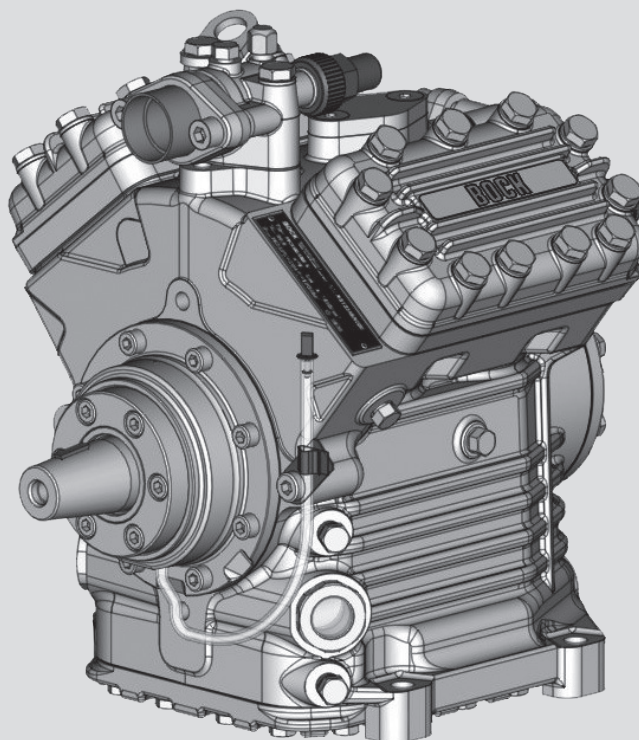




BOCK FK40

Maintenance manual

09665-01.2022-Gb

Translation of the original instructions

FK40/390 K	FK40/470 K	FK40/560 K	FK40/655 K	FK40/755 K
FK40/390 N	FK40/470 N	FK40/560 N	FK40/655 N	
FK40/390 TK	FK40/470 TK	FK40/560 TK	FK40/655 TK	

FKX40/390 K	FKX40/470 K	FKX40/560 K	FKX40/655 K	FKX40/755 K
FKX40/390 N	FKX40/470 N	FKX40/560 N	FKX40/655 N	
FKX40/390 TK	FKX40/470 TK	FKX40/560 TK	FKX40/655 TK	

BOCK®

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of tomorrow

About these instructions

Read these instructions before assembly and before using the compressor. This will avoid misunderstandings and prevent damage. Improper assembly and use of the compressor can result in serious or fatal injury.

Observe the safety instructions contained in these instructions.

Liability and warranty

Manufacturer's liability and warranty are excluded if

- Alterations and functional modifications have been carried out
- No original replacement parts have been used

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1 | Introduction

This maintenance manual is intended to make the repair and maintenance of the FK40 easier for the servicing personnel. The maintenance manual contains a complete description of each work step for the disassembly and assembly of the compressor components. Each step must be carefully adhered to in order to ensure a reliable repair.

Note:

- For replacing components Bock provides suitable spare part kits. Yet assembly jobs which go beyond the replacement of the shaft seal, the valve plates and - if there is one - the capacity regulator (accessory) should be checked carefully for their economic efficiency beforehand.
- The maintenance manual describes the standard type of the FK40 compressor which we deliver. Because of different system conceptions, some passages in this service manual may differ from the unit which you have come across. In these cases the present manual should be used in analogous fashion.

2 | Safety

Safety instructions

Target group of these instructions

- Work on the compressor may only be carried out by persons whose technical training, skills and experience along with their knowledge of pertinent regulations and documentation means that they are capable of assessing the work to be carried out and detecting any possible dangers
- Specialist can mean a refrigeration technician for example. Note that electrical work may only be carried out by a qualified electrician. Alternatively, on a country-specific basis, persons who have undergone electrotechnical instruction and who have proof of their qualification are also permitted to carry out the work.

Identification of safety instructions



DANGER Indicates a dangerous situation which, if not avoided, will cause immediate fatal or serious injury.



DANGER Indicates a dangerous situation which by electrical current, if not avoided, will cause immediate fatal or serious injury.



WARNING Indicates a dangerous situation which, if not avoided, may cause fatal or serious injury.



CAUTION Indicates a dangerous situation which, if not avoided, may cause fairly severe or minor injury.



ATTENTION Indicates a situation which, if not avoided, may cause property damage.



INFO Important information / tips on simplifying work.

2 | Safety

Instrucciones generales de seguridad



DANGER

Danger from electric shock

Compressors contain live parts. Touching these parts can cause electric shock and lead to serious or even fatal injuries.

- Disconnect the compressor from the power supply before commencing work!
- Turn the main switch of the plant to "0" (OFF)!
- Secure the main switch to prevent restart!
- Observe the instructions of the plant/vehicle manufacturer!



WARNING

Danger due to unqualified personnel

Work with or on the compressor by inadequately qualified personnel can cause serious, or even fatal, accidents and injuries.

- Only adequately qualified persons, such as refrigeration plant service technicians or refrigeration mechatronic engineers, are allowed to work on or with the compressor!
- Generally, such persons must be able to assess and judge work and dangers with and on the compressor!



WARNING

Danger from malfunctions

If a compressor continues to be operated during extreme running noise and/or a sharp reduction in refrigerating capacity, there is the danger of further events occurring, such as the fracture of the housing wall. If people are standing in the immediate surroundings, there is the risk of severe injury or even death from flying parts.

- In the event of extreme running noise, switch off the compressor immediately!
- If there is a sharp reduction in refrigerating capacity, switch off the compressor immediately!
- Secure the compressor to prevent restart!
- In such cases do not continue to operate the compressor under any circumstances!



WARNING

Danger from pressure

Compressors are pressurized machines containing very high pressures. They must therefore be handled with extreme caution and care. Serious and even fatal injuries can occur.

- The maximum permissible overpressure must not be exceeded, even for testing purposes!
- Depressurize the compressor before carrying out any work on it!
- Wear protective equipment, such as safety goggles or gloves!



WARNING

Danger from hot parts

Parts on the compressor can get hot. They present a burn hazard.

- Avoid contact with hot parts, such as discharge line valves!
- Wear protective gloves if possible!
- Allow hot parts to cool down sufficiently whenever the situation requires (during disassembly/ installation for example)!



WARNING

Danger from refrigerant

Severe frostbite and skin damage can be caused if the skin comes into contact with the refrigerant.

- The skin must never be allowed to come into contact with refrigerants!
- Wear safety equipment!
- When handling refrigerants, observe their properties!
- Observe the precautionary measures and specifications of the refrigerant manufacturer!

3 | Product description

Product description

Series FK40 vehicle compressors are designed for mobile applications.

Short description

Three design variations are available for different areas of application:

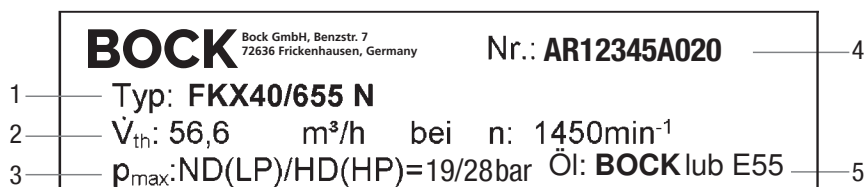
- | | |
|--|---------------|
| > For air conditioning | the K design |
| > For air conditioning or normal cooling | the N design |
| > For deep freezing | the TK design |

The differences are mostly associated with the valve plate version which is adapted to each application range where operational safety and efficiency are concerned.

More features:

- Compact 4-cylinder compressor in V design
- Wear resistant and long-lasting engine
- Five sizes as regards capacity
- Aluminium light-weight construction
- Crankshaft supported in roller bearings on both sides
- Bidirectional lubricating oil pump with relief valve
- Variable arrangement shut-off valves
- Ideally equipped with valve plates for each application
- Integrated pulsation damper for especially quiet running

Name plate (example)



- | | |
|--|--|
| 1. Type designation | 4. Machine number |
| 2. Displacement at 1450 rpm | 5. Factory-filled oil type |
| 3. ND(LP): max. permissible operating pressure low pressure side
HD(HP): max. permissible operating pressure high pressure side | } Observe the limits of application diagrams! |

Type key (example)

Explanation of the type designation

FK X 40 / 655 N

Designs

Swept volume

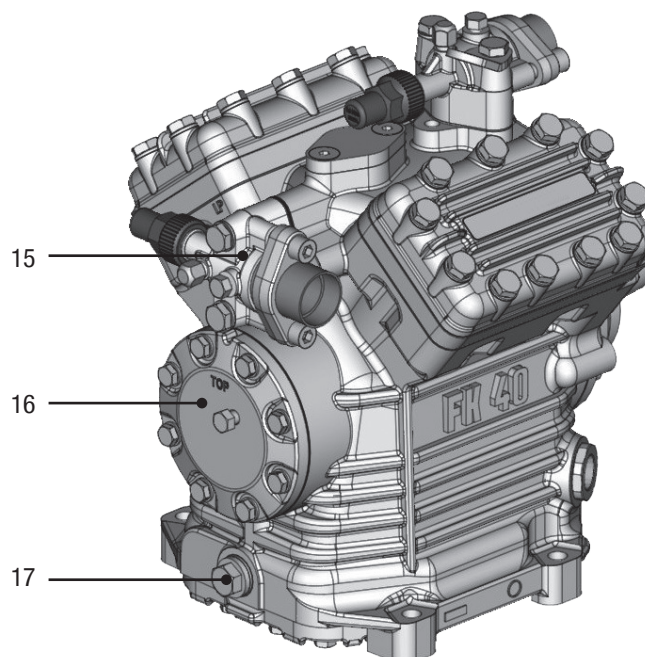
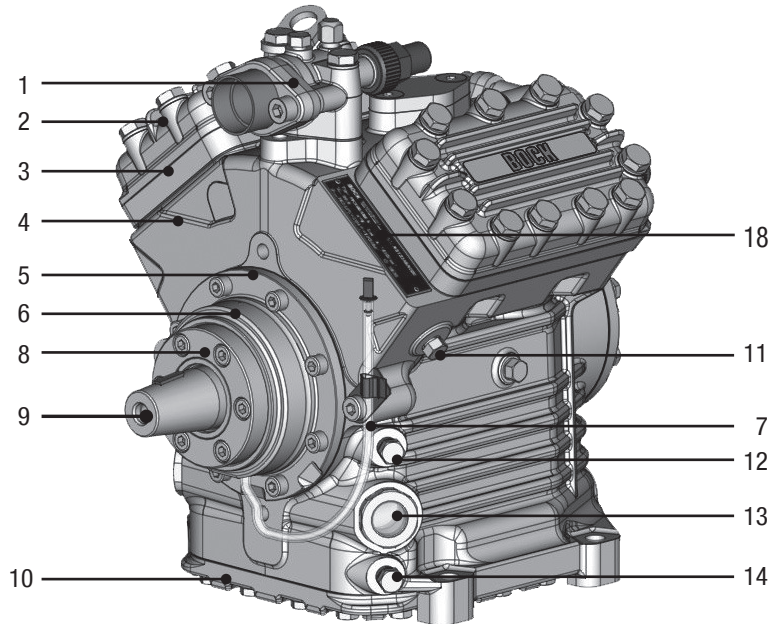
Size

Ester oil charge (HFC refrigerant, e.g. R134a, R407C)

Series

3 | Product description

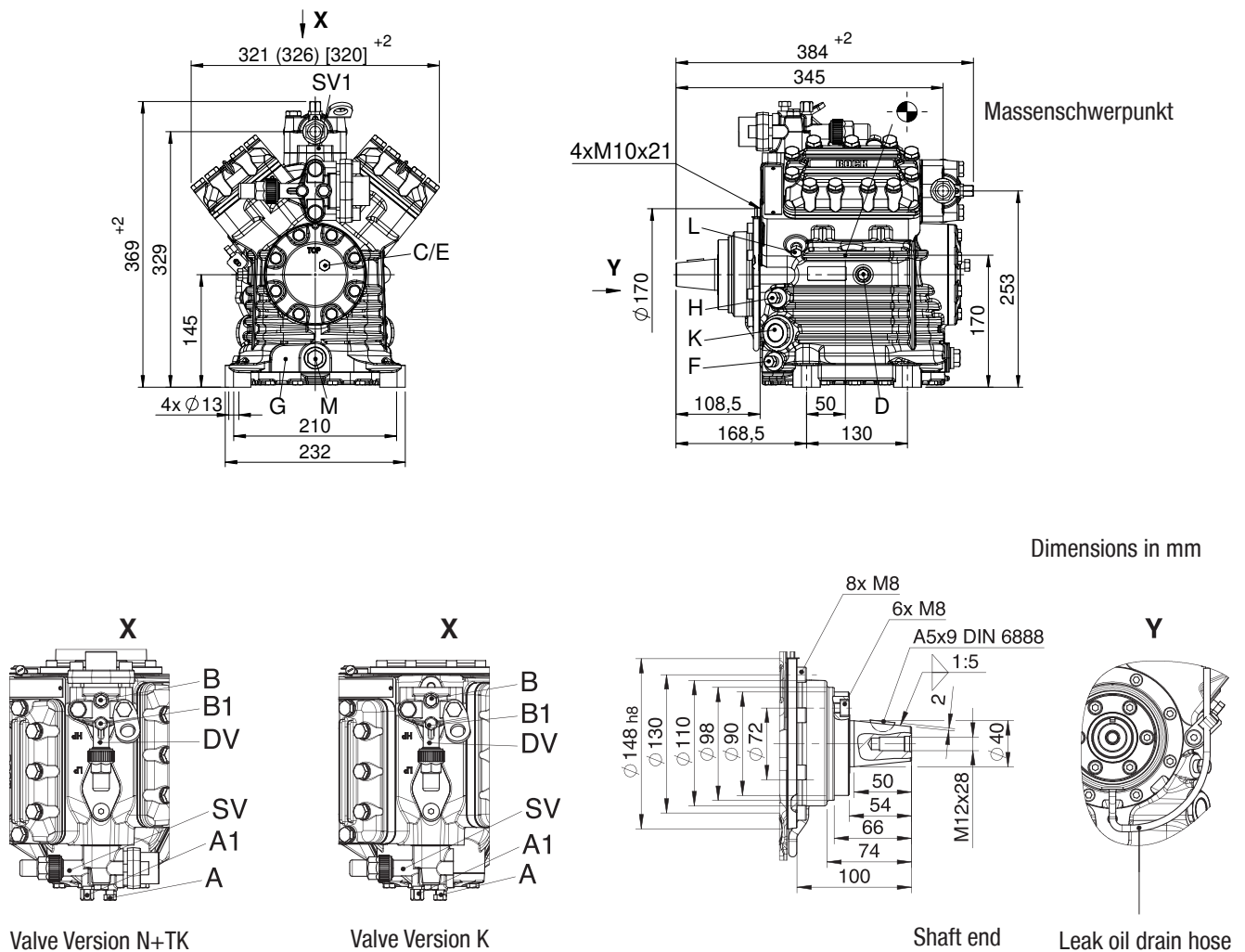
Main and functional parts



- | | |
|--|--|
| 1. Discharge shut-off valve | 10. Baseplate |
| 2. Cylinder cover | 11. Connection thermal protection thermostat |
| 3. Valve plate | 12. Oil filling plug |
| 4. Compressor housing | 13. Oil sight glasses (2x) |
| 5. Location hole for fitting magnetic coupling | 14. Oil drain plug |
| 6. Integrated leak oil collector | 15. Suction line valve |
| 7. Leak oil drain hose | 16. Oil pump |
| 8. Shaft seal | 17. Oil drain plug / Oil filter |
| 9. Shaft end | 18. Name plate |

3 | Product description

Dimension drawing



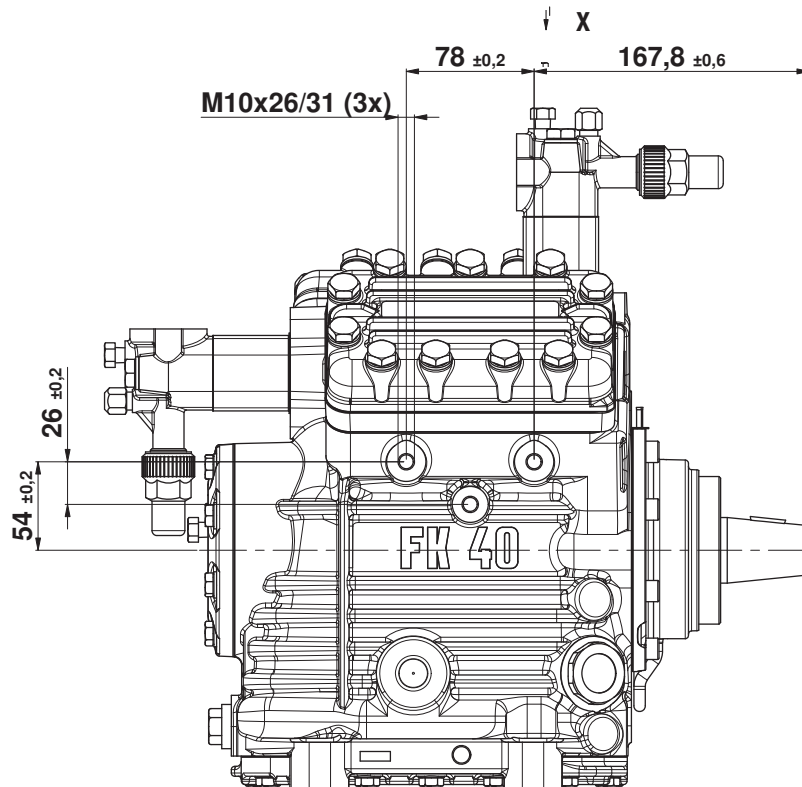
Connections

A	Connection suction side, not lockable	1/8" NPTF
A1	Connection suction side, lockable	7/16" UNF
B	Connection discharge side, not lockable	1/8" NPTF
B1	Connection discharge side, lockable	7/16" UNF
C	Connection oil pressure safety switch OIL	1/8" NPTF
D	Connection oil pressure safety switch LP	1/8" NPTF
E	Connection oil pressure gauge	1/8" NPTF
F	Oil drain	1/4" NPTF
G	Opt. connection for oil sump heater ¹⁾	- -
H	Oil charge plug	1/4" NPTF
K	Sight glass	2 x 1 1/8" NPTF
L	Connection thermal protection thermostat	1/8" NPTF
M	Oil filter	M22x1.5
SV1	Optional connection for suction line valve	- -

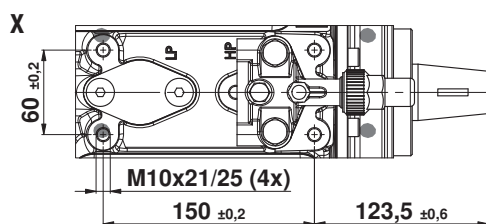
¹⁾ = No connection available as standard.
Available on request (Connection M22 x 1,5)

3 | Produktbeschreibung

Characteristics for K1 special housing



Mounting thread only on this side of the compressor available.



The M10 threads in the housing can be used for screwing on attachments and bracing the compressor.

- Maximum load on the screw connection = 6 g-force
- Maximum tightening torque of the screws = 60 Nm with minimum screw-in depth = 20 mm and friction coefficient = μ 0,15.
- Maximum screw-in depth 25 mm.
- Usable screws up to strength class 10.9.

In case of screw-in depths less than 15 mm or lower friction coefficients than μ = 0.15, the tightening torques and maximum load must be reduced.

INFO



If the M10 threads are used as additional bracing, installation is overdetermined. It must be ensured that the compressor housing is not distorted during installation. The specifications of the motor / chassis manufacturer are mandatory.

4 | Technical data

Type	No. of Cyl.	Displace-ment cm ³	Swept volume (1450 rpm) m ³ /h	Weight kg	Connections		Oil charge Ltr.	Inertia moment of the driving unit [kgm ²]	Lubrication	Oil pump
					Discharge line DV mm / inch	Suction line SV mm/inch				
FK(X)40/390	4	385	33.5	34.0	22 / 7/8	28 / 1 1/8	2.0	0.0043	Forced lubrication	Rotation-independent
FK(X)40/470		466	40.5	33.0	28 / 1 1/8	35 / 1 3/8				
FK(X)40/560		554	48.3	33.0	28 / 1 1/8	35 / 1 3/8				
FK(X)40/655		650	56.6	31.0	35 / 1 3/8	35 / 1 3/8				
FK(X)40/755		755	65.6	31.0	35 / 1 3/8	35 / 1 3/8				

The technical data for the different designs K, N and TK are identical.

The compressor type data therefore do not mention these additions.

5 | Maintenance

Maintenance

Service intervals

To ensure optimum operational reliability and service life of the compressor, carry out the service work required on the compressor at regular intervals as well as in accordance with the specifications of the refrigerating plant's manufacturer.

Regular checks (at least annually)

- Check the tightness of the compressor and of the plant
- Check the compressor for running noises and vibration development
- Check the oil level in the oil sight glass
- Check the oil fill level of the floating ring seal in the oil drain hose
- Drain the oil reservoir of the floating ring seal after 1,400 operating hours at the latest
- Check auxiliary devices, the capacity control for example, for proper function
- Check the pressures and temperatures of the plant
- Check tensioner pulley for correct seating
- Check tension and state of the V-belts
- Check fastening bolts for firm seating
- Check electrical connections for clean, firm contact and supply lines for chafe marks after 1,400 operating hours at the latest

Oil level check

After starting the compressor, the oil level has to be checked. For this:

- The driving engine should be in the „High idle“ operating condition (elevated idling speed)
- Compressor running time at least 10 min.
- The system should have reached the operating point and steady state.
- Check the oil level. Since in practice the installation position of the compressor can be different (inclined positions), it is recommended to check the oil level in both sight glasses. The oil level must be visible in at least one sight glass.

Oil change

Oil change: In principle, an oil change is not a mandatory requirement, if the equipment is correctly manufactured and properly operated. Based on decades of experience, we recommend however that the following oil change/service work is carried out:

- Initial oil change during the first maintenance of the vehicle (at the latest after one year)
- Then after every 5,000 operating hours, at the latest however after 3 years. Also clean the oil filter.
- An oil change is also necessary, if the oil is very cloudy and dark, or after repairs have been carried out on the compressor.

Where requirements are higher during use (frequent operation at the limits of application, or in hotlands with over +40 °C ambient temperature, or in the case of deep freezing), the following requirements must be observed:

- Initial oil change during the first maintenance of the vehicle (at the latest after one year)
- Then an oil change after every 2,000 operating hours, at the latest however after two years. Also clean the oil filter.

Preventive maintenance

The above requirements for higher use applications also apply in the case of preventive maintenance. The shaft seal must also be changed after 3 years.

Regular inspections (at least annually): Checks to be carried out on oil level in the oil sight glass, oil fill level of the shaft seal in the oil drain hose, absence of leaks in the compressor, running noise, vibrations, pressures, temperatures, and functioning of auxiliary devices such as the capacity control.

Emptying the shaft seal oil reservoir: As required depending on use, but at the latest after 1 year or approx. 1,400 operating hours. Since changing the shaft seal involves encroaching into the refrigerant circuit, this is only recommended, if the seal is losing refrigerant, or if oil is escaping in excess of the permissible amount. Changing the shaft seal is described in the relevant spare part kit.

