



KAYDRILL SERVICE DOCUMENTATION

Screw Air Compressor Operation & Maintenance Manual

Electric Units

For KayDrill electric screw air compressors
Portable & stationary units

▲ Read this manual carefully before operating or servicing the machine

Inside

- Safety
- Product & models
- Principle & systems
- Controls & gauges
- Installation & operation
- Maintenance
- Troubleshooting



Zhejiang Kaizuan Machinery Co., Ltd.

KayDrill • Air power solutions for demanding sites

2026

Edition 1 • Supplied with the machine

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PREFACE

To Our Customers

Thank you for choosing a KayDrill rotary screw air compressor. Zhejiang Kaizuan Machinery Co., Ltd. specializes in compressors and mining equipment. Our product range covers portable and stationary, diesel-driven and electric screw air compressors, widely used in mining, highway, railway, bridge, tunnel, water conservancy, drilling and industrial applications.

This manual (Electric Units) applies to KayDrill electric-motor-driven screw air compressors (portable and stationary). It covers safety instructions, operating principles, the control system, installation, operation, maintenance and troubleshooting. Reading and following this manual carefully will help you avoid hazards, improve productivity, reduce repair costs and extend the service life of the machine.

Intended Readers

- Equipment managers and operators;
- Maintenance and repair personnel;
- Personnel responsible for transport, lifting and installation.

This manual is an integral part of the machine. It must be kept with the machine, stored properly, and handed over with the machine if ownership is transferred. If you have any questions after reading it, contact your local KayDrill dealer or the KayDrill after-sales service department (see the back cover for contact details).

Portable and Stationary Units

Portable and stationary units with the same drive type share the same airend, oil/air system, control principle and maintenance procedures; they differ mainly in the chassis and mounting method. This manual covers both. Content that applies to only one type is marked with a label:

Portable

Units with a running gear that can be towed between sites. Content on towing, parking and parking brakes applies to portable units only.

Stationary

Units installed in a compressor room or on a fixed foundation. Content on foundations, compressor room ventilation and piping network connection applies to stationary units only.

Content in this manual marked with this label applies to electric units only.

Important Notice

Always observe the following

1. Only use dedicated screw compressor oil supplied by KayDrill or an authorized KayDrill dealer. KayDrill accepts no liability for failures caused by non-conforming oil.
2. Use only genuine KayDrill parts for repairs and replacement. KayDrill accepts no liability for machine failures caused by non-genuine parts.
3. Do not modify the internal structure, control method or safety device settings of the unit without written approval from KayDrill.

KayDrill products are continuously improved, and details in this manual may differ from the actual product without prior notice; the actual product and on-machine labels shall prevail. Unless otherwise specified, all pressures in this manual are gauge pressures; $1 \text{ MPa} = 10 \text{ bar} \approx 10 \text{ kgf/cm}^2$.

CHAPTER 01

Safety Instructions

KayDrill air compressors are carefully designed and manufactured for safe and reliable operation. Ultimately, however, safe operation depends on the people who operate and maintain the machine. Most accidents result from ignoring basic safety rules. Read and fully understand this chapter before operating, lubricating, maintaining or repairing the machine.

1.1 Safety Symbols

Hazard notices in this manual and on the machine carry the safety alert symbol ▲ together with a signal word:

▲ DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

▲ WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

▲ CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or damage to the machine.

Pictogram labels are affixed to the machine for lifting points, fan hazard, belt entanglement, hot surfaces, pressure hazard, oil drain, coolant drain, main power switch, etc. Keep labels clean and intact; if a label is damaged or missing, obtain a replacement from KayDrill and reapply it.

1.2 General Rules

- Only trained and authorized personnel may operate and maintain the compressor. Read this manual carefully and fully understand its contents before operation.
- Never start the unit in an unsafe condition. If a problem is found, do not attempt to start the machine; isolate the power source and attach a clear warning tag to prevent operation by others.
- Compressed air is dangerous. Carry out repair and maintenance only after confirming that all pressure in the system has been fully released.
- Installation, operation and maintenance of the machine must comply with local laws, regulations and standards.
- Perform routine maintenance. Inspect the unit daily for leaks, loose, damaged, maladjusted or missing parts, and rectify any problem promptly.
- Operators shall wear the required personal protective equipment: safety goggles, protective gloves, safety shoes, work clothes, hard hat and hearing protection.

1.3 Lifting Safety

- Lifting equipment must be suitable and comply with local safety regulations. Use only the designated lifting points on the machine, with a crane hook or shackle.
- Before lifting, check the lifting frame and lifting eyes for cracks and the bolts and nuts for looseness. Remove or secure all loose parts that could fall, and secure doors, drawbars and other movable parts.
- Do not place heavy objects inside the unit during lifting, as this may shift the center of gravity and unbalance the load. Wire ropes, chains or slings must not be bent over sharp edges.
- Use tag lines to prevent the machine from rotating or swinging once lifted. Do not lift in strong winds. Lift only as high as necessary.
- Keep lifting acceleration and deceleration within safe limits. The rigger must not leave the site while the machine is suspended. No one may stand, pass or rest within the lifting danger zone.
- When choosing a location to set the machine down, confirm the load-bearing capacity of the ground.

