



Operating and Maintenance Manual

KOMPBERG BKB22 TWIN

BOOSTERS

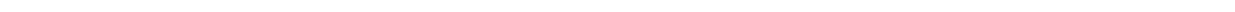


Ladies and Gentlemen,

We heartily welcome you among our valued Customers and thank you for your trust to purchase an BERG Kompressoren GmbHs.

We are sure you will be fully satisfied with both the choice you have made and the cooperation you started with us. Our compressors are machines of top quality, which is the guarantee for a long years and reliable performance.

Our sales and service staff is available to answer all your queries regarding the installation and operation of your compressor. You are also encouraged to use our warranty and post-warranty technical service.



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1. Important notes

1.1. Applications

The compressor is intended for compressing air only. Its use to compress other gases requires prior agreement with machine manufacturer or vendor. Such agreement must be made in writing. The compressor may not be used for any purpose other than specified.

1.2. Operation

While operating the compressor:

- Observe the instructions provided in the Manual and Warranty Book.
- Technical and operating checks should be performed by the manufacturer or authorised service, using the manufacturer's parts and consumables.
- During the warranty period, use only manufacturer's parts and consumables.

1.3. Other remarks and instructions

- The KOMPBERG BKB22 TWIN booster compressor will reach its maximum compression pressure only when 1.0-1.3 MPa is applied on the suction side from the screw compressor,
- Operators should observe general H&S rules for boosters; also the technical supervision body regulations for pressure equipment shall apply,
- An air tank selected individually by our technicians is necessary to ensure proper functioning of the KOMPBERG BKB22 TWIN boosters.

2. Operating safety rules

The present rules are valid for BERG compressors. In addition to the H&S and Technical Supervision regulations applicable to compressors, their assemblies and accessories, the safety instructions given below should be followed in particular. The operators are supposed to observe safe work practices. It is the user's responsibility to continuously maintain the compressor fully operable. Components and equipment considered to be no longer suitable for safe operation should be promptly replaced. Adjustments, installation, operation, maintenance and servicing should be entrusted only to properly trained, qualified and authorized staff.

The limit values (pressure, temperature, time settings etc.) are given in the Technical Data section.



The limit values may not be changed by the user.

The manufacturer accepts no responsibility for any injury, damage of equipment or the compressor itself, at present and in the future, resulting from user's negligence and failure to observe the installation, operation and maintenance requirements contained herein. No responsibility is also taken for failure to observe valid safety standards relating to the equipment and qualified staff.

2.1. Basic requirements for safe transport and positioning of the boosters

In addition to the general H&S and Technical Supervision regulations, the following rules must be observed:

- Use only H&S compliant and approved by the Technical Supervision lifting equipment to lift the compressor. Fix in place all rotating or loose parts of the machine before lifting it. It is strictly forbidden to stand in the hazardous range of the lift operation. Machine movement can be accelerated or slowed down only within applicable limits.
 - The compressor is transported on wooden pallets which should be secured against movement during transport. Fasten the compressor frame with cargo straps to appropriate holders on the vehicle platform to prevent it from sliding or overturning.
 - All screw and pipe connections should be of appropriate size and designed for a given operating pressure.
 - The compressor is not designed to operate outdoors.
-



- The compressor should be installed in a closed room, in cool and clean ambient air. Never block air flow to and from the room. Ensure sufficient flow of cooling air and extraction of heated air out of the room.
- The air sucked in should contain no vapours or flammable gases, e.g. paint thinners, that might cause internal fire.
- There can be no objects close to the air inlet that could be sucked in with a jet of air.
- The pressure conduit connecting the compressor with the compressed air line should allow free expansion due to generated heat. It may not touch hot objects or combustible materials.

2.2. Operating safety requirements

In addition to the requirements contained in the sections: boosters operating description; Start up; Maintenance; the following rules should be observed:

- The compressor is intended for compressing air only.
- All safety equipment must be in place while operating the machine.
- The factory-mounted safety equipment may not be removed.
- There are hot parts in the compressor – conduits, air and oil coolers, screw assembly. They will scald when touched.
- No unauthorized modifications in the control systems are allowed. After power failure, the compressor must be restarted when the power supply is recovered.
- It is prohibited to remove the yellow-green electric shock-prevention conductors.
- No additional equipment can be mounted on the air tank.
- No welding or any other repairs can be done on the tank.
- The plugs and other tank components can be removed only after tank depressurisation to the atmospheric pressure.
- General safety rules should apply while depressurising the air tank. The air must be vented slowly. Keep the air stream away from people.
- Do not allow oil spill around the compressor.
- It is strictly prohibited to service the safety valves or to change their settings.
- Do not change settings in pressure switches above the value given in the identification plate or in the Manual.
- Fulfil the obligation to register the compressor tank with the relevant technical inspection body. Two sets of the required documents of the air tank (if provided) and safety valve are included with the compressor documentation.
- Do not remove the pressure sensor or converter (temperature converter).

2.3. Other hazards




Strictly observe the data given in the product technical documentation to avoid any hazards during the installation, switching on/off and maintenance of the compressor. The risks that could not have been eliminated during the design stage are described in the table below.

