BOGE AIR. THE AIR TO WORK.

BOGE
COMPRESSED AIR SYSTEMS

Operating instructions

Belt-driven screw compressors

Series
C 4...C 9
C 4 D...C 9 D

Separate manual:
Compressor control

GLC CERTIFIED ISO 9001

www.boge.com

Operating instructions for belt-driven screw compressors

- **C 4 / C 4 D (3.0 kW)**
- **C 5 / C 5 D (4.0 kW)**
- **C 7 / C 7 D (5.5 kW)**
- **C 9 / C 9 D (7.5 kW)**

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1.1 General safety instructions

Caution!

Nonobservance of the following safety instructions may lead to injuries and damage to the compressor.

Also observe the generally valid safety and accident prevention regulations in addition to the information in these operating instructions!

Safety instructions for operation

Compressor

1. Ensure that no commissioning and maintenance work on the compressor is undertaken until these operating instructions are understood.
2. Only use the compressor for its intended use, as described in these operating instructions.
3. The owner must ensure:
   – that only appropriately trained and authorized personnel work on this compressor,
   – that no persons work on this compressor, whose ability to react is restricted due to misuse of e.g. drugs, alcohol, medication etc.,
   – that the operating, maintenance and repair personnel has been made fully familiar with all safety instructions, and that they are being observed,
   – that the compressor is only operated in a safe operating condition.
4. Avoid any operating method which may impair the safety of the compressor.
5. Always wear your compulsory personal protective quipment as a protection against injuries from sharp corners or edges when working on the compressor.
6. To avoid dangers from debris or parts lying around, the service area of the compressor has always to be kept tiedied up and clean.
7. Always squat when working on components mounted at low height, never stoop. When working on components mounted higher up always stand upright and erect.
8. Do not exceed the limit value for the final compression pressure specified on the type plate.
9. Do not operate the compressor without the attendant protection and safety devices.
   Do not dismantle any built-in safety devices or put them out of operation. Ensure that all safety claddings and doors are closed prior to commissioning/starting up the compressor and that they are not opened during operation.
10. Place the compressor out of operation as described in these operating instructions, when dismantling the safety claddings or safety devices for repair or maintenance work. Reattach and close all cladding and safety devices immediately upon completion of the repair or maintenance work.
11. Only operate the compressor using the additional equipment (options) recommended or authorized by the manufacturer.

12. Undertake conversions and modifications of the compressor only in agreement with BOGE, taking all relevant safety regulations into consideration. The manufacturer is not liable for damages resulting from independent modifications on the compressor.
13. Never start the compressor when one or serveral parts (e.g. cable, plug) are damaged, when not in perfect working order and when damage is detected or suspected.
14. Observe all safety and danger signs directly attached on the compressor!

Compressed air dryer DRL 9

15. This refrigeration compressed air dryer will also be called DL dryer hereafter.
16. The company does not assume any liability with respect to the non-adherence to or non-observance of any safety instructions concerning the handling, operation, maintenance or repair if even such instructions are not expressly being referred to in this operation manual.
17. We recommend that the operating personnel be required to confirm notice of said operating manual in writing (personal file).
18. The operational capability and service life of the refrigerant compressed air dryer as well as the prevention of premature repairs depend on proper operation, service, maintenance and professional repair in accordance with the instructions contained in this operating manual.

Special hazard warnings

– Any performance of work on pressurized system components may be carried out by duly qualified and specialized personnel only.
– Always wear your compulsory personal protective equipment when working on pressure pipes and connections!
– A protective grid serves to prevent you from accidentally reaching into the impeller of the cooling fan.

Caution: Risk of injury!

A protective grid serves to prevent you from accidentally reaching into the impeller of the cooling fan!

Please note that the cooling fan may run on for a certain time even after the compressor has been switched off!

– During operation, the compressor generates a high sound pressure level which may cause permanent hearing damage due to continuous noise stress. As a rule, the compressor may only be operated with its housing cover closed. Make sure to additionally wear a hearing protection in case of a noise pressure level above 80 dB(A)!
– Any pipelines and/or auxiliary equipment on the compressor are designed such as to resist to any adverse operating conditions and any predictable external influences. Make sure to operate your compressor within the parameters specified in the Technical Data Sheet!
– Exceeding the max. pressure or simultaneous failure of several safety devices will cause the safety valve to be activated. There will be risk of escaping hot air!

Electrical energy hazards

Warning: High Voltage!

There is danger of life when working on the electrical equipment of the compressor!

- Disconnect mains connection prior to starting to carry out works on the compressor and use padlock to secure against switching on again.
- Only duly authorized professional electricians (e.g. plant electricians) are allowed to carry out works in the electrical area of the machine.
- Make sure to check the electrical equipment of the compressor at regular intervals for defects such as loose connections or scorched cables and have any defects repaired immediately.
- Make sure to have all electrical equipment and fixed electrical installations checked by a professional electrician at least every 4 years.
- Any modifications that may have been carried out after examination must conform to DIN EN 60204-1:2007.
- Make sure to check all safety installations on the machine for proper functioning at regular intervals.
- Only use original fuses.

Obligations of the owner

The owner is obliged to,

- operate the compressor only in technically perfect condition,
- check the Emergency Stop device of the compressor regularly for completeness and functionality,
- assess the hazards of the machine working places in his area of responsibility and to issue the ensuing operating instructions,
- to name a person responsible beeing in charge of the safe operation of the machine as well as the coordination of all service work performed on it,
- avoid stress situations while operating the compressor by means of technological and organizational operation scheduling,
- ensure a proper workplace lighting at the compressor control section according to the local health and safety regulations,
- observe the safety data sheet of the used lubricants and to customize the personnel all information as to said data sheet,
- provide the compulsory personal protective equipment and to stipulate and check the wearing of said protective equipment on a regular basis,
- assign the personnel responsible for various tasks and work on the machine,
- instruct the personnel on a regular basis with respect to all obligations as to compressor related preservation of safety and tidiness.

Personnel requirements

Work on and with the compressor may only be carried out by personnel duly authorized by the owner of the compressor.

The personnel working on the compressor has to observe all industrial safety regulations and operating instructions, properly recognize responsibilities and read and understand the operating instructions. It is essential to wear the compulsory personal protective equipment when working on the compressor!

Personal protective equipment

In general for all work on the compressor

– protective clothing,
– chemicals resistant gloves,
– slip-resistant safety shoes and
– hearing protection, if applicable,

are compulsory.

For special duties

– protective helmets (for transport work with lifting gear) and
– safety goggles (when working on the compressed air system, on the control pneumatics and/or on the cooling system of the built-in dryer)

must be worn.

Before starting work using oils or greases a skin protection cream must be applied. Having finished the work a skin care product must be applied.

Safety instructions for maintenance and repair of the compressor

Compressor

Caution!

Only use original spare parts, compressor oils and operating materials released by BOGE during repair or maintenance.

Warning: High voltage!

When working on the electrical system there is a constant danger of getting into contact with live parts!

To avoid such dangers the mains connection must be equipped with a disconnecting device!

The mains disconnecting device has to meet the requirements of DIN EN 60204-1:2007!

1. Ensure that maintenance work is only carried out by appropriately trained persons.
2. Ensure that setting work, malfunction rectification and repair is only carried out by specialists or appropriately trained persons.

3. Prior to maintenance or repair work:
   – Press Emergency Stop button.
   – Open mains disconnecting device.
   – Secure mains disconnecting device against unintentional switching on by means of a padlock.
   – Fix a warning label to the control and fill in the name of the person responsible who is authorized to switch on the maschine again.
   – Check to ensure that all parts are currentless.
   – Disconnect the compressor from the compressed air network (relieve or block pressurized lines).
4. Exercise extreme caution during repair or maintenance work requiring the compressor to be operational.
   Ensure that persons keep out of reach of the hazardous area.
5. Ensure that work on the electrical equipment is only executed by qualified electricians.
6. Work on parts and devices under current is prohibited. Exceptions are governed by the appropriate regulations, e.g. DIN VDE 0105.
7. Prior to starting work on the electrical system the power supply has to be switched off and secured against unintentional switching on again. Immediately after having finished the work all dismantled claddings and safety devices must be refitted.
8. The operator is responsible to check the compressor daily for externally visible damage and defects, and to immediately report any changes (including operational behaviour).
9. When the automatic restart (Auto-Restart) is activated, the compressor will start automatically following a voltage loss.
   Prerequisite: The net pressure is lower than the set switch-on pressure.

Compressed air dryer DRL 9

Attention!

The user / operator are required to adhere to any existing national work, operating and safety regulations.

Any existing internal company regulations are also to be observed.

Any maintenance or repairs are to be carried out by specially trained personnel only and, if necessary, under the supervision of a person duly qualified for such type of work.

10. No protection or safety device may temporarily or permanently be modified, adjusted or removed from the DL dryer.
11. Make sure to only use appropriate tools during maintenance or repairs.
12. Only use original replacement parts.
13. Make sure that any maintenance or repair be only carried out with the system and the power supply being shut off. Also ensure to protect the DL dryer from accidental switching on.
14. Prior to removing any pressurized component make sure to effectively separate the DL dryer from any sources of pressure.

15. Do not use any flammable solvents for cleaning.
16. Maintenance and repairs require utmost cleanliness. Keep away dirt by protecting components and uncovered openings by means of a clean cloth, paper or adhesive tape. Never carry out any welding and/or modifications of any kind on a pressure tank.
17. Never carry out any welding and/or modifications of any kind on a pressure tank.
18. Make sure not to leave behind small tools, loose parts or the like in the compressor station.

Accident prevention regulations

The owner of a compressor plant is responsible to ensure that it is properly installed, operated and maintained.

Prior to commissioning, owners in the Federal Republic of Germany urgently have to read the currently valid regulations of the Main Association of the Industrial Employers' Liability Insurance. Apart from other regulations particularly the Ordinance on Industrial Safety and Health (BetrSichV) is applicable.

The regulations are available at the following locations:

Berufsgenossenschaft (Industrial Employers' Liability Insurance)
Carl-Heymanns-Verlag KG, Luxemburger Straße 449, D-50939 Köln
Beuth Verlag GmbH, Burggrafenstraße 6, D-10787 Berlin

For operation of the compressor plant outside the Federal Republic of Germany, the accident prevention regulations of the country, where the compressor is operated, must be observed in addition to the data contained in these operating instructions.

In the event that measures are required above and beyond the legal regulations specified in the Federal Republic of Germany or the data contained in these operating instructions, then it is of utmost importance that these be carried out prior to commissioning the compressor plant.

Handling of refrigerants

1. Always wear protective goggles and gloves.
2. Prevent liquid refrigerants to come into direct contact with the skin (will cause frostbites).
3. Do not inhale refrigerant vapours.
4. In order to avoid higher concentrations to build up, make sure to sufficiently ventilate workrooms. Opening of doors or windows may possibly be not enough; an exhaust device, preferably close to the connection or the ground, is to be installed.
5. Do not smoke; refrigerants tend to be decomposed by burning cigarette ash. The emitted decomposition substances are toxic and must not be inhaled.
6. Make sure to prevent refrigerants from escaping during filling or repairs.
7. In case of sudden formation of refrigerant concentrations (e.g. due to breakage of pipeline) immediately leave the room and do not re-enter but after sufficient ventilation.
8. Make sure to carry any welding or soldering on refrigerant plants in sufficiently ventilated areas only. Refrigerants tend to be decomposed by flames and electric arcs.
9. Any emitted decomposition products are toxic.

10. It is imperative that the refrigerant be removed prior to any welding or soldering on refrigerant plants.
11. Pungent odors are indicative of refrigerant decomposition:
    – Leave room at once.
    – Thoroughly ventilate room.

First Aid

1. Any victims are to be immediately removed into fresh air or a well ventilated room.
2. Any refrigerant splashes in the eyes are to be blown off by mouth. Rinse eyes with plenty of water. Do not use cloths to wipe eyes!
3. If the victim does not breathe, rescue breathing is to be started by means of artificial breathing or the use of an oxygen breathing apparatus until the arrival of the emergency doctor.
4. CALL A DOCTOR and inform him that refrigerants as specified on the nameplate are being used!
5. Never leave the victim unattended!

Disposal

Caution!

Waste oil must in no way be disposed of in the environment, mixed with domestic refuse, or burnt in plants unapproved for that purpose.

1. When disposing of old equipment do not forget that DL dryers in a closed refrigeration system contain oil and refrigerants. Therefore, prior to disassembly, make sure that such working materials be disposed of by a specialized company.
2. Appropriate measures are to be implemented to prevent refrigerants from escaping into the atmosphere.

1.2 Introduction

The purpose of these operating instructions is to familiarize the user with the function and all application possibilities of the compressor.

These operating instructions contain important information on how to operate the compressor safely, economically and according to its intented use. Observing these operating instructions will assist in avoiding danger, to reduce repair costs and down times and to increase the reliability and service life of the compressor. It contains important information concerning the required maintenance and repair measures, assists in case of malfunctions and contains data concerning spare and wearing parts.

The operating instructions must be available to the compressor operating personnel at the place of operation, at all times.

The operating instructions must be carefully read and applied by all persons engaged to undertake the following work on the compressor:

– Operation, including fault rectification and daily care
– Maintenance (service, inspection, repair)
– Commissioning
– Transport

The compressor and its additional equipment must not be installed and commissioned until the operating instructions are understood.

These operating instructions can be supplemented with instructions on the basis of existing national regulations concerning accident prevention and environmental protection.