1.4 Pressure Hazards

- Manually open the safety valve at least once a week to confirm that it is not blocked, deformed or malfunctioning.
- Pneumatic tools, hoses and valves connected to the compressor must be correctly sized and have a maximum allowable working pressure higher than the rated discharge pressure of the compressor. Do not use worn or damaged hoses.
- Before connecting or disconnecting a hose, close the compressor service valve and confirm that the hose is fully depressurized. Before supplying air, make sure the other end of the hose is secured. A discharge hose may whip during operation; keep personnel clear.
- Do not apply external force to the service valve.
- Add oil only after the compressor has stopped and is fully depressurized. Release pressure before opening any pressurized component such as lines, plugs, fittings or oil filters.
- Never direct compressed air at people or use it for horseplay.
- Never weld on or modify the pressure vessel (separator tank) in any way.

1.5 Moving Parts, Hot Surfaces and Hazardous Substances

- Keep hands, other body parts and clothing away from fans, belts, couplings and other moving parts. Do not operate the compressor with guards removed.
- When working near moving parts, wear close-fitting work clothes, tie up and cover long hair, and do not wear jewelry.
- Keep the unit doors closed except during maintenance. Before starting, make sure no one is inside the unit. If you need to enter a large unit for maintenance, inform other personnel.

- During operation, the surfaces of the separator tank, airend, discharge pipe, coolers, etc. are very hot; do not touch them. Never position any part of your body directly in front of the discharge outlet.
- Air delivered by the compressor is not fit for breathing. Operate the machine only outdoors or in a well-ventilated area. Keep the air intake away from fuel gas, exhaust fumes and toxic or corrosive substances.
- Pipes and parts with temperatures above 80 °C that may be touched accidentally shall be guarded or insulated and clearly marked.
- A first-aid kit shall be available. Treat injuries immediately; do not neglect minor cuts and burns that may become infected. Keep the ground around the unit clean and remove oil and water promptly to prevent slipping.

1.6 Electrical Safety

- Electrical installation, wiring and servicing must be performed by licensed electricians. Before servicing or adjusting electrical parts, disconnect the main power supply and hang a "Under Maintenance - Do Not Switch On" warning tag.
- The unit must be reliably grounded, with grounding resistance complying with local electrical codes.
- Prevent your body, hand tools and other conductive objects from touching exposed live terminals. Keep the unit, tools and personnel at least 3 m away from overhead power lines.
- Carry out repairs in a clean, dry and well-ventilated location. Stay away from the compressor during lightning.
- Keep the control cabinet door closed during operation to keep out dust and moisture.

1.7 Maintenance Safety

- Before maintenance or repair, stop the machine, shut off the power source, disconnect the power supply and release all pressure in the system. Attach a "Under Maintenance - Do Not Start" tag to the starting device; on machines with remote control, disable the remote control.
- Use only the correct tools, and perform maintenance only after the machine has cooled down sufficiently. Use genuine KayDrill parts for replacement.
- Keep exposed openings clean during maintenance to prevent foreign matter from entering the inlet valve, separator tank and airend. Protect the air filter, electronic components and control devices from water and oil.
- Do not weld or perform other hot work near the lubrication system. Never use an open flame as a light source to inspect the interior of the machine or pressure vessels.
- After repairs, make sure no tools, loose parts or rags are left inside or on the machine. Check that all control and shutdown devices are installed and working properly, and that working pressure,

temperature and time settings are correct.

- Each time the separator element is replaced, inspect and remove carbon deposits from the oil return line and the inside of the separator tank.
- Keep sound insulation materials in good condition; replace damaged material with genuine parts.
- **Portable** It is recommended to inflate tires with dry nitrogen.

1.8 Remote Control and Multi-Compressor Systems

- Machines fitted with remote control must carry a clear warning: "DANGER: This machine is remotely controlled and may start without warning." Before starting remotely, make sure no one is inspecting or working on the machine.
- When several compressors supply air in parallel, each must be fitted with a manual shut-off valve for isolation; never rely on check valves alone to isolate a pressure system.
- Do not remove or tamper with safety devices, guards or insulation on the machine.

CHAPTER 02

Products and Models

KayDrill screw air compressors use an oil-injected twin-screw airend driven by an electric motor, integrating the airend, drive, oil separation, cooling and control systems in one unit. Understanding the model designation and nameplate information is the first step toward correct operation, parts ordering and after-sales support.

2.1 Model Designation

The model designation of electric units consists of the series, motor power and operating condition, e.g. **DM250-31/25**: DM = electric screw air compressor (M series); 250 = motor power 250 kW; 31/25 = free air delivery 31 m³/min, rated discharge pressure 25 bar. DMT = permanent-magnet variable-frequency electric unit for tunneling; LGDY = LG series electric unit; suffix B = economy version of the same power.

KDY series electric screw air compressor designation, using **KDY-12/10** as an example: KD = KayDrill electric screw compressor; Y = portable; 12 = nominal volume flow 12 m³/min; 10 = rated discharge pressure 1.0 MPa (10 bar).

