BAUER KOMPRESSOREN

Instruction Manual

› MARINER 320

www.bauer-kompressoren.de

INTRODUCTION

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

Mariner 320

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 2006/42/EG. Specifications on the noise level in accordance with the machine and product safety law as of 01.05.2004 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.

Edition January 2010

TABLE OF CONTENTS

INDEX

ANNEX

Air flow diagram	80721
Pneumatic parts list	76360

Schematic diagram for unit with motor protection switch	76942-S01
Schematic diagram for unit with compressor control system	80228
Schematic diagram for unit with Honda engine and automatic condensate drain	80862
Electric parts list	76360

Operating instructions for automatic condensate drain timer	---

Lubricating oil list	70851

Applicable parts list	
Mariner 320	TM320-4/3
Mariner 320 420 bar	TM320-420-4/3

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 repeated dialling.

Do you want to order spare parts?

☞ **Customer service** Phone no: (089) 78049-129 or -149
Fax no: (089) 78049-101

Do you have problems with maintenance or repair work?

☞ **Technical customer service** Phone no: (089) 78049-246 or -176
Fax no: (089) 78049-101

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

☞ **Sales department** Phone no: (089) 78049-138, -185, -154, -205 or -202
Fax no: (089) 78049-103

Are you interested in any training courses?

☞ **Training manager** Phone no: (089) 78049-175
Fax no: (089) 78049-101

Meet us in the internet at: **www.bauer-kompressoren.de**

NOTES

Model:

Serial no.:

Date of purchase:

Dealer address/phone no.:

1. GENERAL

PURPOSE AND SHORT DESCRIPTION

The **Mariner 320** high pressure compressors are designed to compress air for breathing as required in diving and fire fighting applications. The max. allowable operating pressure (adjusted pressure on final pressure safety valve) is 225 bar or 330 bar depending on unit.

DESIGN AND MODE OF OPERATION

Design

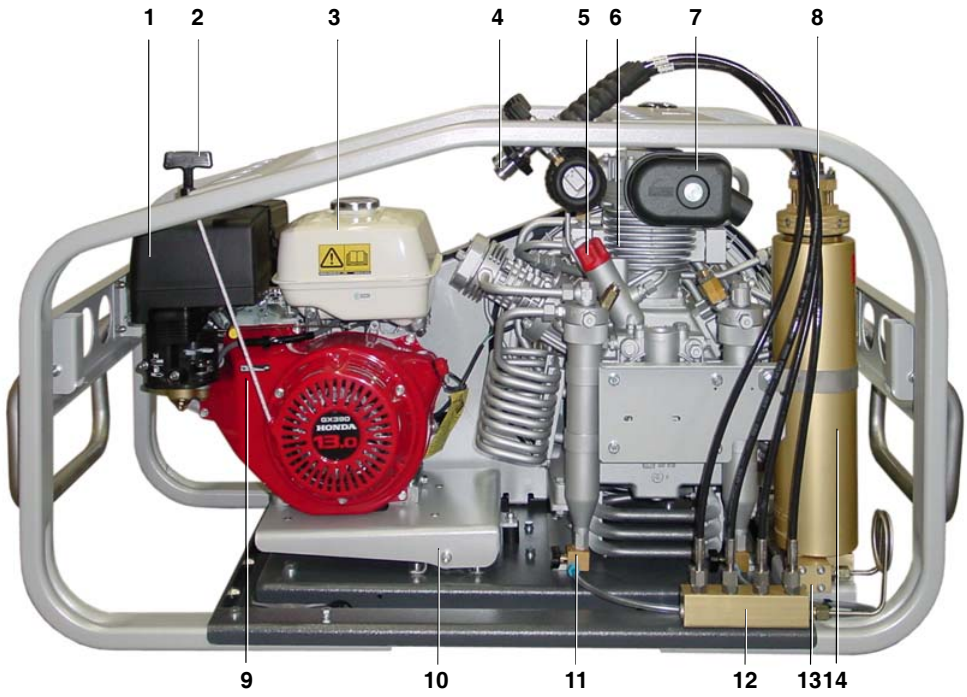
The compressor unit comprises the following major assemblies:

- compressor block
- drive motor
- filter assembly
- filling assembly
- protection and anti-vibration frame
- automatic condensate drain[a)]
- electric control system[a)]

The compressor units are available with electric motor or petrol engine drive (Abb. 1 to Abb. 8).

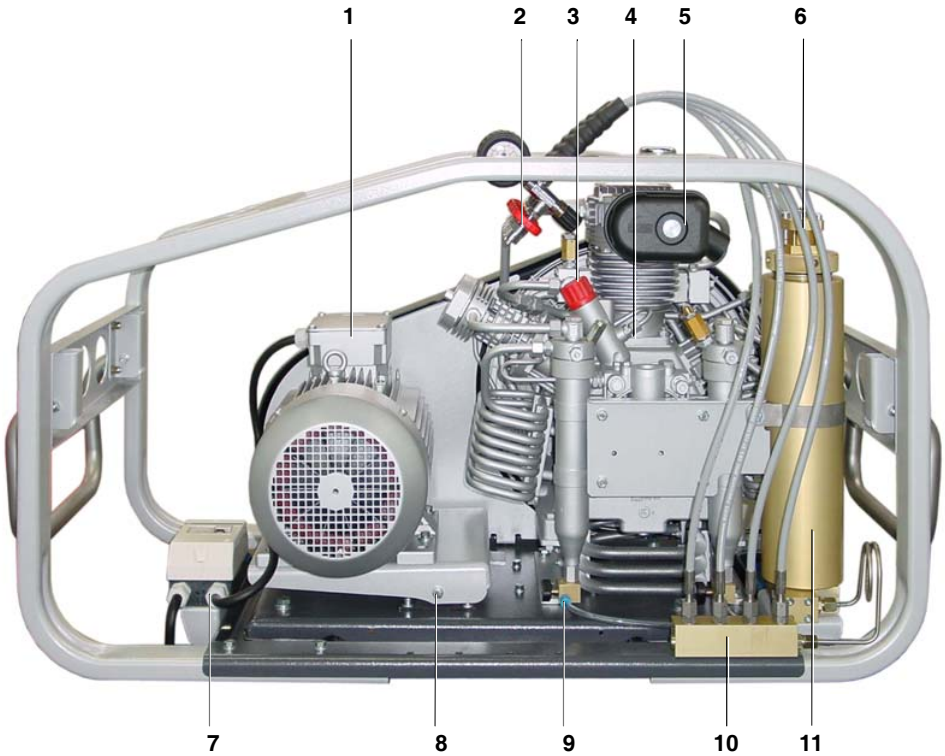
Abb. 1 Compressor unit Mariner 320

a) optional extra according to order



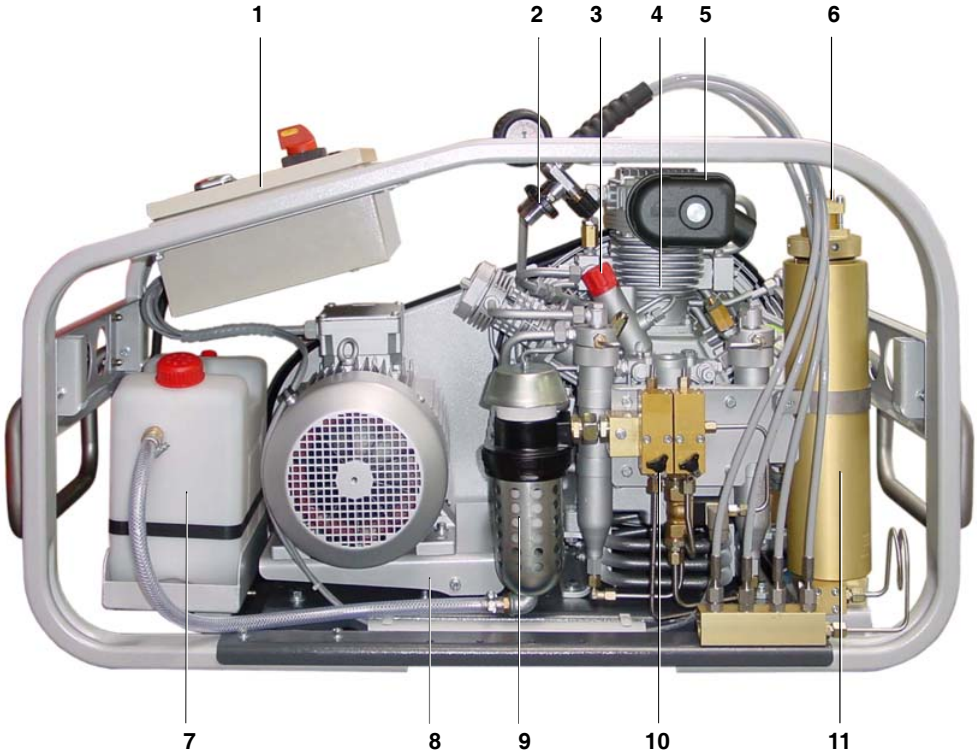
1 Motor intake filter
2 Motor exhaust
3 Fuel tank
4 Filling valve
5 Oil filler neck
6 Compressor block
7 Compressor intake filter
8 Final pressure safety valve
8 Safety valve
9 Rope starter
10 Hinged motor plate
11 Condensate drain tap
12 Filling manifold
13 Pressure maintaining/ non-return valve
14 Filter system P31

Abb. 2 Compressor unit with petrol engine on portable frame



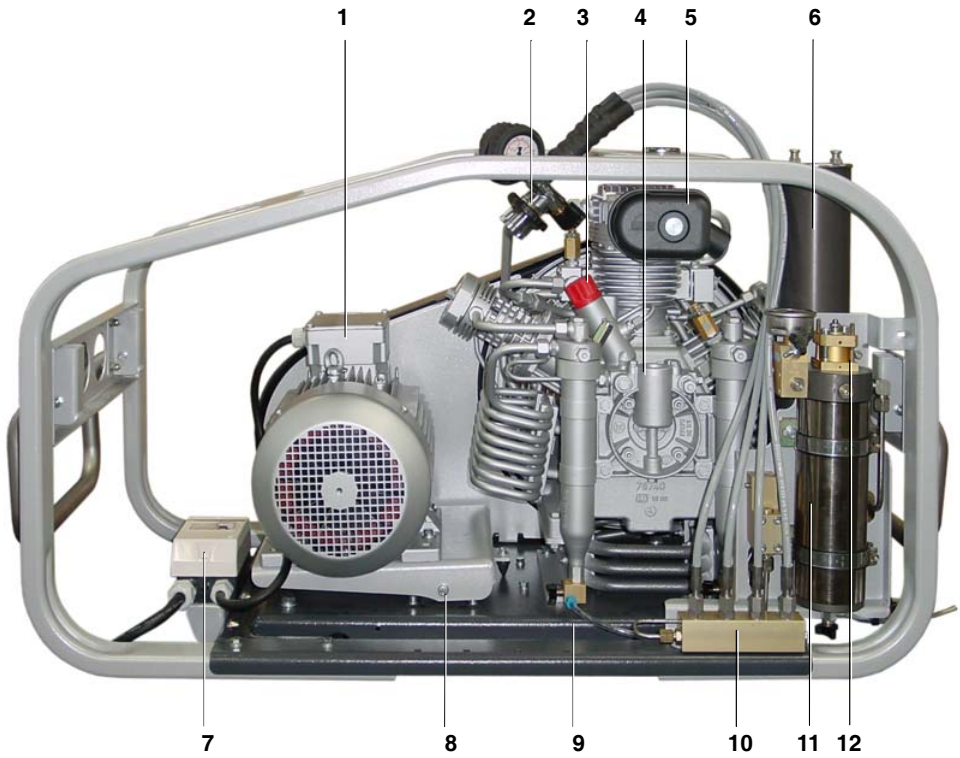
1 Motor terminal box
2 Filling valve
3 Oil filler neck
4 Compressor block
5 Intake filter
6 Final pressure safety valve
7 Motor protection switch
8 Hinged motor plate
9 Condensate drain tap
10 Filling manifold
11 Filter system P31

Abb. 3 Compressor unit with electric motor and filter system P31



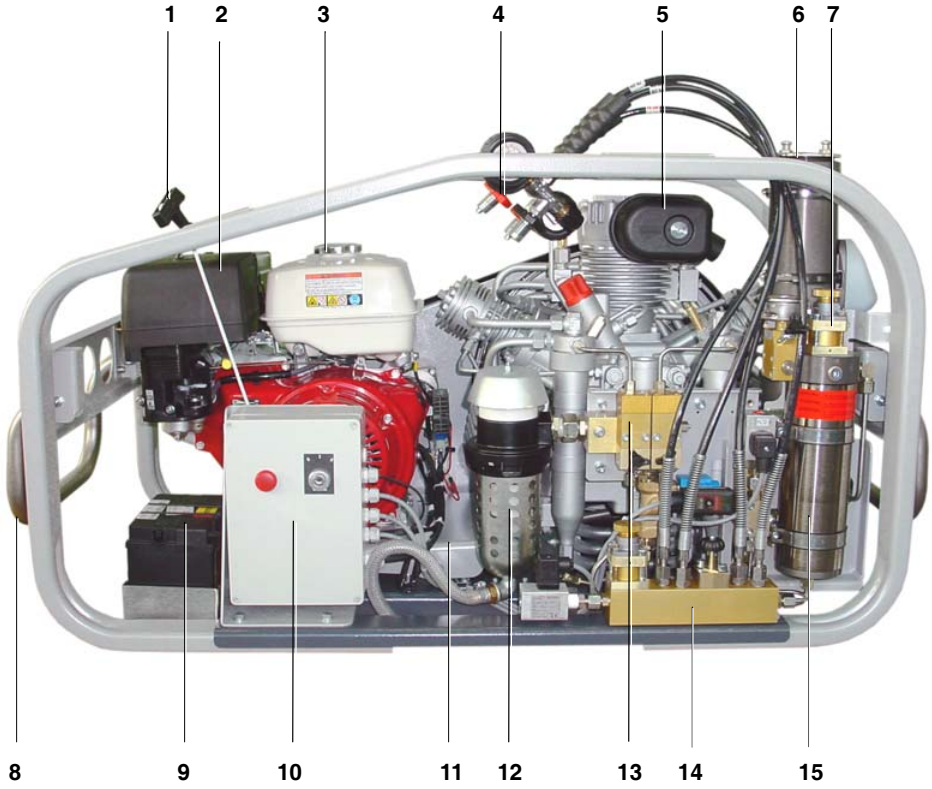
1 Electric control unit
2 Filling valve
3 Oil filler neck
4 Compressor block
5 Intake filter
6 Final pressure safety valve
7 Condensate tank
8 Hinged motor plate
9 Condensate separator
10 Automatic condensate drain unit
11 Filter system P31

Abb. 4 Compressor unit with electric motor, automatic condensate drain and compressor control unit



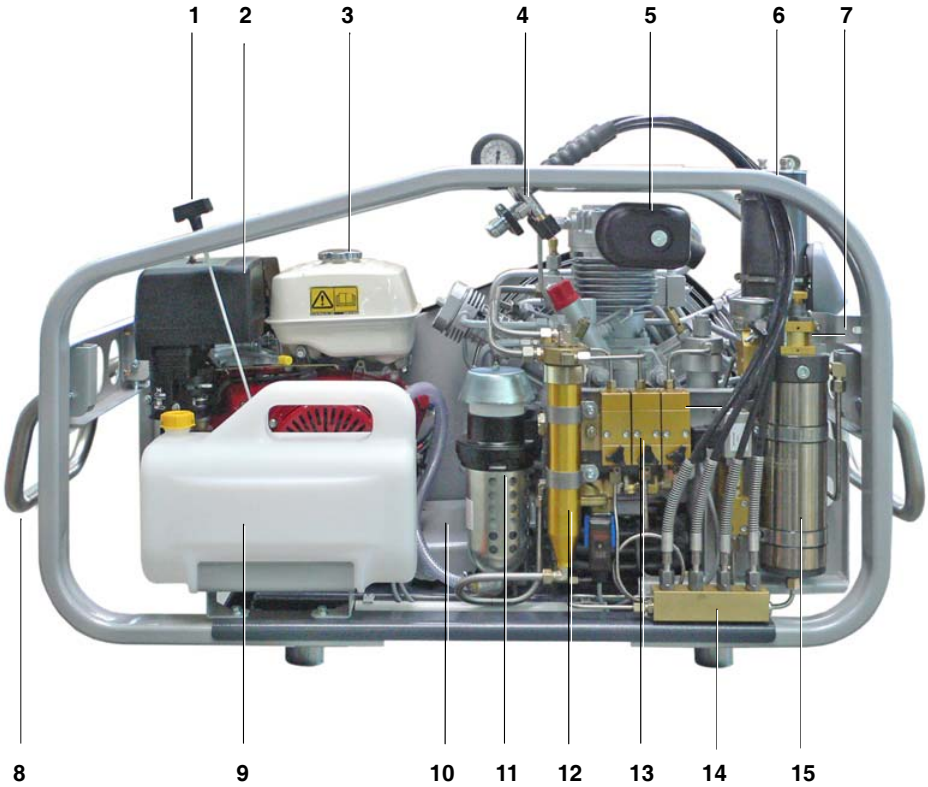
1 Motor terminal box
2 Filling valve
3 Oil filler neck
4 Compressor block
5 Intake filter
6 Filter system P41
7 Motor protection switch
8 Hinged motor plate
9 Condensate drain tap
10 Filling manifold
11 Final separator
12 Final pressure safety valve

Abb. 5 Compressor unit with electric motor and filter system P41



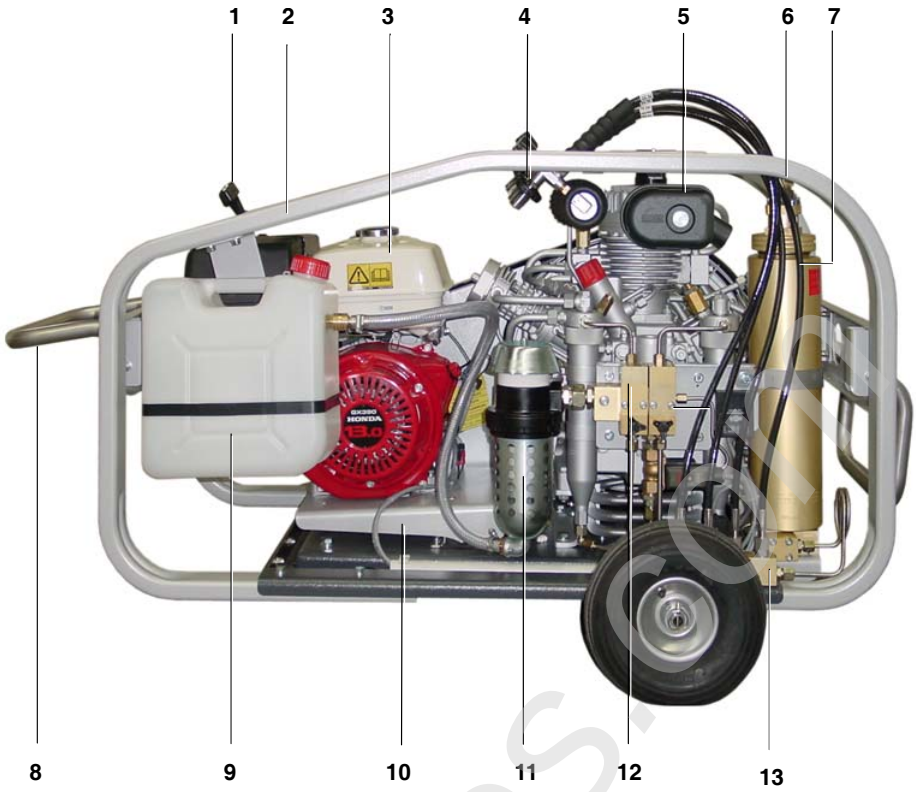
1 Rope starter
2 Engine intake filter
3 Fuel tank
4 Filling valves
5 Compressor intake filter
6 Filter system P41
7 Final pressure safety valve
8 Handle
9 Battery
10 Compressor control
11 Hinged motor plate
12 Condensate separator
13 Automatic condensate drain unit
14 Filling panel
15 Final separator

Abb. 6 Compressor unit with petrol engine, electric starter, filter system P41 and automatic condensate drain



1 Rope starter
2 Engine intake filter
3 Fuel tank
4 Filling valves
5 Compressor intake filter
6 Filter system P41
7 Final pressure safety valve
8 Handle
9 Condensate tank
10 Hinged motor plate
11 Condensate separator
12 Separator 1st stage
13 Automatic condensate drain unit
14 Filling panel
15 Final separator

Abb. 7 Compressor unit with petrol engine, filter system P41, automatic condensate drain and separator 1st stage (optional)



1 Rope starter
2 Engine intake filter
3 Fuel tank
4 Filling valves
5 Compressor intake filter
6 Final pressure safety valve
7 Filter system P31
8 Handle
9 Condensate tank
10 Hinged motor plate
11 Condensate separator
12 Automatic condensate drain unit
13 Filling panel

Abb. 8 Compressor unit with petrol engine on undercarriage and automatic condensate drain unit (optional extra)

Compressor block IK12.14

The compressor block **IK12.14** is used to compress air in the high pressure range up to 420 bar (5,000 psi).

