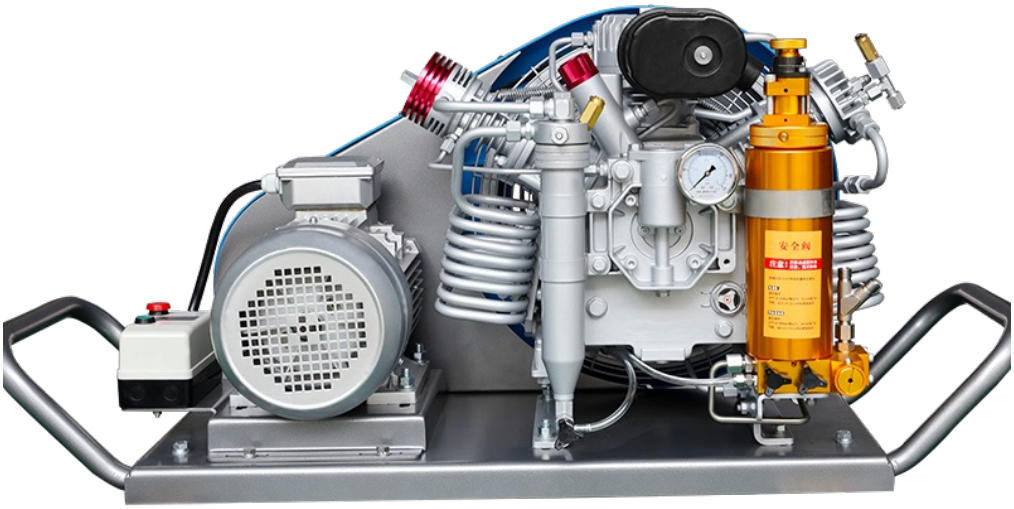
Muskwell
Breathing Air Compressor

Operator's Manual

High Pressure Breathing Air Compressor



Model: AG320

Muskwell Safety Tech Co., Ltd
Jiaxing, Zhejiang Province, China
www.muskwell.com

MANUFACTURER

Muskwell Safety is dedicated to providing innovative safety solutions tailored to meet the evolving needs of various industries. Our mission is to ensure the well-being of workers and the protection of assets by delivering high-quality safety products and services.

Our Offerings:
•Personal Protective Equipment (PPE)
•Workplace Safety Training Programs
•Safety Audits and Compliance Consulting
•Emergency Response Planning

Why Choose Muskwell Safety:
•Expertise: Our team comprises seasoned professionals with extensive experience in occupational safety.
•Quality: We prioritize the highest standards in our products and services to ensure maximum protection.
•Customer-Centric: We work closely with our clients to develop customized safety solutions that align with
• their specific requirements.

At Muskwell Safety, we believe that a safe workplace is a productive workplace. Our commitment is to partner with organizations to foster environments where safety is ingrained in the culture.

INSTRUCTION

This manual contains general information and instructions to operate high pressure breathing air compressor units.

Before taking the compressor into operation it is essential to study the instruction manual of that compressor.

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

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

WARNING

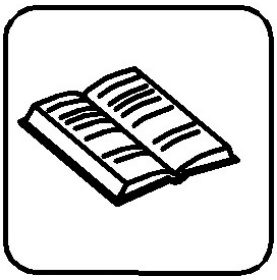
The breathing air produced with this high pressure compressor is sub-ject to strict quality standards. Ignoring the operating and maintenance instructions can lead to severe injury or in serious cases even death.

We reserve the right to make changes to the technology of our com-pressors as well as to this accompanying documentation in accordance to technical progress.