Table 2-1 KDY series electric screw air compressors: main specifications

Model	Volume flow m ³ /min	Rated pressure bar	Motor power kW	Unit weight kg	L × W × H mm	Air outlets
KDY-6.5/7G	6.5	7	37	1300	3090×1520×1500 (G) 2850×1520×1500	2-G3/4, 1-G1½
KDY-6.5/7	6.5	7				
KDY-5.6/10	5.6	10				
KDY-4.8/13	4.8	13				
KDY-7.4/7G	7.4	7	45	1400	3090×1520×1500 (G) 2850×1520×1500	2-G3/4, 1-G1½
KDY-7.4/7	7.4	7				
KDY-6.5/10	6.5	10				
KDY-5.6/13	5.6	13				

KDY-10.5/7G KDY-8.7/10 KDY-7.5/13	10.5 8.7 7.5	7 10 13	55	1700	3320×1660×1800	2-G3/4, 1-G1½
KDY-13/7G KDY-12/10G KDY-10/10G	13 12 10	7 10 10	75	2320 / 2400	3850×2040×1980 3320×1660×2000	1-G2, 1-G½
KDY-10/13	10	13	75	2320	3600×1840×2010	1-G½, 1-G2
KDY-16.5/7G KDY-14/10G KDY-12/13G	16.5 14 12	7 10 13	90	2500	3320×1660×2000	1-G½, 1-G2
KDY-20/7G KDY-16/10G KDY-13/13G	20 16 13	7 10 13	110	4000	3550×1740×2100	1-G1½, 1-G2, 1-G3/4
KDY-22/7G KDY-20/10G KDY-16/13G	22 20 16	7 10 13	132	4100	3550×1740×2100	1-G1½, 1-G2, 1-G3/4
KDY-27/8G KDY-23/10G KDY-20/13G	27 23 20	8 10 13	160	4400	3870×1820×2200	1-G1½, 1-G2, 1-G3/4
KDY-18/17G	18	17	185	4600	3950×1820×2200	1-G1/2, 1-G2
KDY-35/8G KDY-30/10G	35 30	8 10	200	4600	3870×1820×2250	1-G1½, 1-G2, 1-G3/4
KDY-26/20G	26	20	250	7200	4200×1950×2350	1-G2, 1-G3/4

The table lists typical KDY series data. For DM / DMT / LGDY series and stationary units, refer to the product brochure and the unit nameplate.

Detailed specifications of each model are subject to the latest KayDrill Product Catalog and the unit nameplate.

2.2 Nameplate and Serial Number

Each unit carries a product nameplate showing the model, free air delivery, rated discharge pressure, motor power, voltage and frequency, serial number and date of manufacture. **Always quote the complete model and serial number when ordering parts or contacting after-sales service:** as products are continuously improved, parts from different production batches of the same model may not be interchangeable.

2.3 Operating Environment

Table 2-2 Standard operating conditions

Item	Requirement
Ambient temperature	0 °C to +45 °C recommended. Below 0 °C, protect coolers and piping from freezing, and drain all condensate before extended shutdowns
Altitude	Standard models are suitable for altitudes up to 1000 m. At high altitudes, air delivery and power decrease; select a high-altitude configuration or consult KayDrill
Air	Intake air must be clean and free of flammable or explosive gases, vapors and particles (e.g. paint solvents). In dusty locations, fit a pre-filter and shorten the filter element service interval
Power supply	Three-phase 380 V, 50 Hz (special voltages per order). Voltage fluctuation must be within the motor's permissible range (generally not exceeding $\pm 5\%$ of rated voltage), and the three phase voltages should be essentially balanced
Site	Level and firm, with an inclination of no more than 15°; well ventilated, with sufficient space for heat dissipation and maintenance; protected from direct sunlight and rain

2.4 Main Components

Table 2-3 Main components of the unit

System	Main components
Airend	Male and female rotors, housing, bearings; driven by the electric motor via a coupling or belts
Intake system	Air filter (primary element + safety element), restriction indicator, inlet valve (inlet unloader valve)
Oil/air system	Separator tank, separator element (fine oil separator), minimum pressure valve, safety valve, oil return line and oil return check valve
Lubrication and cooling	Thermostatic valve, oil cooler, oil filter, cooling fan; aftercooler on some models

Regulation and control	Load solenoid valve, blow-down valve, pressure regulating valve (inverse proportional valve), pressure/temperature sensors, controller
Electrical system	Electrical control cabinet, main motor, fan motor, star-delta starting contactors (KM1/KM2/KM3), current transformers, microcomputer controller; DMT models use a variable-frequency drive
Portable Chassis	Frame, axle(s), tires, drawbar, parking brake, sound-insulated canopy

CHAPTER 03

Operating Principle and Systems

Once you understand how the air flows, how the oil circulates and how the controls respond, daily operation becomes straightforward and faults can be traced quickly.