The compressor block is of a four stage, three cylinder design. The cylinders are arranged in a W form, the 1st/2nd stage vertical stepped cylinder in the centre, 3rd stage on the right, and 4th stage on the left side looking from the filter side.

The compressor blocks are particularly suitable for continuous operation because of their rugged design and the corrosion resistant intermediate filter and cooler assemblies.

Smooth running is a particular feature of this **BAUER** design. The balance of masses of the 1st rank is zero. The moving parts of the driving gear are all equally balanced. This results in a vibration-free running. The driving gear is fitted with energy saving cylinder roller bearings. The upper and lower connecting rod bearings are also roller bearings. This allows for an even longer life which lasts at least 30,000 operating hours.

The design of the compressor block is shown in Abb. 9. For the mode of operation refer to the flow diagram, Abb. 10.

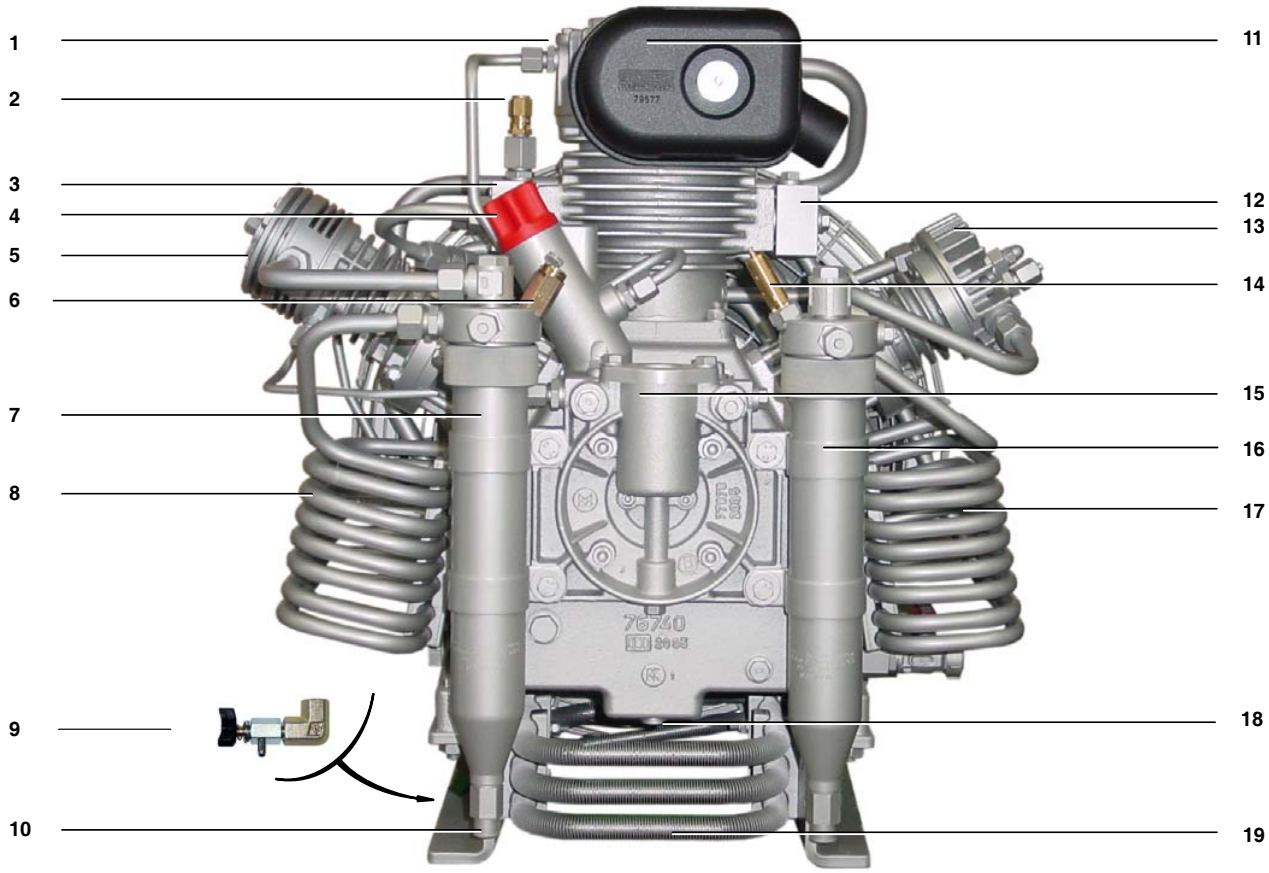


Abb. 9 Compressor block, front view

1 Valve head, 1st stage
2 Safety valve, 1st stage
3 Intake manifold, 2nd stage
4 Oil filler neck
5 Cylinder, 4th stage
6 Safety valve, 3rd stage
7 Intermediate separator, 3rd stage
8 Inter-cooler, 3rd stage
9 Condensate drain tap[a)]
10 Condensate drain connector[a)]
11 Intake filter
12 Outlet manifold, 2nd stage
13 Cylinder, 3rd stage
14 Safety valve, 2nd stage
15 Oil filter housing
16 Intermediate separator, 2nd stage
17 Inter-cooler, 2nd stage
18 Oil drain plug
19 After-cooler, 4th stage

a) optional

Air flow diagram

See Abb. 10. The air is drawn in through intake filter -5, compressed to final pressure in cylinders -1, -2, -3, and -4, and re-cooled by inter-coolers -6, -7 and -8, and after-cooler -9. The safety valves -13, -14, -15 and -16 protect the pressure of the single stages.

The compressed air is purified by interfilters -10 and -11 and filter assembly -12 which is fitted with a Triplex cartridge -17.

The interfilters -10 and -11 and filter assembly -12 are drained by condensate drain valves -18. Pressure maintaining valve -19 keeps the pressure constant within filter assembly -12. Through filling hose -20 and filling valves -21 the compressed and purified air is conducted to the bottles to be filled. Filling pressure can be read from pressure gauge -22.

300 bar compressor units are available with a change-over device -23 to fill 200 bar bottles. In this case, safety valve -24 (225 bar) takes over the function of the final safety valve -16 (330 bar).

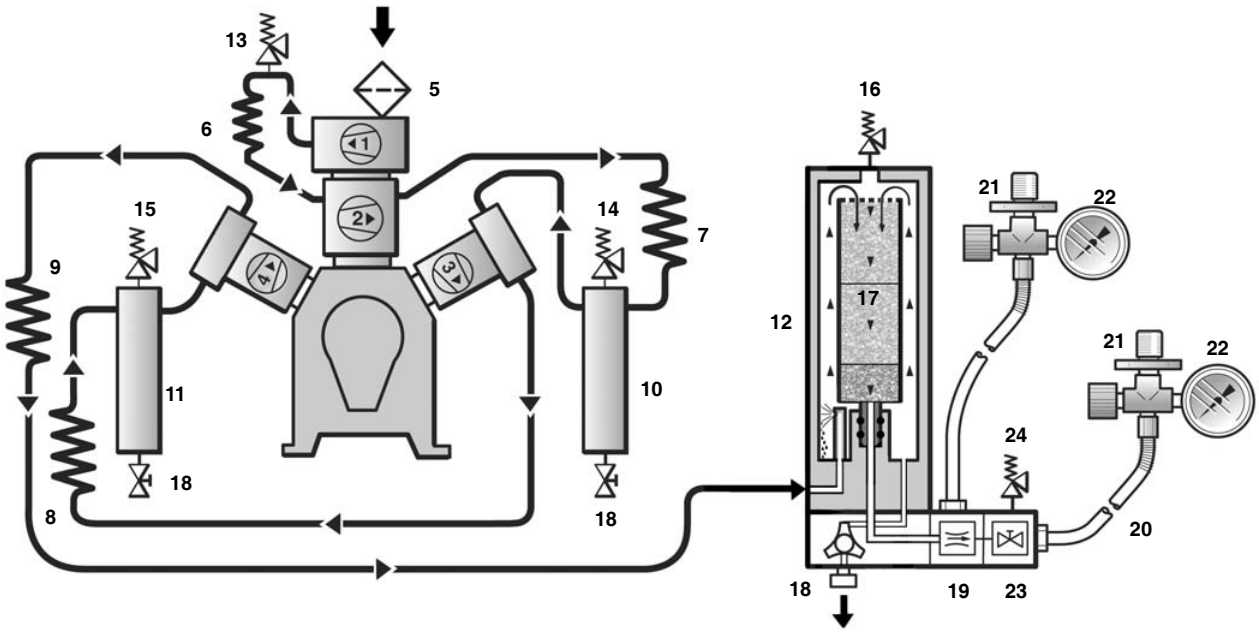


Abb. 10 Air flow diagram with filter system P31

1 Cylinder 1st stage
2 Cylinder 2nd stage
3 Cylinder 3rd stage
4 Cylinder 4th stage
5 Intake filter
6 Cooler 1st stage
7 Cooler 2nd stage
8 Cooler 3rd stage
9 After-cooler
10 Intermediate separator 2nd stage
11 Intermediate separator 3rd stage
12 Filter system P31 (Central filter assembly)
13 Safety valve 1st stage
14 Safety valve 2nd stage
15 Safety valve 3rd stage
16 Final pressure safety valve
17 Triplex filter cartridge
18 Manual condensate drain taps
19 Pressure maintaining valve
20 Filling hose
21 Filling connector
22 Filling pressure gauge
23 Change-over device 300 bar - 200 bar
24 Safety valve 225 bar

TECHNICAL DATA

Compressor units without motor

Compressor unit	**Mariner 320- 1**	
Medium	Breathing air	
Operating pressure	PN 200	PN 300
Delivery[a)]	320 l/min.	320 l/min.
Pressure setting, final pressure safety valve	225 bar	330 bar
Weight	109 kg	109 kg
Compressor block	**IK12.14, mod. 6**	
Number of stages	4	
Number of cylinders	3	
Cylinder bore 1st stage	105 mm	
Cylinder bore 2nd stage	105/88 mm	
Cylinder bore 3rd stage	28 mm	
Cylinder bore 4th stage	12 mm	
Piston stroke	40 mm	
Intermediate pressure 1st stage	2.5 ... 3,5 bar	
Intermediate pressure 2nd stage	14 ... 18 bar	
Intermediate pressure 3rd stage	55 ... 85 bar	
Compressor block oil capacity	2.8 l	
Oil pressure	3 to 6 bar	
Oil type	see lubricating oil list	
Max. permissible ambient temperature	+5 ... +45 °C (+43 ... +113 °F)	
Max. permissible inclination of compressor[b)]	15°	
Max. permissible operating height	0 ... 2000 m above sea level	

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

TECHNICAL DATA

Compressor units with petrol engine

Compressor unit	**Mariner 320-B**	
Medium	Breathing air	
Operating pressure	PN 200	PN 300
Delivery[a)]	320 l/min.	320 l/min.
Operating pressure, final pressure safety valve	225 bar	330 bar
Sound pressure	83 dB(A)	83 dB(A)
Sound (immersion) power	--	--
Weight	140 kg	140 kg
Compressor block	**IK12.14, mod. 6**	
Number of stages	4	
Number of cylinders	3	
Cylinder bore 1st stage	105 mm	
Cylinder bore 2nd stage	105/88 mm	
Cylinder bore 3rd stage	28 mm	
Cylinder bore 4th stage	12 mm	
Piston stroke	40 mm	
Intermediate pressure 1st stage	2.5 ... 3,5 bar	
Intermediate pressure 2nd stage	14 ... 18 bar	
Intermediate pressure 3rd stage	55 ... 85 bar	
Compressor block oil capacity	2.8 l	
Oil pressure	3 to 6 bar	
Oil type	see lubricating oil list	
Max. permissible ambient temperature	+5 ... +45 °C (+43 ... +113 °F)	
Max. permissible inclination of compressor[b)]	15°	
Max. permissible operating height	0 ... 2000 m above sea level	
Drive motor	**Honda petrol engine**	
Manual start model (B)	GX390 K1	
Capacity	389 cm^3	
Power	9,6 kW (= 13 PS) at 3.600 min^{-1}	
Consumption/h (unleaded petrol)	approx. 3 ltrs (tank capacity = 7.5 ltrs.	

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

TECHNICAL DATA

Compressor unit with three phase motor

Compressor unit	**Mariner 320-E**	
Medium	Breathing air	
Operating pressure	PN 200	PN 300
Delivery[a)]	320 l/min.	320 l/min.
Pressure setting, final pressure safety valve	225 bar	330 bar
Sound pressure	83 dB(A)	83 dB(A)
Weight	158 kg	158 kg
Compressor block	**IK12.14, mod. 6**	
Number of stages	4	
Number of cylinders	3	
Cylinder bore 1st stage	105 mm	
Cylinder bore 2nd stage	105/88 mm	
Cylinder bore 3rd stage	28 mm	
Cylinder bore 4th stage	12 mm	
Piston stroke	40 mm	
Intermediate pressure 1st stage	2.5 ... 3,5 bar	
Intermediate pressure 2nd stage	14 ... 18 bar	
Intermediate pressure 3rd stage	55 ... 85 bar	
Compressor block oil capacity	2.8 l	
Oil pressure	3 to 6 bar	
Oil type	see lubricating oil list	
Max. permissible ambient temperature	+5 ... +45 °C (+43 ... +113 °F)	
Max. permissible inclination of compressor[b)]	15°	
Max. permissible operating height	0 ... 2000 m above sea level	
Drive motor	**Three phase squirrel cage**	
Operating voltage	380 - 415 V, 50 Hz; 380 - 480 V, 50 Hz	
Power	7.5 kW (= 10 HP)	
Speed	2,910 min^{-1}	
Size	132 S	
Type of construction	B 3	
Type of enclosure	IP 55	
Current rating	15.3 Amps	

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

2. SAFETY MEASURES

2.1. 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.

WARNING

Automatic compressor control, unit may start-up without warning!

Before carrying out maintenance and repair work, switch off at the main switch or disconnect from the mains and ensure unit will not restart.

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.

MANDATORY

Hearing protectors must be worn!

Hearing protectors must be worn when working on a machine which is running.

NOTE

Ensure correct direction of rotation!

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

2.2. 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.

2.3. FUNDAMENTAL SAFETY NOTICES

2.3.1. Authorized use

- The machine / 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 machine / 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 machine / unit is exclusively for the compression of mediums (air/gas) specified in section A, chapter 1.3. “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.

2.3.2. Organizational measures

- Keep the instruction manual to hand near the machine / 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. See chapter 2.4. 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.

- At the very least, supervise temporary personnel's work in accordance with the instruction manual, taking into account safety and danger factors.
- 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.
- As far as necessary or according to regulations, use personal protective equipment.
- Observe all safety and danger notices on the machine / unit.
- Keep all safety and danger notices on the machine / unit complete and in readable condition.
- If there are any modifications to the machine / unit or operating conditions which may affect safety, stop the machine / unit immediately and inform the department / person responsible of the fault.
- No modifications may be made to the machine / 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.
- Do not carry out programme changes (software) to the programmable control system.
- 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.
- Make sure location and operation of fire extinguishers is known.
- Pay attention to fire warning and fire fighting procedures.

2.3.3. Qualifications, fundamental duties

- Work on / with the machine / 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 machine / unit under constant supervision of an experienced person.
- Work on the electrical equipment of the machine / 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.
- Work on gas equipment may only be carried out by qualified personnel.

2.3.4. Safety notices for operation

- Do not carry out any work if safety is questionable.
- Meet all requirements demanding that the machine / 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 machine / 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 machine / 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 machine / unit, ensure that no one can be put at risk through running the machine / 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 machine / 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.
- Clear and make the maintenance area safe as far as necessary.
- If the machine / 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.
- When replacing individual parts and larger assembly groups, they must be carefully fastened to the lifting device so that there is no risk of danger. Use only suitable and technically perfect lifting devices and equipment with sufficient lifting power and strength. Do not linger or work under suspended loads.
- Only entrust an experienced person with the fixing of loads and guiding of crane drivers. The person guiding must remain within sight or in contact with the operator.

- For assembly work above body height, use appropriate safety approved equipment, e.g. ladders and platforms. Do not climb on machine parts. For maintenance work at high levels, wear a safety harness.
- 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.

2.3.5. 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.
- Machines and 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 machine / unit must be regularly checked. Defects, such as loose screw connections or burnt wires, must be rectified immediately.
- If work is to be carried out on live parts, work with a second person who can operate the emergency off switch or the main switch in the case of an emergency. Close off the work area with a red and white safety chain and a warning sign. Only use voltage isolated tools.
- Only carry out welding, burning and grinding work on the machine / 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.
- Soundproofing equipment on the machine / unit must be in place and functional during operation.
- The stipulated hearing protectors must be worn.
- With regard to oil, grease and other chemical substances, observe the relevant safety regulations for the product.
- For loading, only use lifting device and equipment with sufficient lifting power and strength.
- Appoint trained guide personnel for lifting operations.
- Machines may only be lifted with a lifting device and by trained personnel according to instructions in the instruction manual (fixing points for fixing equipment etc.).
- Use only suitable transporters with sufficient carrying power.