5 I Maintenance

Emptying the oil reservoir

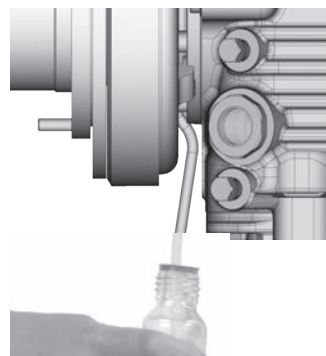
Emptying the oil reservoir: The oil reservoir can be emptied very simple without having to dismantle the coupling and/or belt drive. It is recommended that this is done at the same time as the air-conditioning maintenance and motor service. To proceed, detach the oil hose from the bracket, remove the sealing plug and drain the oil into a collecting vessel. After emptying, reseal the oil hose and clamp it into the bracket.

Dispose of the used oil in accordance with national regulations.

The shaft seal is a wearing part, and its service life depends on the prevailing conditions. Damaging effects on the shaft seal:

- Too little suction gas superheat, particularly during wet operation
- Too high or too low belt tension
- Thermal overload (operation outside the limits of application)
- Frequent cycling
- Long periods of stoppage
- Material deposits / dirt from the system

Due to these effects, the shaft seal can develop leaks, and it must then be replaced.



Recommended spare parts/accessories

Maintenance set for oil change

- **BOCK**lub E55 2 x 1 l
- Oil drain screw with seal

Maintenance set for shaft seal

- shaft seal kit
- **BOCK**lub E55 2 x 1 l
- Oil drain screw with seal

Available spare parts and accessories can be found on our compressor selection tool under **vap.bock.de** as well as in our online spare parts catalogue at **bockshop.bock.de**.

Only use original Bock spare parts!

Lubricants / Oils

The oil type filled as standard in the factory is marked on the name plate, and this should always be used, even in the case of maintenance units. Alternative oil types can vary significantly in quality due to additives or inferior raw materials by the manufacturer. Validation within the compressors entire operating limits can not be guaranteed, if such alternative oil types are used. It is for this reason, that we only recommend the use of oil from Bock! Bock assumes no liability for any damage arising from alternative oil types.

Refrigerant	Bock standard oil grade
HFC (e.g. R134a, R407, R 404A)	BOCK lub E55
HCFC (e.g. R22)	BOCK lub A46

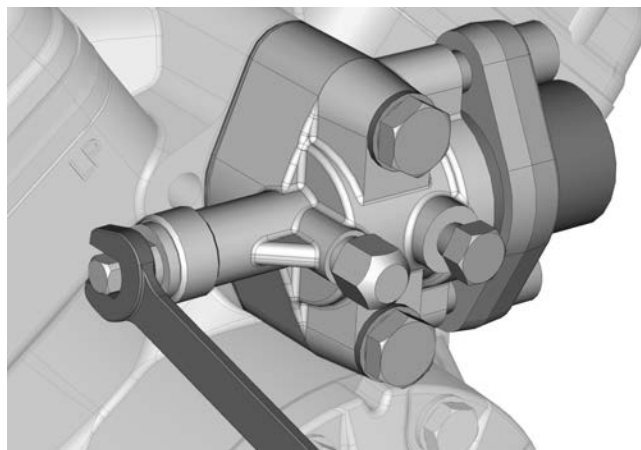
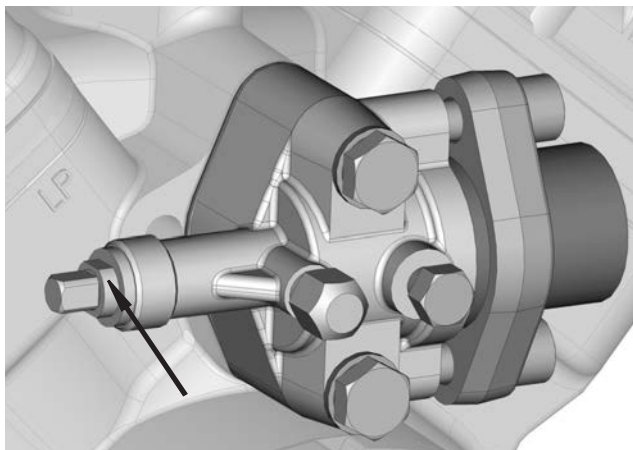
5 | Maintenance

Function and operation of the lockable shut-off valves



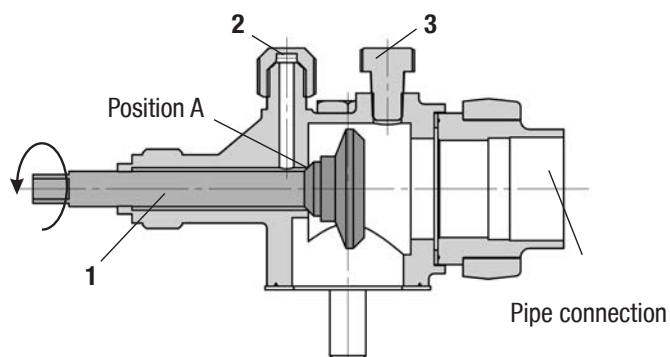
INFO

Before opening or closing the shut-off valve, loosen the valve spindle seal (Fig. left) by 1/4 turn.
After operating the shut-off valve, tighten the valve spindle seal carefully again (Fig. right).



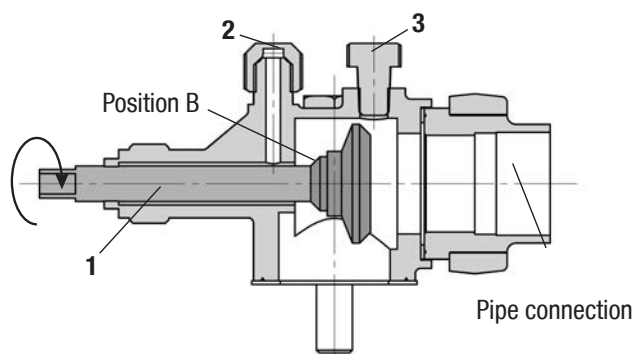
Opening the shut-off valve:

- a) Spindle 1: turn to the left (counter-clockwise) as far as it will go.
—> Shut-off valve fully opened / service connection 2 closed (position A), Fig.



Opening the service connection (2)

- b) Spindle 1: Turn 1/2 - 1 rotation to the right.
—> Service connection 2 opened / shut-off valve opened (position B), Fig.
Connection 3 is provided for safety devices and is not lockable.



6 I Fault diagnosis

Fault diagnosis

In case of malfunctions during compressor operation we recommend to prepare a measurement record for aiding the fault search:

- Pressure measurement: Discharge side, suction side, oil pressure
- Temperature measurement: Compressor casing, discharge end temperature, suction gas overheating
- Oil level
- Compressor speed

According to the expected cause of the fault it may be necessary to check the electrical systems for faults in the control.

In order to localize the causes of operating malfunctions as easy as possible we have compiled the following table with suggestion for remedying compressor malfunctions. Further information is retrievable under vap.bock.de (mobile applications -> tools -> online analysis). Additionally a failure analysis slide is obtainable under service@bock.de.

Function faults - Symptoms

Function faults arising most frequently and their symptoms are:

- Compressor stoppage, compressor cutoff
 - Compressor does not start
 - Compressor starts and then stops again
- Refrigerant performance too low
- Too high compressor temperature
- Oil problems
- Abnormal compressor running noise

Compressor stand still

Compressor does not start

Problem	Possible cause	Remedy
Control circuit is interrupted / no control by control element	Main - or control fuse is switched off or tripped	Replace fuse Determine and remove the cause
	Cut off through: - Low pressure switch - High pressure switch - Heat protection thermostat - Control thermostat - Other safety elements	Locate the interruption in the circuit and remove
Malfunction of electromagnetic coupling	- see also page 16 "Malfunction of electromagnetic coupling"	Checking

Compressor cutoff

Compressor starts and stops again

Problem	Possible cause	Remedy
Cutoff through low pressure switch	Suction pressure too low:	
	- Check the setting of the low pressure switch	- Adjust the switching points or replace switch
	- Suction valve of the compressor closed	- Open suction valve
	- Capacity of compressor too large	- Check operating conditions
	- Refrigerant deficiency	- Leak test / add refrigerant
	- Filter / dryer in the liquid line blocked	- Replace filter / dryer
	- Expansion valve not functioning properly	- Check the setting of the expansion valve
	- Solenoid valve on the liquid line not opening	- Check the control / function
	- Evaporator clogged (dirt / ice)	- Remove cause
	- Evaporator fan defective	- Remove cause
	- Pipeline damaged	- Remove cause

6 I Fault diagnosis

Problem	Possible cause	Remedy
Cutoff through high pressure switch	Condensing pressure too high:	
	- Check the setting of the high-pressure switch	- Adjust the switching points or replace switch
	- Pressure valve of the compressor closed	- Open the pressure valve
	- Condenser fan not functioning	- Check the control / replace motor
	- Condenser performance insufficient, condenser and fan motor contaminated	- Cleaning of condenser fins and fan
	- Excessive refrigerant filling	- Extract refrigerant to normal filling
	- Non-condensable gases in refrigerant	- Extract refrigerant and evacuate the refrigeration plant / refill refrigerant
	- Pipeline damaged	- Checking and repairing the pipeline
Cutoff through heat protection thermostat (accessory)	Discharge end temperatures is too high	- Adapt the operating conditions to the operating range
	- Operating limits of compressor exceeded	
	- Suction gas overheating	- Check expansion valve / check insulation on the suction side
	- Condenser cooling insufficient	- Check fan motors / cleaning of condenser
	- Valve plate damage	- Replace valve plate
	- Internal decompression valve has opened	- Replace decompression valve -> Check compressor and refrigeration plant Determine and remove the cause for the inadmissible high pressure in the high-pressure side
Cutoff through control thermostat	Temperature over / below the desired range	Check operating points

Refrigerant performance too low

Problem	Possible cause	Remedy
Suction pressure too high	- Expansion valve not functioning properly	- Check expansion valve setting; replace valve, if necessary
	- Lack of compressor capacity	- Check the function of the compressor by evacuating to vacuum. Check function of capacity regulator (accessory)
	- Shortage of refrigerant	- Run leakage test / refill refrigerant
Suction pressure too low	- See „Cutoff through low-pressure switch“	- Checking
High-pressure too high	- See „Cutoff through high-pressure switch“	- Checking
High-pressure too low	- Condenser being cooled to much	- Adjust the control of condenser cooling
	- Lack of compressor capacity	- Check compressor / Check the functioning of capacity regulator
	- Pressure laminations of valve plate leaking	- Replace valve plate
	- By-pass between suction and discharge side	- Localize leak between the discharge and suction side and repair it
	- Lack of refrigerant	- Carry out leakage check / top up refrigerant
Power regulator activated	- Malfunction	- Check function
V-belt slips	- missing voltage	- Adjust voltage

6 I Fault diagnosis

Refrigerant temperature too high

Problem	Possible cause	Remedy
Suction gas temperature too high	- Suction gas overheating	- Adjust expansion valve Insulate the gas suction line
	- Too little refrigerant filling	- Establish the operating filling (see Operating Instruction for the refrigeration plant), localize leak
	- Liquid filter blocked	- Clean / replace filter / dryer
	- Shortage of refrigerant	- Run leakage test / refill refrigerant
Discharge pipe temperature too high	- Suction gas temperature too high (Condensing pressure too high)	- Adjust expansion valve Insulate the gas suction line - see „Cutoff through high-pressure switch“
	- Operating limits of compressor exceeded	- see „Cutoff through heat-protection thermostat“
	- Cooling insufficient	- Check refrigerant filling - Adjust expansion valve
	- Short circuit between the discharge and the suction side of the compressor	- Check gaskets on valve plate / change
	- Valve plate damage	- Replace valve plate
	- Internal decompression valve has opened	- Replace decompression valve (see the section on Disassembly / Assembly of Compressor)

Oil problems

Problem	Possible cause	Remedy
Oil pressure too low	- Refrigerant in oil	- see „Oil foams“
	- Too little oil in compressor	- Add oil and search for the cause of oil loss
	- Oil filter dirty / blocked	- Clean / replace oil filter Change oil
Oil foams during start-up phase	- Liquid refrigerant has moved into the oil sump	- Check the laying of pipes - Installation of the check valve in the discharge line / check - Installation of the solenoid valve in the liquid line / check - Check the control
Oil foams during operating	- Expansion valve not functioning	- Adjust / replace expansion valve / check
Oil level decreases	- During start-up, a portion of the oil is carried to the refrigeration plant with the refrigerant	- Refrigerant and oil get mixed. After some time the oil level should stabilize. Add oil, if necessary.
	- Refrigerant in oil	- see „Oil foams during start-up phase“
	- Piston rings worn	- Replace piston rings
	- Suction / discharge laminations of the valve plate leaking	- Replace valve plate
	- Oil return disturbed	- Remove cause
	- Lack of refrigerant	- Remove cause

6 I Fault diagnosis

Abnormal running noise from compressor

Problem	Possible cause	Remedy
Fixation of compressor is loose	- Screwed connections have become loose - Securing elements for screwed connections missing	- Tighten the screwed connections and secure them anew
	- Vibration metals defective	- Replace vibrations metals
Liquid shock	- Liquid refrigerant reaching the compressor	- Adjust / check expansion valve Check refrigerant filling Check evaporator fan - Icing-up of the evaporator / Filter dirty
	- Oil shocks because of too much oil	- Check oil level Check the dimensioning of pipes (gas velocity) Replace worn piston rings
Capacity regulator (accessory)	- Switching on and off constantly / oscillating	- Check the control
	- Defective	- Replace capacity regulator valve
Electromagnetic coupling slipping	- see also p. 16 „Malfunction of electromagnetic coupling“	- Checking
V belt drive, increased noise generation	- Belts vibrating excessively	- Check belt tension Use tensioning roller / guidance roller
	- Incorrect alignment of compressor and motor	- Check alignment and adjust anew

Malfunction of the electromagnetic coupling

Problem	Possible cause	Remedy
Coupling not switching	- No voltage applied	- Apply voltage and check
Coupling slipping too long, getting hot, smoking and squeaking	- Voltage too low	- Keep the voltage at 12 or 24 Volts (check vehicle network)
	- Driving power too high	- Check operating conditions
	- Rotor rubbing at the magnetic field	- Check the seating of the magnet possibly to high belt tension
Coupling not separating	- Voltage still being applied to the magnet	- Check switch / relay
	- Coupling is stuck	- Disconnect the armature disc from the rotor mechanically
	- Coupling overloaded, Armature disc is deformed	- Install new rotor and armature disc

7 I Installation of service kits

Disassembly and assembly of the compressor



WARNING Before starting any work on the compressor:

- Switch of the compressor and guard it against switching on
- Close the discharge and suction shut-off valves
- Relieve the compressor from system pressure
- Prevent air from infiltrating the system
- Move and transport the compressor using an appropriate hoist
- Use only genuine Bock spare parts

After the work is finished:

- Connect the safety switch and check its function
- Evacuate the compressor
- Before commissioning, check whether all the components installed by the user have been mounted expertly and are connected pressure-tight to the compressor
- Open the pressure and suction shut-off valves
- Set off the switching-on lock

For changing components in the framework of customary service works we recommend the kits described on the following pages.

Important Notes



INFO

- Use only new gaskets for assembly
- The following illustrations show a FK40 compressor in standard design.
Components of other designs can differ from these illustrations.
However, the procedure for disassembly and assembly of the compressor is identical.

7 | Installation of service kits

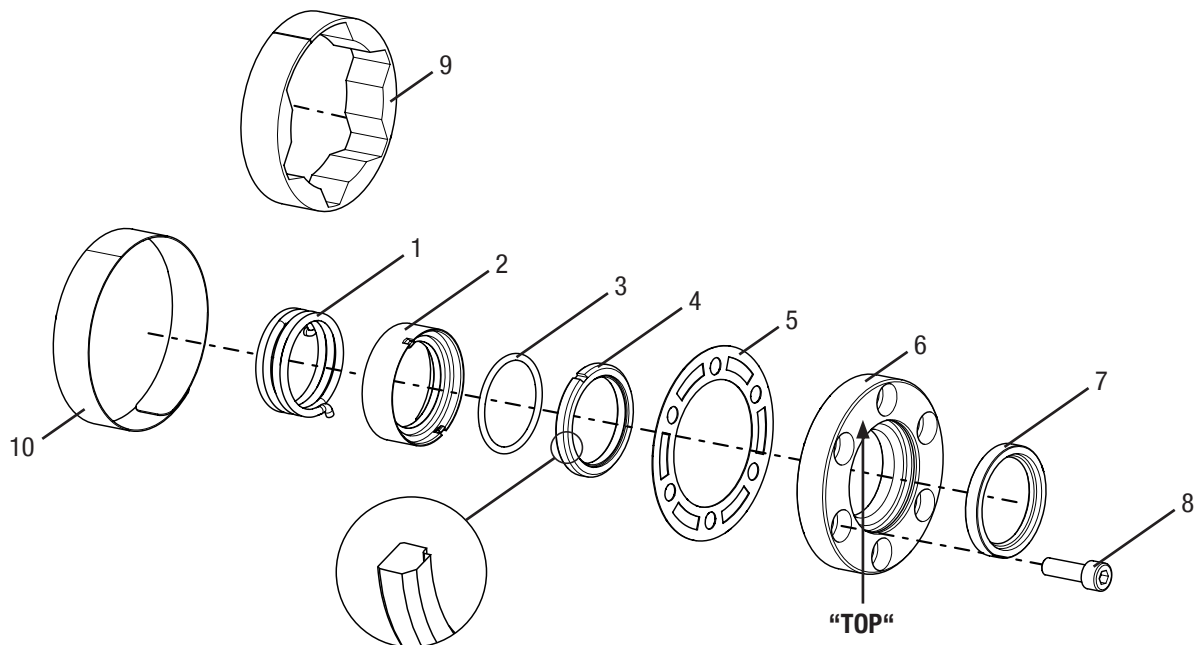
Shaft seal (Item No. 80023 (ester oil charge) resp. 80682 (mineral oil charge))

Removal:

- Dismount the drive/magnetic coupling from the compressor.
- Remove the woodruff key from seat at the shaft end.
- Remove the clamping ring (10) and the oil felt (9) (for this see Fig. 3 on page 17).
- Unscrew the screws (8) from the shaft seal cover (6) .
- Remove the gasket residues and the shaft seal cover gasket (5) from the bearing flange.



ATTENTION The shaft seal cover (6) is under spring tension. The remaining oil may run out of the shaft seal chamber. Keep a suitable collection container ready!



Installation:

- Ensure the greatest possible cleanliness when working.
- Always replace floating ring seals in their entirety, not just individual parts.
- Avoid used parts.
- Before installation, check the sliding and sealing faces for cleanliness and/or damage.
- Push compression spring (1) over the crankshaft. Turn spring until drive lug engages in the crankshaft.
- Apply silicone grease to seat for O-ring joint in the guide ring (2) and O-ring joint (3).
- Push guide ring (2) with O-ring joint (3) and floating ring (4) over the crankshaft. Bevel on the floating ring facing outwards.
- Turn all parts until spring engages in the guide ring. Avoid scratches on the floating ring (4)!
- Apply silicone grease to shaft sealing ring (7) in the floating ring cover (6).
- Mount floating ring cover (6), incl. sealing ring (7) with seal (5), "TOP" marking must be on top, using centring sleeve.
- Press floating ring cover (6) onto bearing flange and tighten bolts.
- Turn crankshaft by hand, remove centring sleeve.
- Mount locking ring (11) with oil pad (10) (only to version ID 014, 4th quarter 2005), see section Locking ring with oil pad, chapter 7 Installation of service kits, P.19.
- Insert woodruff key in the groove of the compressor shaft end.
- Mount drive/coupling.

For graphic instructions on the floating ring seal, refer also to chapter 12/9 Installation of the floating ring seal, P. 50 f!

7 | Installation of service kits

Emptying the oil reservoir / starting from Version ID 015 (starting from 4th quarter 2005)

Emptying the oil reservoir: The oil reservoir can be emptied very simply without having to dismantle the coupling and/or belt drive. It is recommended that this is done at the same time as the air-conditioning maintenance and motor service. Proceed by removing the oil hose from the bracket, remove the sealing plug and drain the oil into a collecting vessel. After emptying, close the oil hose with the sealing plug and fix it to the bracket. Dispose of used oil in accordance with the regulations applicable in the country of use.

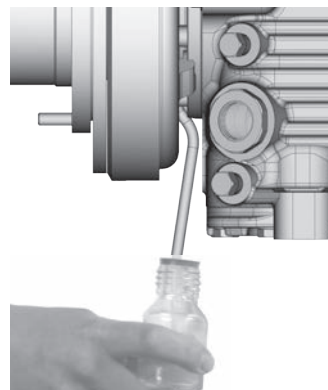
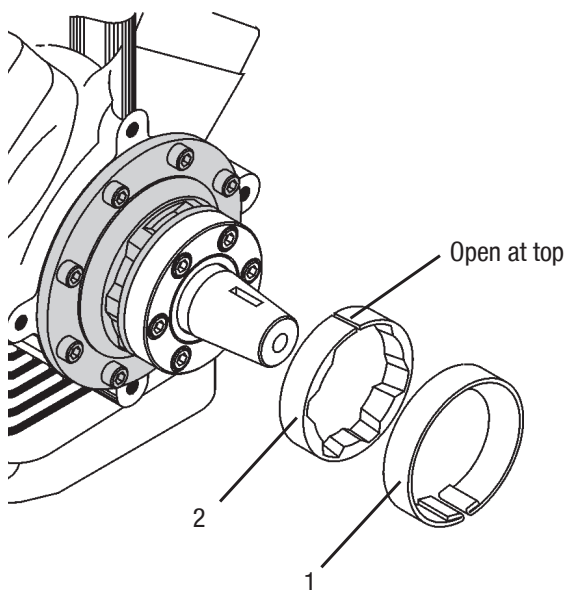


Fig. 1

Version ID 007 - 014 (until 4th quarter 2005)



Clamping ring with oil felt (Item No. 80129)

Procedure:

- Remove the clamping ring (1) and the oil felt (2) (see Fig. 2)
- Insert the oil felt (2) included in the repair kit and mount the clamping ring (1).

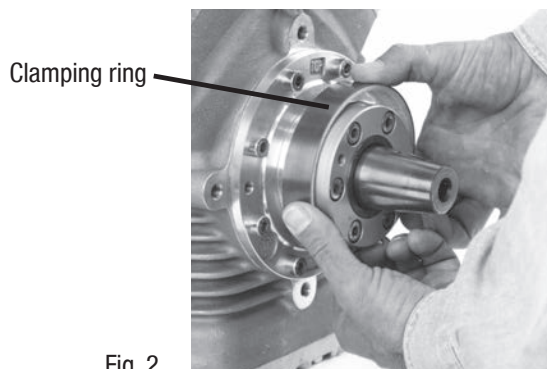
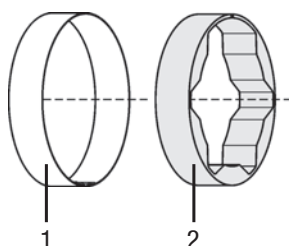


Fig. 2

7 | Installation of service kits

Capacity regulation

The capacity regulation takes place through the turning off of the suction gas flows by means of a solenoid valve on the cylinder cover. For this, the valve is activated electrically by a thermostat or pressostat.

- During normal operation the solenoid is de-energized and the suction gas channel in the valve plate and in the cylinder cover is open. The compressor capacity is 100%
- During regulated operation the solenoid is energized and the suction gas flow is closed through the shut-off piston of the solenoid valve.