Assembly	Residual risk	Action	Precautions
air cooler, guard, frame	minor cuts	touching	avoid touching, wear protective gloves
fan guard and fan	injury	putting sharp objects through the protection mesh with the fan running	do not put any objects through the protection mesh, do not put any objects on it
metallic parts and electric wire	electric shock	damage of wire insulation upstream the motor breaker, live metallic parts	adequate guard for the power supply lead; check the wire insulation for damages

2.4. Explanation of symbols

Pictograms located on the compressor are described below. Explanation is provided below any of them.

For technical reasons, it is impossible to attach pictograms in the very vicinity of the points of risk.

		
MACHINE STARTS AUTOMATICALLY	DANGER OF SCALDS	DANGER OF ELECTRIC SHOCK

3. Setting

3.1. Room requirement

- The compressor requires no foundations. It must be seated on a hard and even surface. Consider load capacity of the floor-ceiling, if the machine is installed in a building.
- Strictly observe the minimum distances from walls and other machines. In case of installation of several compressors, pay attention to the direction of cooling air flow; no compressor should suck air which is heated by other machine.
- Protect the room in which the compressor is installed from negative temperatures. The inlets and outlets to and from the room should be located in such a manner to protect the interior from weather conditions.
- Heat generated during compression should be extracted outside (or to other rooms), and fresh air should be supplied from the outside.
- If the gravity ventilation is insufficient (windows, openings in wall etc.) in the compressor room, force air exchange using ventilators. To ensure sufficient heat extraction, the ventilators should have summarised capacity around 15 – 20 % higher than the total cooling air requirement for all compressors in the room.
- The air temperature in the room should range between +5°C to +40°C.
- Provide sufficient room for maintenance operations.

3.2. Power supply system requirement

The booster compressor is designed to be supplied by a five-conductor 400 V AC, 50 Hz power line. If only four conductor line is available, bridge the PE and N terminals in the cabinet terminal block.

The cross sectional area of conductors should be matched to the current drawn by the booster compressor.

- 3 x 50 mm² + PE wire is recommended for the KOMPBERG BKB22 TWIN with a motor power output of 45 kW (i.e. 2x22 kW).

The KOMPBERG BKB22 TWIN booster should be supplied from a switchgear provided with a time delay fuse (rated for 125 A) and a breaker allowing to completely cut the power supply out.

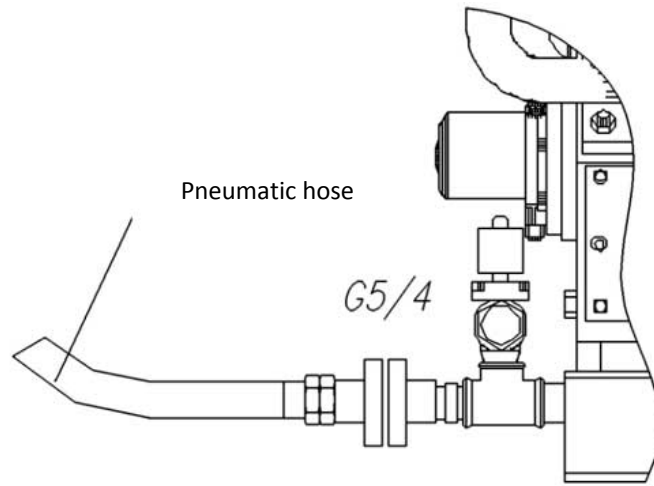
Connect the compressor as specified in the attached electric diagram.

3.3. Compressed air connection

Connect the compressor to the compressed air system with a flexible conduit.



It is recommended to use galvanized steel or plastic tubing for the compressed air system. If conditioning equipment is provided for the compressed air (filters, drier), the existing piping should be replaced with a new one, unless the air supplied previously has not been conditioned by similar equipment.



Compressed air connection for KOMPBERG BKB22 TWIN

3.4. Compressed air treatment

Depending on the desired quality of compressed air, additional equipment for air purification such as dehydrators, filters or drier should be installed downstream the compressor.

Our specialists will select appropriate equipment free of charge.

4. Technical description

4.1. Applications

The KOMPBERG series booster compressors are intended for boosting air pressure from 1.0-1.3 MPa (KOMPBERG BKB22 TWIN) on the suction side, to 2.5-4.0 MPa on the pressure side. The booster is provided with an oil filter and end cooler.

4.2. Main components

The booster compressor comprises an oil piston compressor with "V" cylinder arrangement at 90° angle. The compressor is driven by an electric motor with a belt transmission. A common frame supports the compressor, motor and air end cooler with fans and filters.

4.3. The compressor

It is a single-stage compressor with two cylinders, one-side action, with "V" cylinder arrangement at 90° angle.

The compressor has a tunelled iron cast crankcase. The crankcase bottom serves also as an oil sump with the oil suction filter built in. The oil filter is installed in the oil pump.

Two cylinders with valves are mounted to the crankcase. The valves are held in place in their seats in the head with adjustment bolts through special thrust sleeves. The cylinders have special ribs to ensure efficient heat removal.

The crankshaft forged of increased impact-resistant steel is supported on two rolling bearings. On one side, the crankshaft is provided with a cone end for pulley mounting, whereas the other end drives the oil gear pump.

