BAUER
KOMPRESSOREN

INSTRUCTION MANUAL
AND SPARE PARTS CATALOGUE

HIGH PRESSURE
BREATHING AIR COMPRESSOR
225 bar/330 bar

UTILUS

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INTRODUCTION

This manual contains operating instructions and maintenance schedules for the high pressure breathing air compressor

UTILUS

All instructions should be observed and carried out in the order laid down to prevent damage and premature wear to the equipment.

While every effort is made to ensure the accuracy of the particulars contained in this manual, the manufacturing company will not, under any circumstances, be held liable for any inaccuracies or the consequences thereof.

WARNING

The breathing air produced with this unit is subject to strict quality standards. Ignoring the operating and maintenance instructions can lead to severe injury or death.

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1. GENERAL

1.1. PURPOSE AND SHORT DESCRIPTION

The **UTILUS** breathing air compressors are complete units for filling air tanks to a pressure of 225 bar (3,200 psi) or 330 bar (4,700 psi).

The compressor block of this unit is a 3-cylinder, 3-stage, air-cooled reciprocating piston compressor.

1.2. DESIGN AND MODE OF OPERATION

1.2.1. Design

The compressor unit comprises the following major assemblies:

- compressor block
- drive motor
- filter assembly
- filling assembly
- base plate
- automatic condensate drain[a)]
- electric control system[a)]

The design of the compressor system is shown in Fig. 1 to Fig. 3. For special equipment according to order see figures and parts lists in the annex.

a) optional extra according to order

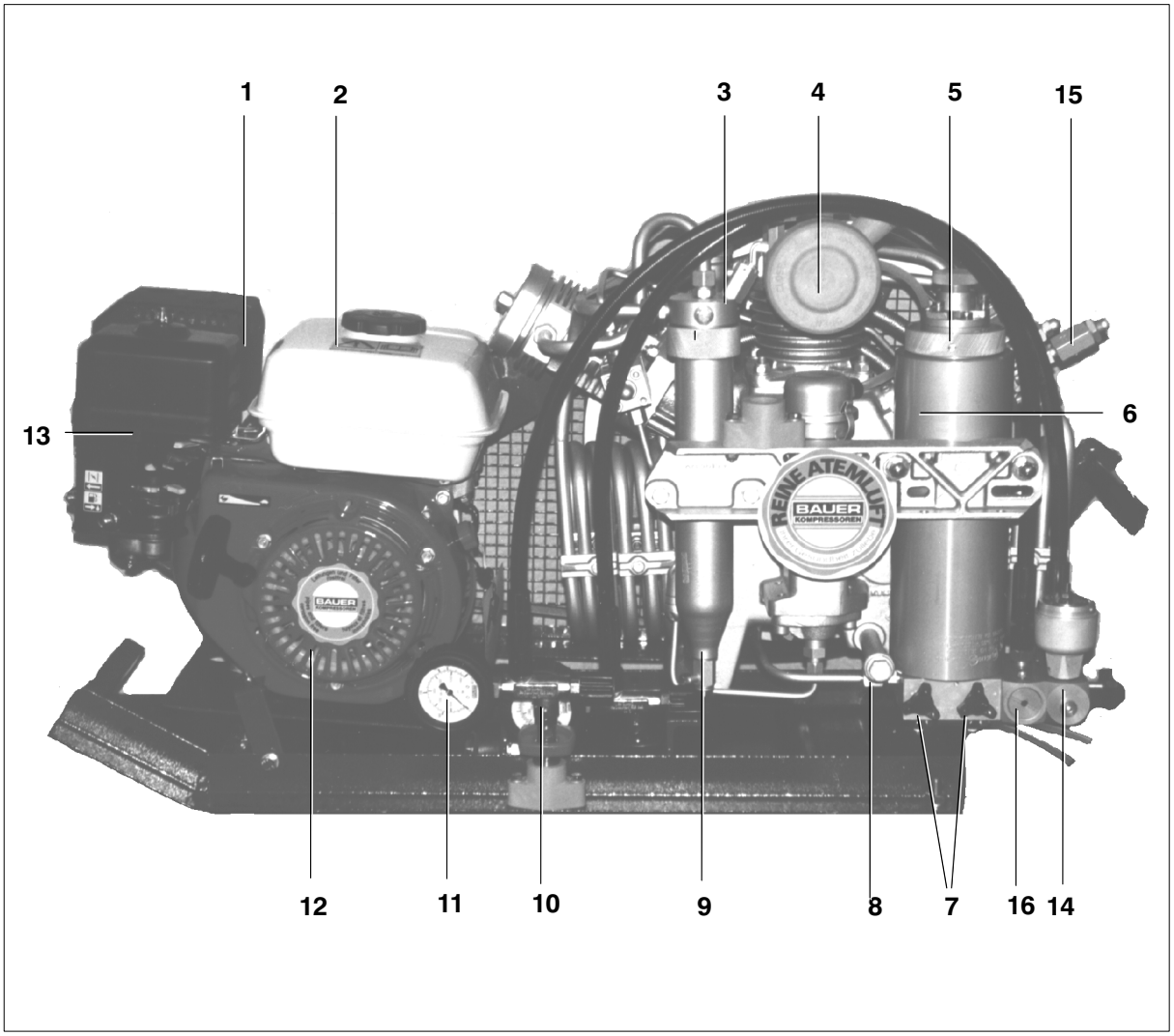


Fig. 1 Compressor unit with petrol engine

1 Engine exhaust
2 Tank
3 Safety valve 2nd stage
4 Intake filter, compressor
5 Final pressure safety valve
6 Central filter assembly
7 Condensate drain valves
8 Oil drain plug
9 Intermediate separator
10 Filling valve
11 Final pressure safety valve
12 Drive engine
13 Engine intake filter
14 Switch-over device
15 Safety valve 1st stage
16 Pressure maintaining valve

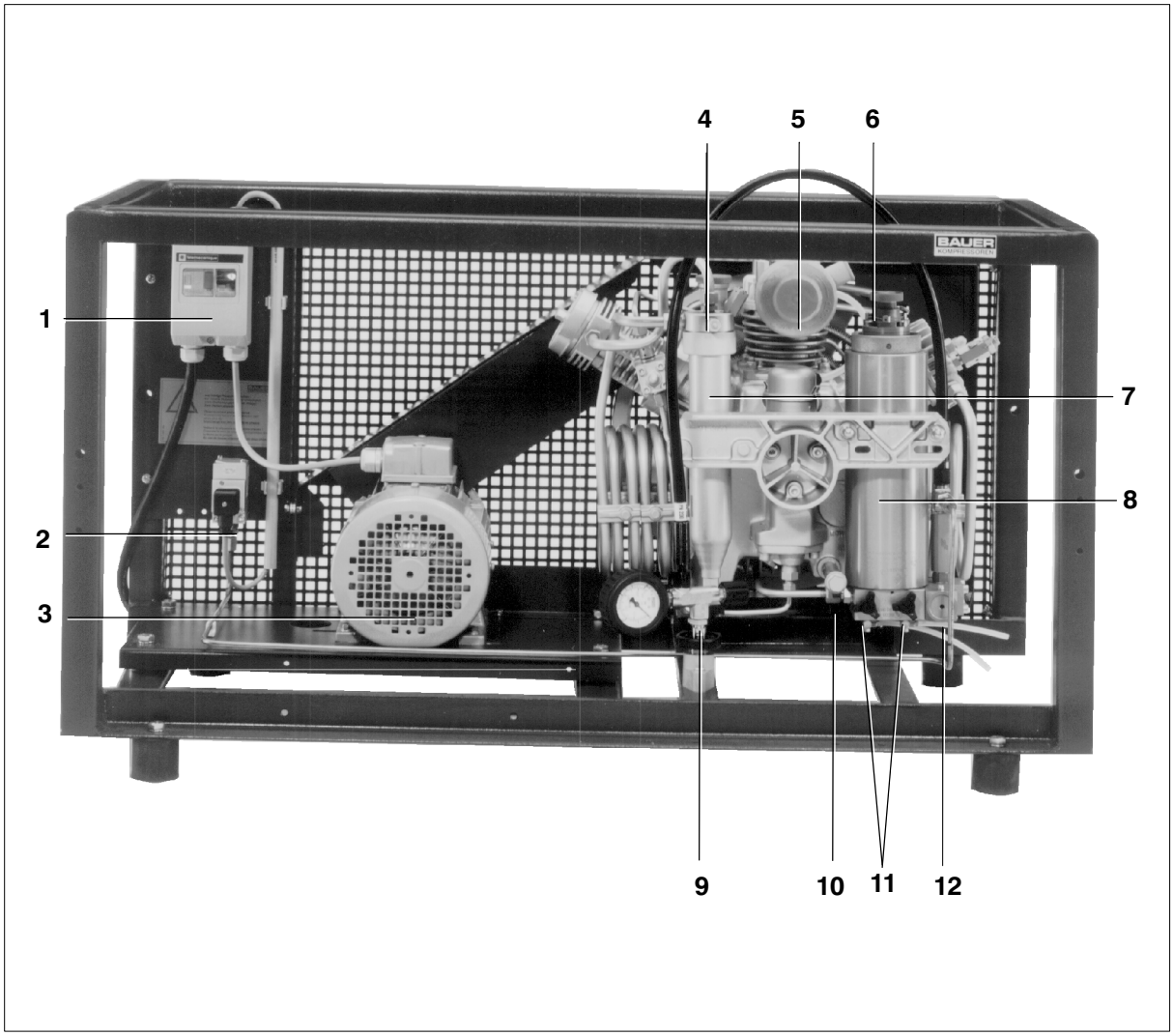


Fig. 2 Compressor unit with electric engine

1 Motor switch
2 Final pressure switch
3 Electric engine
4 Safety valve 2nd stage
5 Intake filter, compressor
6 Final pressure safety valve
7 Intermediate separator
8 Central filter assembly
9 Filling valve
10 Oil drain plug
11 Condensate drain valve
12 Pressure maintaining valve

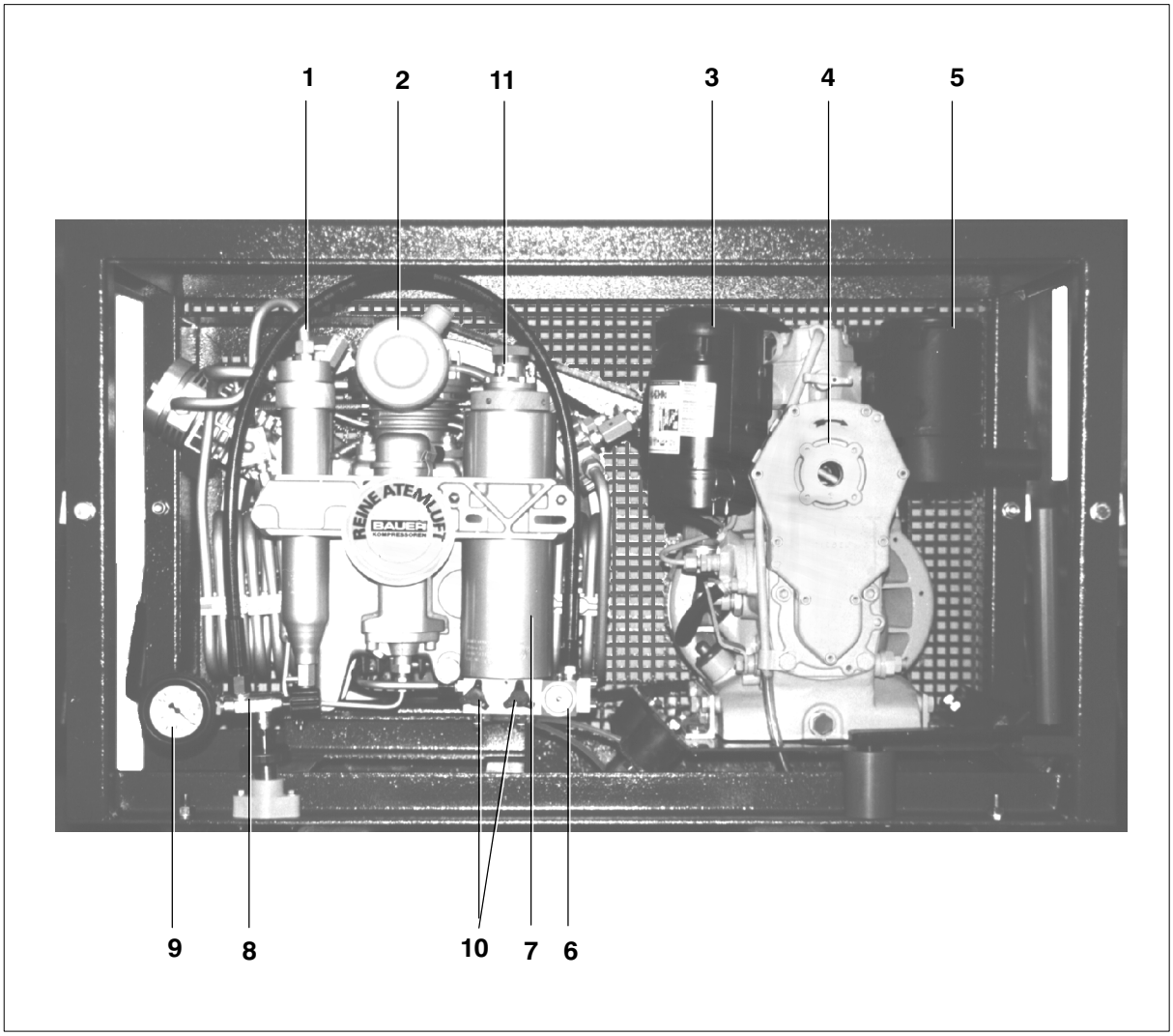


Fig. 3 Compressor unit with diesel engine

1 Intermediate separator
2 Intake filter, compressor
3 Engine intake filter
4 Drive engine
5 Engine exhaust
6 Pressure maintaining valve
7 Central filter assembly
8 Filling valve
9 Final pressure gauge
10 Condensate drain valve
11 Final pressure safety valve

1.2.2. Compressor block

The compressor block **UTILUS** is used to compress air in the high pressure ranges. The max. allowable operating pressure is 225 bar (3,200 psi) for units U1, U2B, U3E, U4D and 330 bar (4,700 psi) for units U1H, U2B-H, U3E-H and U4D-H.

The compressor block is of a three stage, three cylinder design, it is lubricated by means of the forced-feed lubrication system. The cylinders are arranged in a W form, 1st stage in the centre, 2nd stage on the right, and 3rd stage on the left side looking from the filter side.

The compressor block is particularly suitable for continuous operation because of its rugged design and the corrosion resistant intermediate filter and cooler assemblies. Smooth running is a particular feature of this **BAUER** design. The balance of masses of the 1st rank is zero. The moving parts of the driving gear are all equally balanced. This results is an vibration-free running.

The driving gear is fitted with three bearings. It is here that the energy saving cylinder roller bearings are put to use. The upper and lower connecting rod bearings are also roller bearings. This allows for an even longer life which lasts at least 30,000 operating hours. All valves have free access for time saving maintenance. There is no need for dismantling of pipes or pressure gauges.

The design of the compressor block is shown in Fig. 4.

For the mode of operation refer to the flow diagram Fig. 5.

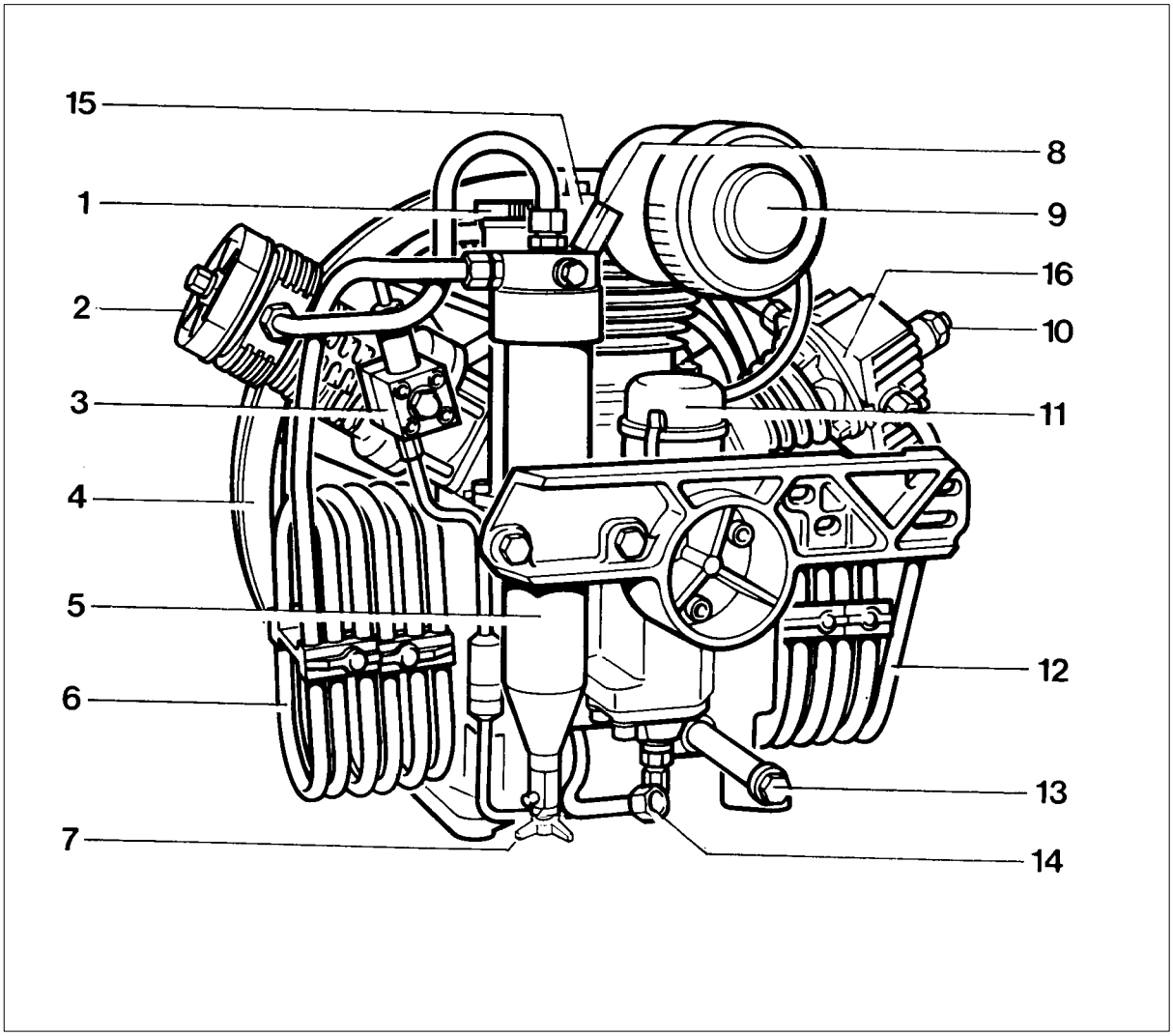


Fig. 4 UTILUS compressor block

1 Oil filler neck and dipstick
2 Cylinder 3rd stage
3 Oil pressure regulating valve
4 Flywheel
5 Intermediate separator 2nd/3rd stage
6 Inter-cooler 2nd/3rd stage
7 Condensate drain tap
8 Safety valve 2nd stage
9 Intake filter
10 Safety valve 1st stage
11 Crankcase venting
12 Inter-cooler 1st/2nd stage
13 Oil drain plug
14 Air outlet
15 Cylinder 1st stage
16 Cylinder 2nd stage

1.2.3. Air flow diagram

See Fig. 5. The air is drawn in through intake filter -1; compressed to final pressure in cylinders -2, -3, -4; recooled by intercoolers -5, -6, and aftercooler -7. The pressures of the single stages are protected by safety valves -8, -9, -10.
The compressed air is pre-cleaned in intermediate separator -11 and purified in central filter -12. Intermediate separator and central filter are drained by means of condensate drain valves -14. Pressure maintaining valve -15 provides a constant pressure within the filter assembly.
The compressed, purified air is passed through filling hose -16 and filling valve -17 to the bottles to be filled. Filling pressure is indicated at pressure gauge -18.
The compressor units can also be provided with a change-over device -19. In this case, the safety valve -20 takes over the function of the final safety valve -10.

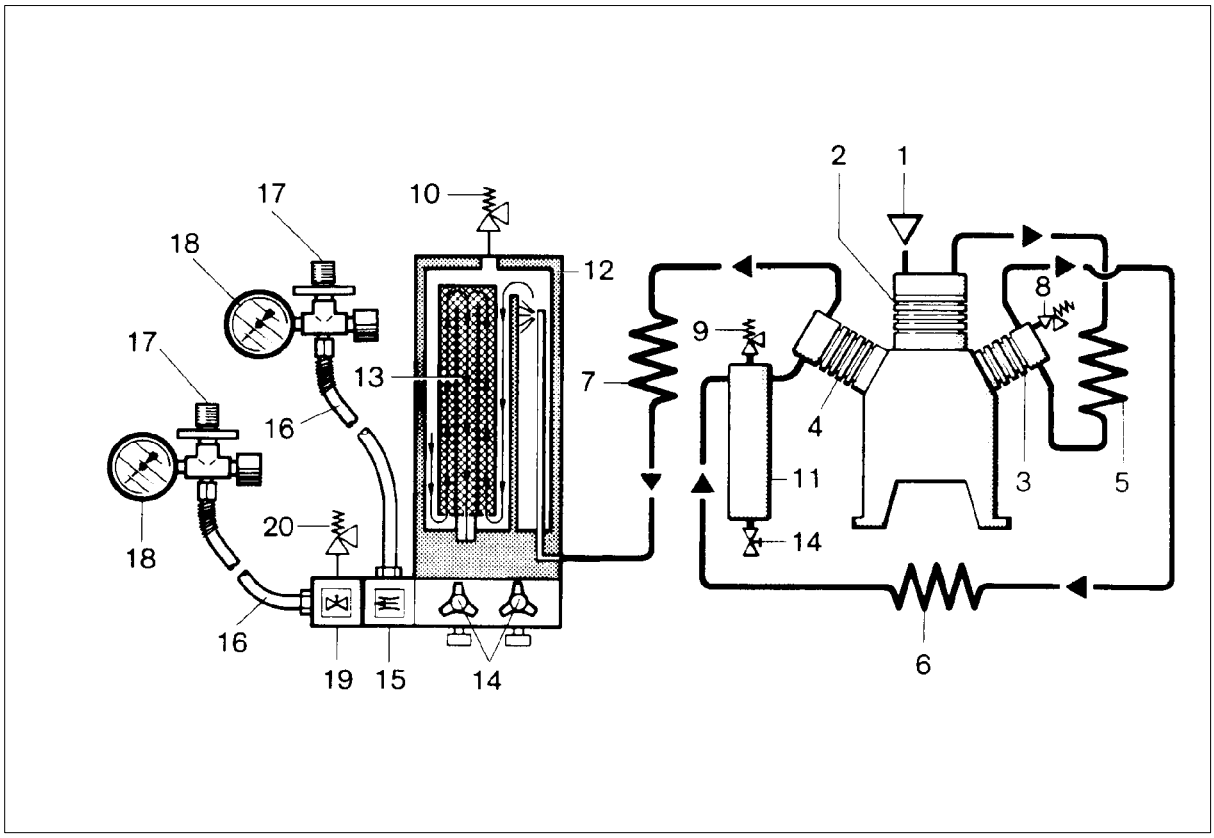


Fig. 5 Air flow diagram

1 Intake filter
2 Cylinder 1st stage
3 Cylinder 2nd stage
4 Cylinder 3rd stage
5 Inter-cooler 1st/2nd stage
6 Inter-cooler 2nd/3rd stage
7 After-cooler
8 Safety valve 1st stage
9 Safety valve 2nd stage
10 Final pressure safety valve
11 Intermediate separator 2nd/3rd stage
12 Central filter assy.
13 TRIPLEX longlife cartridge
14 Condensate drain valve
15 Pressure maintaining valve
16 Filling hose
17 Filling valve
18 Final pressure gauge
19 Change over device*)
20 Safety valve, final pressure PN 200

*) optional extra

1.3. TECHNICAL DATA

1.3.1. Compressor unit UTILUS with petrol motor

Compressor unit	**U2 B**	**U2B-H**
Delivery[a)]	100 l/min.	100 l/min.
Operating pressure	PN 200	PN 300
Pressure setting, final pressure safety valve	225 bar	330 bar
Sound pressure	83 dB(A)	83 dB(A)
Compressor block	**UTILUS, mod. 9**	**UTILUS, mod. 9**
Number of stages	3	3
Number of cylinders	3	3
Cylinder bore 1st stage	60 mm	60 mm
Cylinder bore 2nd stage	36 mm	36 mm
Cylinder bore 3rd stage	12 mm	12 mm
Piston stroke	24 mm	24 mm
Speed	1,800 min^{-1}	1,800 min^{-1}
Intermediate pressure 1st stage	4 bar	4.5 bar
	60 psi	65 psi
Intermediate pressure 2nd stage	37 bar	39 bar
	540 psi	570 psi
Compressor block oil capacity	360 cm^3	360 cm^3
	12 fl. oz.	12 fl. oz.
Oil type	see chap. 2 lubrication	
Max. ambient temperature	+5 ... +45 °C	+5 ... +45 °C
	+43 ... +113 °F	+43 ... +113 °F
Max. permissible inclination of compressor[b)]	10°	10°
Drive motor	**Honda petrol engine**	
Manual start model (B)	GX160K1Q1C8	
Power	4.0 kW	
at nominal speed	3,600 min^{-1}	

a) free air delivered at tank filling from 0 to 200 bar ± 5%.

b) these values are valid only if the oil level of the compressor in normal position corresponds with the upper mark of the oil dipstick and may not be exceeded.