3.1 Operating Principle of the Oil-Injected Screw Compressor

The airend contains a pair of intermeshing male and female rotors. As the rotors turn, the volume between the lobes cyclically decreases, performing intake, compression and discharge:

- 1 **Intake:** When the inter-lobe space reaches the inlet port of the housing, its volume is at maximum and it opens to the inlet. Air filtered by the air filter and passing through the inlet valve fills the grooves axially. Once the grooves rotate past the inlet port, the air is trapped between the lobes.
- 2 **Sealing and transfer:** At the end of intake, the rotor lobe tips seal against the housing so that the air in the grooves can no longer escape; as the rotors continue to turn, the meshing line moves progressively toward the discharge end.
- 3 **Compression and oil injection:** The inter-lobe volume between the meshing line and the discharge port decreases, compressing the air and raising its pressure. At the same time, oil is injected into the compression chamber by differential pressure and mixes with the air.
- 4 **Discharge:** When the inter-lobe space opens to the discharge port, the compressed air/oil mixture is expelled until the inter-lobe volume reaches zero. Meanwhile, a new intake begins at the inlet end, and the cycle repeats.

The injected oil serves four purposes:

Function	Description
Lubrication	Forms an oil film between the rotors, preventing direct contact and reducing friction; also lubricates the bearings
Cooling	Absorbs most of the heat of compression, bringing the process close to isothermal compression and lowering discharge temperature and power consumption
Sealing	The oil film seals the clearances between the rotors and between the rotors and housing, reducing internal leakage and improving volumetric efficiency
Noise reduction	Absorbs high-frequency compression noise

The quality, quantity and temperature of the oil therefore have a decisive effect on the performance and service life of the screw compressor.

3.2 Air and Oil Circuits

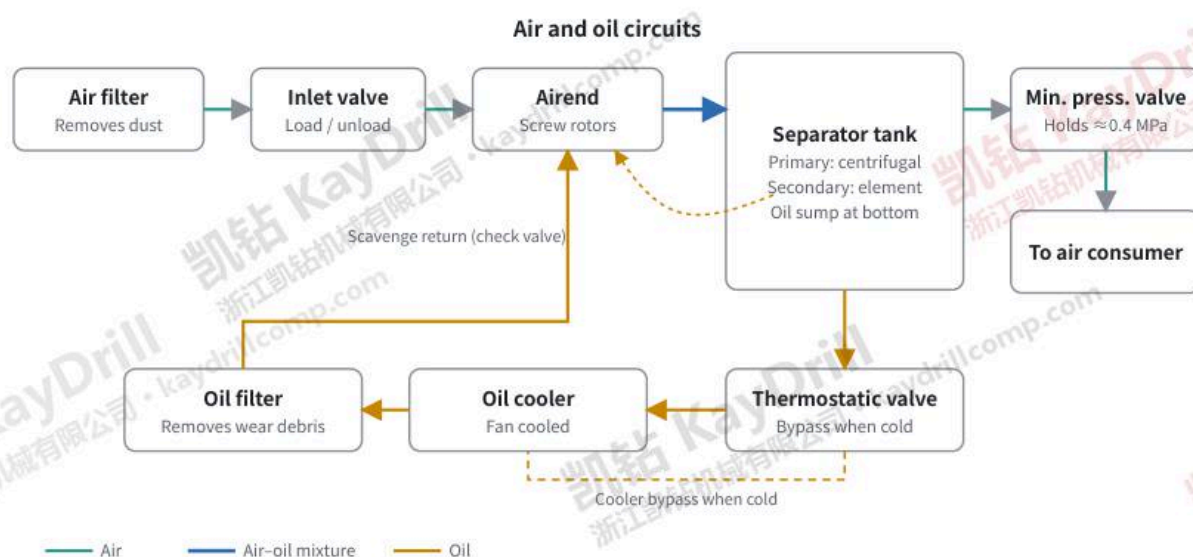


Figure 3-1 Air and oil circuit schematic

■ Air Flow

Ambient air is cleaned of dust by the **air filter**, then enters the airend compression chamber through the **inlet valve**, where it is mixed with oil and compressed. The compressed air/oil mixture is discharged into the **separator tank**, where most of the oil is separated by centrifugal action and gravity; the **separator element** then removes the remaining oil mist. Clean compressed air is delivered to the consumers via the **minimum pressure valve**, the **aftercooler** (some models) and the **service valve**.

■ Oil Flow

Pressure in the separator tank forces the oil out through the **thermostatic valve** and the **oil cooler**, then through the **oil filter** to remove impurities. The oil is then divided into two streams: one is injected into the compression chamber from the lower part of the airend to cool the compressed air; the other is routed to both ends of the airend to lubricate the bearings. All oil collects at the bottom of the compression chamber and is discharged with the compressed air into the separator tank. Residual oil collected by the separator element gathers at the bottom of the element and is returned to the airend via the **oil return line** and the **oil return check valve**.

Oil injection rate is factory-set

The oil injection rate directly affects discharge temperature and performance. It has been set by KayDrill technicians before delivery; do not change it arbitrarily. If adjustment is needed because the discharge temperature is too low or too high, contact KayDrill after-sales service first.