In the illustrations, the compressor is shown in part without safety cladding or safety devices for better visualization. However, operation without these components is prohibited!

Symbols used

In these operating instructions the most important safety notes and tips are especially characterized by the following symbols:

Caution: Risk of injury!

This symbol indicates information warning of possible danger to life and limb of the operator or other persons.

Attention!

This symbol indicates information warning of dangers to life and limb of the operator or other persons or dangers, which might destroy or damage the compressor.

Warning: Voltage!

This symbol indicates information warning of life threatening electrical voltage levels.

It indicates work which must be exclusively performed by skilled electricians.

Note!

This symbol indicates information and tips concerning the economical and careful operation of the compressor.

Symbols on the compressor

Note!

All warning signs on the compressor and in its surrounding must always be kept in a legible condition. Missing or damaged signs must be replaced at once!

The following symbols and warning signs are fitted on the compressor:

Warning!

Hot surfaces: Do not touch!

Warning!

The unit is operated by remote control, and might start without warning.

Note!

Instructions for the operating personnel must be read.

Prohibited!

Never open the valve before the air hose (connection to the compressed air network) is connected.

Intended use

Caution!

Compressor

BOGE compressors, including their additional equipment, are exclusively intended for the compression of air.
The air taken in must not contain any explosive or chemically instable gases or vapours.
Do not exceed the specified final compression temperature.

BOGE compressors are designed for stationary operation.
Ensure that they are only installed and operated in dry and clean rooms.

Operation and control are designed to be executed by trained and authorized operators.

Compressed air dryer DRL 9

The DL dryer is exclusively designed for the dehumidification of compressed air.

Foreseeable misuse

Caution!

Never direct the produced compressed air towards persons.
Danger to life!

Oil is injected into the pressure rooms of the compressor.
Only use the produced compressed air for breathing or let it come in contact with foods, if it was treated beforehand.

This BOGE compressor is not explosion protected.
Do not operate in explosive areas or in a possibly explosive atmosphere!

Do not operate the compressor in rooms in which extreme dust, toxic or flammable vapours and gases may occur.

The following is not permitted:

- Compression of other media than those mentioned under intended use or compression of air loaded with contaminants.
- Exceeding the final compression pressure indicated on the type plate.
- Altering the safety devices and safety cladding or placing them out of operation.
- Removing or painting over signs and symbols on the compressor.
- Operation of the compressor by unauthorized or untrained persons.

Transport damage

BOGE does not accept any liability for breakage or transport damage. Please inspect the compressor immediately after delivery and direct damage claims to the last haulier – even when the packing is not damaged!
To safeguard claims against the haulier we recommend leaving the machine, devices and packing material in the same condition as they were in when the damage was detected.

In the event of any other complaints, please inform us within six days after arrival of the delivery.

Data on the type plate

Enter the data of your compressor from the type plate or enclosed data sheet in the illustration below. This will ensure that in the event of enquiries, you will always have the most important data to hand.

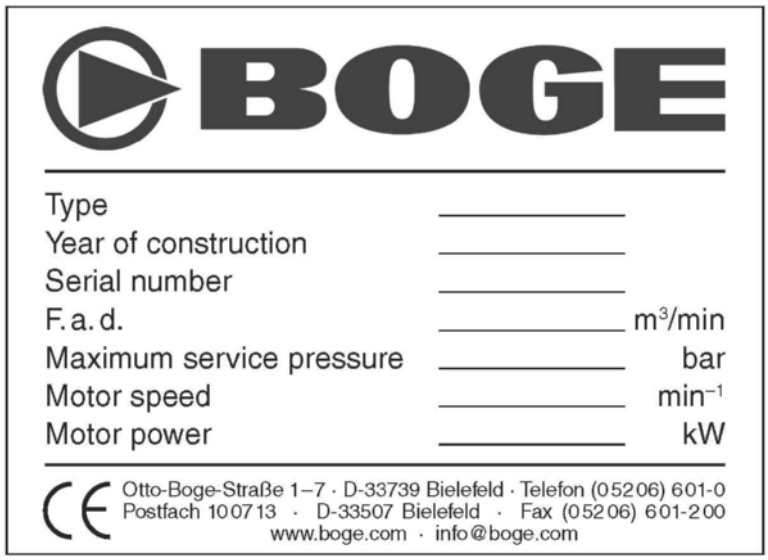


Fig. 1.1: Data on the type plate

Service

Please do not hesitate to contact BOGE service if you have any questions. Please call:

Telephone: +49 5206 601-140

In the event of inquiries, always specify the following data of your compressor to prevent any delays:

– Type
– Year of manufacture
– Machine number

Attention!

Only BOGE service technicians or persons authorized by BOGE in writing may repair or alter the compressor during the warranty period. Otherwise all warranty claims will expire!

2.1 Technical data Compressor

Technical data C 4...C 9, part 1
C 4 D...C 9 D, part 1

Type		C 4	C 5	C 7	C 9	C 4 D	C 5 D	C 7 D	C 9 D
Dimensions									
– Width	[mm]	480	480	480	480	480	480	480	480
– Depth	[mm]	907	907	907	987	987	987	987	987
– Height	[mm]	955	955	955	1234	1234	1234	1234	1234
Weight									
– silenced	[kg]	–	–	–	–	–	–	–	–
– super-silenced	[kg]	190	195	210	215	190	195	210	215
Max. sound pressure level	[±3 dB(A)]								
acc. to DIN EN ISO 2151:2009									
– silenced / super-silenced	[dB(A)]	59	63	64	68	59	63	64	68
Measuring surface dimension									
– silenced / super-silenced	[dB(A)]	14	14	14	16	14	14	14	16
Sound capacity level									
– silenced / super-silenced	[dB(A)]	73	77	78	84	73	77	78	84
Compressor									
max. final compression temperature	[°C]	110	110	110	110	110	110	110	110
Volume flow acc. to									
ISO 1217 appendix C at:									
– p_{max} = 8 bar	[m^3/min]	0,427	0,630	0,900	1,200	0,427	0,630	0,900	1,200
– p_{max} = 10 bar	[m^3/min]	0,340	0,545	0,770	1,100	0,340	0,545	0,770	1,100
– p_{max} = 13 bar	[m^3/min]	0,280	0,440	0,642	0,900	0,280	0,440	0,642	0,900
Drive motor									
Rated power	[kW]	3,0	4,0	5,5	7,5	3,0	4,0	5,5	7,5
Electr. power intake dryer	[kW]	–	–	–	–	0,19	0,19	0,26	0,29
Nominal speed									
– 50 Hz	[min^{-1}]	3000	3000	3000	3000	3000	3000	3000	3000
– 60 Hz	[min^{-1}]	3600	3600	3600	3600	3600	3600	3600	3600
Protection type	IP	55	55	55	55	55	55	55	55
Design	IMB	3	3	3	3	3	3	3	3
ISO class		F	F	F	F	F	F	F	F
Elektrical connection									
Mains voltage/compressor / dryer [1]	[V]	400	400	400	400	400/230	400/230	400/230	400/230
Frequency [1]	[Hz]	50	50	50	50	50	50	50	50
Min. fuse protection [2] [3]	[A]	16	16	20	35	16	16	20	20
Recommended fuse protection [2] [3]	[A]	20	20	25	35	20	20	25	35

[1] Standard equipment. Mains voltages and frequencies are specified on a plate in the switch cabinet.

[2] Only for 400 V / 50 Hz. The fuse values change in the case of other mains voltages and frequencies.

[3] Use fuse gL – gG or circuit-breaker with C-characteristic only.

Technical Data C 4...C 9, part 2
C 4 D...C 9 D, part 2

Type		C 4	C 5	C 7	C 9	C 4 D	C 5 D	C 7 D	C 9 D
Oil filling quantity									
Total oil filling quantity	[l]	4	4	4	4	4	4	4	4
Oil topping up quantity between min. + max.	[l]	1	1	1	1	1	1	1	1
Intake air temperature									
– min.	[°C]	5	5	5	5	5	5	5	5
– max.	[°C]	40	40	40	40	40	40	40	40
Cooling air requirement									
– free-standing installation	[m^3/h]	1600	2200	3000	4000	1600	2200	3000	4000
– with supply and exhaust duct	[m^3/h]	800	1100	1500	2000	800	1100	1500	2000
– free ventilator pressure	[Pa]	60	60	60	60	60	60	60	60
– free ventilator pressure	[mm WCol]	6	6	6	6	6	6	6	6
Operating pressure values [1] (factory settings)									
– p_{max} = 8 bar: Swich-off press. p_{max}	[bar]	8	8	8	8	8	8	8	8
Swich-on press. p_{min}	[bar]	7	7	7	7	7	7	7	7
– p_{max} = 10 bar: Swich-off press. p_{max}	[bar]	10	10	10	10	10	10	10	10
Swich-on press. p_{min}	[bar]	9	9	9	9	9	9	9	9
– p_{max} = 13 bar: Swich-off press. p_{max}	[bar]	13	13	13	13	13	13	13	13
Swich-on press. p_{min}	[bar]	12	12	12	12	12	12	12	12
Safety valve Activation pressure at:									
– p_{max} = 8 bar	[bar]	11	11	11	11	11	11	11	11
– p_{max} = 10 bar	[bar]	11	11	11	11	11	11	11	11
– p_{max} = 13 bar	[bar]	14	14	14	14	14	14	14	14

[1] Compressors for other operating pressures $p_{min} = p_{max} – 1$ bar.

2.2 Technical data compressed air dryer DRL 9

Pos. No.				
1	Volume flow		m^3/h	85
			m^3/min	1.42
2	Cooling air requirement		m^3/h	320
3	Power input (total)	50 Hz	kW	0.26
		60 Hz	kW	0.30
4	Power input (ventilator)	50 Hz	kW	0.06
		60 Hz	kW	0.07
5	Electrical connection		50/60 Hz	230 V 1N~
6	Permissible pressure (compressed air)	min. / max.	bar	2 / 13
7	Permissible pressure (coolant)	Low pressure side / High pressure side	bar	16 / 22
8	Pneumatic connection	G		1 / 2
9	Weight		kg	29
10	Dimensions	Height	mm	450
		Width		450
		Depth		310
11	Refrigerant filling quantity	R134a	kg	0,38
12	ound pressure level (in 1 m distance)		dB (A)	< 70
13	Protection type		IP	20
14	Condensate drain	Hose	mm	8

Explanatory notes:

Accord. to pos.1:	Volume flow related to intake state of air compressor		+ 20°C	1 bar
		at compressed air inlet:	+ 35°C	
		Operating pressure:		7 bar
		Ambient temperature:	+ 25°C	
		Pressure dew point measured at dryer outlet:	+ 3°C	
Accord. to pos. 3, 4:	Power input at ambient temperature:		+ 25°C	
	Compressed air inlet temperature:		max. + 70°C	
	Admissible ambient temperature:		min. + 2°C	
	Admissible ambient temperature:		max. + 50°C	
	Subject to technical changes or modifications!			

2.3 Function description compressor

Function principle of the air end

The air end operates according to the displacement principle. In the housing, the main and secondary screws are driven by means of an electric motor and V-belt.

Both screws have screw-shaped profiles, intermeshing without contact. Together with the housing wall, these screws form chambers which gradually reduce in size, seen in air flow direction.

Rotation of the rotors causes the air taken in to be compressed to the final pressure in the chambers.

During compression oil is continuously injected into the air end. This having a cooling, sealing and lubricating function.

Air circuit

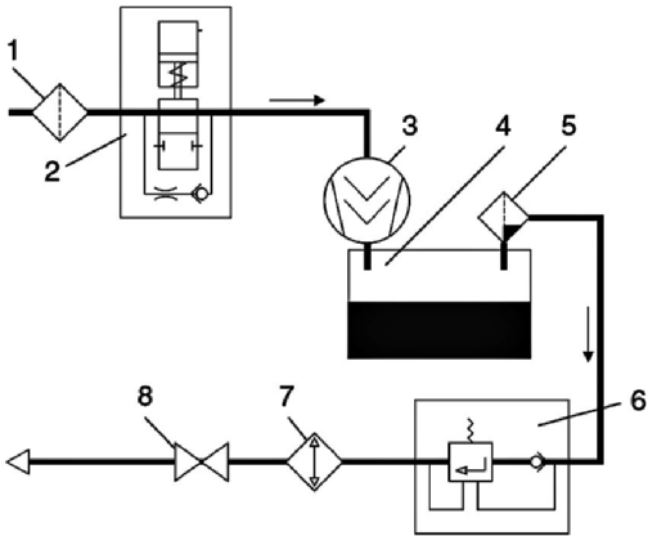


Fig. 2.1: Components of the air circuit

1 Intake filter
The intake filter cleans the air suctioned by the air end.

2 Intake regulator
The intake regulator opens (load operation) or closes (idling operation or standstill) the suction line depending on the operating condition of the compressor.

3 Air end
The air end compresses the suctioned air.

4 Compressed air/oil chamber
The compressed air separates from the oil under the force of gravity in the compressed air/oil chamber.

5 Oil separator
The oil separator separates the residual oil contained in the compressed air.

6 Minimum pressure check valve
The minimum pressure check valve does not open until the system pressure has increased to 3.5 bar. This causes a rapid build-up of the system pressure and ensures lubrication in the starting phase. Once the compressor has been switched off, the check valve prevents the compressed air from flowing back out of the mains line.

7 Compressed air after-cooler (air cooled)
The compressed air is cooled in the compressed air after-cooler, causing the water contained in the air to condensate.

