



NX Series

Oil – Injected Rotary Screw Compressor

Operator Manual

18 – 185 kW (25 – 250 HP)



WARNING

Personal injury and/or equipment damage will be result by failing to pay attention to the vital safety information and instructions in this manual. Carefully read, understand, and retain all safety information and instructions before operating this compressor.

Information on these operating instructions

These instructions enable you to use the machine safely and efficiently. The instructions are a component part of the machine and must be accessible for staff at all times.

Staff must have carefully read and understood these instructions before starting all work. The basic prerequisite for safe working is compliance with all the safety instructions and instruction for actions included in these operating instructions. The local occupational health and safety regulations and general safety rules for operational area of the machine also apply. The instructions for the machine do not cover operation of the controller. Therefore, the instructions and content of the instructions for the controller in question must also be taken into account.

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Limitation of liability

All information and instructions in this manual have been compiled taking account of the applicable standards and regulations, state-of-the-art technology and our years of knowledge and experience.

The manufacturer assumes no liability for damages caused by:

- failure to adhere to these instructions
- improper use
- use of unqualified staff

- unauthorized conversions
- technical modifications
- use of non-approved spare parts

The actual scope of supply may differ from the descriptions and illustrations in these instructions in the case of special designs, the inclusion of additional ordering options or as a result of the latest technical modifications.

The obligations agreed in the contract of supply, the manufacturer's general terms and conditions of business and delivery and the legal regulations valid at the time of completion of the contract apply.

Technical Service

Our Technical Service department is available to provide technical information.

In addition, our employees are always interested in receiving new information and hearing of your experiences from usage which could be valuable for the improvement of our products.

Safety

It is assumed that your safety department will have established a program of safety based upon a thorough analysis of industrial hazards. Before installing and operating or performing maintenance on the equipment described in this instruction book, it is suggested that you again review this program to be certain that it covers the hazards arising from high speed rotating machinery.

It is also important that due consideration be given to those hazards which arise from the presence of electrical power, hot oil, high pressure and temperature, steam, toxic gases and flammable liquids and gases. Proper installation and care of protective guards, shutdown devices and over-pressure protection should also be considered essential parts of any safety program.

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1 Safety

This section is a summary of important safety aspects to ensure optimum protection of the personnel and safe and trouble-free operation.

The owner, lessor or operator of this compressor is hereby notified and forewarned that failure to observe these safety precautions may result in injury and/or property damage.

FS Curtis does not mean to imply that the following safety precautions are all-inclusive or that the observance of these precautions will prevent all injury or property damage.

FS Curtis expressly disclaims responsibility or liability for any injury or property damage caused by failure to follow these specified precautions or by failure to exercise ordinary caution and due care required in operating or handling this equipment even though not expressly specified.

1. Read and understand all the instructions found in this manual before operating your compressor.
2. Disconnect the main power source before working on or performing any maintenance procedures on this unit. Use a lock out and tag out process.
3. Do not attempt to remove any parts, break any connection, loosen oil fill plug or drain plug until the unit has been shut down and air pressure has been relieved.
4. Do not operate the compressor in excess of its rated pressures and speeds indicated on the compressor nameplate.
5. Do not remove guards, shields, or screens while the compressor is in operation. If removed for maintenance replace before resuming operation.
6. Observe the delivery pressure gauge daily to be sure the automatic control system is operating within proper limits.
7. Periodically check all safety and relief devices for proper operation.
8. Use compressed air properly. Pressurized air can cause serious injury to personnel.
9. Be sure that no tools, rags or loose parts are left in or on the compressor or drive parts.
10. Do not use flammable solvents for cleaning parts.
11. Exercise cleanliness during maintenance and when making repairs. Keep dirt away from parts and exposed openings by

covering with clean rags or plastic to prevent cross contamination.

12. Do not install a shut-off valve in the discharge line without installing a pressure relief valve between the shut-off and the compressor package.
13. Do not operate the compressor in areas where there is a possibility of flammable or toxic substances entering the system.
14. Never disconnect (or jump) the air discharge temperature switch or any other safety device and attempt to operate the compressor.
15. Know what state of operation the compressor is in before working around the unit. The power may be on and the machine not running if it is in the auto restart mode. Adhere to note #2 above.
16. Make sure to follow the local electrical and environmental code requirements in your area to ensure compliance prior to installing the compressor.

1.1 Symbols in these instructions

Safety instructions

The safety instructions and safety information in these instructions are denoted by symbols. The safety instructions are prefaced by signal words which express the extent of the risk.



DANGER!

This combination of symbol and signal word indicates a direct hazardous situation which will lead to serious or even fatal injuries if not avoided.



WARNING!

This combination of symbol and signal word indicates a possibly hazardous situation which may lead to serious or even fatal injuries if not avoided.



CAUTION!

This combination of symbol and signal word indicates a possibly hazardous situation which may cause minor or light injuries if not avoided.



NOTICE!

This combination of symbol and signal word indicates a possibly hazardous situation which may cause material damage if not avoided or possible hazards for the environment.

Safety instructions in action sequences

Safety instructions may relate to certain, individual instructions for actions. These safety instructions are embedded in the instruction for action so that they do not interrupt the flow of reading when performing the action. The signal words described above are used.

Example:

1. Unfasten the screw.
- 2.






CAUTION!
Risk of entrapment on the cover!

Close the cover carefully.

3. Tighten the screw.

Special safety instructions

The following symbols are used in conjunction with the safety instructions in order to draw attention to particular hazards:

	Warning – high-voltage.
	Warning – explosive substances.
	Warning – danger zone.

Tips and recommendations







This symbol indicates tips and recommendations and information for efficient and fault-free operation.

Further markings

The following markings are used in these instructions for emphasizing instructions for

actions, results, lists, cross references and other elements:

Marking	Explanation
	Step-by-step instructions for actions
	Results of actions
	References to sections of these instructions and other applicable documents
	Lists without a set order
[Button]	Operating controls (e.g. buttons, switches), display elements (e.g. indicator lamps)
"Display"	Screen elements (e.g. buttons, assignment of function keys)

1.2 Proper use

The machine is designed and constructed exclusively for the proper use described here.

Do not operate the compressor in excess of its rated pressures, operating conditions, and speeds indicated on the compressor nameplate.

The proper use also includes adherence to all details in this manual.

Any use beyond the proper use or other type of use counts as misuse.



WARNING!
Danger due to misuse!

- The compressed air may not be used for breathing without appropriate after-treatment.
- The compressed air may not be used directly for the handling of food without appropriate after-treatment.
- The screw compressor may not be operated outdoors.
- The screw compressor or individual components may not be rebuilt, modified or re-equipped.

Claims of any type for damage due to misuse are excluded.

1.3 Safety devices



WARNING!

Danger to life from nonfunctional safety devices!

If safety devices are not functioning or are disabled, there is a danger of injury or death.

- Check that all safety devices are fully functional and correctly installed before starting work.
- Never disable or bypass safety devices.
- Ensure that all safety devices are always accessible.

1.3.1 Position of the safety devices

The following illustrations show the position of the safety devices.

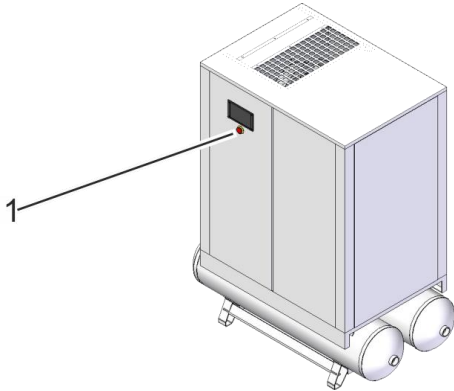


Fig. 1: Emergency stop button (Fig.1-1) on the screw compressor 18–37 kW with tank (optional)

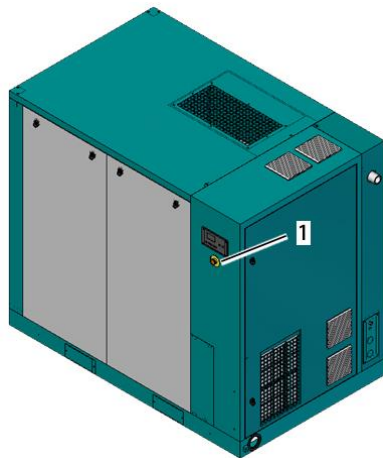


Fig. 2: Emergency stop button (Fig.2-1) on the screw compressor 45–185 kW

1.3.2 Description of the installed safety devices

Emergency stop button

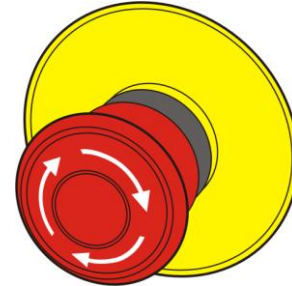


Fig. 3: Emergency stop button

By pressing the emergency stop button, the machine is stopped by an immediate switching off of the compressor. After the emergency stop button has been pressed, it must be unlocked by turning it so that the button is released. The controller fault must be reset. Refer to the [controller documentation](#) for information on fault displays.



WARNING!

Danger to life from an unauthorized restart!

An uncontrolled restart of the machine may cause serious injuries including death.

- Before switching the machine back on, make sure the cause of the emergency stop has been removed and all safety devices have been installed and function properly.
- Do not unlock the EMERGENCY-STOP button until there is no more danger.

Relief valves

Relief valves are unburdening equipment for areas under pressure such as pressure vessels and pipes. In case of an impermissible pressure increase, relief valves bleed off gases, vapors or liquids into the atmosphere.



Fig.4: Pressure Relief Valve

Do not change the pressure setting of the pressure relief valve, restrict the function of the relief valve or replace the relief valve with a plug.

1.4 Environmental protection



NOTICE!

Danger to the environment from incorrect handling of pollutants!

Incorrect handling of pollutants, particularly incorrect waste disposal, may cause serious damage to the environment.

- Always observe the instructions below regarding handling and disposal of pollutants.
- Take the appropriate actions immediately if pollutants escape accidentally into the environment. If in doubt, inform the responsible municipal authorities about the damage and ask about the appropriate actions to be taken.

The following chemicals are used:

Oil

Oils can contain substances that are harmful to the environment. They must not be allowed to escape into the environment. Store oils in suitable containers and dispose of in accordance with applicable local, state and federal regulations

Lubricants

Lubricants such as greases and oils can contain harmful substances. They must not be allowed to escape into the environment. Dispose of lubricants in accordance with applicable local, state and federal regulations.

1.5 Signage



WARNING!

Danger of injury from illegible symbols!

Stickers and signs can become dirty or otherwise obscured over time, with the result that dangers cannot be recognized and the necessary operating instructions cannot be complied with. This, in turn, poses a risk of injury.

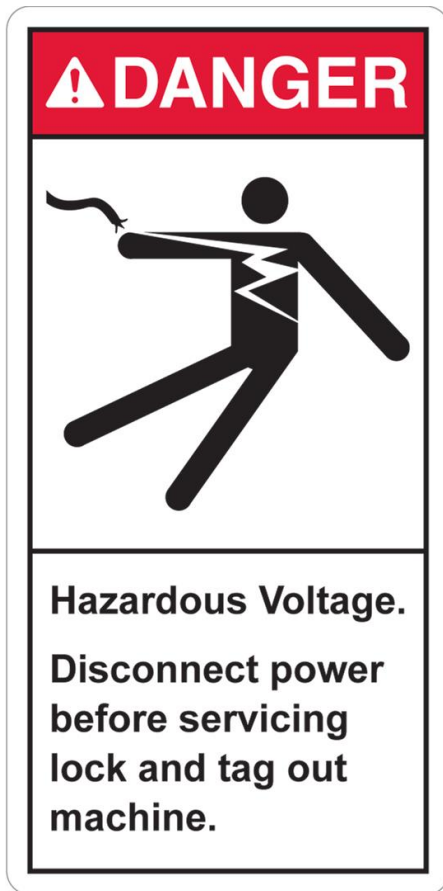
- All safety, warning and operating instructions must always be maintained in a completely legible condition.
- Damaged signs or stickers must be replaced immediately.

