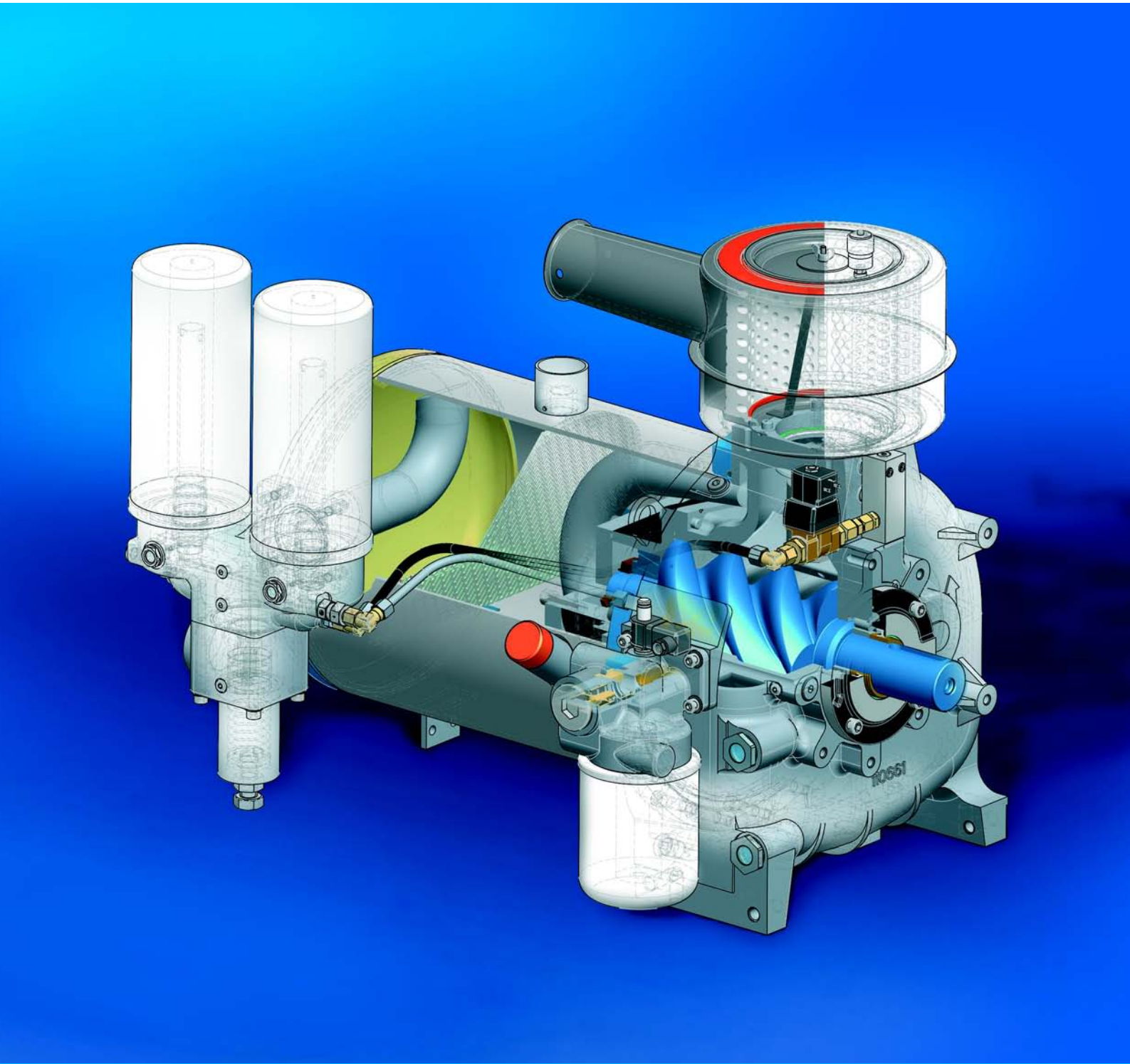
Operating Manual

SCREW COMPRESSOR COMPACT MODULE
NK 200/NK 200 G



Catalog no. 11/2006

1 Foreword

1.1 General

This manual contains instructions and specifications for the assembly and operation of the screw compressor compact module NK 200.

1.2 Validity

This documentation is valid for screw compressors of type Compact Module NK 200 for dates of delivery 10/2006 onwards.

1.3 Change service

This document is not subject to the change service.

1.4 Abbreviations

bar (g)	Operating overpressure (relative pressure in bar)
Bh	Operating hours
DHV	Minimum pressure valve
EVV	Relief delay valve
RC	ROTORCOMP
SIV	Safety valve
Min.	minimal
Max.	maximal
V DC	DC voltage
VAC	AC voltage

1.5 Manufacturer information

1.5.1 General Instructions

This operating manual provides information on the method of working, the operation and maintenance of the NK 200. Therefore, it must be used for operation and maintenance of the NK 200.
Read this operating manual carefully before the initial commissioning of the NK 200, to ensure proper handling, operation and maintenance right from the beginning.
Pay particular attention to all warning and safety instructions.
The separator tank of the NK 200 is a pressure tank in the meaning of the Pressure Equipment Directive DGRL 97/23/EC.
The CE-mark certifies the conformity of the pressure tank with this pressure equipment directive.
With the declaration of conformity, the first design and construction test as well as the pressure test of the manufacturer for the pressure tank is confirmed.
ROTORCOMP screw compressors are carefully inspected and tested before shipping. Upon receiving them, they must be immediately checked for the completeness of the supplied kit and for damage.
Any missing parts and/or transport damage must be reported immediately. Do not operate a damaged compressor module under any circumstances.
Always keep the operating manual ready for the operating personnel and ensure that the operation and maintenance is carried out according to the instructions.
All the instructions in this operating manual should be followed in the specified manner and sequence, in order to avoid danger to persons and damage to the equipment.
The screw compressor has been built according to the state-of-the-art and the recognized technical safety rules.
Nonetheless, its use could result in some danger to the users or third parties or to the compressor plant.
Any other usage other than that described in the chapter “Purpose of Use” will be considered to be not in keeping with intended purpose.
ROTORCOMP is not liable for damage resulting from such use.
We cannot accept any liability for operation downtimes and damage that result from non-compliance with this operating manual.
The manufacturer reserves the right to carry out further technical development without prior notification.
In all correspondence, always specify the type and the complete serial no. from the nameplate.
ROTORCOMP does not accept any responsibility for damage or injury during the handling, operation, maintenance or repair from non-compliance with the safety instructions or from not exercising the usual care and caution, even if this is not expressly mentioned in this operating manual.

1.5.2 Purpose of use

The NK 200 is a compact screw compressor module that is conceived for installation in a compressed air generating station.
The plant is intended exclusively for compressing atmospheric air. The NK 200 may be used for compressing gases or other media only with written permission from ROTORCOMP.
The NK 200 may only be installed by technically competent companies with corresponding know-how.
The safety instructions, technical data, limiting values, installation guidelines and specifications for commissioning and operation given in this operating manual must be followed and complied with.

1.5.3 Standard supplied kit

ROTORCOMP offers a completely fitted, compact compressor module in the form of the NK 200.
The components of the standard supplied kit are described in the following chapters.
Components that may be purchased as an option are marked as (optional).

1.6 Warranty information, exclusion of liability

The ROTORCOMP company is only a manufacturer of screw compressor components and not of compressor plants that are ready for operation.
Within the scope of the warranty terms, ROTORCOMP shall only be liable for any possible defects in such individual components for which ROTORCOMP is responsible.
All liability will be nullified in case of non-compliance with the following instructions and information. Such an exclusion of liability will also result in the loss of damage compensation entitlements. This applies particularly in case of:

- Installation not cleared by RC
- Usage not in compliance with intended purpose
- Operation of the compressor outside the specified limiting values
- Non-compliance with the safety instructions and not exercising the usual care and caution
- Unsuitable operating materials (gases, oils)
- Condensate formation in the screw compressor
- Corrosion as consequential damage
- Improper operation
- Insufficient maintenance, absence of maintenance certification
- Use of unsuitable tools
- Non-use of original spare parts
- Unauthorized modifications to the screw compressor module and/or its components

1.7 Nameplate

The nameplate is attached on the operation side of the plant.

If you have any questions, please quote the data specified on the nameplate. This ensures that you receive the correct information.

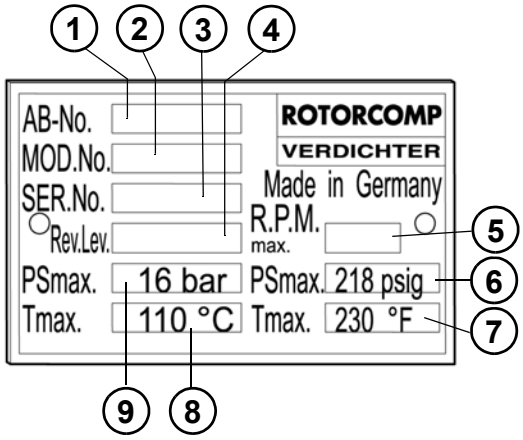


Fig. 1-1

Label for customers outside Germany (Europe)

1. Order no.
2. Type (model)
3. Serial no.
4. Year of construction
5. max. rotational speed
6. max. operating pressure psig
7. max. operating temperature °F
8. max. operating temperature °C
9. max. operating pressure bar

2 Safety Instructions

2.1 Identification of the safety instructions

Important instructions that concern the endangerment of persons, technical safety and the relevant operational protection are highlighted as follows.
They are prefixed to the relevant measures and mean:

Warning:
Identifies work procedures and operation procedures that must be complied with exactly to eliminate the possibility of hazards to persons. These also include pointers to specific hazards in the handling of the system.

Attention:
This refers to work procedures and operation procedures that must be complied with exactly to avoid damage to or destruction of parts of the machine or the entire machine.

Note:
Indicates special instructions for better handling of the operations, control and setting procedures as well as maintenance work.

2.2 Safety regulations

Compliance is required with the country-specific regulations for putting into circulation and operating compressed air machinery. In Germany, these include:

– Directive 97/23/EC (Pressure equipment directive DGRL) dated 29.05.1997
– Betriebssicherheitsverordnung (BetrSichV or Operations Safety Ordinance) dated 27.09.2002

2.3 General Safety Instructions

This operating manual contains important instructions and information on the assembly, commissioning, operation and maintenance, which the owner/operator must follow. It is therefore absolutely essential that before installation and commissioning, the complete documentation be handed over to the technical personnel of the owner/operator, and to make it available at the machine site at all times.
Before installation and commissioning, the technical personnel must carefully read the entire operating manual and then put it away safely.
Non-compliance with the safety instructions can result in serious endangerment of persons, the pressure equipment or the environment.
Please refer to the chapter “Manufacturer information” on page 1-1 of this operating manual.
The following safety instructions refer only to the screw compressor module NK 200 or NK 200 G and **not** to the entire compressor plant.
Compliance is required with the applicable national safety and labor protection specifications of the respective country in which the plant is being run.
It is the responsibility of the manufacturer of the compressor plant to include the safety specifications for the operation of the compressor plant in the operating manual of the compressor plant.
The installation, maintenance and repairs may only be carried out by personnel who are authorized, trained and qualified to do so.
It is expected of the operations personnel that they apply safe working methods and follow all the applicable local operations safety specifications and regulations.
It is the responsibility of the owner/operator to ensure that the machine is always kept in an operationally safe condition.
Limiting values (pressures, temperatures, time settings etc.) must be indicated in permanent marking.
Should a specification in this manual, especially with reference to safety, not be in keeping with the local, legally applicable regulation, the safer of the two applies.

2.3.1 Special symbols

	Do not operate the plant without the protective devices in place.
	Do not inhale any compressed air from this machine.
	Warning: The plant can be started automatically, by remote control, after a power failure.
	Warning: Plant continues to run for 30 seconds after the “OFF” button is pressed.
	Pay attention to cooling air
	Warning: Do not operate with open doors or loose clothing
	Warning: Hot machine parts
	Warning: Part under pressure or symbol
	Lifting point
	Warning: High voltage
	Active environment protection

	Warning of a hazard
	Warning: Danger of explosion and/or deflagration
	Warning: Substances harmful to health
	Warning: Inflammable materials

2.3.2 Instructions regarding the use of protective equipment

	Wear a safety helmet
	Wear safety shoes
	Wear personal safety equipment (safety eyewear, gloves, clothing etc) according to the local safety regulations.
	Please read the operating manual before commissioning, maintenance, servicing and repairs.