8 Stop valve
The screw compressor may be isolated from the mains by means of the stop valve.

Oil circuit

The oil injected into the air end has the following function:

– It dissipates the compression heat (cooling).
– It seals the gaps between the screws and between the screws and housing.
– It lubricates the bearings.

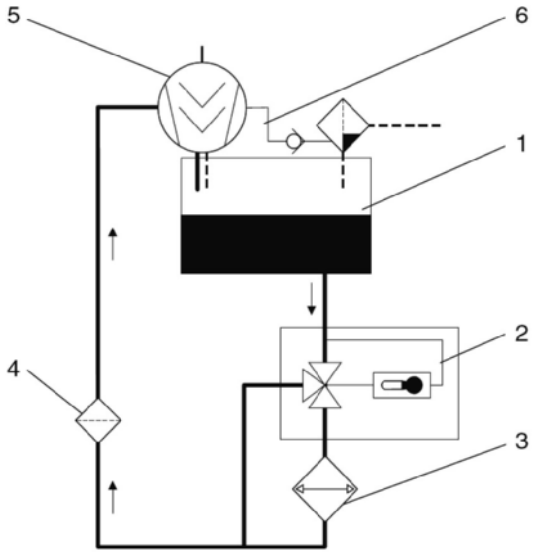


Fig. 2.2: Components of the oil circuit

1 Compressed air/oil chamber
The oil separated from the compressed air through the force of gravity collects in the compressed air/oil chamber.
The system pressure forces it out of the receiver into the air end.

2 Thermostatic oil control valve
Depending on the oil temperature, the thermostatic oil control valve either allows the oil to pass through the oil cooler or through a bypass (e.g. in the starting phase).
Thus the oil constantly maintains its optimum operating temperature.

3 Oil cooler (air or water cooled)
The oil cooler cools down the hot oil to operating temperature.

4 Oil filter
The oil cooler cools down the hot oil to operating temperature.

5 Air end
The injected oil returns to the compressed air/oil receiver together with the compressed air. There, it is separated through the force of gravity.

6 Drainage line
The air end suctions the residual oil which collects in the oil separator back into the oil circuit via a drainage line.

2.4 Function description compressed air dryer DRL 9

Equipment overview

The following components of the compressed air dryer are accessible from the outside:

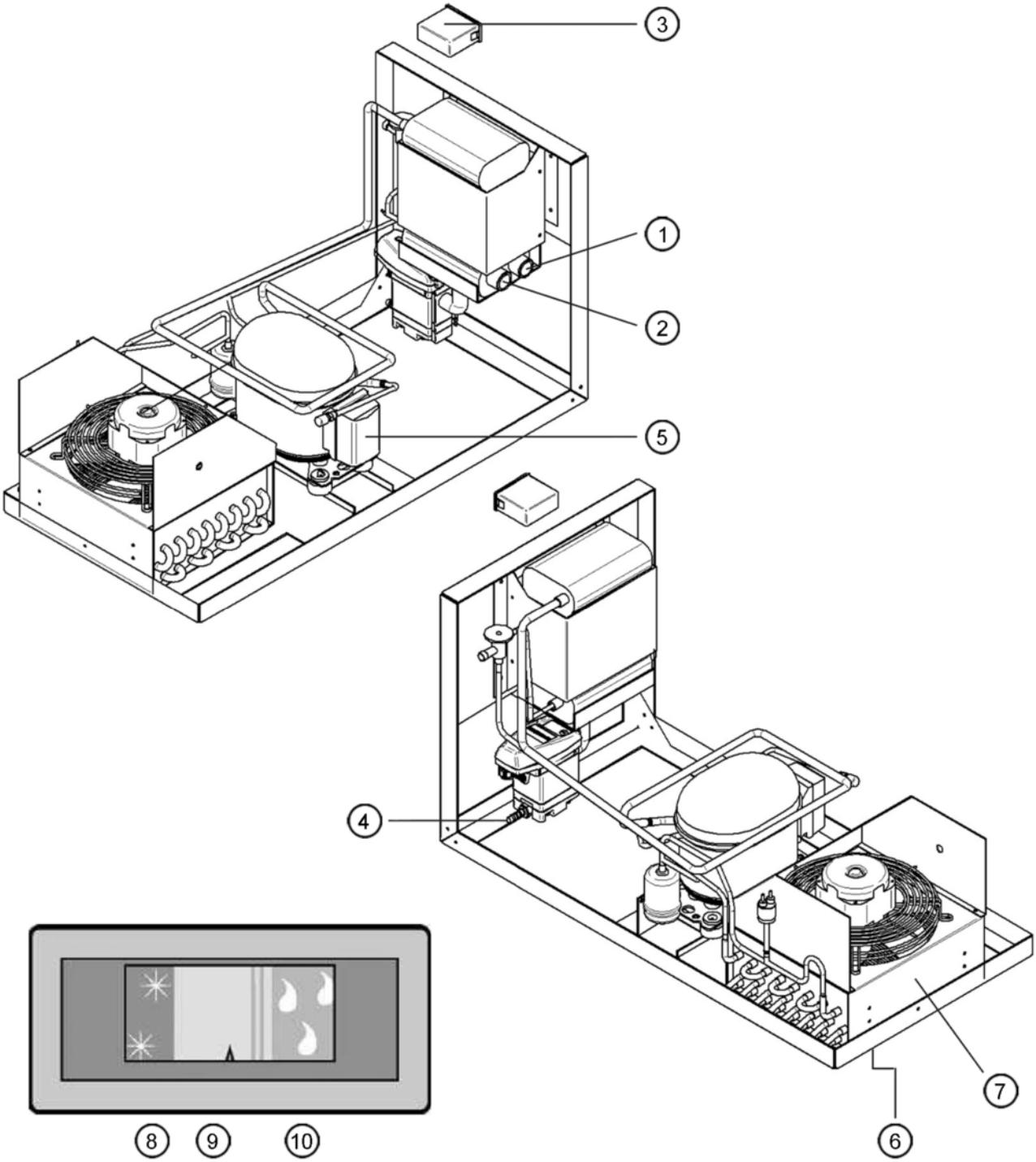


Fig. 2.3: Overview compressed air dryer DRL 9 with pressure dew point display

1 Compressed air inlet
2 Compressed air outlet
3 Pressure dew point display
4 Condensate drain
5 Electrical connection
6 Cooling air inlet
7 Cooling air outlet
8 Blue field: Pressure dew point too low
9 Green field: Pressure dew point ok
10 Red field: Pressure dew point too high

Function principle

The compressed air dryer is equipped with a refrigerating system causing the compressed air to be cooled by way of lowering the water vapor saturation limit. This causes the formation of condensate which is being discharged by a condensate drainer. The larger the cooling temperature difference of the compressed air, the larger the condensed amount of water.
The lower the cooling temperature of the compressed air, the smaller the moisture content.
The lower limit of the compressed air cooling results from the working principle of the compressed air dryer, i.e. that the separation of humidity in liquid state can only be effected above the freezing point of water.

2.5 Compressor control

Network pressure

For the compressor, the pressure downstream of the check valve is termed network pressure. The control system switches the compressor on and off during operation depending on the network pressure.

Operating states

All screw compressor controls are based on three basic operating states:

1. **Load operation**
   - The compressor delivers its maximum amount of compressed air.
   - It consumes its maximum energy.
2. **Idling operation**
   - The compressor runs but does not deliver any compressed air.
   - It consumes approx. 75% less energy than in load operation.
   - When compressed air is required, it switches to load operation without delay.
   - Idling operation reduces switching frequencies which can damage the drive motor, and reduces wear of the system.
3. **Standstill ready for operation**
   - The compressor is standing still but ready for operation.
   - When compressed air is required, it switches automatically to load operation.

Operating modes

The two most important operating modes are achieved by combining the three operating states:

1. **Intermittent operation**
   In intermittent operation the energy balance is perfect.
   - The compressor operates in load operation.
   - Upon reaching the switch-off pressure p_{max} the compressor switches to standstill. It does not consume any energy.
   - Once the pressure has dropped to the switch-on pressure p_{min} the compressor switches back to load operation..
2. **Continuous operation**
   Continuous operation limits the drive motor switching cycles and reduces wear to the system.
   - The compressor operates in load operation.
   - Upon reaching the switch-off pressure p_{max} the compressor switches to idling operation.
   - Once the pressure has dropped to the switch-on pressure p_{min} the compressor switches from idling operation back to load operation.

Short operating times

Attention!

During short operating times, the compressor does not reach its operating temperature. It operates below the dew point. The generated condensate mixes with the oil. The lubricating ability of the oil is reduced. This leads to damage on the air end. It is of utmost importance to consult BOGE, if you operate your system with short operating times.

2.6 Control for compressed air dryer DRL 9

Compressed air side

The precooled and moisture-saturated compressed air in the aftercooler is transferred into the compressed air dryer and precooled in the first cooling stage, viz. the air/air heat exchanger, without any additional external energy. This is effected in counterflow to the already cooled compressed air which is being heats up at the same time. The second cooling stage, viz. the refrigerant/air heat exchanger which is being cooled by the integrated cooling system, enables cooling down to the pressure dewpoint. Then the cooled compressed air is again heated up in the air/air heat exchanger as described above. The pressure dewpoint is being shown in the dewpoint pressure display (see fig. 2.3).

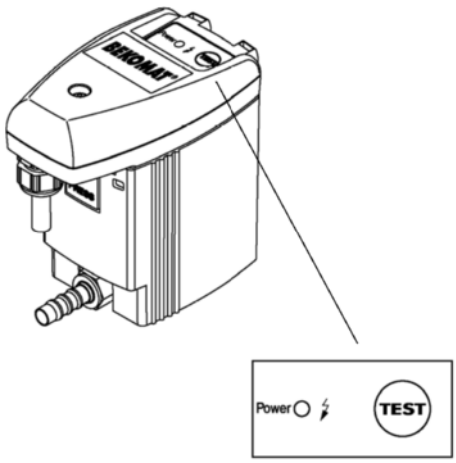
Refrigerant side

The refrigerant is injected into the refrigerant/air heat exchanger before vaporizing while withdrawing heat from the compressed air flow.
A performance control system on the refrigerant side serves to control the compressed air required performance demand in order to enable the pressure dewpoint to remain constant in all ranges of performance.
The refrigerant compressed by the refrigerant compressor is condensed in the condenser before being available again for vaporization.

Pressure dew point regulation

Due to reduced compressed air flow or a lower compressed air inlet temperature the DL dryer can operated at part-load in the 0...100 % performance range in continuous operation.

Condensate drain



The condensate drainer is designed for automatic discharge of the condensate.

A 2 bar min. pressure is required for operational safety.

Fig. 2.4: Condensate separator

Condensate separator, sensor regulated

If the capacitive level sensor indicates that the condensate container is full, the internal solenoid valve is caused to open while working pressure causes the condensate to be pressed into the discharge pipeline.
The condensate discharge electronics ensure that the outlet opening is closed before any compressed air is able to escape. The power LED is lit green when operating voltage is present (fig. 2.4).
In case of a condensate discharge failure the valve opens at intervals (approx. every 2 seconds) in order to automatically remedy the failure. For further information please see separate Operating Instructions of the condensate drain.

2.7 Control device

Operating pressure sensor

An operating pressure sensor is used to control compressor operation within its preset switch limits.

Switch-on pressure p_{min}

If the network pressure drops to the set switch-on pressure p_{min} the compressor switches on.

Switch-off pressure p_{max}

If the network pressure increases to the switch-off pressure p_{max}, the compressor either switches off (intermittent operation) or switches to idling operation (continuous operation).

2.8 Safety and monitoring devices

General

The safety devices guarantee a high degree of operational safety, in connection with the BOGE ARS monitoring system.

When one of the safety devices responds, the control system reacts as follows:

– The compressor is immediately switched off.
– A flashing fault number in the right field of the display indicates the cause of the fault.

Caution: Risk of injury!

Do not operate the compressor without built-in safety devices!

A flashing fault number in the right field of the display indicates the cause of the fault!

The following monitoring devices are standard for BOGE control systems:

Safety temperature limiting device

The safety temperature limiting device switches off the compressor once the maximum admissible final compression temperature has been reached. The compressor does not switch on when dropping below the minimum temperature.

– Rectify the fault.
– Acknowledge error by pressing the **ENTER-key** ↵.
– Switch on the compressor (**ON button**).

Safety valve

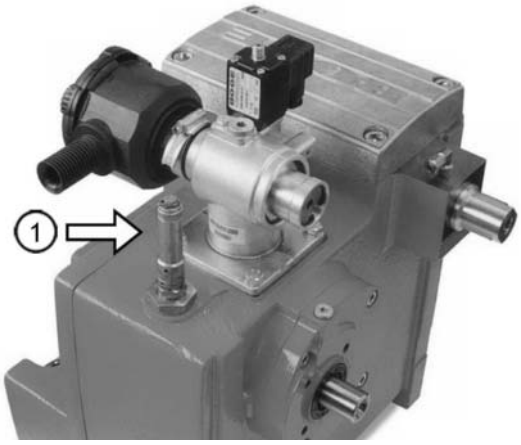


Fig. 2.5: Safety valve

Safety valve (1) on the compressed air/oil receiver prevents the maximum admissible pressure being exceeded.

Caution: Risk of injury!

When the maximum pressure is exceeded (e.g. incorrect setting of the operating pressure switch), the entire delivery volume of the compressor is ejected!