The compressor pistons of the cylinder bank which is regulated down run idle. The capacity of the compressor is still approx. 50%.

Further information together the description of the working principle of the solenoid valve is contained in the publication „Capacity regulation“ (Item No. 09900).

Capacity regulation valve (Item No. 07541)

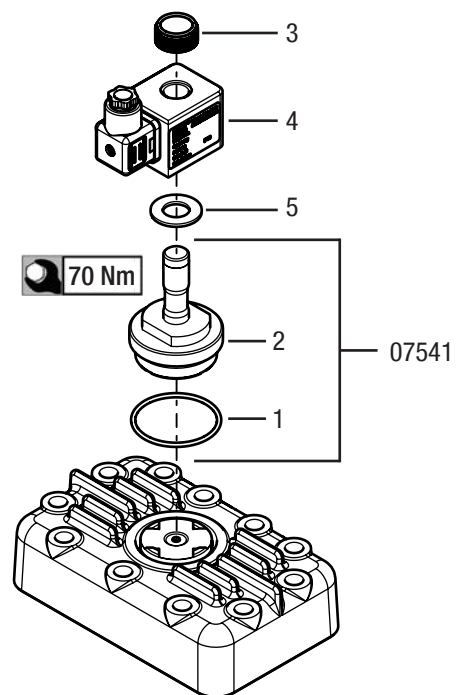
(Only for the capacity regulation which is an accessory)

Removal:

- De-energize the solenoid (4).
- Screw on the fixing nut (3), pull out the solenoid (4) with the washer (5).
- Unscrew the valve body (2).
- Check the valve body (2) for damages and whether the piston moves freely. If necessary, replace the complete valve body (2).

Installation:

- Screw on the valve body (2) with the enclosed new O-ring (1) and tighten it. Observe the screw tightening torque!
- Push on the washer (5) and the solenoid (4) and fasten them with the fixing nut (3).
- Put the compressor into operation and check the functioning of the capacity regulation.

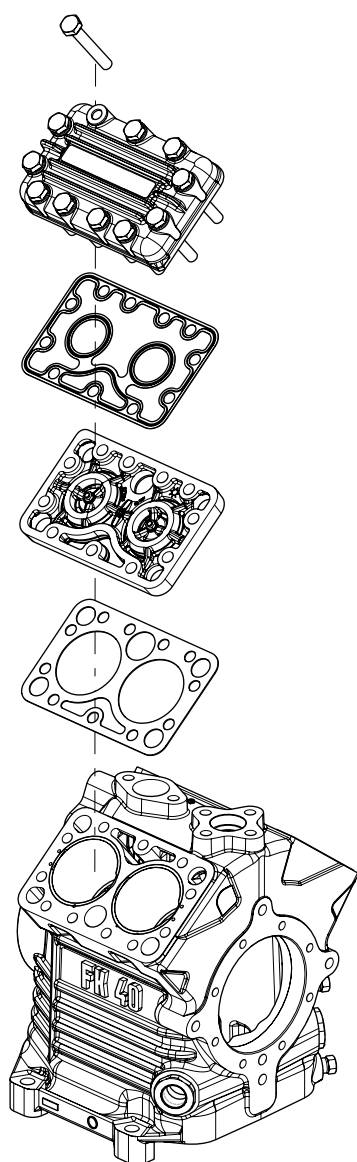


7 I Installation of service kits

Valve plate

Compressor type	Kit (Item No.)	Compressor type	Kit (Item No.)
FK(X)40/390 N	80240	FK(X)40/390 TK	80240
FK(X)40/470 N	80240	FK(X)40/470 TK	80240
FK(X)40/560 N	80241	FK(X)40/560 TK	80241
FK(X)40/655 N	80241	FK(X)40/655 TK	80241
FK(X)40/390 K to FK(X)40/655 K	80010		
FK(X)40/755 K	81297		

K type valve plate



N type and TK type Valve plate

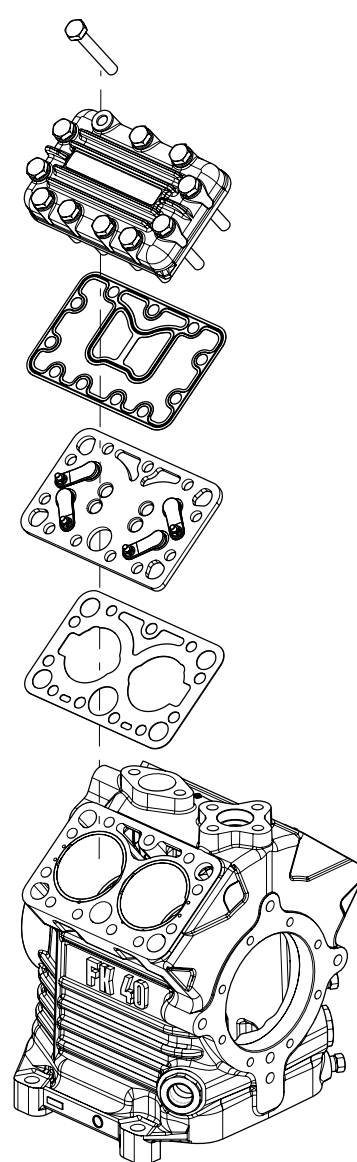


Fig. 3

7 | Installation of service kits

Removal (see Fig. 6):

- Unscrew the screws (1) from the cylinder cover (2) and dismount cylinder cover (2) with valve plate (4).
- Remove the gasket residues from the body of the compressor.



INFO

Don't let any gasket residues fall into the compressor

Installation (see Fig. 6):



ATTENTION The conversion of the compressor from one type of valve plate to another is not possible!

- Apply a little oil to the lower valve plate gasket (5) install the upper valve plate gasket (3) (metallic gasket) dry.
- Pay attention to the correct installation position of the gaskets (3, 5) of the valve plate (4) and of the cylinder cover (2).



ATTENTION Install the K type valve plate (Item No. 80010) only with the inscription „TOP“ facing upwards (see Fig. 6).

- Tighten the cylinder cover screws (Pos. 1 in Fig. 6) according to the sequence shown in Fig. 7!

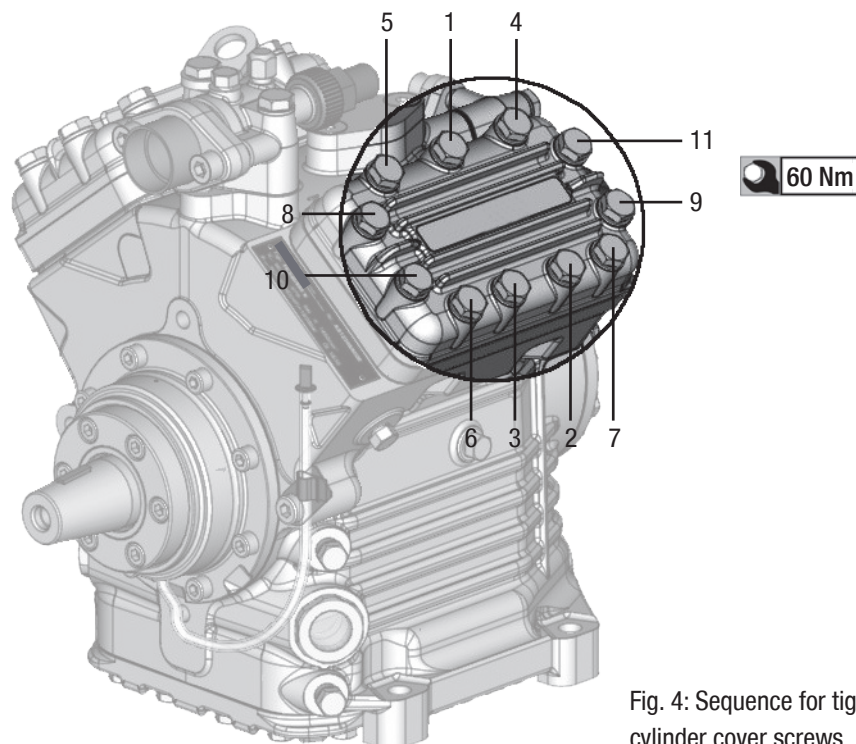


Fig. 4: Sequence for tightening the cylinder cover screws

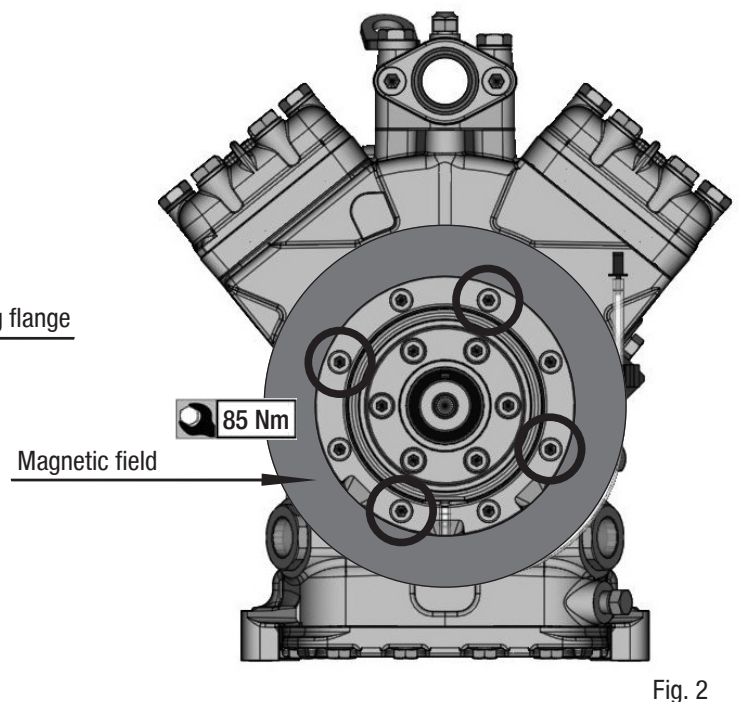
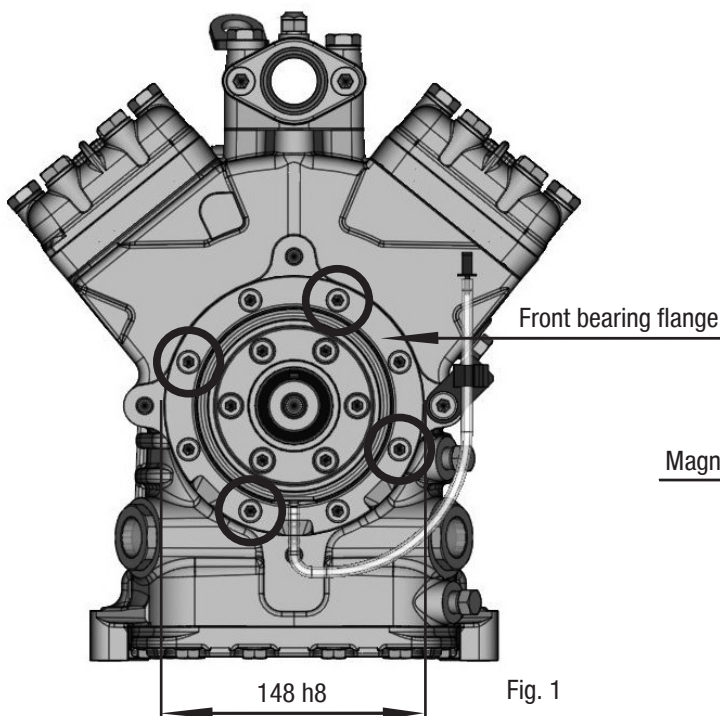
8 | Electromagnetic coupling

Assembly instruction for electromagnetic coupling

For the drive of A/C compressors in buses, mainly electromagnetic couplings are used. The followings assembly instructions for coupling type LA 16 is representative for couplings which are mounted onto the front bearing flange of the compressor.

Assembly instruction for electromagnetic coupling type LA 16

- The front bearing flange has a location face $\varnothing 148\text{ h8}$ for fitting the solenoid of the electromagnetic coupling (see Fig. 1).



- For fitting the solenoid (1) (see page 24 fig. 3) remove the four M8x25 cylinder screws (2) (see page 24 fig. 3) on the bearing flange (indicated with circles and arrows, Fig. 1 page 23 and Fig. 3 page 24).
- Fit the solenoid onto the location seat and fasten it again with the four M8x25 cylinder screws (Fig. 2).



ATTENTION Use only M8x25 screws! Otherwise, serious damages may occur on the electromagnetic coupling and the compressor. Observe the screw tightening torque!

8 | Electromagnetic coupling



INFO

Arrange the cable (8) so that it doesn't touch hot parts (e.g. protection pipe).

$t_{\max} = 105^{\circ}\text{C}$!

- Remove the K-circlip (5) and the clamping screw (4) from the rotor assembly (3). Looking through the rotor hole, pay attention to the correct seating of the Woodruff key in the rotor slot. It should be possible to turn the rotor by hand without the rotor touching the solenoid. Pay attention to the checking projection! Screw on the clamping screw (4) and tighten it. Screw tightening torque: 85 Nm. Install the K-circlip (5).
- Push the sheave (6) over the studs (9) and fasten it with zinc-coated M8 DIN 934-8 nuts (7).
- Connect the cable (8). The connection is polarity-independent. Voltage $\pm 10\%$ of nominal voltage.



INFO

For dismantling the coupling apply grease to the K-circlip and turn the clamping screw (4) to the left for unscrewing.



ATTENTION With all other methods of removal (pressing, hammering) there is risk of damage to the coupling.

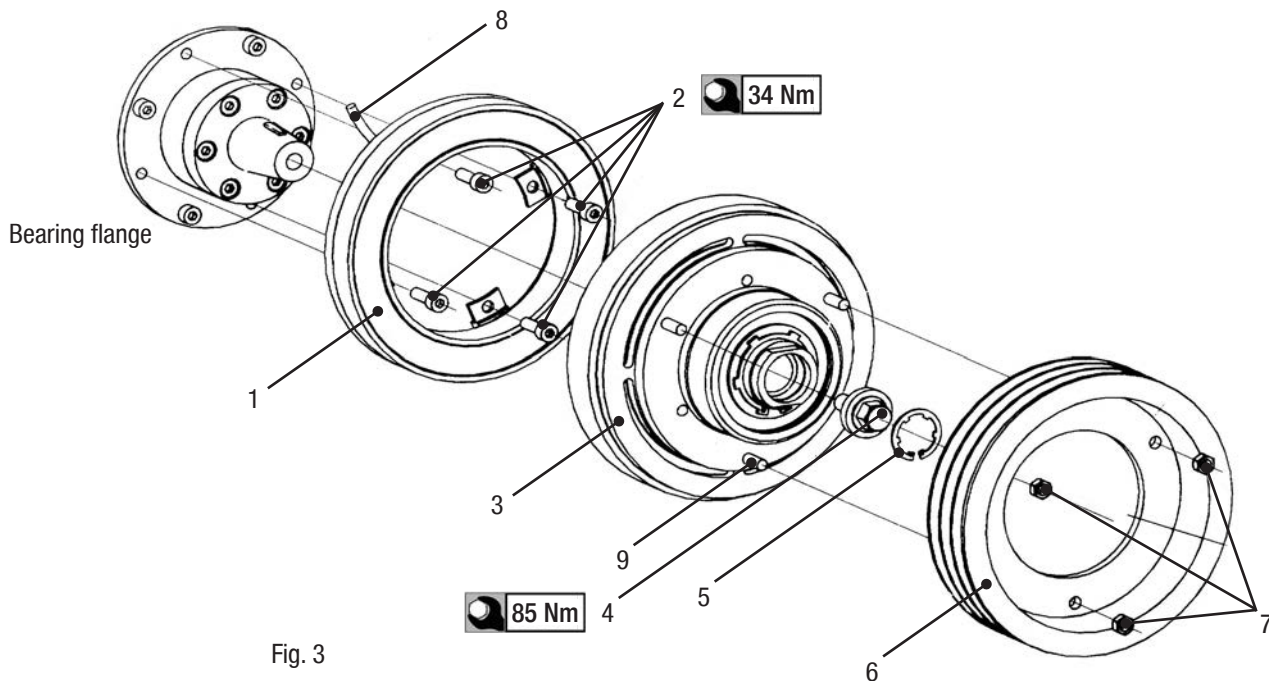


Fig. 3

9 | Compressor defects

Compressor defects

Compressor defects may have various causes. The table below is meant to aid you while analysing the cause of the breakdown by means of the defective compressor parts found. Thus, the specific remedying of the cause of the breakdown is facilitated.

Compressor part	Possible causes / Symptom	Remedy
Valve plates	- Liquid shocks because of liquid refrigerant or oil	
	- Overheating of compressor	- Check the operating conditions
Shaft seal leaking	- Lack of oil - Dirt in the system	- Change oil, clean the system; install a suction line filter, if necessary
	- Standstill time too long	
	- Moisture in the system	- Dry the system trough changing refrigerant and oil, replace the drier; install a suction line filter, if necessary
	- Too frequent starting of the compressor	
	- Overheating of compressor (Heat protection thermostat switches off)	- Check the operating conditions
	- Belt vibrating excessively	
	- Alignment of compressor and motor incorrect	
Oil pump	- Lack of oil - Dirt in the system	- Change oil, clean the system; install a suction line filter, if necessary
	- Moisture in the system	- Dry the system trough changing refrigerant and oil, replace the drier; install a suction line filter, if necessary
	- Overheating of compressor (Heat protection thermostat switches off)	- Check the operating conditions
Bearings	- Lack of oil - Dirt in the system	- Change oil, clean the system; install a suction line filter, if necessary
	- Moisture in the system	- Dry the system trough changing refrigerant and oil, replace the drier; install a suction line filter, if necessary
	- Overheating of compressor (Heat protection thermostat switches off)	- Check the operating conditions
	- Overloading of compressor	- Compare the operating conditions with the application limits
Pistons / Connecting rods	- Lack of oil - Dirt in the system	- Change oil, clean the system; install a suction line filter, if necessary
	- Moisture in the system	- Dry the system trough changing refrigerant and oil, replace the drier; install a suction line filter, if necessary
	- Overheating of compressor (Heat protection thermostat switches off)	- Check the operating conditions
Copper plating	- Moisture in the system - Acid formation in the system	- Dry the system trough changing refrigerant and oil, replace the drier; install a suction line filter, if necessary
Formation of oil-carbon	- Overheating of compressor (Heat protection thermostat switches off)	- Check the operating conditions

10 I Disassembly of the compressor

Removal of the compressor from the refrigerant system

Removal of the compressor from the system, shut-off valves remaining on the compressor

- Extract the refrigerant from the system into a container which may be used for this refrigerant
- Evacuate the systems including the compressor
- Cut off the vacuum, humid air should not get into the system
- Close the shut-off valves on the suction and discharge side; remove the compressor
- Close the suction and discharge line connection points on the system with stoppers
- Relieve the pressure before dismounting the compressor

Removal of the compressor from the system, shut-off valves for compressor remaining at the system

- Close shut-off valves on the suction and discharge side
- Extract the refrigerant from the compressor into a container which may be used for this refrigerant
- Evacuate the compressor
- Cut off the vacuum
- Remove the compressor from the system
- Close the suction and discharge shut-off ports on the compressor with stoppers

Disassembly of compressor

The disassembly of the compressor is explained in separate steps on the following pages. The indicated parts list positions refer to the spare parts lists, repair set lists, special accessories part lists and are available online at www.vap.bock.de. You can find the exploded drawing at the end of the maintenance manual.

Preparation: Necessary tools



INFO

For the removal and installation of the internal decompression valve the Bock special tool Item No. 09524 is necessary (up to version ID 015)!

Pos.	Tool	Size
1	Oil collection container	> 2 liter
2	Spanner	SW 10, 13, 14, 17, 19, 22, 30, 36
3	Allen key	6 mm, 10 mm
4	Needle-nosed pliers	
5	Pulling apparatus	
6	Pressing apparatus	
7	Piston ring pliers	
8	Dial gauge	
9	Bock special tool, Item No. 09524	



INFO

**With compressors starting from year of construction 2008/09 the oil pump, the shut-off valves, the valve plate and the cylinder covers are bolted with washers.
In the individual work sections separately with these washers does not deal.
When assembling the washers must be used again on the installation!**