TECHNICAL DATA

1.3.2. Compressor unit UTILUS with three phase current motor

Compressor unit	**U3E**	**U3E-H**
Delivery[a]	100 l/min.	100 l/min.
Operating pressure	PN 200	PN 300
Pressure setting, final pressure safety valve	225 bar	330 bar
Sound pressure	80 dB(A)	80 dB(A)
Compressor block	**UTILUS, mod. 9**	**UTILUS, mod. 9**
Number of stages	3	3
Number of cylinders	3	3
Cylinder bore 1st stage	60 mm	60 mm
Cylinder bore 2nd stage	36 mm	36 mm
Cylinder bore 3rd stage	12 mm	12 mm
Piston stroke	24 mm	24 mm
Speed	1,200 min^{-1}	1,200 min^{-1}
Intermediate pressure 1st stage	4 bar 60 psi	4.5 bar 65 psi
Intermediate pressure 2nd stage	37 bar 540 psi	39 bar 570 psi
Compressor block oil capacity	360 cm^3 12 fl. oz.	360 cm^3 12 fl. oz.
Oil type	see chap. 2 lubrication	
Max. ambient temperature	+5 ... +45 °C +43 ... +113 °F	+5 ... +45 °C +43 ... +113 °F
Max. permissible inclination of compressor[b]	10°	10°

Drive motor	**Three phase current**
Operating voltage	220 V, 50 Hz
Power	2.2 kW
Speed	2,880 min^{-1}
Size	90 L
Type of construction	B3
Type of enclosure	IP54

a) free air delivered at tank filling from 0 to 200 bar ± 5%.

b) these values are valid only if the oil level of the compressor in normal position corresponds with the upper mark of the oil dipstick and may not be exceeded.

TECHNICAL DATA

1.3.3. Compressor unit UTILUS with alternating current motor

Compressor unit	**U3W**	**U3W-H**
Delivery[a]	100 l/min.	100 l/min.
Operating pressure	PN 200	PN 300
Pressure setting, final pressure safety valve	225 bar	330 bar
Sound pressure	80 dB(A)	80 dB(A)
Compressor block	**UTILUS, mod. 9**	**UTILUS, mod. 9**
Number of stages	3	3
Number of cylinders	3	3
Cylinder bore 1st stage	60 mm	60 mm
Cylinder bore 2nd stage	36 mm	36 mm
Cylinder bore 3rd stage	12 mm	12 mm
Piston stroke	24 mm	24 mm
Speed	1,200 min^{-1}	1,200 min^{-1}
Intermediate pressure 1st stage	4 bar 60 psi	4.5 bar 65 psi
Intermediate pressure 2nd stage	37 bar 540 psi	39 bar 570 psi
Compressor block oil capacity	360 cm^3 12 fl. oz.	360 cm^3 12 fl. oz.
Oil type	see chap. 2 lubrication	
Max. ambient temperature	+5 ... +45 °C +43 ... +113 °F	+5 ... +45 °C +43 ... +113 °F
Max. permissible inclination of compressor[b]	10°	10°
Drive motor	**Alternating current**	
Operating voltage	220 V, 50 Hz	
Power	2.2 kW	
Speed	3,000 min^{-1}	
Size	LS 90 PC	
Type of construction	B3	
Type of enclosure	IP55	

a) free air delivered at tank filling from 0 to 200 bar ± 5%.

b) these values are valid only if the oil level of the compressor in normal position corresponds with the upper mark of the oil dipstick and may not be exceeded.

TECHNICAL DATA

1.3.4. Compressor unit UTILUS with diesel motor

Compressor unit	**U4 D**	**U4D-H**
Delivery[a)]	100 l/min.	100 l/min.
Operating pressure	PN 200	PN 300
Pressure setting, final pressure safety valve	225 bar	330 bar
Sound pressure	88 dB(A)	88 dB(A)
Sound (immersion) power	102 dB(A)	102 dB(A)
Compressor block	**UTILUS, mod. 9**	**UTILUS, mod. 9**
Number of stages	3	3
Number of cylinders	3	3
Cylinder bore 1st stage	60 mm	60 mm
Cylinder bore 2nd stage	36 mm	36 mm
Cylinder bore 3rd stage	12 mm	12 mm
Piston stroke	24 mm	24 mm
Speed	1,800 min^{-1}	1,800 min^{-1}
Intermediate pressure 1st stage	4 bar	4.5 bar
	60 psi	65 psi
Intermediate pressure 2nd stage	37 bar	39 bar
	540 psi	570 psi
Compressor block oil capacity	360 cm^3	360 cm^3
	12 fl. oz.	12 fl. oz.
Oil type	see chap. 2 lubrication	
Max. ambient temperature	+5 ... +45 °C	+5 ... +45 °C
	+43 ... +113 °F	+43 ... +113 °F
Max. permissible inclination of compressor[b)]	10°	10°
Drive motor	**Hatz diesel engine**	
Manual start model (D)	E 637 LS	
Power	4.5 kW	
at nominal speed	3,600 min^{-1}	

a) free air delivered at tank filling from 0 to 200 bar ± 5%.

b) these values are valid only if the oil level of the compressor in normal position corresponds with the upper mark of the oil dipstick and may not be exceeded.

2. LUBRICATION SYSTEM

2.1. FUNCTIONAL DESCRIPTION

The compressor is provided with forced-feed lubrication for the last (third) stage (Fig. 6).

Oil pump (1) is driven by a cam of the crankshaft. It pumps oil into the oil pressure regulating valve (2) at the 3rd stage through an oil filter. The oil pressure regulating valve doses the oil quantity and is adjusted to the respective oil pressure. The oil not needed flows back to the crankcase through the feedback tube (3).

This oil is atomized by the drive gear and lubricates the other moving parts, such as crankshaft, connecting rods, cylinders and pistons, then it returns into the oil sump.

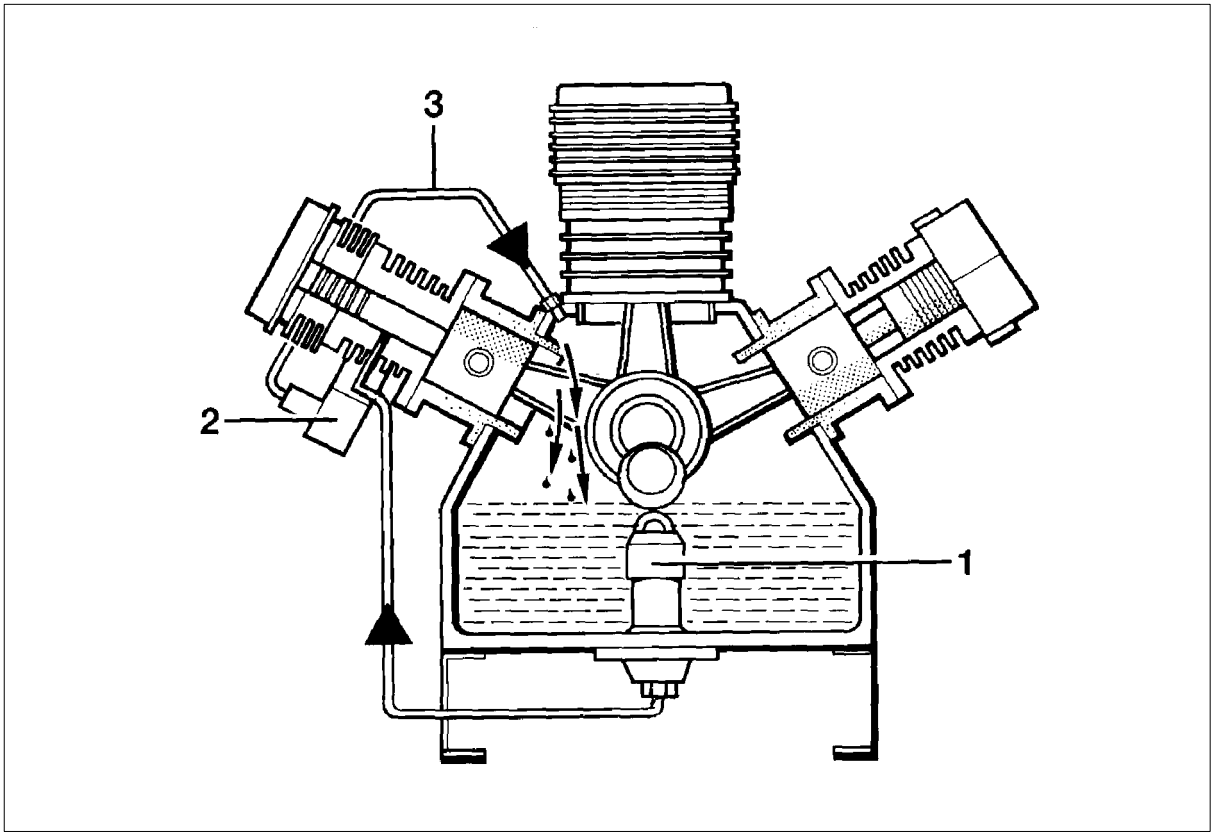


Fig. 6 Lubricating oil circuit

1 Oil pump
2 Oil pressure regulating valve
3 Feedback tube

2.2. OIL LEVEL CHECK

Check oil level daily prior to putting compressor into operation. Check using oil dipstick. Wipe off dip stick with lint-free cloth, note that the oil level must be between minimum and maximum dip-stick notches (see Fig. 7).

Oil level must not exceed maximum as this will cause excessive lubrication of compressor and result in valves sooting up.

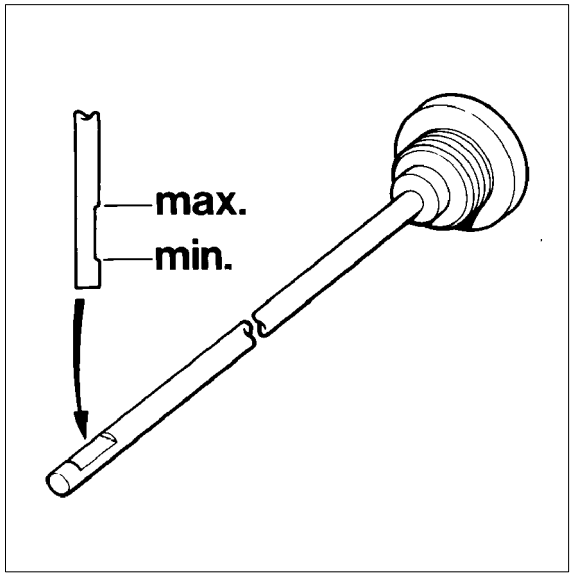


Fig. 7 Oil dipstick markings

2.3. TYPE OF OIL

For proper care and maintenance of the compressor, using the correct oil is of vital importance. Depending on the application of the compressor the requirements placed on the oil are:

- low deposits
- no carbonizing effect, especially in the valves
- good anti-corrosive properties
- emulsification of the condensate in the crankcase
- physiological and toxicological suitability.

Due to the thermal load on the compressor only high quality oil should be used. You are recommended to restrict oils to those which have been approved by us and are listed in our lubricating oil list. This list is available through our Technical Service Department.

2.3.1. Synthetic lube oils

For operation under severe conditions such as continuous running and/or high ambient temperatures we recommend the following synthetic compressor oil, only:

Part No. N 19745 (synthetic oil with corrosion protection)

This oil is tested in our compressors and has proved excellent quality under ambient temperatures between +5 °C (41 °F) and +45 °C (113 °F). The change intervals will be as shown in para. 2.4.

NOTE

All our compressor units are delivered with oil (which, depending on the model is filled into the crankcase, or separate in the consignment), part no. N 19745.

2.3.2. Mineral lube oils

For operation under less severe conditions we can also recommend **High Pressure Compressor Oil, part no. N 16725**, due to its preservative properties and the price advantage. This oil meets the specifications of VD-L group 150 according to German standard DIN 51506. It is suitable for operation under ambient temperatures between +5 °C (41 °F) and +35 °C (95 °F).

2.3.3. Changing the oil type

If you should wish to use a mineral oil (e.g. part no. N 16725) on later oil changes, no problems should arise, but:

CAUTION

To avoid severe damage to the compressor unit when changing from a mineral oil to a synthetic oil, the following measures should be strictly adhered to.

- Drain mineral oil completely while still warm.
- Change or clean oil filter, valves, coolers, separators, purifiers and all pneumatic tubes and hoses from deposits.
- Fill compressor with synthetic oil.
- After approx. 100 operating hours clean or replace filter again. If oil filter is badly soiled, check lubricating oil for degree of contamination, and change oil again if necessary.
- Perform subsequent oil changes according to chapter 2.4.
- Refill compressor with synthetic oil only.

2.4. OIL CHANGE

Part. No. N 16725	every 1,000 operating hours, at least annually
Part. No. N 19745	every 2,000 operating hours, at least bi-annually
Oil capacity	**approx. 1.6 l**

BAUER compressor oil is available in the following quantities:

Qty.	**Mineral oil, Part. No. N 16725**	**Synthetic oil, Part. No. N19745**
1 l	Part. No. 070699	Best.-Nr. 070693
5 l	Part. No. 070700	Best.-Nr. 070694
20 l	Part. No. 070701	Best.-Nr. 070695

Change oil also prior to laying up the compressor. When changing oil, also change the lubricating oil filter.

- Run compressor warm.
- Drain oil while still warm by means of oil drain plug. Refill with oil through the oil filler neck. Replace the sealing, reinstall drain plug and tighten well.
- Oil level is checked with oil dipstick, see Fig. 7 – oil level is correct if at upper mark.

2.5. VENTING OIL PUMP

If no or low oil pressure builds up after starting the unit – especially after maintenance or repair work – venting of the oil pump will be necessary. Proceed as follows:

- With compressor shut down, remove nut (1) and line (2) from oil pump (see Fig. 8).
- Start compressor.
- Loosen connector (3) until oil emerges free of air-bubbles. Tighten connector, fit line and nut and tighten.

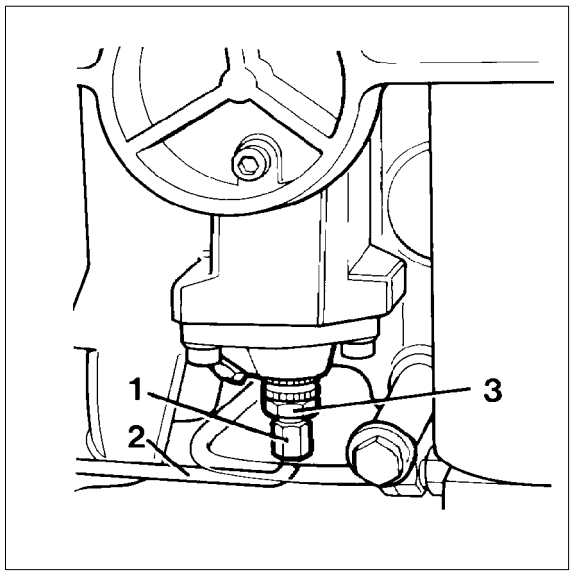


Fig. 8 Venting oil pump

2.6. OIL PRESSURE REGULATOR

The oil pressure regulator is mounted on the 3rd stage cylinder and adjusted to 50 bar (725 psi). The oil pressure regulating valve can be adjusted by removing cap nut and turning the grub screw in the oil pressure regulator (see Fig. 9).

Turning screw clockwise = increases pressure
Turning screw anti-clockwise = reduces pressure

Read oil pressure from an oil pressure gauge connected to the oil pressure regulator test connector.

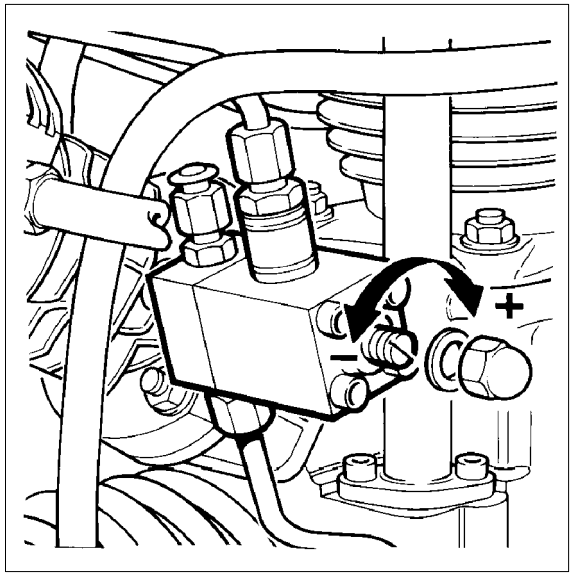


Fig. 9 Oil pressure regulating valve

3. INTAKE FILTER

3.1. DESCRIPTION

A dry Micronic filter is used to filter intake air, see Fig. 10.

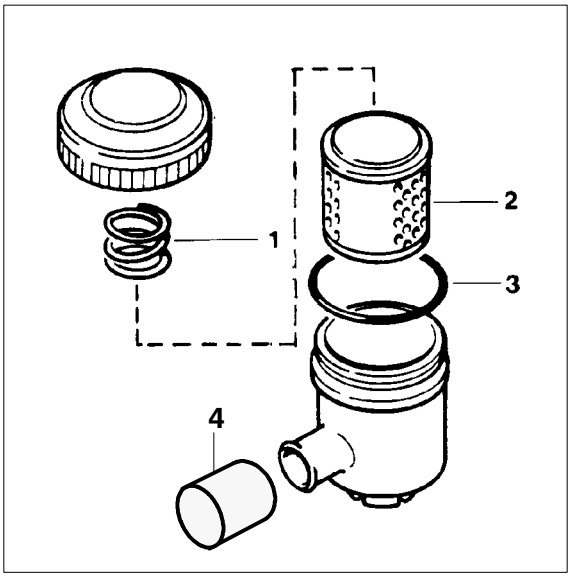


Fig. 10 Intake filter

3.2. INTAKE FILTER MAINTENANCE

Filter cartridge must be changed at regular intervals according to maintenance schedule in chapter 16.

To clean, remove micronic filter cartridge (2) and clean with brush or by blowing air inside out. Turn cartridge through 90° when replacing. Replace dirty cartridge once it has been turned three times and thus used on all sides.

Clean filter housing inside with a damp cloth. Take care to prevent dust from entering intake pipe. Replace O-ring (3) if necessary. When changing cartridge make sure spring (1) on top cover is installed properly.

With cap (4), part no. N 18234, the intake filter can be sealed for storage.

3.3. INTAKE HOSE AND PRE-FILTER

Petrol or diesel driven breathing air compressors should be fitted with an intake hose and a pre-filter (see Fig. 11). This is also recommended for electric power driven compressor units.

The pre-filter is necessary to ensure clean, uncontaminated air, free of exhaust fumes, being compressed. It eliminates any airborne contamination entering the intake hose. Service the pre-filter the same way as the intake filter.

CAUTION

Do not use any cleaning fluids which are a hazard to respiration.

Clean in hot soapy water and blow dry with compressed air.

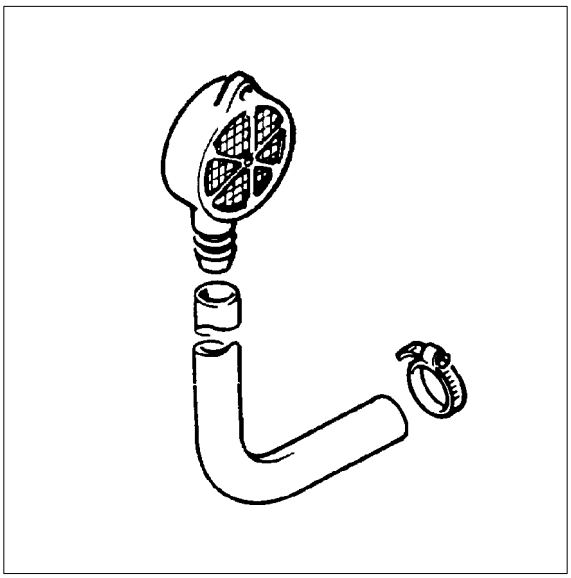


Fig. 11 Intake hose and pre-filter

4. INTERMEDIATE SEPARATORS

4.1. DESCRIPTION

An intermediate separator is mounted on the compressor after 2nd stage. This separator is designed to remove water and oil accumulating due to cooling the air down after the compression process.

Separation is achieved by means of centrifugal action provided by a vortex plate (2). A sintered metal filter (4) is provided additionally to remove dirt contamination, see Fig. 12.

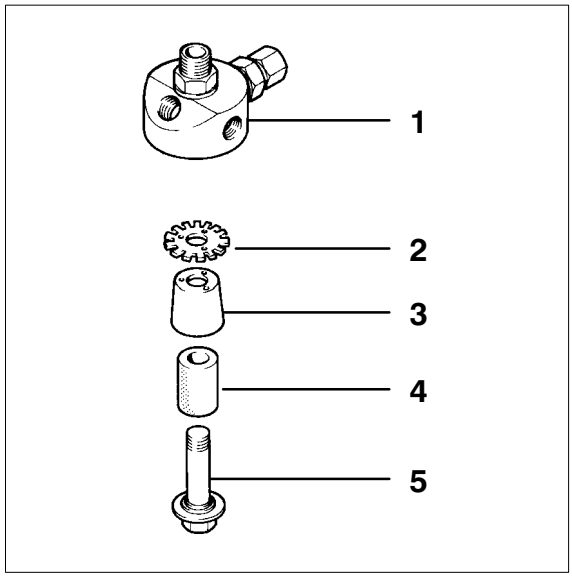


Fig. 12 Intermediate separator

4.2. MAINTENANCE

Proper operation of the individual compression stages will rely on the intermediate separator being properly serviced.

Drain condensate every 15 to 30 minutes from these separators or ensure that the automatic condensate drain unit drains regularly (see chapter 10).

Clean sintered filter elements as follows (for maintenance intervals refer to chapter 16):

- Remove piping connected to filter head. Screw off union nut. Remove filter head (1) along with sintered filter element.
- Remove centre screw (5), and separate sintered filter element (4), baffle (3) and vortex plate (2) from the filter head.
- To clean filter element, the best method is to use hot soapy water and to blow dry with compressed air.

5. FILTER SYSTEM P21

5.1. APPLICATION AND SUMMARY DESCRIPTION

Air leaving final stage is cooled in the after-cooler to approx. 10 - 15 °C (18 - 27 °F) above ambient temperature and then enters filter system **P21** with **TRIPLEX** longlife cartridge (Fig. 13). The filter assembly consists of separator and cartridge chamber. In the separator surrounding the cartridge chamber liquid oil and water particles are reliably separated from the compressed medium by a pipe nozzle.

Residual oil and water vapors are then removed by the **TRIPLEX** longlife cartridge. The air leaving the filter assembly is then free of oil, taste and smell.

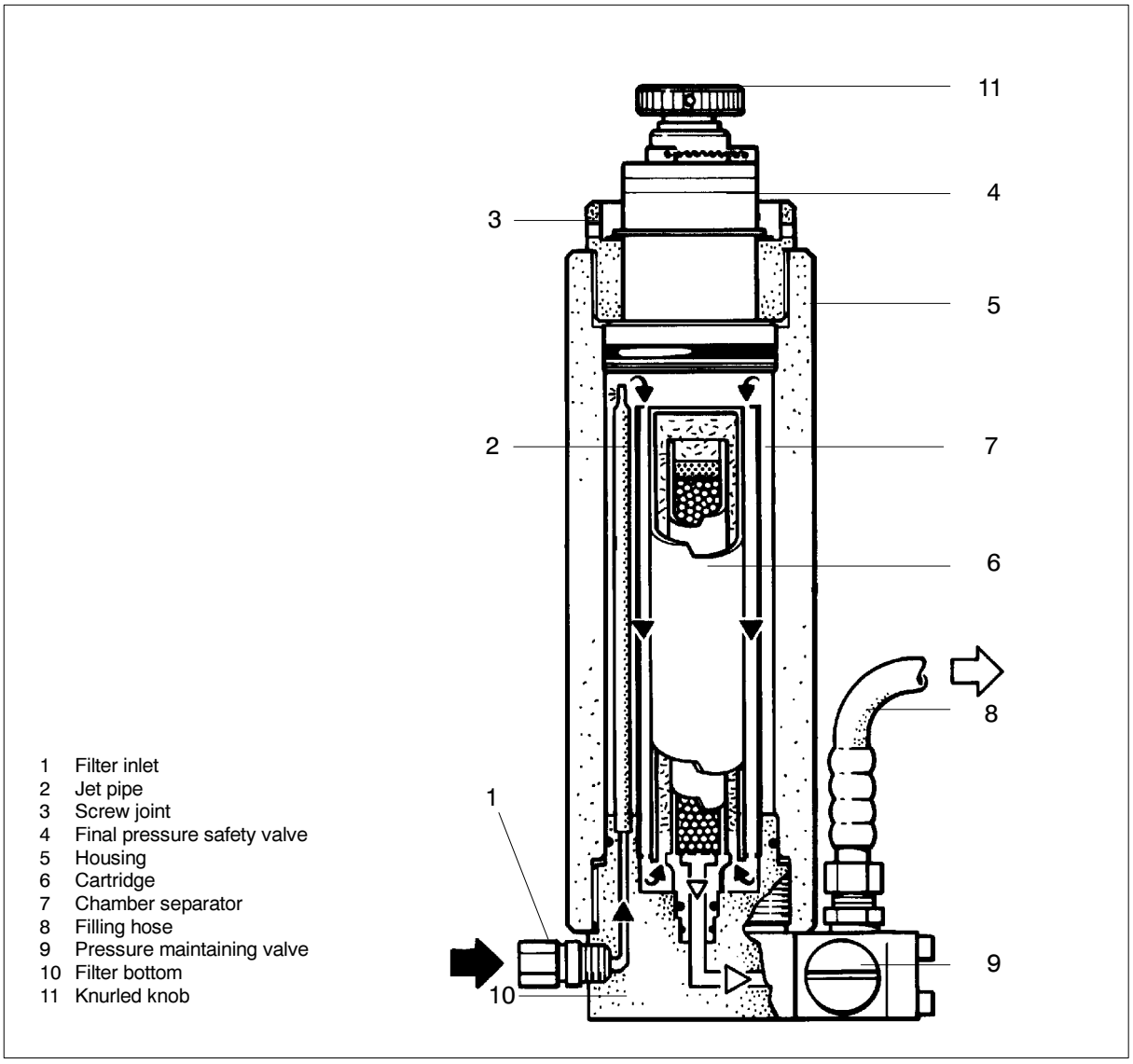


Fig. 13 Filter system P21

5.2. CARTRIDGE SAFETY BORE

The filter system **P21** is designed to prevent pressurizing in the absence of the filter cartridge. A bore provided in the filter bottom is sealed air-tight only if the cartridge is in place (Fig. 14).