3 Technical Description

3.1 Total Overview: Screw Compressor Compact Module NK 200

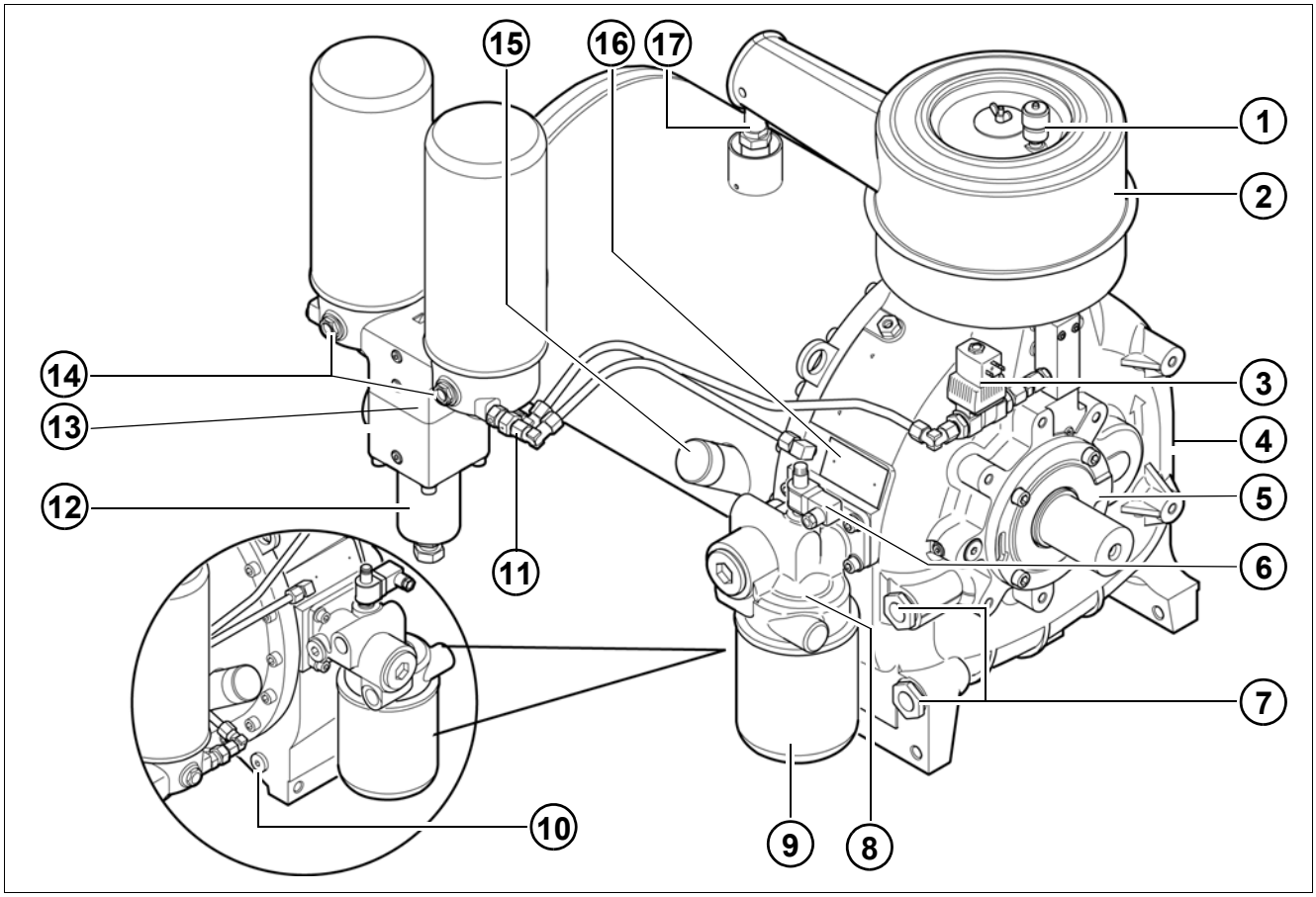


Fig. 3-1

1. Maintenance indicator for intake filter (optional)
2. Intake filter
3. Control unit, electrical
4. NK 200 Basic module
5. End cover
6. Differential pressure indicator (optional)
7. Inspection glasses, oil level indicator
8. Thermostat head
9. Oil filter
10. Oil drain screw
11. Oil suction non-return valve
12. Minimum pressure valve
13. Double separator head
14. Inspection glasses, oil separation
15. Oil filling opening
16. Nameplate
17. Safety valve (optional)

3.2 Total Overview: Screw Compressor Compact Module NK 200 G

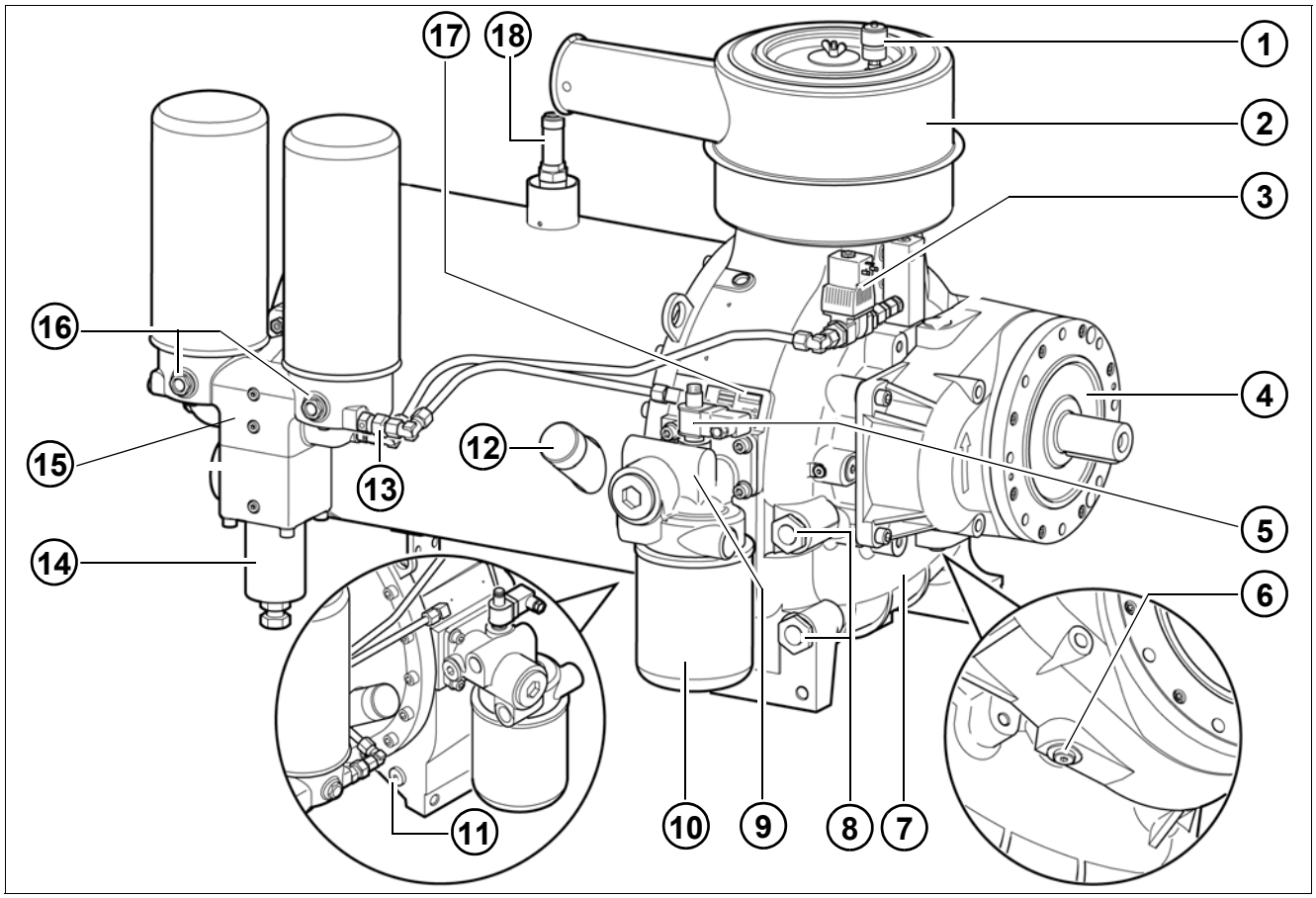


Fig. 3-2

1. Maintenance indicator for intake filter (optional)
2. Intake filter
3. Control unit, electrical
4. Gearbox
5. Differential pressure indicator (optional)
6. Oil drain screw, gearbox
7. NK 200 Basic module
8. Inspection glasses, oil level indicator
9. Thermostat head
10. Oil filter
11. Oil drain screw, basic module
12. Oil filling opening, basic module
13. Oil suction non-return valve
14. Minimum pressure valve
15. Double separator head
16. Inspection glasses, oil separation
17. Nameplate
18. Safety valve (optional)

3.3 Flow schematic, NK models (electrical)

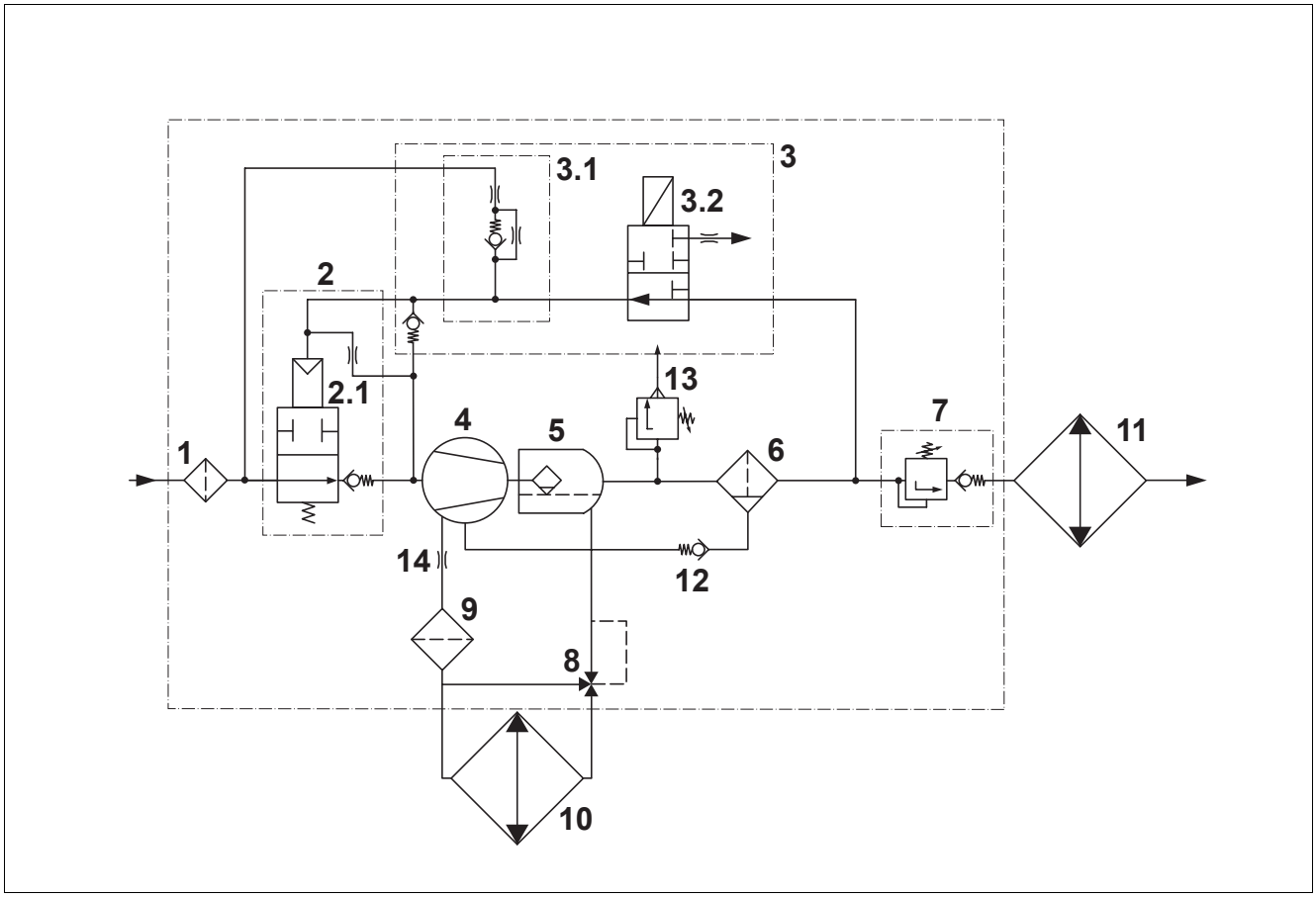


Fig. 3-3

1. Intake filter
2. Suction control
2.1 No-load nozzle
3. Control unit (electrical)
3.1 Discharge delay valve
3.2 Solenoid valve
4. Screw compressor
5. Separator tank with pre-fractionation
6. Fine separator
7. Minimum pressure valve
8. Oil thermostat
9. Oil filter
10. Oil cooler
11. Air after-cooler
12. Non-return valve
13. Safety valve (optional)
14. Oil injection nozzle (optional)

3.4 Functional description for screw compressors compact module NK 200 (electrical)

The flow diagram schematically shows the function principle and the arrangement of the main components of the screw compressor module NK 200 with electrical control, independently of any other fitting.

3.4.1 Standstill

At standstill, the solenoid valve **3.2** is without power and open, the downstream devices are without pressure. The factory setting is about 4 bar of the minimum pressure valve **7**; it is tightly closed. The suction control **2** is closed through the spring pre-tension.

3.4.2 Relieved start

In the relieved (discharged) start, owing to the movement of the rotors, even at minimal vacuum, a small amount of air is sucked in, compressed and flows as pilot compressed air through the current-less, open solenoid valve **3.2** and the discharge delay valve (EVV) **3.1** below the piston of the control. The intake control closes and remains in no-load position. In this throttled position, at a certain rotational speed of the compressor, a corresponding quantity of air is taken in, so that in the separation tank, **5** a residual pressure of 2 bar is retained. The compressed air flows partially through the no-load nozzle **2.1** of the intake control **2** back into the compressor chamber **4** and partially for relieving the system via the discharge delay valve EVV **3.1**.

3.4.3 Compression phase

During the compression phase, the solenoid valve **3.2** is electrically closed. The control pressure of the intake control **2** is dismantled via the no-load nozzle **2.1**. Through spring force and the underpressure in the intake chamber of the compressor, the intake control **2** opens.
The air taken in flows via the intake filter **1** through the intake control **2** directly into the compression chamber of the screwcompressor **4**. There, the air is compressed and oil is injected for lubrication and cooling.
The oil/air mixture then enters the separating tank **5**, in which the majority of the oil is separated from the air.
Through the fine separator **6** and the minimum pressure valve **7**, the air reaches the compressed air outlet.
In the fine separators **6**, the oil is filtered out, except for a residual < 3 mg/m^3 and through nozzles and the non-return valve **12**, fed back to the inlet side of the compressor.
Upon switching off the compressor, the minimum pressure valve **7** with non-return function prevents, in the discharge phase, the compressed air from flowing back from the network into the compressor chamber.
In addition, upon starting, a faster build-up of pressure is ensured, which is required for optimum lubrication and oil separation.
The heat that results during the compression process is carried away by the oil/air mixture.
The oil circuit is effected through the pressure difference between outlet and inlet pressure.
The optimum operating temperature for the oil is controlled by the oil thermostat **8**. Depending on the oil temperature, the oil thermostat valve controls the oil flow through the oil cooler **10** or directly to the oil filter **9**.
Via the oil filter **9**, the oil reaches the various injection points in the compressor block.