10 | Disassembly of the compressor

1

Removal of all shut-off valves and blind flanges

Position in parts list

Parts list position: 2060, 2070, 232

Tools: Spanner SW 17, allen key 6 mm

Working course

220

- The compressor has to be depressurized

330, 210

- Unscrew the fixing screws of shut-off valves

230, 210

- Remove the shut-off valves and the gaskets

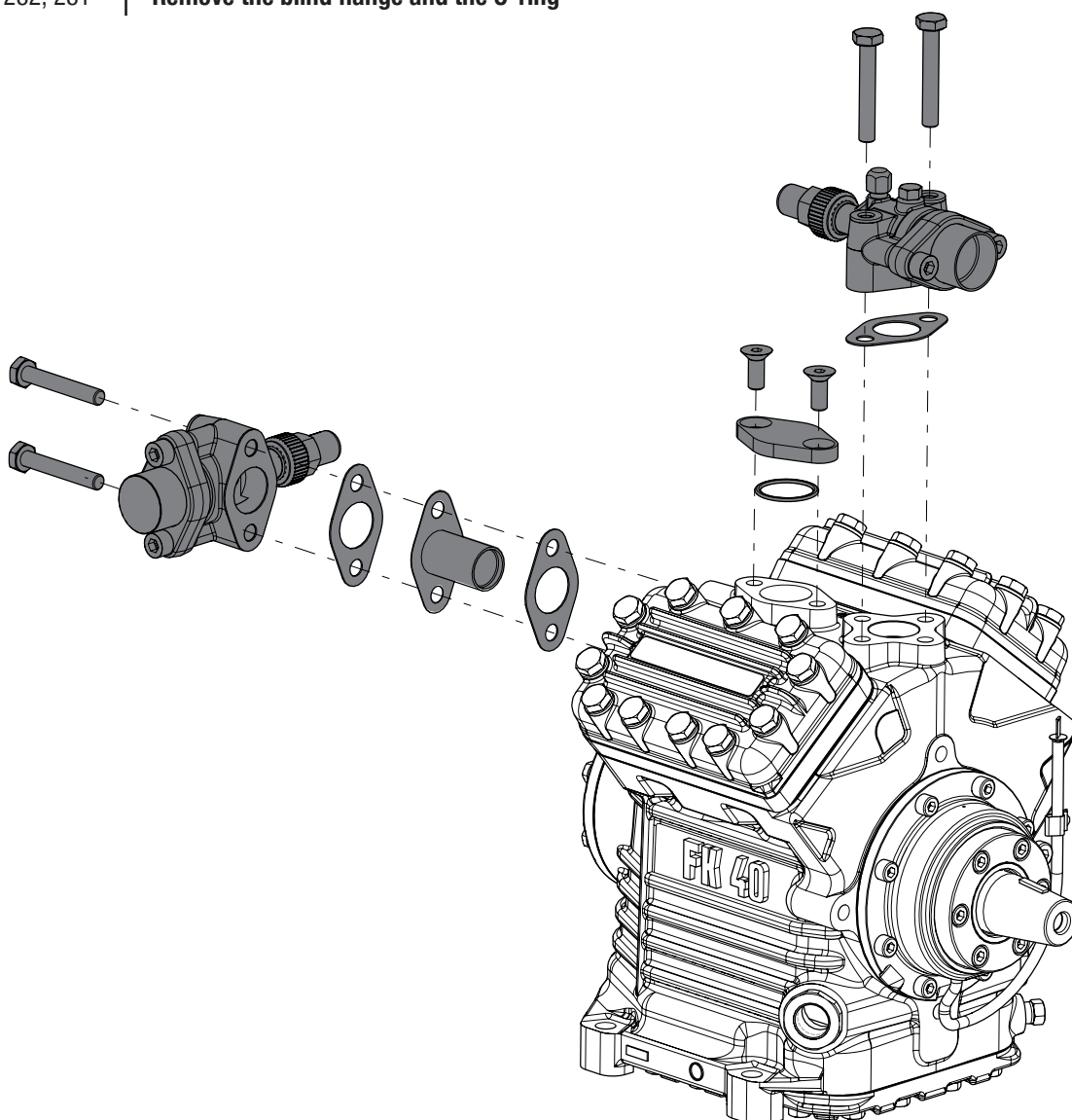
233

- Remove the suction filter and the gasket

232, 231

- Remove the screws from the blind flange

- Remove the blind flange and the O-ring



10 | Disassembly of the compressor

2

Removal of the oil filter

Position in parts list

Parts list position: 2130

Tools: Container > 2 liter for collection oil, spanner SW 19, allen key 10 mm

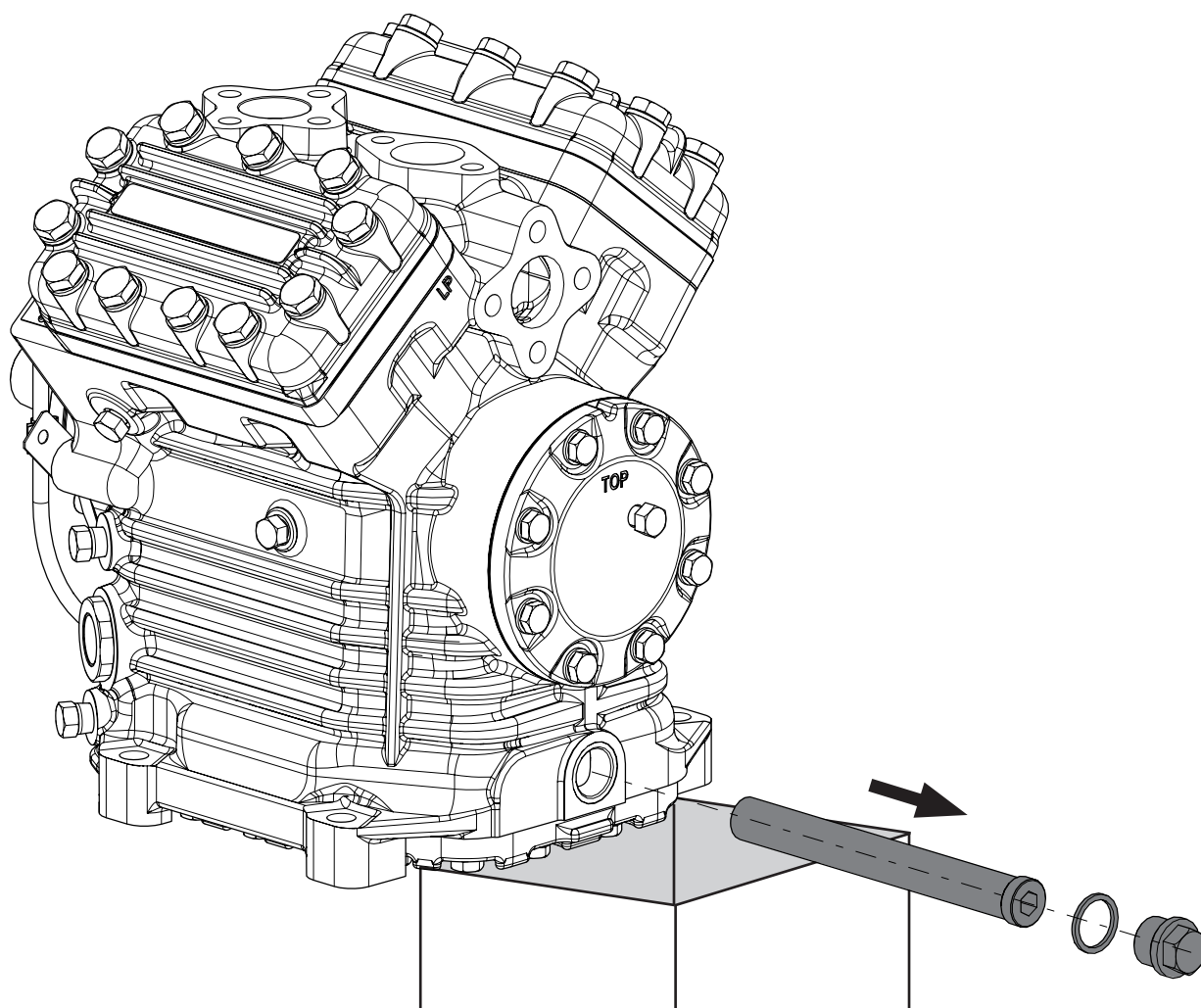
Working course

- Drain the oil from the compressor into a suitable container
- Unscrew the plug
- Remove the gasket
- Unscrew the oil filter

510

500

490



10 | Disassembly of the compressor

3 Removal of the cylinder cover and valve plates

Position in parts list

Parts list position: 170, 2000 (N / TK versions), 1940, 2900 (K version)

Tools: Spanner SW 17

Working course



ATTENTION In order to prevent any mix-up during reassembly, mark the cylinder cover and the valve plates belonging together clearly and in a wipe-resistant fashion!

N / TK | K

180, 181 | 1950, 180

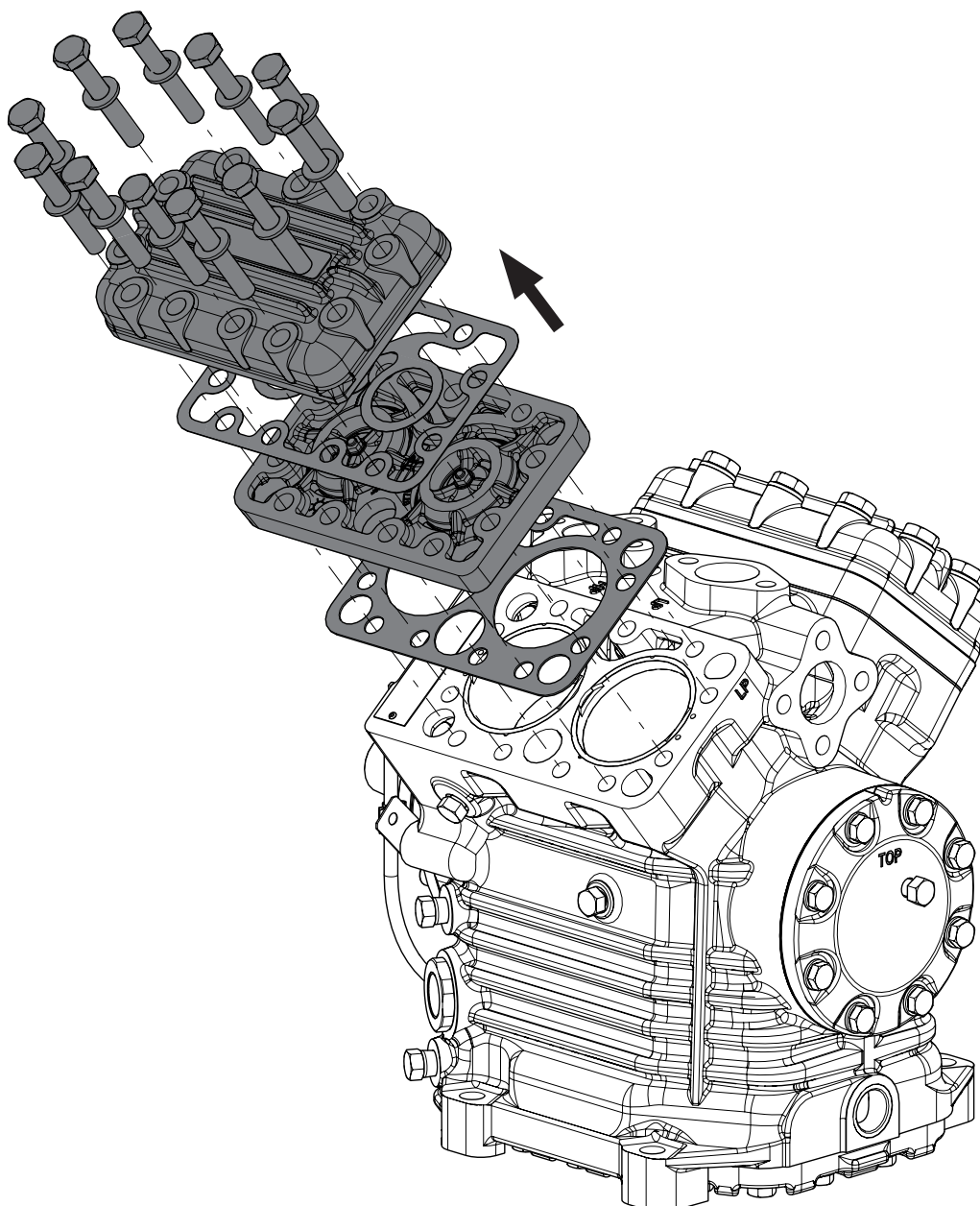
170, 70 | 1940, 1430

60, 50 | 1920, 1910

- Loosen screws at the cylinder cover and unscrew, remove the washers

- Remove the cylinder cover and the upper gasket of the valve plate

- Remove the valve plate and the lower gasket of the valve plate



10 | Disassembly of the compressor

4

Removal of the shaft seal

Position in parts list

Parts list position: 2010

Tools: Allen key 6 mm

Working course



INFO

For a detailed description for the old version (until version ID 014) see also the section on the removal of the shaft seal on page 16!



CAUTION

Danger of injury!

The shaft seal cover is under spring tension! It may jump out by itself.

2110

750

2010

- Place the oil collection container under the shaft seal area
- Remove the leak oil collection device from the bearing flange (until version ID 014)
- Unscrew the cylinder screws

- Remove the shaft seal cover, the guide ring, the O-ring and the spring

The diagram illustrates the disassembly of the shaft seal. On the left, a partial view of the compressor housing shows the shaft seal area. An exploded view to the right shows the components being removed: a clamping ring with oil felt (labeled), a guide ring, an O-ring, a spring, and the shaft seal cover. The shaft seal cover is shown with several screws being removed. An arrow indicates the direction of disassembly.

30

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10 | Disassembly of the compressor

5

Removal of the oil pump

Position in parts list

Parts list position: 2020

Tools: Spanner SW 13

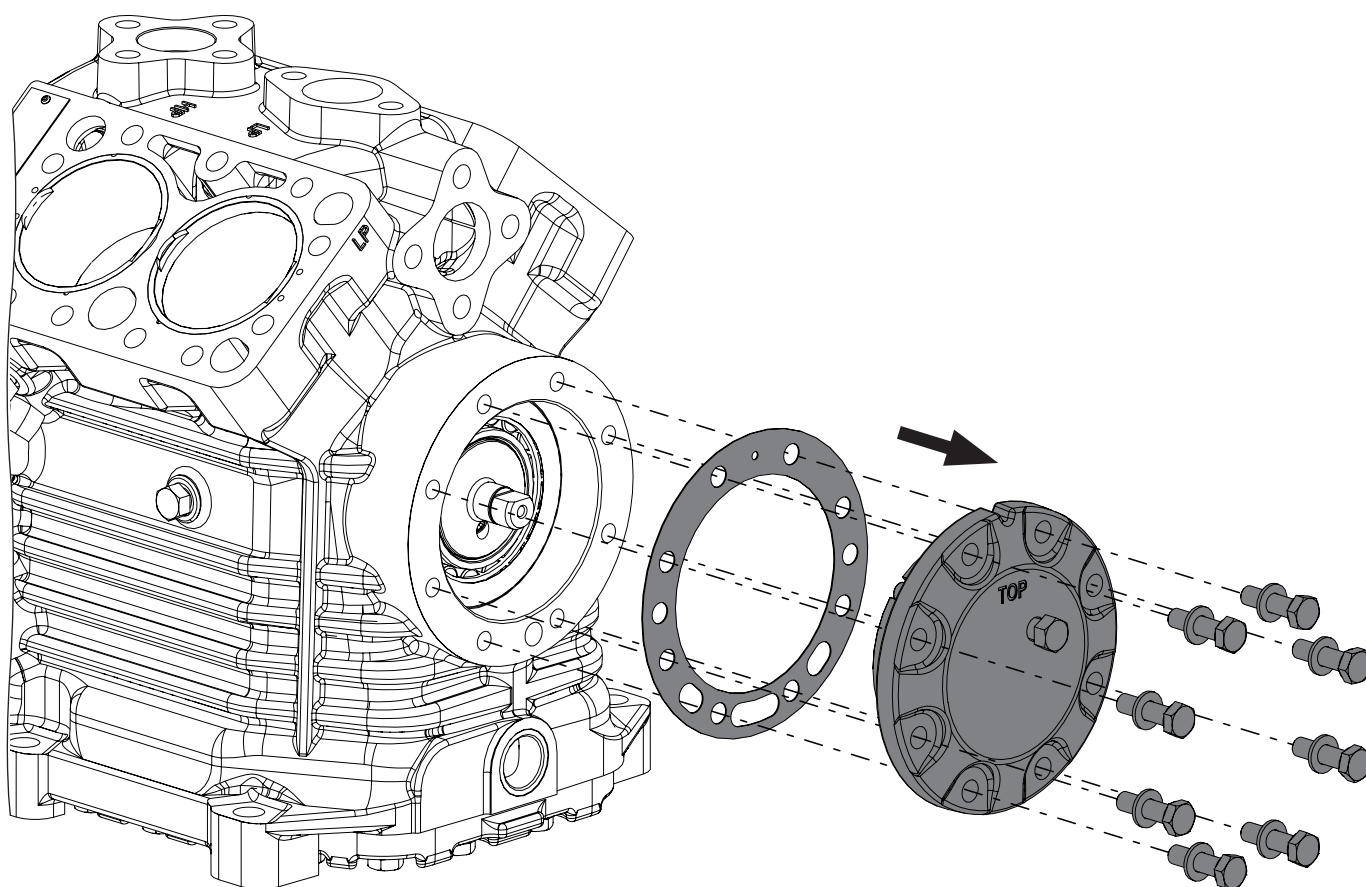
Working course

40, 41

- Loosen screws on the oil pump and unscrew

460, 470

- Remove the oil pump and gasket



10 | Disassembly of the compressor

6

Removal of the baseplate

Position in parts list

Parts list position: 20, 30, 40

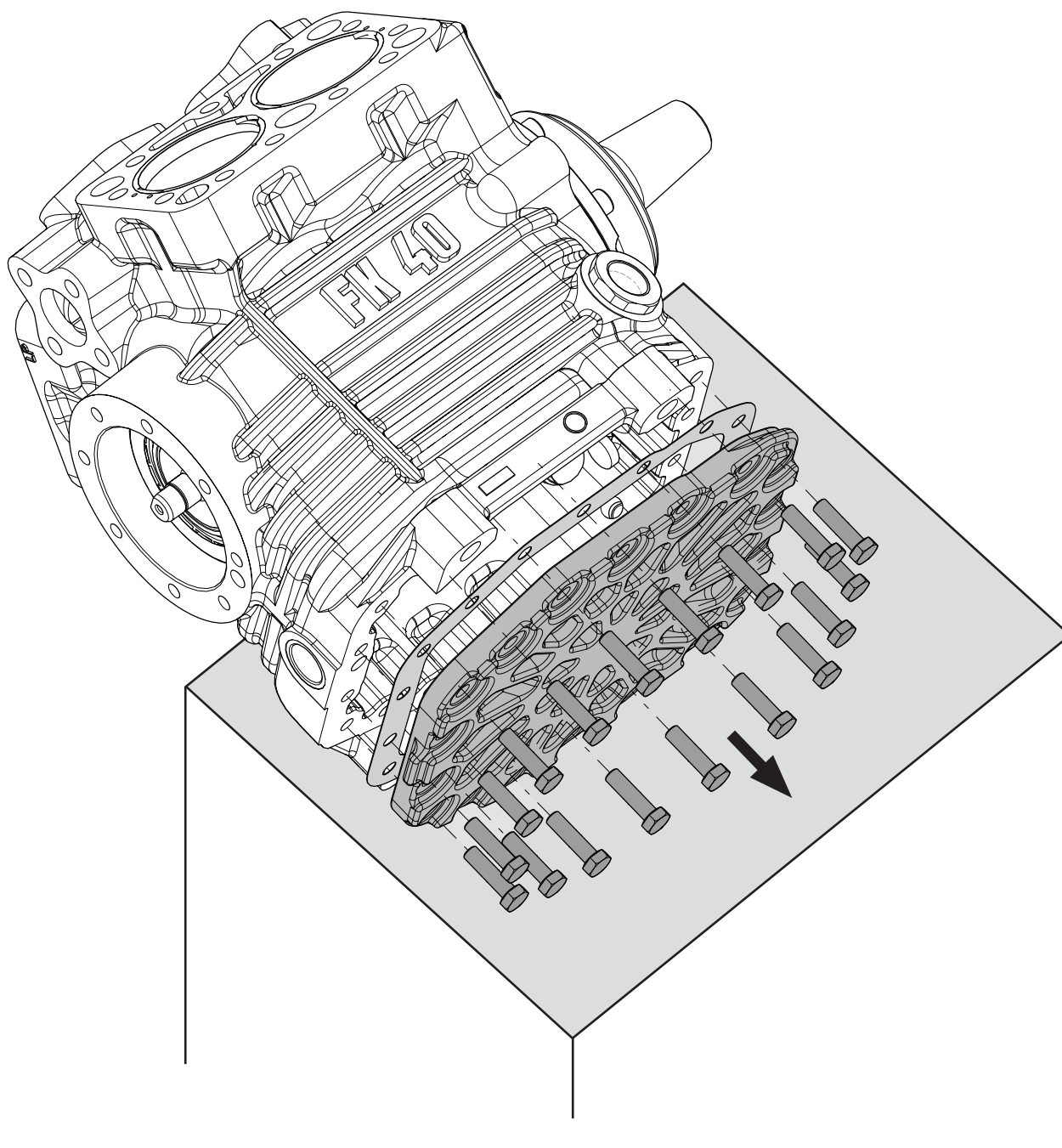
Tools: Container for collection oil, spanner SW 13

Working course

- Place the compressor into the oil collection pan and turn it sideways
- Unscrew the screws from the baseplate
- Remove the baseplate and the gasket

40

20, 30



10 | Disassembly of the compressor

7

Disassembly of the compressor rods from the crankshaft

Position in parts list

Parts list position: 2040 opt. 2045 or 2030 opt. 2035 together with 2100

Tools: Spanner SW 10

Working course



INFO

In order to prevent any mix-up during reassembly, mark the connecting rods and caps belonging together clearly and in a wipe-resistant fashion!

2100

- Unscrew the hexagon head screws from the connecting rod cap

2100

- Mark the connecting rod cap and remove it

2040,

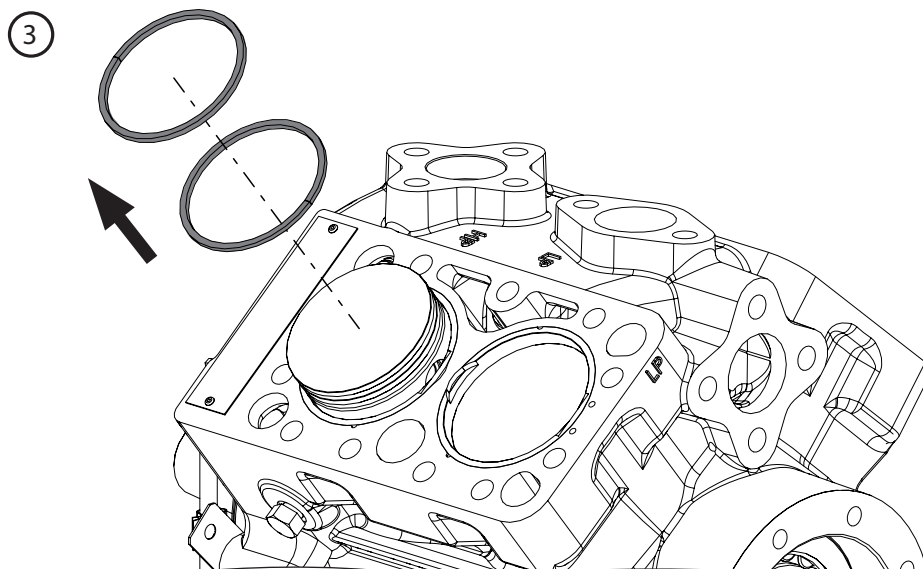
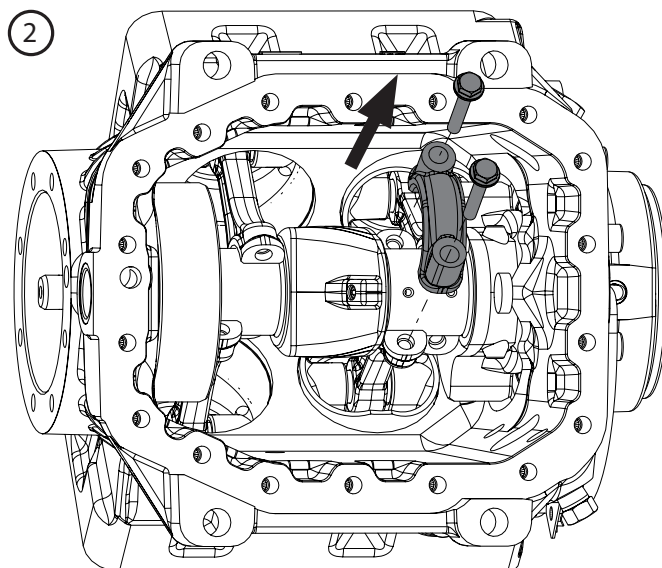
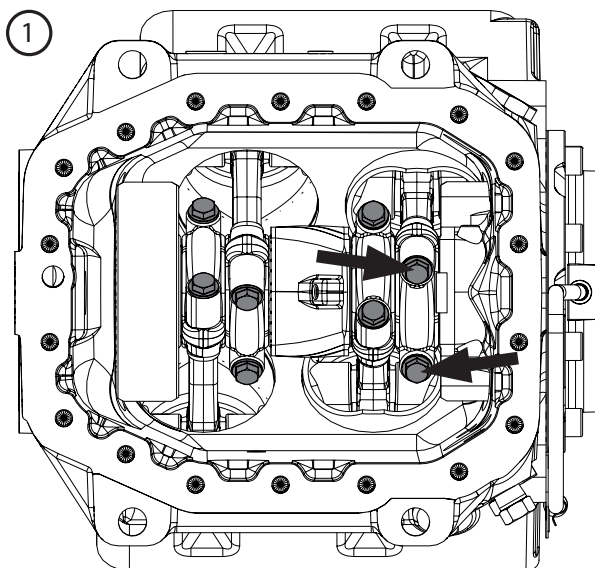
- Push the piston and connecting rod upwards until the stop