Monitoring the drive motor

The drive motor is monitored by PTC resistors.

3.1 Transport and storage

General

Please observe the generally accepted safety and accident prevention regulations when transporting the compressor. BOGE accepts no liability for damage caused by improper transport!

Attention!

The transport of the compressor may only be carried out by adequately instructed and authorized personnel!

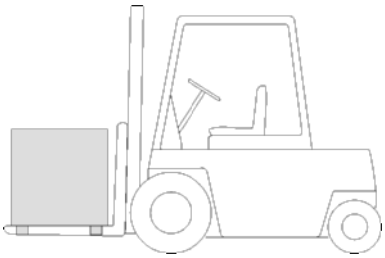
The capacity of the lifting gear (lifting cart or forklift truck) must correspond at least to that of the compressor (see Technical Data)!

Mind the position of the mass centre prior to lifting the compressor! The position of the mass centre is specified both in the attached dimensioned drawing and on the packing of the compressor.

The compressor is delivered filled with oil. Do not tilt during transport!

Transport possibilities

Forklift truck or lifting cart transport



Ensure that the forks are underneath the base frame of the compressor (see illustration).

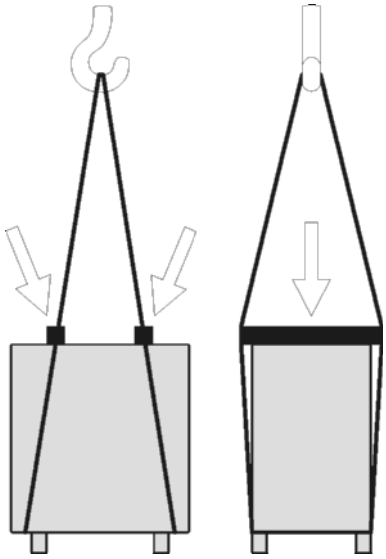
See below if there is no base frame (crane transport):

Fig. 3.1: Transport with forklift truck

Crane transport

Attention!

Do not subject the safety cladding to force during transport. Protect the compressor using wooden spacers (see arrows in the following illustrations). Remove the transport timbers.



Only use suitable transport slings. Position the slings at the ends underneath the base frame of the compressor.

Fig. 3.2: Crane transport

Intermediate storage

In case the compressor is not installed immediately after delivery, it has to be stored at a sheltered location. It must be ensured that during the intermediate storage neither dust nor humidity can penetrate.

Note!

In case of an intermediate storage please observe the specifications and directions as to permissible environmental impacts (see chapter „3.2 Compressor room: Installation, maintenance conditions and application for compressed air receivers arranged below or separately“).

In case of a careless storage we assume no liability for consequent damages!

In the event of an extended intermediate storage you should consult BOGE-Service.

Please observe the directions for commissioning after an extended standstill (see chapter „3.5 Commissioning“) if the intermediate storage takes longer than two months.

3.2 Compressor room

Installation, maintenance conditions and application for compressed air receivers arranged below or separately

Caution!

- Protect compressed air receivers against damage through mechanical effects (e.g. falling objects).
- Operate the compressed air receiver and its equipment from a safe location.
- Adhere to safety areas and safety clearances.
- Ensure that the compressed air receiver stands securely. It must not shift or tilt due to external forces. This also includes the additional weight during a pressure test!
- The compressed air receiver **must not** be bolted to the base.
- Ensure that the compressed air receiver is easily accessible from all sides (for recurring tests). For the necessary operating and maintenance areas have a look at the attached dimensioned drawings.
- Ensure that the factory label is clearly visible.
- Ensure that compressed air receivers are adequatly protected against corrosion.
- Only use the compressed air receiver for compressors operating with cut-in and cut-out mode if the pressure fluctuation range amounts to $\Delta p \leq 20\%$ of the maximum operating pressure.

Installation requirements for compressed air dryer DRL 9

Attention!

In case of different ambient temperatures make sure to adhere to prevailing design conditions!

The compressed air dryer is designed for use at an ambient temperature of 25°C.

The room temperature must not fall below + 2°C because otherwise the condensate is liable to freeze.

Installation surface

A level industrial floor without foundation is adequate for the installation of the compressor. No special fastening elements are required.

Fire protection

The following applies to rooms in which compressors with oil injection cooling are to be installed:

Caution!

- For compressors with motor ratings **exceeding 40 kW,** ensure that the compressor room is equipped with special fire protection.
- Install compressors with motor ratings **exceeding 100 kW** in a separate fire protected room.

Requirements of fire protected compressor rooms:

- Walls, ceilings, floor and doors must be designed in **fire protection class F30** or higher.
- Flammable liquids must never be stored in the compressor room.
- The floor around the compressor must be made of non-flammable material.
- Leaking oil must not spread out over the floor.
- No inflammable materials must be located within a radius of at least 3 metres around the compressor.
- No inflammable machine parts, such as cable ducts, may run overhead of the compressor.

Sound protection

Only install compressors in workrooms if the sound pressure level of their measuring surfaces does not exceed 85 dB(A).

Admissible environmental influences

The compressor room must be clean, dry, cool and free of dust.

Admissible ambient temperatures

Maximum ambient temperature (for air cooling):	+ 40°C
Minimum ambient temperature:	+ 5°C

Attention!

Nonobservance of the admissible ambient temperature may lead to the following problems:

- The compressor will switch off when the admissible final compression temperature is exceeded or gone below.
- Pipe lines and valves will freeze up at low temperatures.
- Damage due to reduced lubricating ability of the compressor oil.

Measures to be taken to ensure that admissible ambient temperatures are observed:

- Avoid any pipe lines or units radiating heat in the vicinity of the compressor, or insulate them well.
- Never install the compressor in the cooling air flow of other machines.
- Provide the supply air openings with adjustable louvres to ensure that the minimum temperature is not gone below in winter.
- Use the BOGE frost protection device (series).

Ventilation

If the following instructions are not observed, the admissible final compression temperature may be exceeded.
In this case, the compressor will switch off automatically.

Caution!

Arrange the compressor intake openings or ducts such, that dangerous admixtures (e.g. explosive or chemically unstable materials) cannot be drawn in.

Ventilation openings (free-standing installation)

– Arrange supply air openings close to the floor.
– Arrange exhaust air openings in the ceiling or at the top of the wall.
– The required cross sections for the supply openings (as well as for the flaps and weather protection grids) are indicated in the table.

Supply and exhaust air ducts

– Ensure that the flow rates in the ducts do not exceed 4 m/s.
– Never position cooling air ducts directly on the compressor. Always use a compensator to avoid distortion and the transfer of vibrations.

Ventilators

Ensure that the heated exhaust air is not taken in again.
If necessary, the heated air must be extracted by ventilators.

To ensure perfect cooling even at higher temperatures in the summer, the ventilators must be designed as follows:

– The ventilator capacity must be rated approx. 10...15% higher than the sum of the cooling air quantity required for all machines operated in the room (VDMA Code of Practice sheet 4363 "Ventilation of compressor rooms").
– For free-standing installation, the cooling air requirement specified in the table corresponds to the required ventilator capacity.

Supply air filter

– The compressor is equipped with supply air filter mats.

Cooling air requirement

Please refer to the following table for the cooling air requirement and size of the supply air openings for your compressor. Ensure that flaps and weather protection grids have the necessary free cross section. We generally recommend contacting a specialist company for performing the duct construction work and planning.

Type	Drive rating [kW]	* Cooling air requirement for free standing unit [m^3/h]	Necessary inlet opening for free standing unit [m^2]	* Cooling air requirement for installation with ducting [m^3/h]	Necessary free duct cross section [m^2]
C 4 / C 4 D	3.0	1600	0.23	800	0.06
C 5 / C 5 D	4.0	2200	0.32	1100	0.06
C 7 / C 7 D	5.5	3000	0.44	1500	0.08
C 9 / C 9 D	7.5	4000	0.58	2000	0.11

* For the cooling air requirements the basis is a 4°C temperature difference between room and outside temperature.

Table 3.1: cooling air requirement, necessary cross sections for openings and ducts

Ventilation possibilities

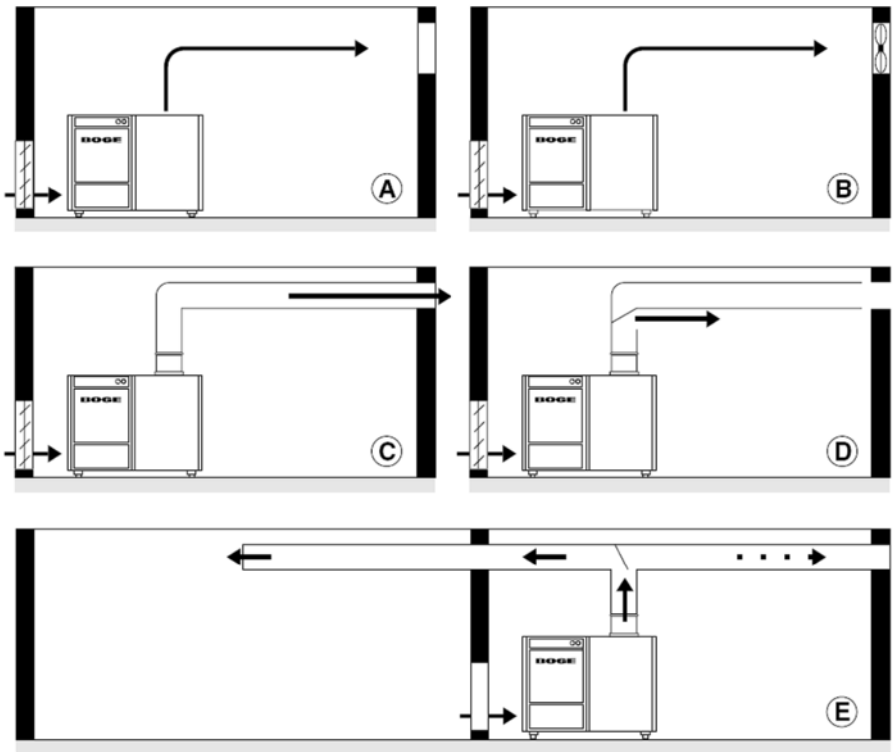


Fig. 3.3: Ventilation possibilities

A Supply and exhaust air openings in the outside walls (free-standing installation)

B Supported by exhaust air ventilator

C Exhaust air duct into the open

D Exhaust air duct with recirculation flap
Hot exhaust air is mixed with the cold ambient air, as required. Thus preventing the plant from freezing up at temperatures below freezing.

E Using the hot exhaust air for heating
In the winter, the hot exhaust air is used for room heating. In summer it is directed into the open.

Condensate disposal

The air taken in contains water in form of vapour, which turns into condensation during compression.

Attention!

The condensate contains oil. Never lead it into the public sewage system without prior treatment.
Strictly observe the effluent disposal laws of your local authorities.

Oil-water separator

The **BOGE-oil-water-separator** separates the oil from the condensate.
The cleaned water may be fed directly into the public sewage system.
The oil is collected in a separate container. Dispose of the oil according to environmental regulations.
If, due to special operating conditions, the oil should emulsify, use an emulsion cracking plant.

3.3 Installation

General

BOGE screw compressor units are supplied ready for connection. Only the work described in the following paragraphs needs to be carried out during the installation.

Caution!

Only have the installation work carried out by appropriately trained persons or specialists.

Lay out all energy supply lines in a trip-proof and barrier-free manner so that potential accidents can be avoided!

Prior to delivery, each compressor is subjected to a trail run at the factory. It is carefully tested and set. However, possible transport damage cannot be excluded.

- Please inspect the compressor immediately after delivery and direct damage claims to the last haulier – even when the packing is not damaged! To safeguard claims against the haulier we recommend leaving the machine, devices and packing material in the same condition as they were in when the damage was detected.
- Prior to commissioning, check the compressor for external damage.
- Observe the compressor very closely during commissioning and the following trial run.
- If malfunctions occur, switch off the compressor immediately and inform the BOGE-Service.

Checking the delivery scope

The delivery scope depends on your order.
Prior to commissioning, please check whether all required parts have been provided. Please check the order confirmation for any possible accessory equipment.

The delivery scope includes the following component parts:

- Operating instructions
- Electric circuit diagram (in the compartment of the switch cabinet)
- List of electrical equipment (in the compartment of the switch cabinet)
- Oil drainage hose
- Head nut (in the compartment of the switch cabinet)
- Spare parts list

Installing the compressor

- Remove the packing material on and in the compressor.
- Install compressor and align horizontally.The compressor must stand firmly on the ground on all feet.

Connection condensate drain

Attention!

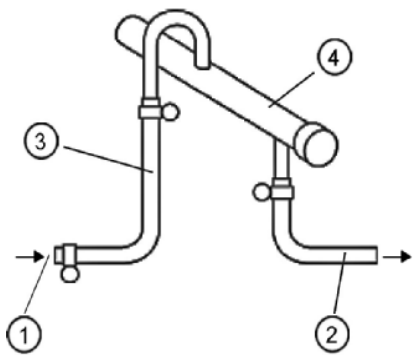
The compressed air dryer serves to discharge water as well as oil from the compressed air.

The water/oil mixture must not be discharged into the waste water system. Oil and water must be separated by appropriate separating devices (additional equipment).

A 2 bar min. pressure is required for operational safety.

Attention!

The condensate discharge is to be designed such as to prevent persons or objects from being hit by the condensate (condensate discharge with operating pressure!