3.3 Main Components

Table 3-1 Functions of main components

Component	Function and key points
Air filter	Dry paper element with a filtration rating of approx. 10 μm , preventing premature rotor wear and premature clogging of the oil filter and separator element. A restriction indicator is fitted at the outlet: when the indicator piston enters the red zone, service or replace the element. A safety element is installed behind the primary element; the safety element must only be replaced, never cleaned
Inlet valve (inlet unloader valve)	Controls the amount of air entering the airend and thus regulates air delivery. It consists of the inlet port, a bleed orifice, a valve disc and a servo cylinder; control air pressure moves the disc from fully open through partially closed to fully closed. At shutdown it also acts as a check valve, preventing oil and air from blowing back through the intake
Separator tank	Performs both oil/air separation and oil storage. Its large oil capacity prevents freshly separated hot oil from immediately re-entering the next cycle, helping to lower discharge temperature. An oil level gauge is fitted on the side, a filler port on top and a drain (water drain) valve at the bottom
Separator element (fine oil separator)	Multi-layer special fiber media that removes virtually all oil mist from the compressed air; outlet oil content can be kept below 3 ppm. The staple-type metal conductive clips on the upper and lower flange gaskets of the element dissipate static electricity and must not be removed during replacement
Minimum pressure valve	Installed at the separator element outlet, with an opening pressure of approx. 0.4–0.5 MPa. During start-up it ensures that the oil pressure needed for lubrication is built up first; it opens only when tank pressure exceeds the opening pressure, limiting air velocity through the separator element to ensure good separation and protect the element. After shutdown it also acts as a check valve, preventing compressed air from flowing back from the air network
Thermostatic valve	Controls the temperature of the oil injected into the airend, preventing moisture in the air from condensing in the separator tank and emulsifying the oil. When cold, the valve is closed and oil bypasses the cooler and is injected directly; it begins to open at approx. 70 $^{\circ}\text{C}$ and is fully open at approx. 76 $^{\circ}\text{C}$. Never remove or wedge open the thermostatic valve element without KayDrill's approval
Oil cooler / aftercooler	Plate-fin design with forced ventilation by the cooling fan. Aftercooler outlet air temperature is generally no more than ambient +15 $^{\circ}\text{C}$. The fins easily become covered with dust and oily sludge; clean them regularly and keep the cooling air flow unobstructed (for stationary units, keep at least 2 m clearance from obstacles on the cooler air outlet side)
Oil filter	Paper element with a filtration rating of approx. 10–15 μm , removing metal particles, dust and oil degradation products to protect bearings and rotors. A clogged filter reduces the oil injection rate, shortening bearing life and causing high discharge temperature or even shutdown
Oil return check valve	Residual oil collected by the separator element is returned to the airend via the oil return line; the check valve prevents oil in the airend from flowing back during unloading. If oil consumption suddenly increases during operation, check whether the oil return orifice is blocked

Safety valve	Mounted on the separator tank. If the regulation system fails and tank pressure exceeds the rated discharge pressure by approx. 10%, the valve opens automatically to relieve pressure. It is factory-set; do not adjust it. If the safety valve opens, stop the machine and find the cause
Temperature sensor	PT100 platinum resistance sensor measuring airend discharge temperature. Oil loss, low oil level or poor cooling will cause excessive discharge temperature; when it reaches the shutdown setpoint (typically 110–115 °C), the unit shuts down automatically
Pressure sensor / pressure gauge	The pressure sensor measures the supply pressure downstream of the separator element, on which the controller bases loading and unloading. The separator tank pressure gauge shows the pressure upstream of the separator element. Replace the separator element when the difference between the two exceeds 0.15 MPa

3.4 Regulation and Control Principle

■ Loading, Unloading and Capacity Control

- 1 Start:** Before starting, the inlet valve and the load solenoid valve are both closed. After the motor starts, a small amount of air is drawn in through the inlet valve bleed orifice, and the minimum pressure valve allows pressure to build up gradually in the separator tank, ensuring oil is injected into the airend.
- 2 Loading:** After star-delta reduced-voltage starting is complete, the load solenoid valve is energized and opens after a delay of a few seconds; control air opens the inlet valve and the compressor runs loaded. When tank pressure exceeds approx. 0.4 MPa, the minimum pressure valve opens and air delivery begins.
- 3 Capacity control:** When supply pressure reaches the setpoint of the inverse proportional valve, the valve starts to act: the higher the system pressure, the lower its output control pressure, so the inlet valve opening and intake volume decrease, balancing air delivery with air demand for stepless capacity control. Some models have no capacity control and regulate delivery by load/unload control only.
- 4 Unloading:** When air demand is low or zero, supply pressure rises to the upper limit set on the controller (unload pressure); the load solenoid valve is de-energized, the inlet valve closes and the blow-down valve opens to release separator tank pressure, and the unit runs at light load. When the unload duration reaches the setpoint (idle run time), the unit stops automatically; when pressure falls to the lower limit (load pressure), it reloads.
- 5 Stop:** When the stop button is pressed, the unit first unloads and then stops automatically after a delay of several tens of seconds.