2045

- Remove the piston rings

300, 290

- The same procedure should be applied for the remaining connecting rods



10 | Disassembly of the compressor

8

Removal of the front bearing

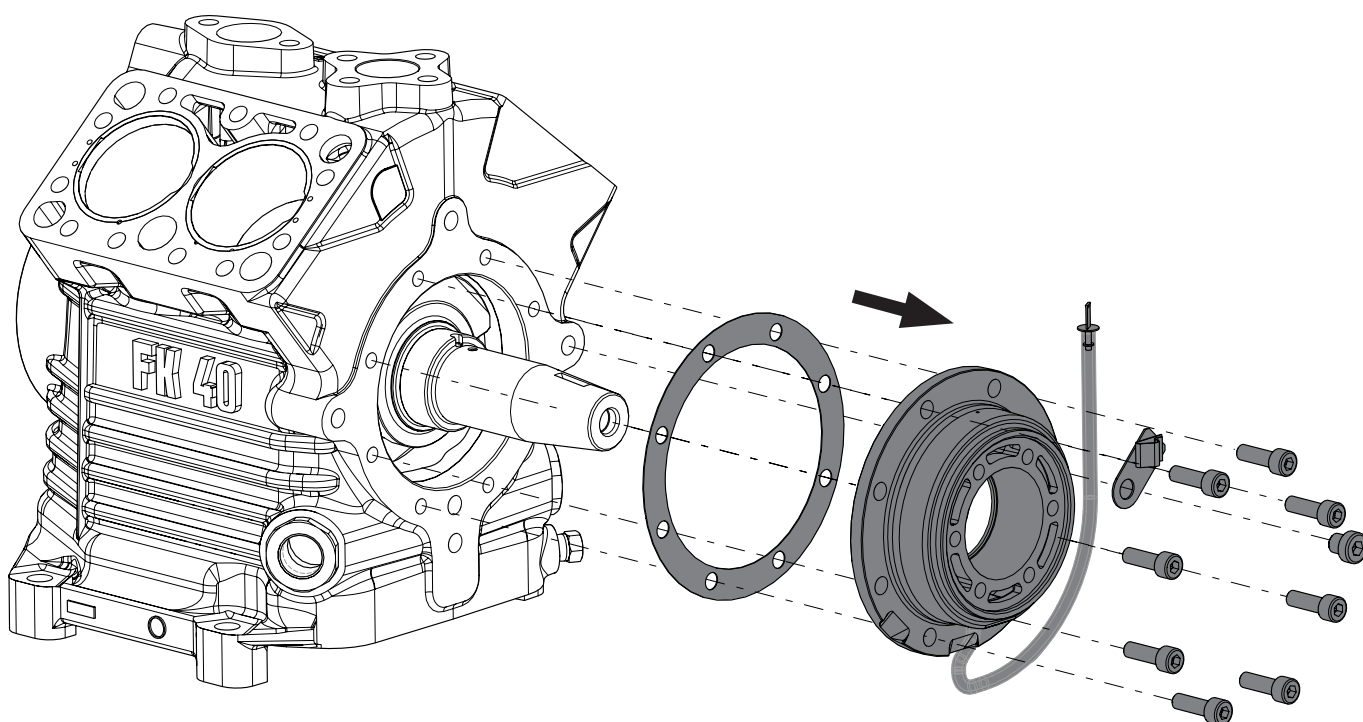
Position in parts list

Parts list position: 2140

Tools: Allen key 6 mm

Working course

- 750
730, 740,
745
- Loosen the screws at the front bearing and unscrew
 - Remove the front bearing flange, gasket, and O-ring



10 | Disassembly of the compressor

9

Removal of the crankshaft

Position in parts list

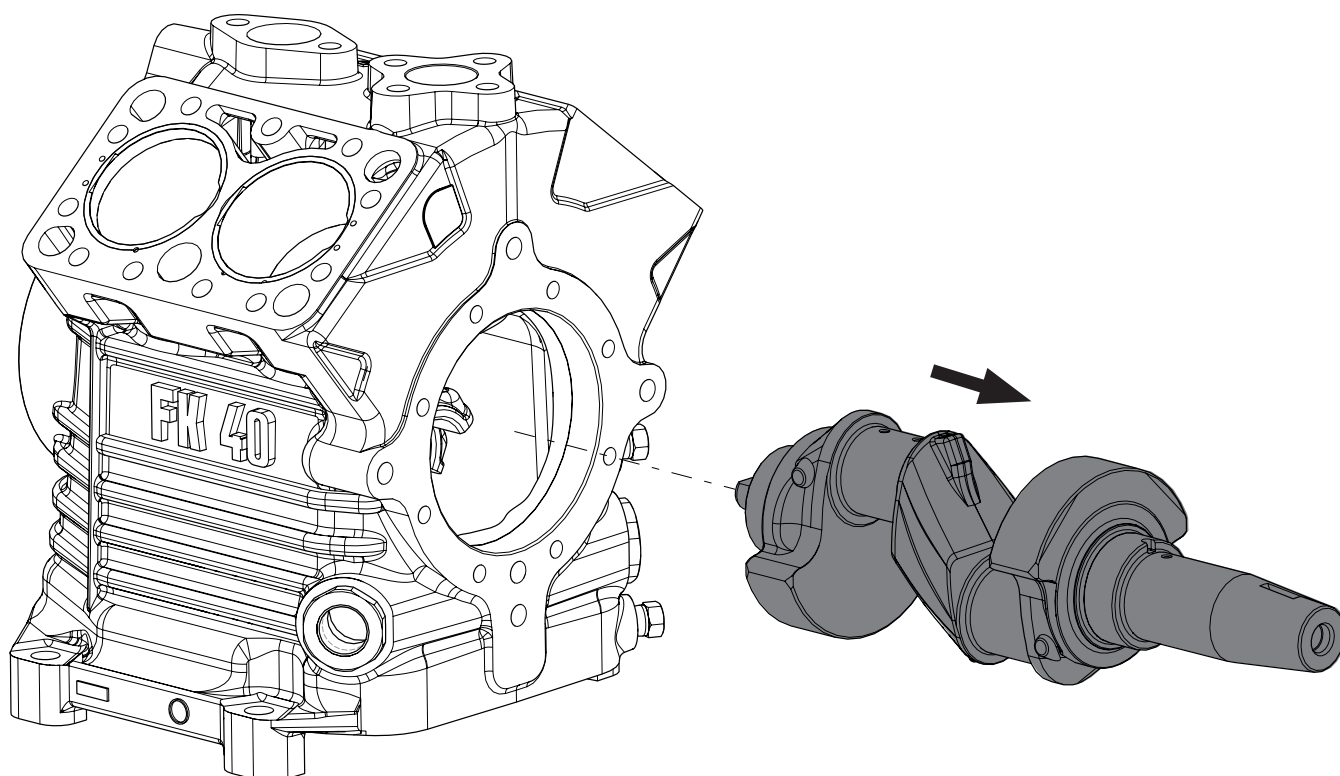
Parts list position: 2050

Tools: -

Working course

2050

- Pull out the crankshaft carefully in direction of the front bearing flange



10 | Disassembly of the compressor

10 Remove pistons and connecting rods

Position in parts list

Parts list position: 2040 opt. 2045 or 2030 opt. 2035 together with 2100

Tools: Needle-nosed pliers

Working course

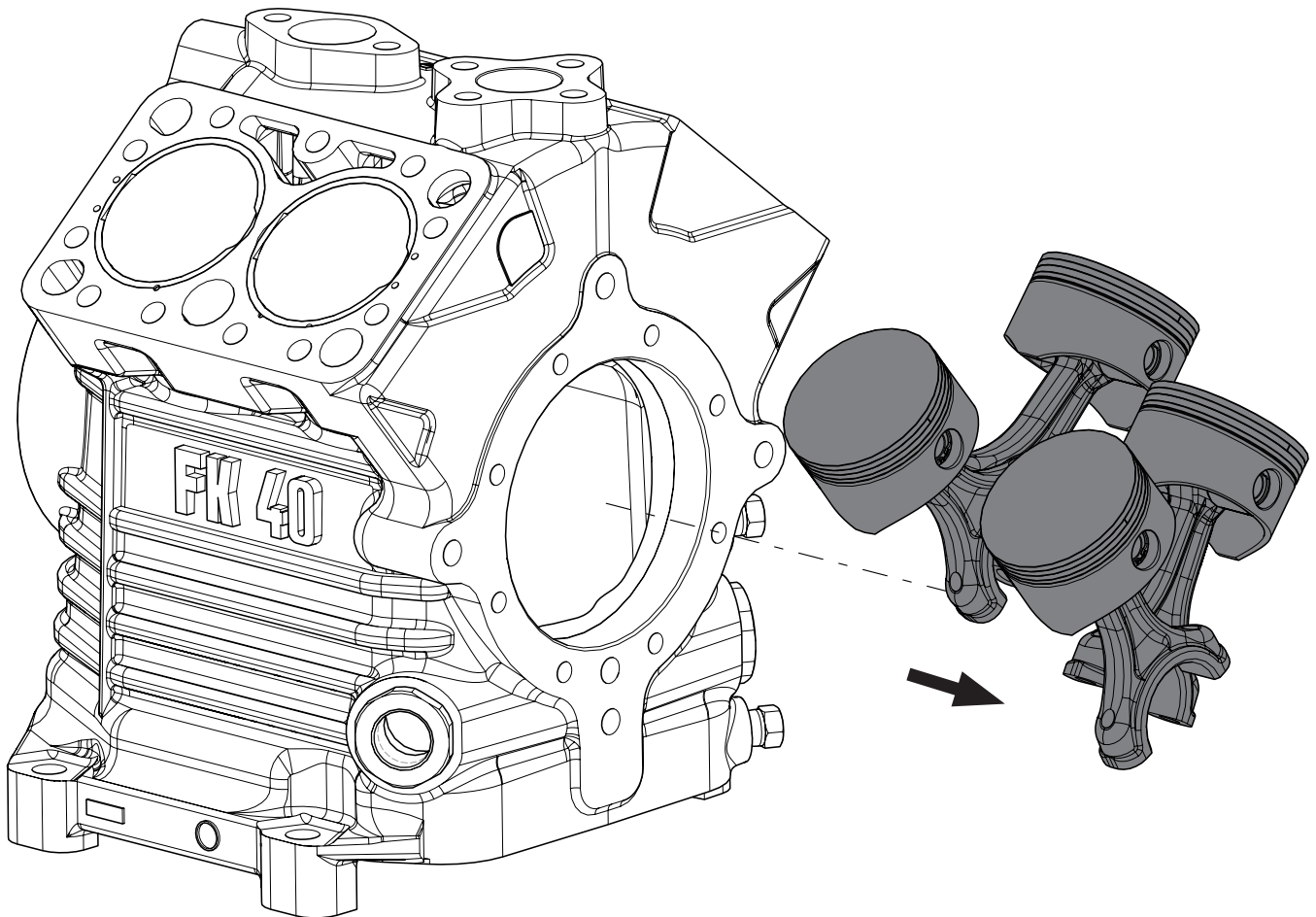
- Mark corresponding pistons of cylinder bore
- Remove the piston / connecting rod in direction of baseplate
- Remove circlips of the piston pins with needle-nosed pliers
- Push the piston pins out of the pistons and remove pistons
- In order to prevent mix-ups, fasten the connecting rod caps to the connecting rods again

2100, 2030

280

270

2100



10 | Disassembly of the compressor

11

Removal of the remaining parts

Position in parts list

Parts list position: -

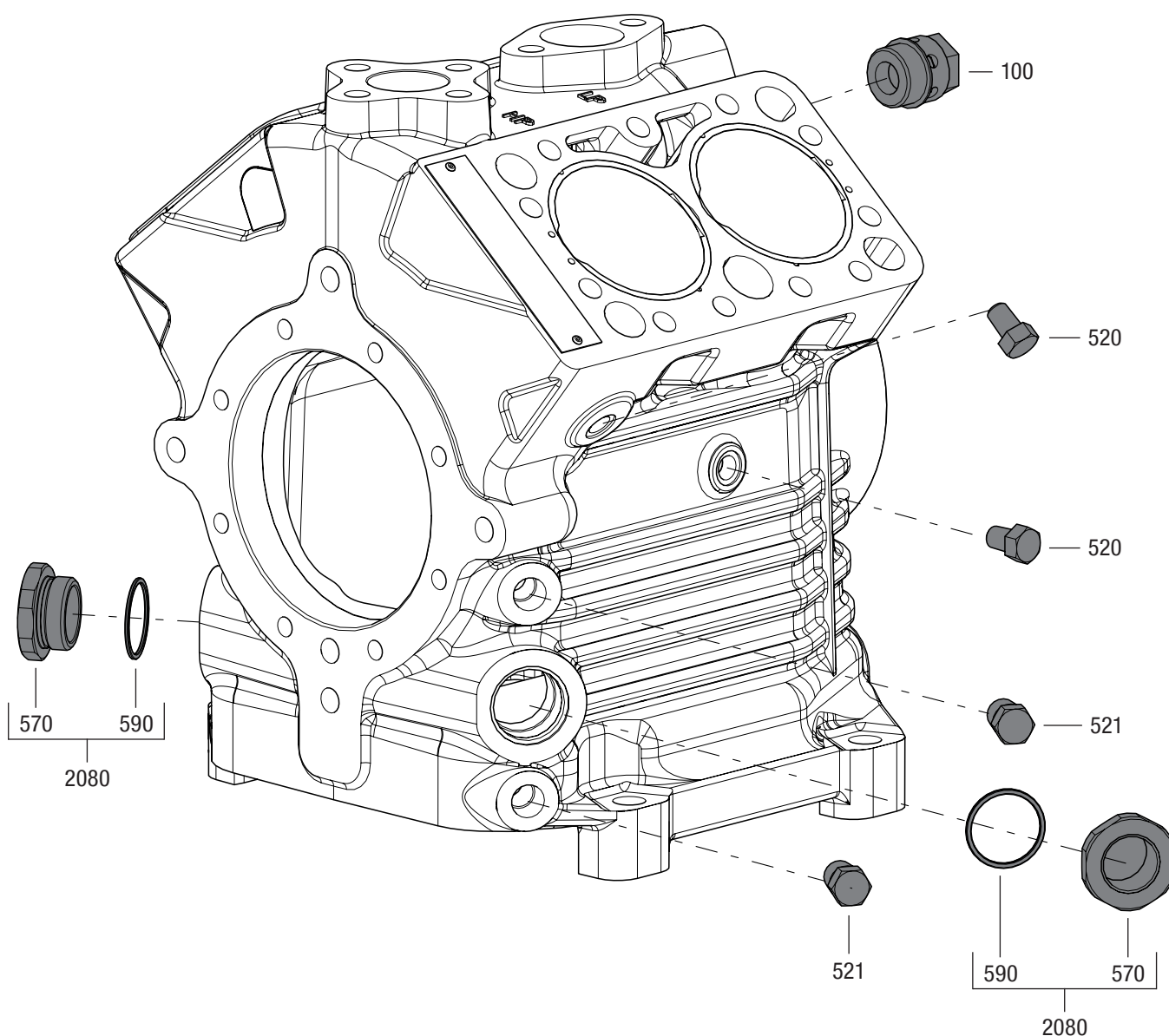
Tools: Spanner SW 13, 14, 30 or 36.

For the decompression valve: Bock special tool item No. 09524 (up to A015*), socket wrench SW 22 (from A017*)

Working course

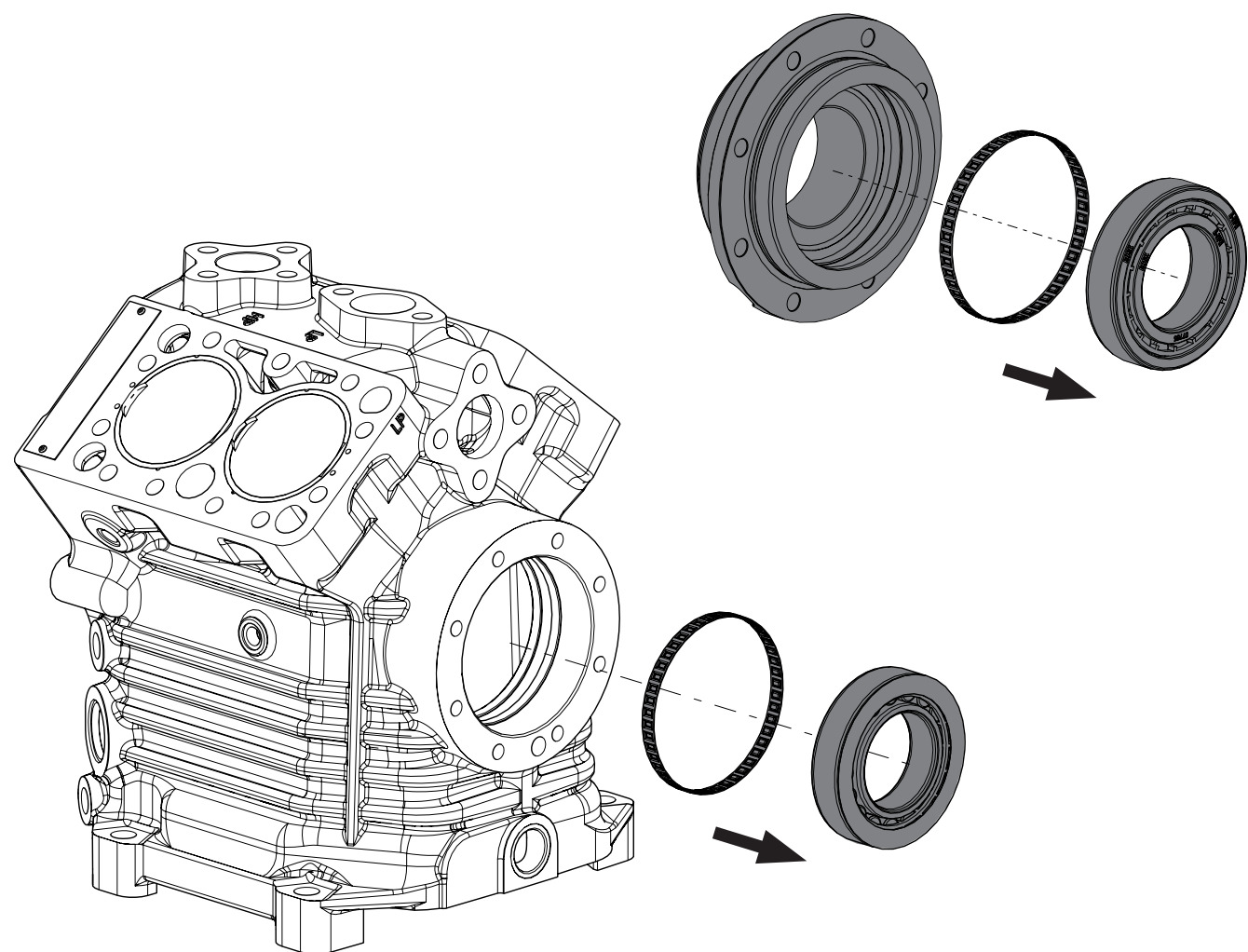
- 570 - Dismount the sight glass
- 590 - Remove O-ring
- 520 - Remove the 1/8" NPTF plugs
- 521 - Remove the 1/4" NPTF plugs
- 100 - Unscrew the decompression valve

*) see the last four sites of the machine number



10 I Disassembly of the compressor

12 Removal of the roller bearings	
Position in parts list	Parts list position: 2150 Tools: Pulling apparatus
Working course	
2150, 730	- With the pulling apparatus pull out the roller bearing from the front bearing flange
 INFO Use oil, if necessary!	
If a pulling apparatus is not available, the front bearing flange may be heated for approx. 15 minutes in a pre-heated (220°C) baking oven. Afterwards the roller bearing can be pressed out by hand.	
 CAUTION Risk of burns! Parts are hot! Use protective gloves!	
2150	- Press out the roller bearing from the compressor body
312	- Take out the tolerance ring, if there is any
 INFO Use oil, if necessary!	



11 | Checking the compressor parts

Checking compressor parts for damages and wear

• Cylinder liners

The cylinder liners should not have any visible damages in the piston movement area.
If there is fluting, the casing should be replaced.

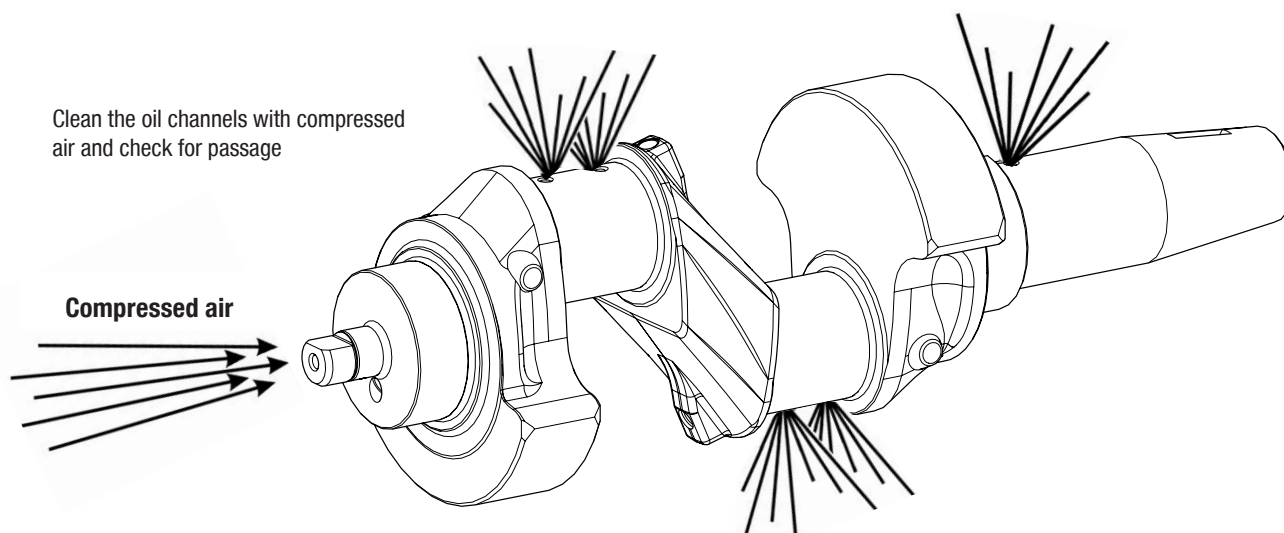
• Crankshaft

The bearing surfaces should not have any damages. The oil channels should be clean so that an unhindered oil flow is ensured.



CAUTION Remaining oil can cause eye injury!

When compressed air is used, remaining oil can splash out of the oil channels.
Wear protective goggles.

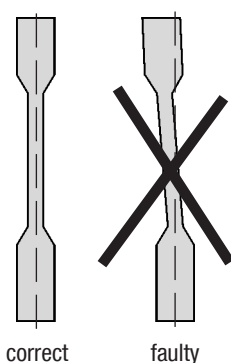


• Pistons

There should be no visible damages on the piston crown and the piston walls. The grooves for the piston rings must be clean and undamaged. Check the condition of the piston rings for wear, fractures and other irregularities.

• Connecting rods

There should be no damages on bearing surfaces.
The connecting rod shank must be straight.