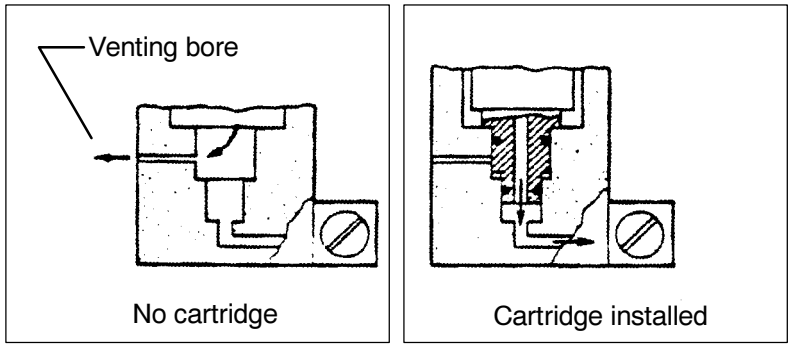


Fig. 14 Safety bore

NOTE

No pressure build up without cartridge!

Without cartridge the venting bore is not sealed, the air escapes into the atmosphere, no pressure can be built up and thus it is ensured, that unfiltered air is not supplied to the consuming device.

The venting bore is also used to check the O-rings on the cartridge pin. If air is leaking out of the venting bore even though a cartridge is installed, the O-rings are either broken or were damaged on installation.

Remove and check cartridge. If necessary replace cartridge or O-rings.

5.3. LIFETIME

WARNING

The filter system is subject to dynamic load. It is designed for a certain number of load cycles, which originate from an abrupt pressure loss at condensate drain (1 load cycle i.e. condensate drain = 1 depressurization, 1 pressurization). After reaching the max. number of load cycles the filter assembly must be replaced, otherwise the housing may burst due to material fatigue.

The max. number of load cycles for the P21 Central Filter Assembly part no. KB 062211-410 is **4,500** if operated at the max. allowable pressure difference range of 330 bar (4,700 psi). For a pressure difference of 225 bar (3,200 psi) the max. no. of load cycles is **63,000**.

To avoid exceeding the max. number of load cycles the operating hours should be recorded in the table in chapter 16.3.1 of this instruction manual. On condition that a max. number of four cycles per hour is not exceeded (condensate is drained every 15 minutes) the max. number of operating hours is 1,125 for 330 bar units. It is not necessary to record the operating hours for 225 bar units as the theoretical filter housing lifetime is 15,750 operating hours.

5.4. CHANGE-OVER DEVICE PN 300/PN 200 (OPTION)

5.4.1. Description

(Fig. 15) This device allows bottle filling to 200 bar (3,200 psig) with a 300 bar (4,700 psig) rated unit. Safety valve -B and filling device PN 200 bar are connected by opening change-over valve -A and the connected bottles can be filled with a 200 bar pressure, as described in "FILLING", see chapter 15.4.

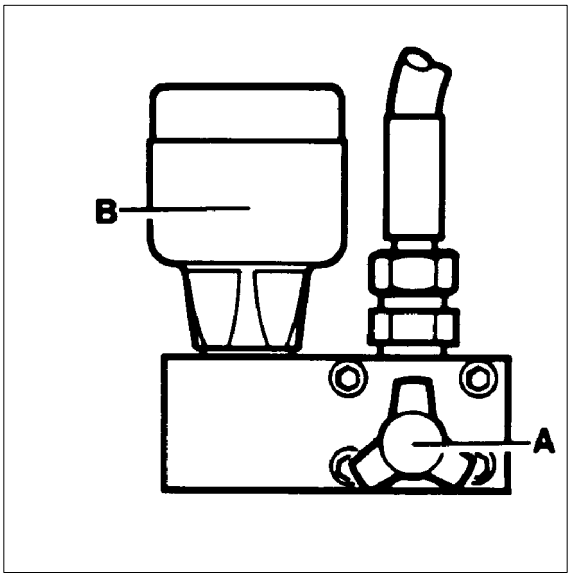


Fig. 15 Change-over device

5.5. GENERAL INSTRUCTIONS FOR FILTER MAINTENANCE

- **Depressurize** system before starting any maintenance work.
- **Dry** inside of filter housing with a clean cloth before installing new cartridge and check for corrosion.
- **Lubricate** threads and O-rings as well as threaded part of cartridge with white petrolatum DAB 9 order no. N 19091 or WEICON WP 300 white order no. N 19752.
- **Record** number of pressure bottles and/or operating hours to ensure exact attention to maintenance intervals (if an hour meter is installed observe number of operating hours as indicated to ensure exact attention to the maintenance intervals).
- **Change** cartridge before reactivating a compressor unit after out-of-service periods of more than 6 months.
- **Leave** cartridge in the filter as long as unit is out of service.
- **Keep** all condensate drain valves and taps closed. Keep a minimum pressure of approx. 50 to 80 bar (700 to 1,100 psi) within the system to prevent moisture entering the compressor piping and filter system.
- **The nozzle type oil and water separator is maintenance-free.**
- **The purifier cartridge must be replaced regularly according to the following tables:**

CAUTION

For safety reasons only CO removal cartridges part no. KB 059183 should be used on compressor units with petrol engine.

On units with electric engine either CO removal cartridge part no. KB 059183 or TRIPLEX cartridge part no. KB 057679 should be used.

Units with petrol engine are delivered with CO removal cartridge part no. KB 059183 as standard, units with electric engine are delivered with TRIPLEX cartridge part no. KB 057679 as standard.

When changing from electric engine to a petrol engine also replace cartridge part no. KB 057679 with cartridge part no. KB 059183.

5.6. REPLACEMENT INTERVALS

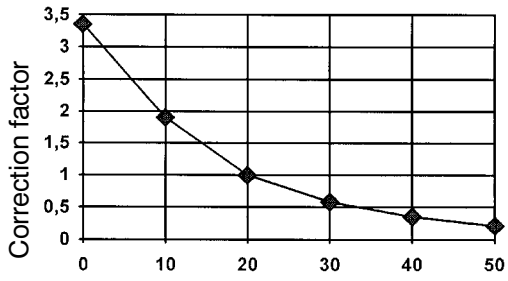
Change cartridge according to the following table:

KB number	Air to be processed Va [Nm^3]	Operating hours/100 l*)	Afte r ... **7-ltrs.** bottle fillings	Afte r ...**10-ltrs.** bottle fillings
057679				
PN 200 bar (2,900 psi)	89.7	15	65	45
PN 300 bar (4,400 psi)	140	23	65	45
059183				
PN 200 bar (2,900 psi)	72.5	12	50	35
PN 300 bar (4,400 psi)	113	19	50	35

CAUTION

The indicated change intervals are valid for 20 °C (68 °F) air temperature, of the surrounding air only. Read the correction factor from the table below or from the diagram on the right.
Example: Air temperature 30 °C
Correction factor 0.58

°C	°F	Correction factor
50	122	0.21
40	104	0.34
30	86	0.58
20	68	1.00
10	50	1.81
0	32	3.44



CAUTION

On units without operating hour meter, keep a record of the number of operating hours on the sheet provided* in order to avoid exceeding the cartridge lifetime.

*) see record for operating hours chapter 16.3.1

5.7. CONDENSATE DRAINAGE

Drain condensate from separator and cartridge chamber regularly by slowly opening drain valves

- before each filling procedure
- during filling procedure every 15 minutes.

5.8. CARTRIDGE CHANGE

NOTE

Never remove spare cartridge from its packing prior to actual use. Otherwise the highly sensitive filling material will adsorb moisture from the ambient air, become saturated, and are useless.

- Depressurize central filter by opening condensate drain valves.
- Unscrew knurled nut (3, Fig. 13) on top of the filter.
- Extract old cartridge and insert a new one.

NOTE

The used cartridge must be disposed of according to local regulations.

6. PRESSURE MAINTAINING VALVE

6.1. DESCRIPTION

A pressure maintaining valve is mounted at the outlet of the filter.

It ensures that pressure is built up in the filters even from the start of delivery, thus achieving a constant, optimum filtration. It will also guarantee proper working conditions for the final stage cylinder.

The pressure maintaining valve is adjusted to **150 ±10 bar (2,175 psi)**.

6.2. MAINTENANCE

The pressure maintaining valve (Fig. 16) is adjusted at the factory to the required pressure and normally does not require regular maintenance or readjustment. In case of readjustment becoming necessary, loosen jam nut (2) and set screw (3). Adjust screw (1) to the required pressure using a suitable screw-driver.

Clockwise = increase pressure
Counter-clockwise = decrease pressure

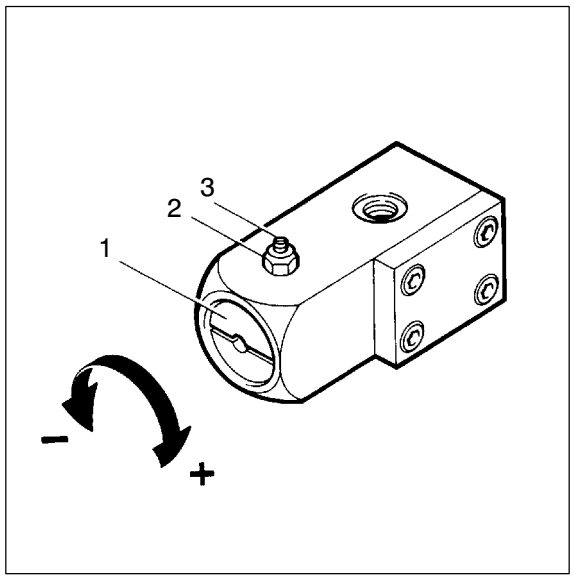


Fig. 16 Pressure maintaining valve

7. SAFETY VALVES

7.1. DESCRIPTION

All 3 compressor stages are protected by safety valves as follows

1st stage	**8 bar (116 psi)**
2nd stage	**50 bar (730 psi)**

The safety valve for protection of the last stage is mounted on top of the oil and water separator and is adjusted to the operating pressure of the unit see 1.3., Technical Data, but

max.	**225 bar (3,200 psi)**
for model -H max.	**330 bar (4,700 psi)**

The safety valves are sealed at the factory and adjusted to the corresponding pressure. If one of the intermediate pressure safety valves blows off, the valves in the next stage are not closing properly, affording valve check. The cause of the trouble is usually the inlet valve of the next stage. See also chapter 9.

7.2. MAINTENANCE

7.2.1. Operating check

The final pressure safety valve has to be checked regularly before starting each filling process.

For this purpose the safety valve can be vented manually. Turn knurled knob on top of the valve clockwise until valve blows off (Fig. 17). We recommend that a final pressure setting of 80 % should not be exceeded, to avoid damaging the safety valve.

This just ensures that the valve is functional and will release pressure in case of a malfunction. To check the blow-off pressure value refer to 7.2.2.

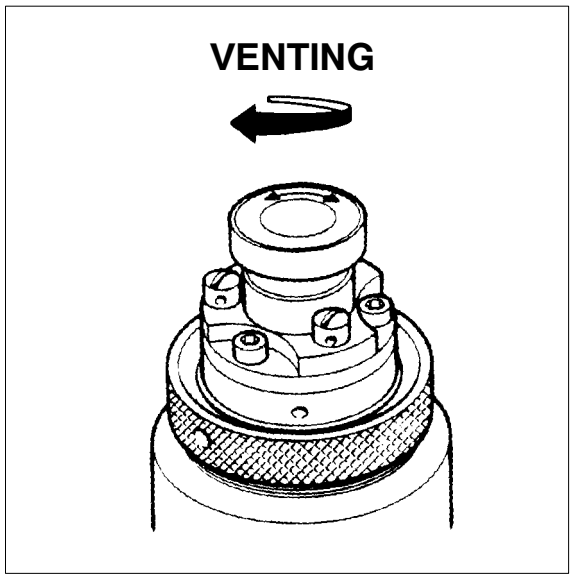


Fig. 17 Venting the final pressure safety valve

7.2.2. Blow-off pressure check

Check blow-off pressure of the final pressure safety valve regularly, see maintenance schedule chapter 16. Pump unit to final pressure with shut-off valve closed until safety valve blows off. Check blow-off pressure of safety valve at pressure gauge.

On compressors fitted with a factory-installed **COMP-TRONIC** compressor control unit, switch to ”test operation - continuous mode” to override pressure switch. Refer to chapter 11.

8. PRESSURE GAUGES

8.1. DESCRIPTION

The pressure in the compressor stages can be monitored by means of the intermediate and the final pressure gauges. They are mounted on a common instrument panel which, depending on the type of unit, is fastened on a support to the frame, or integrated in the panelling.

8.1.1. Intermediate pressure gauges

Intermediate pressure gauges are optional extra according to order.

The following intermediate pressure values should be shown during operation:

	final pressure up to 225 bar	**final pressure up to 330 bar**
1st/2nd stage	**approx. 6 bar (90 psi)**	**approx. 6,5 bar (95 psi)**
2nd/3rd stage	**approx. 45 bar (650 psi)**	**approx. 47 bar (685 psi)**

8.1.2. Final pressure gauge

The final pressure gauge shows a red mark indicating the maximum operating pressure.

8.1.3. Oil pressure gauge

The oil pressure gauge is optional extra according to order.

The instrument panel also includes the oil pressure gauge. Correct oil pressure indication should read **approx. 50 bar (850 psi)**. If not, check the lube oil circuit or adjust the oil pressure. See section 2.

8.2. MAINTENANCE

If the values listed in 8.1 are exceeded and the safety valve of the corresponding stage blows off, this is an indication that the downstream compressor stage is not working properly. See paragraph 9.1.

If a pressure gauge indicates excessive pressure, and the corresponding safety valve does not blow off or indicates the pressure as being too low, check the pressure gauge for proper operation.

We recommend that pressure gauges are checked from time to time. For this purpose we have developed a special test pressure gauge with an adaptor which immediately recognizes any deviations in readings. See High Pressure Accessories Catalogue no. 8550/1.89.

Slight deviations during operation are normal and can be ignored. Excessive inaccuracy will require the pressure gauge to be readjusted or sent back for repair.

9. VALVES

9.1. FUNCTIONAL DESCRIPTION

The valve heads of the individual stages form the top part of the cylinders. The intake and pressure valves are fitted inside the valve heads. Note that the valves are operated by the flow of the medium. On the suction stroke, the intake valves open and the medium flows into the cylinders. At the start of the compression stroke the intake valve closes and the medium opens the pressure valve, Fig. 18.

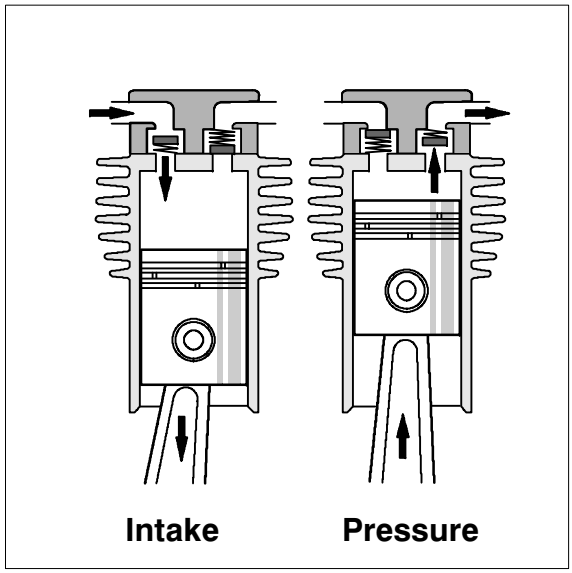


Fig. 18 Valve operation

9.2. INITIAL OPERATIONAL CHECK

After roughly half an hour's operation, valves should be checked. Note that the intake line to the valve heads should be warm and outlet piping should be hot. Valves are then operating properly.

If the intake pipe to the valve head of the second stage heats up excessively, and the first stage safety valve blows off, either the intake or pressure valve of second stage is malfunctioning. It is therefore necessary to remove the valve head and to check and clean these valves, or to replace them.

9.3. GENERAL INSTRUCTIONS FOR CHANGING THE VALVES

- **Always replace** valves as a complete set.
- **Carefully clean** dirty valves. Never use a sharp tool for this purpose. Soak the valves in diesel oil or petroleum and clean with soft brush.
- **Check** individual components for excessive wear. If the valve seat and valve disks are dented, replace the valves.
- **Valve head screws** must be tightened with a torque wrench (see tightening torque values chapter 20).
- **Check** the valve space in the valve heads for dirt and clean, if necessary.
- **Use only** satisfactory gaskets and O-rings on reassembly.
- **Observe** the correct sequence when fitting together again.
- **After finishing** all maintenance work on the valves, turn the compressor manually using the flywheel and check whether all items have been correctly installed.
- **30 minutes after restarting** the compressor unit stop unit, let it cool down to ambient temperature and retighten valve studs and cap nuts. Otherwise valves could work loose due to setting of the gaskets.
- **Remove and check** the valves every **1,000 operating hours.**
- **Replace** the valves every **2,000 operating hours** to avoid fatigue failure.

9.4. CHANGING THE VALVES OF THE 1ST AND 2ND STAGES

Intake and pressure valves of the 1st stage are combined in one plate valve under the valve head. Check that the mark ”TOP” is really at the top when installed.

Removal of 2nd stage pressure valves:

- Remove cap nut
- Loosen allen set screw
- Remove the coupling

Assemble in reverse sequence.

9.5. CHANGING THE VALVES OF THE 3RD STAGE

For removal and installation of the intake valve use special tool (part no. 4555-645) which is also part of the tools set delivered with the unit. Pressure valve (5) is merely inserted into valve head (7). It is sealed by O-ring (4) and fixed to the valve head by stud (3).

NOTE

Change intake and pressure valves of 3rd stage together, only.

Removal and reinstallation of 3rd stage pressure valve (Fig. 19).

- Remove acorn nut (1), rewind stud (3) up to three or four turns.
- Remove internal hex. screw (9) fixing valve head (7), take off valve head cover (8).
- Put two screwdrivers into the groove of outlet valve body, see Fig. 20. If necessary loosen valve at first by using a 13 mm spanner on the flat surfaces.
- Lift out pressure valve (5) together with O-ring (4).

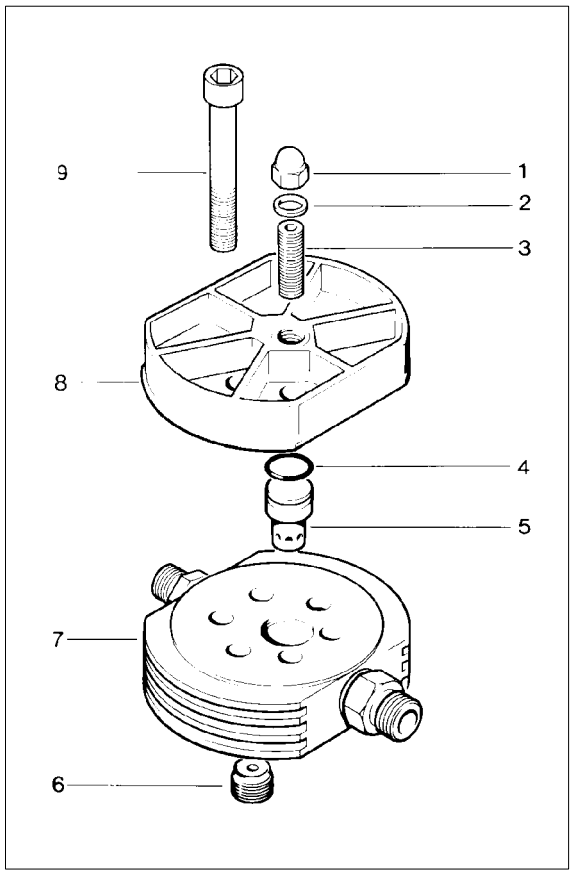


Fig. 19 Valve head 3rd stage

Reinstall pressure valve (5) in reverse sequence:

- Put O-ring (4) into valve head (7). Check O-ring for abrasions.
- Insert pressure valve (5). Put on valve head cover (8).
- Fix valve head (7) with internal hex. screws. Observe tightening torque values, chapter 20.
- Screw in and fasten stud (3).
- Put on gasket (2).
- Screw on acorn nut (1).

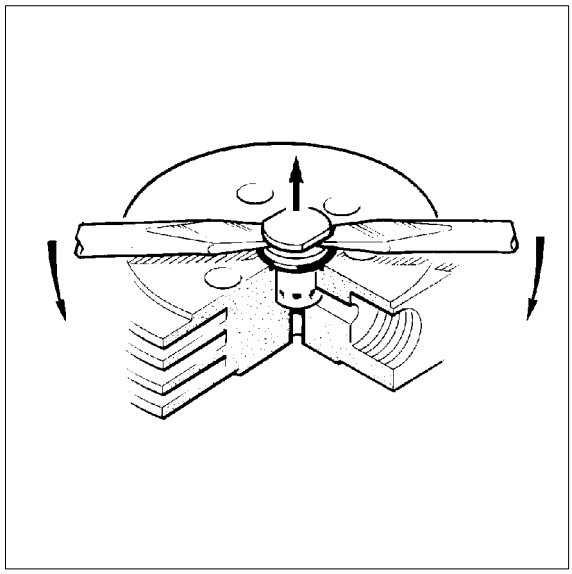


Fig. 20 Removal of 3rd stage pressure valve

10. AUTOMATIC CONDENSATE DRAIN (OPTION)

10.1. PURPOSE AND SHORT DESCRIPTION

The automatic condensate drain unit (Fig. 21) drains the intermediate separators and the oil and water separator after the last stage every 15 minutes during operation.

In addition, the automatic condensate drain is designed to drain these filters after shut-down of the compressor unit and to unload the compressor during the starting phase, see sections 10.4. and 10.5.

The automatic condensate drain system operates electro-pneumatically and comprises the following main items:

- One solenoid valve, normally open type, functioning as condensate drain valve after the 2nd stage
- One pneumatically operated condensate drain valve, normally open type for the oil and water separator or the central filter after the last stage
- A condensate manifold
- A condensate separator/silencer
- A condensate tank
- A bracket for mounting the drain unit on the compressor block or on the unit
- An electrical timer (part of compressor control assy or at units without compressor control assy installed in a separate cartridge)

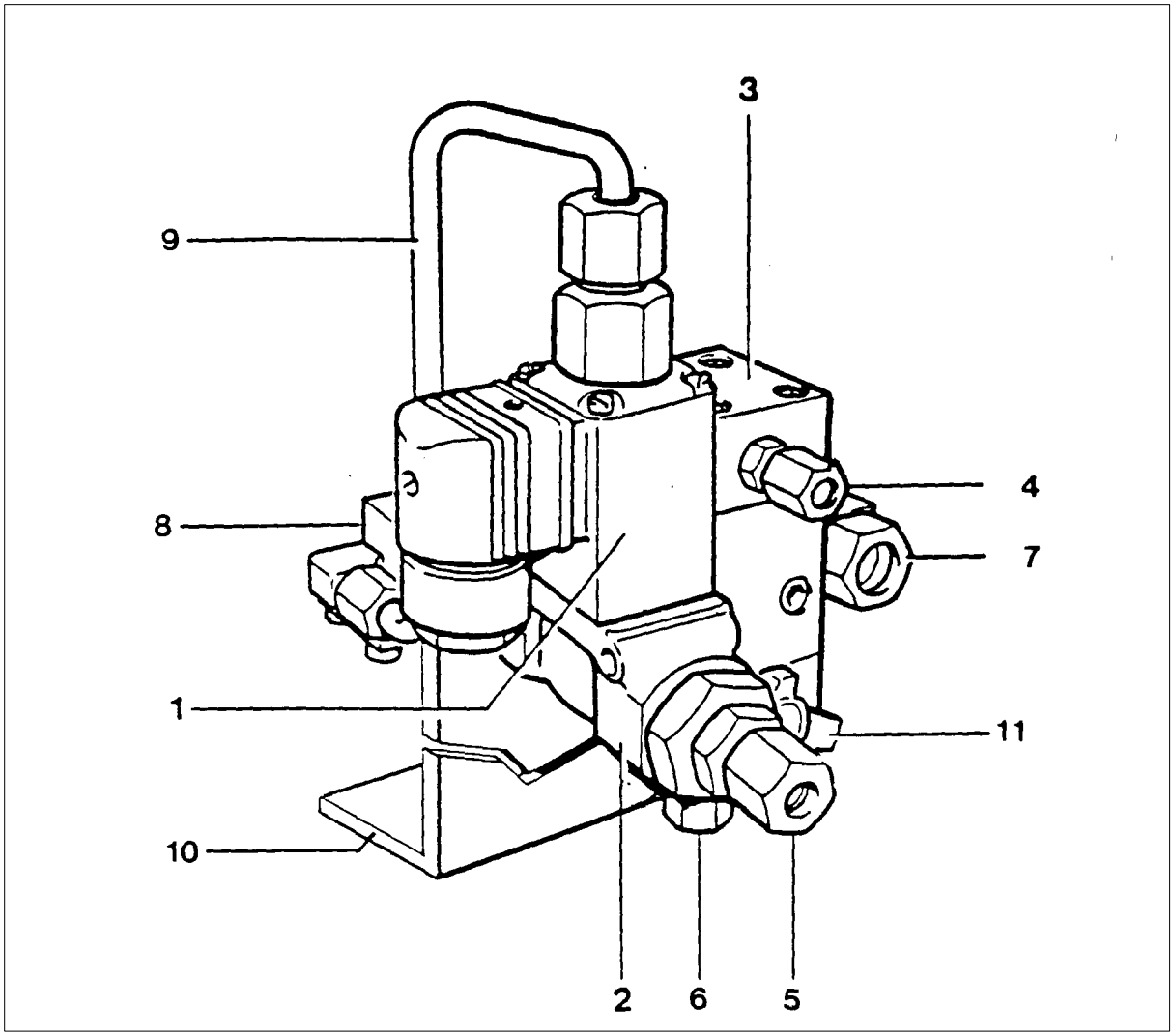


Fig. 21 Automatic condensate drain unit

1 Solenoid valve coil
2 Solenoid valve, condensate drain 2nd/3rd stage intermediate separator
3 Condensate drain valve for oil and water separator after 3rd stage
4 Control air connection from 2nd stage
5 Condensate connection from intermediate separator 2nd/3rd stage
6 Condensate connection from oil and water separator
7 Condensate outlet (tube connector)
8 Condensate manifold
9 Vent line, solenoid valve/manifold
10 Bracket for mounting on frame
11 Manual condensate drain valve

10.2. OPERATION

All positions refer to Fig. 22. The normally open condensate drain valves are connected in cascade mode. The condensate from the intermediate separator (1) after the 2nd stage is applied to the solenoid valve (4). The solenoid valve is normally open. The condensate from the oil and water separator (2) and purifier (3) is applied to the pneumatically operated condensate drain valve (5).