3.4.4 Switching off

When the system is switched off, the intake control **2**, supported by the spring pressure, works as an independent non-return valve. In addition, during the stop operation, the solenoid valve **3.2** is without power and opens. As a result, compressed air flows into the control cylinder of the intake control **2**, which closes the intake opening in an oil-tight manner. The system is then relieved completely through the discharge delay valve **3.1**.

3.5 Flow schematic, NK models (pneumatic)

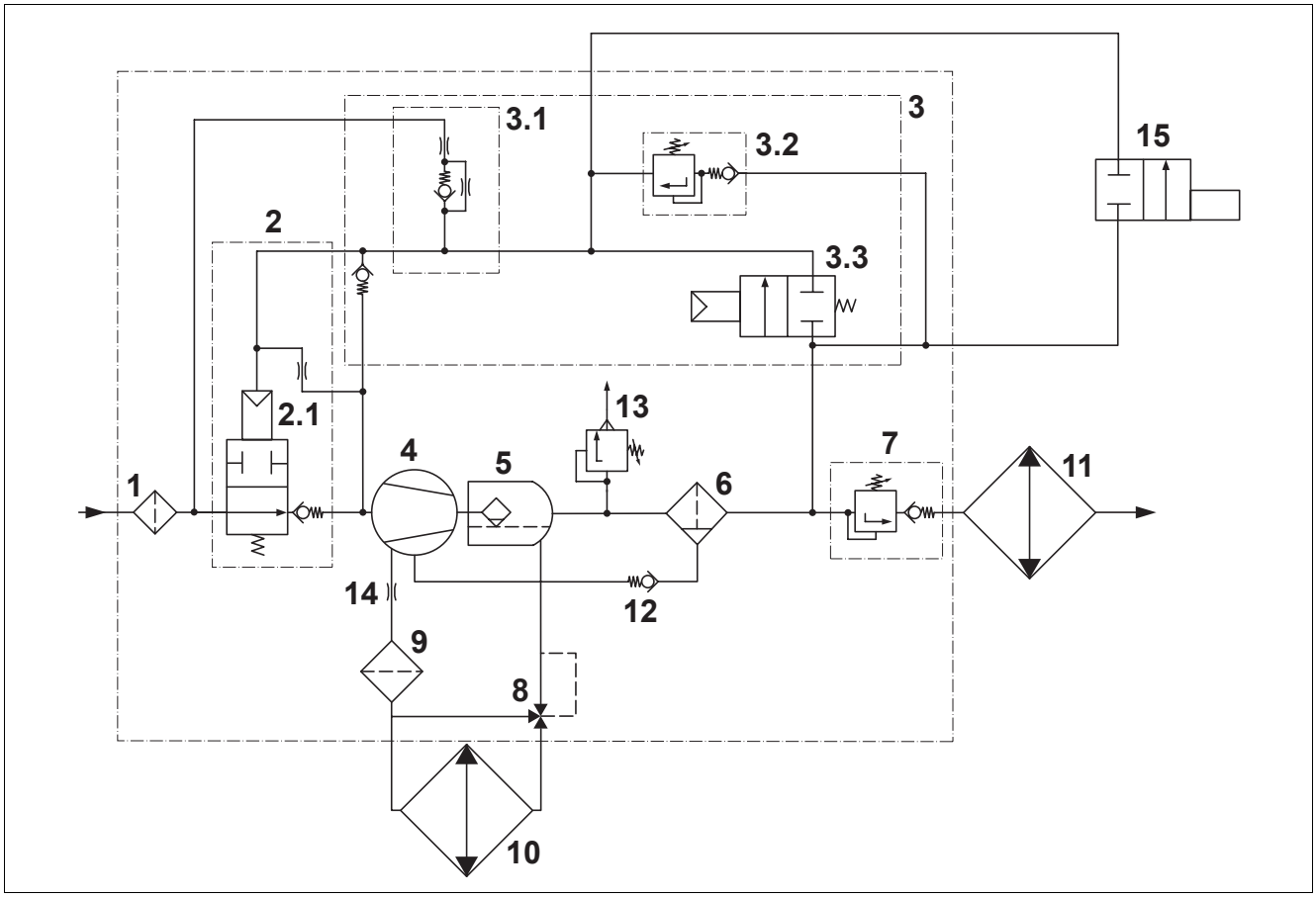


Fig. 3-4

1. Intake filter
2. Suction control
2.1 No-load nozzle
3. Control unit (pneumatic)
3.1 Discharge delay valve
3.2 Proportion regulator (positive)
3.3 Pulse pressure relief valve
4. Screw compressor
5. Separator tank with prefractionation
6. Fine separator
7. Minimum pressure valve
8. Oil thermostat
9. Oil filter
10. Oil cooler
11. Air after-cooler
12. Non-return valve
13. Safety valve (optional)
14. Oil injection nozzle (optional)
15. Bypass valve (optional)

3.6 Functional description for screw compressors compact module NK 200 (pneumatic)

The flow diagram schematically shows the function principle and the arrangement of the main components of the screw compressor module NK 200 with pneumatic control, independently of any other fitting.

3.6.1 Standstill

At standstill, the intake control **2** and the pulse pressure relief valve **3.3** are closed owing to the spring pre-tension. The downstream devices are pressure-less. The minimum pressure valve **7** is set at the factory to about 4 bar and closed tight. The proportional regulator **3.2** is set to operating pressure.

3.6.2 Start

At the start, owing to the rotor movement, even at minimal vacuum, in the suctionchamber of the screw compressor **4**, the intake control opens. The air taken in flows via the intake filter **1** through the intake control **2** directly into the compression chamber of the screw compressor **4**. There, the air is compressed and oil is injected for lubrication and cooling.
The oil/air mixture then enters the separating tank **5**, in which the majority of the oil is separated from the air.
Through the fine separator **6** and the minimum pressure valve **7**, the air reaches the compressed air outlet.
In the fine separators **6**, the oil is filtered out, except for a residual < 3 mg/m^3 and through nozzles and the non-return valve **12**, fed back to the inlet side of the compressor.
Upon switching off the compressor, the minimum pressure valve **7** with non-return function prevents, in the discharge phase, the compressed air from flowing back from the network into the compressor chamber.
In addition, upon starting, a faster build-up of pressure is ensured, which is required for optimum lubrication and oil separation.
Upon reaching the working air pressure, the proportional regulator **3.2** opens and the pilot air flows through the discharge delay valve (EVV) **3.1** below the piston of the intake control **2**, which starts to close. The adjustable proportional controller **3.2** steplessly regulates, depending on the compressed air discharge, the pressure below the piston of the intake control **2**. This pressure acts against the spring force and as a result determines the valve stroke and hence the intake air quantity. The compressed air flows partially through the no-load nozzle **2.1** of the intake control **2** back into the compressor chamber **4** and partially for relieving the system via the discharge delay valve EVV **3.1**.
The heat resulting from the compression process is carried away by the oil/air mixture. The oil circuit is effected through the pressure difference between outlet and inlet pressure. The ideal operating temperature for the oil is controlled by the oil thermostat **8**. Depending on the oil temperature, the thermostat valve controls the oil flow through the oil cooler **10** or directly to the oil filter **9**.
Via the oil filter **9**, the oil reaches the various injection points in the compressor block.

3.6.3 Switching off

When the system is switched off, the intake control **2**, supported by the spring pressure, works as an independent non-return valve and closes the intake opening. The pressure in the intake chamber increases. This is a signal for the pneumatic pulse pressure relief valve **3.3**, which automatically directs the compressed air flow to the discharge delay valve EVV **3.1**. The system is then relieved completely through the discharge delay valve **3.1**.

3.6.4 Relieved start (optional)

In the relieved (discharged) start, owing to the movement of the rotors, even at minimal vacuum, a small amount of air is sucked in, compressed and flows as pilot compressed air through the open bypass valve and the discharge delay valve EVV) **3.1** below the piston of the control. The intake control closes and remains in no-load position. In this throttled position, at a certain rotational speed of the compressor, a corresponding quantity of air is taken in, so that in the separation tank, **5** a residual pressure of 2 bar is retained. The compressed air flows partially through the no-load nozzle **2.1** of the intake control **2** back into the compressor chamber **4** and partially for relieving the system via the discharge delay valve EVV **3.1**.
Upon starting with the intake opening closed, the force requirement of the screw compressor is low. In the compression phase, the bypass valve **15** is closed and the screw compressor module is controlled automatically by means of the pneumatic control.

3.7 Suction control

The NK 200 is fitted with an integrated suction control, which is located directly below the intake air filter in the compressor housing.
Depending on the application, the use of other intake controls is also possible.

Different control units can be used for different operating modes:

– the electrical control unit EMC or
– the pneumatic control unit PMC

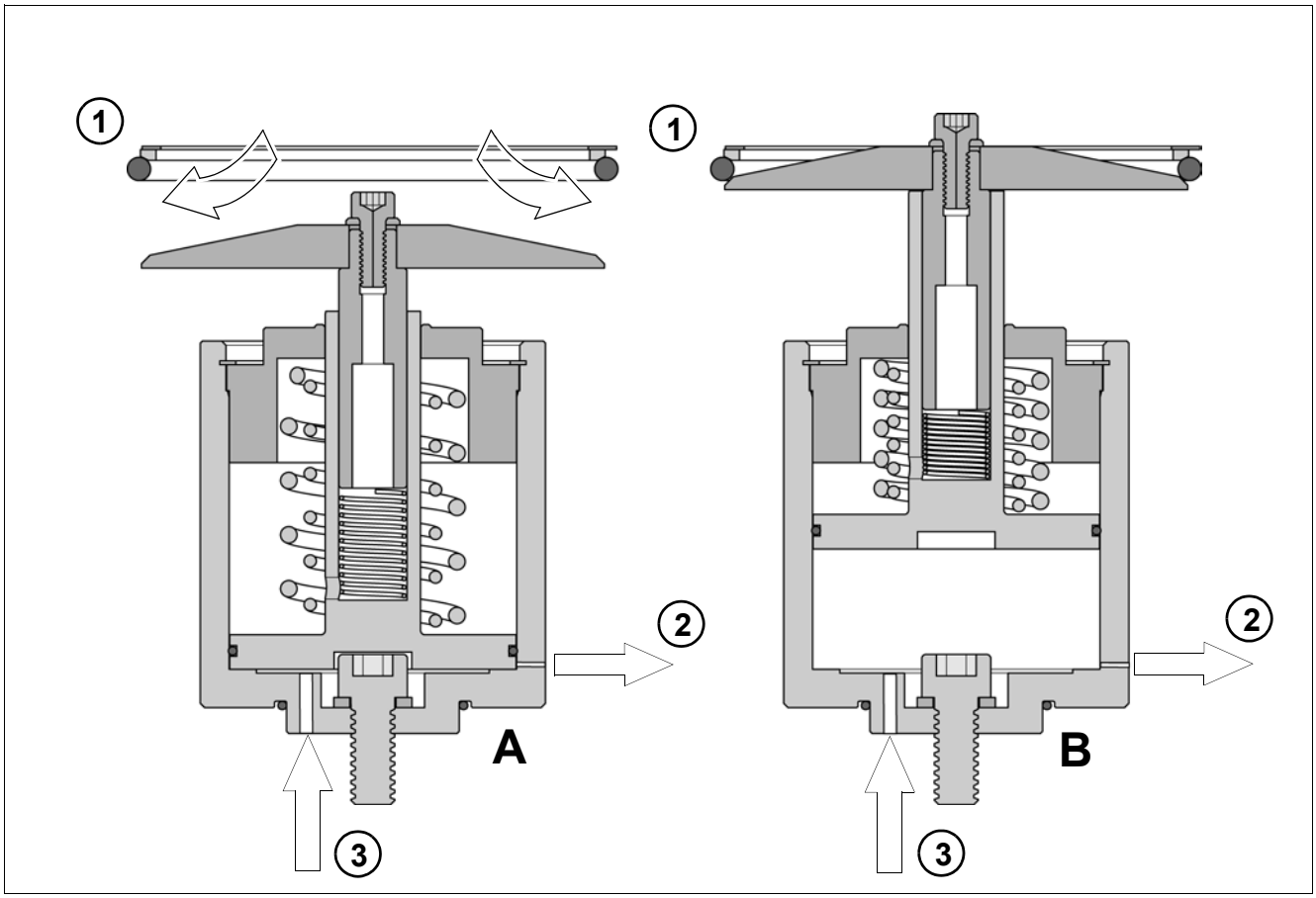


Fig. 3-5

A Intake control opened
B Intake control closed
1. Air entry
2. No-load nozzle
3. Pilot compressed air

3.7.1 Installation position

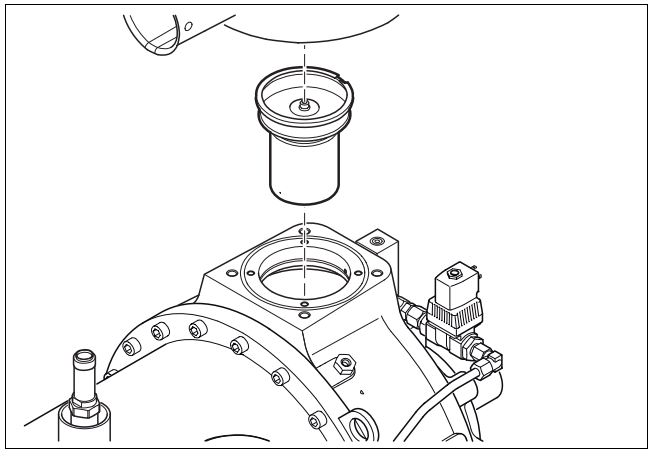


Fig. 3-6

3.8 Intake air filter

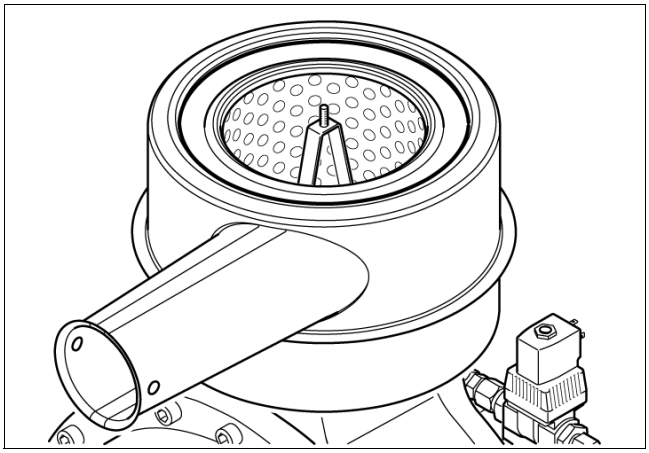


Fig. 3-7

3.8.1 Micro air filter element

The RC intake air filter is installed directly above the intake valve.