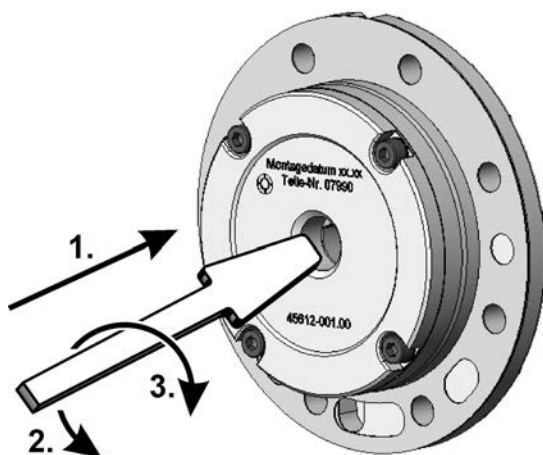
11 | Checking the compressor parts

- **Valve plates**

Suction and pressure lamella must be undamaged and undeformed. The sealing surfaces must be clean and undamaged, between lamellas and valve plates there should not be any pollution (dirt, swarfs etc.). In case of a damage the valve plate must be replaced completely. Single lamella are not available.

- **Oil pump**

It must be possible to turn the oil pump by hand (turning to the left and to the right).
In the removed conditioning the reversing device of the oil pump must switch over audibly.

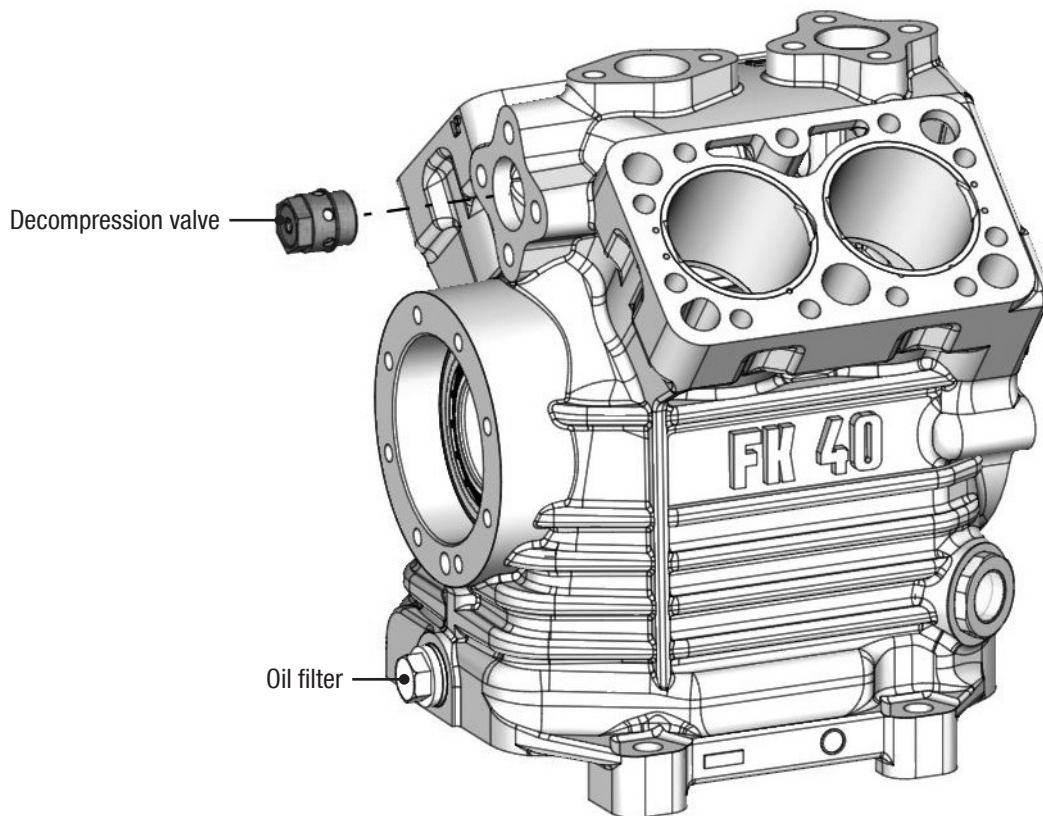


11 | Checking the compressor parts

- **Oil filter / suction filter**

The filter screen must be in an undamaged condition. Dirt and residues have to be removed.
If necessary, the filter have to be cleaned with compressed air or replaced with new ones.

- **Internal decompression valve (use Bock special tool item No. 09524 up to A015, socket wrench SW 22 from A017).**
The internal decompression valve must be replaced after it has operated.



INFO

In case of larger compressor damages which necessitate a complete disassembly of the compressor, we recommend in principle the replacement of the following assemblies

- Valve plates
- Piston rings
- Shaft seals
- Roller bearings

Thus, concealed defects of parts which have been in operation may be prevented.

12 | Assembly of compressor

1

Fitting the roller bearings

Position in parts list

Parts list position: 2150

Tools: Pressing apparatus

Working course

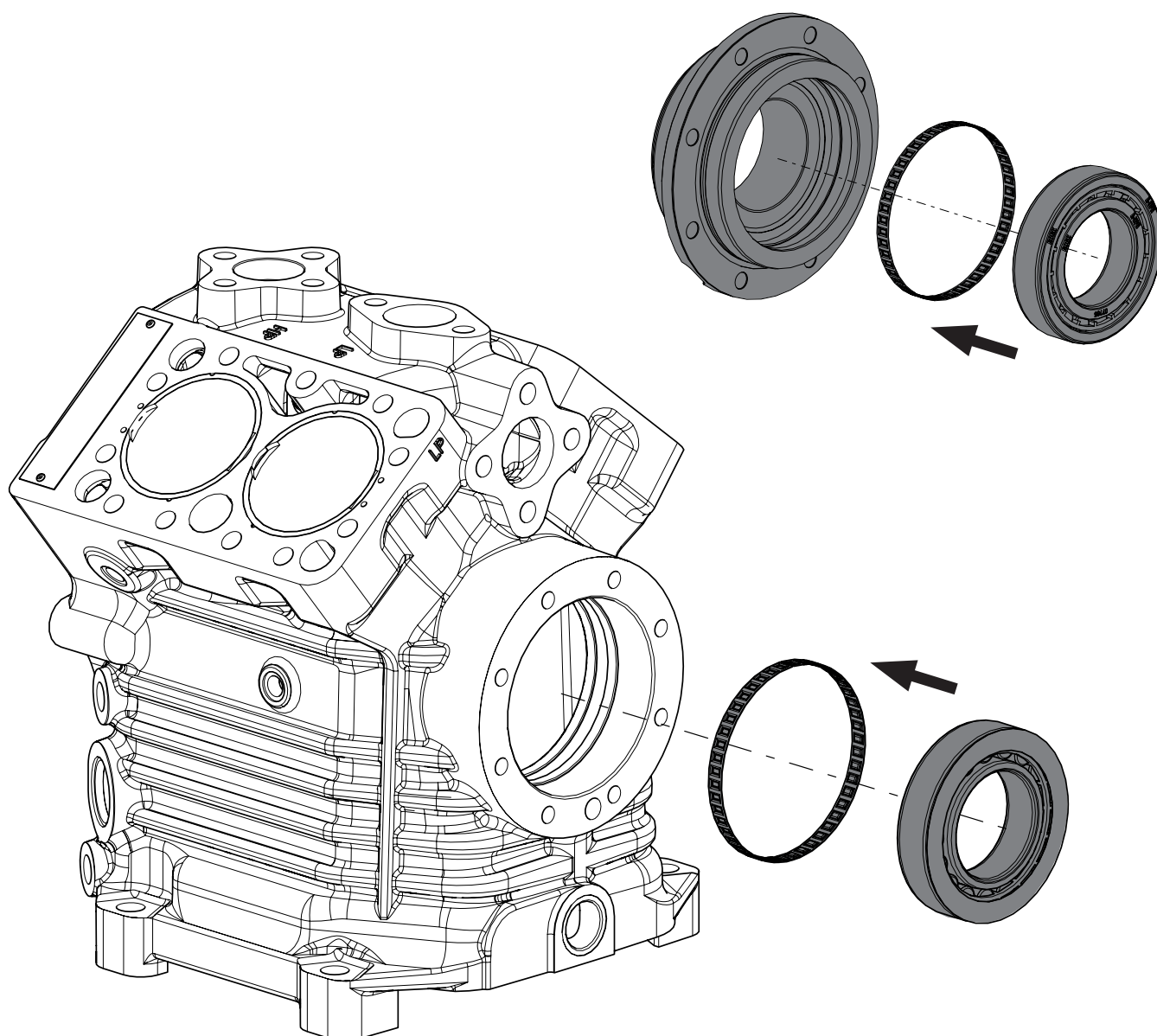
- 730 - Heat the bearing flange / compressor casing for approx. 20 minutes in a pre-heated (120°C) baking oven
- 312 - Insert tolerance ring into the roller bearing, if available
- 2150 - Press the roller bearings onto the compressor casing and the front bearing flange



CAUTION Risk of burns!
Parts are hot! Use protective gloves!



INFO Use tolerance ring if the bearing seat has a groove!



12 | Assembly of compressor

2

Fitting the sight glass, plugs and decompression valve

Position in parts list

Parts list position: -

Tools: Spanner SW 13, 14, 30 or 36. For the decompression valve: Bock special tool item No. 09524 (up to A015), socket wrench SW 22 (from A017)

Working course



INFO

Observe the screw tightening torques!

570, 590

- Screw on the sight glass with oiled O-ring to the compressor body

520

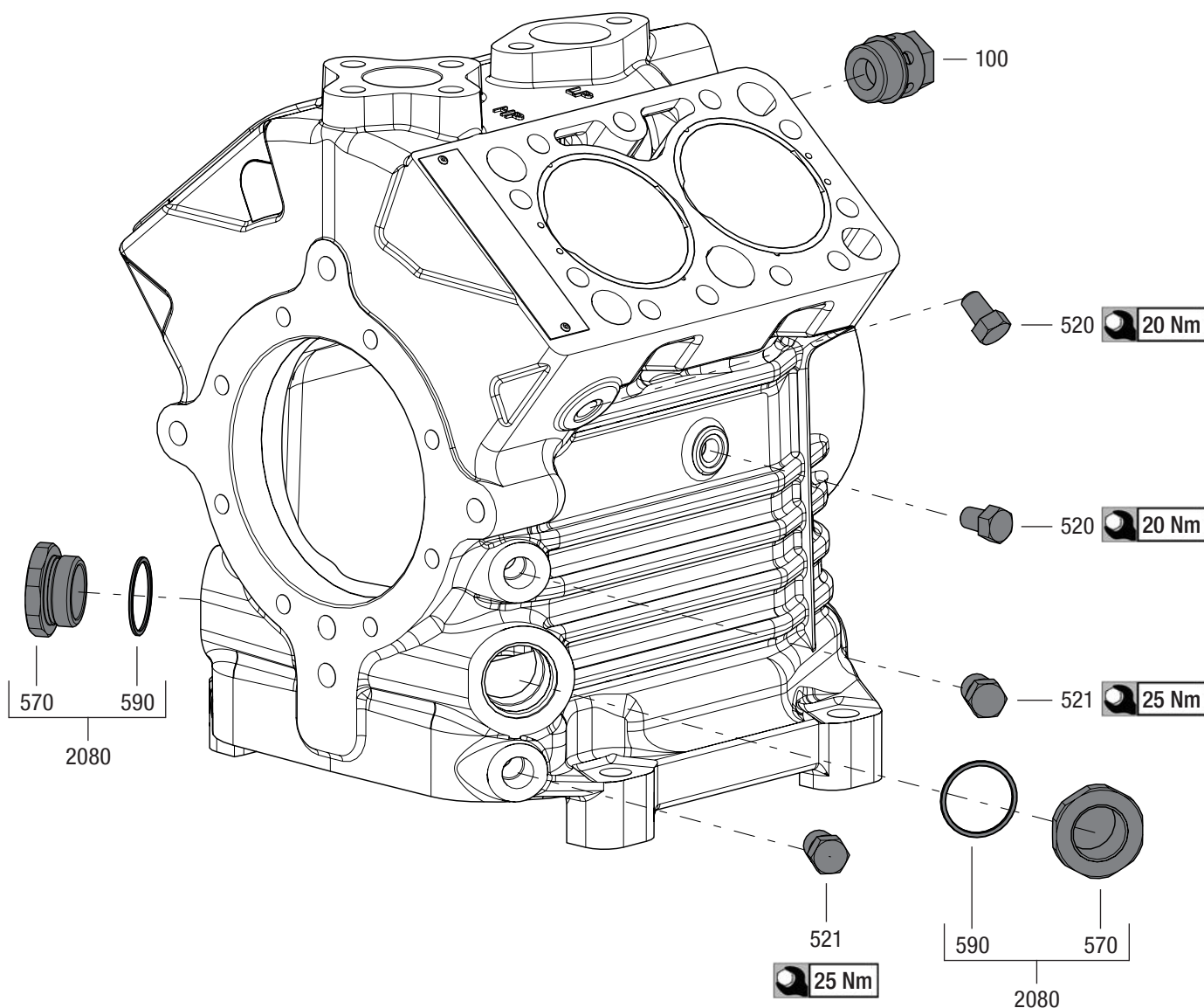
- Screw in the 1/8" NPTF screw plugs

521

- Screw in the 1/4" NPTF screw plugs

100

- Screw in the decompression valve into the suction channel



12 I Assembly of compressor

3

Assembly of the pistons / connecting rods

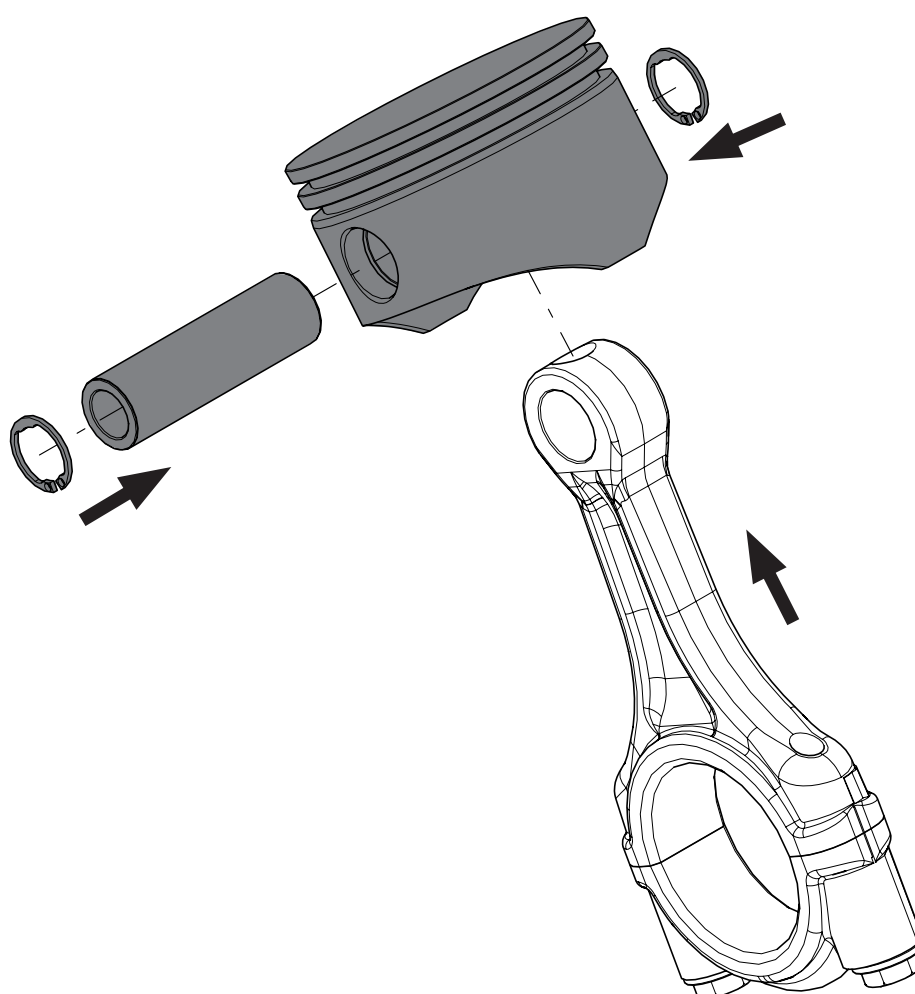
Position in parts list

Parts list position: 2040 opt. 2045 or 2030 opt. 2035 together with 2100

Tools: Needle-nosed pliers

Working course

- 270 - Assemble piston and connecting rod with piston pin, use some oil for easier assembly
- 280 - Mount circlips with pliers on both sides of the piston pins



12 | Assembly of compressor

4

Fitting the piston / connecting rods

Position in parts list

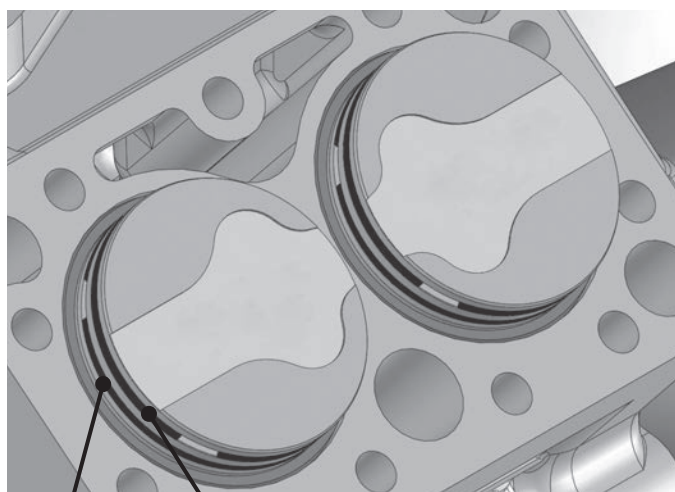
Parts list position: 2040 opt. 2045 or 2030 opt. 2035 together with 2100

Tools: Spanner SW 10, piston ring pliers

Working course

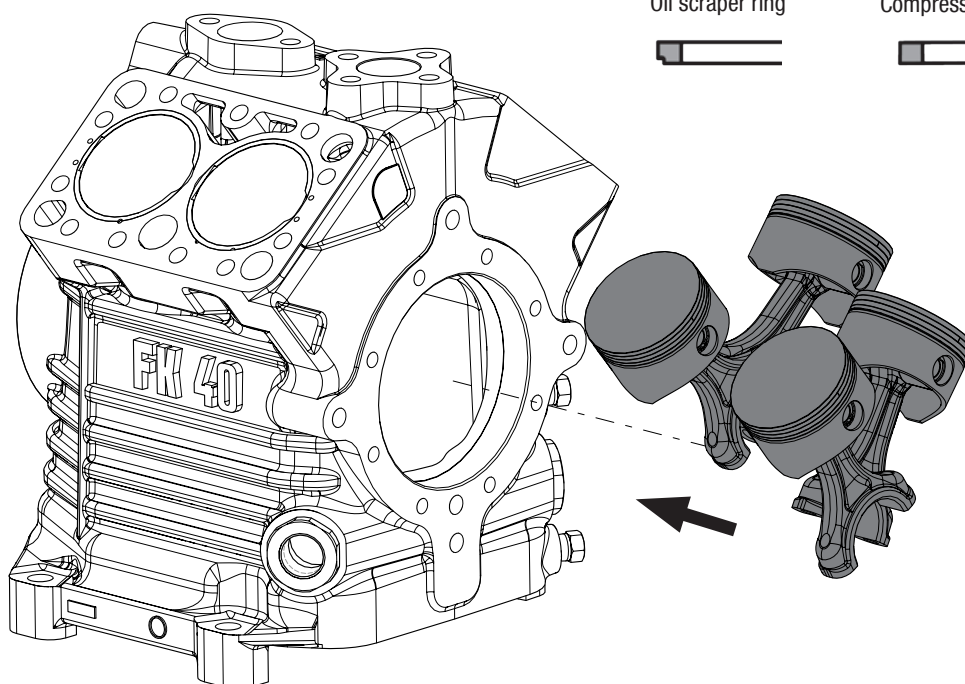
We recommend, cleaning the housing from the inside before assembly

- 2100
 - Remove the connecting rod cap from the preassembled connecting rod assembly and mark it
 - Apply a little oil to the cylinder bore
- 2040,
2045
 - Insert pistons/connecting rods from below into the cylinder liners
 - > In the case of TK compressors pay attention to the correct assembly position of the pistons (suction fin grooves, see figure)
- 290, 300
 - Install oil scraper rings in the lower groove and compression rings in the upper groove
 - > Fit with the marking "TOP" facing upwards
 - > The butt joints of the piston rings have to be installed min. 30° twisted to each other and may not be lying upon each other



Oil scraper ring

Compression ring



12 | Assembly of compressor

5

Fitting the crankshaft

Position in parts list

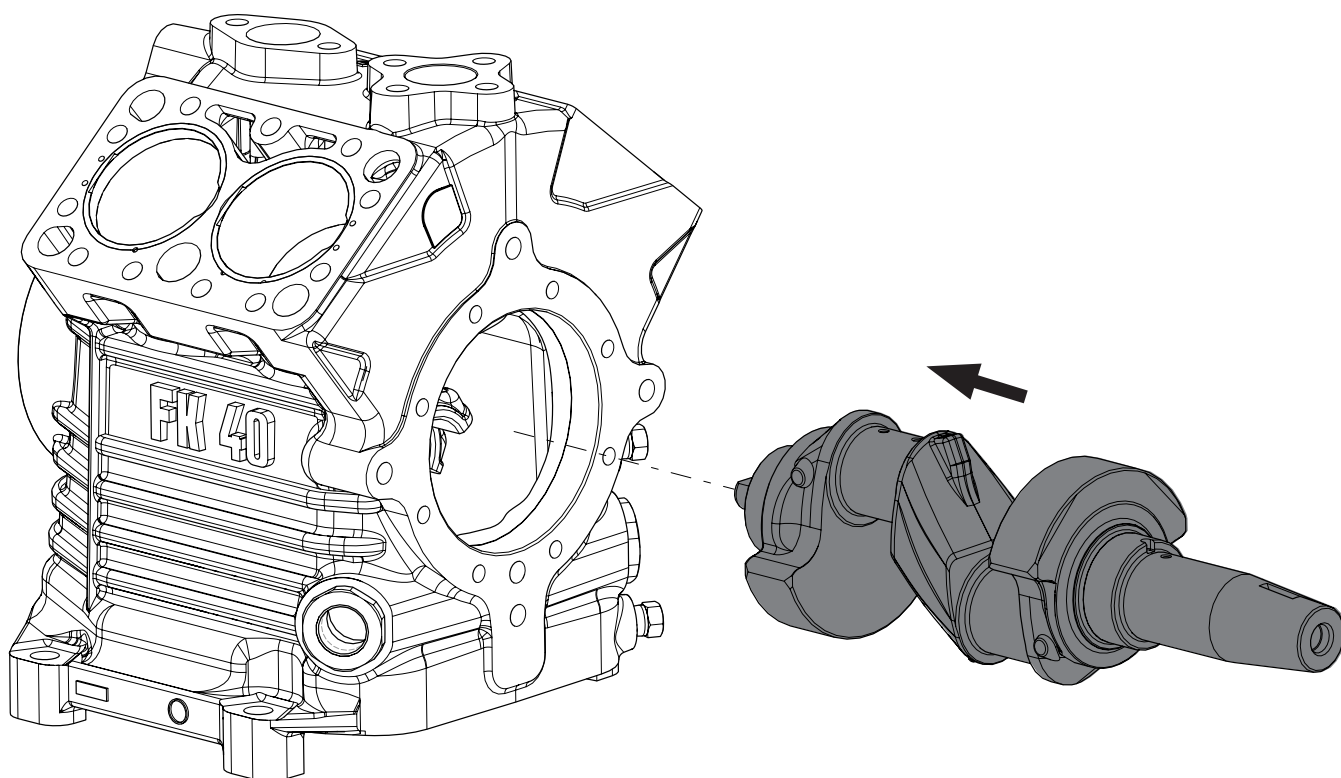
Parts list position: 2050

Tools: -

Working course

2050

- Fit the crankshaft so that the drive journal engages into the pump gear
- Apply bearing position with oil



12 | Assembly of compressor

6

Installation of the front bearing flange

Position in parts list

Parts list position: 2140, 2120

Tools: Allen key 6 mm

Working course



INFO

Observe the tightening torques!