Edition January 2025

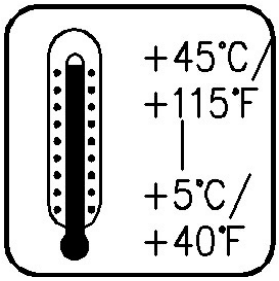
Muskwell Safety Tech Co., Ltd, China

Brief Description of the Warning Icons

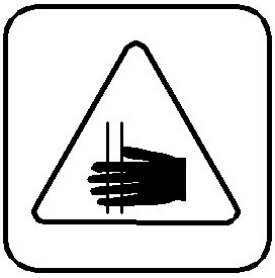


Read the manual before operating

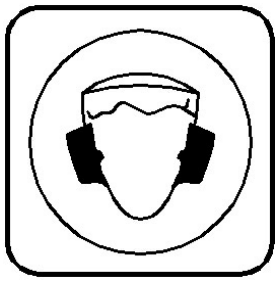
Keep away from hot surfaces



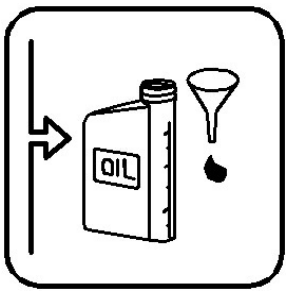
The operating temperature range



No tough when machine is running



Wear PPE when operating



Check oil level before operating

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1. General

1.1. Purpose and short description

High pressure compressor units are complete units for filling air tanks in the high-pressure ranges 200 and 300 bar. The compressors are mainly used to compress air for breathing as required in fire fighting and diving applications, for instance.
The heart of this unit is formed by a three stages, air-cooled high pressure compressor block.

1.2. Theoretical principle

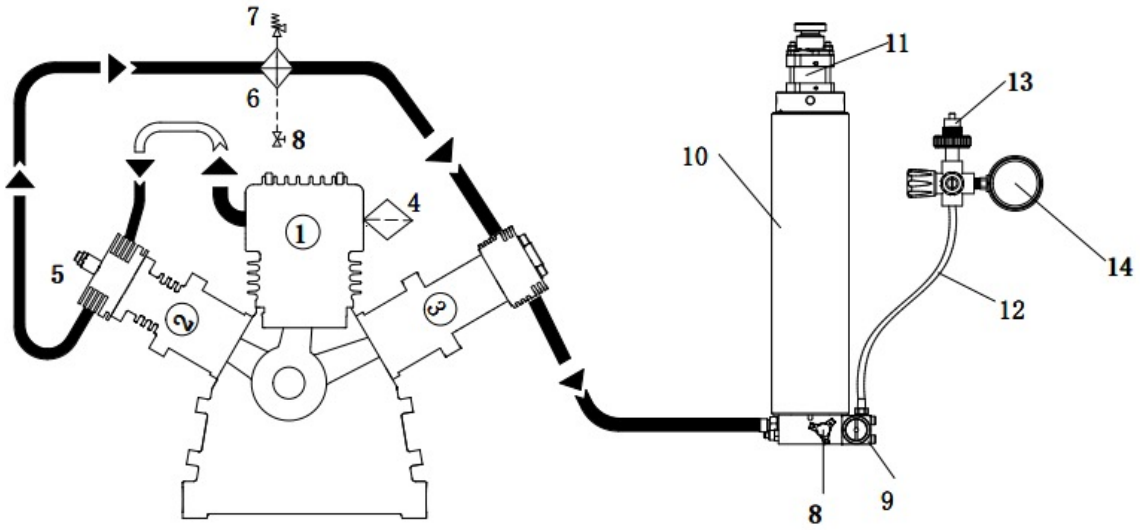
The piston compressor achieves gas compression through the reciprocating motion of the piston in the cylinder. When the piston moves from the top dead center to the bottom dead center, the volume of the cylinder increases, the pressure decreases, and the outside air enters the cylinder under the action of the pressure difference (intake process). When the piston moves from the bottom dead center to the top dead center, the gas in the cylinder is compressed and the pressure gradually increases. When the pressure exceeds the resistance of the exhaust valve, the compressed gas is discharged (compression and exhaust process). This process is repeated to achieve continuous gas compression.. This is the main reason for designing compressors with 3 or 4 stages.

1.3. Design and mode of operation

The compressor unit comprises the following major assemblies:
- Compressor block
- Drive motor
- Filter set
- Fan cover components
- Base and frame assembly
- Electric control system
- Filling hose and connectors

Working principle of compressor

The air is drawn in through inlet filter(4), it enters the first-stage cylinder through the inlet valve of the first-stage cylinder and then being compressed by the first-stage cylinder, then enters the first-stage cooler through the outlet valve of the first-stage cylinder, the cooled air enters the 2nd-stage ②. The compressed air enters the 2nd-stage cooling pipe through the outlet valve of the 2nd-stage cylinder and then enters the 3rd-stage cylinder after being treated by the oil-water separator. The air compressed by the 3rd-stage cylinder enters the 3rd-stage cylinder through the outlet valve of the 3rd-stage cylinder cooling pipe, and then into the ⑩F12 filter system, the filtered pure air is discharged through the filling hose.