Direction of rotation



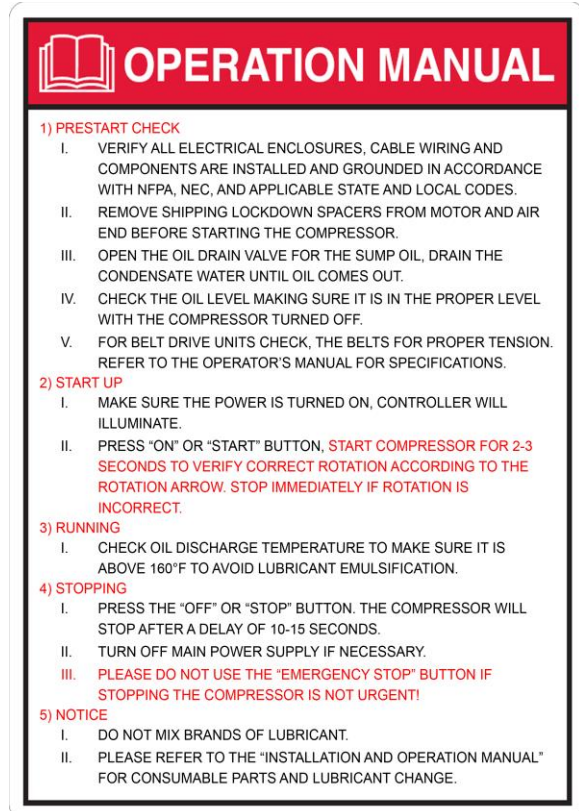
There is a direction of rotation sticker on the drive unit and on the cooling air ventilator. This sticker shows the appropriate direction of rotation.

Hazardous Voltage



Brief instructions for operation

This sticker is on the enclosure and contains brief instructions for operation.



2 Transportation, packaging and storage

2.1 Safety instructions for transportation

Improper transport



NOTICE!
Damage to property due to improper transport!

Air compressors may fall or tip over as a result of improper transport. This can cause a significant level of property damage.

- Proceed carefully when unloading compressor units at delivery and during in-house transport; observe the symbols and instructions on the packaging.
- Only use the attachment points provided.
- Only remove the packaging shortly before assembly.

2.2 Inspection on receipt of delivery

On receipt, immediately inspect the delivery for completeness and transport damage.

Proceed as follows in the event of externally apparent transport damage:

- Do not accept the delivery, or only accept it subject to reservation.
- Note the extent of the damage on the transport documentation or the shipper's delivery note.
- Initiate complaint procedures.



Issue a complaint in respect of each defect immediately following detection. Damage compensation claims can only be asserted within the applicable complaint deadlines.

2.3 Packaging

About the packaging

The individual screw compressors are packaged in cartons or sometimes on wooden frames and according to the anticipated transport conditions. Only environmentally-friendly materials are used for the packaging.

The packaging should protect the individual components against transport damage, corrosion and other damage until assembly. Therefore, do not destroy the packaging and only remove it shortly before assembly.

Handling packaging materials

Dispose of packaging material in accordance with the relevant applicable legal requirements and local, state and federal regulations.

2.4 Symbols on the packaging

The following symbols can be on the packaging. Always heed these symbols during transport.

Top



The arrow tips on the sign mark the top of the package. They must always point upwards; otherwise the content could be damaged.

Fragile



Marks packages with fragile or sensitive contents.

Handle the package with care; do not allow to fall and do not expose to impacts.

Protect against moisture



Protect packages against moisture and keep dry.

2.5 Transportation

Transportation with a fork lift

Packages can be transported with a fork lift under the following conditions:

- The fork lift must be engineered for the weight of the packages.
- Existing guide rails on the frame must be used.
- The length of the forks must be at least 55 inch (1400 mm).

Transporting

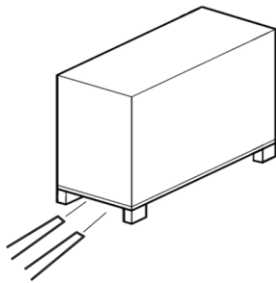


Fig. 5: Transportation with a fork lift

1. Drive the fork lift with the forks as shown in Fig. 5.
2. Insert the forks so that they stick out on the other side.
3. Ensure that the package cannot tip if the centre of gravity is off-centre.
4. Lift the package and begin transportation.

2.6 Storage

Storage of the packaged compressor

Store the compressor under the following conditions:

- Do not store outdoors.
- Store dry and dust-free.
- Do not expose to any aggressive media.
- Protect against solar radiation.
- Avoid mechanical jolts.

- Storage temperature: 60 to 95F (15 to 35 °C).
- Relative humidity: max. 60 %.
- In case of storage for longer than 3 months, check the general condition of all parts and the packaging regularly. If necessary, refresh or replace the rust-proofing.



Under some circumstances there may be notes about storage on the packaging that extend beyond the requirements named here. Adhere to these accordingly.

- Extended storage: Rotate the compressor and motor by hand every thirty to sixty days to prevent flat spots on the bearings that can lead to premature failure.

3 Installation and commissioning

3.1 Safety instructions for the installation and commissioning

Electrical system



DANGER!

Danger to life from electric power!

Contact with live parts may prove fatal. When switched on, electric components can be subject to uncontrolled movements and may cause grave injury or death.

- Switch off the power supply before starting work and make sure that it cannot be switched on again. Follow lockout/ tagout procedure.

Improper initial commissioning



WARNING!

Danger of injury due to improper initial commissioning!

Improper initial commissioning can result in serious injury and significant damage to property.

- Before the initial commissioning, ensure that all installation work has been carried out and completed in accordance with the information and instructions in this manual, National Electric Code, and local state and federal regulations.

Securing to prevent restart



WARNING!

Danger to life from an unauthorized restart!

In the event of an unauthorized restart of the power supply during installation, there is a danger of

serious injuries or death for persons in the danger zone.

- Switch off all power supplies before starting work and make sure they cannot be switched on again. Follow lockout/ tagout procedure.

Improper installation and commissioning



WARNING!

Risk of injury due to improper installation or commissioning!

Improperly performed installation and commissioning may lead to serious injury and significant material damage.

- Provide for sufficient mounting clearance before starting to work.
- Use caution when handling exposed components with sharp edges.
- Keep the assembly area tidy and clean! Loose components and tools lying around or on top of each other may lead to accidents.
- Mount all components properly. Tighten all screws to the prescribed torque.
- Secure components to prevent them from falling down or tipping over.
- Observe the following prior to commissioning:
 - make sure that all installation work has been performed and completed following the instructions and information provided in this manual.
 - make sure that no persons are still in the danger zone of the machine.

3.2 Requirements in the installation location

Set up the screw compressor so that the following conditions are fulfilled:

- The installation location is level.
- The machine is easily accessible and can be accessed from all sides.
- There is sufficient lighting.
- There is sufficient ventilation.
- There is a power supply available.
- Escape paths and rescue equipment are freely accessible.
- The machine is not subjected to an explosive atmosphere.
- The machine is not subjected to a corrosive atmosphere.
- The machine is not subjected to direct solar radiation.
- Outside heating from surrounding heat sources is excluded.
- There is no dust accumulation.
- Fire protection measures have been taken.
- The machine is not subjected to vibrations.
- The floor is resistant to solvents, impermeable to liquids, anti-static and easy to clean.
- There are no machines in the vicinity that cause electrical or electromagnetic disturbance.

3.3 Installation

3.3.1 Remove shipping spacers

To protect the vibration isolators underneath the motor/airend assembly during transport, there are red spacers that hold the assembly in place. **Make sure all of these spacers are removed before first startup of the compressor.** Failure to remove the spacers will result in excessive vibration and can cause damage to the compressor.

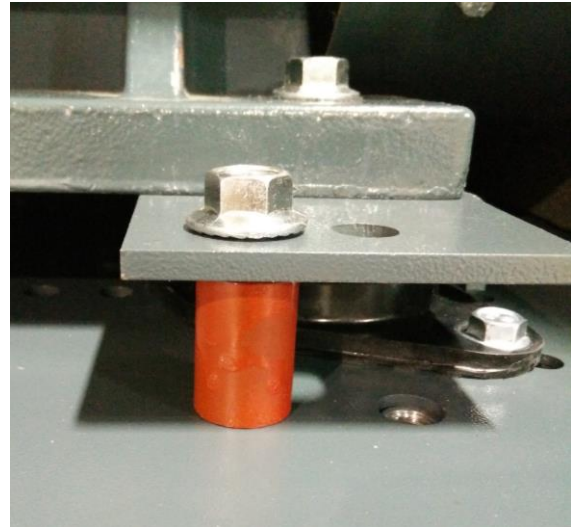


Fig.6 : Shipping spacer

3.3.2 Ventilation



DANGER!

Risk of fatal injury from the use of explosive gas mixtures, vapors, dust or aggressive hazardous substances!

The use of explosive gas mixtures, vapors, dust or aggressive hazardous substances to ventilate the screw compressor can cause severe or even fatal injuries as well as significant material damage.

- Never use explosive gas mixtures, vapors, dust or aggressive hazardous substances to ventilate the screw compressor.
- Make sure that no potentially explosive gas mixtures, vapors, dust or aggressive hazardous substances enter into the ventilation for the screw compressor.

The air fed via the intake openings is used for compression and for cooling the machine.



NOTICE!

Risk of material damage from condensation!

Cooling air with moisture content can cause condensation.

- Make sure that the cooling air is cool, dry and free of dust.

1. Provide the required rate of cooling air as per the technical data sheet for the screw compressor.
2. Extract the exhaust air as per the technical data sheet for the screw compressor.
 - ⇒ This prevents the installation room and the screw compressor from heating up.

3.3.3 Connection to the compressed air network



WARNING!

Danger of injury due to unpredictable movement of the compressed air hose!

Load switches in the compressed air network causes jerky movements of the compressed air hose with high force.

- Anchor and fasten the compressed air hose sufficiently.



The prerequisite for the correct installation is the presence of a professionally-planned, installed and maintained compressed air network and an additional shut-off valve installed at the entrance to the compressed air network. Relief valves are to be placed ahead of any potential blockage point, including but not limited to shut-off valves, heat exchangers and discharge silencers. Always direct discharge from relief valves away from areas where personnel may be.

FSC base mounted compressor packages come with a mounted starter. Ensuring that the starter is mounted per national and local NEL requirements, it's responsibility of the owner.

1. Connect the compressed air.
2. Ensure that the compressed air connection does not represent a stumbling hazard.
3. Anchor and fasten the compressed air connection sufficiently.

Air piping requirements:

1. Install required accessories.
2. Main piping should have 1° - 2° slant away from the compressor to drain the condensate.
3. Pressure drop of piping must not exceed 5% of discharge pressure. Select larger piping than required for better efficiency.
4. Branch line must be located at the topside of main piping to avoid condensate from flowing into the facilities.
5. To prolong service life of pneumatic tools, install an air filter regulator unit on the outlet.
6. Do not randomly reduce the size of the main piping. If necessary, use the proper reducer or a large pressure loss may incur .
7. The common installation arrangement is; air compressor + air tank + dryer. An air tank is capable of draining some of the condensate and cooling down the temperature of compressed air. This will lead to more efficient dryer operation.
8. If the air requirement is large for a short period, install a higher volume air tank to reduce the frequency of full/off load control.
9. The ideal piping main would be constructed around the factory as a loop for delivering compressed air from both sides at any point.

3.3.4 Connecting to the power supply

Personnel: ■ Qualified Electrician



NOTICE!

Property damage to the compressor aircend due to incorrect connection of the power supply!

In case of incorrect connection of the power supply, there is a danger that the compressor aircend will be

destroyed due to the drive turning incorrectly.

- Connect the power according to the wiring diagram and check the aircend and motor for correct rotation before starting the compressor.



The prerequisite for the correct installation are professionally sized fuses in the network supply (person/system protection) and an appropriate main switch (for switching the supply on and off).

1. Using the data in the wiring diagram, check whether the existing supply network is suitable. Voltage deviations of more than 10% are not permitted.
2. Connect the power according to the wiring diagram.
3. Check correct direction of rotation by briefly starting the compressor and verifying that the rotation of the machine follows the arrows on the main motor and fan motor.
4. Ensure that the power cable does not represent a stumbling hazard.
5. Select the correct wire diameter according to the rated power of the air compressor. Do not use wire diameter that is too small, or power cord will be easily burnt out and generate danger.
6. Avoid use with other systems with different power consumption in parallel. If it is used in parallel, excessive voltage drop or three-phase current unbalance will result in electrical overload and the protective devices will shut down the machine.
7. Power supply cable, fuse and air-break switch need to match the compressor power supply requirements to ensure the safety of all electrical components.
8. It is necessary to confirm the correct voltage while performing power distribution of the air compressor.