745

- Apply oil to the O-ring and place it into the groove in the bearing flange

740

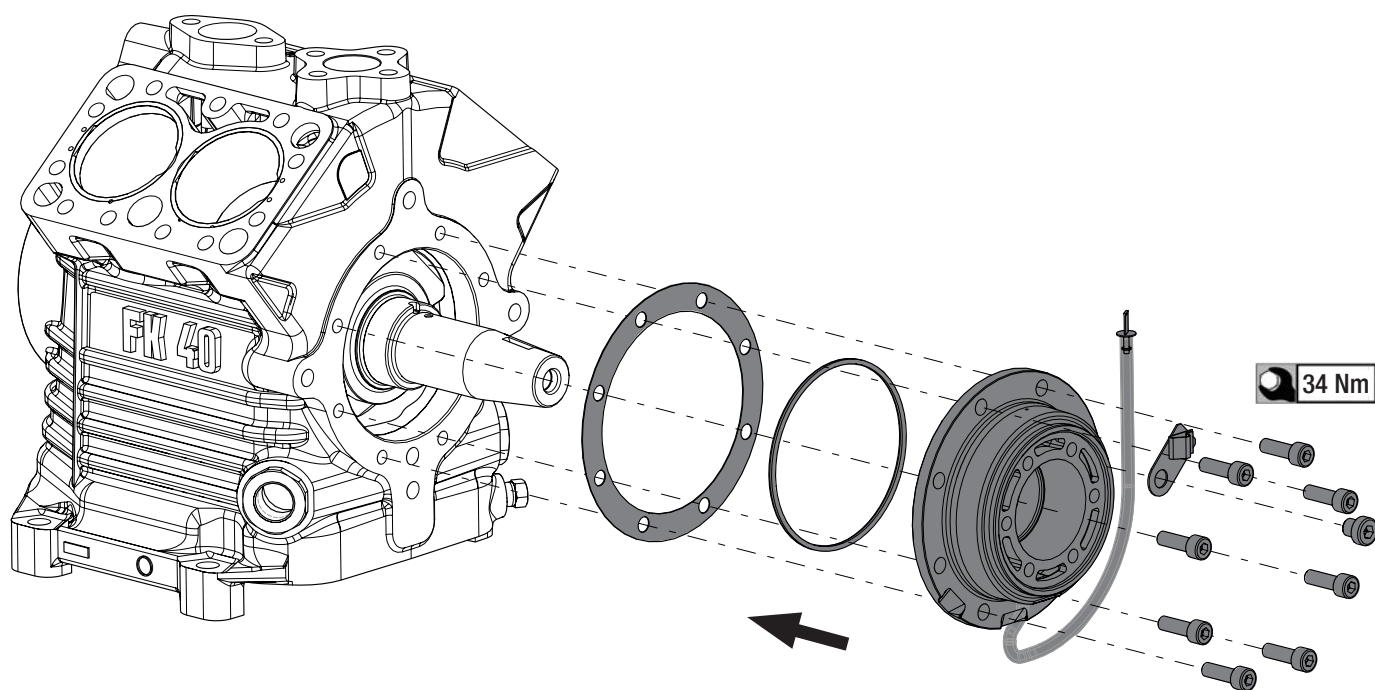
- The sealing surfaces have to be clean. Slightly oil seals

730, 740

- Install the front bearing flange with gasket to the body so that the hole for the clamping ring faces upwards

750

- Tighten the screws (M8x25) crosswise



12 | Assembly of compressor

7 Assembly of the inserted connecting rods and pistons

Position in parts list Parts list position: 2040 opt. 2045 or 2030 opt. 2035 together with 2100
Tools: Piston ring pliers, spanner SW 10

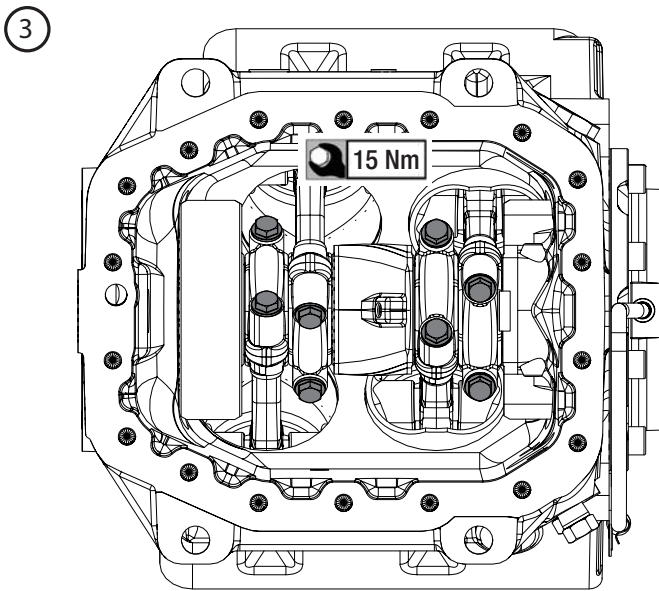
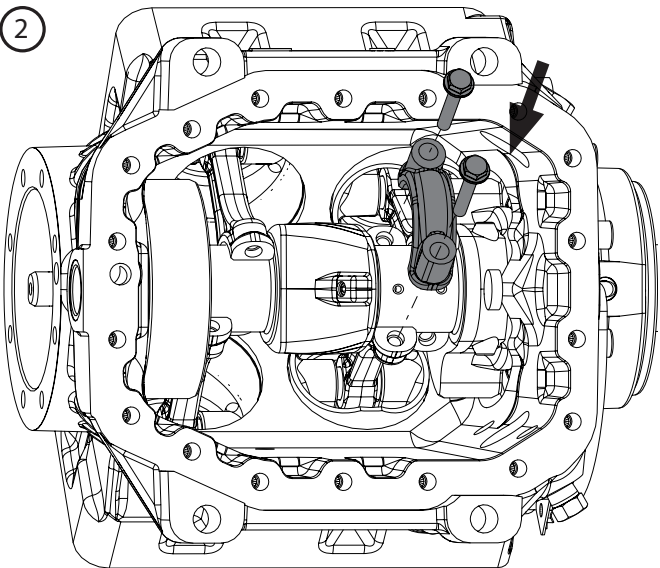
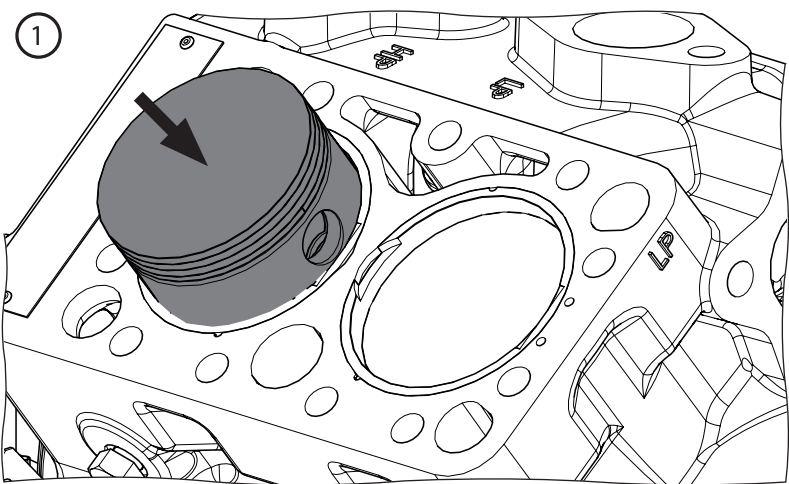
Working course



INFO

Pay attention to the correct pairing of connecting rods and connecting rod caps!
Replace connecting rod cap screws or in the case of reusing put on a sticker!

- 290, 300
- 2100
- 2050
- Compress the oil scraper ring and compression ring with the piston ring pliers and insert the piston into the cylinder liner
 - Place the marked connecting rod caps onto the related connecting rods
 - Screw on the connecting rod caps and tighten
 - Turn the crankshaft by hand. In case the crankshaft does not rotate freely check the seating of the connecting rods; if necessary, disassemble the connecting rods and carry out this step once more



12 | Assembly of compressor

8

Install of the oil pump

Position in parts list

Parts list position: 2020

Tools: Spanner SW 13

Working course



INFO

Observe the tightening torques!

Pay attention to the tightening sequence of the screws!

40, 41

460, 470

- The sealing surfaces have to be clean. Slightly oil seals

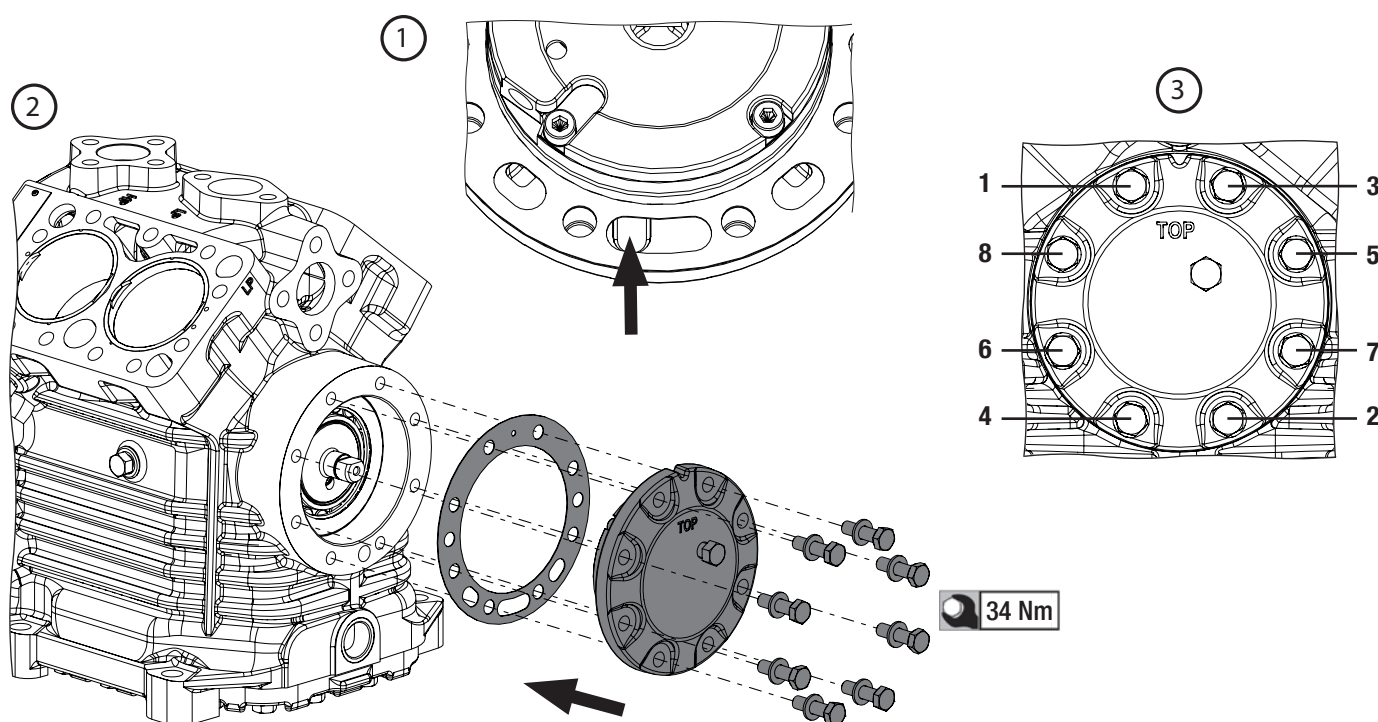
- Install the oil pump with gasket into the body with the inscription „TOP“ facing upwards!



INFO

Pay attention to the position of the holes in the gasket!

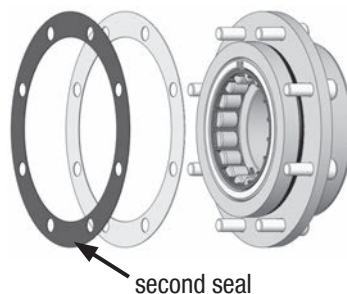
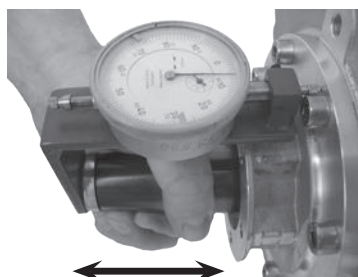
- Screw oil pump tightly. Tighten the screws (M8x30) crosswise



INFO

Adjust axial clearance!

The axial clearance of the crankshaft must be at least 0.15 mm. When parts of the driving unit of the compressor have been repaired or replaced, an accurate measurement of the axial clearance is necessary. The measurement has to be at the disassembly shaft seal cover. If the axial clearance is less than 0.15 mm, the bearing flange must be disassembled and a second seal must be inserted.

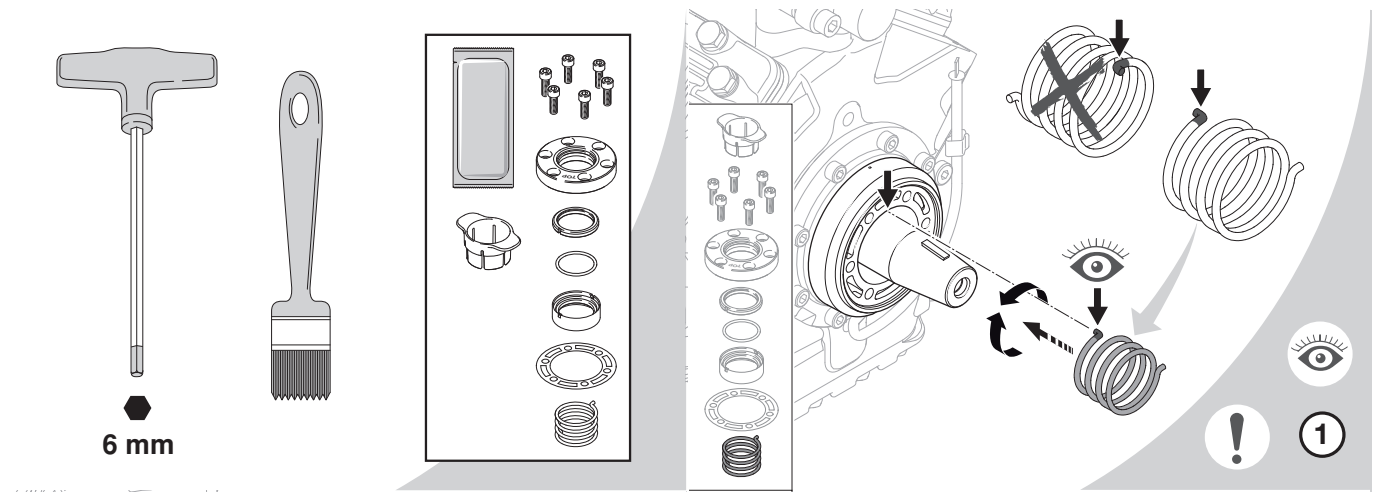


second seal

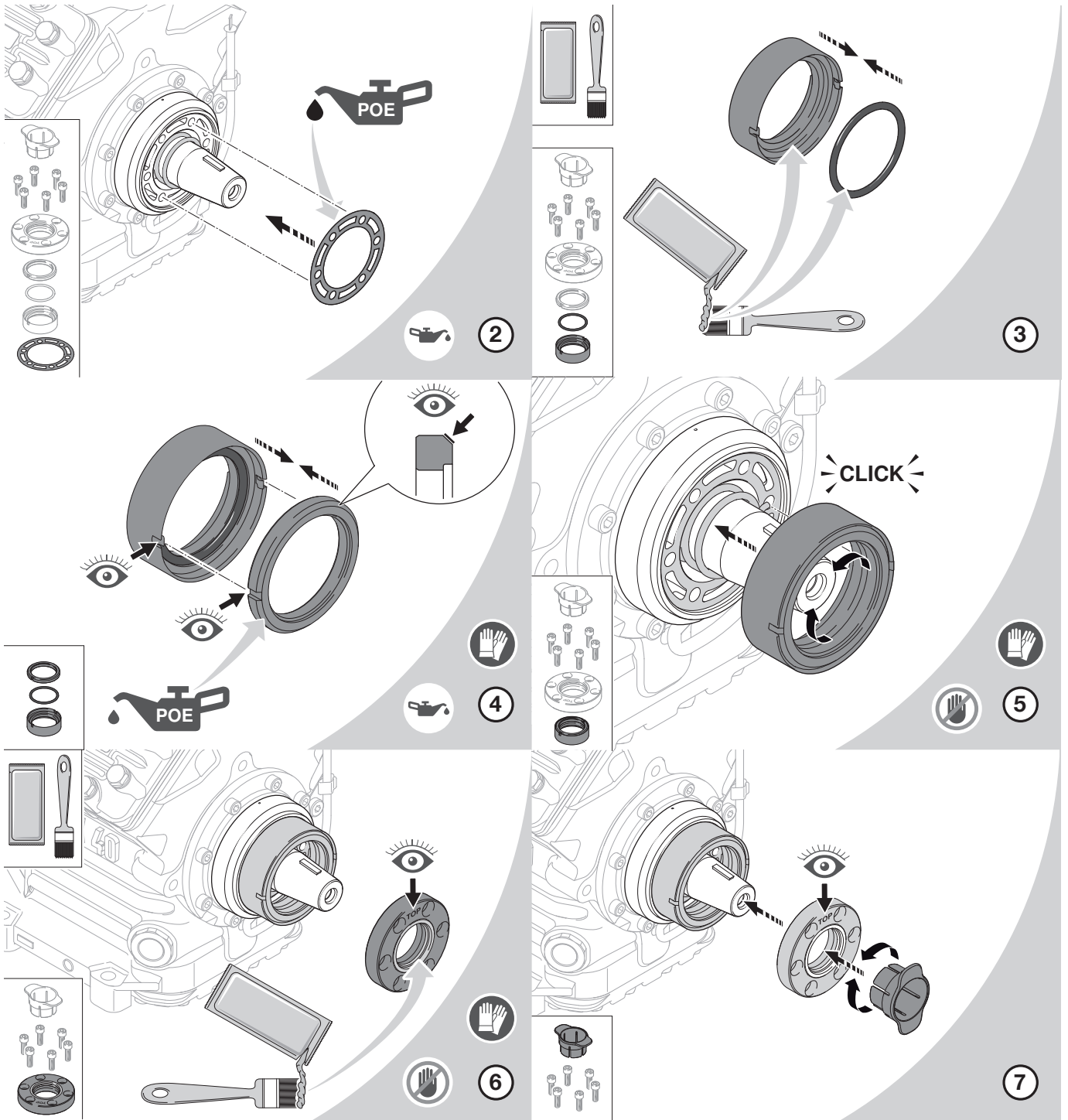
12 I Assembly of compressor

9 Fitting the shaft seal

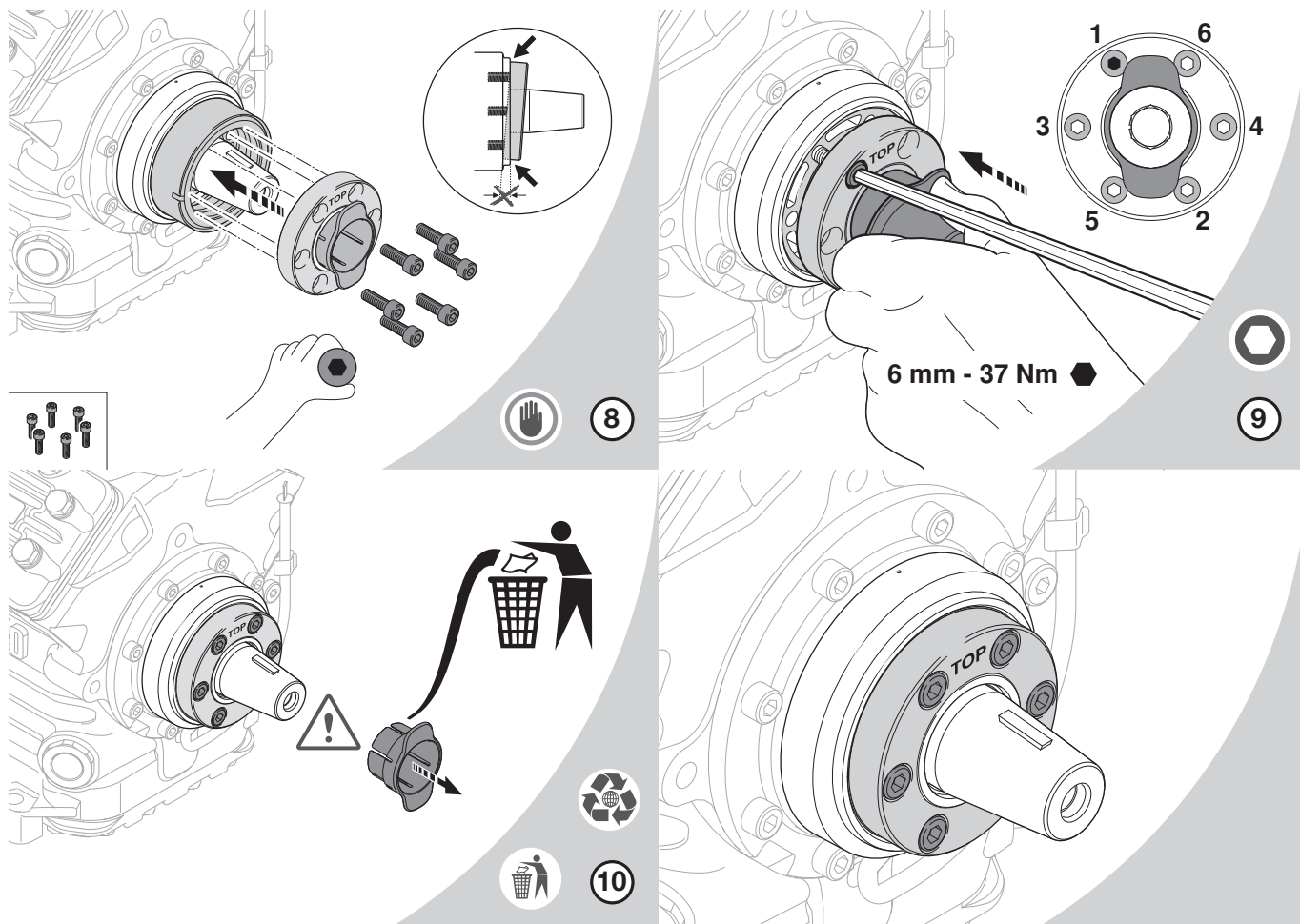
Position in parts list	Parts list position: 2010
	Tools: Allen key 6 mm, brush
	Working course
880 750 2050 2110	 INFO Caution! Avoid damages! Pay attention to the markings! Be sure to observe the detailed working steps illustrated below! Observe tightening torques!
	- Push the compression spring onto the crankshaft. Rotate the spring until the driving catch is engaged in the crankshaft. - Lubricate O-ring seating area in guide ring and O-ring with silicone grease. - Push the guide ring with O-ring and sliding ring onto the crankshaft. Chamfer on sliding ring points outward. Rotate all parts until the spring is engaged in the guide ring. Avoid scratches on the sliding ring! - Apply silicone grease to rotary shaft seal in shaft seal cover. - Install the shaft seal cover with the gasket using the protective sleeve. The inscription „TOP“ must be at the top. - Press the shaft seal cover onto the bearing flange and tighten the screws. - Turn the crankshaft by hand. Remove the protective sleeve. - Install the leak oil collection device (only up to version ID 014 and see also under service-kits: clamping ring with oil felt).