Secure the load properly. Use suitable fixing points.

- If necessary, provide machine / unit with transportation brackets. Display the appropriate notice. Remove transportation brackets in the correct manner before taking into operation.
- Parts which need to be dismantled for transport purposes must be carefully replaced and secured before taking into operation.
- Even when moving the machine / unit only slightly, the machine / 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.

2.3.6. 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 or 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.

2.4. SAFETY REGULATIONS (EC; partly 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 by the following regulations:

Pressure vessel directive (Directive 97/23/EC) of 29.05.1997

Operating safety regulations (BetrSichV) of 27.09.2002

Machine safety law (GSG) of 11.05.2001

14th regulation to machine safety law (14. GSGV - pressure vessel regulation) of 03.10.2002

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:

Accident Prevention Regulations (UVV):

BGV A1 of 01. January 2004

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

Carl Heymanns Verlag
Luxemburger Str. 449
50939 Köln

Beuth-Vertrieb GmbH
Burggrafenstr. 4 - 7
10787 Berlin

The manufacturer has complied with all applicable regulations and the unit is prepared accordingly. If desired, we offer at our Munich site a partial acceptance test according to § 14 BetrSichV. Please contact our Technical Service Department with regard to this. They can also supply our leaflet **"IMPORTANT NOTES FOR CERTIFICATION"**.

According to the operation safety regulations (BetrSichV), 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.

We strongly emphasize these regulations.

3. INSTALLATION, OPERATION, FILLING PROCEDURE

3.1. INSTALLATION OF THE COMPRESSOR UNIT

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

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.

Outdoor location

For installation observe the following:

- 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. It is good practice to have an intake hose of at least 3 m length with pre-filter and intake filter. Pre-filter to be located 2 m above ground. See Abb. 11 and chapter 4.5.1. This arrangement will ensure necessary spacing between exhaust outlet and air inlet.

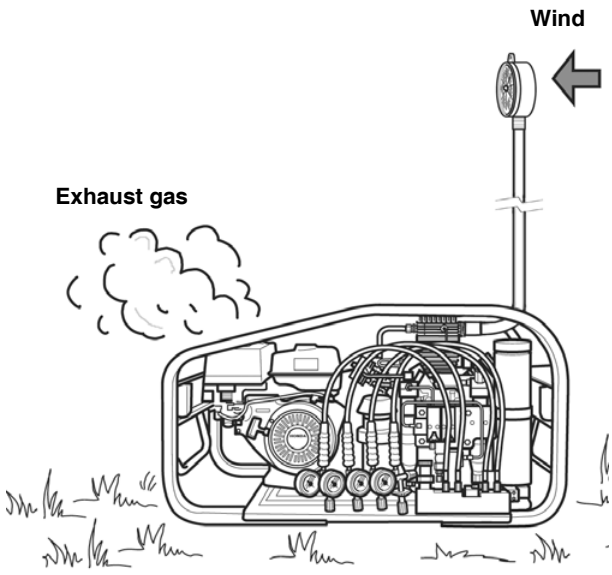


Abb. 11 Outdoor location

- The use of a windvane is recommended. Turn unit as soon as wind direction changes.
- On petrol or diesel engine, operation unit must only be located outdoors, never indoors.
- Take care that no vehicles are in direct vicinity with engines running.
- Do not operate unit in the vicinity of open fire (flue gas!).

Indoor location

- 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. Distance from wall should be at least 0.5 meters.

Never operate petrol driven units indoors !

3.2. ELECTRICAL INSTALLATION

For installation of electrical equipment observe the following:

- In the annex of this instruction manual you will find the standard schematic diagrams valid for the respective compressor unit. To connect the compressor control system, use only the diagram contained in the control box of the unit, because any deviations from the standard diagrams according to order are marked there.
- Observe regulations of local electricity supply company.
- Connection must be carried out by an expert only. Units which are operated with 380/400 V are delivered with an electric plug. All other units are delivered without a plug and have to be equipped with a suitable plug depending on the country.
- Ensure correct installation of protective conductor.
- Check conformity of motor and control device tension and frequency with those of electric network.
- Adjust motor protection, thermal overload relay. For start over contactor adjust to motor amperage rating. For start via star-delta contactor adjust to motor amperage rating x 0.58.
  For example: motor amperage rating = 10 Amp.:
  adjust relay to 10 x 0.58 = 5.8 Amp.
- Fuse motor correctly (see table below; use slow-blow fuses, only).

Fuse table

Motor type	V	125	230	240	400	415	440	500	600	660
3-phase, 7.5 kW (star-delta starting)	A	50	35	35	20	16	16	16	16	10
3-phase, 7.5 kW (direct starting)	A	63	35	35	25	25	25	20	16	16

3.3. OPERATION

Preparation for operation

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%!**

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

- **Prior to first operation** read Instruction Manual carefully. Make sure that all persons handling the compressor and the filling station are familiar with the function of all controls and monitors. Particularly observe chapter 2. SAFETY REGULATIONS.
- **Before 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.
- **Immediately after switching on the system for the first time** check the direction of rotation of the motor for compliance with the arrow on the unit. If motor turns in the wrong direction, the phases are not connected properly. Shut down unit immediately and interchange two of the three phase leads in the switch box. Never change leads at the motor terminal board.
- **Prior to first operation** or operation subsequent to repair work operate unit for at least 10 minutes with open condensate valves (pressureless) to ensure proper lubrication of all parts before pressure is built up. To keep drain valves open, loosen screw (3, Abb. 12) on coil (1) and pull timer (2) from solenoid valve.

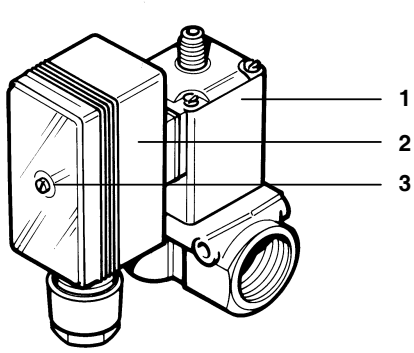


Abb. 12 Solenoid valve with timer

- Prior to each operation check the oil level according to chapter 4.4.1. 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.
- When using extension leads or cable drums, operate unit with unwound cable only to avoid overheating and risk of fire. The maximum length for extension cables at normal ambient temperatures (approx. 20 °C) is 25 metres.

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.

3.4. STARTING THE UNIT

Units with electric engine without compressor control system:

- The motor is switched on manually by pressing the start button (1, Abb. 13).

On units with 4 kW engine without automatic condensate drain, the manual condensate drain valves have to be opened before starting the unit, as soon as the unit is running the valves can be closed again.

Abb. 13 Motor protection switch

Units with electric engine with compressor control system:

- Place main switch (1, Abb. 14) to 1.

- Press ON button (2).

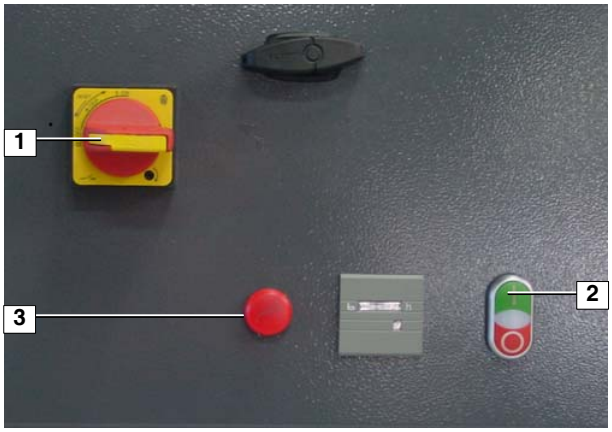


Abb. 14 Compressor control unit

Units with petrol engine:

Open condensate drain valves on the filters to release pressure, 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 tightly (spring pressure alone may sometimes not be sufficient for higher pressures) 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.

3.5. FILLING PROCEDURE

General

WARNING **Ensure intake air is free from noxious gas (CO), exhaust fumes and solvent vapour. On units employing petrol or diesel engine it is most important to use an intake hose and observe that only clean air is drawn in. The intake hose is also recommended for units with electric engine. When operating the unit in areas with possibly high CO contents, the CO removal filter cartridge is recommended for electric driven units, also. Note that for CO contents of more than 25 ppmV in the intake air the allowed limits cannot be guaranteed even with a CO removal filter cartridge, resulting in a life-threatening CO concentration! Also, due to chemical reaction of CO with hopcalite, warming up of the cartridge and danger of fire may result.**

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 casing is scored, hose must be discarded.**

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. **The use of adapters is not allowed!**

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 ppm_v in workrooms are not unusual (MAK-value (max. workroom concentration) is 5,000 ppm_v). Another additional increase is caused by cigarette smoking, producing approx. 2g CO_2 ($\approx$ 2,000 ppm_v) per cigarette. These pollutions add up to the basic pollution of approx. 400 ppm_v. 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.

Connecting the bottles

- Connect air bottle to filling valve (see Abb. 15).

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

Abb. 15 Connecting air bottle

- Air bottles with international filling connector can be connected with filling adaptor (PN 79375) to the German filling connector (see Abb. 16).

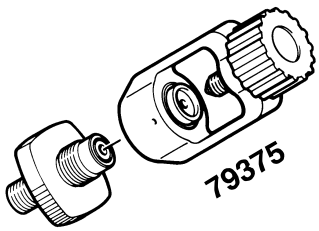


Abb. 16 International filling connector

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).

Filling the bottles

- Open filling valve (1, Abb. 17).
- 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.

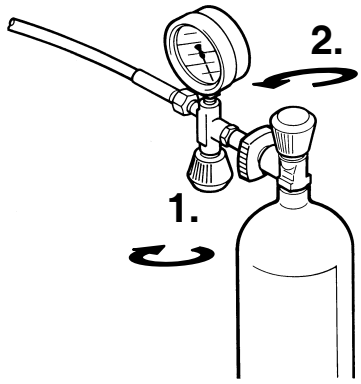


Abb. 17 Filling air bottle

Removing the bottles

- Upon reaching final bottle pressure **close bottle valve first** (1, Abb. 18)**, then filling valve** by returning handle to closed position (2).
- Remove compressed air bottle.

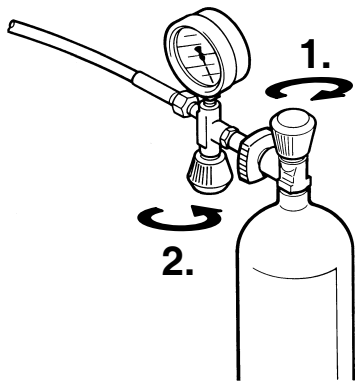


Abb. 18 Removing air bottle

3.6. CHANGE-OVER DEVICE PN 300/PN 200

(Abb. 19) This device allows bottle filling to 200 bar (3,200 psig) with a 300 bar (4,700 psig) rated unit. Safety valve (1) and filling device PN 200 bar are connected by opening change-over valve (2) and the connected bottles can be filled with a 200 bar pressure, as described in "Filling the bottles".

Depressurize unit before opening valve (2) to avoid damage to the change-over device

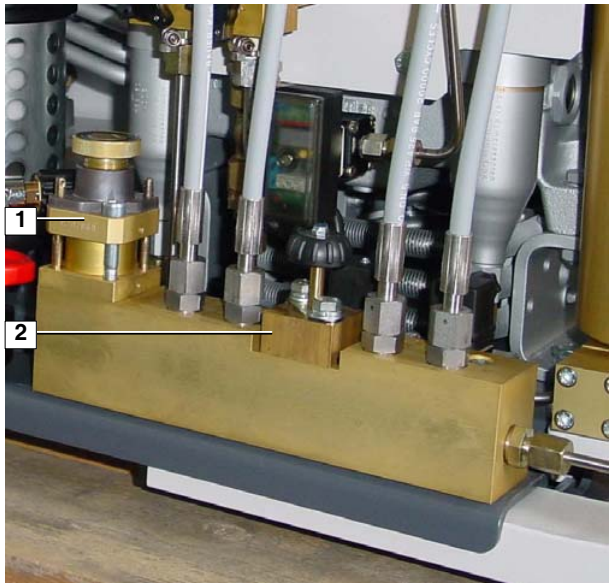


Abb. 19 Change-over device

3.7. SHUT-DOWN PROCEDURE

Units with electric engine without compressor control system:

The motor is switched off manually by pressing the stop button (1, Abb. 20).

Units with electric engine with compressor control system:

- Press OFF button (2, Abb. 21).
- Place main switch (1) to 0.

Units with petrol engine:

- Switch off petrol engine with stop button, close fuel tap
- Switch off diesel engine with engine switch-off lever, close fuel tap.

All units:

- Vent unit by means of filling valves to approx. 80 bar (1,150 psi) then decompress with drain valves to remove all moisture in filters and oil and water separator. Close all valves again.
- Check the oil level in the compressor and top up, if necessary. Also check whether the compressor needs servicing in accordance with maintenance schedule - see chapter 4.3.

Abb. 20 Motor protection switch

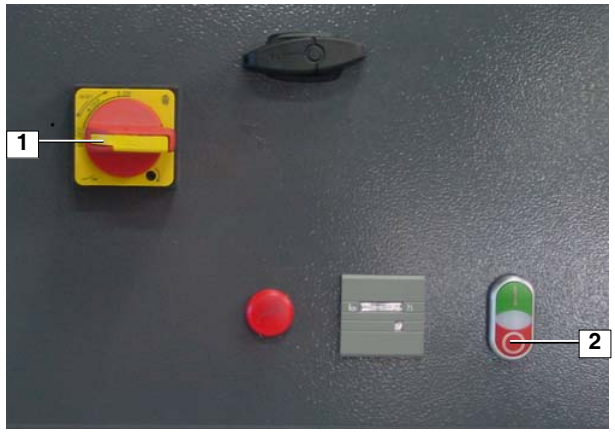


Abb. 21 Compressor control unit

3.8. B-TIMER

Introduction

Read operating instructions carefully before operating the unit.

The settings in the setup menu are essential for the correct indication of the filter capacity. Without correct settings, the B-Timer can be used as an hourmeter, only!

Make sure that the pressure maintaining valve of the compressor is adjusted to 150 bar (factory setting) and is working properly to ensure correct indication of the filter capacity and compressor operation recognition (see chapter 4.5.5.).

Description

The **B-Timer** (Abb. 22) is a self-activating mini-computer that counts the operating hours of the compressor and calculates the saturation of the filter cartridge from time, temperature, cartridge type, and delivery rate of the compressor. It displays operating hours, cartridge lifetime, and all maintenance due for the compressor. The **B-Timer** does neither need external power nor any other connection to the pressure system. It is simply fastened to the filter housing which has to be monitored, by means of a clamp, and is therefore the ideal filter control device for all mobile compressor units, especially for portable petrol or diesel driven scuba diving models. In addition, the B-Timer can be mounted easily to any unit as an upgrade device.

Abb. 22 B-Timer

Authorized use

This unit is to be used exclusively as operating status monitoring device and does not release the user from additional surveillance and testing of the breathing air quality of the filter system according to national standards (e.g. EN 12021). With the **B-Timer**, this is ***not*** possible!

The **B-Timer** may only be used with the filter systems P21, P31 or P41. The respective filter cartridge numbers are stored in the software. Other use is strictly prohibited. The manufacturer and the supplier void all responsibility for risk, damage or injury resulting from failure to follow these instructions.

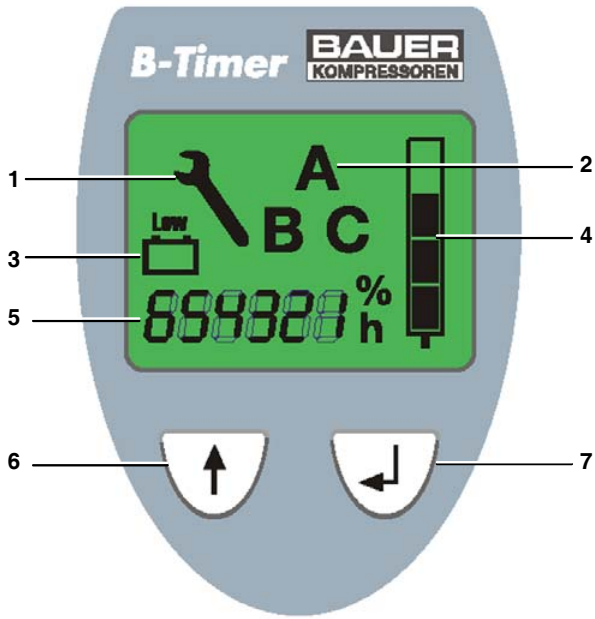
Please observe the operating limits of the unit:

Operating temperature range 0° C to +50 °C,
Storage temperature -20° C bis +70 °C
Protection class IP65 (Protection against contact with wire, dust, and jet of water
Vibration ± 3g in operation
max. 95% humidity, not condensating

Function

The B-Timer display shows the following functions:

- Operating hours of the compressor unit
- Cartridge lifetime in % by means of four segments in the cartridge symbol.
- Flashing last segment and change from operating hours indication to cartridge part no. if capacity is equal or less than 20% of the original lifetime.



1 Key symbol (maintenance due)
2 Letter symbol (maintenance type)
3 Low battery symbol
4 Cartridge saturation indicator
5 Operating hours or cartridge number
6 Mode select key

- Indication of compressor maintenance due by means of letter symbols and operating hours.
  A = 500 hours or 1 year
  B = 1000 hours or 1 year
  C = 2000 hours or 2 years
- Battery symbol indicating that the lithium battery is low and has to be changed. ***All data are stored and will not be lost when changing battery.***

The **B-Timer** is operated using the mode select and the enter keys.

Error indication

If the temperature sensor in the unit should be defective, an error message "Error 1" or "Error 2" is shown at the display (Abb. 24). In this case the unit should not be used but sent to the factory or the nearest BAUER representative for repair.

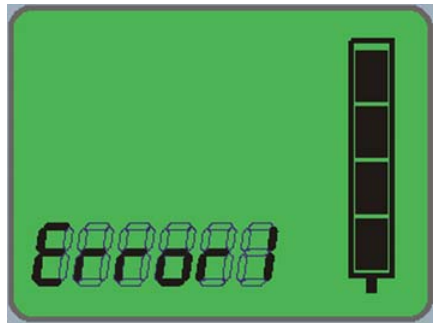


Abb. 24

Battery change

The battery (1, Abb. 25) is merely inserted into the holder.

To change the battery remove two bolts and separate housing from base plate. Remove plug (2) and pull out battery.

Make sure to use the same type battery (BAUER part no. 82743).

Abb. 25 Battery

Operation

The B-Timer is activated when starting the compressor. Compressor operation is indicated by the flashing "h" symbol.

To switch on the B-Timer press one of the keys on the display. Main menue will be displayed (Abb. 26).

If no key is pressed within 1 minute, the indication will return to the main menue. After 2 minutes the B-Timer is switched off, if no compressor operation is detected.