1 from condensate drain
2 to compressed air treatment

The condensate discharge pipe (3) must be installed not extend more than 5 m upward on the wall.
The min. operating pressure will increase by 0.1 bar per meter. Manifold (4) is to be designed as to have at least the condensate discharge diameter.

Connecting the compressor to the compressed air network

– Connect the compressor to the compressed air network or a compressed air receiver.
For this, use a BOGE high pressure hose.

Note!
Do not install a check valve in the pressure line.
The compressor is already equipped with a check valve.

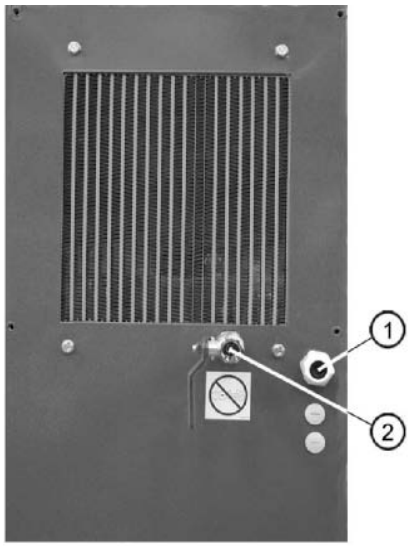
Remove cladding

Caution: Risk of injury!
Make sure to always wear protective gloves to protect yourself against any sharp edges and corners on covering components!

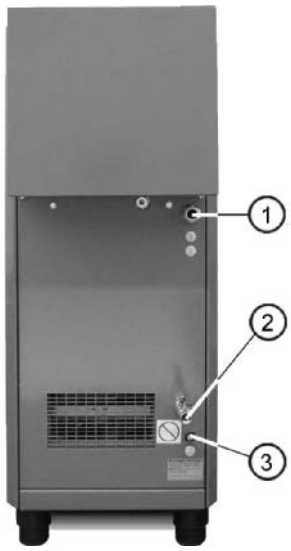
– Remove top cover sheet (1).
– Loosen screws (2) above side sheets and remove.

Fig. 3.4: Remove cladding

Attention!
To avoid damage to the cooling unit, hold up screw connections at the pressure outlet with a spanner.



Series C 4...C 7



Series C 9 / C 4 D...C 9 D

Fig. 3.5: Connecting the compressor

1 Electrical connection
2 Compressed air outlet
3 Kondensate tube dryer

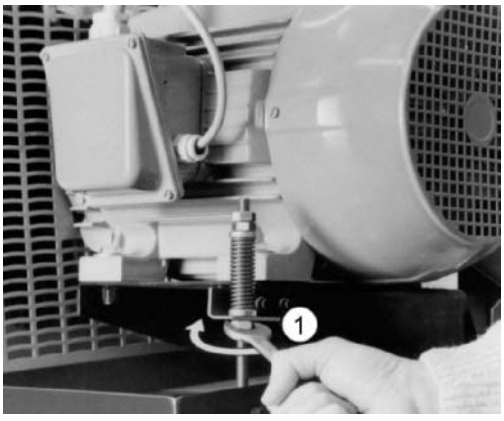
Activating the belt tensioning device

The V-belts are slackened for transport.

Activate the GM belt tensioning device prior to commissioning by lowering the motor plate.

– Turn checking nut (1) downwards as far as possible by means of a spanner (NW 17) and counter.

The belt tensioning device is activated. It automatically sets the correct V-belt tension in every operating mode.



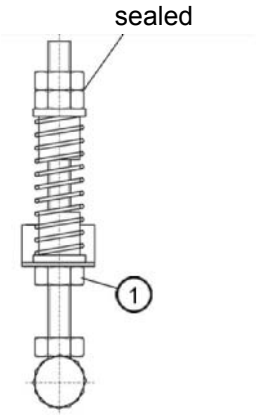


Fig. 3.6: Activating the belt device.

Caution!

The sealed nuts for adjustment of the spring tension must not be loosened or modified.

Checking the oil level

BOGE compressors are supplied with a complete oil filling.

Prior to commissioning/start up, check the oil level as described in chapter "Maintenance".

3.4 Electrical connection

Caution: High voltage!

Ensure that work on the electrical equipment of the compressor is only carried out by authorized electricians.

When connecting to the power supply, observe the valid VDE, DIN and EVU regulations or the local safety regulations.

Also observe the regulations of your local power supply company regarding the load rating of your power supply.

Mains disconnecting device

According to accident prevention regulation VBG 5, § 12, the customer is responsible to provide the following safety measures:

Each compressor plant has to be equipped with a power disconnecting device according to DIN EN 60204-1:2007.

Please refer to the "Technical data" for the design and fuse rating.

Rated voltage

The data of your mains (operating voltage, control voltage, type of current, frequency, ...) must coincide with the data on the type plate on the switch cabinet.

In the event of deviations, please contact the BOGE service or your supplier.

Connecting the leads

- Check to ensure that all terminals in the switch cabinet are firmly tightened.
  If necessary, retighten the screw connections.
- Guide the lead cable through the PG screw connection.
- Connect the leads L1, L2, L3, N, Pe (PEN) firmly to the power supply terminal.
  A clockwise rotational field must be created.
- Retighten the electrical connections after the first 50 operating hours.

Caution: Risk of injury!

Prior to any work on the compressor:

- Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.
- Check to ensure that all conducting machine parts are voltage free.
- Depressurize all areas under pressure.

Never omit a single safety step! Otherwise, you will risk injuries due to restarting, electric shock or self-releasing parts.

Caution!

With an activated automatic restart (Auto-Restart) the compressor may restart automatically after a voltage failure.

Prerequisite: The net pressure is lower than the set switch-on pressure.

3.5 Commissioning

Note!

We recommend the drawing up of a commissioning certificate in which the test results during the commissioning process can be listed up.

Caution: Risk of injury!

The commissioning may only be carried out by experienced and authorized qualified personnel!

Always wear protective gloves when working on the compressor to avoid bruising of fingers or hands while opening or closing components!

Check installation requirements

Attention!

Make sure that the compressor is installed according to the installation requirements!

Prior to starting the compressor for the first time, check if the transport securing device was duly removed. (see chapter „3.3 Installation“)!

List up the test results in the commissioning certificate.

Checking the rotational direction

Attention!

Always check the rotational direction of the drive motor prior to commissioning/initial start up.

Even brief operation in the wrong direction of rotation (more than approx. 5 seconds) may cause total destruction of the air end!

List up the test results in the commissioning certificate.

Caution!

Ensure that the rotational direction coincides with the rotational direction arrow on the air end.

– Close mains disconnecting device.
– Switch the compressor on and immediately off again to check the rotational direction.

Changing the rotational direction:

Caution: Risk of injury!

Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.

– Interchange two phases (L1, L2 or L3) in the power cable.

Check compressed air outlet for tightness

Caution: Risk of injury!

Work on the compressed air system may only be carried out by experienced and authorized qualified personnel!

Always wear protective clothing and goggles!

Immediately after having switched on the machine the connection of the compressed air outlet must be checked for tightness!

Make sure to observe an appropriate safety distance during the inspection!

– Close mains disconnecting device.
– To conduct the inspection switch on the compressor and check the compressed air outlet for tightness.
– Switch off compressor.

Caution: Risk of injury!

Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.

– If necessary, have leakages repaired by skilled qualified pesonnel.

List up the test results in the commissioning certificate.

Opening the stop valves

Open ball valve on the compressor delivery.

Checking for leaks

Caution: Risk of injury!

In case of leakages in the oil circuit there is a certain danger to slip and fall because of oil spills!

Have all connections of the oil circuit checked for leakages by authorized qualified personnel

During the inspection slip-resistant safety shoes and protective clothing are obligatory!

Undertake the following to prevent leaks:

– Check screw connection of the lines and retighten, if necessary.
– Check to ensure that the oil filter and oil separator are hand tight seated.

Conduct trail run

Close mains disconnecting device.

– Switch on the compressor using the ON key. The compressor starts.
– When the factory-set switch-off pressure is reached, the compressor cuts off automatically.
– Check network pressure on control display.
  If necessary, reset operating pressure (pressure target value).
– The compressor is ready for operation.

Switch off the compressor after a trial run of several hours under maximum load.

List up the test results in the commissioning certificate.

Commissioning following extended stoppages

If an extended stoppage is scheduled, you should contact BOGE-Service beforehand.

Following an extended stoppage of more than 2 months, fill a small amount of oil in the suction controller prior to starting the compressor.

Attention!

Only fill the suction controller with the grade of oil used to operate the compressor.

Never mix different oil grades and brands.

Caution: Risk of injury!

Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.

Fig. 3.7: Suction controller

– Unscrew the plug on the suction controller (1).
– Fill approx. 1/4 l compressor oil into the suction controller.
– Turn compressor stage at the shaft by hand 5- to 10 times to spread the oil evenly.

Refrigeration compressed air dryer

Caution: Risk of injury!

Observe all safety notes specified in the attached operating instructions when working with refrigerants!

3.6 Dismantling

Note!

To avoid dangers when dismantling the compressor please consult your BOGE Service:

Telephone: +49 5206 601-140

Caution!

Dismantling of the compressor may only be carried out by experienced and authorized qualified personnel!

Make also sure to observe all information in the attached operation instructions as to a safe dismantling of the refrigeration compressed air dryer and a secure disposal of the refrigerant!

Caution: High voltage!

All work on the electrical installation may only be carried out by authorized and skilled electricians!

Prior to starting the work the power cable to the switch cabinet must be disconnected from the mains and secured against unintentional switching on!

4.1 Operation

The compressed air dryer is switched on/off via the compressed air compressor.

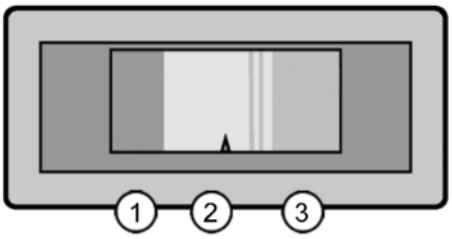
Attention!

A time span of approx. 5 minutes is to be observed between switching on and off of the compressed air dryer in order to create a pressure balance in the cooling system.

Condensate

After some operating hours with compressed air flow it should be checked if condensate occurs and if it is drained properly.

Display pressure dew point



The pressure dew point display shows the pressure dew point achieved by the compressed air dryer.

1 Blue field: pressure dew point too low
2 Green field: pressure dew point ok
3 Red field: pressure dew point too high

Fig. 4.1: Pressure dew point display

5.1 General

The tables on the following pages give information on the possible causes of operating faults and measures for their rectification (please also refer to operating instructions of the compressor control).

Caution!

Ensure that any work required to rectify faults is only carried out by trained personnel or specialists.

Any performance of work on pressurized system components may be carried out by duly qualified and specialized personnel only.

Ensure that components which have a safety function are only set, repaired or exchanged by BOGE Service!

Please contact BOGE-Service at the following telephone number, if you have any questions.

Telephone: +49 5206 601-140

Caution: High voltage!

Prior to any work required to rectify faults:

Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.

5.2 Compressor faults

Fault	Possible cause	Rectification
No quantity delivered, no pressure build-up, max. pressure 0.5 bar	System components in the compressor are leaking	Check oil and compressed air lines inside the compressor; tighten and/or reseal screw connections, if necessary
	Minimum pressure valve is defective	Close ball valve and check whether pressure builds up; if so, open ball valve again immediately; replace minimum pressure valve
	Electromagnetic venting valve does not close	Check solenoid valve and replace, if necessary
	Suction controller does not open	Suction controller or solenoid valve is defective; check and replace, if necessary
	V-belts are torn	Fit new V-belts

Fault	Possible cause	Rectification
Compressor does not start up 	No electric power to compressor	Check electrical connection
	Fuses are defective	Check the mains and control fuses, replace if necessary
	Machine has not vented perfectly	Check venting valve and replace, if necessary
	Voltage fluctuations in the electrical mains power	Ensure constant voltage in accordance with IEC 38
	Compressor oil is very viscous due to low ambient temperature	Heat up the compressor (additional heater available as as option)
Oil in suction filter 	Minimum pressure non-return valve is leaking	Check the minimum pressure check valve and replace, if necessary
	Suction controller is leaking	Check the suction controller and replace, if necessary
	Cut-out performed by emergency-off switch	Cut-out normally via **O**-key
Excessive oil consumption 	Drain line is blocked	Dismantle and clean drain line
	Defective oil separator element	Check oil separator and replace, if necessary
	Excessive oil filling	Drain off oil
Safety valve blows 	Operating pressure switch has been misadjusted	Set operating pressure to the maximum permissible pressure of the screw compressor
	Defective safety valve	Replace safety valve
System pressure does not decrease when switching off 	Venting valve does not open	Check venting valve and replace, if necessary
	Check valve is leaking	Check the check valve and replace, if necessary

5.3 Compressed air dryer DRL 9 faults

Fault	possible cause	Rectification
Function	no function	– Check and ensure power supply. – In case of tensions supply failure, please call customer service or send compressed air dryer to manufacturer.
Water in the compressed air network	In case of defect condensate discharge (clogged discharge pipe, falling short of min. operating pressure)	Clean condensate drainer using a neutral cleaning product.
Cut-off of compressed air dryer during operation	Cut-off of compressed air dryer by integrated electric start-up and protection device (Klixon) due to overload	– Remove cause of fault. – Compressed air dryer automatically starts again after cooling down of protection device. Note: Prompt restarting of the unit is not immediately possible because the protection device needs a minimum time span to cool down to the permissible operating temperature.
	Ventilator is defective.	Replace ventilator.
	Condenser contaminated.	Clean condenser.
High pressure difference on compressed air side	Icing of compressed air dryer	Characteristics: – Pressure difference on compressed air side increases. – Volume flow decreases. Switch off unit and ensure compressed air to continue go flow. Pressure difference will return to normal value after approx. 1/2 h. Restart unit. If icing up appears to start again please call customer service.