Table 3-2 Pneumatic control components

Component	Function
Load solenoid valve	2/2-way normally closed solenoid valve that opens or closes the control air line when energized or de-energized, providing loading and unloading

Blow-down valve	Opens during unloading or shutdown to release separator tank pressure, allowing the unit to run at light load and ensuring restart without load
Inverse proportional valve	Becomes active only above the set regulating pressure; the higher the input pressure, the lower the output control pressure, which controls the inlet valve opening. Setting: lift the black cap, turn clockwise to increase pressure or counterclockwise to decrease it, then press the cap down to lock the setting. The setpoint must be below the rated discharge pressure; if it is higher than the controller unload pressure, the unit will only load/unload without capacity control

CHAPTER 04

Controller and Instruments

The controller is the "brain" of the unit: it monitors pressure, temperature and current, controls starting, stopping, loading and unloading, and raises an alarm or shuts the unit down when a fault occurs. Operators must be familiar with the meaning of every key and display on the panel.

4.1 Text Display and Keys

Electric units are equipped with a Type 100 (overall dimensions 164 × 102 mm) or Type 200 (overall dimensions 250 × 150 mm) text display, connected to the main controller by a communication cable. The Type 100 is described below; for the Type 200, use the corresponding function keys.

Table 4-1 Key functions

Type 100	Type 200	Function
ON	I	Start key: starts the motor
OFF	O	Stop key: stops the motor
M	S	Set key: press to confirm and save modified data; in manual mode, used as the load / unload key
↑ / ↓	↑ / ↓	Up / Down keys: increase / decrease the current digit when editing data; move the selection bar in menus
→	→	Shift / Enter key: moves to the next digit when editing data; acts as the Enter key in menus
RT	C	Return / Reset key: returns to the previous menu level; resets the controller after a fault shutdown

■ Main Screen and Menus

When the unit is powered on, a welcome screen is displayed; after approx. 5 seconds the main screen appears, showing discharge temperature, supply pressure, operating status and control mode (Local / Remote):

```
Discharge temp: 20 °C
Supply pressure: 0.60 MPa
Status: Unit stopped      Local
```

Press "↓" to enter the menu: **Running Parameters, Calendar, User Parameters, Factory Parameters**. Use "↓" and "↑" to move the selection bar, "→" to enter, and "RT" to return. The display returns to the main screen automatically after a few seconds without key operation.

- **Running Parameters:** three-phase currents of the main motor and fan motor, total running time, current running time, maintenance parameters (hours used by each filter element and the oil), fault history, serial number, and current faults.
- **Calendar:** the date and time can be adjusted when the unit is stopped.
- **User Parameters:** requires the user password; pressure, temperature, delay, operating mode, sequencing and maintenance parameters can be modified (see table below). **Parameters cannot be modified while the unit is running or during the stop delay.**
- **Factory Parameters:** modifiable only with the factory password; these include protection values such as motor rated current, alarm temperature and shutdown pressure, and must not be changed by the user.

To modify a value: select the parameter and press "→"; a flashing digit appears. Use "↑" / "↓" to change the current digit and "→" to move to the next digit, then press "M" to confirm; the flashing digit disappears. An "*" in the upper-right corner indicates that User Parameter setting mode is active.

4.2 User Parameters

Table 4-2 Main user parameters (initial values for 0.8 MPa models; factory settings prevail)

Category	Parameter	Initial value	Function
Pressure, temperature	Pressure upper limit	0.80 MPa	Unload pressure; can only be set within the factory parameter "Unload pressure high limit"
	Pressure lower limit	0.60 MPa	Load pressure; the difference between upper and lower limits should generally be no less than 0.1 MPa
	Fan start temperature	80 °C	The fan runs when discharge temperature is above this value; set to 120 °C if there is no fan control
	Fan stop temperature	70 °C	The fan stops when discharge temperature is below this value

Start / stop delays	Main motor start time	8 s	Bypasses motor inrush current; must be greater than star-delta time + load delay
	Fan start time	6 s	Bypasses fan motor inrush current
	Star-delta time	6 s	Star-delta reduced-voltage starting changeover time
	Load delay	2 s	Delay before loading after star-delta starting is completed
	Idle-run time	20 min	The unit stops automatically when running unloaded continuously for longer than this time
	Stop delay	10 s	After the stop key is pressed, the unit unloads first and stops after this delay
Auto drain	Restart delay	100 s	After a stop or an idle-run shutdown, the unit can be restarted only after this delay
	Drain open time	2 s	Duration of each drain cycle when an automatic drain valve is fitted
Operating mode	Drain close time	10 min	Interval between drain cycles
	Start / stop mode	Local	When set to "Remote", the unit can be started and stopped by both the local keys and the remote switch
	Load mode	Auto	When set to "Manual", the unit can only be loaded / unloaded by key
	Communication mode	Disabled	Set to "Computer" for network monitoring, or "Sequencing" for multi-unit sequence control
Sequencing parameters	Communication address	255	Communication address
	Sequencing status, start / stop order, rotation time, number of units, sequencing pressure upper / lower limits, sequencing delay	—	Set when several units operate in sequence; the master controls the slaves, and the master must be unit 1#
Maintenance parameter reset	Oil filter, separator element, air filter, lubricating oil, grease	0 h	Reset the hours used to zero after replacing the corresponding part
Maximum service time	Oil filter, separator element, air filter, lubricating oil, grease	Per maintenance interval	When reached, the display shows "×× service time expired"; set to 0 to disable the message
Language (Chinese / English) / User password		Chinese	Switches to the English interface; the user password can be changed

