BAUER KOMPRESSOREN

Instruction manual and spare parts catalogue

High pressure breathing air compressor

Junior II

225 bar
330 bar

Edition January 1999

TÜV PRODUCT SERVICE GS geprüfte Sicherheit

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BAUER KOMPRESSOREN

INTRODUCTION

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

Junior II

WARNING

! Pneumatic high pressure system !

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

This compressor has been built in accordance with the EC machine regulations 89/392 EWG. Specifications on the noise level in accordance with the 3rd rule of the machine safety law as of 18.01.91 and the EC machine regulations, chapt. I, section 1.7.4. The machine has been built according to the highest standard of technology and the generally acknowledged safety standards. Nevertheless, operation could still cause danger for the operating personnel or third parties, or result in damage to the machine and other values. The machine may only be used to produce compressed air as specified in this manual. Other use is strictly prohibited.

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

The manufacturer and the supplier void all responsibility for damage or injury resulting from failure to follow these instructions.

TÜV PRODUCT SERVICE GS geprüfte Sicherheit

Edition January 1999

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 -176
Fax no: (089) 78049-103

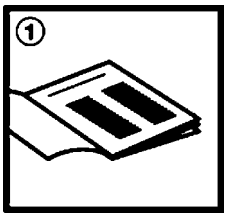
Do you need further information regarding your unit, accessories, prices etc.?

☞ **Sales department**
Phone no: (089) 78049-138, -185, -154 or -202
Fax no: (089) 78049-167

Are you interested in any training courses?

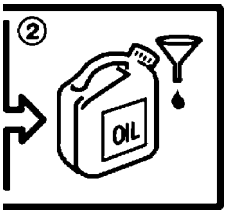
☞ **Training manager**
Phone no: (089) 78049-176
Fax no: (089) 78049-103

Explanation of the short operating instructions on the unit



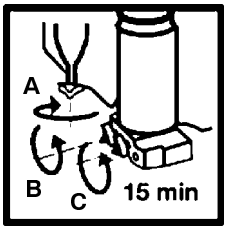
Read instruction manual before operating unit

☞ chapter 3.



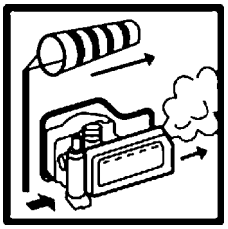
Check oil level on compressor and petrol engine before operating unit

☞ chapter 4.5.1.



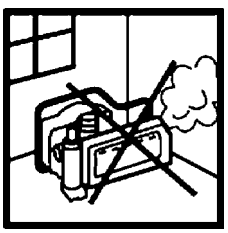
Drain condensate at least every 15 minutes (3 locations)

☞ chapter 4.5.3. and 4.5.4.



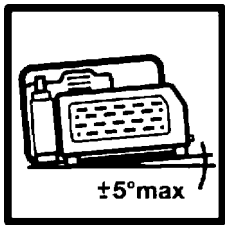
Position units with petrol engine with exhaust in wind direction to prevent exhaust fumes being sucked in by the compressor

☞ chapter 3.



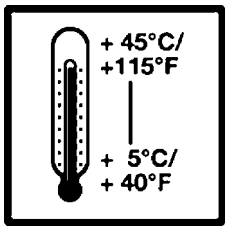
Petrol driven units must not be operated indoors.

☞ chapter 3.



Position unit level: max. inclination 5°

☞ chapter 3.



Operate unit only at ambient temperatures between +5 and +45 °C

☞ chapter 3.

Keep away from hot surfaces on motor and compressor

☞ chapter 2.

Wear ear protectors when unit is running

☞ chapter 2.

INDEX

ANNEX

NOTES

Model:

Serial No.:

Date of purchase:

Dealer address / phone no.:

1. GENERAL

PURPOSE

The **JUNIOR II** breathing air compressor is designed to compress air for breathing as required in diving applications. The max. allowable operating pressure (adjusted pressure on final pressure safety valve) is 225 bar (3,200 psi) on JII2B, JII3E, JII3W units and 330 bar (4,700 psi) on JII2BH, -HU, JII3EH, -HU and JII3WH, -HU units.

DESIGN

The compressor unit comprises the following major assemblies:

- compressor block
- drive motor
- filter system P21
- filling assembly
- base plate and frame

The design of the compressor system is shown in Fig. 1 to Fig. 4.

AIR FLOW DIAGRAM

See Fig. 5 . The air is drawn in through telescopic tube (necessary for units with petrol engine) -1, intake filter -2; compressed to final pressure in cylinders -3, -4, -5; recooled by intercoolers -6, -7, and aftercooler -9. The pressures of the single stages are protected by safety valves -10, -11, -12. The compressed air is precleaned in intermediate separator -8 and purified in filter system P21 -13. Intermediate separator and filter system P21 are drained by means of condensate drain valves -15. Pressure maintaining valve -16 provides a constant pressure within the filter assembly. The compressed, purified air is passed through filling hose -17 and filling valve -18 to the bottles to be filled. Filling pressure is indicated at pressure gauge -19. With -HU model with change over device it is possible to fill bottles with 200 bar nominal pressure by opening valve -21 at filling valve -18. Safety valve -20 is adjusted to a blow off pressure of 225 bar.

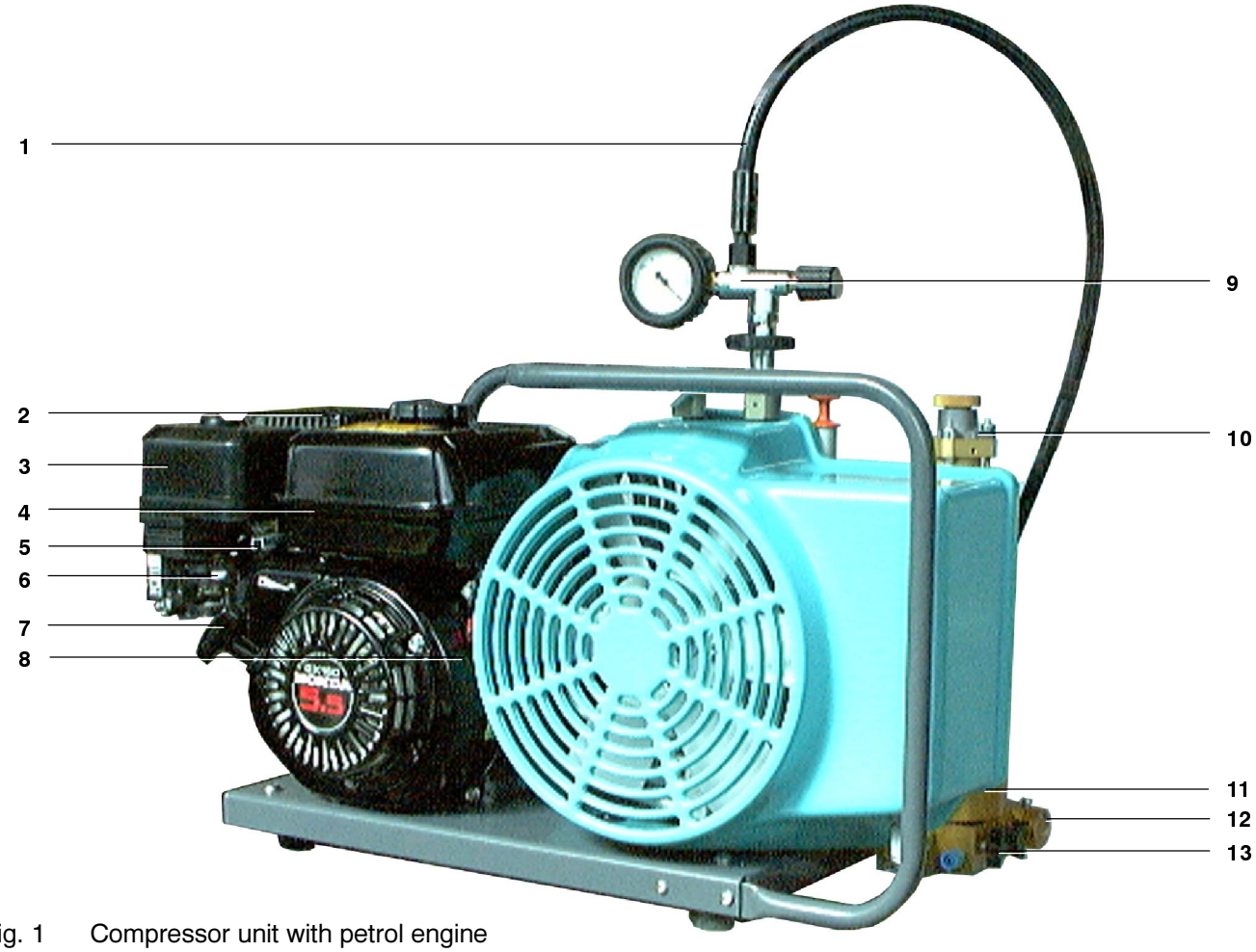


Fig. 1 Compressor unit with petrol engine

1 Filling hose
2 Exhaust
3 Air filter
4 Tank
5 Throttle lever
6 Choke lever
7 Starter rope
8 Engine stop switch (ignition)
9 Filling valve with final pressure gauge
10 Safety valve, final pressure
11 Filter system P21
12 Pressure maintaining valve
13 Condensate drain taps

1 Filling hose
2 Filling valve with pressure gauge
3 Motor terminal box
4 Three-phase motor
5 Final pressure safety valve
6 Handle
7 Fanwheel cover
8 Pressure maintaining valve
9 Condensate drain valves
10 Mains plug with ON-OFF switch and motor protection circuit breaker

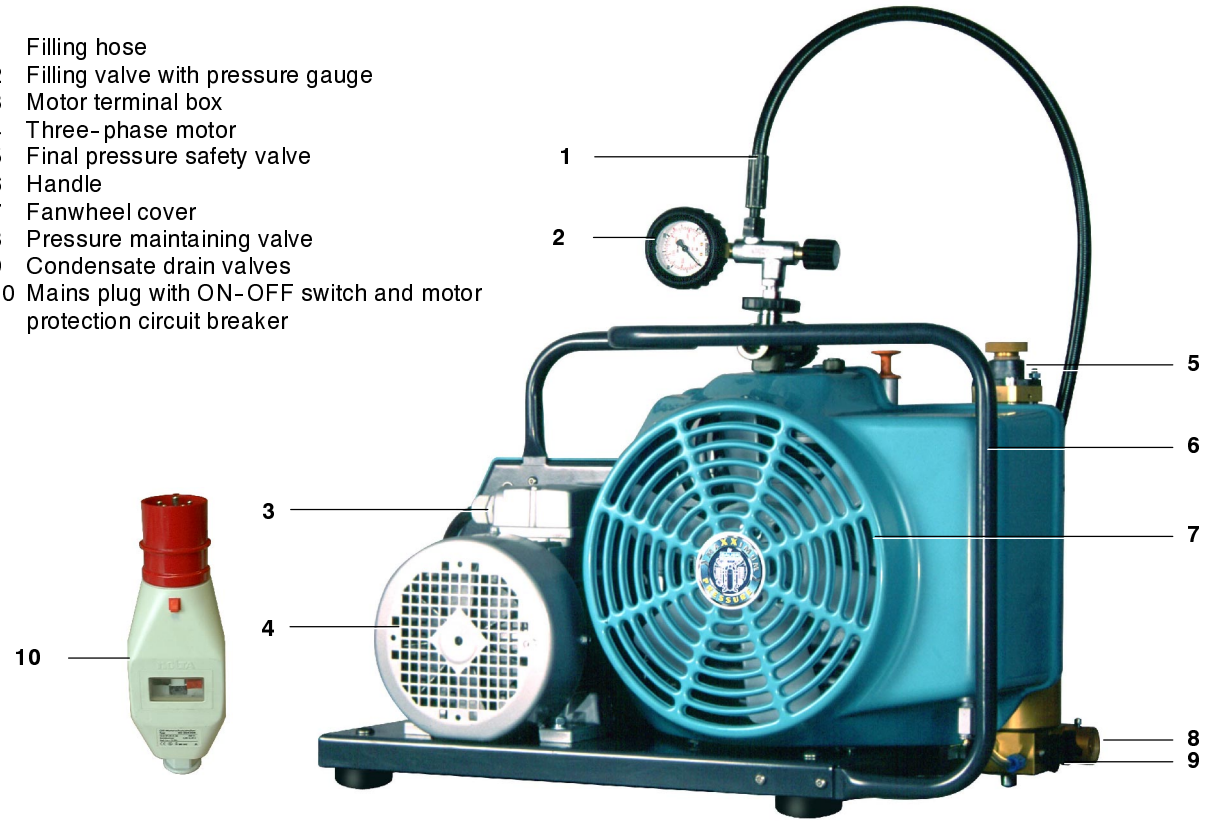


Fig. 2 Compressor unit with electric motor (three-phase current)

