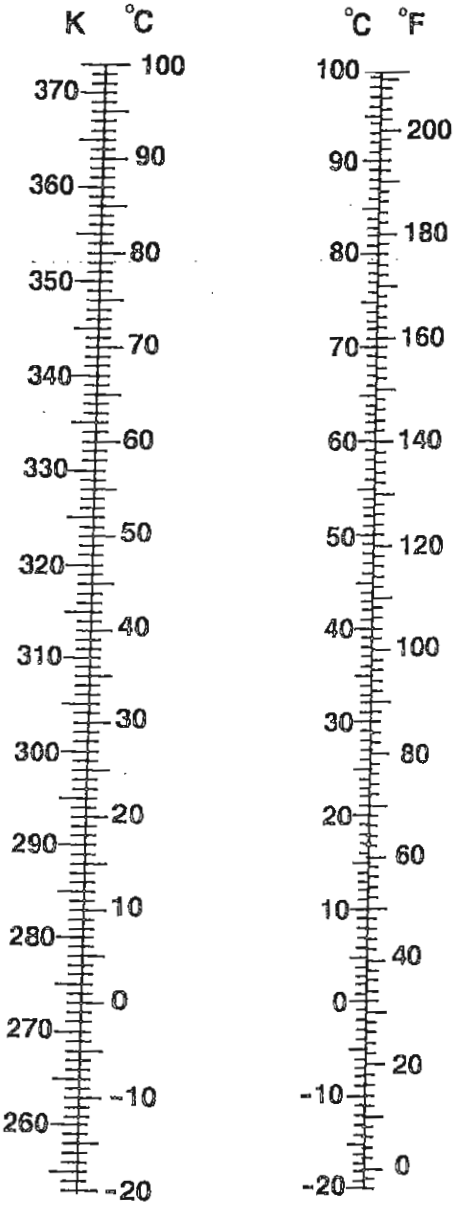
20.6. CONVERSION TABLE bar - psi

bar	psi	bar	psi	bar	psi	bar	psi	bar	psi
1	15	56	812	111	1,610	166	2,407	230	3,335
2	29	57	827	112	1,624	167	2,422	235	3,408
3	44	58	841	113	1,639	168	2,436	240	3,480
4	58	59	856	114	1,653	169	2,451	245	3,553
5	73	60	870	115	1,668	170	2,465	250	3,625
6	87	61	885	116	1,682	171	2,480	255	3,698
7	102	62	899	117	1,697	172	2,494	260	3,770
8	116	63	914	118	1,711	173	2,509	265	3,843
9	131	64	928	119	1,726	174	2,523	270	3,915
10	145	65	943	120	1,740	175	2,538	275	3,988
11	160	66	957	121	1,755	176	2,552	280	4,060
12	174	67	972	122	1,769	177	2,567	285	4,133
13	189	68	986	123	1,784	178	2,581	290	4,205
14	203	69	1,001	124	1,798	179	2,596	295	4,278
15	218	70	1,015	125	1,813	180	2,610	300	4,350
16	232	71	1,030	126	1,827	181	2,625	305	4,423
17	247	72	1,044	127	1,842	182	2,639	310	4,495
18	261	73	1,059	128	1,856	183	2,654	315	4,568
19	276	74	1,073	129	1,871	184	2,668	320	4,640
20	290	75	1,088	130	1,885	185	2,683	325	4,713
21	305	76	1,102	131	1,900	186	2,697	330	4,785
22	319	77	1,117	132	1,914	187	2,712	335	4,858
23	334	78	1,131	133	1,929	188	2,726	340	4,930
24	348	79	1,146	134	1,943	189	2,741	345	5,003
25	363	80	1,160	135	1,958	190	2,755	350	5,075
26	377	81	1,175	136	1,972	191	2,770	355	5,148
27	392	82	1,189	137	1,987	192	2,784	360	5,220
28	406	83	1,204	138	2,001	193	2,799	365	5,293
29	421	84	1,218	139	2,016	194	2,813	370	5,365
30	435	85	1,233	140	2,030	195	2,828	375	5,438
31	450	86	1,247	141	2,045	196	2,842	380	5,510
32	464	87	1,262	142	2,059	197	2,857	385	5,583
33	479	88	1,276	143	2,074	198	2,871	390	5,655
34	493	89	1,291	144	2,088	199	2,886	395	5,728
35	508	90	1,305	145	2,103	200	2,900	400	5,800
36	522	91	1,320	146	2,117	201	2,915	405	5,873
37	537	92	1,334	147	2,132	202	2,929	410	5,945
38	551	93	1,349	148	2,146	203	2,944	415	6,018
39	566	94	1,363	149	2,161	204	2,958	420	6,090
40	580	95	1,378	150	2,175	205	2,973	425	6,163
41	595	96	1,392	151	2,190	206	2,987	430	6,235
42	609	97	1,407	152	2,204	207	3,002	435	6,308
43	624	98	1,421	153	2,219	208	3,016	440	6,380
44	638	99	1,436	154	2,233	209	3,031	445	6,453
45	653	100	1,450	155	2,248	210	3,045	450	6,525
46	667	101	1,465	156	2,262	211	3,060	455	6,598
47	682	102	1,479	157	2,277	212	3,074	460	6,670
48	696	103	1,494	158	2,291	213	3,089	465	6,743
49	711	104	1,508	159	2,306	214	3,103	470	6,815
50	725	105	1,523	160	2,320	215	3,118	475	6,888
51	740	106	1,537	161	2,335	216	3,132	480	6,960
52	754	107	1,552	162	2,349	217	3,147	485	7,033
53	769	108	1,566	163	2,364	218	3,161	490	7,105
54	783	109	1,581	164	2,378	220	3,190	495	7,178
55	798	110	1,595	165	2,393	225	3,263	500	7,250