6.1 Safety instructions

Caution!

Ensure that maintenance work is ony carried out by specialists or appropriately trained person.

Any performance of work on pressurized system components may be carried out by duly qualified and specialized personnel only.

– Prior to starting any maintenance work, always stop the compressor as described in these operating instructions prior to removing any cladding or safety devices. Refit the cladding or safety devices immediately upon completion of the maintenance work.
– Heavy components may only be lifted up by various persons in due consideration of the local industrial safety regulations.
– Only use original spare parts, compressor oils and operating materials released by BOGE for the maintenance work.
– With an activated automatic restart (Auto-Restart) the compressor may restart automatically after a voltage failure.
  Prerequisite: The net pressure is lower than the set switch-on pressure.

Caution: Risk of injury!

Always adhere to the prescribed operating method described below for all maintenance work. Never omit a single safety step!

Otherwise you will risk injury from restarting, electric shock or parts which may fly off.

Prior to all maintenance work:

1. Switch off the compressor using the OFF button.
2. Press Emergency Stop button.
3. Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.
4. Fix a warning label to the control and fill in the name of the person responsible who is authorized to switch on the maschine again.
5. Check to ensure that all machine elements are definitely currentless.
6. Prior to starting work let cool down all hot components of the compressor to 50°C.
7. Separate the compressor from the compressed air network by closing the ball valve at the compressed air outlet.
8. Vent the compressor.
   To this effect open the safety valve on the combined compressed air-oil receiver as follows:
   – Turn the knurled nut anticlockwise until you can feel a resilient resistan.
   – Tun the knurled nut a little further.
     Any possibly existing air will escape.
     The system pressure gauge will indicate a pressure of 0 bar.
   – Once the residual air has completely escaped from the system, firmly retighten the knurled .
9. Remove all safety cladding necessary to perform the maintenance work.

Once the maintenance work has been concluded:

10. Reattach all removed safety cladding.
11. Open the ball valve at the compressed air outlet.
12. Prior to switching on again, check whether anyone else is working on the compressor.
13. Remove warning sign not until then and release mains disconnecting device.
14. Unlock Emergency Stop button.

6.2 General

Maintenance through BOGE customer service

Have BOGE service check your compressor every 3,000 operating hours or annually.

Note!

Maintenance agreement!

Enter into a maintenance agreement with BOGE.

BOGE service will carry out the proper maintenance on your compressor at regular intervals. This guarantees maximum safety and realiability of your compressed air supply.

Review of regular maintenance work

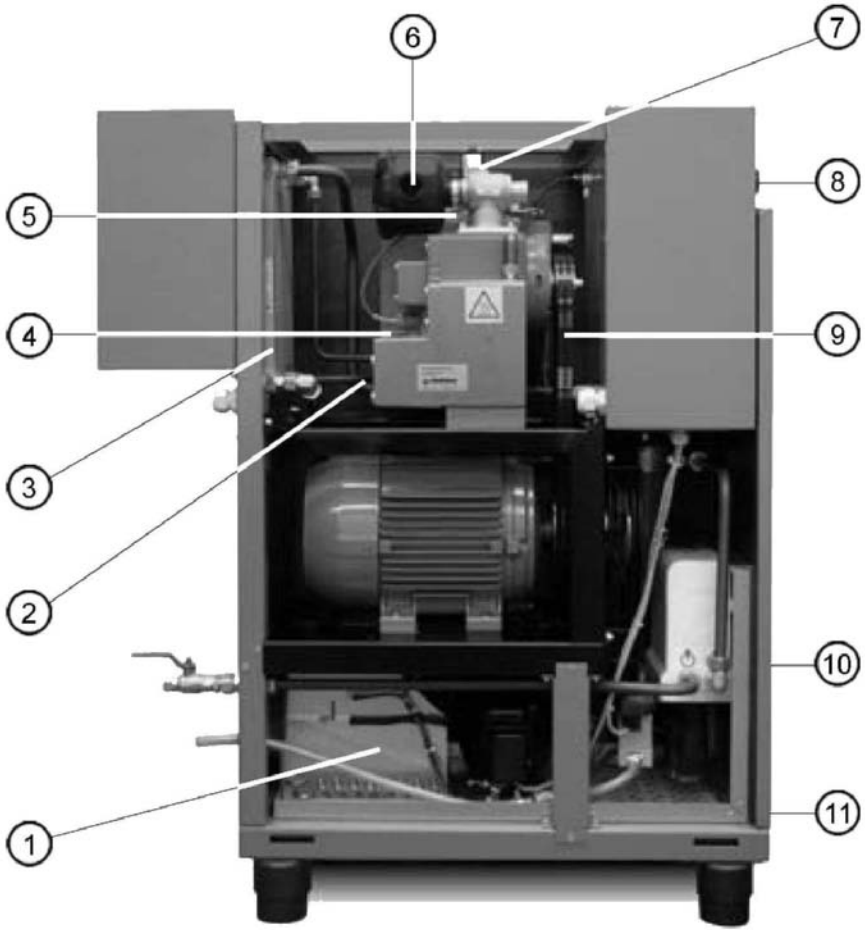


Fig. 6.1: Review of regular maintenance work

1 Compressed air refrigeration dryer DRL 9 (only series C 4 D...C 9 D)
2 Oil change
3 Clean compressed air/oil cooler exernally
4 – Check oil level
– Top up oil

5 Change oil filter and oil separator
6 Check suction filter
– Clean/Change filter cartridge
7 Top up oil in the suction controller after extended stoppages
8 Check pressure/adjust
9 Check V-belts
10 Change supply air filter: series C 4...C 7
11 Change supply air filter: series C 9 / C 4 D...C 9 D

Maintenance intervals

The maintenance intervals specified in the table are based on average operating and ambient conditions.

Extreme conditions may require shorter maintenance intervals.

Note!

Note down any maintenance work in the table on the last page.
This will facilitate trouble shooting for Boge service.

Attention!

Check monthly if all screw connections on the compressor are fully tightened.

Oil change:

Prior to using mineral or food compatible oil make sure to change oil filter after the first 500 operating hours.

Maintenance work	Maintenance intervals in operating hours [1]					Page
	weekly, monthly	1,000 annually	1,500 annually	3,000 annually	9,000 every 2 years	
General maintenance work						
Check final compression temperature (target value: 70...100°C)	w					Control
Check compressor for leaks				X		–
Check system relief at system pressure gauge (22) (target value 0 – 1.5 bar)	w					Control
Check function of Emergency Stop button	m					Control
Cleaning the oil cooler			X			61
Check and if necessary change supply filter	w					53
Check automatic condensate drain (C 4 D and C 9 D)	w					–
Check if electrical connections are tightened			X			–
Air circuit						
Check and if necessary clean suction filter	m					52
Change suction filter cartridge				X		52
Check safety valve				X		62
Replace minimum pressure valve (wearing parts set)				X		–
Replace suction controller					X	–
Oil circuit						
Check oil level and top up as required [2]		X				55
Change oil separator [2]				X		58
Change oil filter [2]				X		57
Change oil [2]					X	58
Replace oil regulator (wearing parts set) [2]				X		–
Replace nozzle with dirt catch				X		–
Drive						
Check / change V-belt				X		54
Lubricate drive motor bearings	Drive motors with permanent lubrication					53
Replace motor bearing	Depending on mains frequency: 50 Hz 10,000 operating hours 60 Hz 8,000 operating hours					

[1] If the compressor is not often used, undertake the maintenance according to the specified intervals (weekly/monthly/annually) depending on the number of operating hours.

[2] The specified intervals only apply when BOGE compressor oil Syprem 8000 S is used! The service life may differ depending on the ambient temperature. In this case have the oil analyzed by your BOGE service!

Table 6.1: Maintenance intervals

General information concerning the lubricants used

Caution: Risk of injury!

Oil presents a potential danger to health and environment due to their additives.

- Avoid contact with skin and eyes.
  Wear protective gloves made of resistant synthetic material.
  Wash yourself thoroughly after contact with oils.
- Do not inhale the fumes or mist.
- Protect your environment.
  Ensure that no oil is spilt.
- Fire, naked flames and smoking is strictly prohibited when handling oil.

Please take notice of the directions in the corresponding safety data sheet!

We recommend using only oil according to the following specification:

- Viscosity range of 55 mm²/s at 40°C.
- Minimum viscosity at 100°C of 8 mm²/s.
- Maximum viscosity at 0°C of 1,000 mm²/s.
- Comply to FZG test acc. to DIN 51 354 with failure load stage 10.
- (Test Method A/8,3/90 10).
- Excellent oxidation stability: Meets requirements of Pneurop oxidation test.
- Antifoam – additives.
- Additives to prevent residue formation.
- Compatibility with all used sealing materials like Neoprene, FPM, PTFE, FKM (Viton) and acrylic and epoxy resin paints.
- Flash point > 230°C.
- Additives for excellent demulsifying properties.
- Additives for corrosion protection of metallic surfaces.
- Excellent oxidation stability: Rotating bomb oxidation Test (ASTM D 2272) higher than 2,400 minutes.
- Meets VDL requirements DIN 51 506 for lube oils (including Pneurop test).
- Or you use BOGE compressor oil **Syprem 8000 S**.The stated maintenance intervals refer to the use of **Syprem 8000 S** only.
- **Syprem 8000 S** can be purchased from BOGE retailers.
- Never mix different oil types and brands.
  The additives may be incompatible. It may lead to foam formation, premature aging or loss of lubricating ability.

Disposal of used operating material

Attention!

The handling and disposal of mineral oils is subject to legal regulations. It is an offense not to ensure correct and safe disposal of old oil!

Please instruct one of the known service companies to dispose of used operating materials or deliver them to an authorized disposal point.

Observe the following points when disposing of old oil:

– Never mix the oil with other material or liquids.
– Used oil filters and oil separator cartridges require special waste treatment and must be kept separate from normal waste!

Pressure hoses

Caution!

Risk of injury and damage to compressor due to obsolete pressure hoses!

Never use pressure hoses beyond the prescribed service life!

Check hoses and connections regularly for leakages! Check the service life of the hoses and replace them in due time!

As replacement only use original spare parts released by BOGE!

Used pressure hoses are not permitted as a replacement!

Spare and wearing parts

Caution!

Only use original spare parts, compressor oils and operating materials released by BOGE for repair and maintenance work.

BOGE is not liable for any damage resulting from the use of other spare parts or operating materials.

Attention!

If the nozzle with dirt catch is soiled the oil consumption may increase significantly!

6.3 Compressor maintenance work

Clean or change suction filter

Cleaning:

– 1x monthly, however, at least every 500 operating hours.
– Correspondingly earlier if the air taken in is heavily soiled.

Change:

– In the event of damage.
– After the second cleaning.

Switch off the compressor with the OFF button.

Caution: Risk of injury!

Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.

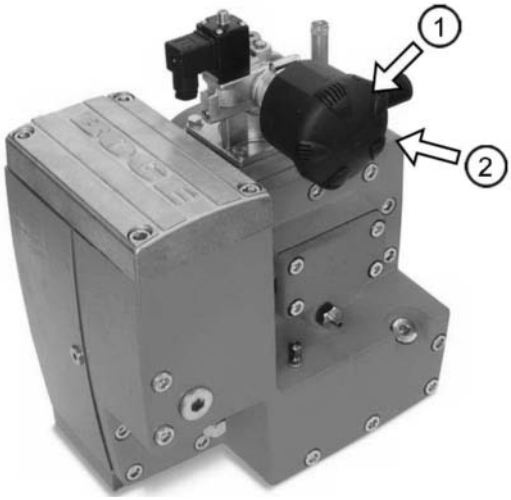


Fig. 6.2: Changing the intake filter

Removing the filter cartridge

– Open sound absorbing hood.
– Remove the lid (1) of the filter case.
– Take out the filter cartridge (2).

Cleaning the filter cartridge

Attention!

Do not clean filter cartridges in liquids.

Do not use any hard objects when cleaning to avoid damaging the filter paper.

Refit a new filter cartridge in the event of damage or once it has been cleaned twice.

– Hit on the filter cartridge using the palm of your hand to knock out coarse dust.
– Blow out fine dust from the inside to the outside using dry compressed air (maximum pressure 5 bar).
– Clean the sealing surface of the filter cartridge.

Fitting a filter cartridge

– Insert filter cartridge into the filter housing.
– Attach lid of the filter housing.
– Fit sound absorbing safety hood again.

Changing the supply air filter mats

Check:

– 1x weekly,
  however, at least every 500 operating hours.
– Correspondingly earlier if the air taken in is heavily soiled.