The required control air for the oil and water separator drain valve is taken from the intermediate separator after the 2nd stage (6). Before compressor start-up, solenoid valve (4) is open and so is the condensate drain valve (5) because there is no control air available at this moment.

At start-up of the compressor, the solenoid valve (4) is energized and closes: due to build-up of pressure by compressor operation, control air flows into condensate drain valve (5). The servo-piston (7) is pressed onto valve seat (8) and the condensate drain valve closes. The compressor builds up pressure and delivers to the consuming devices.

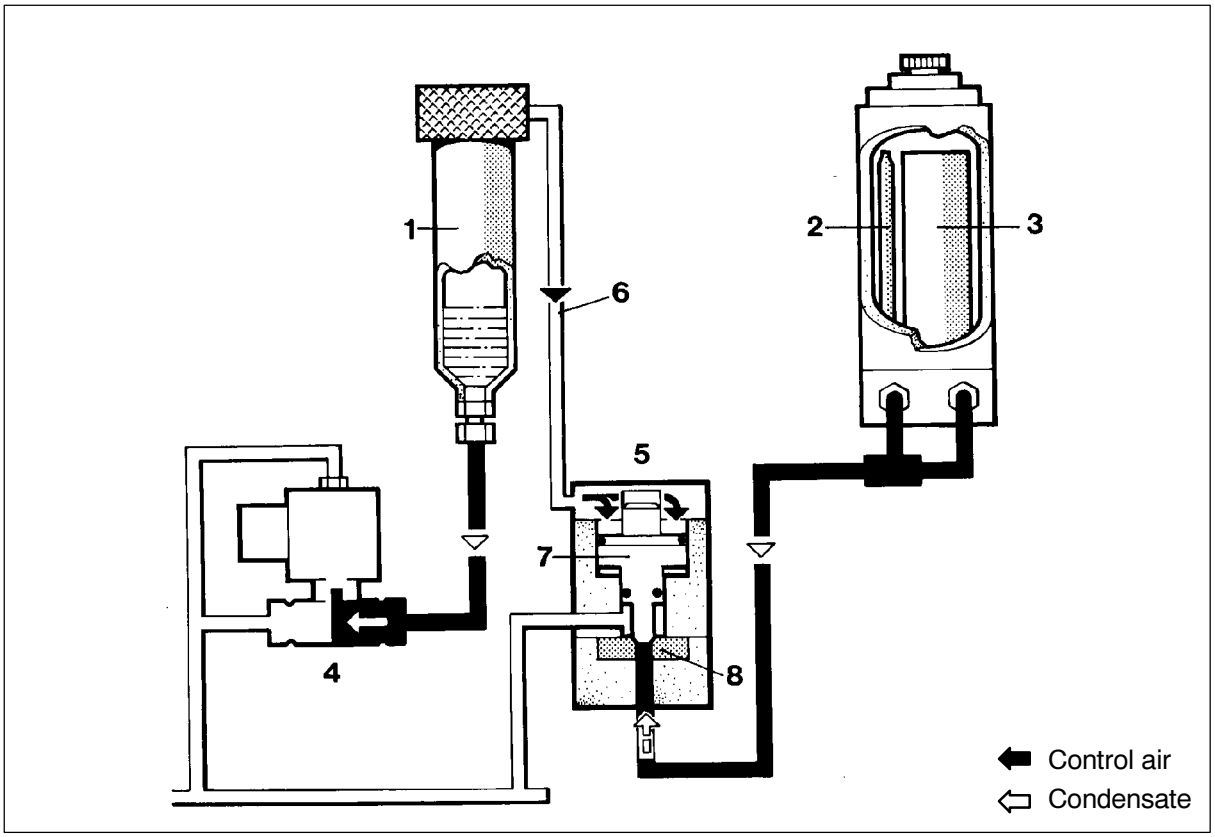


Fig. 22 Condensate drain unit at normal operation

1 Intermediate separator 2nd/3rd stage
2 Oil and water separator after 3rd stage
3 Purifier cartridge
4 Solenoid valve condensate drain 2nd stage
5 Condensate drain valve 3rd stage
6 Control air line
7 Valve piston
8 Valve seat

10.3. CONDENSATE DRAIN

All positions refer to Fig. 23. Every 15 minutes, 3/2-way solenoid valve (4) is deenergized for approx. 10 seconds by the timer. Solenoid valve (4) opens and drains the condensate from the 2nd stage intermediate separator (1). Due to the pressure loss in intermediate separator (1) the control pressure for condensate drain valve (5) for the TRIPLEX filter (2,3) is also removed. The servo-piston (7) of the condensate drain valve is unloaded, the control pressure vented through the relief port.

The piston of the drain valve is raised by pressure from the TRIPLEX filter, the valve opens, and condensate is drained.

After 10 seconds, solenoid valve (4) closes again, control pressure builds up at drain valve (5), and the valve closes.

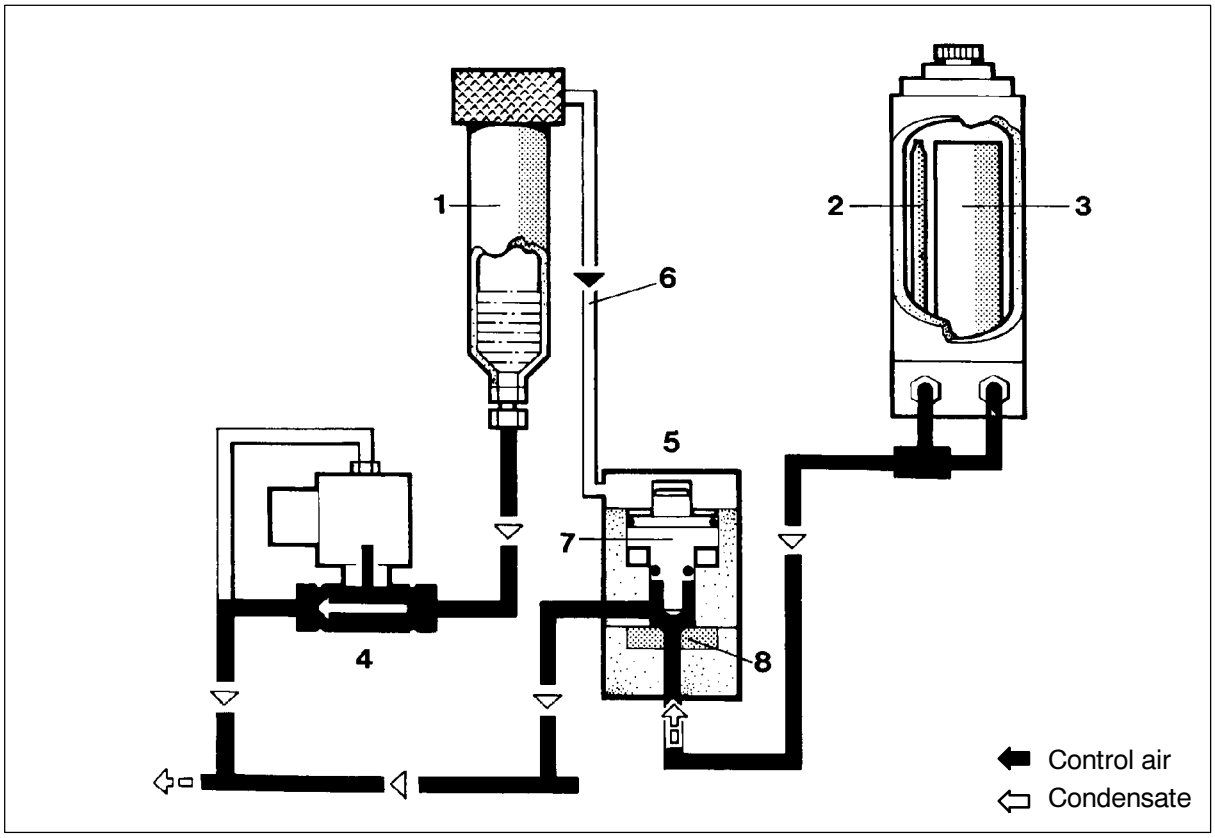


Fig. 23 Condensate drain

1 Intermediate separator 2nd/3rd stage
2 Oil and water separator after 3rd stage
3 Purifier cartridge
4 Solenoid valve condensate drain 2nd stage
5 Condensate drain valve 3rd stage
6 Control air line
7 Valve piston
8 Valve seat

10.4. START UNLOADING

The unloading during the starting phase of the compressor is effected due to the lack of control air immediately after switching on the unit. After the compressor has attained nominal speed, control air flows to the condensate drain valves which close and the compressor starts delivering to the consuming device.

10.5. STANDSTILL DRAINAGE

At compressor shut-down, solenoid valve (4) is deenergized and opens. The condensate coming from the intermediate separator after the 2nd stage is drained as described in chapter 10.3.

The valve piston of valve (5) is raised by the residual pressure within the separator. The valve opens, and the separator is also drained at standstill of the compressor unit.

10.6. CONDENSATE DRAIN PIPING AND CONDENSATE COLLECTOR

The outlet opening of the condensate drain manifold is connected to a condensate drain separator. It separates the condensate from the air escaping together with the condensate from the filters. The air passes through a silencer and is released into the open air, the condensate is collected in a condensate tank. An additional silencer is mounted on top of the tank. The condensate tank should be emptied at regular intervals. The maximum condensate level is marked with a black line.

Due care must be taken to ensure that any oil which may be drained with the condensate will not pollute the environment. For example, the drain pipe can be directed into a collecting vessel or into drain facilities incorporating oil separators.

NOTICE

Dispose of condensate according to local regulations!

10.7. MAINTENANCE

The condensate drain valves for the intermediate separator and for the oil and water separator are provided with manual drain valves to check correct operation of the automatic system.

The automatic condensate drain system must be serviced as follows:

- Open all manual drain valves (11, Fig. 21) one after the other, once a week.
- This must be carried out immediately after the automatic system has drained the condensate. Observe the drainage of condensate when opening the manual drain valves. If the system drains a lot of condensate this is a sign that the system or the corresponding condensate drain valves are not working properly or that codensate drain intervals are to long. Find the fault and remedy accordingly.

If hardly any condensate emerges, the automatic system is operating properly. For fault correction, see also section 19 ”Trouble-shooting”.

10.8. TIMER SETTING

CAUTION

The factory set condensate drain intervals are valid for 20 °C (68 °F) air temperature, of the surrounding air only. It is possible to shorten the condensate drain interval when operating the unit at a higher temperature. For adjustment of the electrical timer see leaflet in the annex of this instruction manual.

11. ELECTRICAL SYSTEM

This section describes the standard electric control and electronic monitoring system of the compressor unit. The amount of built-in components varies depending on order.

NOTE

For schematic diagrams, see annex.

11.1. ELECTRIC UNITS

The electrical equipment of the compressor unit consists of:

- drive motor M1
- electric control system
- Standard motor protection switch or optional COMP-TRONIC compressor control.

11.1.1. Drive Motor

The compressor unit is driven by an electric motor by means of V-belts. Check the V-belts regularly for tension and wear. See section 12.

Except for external cleaning, the drive motor requires no servicing. The motor bearings may need lubricating, depending on the model. Please observe the instructions written on the motor.

Motor protection switch

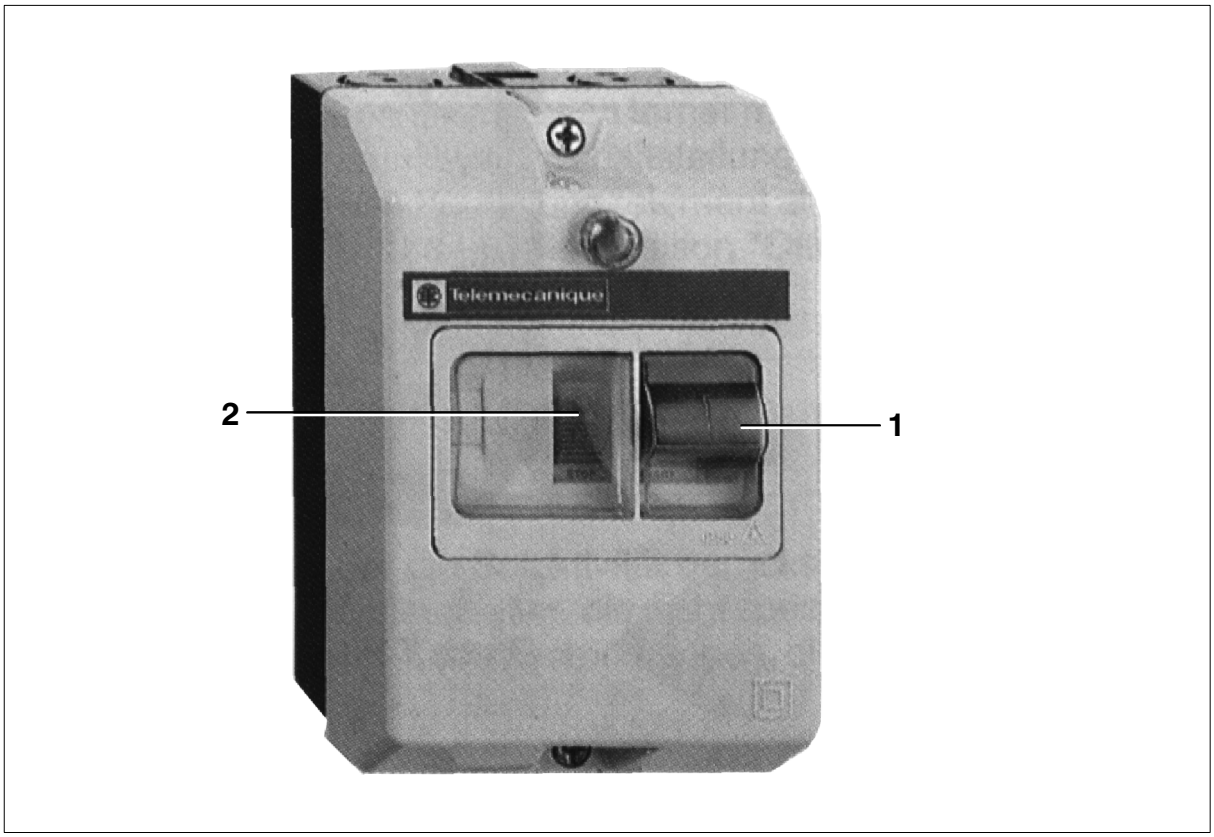


Fig. 24 Motor protection switch

Protection of the motor is ensured by the thermomagnetic releases integrated into the motor protection switch. The response value of the electromagnetic releases (protection against short-circuit) is preset.

The motor is switched on manually by pressing the start button (1). It is switched off either manually by pressing the stop button (2) or automatically by a thermic release. On units with final pressure switch the unit is switched off by a low-volt releaser.

For safety of the operating personnel all voltage carrying parts have a protective cover. On units with low volt releaser the motor protection switch is also released during power failure. Thereby operating personnel are protected from unintentional start-up in power return.

NOTE

The motor can only be restarted by pressing the start-button.

11.1.2. COMP-TRONIC compressor control system (OPTION)

BAUER COMP-TRONIC is an electronic programmable compressor control system, with a modern display. The control system is specially designed for all **BAUER** compressors and can be set and configured for all **BAUER** unit models.

EMERGENCY SHUTDOWN

Every unit has an "Emergency Shutdown" push button. Pressing this push button interrupts the control voltage and the unit shuts down.

The **BAUER COMP-TRONIC** offers the following advantages:

- programmable through EPROM for all compressor models,
- display of operating, maintenance and error messages in text display unit on the control and monitoring unit,
- messages in different languages possible,
- 2 chosen languages can be switched over at any time from working to service language,
- semi or fully automatic operating mode can be switched over at any time on the main board,
- 8 analog and 8 digital user's choice inputs for sensors,
- outputs for mains star delta contactor, 5 condensate drain valves, 1 potential free collective transmitting relay on main board as standard,
- connection of max. 3 final pressure sensors possible and display of operating pressure on the control and monitoring unit,
- control voltage generally 24V AC/DC (for diesel units also possible with 12 V),
- push button switches on main board to check both automatic condensate drains,
- connection of max. 3 control and monitoring units,
- direct connection of "remote on-off" possible.

A complete compressor control system consists of 4 components:

- **power unit:** mains star delta contactor with overload relay and terminal strip.
- **main board:** electronic control device with program and EPROM, outputs to drive the contactor and valves and all inputs for the sensors.
- **control and monitoring unit:** built into the instrument panel for operation of the compressor, the control and monitoring unit is connected directly to the main board via a 16-pole control cable.
- **monitoring devices:** all sensors needed to monitor and control the compressor (pressure sensors, temperature sensors, pressure switches etc.).

Control and monitoring unit

All commands are issued via the operator control and monitoring unit. The operating and error messages are displayed on a 2 x 24-digit display unit. Operator controlled operating and monitoring values are specially marked on the display.

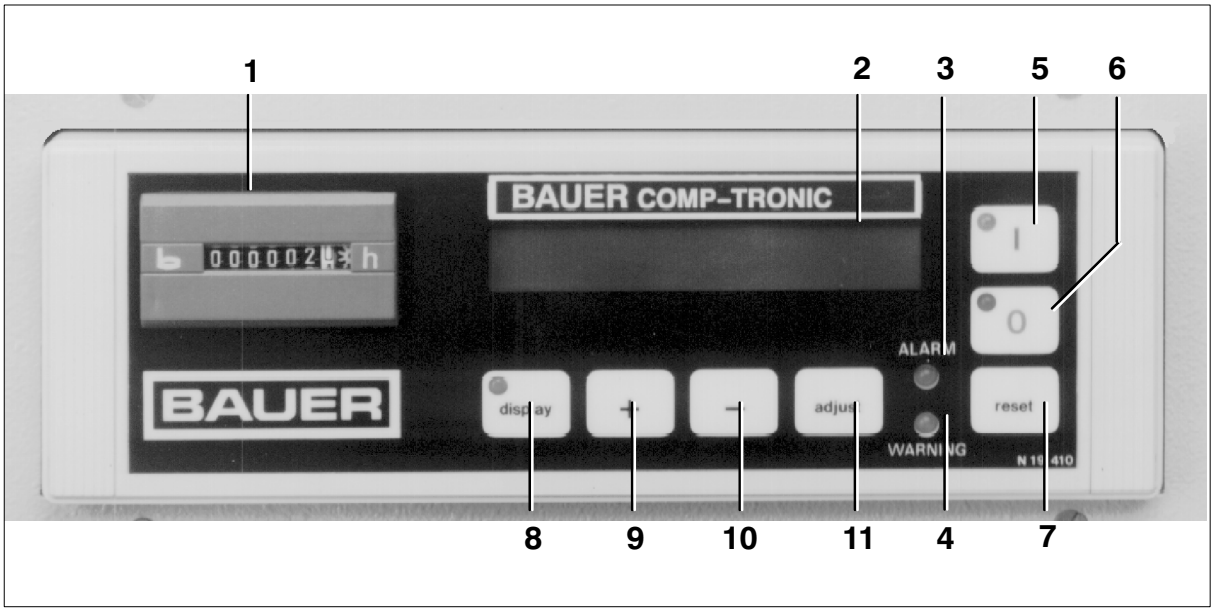


Fig. 25 COMP-TRONIC control and monitoring unit

1.-**Operating hourmeter.** The counter works when the compressor is switched on.

2.-**LCD display.** Shows operating conditions, maintenance messages, error messages (alarm), configuration data and adjustable parameters.

3.-**Alarm LED (red).** Flashes if a shutdown alarm is active.

4.-**Warning LED (yellow)**. Flashes if a warning message is displayed.

5.-**"I" button.** Switches on compressor.

6.-**"O" button.** Switches off compressor.

7.-**"Reset" button.** Resets error messages, maintenance messages and maintenance intervals if pressed at the same time as "adjust" button.

8.-**"Display" button.** Switches over from operating mode to display/set mode and vice versa. The display/set mode is indicated by the LED display in the touch pad.

9.-**"+" button.** Selects the next display field in display/set mode, changes adjustable parameters if the "adjust" button is pressed at the same time.

10.-**"-" button.** Selects the previous display field in display/set mode, changes adjustable parameters if the "adjust" button is pressed at the same time.

11.-**"Adjust" button.** Changes adjustable parameters. If the "adjust" button and one of the "+", "-" or "reset" buttons are pressed at the same time, changes parameters or resets to standard values.

The control and monitoring unit is directly connected to the main board via a 16-pole control cable. For this reason the control and monitoring unit and the main board have connectors. The max. cable length between the control and monitoring unit and main board is 100 metres. When installing the control cable make sure that it is not close to electric wires with high voltage or current rating. Under certain circumstances this could cause disturbances of the electronics due to electromagnetic fields.

CAUTION

The control cable should be connected to the connector in such a way that the blue lead of the cable is above the marking arrow on the connector. The cable should be checked for correct wiring and for possible shorts. Faults in the cable may destroy the electronic circuits. Therefore, we recommend you to use pre-mounted cable, only.

Additional control and monitoring units and control and monitoring units in external instrument panels are supplied with a 3 m power cable and connector. Extension cables are available as follows:

Length	Part no.
3 m	KB 072792
5 m	KB 072793

Length	Part no.
10 m	KB 072794
25 m	KB 072795

For the connection of an additional control and monitoring unit an extension board (part no. 072136) is necessary.

NOTE

Pressure sensors in external filling panels are delivered with 3 m connecting cable. This cable can be extended as required. For extension use standard control cable 3 x 1 mm^2 (part no. N 21665, price per metre). Ensure correct connection according to schematic diagram.

Main board

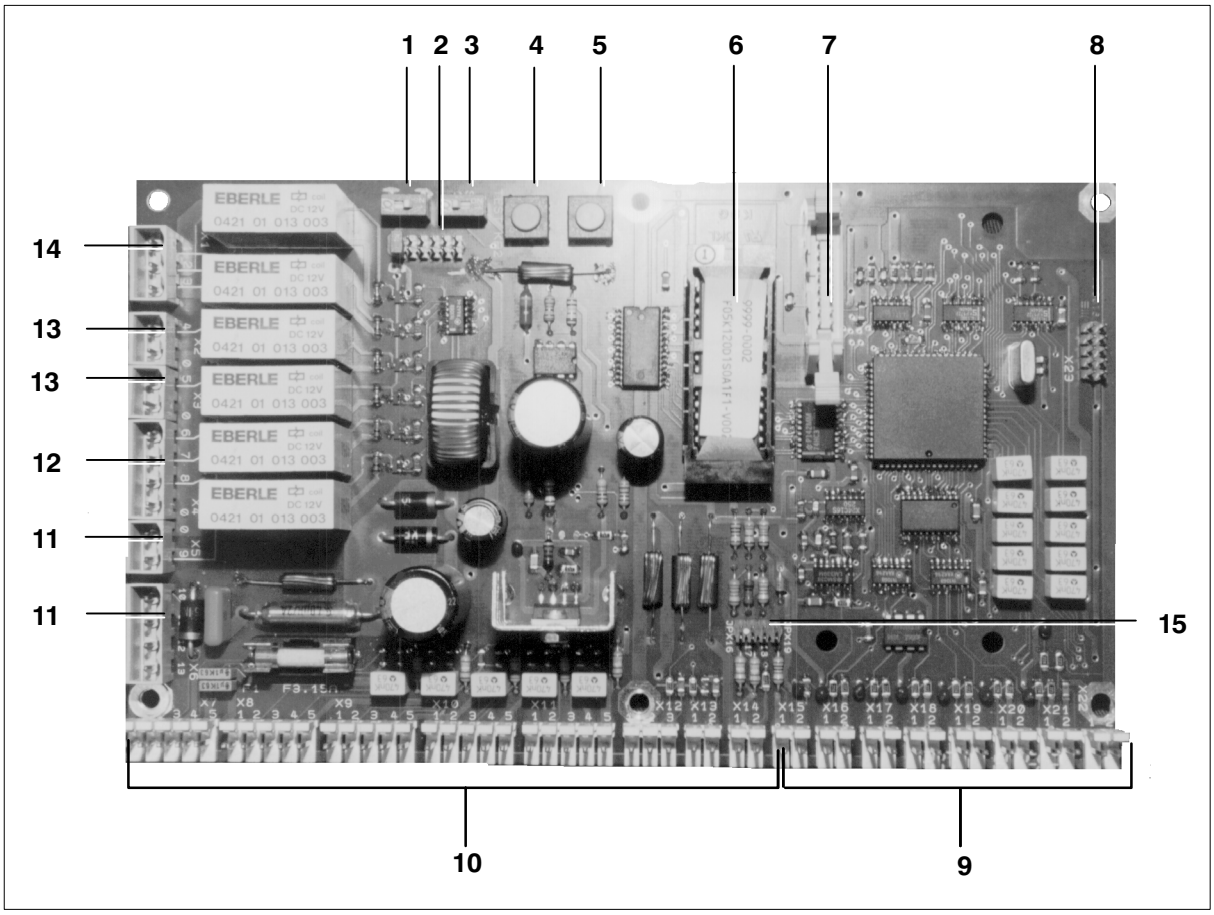


Fig. 26 Main board

1 Switch S2
2 Jumpers JP1 to JP6
3 Switch S1
4 Push button ACD2 test
5 Push button ACD1 test
6 EPROM chip
7 Connector for control and monitoring unit
8 Serial interface
9 Digital inputs X15 to X22
10 Analog inputs X7 to X14
11 Power supply
12 Connector for motor contactor
13 Connector for automatic condensate drain
14 Connector for transmitting relay
15 Jumpers JPX16 to JPX19

The main board offers the following features:

Outputs

- Relays for motor contactors

  There are 3 relays on the main board to drive the motor contactors (mains, star, delta) (N/O contact).
- Relays for automatic condensate drain

  There are 2 relays to control the automatic condensate drains (ACD) (N/O contact).

- Message relay

  There is a collective message relay (double-throw contact).

Switches

The following switches are on the main board.

- Switch S1

Position “OFF”:	Normal operation
Position “ON”:	Resetting of maintenance intervals enabled with jumper installed: parameter setting enabled.

The compressor cannot be started when switch S1 is in position “ON”.