20.7. CONVERSION TABLE psi - bar

psi	bar	psi	bar	psi	bar	psi	bar	psi	bar
1	0.07	61	4.21	310	21.38	910	63	3,400	234
2	0.14	62	4.28	320	22.07	920	63	3,500	241
3	0.21	63	4.34	330	22.76	930	64	3,600	248
4	0.28	64	4.41	340	23.45	940	65	3,700	255
5	0.34	65	4.48	350	24.14	950	66	3,800	262
6	0.41	66	4.55	360	24.83	960	66	3,900	269
7	0.48	67	4.62	370	25.52	970	67	4,000	276
8	0.55	68	4.69	380	26.21	980	68	4,100	283
9	0.62	69	4.76	390	26.90	990	68	4,200	290
10	0.69	70	4.83	400	27.59	1,000	69	4,300	297
11	0.76	71	4.90	410	28.28	1,010	70	4,400	303
12	0.83	72	4.97	420	28.97	1,020	70	4,500	310
13	0.90	73	5.03	430	29.66	1,030	71	4,600	317
14	0.97	74	5.10	440	30.34	1,040	72	4,700	324
15	1.03	75	5.17	450	31.03	1,050	72	4,800	331
16	1.10	76	5.24	460	31.72	1,060	73	4,900	338
17	1.17	77	5.31	470	32.41	1,070	74	5,000	345
18	1.24	78	5.38	480	33.10	1,080	74	5,100	352
19	1.31	79	5.45	490	33.79	1,090	75	5,200	359
20	1.38	80	5.52	500	34.48	1,100	76	5,300	366
21	1.45	81	5.59	510	35.17	1,110	77	5,400	372
22	1.52	82	5.66	520	35.86	1,120	77	5,500	379
23	1.59	83	5.72	530	36.55	1,130	78	5,600	386
24	1.66	84	5.79	540	37.24	1,140	79	5,700	393
25	1.72	85	5.86	550	37.93	1,150	79	5,800	400
26	1.79	86	5.93	560	38.62	1,160	80	5,900	407
27	1.86	87	6.00	570	39.31	1,170	81	6,000	414
28	1.93	88	6.07	580	40.00	1,180	81	6,100	421
29	2.00	89	6.14	590	40.69	1,190	82	6,200	428
30	2.07	90	6.21	600	41.38	1,200	83	6,300	434
31	2.14	91	6.28	610	42.07	1,210	83	6,400	441
32	2.21	92	6.34	620	42.76	1,220	84	6,500	448
33	2.28	93	6.41	630	43.45	1,230	85	6,600	455
34	2.34	94	6.48	640	44.14	1,240	86	6,700	462
35	2.41	95	6.55	650	44.83	1,250	86	6,800	469
36	2.48	96	6.62	660	45.52	1,260	87	6,900	476
37	2.55	97	6.69	670	46.21	1,270	88	7,000	483
38	2.62	98	6.76	680	46.90	1,280	88	7,100	490
39	2.69	99	6.83	690	47.59	1,290	89	7,200	497
40	2.76	100	6.90	700	48.28	1,300	90	7,300	503
41	2.83	110	7.59	710	48.97	1,400	97	7,400	510
42	2.90	120	8.28	720	49.66	1,500	103	7,500	517
43	2.97	130	8.97	730	50.34	1,600	110	7,600	524
44	3.03	140	9.66	740	51.03	1,700	117	7,700	531
45	3.10	150	10.34	750	51.72	1,800	124	7,800	538
46	3.17	160	11.03	760	52	1900	131	7,900	545
47	3.24	170	11.72	770	53	2,000	138	8,000	552
48	3.31	180	12.41	780	54	2,100	145	8,100	559
49	3.38	190	13.10	790	54	2,200	152	8,200	566
50	3.45	200	13.79	800	55	2,300	159	8,300	572
51	3.52	210	14.48	810	56	2,400	166	8,400	579
52	3.59	220	15.17	820	57	2,500	172	8500	586
53	3.66	230	15.86	830	57	2,600	179	8,600	593
54	3.72	240	16.55	840	58	2,700	186	8,700	600
55	3.79	250	17.24	850	59	2,800	193	8,800	607
56	3.86	260	17.93	860	59	2,900	200	8,900	614
57	3.93	270	18.62	870	60	3,000	207	9,000	621
58	4.00	280	19.31	880	61	3,100	214	9,100	628
59	4.07	290	20.00	890	61	3,200	221	9,200	634
60	4.14	300	20.69	900	62	3,300	228	9,300	641