1. 1st stage cylinder; **2.** 2nd stage cylinder; **3.** 3rd stage cylinder; **4.** Inlet filter; **5.** 1st stage safety valve; **6.** 1st stage inter-cooler; **7.** 2nd stage safety valve; **8.** Manual condensate drain tap; **9.** Pressure maintenance valve; **10.** F09 filter system; **11.** 3rd stage safety valve; **12.** Air filling hose; **13.** Air filling connector; **14.** Pressure gauge;

1.4. Warranty terms

Muskwell provide two-years warranty, and the warranty period starts from the date of shipping. During the warranty period, Muskwell provides repair or replacement of the product components.

The compressor must be regularly and irregularly maintained in accordance with the contents of this manual. If the machine is not maintained according to the instructions in the maintenance schedule of this manual, or the compressor is disassembled without contacting Muskwell, we will not be responsible for the relevant warranty.

At the same time, Muskwell will not responsible for the warranty for faults and damages caused by unauthorized operators.

Muskwell guarantees that the spare parts used in our compressors have been designed and processed qualified, spare parts available to replace more than 10 years for the compressors.

Customers should pay attention: within 2 months after discovering the problem, they must report the fault of the machine to Muskwell, otherwise we will not be able to provide warranty service.

The warranty covers only compressors that have been regularly maintained in accordance with the instructions in this manual.

The warranty does not cover damages or failures caused by mis-operation of the compressor, exposure to open air(such as rain, etc.), or transportation. Material wear and accessories that require regular replacement and maintenance are not covered by the warranty and must be purchased by the customer.

Modifications to the machine without authorization from Muskwell will automatically invalidate the warranty.

The cost of repairing and replacing compressors due to defects in design, processing or materials will be borne by Muskwell. Shipping and material costs for wearing parts, etc. shall be borne by the customer.

If the warranty work must be carried out at the customer's site, the travel expenses of Muskwell staff shall be borne by the customer.

Machine failures reported by customers themselves are not necessarily covered by the warranty. Repairs or replacements provided by Muskwell during the warranty period do not automatically extend the warranty period.

Muskwell is not responsible for any other direct or/and indirect losses caused by compressor failure.

All parts are specified by Muskwell Safety Tech Co., LTD. For the safety of you and the machine, please use parts that meet the specifications of Muskwell Safety, so that the compressor can work perfectly.

Muskwell after-sales service:

If you have any technical questions about maintenance and repairs, please contact our after-sales service.

2. Safety regulations

2.1. Notes and warning notices

Potential injuries to personnel (including important technical and operational safety contents) will be marked with the following notes and signs for emphasis.
Attention and warning signs:

This symbol is set to prevent damage to the machine and its accessories.

WARNING: <u>Hot surfaces, do not touch!</u>
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.

<u>Ensure correct direction of rotation</u>!

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

2.2. Authorized Operation

- The machine is built according to the 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 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 is exclusively for the compression of mediums (air/gas) specified in section 3.2 "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. Organizational measures

- Keep the instruction manual to hand near the machine at all times in the relevant holder.
- In addition to the instruction manual, observe and comply with universally valid legal and other obligatory regulations regarding accident prevention and environment protection. This can involve, for example, contact with hazardous substances or the provision / wearing of personal protective equipment.
- In addition to the instruction manual, provide supplementary instructions for supervision and monitoring duties taking into consideration exceptional factors e.g. with regard to organization of work, production, personnel employed.
- Personnel engaged to operate the machine must have read the instruction manual before beginning work, especially the safety notices chapter. When work is already underway it is too late. This is particularly relevant for temporary personnel, e.g. maintenance personnel.
- Personnel may not wear long hair loose, loose clothing or jewelers, including rings. There is a danger of injury through, for example, these getting caught or being pulled into the equipment.
- Observe all safety and danger notices on the machine.
- No modifications may be made to the machine which could impair safety without first obtaining permission from the suppliers. This is also the case with regard to installation and adjustment of safety devices and valves as well as welding of piping and reservoirs.
- Spare parts must always comply with the technical requirements specified by the manufacturer. This is always guaranteed with original spare parts.
- Piping must be thoroughly checked (pressure and visual inspection) by the operator at appropriate time intervals, even if no safety related faults have been noticed.
- Intervals stipulated or given in the instruction manual for recurring checks/inspections must be adhered to.
- It is absolutely essential that the workplace is appropriately equipped for maintenance measures.
- Make sure location and operation of fire extinguishers is known.