On a skin-hardened crank pin of the shaft, two connecting rods with thin-wall double-split bearing bushings are mounted.

There are no separate heads in the compressor, as the cylinder and head is a one-component iron cast. Both cylinders are linked with a common suction collector, at the inlet side, and with the air end cooler, at the outlet side.

4.4. Electric motor

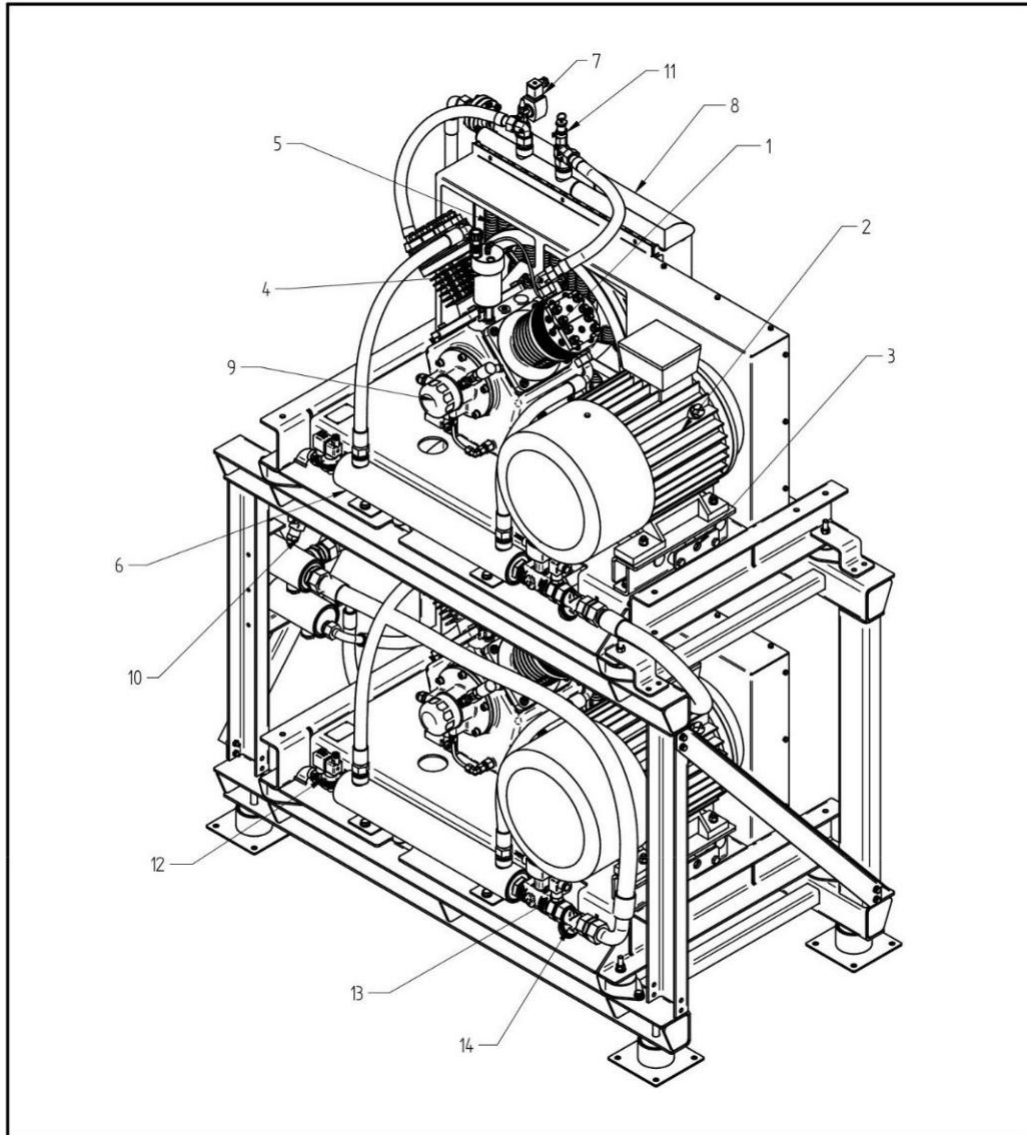
The booster compressor is driven by a squirrel-cage, AC electric motor. The motor is designed for an intermittent run, for maximum 20 starts per hour. The compressor is driven by the motor via a belt transmission.

4.5. End cooler

The cooler in the KOMPBERG boosters is made of vertical ribbed steel tubes connected with horizontal collectors at the ends. The cooler has welded construction. In the upper cooler collectors, valves for draining condensate and a relief solenoid valve are provided. Air circulation in both solutions is forced by a fan driven by an electric motor.

4.6. Booster compressor frame

The KOMPBERG BKB22 TWIN booster frame, on which the motor and compressor are supported, is made of plate and seated on four shock absorbers.