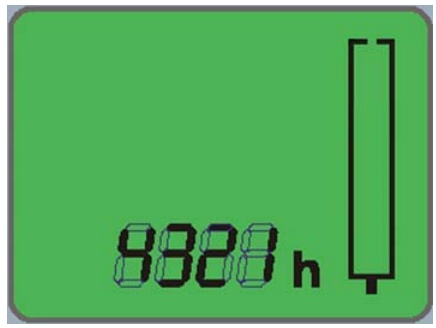


Abb. 26

Function Display

To *display* the desired function, press the select key (↑).

Press ↑ key. Remaining filter capacity is shown, Abb. 27)

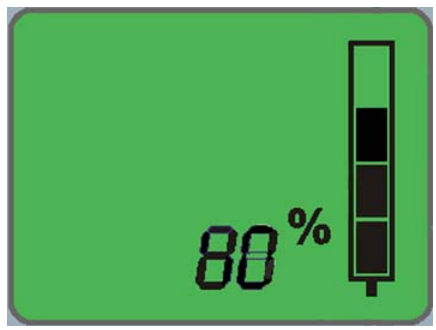


Abb. 27

Press ↑ key again. Remaining operating hours to service interval A (500 hours or annually) are shown (Abb. 28).

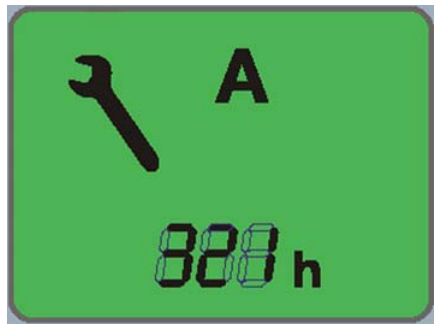


Abb. 28

Press ↑ key again. Remaining operating hours to service interval B (1000 hours or annually) are shown (Abb. 29).

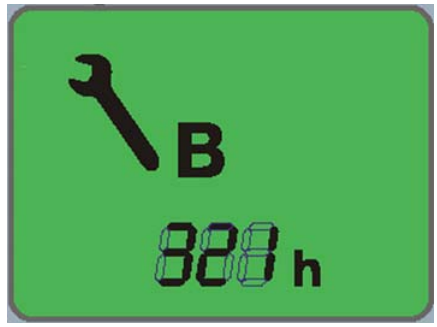


Abb. 29

Press ↑ key again. Remaining operating hours to service interval C (2000 hours or biennially) are shown (Abb. 30).

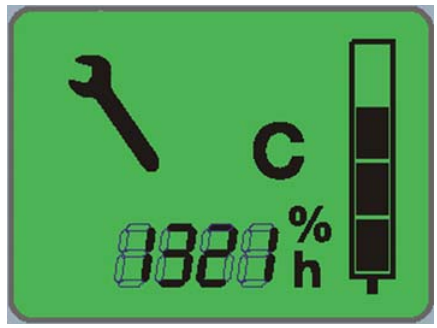


Abb. 30

Press ↑ key. Filter cartrige number is shown (Filter symbol flashing, Abb. 31).

Press ↑ key again. operating mode will be displayed.

To change operating mode, press ↵ key for 3 seconds. Press the ↑ key to select the new setting, press ↵ key to accept the new setting.

Press ↑ key again. Display returns to the main menue

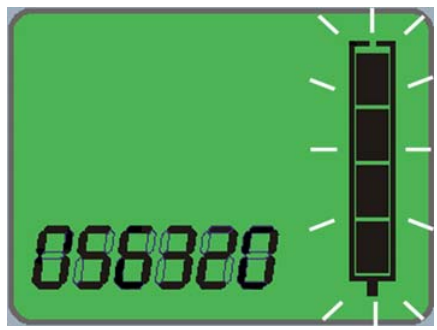


Abb. 31

Reset

The filter capacity must not be reset unless a new filter cartridge has been fitted!

To ***reset*** the filter capacity or the A, B, and C maintenance intervals, press ↵ key for more than 5 seconds from the respective maintenance interval display (Abb. 32).

Abb. 32

Setup

To ***enter the setup*** for the different functions of the **B-Timer** press the ↑ and ↲ keys on the display simultaneously for more than 5 seconds from the cartridge number display (Abb. 33). Filter symbol starts flashing (Abb. 31) indicating the setup mode.

Under **setup A** the filter cartridge number is set. To change cartridge type, press ↲ key for 3 seconds, the number starts flashing. Press the ↑ key to select the correct number, press ↲ key to accept the new setting.

Numbers beginning with 999 require a special adjustment:

Press ↲ key for 3 seconds. Press the ↑ key to select 999000, the last 0 starts flashing. Press the ↑ key to select the correct number, then press ↲ key: the second 0 will start flashing, proceed as above and finally adjust the 3rd 0 accordingly.

Pressing the ↑ key, display changes to **setup B** for the delivery setting. Filter symbol starts flashing (Abb. 34). To change delivery, press ↲ key for 3 seconds, the 1st digit starts flashing. Press the ↑ key to select the correct number, press ↲ key to accept the new setting. Repeat procedure for the other two digits

Pressing the ↑ key again, display changes to **setup C** for the pressure range setting. Filter symbol starts flashing (Abb. 35). To change pressure, press ↲ key for 3 seconds. Press the ↑ key to select the correct pressure (200, 300 or 200/300), press ↲ key to accept the new setting.

After finishing setup and fitting a new cartridge, the filter capacity has absolutely to be reset, see *"Reset"* above.

Pressing the ↑ key again, display changes to the menue for **adjusting the operating hours**. Press ↲ key for 2 seconds, the last digit will start flashing. Press the ↑ key to select the correct number, then press ↲ key etc., until all digits are set. Then pressing the ↑ key twice will lead back to the main menue, Pressing the the ↑ key and the ↲ key gives the possibility to readjust the hours again, if required.

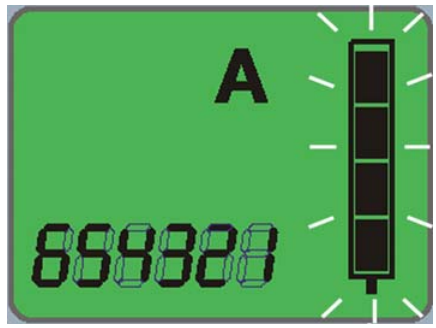


Abb. 33

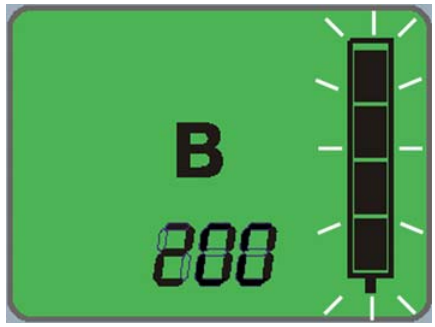


Abb. 34

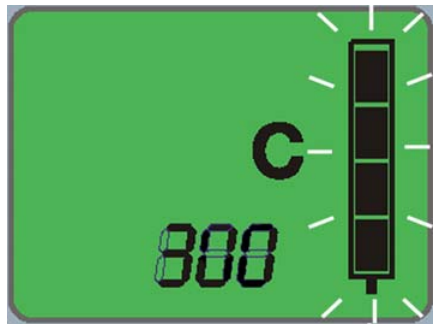


Abb. 35

4. MAINTENANCE

4.1. MAINTENANCE RECORD

We recommend that all maintenance work is recorded in the service book delivered with every compressor unit, 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.

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 4.5.3.!

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

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

For units with B-Timer, observe the maintenance informations on the display

4.3. MAINTENANCE SCHEDULE

The maintenance schedule is contained in the service manual delivered with every compressor unit.

4.4. MAINTENANCE WORK

This chapter contains the maintenance work as well as a short functional description for each component. For trouble-shooting information refer to 4.6.

4.4.1. LUBRICATION

FUNCTIONAL DESCRIPTION

The compressor is provided with a low pressure lubrication system. The oil pressure is produced by a low reving gear pump. The oil pressure is approximately **5 bar**.

The oil pump (1, Abb. 36) is coupled to and driven by the crankshaft. It pumps oil from the oil sump (5) through the oil fine filter (2) and a minimum pressure valve (3) to the 3rd stage cylinder. The oil is then distributed by the guide piston of the 3rd stage (4) and lubricates all moving parts of the compressor block.

The minimum pressure valve allows for oil pressure indication at a pressure gauge and electronic oil pressure monitoring.

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
- for breathing air application, also 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. 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).

All our compressor units are delivered ex-works with lubricating oil N28355 (filled into the crankcase or as consignment, depending on the model).

For operation under less severe conditions 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.

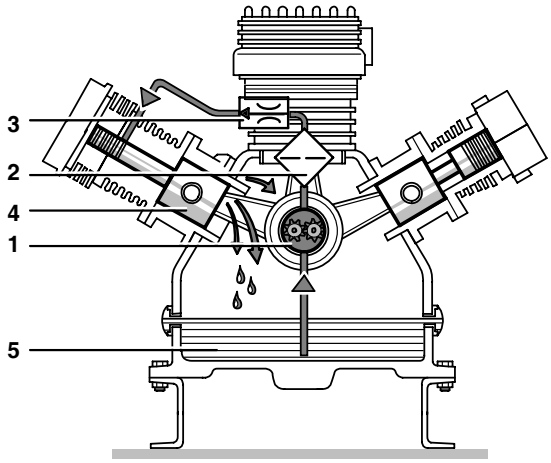


Abb. 36 Lube oil circuit

OIL LEVEL CHECK

Check oil level at sight gauge on either side of compressor block every day prior to putting compressor into operation. Oil level must be between minimum and maximum notches, see Abb. 37. Oil level must never be below minimum mark as this will cause severe damages due to lack of lubrication. Oil level must also not exceed maximum as this will cause excessive lubrication of compressor and result in valves sooting up.

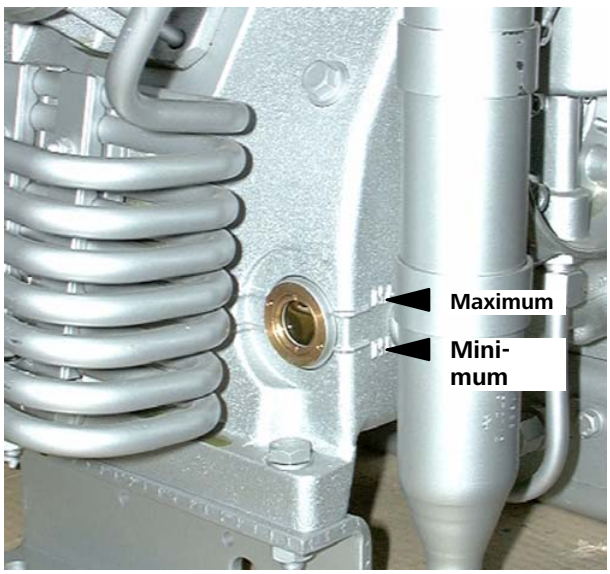


Abb. 37 Oil sight gauge

OIL CHANGE INTERVALS

For units equiped with B-Timer, observe the maintenance informations on the display (see chapter 3.8.).

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

OIL CAPACITY

Oil capacity	approx. 2.8 liters

OIL PACKAGES

BAUER compressor oil is available in various quantities, refer to oil list in the annex.

OIL CHANGE

- Run compressor warm.
- Remove red cap from oil filler neck (1, Abb. 38).
- Drain oil while still warm by means of oil drain plug. On units equipped with oil drain hose remove hose union nut from coupling at hose bracket. Collect oil in a suitable container. Exchange gasket and reinstall plug.

Replace oil filter with every oil change, otherwise the bypass valve would open if filter is clogged, and the oil would circulate without being filtered!

- Remove two screws (1, Abb. 39) with a 13 mm spanner. Remove cover (2).
- Remove oil filter (1, Abb. 40) from rubber gasket at cover.
- Mount a new filter element (P/N N25326) and replace and fasten cover.
- Fill new oil through filler neck to Max.- mark at sight gauge.
- Pour oil in slowly, wait a few minutes, then put unit into operation.

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.
- Perform subsequent oil changes according to chapter OIL CHANGE.
- Refill compressor with same oil, only.

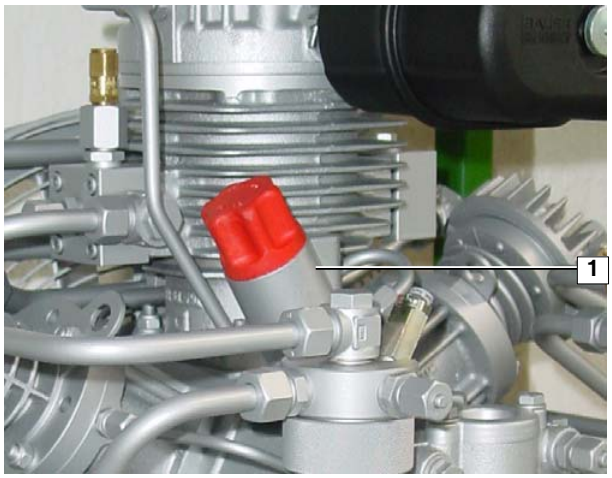


Abb. 38 Oil filler neck

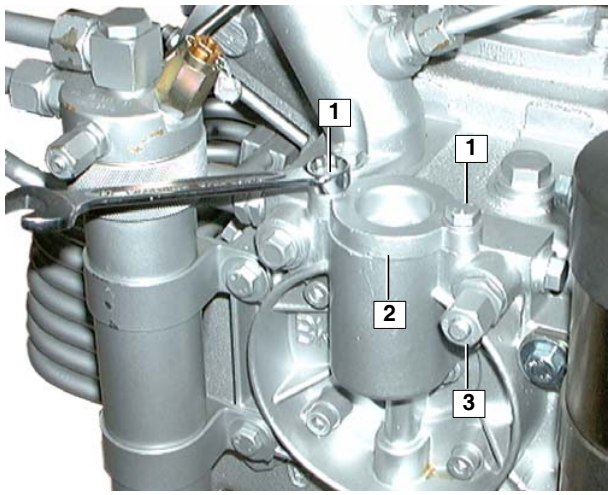


Abb. 39 Removing the cover

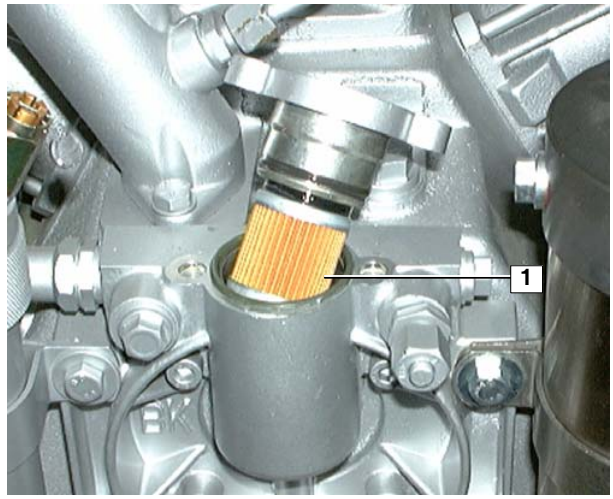


Abb. 40 Replacing the oil filter

4.5. VENTING OIL PUMP

If no or low oil pressure builds up after starting the unit- especially after maintenance or repair work, or if the unit should have been running in the wrong direction due to a wrong phase sequence - venting of the oil pump may be necessary. Proceed as follows:

- With the compressor running and all condensate drain valves open to avoid pressure being built up during this procedure, unscrew screw cap and plug (3, Abb. 39) three turns and wait until oil pours out free of air bubbles. Retighten plug and cap nut.

4.5.1. INTAKE FILTER

DESCRIPTION

A dry micronic filter is used to filter intake air, see Abb. 41.

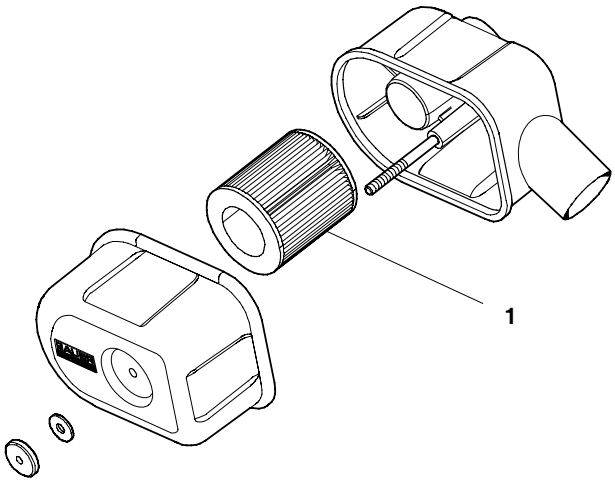


Abb. 41 Intake filter

MAINTENANCE

The filter cartridge must be cleanded or changed at regular intervals according to maintenance schedule in chapter 4.3.

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

To clean, remove micronic filter cartridge (1) and clean with brush or by blowing air inside out. Clean filter housing inside with a damp cloth. Take care to prevent dust from entering intake pipe.

INTAKE HOSE WITH PRE-FILTER

Petrol or diesel driven breathing air compressors should be fitted with an intake hose and a pre-filter which is also recommended for electric power driven compressor units. It ensures clean air, free of exhaust fumes, being compressed.

For positioning of the pre-filter refer to chapter 3.

MAINTENANCE

Change the pre-filter in the same intervals as the intake filter.

At replacement make sure that only a hose with same length and inner diameter is used.

4.5.2. INTERMEDIATE SEPARATOR

DESCRIPTION

An intermediate separator is mounted on the compressor after the 2nd and 3rd stage. The separators are designed to remove water and oil accumulating due to cooling the air down after the compression process.

Separation is achieved by means of centrifugal action provided by a vortex plate.

LIFETIME

WARNING **The separators are subject to dynamic load. They are designed for a certain number of load cycles, which originate from an abrupt pressure loss at condensate drain (1 load cycle i.e. condensate drain = 1 depressurization, 1 pressurization). After reaching the max. number of load cycles the separators must be replaced, otherwise the housing may burst due to material fatigue. Refer to the pressure vessel operating manual delivered with the unit.**

The maximum recommended amount of four load cycles per hour should not be exceeded. If it is possible to regulate the operation of the unit to such a degree as to achieve four load cycles per hour, in our opinion this would be an optimum between usage and actual life.

To avoid exceeding the max. number of load cycles the operating hours should be recorded in the service manual.

MAINTENANCE

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

Drain condensate every 15 to 30 minutes from the separator or ensure that the automatic condensate drain unit drains regularly (see chapter 4.5.10.).

4.5.3. FILTER SYSTEM P31

APPLICATION AND SUMMARY 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 **P31** with **TRIPLEX** longlife cartridge (Abb. 43).

The filter assembly consists of separator and cartridge chamber. In the separator underneath 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.

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. Refer to the pressure vessel operating manual delivered with the unit.**

The maximum recommended amount of four load cycles per hour should not be exceeded. If it is possible to regulate the operation of the unit to such a degree as to achieve four load cycles per hour, in our opinion this would be an optimum between usage and actual life.

CARTRIDGE SAFETY BORE

The filter system **P31** 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 (Abb. 42).