1 Filling hose
2 Filling valve with pressure gauge
3 Motor terminal box with ON-OFF switch
4 Three-phase motor
5 Final pressure safety valve
6 Handle
7 Fanwheel cover
8 Pressure maintaining valve
9 Condensate drain valves
10 Mains plug with ON-OFF switch and motor protection circuit breaker

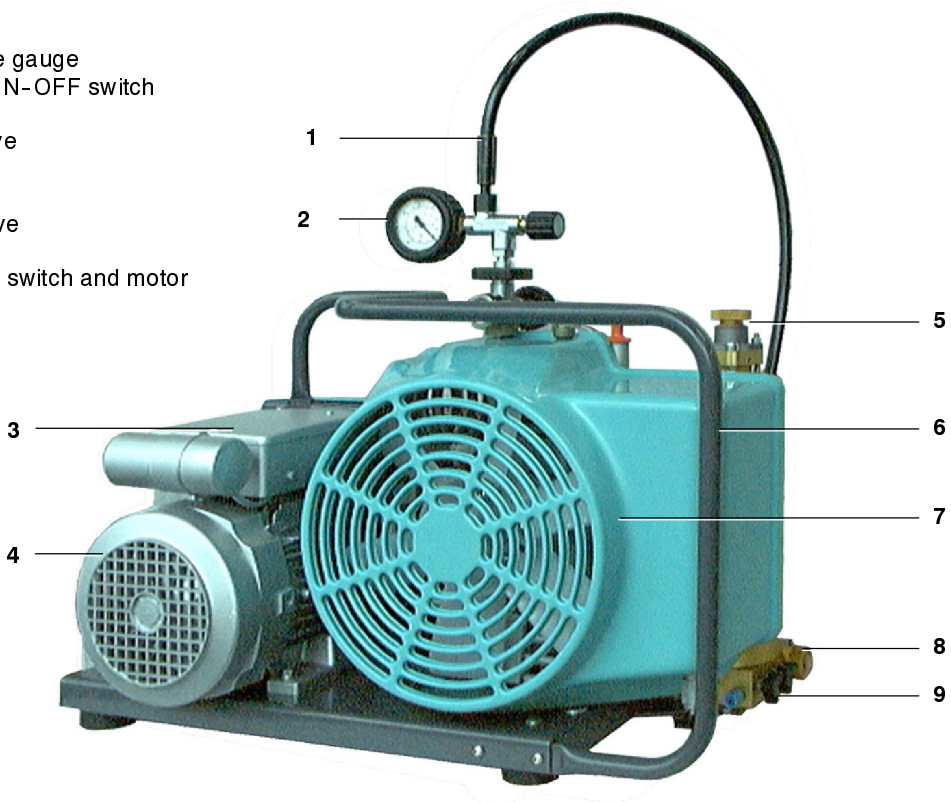
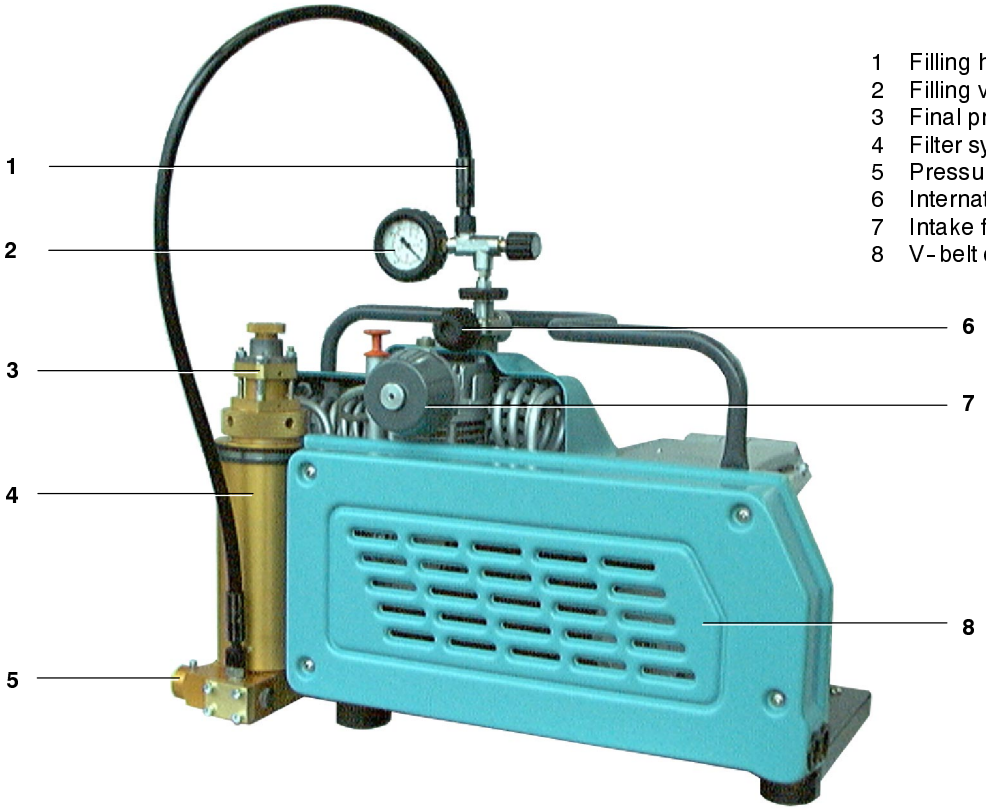
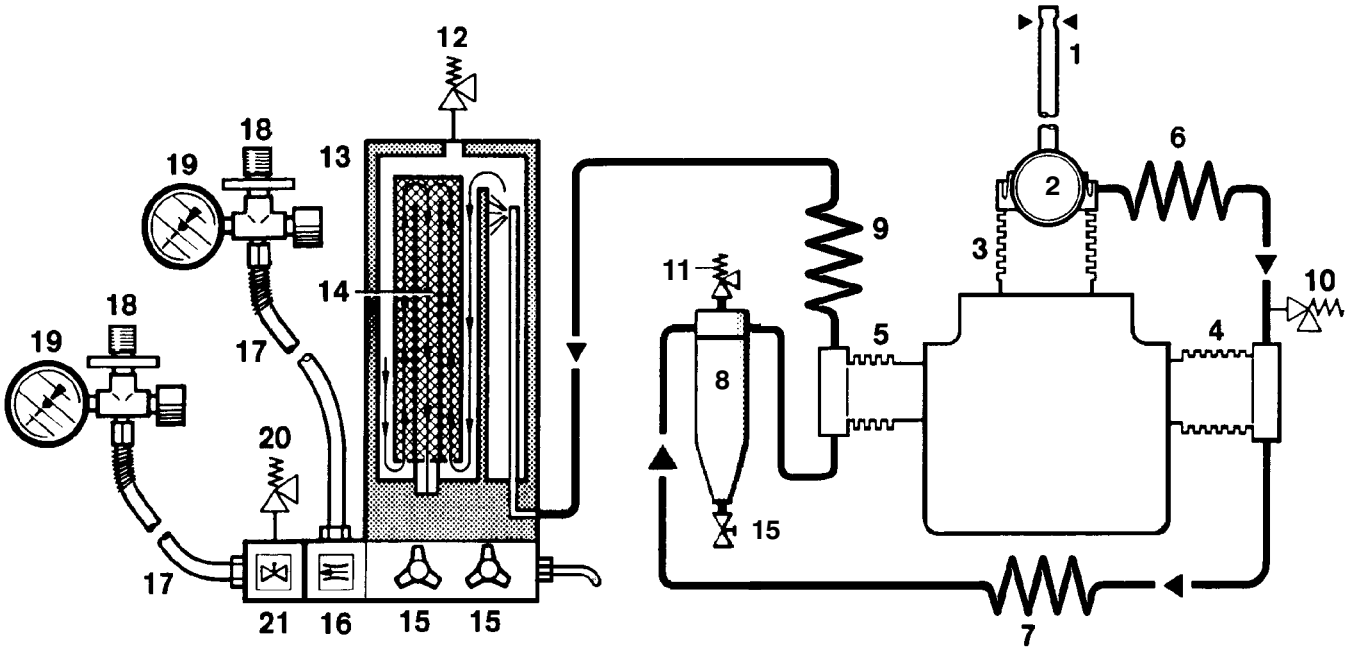


Fig. 3 Compressor unit with electric motor (alternating current)



1 Filling hose
2 Filling valve with pressure gauge
3 Final pressure safety valve
4 Filter system P21
5 Pressure maintaining valve
6 International filling connector
7 Intake filter
8 V-belt cover

Fig. 4 Compressor unit with electric motor, v-belt pulley side



1 Telescopic air intake
2 Intake filter
3 Cylinder 1st stage
4 Cylinder 2nd stage
5 Cylinder 3rd stage
6 Inter-cooler 1st/2nd stage
7 Inter-cooler 2nd/3rd stage
8 Intermed. separator 2nd/3rd stage
9 After-cooler
10 Safety valve 1st stage
11 Safety valve 2nd stage
12 Final pressure safety valve
13 Filter system P21
14 TRIPLEX longlife cartridge
15 Condensate drain valve
16 Pressure maintaining valve
17 Filling hose
18 Filling valve
19 Final pressure gauge
20 Safety valve, final pressure PN 200
21 Change over device (optional extra)

Fig. 5 Air flow diagram

TECHNICAL DATA

Compressor unit	**JII 2B**	**JII 2B-H, -HU**	**JII 3E**	**JII 3E-H, -HU**	**JII 3W**	**JII 3W-H, -HU**
Medium	air					
Intake pressure	atmospheric					
Delivery[a)]	100 l/min.					
Operating pressure	PN 200	PN 300	PN 200	PN 300	PN 200	PN 300
Pressure setting, final pressure safety valve	225 bar	330 bar	225 bar	330 bar	225 bar	330 bar
Sound pressure	87 dB(A)	87 dB(A)	86 dB(A)	86 dB(A)	86 dB(A)	86 dB(A)
Sound (immersion) power	100 dBA)	100 dB(A)	99 dB(A)	99 dB(A)	99 dB(A)	99 dB(A)
Weight	46 kg	46 kg	44 kg	44 kg	47 kg	47 kg
Compressor block	**JUNIOR, mod. 3**					
Number of stages	3					
Number of cylinders	3					
Cylinder bore 1st stage	60 mm					
Cylinder bore 2nd stage	28 mm					
Cylinder bore 3rd stage	12 mm					
Piston stroke	24 mm					
Speed	2,300 min^{-1}					
Intermediate pressure 1st stage	5.5 bar	6.5 bar	5.5 bar	6.5 bar	5.5 bar	6.5 bar
Intermediate pressure 2nd stage	55 bar	65 bar	55 bar	65 bar	55 bar	65 bar
Compressor block oil capacity	360 ml					
Oil volume between dipstick min. and max. marks	50 ml					
Oil type	see chapter 4.5.1. lubrication					
Max. ambient temperature	+5 ... +45 °C					
Max. inclination of compressor[b)]	5°					

Compressor drive	**JII 2B/-H, -HU**
Drive motor	Honda petrol engine
Manual start model (B)	GX160K1QMC8
Power	4.0 kW (5.5 PS)
at nominal speed	3,600 min^{-1}

Compressor drive	**JII 3E/-H, -HU**
Drive motor	Three phase current
Operating voltage	400 V, 50 Hz
Power	2.2 kW (3 PS)
Speed	2,850 min^{-1}
Size	90 L
Type of construction	B3
Type of enclosure	IP54

Compressor drive	**JII 3W/-H, -HU**
Drive motor	Alternating current
Operating voltage	230 V, 50 Hz
Power	2.2 kW (3 PS)
Speed	3,000 min^{-1}
Size	LS 90 PC
Type of construction	B3
Type of enclosure	IP44

a) free air delivered at bottle filling from 0 to 200 bar ±5%
b) these values are valid only if the oil of the compressor in normal position corresponds with the upper mark of the oil dipstick and may not be exceeded.