9. The grounding wire of a motor or system must be reliably installed and grounding wire cannot be connected to air delivery pipe or cooling water pipe. Air compressor must be reliably grounded to prevent danger from electrical leakage.

10. Ensure that the power supply is shut off before any electrical maintenance work. Use lockout tag out.

3.4 Checking the oil level

1. Switch the compressor off and secure it to prevent it from being switched back on again.
2. Open and remove the enclosure panels with the special wrench.

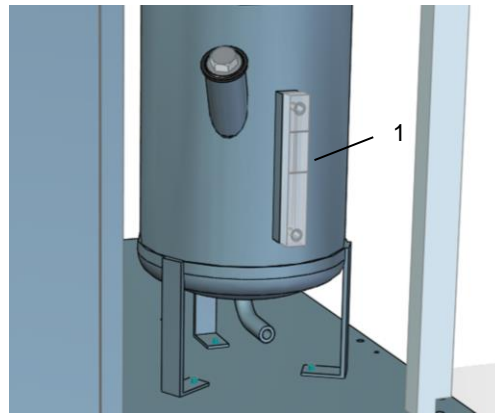


Fig. 7: Inspection glass

3. Check the inspection glass (Fig. 7-1) to make sure the oil is between the top and bottom oil level indicator lines.
4. If necessary, top up oil ↪ *Chapter 7.5.9 'Replacing the oil/changing the oil filter' on page 39.*

3.5 Start-up lubrication of the compressor aircend



NOTICE!

Risk of material damage due to a lack of oil in the compressor aircend!

A lack of oil in the compressor aircend after longer downtimes, e.g. between factory delivery and initial commissioning or after a longer

downtime, can cause significant material damage to the screw compressor.

- Add 0.5 quarts of oil directly in the compressor airend before initial commissioning or after a longer downtime.

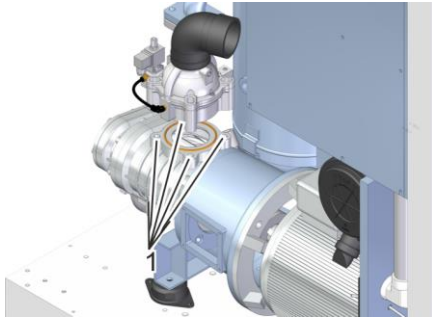


Fig. 8: Intake valve fastening screw

1. Unfasten the fastening screws on the intake valve (Fig. 8-1).



NOTICE!
Property damage due to incorrect oil!

Mixing different oils or using incorrect oils causes significant property damage to the screw compressor.

- Only use the oil prescribed in the technical data.
- For high temperature systems, use only fully synthetic oil FSC-8000.

2. Unscrew the intake valve.
3. Pour oil directly into the compressor airend.
4. Re-fit the intake valve and tighten the screws.

3.6 Switching on after installation

1. Check all connections to make sure they are installed correctly and all screws are properly fastened.
2. Make sure that there are no tools or loose objects lying in or on the machine.
3. Install the enclosure doors and make sure that they are sealed.

4. Carefully open the shut-off valve downstream of the discharge port between the screw compressor and the compressed air network.
 - ⇒ The screw compressor is now connected to the compressed air network.
5. Switch on the main switch.
6. Start the screw compressor ↻ *controller documentation*.
 - ⇒ The compressor is ready and may start up automatically at any time.

3.7 Work after the initial commissioning



WARNING!
Danger of injury from hot surfaces!

Surfaces of components can heat up a lot during operation. Skin contact with hot surfaces will cause severe skin burns.

- Wear heat-resistant protective clothing and protective gloves during all work near hot surfaces.
- Before all work, make sure that all surfaces have cooled off to the ambient temperature, wait at least 30 minutes.



CAUTION!
Danger of injury from oil vapor!

In case of high temperatures oil vapor can form. Oil vapor can irritate eyes and the respiratory system.

- When working on the oil system and if an oil vapor arises, wear breathing protection and protective goggles and ensure that there is a fresh air supply.

1. Switch the screw compressor off and secure it to prevent it from being switched back on again.
2. Open and remove the cubicle doors with the special wrench.
3. Wait until the components have cooled.

4. Check all oil and compressed air lines for leaks and tighten as necessary.
5. Tighten screws where needed.
6. Check the oil level in the inspection glass and top up as described in ↗ Chapter 7.5.3 'Checking the oil level/topping up the oil' on page 36 if necessary.
7. Install the enclosure doors and make sure that they are sealed.



NOTICE!
Risk of material damage due to too low or too high compressor temperature!

If the compressor temperature is too low or too high, the screw compressor may become damaged.

- For detailed information, contact the manufacturer.



If the compression temperature is sufficiently high, this ensures that the air humidity taken in does not form condensation. Frequent switching on and off of the screw compressor can prevent the compressor from reaching the required operating temperature ↗ Chapter 7.5.4 'Checking the build-up of condensation' on page 37.

5. Check the compressor temperature ↗ Chapter 7.5.5 'Checking the compressor temperature' on page 38.

4 Design and function

4.1 Overview

Screw compressor

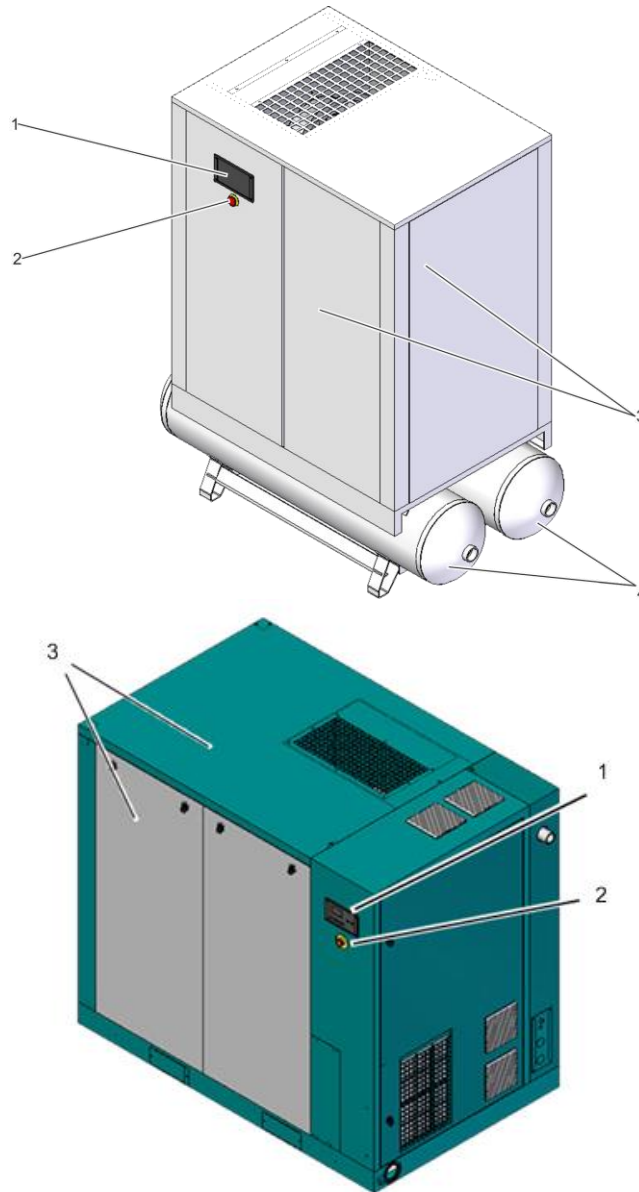


Fig. 9: Screw compressor

1 Controller

2 Emergency stop button

3 Enclosure panels

4 Air receiver (*optional on 18 - 22 kW models*)

This chapter shows the screw compressors described in these instructions. The compressors differ primarily in size and the installed drive. However, their basic design is the same.

Assemblies
BELT DRIVEN (18-37 kW Fixed Speed Models)

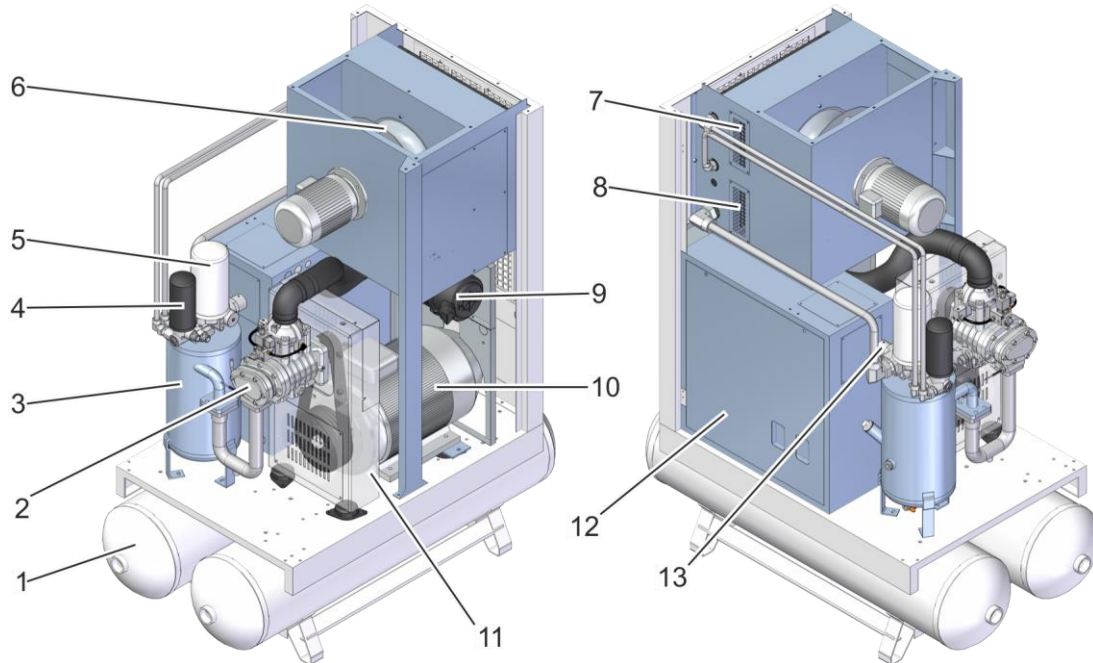


Fig. 10: Screw compressor 18–37 kW with V-belt (optional air receiver on 18–22 kW models)

- | | |
|----------------------|--|
| 1 Air receiver | 8 Air after-cooler |
| 2 Compressor airend | 9 Intake air filter |
| 3 Oil separator tank | 10 Drive motor |
| 4 Oil filter | 11 Belt guard |
| 5 Air/oil separator | 12 Electrical cabinet |
| 6 Cooling air fan | 13 Minimum pressure and non-return valve |
| 7 Oil cooler | |

DIRECT COUPLED (45-90 kW Variable Speed Models)