9 Fitting the shaft seal



9 Fitting the shaft seal



12 | Assembly of compressor

10 Installation of the baseplate

Position in
parts list

Parts list position: 20, 30, 40

Tools: Spanner SW 13

Working course



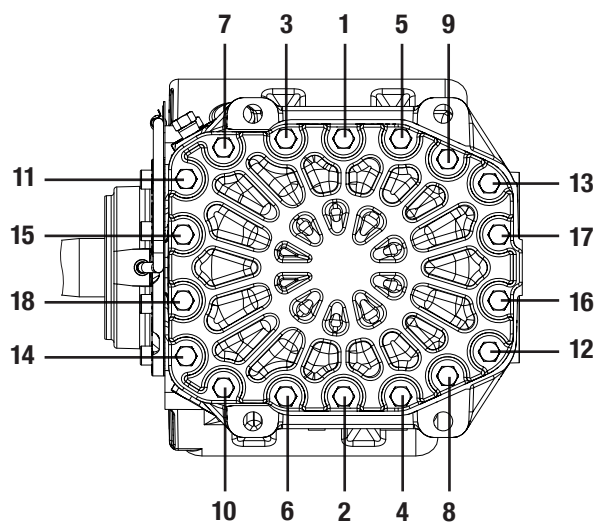
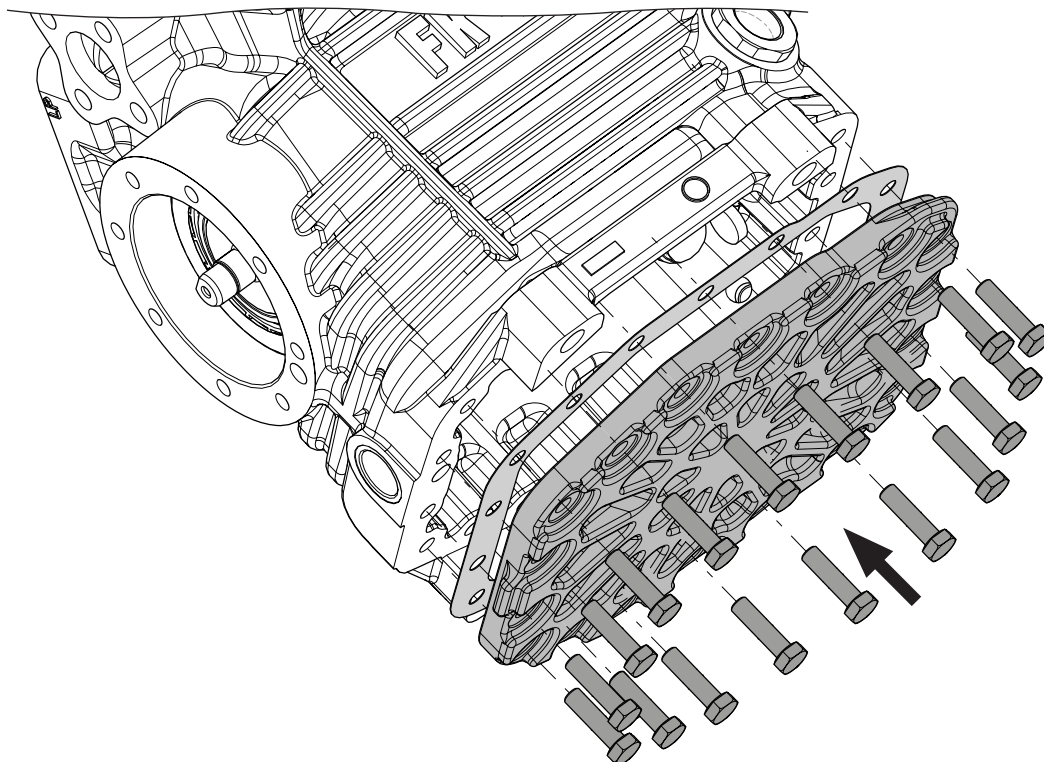
INFO

Observe the tightening torques!

Pay attention to the tightening sequence of the screws!

20, 30
40

- Install the baseplate with gasket
- Tighten the screws (M8x30) crosswise



 34 Nm

12 | Assembly of compressor

11 Installation of the oil filter

Position in parts list

Parts list position: 2130

Tools: Allen key 10 mm, spanner SW 19

Working course

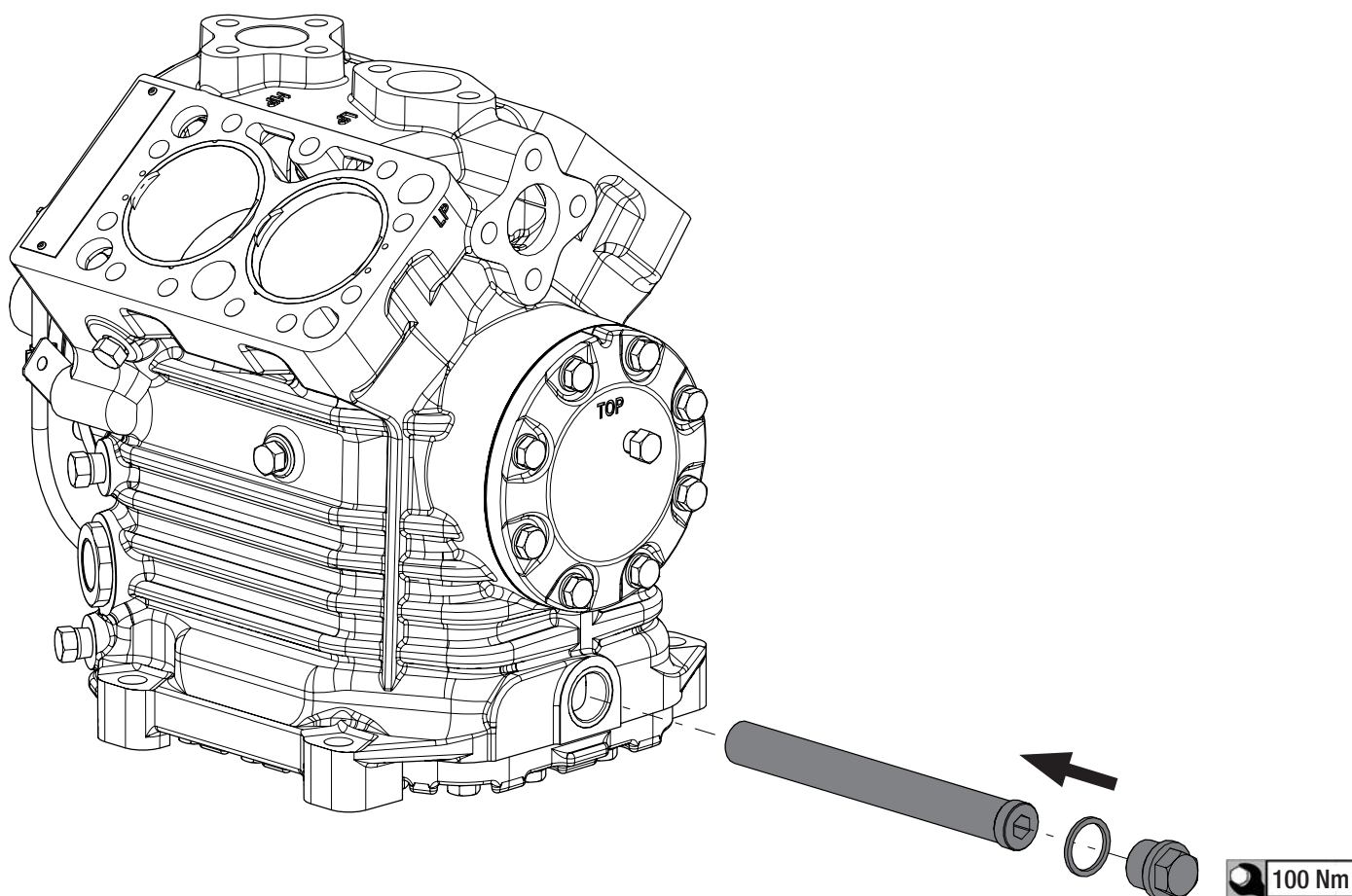


INFO

Observe the tightening torques!

490
500
510

- With the allen key, screw on the filter into the hole in the body and tighten it
- Install gasket
- Screw on the M22x1.5 mm plug and tighten it



12 | Assembly of compressor

12 Installation of the cylinder covers and valve plates

Position in parts list

Parts list position: 170, 2000 (N / TK versions), 1940, 2900 (K version)

Tools: Spanner SW 17

Working course



ATTENTION Install only the cylinder covers and valve plates which belong together, avoid mix-ups! Observe the tightening torques!

N / TK

K

60, 50

1920, 1910

170, 70

1940, 1930

- Mount the valve plate with the lower valve plate gasket onto the body

- Mount the cylinder cover with the upper valve plate gasket on the valve plate



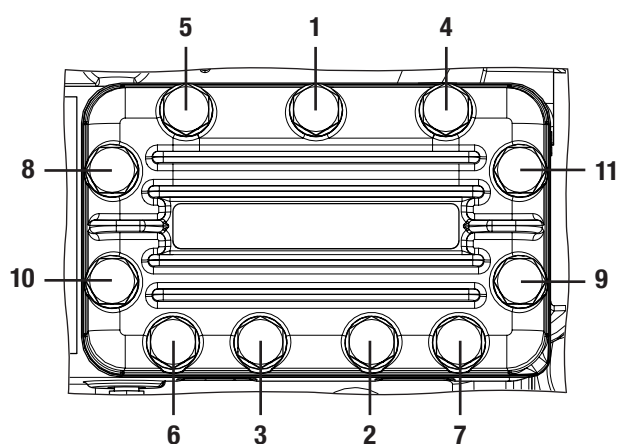
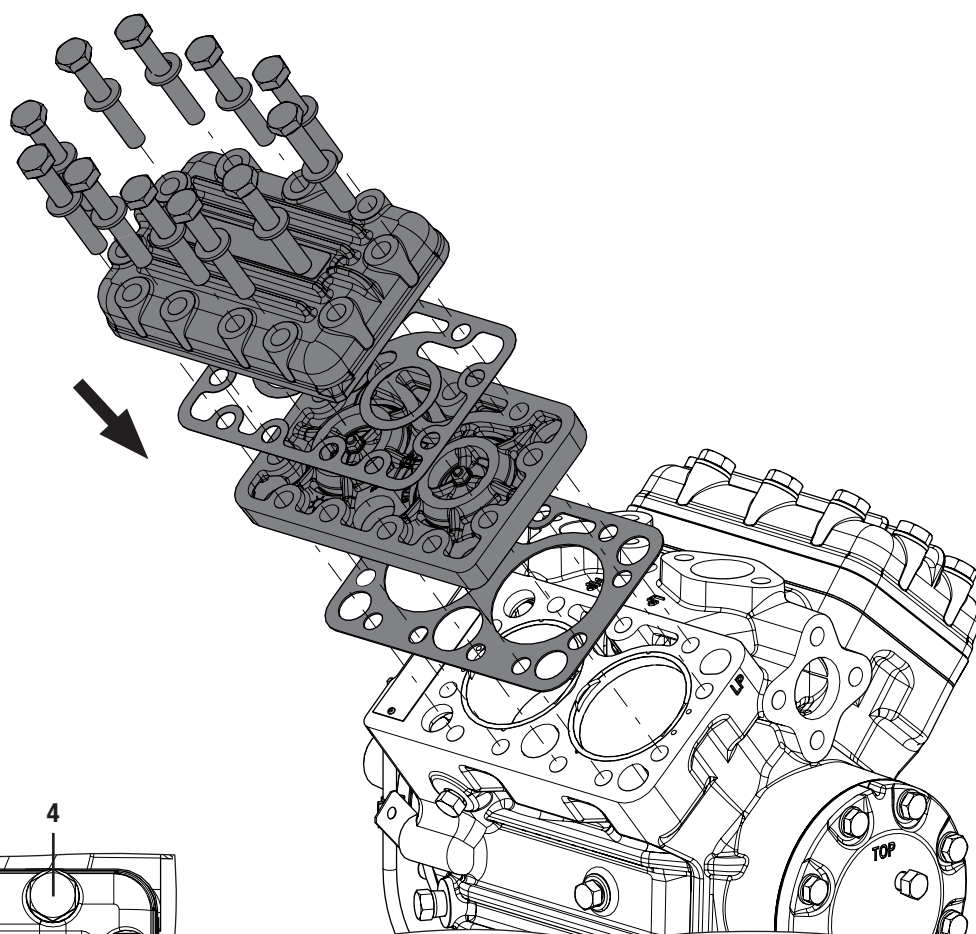
INFO

Mount the K type plate with the marking „TOP“ facing upwards!

180, 181

1950, 181

- Tighten the screws and washers cross-wise in at least two steps



 60 Nm

12 | Assembly of compressor

13

Installation of all shut-off valves and blind flanges

**Position in
parts list**

Parts list position: 2060, 2070, 232

Tools: Spanner SW 17, allen key 6 mm

Working course



INFO

Observe tightening torques!

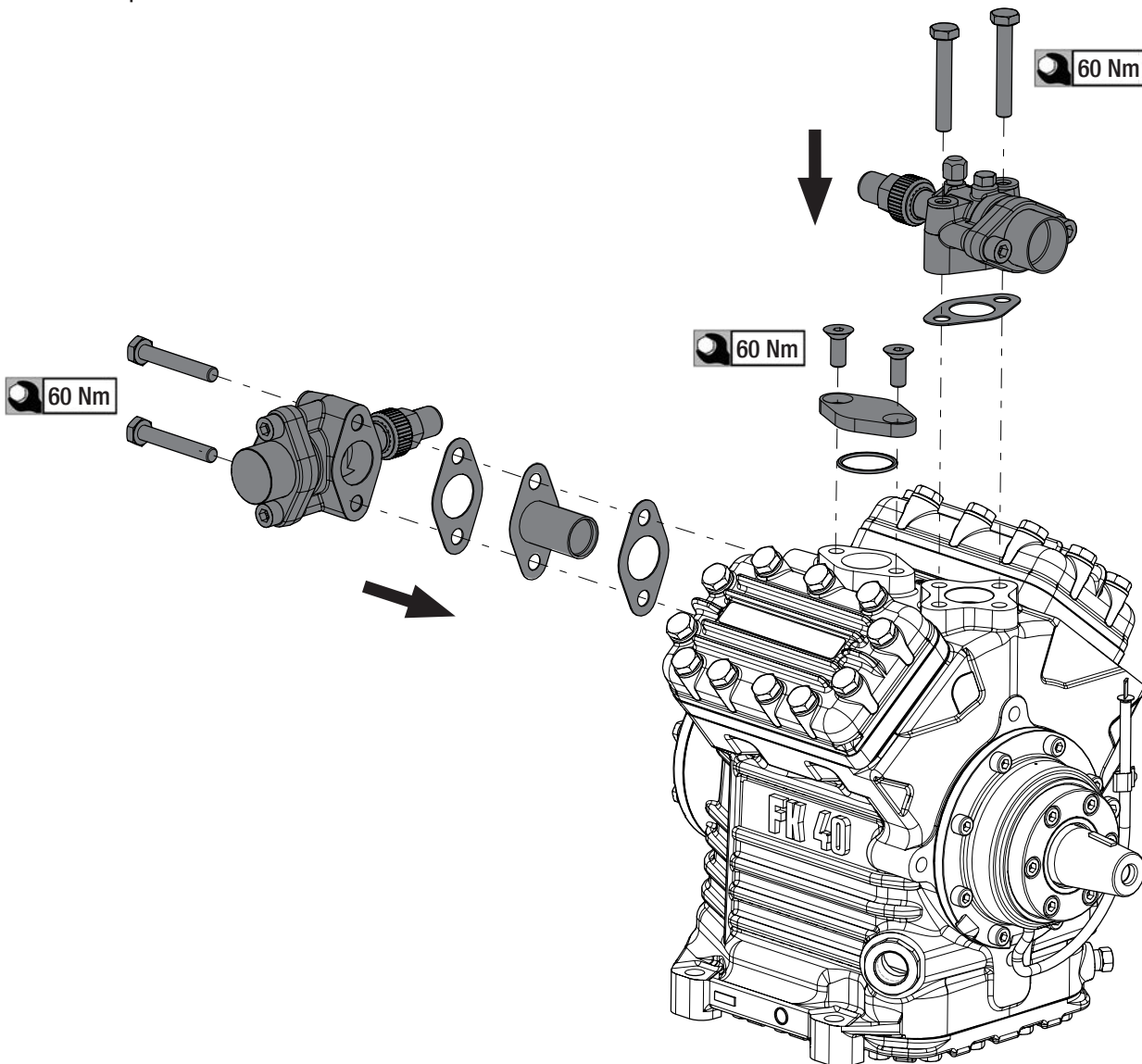
Use screws of correct length for the installation of the intermediate flanges!

230, 210

2060

233, 232,
231

- Put in the suction filter with the gasket
- Install the shut-off valves (on the discharge and suction side) with gaskets and screws
- Install the blind flange with O-ring and screws
- Tighten all screws



12 | Assembly of compressor

Checking the compressor

Working course

1. Evacuation / leak check of compressor

- Connect the discharge and suction sides of the compressor to a vacuum pump
- Evacuate the compressor from both sides; vacuum < 1.5 mbar. Check increase in pressure
- In case there is an increase in pressure, check the compressor for leaks and evacuate again
- Fill in the stipulated amount of oil (2.0 litres)

2. Carrying out the function test

- Install the compressor in the system
- Carry out a leak test with refrigerant
- Make a test run. During this, check the oil level, the leak-tightness of the compressor, the running noise, pressure, temperatures and the functioning of additional devices such as the capacity regulation

Remark: If the compressor is going to remain in the warehouse, charge it with nitrogen (at about 3 bar pressure) for protection.



ATTENTION Take the reminders for commissioning in the assembly instruction for FK40 into account!

Torques for screwed connections

General connections with flat seal in fibre or metal design

Screw size	Tightening torque
M8	34 Nm
M10	60 Nm

Note: Tighten the screws cross-wise in at least two stages (tightening torque 50 / 100%) .

Special connections

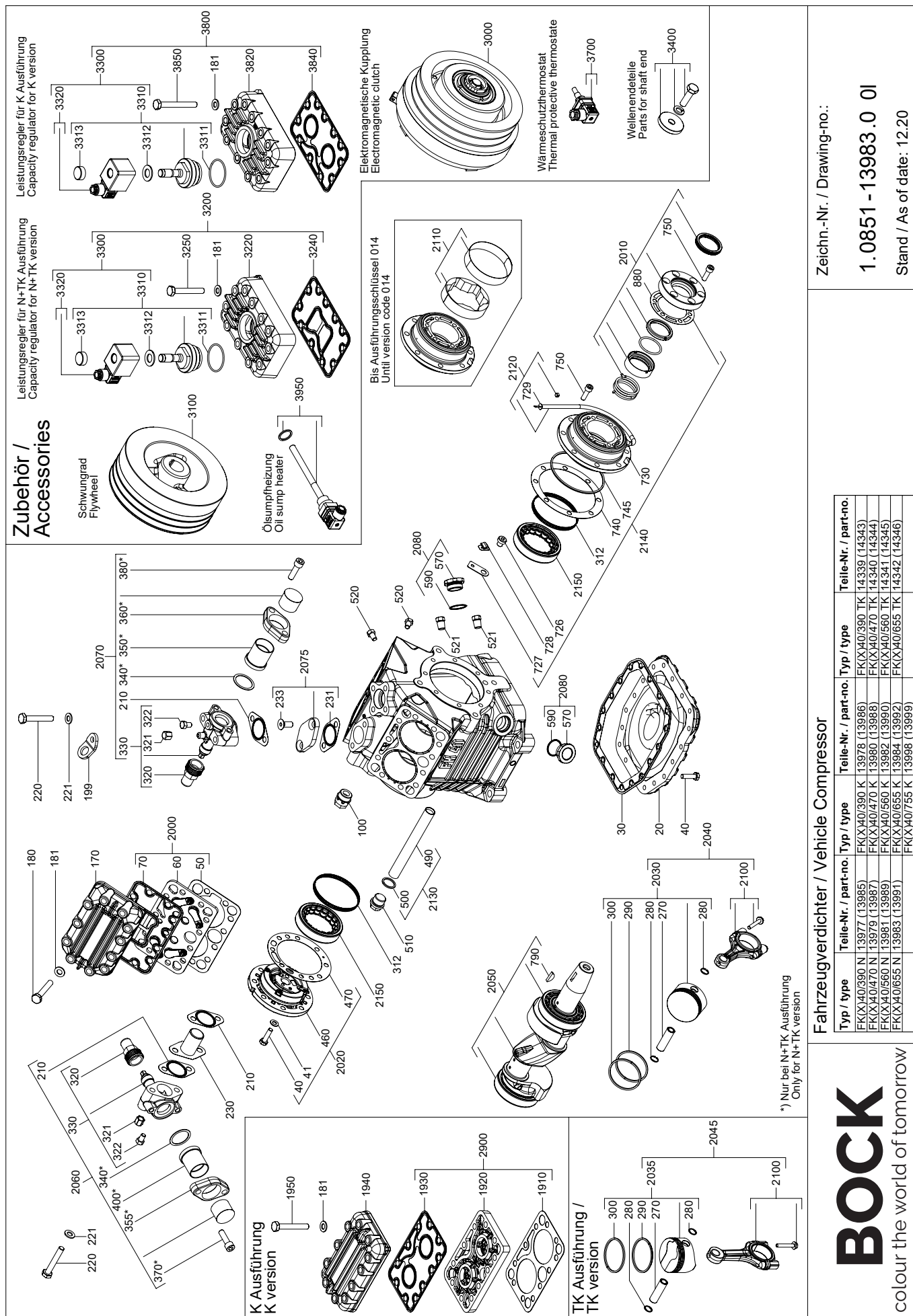
Designation	Screw size	Tightening torque
Shaft seal cover	M8	37 Nm
Connecting rod screws	M6	15 Nm
Oil drain plug	M22x1.5 ¹⁾	100 Nm
Oil intake plug	1/4" NPTF	25 Nm
Sight glass	1 1/8" -18 NPTF	25 Nm
Flange connection	M10	45 Nm
Soldering gland-shut-off valves		
Screw plugs	1/8" NPTF	25 Nm
Plug		
Electromagnetic coupling	M12	85 Nm
Decompression valve	M24	100 Nm

¹⁾ = Screw with aluminium sealing ring

13 I Spare parts list

You can order individual items listed in this maintenance manual, with the corresponding item number, simply via our spare parts lists. You can view these at any time via our **Bock compressor selection programme „VAP“** (vap.bock.de) or our **spare parts catalogue BOCK shop** (bockshop.bock.de).

14 I Exploded drawing





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