2. SAFETY MEASURES

IDENTIFYING THE SAFETY NOTICES

Important instructions concerning the endangerment of personnel, technical safety and operating safety will be specially emphasized by placing the following signs before the instructions.

WARNING This notice is used with maintenance work and operating procedures and must be adhered to exactly in order to avoid endangering personnel.

This notice must be complied with in order to avoid damage to or destruction of the machine or its equipment.

This notice advises of technical requirements which the operator must take particular note of.

NOTES AND WARNING SIGNS

Notes and warning signs displayed on compressors according to model, application or equipment.

Warning

Hot surfaces, do not touch!

Danger of burning by touching cylinders, cylinder heads and pressure lines of individual compressor stages.

Warning

High voltage!

Life threatening danger of electric shock. Maintenance work on electric units or operating equipment may only be carried out by a qualified electrician or by a person instructed and supervised by a qualified electrician according to electrical regulations.

Mandatory

Instructions must be read by persons operating the machinery!

The instruction manual supplied and all other applicable instructions, regulations etc. must be read and understood by operating personnel before using the machine.

Note

Ensure correct direction of rotation!

When switching on the machine, check the arrow to ensure correct direction of rotation of the drive motor.

FUNDAMENTAL SAFETY NOTICES

Authorized use

- The unit is built according to state of the art technology and established safety technical regulations. Nevertheless, its use can cause danger to life and limb of the operator or third parties or damage to the machine and other equipment.
- Operate the unit only in technically perfect condition in accordance with regulations and safety and danger notices detailed in the instruction manual! In particular, immediately correct faults (or have them corrected) which can impair safety!
- The unit is exclusively for the compression of mediums specified in chapter 1 “Technical data”. Any other medium or use outside that specified is not authorized. The manufacturer/supplier is not liable for damage resulting from this. The user alone is responsible for this risk. Authorization for use is also under the condition that the instruction manual is complied with and inspection and maintenance requirements are enforced.

Organizational measures

- Keep the instruction manual to hand near the unit at all times in the relevant holder.
- In addition to the instruction manual, observe and comply with universally valid legal and other obligatory regulations regarding accident prevention and environment protection. This can involve, for example, contact with hazardous substances or the provision/wearing of personal protective equipment.
- In addition to the instruction manual, provide supplementary instructions for supervision and monitoring duties taking into consideration exceptional factors e.g. with regard to organization of work, production, personnel employed.
- Personnel engaged to operate the machine must have read the instruction manual before beginning work, especially the safety notices chapter. When work is already underway it is too late. This is particularly relevant for temporary personnel, e.g. maintenance personnel.
- Personnel may not wear long hair loose, loose clothing or jewellery, including rings. There is a danger of injury through, for example, these getting caught or being pulled into the equipment.
- Observe all safety and danger notices on the unit.
- Keep all safety and danger notices on the unit complete and in readable condition.
- No modifications may be made to the unit which could impair safety without first obtaining permission from the suppliers. This is also the case with regard to installation and adjustment of safety devices and valves as well as welding of piping and reservoirs.
- Spare parts must always comply with the technical requirements specified by the manufacturer. This is always guaranteed with original spare parts.

- Piping must be thoroughly checked (pressure and visual inspection) by the operator at appropriate time intervals, even if no safety related faults have been noticed.
- Intervals stipulated or given in the instruction manual for recurring checks/inspections must be adhered to.
- It is absolutely essential that the workplace is appropriately equipped for maintenance measures.

Qualifications, fundamental duties

- Work on/with the unit may only be carried out by reliable personnel. Observe the legal minimum age permissible.
- Only employ trained personnel, clearly establish responsibility of personnel for operation, maintenance and repairwork.
- Ensure that only trained personnel work with the machine.
- Establish the responsibilities of the machine operator and establish a procedure for him to inform a third person of unfavourable safety conditions.
- People who are being trained or introduced to the job should only be allowed to work with the unit under constant supervision of an experienced person.
- Work on the electrical equipment of the unit may only be carried out by a qualified electrician or by an instructed person under the direction and supervision of a qualified electrician according to electrotechnical regulations.

Safety notices for operation

- Do not carry out any work if safety is questionable.
- Meet all requirements demanding that the unit is only operated in safe and good working order. Only operate the machine if all protective and safety equipment, e.g. all detachable protective equipment, emergency shut-down devices, soundproofing is provided and in good working order.
- At least once every day, check the unit externally for damage and faults. Inform the department/person responsible immediately if anything is not as is should be (including operation). If necessary, shut the machine down immediately and make it safe.
- If there are any malfunctions, shut the unit down immediately and make it safe. Correct faults immediately (or have them corrected).
- Observe switching on and off processes and monitoring indications according to the instruction manual.
- Before switching on/starting up the unit, ensure that no one can be put at risk through running the unit.
- Carry out the setting, maintenance and inspection processes at the intervals specified in the instruction manual, including replacement of parts/equipment. This work may only be carried out by qualified personnel.
- Before carrying out any exceptional work or repairwork, operating personnel should be informed. Call the supervisor.
- For all work concerning operation, change in production, conversion or regulating of the unit and its safety measures such as inspection, maintenance and repairwork, observe the switching on and off processes in the instruction manual and the notices for maintenance work.
- If the unit is completely switched off for maintenance and repairwork, ensure that it is protected from unexpected start-up. Turn off main control device and remove the key and/or display a warning sign on the main switch.
- Clean oil, fuel or care products from the machine, in particular the connections and screw joints, before carrying out maintenance/repairwork. Do not use aggressive cleaning fluid. Use a fibre-free cleaning cloth.
- Before cleaning the machine with water or jet of steam (high pressure cleaner) or detergent, cover/seal all openings which for safety and/or operating reasons no water/steam/detergent may penetrate. Electric motor and switch cabinets are particularly at risk.
- When cleaning the operating room, ensure that the temperature sensors of the fire alarm and sprinkler system do not come into contact with hot cleaning fluid, in order to avoid triggering the sprinkler system.
- Completely remove all covers/seals after cleaning.
- After cleaning, check all pressure lines for leaks, loose connections, wear and damage. Immediately eliminate any faults.
- Always retighten any screw connections loosened for maintenance or repairwork.
- If it is necessary to remove safety devices for maintenance and repairwork, these must be replaced and checked immediately after completion of the maintenance or repairwork.
- Ensure safe and environmentally friendly disposal of consumables and old parts.

Particular areas of danger

- Use only original fuses with specified current rating. If there is a failure in the electric energy supply, shut the machine / unit down immediately.
- Work on electric units or operating equipment may only be carried out by a qualified electrician or by a person under the instruction and supervision of a qualified electrician according to electric technical regulations.
- Unit parts which must undergo inspection, maintenance and repairwork, must be disconnected from the mains supply, if specified. Parts which have been disconnected must first be checked for voltage, then earthed and short-circuited and isolated from live neighbouring parts.
- The electrical equipment of a unit must be regularly checked. Defects, such as loose screw connections or burnt wires, must be rectified immediately.

- Only carry out welding, burning and grinding work on the unit when specifically approved. There can, for example, be a risk of fire or explosion.
- Before carrying out welding, burning or grinding work, clean the machine / unit and surrounding area from dust and flammable material and ensure there is adequate ventilation (danger of explosion!).
- When working in small rooms, observe any national regulations.
- Only personnel with particular knowledge and experience with pneumatics may carry out work on pneumatic equipment.
- Check all pressure lines, hoses and screw connections regularly for leaks and visible damage. Immediately repair any damage. Escaping air or gas under pressure can cause injury and fire.
- Depressurize system and pressure lines before commencing repairwork.
- Pressurized air lines must be laid and mounted by qualified personnel. Connections must not be mixed up. Fittings, length and quality of the piping must correspond to requirements.
- With regard to oil, grease and other chemical substances, observe the relevant safety regulations for the product.
- Even when moving the unit only slightly, the unit must be disconnected from all external energy sources. Before putting into use again, reconnect the machine to the mains according to regulations.
- When taking back into operation, proceed according to the instruction manual.

Notices of danger regarding pressure vessels

- Never open or loosen pressure vessel lids or pipe connection parts under pressure; always depressurise the vessel or the unit.
- Never exceed the permissible operating pressure of the vessels!
- Never heat the vessels or any of their parts above the stated, maximum operating pressure.
- Always exchange damaged pressure vessels completely. Individual parts that are subject to pressure loads cannot be purchased as spare parts, since the vessels are tested as a complete part and the documentation considers them as a whole (see pressure vessel documentation, serial-numbers!).
- Always pay attention to the permissible operating mode of the pressure vessels. We differentiate:

- vessels for static load
- vessels for dynamic load

Vessels for static load:

These pressure vessels are permanently under virtually constant operating pressure; the fluctuations of pressure are very small.

Vessels for this type of load are not marked in a particular way and may be used as long as the vessel inspections, carried out regularly, do not uncover any safety-relevant deficiencies.

We recommend that aluminium vessels should be exchanged after 15 years at the latest.

Vessels for dynamic load:

These pressure vessels may also be used under conditions of changing operating pressure. The pressure may vary between the atmospheric and the maximum admissible operating pressure.

The pressure vessel documentation and the appropriate notes in the operating manual particularly characterise vessels of this type as being adequate for dynamic loads. In the technical information for these vessels you will find specifications concerning their permissible operating period.

Due to the variation of the operating pressure, these vessels are subject to a so-called dynamic load, which puts the vessels under great stress. The change between two different pressures is called a load change, two load changes are called a cycle. In the technical information for these vessels you will find specifications concerning the permissible number of cycles depending on the fluctuation of the operating pressure.

Having reached half the permissible number of cycles, the vessel has to be submitted to an internal check, in which the critically stressed areas of the vessels are examined by means of suitable testing methods, in order to ensure the operating safety.

After having reached the total permissible number of load cycles, the vessel must be exchanged and scrapped.

Record the number of load cycles in writing if you do not have an automatic cycle-counter.

We recommend that aluminium vessels should be exchanged after 15 years at the latest.

Please pay attention to and follow these measures, for your own safety and that of you employees and customers!

In order not to unnecessarily load the pressure vessels additionally, the non-return valves, that are meant to avoid a drop in pressure, and also the pressure maintaining valves, which should reduce big pressure fluctuations as well, should be checked regularly for internal and external tightness and functionality.

- Check the pressure vessels regularly on the inside and outside for damage from corrosion.
- Be particularly careful with second-hand pressure vessels, when their previous operating mode is not specifically clarified.

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 Germany by the following regulations:

a- Pressure vessels regulations (DruckbehV) of 27 February 1980, in the present version.

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

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

c- Accident Prevention Regulations (UVV):

- UVV compressors (VBG 16),

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

Carl Heymanns Verlag	Beuth-Vertrieb GmbH
Luxemburger Str. 449	Burggrafenstr. 4 - 7
50939 Köln	10787 Berlin

The manufacturer has complied with all applicable regulations and the unit is prepared accordingly. If desired, we offer at our Munich site a TÜV acceptance test according to paragraph 28 (1). Please contact our Technical Service Department with regard to this. They can also supply our leaflet **"IMPORTANT NOTES FOR TÜV CERTIFICATION"**.

According to paragraph 26 of the pressure vessel regulations (DruckbehV), all compressor units which will be used as filling stations must undergo an acceptance test by a professional at their location before bringing them into service. If pressure vessels (bottles) are to be filled by the compressor for a third party then the appropriate permission must be obtained from the responsible authority before the acceptance test. As a rule, this is the factory inspectorate. The procedure for obtaining permission is according to TRG 730, guidelines for permission to set up and operate filling stations. The test certificates and documents delivered with the compressor are important and may be requested during the procedure for obtaining permission. In addition, the documents belonging to the unit are important for recurrent inspections and should therefore be carefully kept.

Inspections in accordance with the regulations for prevention of accidents will be carried out by the manufacturer or by a specialist.No guarantees whatsoever are valid for damage caused or favoured by the non-consideration of these directions for use. 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[a)] 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 combustible, corrosive or toxic gas, 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 testing. Interior inspection (according to section 1) shall be carried out by pressure testing, if this cannot be done in its entirety, 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[a)] shall take place every 5 years, pressure inspection every 10 years and exterior inspection every 2 years.
The supervising authority is authorized 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

a) BAUER compressor units include pressure vessels from test groups II, III and IV, only.