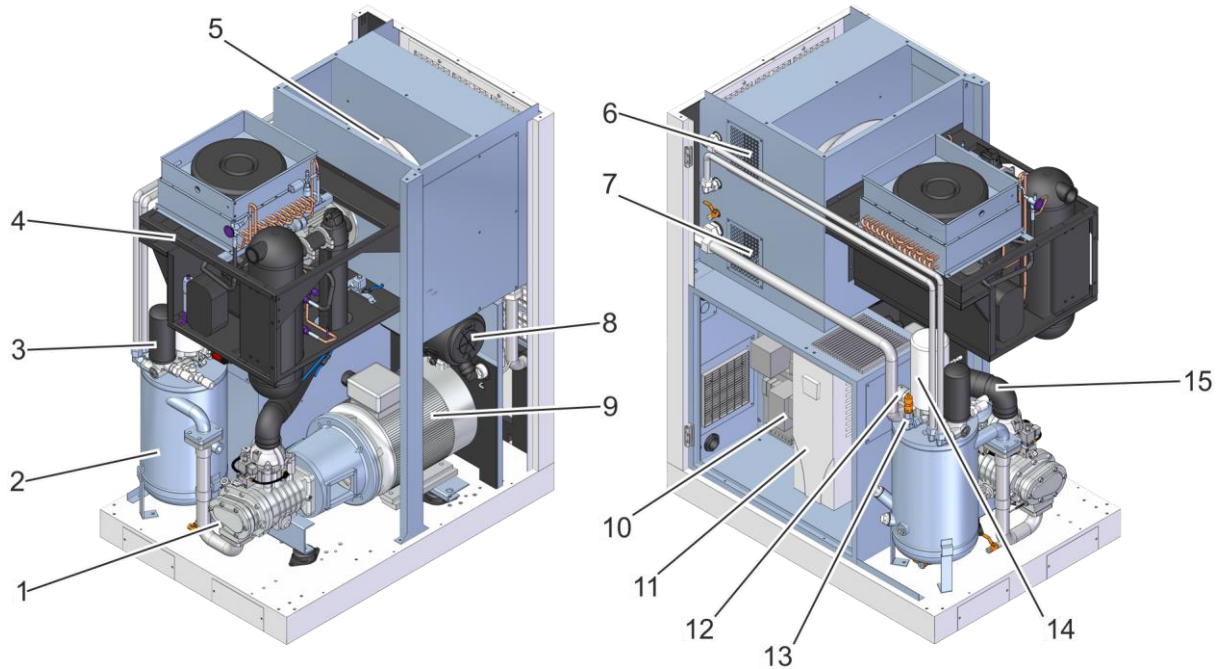


Fig. 11: Screw compressor 18-90 kW with direct drive, frequency converter and refrigeration dryer (optional)

- | | |
|----------------------------------|--|
| 1 Compressor air end | 9 Drive motor |
| 2 Oil separator tank | 10 Electrical cabinet |
| 3 Oil filter | 11 Frequency converter |
| 4 Refrigeration dryer (optional) | 12 Minimum pressure and non-return valve |
| 5 Cooling air fan | 13 Safety valve |
| 6 Oil cooler | 14 Air/oil separator |
| 7 Air after-cooler | 15 Intake manifold |
| 8 Intake air filter | |

DIRECT COUPLED (45-185 kW Models)

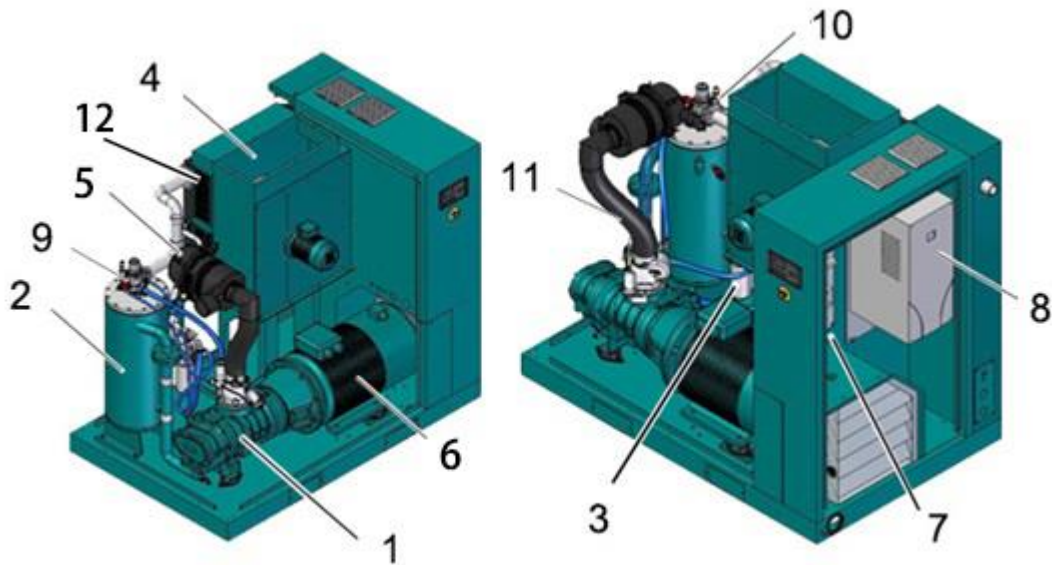


Fig. 12: Screw compressor 45–185 kW with direct drive

- | | |
|----------------------|---|
| 1 Compressor air end | 7 Electrical cabinet |
| 2 Oil separator tank | 8 Frequency converter (<i>optional</i>) |
| 3 Oil filter | 9 Minimum pressure and non-return valve |
| 4 Cooling fan | 10 Safety valve |
| 5 Intake filter | 11 Connection pipe |
| 6 Main motor | 12 After cooler |

4.2 Brief description

The fresh air supplied by the installed cooling air fan is filtered through the intake filter. The air flows through the intake valve into the compressor aircend, where it is compressed together with the injected oil to the final pressure. The oil is largely separated from the compressed air in the oil separator tank. The air/oil separator removes the remaining oil from the compressed air. The compressed air then flows through the minimum pressure and non-return valve into the air after-cooler and is cooled down before it leaves the screw compressor via the discharge port.

The oil is separated from the compressed air in the oil separator tank and the air/oil separator and flows to the oil cooler. The oil temperature thermostat adds the cooled oil to the hot oil via the oil cooler bypass according to the set point temperature. Finally, the oil filter cleans the oil before it is injected into the compressor aircend again.

4.3 Assembly description

4.3.1 Enclosure doors

Only qualified personnel may remove the enclosure doors with the included special wrench. Enclosure doors are a part of the electric shock protection and reduce the sound level emitted by the unit.

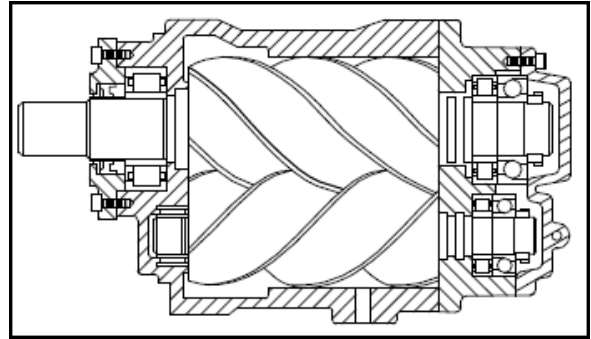
4.3.2 Screw Compressor

The compressor assembly is an oil flooded positive displacement, single stage, helical screw type unit consisting of two rotors or screws supported axially by roller bearings and enclosed in a housing or stator as depicted in the sectional view.

4.3.2.1 Drive unit

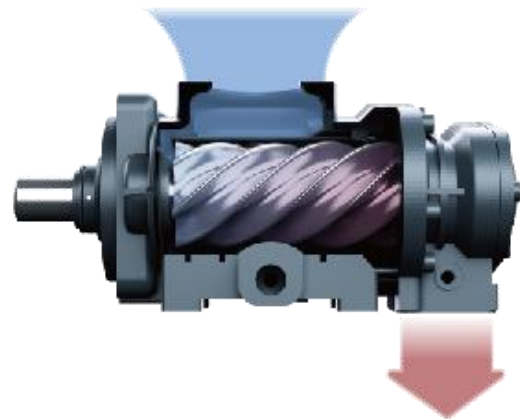
Belt and direct drive units are installed in the screw compressors. They differ in construction,

their technical data and their functional principle as follows:



In operation as depicted above in the compression cycle, air entering the compressor through the inlet port becomes trapped between the helical lobes of the main rotor and the matching grooves of the secondary rotor. As the rotors turn air is trapped in the cavity created by the meshing lobe and groove and reduced in volume or "compressed". It is then pushed through the successive cavities until it reaches the discharge end of the compressor and is sent to the oil separator.

During the compressor cycle, oil is injected into the compressor for the purpose of dissipating the heat of compression and to seal the internal clearances. The compressed air laden with oil leaves the compressor through the discharge port and enters a reservoir where the oil and air are separated. This process delivers a smooth flow of compressed air at the desired pressure.



4.3.2.1.1 Screw compressor with V-belt drive

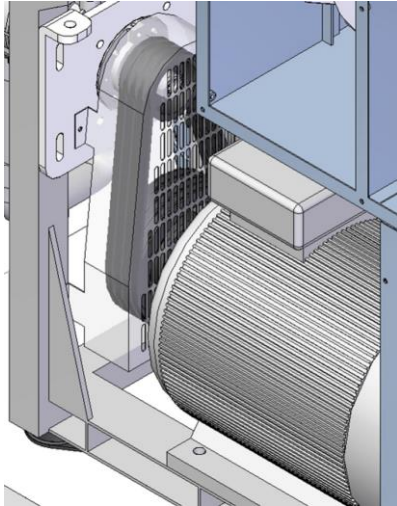


Fig. 13: Screw compressor with V-belt drive
The electric motor drives the air end through a belt and pulley arrangement.

4.3.2.1.2 Screw compressor with direct drive

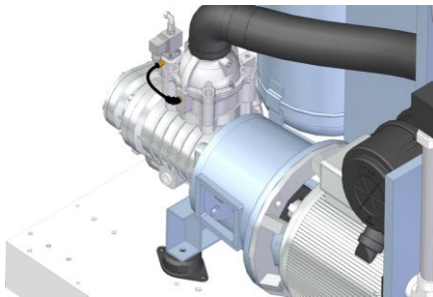


Fig. 14: Screw compressors with direct drive
The screw compressor with direct drive is driven directly by the motor.
On the screw compressor with frequency converter the electric motor is speed-controlled by the frequency converter in the electrical cabinet. Actuation is also performed directly with a coupling.

4.3.3 Intake filter

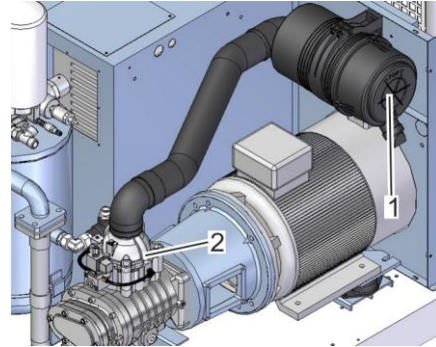


Fig. 15: Intake filter
The intake air filter (Fig. 15-1) is fitted above the drive motor. The air which the cooling air fan pulls into the enclosure is filtered by the intake filter and fed to the compressor aircend through the inlet valve (Fig. 15-2).

4.3.4 Compressor aircend

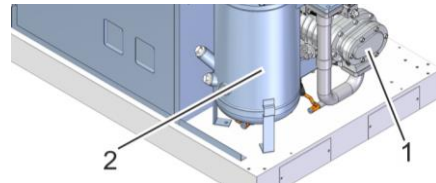


Fig. 16: Compressor aircend
The air is compressed by the compressor aircend (Fig. 16-1) and fed to the oil separator tank (Fig. 16-2) together with the injected oil.

4.3.5 Oil separator tank

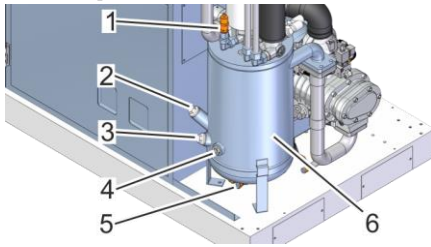


Fig. 17: Oil separator tank with safety valve (18-37 kW models)

- 1 Safety valve
- 2 Filler nozzle
- 3 Connection for oil heater (optional)
- 4 Sight glass
- 5 Oil drain
- 6 Oil separator tank

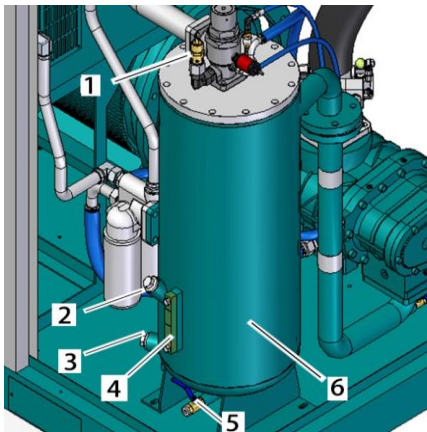


Fig. 18: Oil separator tank with safety valve (45-185 kW models)

- 1 Safety valve
- 2 Filler nozzle
- 3 Connection for coolant heater (optional)
- 4 Sight glass
- 5 Drain
- 6 Separator tank

The oil separator tank has several components. The relief valve protects the oil separator tank from overpressure. The level of the oil can be read through the sight glass. The oil is topped up via the filler nozzle and removed via the oil drain.