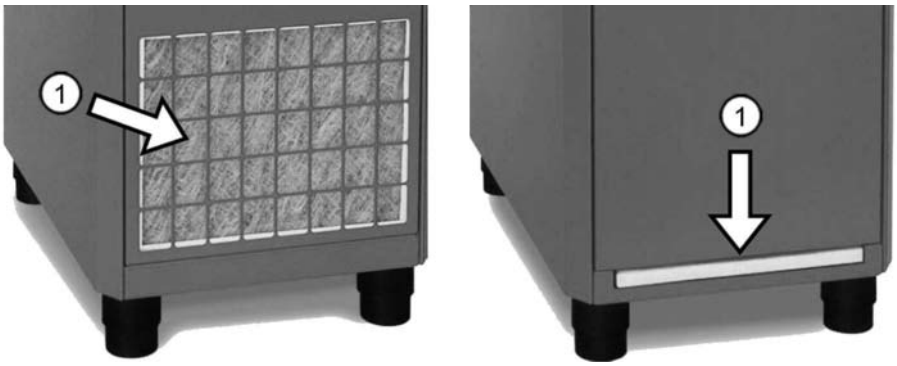
Change:

– When a crust of dirt has accumulated on the filter mat.
– When the final compression temperature has exceeded its set point value by 4 to 5°C.
  The crust of dirt on the filter mat prevents an adequate cooling air supply.

Switch off the compressor with the OFF button.

Caution: Risk of injury!

Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.



C 4...C 7 C 9

Fig. 6.3: Changing the supply air filter mats

– Pull plug-in filter mat (1) out of its holder.
– Insert new plug-in filter mat (1) into the holder.

Drive motors with permanent lubrication

As a rule, the bearings of the drive motors are provided with a maintenance free **permanent lubrication**.

Under normal operating conditions (coolant temperature max. 40°C, continous operation) the bearings are maintenance free for the service life.

The service life decreases or increases as thermal stress increases or decreases (due to increased or reduced coolant temperature).

Attention!

Have BOGE service dismantle the bearings and install new bearings once the specified service life has expired.

Changing the V-belt

Check:

– Once a year for damages.

Change:

– In case of visible damages

Note!

The BOGE GM drive system automatically adjusts the V-belt to the correct V-belt tension in any operating mode.

Thus maintenance of the V-belt drive is limited to the above mentioned work.

Switch off the compressor with the OFF button.

Caution: Risk of injury!

Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.

Let the compressor cool down. As the cooler is approx. 80 – 90°C hot there is a risk of burns.

Changing the V-belt:

– Open sound absorbing hood.
– Turn checking nut (1) upwards. The two bushes in the spring must butt.
– Remove the slackened belts from the belt pulleys.
– Fit new V-belts.
– Turn checking nut (1) downwards as far as possible. The V-belts are automatically correctly tensioned by the BOGE GM drive system.
– Fit sound absorbing hood again.

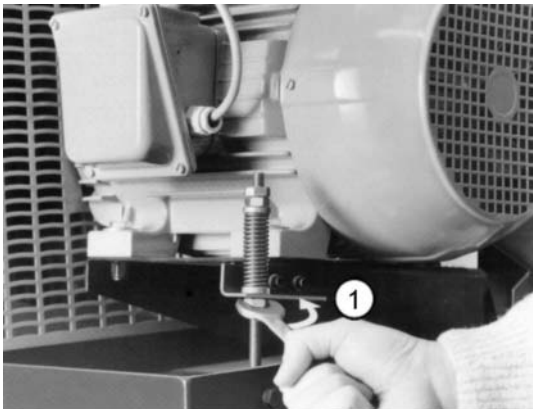
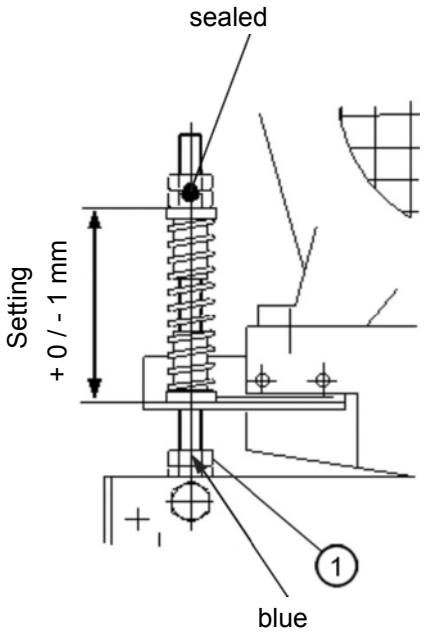


Fig. 6.4: Lift motor plate

Settings of the GM motor tensioning device C 4...C 9 D



The settings shown in the following table are fixed by the manufacturer and may not be changed. Slight deviations are allowed and compensated by the GM drive system.

The current settings are also shown on the GM drive system. With special versions the settings on the sticker may deviate from the standard values.

1 Checking nut

Model	Pressure [bar]	Standard motor [kg]	Setting + 0 / – 1 [mm]
C 4 / C 4 D	8 / 10 / 13	45	98
C 5 / C 5 D	8 / 10 / 13	49	90
C 7 / C 7 D	8 / 10 / 13	66	102
C 9 / C 9 D	8 / 10 / 13	68	Motor tens. spring w/o initial tension (Tensioning device may not clatter)

Table 6.2: Settings for standard motors

Checking the oil level, topping up oil

Check:

– Prior to commissioning/start-up of the compressor.
– Then every 1,000 operating hours, however at least once a year.

Topping up:

– When the oil level has dropped below the "min" mark (see sketch).

Attention!

Always use the same oil type when topping up. Never mix different oil types and brands.

– Switch off the compressor using the OFF button.

Caution: Risk of injury!

Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.

– Close ball valve at the compressed air outlet.
– Open sound absorbing safety hood.
– Vent the compressor (as described in the beginning of the chapter).
– Wait approx. 3 minutes to permit the oil to settle.

Caution: Risk of injury!

Danger of burning due to hot oil!

Always wear your compulsory personal protective equipment when working on the compressor!

– Open sound absorbing safety hood.
– Remove plug (2) of oil filling socket (1) (see Figure 6.5).

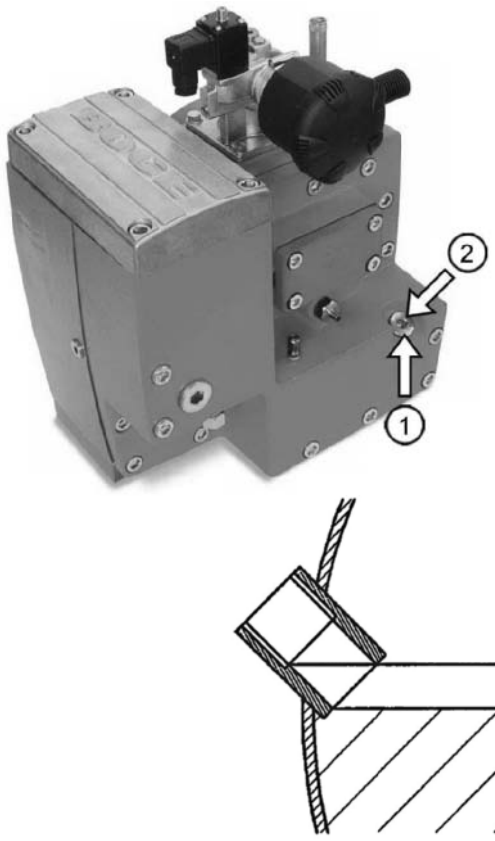


Fig. 6.5: Checking the oil level, topping up with oil

– Check oil level.
  The oil level must not drop below the "min" mark.
– If necessary, top up with oil to the lower edge of the thread ("max." mark) on the oil filling socket.
– Screw plug (2) back in.

– Close sound absorbing safety hood.
– Open ball valve at the compressed air outlet.

Changing the oil filter

Change:

- Prior to using mineral or food compatible oil make sure to change oil filter after the first 500 operating hours.
- After 3,000 operating hours, however, no later than after one year.
- With each oil change!

Switch off the compressor using the OFF button.

Caution: Risk of injury!

Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.

- Close ball valve at the compressed air outlet.
- Vent the compressor (as described in the beginning of the chapter).
- Open sound absorbing safety hood.
- Wait approx. 3 minutes to permit the oil to settle.

Caution: Risk of injury!

Do not touch hot surfaces!

- Slacken screws on service cover (3) land remove cover.
- Take out oil filter cartridge (4) and remove from support body (5).
- Slide support body in the new oil filter cartridge.

Attention!

Over-current/ Non-return valve (6) must be fitted facing up.

- Fit oil filter cartridge (4) with support body (5).
- Check o-rings on service cover for damage and replace if necessary.
- Fit service cover (3) and tighten screws.
- Open ball tap at compressed air exit.
- Switch on compressor and run till it reaches operating temperature.
- Check tightness of service cover and re-tighten screws.
- Close sound absorbing safety hood.

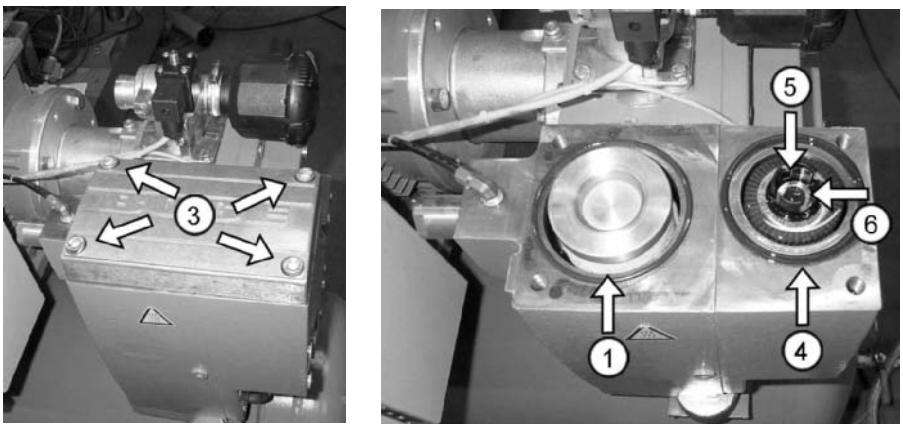


Fig. 6.6: Changing the oil filter

Changing the oil separator (Fig. 6.6)

Change:

– When warning message "8" appears on the contro system display (RATIO only).
– After 3,000 operating hours, however, no later than after one year.

Caution: Risk of injury!

If the prescribed maintenance intervals are not observed, the oil separators might become blocked. In this case, the differential pressure will increase until the safety valve blows.

Switch off the compressor using the OFF button

Caution: Risk of injury!

Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.

Caution: Risk of injury!

– **Do not touch hot surfaces!**
– Slacken screws on service cover (3) and remove cover.
– Pull oil disperser cartridge (1) up out of the o-ring seal.
– Check seat of o-ring.
– Lightly oil bottom of new cartridge in and press into o-ring seal.
– Check o-rings on service cover for damage and replace if necessary.
– Fit service cover (3) and tighten screws.
– Open ball tap at compressed air exit.
– Switch on compressor and run till it reaches operating temperature.
– Check tightness of service cover and re-tighten screws.
– Close sound absorbing safety hood.

Oil change

Change:

– After 9,000 operating hours, however, at the latest after two years.
– With other types the appropriate oil change intervals must be complied with.

Note!

The service life of the oil, the oil filter and oil separators is reduced under the following conditions:

– When the compressor is operated at extreme ambient temperatures.
– When the intake air is extremely soiled.

Building up a pressure cushion

The combined compressed air / oil receiver is located at the lowest point of the system. Therefore, a light pressure cushion (approx. 1.5 bar system pressure) must be applied to drain the oil. This pressure cushion forces the oil through the drain hose into a suitable collecting basin (see fig. 6.8, 6.9).

– Switch off the copressor using the OFF button.

Caution: Risk of injury!

Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.

Draining old oil

– Switch off compressor. After approx 2 sec screw cap nut (5) on the bleed aperture of the magnetic valve.
(The nut is located in the storage compartment of the switch cabinet.)

Caution: Risk of injury!

Danger of scalding with hot oil!

Always wear protective gloves when working on the compressor!

– Remove blind plug (1) at oil drain (3) with the tap closed.
– Fit oil drainage hose (2). (The hose is located on the machine.)
– Place the oil drain hose into a suitable container.
– Slowly open the stop valve. The pressure cushion forces the oil into the container.
– Once the compressed air/oil receiver has been completely drained, close the stop valve.
– Remove oil drainage hose and replace blind plug with new copper seal.
– **Remove cap nut from solenoid valve**.
– Change oil filter (proceed as described before).
– Change oil separators (proceed as described before).

Filling with new oil:

– Fill up to the edge of the thread of the filling socket (max.) (proceed as described before).

Attention!

After each oil change you have to fill a small quantity of oil into the suction controller before starting the compressor.

For oil quantity and procedure see chapter "Installation", chapter "Commissioning following extended stoppages".

Attention!

Always fill with the same oil type as previously used. Never mix different oil types and brands.

The oil circuit must be flushed prior to changing the oil type.

– Conduct trial run.

Caution: Risk of injury!

Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.

– Check the oil filters and oil separators for leaks and tighten by hand, if necessary (proceed as described before).
– Check oil level (proceed as described before).
  Top up oil losses, if any.