The micro air filter element with a fineness of 10 µm serves for filtering the intake air.

Thanks to the constant degree of filtration of almost 100% at all loading levels, which allows resistance to heat, cold, water, oil and fuel as well as large filter areas that facilitates durability, the micro air filter element is the ideal fine filter for filtering the intake air of compressor systems.

3.8.2 Intake filter monitoring

- Maintenance indicator, visual (option)
- Maintenance indicator, electrical (option)

The micro air filter elements are recommended as **1-stage filters** with a low filter resistance for **standard applications**.

⚠ **Attention:**
Special applications, e.g. plant installation in a heavily polluted environment, mobile plants etc. require 2-stage filters with a somewhat higher filter resistance, but better filtration efficiency for protecting the compressor plant.
Filter type/catalog no.: on special request.

3.9 Double fine filter

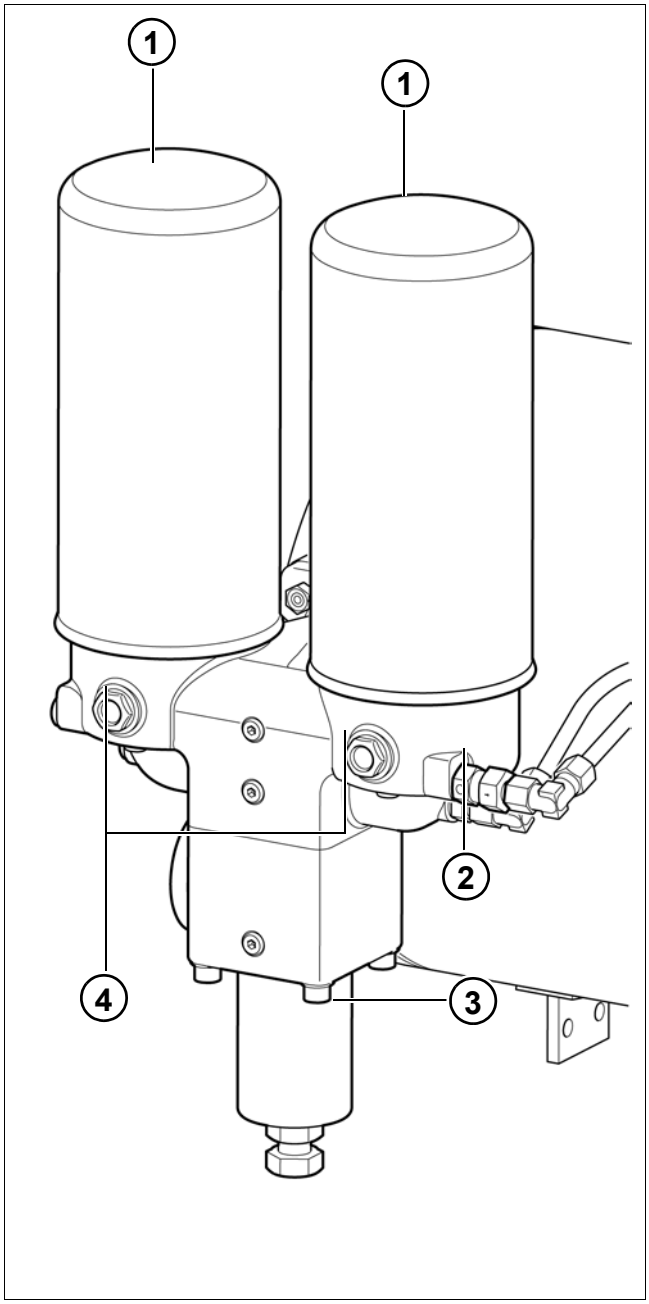


Fig. 3-8

1. Fine filtration cartridge
2. Oil suction non-return valve
3. Minimum pressure valve
4. Inspection glasses

3.9.1 Inspection glass

The oil separation becomes visible through the inspection glasses **4**:
If, after a prolonged working time, there is no oil visible in the inspectionglass, the nozzle may be blocked.
The oil that is not separated in the fine filtration cartridge is then circulated with the compressed air into the network (increased residual oil component in the compressed air).
Any impurities should be removed.

3.9.2 Oil suction non-return valve

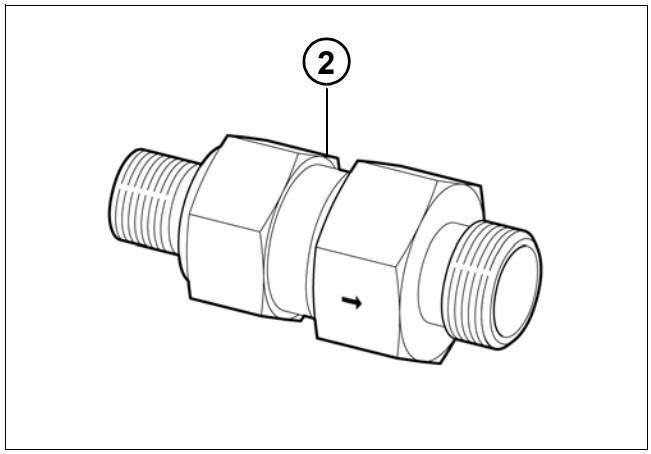


Fig. 3-9

The oil intake non-return valve **2** prevents flooding of the fine filtration cartridge by returning oil from the screw compressor upon switching off the screw compressor system, caused by the pressure difference in the system.

3.9.3 Fine filtration cartridge

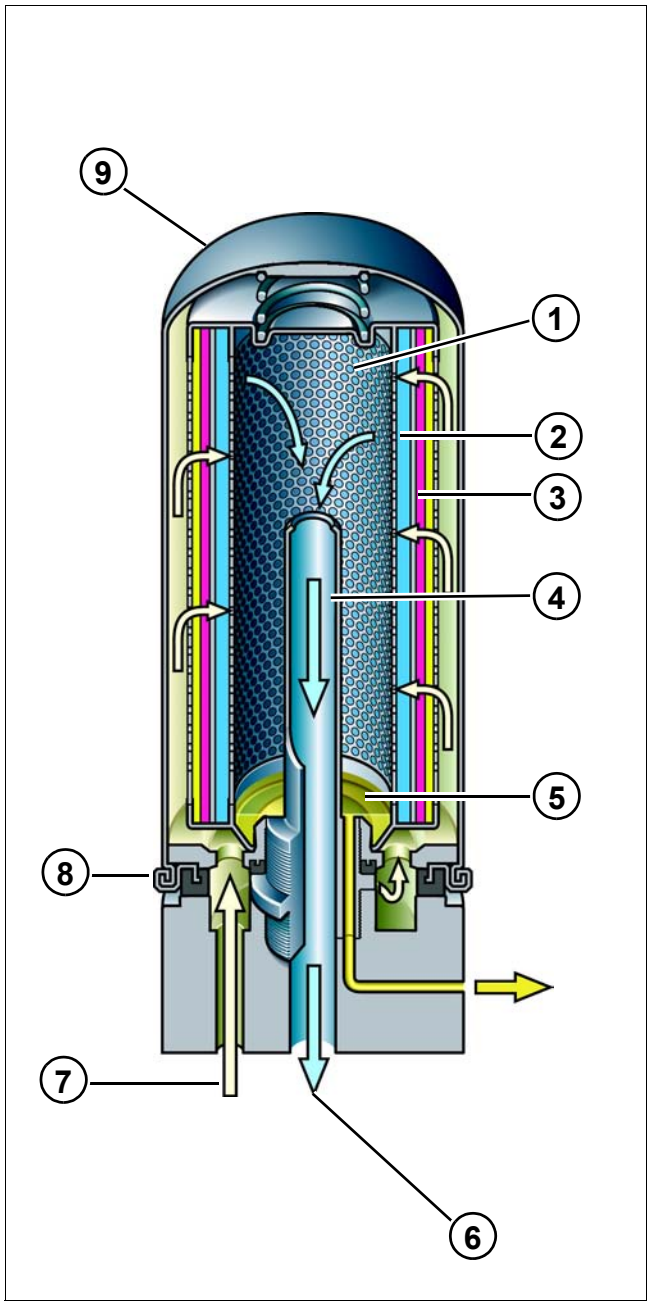


Fig. 3-10

1. De-oiled compressed air
2. After-separator
3. Fine separator
4. Support tube, pressure-resistant
5. Separated oil
6. Exit of the de-oiled air
7. Entry of the air/oil mixture
8. Sealing
9. Pressure-resistant housing

The fine separator cartridge serves for recovery of the very finely distributed residual oil in drop form after the pre-filtration.
The fine separator cartridge separates almost the entire residual oil from the compressed air.
The precondition is optimum pre-filtration in the separation tank – the better the pre-filtration, the better the fine separation.
Flow to the vertical cartridge is from below, with the residual oil being separated upon flowing through the special filter element. It is then fed back into the oil circuit.
Together with the vapor-formed oil contents of the compressed air that cannot be separated in this process, depending on the operating temperature, the operating pressure, the flow speed and the type of mineral oil used, a better separation capacity can be achieved.

3.9.4 Minimum pressure valve

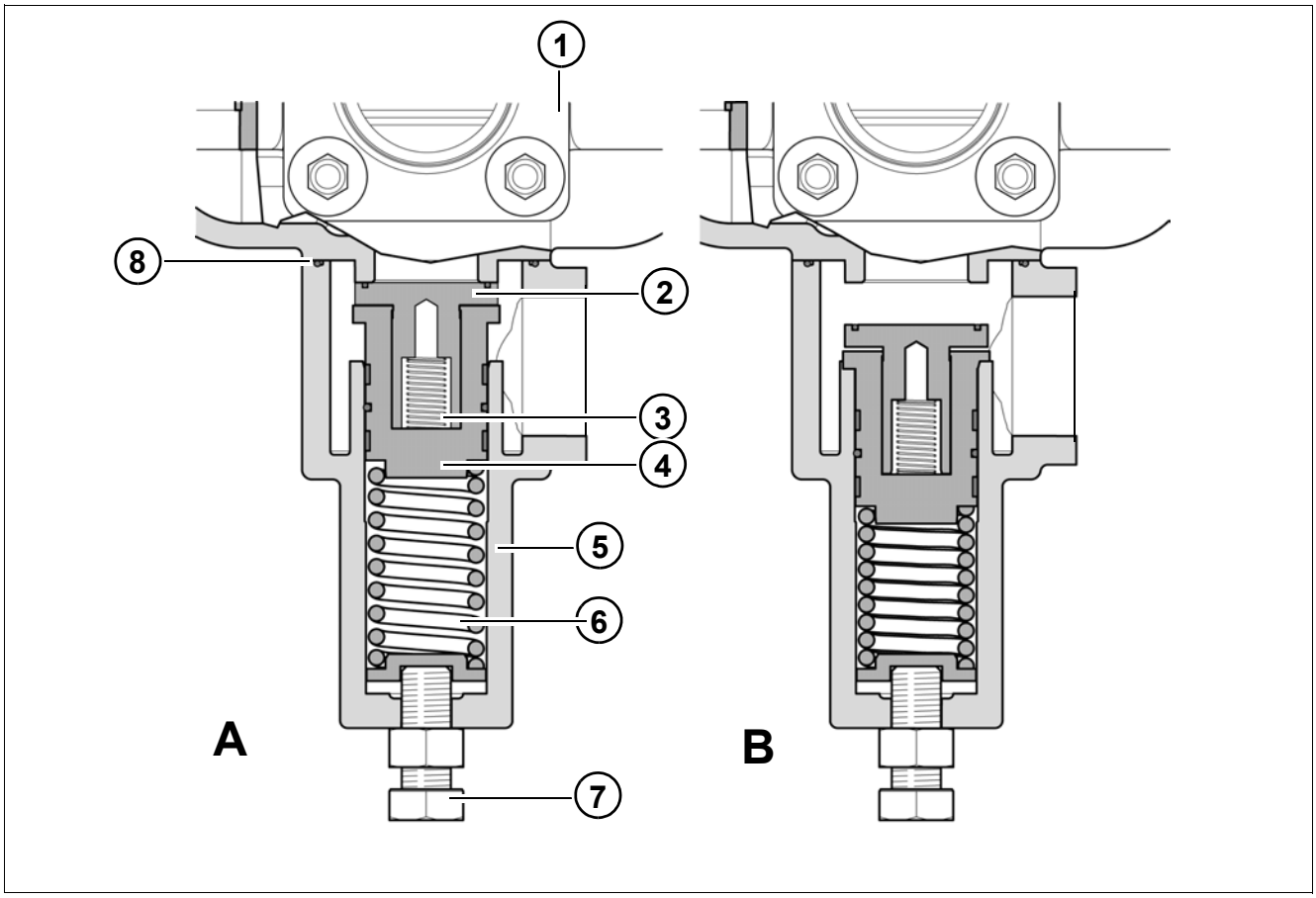


Fig. 3-11

1. Separator head
2. Non-return valve disk
3. Non-return valve spring
4. Pressure control valve piston
5. Pressure control valve housing
6. Pressure control valve spring
7. Adjusting screw for minimum pressure
8. O-ring

A Minimum pressure valve closed
B Minimum pressure valve opened

The minimum pressure valve is located at the outlet of the compressor before the air after-cooler and serves as:

a) Pressure control valve
It prevents the dropping of the pressure, in the absence of counter pressure, below a minimum pressure of about 6 bar**.** This pressure is necessary to ensure the oil supply to the compressor. At the same time, this is the precondition for a good oil separation.

b) Non-return valve
It prevents the compressed air from the network or the compressed air chamber from flowing back into the screw compressor. As a result, upon switching off the separator chamber, the plant can be totally relieved.
This valve works automatically.