4.3.6 Air/oil separator

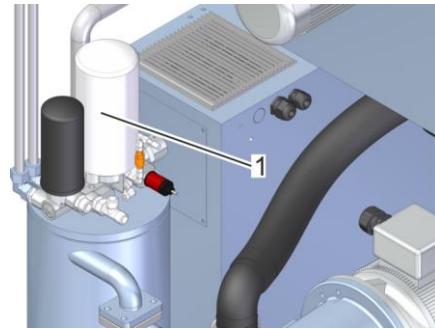


Fig. 19: Air/oil separator (18-37 kW models)

The air/oil separator (Fig. 19-1) removes the residual oil from the compressed air.

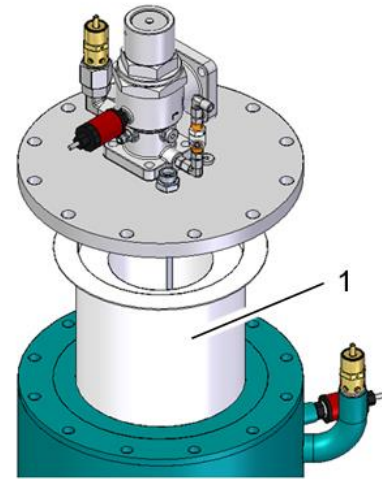


Fig. 20: Air/oil separator (45-185 kW models)

The air/oil separator (Fig. 20-1) removes the residual oil from the compressed air.

4.3.7 Minimum pressure and non-return valve

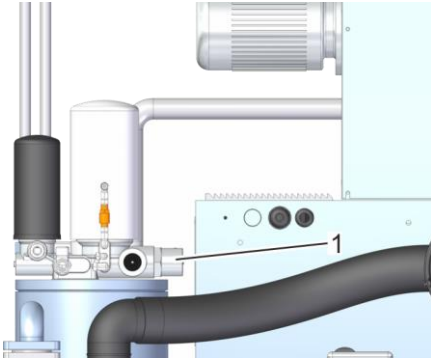


Fig.21: Minimum pressure and non-return valve (18-37 kW models)

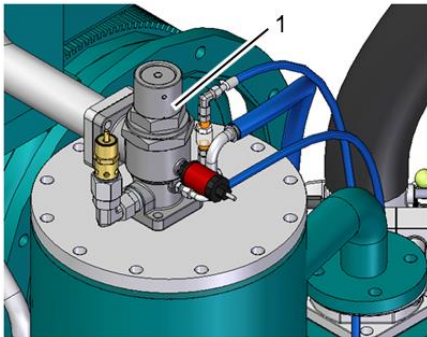


Fig. 22: Minimum pressure and non-return valve (45-185 kW models)

The minimum pressure and non-return valve (Fig.22-1) does not open until the system pressure has risen to 72 psi (5 bar). After switching off the compressor the minimum pressure and non-return valve prevents the compressed air from flowing back out of the network into the oil separator tank.

4.3.8 Coolers

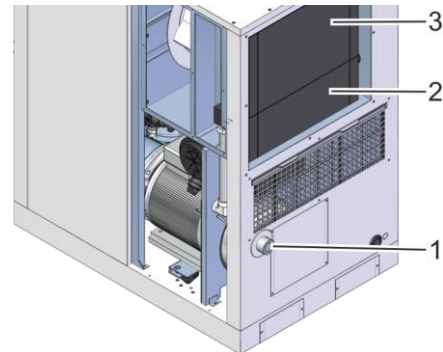


Fig. 23: Air/oil Coolers (18-37 kW models)

The compressed air is cooled in the air after-cooler (Fig. 23-2) before it leaves the screw compressor via the discharge port (Fig. 23-1). The oil is cooled by the oil cooler (Fig. 23-3) and fed back into the oil circuit.

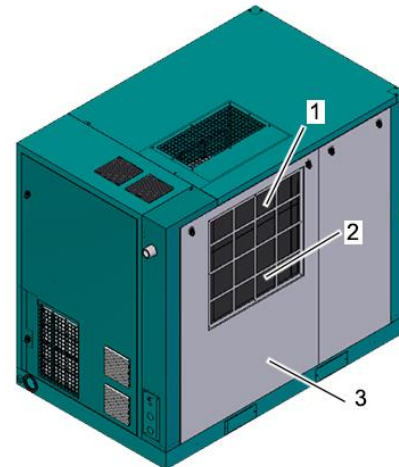


Fig.24: Air/oil Coolers (45-185 kW models)

The compressed air is cooled in the after-cooler (Fig. 24-1) before it leaves the screw compressor via the discharge port. The oil is cooled by the oil cooler (Fig. 24-2) and fed back into the oil circuit. The panel (Fig. 24-3) can be removed for cleaning the coolers.

4.3.9 Oil filter

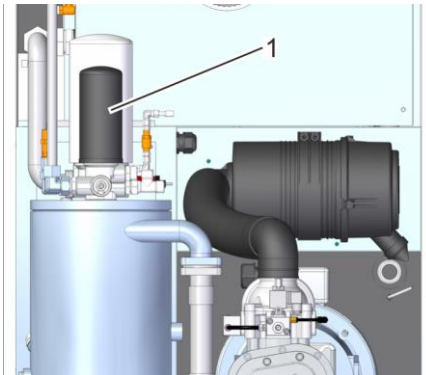


Fig.25: Oil filter (18-37 kW Models)

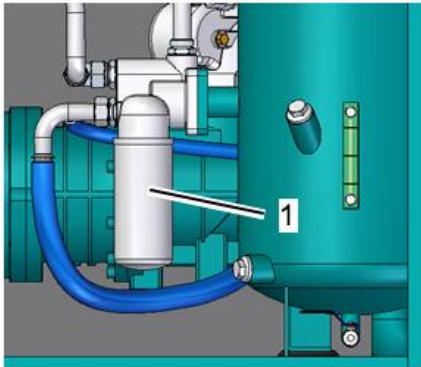


Fig.26: Oil filter (45-185 kW Models)

The oil filter (Fig.25-1, Fig.26-1) cleans the oil before it is injected into the compressor airend once again. **(160-185 kW units contain a second oil filter that requires periodic replacement.)**

4.3.10 Cooling air fan

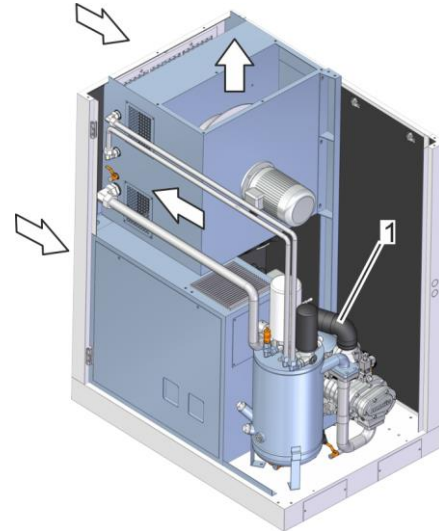


Fig.27: Cooling air fan (18-37 kW models)

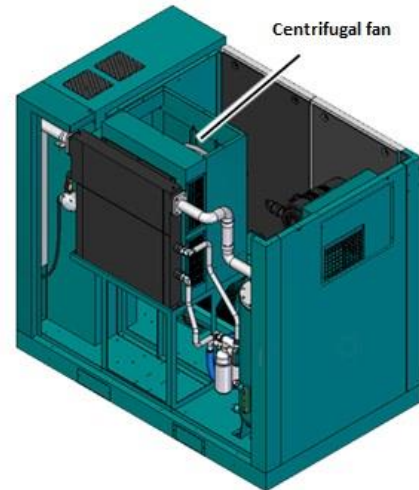


Fig.28: Cooling air fan (45-185 kW models)

The cooling of the air after-cooler and of the oil cooler is performed by the cooling air fan. The cooling air fan also supplies the intake filter (Fig. 28-1) with sufficient intake air.

4.4 Interfaces

The following interfaces are found in the screw compressor:

- Air supply
 - Cooling air fan
 - Intake filter
 - Discharge port

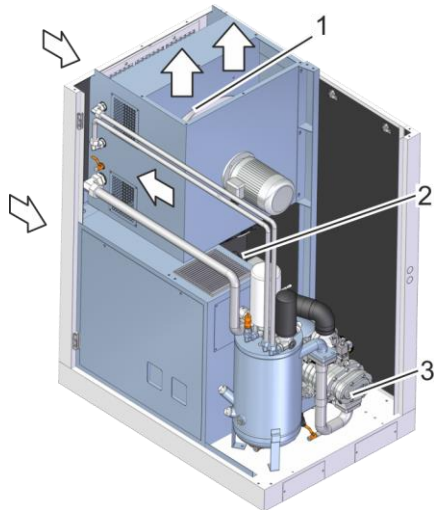


Fig.29: Flow diagram of screw compressor 18–37 kW with direct drive

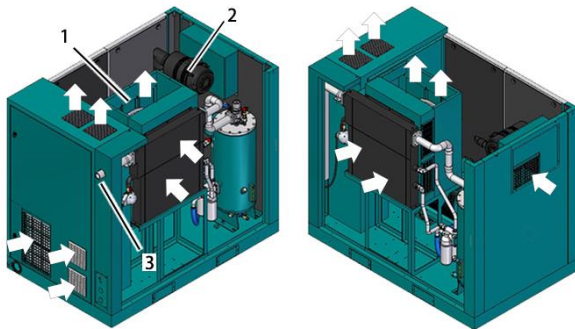


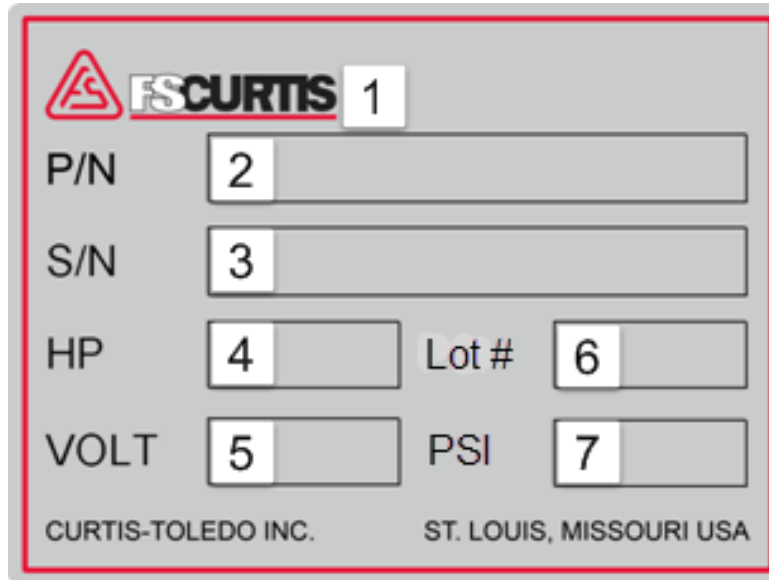
Fig.30: Flow diagram of screw compressor 45-185 kW with direct drive

5 Technical data



For more information refer to the technical data sheet.

5.1 Serial tag



The serial tag form is a rectangular label with a red border. It features the FSCURTIS logo at the top left, followed by a box labeled '1'. Below this are several input fields: 'P/N' with box '2', 'S/N' with box '3', 'HP' with box '4', 'Lot #' with box '6', 'VOLT' with box '5', and 'PSI' with box '7'. At the bottom, it reads 'CURTIS-TOLEDO INC.' and 'ST. LOUIS, MISSOURI USA'.