4.3 Protection Functions

Table 4-3 Factory protection settings (0.8 MPa models as example)

Item	Setting	Description
Discharge temperature pre-alarm	105 °C	A pre-alarm is displayed when discharge temperature exceeds this value
Discharge temperature alarm	110 °C	Alarm and shutdown when discharge temperature exceeds this value; display shows "High discharge temperature"
Supply pressure shutdown	1.00 MPa	Alarm and shutdown when supply pressure exceeds this value; display shows "High discharge pressure"
Unload pressure high limit	0.80 MPa	The user "Pressure upper limit" must be less than or equal to this value
Motor rated current	Maximum permissible motor overload $\div 1.2$	Set separately for main motor and fan motor; used as the motor protection reference

The controller provides the following protection for both the main motor and the fan motor:

Table 4-4 Motor protection

Protection	Trip condition	Fault display / common causes
Locked rotor	Current reaches 4–8 times the set current after starting is completed; trips in ≤ 0.2 s	"Main motor or fan locked rotor": excessive load, worn bearings or other mechanical fault
Short circuit	Current reaches 8 times the set current or more; trips in ≤ 0.2 s	"Main motor or fan short circuit": short circuit or incorrect rated current setting
Phase loss	Loss of any phase; trips in ≤ 2 s	"Main motor or fan phase $\times$ loss": phase loss in power supply, contactor or motor
Imbalance	Current difference between any two phases of 60%–75%; trips in ≤ 5 s	"Main motor or fan current imbalance": poor contactor contact, open circuit inside the motor
Overload	Current ≥ 1.2 times the set current; trips with inverse-time delay (see table below)	"Main motor or fan overload": excessive load, worn bearings, other mechanical faults
Phase sequence	Incoming phase sequence does not match the setting; trips in ≤ 2 s, unit cannot start	"Phase sequence error": swap any two power supply wires
Sensor failure	Pressure or temperature sensor wire broken	" $\times \times$ sensor failure": check the sensor and wiring

Interlock protection	Discharge temperature has reached the fan start temperature but the fan is not running	"Fan not running": check the fan and its contactor
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Table 4-5 Overload inverse-time characteristic

Actual current / set current	≥ 1.2	≥ 1.3	≥ 1.5	≥ 1.6	≥ 2.0	≥ 3.0
Trip time (s)	60	48	24	8	5	1

■ Pre-Alarm Messages

Based on differential pressure switches or accumulated service time, the controller displays "Air filter clogged", "Oil filter clogged", "Separator clogged", or "Air filter / Oil filter / Separator / Lubricating oil / Grease service time expired". When such a message appears, schedule maintenance as soon as possible, and reset the counter to zero under "Maintenance parameter reset" after maintenance.

4.4 Control Modes and Starting Sequence

■ Star-Delta Starting

After power-on, the controller performs a self-test of approx. 3 seconds, during which the start key is inactive. After the self-test, press "ON": KM3 (star) and KM1 (main) are energized and the motor starts in star connection; when the star-delta time has elapsed, KM3 is de-energized and KM2 (delta) is energized (KM2 and KM3 are interlocked), and the motor switches to delta operation; the unit then loads after the load delay.

■ Four Control Modes

Mode	Description
Local auto	Started and stopped by the local keys; loads and unloads automatically according to the pressure upper / lower limits; stops automatically when running unloaded longer than the idle-run time, and restarts automatically when pressure drops to the lower limit
Remote auto	Same as local auto; starting and stopping can also be done with the remote switch
Local manual	After starting, the unit is unloaded; press "M" to load. The unit unloads automatically when pressure exceeds the unload pressure; if "M" is not pressed it remains unloaded until the idle-run shutdown. Press "M" while loaded to unload
Remote manual	Same as local manual; starting and stopping can also be done with the remote switch

Manual intervention is also possible in auto mode: when unloaded, press "M" once; if pressure is below the unload pressure, the unit loads until pressure reaches the unload pressure. When loaded, press "M" once; if pressure is above the load pressure, the unit unloads until pressure falls below the load pressure.

Normal stop: press "OFF"; the load solenoid valve is de-energized and the blow-down solenoid valve is energized; after the stop delay, the motor contactors are de-energized and the airend and fan stop.

Frequent-start prevention: after any stop, the unit cannot be restarted immediately; the display counts down the remaining delay, and the unit can be started only when it reaches zero.