2.4. Qualifications and basic responsibilities

- 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 repair work.
- 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 unfavorable 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.

2.5. Safety measures for operation

- Do not carry out any work if safety is questionable.
- Meet all requirements demanding that the machine is only operated in safe and good working order.
- At least once every day, check the machine externally for damage and faults. Inform the department or person responsible immediately if anything is not as is should be (including operation). If necessary, shut the machine down immediately and make it safe.
- Observe switching on and off processes and monitoring indications according to the instruction manual.
- Carry out the setting, maintenance and inspection processes at the intervals specified in the instruction manual, including replacement of parts or equipment. This work may only be carried out by qualified personnel.
- Before carrying out any exceptional work or repair work, operating personnel should be informed. Call the supervisor.
- For all work concerning operation, change in production, conversion or regulating of the machine and its safety measures such as inspection, maintenance and repair work, 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 is completely switched off for maintenance and repair work, 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.

➢ Clean oil, fuel or care products from the machine, in particular the connections and screw joints, before carrying out maintenance or repair work. Do not use aggressive cleaning fluid. Use a fiber free cleaning cloth.

- Before cleaning the machine with water or jet of steam (high pressure cleaner) or detergent, cover or seal all openings which for safety and/or operating reasons no water or steam or 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.
- After cleaning, check all pressure lines for leaks, loose connections, wear and damage. Immediately eliminate any faults.
- Always re-tighten any screw connections loosened for maintenance or repair work.
- If it is necessary to remove safety devices for maintenance and repair work, these must be replaced and checked immediately after completion of the maintenance or repair work.
- Ensure safe and environmentally friendly disposal of consumables and old parts.

2.6. 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 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 repair work, 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 neighboring 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.
- 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 pneumatic 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 repair work.
- Regularly inspect all pressure lines, pipes and coil connections for leaks and visible damage. Clean up immediately if damaged. Escaping air or gas can cause injury or fire.
- 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.
- 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.

2.7. Notice of danger regrading pressure vessels

- Never open or loosen pressure vessel lids or pipe connection parts under pressure; always depressurize 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!).
- After cleaning, remove all seals and coverings.
- Always pay attention to the permissible operating mode of the pressure vessels.
- 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.

- 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 characterize 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.

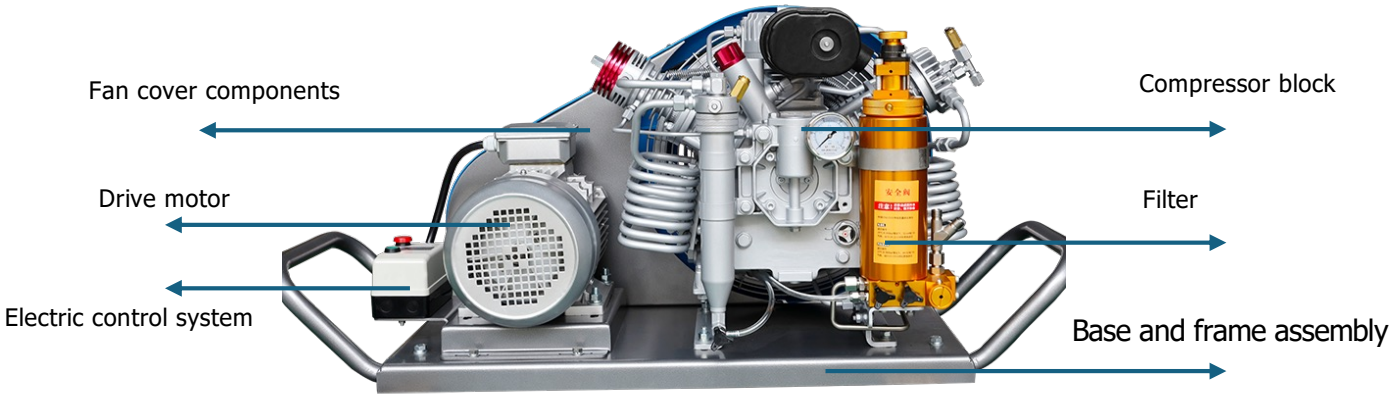
- Having reached half the permissible number of cycles, the vessel has to be submitted to an internal check, in which the critically stressed areas of the vessels are examined by means of suitable testing methods, in order to ensure the operating safety.