500-113-000

Booster KOMPBERG BKB22 TWIN

- | | |
|----------------------------|-----------------------------|
| 1. Compressor | 8. Cooler |
| 2. Electric motor | 9. Oil filter |
| 3. Belt tensioner | 10. Pressure transmitter |
| 4. Breather | 11. Safety valve |
| 5. Belt transmission cover | 12. Solenoid valve - unload |
| 6. Intake collector | 13. Solenoid valve - intake |
| 7. Solenoid valve | 14. Mesh filter |

4.7. Control and protection equipment

The unit is provided with the following control and protection equipment:
In the suction collector, a mesh filter is installed with two solenoid valves:

- $\frac{5}{4}$ " valve (or $\frac{3}{4}$ "") is placed behind the mesh filter and supplies air to the booster suction side. This valve is only open when the compressor is pressing an air.
- The $\frac{3}{8}$ " valve is located on the opposite side of the suction manifold and is used to relieve the suction side of the compressor during start-up and idle run.

A $\frac{1}{4}$ " solenoid valve (for high pressure) is installed on the aftercooler to relieve the pressure on the compressor's discharge side during start-up and idle run.

All used solenoid valves are normally closed, so they shall be in the closed position when they aren't electric supplied. When the booster is switched on (switch in START position), the relief valves on the booster suction and discharge sides first open (when the motor is stopped) for possible their relief and next the motor starts after a few seconds.

After the start-up, when the motor switches from Y (star) to (delta), the relief valves close and the air supply valve opens to provide the air to the booster suction side. When the preset discharge pressure is reached, the booster switches to idle run, i.e. the relief valves open and the booster inlet valve closes.

A suction pressure sensor is also mounted on the suction manifold, which protects the compressor (booster) against excessive pressure ratio, together with a discharge pressure sensor (which must be mounted on a high pressure air receiver).

A safety valve is placed on the aftercooler to protect the compressor (booster) against excessive increasing overpressure. There is also an oil pressure sensor placed on the oil pump, which protects the compressor against incorrect oil pressure and the wrong direction of rotation.

The maximum pressure ratio of the booster equals 4. The maximum pressure that the booster can generate on the discharge side depends on the suction pressure.

The pressure ratio π is determined by the following formula:

$$\pi = \frac{P_d}{P_s} \leq 4$$

where: π – pressure ratio, P_d – absolute discharge pressure, P_s – absolute suction pressure.

It means that the maximum absolute discharge pressure which a booster can generate is four times greater than the absolute suction pressure. If the pressure ratio value is exceeded, the booster switches to idle run.



After switch off the compressor (motor is stopped) there may be an overpressure in the suction manifold and in the aftercooler. It's necessary to keep this in mind when performing any maintenance work.

5. Technical data

		KOMPBERG BKB22 TWIN
Overpressure	MPa	4,0
Suction overpressure	MPa	1,0
Efficiency *)	m ³ /h	600
	m ³ /min	10
Weight of compressor	kg	1200
Weight of electrical box		8
Dimensions of compressor (LxWxH)	mm	1607x851x1955
Dimensions of electrical box (LxWxH)	mm	278x500x1600
Suction air connection		G2
Compressed air connection		G1¼
Inlet height dimension	mm	747
Outlet height dimension	mm	587
Ambient temperature	°C	from +5 to +40
Air temperature on the outlet	°C	approx.20 above ambient temperature
Noise level L **)	dB(A)	82
Compressor		V3.7.C
Number of cylinders		2
Cylinders diameters	mm	72
Piston stroke	mm	85
Rotational Speed	rpm	900
Volume of oil	dm ³	3,6
Using oil up	g/h	≤8,5
Motor power	kW	2 x 22
Motor rotational speed	rpm	3000
Feed voltage		400V / 50Hz / 3Ph

*) - capacity measured acc. to ISO 1217, 1999

**) - momentary value of acoustic pressure corrected by C characteristic does not exceed 130 dB;

- equivalent acoustic pressure level corrected by A characteristic does not exceed 85 dB(A).

6. Operating description

6.1. Air circuit

The air supplied to the head passes through the head chamber and suction valve to the cylinder. Once compressed in the cylinder, the air is forced through the pressure valve to the end cooler.

After being cooled, the air passes through filters (option) and is supplied to the air tank. As water condenses during the cooling and compressing process, the KOMPBERG BKB22 TWIN booster cooler is provided with a valve for draining the condensate.