20.8. TEMPERATURE CONVERSION TABLE



20.9. MISCELLANEOUS CONVERSION TABLES

Linear measures

	cm	m	km	in	ft	mile
cm	1	0.01	1×10^{-5}	0.3937	0.03281	6.21×10^{-6}
m	100	1	0.001	39.37	3.281	6.21×10^{-4}
km	1×10^{5}	1000	1	3.94×10^{4}	3281	0.6214
in	2.540	0.02540	2.54×10^{-5}	1	0.08333	1.58×10^{-5}
ft	30.48	0.3048	3.05×10^{-4}	12	1	1.89×10^{-4}
mile	1.61×10^{5}	1.609	1.609	6.34×10^{4}	5280	1

Volume measures

	cm^3	litre	m^3	in^3	ft^3	gal
cm^3	1	0.001	1×10^{-6}	0.06102	3.53×10^{-5}	2.64×10^{-4}
litre	1000	1	0.001	61.02	0.03532	0.2642
m^3	1×10^{6}	1000	1	6.10×10^{4}	35.31	264.2
in^3	16.39	0.01639	1.64×10^{-5}	1	5.79×10^{-4}	0.00433
ft^3	2.83×10^{4}	28.32	0.02832	1728	1	7.481
gal	3785	3.785	0.00379	231.0	0.1337	1

Flow rates

	l/sec	gal/min	ft^3/sec	ft^3/min	l/min
l/sec	1	15.85	0.03532	2.119	60
gal/min	0.06309	1	0.00223	0.1337	3.785
ft^3/s	28.32	448.8	1	60	1699.2
ft^3/min	0.4719	7.481	0.01667	1	28.32
l/min	0.0167	0.2642	0.0005885	0.03532	1