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 authorized 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 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) the inspection interval has not expired[a] ;
  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 adapters 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[b]

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[b] 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 cannot 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[c] .

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 occurrence of a hazardous pressure[d] .

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).

a) For diving bottles (labelled Druckluft-TG or Preßluft-TG) the inspection intervals are governed by TRG 102, enclosure 1, group 1.1. According to this, the inspection interval is 2 years. For breathing apparatus (labelled Druckluft-AG or Preßluft-AG) the inspection interval is 6 years.

b) See this instruction manual.

c) Notices for maintenance and repair work can be found in chapter 4 of this instruction manual.

d) Does not apply to the compressor itself but to the pressure vessels filled.

6. Procedure after filling

6.3 Defects on filled 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 emptying (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 authorized 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[a)].

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/subsystem 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)[b)] must be tested prior to first time operation and at least once a year 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[c)]. 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 Parts coming into contact with oxidizing pressurized gases shall be inspected for signs of oil and grease in suitable intervals and cleaned as 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 insurer 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) For compressor units use only compressed air which has been compressed by the compressor itself.

b) On breathing air units: filling hoses.

c) Filling hoses must be thoroughly dried inside and out after pressure testing.

3. LOCATION, OPERATION, BOTTLE FILLING

LOCATION

Outdoor location

The compressor unit is not seawater resistant. At operation in salty air spray compressor with anticorrosive protection (e. g. Quicksilver Corrosion Guard). Electric driven units should be operated and stored below deck. Units with petrol engine should also be stored below deck after the filling process.

Keep unit away from inflammable items. Do not smoke while petrol tank is open and while unit is in operation.

- Locate the unit level.
- On units with petrol 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.
- Turn unit as soon as wind direction changes.
- Take care that no vehicles are in direct vicinity with engines running.
- Do not operate unit in the vicinity of open fire (flue gas!).

Indoor location

Petrol driven units must not be operated 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.
- Ensure that an adequate exhaust air opening is provided.
- When locating the compressor in small rooms where natural ventilation is not ensured, measures must be taken to provide artificial ventilation (this also applies when other systems having high radiation are operating in the same room).

Electrical installation

For installation of electrical equipment observe the following:

- Comply with regulations of local electricity supply company.
- Arrange for the electrics to be connected by an electrician only.
- Ensure correct installation of protective conductor.
- Check conformity of motor tension and frequency with those of electric network.
- Operate electric units only on mains sockets equipped with fault current circuit breaker according to DIN VDE 0664 with a nominal differential current of less than 30 mA (up to 16 A in single-phase AC circuits).
- For units not connected through a plug, but permanently installed, a main switch must be provided which has a contact gap of minimum 3 mm on each pole.
- Fuse motor correctly (see following table; use slow-blow fuses, only).
- Immediately after start-up check direction of rotation for agreement with arrow on unit.

Sicherungstabelle

Voltage	V	110	127	220	**230**	240	**400**	415	440
Three-phase current I_n=5,5 A	A	**--**	**--**	16	**--**	16	**10**	10	10
Alternating current I_n=8,7 A	A	35	35	**--**	**20**	20	**--**	--	--

If power supply cable is to be replaced, use cable of same type, only!

OPERATION

Preparation for operation

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:

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%!**

- 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. Particularly observe chapter 2. **SAFETY REGULATIONS**.
- 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 **first** operation or operation subsequent to repair work operate unit for at least 5 minutes with open condensate valves (pressureless) to ensure proper lubrication of all parts before pressure is built up.
- Prior to **each** operation check the oil level according to chapter 4.5.1. and determine whether maintenance is necessary in accordance with chapter 4.3.
- 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.

Units with three phase current motor, additionally:

- 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.

Units with petrol engine, additionally:

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

Starting the unit

Units with electric drive motor:

- **Three-phase current:** the motor is switched on manually by pressing the start button (1, Fig. 6).

Fig. 6 Motor protection switch (three-phase motor)

- **Alternating current:** Set 0-I switch to I.
- If final pressure is reached and safety valve blows off, open condensate drain valves and drain condensate. Unit is then ready for operation.

Units with petrol engine:

- Open condensate drain valves on the filters so that motor starts without load.
- 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.

All units:

- 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.

FILLING PROCEDURE

General

WARNING **Ensure intake air is free from noxious gas, exhaust fumes and solvent vapour. On units employing a petrol engine it is most important to use an intake hose also observe that only clean air is drawn in. The intake hose is also recommended for units with electric engine.**

WARNING **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.**

WARNING **Never open filling valves or shut-off valves when under pressure and not connected as highly compressed air emerging can cause serious accidents.**

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.

WARNING **To meet the CO_2 maximum rating value in breathing air bottles, please observe the two following chapters "Intake air quality" and "Scavenging the compressor unit".**

Intake air quality

At routine tests, CO_2 values beyond the permissible values are noted from time to time. Closer investigations often show that the compressed air is taken from rooms in which one or more persons are working. At insufficient ventilation, the CO_2 value in the surrounding air can increase quite fast because of the exhaling of CO_2. CO_2 values from 1,000 to 5,000 ppmv in workrooms are not unusual (MAK-value (max. workroom concentration) is 5,000 ppmv). Another additional increase is caused by cigarette smoking, producing approx. 2g CO_2 ($\approx$ 2,000 ppmv) per cigarette. These pollutions add up to the basic pollution of approx. 400 ppmv. The technically caused excessive increase of CO_2 during the filling process and the CO_2 peak at taking the unit into operation. **Because of the reasons stated above and for your own security, the filling of breathing air bottles is not allowed in rooms used as workrooms.**

Scavenging the compressor unit

CO_2 is present in the atmosphere with a natural amount of 350 to 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, we recommend to flush the compressor unit 1 to 2 minutes prior to connecting the bottles, i.e. to let the air escape into the surroundings. Remove filling hose for this purpose, refer to refer to **WARNING** under "Filling the bottles" below.

Connecting the bottles

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

- Connect air bottle to filling valve (see Fig. 7).

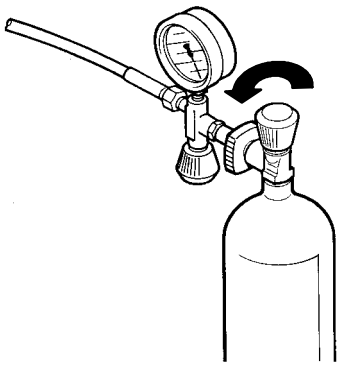


Fig. 7 Connecting air bottle

- Air bottles with international filling connector can be connected with filling adaptor (part no. 08487) to the German filling connector (see Fig. 8).

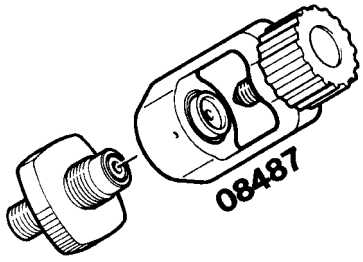


Fig. 8 International filling connector

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.

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. 9).
- 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.

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.

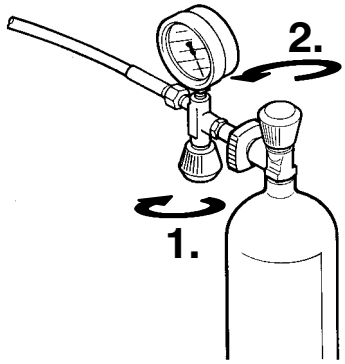


Fig. 9 Filling air bottle

Removing the bottles

- Upon reaching final bottle pressure **close bottle valve first** (1, Fig. 10)**, then filling valve** by returning handle to closed position (2).
- Remove compressed air bottle.

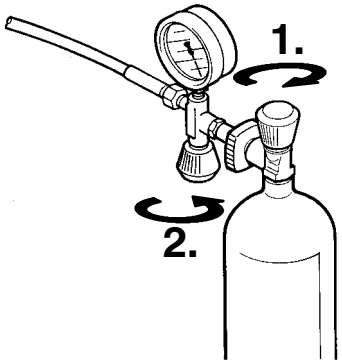


Fig. 10 Removing air bottle

CHANGE-OVER DEVICE PN 300/PN 200

(Fig. 11) 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 the bottles".

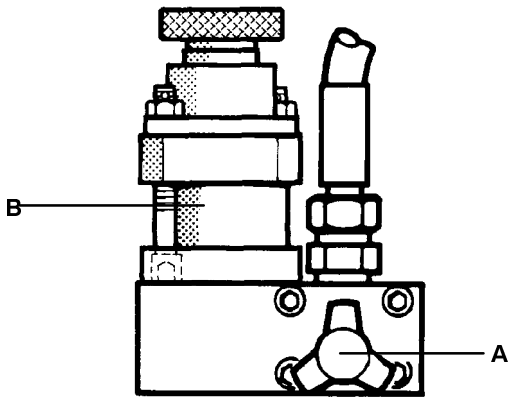


Fig. 11 Change-over device

SHUT-DOWN PROCEDURE

Close filling valve.

Units with electric motor:

- **Three-phase current:** the motor is switched off either manually by pressing the stop button (1, Fig. 12).

Fig. 12 Motor protection switch (three-phase motor)

- **Alternating current:** set 0 - I switch to 0.

Units with petrol engine:

- Shut down petrol 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 the filter and the 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 4.3.

4. MAINTENANCE

4.1. 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). Please fill in the appropriate lines to show what maintenance work has been carried out, and sign and date.

4.2. MAINTENANCE INSTRUCTIONS

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

WARNING **Never repair pressure lines by soldering or welding.**

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.

Only use original spare parts for maintenance or repair work.

Change TRIPLEX longlife cartridge according to chapter 4.5.4.!

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

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

4.3. MAINTENANCE SCHEDULE

After first 25 operating hours	Chapter	Date	Signature
Check functioning and tightness of filling valve	--		
Clean intake filter and intake filter cartridge	4.5.2.		
Check tightness of O-rings	4.5.2./ 4.5.4.		
Check V-belt tension and condition	4.5.9.		
Check tightness of all cooler-pipes and couplings	--		
Check cooler fastening	--		
Check zero position on final pressure gauge when depressurized	4.5.7.		
Tighten valve head bolts and pressure studs	4.5.8.		

Every 125 operating hours	Chapter	Date	Signature
Change intake filter cartridge	4.5.2.		
Check V-belt and replace if necessary	4.5.9.		

Every 1000 operating hours, at least annually	Chapter	Date	Signature
Check and clean filter element of intermediate separator	4.5.3.		
Valve check	4.5.8.		
Oil change mineral oils	4.5.1.		

Every 2000 operating hours, at least bi-annually	Chapter	Date	Signature
Oil change, synthetic oils	4.5.1.		
Valve change	4.5.8.		

Annually or as required	Chapter	Date	Signature
Check blow-off pressure of final pressure safety valve	4.5.6.		
Perform a breathing air quality check with **BAUER** AirLab IV test unit or equivalent	--		

After repair work	Chapter	Date	Signature
Check functioning and tightness of filling valve	--		
Clean intake filter and intake filter cartridge	4.5.2.		
Check tightness of O-rings	4.5.2./ 4.5.4.		
Check V-belt tension and condition	4.5.9.		
Check tightness of all cooler-pipes and couplings	--		
Check cooler-brackets	--		
Check zero position on final pressure gauge when depressurized	4.5.7.		
Tighten valve head bolts and pressure studs	4.5.8.		

After storage and preservation	Chapter	Date	Signature
Check functioning and tightness of filling valve	--		
Clean intake filter and intake filter cartridge	4.5.2.		
Check tightness of O-rings	4.5.2./4.5.4.		
Check V-belt tension and condition	4.5.9.		
Check tightness of all cooler-pipes and couplings	--		
Check cooler-brackets	--		
Check zero position on final pressure gauge when depressurized	4.5.7.		

4.4. RECORD FOR OPERATING HOURS

Date	Minutes	Total

Date	Minutes	Total
Subtotal:		

Date	Minutes	Total
Subtotal:		

Date	Minutes	Total
Subtotal:		

4.5. MAINTENANCE WORK

This chapter contains the maintenance work as well as a short functional description for each component.

4.5.1. LUBRICATION

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.

The current oil list is provided in the annex, chapter 8. Order this list regularly through the BAUER Technical Service Department.