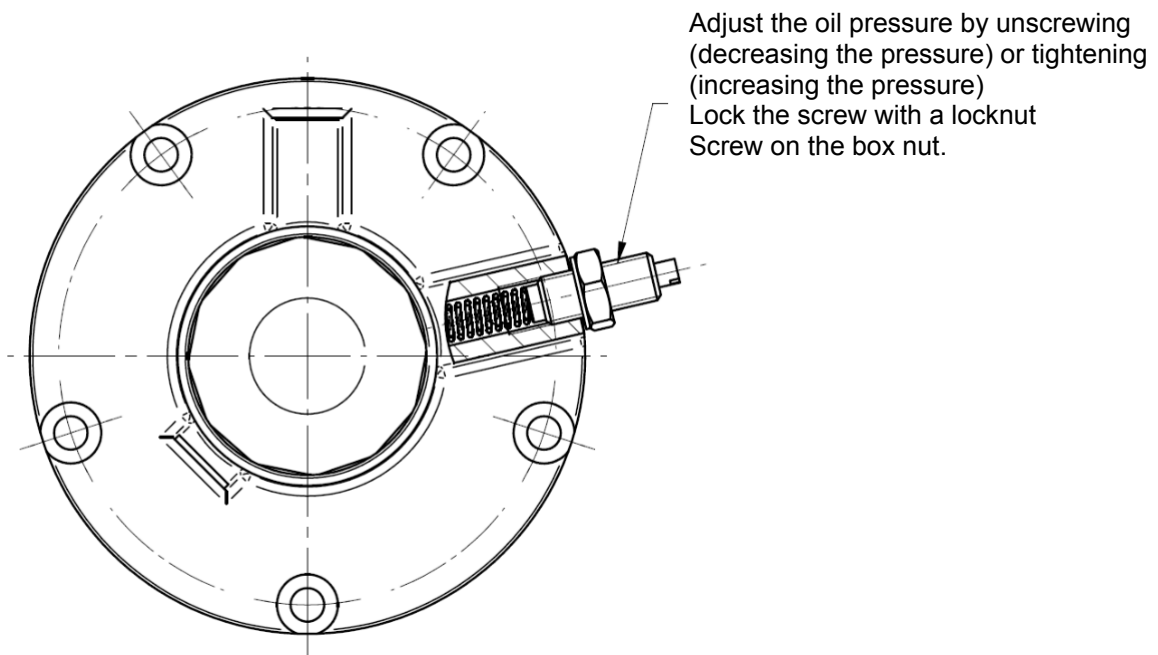
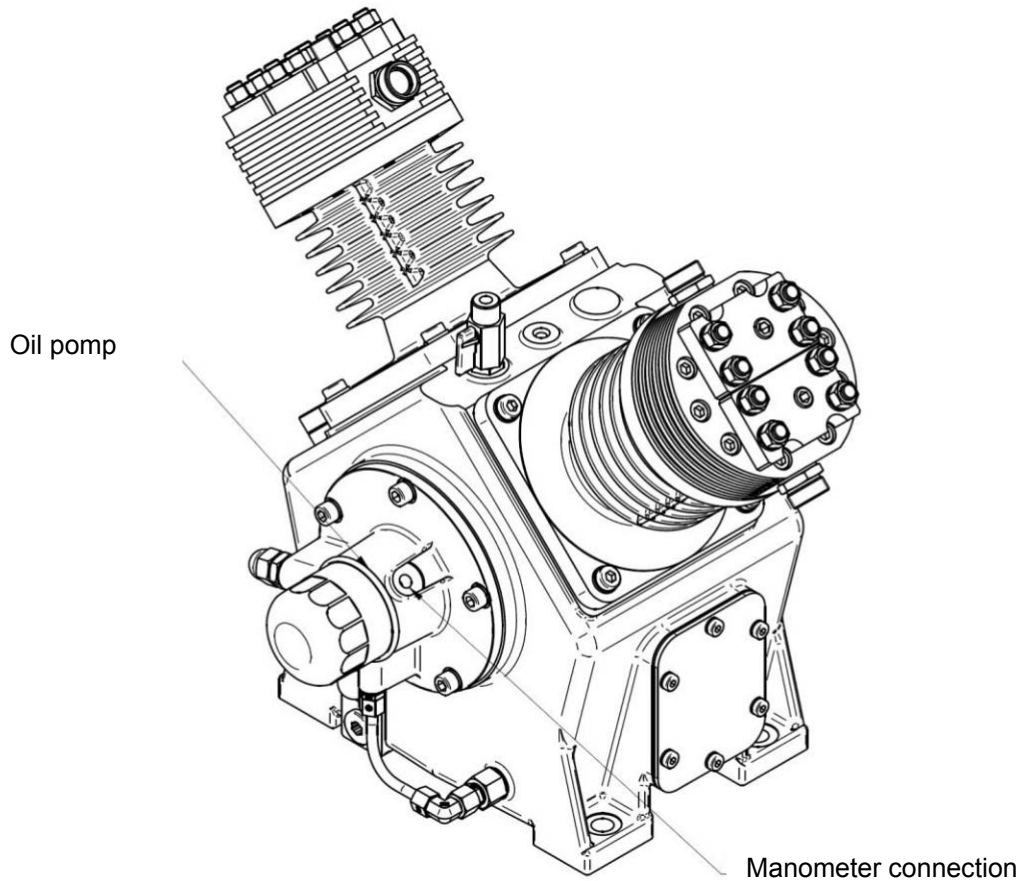
6.2. Lubrication system