Fig.31: Serial tag

The serial tag can be found on the enclosure. It includes the following details:

1. Manufacturer
2. Part number
3. Serial number
4. Motor power [HP]
5. Voltage [V]
6. Lot number
7. Discharge pressure [PSI]

5.2 General specifications

5.2.1 Operating conditions

Environment

Data	Value
Fixed speed temperature range	+37 to +113F (+3 to +45°C)
Variable speed temperature range	+37 to +104F (+3 to +40°C)
Relative humidity	60%
Maximum installation altitude above sea level	3281ft (1000m)

Curtis Lube Plus FSC-8000 Oil

Discharge Temperature	Operating Hours		
	Below 185°F	185°F to 194°F	Above 194°F
Intervals	8000	6000	4000

5.2.2 Oil

The following oils have been tested and approved for use in these compressors:

Designation	Type
Synthetic oil	FSC-8000
Food grade oil	FSC-4000FG

5.2.3 Oil Capacity

Screw compressor type 18 - 185 kW models

Type	Consumable	Fill level
18	Oil	4 US GAL.
22	Oil	4 US GAL.
30	Oil	5 US GAL.
37	Oil	5 US GAL.
45	Oil	10.5 US GAL.
55	Oil	10.5 US GAL.
75	Oil	14 US GAL.
90	Oil	14 US GAL.
110	Oil	22 US GAL.
160	Oil	32 US GAL.
185	Oil	32 US GAL.
220	Oil	37 US GAL.
260	Oil	37 US GAL.

6 Operation

6.1 Safety instructions for operation

Improper operation



WARNING!
Danger of injury due to improper operation!

Improper operation can cause serious injury and significant material damage.

- Carry out all operating steps in accordance with the information and notices in this manual.
- Pay attention to the following points before starting work:
 - Ensure that all covers and safety devices are installed and work properly.
 - Ensure that that no one is in the danger zone.
 - Never override or bridge safety features during operation.

6.2 Modulation Control

General description

The modulation valve allows the compressor to unload and then load gradually to meet system air demand. As demand decreases and system pressure increases above the modulation valve low setting, pressure is passed to the inlet valve piston, which closes enough to match the air system demand, preventing the compressor from switching to unload. When the system air demand falls below 50% of full flow the controller switches the compressor to unload.

Changing the setting of the modulation valve

The modulation valve is not set at the factory. The compressor will run load/unload. To set modulation control refer to the following paragraph.

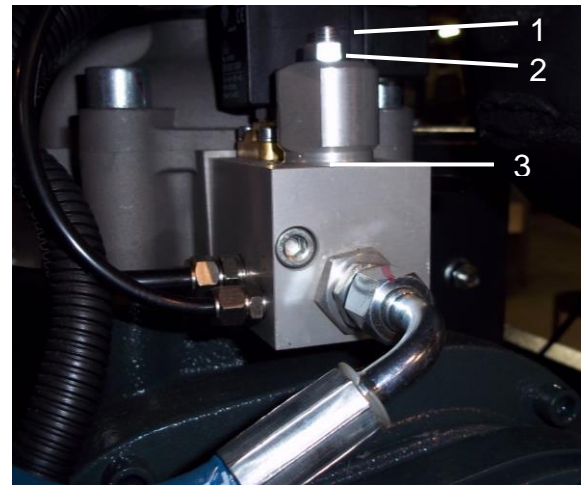


Fig.32: Changing the modulating valve setting

To change to modulating control, start by loosening the jam nut (Fig. 32-2) and turning the set screw (Fig. 32-1) counter-clockwise. This lowers the pressure setting of the modulating valve. This adjustment should be made slowly. The desired pressure settings in the controller should be set prior to adjusting the modulation valve. The modulation valve should be set to “weep” air from the vent hole (Fig. 32-3) in the valve dome at 7-8 PSI (0.5 bar) less than cutout pressure setting. Once the desired modulation control pressure is set, tighten the jam nut.

If the screw is completely turned in (clockwise), modulation is no longer operational (=factory setting). The unit will run in regular load/unload again.

7 Maintenance

7.1 Environmental protection

Observe the following environmental protection instructions during maintenance work:

- In respect of all lubrication points supplied manually with lubricant, remove any escaping used or surplus grease and dispose of in accordance with applicable local, state and federal regulations.
- Catch replaced oils in suitable containers and dispose of in accordance with applicable local, state, and federal regulations.

wear. For questions about maintenance work or intervals contact an authorized distributor.

* The change intervals refer to:

- Ambient temperature of 37-104 F
- Max. humidity of 60%
- Compressor temperature of approx. 185 F

** In high-temperature plants reduce the indicated maintenance intervals by the refrencing ↻Appendix 10.2.

7.2 Spare parts



WARNING!

Risk of injury due to using wrong spare parts!

Using incorrect or faulty spare parts brings dangers to the personnel and can cause damages, malfunctions or complete failure.

- Only use genuine spare parts supplied by the manufacturer or manufacturer-approved spare parts.
- If in doubt, always contact the manufacturer.



Loss of warranty

The use of non-approved spare/replacement parts will invalidate the warranty.

Obtain replacement parts from an authorized distributor.

Please refer to the Parts list for accurate part number information.

7.3 Maintenance schedule

The next sections describes the maintenance work that is required for optimal and fault-free operation of the machine.

Since increased wear can occur during regular checks, the required maintenance intervals may be shortened according to the actual signs of

7.4 Service kits

Nx (18-90kW) MAINTENANCE SCHEDULE

DESCRIPTION	PART#	QTY	DLY.	WKLY.	YRLY	SERVICE INTERVALS (HOURS)																		
						50	500	2 000	4 000	6 000	8 000	10 000	12 000	14 000	16 000	18 000	20 000	22 000	24 000					
Check sump oil level (fill if necessary)			•																					
Check pressure operating point and controls			•																					
Check oil scavenger line for oil flow			•																					
Drain condensate from air receiver			•																					
Check pressure relief valve for operation ³				•3																				
Drain condensate from sump				•																				
Inspect/clean air suction filter element				•																				
Inspect/clean panel filters				•																				
Inspect/clean finned surface of radiator(s)				•																				
Check for loose fittings and fasteners ⁴							•4																	
Inspect hoses for signs of wear ⁴				•																				
Change oil filter		1					•1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Oil sample									•		•		•		•		•		•		•		•	
Motor bearing lubrication								•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Inspect anti-vibration pads									•		•		•		•		•		•		•		•	
Inspect drive coupling									•		•		•		•		•		•		•		•	
Belt Tensioning/Replacement ⁵				•5		•5	•5	•5	•5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Change Lubricant ² – Use FSC- Max Fluid FSC-8000-5 (5 gallon pail)	NX18 / NX22	See page 32																						
	NX30 / NX37					•2					•2												•2	
	NX45 / NX55																							
	NX75 / NX90																							

Maintenance Notes:

- 1) Initial 500 hours only. Follow regular intervals thereafter.
 - 2) Change oil yearly if operating under 8000 h. Lubricant may require more frequent changes depending on operating environment and running conditions. For oil life versus operating temperature see chart on page 31.
 - 3) Do not tamper with safety valve setting - it is factory set - only check operation! Tampering will void warranty and result may cause severe injury or death.
 - 4) Replace as necessary or every 5 years.
 - 5) Visual check weekly. Re-tension and re-align 50 hours after belt change. Check tension and alignment every 500 hours thereafter. Change belts every 4,000 hours or as needed. Refer to the FS-Curtis Technical Bulletin #W 20151213-TB003 for detailed instructions on belt replacement, tensioning, and pulley alignment.
- * The maintenance intervals described herein are for normal operating condition in clean and well ventilated environments. Frequency of intervals will increase for non-standard environments. Please contact your authorized FS-CURTIS distributor for more information and recommendations.

Service Kits:

2000 & 6000 Hours = inlet air filter + oil-filter

4000 Hours = inlet air filter + oil-filter + air/oil separator, ventilation filter material

8000 Hours = inlet air filter + oil filter + air/oil separator + inlet vlv. Kit + min. pre. vlv. Kit

Nx (110-260 kW) MAINTENANCE SCHEDULE

DESCRIPTION	PART#	QTY	DLY.	WKLY.	YRLY	SERVICE INTERVALS (HOURS)												
						500	2 000	4 000	6 000	8 000	10 000	12 000	14 000	16 000	18 000	20 000	22 000	24 000
Check sump oil level (fill if necessary)			•															
Check pressure operating point and controls			•															
Check oil scavenger line for oil flow			•															
Drain condensate from air receiver			•															
Check pressure relief valve for operation ³				• 3														
Drain condensate from sump				•														
Inspect/clean air suction filter element				•														
Inspect/clean panel filters				•														
Inspect/clean finned surface of radiator(s)				•														
Check for loose fittings and fasteners ⁴				• 4														
Inspect hoses for signs of wear ⁴				•														
Change Oil Nx110Kw ²	FSC-8000-5	See page 32							•2				•2					•2
Change Oil Nx160Kw-185Kw ²	FSC-8000-5	See page 32							•2				•2					•2
Change oil filter (2) Nx110Kw - 185Kw	2116020084	2				•1	•	•	•	•	•	•	•	•	•	•	•	•
Change Pre-Filter Oil (1) Nx110Kw-185Kw	2605539870	1				•1	•	•	•	•	•	•	•	•	•	•	•	•
Change Air Oil Separator Nx110Kw	2116010179	1						•		•		•		•		•		•
Change Air Oil Separator Nx160Kw-185Kw	2116010180	1						•		•		•		•		•		•
Oil sample	FVO701-POL	1				•		•		•		•		•		•		•
Change Air Filter Element Nx110Kw	2116040232	1				•	•	•	•	•	•	•	•	•	•	•	•	•
Change Air Filter Element Nx160Kw-185Kw	2116040234	1				•	•	•	•	•	•	•	•	•	•	•	•	•
Motor bearing lubrication																•		
Min. Pressure Valve 110Kw	2104020058	1							•				•					•
Min. Pressure Valve 160Kw-185Kw	2104020039	1							•				•					•
Inlet Valve 110Kw	2104050195	1							•				•					•
Inlet Valve 160Kw-185Kw	2104050196	1							•				•					•
Pressure Sensor	2105040250	2							•				•					•
Temperature Sensor 110Kw	2105040246	1							•				•					•
Temperature Sensor 160Kw-185Kw	2105040252	1							•				•					•

Maintenance Notes:

- 1) Initial 500 hours only. Follow regular intervals thereafter.
- 2) Change oil yearly if operating under 8000 h. Lubricant may require more frequent changes depending on operating environment and running conditions. For oil life versus operating temperature see chart on page 48.
- 3) Do not tamper with safety valve setting - it is factory set - only check operation! Tampering will void warranty and result may cause severe injury or death.
- 4) Replace as necessary or every 5 years.
- * The maintenance intervals described herein are for normal operating condition in clean and well ventilated environments. Frequency of intervals will increase for non-standard environments. Please contact your authorized FS-CURTIS distributor for more information and recommendations.


Service Kits:


2000 & 6000 Hours = inlet air filter + oil-filter
 4000 Hours = inlet air filter + oil-filter + air/oil separator, ventilation filter material
 8000 Hours = inlet air filter + oil filter + air/oil separator + inlet vlv. Kit + min. pre. vlv. Kit

7.5 Maintenance work



Necessary maintenance work

Necessary maintenance work appears on the display of the controller as a warning  Controller documentation.

Observe all safety instructions and precautions as described in this manual, and in particular section  1.3 General safety.

7.5.1 Checking for leaks

1. Close the shut-off valve on the pressure outlet side and secure it to prevent it from being opened again.
2. Open and remove the enclosure panels with the special wrench.
3. Check all lines and the base for leaks.
4. If there is oil in the system, remove it.
5. Check the connectors of the components and tighten all the screws and fittings.

7.5.2 Checking the electrical connections

Personnel: ■ Qualified Electrician



DANGER! Danger to life from stored charges!

Electric charges may be stored in electrical components; these charges may be maintained even after the system has been switched off and disconnected from the power supply. Contact with these components may result in serious or fatal injury.

- Before working on the specified components, ensure that they have been completely disconnected from the power supply. Allow 10 minutes to elapse in order to ensure that the internal capacitors have been fully discharged.

1. Close the shut-off valve on the pressure network side and secure it to prevent it from being opened again.
2. Open and remove the enclosure panels with the special wrench.
3. Check all electrical connections and tighten if necessary.