- 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 aluminum liner carbon fiber cylinders should be exchanged after 15 years while the hydrostatic testing every 5 years according to EN12245 standard.

3. Technical specifications

The compressors produced by Muskwell are mainly used for the inflation (filling) of air breathing apparatus cylinders. The compressed air is high quality and complies with the current highest European standard EN12021.



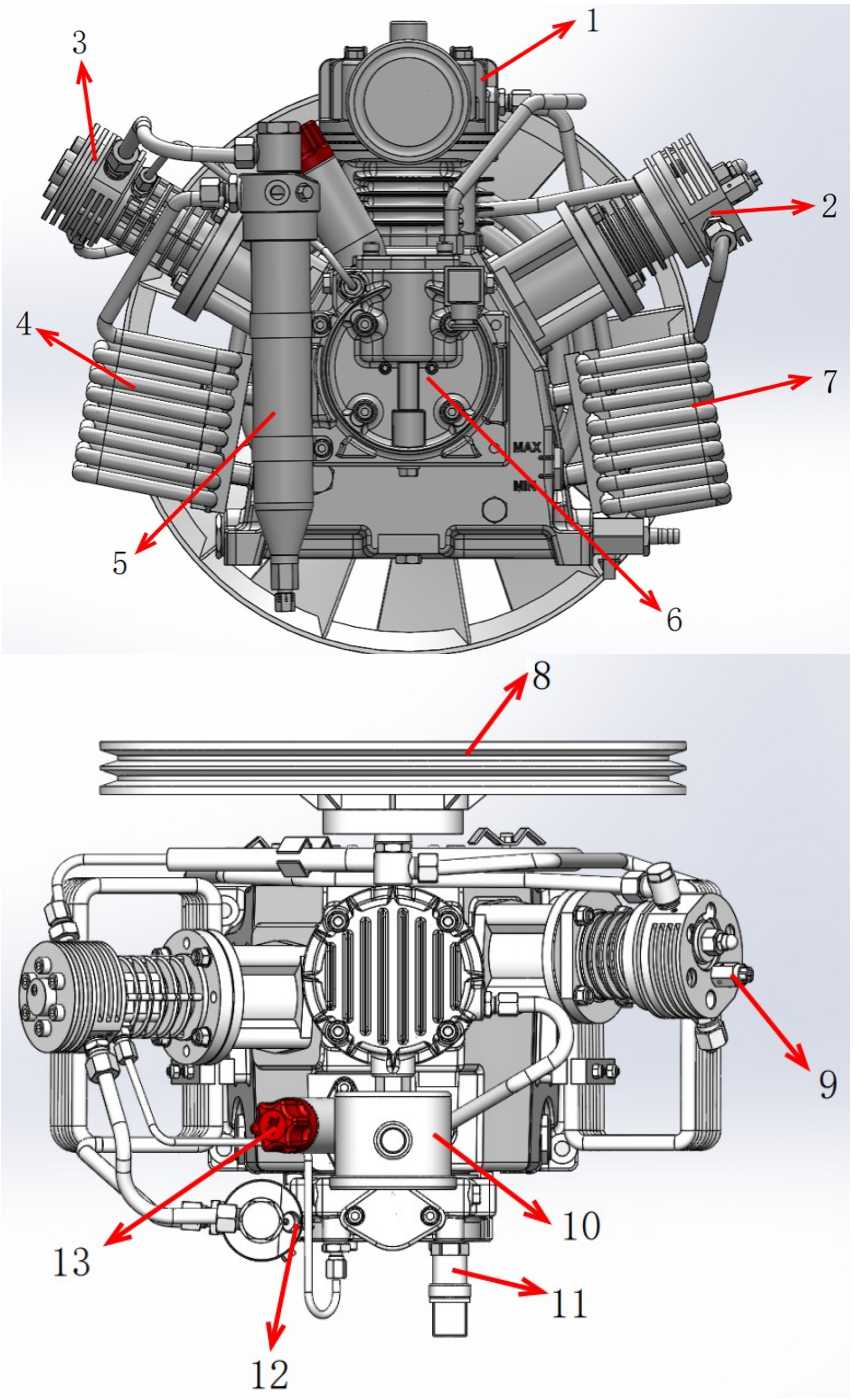
3.1. Compressor structure

The compressor unit compresses air up to 300 bar (4700 psi).