3.10 Air-oil circuit outside the compressor module

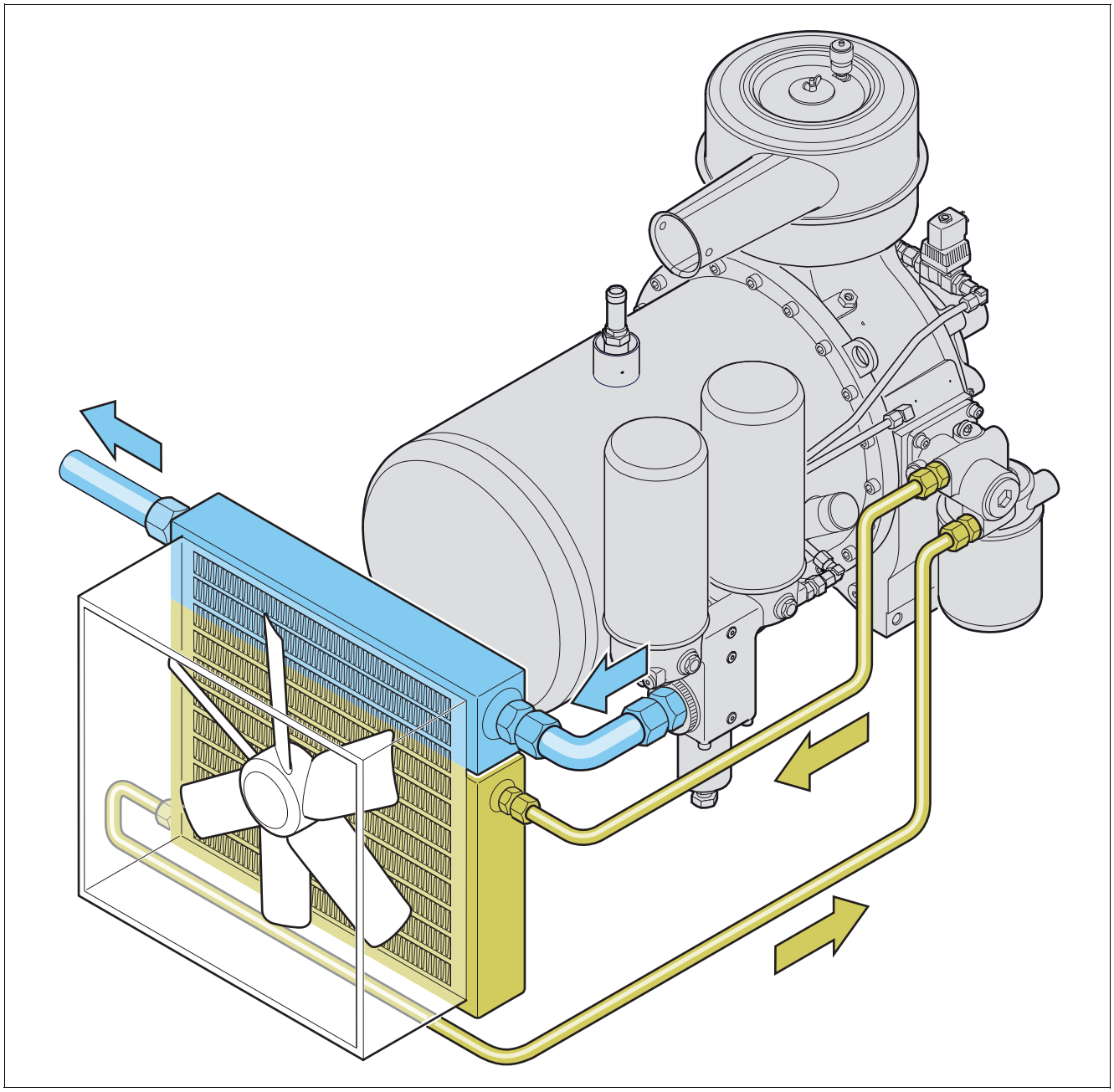


Fig. 3-12

After the oil-air mixture has been de-oiled in the fine separator cartridge, the compressed air flows through the air cooler and from there, reaches the load.
The oil flows via a thermostat located in the thermostat head to the oil cooler.
The cooled oil goes from the oil cooler via the oil filter back into the internal oil/air circuit of the compressor module.

3.10.1 Thermostat head with oil filter element

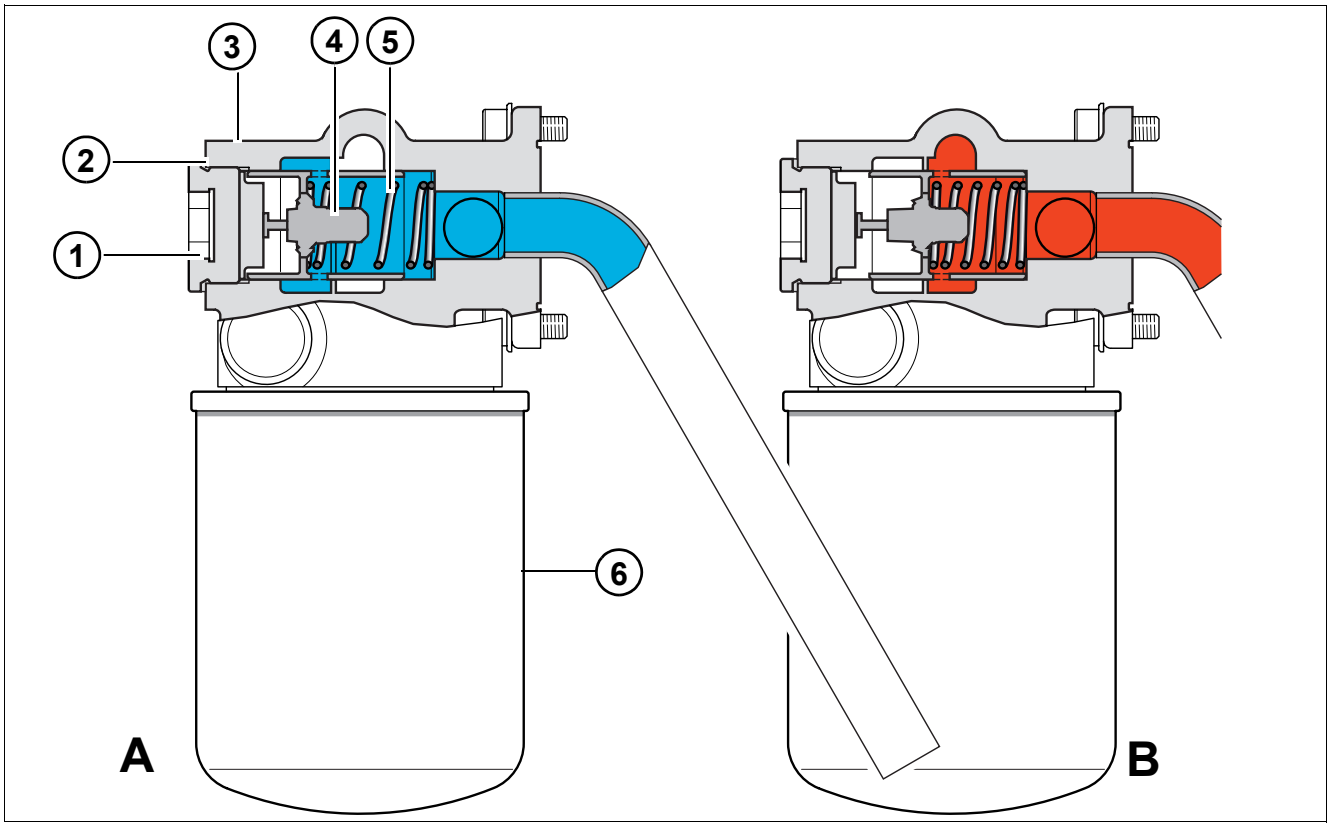


Fig. 3-13

1. Screw plug
2. Sealing ring
3. Thermostat head
4. Thermostat working element
5. Compression spring
6. Exchangeable filter cartridge

A Oil cooler pipe closed
B Oil cooler pipe or channel open

3.10.2 Oil filter

The oil filter is screwed onto the thermostat head **1**.

The filter fineness is 5 to 10 µm.

The replaceable filter has a bypass valve which opens in case of cold, highly viscous oil or when the filter is badly fouled, at 2.5 bar differential pressure. This eliminates the possibility of a shortage of oil supply to the screw compressor, which would result in the maximum permissible compression temperature being exceeded.

3.10.3 Oil thermostat

The NK 200 is fitted with an integrated oil thermostat. It is located in the thermostat head **3** before the oil filter **6** and accessible from the outside. The oil thermostat working element is exchangeable and selected according to the working temperature.
The oil thermostat opens the connection to the oil cooler upon reaching the operating temperature and in the subsequent process regulates the retention of the optimum temperature of the plant. In the startup phase, this parameter is reached faster and hence a development of condensate in the oil circuit is mostly avoided.
Depending on the compressor operating data, the temperature should be between 80 °C - 110 °C/ 176 °F - 230 °F (measured at the compressor outlet).
The oil thermostat is maintenance-free. Operation of the compressor system with an impermissible overtemperature can result in a failure of the working element (in this case, it will be necessary to replace the working element).

Note:
If operating the system at 15 bar, the thermostat working element must be matched to the increased requirements without fail.

3.11 Oil cooler/air after-cooler (option)

In the case of air-cooled screw compressors, the circulating oil is cooled down from the compressor outlet temperature to the compressor injection temperature.
ROTORCOMP offers, as an option, combination-coolers with aluminum lamellae, which are connected to the air and oil circuit of the respective compressor (see Fig. 3-12).
The corresponding coolers are so dimensioned that they guarantee operational safety at an ambient temperature of up to 45 °C/+ 113 °F. Sufficient cooling air parameters are a precondition.
The cold ambient air should be forced through the cooler by means of a fan. The distance to the cooler should be selected so that it is sufficiently large to achieve a uniform cooling air distribution over the entire effective cooling area.

3.12 Safety valve (SIV) (option)

Warning:
Before commissioning, the safety valve must be installed.
Operating the plant without a safety valve can be life-threateningly dangerous!

The safety valve is located at the separator tank and is fitted with a testing device.
Taking into account the pressure loss in the oil separator system, the blowing-off pressure is max. 1.5 bar above the respective operating pressure (ultimate pressure) of the plant.
The valve is type-tested and sealed (manufacturer certification available on request).

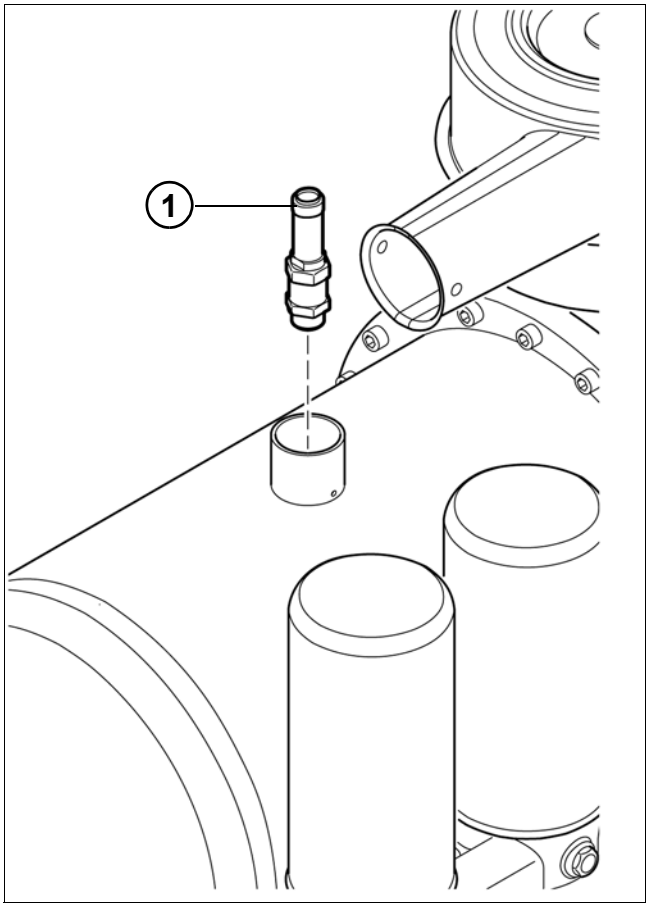


Fig. 3-14

1. Knurled screw for function test

4 Transport

4.1 Delivery and Packing

The system is shipped in appropriate packing according to the selected mode of shipping and the terms and conditions of supply.

4.2 Transportation damage

Despite great care being taken at the factory, there is a possibility that the screw compressor module can get damaged during transport. Therefore, the screw compressor module must be checked after every time it is transported to ensure that it is intact.

Attention:
Do not operate a damaged compressor module under any circumstances. In case of transportation damage, it is in your interest to secure your damage compensation claims by having a representative of the transportation company on hand for assessing the damage, i.e.

A) Outwardly visible damage or losses
- must be officially certified by means of a corresponding entry on the bill of lading before accepting the goods. In addition, in case of rail transportation damage, ask for a **recording of facts**.
- In case of mail consignments, **before you accept** damaged packages etc., the damage must be confirmed in writing by the postal service.

B) In case of damage that is not immediately apparent:
- if the damage comes to light during unpacking, the freight carrier must be notified **immediately** and **in writing**.
- Do not alter the condition of the packaging material and damaged products as far as possible, till a statement of facts has been recorded.

Above all, comply with the deadlines for filing complaints.

The deadlines are as follows:

a) GERMAN RAIL:
within 7 days
(Paragraph 81/82 EVO)
b) ROAD CARRIER
within 7 days
(Paragraph 60ADSp)
c) MAIL:
immediately, not later than 24 hours after delivery of the consignment

Note:
Prior to shipping, every product is checked with regard to type and quantity. If, despite this, you have reason to complain, please state the order number.