7.5.3 Checking the oil level/topping up the oil

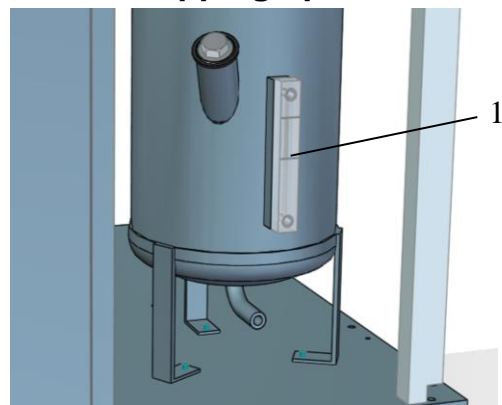


Fig.33: Inspection glass

1. Close the shut-off valve on the pressure outlet side and secure it to prevent it from being opened again.
2. Open and remove the enclosure panels with the special wrench.
3. Check the oil sight glass (Fig. 33-1) to make sure the oil is between the top and bottom oil level indicator lines
4. If the oil is below the bottom line, the oil will need to be topped up.

Topping up the oil

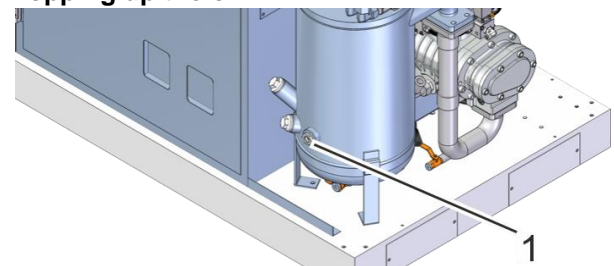


Fig. 34: Filler nozzle

1. Close the shut-off valve on the pressure outlet side and secure it to prevent it from being opened again.
2. Open and remove the enclosure panels with

the special wrench.

3. Use a drip pan to make sure that the leaking oil is collected.
4. Unfasten the filler nozzle (Fig. 34-1), remove it and make sure that the gasket is not misplaced.



NOTICE!
Property damage due to incorrect oil!

Mixing different oils or using incorrect oils causes significant property damage to the screw compressor.

- Only use the oil recommended in the technical data.
- For high temperature systems, use only fully synthetic oil FSC-8000.

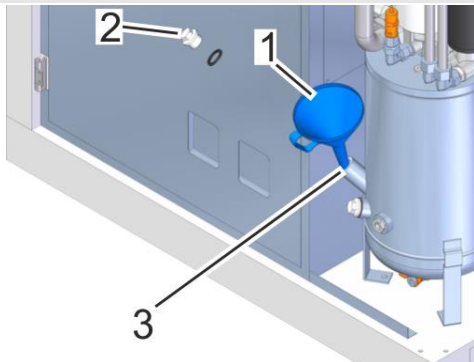


Fig. 35: Filler nozzle

5. Use a funnel (Fig. 35-1) to top off the oil to the filling edge on the filler nozzle (Fig. 35-3).
6. Position the gasket and check that it is firmly in place.
7. Insert the screw plug (Fig. 35-2) and tighten.

7.5.4 Checking the build-up of condensation



If the compression temperature is sufficiently high, this ensures that the air humidity taken in does not form condensation. Frequent switching on and off of the screw compressor can prevent the compressor from reaching the required operating temperature.



NOTICE!
Risk of material damage from condensate in the oil circuit!

Condensate in the oil circuit can cause the destruction of the compressor air end.

- In case of condensate in the oil separator tank, contact your authorized distributor department immediately.

1. Close the shut-off valve on the pressure outlet side and secure it to prevent it from being opened again.
2. Open and remove the enclosure panels with the special wrench.
3. Use a drip pan to make sure that the leaking oil is collected.
4. Unscrew the screw plug (Fig. 36-1).



Condensate is heavier than the oil

Since the condensate is heavier than the oil, after longer downtimes, it collects on the bottom of the oil separator tank.

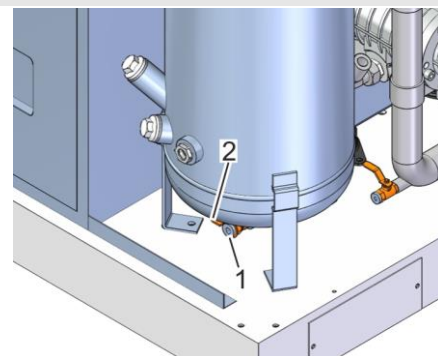


Fig. 36: Oil drain

5. Carefully open the oil drain (Fig. 36-2) and check the liquid being drained.
6. Slowly drain condensate until oil escapes.
7. Close the oil drain (Fig. 36-2).
8. Screw the screw plug (Fig. 36-1) back in.
9. Switch on the compressor and switch it off again without waiting any longer than one minute ↻ *controller documentation*.
10. Check the oil level and top up as necessary

☞ Chapter 7.5.3 'Checking the oil level/topping up the oil' on page 36.

7.5.5 Checking the compressor temperature



NOTICE!
Property damage due to compressor temperature that is too low or too high!

A compressor temperature that is too low or too high can cause damage to the screw compressor.

- For detailed information, contact the manufacturer.



- The compressor temperature should be between 160-212°F (71-100°C).
- At 221°F (105 °C) a warning is put out.
- At 230°F (110 °C) the screw compressor is switched off automatically.

1. Check compressor temperature via the controller (see controller manual).

7.5.6 Inspect/clean coolers

1. Close compressed air network-side shut-off valve and secure against re-opening.
2. Open and remove the enclosure panels with the special wrench.
3. Check after cooler and oil cooler from inside and outside for dirt.
4. Clean cooler surfaces.



Dirt can be removed by blowing it out. While doing this, make sure that the dirt from the device is blown out of rather than into the machine. In case of severe dirt buildup, consult your authorized distributor.

7.5.7 Checking the drive unit

1. Close compressed air outlet side gate valve and secure against re-opening.
2. Open and remove the enclosure panels with the special wrench.
3. Visually check the drive unit.
 - ☞ In case of visible defects, contact the manufacturer.
 - ☞ Check belt condition, tension and alignment.
 - ☞ Check coupling condition.

7.5.8 Re-lubricating the electric motor



If there is no grease port on the electric motor, it has encapsulated permanently-lubricated bearings.

1. Close compressed air outlet side gate valve and secure against re-opening.
2. Open and remove the enclosure panels with the special wrench.
3. Fill quantity: 0.7 oz (20g)
Grease: Polyrex EM
4. Grease the motor bearing at the motor bearing grease port using a grease gun.

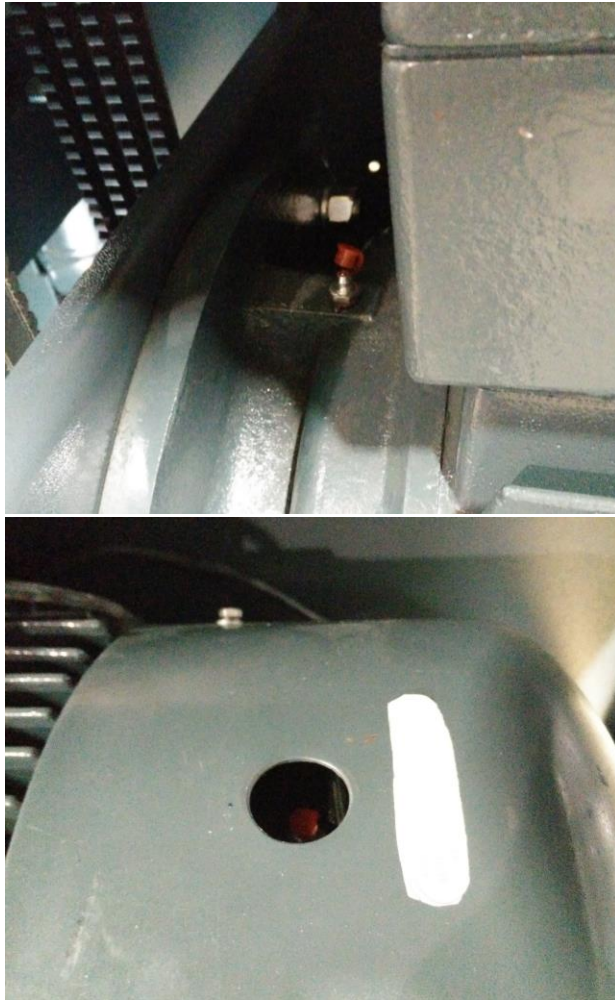


Fig. 37: Example: motor bearing grease port

7.5.9 Replacing the oil/changing the oil filter

Replace the oil

1. Close the shut-off valve on the pressure outlet side and secure it to prevent it from being opened again.
2. Open and remove the enclosure doors with the special wrench.
3. Use a drip pan to make sure that the leaking oil is collected.
4. Unfasten the filler nozzle and remove it. Make sure that the gasket is not misplaced.
5. Unscrew the screw plug.
6. Open the oil drain.
⇒ The oil is drained.

7. Close the oil drain.
8. Screw the screw plug back in.



NOTICE!

Property damage due to incorrect oil!

Mixing different oils or using incorrect oils causes significant property damage to the screw compressor.

- Only use the oil prescribed in the technical data.
- For high temperature systems, use only fully synthetic oil FSC-8000.

9. Use a funnel to top up the oil to the filling edge on the filler nozzle.
10. Position the gasket and check that it is firmly in place.
11. Insert the screw plug and tighten.
12. Switch on the compressor and switch it off again without waiting any longer than one minute ↪ *controller documentation*.
13. Check the oil level and top up as necessary ↪ *Chapter 7.5.3 'Checking the oil level/topping up the oil' on page 36.*

Replace the oil filter

1. Close the shut-off valve on the pressure outlet side and secure it to prevent it from being opened again.
2. Open and remove the enclosure panels with the special wrench.
3. Use a drip pan to make sure that the leaking oil is collected.
4. Use the strap wrench to unfasten and remove the old oil filter.
5. Remove old gasket remains from the oil filter housing.
6. Moisten the new gasket with a little compressor oil.
7. Screw in the new oil filter all the way.
8. Tighten the new oil filter half a turn by hand.
9. Switch on the compressor and switch it off again without waiting any longer than one minute ↪ *controller documentation*.
10. Check the oil level and top off as necessary ↪ *Chapter 7.5.3 'Checking the oil*

level/topping up the oil' on page 36.

7.5.10 Replacing the air/oil separator

7.5.10.1 Spin on/off separator style for 18-37kW

1. Close the shut-off valve on the pressure outlet side and secure it to prevent it from being opened again.
2. Open and remove the enclosure panels with the special wrench.
3. Use a drip pan to make sure that the leaking oil is collected.

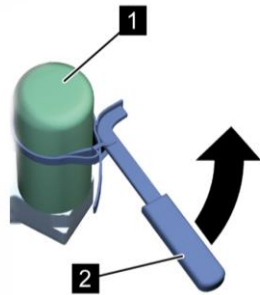


Fig. 38: Unfastening the air/oil separator

4. Use the strap wrench (Fig. 38-2) to unfasten and remove the air/oil separator (Fig. 38-1).
5. Remove old gasket remains from the air/oil separator (Fig. 38-1).
6. Moisten the new gasket with a little compressor oil.
7. Screw in the new air/oil separator (Fig.38-1) up to the stop.
8. Tighten the new air/oil separator (Fig. 38-1) half a turn by hand.

7.5.10.2 Drop in style separator for 45-90kW

1. Switch the screw compressor off and secure it to prevent it from being switched back on again.
2. Close the shut-off valve on the outlet side and secure it to prevent it from being opened
3. Open and remove the enclosure panels with the special wrench.
4. Use a drip pan to make sure that the leaking

oil is collected.

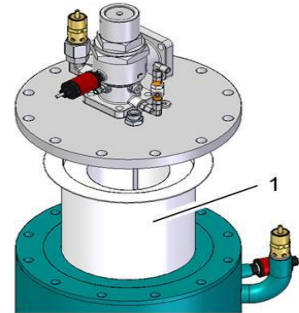


Fig. 39: Unfastening the air/oil separator

- 5 Use a wrench to unfasten the cover of air/oil separator tank and remove the fine separator (Fig. 39-1).
- 6 Remove old gasket remains from the fine separator (Fig. 39-1).
- 7 Moisten the new gasket with a little compressor oil.
- 8 Put the new fine separator (Fig. 39-1) into the air/oil separator tank.
- 9 Lock the cover of air/oil separator tank tight (Fig. 39-1) with a wrench.