The compressor unit is a three-stage, three-cylinder design. The cylinders are arranged in a W-shape, and when viewed from the filter side, the 1st stage is in the center, the 2nd stage is on the right, and the 3rd stage is on the left.

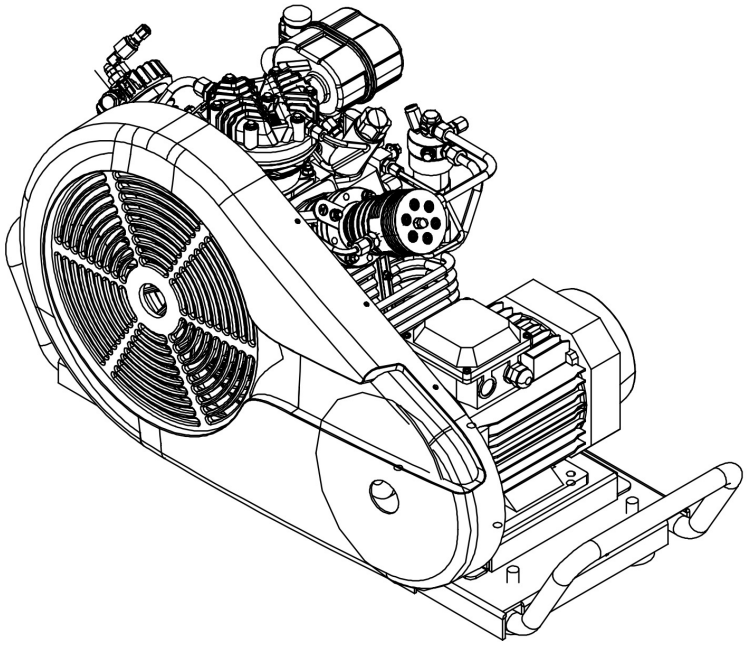
The compressor units are suitable for continuous operation because of their rugged design and the corrosion-resistant intermediate filter and cooling assemblies. Smooth running is a particular feature of our design. The balance of masses of the 1st rank is zero. The moving parts of the driving gear have been tested are all equally balanced, This results in a vibration-free running.

The driving gear is fitted with energy saving cylinder roller bearing. The upper and lower connecting rods bearings are also roller bearings. This allows for any even longer life which lasts at least 30,000 operating hours.



1. 1st stage cylinder assembly 2. 2nd stage cylinder assembly 3. 3rd stage cylinder assembly 4. 2nd stage cooling pipe 5. 2nd stage oil-water separator 6. lube oil system 7. 1st stage cooling pipe 8. fan assembly 9. 1st stage safety valve 10. 1st stage inlet filter 11. sensor for cylinder oil pressure 12. 2nd stage safety valve 13. oil filler neck

Remarks: The compressor driven by the engine is only different in the driving mode, and the rest of the components are the same.



3.2. Technical data

Technical data	AG320
Charging rate	≥300L/min
Max. working pressure	225bar / 330bar (3200/4700 psi)
Speed	1800r/min
Stages of compression	3
Stroke	40mm
Medium	air
Inlet temp.(min/max)	5~45℃
Drive method	Three-phase motor
Power	7.5KW
Voltage	230V~480V
Oil tank capacity	2.5L
Noise level	≤87dB
Volume(L*W*H)(mm)	1100×520×570
Weight(Kg)	140
Air quality	Comply with EN12021 Standard

4. Installation, operation

4.1. Installation of the compressor unit

All compressor 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 are familiar with the function of all controls and monitors especially the safety regulations.
- Prior to **first** operation fill with oil. After taking unit into operation after a standstill period of 2 years or more change compressor oil. When using a mineral oil, change oil after one year.
- Prior to **each** operation check the oil level and determine whether maintenance is necessary in accordance with the manual stipulated..
- Before each operation, it is necessary to check whether all systems are normal. If any problem is found, stop the machine immediately, check the cause or notify the maintenance department.

4.2. Compressor room conditions

The compressor is not sea water proof. When operating in air with high salinity, spray rust inhibitor.

Keep the machine away from flammable and explosive materials. Do not smoke while the cylinder is on or the machine is in operation.