4.3 Transporting the unpacked unit

The screw compressor can be moved by a crane or fastened on a transport pallet, with a forklift truck or a low lift truck.
For transporting by crane, the compressor module has transport hooks **1**.

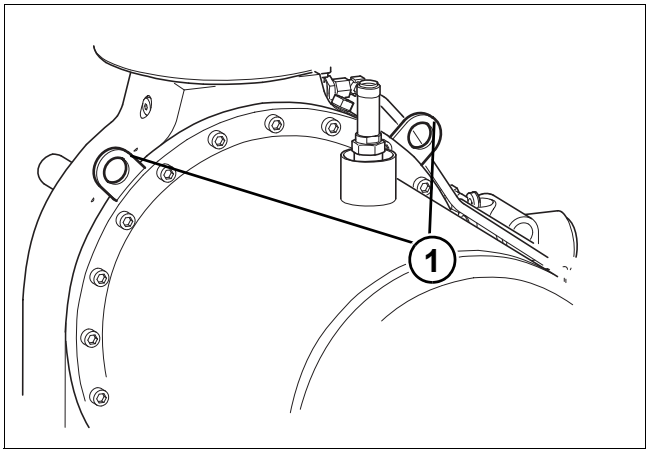


Fig. 4-1

Warning:
Danger of death or serious bodily injury from falling loads!
- Comply with the local safety regulations!
- Select hoists according to the total weight to be transported.
- Remove all loose or swiveling parts before raising the screw compressor.
- Remove drive or body components before doing so.
- Transport the compressor module only in a pressure-less state.
- When transporting on a pallet, the compressor module must be securely fastened to it.
- Do not transport the compressor module on the tines or prongs of a forklift truck or low lift truck.
- The transport hooks are designed only for transporting the compressor module.
- Do not wait below the load during transport.

4.4 Transporting options

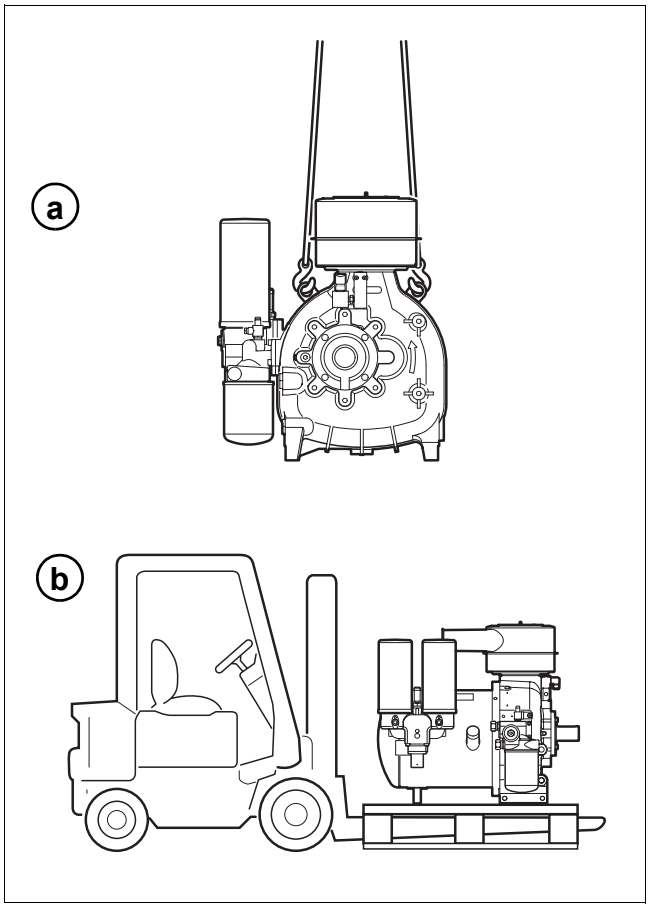


Fig. 4-2

a) Crane transport
b) Fork lift truck transport

5 Installation/Assembly

5.1 Connecting thread/Assembly

5.1.1 Fastening screws

There are inner threads provided on the NK housing, which are to be used for fastening. Only screws with a METRIC THREAD suitable for this internal screw thread should be used.

5.1.2 Piping connections

On the NK housing, there are piping connections provided, with an internal thread for the compressed air outflow, the oil circuit, drainage and control pipes. Only fittings or threaded joints suitable for this internal thread with a CYLINDRICAL THREAD BASED ON THE INCH-SYSTEM should be used.

CONICAL THREADS should be avoided, since damage can occur on the NK housing while screwing in (see the assembly drawing)

Attention:
The max. permissible tightening torque for all threaded joints must not be exceeded.
VDI 2330 (see Chapter 9.2 “Tightening torques”)
Only screws suitable for the purpose should be used for fastening the compressor housing.
If required, discuss in advance with ROTORCOMP

5.2 Safety instructions on installation and erection

Attention:
– A suitable hoist must be used for lifting the compressor module, which conforms to the local safety specifications.
– All dummy flanges, plugs, caps and bags with dehumidifiers must be removed from the piping before assembly. Threaded joints and piping must conform to the correct size and be suitable for the relevant operating pressure.
– The intake air must not contain any flammable, corrosive, poisonous or aggressive vapors or gases.
– Ensure that the high-pressure pipe from the compressor to the after-cooler or the air circuit can expand owing to the heat and does not come in contact with inflammable materials.
– The air intake opening should be so arranged that objects such as loose items of clothing from passersby cannot be sucked in.
– There must be no external force applied on the air outlet valve; the connected piping must be installed free of stress.

The compressor block must be adequately grounded.

5.3 Installation

Attention:
- The unit should be installed at a place at which the ambient air is as cool and pure as possible. Never block the air inlet. It must be ensured that the penetration of moisture with the intake air is kept minimal.
- Screw compressors must always be installed on a flat surface and if required, aligned with a water level.

In exception cases, e.g. in case of portable units, they must only be operated with a maximum angle of inclination of 5.
The inclined position must be taken into consideration in these cases at the time of the oil level check, and the oil level check should be carried out particularly carefully.

The base frame for the following fastening variants must be torsion-free and even.
The fastening of the compressor module on a base frame, together with the drive motor, can be done according to the following variants.

5.3.1 Fastening by bolting to the base frame

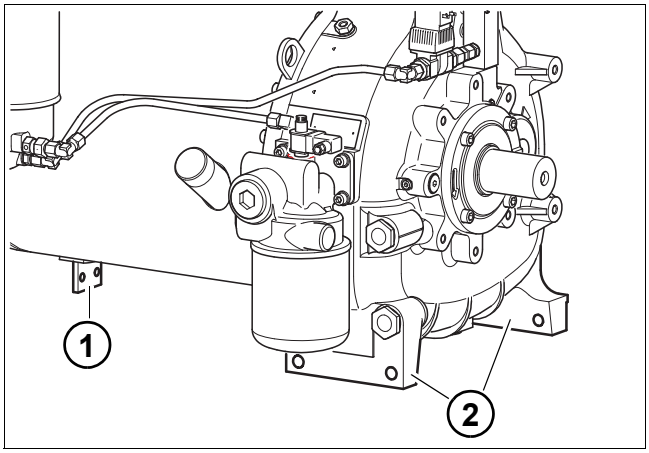


Fig. 5-1

Attention:
The compressor module may only be fixed at the side holes on the left or right of the compressor housing that are specifically provided for the purpose.

The assembly must be fastened free of tension at the respective fastening points **1** and **2** on the base frame.

5.3.2 Drive

The compressor module is alternatively designed for being driven by electric motors, internal combustion engines, hydraulic motors etc.
The force transmission can also be indirect via a belt drive (V-belt, toothed belt etc.) or directly via a flexible coupling.
The direction of rotation, looking at the shaft, is counter-clockwise.

In the case of the model with a gearbox, the direction of rotation, when looking towards the shaft, is clockwise.

5.4 V-belt drive

Improper design and/or assembly of the V-belt drive can result in a significant reduction of the shelf life and/or fracture of the drive shaft.
In case of fracture of the drive shaft and/or premature bearing damage, ROTORCOMP can only honor the warranty if the belt drive is properly designed and constructed.
In this context, the following instructions must be followed.

- The belt drive must not be under-dimensioned. The maximum design rating for a belt drive is 75 kW at 4900 min^{-1} for this screw compressor.
- The belt pulley must be pushed onto the drive shaft up to the limit stop and fastened.
- With the help of the scale on the clamping element, the correct belt tension can be set again easily without a pre-tension measuring instrument.
- The V-belt pulleys must be balanced. Forcing the belt pulley on the drive shaft by hitting it with a hammer is not permissible and can result in bearing damage.
- When aligning the belt drive, attention must be paid to achieving exact parallelism without a vertical and horizontal angle error.
- A torsion-resistant base frame for the belt drive should be erected in such a way that it is exactly aligned with the compressor module.
- Flapping of the belt of the belt drive should be eliminated by design (axial distances of the pulleys, belt tension and stability of the base frame and tension jack).

5.5 Direct drive

⚠ **Attention:**
Displacement and angle errors result in damage to bearings and the drive shaft.
ROTORCOMP recommends installing with an elastic coupling. The motor and the compressor module must be aligned according to the manufacturer data of the elastic coupling.

For directly coupled assemblies, the compressor module has a centering flange.
The flanged assembly must be fastened free of stress on the base frame. The connection dimensions of the flange can be seen from the proposal drawing.

5.6 Separator tank

The separator tank is a pressure tank of category III in the meaning of the Pressure Equipment Directive DGRL 97/23/EC.
The national specifications with regard to commissioning and repetitive tests must be followed.

Warning:
Unauthorized changes to the pressure device through mechanical working like welding, drilling etc. or placing other components on the separator tank as well as corrosion as consequential damage owing to damage to the surface protection endanger the safety of the pressure tank and can result in rejection of all liability.

As regards the testing before commissioning, the relevant country-specific specifications must be fulfilled.

5.7 Air outlet

The pressure loss at the air outlet owing to the air after-cooler, fittings, piping etc. must be as small as possible.

Note:
Cross-sections of the outlet pipe must be of generous proportions. Pressure losses through elbow unions must be avoided.
The outlet pipe must be connected stress-free at the outlet.

Warning:
If operating without a safety valve, serious damage to persons and property is possible. Operation without a safety valve at the separator tank is not permissible.

Note:
A possible compressed air temperature (at the outlet) of up to 110 °C requires that the downstream components like the compressed air pipe, manometric switch, air after-cooler, fittings etc. must be designed for that temperature.
We therefore recommend the installation of an air after-cooler.
In case of deployment without an air after-cooler, the end customer must be made aware of the high outlet temperature.

5.8 Oil cooling

Note:
The cooler connecting pipes must be connected stress-free to the oil connections.
The following instructions regarding the design and construction of the oil cooling must be followed.

- The oil cooling must be so designed that at the max. envisaged ambient temperature, the oil outlet temperature is max. 105 °C.
- The oil circulation quantity depends on the pressure difference between the outlet and inlet pressures of your application.
- The oil cooler must be so installed that it can be easily cleaned.
- If using two equally large oil coolers, we recommend connecting them in parallel. This reduces the pressure loss and increases the cooling capacity.

5.9 Service

When installing the compressor module in a housing, attention must be paid to good accessibility of the service points:
- Oil filling
- Oil draining
- Dismantling the separator cartridges (completed size dimensions according to proposal drawing)
- Dismantling the oil filter cartridge (note the completed size given in the proposal drawing)
- Easy cleaning of the oil cooler
- Replacement of the shaft seal (dismantling and assembly of the end cover and the bearing race)
- Belt drive (accessibility, specifications for correct belt tensioning)

6 Commissioning

6.1 Preparation for commissioning

The components of the screw compressor are carefully inspected and tested in the factory. These inspections and tests ensure compliance with the required rating and control data. Nonetheless, the screw compressor system must be observed during the first hours of commissioning.

⚠ **Attention:**
As regards the commissioning, the relevant country-specific specifications must be fulfilled. For example, in Germany, these are the Betriebssicherheitsverordnung or Operation Safety Ordinance.
Before the first commissioning, the following points must be followed:

- Direction of rotation: pay attention without fail (see Chapter 6.2 “Checking the direction of rotation”).
- The final pressure given on the nameplate must not be exceeded.
- Do not switch off screw compressor systems running under load with the emergency stop or the main switch.
- Checking the oil level (see Chapter 7.2 “Oil level”)
- Before every first commissioning and in case or resuming operations after a prolonged downtime of the compact screw compressor module, carry out the activities described in Chapter 6.4 “Recommissioning the screw compressor system” without fail.
- In case of V-belt operation: Checking the belt tension and the running of the belt (see Chapter 7 “Maintenance”)
- Checking the position of the shut-off valve
- Checking the threaded joints and the fastening screws for firm seating.

6.2 Checking the direction of rotation

Direction of rotation:
Standard design: looking at the shaft, counter-clockwise
Gearbox design: looking at the shaft, clockwise

⚠ **Attention:**
At the time of the first commissioning, as well as after modifications to the supply of the electrical motor drive, the direction of rotation of the screw compressor must be checked. To do so, very briefly start the drive motor, and switch it off again immediately.
The wrong direction of rotation for more than 2 seconds will result in destruction in the screw compressor. If required, interchange the phases of the connecting cables.

6.3 Test run

⚠ **Attention:**
The system, in the inching operation “with the shut-off valve open”, is relieved very quickly up to the opening pressure of the “Minimum pressure valve”. This can result in foaming of the oil in the separating tank.
The possible consequences:

- Oil coming out with the relief air
- Oil flooding of the fine separator cartridges
- Compressed air containing oil upon restarting the system

Therefore, the following points need close attention during the test run:

- Switching off the system only when the shut-off valve is closed.
- If possible, connect the system to a compressed air reservoir.

6.4 Recommissioning the screw compressor system

Screw compressor systems that have been shut down or stored for longer than 3 months may be made operational again only after the following measures have been carried out.