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.

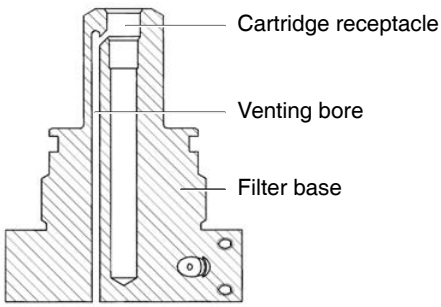
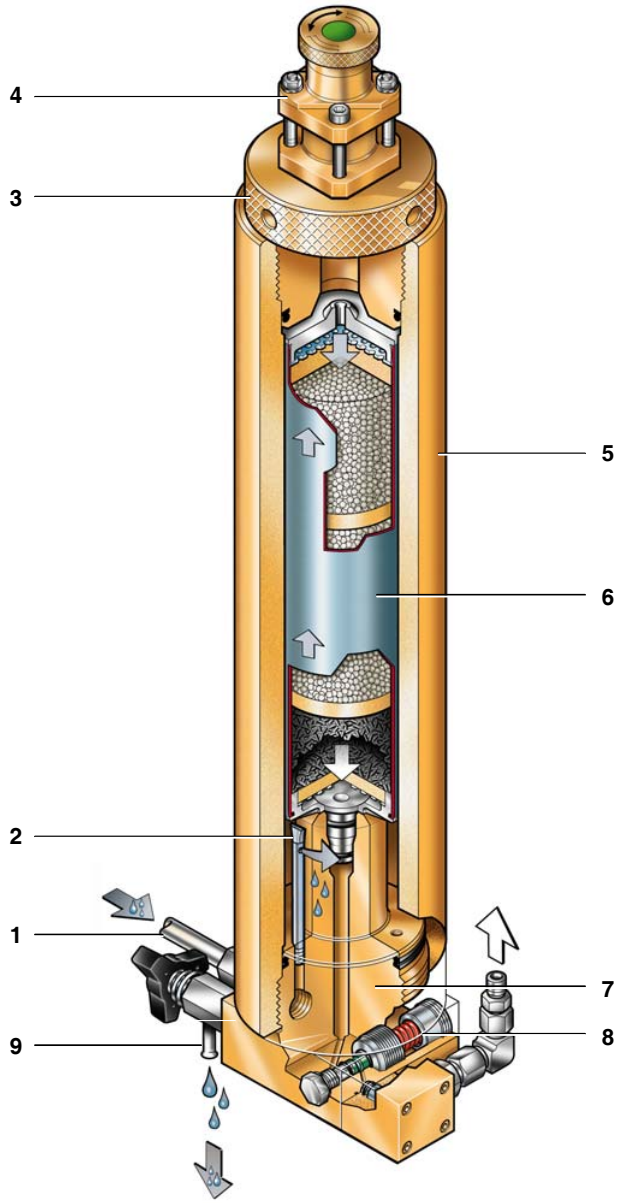


Abb. 42 Safety bore



1 Filter inlet
2 Jet pipe
3 Filter head
4 Final pressure safety valve
5 Housing
6 Triplex cartridge
7 Filter base
8 Pressure maintaining valve
9 Condensate outlet

Abb. 43 Filter system P31

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 is maintenance-free.

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

For units equiped with B-Timer, observe the maintenance informations on the display (see chapter 3.8.).

The number of operating hours or the amount of possible bottle fillings per filter cartridge can be determined by the tables of the pages 32 to 33 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 80110 is the normal TRIPLEX-cartridge for electric units.

Example: at an ambient temperature of 20°C, 165 to 205 10-ltr-bottles can be filled with a TRIPLEX-cartridge, which is equivalent to 17 to 21 compressor operating hours at a filling pressure of 200 bar.

On compressor units with petrol engines only use **cartridge, part no. 80114 to dry and remove oil and CO.**

Example: at an ambient temperature of 20°C, 124 to 153 10-ltr-bottles can be filled with this cartridge, which is equivalent to between 13 and 16 operating hours at a filling pressure of 200 bar.

CARTRIDGE CHANGE

WARNING **For safety reasons only CO removal cartridges part no. 80114 should be used on compressor units with petrol engine. On units with electric engine either CO removal cartridge part no. 80114 or TRIPLEX cartridge part no. 80110 can be used.**

Units with petrol engine are delivered with CO removal cartridge part no. 80114 as standard, units with electric engine with TRIPLEX cartridge part no. 80110. When changing from electric engine to a petrol engine also replace cartridge part no. 80110 with cartridge part no. 80114.

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.

- Depressurize filter system by opening condensate drain valves.
- Remove filter head (3, Abb. 43).
- 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.

CONDENSATE DRAINAGE

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

- 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.

FILLING VALVE MAINTENANCE

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

- 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 80100: Filter cartridge lifetime [hours]		
Filling pressure p = 200 bar		**Mariner 320**
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Flow capacity Q [l/min]
		320
10	20 - 24	37 - 30
15	25 - 29	28 - 23
20	30 - 34	21 - 17
25	35 - 39	16 - 13
30	40 - 44	13 - 10
35	45 - 49	10 - 8
40	50 - 54	8 - 6
Filling pressure p = 300 bar		**Mariner 320**
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Flow capacity Q [l/min]
		190
10	20 - 24	56 - 45
15	25 - 29	42 - 34
20	30 - 34	32 - 26
25	35 - 39	25 - 20
30	40 - 44	19 - 16
35	45 - 49	15 - 12
40	50 - 54	12 - 10

Filter cartridge 80100: Bottle fillings [number] mass of molecular sieve mMS [g] = 311							
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Moisture content of air, 100% satured X [g/m³]	Volume of processed air Va [m³] at pressure p [bar]		Number of bottle fillings n and bottle size		
			200	300	7 l	10 l	12 l
10	20 - 24	17,31 - 21,80	719 - 571	1078 - 856	513 - 408	359 - 285	299 - 238
15	25 - 29	23,07 - 28,79	539 - 432	809 - 648	385 - 309	270 - 216	225 - 180
20	30 - 34	30,40 - 37,63	409 - 331	614 - 496	292 - 236	205 - 165	171 - 138
25	35 - 39	39,65 - 48,64	314 - 256	471 - 384	224 - 183	157 - 128	131 - 107
30	40 - 44	51,21 - 62,41	243 - 199	364 - 299	174 - 142	121 - 100	101 - 83
35	45 - 49	65,52 - 79,28	190 - 157	285 - 235	136 - 112	95 - 78	79 - 65
40	50 - 54	83,08 - 99,85	150 - 125	225 - 187	107 - 89	75 - 62	62 - 52

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

Number of bottle fillings n=
processed volume of air / bottle filling volume = Va / VF

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

Volume of air wich can be processed: Va [m³] = 0,2 x mMS [g] / (X [g/m³] / p [bar]) = 0,2 x p [bar] x mMS [g] / X [g/m³]

Lifetime of filter cartridge: tp [h] = Va [m³] / (Q [m³/min] x 60 [min/h])

2. Filter cartridge 80114: Filter cartridge lifetime [hours]		
Filling pressure p = 200 bar		**Mariner 320**
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Flow capacity Q [l/min]
		320
10	20 - 24	28 - 22
15	25 - 29	21 - 17
20	30 - 34	16 - 13
25	35 - 39	12 - 10
30	40 - 44	9 - 8
35	45 - 49	7 - 6
40	50 - 54	6 - 5
Filling pressure p = 300 bar		**Mariner 320**
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Flow capacity Q [l/min]
		320
10	20 - 24	42 - 33
15	25 - 29	32 - 25
20	30 - 34	24 - 19
25	35 - 39	18 - 15
30	40 - 44	14 - 12
35	45 - 49	11 - 9
40	50 - 54	9 - 7

Filter cartridge 80114: Bottle fillings [number] mass of molecular sieve mMS [g] = 233							
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Moisture content of air, 100% satured X [g/m^3]	Volume of processed air Va [m^3] at pressure p [bar]		Number of bottle fillings n and bottle size		
			200	300	7 l	10 l	12 l
10	20 - 24	17,31 - 21,80	538 - 428	808 - 641	385 - 305	269 - 214	224 - 178
15	25 - 29	23,07 - 28,79	404 - 324	606 - 486	289 - 231	202 - 162	168 - 135
20	30 - 34	30,40 - 37,63	307 - 248	460 - 372	219 - 177	153 - 124	128 - 103
25	35 - 39	39,65 - 48,64	235 - 192	353 - 287	168 - 137	118 - 96	98 - 80
30	40 - 44	51,21 - 62,41	182 - 149	273 - 224	130 - 107	91 - 75	76 - 62
35	45 - 49	65,52 - 79,28	142 - 118	213 - 176	102 - 84	71 - 59	59 - 49
40	50 - 54	83,08 - 99,85	112 - 93	168 - 140	80 - 67	56 - 47	47 - 39

Bottle filling volume VF [m^3]		
Bottle size	at pressure p [bar]	
l [ltr.]	200	300
7	1,4	2,1
10	2	3
12	2,4	3,6

Number of bottle fillings n=
processed volume of air / bottle filling volume = Va / VF

Bottle filling volume: VF [m^3] = p [bar] x l [l] / 1000 [l/m^3]

Volume of air wich can be processed: Va [m^3] = 0,2 x mMS [g] / (X [g/m^3] / p [bar]) = 0,2 x p [bar] x mMS [g] / X [g/m^3]

Lifetime of filter cartridge: tp [h] = Va [m^3] / (Q [m^3/min] x 60 [min/h])

4.5.4. FILTER SYSTEM P41 (OPTION)

PURPOSE AND SHORT DESCRIPTION

The Mariner 320 compressor units can be fitted with filter system P41 as an optional extra instead of the standard filter system P31. The difference is a much higher filter cartridge life time due to the longer filter housing and cartridge. In the standard version, filter system P41 is not fitted with the SECURUS monitoring systeml.

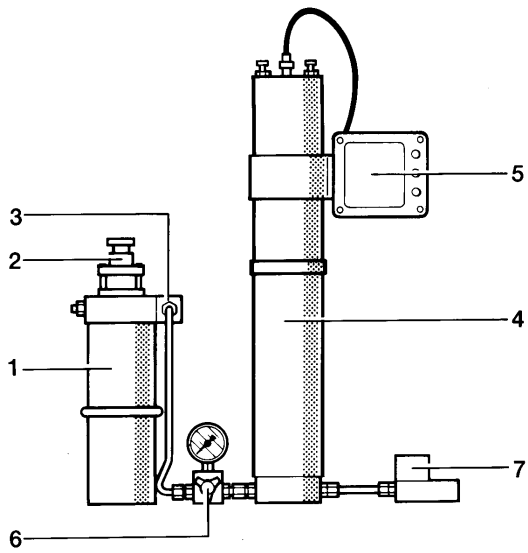


Abb. 44 Filter system with **SECURUS** monitoring

1 Oil and water separator
2 Final pressure safety valve
3 Non-return valve
4 Purifier
5 **SECURUS** indicator unit
6 Bleeding valve with pressure gauge
7 Pressure maintaining valve

Filter system **P41** (Abb. 44) consists of:

- Separator with final pressure safety valve
- Non-return valve between separator and purifier
- High pressure purifier
- **SECURUS** sensor head
- Venting valve with pressure gauge
- Pressure maintaining/non-return valve

The system is integrated into the compressor unit, i.e. the filters and other components are mounted on the frame, the pressure maintaining valve is situated at the filling panel. If the **SECURUS** monitoring system is provided, the breathing air regeneration process and the degree of dryness of the air are continuously monitored during the regeneration process by measuring the cartridge saturation within the filter cartridge.

Unlike other filter systems the **SECURUS** filter system ensures continuous monitoring of the breathing air purification parameters while the air is still in the regeneration process. The influences of

- ambient temperature
- ambient humidity
- temperatures of the compressor and regeneration system are taken into consideration.

The exchangeable **SECURUS** cartridges are designed for

- drying of air
- adsorption of aromatic components (aerosols)
- partial conversion of CO into CO_2
- partial adsorption of CO_2

The quality of the breathing air produced conforms to the national and international

- DIN EN 12021
- STANAG 1079 MW
- British Standard 4001
- US CGA Spec. G.7.1
- Canada CSA Standard Z 180.1
- Australian Army Standard 5017

It is impossible to exceed the cartridge utilization time since a preliminary warning message indicates the approaching saturation of the cartridge. Depending on the size of compressor used, the prewarning message will appear between 1 and 7 hours prior to cartridge saturation. If the cartridge is not replaced after indication of the preliminary warning message, the **SECURUS** filter system will automatically shut down the compressor as soon as the cartridge has been exhausted. The compressor cannot be turned on as long as no cartridge has been inserted.

The **SECURUS** filter system operates in the FAIL-SAFE mode: the compressor will be shut down if the circuit between the control unit and the sensor is interrupted.

As soon as the preliminary warning message appears or, at the latest, after the SECURUS monitoring unit has shut down the system, the cartridge must be changed.

Final Separator

The air leaving the final stage is cooled in the after-cooler to approx.10 to 15 °C (18-27 °F) above ambient temperature and then enters the oil and water separator (Abb. 45). The oil and water separator is standard for all industrial compressors and part of the breathing air purification system and separates reliably liquid oil and water particles from the compressed air.

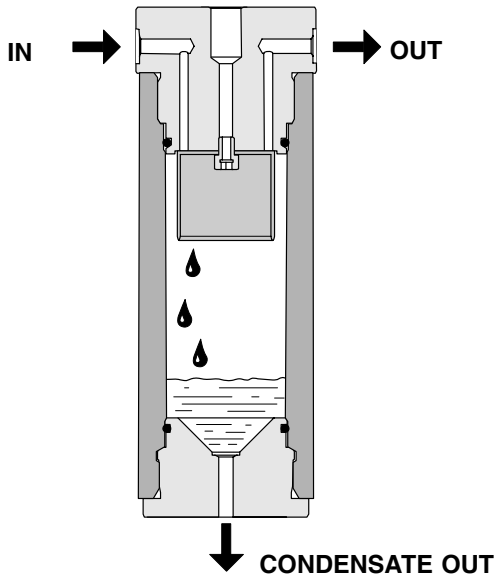


Abb. 45 Oil and water separator

Maintenance

Lifetime

WARNING **The oil and water separator 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. Refer to the pressure vessel operating manual delivered with the unit.**

The maximum recommended amount of four load cycles per hour should not be exceeded. If it is possible to regulate the operation of the unit to such a degree as to achieve four load cycles per hour, in our opinion this would be an optimum between usage and actual life.

The cycles are counted by the cycle counter of the compressor control unit. After the max. number of load cycles have been reached (refer to the pressure vessel operating manual delivered with the unit), the separator must be exchanged.

Condensate drain

The condensate produced by the re-cooling after the compression process has to be drained regularly by means of the manual condensate drain valves

- before start-up of the compressor unit
- during operation every 30 minutes, at high humidity every 15 minutes.

For units equipped with an automatic condensate drain system refer to chapter 4.5.10.

Purifier

The filter housing consists of an anodized aluminium alloy pipe with 100 mm external diameter. Both ends are provided with fine threads on the inside.

The screw-in filter bottom contains inlet and outlet. For connector threads see specifications, chapter 1.

The upper screw connection contains a pressure resistant bushing for the electrical connections. The coaxial cable which leads from the sensor to the control unit is connected to the BNC connector located there.

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.

The cartridge tube is made of aluminium. Cover and bottom consist of pressure diecast aluminium. The cartridge cover contains the sensor for the monitoring function and the clip to facilitate changing of the cartridge.

Different cartridges are available depending on the required air quality. See table below.

Part no.	Cartridge contents	SECURUS sensor
062565	MS/AC/MS	---
061686	MS/AC/MS	●
061687	MS/AC/MS/HP	●

SM = Sintered Metal Cartridge, MS = Molecular Sieve, AC = Activated Charcoal, HP = Hopcalite

Maintenance

- **Depressurize** system before starting any maintenance work. The filter line can be vented manually with the venting valve, wait until the pressure gauge reads zero.
- **Dry** inside of filter housing with a clean cloth before installing new cartridge and check for corrosion.
- **Lubricate** threads and O-rings as well as end of cartridge with both o-rings with white petrolatum. Apply sparingly. See chapter 7.
- **Observe** number of operating hours as indicated on hour meter to ensure exact attention to the maintenance intervals.

- **Change** cartridge before reactivating a compressor unit which has been out of service for more than 6 months.
- **Leave** cartridge in the filter as long as unit is out of service.
- **Keep** all condensate drain valves and shut-off valves closed. Keep a minimum pressure of approx. 50 to 80 bar (700 to 1,100 psig) within the system to prevent moisture entering the compressor piping and filter system.

Cartridge change

- On filter systems with SECURUS monitoring, unscrew nut and pull off cable plug.
- Unscrew the filter head (1) with the special spanner (2) supplied with the unit.
- Pull out used cartridge by means of its clip (3).
- Remove new cartridge from packing and protective caps from both ends of cartridge.
- Insert new cartridge into housing and push down firmly.
- Replace filter head, screw in by hand and tighten with the special spanner.

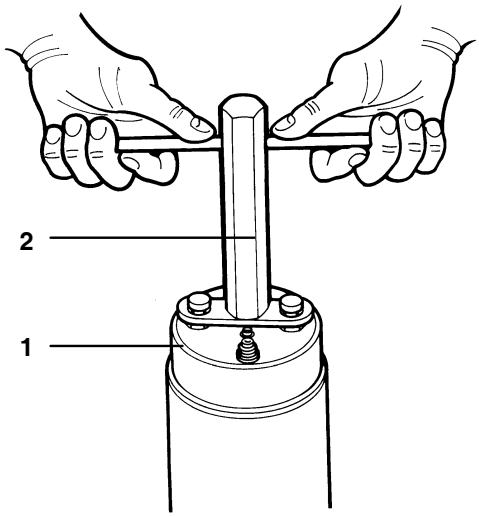


Abb. 46 Removing the filter head

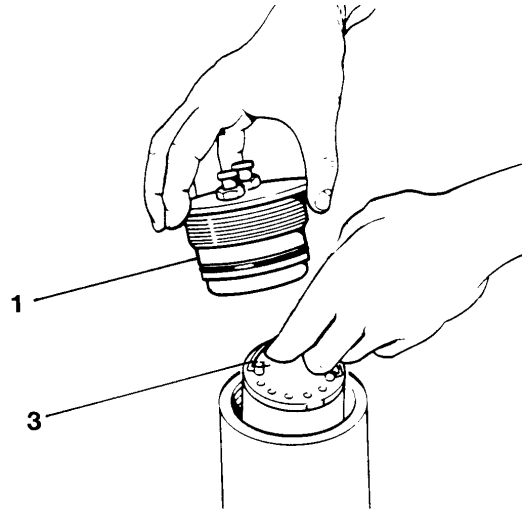


Abb. 47 Extracting the cartridge

SECURUS filter replacement intervals

For units equiped with B-Timer, observe the maintenance informations on the display (see chapter 3.8.).

The number of operating hours or the amount of possible bottle fillings per filter cartridge can be determined by the tables of the pages 37 to 38 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 062565 is the normal TRIPLEX-cartridge for electric units.