For operation under difficult conditions such as continuous running and/or high ambient temperatures we recommend the use of **BAUER** high performance compressor oils, only, according to the oil list. These oils are tested in our compressors and have proved excellent quality under ambient temperatures between +5 °C (41 °F) and +45 °C (113 °F). For lower temperatures, a heating device is required which is capable of pre-heating the crankcase up to +5 °C (41 °F).

For operation under less severe conditions, for intermittent operation, or operation with long idle periods we can also recommend mineral compressor oils which are suitable for operation under ambient temperatures between +5 °C (41 °F) and +35 °C (95 °F). Here also, pre-heating is required for lower temperatures.

OIL LEVEL CHECK

Check oil level daily prior to putting compressor into operation. Check using oil dipstick.

Take care that dip stick is inserted completely. Note that the oil level must be between minimum and maximum dipstick markings (see Fig. 13).

Oil level must not decrease below min. mark but also not exceed max. mark as this will cause excessive lubrication of compressor and result in valves sooting up.

OIL CHANGE INTERVALS

Mineral oils	every 1,000 operating hours, at least annually
Synthetic oils	every 2,000 operating hours, at least bi-annually

OIL CAPACITY

Junior II	approx. **360 ml**

OIL PACKAGES

BAUER compressor oil is available in various quantities, refer to oil list in chapter 8.

OIL CHANGE

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

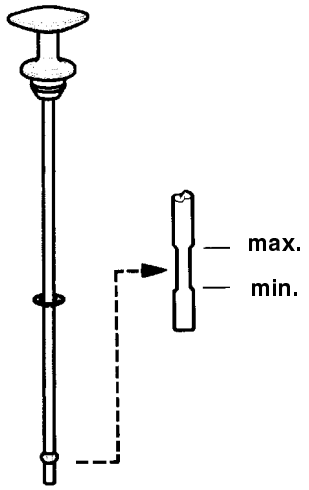


Fig. 13 Oil dipstick markings

CHANGING THE OIL TYPE

To avoid severe damage to the compressor unit when changing the oil type, the following measures should be strictly adhered to:

- Drain oil completely while still warm.
- Check valves, coolers, separators, purifiers, and all pneumatic tubes and hoses for deposits.

If deposits are detected, perform the following:

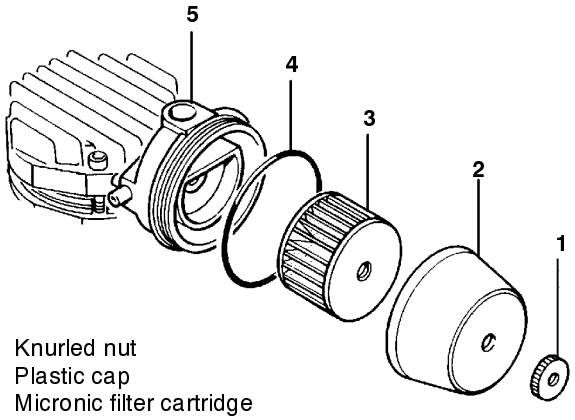
- Change or clean valves, coolers, separators, purifiers, and all pneumatic tubes and hoses from deposits.

- Fill compressor with the new oil.
- After approx. 100 operating hours check lubricating oil for degree of contamination, and change oil again if necessary.
- Top up compressor and perform subsequent oil changes with same oil, only.

4.5.2. INTAKE FILTER

DESCRIPTION

A dry micronic filter is used to filter intake air (Fig. 14).



1 Knurled nut
2 Plastic cap
3 Micronic filter cartridge
4 O-ring
5 Opening

Fig. 14 Intake filter

INTAKE FILTER MAINTENANCE

Filter cartridge must be changed at regular intervals according to maintenance schedule in chapter 4.3.

- Remove knurled nut (1) and take off plastic cap (2). Remove filter cartridge (3, part no. N4823) 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 made used on all sides.
- Clean filter housing inside with a damp cloth. Take care to prevent dust from entering intake pipe.
- Replace O-ring (4) if damaged.

TELESCOPIC INTAKE TUBE

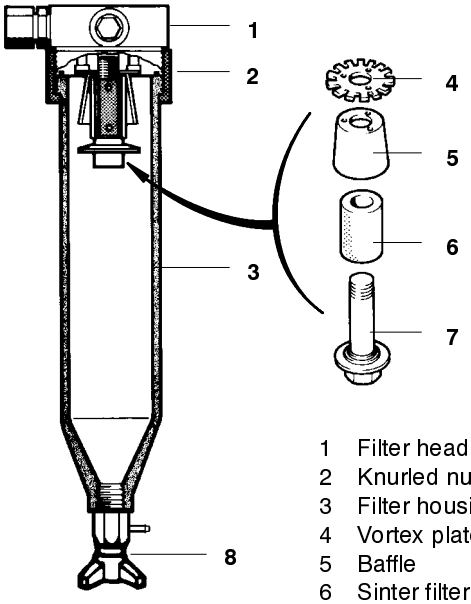
The telescopic intake tube has to be inserted in opening 5, Fig. 14. It is necessary to ensure clean air. Petrol driven breathing air compressor units are fitted with a telescopic intake tube supplied with the unit. The use of it is also recommended for electric power driven units.

4.5.3. INTERMEDIATE SEPARATOR

DESCRIPTION

An intermediate separator is mounted on the compressor between 2nd and 3rd stage. It is designed to remove water and oil accumulating due to cooling the compressed medium down after the compression process.

Separation is achieved by means of centrifugal action provided by a vortex plate (4). A sintered metal filter (6) is provided additionally to remove dirt contamination.



1 Filter head
2 Knurled nut
3 Filter housing
4 Vortex plate
5 Baffle
6 Sinter filter insert
7 Bolt
8 Condensate drain tap

Fig. 15 Intermediate separator

INTERMEDIATE SEPARATOR MAINTENANCE

Proper operation will rely on the intermediate separator being properly serviced.

Drain off condensate every 15 to 30 minutes.

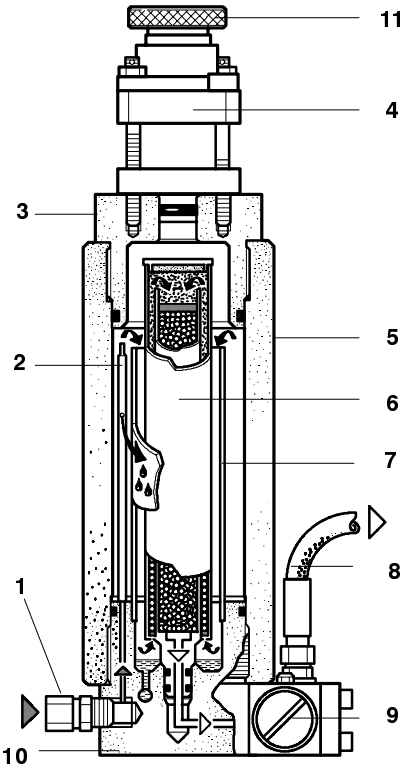
Clean sintered filter element as follows (for maintenance intervals refer to chapter 4.3.):

- Remove handle.
- Remove filling valve bracket.
- Losen filter brackets.
- Remove knurled nut (2) from filter head (1).
- Remove filter housing (3).
- Remove bolt (7), and take out sintered filter element (6).
- To clean filter element, the best method is to use hot soapy water and to blow dry with compressed air.

4.5.4. FILTER SYSTEM P21

DESCRIPTION

The air leaving the 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. 16).



1 Filter inlet
2 Jet pipe
3 Filter head
4 Final pressure safety valve
5 Housing
6 Cartridge
7 Chamber separator
8 Filling hose
9 Pressure maintaining valve
10 Filter base assy
11 Knurled knob

Fig. 16 Filter system P21

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 quality of the breathing air produced conforms to DIN EN 12021.

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. 17).

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.

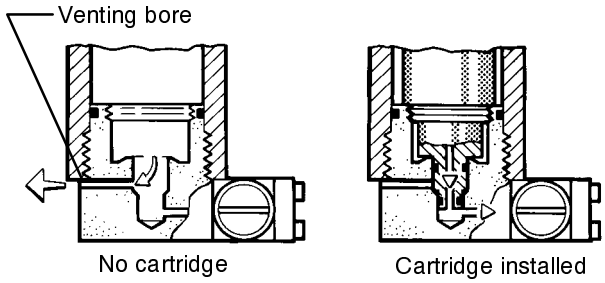


Fig. 17 Safety bore

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). Acc. to no. 15 of the annex II to the German pressure vessel regulations the filter housing has to be inspected internally by an expert after having reached half of the determined number of load cycles. The inspections have to be arranged by the operator. 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 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 4.4. 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.

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. Change if necessary.
- **Lubricate** threads and O-rings as well as threaded part of cartridge with white petrolatum DAB 9 order no. N19091 or WEICON WP 300 white order no. N19752.
- **Record** number of pressure bottles and/or operating hours to ensure exact attention to maintenance intervals.
- **Change** cartridge before reactivating a compressor unit after out-of-service periods of more than 3 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 separator of the **TRIPLEX** filter system is maintenance-free besides the regular condensate drainage.

CONDENSATE DRAINAGE

Drain condensate from separator and cartridge chamber regularly by slowly opening drain taps (15, Fig. 1)

- before changing cartridge
- before each filling procedure
- during filling procedure every **15 minutes**.

Slowly open left tap first, then right tap approx. 1/3 turn to the left, until condensate is completely drained. The taps close by spring pressure, if necessary tighten by hand to make sure they are completely air-tight.

FILTER CARTRIDGES

New filter cartridges are vacuum-packed and can be stored for two years (refer to date on the cartridge). A defective vacuum package cannot protect the cartridge appropriately against environmental influences during storage. Should the package be damaged, do not use the cartridge.

To avoid any danger to your health or damage to your unit, change used up cartridges in good time.

Never fill used up cartridges yourself! The filter material was chosen specifically by BAUER-KOMPRESSOREN for each kind of application.

Pay attention to cleanliness an hygiene when changing the filter.

FILTER SERVICE LIFETIME

The average weight (without package) of a new cartridge and the increase in weight can be checked with appropriate weighing scales. Due to inevitable production tolerances, there may be small differences compared to the given data.

The number of operating hours or the amount of possible bottle fillings per filter cartridge can be determined by the tables on page 27 and 28 taking into consideration the ambient temperature and the cartridge used.

These tables contain calculated cartridge lifetime data, that refer to defined and constant operating conditions. Tolerances at bottle fillings and different operating temperatures can lead to considerable divergences compared to data given, which therefore can only serve as reference values for the user.

Cartridge 057679 is the normal TRIPLEX-cartridge for electric units.

Filling weight: 191 g; Saturation weight 205 g.

Example: at an ambient temperature of 20°C, 36 to 45 10-ltr-bottles can be filled with a TRIPLEX-cartridge, which is equivalent to 12 to 15 compressor operating hours at a filling pressure of 200 bar.

On compressor units with petrol engines only use **cartridge, part no. 059183 to dry, de-oil and remove CO.**

Filling weight: 217 g; Saturation weight 229 g.

Example: at an ambient temperature of 20°C, 31 to 38 10-ltr-bottles can be filled with this cartridge, which is equivalent to between 10 and 13 operating hours at a filling pressure of 200 bar.

The longer service life of the cartridge at a filling pressure of 300 bar is annihilated by the larger volume of filled air per bottle, therefore the possible number of bottle fillings stays the same at different pressures.

CARTRIDGE CHANGE

WARNING **For safety reasons only CO removal cartridges part no. 059183 should be used on compressor units with petrol engine. On units with electric engine either CO removal cartridge part no. 059183 or TRIPLEX cartridge part no. 057679 can be used.**

Units with petrol engine are delivered with CO removal cartridge part no. 059183 as standard, units with electric engine with TRIPLEX cartridge part no. 057679. When changing from electric engine to a petrol engine also replace cartridge part no. 057679 with cartridge part no. 059183.

Never remove replacement cartridge from packaging prior to actual use otherwise highly sensitive molecular sieve will absorb water vapour from surrounding air and cartridge saturated and thus be ruined.

- Prior to changing the filter cartridge, drain condensate and depressurize filter system completely by opening condensate drain valves.
- Remove filter head (3, Fig. 16).
- Extract old cartridge and insert a new one.
- Screw in filter head to the stop without use of force.