- Make sure that the area where the compressor is placed is well ventilated and free from dust and explosion, corrosion or fire hazards.
- Also, the air must not be polluted by exhaust or toxic gases (e.g: smoke, volatile gases, etc.).
- If possible, install the machine in a location where fresh air can be drawn directly from the outside, for example, by making a hole in the wall.
- Make sure there are adequate exhaust outlets.
- When the machine is installed in a small room with insufficient natural ventilation, artificial ventilation must be installed (this also applies to radiators with other equipment working in the same room).
- If the ambient temperature exceeds 45°C, use an air conditioner to cool down.
- Make sure that the compressor is located at least 1 meter away from the wall and at least 1.5 meters away from the ceiling, so as to ensure the normal operation of the compressor and the normal cooling of the unit.
- Ensure that the area where the compressor is located is well lit and that the various components and headings are clearly visible.

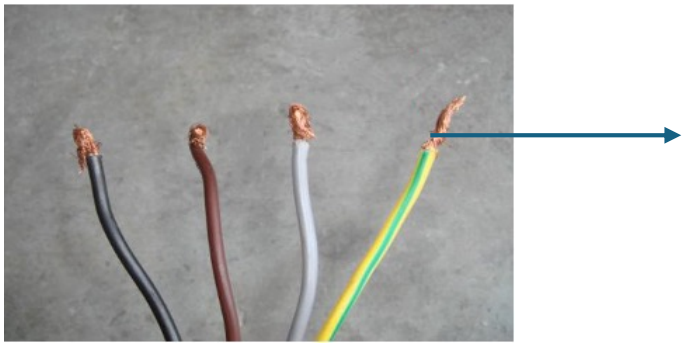
4.3. Electrical installation

4.3.1. Precautions for electrical installation

The installation of electrical equipment must comply with the following items:

- Comply with local power company regulations.
- Arrangements for electrical installations to be connected must only be made by an electrician.
- Check the compliance of the voltage frequency of the motor with the voltage and frequency of the grid.
- For installations not connected by plugs, but which are permanently installed, a main switch shall be provided with a minimum contact gap of 3mm on each pole.
- Check immediately after starting that the direction of rotation corresponds to the direction of the arrow on the unit.

If the main cable should be replaced, use only the same type of cable!



4.3.2. Connecting the power supply

- This compressor is a three-phase motor-driven compressor, the power wires are four cores, one ground wire and three power wires.
- Check that the data on the compressor technical data correspond to the power supply, especially the rated voltage and current.
- The power supply must have an effective ground wire, check that the resistance of the ground wire is consistent with the protection/operation requirements of the compressor.

4.4. Filling lubricated oil and check the oil level

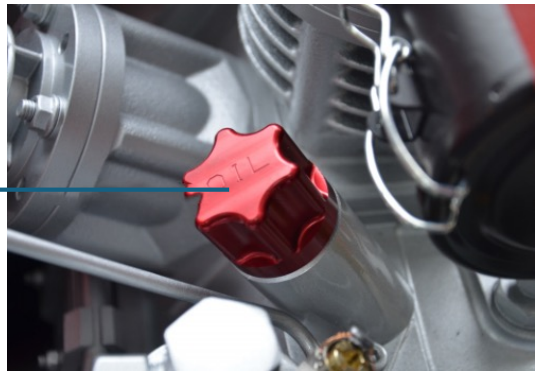
All pistons, cylinders, main parts, and connecting rod bearings are mechanically lubricated. When the compressor is delivered, there is no lubricating oil in the machine, but there is 2.5L oil in the package.

Refilling capacity	2.5 liter
Recommended oil	CE750

Refueling steps:

1. Carefully open the top cover of the oil filling barrel.
2. Do not overfill with oil.
3. Check the oil level indicator glass and observe the amount of oil filled.

Oil Cover



Check oil level:
After filling 2.5 liters of lubricating oil, observe the oil level indicator glass.
The oil level should be exceed one-half of the oil level indicator glass.