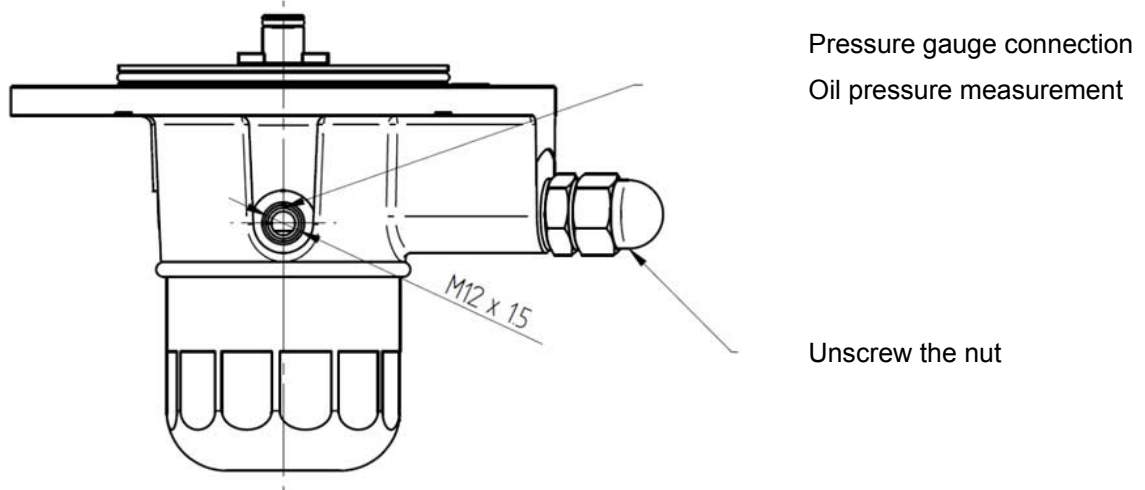
Oil sucked by the gear pump is initially purified in the suction filter. Oil is forced through the fine filter to the hole in the crankshaft, and further on through gaps in the crank pin to the crank bearing bushings and pins.

6.3. Oil pressure control

Oil pressure in the lubrication system with the compressor running should be between 0.2 – 0.4 MPa, and the value should be checked on a pressure gauge connected to the oil pump connection pipe.

The adjustment should be performed when the compressor has heated up and after the state of heat balance has been reached, i.e. after 0.5 hour of work. Secure the locknut and cap nut back when the adjustment is finished.

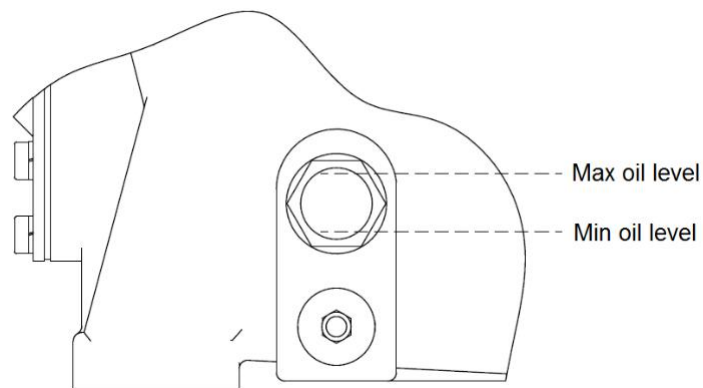




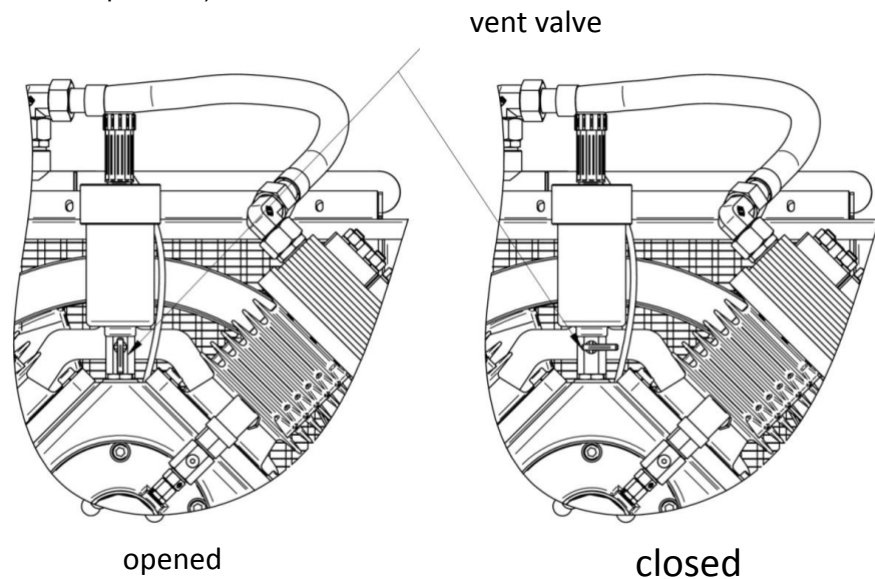
7. Unit operation and maintenance

Before each start and at least once a day:

- check oil level in the crankcase and top it up if necessary,
- check the connections,



- open the breather valve for about 10 seconds (the valve should be closed during normal operation).



8. Periodic maintenance and servicing

In order to ensure fault-free performance of the unit, observe the below listed instructions relating to periodic checks and maintenance.