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

FILLING VALVE MAINTENANCE

To protect filling valve against contamination a sintered metal filter is screwed in the filling valve body.

Remove filter insert and clean, if heavily soiled replace, as follows (refer to maintenance schedule, 4.3.):

- Unscrew pressure gauge from filling valve body.
- Screw off sintered metal filter with a suitable screw driver.
- To clean filter element, the best method is to use hot soapy water and to blow dry with compressed air. Replace if heavily soiled.
- Screw in filter element,.
- Seal pressure gauge with PTFE tape or Loctite 243 and screw in tight to desired position.

1. Filter cartridge 057679: lifetime [hours]					
Filling pressure p = 200 bar		Junior	Capitano	Mariner	
		Utilus		Diesel	Electric
Ambient temperature tU [°C]	Final separator temperature tAb [°C]	Delivery Q [l/min]			
		100	140	170	190
10	20 – 24	26 – 21	19 – 15	15 – 12	14 – 11
15	25 – 29	20 – 16	14 – 11	12 – 9	10 – 8
20	30 – 34	15 – 12	11 – 9	9 – 7	8 – 6
25	35 – 39	11 – 9	8 – 7	7 – 5	6 – 5
30	40 – 44	9 – 7	6 – 5	5 – 4	5 – 4
35	45 – 49	7 – 6	5 – 4	4 – 3	4 – 3
40	50 – 54	5 – 5	4 – 3	3 – 3	3 – 2
Filling pressure p = 300 bar		Junior	Capitano	Mariner	
		Utilus		Diesel	Electric
Ambient temperature tU [°C]	Final separator temperature tAb [°C]	Delivery Q [l/min]			
		100	140	170	190
10	20 – 24	39 – 31	28 – 22	23 – 18	21 – 16
15	25 – 29	29 – 24	21 – 17	17 – 14	16 – 12
20	30 – 34	22 – 18	16 – 13	13 – 11	12 – 10
25	35 – 39	17 – 14	12 – 10	10 – 8	9 – 7
30	40 – 44	13 – 11	9 – 8	8 – 6	7 – 6
35	45 – 49	10 – 9	7 – 6	6 – 5	5 – 5
40	50 – 54	8 – 7	6 – 5	5 – 4	4 – 4

Filter cartridge 057679: bottle fillings [number] Molecular sieve mass mMS [g] = 68							
Ambient temperature tU [°C]	Final separator temperature tAb [°C]	Air humidity, saturated X [g/m³]	Processable air volume Va [m³] at pressure p [bar]		Number of bottle fillings n acc. to bottle size		
			200	300	7 l	10 l	12 l
10	20 – 24	17,31 – 21,80	157 – 125	236 – 187	157 – 125	157 – 125	157 – 125
15	25 – 29	23,07 – 28,79	118 – 94	177 – 142	118 – 94	118 – 94	118 – 94
20	30 – 34	30,40 – 37,63	89 – 72	134 – 108	89 – 72	89 – 72	89 – 72
25	35 – 39	39,65 – 48,64	69 – 56	103 – 84	69 – 56	69 – 56	69 – 56
30	40 – 44	51,21 – 62,41	53 – 44	80 – 65	53 – 44	53 – 44	53 – 44
35	45 – 49	65,52 – 79,28	42 – 34	62 – 51	42 – 34	42 – 34	42 – 34
40	50 – 54	83,08 – 99,85	33 – 27	49 – 41	33 – 27	33 – 27	33 – 27

Bottle volume VF [m³]		
Bottle size	at pressure p [bar]	
l [l]	200	300
7	1,4	2,1
10	2	3
12	2,4	3,6

Number of bottle fillings n=
processable air volume / bottle volume = Va / VF

Bottle volume: VF [m³] = p [bar] x l [l] / 1000 [l/m³]

Processable air volume: Va [m³] = 0,2 x mMS [g] / (X [g/m³] / p [bar]) = 0,2 x p [bar] x mMS [g] / X [g/m³]

Filter cartridge lifetime: tp [h] = Va [m³] / (Q [m³/min] x 60 [min/h])

2. Filter cartridge 059183: lifetime [hours]					
Filling pressure p = 200 bar		Junior	Capitano	Mariner	
		Utilus		Diesel	Electric
Ambient temperature tU [°C]	Final separator temperature tAb [°C]	Delivery Q [l/min]			
		100	140	170	190
10	20 – 24	22 – 18	16 – 13	13 – 10	12 – 9
15	25 – 29	17 – 13	12 – 10	10 – 8	9 – 7
20	30 – 34	13 – 10	9 – 7	7 – 6	7 – 5
25	35 – 39	10 – 8	7 – 6	6 – 5	5 – 4
30	40 – 44	8 – 6	5 – 4	4 – 4	4 – 3
35	45 – 49	6 – 5	4 – 3	3 – 3	3 – 3
40	50 – 54	5 – 4	3 – 3	3 – 2	2 – 2
Filling pressure p = 300 bar		Junior	Capitano	Mariner	
		Utilus		Diesel	Electric
Ambient temperature tU [°C]	Final separator temperature tAb [°C]	Delivery Q [l/min]			
		100	140	170	190
10	20 – 24	34 – 27	24 – 19	20 – 16	18 – 14
15	25 – 29	25 – 20	18 – 14	15 – 12	13 – 11
20	30 – 34	19 – 15	14 – 11	11 – 9	10 – 8
25	35 – 39	15 – 12	10 – 9	9 – 7	8 – 6
30	40 – 44	11 – 9	8 – 7	7 – 5	6 – 5
35	45 – 49	9 – 7	6 – 5	5 – 4	5 – 4
40	50 – 54	7 – 6	5 – 4	4 – 3	4 – 3

Filter cartridge 059183: bottle fillings [number] molecular sieve mass mMS [g] = 58							
Ambient temperature tU [°C]	Final separator temperature tAb [°C]	Air humidity, saturated X [g/m³]	processable air volume Va [m³] at pressure p [bar]		Number of bottle fillings n acc. to bottle size		
			200	300	7 l	10 l	12 l
10	20 – 24	17,31 – 21,80	134 – 106	201 – 160	96 – 76	67 – 53	56 – 44
15	25 – 29	23,07 – 28,79	101 – 81	151 – 121	72 – 58	50 – 40	42 – 34
20	30 – 34	30,40 – 37,63	76 – 62	114 – 92	55 – 44	38 – 31	32 – 26
25	35 – 39	39,65 – 48,64	59 – 48	88 – 72	42 – 34	29 – 24	24 – 20
30	40 – 44	51,21 – 62,41	45 – 37	68 – 56	32 – 27	23 – 19	19 – 15
35	45 – 49	65,52 – 79,28	35 – 29	53 – 44	25 – 21	18 – 15	15 – 12
40	50 – 54	83,08 – 99,85	28 – 23	42 – 35	20 – 17	14 – 12	12 – 10

Bottle volume VF [m³]		
Bottle size	at pressure p [bar]	
l [l]	200	300
7	1,4	2,1
10	2	3
12	2,4	3,6

Number of bottle fillings n=
processable air volume / bottle volume = Va / VF

Bottle volume: VF [m³] = p [bar] x l [l] / 1000 [l/m³]

Processable air volume: Va [m³] = 0,2 x mMS [g] / (X [g/m³] / p [bar]) = 0,2 x p [bar] x mMS [g] / X [g/m³]

Filter cartridge lifetime: tp [h] = Va [m³] / (Q [m³/min] x 60 [min/h])

4.5.5. PRESSURE MAINTAINING VALVE

DESCRIPTION

A pressure maintaining valve is mounted at the outlet of the filter system P21.

It ensures that pressure is built up in the filter 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)**.

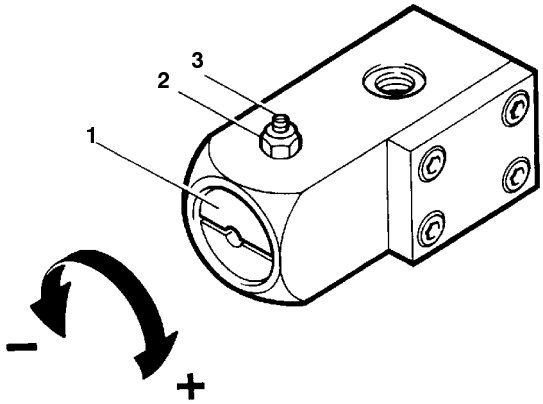


Fig. 18 Pressure maintaining valve

MAINTENANCE

The pressure maintaining valve (Fig. 18) 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

4.5.6. SAFETY VALVES

DESCRIPTION

All three compressor stages are protected by safety valves as follows

1st stage	**8 bar (116 psi)**
2nd stage	**80 bar (1,160 psi)**

The safety valve for protection of the last stage is mounted on top of the filter system P21 and is adjusted to the operating pressure of the unit (see chapter 1, Technical Data), **225 bar (3,200 psi)** for the standard units, **330 bar (4,700 psi)** for models -H or -HU**.** All safety valves are sealed at the factory.

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 4.5.8.

MAINTENANCE

Checking function

The final pressure safety valve has to be checked regularly. For this purpose the safety valve can be vented manually. Turn knurled knob on top of the valve clockwise until valve blows off (Fig. 19).

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 "Blow-off pressure check".

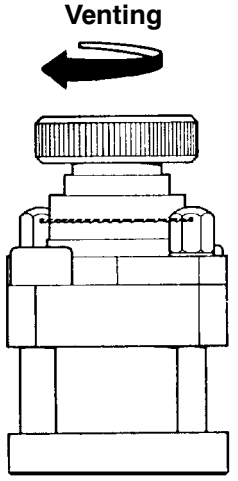


Fig. 19 Venting the final pressure safety valve

Checking blow-off pressure

Check blow-off pressure of the final pressure safety valve regularly, see maintenance schedule chapter 4.3. 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. If deviation is 10% or more, replace safety valve.

4.5.7. PRESSURE GAUGE

DESCRIPTION

The compressor unit is equipped with a final pressure gauge (Fig. 20). The red marking on it shows the max. allowable operating pressure.

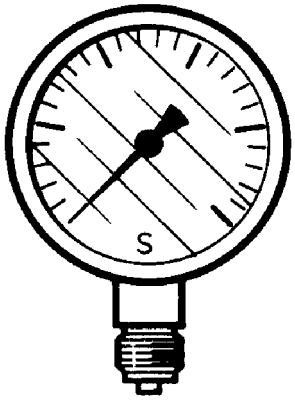


Fig. 20 Final pressure gauge

MAINTENANCE

We recommend that the final pressure gauge is 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 8550/..).

Slight deviations during operation are normal and can be ignored. Excessive inaccuracy will require the pressure gauge to be replaced.

4.5.8. VALVES

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 air.

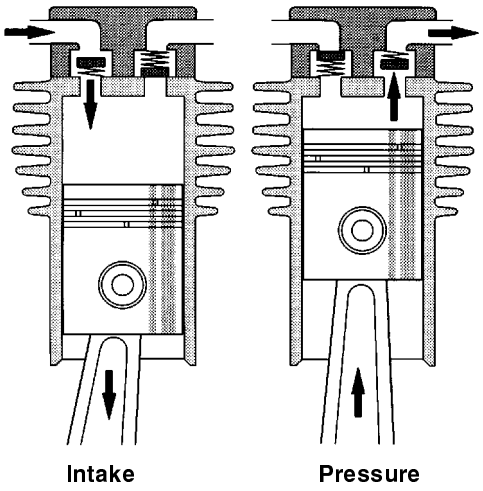


Fig. 21 Valve operation

On the suction stroke, the intake valves open and the air flows into the cylinders. At the start of the compression stroke the intake valve closes and the air opens the pressure valve, Fig. 21.

Intake and pressure valve of the 1st stage is a plate valve (Fig. 22).