Pressure conversion table

	mm Hg	inch Hg	inch H_2O	ft H_2O	atm	psi	kg/cm^2	bar	kPa
mm Hg	1	0.03937	0.5353	0.04460	0.00132	0.01934	0.00136	0.00133	0.133
inch Hg	25.40	1	13.60	1.133	0.03343	0.4912	0.03453	0.0340	3.395
inch H_2O	1.868	0.07355	1	0.08333	0.00246	0.03613	0.00254	0.0025	0.249
ft H_2O	22.42	0.8826	12	1	0.02950	0.4335	0.03048	0.0300	2.984
atm	760	29.92	406.8	33.90	1	14.70	1.033	1.013	101.375
lb/in^2	51.71	2.036	27.67	2.307	0.06805	1	0.07031	0.069	6.895
kg/cm^2	735.6	28.96	393.7	32.81	0.9678	14.22	1	0.981	98.066
bar	751.8	29.41	402.164	33.3	0.9870	14.50	1.02	1	100
kPa	7.525	0.2960	4.021	0.3350	0.0098	0.1450	0.01	0.01	1

Lubricating oil list

BAUER POSEIDON KOMPRESSOREN

2. 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 overleaf.

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, industrial air compressor units:	**BAUER special Compressor oil, part no. 020 2138**
Gas compressor units:	**Mobil Rarus 829**
CNG compressor units	**BAUER special Compressor oil, part no. N26303**

For operation under difficult conditions, such as continuous running and/or high ambient temperatures, we only recommend the BAUER special 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 mineral oils acc. to the list on the previous page. These oils are suitable for ambient temperatures between +5 °C and +35 °C. Here also, a pre-heating device will be required if ambient temperatures should fall below +5 °C.

2.1. Changing the Oil Type

CAUTION

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 bi-annually
Oil capacity	Refer to compressor unit instruction manual

BAUER compressor oil is available in the following quantities:

Oil quantity ⇔ Oil type ⇕	Mineral oil 020 2138	Synthetic oil N26303	Synthetic oil N19745
1 l bottle	part no. 020 2138	part no. N26303-1	part no. N19745-1
5 l container	part no. 020 2138-A	part no. N26303-5	part no. N19745-5
20 l container	part no. 020 2138-B	part no. N26303 -20	part no. N19745-20

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Lubricating oil list

1. GENERAL

After extensive tests with many different kinds of lubricants, we have decided to authorize the following brands of oil for use in BAUER-POSEIDON 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-POSEIDON 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-POSEIDON compressor oil in the instruction manual of your unit.

Oil type			Use					Ambient temperature	
Brand name	Designation	Type	A Breathing air	I Industrial air	G Helium, Argon	C CNG	GI Nitrogen	+5 ... +35 °C	+5 ... +45 °C
BAUER POSEIDON KOMPRESSOREN	Special Compressor oil Part no. 020 2136 a)	M	+	+	-	-	-	+	+
BAUER KOMPRESSOREN	Special Compressor oil Part no. N26303 b)	S	-	-	-	+	-	+	+
BAUER KOMPRESSOREN	Special Compressor oil Part no. N19745 b)	S	+	+	-	-	-	+	+
BP	Energol RC 150 a)	M	+	+	-	-	-	+	◆
DEA	Actro EP VDL150 a)	M	+	+	-	-	-	+	◆
LIQUI MOLY	LM 750 with corrosion protection b)	S	+	+	-	-	-	+	+
Anderol	755 b)	S	+	+	-	-	-	+	+
Mobil	Rarus 829 b)	S	-	+	+	-	+	+	+
Shell	Corena P150 a)	M	+	+	-	-	-	+	+
Mobil	Pegasus 1 b)	S	-	-	-	+	-	+	+

Oil type

S	synthetic oil
M	mineral oil

Application

A	approved for breathing air application with BAUER-POSEIDON air purification systems
I	suitable for industrial air compressor units
G	suitable for gas compressor units for dry and highly pure gases
C	suitable for compressed natural gas compressors (CNG filling stations)
GI	suitable for gas compressor units for nitrogen
a)	oil change every 1000 operating hours
b)	oil change every 2000 operating hours

Suitability

+	= suitable
◆	= partly suitable
-	= not suitable

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