The compressor turns off if S1 is switched to position “ON” during operation.

- Switch S2

Position “OFF”:	(Position “H”), semi-automatic operation
Position “ON”:	(Position “A”), automatic operation

- Push buttons ACD 1 and ACD 2: To check the automatic condensate drain.

Jumpers JP 1 to JP 6

JP 1:	jumper 1 not installed: jumper 1 installed:	normal operation basic initialization
JP2:	jumper 2 not installed: jumper 2 installed:	normal operation parameter setting enabled (with switch S1 in position “ON”)
JP3:	jumper 3 not installed jumper 3 installed	normal operation basic initialization, sensor correction values and special unit setting values will not be overwritten
JP4:	jumper 4:	not assigned
JP5:	jumper 5 not installed: jumper 5 installed:	display in working language display in service language
JP6:	jumper 6 not installed: jumper 6 installed:	normal operation sensor alignment and test operation enabled

Order no. for jumpers is N 21938.

Inputs

Analog inputs X7 to X14

The analog inputs transform linear each signal from 0..+5V into a digital value of 0..1023. This is used by a program to calculate the display values and the derived control commands, depending on the connected sensor. The analog inputs can also be used as switch inputs.

Inputs X7....X11

These inputs are for the KTY temperature sensors. Due to the resistor input network the linearity is very good and therefore the temperature is calculated using a linear translation of the transformation result.

Other sensors, (e.g. pressure sensors), that need a higher supply voltage and a load >10 kΩ to ground can be connected, too.

Pin assignments:

1 = signal input with 2.49 kΩ +-1% to ground
2 = +5V
3 = signal input with 12.5 kΩ +-5% to ground
4 = ground
5 = + 10.5 V
Pin assignment 1/2 for temperature sensor KTY or switch.
Pin assignment 3/4/5 for pressure sensor.

Input X13, X14

These inputs are appropriate for the connection of KTY temperature sensors (see above).

Pin assignment:

1 = signal input with 2.49 kΩ +-1% to ground
2 = + 5 V

Here too, other sensors (switches) can be connected.

PTC input X15

The PTC input is preferably for the connection of sensors measuring the motor temperature. It can, however, also be used as a switch input (see below).

1 = input
2 = +5 V

The response level is approx. 2 kΩ between pin 1 and pin 2.

Digital inputs X16 to X22 and X25 to X32 on additional pcb

1 = input
2 = +5 V

These inputs are appropriate for alarm contacts (preferably break contacts), pressure control devices, remote on-off devices and similar things. The jumpers JPX16...JPX19 are fitted parallel to X16...X19. These inputs should preferably be used for signals that, for example, should be inactive while work is being done (e.g. remote on-off).

These inputs can be shunted with the jumpers.

Sensors and input assignments

Connectable sensors

Pressure sensors

The following pressure sensors can be connected to the analog inputs X7 to X11:

- 3 conductor models, supply voltage 10.5V-, output signal 1....5 V-.

Pin assignment on the main pcb: pin 3: signal input 1...5 V, pin 4: ground, pin 5: power supply +10.5 V.

The measuring values of the pressure sensors are displayed in “bar” or “psig”, and can be evaluated as operating, maintenance, prewarning or error messages.

Fig. 27 shows the pressure sensor used with the COMP-TRONIC control unit. For pressure range 0 to 400 bar use pressure sensor, part no. N19999.

Ensure correct wiring as shown when connecting it.

NOTE

Pressure sensors in external instrument panels are supplied with a 3 m power cable. This cable can be extended as required using a standard 3 x 1 mm² control cable. (BAUER part no. N 21665, price per metre).

Upper and lower switching values are adjustable on the COMP-TRONIC control unit as follows:

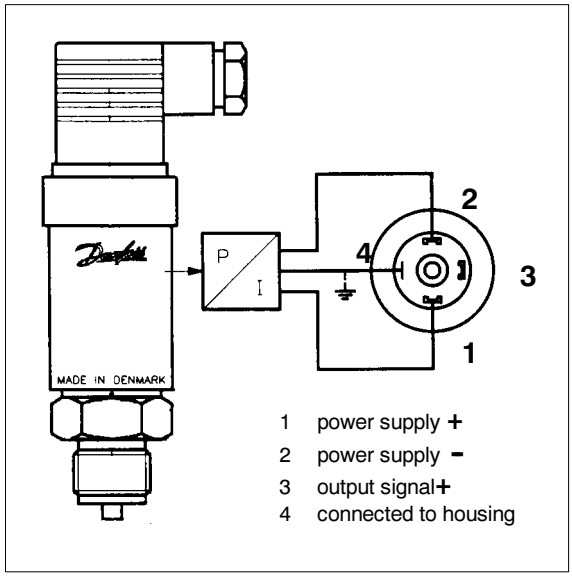


Fig. 27 Pressure transmitter

Pressure sensor	
Adjustable shut-off pressure	**Adjustable switch-on pressure**
High pressure compressor units up to 330 bar:	
OFF = 90 to 325 bar	ON [redacted] ch-off pressure.
High pressure compressor units up to 225 bar:	
OFF = 90 to 220 bar	ON max. = 25 bar below adjusted switch-off pressure.

Temperature sensors

The following temperature sensor can be connected to the analog inputs X7 to X11 and X13, X14:

- semiconductor-silicon temperature probe, type KTY 84-130, measuring range -20.....+300 °C, resistor conducting value at 100 °C: 970...1030 Ω, colour code white (casting compound), screw thread M5.

Pin assignment main pcb:

pin 1: signal input
pin 2: power supply +5 V

The measuring values of the temperature sensors are displayed in degrees Celsius or degrees Fahrenheit and can be evaluated as operating, maintenance, prewarning or error messages.

PTC sensors

The input X15 is designed for connecting PTC sensors, preferably to measure the temperature of electric motors. The threshold of this input is at approx. 2 kΩ.

Pin assignment main pcb:

Pin 1: signal input
Pin 2: power supply +5 V

This input can however also be used as a switch input with closing or opening function. The measuring value can be evaluated as an operating, maintenance, prewarning or error message.

Switches

The digital inputs X15 to X22, X25 to X32 on additional pcb and the analog inputs X7 to X14 are for the connection of any kind of switches (e.g. pressure switch, level switch, relay contacts, temperature switch). The inputs can be assigned with break or make contacts.

Pin assignment main pcb:

Pin 1: signal input
Pin 2: power supply +5 V

The measuring values can be evaluated as operating, maintenance, prewarning or error messages.

Remote on-off input

One of the digital inputs X15 to X22 or X25 to X32 on additional pcb (preferably X16 to X19 with parallel jumper) can be used as remote on-off. A potential free contact serves as a control device.

Function: contact closed, unit in operation
contact open, unit not in operation

On-off push button switch on operator panel and "remote on-off" contacts have the same priority. When the "remote on-off" is on and the unit is turned off at the display unit, the unit can be put back into operation by turning it off and then on via the "remote on-off".

This process is also possible the other way around.

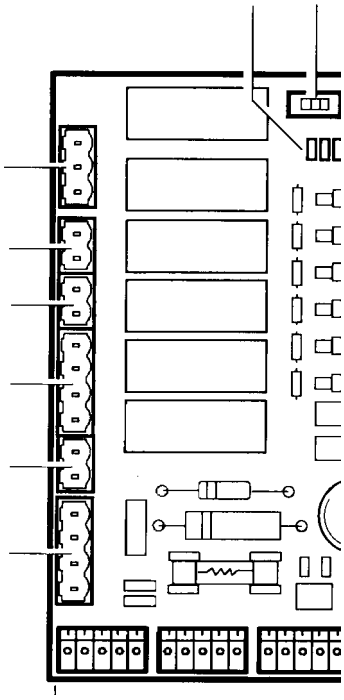
The "remote on-off" function can be disabled by putting a jumper on any of JPX16...JPX19 (e.g. for service reasons).

Multiple final pressure sensors

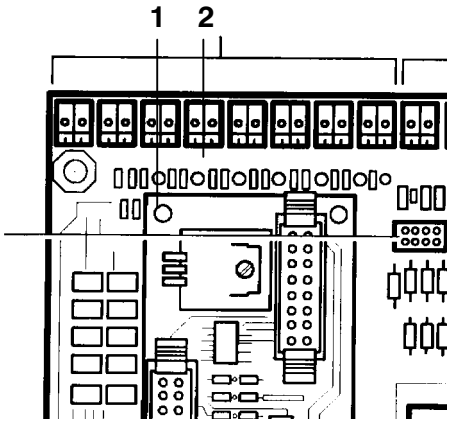
There is the possibility of connecting up to 3 final pressure sensors (or switches) for different pressure ranges to the main pcb (e.g. for switch-over device). The sensors can have the switch off pressure and hysteresis set differently, but they have to receive pressure from different sources. The control unit reports the final pressure that was reached first and shuts down the unit.

Optional components

Extension board



Extension board



Extension board, connected to main board

Fig. 28 Extension board

To connect more than one control and monitoring unit to the main board, it is necessary to have an extension board (BAUER part no. 072136). This is plugged into the main board. Three plugs offer the possibility of connecting 3 control and monitoring units to the main board.

All control and monitoring units have the same priority, i.e. the unit can be switched on and off from all control and monitoring units independent of its condition.

NOTE

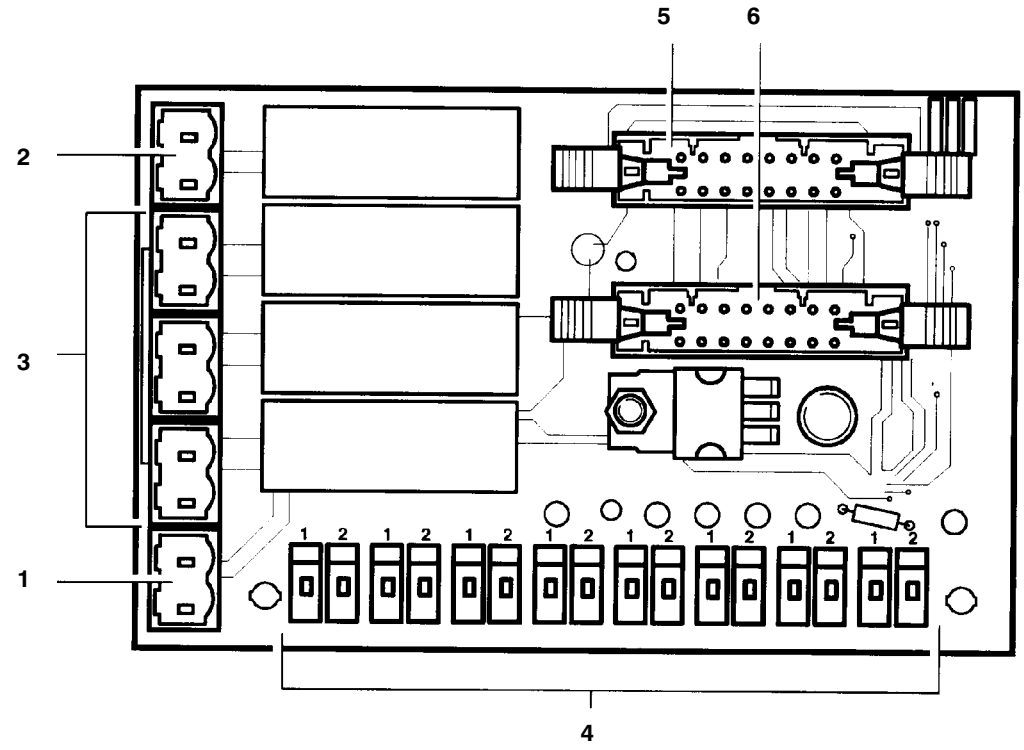
One control and monitoring unit has to be connected to the extension board connector plug (2, Fig. 28), which is directly above the main board connector plug (1)! If this connector plug is not used, the control and monitoring unit will be inoperative!

Aux board

The aux board (BAUER part no. N 21661) is snapped on to the mounting rail in the switch box and connected to the main board via a 16-pole cable.

The aux board has the following functions:

- 8 additional inputs X25 to X32 (4, Fig. 29).
- 1 output relay (double-throw contact) to control a solenoid valve for the unloading control device.
- 3 output relays for controlling automatic condensate drain units.



1 Power supply
2 Connector for unloading control system (X37)
3 Connector for automatic condensate drains ACC3 to ACC5 (X34 to X36)
4 Digital inputs (X25 to X32)
5 Connector to main board (ZP)
6 Connector for control unit (BDF)

Fig. 29 Aux board

Cycle counter

The electromechanical counter (BAUER order no. N19096, 24 V AC) is mounted in the control box.

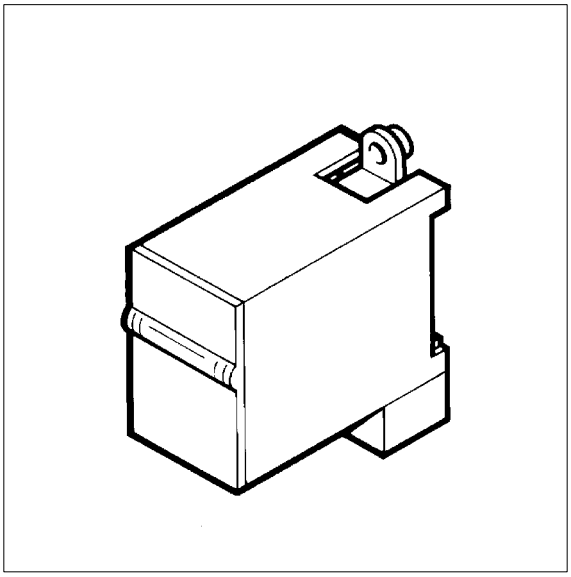
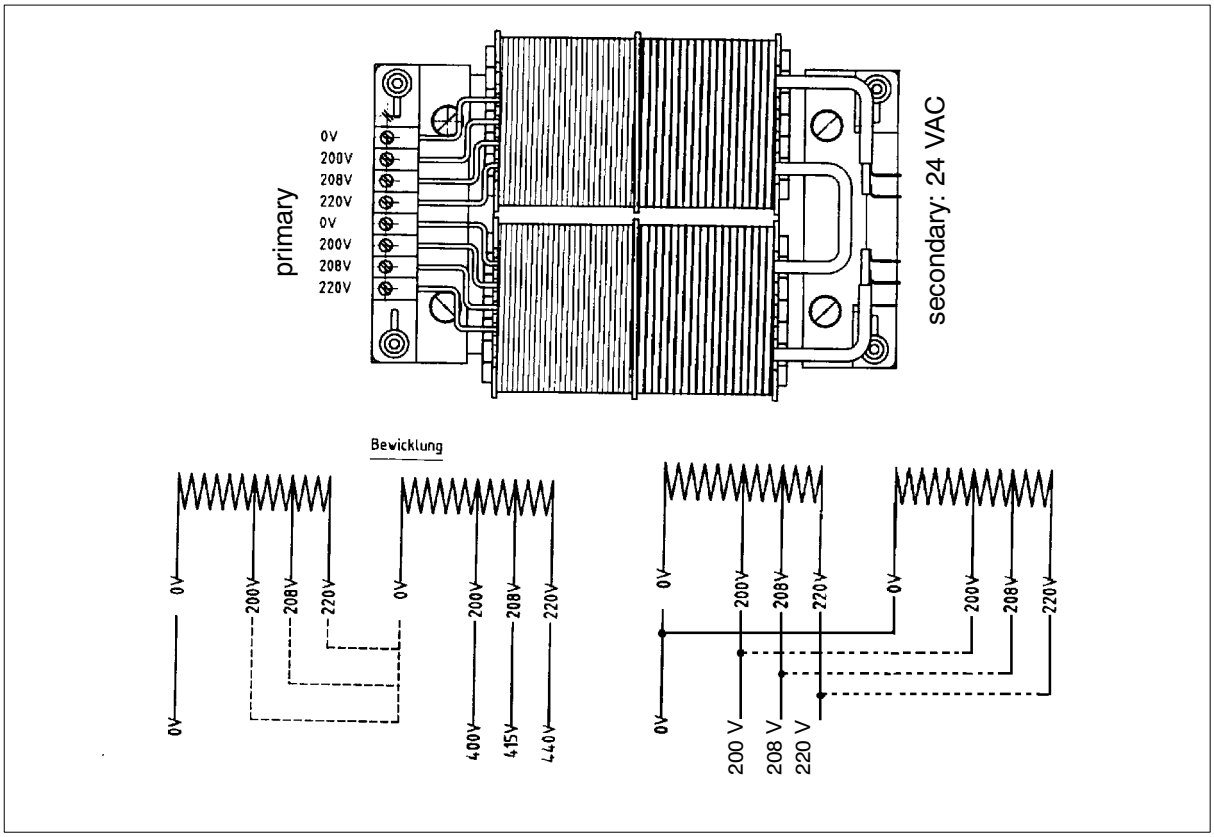


Fig. 30 Cycle counter

Control voltage, transformer

The whole control system including all the unit's contactors and solenoid valves are operated with a control voltage of 24 V AC. This control voltage is generated via a transformer.



The primary voltage is taken from 2 phases of a three-phase network. The transformer has a terminal strip on the primary side with connection possibilities for different supply voltages. The control system can therefore be adjusted quickly to the above-mentioned voltages. Only the power unit (contactor and overload relay) has to be individually adjusted to the motor current.

Technical data

General

Power supply:	Terminal X6-11: 12 - 24 V AC +10%, 50/60 Hz 13 to 30 V DC +10% Terminal X6-10: 11.5 to 18 V DC
Operating temperature:	-15 °C to +60 °C referred to 80% relative humidity at 40 °C
Storage temperature:	-20 °C to +70 °C
Relay outputs:	8 A, 250 V AC

6 relay outputs
8 analog inputs
8 digital inputs
Serial interface
LCD display with 2x24 characters
Touch pad

EMC

EMC according to EN 55011 3/91, 50082-1 1/92

- terminal voltage according to EN55011
- radio interference field strength according to EN 55011
- resistance to electromagnetic fields >6V/m at 27-500 Mhz according to EN50082-1
- resistance to transients >1kV on power supply lines according to EN 50082-1
- resistance to discharge of static electricity >8kV according to EN 50082-1

Transformer

Power 277 VA
Primary voltage: 200, 208, 220 V 50/60 Hz
400, 415, 440 V, 50/60 Hz
Permissible tolerance of power supply + 6%/-10%
Secondary voltage: 24 V +- 10%
No-load voltage: 24 V +4% at 400 V

Serial No.

Every main board has a serial number on the back.

Fuses

Fuse main board:	3,15 A fast blow (BAUER part no. N 21945)
Fuse transformer (primary):	4 A slow blow (BAUER part no. N 22088)

Function and operation

The COMP-TRONIC control system is programmed by creating a particular control configuration via a PC program. An EPROM memory chip is programmed with this configuration and installed on the main board at a later date.

The EPROM program assigns the function of the sensors to each sensor input on the main board and its text message in the appropriate language. These inputs are assigned to respective monitoring, maintenance or error messages. The alarm delays are assigned to the corresponding sensors. The function of the star delta switch-over and the mode of operation of the automatic condensate drain is defined.

With this data a unique control configuration is created and is given a variant number (e.g. F05K120D150A1F1-V001).

The program variants are devised individually for each unit. The EPROM storage components are individually created for each order and include all basic information about that particular unit.

- **standard:** monitoring of oil pressure, temperature last stage, motor overload
- **extended type:** monitoring of oil pressure, temperature last stage, motor overload, all intermediate pressures.

Operation

a.-Basic initialization

By this the EPROM is initialized and all the parameters are set to their default values. This procedure is performed at BAUER Kompressoren GmbH in Munich immediately after plugging the EPROM into the main pcb before taking the unit into operation for the first time.

NOTE

This procedure should not be repeated. A second basic initialization is not necessary unless after an EPROM exchange. It would cause all specific parameters set according to order to be lost i.e. reset to the initially programmed state, e.g. final pressure adjusted to 330 bar would be reset to 220 bar.

Before putting the system into operation for the first time, jumper 1 must be installed. This is carried out during the factory test and therefore the following steps in brackets do not normally need to be carried out. If for any reason the stored information has been lost, these steps should be repeated.

NOTE

Handle the electronic components with care! Protect them from moisture and mechanical shock. Do not touch the components, their terminals, or jumpers with metal tools or other metal parts in order to avoid static discharge which can cause damage to the electronic circuits.

[For the basic initialization the control system must be off. This can be achieved, for example by pressing the emergency shut-off button.]

[Connect jumper 1, supply control system with voltage, remove the jumper after approx.15 seconds. The EPROM is initialized and all the parameters are set to their default values. Control system is ready to operate.]

After switching on the COMP-TRONIC unit, the message “unit ready to operate” is displayed if no shut-down alarm is active. The compressor remains turned off and the red LED in the “O” button illuminates.

If an immediate shut-down alarm is active, the alarm LED flashes in addition and the relating alarm message is displayed. After eliminating the cause of the alarm, the alarm message can be reset by pressing the “reset” button. The alarm LED goes out. The message “Unit ready to operate” appears on the display unit.

NOTE

The compressor can only be started if no alarm is active, i.e. the alarm LED is not flashing, and if the S1 switch is in position “OFF” (normal operation).

b.-Reorganizing the programme without resetting the specifically adjusted parameters of the compressor unit and the sensor correction values

By this procedure the programme will be reorganized to clear faults which might have caused wrong functioning or displays. This procedure can be repeated as required. The specific parameter setting will not be affected.

For reorganizing the control system it must be off. This can be achieved, for example by pressing the emergency shut-off button.

NOTE

Handle the electronic components with care! Protect them from moisture and mechanical shock. Do not touch the components, their terminals, or jumpers with metal tools or other metal parts in order to avoid static discharge which can cause damage to the electronic circuits.

Connect jumper 3, supply control system with voltage, remove the jumper after approx.15 seconds. Further steps according to basic initialization.

c.-Shutdown alarms

If an alarm is activated, the compressor is turned off. The alarm LED flashes and the corresponding alarm message is displayed. By pressing the “reset” button the alarm message is reset.

The control and monitoring unit has 2 alarm delay times which can be individually set. These can be assigned to any input.

There are three different kinds of shutdown alarms:

Immediate shutdown alarm

The compressor is shut down and the alarm is reported as soon as the alarm condition is detected at the appropriate input. The alarm message can only be reset if the cause of the alarm has been eliminated. An immediate shutdown alarm is also reported if the compressor is turned off.

Delayed shutdown with alarm delay 1

The alarm is not reported if the compressor is turned off. After turning on the compressor the alarm delay time 1 begins after the operating mode is switched over from star to delta operation. After the alarm delay time, and if an alarm condition is detected at the appropriate input, the compressor is switched off and the alarm is reported.

The alarm is overridden during the automatic condensate drain period. After the drain period, alarm delay time 1 begins and when this period has elapsed, the alarm is reactivated.

The alarm message can be reset after turning off the compressor.

Delayed shutdown with alarm delay 2

The alarm is not reported if the compressor is turned off. After turning on the compressor, the alarm delay time 2 begins after the operating mode is switched over from star to delta operation. After the alarm delay time and if an alarm condition is detected at the appropriate input, the compressor is switched off and the alarm is reported.
The state of the condensate drain devices does not affect the alarm.
The alarm message can be reset after turning off the compressor.

d.-Maintenance messages

Maintenance messages are displayed in addition to the operating condition messages on the bottom line of the display unit. At the same time the yellow warning LED flashes.

Maintenance messages are reset by pressing the “reset” button.

Maintenance intervals

Maintenance intervals are displayed if the set number of operating hours before maintenance has been reached, or a prewarning of a possible error in monitored equipment occurs. The warning LED flashes slowly.

Maintenance interval messages can only be reset if the maintenance interval has been reset (see below). The following maintenance messages are part of every control system:

- Intake filter change
- Oil and oil filter change
- Valve maintenance

e.-Operation modes

Semi-automatic mode (Switch S2 in position OFF (“H”))

The compressor is turned on by pressing the “I” button. The red LED in the “O” button turns off, the green LED in the “I” button illuminates. The LCD display shows the text “compressor in operation”.

By pressing the “O” button, the compressor can be turned off at any time.

If the shutdown pressure is reached, the compressor shuts down. The green LED in the “I” button turns off, the red LED in the “O” button illuminates. The LCD display shows the text “final pressure reached”. If the “I” button is pressed under these conditions, the green LED flashes, to show that the final pressure has been reached and that it is not possible to start the compressor.

If the pressure falls below starting pressure, the LCD text changes to “unit ready to operate”. The compressor does not start again automatically, but can be started again by pressing the “I” button (see above).

Fully automatic mode (Switch S2 in position ON (“A”))

The compressor is turned on by pressing the “I” button. The red LED in the “O” button turns off, the green LED in the “I” button illuminates. The LCD display shows the text “compressor in operation”.

By pressing the “O” button, the compressor can be turned off at any time.

If the shutdown pressure has been reached, the compressor shuts down. The green LED in the “I” button remains illuminated. The LCD display shows the text “compressor starts automatically”.

If the pressure falls below starting pressure, the compressor starts automatically. The LCD display shows the text “compressor running”.

Unloading control operation (optional feature; with aux board, only)

This function is recommended. Under unloading control conditions, the compressor continues to run unloaded, i.e. with reduced pressure in the last stage, thus considerably reducing the power requirement.

When final pressure is reached the unit is not shut down, but continues running. The compressed air is blown off via a solenoid valve. If the final pressure drops to the restart value, the solenoid valve closes and the compressor delivers to the consumer again. The idle running time can be set. If the unit runs continuously longer in idle mode than the set time, the unit shuts down. If the final pressure continues to drop and reaches the restart value, the compressor starts running again.

The unloading control time is adjustable as follows:

Set switch 1 to “ON”. press adjust button and “+” or “–” simultaneously to change the time.

Overtime shutdown

The overtime shutdown is a standard feature of the COMP–TRONIC system. It is used to avoid excessive operating times for unsurveyed units, especially if they are installed in a remote site.

By simultaneously pressing the adjust button in display mode and “+” or “–” in display field “overtime shutdown” a time between 0 and 100 hours can be set. If running continuously, the compressor will be shutdown automatically after the preset time. If the time is set to 0 hours, the overtime shutdown is disabled.