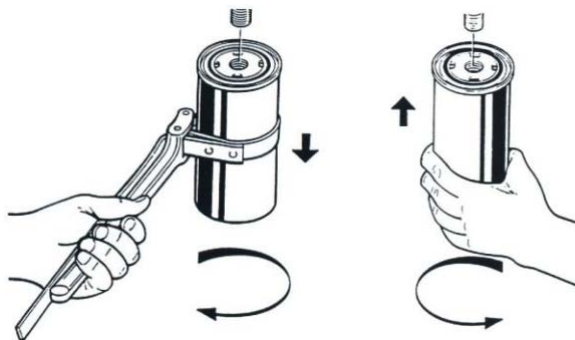
<p>every 500 working hours <i>(made by the user)</i></p>	<ul style="list-style-type: none"> -Clean the external surfaces, especially those of the cooler and compressor cylinders. - Tension drive belts, replace if worn excessively.
<p>every 2000 working hours or once a year if booster doesn't work 2000 per one year <i>(made by the authorized Berg Kompressoren service)</i></p>	<ul style="list-style-type: none"> - Change oil. - Change oil filter.
<p>every 2000 working hours <i>(made by the authorized Berg Kompressoren service)</i></p>	<ul style="list-style-type: none"> - Change vent cartridge. -Change the rings and valves. - Change non return valve cartridge.
<p>every 6000 working hours <i>(made by the authorized Berg Kompressoren service)</i></p>	<ul style="list-style-type: none"> -Change V-drive belts.



Disconnect the unit from its power source and depressurise it to the atmospheric pressure before you proceed with any of the above service operations.

9. Procedure for important service operations

9.1. Oil filter replacement



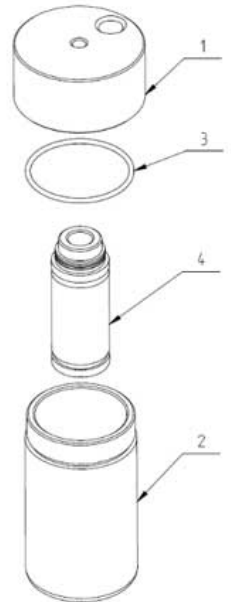
- Turn off the booster compressor, close the valve on the discharge and suction lines.
- Turn off power supply and secure it against being reconnected by unauthorized persons.
- After waiting for at least 5 minutes, open the safety valve on the radiator by pulling the stem.
- Replacing the filter is best done using a special key.
- Before screwing on the new filter, apply a thin layer of oil on the oil filter gasket. Then screw on the filter by hand, without using any tool.
- Slowly open the valves on the suction and discharge lines
- Start the compressor and check for leaks.



Hot oil.

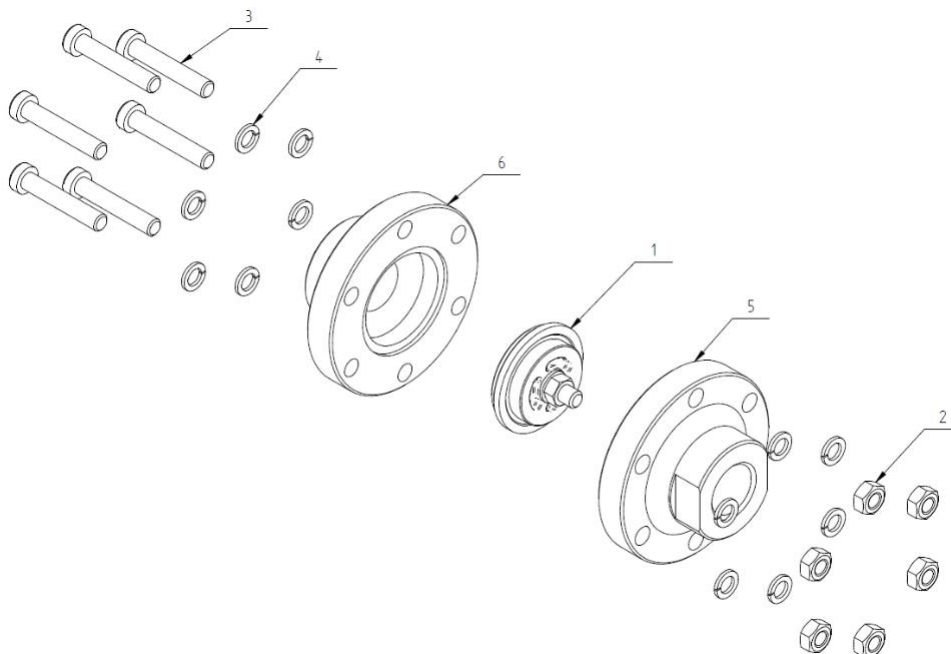
9.2. Vent cartridge replacement (fig. 174-22-000)

- Turn off the booster compressor, close the valve on the discharge and suction lines.
- Turn off power supply and secure it against being reconnected by unauthorized persons.
- After waiting for at least 5 minutes, open the safety valve on the radiator by pulling the stem.
- Disconnect the hose from the vent cover
- Unscrew the vent cover.
- Replace the insert with a new one.
- Assemble the vent in the reverse order.
- Slowly open the valves on the suction and discharge lines.
- Start the compressor and check for leaks.



9.3. Check valve cartridge replacement (563-38-000)

- Turn off the booster compressor, close the valve on the discharge and suction lines.
- Turn off power supply and secure it against being reconnected by unauthorized persons.
- After waiting for at least 5 minutes, open the safety valve on the radiator by pulling the stem.
- Undo the screws and remove the valve body from the side of the compressed air network
- Replace the check valve insert with a new one
- Assemble the check valve in the reverse order
- Slowly open the valves on the suction and discharge lines
- Start the compressor and check for leaks.