Example: at an ambient temperature of 20°C, 432 to 534 10-ltr-bottles can be filled with one cartridge, which is equivalent to 45 to 56 compressor operating hours at a filling pressure of 200 bar.

On compressor units with petrol engines only use **cartridge, part no. 067224 to dry and remove oil and CO.**

Example: at an ambient temperature of 20°C, 359 to 444 10-ltr-bottles can be filled with this cartridge, which is equivalent to between 37 and 46 operating hours at a filling pressure of 200 bar.

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

3. Filter cartridge 062565: Filter cartridge lifetime [hours]		
Filling pressure p = 200 bar		**Mariner 320**
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Flow capacity Q [l/min]
		320
10	20 - 24	98 - 78
15	25 - 29	73 - 59
20	30 - 34	56 - 45
25	35 - 39	43 - 35
30	40 - 44	33 - 27
35	45 - 49	26 - 21
40	50 - 54	20 - 17
Filling pressure p = 300 bar		**Mariner 320**
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Flow capacity Q [l/min]
		190
10	20 - 24	147 - 116
15	25 - 29	110 - 88
20	30 - 34	83 - 67
25	35 - 39	64 - 52
30	40 - 44	50 - 41
35	45 - 49	39 - 32
40	50 - 54	31 - 25

Filter cartridge 062565: Bottle fillings [number] mass of molecular sieve mMS [g] = 812							
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Moisture content of air, 100% satured X [g/m^3]	Volume of processed air Va [m^3] at pressure p [bar]		Number of bottle fillings n and bottle size		
			200	300	7 l	10 l	12 l
10	20 - 24	17,31 - 21,80	1876 - 571	2815 - 2235	1340 - 1064	938 - 745	782 - 621
15	25 - 29	23,07 - 28,79	1408 - 432	2112 - 1692	1006 - 806	704 - 564	587 - 470
20	30 - 34	30,40 - 37,63	1068 - 331	1603 - 1295	763 - 617	534 - 432	445 - 360
25	35 - 39	39,65 - 48,64	819 - 256	1229 - 1002	585 - 477	410 - 334	341 - 278
30	40 - 44	51,21 - 62,41	634 - 199	951 - 781	453 - 372	317 - 260	264 - 217
35	45 - 49	65,52 - 79,28	496 - 157	744 - 615	354 - 293	248 - 205	207 - 171
40	50 - 54	83,08 - 99,85	391 - 125	586 - 488	279 - 232	195 - 163	163 - 136

Bottle filling volume VF [m^3]		
Bottle size	at pressure p [bar]	
l [ltr.]	200	300
7	1,4	2,1
10	2	3
12	2,4	3,6

Number of bottle fillings n=
processed volume of air / bottle filling volume = Va / VF

Bottle filling volume: VF [m^3] = p [bar] x l [l] / 1000 [l/m^3]

Volume of air wich can be processed: Va [m^3] = 0,2 x mMS [g] / (X [g/m^3] / p [bar]) = 0,2 x p [bar] x mMS [g] / X [g/m^3]

Lifetime of filter cartridge: tp [h] = Va [m^3] / (Q [m^3/min] x 60 [min/h])

4. Filter cartridge 067224: Filter cartridge lifetime [hours]		
Filling pressure p = 200 bar		**Mariner 320**
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Flow capacity Q [l/min]
		320
10	20 - 24	81 - 65
15	25 - 29	61 - 49
20	30 - 34	46 - 37
25	35 - 39	35 - 29
30	40 - 44	27 - 23
35	45 - 49	21 - 18
40	50 - 54	17 - 14
Filling pressure p = 300 bar		**Mariner 320**
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Flow capacity Q [l/min]
		190
10	20 - 24	122 - 97
15	25 - 29	91 - 73
20	30 - 34	69 - 56
25	35 - 39	53 - 43
530	40 - 44	41 - 34
35	45 - 49	32 - 27
40	50 - 54	25 - 21

Filter cartridge 067224: Bottle fillings [number] mass of molecular sieve mMS [g] = 675							
Ambient temperature tU [°C]	Temperature of final separator tAb [°C]	Moisture content of air, 100% satured X [g/m^3]	Volume of processed air Va [m^3] at pressure p [bar]		Number of bottle fillings n and bottle size		
			200	300	7 l	10 l	12 l
10	20 - 24	17,31 - 21,80	1560 - 1239	2340 - 1858	1114 - 885	780 - 619	650 - 516
15	25 - 29	23,07 - 28,79	1170 - 938	1756 - 1407	836 - 670	585 - 469	488 - 391
20	30 - 34	30,40 - 37,63	888 - 718	1332 - 1076	634 - 513	444 - 359	370 - 299
25	35 - 39	39,65 - 48,64	681 - 555	1021 - 833	486 - 396	340 - 278	284 - 231
30	40 - 44	51,21 - 62,41	527 - 433	791 - 649	377 - 309	264 -216	220 - 180
35	45 - 49	65,52 - 79,28	412 - 341	618 - 511	294 - 243	206 - 170	172 - 142
40	50 - 54	83,08 - 99,85	325 - 270	487 - 406	232 - 193	162 - 135	135 - 113

Bottle filling volume VF [m^3]		
Bottle size	at pressure p [bar]	
l [ltr.]	200	300
7	1,4	2,1
10	2	3
12	2,4	3,6

Number of bottle fillings n=
processed volume of air / bottle filling volume = Va / VF

Bottle filling volume: VF [m^3] = p [bar] x l [l] / 1000 [l/m^3]

Volume of air wich can be processed: Va [m^3] = 0,2 x mMS [g] / (X [g/m^3] / p [bar]) = 0,2 x p [bar] x mMS [g] / X [g/m^3]

Lifetime of filter cartridge: tp [h] = Va [m^3] / (Q [m^3/min] x 60 [min/h])

4.5.5. PRESSURE MAINTAINING VALVE

DESCRIPTION

A pressure maintaining valve is integrated in the P31 filter base (Abb. 48), or mounted at the outlet of the filter system P41 (Abb. 49).

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.**

MAINTENANCE

The pressure maintaining valve (Abb. 48) 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

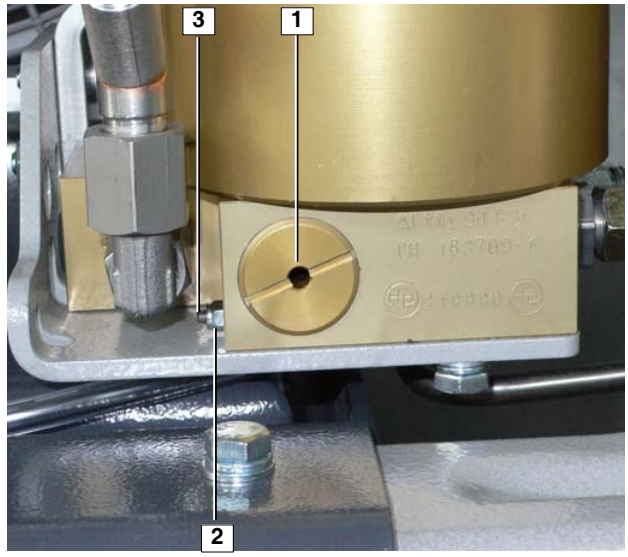


Abb. 48 Pressure maintaining valve, P31

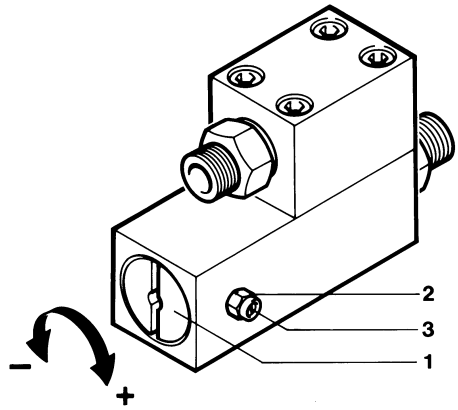


Abb. 49 Pressure maintaining valve, P41

4.5.6. SAFETY VALVES

DESCRIPTION

All 4 compressor stages are protected by safety valves as follows

1st stage	**5 bar**
2nd stage	**24 bar**
3rd stage	**95 bar**

The safety valves are adjusted to the corresponding pressure and sealed at the factory. The safety valve for protection of the last stage is mounted on top of the filter system P31 or P41 oil and water separator, respectively, and is adjusted to the operating pressure of the unit (see chapter 1, Technical Data), **225 bar (3,200 psi)** or **330 bar (4,700 psi).**

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 (Abb. 50).

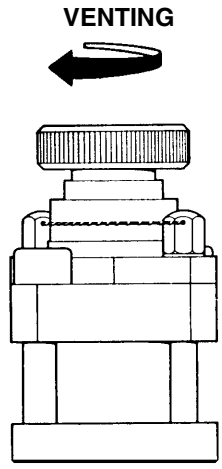


Abb. 50 Venting the final pressure safety valve

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

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.

4.5.7. PRESSURE GAUGE

DESCRIPTION

The compressor unit is equipped with a final pressure gauge (Abb. 51). The red marking on it shows the max. allowable operating pressure.

Abb. 51 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

FUNCTIONAL DESCRIPTION

The valve heads of the individual stages form the top part of the cylinders. The intake and pressure valves are fitted inside the valve heads.

Note that the valves are operated by the flow of the medium. On the suction stroke, the intake valves open and the medium flows into the cylinders. At the start of the compression stroke the intake valve closes and the medium opens the pressure valve, Abb. 52.

GENERAL INSTRUCTIONS FOR CHANGING THE VALVES

- **Always replace** valves as a complete set.
- **Carefully clean** dirty valves. Never use a sharp tool for this purpose. Soak the valves in diesel oil or petroleum and clean with soft brush.
- **Lubricate** valves before mounting with Weicon AS 040, part no. N19753, or equivalent.
- **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 section 7.
- **Check** the valve space in the valve heads for dirt and clean, if necessary.
- **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.
- **30 minutes after restarting** the compressor unit 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.

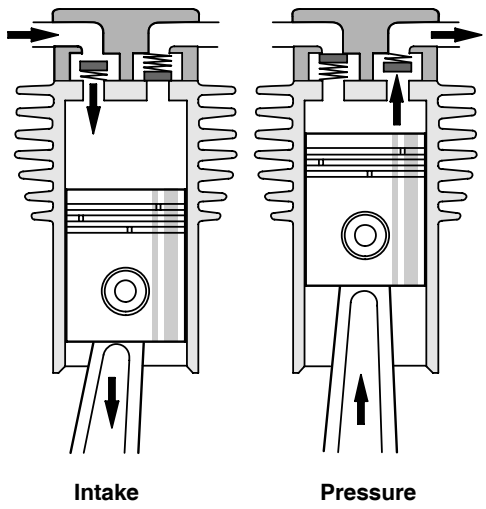


Abb. 52 Valve operation

Intake and pressure valve of the 1st stage is a combined plate valve under the valve head (Abb. 53).

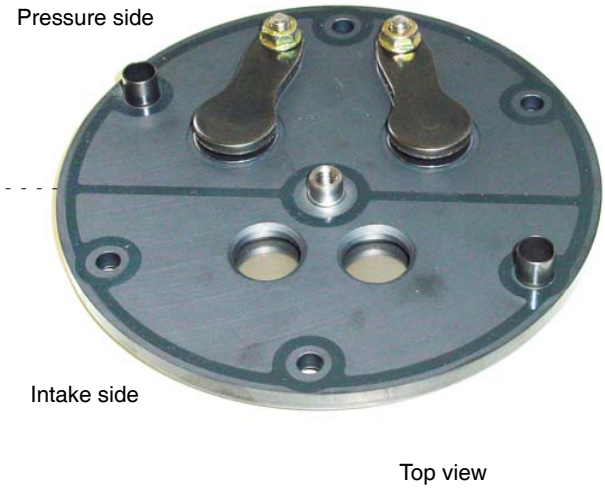


Abb. 53 Combined plate valve

VALVE CHANGE

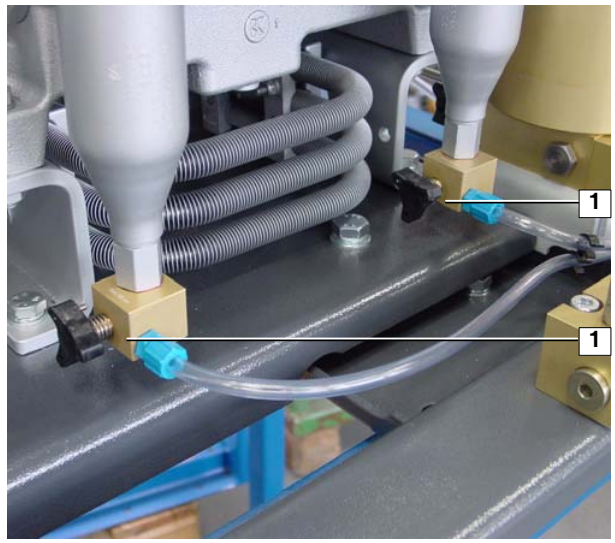
Changing the valves should be performed by trained personnel, only.

Valve change is described in the workshop manual which is available through the **BAUER** technical service.

4.5.9. CONDENSATE DRAIN

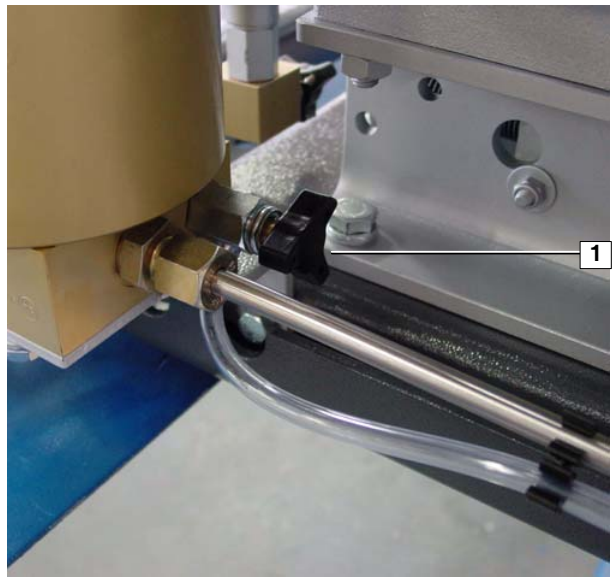
DESCRIPTION

The intermediate separators and the oil and water separator or filter system are fitted with manual drain taps. The condensate should be drained every 15 minutes during operation by slowly opening the taps one after the other.



1 Manual drain tap

Abb. 54 Condensate drain taps, intermediate separators



1 Manual drain tap

Abb. 55 Condensate drain tap, filter system P31

4.5.10. AUTOMATIC CONDENSATE DRAIN (OPTION)

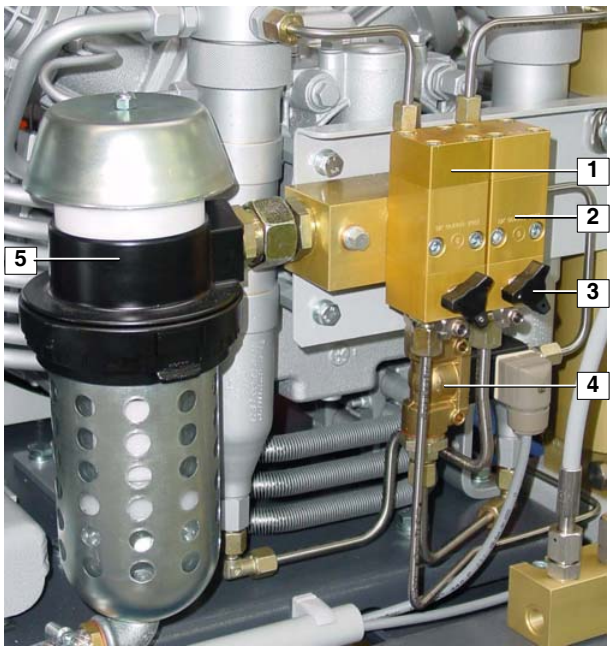
DESCRIPTION

The automatic condensate drain unit drains the intermediate separators and the oil and water separator after the last

stage every 15 minutes during operation. In addition, the automatic condensate drain is designed to drain these filters after shut-down of the compressor unit and to unload the compressor during the starting phase.

The automatic condensate drain system (Abb. 56) operates electro-pneumatically and comprises the following main items:

- One solenoid valve, normally open type, functioning as condensate drain valve after the 2nd stage
- Two pneumatically operated condensate drain valves, normally open type for the intermediate separator after 3rd stage and the oil and water separator or the central filter after the last stage.
- A condensate manifold
- A condensate separator/silencer
- A condensate tank
- An electrical timer



1 Condensate drain valve, intermediate separator 3rd stage
2 Condensate drain valve, filter system
3 Manual drain tap
4 Solenoid valve, condensate drain 2nd stage
5 Condensate separator/silencer

Abb. 56 Automatic condensate drain unit

Operation

The normally open condensate drain valves are connected in cascade mode. The condensate from the intermediate separator after the 2nd stage is applied to the solenoid valve. The solenoid valve is normally open. The condensate from the intermediate separator after the 3rd stage and from the oil and water separator is led to the respective pneumatically operated condensate drain valve.

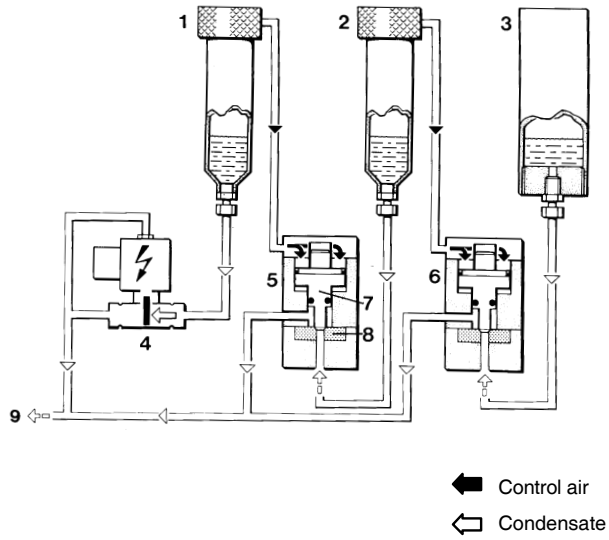


Abb. 57 Normal operation

1 Intermediate separator after 2nd stage
2 Intermediate separator after 3rd stage
3 Oil and water separator after 4th stage
4 Solenoid valve condensate drain 2nd stage
5 Condensate drain valve 3rd stage
6 Condensate drain valve 4th stage
7 Servo piston
8 Valve seat
9 Condensate outlet

The required control air for the 3rd/4th stage intermediate separator drain valve is taken from the intermediate separator after the 2nd stage. The control air for the oil and water separator drain valve is taken from the intermediate separator after the 3rd stage. At compressor start-up, the solenoid valve (4) is open and so are condensate drain valves (5) and (6) because there is no control air available at this moment.

At start-up of the compressor, the solenoid valve is energized and closes: due to build-up of pressure by compressor operation, control air flows into condensate drain valves (5) and (6). The servo-pistons (7) are pressed onto valve seats (8) and the condensate drain valves close.