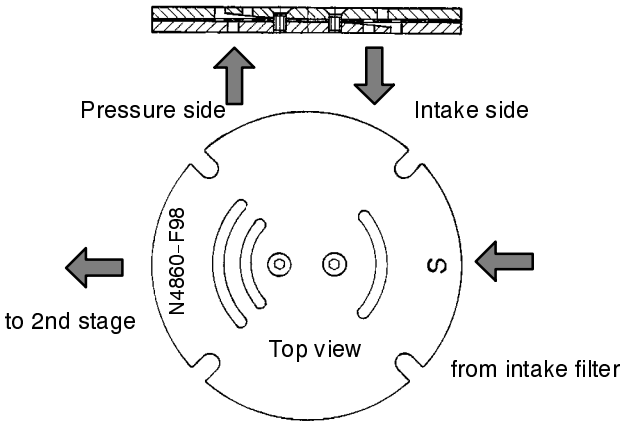


Fig. 22 Valve 1st stage

INITIAL OPERATIONAL CHECK

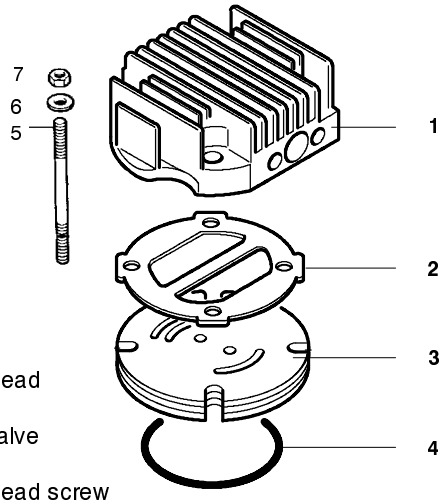
After maintenance work on the valves, valves should be checked. Note that the intake line to the valve heads should be warm and outlet piping should be hot. Valves are then operating properly.

GENERAL INSTRUCTIONS FOR CHANGING THE VALVES

- **Always replace** valves as a complete set.
- **Observe** the correct sequence when fitting together again.
- **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 7.).
- **Check** the valve space in the valve heads for dirt and clean, if necessary.
- **30 minutes after restarting** the compressor stop unit, let it cool down to ambient temperature and re-tighten valve studs and cap nuts. Otherwise valves could work loose due to setting of the gaskets.
- **Use only** satisfactory gaskets and O-rings on reassembly.
- **After finishing** all maintenance work on the valves, turn the compressor manually using the flywheel and check whether all items have been correctly installed.
- **Remove and check** the valves every **1,000 operating hours.**
- **Replace** the valves every **2,000 operating hours** to avoid fatique failure.

CHANGING THE VALVES OF THE 1ST STAGE

Intake and pressure valves of the 1st stage are combined in one plate valve under the valve head, see Fig. 23.



1 Valve head
2 Gasket
3 Plate valve
4 O-ring
5 Valve head screw
6 Washer
7 Nut

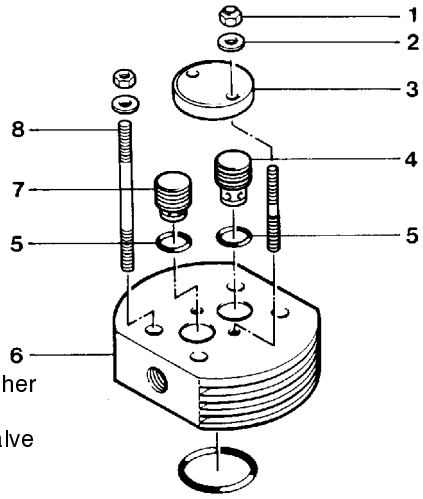
Fig. 23 Valve head 1st stage

- Loosen two cap nuts from tube connectors at valve head and safety valve connector and remove intercooler.
- Remove four valve head screws (5) from valve head (1). Take off valve head.
- Remove gasket (2) and plate valve (3).
- When re-installing the valve, check that mark "S" is facing upwards and towards intake filter side. The crossbar of gasket (2) seals the intake opening with respect to the two outlet openings of the pressure valve.

CHANGING THE VALVES OF THE 2ND STAGE

Both, pressure and intake valves can be serviced from outside, see Fig. 24.

- Remove two captive nuts (1) and spring-washers (2).
- Remove plate (3).
- Remove valves (4) and (7) using two screw-drivers as shown in Fig. 26.
- Assemble in reverse sequence. Position spring-washers with curved side facing upwards. Fasten nuts so that plate (3) is parallel to the valve head. Torque with 10 Nm (1 kpm).



1 Nut
2 Spring-washer
3 Plate
4 Pressure valve
5 O-ring
6 Valve head
7 Intake valve
8 Valve head screw

Fig. 24 Valve head 2nd stage

CHANGING THE VALVES OF THE 3RD STAGE

On this valve head, the valves are arranged on the upper and lower side due to the small diameter of the 3rd stage, see Fig. 25.

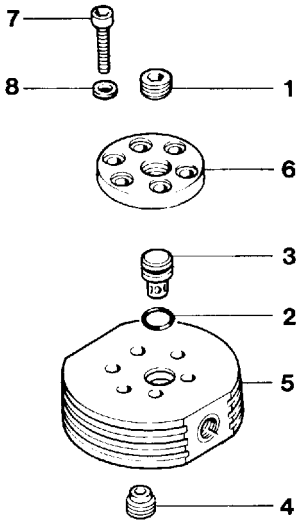
For removal and installation of the intake valve (4) use special tool which is also part of the tool set delivered with the unit.

Pressure valve (3) is merely inserted into valve head (5). It is sealed by O-ring (2) and fixed to the valve head by bolt (1).

Change intake and pressure valve of 3rd stage together only.

Remove of 3rd stage pressure valve (3) according to Fig. 25.

- Unwind torque stud (1) a couple of turns.
- Remove allen screws (7), take off valve head cover (6).
- Put two screwdrivers into the groove of pressure valve body (Fig. 26). If necessary turn valve loose at first using a 13 mm spanner on the flat surfaces.
- Lift out pressure valve (3) together with O-ring (2).



1 Torque stud
2 O-ring
3 Pressure valve
4 Intake valve
5 Valve head
6 Valve head cover
7 Allen screw
8 Gasket

Fig. 25 Valve head 3rd stage

Reinstall pressure valve (3) in reverse sequence:

- Check O-ring for abrasion and replace if necessary. Put O-ring (2) into valve head (5).
- Insert pressure valve (3). Install valve head cover (6).
- Fasten valve head with allen screws (7) and washers (8).
- Screw in torque stud (1) with 20 Nm (2 kpm).

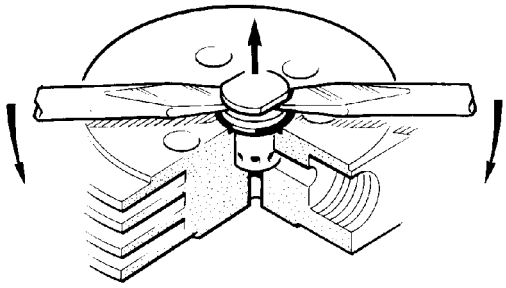


Fig. 26 Removal of 3rd stage pressure valve

4.5.9. COMPRESSOR DRIVE SYSTEM

DESCRIPTION

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

Improper v-belt tension and adjustment of the pulleys will result in extreme v-belt abrasion and premature wear.

MAINTENANCE

Checking the drive belt tension

- Readjust new V-belt after the first 25 operating hours.
- 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 mm** when pressed with thumb pressure between the two pulleys (Fig. 27). For best results we recommend our v-belt tension meter, part no. N25238.
- Every **125** operating hours check again for damage or wear.

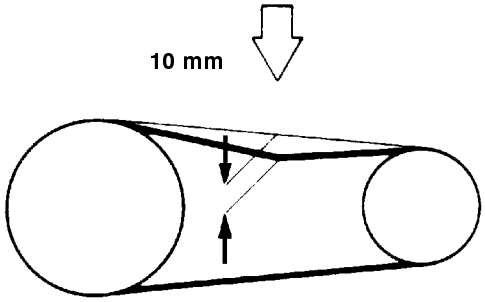


Fig. 27 Checking V-belt tension

V-belt tension adjustment

- Slightly loosen motor mounting nuts
- Adjust motor until the belt tension is correct (see Fig. 27).
- 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. 28: edge must be parallel to the v-belt.

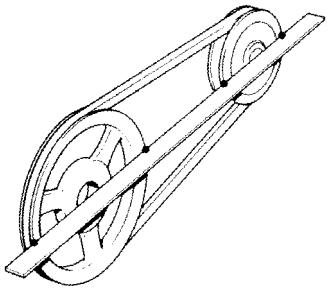


Fig. 28 V-belt pulley adjustment

4.5.10. ELECTRICAL SYSTEM

DESCRIPTION

This section describes the standard electrical system.

For schematic diagram, see annex.

The electrical equipment of the compressor unit consists of:

- drive motor
- electric control system

To start the electric motor and enable the functioning of the electric control, the following components are essential:

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

DRIVE MOTOR

The compressor unit is driven by an alternating or a three phase current motor by means of a V-belt.

MOTOR PROTECTION SWITCH (ALTERNATING CURRENT MOTOR)

Protection of the motor is ensured by the thermic releases integrated into the motor protection switch (1, Fig. 29). The response value is preset.The motor is switched on manually by pressing the 0-I switch to I. For safety of the operating personnel all voltage carrying parts have a protective cover.

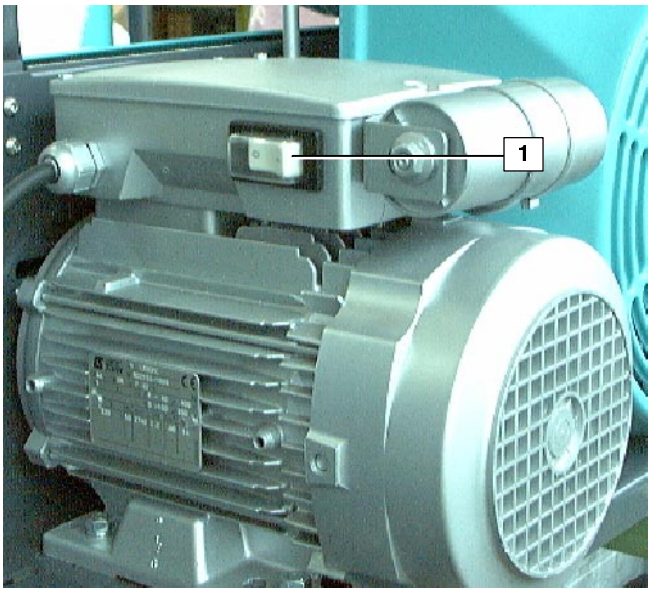


Fig. 29 Motor protection switch (alternating current)

MOTOR PROTECTION SWITCH (THREE-PHASE MOTOR)

The motor is switched on manually by pressing the start button I (1). It is switched off manually by pressing the stop button ○ (2).

For safety of the operating personnel all voltage carrying parts have a protective cover.

After the switch has shut off by overcurrent triggering, the motor can be restarted by pressing the start-button not before the bi-metal in the switch has cooled down. This may last a couple of minutes.

Protection of the motor is ensured by the thermomagnetic releases integrated into the motor protection switch (Fig. 30). The response value of the electromagnetic releases (protection against short-circuit) is preset.

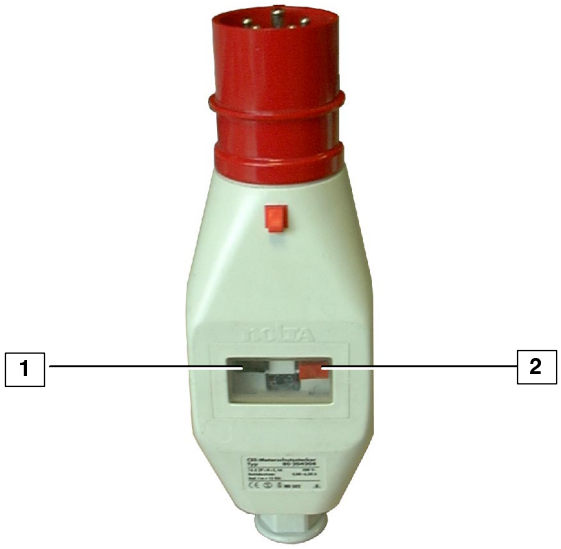


Fig. 30 Motor protection switch (three-phase motor)

MAINTENANCE

For the electrical system no regular maintenance is required.

4.5.11. COOLING SYSTEM

DESCRIPTION

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 connected to the counter-weight at the crankshaft end opposite to the V-belt pulley. It draws the cooling air through the fanwheel cover from the surroundings.

Refer to chapter 3. for proper installation and cooling air supply. For maximum ambient temperature, see Technical Data, chapter 1.

MAINTENANCE

For the cooling system no regular maintenance is required.