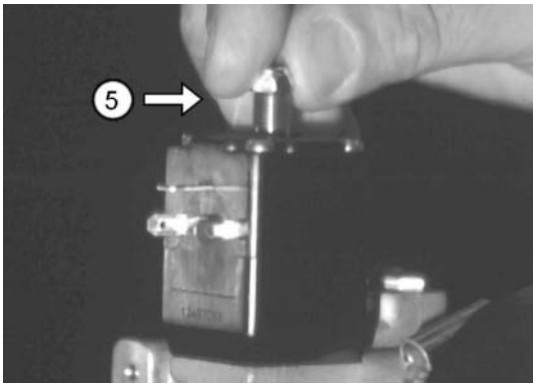


Fig. 6.7: Solenoid valve on the suction controller with the cap nut screwed on

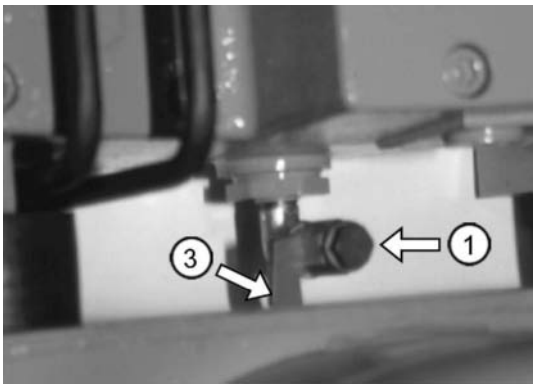


Fig. 6.8: Oil drain – Oil compressed air chamber

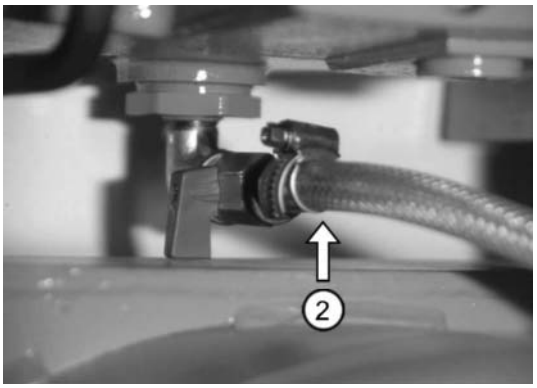


Fig. 6.9: Oil drain with fitted oil drainage hose

Flushing the oil circuit

Flushing the oil circuit with clean oil becomes necessary:

– When the oil is excessively soiled.
– Prior to changing the oil type.

Attention!

Detailed information as to the flushing with BOGE oils you can obtain from the following service number:

Telephone: +49 5206 601-140

Cleaning the compressed air/oil cooling unit

Cleaning:

– After 1,500 operating hours, however, at the latest after one year.

Note!

The service life of the compressed air/oil cooling unit depends on the degree of soiling (dust, oil vapour) of the suctioned cooling air. Extreme external soiling of the cooling unit leads to an increased temperature in the oil circuit.

Switch off the compressor using the OFF button.

Caution: Risk of injury!

Press Emergency Stop button, open mains disconnection device and secure against unintentional switch on by means of a padlock.

Attention!

Do not use any sharp objects for cleaning!

These could damage the cooling unit.

– Blow down the dirt with compressed air in the opposite direction to the normal cooling air flow. Vacuum out the dirt using an industrial vacuum cleaner.

If the cooling unit is excessively soiled (cleaning is no longer possible with compressed air), have it disassembled and cleaned by BOGE service.

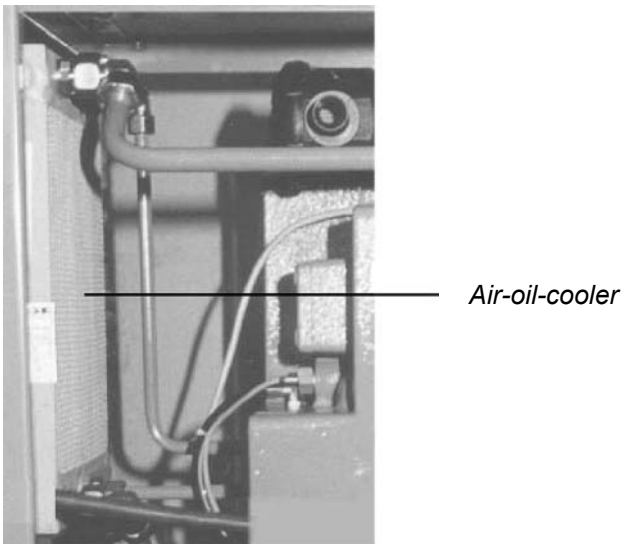


Fig. 6.10: Cleaning the compressed air/oil cooling unit

Checking the safety valve

Check:

– After approx. 3,000 operating hours, however, at least once a year.

Check safety valve by opening the screw plug (1).

Caution: Risk of injury!

Danger of scalding with hot oil!

Always wear protective goggles and gloves!

Take extreme care when checking the safety valve with the compressor running taking all safety measures into consideration.

A hot air-oil mixture escapes when opening!

– Open the threaded plug (1) counterclockwise. The hot air-oil mixture escapes.
– Tighten the threaded plug by turning clockwise.

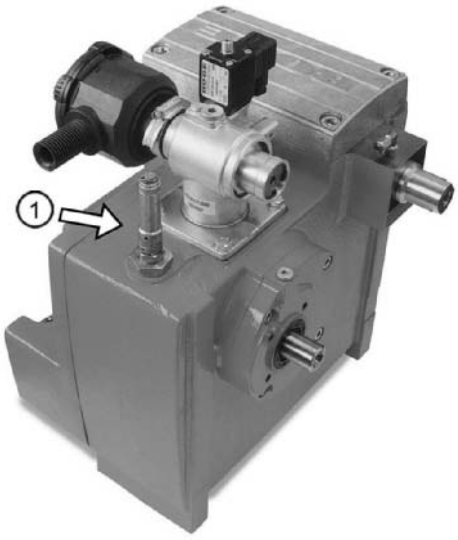


Fig. 6.11: Check safety valve

6.4 Maintenance work compressed air dryer DRL 9

Attention!

Prior to any maintenance make sure to observe applicable safety regulations for electrical equipment and devices (see chapter „General safety instructions“ at 1).

Note!

Owing to the fact that maintenance intervals extremely depend on the respective operation and installation conditions, all values provided are reference values only.

Daily checks

– Check function of condensate drain.
  Check if water is discharged.
– Pressure dew point monitoring.

Weekly maintenance

Inspection and, if necessary, cleaning of condensate draining system.

Annually maintenance

Condensate drain: Replace wearing part kit.
For further information please see separate Operating Instructions of the condensate drain.

Attention!

Any maintenance on the condensate drainer may be performed under pressureless conditions only.

6.5 Spare parts and optional equipment

List of spare and wearing parts for the compressor (for maintenance)

Designation
Compressor oil Syprem 8000 S
Set of V-belts
Maintenance kit comprising of: oil filter, oil separator, suction filter cartridge, gaskets, nozzle with dirt catch
Wearing part kits comprising of: oil regulator, minimum pressure valve, solenoid valve
Intake regulator including solenoid valve

Spare parts compressed air dryer DRL 9

Note!

BOGE will make every effort to permanently update replacement parts inventory. Please contact the BOGE service department for any DRL 9 compressed air dryer replacement parts:

Telephone: +49 5206 601-140

List of available optional equipment

Designation
Optional equipment for compressed air treatment
Oil/water separator
Automatic condensate draining unit Bekomat

Attention!

When ordering, please specify the data on the type plate:

– Type
– Year of manufacture
– Machine number

7.1 Guidelines and standards complied with

The compressor conforms to the following guidelines and standards:

Guidelines and directives

– Machinery Directive 2006/42/EC
– Pressure Equipment Directive 97/23/EC
– EMC Directive 2004/108/EC
– Low Voltage Directive 2006/95/EC
– Simple Pressure Vessels Directive 2009/105/EC

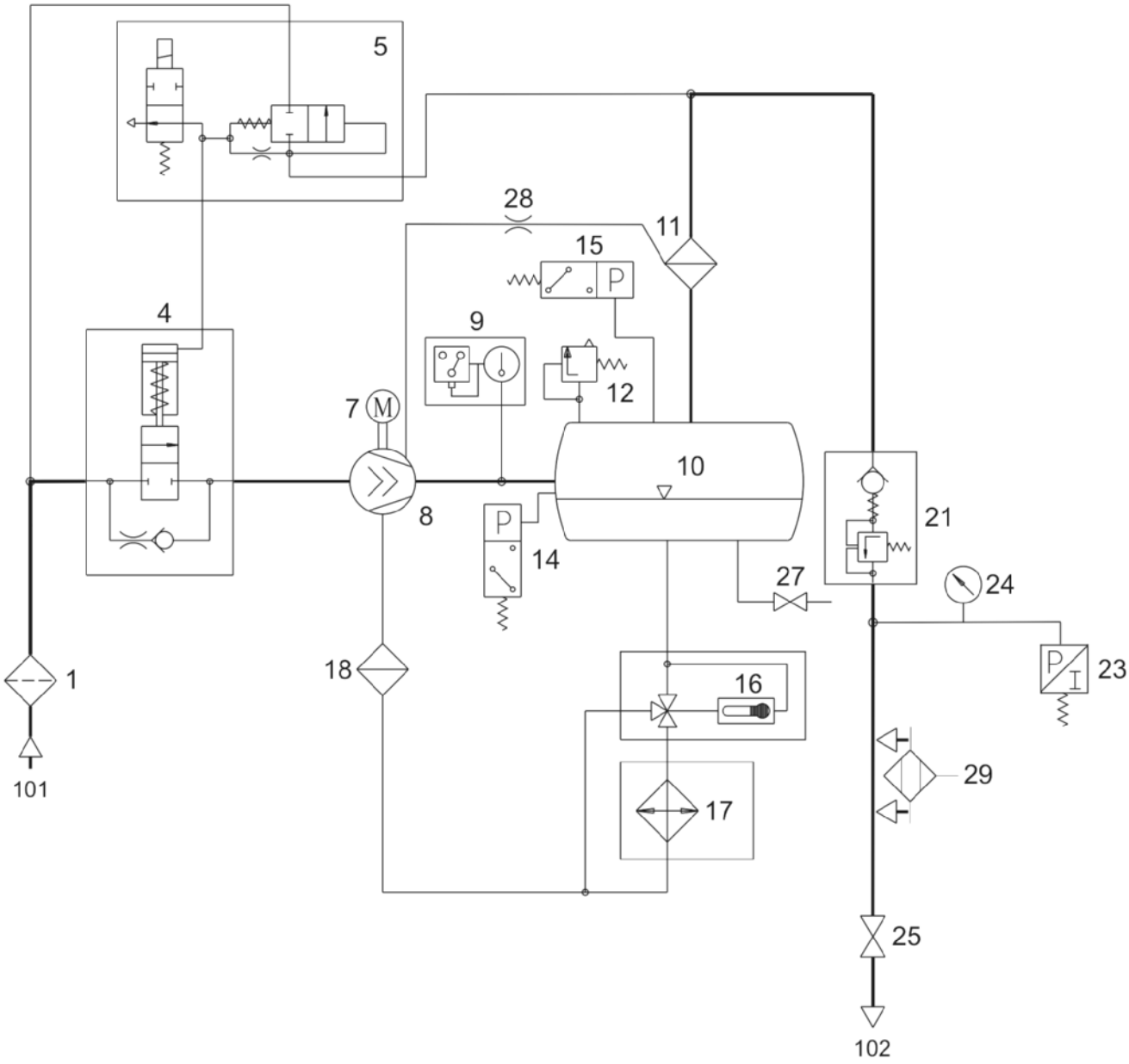
Applied harmonized standards

– DIN EN 1012-1:2011
– DIN EN ISO 12100:2011
– DIN EN 60204-1 / VDE 0113-1:2007
– DIN EN 61000-6-2 / VDE 0839-6-2:2006
– DIN EN 61000-6-4 / VDE 0839-6-4:2007

7.2 Flow chart

On the following pages you will find the individual flow charts for the different machine types and components.

**Air cooled version,
standard,
series C 4...C 9 D**



101 Intake air INLET
102 Compressed air OUTLET

1 Suction filter
4 Suction controller
5 Air relief and regulation control valve
7 Drive motor
8 Air end
9 Final compression temperature display and switch
10 Combined compressed air/oil receiver
11 Oil separator
12 Safety valve
16 Thermostatic oil control valve
17 Oil cooler
18 Oil filter
21 Minimum pressure check valve
23 Network pressure transmitter
24 Pressure gauge reading in display
25 Stop valve, compressed air outlet
27 Stop valve, oil drainage
28 Throttle with filter
29 Compressed air refrigeration dryer (only series C 4 D...C 9 D)

7.3 List of maintenance and service work

Please note the completed maintenance work in the respective columns.

Date	*Operating hours*	*Net pressure*	*System pressure*	*Tempera-ture*	*Suction filter* *	*Intake filter*	*Oil filter*	*Oil level* **	*Oil separator*	*Cooling unit cleaning*	*Motor maintenance*	*Com-pressed air dryer*	*Remarks*

* *Cl = Cleaning*
Ch = Change

** *Co = Control*
Ch = Change

Please note the completed maintenance work in the respective columns.

Date	Operating hours	Net pressure	System pressure	Tempera-ture	Suction filter *	Intake filter	Oil filter	Oil level **	Oil separator	Cooling unit cleaning	Motor mainte-nance	Com-pressed air dryer	Remarks

* Cl = Cleaning
Ch = Change

** Co = Control
Ch = Change

Please note the completed maintenance work in the respective columns.

Date	*Operating hours*	*Net pressure*	*System pressure*	*Tempera-ture*	*Suction filter* *	*Intake filter*	*Oil filter*	*Oil level* **	*Oil separator*	*Cooling unit cleaning*	*Motor mainte-nance*	*Com-pressed air dryer*	*Remarks*

* *Cl = Cleaning*
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** *Co = Control*
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