Condensate drain

Every 15 minutes, 3/2-way solenoid valve (4) is deenergized for approx. 10 seconds by the timer.

Solenoid valve (4) opens and drains the condensate from the 2nd stage intermediate separator (1). Due to the pressure loss in intermediate separator (1) the control pressure for condensate drain valve (5) for intermediate separator (2) is also removed. The servo-piston (7) of the condensate drain valve for the intermediate separator is unloaded, and the control pressure vented through the relief port.

The piston (7) of the drain valve is raised by pressure from the intermediate separator (2), the valve opens, and condensate is drained. Because of the resulting pressure loss within the intermediate separator (2), the control pressure for the condensate drain valve (6) for the oil and water separator (3) is

removed and the condensate drain valve (6) drains as described above.

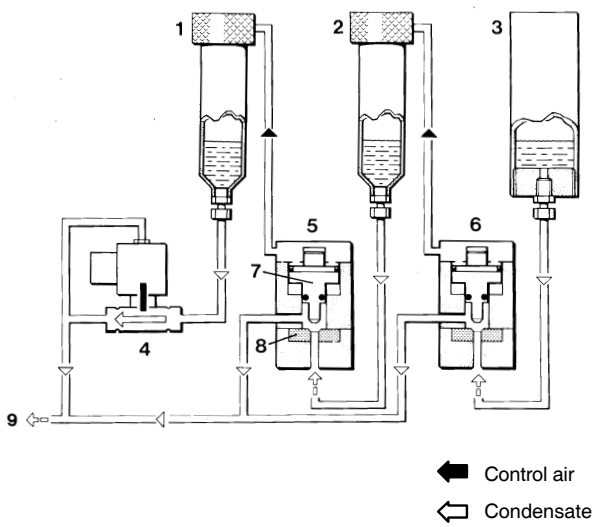


Abb. 58 Condensate drain

1 Intermediate separator after 2nd stage
2 Intermediate separator after 3rd stage
3 Oil and water separator after 4th stage
4 Solenoid valve condensate drain 2nd stage
5 Condensate drain valve 3rd stage
6 Condensate drain valve 4th stage
7 Servo piston
8 Valve seat
9 Condensate outlet

CONDENSATE DRAIN PIPING AND COLLECTOR

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

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

Dispose of condensate according to local regulations!

MAINTENANCE

The condensate drain valve for the oil and water separator is fitted with a manual drain tap to check correct operation of the automatic system.

- Open the manual drain valves (3, Abb. 56) once a week.

This must be carried out immediately after the automatic system has drained the condensate. Observe the drainage of condensate when opening the manual drain valves. If the system drains a lot of condensate this is a sign that the system or the corresponding condensate drain valves are not working properly or that condensate drain intervals are to long. Find the fault and remedy accordingly. If hardly any condensate emerges, the automatic system is operating properly. For fault correction, see also chapter 4.6. "Trouble-shooting".

Maintenance of the condensate separator

The condensate separator elements must be replaced regularly according to the maintenance schedule. Proceed as follows:

- Press the lock button on the ring (1), unlock the ring and remove it.
- Remove container (2).
- Remove the self-locking nut (3), the metal cover (4) and the element (5).
- Unscrew the deflector (8).
- Remove element (9).
- Remove O-ring (10).

Reinstallation:

- Insert a new filter element (5).
- Replace the metal cover (4) and secure it with the self-locking nut (3).
- Lubricate an O-ring (10) from the repair kit and place it on the container.
- Insert a new filter element (9) and hand-tighten the deflector (8).
- Replace the container (2) and secure it with the ring (1).

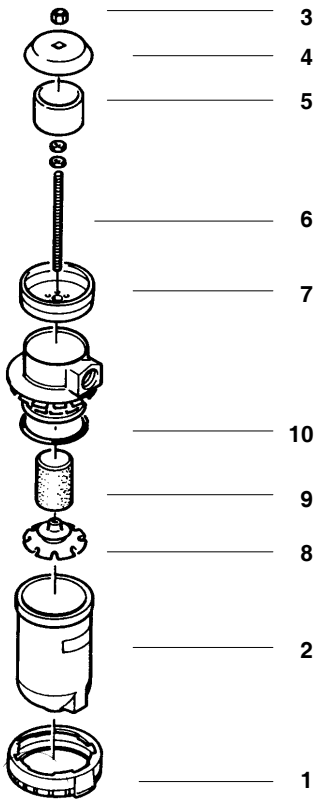


Abb. 59 Condensate separator

4.5.11. ELECTRICAL SYSTEM

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

For schematic diagrams, see annex.

ELECTRIC UNITS

The electrical equipment of the compressor unit consists of:

- drive motor M1
- motor protection switch (standard)
- electric control system (optional), containing:

- switch box containing air break contactor K1 or star-delta contactor K1-K3 with time relay K4
- service switch S3
- final pressure switch F16
- timer for automatic condensate drain K10

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

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

Drive engine

The compressor unit is driven by an electric motor by means of V-belts. Check the V-belts regularly for tension and wear. See chapter 4.5.12. Except for external cleaning, the drive motor requires no servicing. The motor bearings may need lubricating, depending on the model. Please observe the instructions written on the motor.

Motor protection switch

Protection of the motor is ensured by the thermomagnetic releases integrated into the motor protection switch.

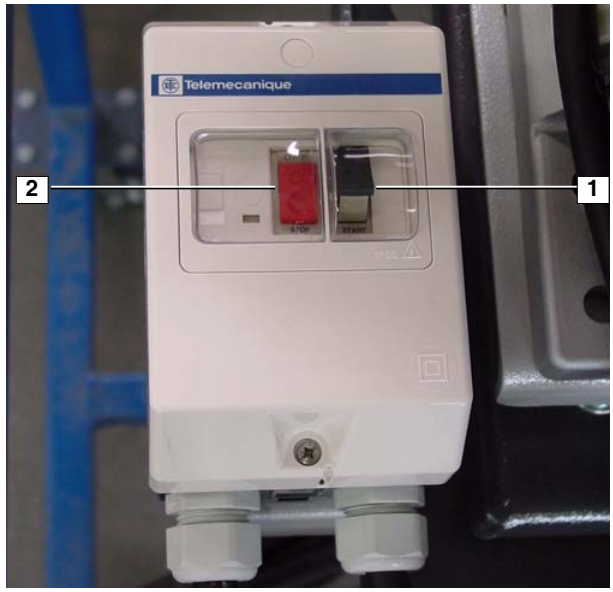


Abb. 60 Motor protection switch

The response value of the electromagnetic releases (protection against short-circuit) is preset. The motor is switched on manually by pressing the start button (1). It is switched off either manually by pressing the stop button (2) or automatically by a thermic release. For safety of the operating personnel all voltage carrying parts have a protective cover. On units with low volt releaser the motor protection switch is also released during power failure. Thereby operating personnel are protected from unintentional start-up in power return.

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

Semi-automatic compressor control (optional)

Unit switches off automatically when the final pressure is reached in the pressure system connected to the compressor. Restart the unit manually by pressing operation button 1 on the control and monitoring unit.

Pressure switch (optional)

Switching **on** and/or **off** of the compressor unit is controlled by pressure switch F16. The upper threshold value is adjustable as follows.

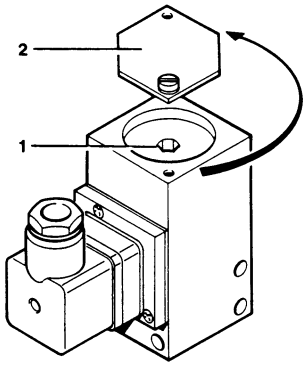


Abb. 61 Final pressure switch

OFF max. = 350 bar[a)] **OFF min. = 200 bar**

In case of readjustment becoming necessary, open cover (2, Abb. 61). Adjust screw (1) to the required pressure using a 6 mm allen key.

Service switch (optional)

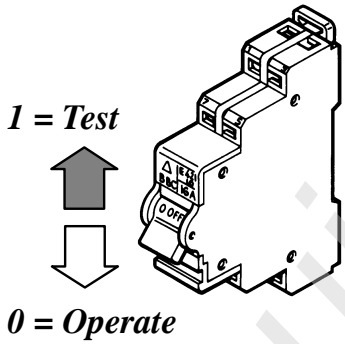


Abb. 62 Service switch

The switch is labelled S3. It is mounted on the switch box. In position "0" the compressor operates normally, i.e. the unit is switched OFF automatically by the pressure switch. In position "1" the pressure switch F16 is overridden.

Use this switch position for servicing purposes only, e.g. checking the blow-off pressure of the safety valves. The unit will not shut off automatically when switch is in this position.

Cycle counter

The cycle counter is mounted in the switch box and labelled P14 (1, Abb. 36) . It counts the electrical control pulses for the automatic condensate drain solenoid valve and hence the accumulated amount of load cycles of the installed oil and water separator after the last compressor stage.

1 count corresponds to 1 load cycle
(1 pressurization, 1 depressurization).

Oil pressure switch

The oil pressure monitoring ensures that the compressor is operated with the correct oil pressure. Missing or low oil pressure causes the compressor to be switched off and the red warning lamp (3, Abb. 14) at the instrument panel to be illuminated. At start, the missing oil pressure is overriden for 40 seconds.

Emergency shutdown

The unit can be shut down with main switch S0 installed in the switch box.

Electrical connection of the automatic condensate drain (optional)

For electrical connection of the automatic condensate drain see the schematic diagram in the annex of this manual. The automatic condensate drain is an optional extra for all compressor units, i.e. the amount of built-in components varies depending on order.

The factory set condensate drain intervals are valid for 20 °C (68 °F) air temperature of the surrounding air. It is possible to shorten the condensate drain interval when operating the unit at a higher temperature. Adjust the electrical timer as follows.

Adjustment of the condensate drain timer

Standard setting condensate drain

- Drain interval = 15 min.
- Drain period = 6 s.

Adjusting the timer (units with electric motor)

Timer K10 controls the automatic condensate drain unit.

K10 is an industrial timing relay with 1 single pole, double throw contact. The drain interval and drain period is set with controls t1 (1, Abb. 63) and t2 (2).

Switch (3, Abb. 63) is set to the position to start with a pulse. t1 is factory set to 15 minutes, t2 to a drain time of 6 seconds.

a) Max. possible setting value; for max. allowable value refer to chapter 1., Technical data

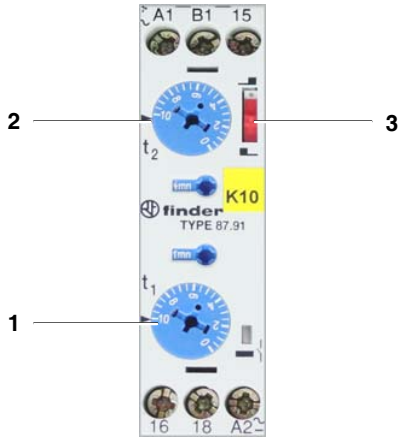


Abb. 63 Timer K10 (electric units)

Adjusting the timer
(units with petrol engine; power-flow timer)

- Adjust condensate drain period (in seconds) with control (1, Abb. 64).
- Adjust condensate drain interval (in minutes) with control (2).

Abb. 64 Timer K10 (petrol units)

Adjusting the timer
(units with petrol engine; Bürkert timer)

Example: standard adjustment:

- Condensate drain interval = 15 min.
- Drain time = 6 s.

Adjust the electric timer as follows:

- Remove cover by undoing the screw.
- Ensure that DIP switches 1 to 8 at timer are set to OFF.
- Place DIP switches 3 and 8 to ON as shown in A, Abb. 66. In this preliminary configuration, the condensate drain interval can be adjusted in seconds. (See also Bürkert instructions in the annex).
- Switch on power.
- Adjust switch-on time with potentiometer t_{on} assigned to DIP switches 1 to 3 (preliminary 15 seconds). Turn potentiometer fully ccw. The desired switch-on time of 15 seconds wihtin the range setting of 1.5 to 30 seconds is approx. between 5 and 7 o'clock (Abb. 67). The exact position has to be found with a stop watch.
- Then adjust drain time with potentiometer t_{off} assigned to DIP switches 6 to 8 (6 seconds). Turn potentiometer fully ccw, then start turning cw. The desired switch-on time of 6 seconds within the range setting of 1.5 to 30 seconds is approx. between 2 and 4 o'clock (Abb. 67). The exact position has to be found with the stop watch.
- Finally place DIP switches 3 to OFF and 1 to ON as shown in B, Abb. 66. In this configuration the preliminary condensate drain interval is converted in a range setting of 1.5 to 30 min. The setting of time is proportional: setting 15 sec in the time range 1.5...30 sec (preliminary setting) becomes 15 min when changing the range to 1.5...30 min (final setting). The operating time will now be 15 minutes.

Abb. 65 Condensate drain timer

Abb. 66 DIP switch adjustment

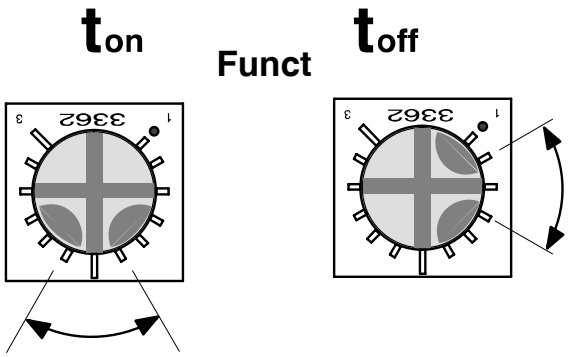


Abb. 67 Potentiometer setting

UNITS WITH PETROL OR DIESEL ENGINE

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

4.5.12. COMPRESSOR DRIVE SYSTEM

GENERAL

The compressor is driven by the drive motor through a V-belt.

V-BELT TENSION ADJUSTMENT

On units with electric, petrol or diesel motor which are equipped with a hinged motor plate, readjustment is not necessary.

On units with electric motor fitted with a slide rail the motor can be adjusted on the rail.

On units with protection frame which are equipped with a petrol engine, the engine is mounted on a plate and can be adjusted as necessary.

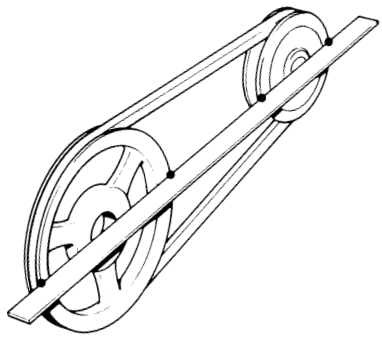


Abb. 68 V-belt pulley adjustment

After adjustment, 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 Abb. 68.: edge must touch pulleys at four points, otherwise readjust motor.

4.5.13. COOLING SYSTEM

GENERAL

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

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

Refer to chapter 3. for proper installation and cooling air supply.

For maximum ambient temperature, see Technical Data, chapter 1.

4.6. TROUBLE-SHOOTING

Trouble	Cause	Remedy
Drive motor (electric)		
Motor will not start	Electric circuitry faulty	Before attempting to make any repairs, check all fuses, terminal connections, wire leads, make sure that motor data complies with mains supply
Drive engine (petrol)		
Engine will not start	See engine instructions	See engine instructions
Engine running unsteadily	V-belt worn	Change drive v-belt
Engine stops	Low oil level	Top up motor oil
Drive system		
V–belt excessively worn out; black residue on v–belt cover	Misalignment of v-belt pulleys	readjust
Compressor block		
No oil pressure	Low oil level	Check oil level, see chapter 4.4.1.
Oil foam in the crankcase	Last stage piston worn	Operate compressor with final stage valve head removed. If oil flows continuously out of cylinder, replace piston and liner
	Last stage outlet valve defective	Replace
Compressor output insufficient	Condensate drain valve(s) and/or fittings leaking	Tighten and reseal
	Premature opening of final safety valve	Clean final safety valve and readjust
	Piston rings worn	Replace
	Excessive piston clearance	Replace
	Pipes leaking	Re-tighten
Safety valves between individual stages releasing pressure	Intermediate pressure too high	Check valves - see chap. 4.5.8. - Service and clean valves
	Valves not closing properly	
Compressor running too hot	Insufficient supply of fresh cooling air	Check location: max. ambient temperature + 45 °C (113 °F)
	Intake or outlet valves not closing properly	Check and clean valves, replace as necessary
	Wrong direction of rotation	See arrow on compressor and remedy accordingly
Oil residue in delivered air	Improper maintenance of filters, filter cartridge saturated	Remedy filters, change filter cartridges
	Wrong oil type	Use right oil type (see oil list) and clean sooted valves

Trouble	Cause	Remedy
Automatic Condensate Drain (optional)		
Drain valves do not close	No control air	Check control air line
	Drain valves leaking	Dismantle drain valve and clean
Drain valves do not open	Condensate drain valve piston jammed	Dismantle drain valve, clean or replace valve
Solenoid valve does not close	Solenoid valve faulty	Check solenoid valve and replace if necessary
	No electrical signal	Check for voltage from timer
Solenoid valve does not open	Solenoid valve faulty	Check solenoid valve and replace if necessary
	Continuous electrical signal	Check electrical control circuit and timer
Unsatisfactory drainage (lot of condensate from manual valves)	Nozzle in 3rd stage drain valve clogged	Remove nozzle, clean Note: 3rd stage 0,8 mm ∅

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.

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

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.

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/outlet valve.
- 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.
- Only applicable for units equipped with a filter system: open the purifier and change all filter cartridges.
- Run the compressor warm with open filling valves or outlet valve for approx. 10 minutes.
- Check the oil pressure on the pressure gauge. If there is any fault, check the lubrication of the compressor.
- After 10 minutes, close the filling valves or the outlet valve and run the unit up to final pressure until the final pressure safety valve blows.
- Check the inter-pressure safety valves for leakage.
- Establish cause of any fault from the trouble-shooting table, chapter 4.6., and remedy.
- 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 all further repair instructions refer to applicable workshop manual.

7. TABLES

MAINTENANCE PARTS

Maintenance kits:

Designation	Part No.
Maintenance kit (500 hours) Mariner electric	Mariner320-E-MU-a1
Maintenance kit (500 hours) Mariner petrol	Mariner320-B-MU-a1
Maintenance kit (1000 hours) Mariner electric	Mariner320-E-MU-b1
Maintenance kit (1000 hours) Mariner petrol	Mariner320-B-MU-b1
Maintenance kit (2000 hours) Mariner electric	Mariner320-E-MU-c1
Maintenance kit (2000 hours) Mariner petrol	Mariner320-B-MU-c1
Note: In order to identify the parts, spare parts list TM320 is required	
Attention: The 2000 resp. 1000 hours maintenance kit does not include the parts of the 1000 resp. 500 hours kit, i.e. for a 2000 hours service 1 500 h, 1 1000 h and 1 2000 h kit is required.	