7.5.11 Replacing the intake filter

Standard intake filter

1. Close the shut-off valve on the outlet side and secure it to prevent it from being opened again.
2. Open and remove the enclosure panels with the special wrench.

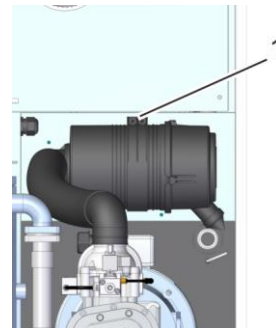


Fig. 40: Unfastening the clamp on the intake filter
3. Unfasten the intake filter (Fig. 40-1).

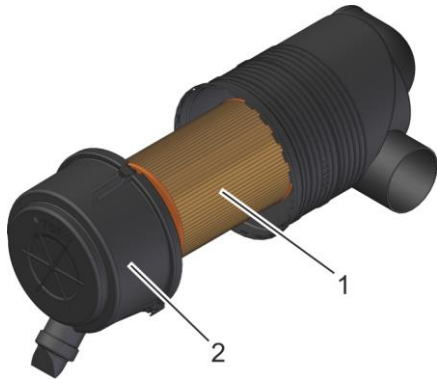


Fig. 41: Removing the cover from the intake filter

4. Remove the cover from the intake filter (Fig. 41-2).
5. Remove the old filter element (Fig. 41-1).
6. Insert the new filter element (Fig. 41-1).
7. Replace the cover on the intake filter (Fig. 41-2).
8. Tighten the clamp on the intake filter (Fig. 41-1).

7.6 Clean/replace scavenge line

1. Close the shut-off valve on the outlet side and secure it to prevent it from being opened again.
2. Open and remove the enclosure panels with the special wrench.
3. Use a drip pan to make sure that the leaking oil is collected.

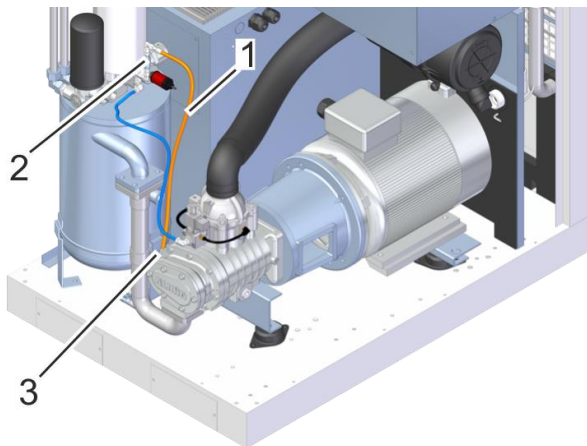


Fig. 42: Return line

4. Unfasten the return line (Fig. 42-1) on the air/oil separator (Fig. 42-2) and the compressor airend (Fig. 42-3).

5. Clean the return line (Fig. 42-1) and nozzle. If necessary, replace them with original spare parts (☞ *Parts List*).
6. Place the nozzle and return line (Fig. 42-1) back in position and tighten the screw connections.

7.7 Measures after maintenance has been performed

After completion of the maintenance work and before switching the machine on, carry out the following steps:

1. Check all previously-loosened hose connections and fittings to make sure they are tight.
2. Check whether all previously-removed protective equipment and covers have been replaced properly.
3. Ensure that all tools, materials and other equipment used have been removed from the work area.
4. Carefully open the compressed air outlet shut-off valve.
5. Clean the work area and remove any substances such as liquids, processing material or similar that may have escaped.
6. Ensure that all safety equipment on the machine functions perfectly.
7. Document all work on the machine in the maintenance log for warranty purposes.

8 Faults

The following section describes possible causes of faults and the work to remedy them.

In case of faults that occur more than once, shorten the maintenance intervals according to the actual utilization.

In case of faults that cannot be remedied using the following instructions, contact your authorized distributors.

8.1 Safety instructions for fault clearance

Electrical system



DANGER!
Danger to life from electric power!

Contact with live parts may prove fatal. When switched on, electric components may be subject to uncontrolled movements and may cause grave injury.

- Switch off the power supply before starting work and make sure that it cannot be switched on again.

Securing to prevent restart



WARNING!
Danger to life from an unauthorized restart!

In the event of an unauthorized restart of the power supply while tracking down and rectifying a fault, there is a danger of serious injuries or death for persons in the danger zone.

- Switch off all power supplies before starting work and make sure they cannot be switched on again.

Improperly executed troubleshooting work



WARNING!
Danger of injury from improper troubleshooting!

Improperly executed troubleshooting work may result in serious injury and significant damage to property.

- Ensure sufficient assembly space before starting work.
- Pay attention to orderliness and cleanliness in the assembly location! Loosely stacked or scattered components and tools could cause accidents.
- If components have been removed, pay attention to correct assembly, refit all fixing elements and comply with bolt tightening torques.
- Before the restart, ensure that
 - all troubleshooting work has been carried out and completed in accordance with the information and instructions in this manual.
 - no persons are in the danger zone.
 - all covers and safety devices are installed and functioning properly.

Hot surfaces



WARNING!
Danger of injury from hot surfaces!

Surfaces of components can heat up a lot during operation. Skin contact with hot surfaces will cause severe skin burns.

- Wear heat-resistant protective clothing and protective gloves during all work near hot surfaces.
- Before all work, make sure that all surfaces have cooled off to the ambient temperature, wait at least 30 minutes.

Compressed air



WARNING!
Danger of injury from compressed air!

Compressed air can escape from compressed air hoses or components under pressure in case of improper handling or in case of a fault. It can injure eyes, whip up dust or cause uncontrolled movements of hoses.

Components under pressure can move in uncontrolled fashion with improper handling and cause injuries.

- Before removing hoses or components, make sure the pressure is relieved.
- Have faulty components that are under pressure during operation replaced by appropriate specialist personnel immediately.

- Before all work, make sure that the compressor is not under pressure; wait at least 5 minutes.

Oil vapor



CAUTION!
Danger of injury from oil vapor!

In case of high temperatures, oil vapor can form. Oil vapor can irritate eyes and the respiratory system.


- When working on the oil system and if an oil vapor arises, wear breathing protection and protective goggles and ensure that there is a fresh air supply.

Behavior in the event of faults

The following applies in principle:

1. Immediately initiate an emergency stop in the event of faults posing an immediate danger to people or property.
2. Ascertain the cause of the fault.
3. If fault rectification requires work in the danger zone, shut down the machine and secure to prevent restarting. Immediately notify those responsible at the place of use about the fault.
4. Depending on the nature of the fault, have it rectified by authorized specialized personnel or rectify it yourself.

8.2 Fault displays

Refer to the  *controller documentation* for information on fault displays.

8.3 Troubleshooting

Fault description	Cause	Remedy
Compressor temperature too high	Intake or ambient temperature too high	Ventilate compressor room
	Cooling air intake or outlet blocked	Unblock cooling air intake or outlet sufficiently
	Oil is degraded	Change oil ↪ Chapter 7.5.9 'Replacing the oil/changing the oil filter' on page 39
	Oil level low	Top up oil ↪ Chapter 7.5.3 'Checking the oil level/topping up the oil' on page 36
	Oil cooler blocked	Clean oil cooler ↪ Chapter 7.5.6 'Inspect/clean coolers ' on page 38
System pressure drops	Compressed air consumption higher than flow capacity of the screw compressor	Screw compressor with greater flow capacity necessary
	Intake filter clogged	Replace intake filter ↪ Chapter 7.5.11 " on page 40
	Bleeder valve blows during compression	Check bleeder valve and replace gaskets if necessary
	Intake valve does not open	Check solenoid valve and replace if necessary
	Leaks in the compressed air network	Seal up the compressed air network
Screw compressor blows via safety valve	Minimum pressure valve blocked	Clean or replace minimum pressure valve
	Safety valve faulty	Check safety valve and replace if necessary
	Air/oil separator clogged	Change air/oil separator ↪ Chapter 7.5.10 'Replacing the air/oil separator' on page 40
"Overpressure fault" or "Network pressure too high"	Air/oil separator clogged	Change air/oil separator ↪ Chapter 7.5.10 'Replacing the air/oil separator' on page 40
	Higher outside pressure present in compressed air network	Balance out outside pressure or disconnect from the network
Compressor does not start automatically or does not discharge after previous switching-off by reaching the final pressure or from idle.	Network pressure set too high	Reset network pressure ↪ Controller documentation
	Interruption in the power circuit	Check power circuit for interruption
	Ambient temperature below +34F (+1 °C), message "Oil temperature too low"	Install additional heating or warm up the compressor room and also contact your authorized distributor
	Switching times are activated in the circuitry	Check switching and pressure times in the circuitry ↪ Controller documentation
System does not start up when the	Network pressure greater than switch-on pressure	Heed network pressure and change settings ↪ Controller documentation

Fault description	Cause	Remedy
start key is pressed	Symbol "remote" flashes	Remote control activated ↪ <i>Controller documentation</i>
	Lacking voltage on the screw compressor	Check incoming voltage
	Electrical fault in the controller	Check controller ↪ <i>Controller documentation</i>
	Switching times are activated in the circuitry	Check switching and pressure times in the circuitry ↪ <i>Controller documentation</i>
Compressed air contains a lot of oil (oil consumption too high)	Return line for the oil is blocked	Clean or replace return line for the oil ↪ <i>'Clean/replace scavenge line' on page 41</i>
	Flawed air/oil separator	Change air/oil separator ↪ <i>Chapter 7.5.10 'Replacing the air/oil separator' on page 40</i>
	Wrong oil being used	Refer to ↪ <i>Chapter 5.2.2 'Oil' on page 31</i>
System stops before reaching the final pressure	Overheating or overpressure	Remedy fault ↪ <i>Controller documentation</i>
	Interruption in the control power circuit	Check power circuit
	Overload motor, thermal overload relay tripping	Press reset button on overload. Inspect motor circuit for over current condition
Pressure drop	Pressure difference of the filter too high	Replace filter

8.4 Work for fault clearance

Observe all safety instructions and precautions as described in this manual, and in particular section ↪ 1.3 General safety.

1. Reset emergency stop equipment.
2. Acknowledge fault ↪ *Controller documentation*.
3. No persons are in the danger zone.
4. Start the screw compressor ↪ *Controller documentation*.

8.5 Commissioning after remedied fault

After remedying the fault, carry out the following steps for re-commissioning:

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10 Appendix

10.1 Bolt tightening torque requirements

Lock screw/nuts B 158/193/196/251 design or similar				
Thread	Category 8.8	Unit	Category 10.9	Unit
M 5	3.69 (5)	lbf ft (Nm)	7.38 (10)	lbf ft (Nm)
M 6	5.9 (8)	lbf ft (Nm)	13.28 (18)	lbf ft (Nm)
M 8	14.75 (20)	lbf ft (Nm)	32.45 (44)	lbf ft (Nm)
M 10	29.5 (40)	lbf ft (Nm)	64.17 (87)	lbf ft (Nm)
M 12	50.89 (69)	lbf ft (Nm)	111.37 (151)	lbf ft (Nm)
M 16	125.39 (170)	lbf ft (Nm)	280.27 (380)	lbf ft (Nm)

Lock screw/nuts DIN 912/931/933/934/982 design or similar				
Thread	Category 8.8	Unit	Category 10.9	Unit
M 5	4.43 (6)	lbf ft (Nm)	6.27 (8.5)	lbf ft (Nm)
M 6	7.38 (10)	lbf ft (Nm)	10.33 (14)	lbf ft (Nm)
M 8	18.44 (25)	lbf ft (Nm)	25.81 (35)	lbf ft (Nm)
M 10	36.14 (49)	lbf ft (Nm)	50.89 (69)	lbf ft (Nm)
M 12	63.43 (86)	lbf ft (Nm)	88.51 (120)	lbf ft (Nm)
M 16	154.89 (210)	lbf ft (Nm)	217.58 (295)	lbf ft (Nm)

10.2 Oil change intervals at elevated temperatures

Discharge temperature	FSC-8000 Change interval	FSC-4000FG Change interval
Up to 180F	8000 Hrs	4000 Hrs
180 to 190F	6000 Hrs	3000 Hrs
190 to 200F	4000 Hrs	2000 Hrs
200 to 210F	2000 Hrs	1000 Hrs



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