1. Check valve
2. Nut
3. Allen screw
4. Spring washer
5. Valve body
6. Valve body

9.4. Oil change

- Replace used oil after pre-heating the machine; this way, the oil will quickly and thoroughly leave the tank. Always replace oil filter when replacing oil.
- Turn off the booster compressor, close the valve on the discharge and suction lines.
- Turn off power supply and secure it against being reconnected by unauthorized persons.
- After waiting for at least 5 minutes, open the safety valve on the radiator by pulling the stem.
- Drain the oil completely and screw the drain plug back in.
- Pour new oil through the inlet to reach the max level mark.
- Screw the threaded plug tightly by hand into the oil inlet.
- Slowly open the valves on the suction and discharge lines
- Start the compressor and check for leaks and the oil level, replenish if necessary.

Use only:



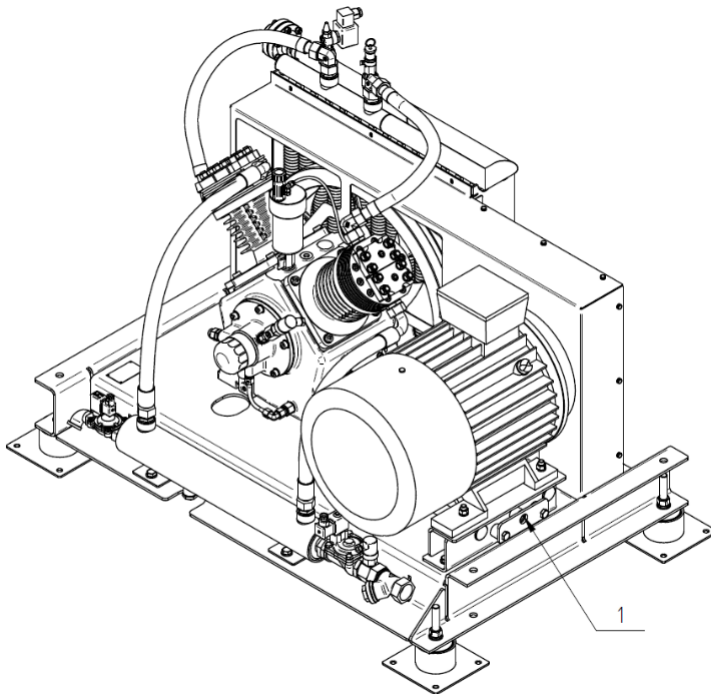
- ❖ Synthetic compressor oil PNEUMOIL ST150 (KOMPBERG BKB22)

Booster	Oil*	Quantity
KOMPBERG BKB22 TWIN	COL0045 (synthetic)	2 x 3,6 l

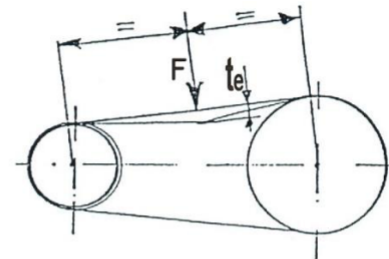
* 5 L package

9.5. V-belts tension

In order to obtain the correct tension of V-belts, loosen or tighten the nut 1.



$t_e=8\text{mm}$
 $F=25\text{N}$



Correct belt tension parameters.

10. Troubleshooting

Symptoms	Cause	Remedy
knocking in the crankshaft assembly	loose crank bolts	tighten the bolts
	bushings worn out	replace the big end bushings
	bearings worn out	replace the main bearings
knocking in the cylinder	bad contact between working valve and head seat	tighten the set screw in the head cover
	excessive play between piston head sleeve and piston pin	replace sleeve and fit new one to piston pin
	excessive play of rings in piston grooves	replace piston rings
	valve plate or spring cracked in the valve	replace the plate, check cylinder bearing surface
other acoustic disturbances in the compressor	severe overheating causing piston seizing	remove and clean the piston and cylinder bearing surface, check oil quality
	large amounts of carbon deposits on the cylinder bearing surface	check the piston rings fit in grooves
oil temperature too high	oil is too viscous or contaminated	check oil quality, replace if necessary
	insufficient quantity of oil	replenish until maximum level is reached
	bearings fitted too close	fit properly
	contaminated bearings	rinse bearings
reduced compressor performance	leaking or damaged working valves	repair and check valves for tightness
	protection for piston rings in grooves	remove deposits from rings and grooves
	excessive wear	replace the rings in piston rings
	leaking connection between the compressor and air system	find and repair leakage
	safety valves are leaking gas	blow or replace the valve with new one
increase in the compressed air temperature	intercooler contaminated	clean and wash the intercooler
	contaminated surfaces in cylinders and heads	clean heads and cylinders
pressure gauge indicates that the pressure is too low	overflow valve ill-adjusted	tighten the overflow valve screw
	not enough oil in the crankcase	add oil

11. Consumables

	Name	Part No.	Quantity
1	Oil filter	MFS0006	2
2	Vent cartridge	UFW0003	2
3	V-belt	MPK0012	4
4	Synthetic oil PNEUMOIL ST150	COL0045*	2 x 3,6 L

*5L package