– Turn the screw compressor manually several times in the direction of rotation.
– Upon standstill of the screw compressor system, add about 1.5 l oil (same type of oil as in the oil separator tank) in the intake pipe after removing the intake filter or the intake manifold.
– In the case of the model with gearbox, fill 0.25 l of oil into the gearbox through the oil filling opening.
– Turn the screw compressor once again manually several times in the direction of rotation.
– Check the oil level in the separator tank and if required, replenish it (see Chapter 7 “Maintenance”).
– Testing of the running control for the screw compressor system for at least 15 minutes.

Warning:
The system must not be started with the conveying space full. There is a danger of considerable damage.

7 Maintenance

7.1 Safety Instructions

The operator must ensure that all maintenance, assembly and repair work is carried out by authorized and qualified technical personnel who have gained sufficient knowledge about the plant in advance by a thorough study of the operating manual. The responsibility and liability for the equipment and assembly after commissioning is that of the owner/operator.

- Use only permitted or suitable tools for maintenance and repair work.
- Use only original spare parts.
- Any maintenance and repair work should only be carried out with the machine switched off and with the mains supply turned off. The machine should then be secured against getting switched on accidentally.
- Before dismantling parts under pressure, the assembly must be effectively isolated from all sources of pressure and the entire unit must be completely discharged.
- Never use inflammable solvents or carbon tetrachloride for cleaning parts. Take countermeasures against poisonous vapors of cleaning agents.
- During maintenance and when carrying out repair work, always pay attention to absolute cleanliness. Keep dirt away. Cover parts and exposed openings with a clean cloth, paper or adhesive tape.
- Do not carry out any welding work or any other work requiring or generating heat near the oil system.
- Ensure that no tools, loose parts or cleaning rags are left behind in or on the unit.
- Before clearing the assembly for operation after maintenance or overhauling, check whether the operating pressures, temperatures and time settings and the oil level are correct, and whether the control and cutoff devices are working smoothly.
- Electrical components, control devices etc. must be protected from the penetration of moisture, for example, through steam jets.

Warning:
During any maintenance work:
DANGER OF ACCIDENTS!

Note:
All the maintenance work carried out must be immediately entered in the check sheet.

7.2 Oil level

One important factor for the operational safety of the unit is the oil level in the oil tank.
The oil level must be checked before commissioning the screw compressor module and thereafter, repeated every 100 operating hours.

There are two options for oil level checking:
– Through the oil level inspection glasses
– Through the oil filling opening
The exact oil level check can only be carried out through the oil filling opening.

Warning:
Rotating or hot parts, or parts under pressure, DANGER OF INJURY!

7.2.1 Oil level check through inspection glasses

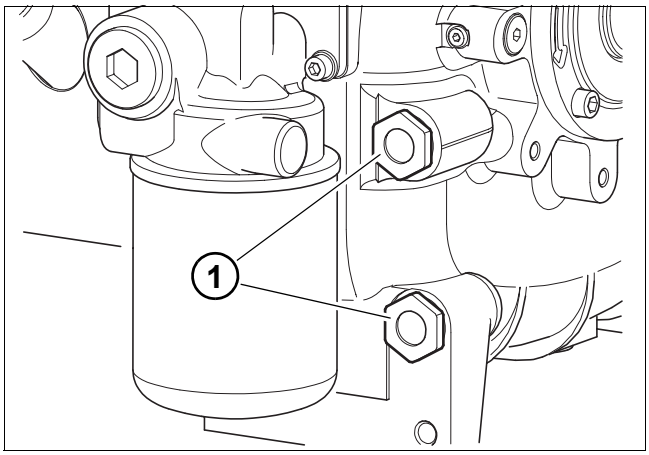


Fig. 7-1

The oil level inspection glasses **1** are mainly intended for the oil level checking when the unit is running.
When the oil level is correct, at standstill, the oil level must be visible in the upper inspection glass. When the unit is running, the oil must be visible in the lower inspectionglass; if not, carry out an oil level check through the oil filling opening.

7.2.2 Oil level check through oil filling opening

Warning:
– Assembly parts, oil and oil filling screw **1** can be at more than 80 °C, danger of burning!
Wear personal protection equipment!
– Shortly after discharging, when the oil is hot, the oil level can be about 10 mm higher than is the case with cold oil.
Therefore, at the maximum oil level, upon opening the oil filling screw, oil may escape. In this case, immediately close the oil filling screw and carefully remove the oil that has escaped.

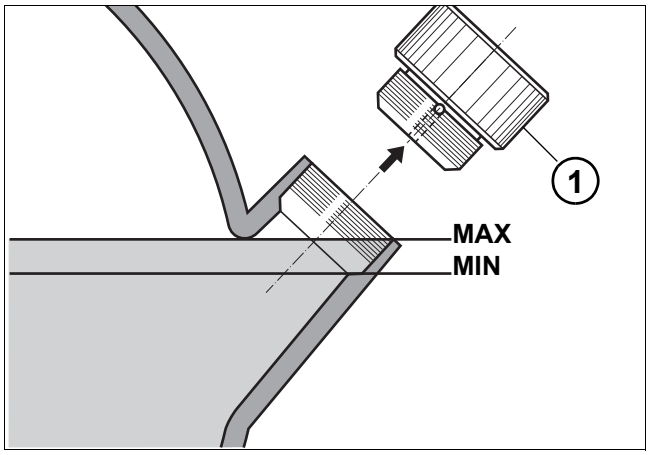


Fig. 7-2

Note:
The screw plug of the oil filling pipe has a safety hole on the side, through which, if there is any residual pressure in the separating tank, oil or air may escape. In such a case, wait for a while.

- Switch off the unit and secure it from getting switched on again accidentally.
- Wait for a minute of standstill time.
- Unscrew the screw plug **1** of the filling pipe by hand at a pressure-less state of the oil level.
- Check the oil level.

- If required, fill up oil of the same oil type and the same brand up to the maximum level.

Note:
The oil filling pipe is so arranged that overfilling the screw compressor unit is not possible. Excess oil escapes from the filling pipe.

- Screw on the screw plug **1** firmly by hand.
- Switch on the unit.
- Check the oil filling screw for leaks, if required, replace the O-ring.
- Carefully remove any excess oil that has escaped.

7.3 Oil change

Warning:
Rotating or hot parts, or parts under pressure, DANGER OF INJURY
The oil change may only be carried out at standstill and with the screw compressor unit completely discharged.

7.3.1 Oil change intervals

According to the specifications of the unit manufacturer. Reference values for the screw compressor compact module (see Chapter 7.8 “Maintenance intervals”).

7.3.2 Oil draining

Here, the unit should be in a warm, operational state (approx. 60 - 80 °C/154 - 176 °F).

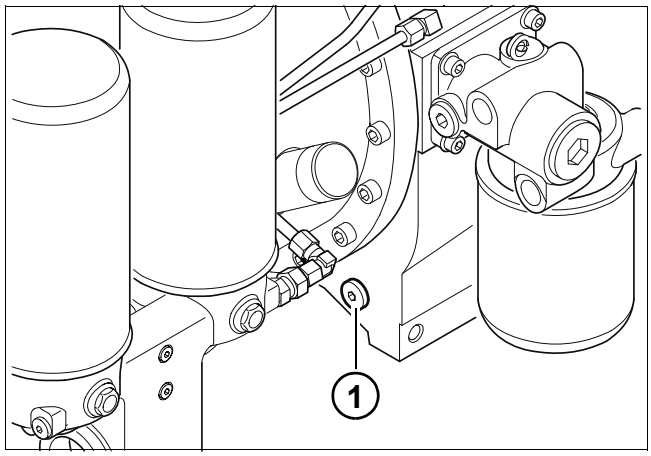


Fig. 7-3

Note:
Dispose of the used oil according to regulations.

- Switch off the screw compressor using the main switch and the selector switch and secure it from getting switched on again.
- Completely dismantle the pressure in the screw compressor.
- Slowly unscrew the screw plug at the oil filling pipe.
- Carefully unscrew the oil drain screw **1** and catch the used oil in a suitable container.
- Clean the oil drain screw **1** and screw it in again.
- In case of the model with gearbox, carefully unscrew the oil drain screw from the gearbox and catch the used oil in a suitable container.
- Clean the oil drain screw **1** and screw it back in again in the gearbox housing.

7.3.3 Oil filling

Attention:
Follow the oil recommendation; see “Lubricants and operating materials”. Top up oil of the same oil type and the same brand.
Switching over to another oil type can require the compressor module to be rinsed.

ROTORCOMP also recommends replacing the oil filter at the time of an oil change.

Note:
The gearbox model NK 200 G has a common oil system as the basic module.

- If required, replace the oil filter
- Fill in oil up to the maximum level in the filling pipe at the separator tank and put on the screwed plug **1** tightly by hand onto the filling pipe (see Fig. 7-2).
- Switch on the screw compressor and let it run for three minutes.
- Oil level check:
  Top up the short oil quantity once again up to the maximum level.
- Check sheet entry (see Chapter 7.7 “Maintenance check sheet”).

7.4 Oil filter

Warning:
Rotating or hot parts, or parts under pressure, DANGER OF INJURY
– Assembly parts, oil and oil filling screw can be hot, at more than 80 °C, danger of burning!
– Wear personal protection equipment!
The oil filter replacement may only be carried out at standstill and with the screw compressor unit completely discharged.

7.4.1 Oil filter replacement intervals

According to the specifications of the unit manufacturer. Reference values for the screw compressor compact module (see Chapter 7.8 “Maintenance intervals”).

7.4.2 Oil filter replacement

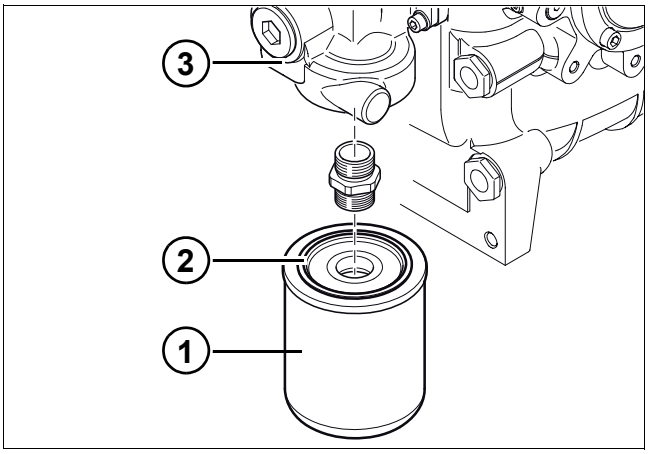


Fig. 7-4

- Switch off the unit and completely dismantle the pressure in the unit.
- Dismantle the oil filter cartridge **1** with a suitable tool, e.g. oil filter strap wrench.
- Rub the seal **2** at the new oil filter cartridge **1** with oil; oil type should be the same as in the separator tank.

Note:
Dispose of the old oil filter cartridge according to regulations.

- The new oil filter cartridge **1** should be filled in a vertical position, before screwing it on, with oil of the same oil type as in the separator tank.
- Screw on the new oil filter cartridge at the thermostat head **3** and tighten it by hand. No tool necessary.
- Switch on the screw compressor.
- The oil filter should then be checked for leaks when the unit is running.
- Check sheet entry (see Chapter 7.7 “Maintenance check sheet”).

7.5 Fine separator cartridges

Warning:
Rotating or hot parts, or parts under pressure, DANGER OF INJURY
– Assembly parts and oil can be hot, at more than 80 °C, danger of burning!
– Wear personal protection equipment!
The replacement of the fine separator cartridges may only be carried out at standstill and with the screw compressor unit completely discharged.

7.5.1 Maintenance intervals

According to the specifications of the unit manufacturer. Reference values for the screw compressor compact module (see Chapter 7.8 “Maintenance intervals”).
In case of badly fouled intake air, or inadequate oil quality, the cartridge gets fouled more, so that earlier replacement can become necessary.

7.5.2 Replace the fine separator cartridges

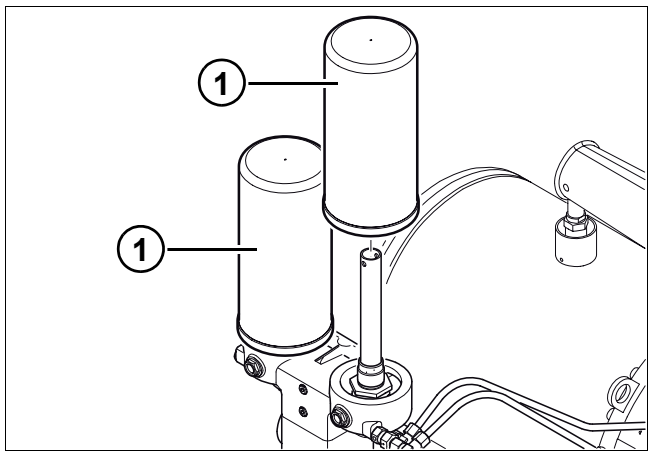


Fig. 7-5

Note:
Dispose of the used fine separator cartridges according to regulations.

- Dismantle the fine separator cartridges **1** with a suitable tool, e.g. oil filter strap wrench.
- Screw on the new fine separator cartridges on the double fine separator head and tighten by hand. No tool necessary.
- Stick on the placard for the next cartridge replacement and mark the corresponding month (see Chapter 7.8 “Maintenance intervals”).
- Switch on the screw compressor unit.
- The fine separator should be checked for leaks with the unit running.
- Check sheet entry (see Chapter 7.7 “Maintenance check sheet”).

7.6 Intake air filter

7.6.1 Maintenance intervals

According to the specifications of the unit manufacturer. Reference values for the screw compressor compact module (see Chapter 7.8 “Maintenance intervals”).
In case of badly fouled intake air, an earlier replacement of the filter element is necessary if the optical or electrical maintenance indicator (optional) indicates this (permissible underpressure up to 50 mbar).