Single maintenance parts:

Designation	Part No.
Oil filter cartridge	N25326
Air intake filter cartridge	N25950
Triplex filter cartridge for drying and oil removal	80100
Triplex filter cartridge for drying oil and CO removal (obligatory for petrol units)	80114
Filter cartridge P41 for drying and oil removal	062565
Filter cartridge P41 drying and oil removal with SECURUS	061686
Filter cartridge P41 for drying, oil and CO removal (obligatory for petrol units)	067224
Filter cartridge P41 f. for drying, oil and CO removal with SECURUS(obligatory for petrol units)	061687
V-belt Mariner with petrol engine	N2598
V-belt Mariner with electric motor 50 Hz	N18841
V-belt Mariner with electric motor 60 Hz	N2598
Maintenance kit for Filter/Silencer of the Automatic Condensate Drain Unit (Option)	N26544

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

LUBRICATION CHART

TORQUE SEQUENCE

Tighten valve head and cylinder bolts/nuts equally in the sequence shown in Abb. 69.

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

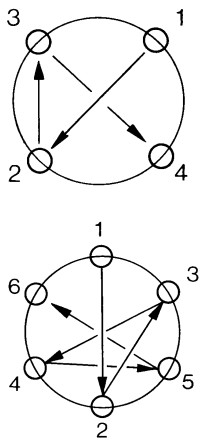


Abb. 69 Torque sequence

Usage	Lubricants
Rubber and plastic parts, filter housing threads	WEICON WP 300 WHITE part no. N19752 or BAUER special grease part no. 072500
Sealing rings	BAUER special grease part no. 072500
Shaft seal (seal) Shaft seal (shaft)	BAUER special grease part no. 072500 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

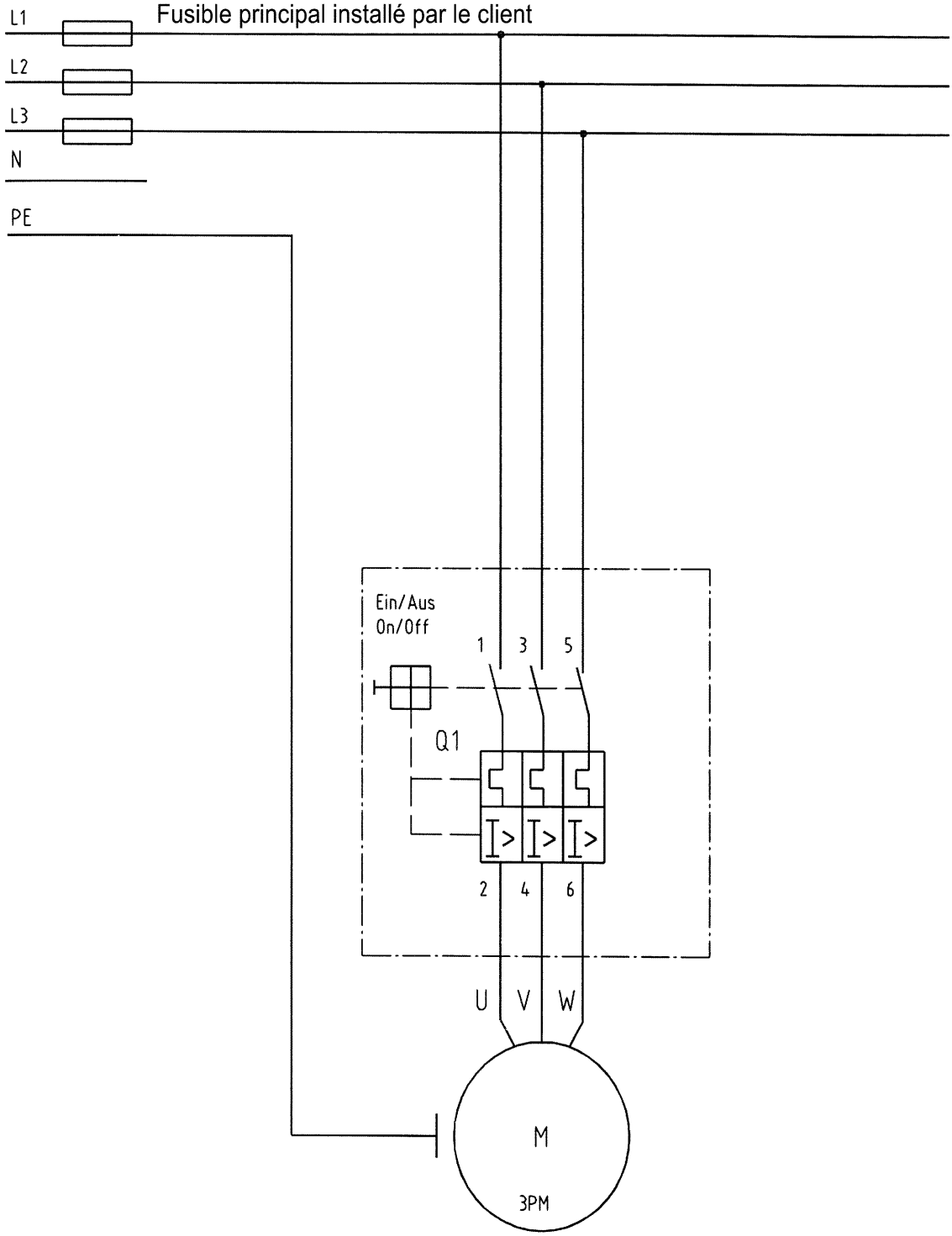
Usage	Testing agents
Tube connectors, tubes	Leakage test spray, part no. FM0089

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

8. ANNEX

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

Hauptsicherung Bauseits
Main fuse by customer
Fusible principal installé par le client

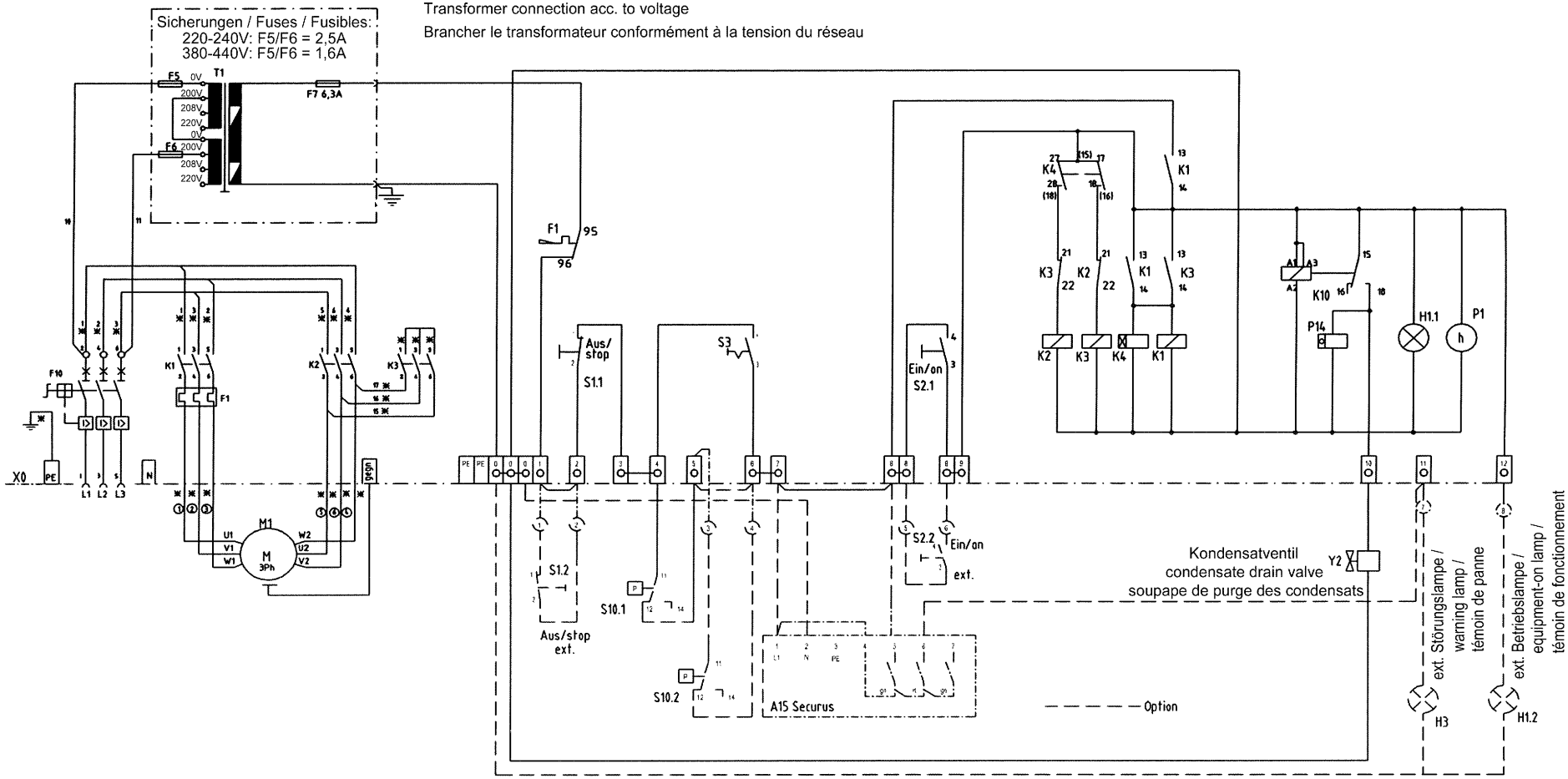


Für diese techn. Unterlage wird jeglicher gesetzlich vorgesehene Rechtsschutz nach DIN 34 in Anspruch genommen.				zul. Abw. ISO 2768 mH		Oberfläche DIN ISO 1302	Masstab: 1:1	Masse:
							Werkstoff:	
	.	.	.		Datum	Name	Benennung:	
	.	.	.	Gez.	13.06.2002	SCHWARZ	Schaltplan	
	.	.	.	Gep.	13.06.2002	SCHWARZ		
	.	.	.	Freig.	13.06.2002	EDBCUSTO	Motorschutzschalter	
	.	.	.					
	.	.	.	BAUER			Zeichnungs-Nr. 76942-S01	Blatt 0
	.	.	.	KOMPRESSOREN				
aa	.	.	.					
Zust.	Änderung	Datum	Name					

Trafo entsprechend Netzspannung anschließen

Transformer connection acc. to voltage

Brancher le transformateur conformément à la tension du réseau



Verdrahtungsfarben / Wire colors / Couleur des câbles:

-Phase: Schwartz / black / noir

-Schutzleiter / Ground / Terre: grün-gelb / yellow-green / jaune-vert

-Steuerspannung / Control voltage / Tension de commande:

-AC: rot / red / rouge

-DC: blau / blue / bleu

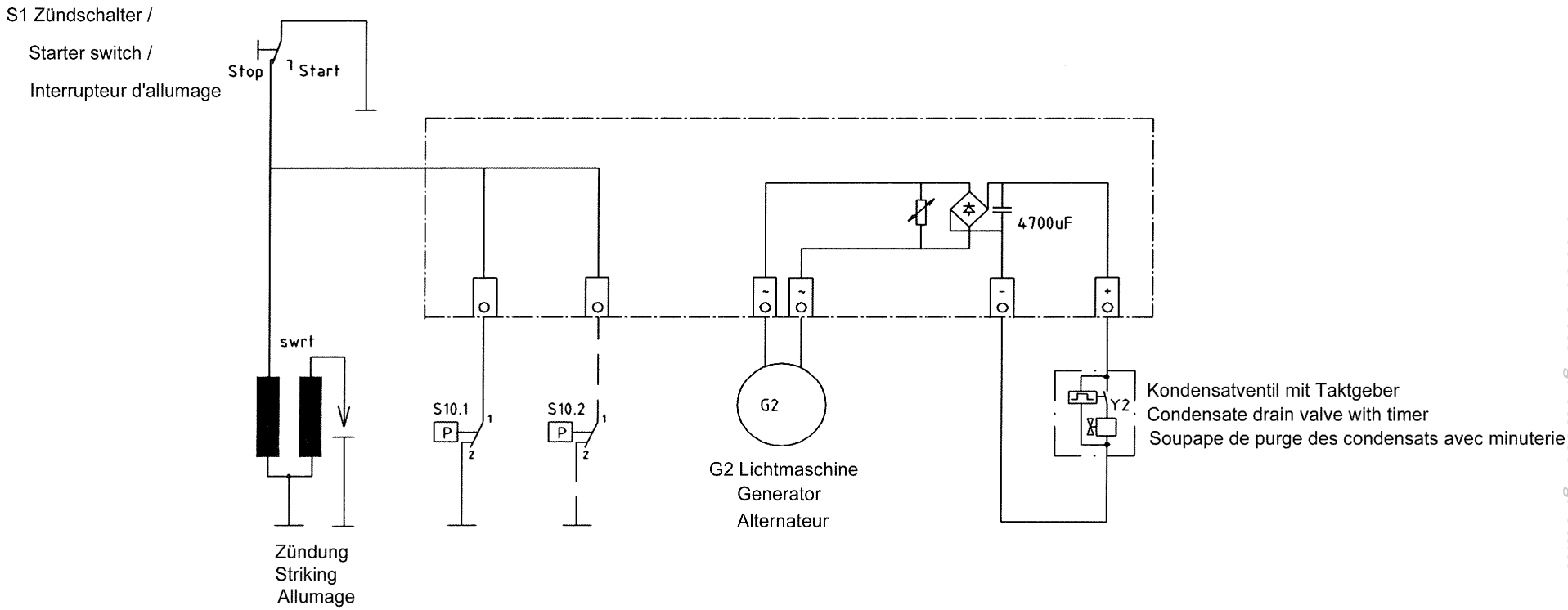
Aderquerschnitte Hauptstromverbindungen / Wire gauges / Section des câbles:

-(mit * gekennzeichnet) an Motorleistung anpassen; siehe Tabelle 11095

-(marked with *) depending on motor power; see table 11095

-(identifiés par *) dépend de la puissance du moteur; voir tableau 11095

Für diese techn. Unterlage wird jeglicher gesetzlich vorgesehene Rechtsschutz nach DIN 34 in Anspruch genommen.				zul. Abw. ISO 2768 mH		Oberfläche DIN ISO 1302	Masstab: 1:1.5		Masse:
							Werkstoff:		
					Datum	Name	Benennung:		
				Gez.	19.04.2002	SCHWARZ	Schaltplan		
				Gep.	21.08.2002	SCHWARZ	Mariner320-E;7,5kW		
				Freig.	21.08.2002	EDBCUSTO			
							BAUER KOMPRESSOREN	Zeichnungs-Nr. 80228	Blatt 0
ab									
Zust.	Änderung	Datum	Name						



Für diese techn. Unterlage wird jeglicher gesetzlich vorgesehene Rechtsschutz nach DIN 34 in Anspruch genommen.				zul. Abw. ISO 2768 mH		Oberfläche DIN ISO 1302	Masstab: 1:1		Masse:
							Werkstoff:		
					Datum	Name	Benennung:		
				Gez.	06.08.2002	SCHWARZ	Schaltplan		
				Gep.	21.08.2002	SCHWARZ			
				Freig.	21.08.2002	EDBCUSTO	Mariner320-B;m.KAA		
							BAUER KOMPRESSOREN	Zeichnungs-Nr. 80862	Blatt 0
aa									
Zust	Änderung	Datum	Name						

11095 Connecting values for 3 phase motors

Drive motor power in KW	Operating voltage 230 V: Nominal current of motor in A	Fuse protection for starter in A: direct	Fuse protection for starter in A: star/delta (Y-Δ)	Lead-in wire gauge in mm² from...: mains to relay	Lead-in wire gauge in mm² from...: (Y-Δ)	Drive motor power in KW	Operating voltage 400-500 V: Nominal current of motor in A	Fuse protection for starter in A: direct	Fuse protection for starter in A: star/delta (Y-Δ)	Lead-in wire gauge in mm² from...: mains to relay	Lead-in wire gauge in mm² from...: (Y-Δ)
1,1	4,6	6		1,5	1,5	1,1	2,6	4		1,5	1,5
1,5	6,3	16		1,5	1,5	1,5	3,6	6		1,5	1,5
2,2	8,7	20		1,5	1,5	2,2	5	10		1,5	1,5
3	11,5	20		2,5	1,5	3	6,6	16		2,5	1,5
4	14,8	25	20	2,5	1,5	4	8,5	20	16	2,5	1,5
5,5	19,6	35	25	4	2,5	5,5	11,3	25	16 / 20	2,5	1,5
7,5	26,4	50	35	6	4	7,5	15,2	25	20	2,5	1,5
11	38	63	50	6	4	11	21,7	35	25	4	2,5
15	51	80	63	10	4	15	29,9	50	35	6	4
18,5	63	100	80	16	6	18,5	36	63	50	6	4
22	71	100	80	16	6	22	41	63	50	10	4
30	96	160	125	25	10	30	55	80	63	10	6
37	117	200	160	35	16	37	68	100	80	16	6
45	141	250	160	50	16	45	81	125	100	25	10
55	173	300	200	70	25	55	99	160	125	25	16
75	233	355	300	95	35	75	134	200	160	35	25
90	279	425	355	120	50	90	161	224	200	50	25
110	342	500	400			110	196	250	224	70	35
132	401	630	500			132	231	300	250	95	50
160	486	630	630			160	279	355	300	120	70

Annotations:

1. This table contains approximate values without obligation and is applicable for BAUER units only.
2. The values are based on the current norms DIN VDE 0100 and 0113 and on the standard rules.
3. For units without starter relay (direct switch-on), use the wire gauges of "mains to relay" from mains to motor.

Oil list • Breathing air compressors

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 air**	**N** **Nitrox**	**+5 ...+45 °C**
BAUER KOMPRESSOREN	Special Compressor oil Part no. N28355 b) c)	**S**	**+**	**+**	**+**
BAUER KOMPRESSOREN	Special Compressor oil Part no. N22138 a)	**M**	**+**	**–**	**+**

Oil type

S	synthetic oil
M	mineral oil

Application

A	approved for breathing air application with **BAUER** air purification systems
N	approved for nitrox application (with **BAUER** membrane unit, only)
a)	oil change every 1000 operating hours
b)	oil change every 2000 operating hours
c)	oil change every 1000 operating hours in case of nitrox application

Suitability

+	= 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 on page 1.

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. N28355**
Nitrox compressor units:	**BAUER Special Compressor oil, part no. N28355**

For operation under difficult conditions, such as continuous running and/or high ambient temperatures, we only recommend the BAUER special synthetic 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 the mineral oil acc. to the list on the previous page. This oil is suitable for ambient temperatures between +5 °C and +45 °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.
- Change oil filter, if applicable.
- Fill compressor with the new oil.
- After approx. 100 operating hours, replace oil filter again (if applicable). and change oil.
- 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 every two years
Oil change volume	see compressor unit operating manual

BAUER compressor oil is available in the following quantities:

Oil quantity ◂▸ Oil type ▸	**Synthetic oil N28355**	**Mineral oil N22138**
0.5 ltr. bottle	part no. N28355−0,5	part no. N22138−0,5
1 ltr. bottle	part no. N28355−1	part no. N22138−1
5 ltr. container	part no. N28355−5	part no. N22138−5
20 ltr. container	part no. N28355−20	part no. N22138−20