Remote ON-OFF

One of the digital inputs (refer to configuration chart) is assigned as “remote ON–OFF”. The remote control can be controlled via a potential–free contact.

contact closed = unit operating
contact open = unit stopped

Both local and remote control units are equal: if the remote ON–OFF contact is on and the unit is shutdown from the local display unit, the unit can be taken into operation by simply switching the remote ON–OFF contact off and then on again. This is also possible vice versa.

Test mode

In display mode with jumper JP6 connected, the last fields display “continuous mode” and “leak test”.

Continuous mode:

If this field has been chosen and turned on with the “I” button, the compressor runs in continuous mode without final pressure shutdown. This operating condition is displayed accordingly. By pressing the “O” button the continuous mode is turned off (to check the opening pressure of the safety valve).

Leak test:

If this field has been chosen and turned on with the “I” button, the compressor runs in normal mode. After turning it off however, the condensate drain valves are not opened. If an automatic condensate drain device with the characteristic “ACD currentless open” is working, the relay stays closed and the LED in the “O” button flashes. The compressor cannot be started. After confirming with the “O” button again, the relay and the condensate drain valve are opened. The LED lights up in continuous mode and the compressor can be started again.

f.–Automatic condensate drain

Automatic condensate drain devices can work with two different characteristics:

ACD currentless open (characteristic 1)

The condensate drain valve is open if the relay is turned off.

The relay is turned off if the compressor is turned off. After turning on the compressor, the relay stays turned off at first. After switching over from star operating mode to delta operating mode the relay turns on after a short delay time. The relay stays on for the duration of the interval time minus the drain time and then turns off for the duration of the drain time. This cycle repeats itself until the compressor shuts down. If the compressor shuts down the relay is turned off as well.

During operation, by pressing the push button “test ACD1” on the main board, the relay is turned off for the length of time the switch is pressed down.

ACD currentless closed (characteristic 2)

The condensate drain valve is open if the relay is turned on.

The relay is turned off if the compressor is turned off. After turning on the compressor, the relay stays turned off at first. After switching over to delta operating mode the relay is turned on for the duration of the drain time. Afterwards the relay is turned off for the duration of the interval time minus the drain time. This cycle repeats itself until the compressor shuts down. If the compressor shuts down the relay is turned on for a last time during the drain time.

During operation, by pressing the push button "test ACD2" on the main board, the relay is turned on for the length of time the switch is pressed down.

NOTE

If the compressor is run in the test mode "leak test", the automatic condensate drain valves do not open after the compressor has turned off (see below).

g.-Transmitting relay

The transmitting relay signals alarms and maintenance messages in the following way:

Maintenance message: the relay turns on every 2 mins for 1 sec

Alarm: the relay switches over regularly after every 1 sec

Display/setting mode

a.-Function

By pressing the "display" button you can switch over from operating mode to display/setting mode. The LED in the "display" button illuminates. The LCD display shows the first display field. In the display/setting mode all the parameter settings and their latest values and all active alarms are displayed. As long as the alarms are assigned to analog inputs, the threshold values (values above or below set off the alarm) and the latest measured values are displayed.

NOTE

If a shutdown alarm occurs or if the operating condition changes while the compressor is running, the mode is automatically reset to operating mode and the latest message is displayed. By pressing the "display" button, you can switch back immediately to the display/setting mode.

Values which can be changed by the customer are marked with "+-*". The possibility of resetting maintenance intervals is indicated by "R*". The running time of the "automatic shutdown" can be changed at any time.

Apart from the parameters that can be changed by the customer, there are also settings that should only be changed by the service technician (e.g. the alteration of analog threshold values for alarms, times, default times for maintenance messages). These values are not marked and can only be changed if switch S1 is set to "ON" and jumper JP2 is connected.

b.-Operating

Selection of display fields

If the control and monitoring unit is switched off (currentless), the first text field is displayed after the first switch over to display mode. By pressing the "+" button you can change over to the next display field. By pressing the "-" button you can change back to the previous display field. By pressing continuously the changeover is made with a fixed clock frequency. At the end or at the beginning of the display you can no longer change over, which means there is no overrun from the last position to the first one and vice versa.

Before leaving the display mode by pressing the "display" button or by changing the operating conditions, the position of the chosen text field is stored. This field will be displayed when you change back to display mode again.

After changing to display mode with the "-" button pressed, the first field will be displayed.

After changing to display mode with the "+" button pressed, the last field will be displayed.

Reset maintenance intervals

The possibility of resetting is indicated by "R*". You can reset by pressing the "reset" button with the "adjust" button pressed down. The switch S1 must be set to "ON". The maintenance interval is reset to the displayed preset value.

Changing parameters

Set S1 switch to "ON" and connect jumper JP2. By pressing the "+" button with the "adjust" button pressed down, the value is increased. By keeping the button continuously pressed down, the value increases automatically with increasing clock frequency.

By pressing the "-" button with the "adjust" button pressed down, the value is decreased. By keeping the button continuously pressed down, the value decreases automatically with increasing clock frequency.

The parameters can be changed within an upper and lower threshold value. The threshold values are preset.

NOTE

The maintenance message can be deleted by pressing the "reset" button (see above) only after resetting the maintenance interval.

Display language

At any given time there are 2 languages to choose from.

Jumper 5 disconnected:

Working language in which the unit is normally operated.

Jumper 5 connected:

Service language, e.g. for a service technician who speaks a different language.

At the moment german, english and french languages are available. Other languages are in preparation.

11.2. ELECTRIC CONTROL SYSTEM FOR DIESEL AND PETROL ENGINE DRIVEN COMPRESSOR UNITS

The electrical equipment of the compressor unit consists of:

- drive motor M1
- electric control, containing:
  - final pressure switch S10
  - switch box containing air break contactor K1 or star–delta contactor with time relay for drive motor
  - timer for automatic condensate drain
  - service switch S3
  - control and monitoring unit with ON–OFF push–button switches S1, hourmeter and electronic control warning lamp
- electronic monitoring unit **BAUER** Control BC2[a)]

To start the electric motor and enable the functioning of the controls as well as the monitors, the following components are absolutely essential:

- main switch Q1 and
- main fuse, both to be installed by the customer.

11.2.1. Drive engine

Description of drive engine see instruction manual of Honda petrol engine or Hatz diesel engine.

11.2.2. Fully automatic compressor control[a)]

As long as the S1 switch on the control and monitoring unit is set at position 1, the unit switches off automatically when the final pressure is reached and on again when the pressure drops to the preset minimum.

11.2.3. Pressure switch S10

Switching **on** and/or **off** of the compressor unit is controlled by pressure switch S10. The upper threshold value is adjustable as follows.

OFF max. = 500 bar (7,100 psi)[b)] **OFF min. = 50 bar (710 psi)**

a) optional extra

b) maximum possible operating pressure; for maximum allowable operating pressure, refer to Technical Data, 1. 3.

11.2.4. Electronic Monitoring Unit BC2 (Option)

The **BAUER** Electronic Monitoring Unit monitors the compressor units and drives by monitoring and indicating temperatures, pressures and other operating conditions which are registered by sensors.

Design

The **BAUER** monitoring unit consists of the following:

- **BAUER Control BC2** with power supply, time relay element, electronic control and interlocking circuit, power relay and fuse
- threshold sensors
- connecting leads

The monitoring unit is available in two versions: exterior mounted or built in. Units with compressor control are equipped with one of these versions. See Fig. 32 and schematic diagrams in the annex.

Technical data

Supply voltage DC	12 V, 24 V
Electronic circuit supply voltage	12 V–
Relay type	single pole, double throw
Contact rating	1100 VA
Service life	10^5 cycles
Power consumption	3.3 VA
Enclosure	IP 65
Ambient temperature	–40 °C to +60 °C (–40 °F to +140 °F)

Mode of operation

The **BAUER** monitoring unit monitors the operating conditions of the compressor: threshold sensors register these conditions which are indicated on the **BAUER Control BC2**.

It has a time delay of 40 seconds allowing the operating conditions e.g. oil pressure to be overridden. These conditions are missing at the start.

When a fault occurs after the time delay, it is reported to the **BAUER Control** by the respective threshold sensors. The **BAUER Control** stops the compressor immediately, locks itself and indicates the fault on the warning lamp.

Note: If any faults are detected by the **BC2**, the oil pressure lamp (lamp position 1) also illuminates after a short time. This is due to the decreasing oil pressure after shut-down by the **BAUER Control**.

To restart the unit, the operation switch on the monitoring unit should be placed first to 0, then to 1 again.

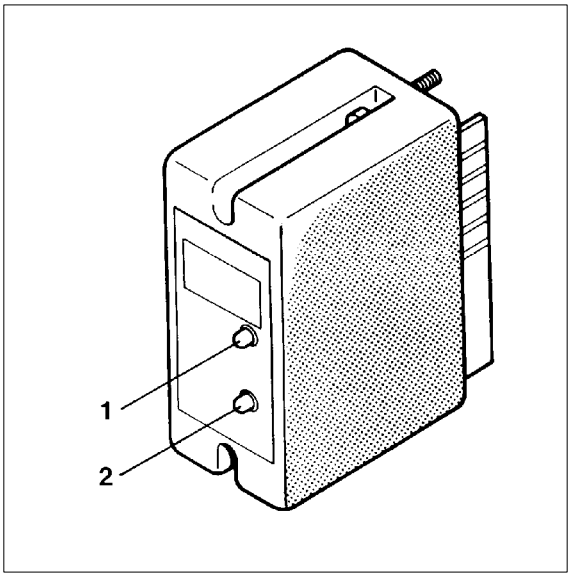


Fig. 32 Monitoring unit **BC2** (built-in)

CAUTION

On units with semi-automatic compressor control, the 0 button has to be pressed first before the unit can be turned on again.

Threshold sensors and position of warning lamps

The standard built-in threshold sensors can be seen in the following list.

Position 1: oil pressure of the compressor

The compressor oil pressure is monitored by pressure switch F13, which is closed during operation and opens when oil pressure drops below the preset value: warning lamp 1 illuminates, the compressor unit stops.

Position 2: final temperature (last stage)

The final stage temperature is monitored directly at the pressure outlet by temperature sensor B1. If the temperature should rise above the allowed running temperature, due to some defect, the temperature sensor B1 opens and the unit switches off. Warning lamp 2 illuminates.

Other monitoring positions for special version BC2:

(The installed monitoring positions are marked on the unit.)

Compressor oil flow

The oil flow is monitored by flow meter F14, which is closed during operation and opens when oil pressure drops: the warning lamp illuminates, the compressor unit stops.

Intermediate pressure, collective monitoring

The intermediate pressures of the individual stages are monitored by safety valves whose blow-off lines lead to a common manifold. Pressure switch F11 is mounted here. In the case of a defective stage, the intermediate pressure rises and the safety valve of the corresponding stage blows off. The pressure rises in the manifold and pressure switch F11 opens: the warning lamp illuminates, the compressor unit stops.

Intermediate pressure, individual monitoring

Every compressor stage is equipped with a pressure switch. If there is a defect in any stage, the intermediate pressure between that stage and the previous one rises. The pressure switch opens and the unit switches off.

Intermediate pressure, 1st/2nd stage

Pressure switch F11.1 opens if there is a defect: the warning lamp illuminates, the compressor unit stops.

Intermediate pressure, 2nd/3rd stage

Pressure switch F11.2 opens if there is a defect: the warning lamp illuminates, the compressor unit stops.

Temperature monitoring

The temperature of each stage is monitored directly at the pressure outlet by temperature sensor B1. If the temperature should rise above the allowed running temperature, due to some defect, the temperature sensor B1 opens and the unit switches off.

Temperature, 1st stage

Temperature sensor B1.1 opens if there is a defect: the warning lamp illuminates, the compressor unit stops.

Temperature, 2nd stage

Temperature sensor B1.2 opens if there is a defect: the warning lamp illuminates, the compressor unit stops.

Minimum pressure of bottles

This pressure is monitored by pressure switch S13. There should always be a minimum pressure in the bottles. When the pressure drops below the preset minimum, a defect is registered: the warning lamp illuminates, the compressor unit stops.

12. COMPRESSOR DRIVE SYSTEM

12.1. GENERAL

The compressor is driven by the drive motor through a V-belt. The electric motor is mounted on slide rails and requires adjustment for proper V-belt tension.

Petrol and diesel driven units are fitted with an adjustable idler pulley to provide correct V-belt tension.

12.2. CHECKING THE DRIVE BELT

The best tension for a belt drive is the lowest possible, where the belt under full load does not slip. A rough value for this is when the belt deflects **10 to 20 mm** when pressed with thumb pressure between the two pulleys (Fig. 33).

- Readjust V-belt after the first 25 operating hours.
- Every 250 operating hours check again for damage or wear.
- If necessary, replace it.

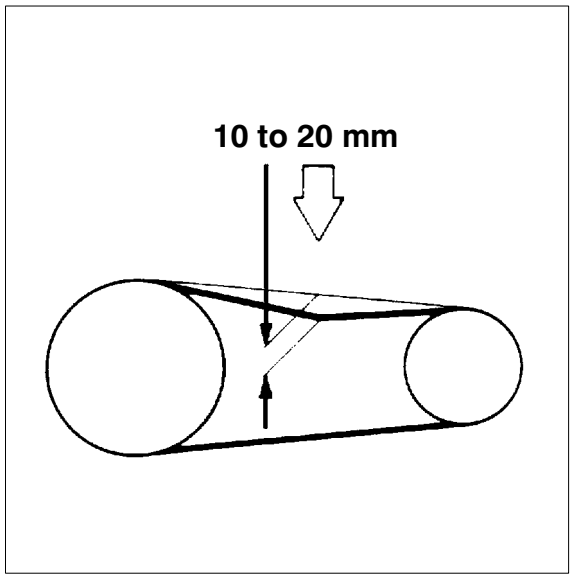


Fig. 33 Checking V-belt tension

12.3. V-BELT TENSION ADJUSTMENT (ELECTRIC MOTOR)

- Slightly loosen motor mounting nuts (1, Fig. 34).
- Adjust motor by turning the square adjustment screw (2) until the belt tension is correct (see 12.2.)
- Tighten motor mounting nuts.
- Run motor for approx. 5 minutes. Stop motor, check V-belt tension, and readjust if required.
- Check that after tension adjustment and tightening the motor mounting nuts, both pulleys are in a straight line to avoid excessive wear of the V-belt. Hold a straight edge against compressor and motor V-belt pulleys as shown in Fig. 35.: edge must touch pulleys at four points, otherwise readjust motor.

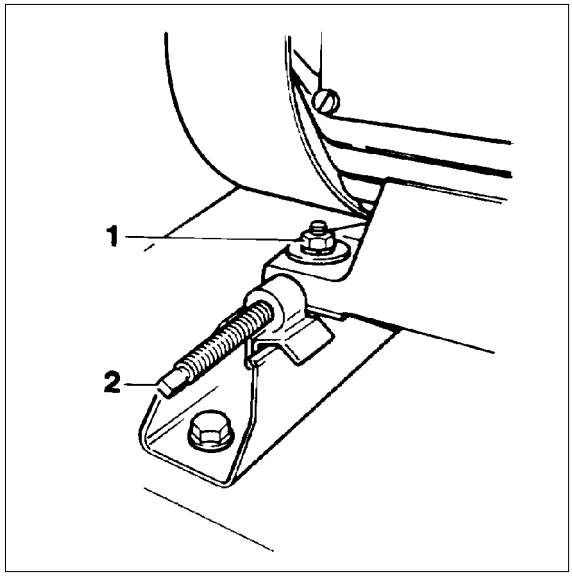


Fig. 34 Motor adjustment

12.4. V-BELT TENSION ADJUSTMENT (PETROL AND DIESEL ENGINES)

- Slightly loosen motor mounting nuts.
- Adjust V-belt until the belt tension is correct.
- Tighten motor mounting nut.
- Run the motor for approx. 5 minutes. Stop motor, check V-belt tension, and readjust if required.

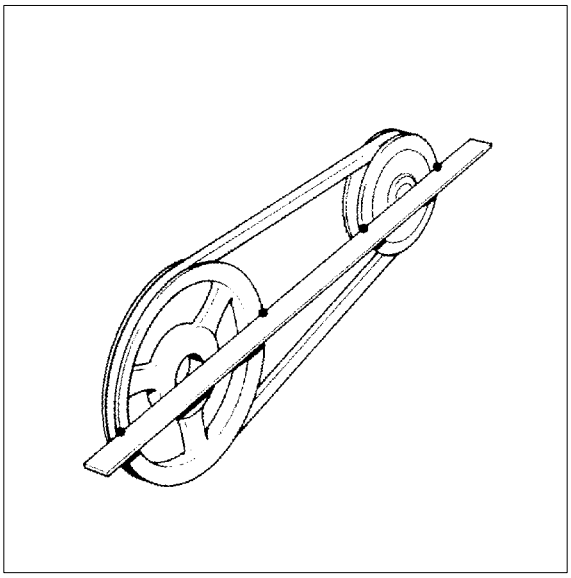


Fig. 35 V-belt pulley adjustment

13. COOLING SYSTEM

13.1. GENERAL

The cylinders of the compressor block, the intermediate coolers and the after-cooler are air-cooled.

For this purpose, the compressor is equipped with a fanwheel. It draws the cooling air through the fanwheel cover from the surroundings.

Refer to chapter 15 for proper installation and cooling air supply.

For maximum ambient temperature, see Technical Data, chapter 1.3.

14. SAFETY REGULATIONS

14.1. GENERAL

WARNING

The compressors described in this manual are not suitable for compression of oxygen. EXPLOSION occurs if an oil lubricated compressor is operated with pure oxygen or gases with an oxygen content of more than 21%!

CAUTION

Always shut down and decompress the complete system prior to carrying out any work on the compressor.

CAUTION

Always disconnect the system from mains supply prior to carrying out any work on compressor systems with electric drive motor.

WARNING

Never open filling valves when under pressure and not connected as highly compressed air emerging can cause serious accidents.

WARNING

Never repair pressure lines by soldering or welding.

WARNING

Ensure intake air is free from noxious gas, exhaust fumes and solvent vapour.

CAUTION

Filling hoses must be in satisfactory condition and threads undamaged. Pay particular attention to damage on the interface from hose fitting to hose. If the rubber is scored, hose must be discarded otherwise water can enter and attack wire gauze causing it to rust and thus endangering pressure tightness.

CAUTION

Check the complete system for leakage from time to time by brushing all fittings and couplings with soapy water or spraying with leak test spray. Repair any leakage.

14.2. SAFETY REGULATIONS (Germany only)

A compressor is identified by German law as being a filling system if pressure cylinders are filled by the system, especially when these cylinders are made available for third parties. The start-up and operation of compressor systems for use as filling stations is governed in the Federal Republic of Germany by the following regulations:

a- Pressure vessels regulations (DruckbehV) as of 27 December 1993,

b- Technical regulations for pressure gases (TRG 400, 401, 402, 730).

If a high pressure compressor is used as an industrial plant for filling pressure vessels or for the supply of pneumatic systems, the following regulations apply:

c- Accident Prevention Regulations (UVV):

- UVV compressors (VBG 16),
- UVV pressure vessels (VBG 17).

If an industrial unit is used as a filling station, a. and b. will also apply. With regard to the manufacturer, all regulations have been observed and the compressor is designed accordingly.

Copies of the above regulations are available through the usual outlets, e.g. in Germany from:

Carl Heymanns Verlag
Luxemburger Str. 449
50939 Köln

Beuth-Vertrieb GmbH
Burggrafenstr. 4 - 7
10787 Berlin

In accordance with the regulations for prevention of accidents, all compressor units have to undergo an acceptance test at their location before bringing them into service. Consequently the containers must be registered with the relevant supervising authorities, presenting the receiver test certificates supplied with the unit. The test certificates must be kept carefully, as they will be required for possible inspections by the supervising authorities.

No guarantees whatsoever are valid for damage caused or favoured by the non-consideration of these directions for use. The maintenance of our compressors should be carried out by qualified and reliable personnel only.

Excerpts from the above regulations are given below. We strongly recommend that they are observed.

- According to item 10 of the regulations concerning pressure vessels, pressure vessels shall undergo regular inspection:

  (1) Vessels from groups IV and VII shall undergo regular inspection carried out by a qualified inspector at intervals stated in paragraphs 4 and 9.

  (2) Vessels from group 1, which are used for gas, combustible corrosive or toxic vapours or liquids, as well as vessels from groups II, III and IV shall undergo regular inspection carried out by a qualified inspector on a date set by the operator according to the mode of operation and the medium compressed.

  (3) Regular inspection shall include the inspection of interiors and pressure. For vessels that will be heated by fire, exhaust fumes or electrically, regular inspections shall also include exterior inspection, carried out, as a rule, on pressure vessels in use. Interior inspection (according to section 1) shall be carried out, if this cannot be done in its entirety, pressure inspection or other equivalent inspection shall be carried out. Pressure inspection (ref. section 1) must be replaced by non-destructive inspection if pressure inspection is not possible due to the construction of the vessel or the mode of operation.

(4) Interior inspection of pressure vessels from groups IV and VII shall take place every 5 years, pressure inspection every 10 years and exterior inspection every 2 years.
The supervising authority is authorised in particular cases to:
1. lengthen inspection intervals, providing safety is guaranteed
2. shorten inspection intervals, if this is necessary to protect employees or other persons.

(5) If inspection intervals for pressure vessels are included in traffic regulations concerning internal transport, these supersede intervals stated in paragraph 4 section 1.

(6) Interior and pressure inspection intervals commence after the first inspection on reception and following re–location after the new reception inspection.
Inspections must be carried out, at the latest, 6 months after the renewal date. Contrary to section 1, the intervals begin:
1. after the construction inspection, if this took place 2 years before the first reception inspection
2. after the last interior examination, if this took place 2 years before the new reception inspection.

(7) The inspection interval is considered completed if the inspection takes place during the calendar year in which it is due.

(8) If the pressure vessel is not in use on the day of inspection, the inspection due should be carried out before it is used again.

(9) If an additional inspection is carried out, the interval for the following inspection begins after the additional inspection, as long as the additional inspection corresponds with the scheduled inspection.

(10) Pressure vessels from groups IV or VII shall only be used again, after the inspection is due, if the inspection has already taken place within the stated period and if the authorised inspector has certified the vessel satisfactory according to inspection guidelines.

(11) If the authorized inspector has not declared the pressure vessel to be in perfect condition, the supervising authority shall decide on the outcome.

(12) §9, para. 9 will be applied accordingly.

- **Regulations governing the handling of pressure vessels (DruckbehV). Paragraph 15 of these regulations (dating from 27 December 1993) requires that a mobile pressurized tank – in this case a compressed air cylinder – shall only be filled with gas or air under pressure if:**

  a) the cylinder is identified with the mark and date of inspectorate approval together with the inspection interval;

  b) when the inspection interval has not expired (inspection interval is governed by paragraph 23 of the regulation);

  c) the cylinder or tank in question exhibits no defects which could result in a hazard to those concerned or third parties (e.g. faulty valve).

Only compressed air cylinders shall be filled with the system – never oxygen cylinders. the connecting screw thread (DIN 477) shall be designed to make direct connection of oxygen cylinders impossible. The use of connecting unions is prohibited.

- **TRG 402, operating filling systems**

  2. Personnel and personnel instruction

  2.1 Filling systems shall only be operated and maintained by persons who:

  1. are more than 18 years of age
  2. are competent and trained in the use of the system
  3. can be expected to do their job satisfactorily.

2.2 Supervised operations can also be executed by persons who do not fulfil requirements stated in 2.1. items 1 and 2.

2.3 Prior to starting their job and periodically in reasonable intervals, however at least once a year, operating personnel are to be instructed regarding the following subjects:

1. the particular hazards involved in handling compressed gases
2. safety regulations, especially those of the TRG
3. what to do in case of fault, damage and accident
4. how to use fire extinguishers and other safety equipment
5. operation and maintenance of the filling systems according to the instruction manual [a)] (see item 3.1).

2.4 A written record shall be kept with regard to the instructions of 2.3 requiring the signature of the employee as acknowledgement of instruction.

2.5 Items 2.3 and 2.4 also apply to persons who are only temporarily involved.

3. Operation

3.1 An operating manual[a)] in plain, understandable language must be provided for each and every filling system and must detail procedures to ensure correct operation and to avoid hazards and accidents.
Copies of these instructions and translations thereof must be available to the operating and maintenance personnel at all times.

3.2 High risk work (in conjunction with the maintenance of such systems) which cannnot be carried out according to item 3.1 in the instruction manual must only be carried out according to separate, written instructions by the contractor or his representative in which the responsibilty for supervision activities is clearly stated[b)].

3.6 If pressurized gases can be isolated in sections of a filling system which can be closed so that the pressure can become hazardous under the effects of heat, measures must be taken to ensure that the pressure is relieved immediately after isolating the section, unless means are already provided for eliminating the occurence of a hazardous pressure [c)].

3.7 Empty cylinders or tanks must be filled as quickly as possible and filled cylinders or tanks shall be removed from the premises as quickly as possible (see TRG 401 item 3.2, sentence 2, No. 2). Empty or filled cylinders and tanks shall not be placed where they obstruct an escape route, it is therefore prohibited to place tanks or cylinders in passageways and stairways of any kind.

5. Filling procedure

5.1 A pressurized gas tank or cylinder shall be filled only with the pressurized gas as identified on the tank or cylinder and only to the amount stated on the tank resulting from the corresponding pressure, weight or volume (see para. 15, section 2, DruckbehV).

6. Procedure after filling

6.3 Defects on cylinders and filling tanks

Should a filled pressurized gas cylinder or tank prove to leak on inspection in a way which does not permit immediate remedy or should the filled cylinder or tank exhibit a defect of any kind which could result in a hazard to the handling personnel or third parties, said cylinders or tanks shall be immediately rendered harmless by discharge (see para. 21, section 1, DruckbehV).

9. Testing and servicing filling systems

9.1 Testing filling system leakage

9.1.1 Filling systems and selection of such systems shall only be put into operation for the first time after a major modification or after repair when they have been checked for leakage by an authorised technician or on order of the contractor by an inspector. Testing by the technician shall only be carried out under supervision of the contractor or his representative.