7.6.2 Replacing the air filter element

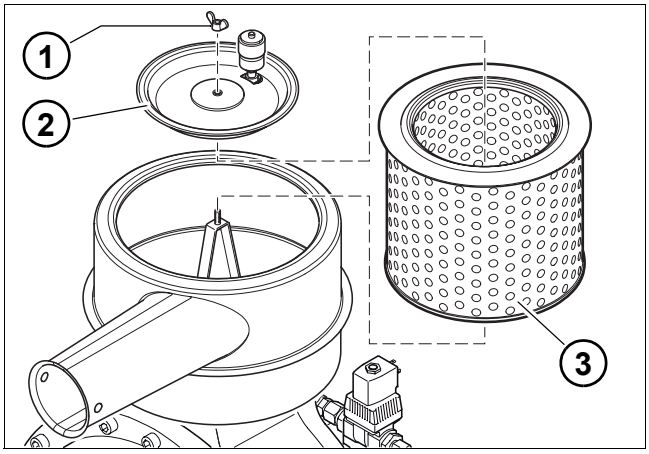


Fig. 7-6

Attention:
No dirt or dust particles may penetrate into the air inlet of the screw compressor.

Note:
Cleaning the filter element is not permitted; the filter element must always be replaced if dirty. Dispose of the used air filter element according to regulations

- Switch off the unit and secure it from getting switched on again accidentally.
- Unscrew the thumb nut **1** and take off the filter cover **2**.
- Carefully remove dust from the filter housing.
- Take out the old filter element **3**.
- Insert a new filter element in the filter housing.
- Put on the filter cover; ensure the correct position while assembling.
- Tighten the thumb nut.
- Switch on the screw compressor unit.
- Test run and function test.

7.7 Maintenance check sheet

• Operating hours counter status								
	• Replace air intake filter							
		• Replace oil filter cartridge						
			• Replace oil fine separator cartridge					
				• Re-tighten the V-belt				
					• Replace V-belt set			
						• Unit repairs		
							• Date	
								• Fitter

Mark a cross against the work that has been carried out or enter the measurement readings and confirm with signature.

7.8 Maintenance intervals

⚠ Attention:
The frequency of the maintenance intervals (replacement of oil, oil filter, fine separator cartridges as well as air filter element) varies with the application and the operating parameters. Therefore, depending on the model of the unit, the compressor manufacturer should specify the maintenance intervals. These must be complied with on priority. Signing a maintenance contract is recommended. The following table provides an overview of the reference values for the screw compressor module NK 200.

Maintenance intervals (Bh=operating hours)	**Maintenance work**	**see Chapter**
before commissioning	Check the oil level in the separator tank	7.2
once after 50 Bh	Check the oil level in the separator tank Tighten all piping threaded joints and electrical terminals, check all other joints/ connections for firm seating.	7.2
every 100 operating hours	Check the oil level in the separator tank, top up in case of insufficient oil Check maintenance indicator	7.2
every 1000 - 6000 Bh or after 18 months	Replace the fine separator cartridge Carry out oil change Replace oil filter Change the filter element in the intake air filter Check the unit for leaks Unit inspection	7.5.2 7.3 7.4.2 7.6.2

8 Lubricating and operating equipment, maintenance parts

8.1 Lubricating and operating equipment

8.1.1 Oil recommendation

RC screw compressors should be operated with an oil that is suitable for special requirements. This oil must be approved by the manufacturer for screw compressors. It must also be suitable in case of unfavorable operating conditions, such as pollution of the intake air by gases, solvent vapors and exhaust gases, and also in case of high ambient temperatures.

Upon request, we can specify oil types suitable for screw compressors and their manufacturers. Petroleum raffinates (mineral oils), synthetic oils as well as bio-degradable oils can be used as screw compressor oils.

The materials and substances used in the screw compressor system as well as the seals must be taken into consideration when selecting the oil type. Corrosion and other material degradation must not occur.

Mixing different oils is not permissible.

8.1.2 Topping up the oil

Use the same brand and the same oil type (see the sticker on the oil separating tank). Reduction of the room temperature -5 °C/23 °F while the compressor is at standstill should be avoided.

8.1.3 Remedies in case of low room temperature

Sufficient room heating.
In case of ambient temperatures close to freezing point, prevent the system from freezing by installing a standstill heater, which comes into operation whenever the compressor is off.

8.1.4 Pipeline materials

The oil used in the screw compressor can attack compressed-air pipeline networks made of plastic.

Note:
Follow the instruction sheet!

The cooling oil in the screw compressor must meet the following requirements:

- high ageing stability
- high dispersive capacity
- Flash point: above 200 °C/392 °F
- minimum foaming
- high corrosion protection
- Basic oil: Solvent raffinate
- Operating temperature: up to 110 °C/230 °F
- Viscosity class: ISO VG 68

Attention:
Pay close attention to the oil viscosity without fail, otherwise the life of the bearings is at risk.

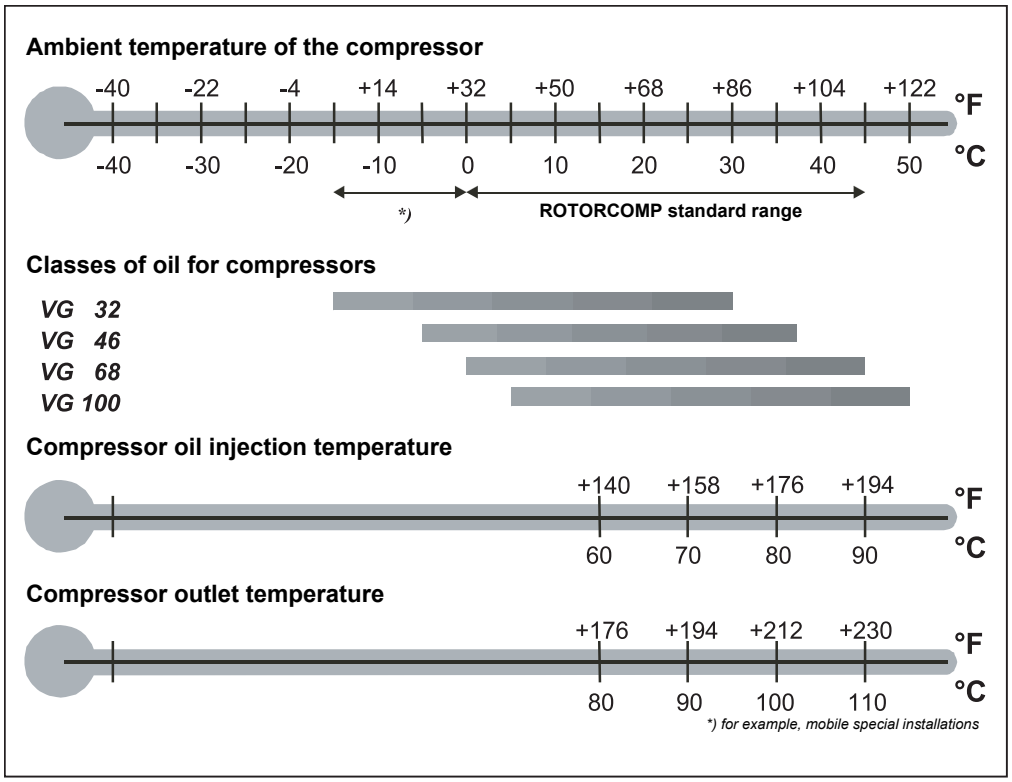


Figure 8-1 Oil type schema

8.1.5 Temperatures and oil types (guide values at 60% relative humidity and 10 bar ultimate pressure)

Note:
The optimum operating temperatures for the screw compressor installation can only be reached if the oil circuit components (thermostat, radiator, fan etc.) have been correctly designed and the air inlet and outlet temperatures of the installation room and the compressor installation allow these temperatures. Calculation of the overall thermal economy is necessary.

8.1.6 Condensate damage

The relative humidity and the ultimate working pressures in accordance with the selection diagram for the working temperature of the thermostat component and for the compressor must be observed without fail in order to avoid the formation of condensate within the installation.

8.1.7 Cold starts

In case of **compressor coldstarts,** the viscosity of the oil, taking into account the higher pressure losses when the oil circuit is still cold, must facilitate sufficient and immediate lubricating oil supply to the compressor after the start. The higher energy demand at cold start must not overload the compressor drive.

8.1.8 Oil separation

The fine separation of oil gets degraded with increasing compressor outlet temperature in the upper range.

8.1.9 Multigrade oils

The use of **multigrade oils** can become problematical over time, since the “viscosity improvers” used get destroyed over time. The upper viscosity grade is then endangered and complete temperature stability is not guaranteed any more. Therefore, multigrade oils are not permitted for use in ROTORCOMP compressors.

⚠ **Attention:**
Use only oils permitted for screw compressors.

9 Technical Data and Tightening Torques

9.1 Technical Data

Screw compressor type	RC	NK 200-55	NK 200-75	NK 200 G-55	NK 200 G
Working overpressure max.	bar	15	15	15	15
	psi	218	218	218	218
max. delivery quantity according to DIN 1945 up to	m^3/min	8.6	11.2	8.6	
	CFM	304	396	304	
Rating up to (full load) without fan)	kW	55	75	55	90
	HP	75	100	75	120
Rotational speed, main rotor, max.	min^{-1}	3.300	4.400	3.300	5.500
Oil filling, approx.	l	35	40		40
Machine weight without oil, approx.	kg	244	263		304
	lbs	538	580		670
Compressed air connection	inch	2"	2"	2"	2"
max. outlet temperature	°C	110	110	110	110
	°F	230	230	230	230
max. room temperature	°C	45	45	45	45
	°F	115	115	115	115

9.2 Tightening torques

⚠ Attention:
The max. permissible tightening torque for all threaded joints must not be exceeded.
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Unless otherwise specified, the following tightening torques should be used. Always tighten bolts with a torque wrench.

Screw/bolt type	Thread	max. torque
Hexagonal bolts Hexagon socket screws	M 6	10 Nm (213.36 cm.lbs)
Hexagonal bolts Hexagon socket screws	M 8	25 Nm (548.64 cm.lbs)
Hexagonal bolts Hexagon socket screws	M 10	43 Nm (975.36 cm.lbs)
Hexagonal bolts Hexagon socket screws	M 12	75 Nm (1,615.44 cm.lbs)
Hexagonal bolts Hexagon socket screws	M 14	120 Nm (2,590.80 cm.lbs)
Hexagonal bolts Hexagon socket screws	M 16	180 Nm (3,840.48 cm.lbs)

10 Rectifying operational malfunctions

Malfunction	Possible cause	Remedy	see Chapter
Wrong direction of rotation	Phases reversed	Interchange the connections of 2 phases	
Unit does not start easily	Motor rating too low	Check	
	Drive transmission “too fast”	Check	
	Star-delta switchover is wrongly set	Set correctly	
	Compressor is oil-flooded	Check	
	Unit is not yet relieved (discharged)	Check	
	Ambient temperature too high		5.3
	Oil top-up is too viscous	Check the viscosity	8.1.5
Differential pressure	Pressure too high between screw compressor and separator cartridge	Change the separator cartridge	7.5.2
Combistat switches off due to excessively high temperature	Shortage of oil	Check the oil level in the oil tank and if required, top it up.	7.2
	Oil filter dirty	Clean the filter	
	Oil filter dirty	Change the oil filter cartridge	7.4.2
	Thermostat faulty	Replace the thermostat	
	Oil cooler dirty	Clean the oil cooler on the downstream side, if required, clean it on the upstream side	
	Incorrect installation a) Room ventilation b) Exhaust air blocked c) Thermal short-circuit	Observe the recommen-dations for installation of the unit	5.3
	Combistat faulty or wrongly set	Set or replace the combistat	

Malfunction	Possible cause	Remedy	see Chapter
Safety valve blows off	Safety valve faulty	Replace safety valve	
	Fine separator cartridge clogged	Replace cartridge	7.5.2
	Unit does not discharge Continuous operation	see fault, page	
	Unit does not switch off automatically (intermittent operation)	see fault, page	
Oil in the compressed air	Oil intake pipe with nozzle in oil inspection glass contaminated	Clean the oil intake system	
	Fine separator cartridge faulty	Check the cartridge and change it if required	7.5.2
	Excessively high oil level in the oil tank; there may be too much condensate	Observe oil level marking, drain and replace oil if necessary	7.2
Unit is not discharged in continuous operation, unit is not switched off automatically in intermittent operation (i.e. safety valve blows)	Upper switching point of the network pressure monitor is set too high	Reset the network pressure monitor	
	Solenoid valve defective Relief valve defective	Replace solenoid valve/ relief valve	
	Minimum pressure valve jammed	Check minimum pressure valve for ease of movement, repair if necessary	
Unit constantly discharges a small amount of air	Solenoid valve defective Relief valve defective	Replace solenoid valve/ relief valve	
	Electrical feed line to the solenoid valve interrupted	Remove the interruption	
No or too little air delivery	Intake filter fouled	Replace filter insert	
	Shortage of oil	Check oil level, top up if necessary	7.2
	Intake control is jammed or incorrectly set	Check the control and flap, clean the bearing and guides, check the stroke	
	Leaks in the system	Check, seal	

Malfunction	Possible cause	Remedy	see Chapter
Control does not open (opening time 7-15 seconds, depending on separator size	Control pressure too low, unit leaky	Check unit, or seal it	
	Solenoid valve/electrical system, bypass valve, piston gasket, minimum pressure valve	Check or replace parts	
Control does not regulate (two-point/continuous)	Manometric switch or control	Check the setting	
	Nozzle M 5 (pneumatic)	Replace with another nozzle diameter	
Oil leak upon stopping	Sealing surfaces damaged; spring broken	Check or replace parts	
Unit does not discharge (discharge time 100-200 seconds, depending on separator size)	Solenoid valve/ electrical system	Check	
	Pulse pressure relief valve	Check or replace parts	
Continuous pressure relief by control	Solenoid valve/electrical system	Check	
	Pulse pressure relief valve	Check or replace parts	
Oil leak during pressure discharge (oil foam in fine separator cartridge)	Wrong type of oil	Change oil	7.3
	Formation of oil foam at stop	Install discharge delay valve, replace with nozzle of another diameter	
	Oil level too high	Drain oil	7.2