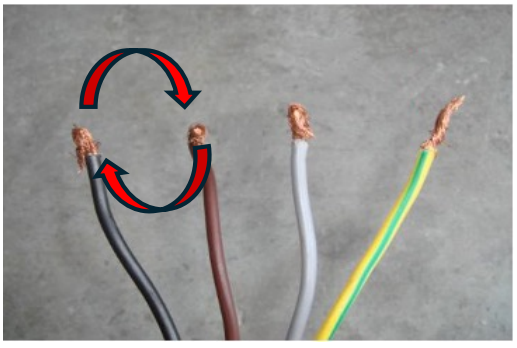
Before the compressor starts working every day, the oil level must be checked.

4.5. Push buttons as ON/OFF switch

Push green button to start the compressor, push red button to stop the compressor.

4.6. Pay attention to the follows after start the compressor

After start the compressor, check the direction of rotation of the motor immediately. If it shows that the direction of rotation is wrong, then disconnect the power supply and exchange the positions of two phases among the three phases (as shown in the figure).



If the direction is not correct, please swap the two wires

Re-start the compressor, confirm if rotation is correct.
Press the stop button (red) to turn off the compressor and turn the power off button switch counterclockwise.

4.7. Filling the cylinder

Make sure the fresh air is free from toxic, exhaust, or volatile gases. It is very important to use a fresh air suction hose to ensure only fresh air is used.

Before filling for the first time, check the last stage safety valve and the filling connection are compatible with the working pressure.

Operation method: close the filling valve and start the compressor. Boost the compressor and the pressure gauge will begin to show an increasing in pressure after the pressure maintenance valve opens (approximately 1 minute after start-up). The pressure will continue to increase until the safety valve vents the air. If the safety valve does not release air, the compressor exceeds the operating pressure, please manually shut down the compressor and contact a technician.

Only fill cylinders that meet the following requirements:

- Cylinders used for filling must pass regular inspections by the national safety inspection department before they can be used.
- Cylinders with a valid test pressure label attached.
- Cylinders and valves are not damaged or corroded.
- There is no any moisture or dirt in the cylinder.

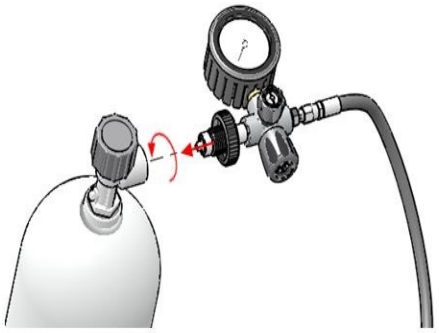
Breathing air must be dry. Moisture in the air may cause corrosion to the inside of the machine and/or freeze the pressure reducer. This may cause serious injury or even death to the human body.

4.7.1. Cleaning the compressor

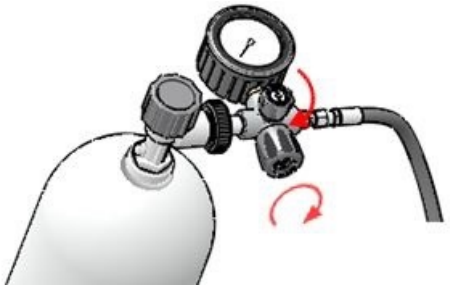
Carbon dioxide in the air is at 350 to 400 ppm level. The molecular sieve of the filter system can absorb the carbon dioxide accumulated in the filter cartridge. After the compressor is turned off, the absorbed carbon dioxide may be released again due to the reduction of partial pressure, so after restarting, the carbon dioxide in the filter cartridge needs to be flushed out. To prevent high concentrations of carbon dioxide in the compressed breathing air, we recommend flushing the compressor for one or two minutes before connecting the cylinder, e.g by venting the compressed air directly into the atmosphere.

4.7.2. Main steps for filling cylinders.

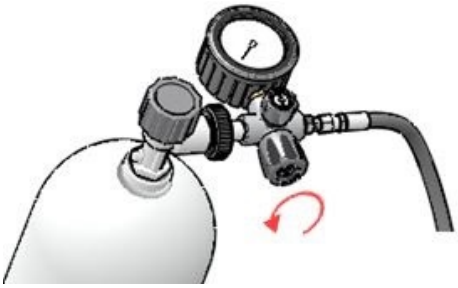
(1)Connect the filling valve to the cylinder



(2)Close the vent valve



(3)Press the start button(green) on the motor's switch box to start
(4)Close the blow-down valve on the compressor(rotate counterclockwise)
(5)Open the filling valve



(6)Open the cylinder valve

(7)When the specified working pressure
(8)Close the filling valve and turn off the compressor

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