9.1.2 For the purpose of testing, a pressurized gas shall be used which is available in gaseous form under the condition of testing. If the gas is flammable or highly toxic, it is mandatory that the necessary safety measures be taken. The test gas shall not aggravate the materials of the system being tested, resulting in hazardous reaction. Where there is a possibility of the test gas reacting with the pressurized gas of the system, the system must be adequately flushed. On systems intended for pressurized gases which are sensitive to moisture, the test gas must be free from water or the system must be suitably dried on completion of testing. On filling systems utilizing oxygen, the test gas must be free from oil. [d].

9.1.3 The pressure shall be elevated gradually in increments until the highest operating pressure of the system is attained.

9.1.4 Testing shall be documented and the documents duly held in a safe place. The documentation shall identify:

1. date of testing
2. persons responsible for supervision
3. persons responsible for inspection
4. description of the system or sub–system being tested
5. test gas
6. description of the method of testing
7. any defect noted and how these defects were remedied.

9.2 Testing flexible piping

9.2.1 Flexible piping (i.e. hose pipes and articulated pipes) must be tested prior to first time operation and at least once every six months (hose pipes) or at least once a year (articulated pipes) and according to actual requirements to ensure satisfactory condition (i.e. no wear and tear or leakage). This shall be carried out by the manufacturer or the persons responsible for the filling operation.

9.2.2 Testing as per item 9.2.1 shall include the following individual tests:

1. visual inspection inside and outside to the extent possible to ascertain general conditions.
2. pressure testing to 1.5 times the highest service pressure.

9.2.3 Pressure testing hoses shall be carried out with water[e] or , if possible, with natural oil on articulated pipes, otherwise water. The test pressure shall be maintained for at least 10 minutes. Hoses shall be first tested when extended and then when rolled up (drum diameter approx. 30 times hose diameter).

9.2.4 The results of testing shall be certified by the manufacturer prior to first time operation and later testing shall be documented by the filling inspector. These certificates shall be filed in a safe place. The certificate shall identify:

1. date of testing
2. persons responsible for testing
3. nature and identification of the pipe tested
4. test medium
5. description of test method
6. any defects established and how they were remedied.

In addition, the manufacturer's test certificate shall identify the material and rated pressure. The certificate relating to the hose pipes shall state that the hose is suitable for the pressurized gas.

9.3 Maintenance

9.3.1 Infrequently used closing devices shall be checked at suitable intervals.

9.3.2 Items coming into contact with oxidizing pressurized gases shall be inspected for signs of oil grease in suitable intervals and cleaned as may be required.

10. Shutting down the system, reporting accidents and damage.

10.1 Should a filling system not be in proper condition, thus constituting a hazard for operating personnel or third parties, the system shall be shut down immediately (see para. 30, section 3, DruckbehV).

10.2 Any person operating a filling system is obliged to report any accident to do with the operation of the system in which a person has been killed or health damaged and shall file the details with the supervising authorities and the responsible accident insurance without delay (see para. 34., DruckbehV).

10.3 Item 10.2 also applies when a pressurized gas container having a capacity in excess of 1 litre (1.05 quarts) is split open or explodes inside or outside the filling system (see para. 34, DruckbehV).

---

a) See this Instruction Manual

b) The instructions for maintenance and repair are given in chapters 2 to 16 of this Instruction Manual

c) Does not apply to the compressor itself but to the filled compressed air cylinders

d) The only test medium to be used in conjunction with the compressor system is compressed air, i.e. the air produced by the compressor itself.

e) Filling hoses are to be dried thoroughly inside and outside after pressure testing

15. INSTALLATION, OPERATION

15.1. INSTALLATION OF THE COMPRESSOR UNIT

The compressor frame is equipped with anti-vibration mounts and thus a machine base or special means of securing the compressor are not necessary.

15.1.1. Outdoor location

For installation observe the following:

- Locate the unit level.
- On units employing petrol or diesel engine it is most important that only clean air be used, position compressor in direction of wind so that exhaust fumes are blown away from the unit. It is good practice to have intake hose of at least 3 m length with pre-filter and intake filter. Pre-filter to be located 2 m above ground. See Fig. 36. This arrangement will ensure necessary spacing between exhaust outlet and air inlet.
- The use of a windvane is recommended. Turn unit as soon as wind direction changes.
- On petrol or diesel engine, operation unit must only be located outdoors, never indoors.
- Take care that no vehicles are in direct vicinity with engines running.
- Do not operate unit in the vicinity of open fire (flue gas!).

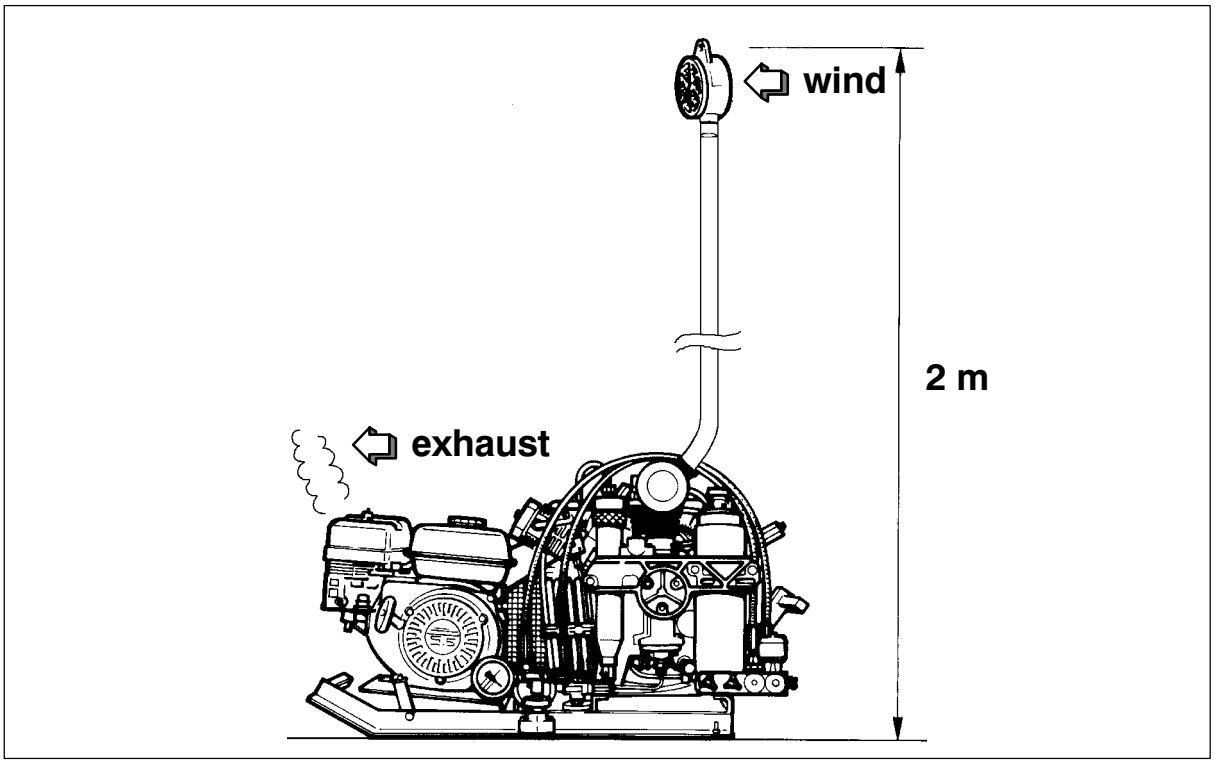


Fig. 36 Locating air intake hose

15.1.2. Indoor location

WARNING

Never operate petrol or Diesel driven units indoors !

- Ensure adequate ventilation.
- Here too, air must be free from exhaust fumes and hazardous vapours (e.g. smoke, solvent vapours, etc.).
- If possible install unit in such a manner that the compressor fan can get fresh air from outside, for instance through an opening in the wall.

15.2. ELECTRICAL INSTALLATION (ELECTRIC UNITS)

For installation of electrical equipment observe the following:

- Connection must be carried out by an expert only.
- In the annex of this instruction manual you will find the standard schematic diagrams valid for the respective compressor unit. To connect the compressor control system, use only the diagram contained in the control box of the unit, because any deviations from the standard diagrams according to order are marked there.
- Observe regulations of local electricity supply company.
- Check conformity of motor and control device tension and frequency with those of electric network.
- Adjust motor protection, thermal overload relay. For start over contactor adjust to motor amperage rating. For start via star-delta contactor adjust to motor amperage rating x 0.58.
  For example: motor amperage rating = 10 Amp.:
  Adjust relay to 10 x 0.58 = 5.8 Amp.
- Fuse motor correctly (see table below; use slow-blow fuses, only).

FUSE TABLE

motor type	**voltage**	V	125	220	240	**380**	440	500	600	660
3-phase, 4 kW (star-delta starting)	current	A	35	20	20	**10**	10	10	10	6
3-phase, 4 kW (direct starting)	current	A	35	25	25	**16**	16	16	10	10

15.3. OPERATION

15.3.1. Preparation for operation

CAUTION

All compressor units are tested prior to delivery to the customer, so after correct installation of the unit there should be no problem putting it into operation, observing the following points:

- Prior to **first** operation read Instruction Manual carefully. Make sure that all persons handling the compressor and the filling station are familiar with the function of all controls and monitors.
- Depending on the model range, some compressor units are delivered **without** oil in the crankcase. In this case, the first filling quantity is delivered separately in the consignment. Prior to **first** operation fill with oil according to chapter 2. After taking unit into operation after a standstill period of 2 years or more change compressor oil. When using a mineral oil change oil after one year.
- Prior to **each** operation check the oil level according to chapter 2 and determine whether maintenance is necessary in accordance with chapter 16.
- Prior to **first** operation or operation subsequent to maintenance work, turn the compressor manually using the flywheel to ensure that all parts are turning free.
- **Immediately** after switching on the system for the first time check the direction of rotation of the motor for compliance with the arrow on the unit. If motor turns in the wrong direction, the phases are not connected properly. Shut down unit immediately and interchange two of the three phase leads in the switch box. **Never** change leads at the **motor** terminal board.
- Prior to **first** operation or operation subsequent to repair work operate unit for at least 10 minutes with open condensate valves (pressureless) to ensure proper lubrication of all parts before pressure is built up. To keep drain valves open, loosen screw (3, Fig. 37) on coil (1) and pull plug (2) from solenoid valve.
- **Every time** the unit is started up check all systems for proper operation. If any malfunction is observed stop unit **immediately** and find the cause of the fault or call the service department.

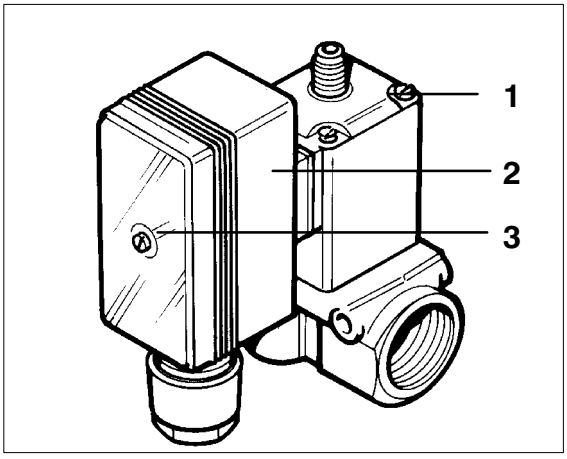


Fig. 37 Solenoid valve plug

Units with petrol or diesel engine, additionally:

- Check engine oil level according to manufacturer's instruction manual.
- Check fuel tank. Top up if necessary
- Open fuel shut–off valve.

NOTE

Charge battery before taking unit into operation!

15.3.2. Starting the unit

Electric units without COMP-TRONIC compressor control unit

The motor is switched on manually by pressing the start button (1).

Fig. 38 Motor protection switch

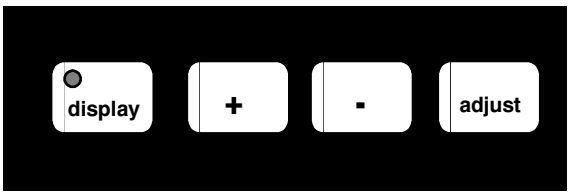
Electric units with COMP-TRONIC compressor control unit

NOTE

The following steps describe the action taken by the operator, only. Description, function and adjustments for the COMP-TRONIC compressor control system are found in chapter 11.

NOTE

For all alarm and warning indications of the COMP-TRONIC compressor control system refer also to chapter 11.

Action	Indication on Comp-Tronic display
- Master switch must be ON (to be supplied by customer). Memory check is carried out by the control unit after power is switched on.	Memory Check . . . . . passed
- Control voltage is supplied to the compressor control unit. After approx. 5 seconds the red LED in the "0" button illuminates and the display reads	Unit ready for start
- Press the "I" button on the COMP-TRONIC compressor control and monitoring unit: the green LED illuminates and the unit starts operating. Display reads:	Unit operating
- By pressing the "display" button the indication switches from operating mode to display/setting mode (The green LED in the button illuminates). In this mode all installed parameters can be selected and observed. Use the "+" and "-" buttons to switch to the required indication.	

NOTE

The following indications show the standard programming of serial compressor units. The actual programming is listed in the configuration chart which is delivered with each unit. The indicated values are dependent on the respective nominal and real values.

All units are equipped as standard with automatic condensate drain unit. The setting for the solenoid valve is displayed as shown on the right:

Auto condensate drain drain duration 10 sec	1
Auto condensate drain drain interval 15 min	1

The star-delta switch-over time is displayed as shown on the right:

Wye - delta starter start mode time	4 sec

The actual pressure and pressure switch no. 1 shut-off pressure are displayed as shown on the right:

Final press. 1 cut out press.	000 bar 220 bar

The hysteresis for pressure switch no. 1 is displayed as shown on the right:

Final pressure switch 1 differential pressure	40 bar

The actual pressure and pressure switch no. 2 shut-off pressure (e.g. for breathing air units with switch-over device) are displayed as shown on the right:

Final press. 2 cut out press.	000 bar 330 bar

The hysteresis for pressure switch no. 2 is displayed as shown on the right:

Final pressure switch 2 differential pressure	40 bar

Display for the delayed time alarm.The time delay is necessary to allow the operating conditions to establish in order to avoid unnecessary shut-down. For example compressor oil pressure at start-up, intermediate pressure during condensate drain etc.

Delayed time alarm DA1 with ACD	40 sec

The overtime shutdown is displayed as shown on the right. Overtime shutdown prevents the unit from running longer than the pre-determined time. If set to 0 the unit will run continuously unless shut down by other means.

Overtime shutdown 12 h (rem: 0 h)	+ -*

The oil pressure monitoring option is displayed as shown on the right:

Oil press. compressor too low	/1

The final stage temperature monitoring option is displayed as shown on the right:

..th stage temperature 000 °C limit ... °C

The motor current monitoring option is displayed as shown on the right:

High motor current

The cooling air temperature monitoring option is displayed as shown on the right:

Cooling air temperature 000 °C limit 5 °C/45 °C

The **maintenance intervals** are displayed as follows:

NOTE

***R* = display can be reset. For adjustment and reset procedures refer to chapter 11.**

- Oil change:

  Oil change every 2000 h
  next change in . . . . . h *R*

- Intake filter maintenance:

  Inlet filter svc. 2000 h
  next service in . . . . . h *R*

- Valve check:

  Valve inspection 1000 h
  next inspection in . . . . . h *R*

For all alarm and warning displays refer to chapter 11.

Units with petrol or diesel engine

- Open condensate drain valves on the filters so that motor starts without load (units with manual condensate drain, only).
- Set choke to position START. Start engine with recoil starter or crank handle. As soon as motor runs smoothly return choke to normal operating position.
- Close condensate drain valves and run unit to final pressure. Check final pressure safety valve and pressure gauge.
- As soon as final pressure is reached and final pressure safety valve blows off, open condensate drain valves and drain condensate – unit is ready for filling operation.

15.4. FILLING PROCEDURE

15.4.1. General

The filling valve connection is of the manual type and permits connection to air tanks without using tools. An O-ring is provided for self-sealing due to internal overpressure.

Compressed air tank filling valves for a pressure in excess of 200 bar are standardized (DIN 477, sheet 5) and connectors for 200 and 300 bar are different and cannot be mixed up. To ensure safe air tank removal after filling, the valve has an integral venting bore. Therefore always close tank valve first before closing filling valve.

During filling procedure bottles will warm up due to recompression. After removing, allow to cool down, bottles may then be reconnected and topped up to the respective maximum filling pressure.

15.4.2. Scavenging the compressor unit

CO_2 is present in the atmosphere with a natural amount of 350 - 400 ppm_V. The molecular sieve used in the purifier for drying the breathing air is, as well as other capabilities, able to adsorb CO_2 which is accumulated in the cartridge. After shut-down of the compressor, adsorbed CO_2 may be desorbed again due to the partial pressure decrease. The now free CO_2 then gets washed out of the cartridge when the compressor is started again.

To avoid increased CO_2 contents in the compressed breathing air, it is absolutely necessary to fill the air bottles according to chapter 15.4.4, also refer to **WARNINGS** in chapter 14.

15.4.3. Connecting the bottles

- Connect air bottle to filling valve (see Fig. 39).

NOTE

On models of 300 bar rated filling pressure do not attach bottles unless rated for this presssure (note pressure stamped on tank neck).

- Air bottles with international filling connector can be connected with filling adaptor (PN 08487-635) to the German filling connector (see Fig. 40).

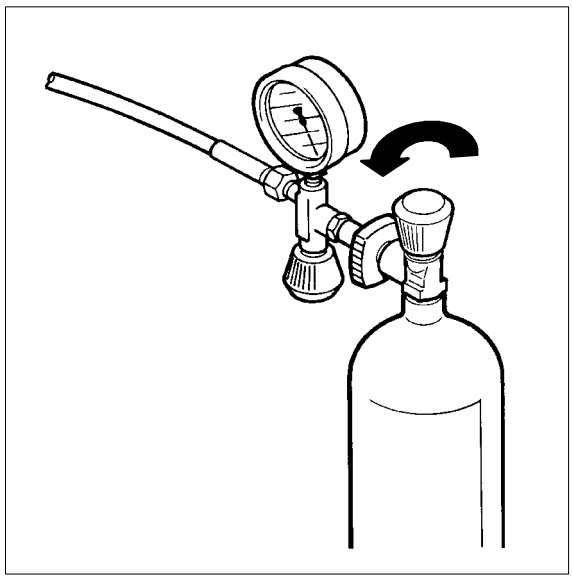


Fig. 39 Connecting air bottle

NOTE

The international connector is not permitted in the Federal Republic of Germany. In other countries it is allowed only for pressures up to 200 bar (2,850 psi). This filling connector cannot be used on 300 bar (4,350 psi) models due to constructive measures.

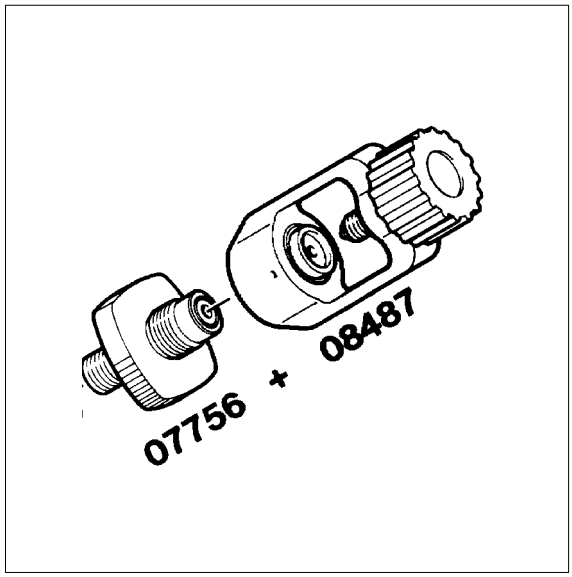


Fig. 40 International filling connector

15.4.4. Filling the bottles

WARNING

Never open filling valve unless bottle is connected to filling hose. Hose whipping due to pressurized air outstream can cause serious injury!

- Open filling valve (1, Fig. 41).
- Open bottle valve (2) – bottle will be filled. Drain condensate regularly during filling. On units with automatic condensate drain check that condensate is drained regularly.

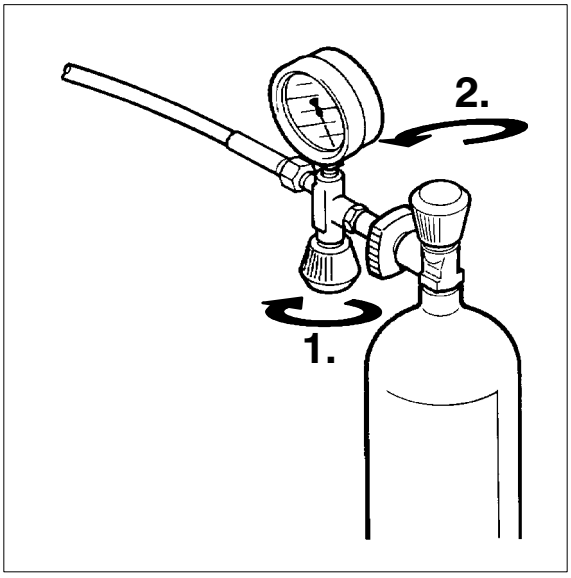


Fig. 41 Filling air bottle

NOTE

The filling procedure should not be interrupted for more than 10 minutes to avoid increased CO_2-values in the air filled into the bottles.

15.4.5. Removing the bottles

- Upon reaching final bottle pressure **close bottle valve first (1, Fig. 42), then filling valve** by returning handle to closed position.
- Remove compressed air bottle (2).

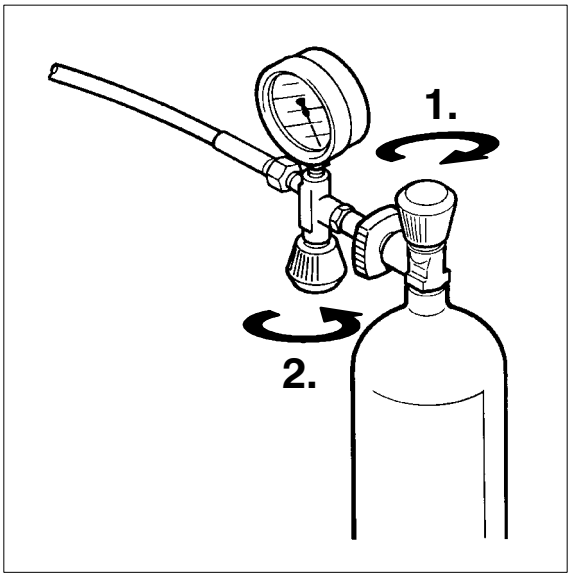


Fig. 42 Removing air bottle

15.5. SHUT-DOWN PROCEDURE

Electric units without COMP-TRONIC compressor control unit

The motor is switched off either manually by pressing the stop button (2) or automatically by a thermic release. On units with final pressure switch the unit is switched off by a low-volt releaser.

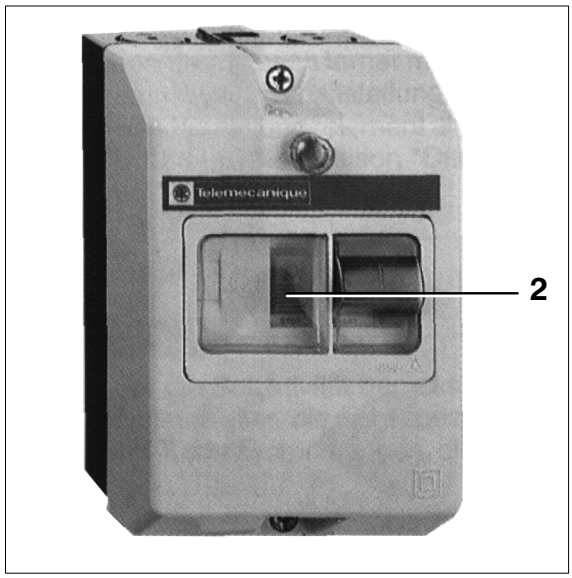


Fig. 43 Motor protection switch

Electric units with COMP-TRONIC compressor control unit

Action	Indication on Comp-Tronic display
- Press the "0" (OFF) button on the COMP-TRONIC compressor control and monitoring unit: the red LED illuminates and the unit is shut down. Indication:	Unit ready for start

Units with petrol or diesel engine:

- Shut down petrol or diesel engine with stop button or stop lever.

All units:

- Vent unit by means of filling valves to approx. 80 bar (1,150 psi) then decompress with drain valves to remove all moisture in filters and oil and water separator. Close all valves again.
- Check the oil level in the compressor and top up, if necessary. Also check whether the compressor needs servicing in accordance with maintenance schedule – see chapter 16.

16. MAINTENANCE

16.1. MAINTENANCE RECORD

We recommend that all maintenance work is recorded in a service book, showing the date and details of the work carried out. This will help to avoid expensive repairwork caused by missed maintenance work.

If it is necessary to claim against the warranty, it will help to have proof that regular maintenance work has been carried out and that the damage has not been caused by insufficient maintenance. Please refer to section 23 of our general terms and conditions.

For this purpose, the following maintenance control sheets are provided (copy as required). The grey boxes indicate when the maintenance work is due. Please mark the appropriate box(es) to show what maintenance work has been carried out and the number of hours of service, then sign and date.

16.2. MAINTENANCE INTERVALS

NOTE

Change TRIPLEX longlife cartridge according to chapter 5!

NOTE

The used cartridge must be disposed of according to local regulations.

16.3. MAINTENANCE SCHEDULE

Maintenance of drive motor/engine according to manufacturer's operating instructions.

After first 25 operating hours	Chapter	Date	Signature
Check functioning and tightness of filling valve	--		
Clean intake filter and intake filter cartridge	3.		
Check tightness of O-rings	3./5.		
Check V-belt tension and condition	12.		
Check tightness of all cooler-pipes and couplings	--		
Check cooler-brackets	--		
Check zero position on final pressure gauge when depressurized	8.		
Tighten valve head bolts and pressure studs	9.		

Every 125 operating hours	Chapter	Date	Signature
Change intake filter cartridge	3.		
Check V-belt and replace if necessary	12.		

Every 1000 operating hours, at least annually	Chapter	Date	Signature
Check and clean sintered metal filter element of intermediate separator	4.		
Valve check	9.		
Oil change mineral oil	2.		

Every 2000 operating hours, at least bi-annually	Chapter	Date	Signature
Change compressor oil (BAUER compressor oil, part no. N 19745). For alternative types of oil see ”Lubricating Oil List” available through BAUER customer service.	2.		
Valve change	9.		