4.6. TROUBLE-SHOOTING

Trouble	Cause	Remedy
Drive motor (electric)		
Motor will not start	Electric circuitry faulty	Check all fuses, terminal connections, wire leads, make sure that motor data complies with mains supply
Motor/engine runs eccentrically	V-belt worn	Replace
Motor protection switch is switching off the unit	Wrong adjustment of the motor protection switch	Set to nominal motor current. Observe temperature compensation (+20 °C =1,0) For ambient temperature + 10 °C : correction factor 0,94 + 30 °C : correction factor 1,05 + 40 °C : correction factor 1,12
	Unsufficient voltage because of weak power supply	Switch off other consuming devices
Motor protection switch is switching off the unit	Power supply cable to long or to thin	Use suitable cable
Drive motor (petrol)		
Motor will not start	See motor instructions	See motor instructions
Motor runs eccentrically	V-belt worn	Replace
Motor stops	Low oil level	Top up oil
Drive system		
Excessive v-belt wear (black deposits on belt guard)	V-belt tension	Re-tighten, see chapter 4.5.9.
	Pulleys not aligned	Re-adjust, see chapter 4.5.9.
Compressor		
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 filter system P21 (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
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 if necessary
Taste of oil in the air	TRIPLEX cartridge saturated	Replace cartridge
	Unqualified lubricant being used	Replace oil with an approved brand

Trouble	Cause	Remedy
High oil consumption	Piston rings, Pistons or cylinders worn out	Replace defective parts
	Intake filter clogged	Replace filter cartridge
	Compressor too hot	Enhance cooling
Air escaping through cartridge safety bore	Cartridge missing	Insert cartridge
	Cartridge installed but O-rings defective	Check/replace O-rings

5. STORAGE, PRESERVATION

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.

The compressor is not resistant to salt-water! If not in use keep unit in a dry place.

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 4.5.5.) for approx. 5 minutes.
- After these 5 minutes, shut the system down. Drain condensate from separators. Depressurize unit. Shut filling valves.
- Open filters and grease threads.
- **Ensure that filter cartridge remains 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.

PRESERVING THE COMPRESSOR

- Turn the compressor on and spray a small amount (approx. 10 ccm/0.6 cu. in.) of compressor oil into the valve head inlet port 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.

PRESERVING THE MOTOR/ENGINE

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

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 chapter ”preserving the compressor”

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.
- 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.

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.
- 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.
- Check the inter-pressure safety valves for leakage.
- Establish cause of any fault from the trouble-shooting table, chapter 4.6., and take corrective action.
- Stop the system when running properly, the compressor is then ready for operation.

6. REPAIR INSTRUCTIONS

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.

For many **BAUER** compressor units, workshop manuals are available through our customer service.

For questions on maintenance and repair, please contact our technical service department.

7. TABLES

TIGHTENING TORQUE VALUES

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 swrew	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

TORQUE SEQUENCE

Tighten valve head and cylinder bolts/nuts equally in the sequence shown in Fig. 31.

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

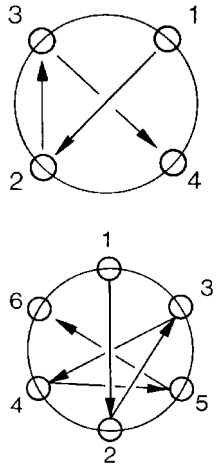


Fig. 31 Torque sequence

LUBRICATION CHART

Usage	Lubricants
Rubber and plastic parts, filter housing threads	WEICON WP 300 WHITE part no. N19752 or White petrolatum DAB9 part no. N19091
Sealing rings	Klüber Microlube GL261
Shaft seal (seal) Shaft seal (shaft)	Klüber Microlube GL261 Klüber SK 01-205
Screws, bolts, threads	WEICON ANTI-SEIZE AS 040 P part no. N19753 or equivalent compound with copper or MoS_2 additives

For lubricating oils refer to oil list in chapter 8.

ADHESIVE AND SEALANT CHART

Usage	Adhesives and Sealants
Screws	Loctite 2701
Seals for conical threads	Loctite 243
Metal - metal seals High temperature connections, e.g. valve heads, cylinders	Temperature resistant compound, e.g. WACKER E10, part no. N18247
Paper gaskets	Loctite FAG 2

TESTING AGENTS

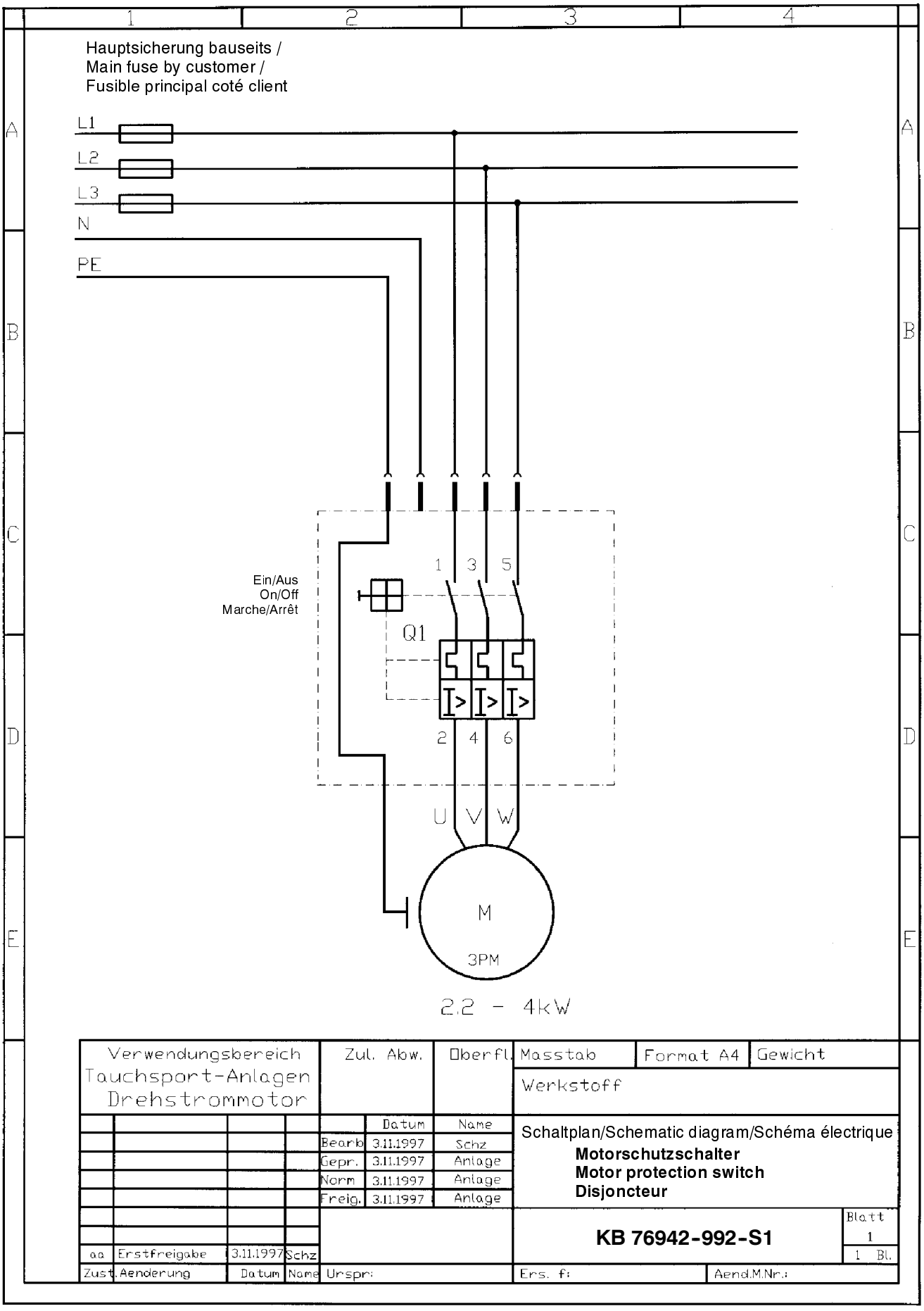
Usage	Testing agents
Tube connectors, tubes	Leakage test spray, part no. FM0089

* Exception: mounting bolts of final pressure safety valve: 10 Nm

8. ANNEX

- **Schematic diagram**
  Lubricating oil list
  Parts list

Schematic diagram motor protection switch, three phase current



LUBRICATING OIL LIST

GENERAL

After extensive tests with many different kinds of lubricants, we have decided to authorize the following brands of oil for use in **BAUER** compressors under the given operating conditions.

This list is up to date at the time of printing and will be reviewed continuously. Should your list or your instruction manual be older, please request the latest edition from **BAUER** Customer Services. When using any of the oils listed below, please follow the oil change intervals and the oil filling level described for the equivalent **BAUER** compressor oil in the instruction manual of your unit.

Oil type			Use				Ambient temperature	
Brand name	Designation	Type	A Breathing	I Industry	G Gas	C CNG	+5 ... +35 °C	+5 ... +45 °C
BAUER KOMPRESSOREN	Special Compressor oil Part no. N22138 a)	M	+	+	+	-	+	+
BAUER KOMPRESSOREN	Special Compressor oil Part no. N24906 a)	M	-	-	-	+	+	+
BAUER KOMPRESSOREN	Special Compressor oil Part no. N19745 b)	S	+	+	+	-	+	+
BP	Energol RC 150 a)	M	+	+	-	-	+	◆
DEA	Actro EP VDL150 a)	M	+	+	-	-	+	◆
LIQUI MOLY	LM 750 with corrosion protection b)	S	+	+	+	-	+	+
Anderol	755 b)	S	+	+	+	-	+	+
Mobil	Rarus 829 b)	S	-	+	+	-	+	+
Shell	Corena P150 a)	M	+	+	+	-	+	+
Shell	Myrina TX 5W-30 a)	M	-	-	-	+	+	+

Oil type

S	synthetic oil
M	mineral oil

Application

A	approved for breathing air application with BAUER air purification systems
I	suitable for industrial air compressor units
G	suitable for gas compressor units for dry and highly pure gases
C	suitable for compressed natural gas compressors (CNG filling stations)
a)	oil change every 1000 operating hours
b)	oil change every 2000 operating hours

Suitability

+	= suitable
◆	= partly suitable
-	= not suitable

TYPE OF OIL

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 the instruction manual or in the lubricating list overleaf.

Our compressor units are delivered ex works with lubricating oil filled into the crankcase or as consignment, depending on the model, as follows:

Breathing air compressor units:	**BAUER special Compressor oil, part no. N22138**

For operation under difficult conditions, such as continuous running and/or high ambient temperatures, we only recommend the BAUER special compressor oils acc. to the list on the previous page. These have proved excellent quality under ambient temperatures between +5 °C and +45 °C. For lower temperatures a compressor heating device is required which is capable of pre-heating the unit up to +5 °C.

For operation under less severe conditions, and for intermittent operation, i.e. when the compressor is not used for longer periods between the operating periods, we also recommend the use of mineral oils acc. to the list on the previous page. These oils are suitable for ambient temperatures between +5 °C and +35 °C. Here also, a pre-heating device will be required if ambient temperatures should fall below +5 °C.

Changing the Oil Type

To avoid severe damage to the compressor unit when changing to another oil type, the following measures should be strictly adhered to.

- Drain mineral oil while still warm.
- Check valves, coolers, separators, purifiers and all pneumatic tubes and hoses for deposits.

If deposits are present, perform the following steps:

- Remove deposits or change valves, coolers, separators, purifiers and all pneumatic tubes and hoses.
- Fill compressor with the new oil.
- After approx. 100 operating hours check lube oil for degree of contamination, and change if necessary.
- Top up with same oil type.

OIL CHANGE

Mineral oil	Every 1000 operating hours, at least annually
Synthetic oil	Every 2000 operating hours, at least bi-annually
Oil capacity	Refer to compressor unit instruction manual

BAUER compressor oil is available in the following quantities:

Oil quantity ▼ Oil type ▶	**Mineral oil N22138**	**Mineral oil N24906**	**Synthetic oil N19745**
1 l bottle	part no. N22138-1	part no. N24906-1	part no. N19745-1
5 l container	part no. N22138-5	part no. N24906-5	part no. N19745-5
20 l container	part no. N22138-20	part no. N24906 -20	part no. N19745-20