After repair work	Chapter	Date	Signature
Check functioning and tightness of filling valve	--		
Clean intake filter and intake filter cartridge	3.		
Check tightness of O-rings	3./5.		
Check V-belt tension and condition	12.		
Check tightness of all cooler-pipes and couplings	--		
Check cooler-brackets	--		
Check zero position on final pressure gauge when depressurized	8.		
Tighten valve head bolts and pressure studs	9.		

After storage and preservation	Chapter	Date	Signature
Check functioning and tightness of filling valve	--		
Clean intake filter and intake filter cartridge	3.		
Check tightness of O-rings	3./5.		
Check V-belt tension and condition	12.		
Check tightness of all cooler-pipes and couplings	--		
Check cooler-brackets	--		
Check zero position on final pressure gauge when depressurized	8.		

16.3.1. RECORD FOR OPERATING HOURS

Date	Minutes	Total

Date	Minutes	Total
Subtotal:		

Date	Minutes	Total
Subtotal:		

Date	Minutes	Total
Subtotal:		

17. STORAGE, PRESERVATION

17.1. GENERAL

If the compressor is put out of service for more than six months, the unit should be preserved in accordance with the following instructions:

Make sure the compressor is kept indoors in a dry, dust free room. Only cover the compressor with plastic if it is certain that no condensation will form under the sheet. Nevertheless, the sheet should be removed from time to time and the unit cleaned on the outside.

If this procedure cannot be followed and/or the compressor is going to be taken out of service for more than 2 years, please contact our Technical Service Department for special instructions.

17.2. PREPARATION

Before preserving the compressor unit, run it warm and when it reaches the specified service pressure, keep it running for approx. 10 minutes.

Then carry out the following:

- Check all pipes, filters and valves (also safety valves) for leakage.
- Tighten all couplings, as required.
- After 10 minutes, open the filling valves or the outlet valve and run the compressor at the set minimum pressure (pressure maintaining valve, see chapter 6) for approx. 5 minutes.
- After these 5 minutes, shut the system down. Drain condensate from separators. Depressurize unit. Shut filling valves/outlet valve.
- Open filters and grease threads.
- **Ensure that filter cartridge remain in the filter!**
  This will prevent oil entering filling lines as a result of preservation procedures.
- Remove intake filter from manifold and all intake lines from valve heads.
- Let compressor unit cool down.

17.3. PRESERVING THE COMPRESSOR

- Turn the compressor on and spray a small amount (approx. 10 ccm/0.6 cu. in.) of **compressor oil N 19745** (refer to chapter 2) into the valve head inlet port (compressors with dual 1st stage: **each** of the inlet ports) while the compressor is running. Do not let the compressor warm up too much, to keep oil sticky.
- Shut compressor unit off.
- Close all valves.
- Place the dust cap onto the inlet port.

17.4. PRESERVING THE MOTOR/ENGINE

Preserve the motor/engine according to the instructions of the motor/engine manufacturer.

17.5. PREVENTIVE MAINTENANCE DURING STORAGE

Run the compressor **once every 6 months** as described in the following:

- Remove the dust cap from the inlet port and insert the intake filter.
- Open the filling valves or the outlet valve and let the unit run for approx. 10 minutes or until the pressure gauges indicate the correct values.
- Stop the compressor.
- Open condensate drain valves and release compressed air. Close condensate drain valves again.
- Carry out preservation procedure according to para.17.3.

17.5.1. Changing the lube oil for preserving

- After prolonged storage, the oil will age in the compressor and engine. It should be drained after **2 years** at the latest and replaced with fresh oil.
- The stated period can only be attained when the crankcase is sealed during the preservation period in accordance with the preservation requirements.
- After changing the oil, turn the compressor and the engine or run them for the required period. See paras. 17.3. and 17.4.
- Check the lubrication of the compressor when putting the unit into operation once every six months or when turning the compressor.

  The oil pump is functioning properly when oil can be seen flowing through the sight glass of the oil pressure regulator and if the oil pressure gauge indicates the prescribed pressure.

17.6. REACTIVATING THE COMPRESSOR UNIT

- Remove the dust cap from the inlet port and insert the intake filter.
- Check the oil level of the compressor.
- Check the motor/engine according to the manufacturer's instructions.
- Only applicable for units equipped with a filter system:
  open the purifier and change all filter cartridges.
- Run the compressor warm with open filling valves or outlet valve for approx. 10 minutes.
- Check the oil pressure on the pressure gauge. If there is any fault, check the lubrication of the compressor.
- After 10 minutes, close the filling valves or the outlet valve and run the unit up to final pressure until the final pressure safety valve blows. To do so, override the pressure switch, if installed on the unit. On compressors fitted with a factory-installed **COMP-TRONIC** compressor control unit, switch to "test operation - continuous mode" to override pressure switch. Refer to chapter 11.
- Check the inter-pressure safety valves for leakage.
- Establish cause of any fault from the trouble-shooting table, section 19, and remedy.
- Stop the system when running properly, the compressor is then ready for operation.

18. REPAIR INSTRUCTIONS

18.1. GENERAL

Preventive maintenance usually involves replacing the valves, gaskets and sealing rings as well as carrying out the maintenance work.

Repair work can be carried out on the compressor block to a certain extent but a certain experience and skill is necessary. It should be noted, however, that

- no repair should be carried out on the crankdrive nor on the bearings
- safety valves are not repaired but always replaced completely.

NOTE

For all further repair instructions refer to applicable workshop manual.

19. TROUBLE-SHOOTING

Trouble	Cause	Remedy
Drive motor (electric)		
Motor will not start	Electric circuitry faulty	Before attempting to make any repairs, check all fuses, terminal connections, wire leads, make sure that motor data complies with mains supply
Drive motor (petrol or diesel)		
Engine will not start	See engine instructions	See engine instructions
Compressor block		
No oil pressure	Air trapped in oil pump	Vent pump and line see 2.5.
Sight glass exhibits air bubbles	Oil pressure regulator dirty	Clean valve and readjust oil pressure regulator see 2.6.
Oil foam in the crankcase	Last stage piston worn	Operate compressor with final stage valve head removed. If oil flows continuously out of cylinder, replace piston and liner
Compressor does not attain final pressure	Condensate drain valve(s) leaking	Tighten and reseal
	Final pressure safety valve defective (blows too soon)	Replace safety valve
	No cartridge in central filter (air escaping through cartridge safety bore)	Replace cartridge
	Vent screw for final pressure safety valve not in operating position	To vent, unscrew until completely open
Air delivery drops	Intake filter soiled	Clean or replace filter cartridge
	Pipe coupling leaking	Retighten couplings
	Excessive wear of 3rd stage piston	Replace piston and sleeve of 3rd stage
Intermediate pressure safety valve blows	Intermediate pressure too high because of defective inlet or pressure valve of the following stage	Check/replace inlet or pressure valve
	Safety valve leaking	Replace safety valve
Air escaping through cartridge safety bore	Cartridge missing	Insert cartridge
	Cartridge installed but O-rings defective	Check/replace O-rings

Trouble	Cause	Remedy
Taste of oil in the air	TRIPLEX cartridge saturated	Replace cartridge
	Unqualified lubricant being used	Replace oil with an approved brand
Compressor overheats	Insufficient cooling air	Inlet and pressure valve of one stage leaking; direction of rotation incorrect
	Ambient temperature too high	Check location; ambient temperature max. +45 °C (113 °F); check valves, clean/replace
	Direction of rotation is wrong	Correct direction of rotation
	Inlet and pressure valve of one stage is leaking	Check valves, clean/replace
Motor/engine runs eccentrically	V-belt worn	Replace
Electric Control System		
Control does not switch on	No control voltage	Check feed line
	Control fuse defective	Replace fuse, eliminate cause
	Control current line cut off, line or terminal loose	Tighten terminal
	Thermal overload triggered	Clear faults as described in the following
Thermal overload relay for drive motor triggered	Current consumption too high	Check compressor drive
	Overload relay set too low	Correct setting
Control does not switch off, final pressure safety valve blows off	Final pressure switch set too high	Correct setting
	Final pressure safety valve defective	Replace safety valve
COMP-TRONIC Monitoring Unit (optional)		
Electronic Monitoring Unit shuts off unit before 40 seconds have elapsed	Timing circuit defective	Replace Electronic Monitoring Unit
Electronic Monitoring Unit shuts off unit although all monitored items are ok	Wire to monitored item broken	Repair wiring
Electronic Monitoring Unit shuts off unit although operating parameters are ok	Sensor defective	Replace sensor

Trouble	Cause	Remedy
Automatic Condensate Drain (optional)		
Drain valves do not close	No control air	Check control air line
	Drain valves leaking	Dismantle drain valve and clean
Drain valves do not open	Condensate drain valve piston jammed	Dismantle drain valve, clean or replace valve
Solenoid valve does not close	Solenoid valve faulty	Check solenoid valve and replace if necessary
	No electrical signal	Check for voltage from timer
Solenoid valve does not open	Solenoid valve faulty	Check solenoid valve and replace if necessary
	Continuous electrical signal	Check electrical control circuit and timer
Unsatisfactory drainage (lot of condensate from manual valves)	Nozzle in 3rd drain valve clogged	Remove nozzle, clean Note: 3rd stage 2mm ∅

20. TABLES

20.1. TIGHTENING TORQUE VALUES

NOTE

Unless otherwise specified in text, the following torque values apply. All valve head screws require torque wrench tightening! The indicated torque values are valid for bolts in greased condition. Replace self-retaining nuts on reassembly.

Bolt or screw	Thread	Max. torque
Hex and allen head	M 6	10 Nm (7 ft.lbs)
Hex and allen head	M 8	25 Nm (18 ft.lbs)
Hex and allen head	M 10	45 Nm (32 ft.lbs)
Hex and allen head	M 12	75 Nm (53 ft.lbs)
Hex and allen head	M 14	120 Nm (85 ft.lbs)
Hex and allen head	M 16	200 Nm (141 ft.lbs)
Pipe connections (swivel nuts):		Finger-tight + 1/2 turn

20.2. TORQUE SEQUENCE

Tighten valve head and cylinder bolts/nuts equally in the sequence shown in Fig. 44.

Be sure to tighten all parts in **cold** condition only.

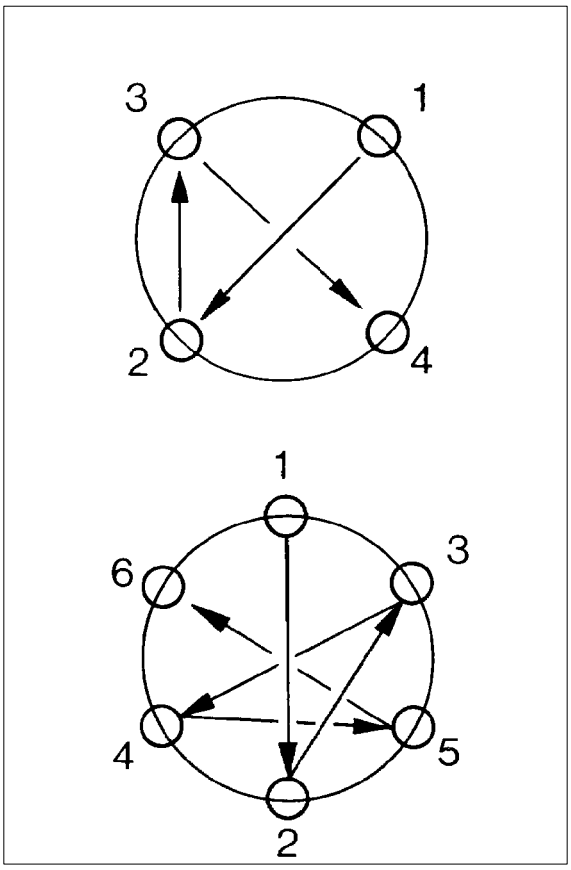


Fig. 44 Torque sequence

20.3. LUBRICATION CHART

Usage	Lubricants
O-rings, rubber and plastic parts, filter housing threads	WEICON WP 300 WHITE part no. N 19752 or White petrolatum DAB9 part no, N 19091
Sealing rings	Universal grease
Bolts, nuts, studs, valve parts, CU gaskets and pipe connectors (threads, cap nut and compression rings)	WEICON ANTI-SEIZE AS 040 P part no. N 19753 or equivalent compounds with copper or MoS_2 additives
Paper gaskets	Apply silicon compound on both sides before assembly e.g. WACKER silicon compound, part no. N 18247
High temperature connections, e.g. valve heads/ cylinders	Temperature resistant compound, e.g. WACKER silicon compound, part no. N 18247

For all lubricating oils refer to chapter 2 or lubricating oil list available through **BAUER** Service Department.

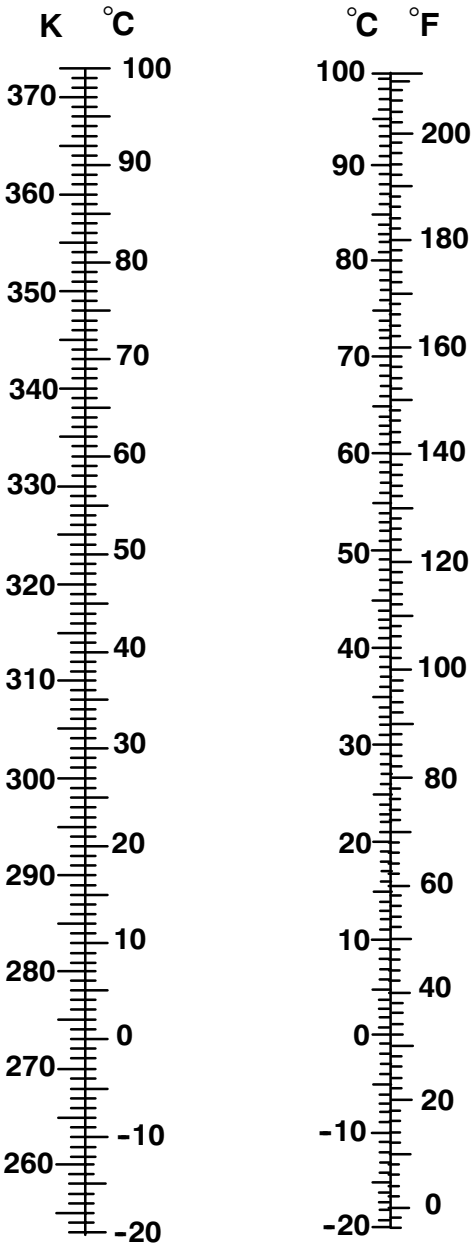
20.4. CONVERSION TABLE bar – psi

bar	psi	bar	psi	bar	psi	bar	psi	bar	psi
1	15	56	812	111	1,610	166	2,407	230	3,335
2	29	57	827	112	1,624	167	2,422	235	3,408
3	44	58	841	113	1,639	168	2,436	240	3,480
4	58	59	856	114	1,653	169	2,451	245	3,553
5	73	60	870	115	1,668	170	2,465	250	3,625
6	87	61	885	116	1,682	171	2,480	255	3,698
7	102	62	899	117	1,697	172	2,494	260	3,770
8	116	63	914	118	1,711	173	2,509	265	3,843
9	131	64	928	119	1,726	174	2,523	270	3,915
10	145	65	943	120	1,740	175	2,538	275	3,988
11	160	66	957	121	1,755	176	2,552	280	4,060
12	174	67	972	122	1,769	177	2,567	285	4,133
13	189	68	986	123	1,784	178	2,581	290	4,205
14	203	69	1,001	124	1,798	179	2,596	295	4,278
15	218	70	1,015	125	1,813	180	2,610	300	4,350
16	232	71	1,030	126	1,827	181	2,625	305	4,423
17	247	72	1,044	127	1,842	182	2,639	310	4,495
18	261	73	1,059	128	1,856	183	2,654	315	4,568
19	276	74	1,073	129	1,871	184	2,668	320	4,640
20	290	75	1,088	130	1,885	185	2,683	325	4,713
21	305	76	1,102	131	1,900	186	2,697	330	4,785
22	319	77	1,117	132	1,914	187	2,712	335	4,858
23	334	78	1,131	133	1,929	188	2,726	340	4,930
24	348	79	1,146	134	1,943	189	2,741	345	5,003
25	363	80	1,160	135	1,958	190	2,755	350	5,075
26	377	81	1,175	136	1,972	191	2,770	355	5,148
27	392	82	1,189	137	1,987	192	2,784	360	5,220
28	406	83	1,204	138	2,001	193	2,799	365	5,293
29	421	84	1,218	139	2,016	194	2,813	370	5,365
30	435	85	1,233	140	2,030	195	2,828	375	5,438
31	450	86	1,247	141	2,045	196	2,842	380	5,510
32	464	87	1,262	142	2,059	197	2,857	385	5,583
33	479	88	1,276	143	2,074	198	2,871	390	5,655
34	493	89	1,291	144	2,088	199	2,886	395	5,728
35	508	90	1,305	145	2,103	200	2,900	400	5,800
36	522	91	1,320	146	2,117	201	2,915	405	5,873
37	537	92	1,334	147	2,132	202	2,929	410	5,945
38	551	93	1,349	148	2,146	203	2,944	415	6,018
39	566	94	1,363	149	2,161	204	2,958	420	6,090
40	580	95	1,378	150	2,175	205	2,973	425	6,163
41	595	96	1,392	151	2,190	206	2,987	430	6,235
42	609	97	1,407	152	2,204	207	3,002	435	6,308
43	624	98	1,421	153	2,219	208	3,016	440	6,380
44	638	99	1,436	154	2,233	209	3,031	445	6,453
45	653	100	1,450	155	2,248	210	3,045	450	6,525
46	667	101	1,465	156	2,262	211	3,060	455	6,598
47	682	102	1,479	157	2,277	212	3,074	460	6,670
48	696	103	1,494	158	2,291	213	3,089	465	6,743
49	711	104	1,508	159	2,306	214	3,103	470	6,815
50	725	105	1,523	160	2,320	215	3,118	475	6,888
51	740	106	1,537	161	2,335	216	3,132	480	6,960
52	754	107	1,552	162	2,349	217	3,147	485	7,033
53	769	108	1,566	163	2,364	218	3,161	490	7,105
54	783	109	1,581	164	2,378	220	3,190	495	7,178
55	798	110	1,595	165	2,393	225	3,263	500	7,250

20.5. CONVERSION TABLE psi - bar

psi	bar	psi	bar	psi	bar	psi	bar	psi	bar
1	0.07	61	4.21	310	21.38	910	63	3,400	234
2	0.14	62	4.28	320	22.07	920	63	3,500	241
3	0.21	63	4.34	330	22.76	930	64	3,600	248
4	0.28	64	4.41	340	23.45	940	65	3,700	255
5	0.34	65	4.48	350	24.14	950	66	3,800	262
6	0.41	66	4.55	360	24.83	960	66	3,900	269
7	0.48	67	4.62	370	25.52	970	67	4,000	276
8	0.55	68	4.69	380	26.21	980	68	4,100	283
9	0.62	69	4.76	390	26.90	990	68	4,200	290
10	0.69	70	4.83	400	27.59	1,000	69	4,300	297
11	0.76	71	4.90	410	28.28	1,010	70	4,400	303
12	0.83	72	4.97	420	28.97	1,020	70	4,500	310
13	0.90	73	5.03	430	29.66	1,030	71	4,600	317
14	0.97	74	5.10	440	30.34	1,040	72	4,700	324
15	1.03	75	5.17	450	31.03	1,050	72	4,800	331
16	1.10	76	5.24	460	31.72	1,060	73	4.,900	338
17	1.17	77	5.31	470	32.41	1,070	74	5,000	345
18	1.24	78	5.38	480	33.10	1,080	74	5,100	352
19	1.31	79	5.45	490	33.79	1,090	75	5,200	359
20	1.38	80	5.52	500	34.48	1,100	76	5,300	366
21	1.45	81	5.59	510	35.17	1,110	77	5,400	372
22	1.52	82	5.66	520	35.86	1,120	77	5,500	379
23	1.59	83	5.72	530	36.55	1,130	78	5,600	386
24	1.66	84	5.79	540	37.24	1,140	79	5,700	393
25	1.72	85	5.86	550	37.93	1,150	79	5,800	400
26	1.79	86	5.93	560	38.62	1,160	80	5,900	407
27	1.86	87	6.00	570	39.31	1,170	81	6,000	414
28	1.93	88	6.07	580	40.00	1,180	81	6,100	421
29	2.00	89	6.14	590	40.69	1,190	82	6,200	428
30	2.07	90	6.21	600	41.38	1,200	83	6,300	434
31	2.14	91	6.28	610	42.07	1,210	83	6,400	441
32	2.21	92	6.34	620	42.76	1,220	84	6,500	448
33	2.28	93	6.41	630	43.45	1,230	85	6,600	455
34	2.34	94	6.48	640	44.14	1,240	86	6,700	462
35	2.41	95	6.55	650	44.83	1,250	86	6,800	469
36	2.48	96	6.62	660	45.52	1,260	87	6,900	476
37	2.55	97	6.69	670	46.21	1,270	88	7,000	483
38	2.62	98	6.76	680	46.90	1,280	88	7,100	490
39	2.69	99	6.83	690	47.59	1,290	89	7,200	497
40	2.76	100	6.90	700	48.28	1,300	90	7,300	503
41	2.83	110	7.59	710	48.97	1,400	97	7,400	510
42	2.90	120	8.28	720	49.66	1,500	103	7,500	517
43	2.97	130	8.97	730	50.34	1,600	110	7,600	524
44	3.03	140	9.66	740	51.03	1,700	117	7,700	531
45	3.10	150	10.34	750	51.72	1,800	124	7,800	538
46	3.17	160	11.03	760	52	1900	131	7,900	545
47	3.24	170	11.72	770	53	2,.000	138	8,000	552
48	3.31	180	12.41	780	54	2,100	145	8,100	559
49	3.38	190	13.10	790	54	2,200	152	8,200	566
50	3.45	200	13.79	800	55	2,300	159	8,300	572
51	3.52	210	14.48	810	56	2,400	166	8,400	579
52	3.59	220	15.17	820	57	2,500	172	8500	586
53	3.66	230	15.86	830	57	2,600	179	8,600	593
54	3.72	240	16.55	840	58	2,700	186	8,700	600
55	3.79	250	17.24	850	59	2,800	193	8,800	607
56	3.86	260	17.93	860	59	2,900	200	8,900	614
57	3.93	270	18.62	870	60	3,000	207	9,000	621
58	4.00	280	19.31	880	61	3,100	214	9,100	628
59	4.07	290	20.00	890	61	3,200	221	9,200	634
60	4.14	300	20.69	900	62	3,300	228	9,300	641

20.6. TEMPERATURE CONVERSION TABLE



20.7. MISCELLANEOUS CONVERSION TABLES

Linear measures

	cm	m	km	in	ft	mile
cm	1	0.01	1×10^{-5}	0.3937	0.03281	6.21×10^{-6}
m	100	1	0.001	39.37	3.281	6.21×10^{-4}
km	1×10^{5}	1000	1	3.94×10^{4}	3281	0.6214
in	2.540	0.02540	2.54×10^{-5}	1	0.08333	1.58×10^{-5}
ft	30.48	0.3048	3.05×10^{-4}	12	1	1.89×10^{-4}
mile	1.61×10^{5}	1.609	1.609	6.34×10^{4}	5280	1

Volume measures

	cm^3	litre	m^3	in^3	ft^3	gal
cm^3	1	0.001	1×10^{-6}	0.06102	3.53×10^{-5}	2.64×10^{-4}
litre	1000	1	0.001	61.02	0.03532	0.2642
m^3	1×10^{6}	1000	1	6.10×10^{4}	35.31	264.2
in^3	16.39	0.01639	1.64×10^{-5}	1	5.79×10^{-4}	0.00433
ft^3	2.83×10^{4}	28.32	0.02832	1728	1	7.481
gal	3785	3.785	0.00379	231.0	0.1337	1

Flow rates

	l/sec	gal/min	ft^3/sec	ft^3/min	l/min
l/sec	1	15.85	0.03532	2.119	60
gal/min	0.06309	1	0.00223	0.1337	3.785
ft^3/s	28.32	448.8	1	60	1699.2
ft^3/min	0.4719	7.481	0.01667	1	28.32
l/min	0.0167	0.2642	0.0005885	0.03532	1

Pressure conversion table

	mm Hg	inch Hg	inch H_2O	ft H_2O	atm	psi	kg/cm^2	bar	kPa
mm Hg	1	0.03937	0.5353	0.04460	0.00132	0.01934	0.00136	0.0010	0.133
inch Hg	25.40	1	13.60	1.133	0.03342	0.04912	0.03453	0.0340	3.395
inch H_2O	1.868	0.07355	1	0.08333	0.00246	0.03613	0.00254	0.0025	0.249
ft H_2O	22.42	0.8826	12	1	0.02950	0.4335	0.03048	0.0300	2.984
atm	760	29.92	406.8	33.90	1	14.70	1.033	1.0130	101.375
lb/in^2	51.71	2.036	27.67	2.307	0.06805	1	0.07031	0.069	6.895
kg/cm^2	735.6	28.96	393.7	32.81	0.9678	14.22	1	0.981	98.066
bar	752.47	29.575	402.164	33.5136	0.9870	14.50	1.02	1	100
kPa	7.525	0.2960	4.021	0.3350	0.0098	0.1450	0.01	0.01	1

21. ANNEX

- **Air flow diagram**
  Schematic diagrams
  Lubricating oil list
  Parts lists

Dear customer

We are happy to give you advice on any questions regarding your BAUER compressor and help as soon as possible with any arising problems.

You can contact us Mondays to Thursdays from 08^{00} till 16^{30}, Fridays from 08^{00} till 14^{00} on phone no. (089) 78049-0.

If you call the following extensions directly, it will save you time and continuous dialling.

Do you want to order spare parts?
☞ **Customer service** Phone no: (089) 78049-129 or -149
Fax no: (089) 78049-103

Do you have problems with maintenance or repair work?
☞ **Technical customer service** Phone no: (089) 78049-175 or -106
Fax no: (089) 78049-103

Do you need further information regarding your unit, accessories, prices etc.?
☞ **Sales department** Phone no: (089) 78049-138 or -202
Fax no: (089) 78049-167

Are you interested in any training courses?
☞ **Training manager** Phone no: (089) 78049-202
Fax no: (089) 78049-167