■ Controller Status Indicators

Indicator	Meaning
PWR	On when the controller is powered; flashes once when setting data is saved
RUN	On when the controller is running
ERR	Flashes when a fault is detected and the unit has shut down
IN00-08	On when the corresponding digital input (air filter, separator, oil filter differential pressure switches, emergency stop, etc.) is active
OUT00-09	On when the corresponding relay output (main, star, delta contactors, load valve, fan, blow-down valve, run / fault / pre-alarm indication) is active

Main controller specifications: 9 digital inputs, 10 relay outputs (contact rating 250 V / 5 A); 2 Pt100 temperature inputs, 2 inputs of 4–20 mA, two sets of three-phase current inputs (with current transformers); phase sequence detection voltage three-phase 380 V; power supply 220 V, 50 Hz, 20 VA; temperature display –20–150 °C (± 1 °C), pressure display 0–1.60 MPa (0.01 MPa), current display 0–999.9 A; RS-485 communication. Refer to the electrical schematic supplied with the unit for wiring.

CHAPTER 05

Transport, Installation and Parking

Where the unit is placed and how the air lines and power supply are connected directly affect cooling, filter element life and operating safety. A correct installation makes subsequent operation and maintenance much easier.

5.1 Lifting and Transport

- The lifting eye is located beneath the lifting opening on top of the unit. Lift the unit only after confirming that the lifting equipment has sufficient capacity; see Chapter 1 for lifting requirements.
- Before transport, switch off the main power switch and secure all loose and movable parts (doors, towbar, etc.); fasten the unit to the transport vehicle with chocks and wire ropes so that it cannot shift during transport.
- Strictly observe local traffic regulations. For long-distance transport on main roads, carry the unit on a vehicle.

Portable

■ Towing

Before towing: check that the towbar, towing eye and trailer coupling are secure and in good condition, and that the coupling is level and fully locked; check tire pressure and make sure the axles, mounting bolts and wheels are tight; close and lock all doors and toolbox covers, making sure no one is inside the unit before closing the doors; before descending a slope, pre-apply the brake as appropriate for the gradient.

During towing:

- Towing speed must be less than 10 km/h; never exceed this speed. Avoid towing on gradients greater than 15°;
- Whether moving forward or reversing, the towbar and coupling must not exceed their free steering angle; never tow roughly;
- Avoid potholes, stones and other obstacles as well as soft ground; no one may ride on the compressor or stand or walk between the compressor and the towing vehicle.

5.2 Selecting the Installation Site

- The unit must be parked on level, even and firm ground with a maximum inclination of 15°, away from slopes, embankments, pits and trenches.
- Place the unit where the air is as cool and clean as possible, leaving sufficient space around it for cooling, operation and maintenance; in summer, place it in the shade where possible and avoid direct sunlight.
- In dusty locations, choose a relatively clean position; the air intake must not be too close to obstacles, to avoid drawing in hot air.
- Consider the wind direction: the air intake should face into the wind, and hot cooling air must not recirculate to the intake, otherwise overheating will occur. This orientation also extends the life of the air filter, oil filter and separator element and the cooler cleaning interval.
- Intake air must not contain flammable gases, vapors or particles; take measures to minimize moisture drawn in with the intake air.

Portable

■ Parking Portable Units

- Apply the parking brake and, if necessary, place wheel chocks on both sides of the wheels to prevent the unit from moving;
- When parked beside a road, set up warning signs, and warning lights at night;
- Do not operate the unit in the rain. Rain wetting the primary air filter element will make it ineffective; in serious cases rainwater can enter the compressor system, causing poor air end lubrication, accelerated wear or even seizure.

Stationary

■ Installing Stationary Units

- Install the unit on a level concrete floor or foundation capable of bearing the weight of the unit, with proper drainage;
- The compressor room must be well ventilated, clean and dry. For indoor operation, hot cooling air should be ducted outdoors to prevent excessive room temperature; keep at least 2 m clearance between the cooler air outlet and any obstacle;
- If the room temperature exceeds 40 °C, improve ventilation or take cooling measures; in winter, keep the room temperature above 0 °C;
- Leave service access around the unit for replacing filter elements and the separator element and for cleaning the cooler.

5.3 Connecting the Air Supply Line

- Air connection hoses must be correctly sized and have a pressure rating suitable for the working pressure of the model; do not use worn or damaged hoses. Fittings must be tightened securely to prevent them from coming loose and causing injury during operation.
- The line must be unobstructed to avoid a rapid pressure build-up (dead-heading) after startup. Do not apply external force to the air outlet valve.
- When several compressors supply air in parallel, fit a manual shut-off valve at the outlet of each unit; do not rely on check valves alone for isolation.
- **Stationary** For stationary units, an air receiver and drying and filtration equipment are recommended at the outlet; where air demand fluctuates significantly, an undersized air receiver will cause frequent load / unload cycling.

5.4 Electrical Connection

- Wiring must be carried out by a licensed electrician according to the electrical schematic supplied with the unit. Power supply capacity, switchgear and cable cross-section must match the motor power; excessively long lines or undersized cables cause voltage drop, resulting in overcurrent and overload alarms.
- The unit enclosure must be reliably grounded.
- After power is connected, if the three-phase sequence does not match the controller setting, the display shows "Phase sequence error" and the controller will not start the motor. In this case, switch off the main power supply and swap any two power supply wires.
- Even with phase sequence protection, the airend rotation direction must still be checked at the first test run: press the start key, then press the emergency stop after approx. 2 seconds, and confirm that the airend rotates in the direction of the arrow on the airend end face (drive shaft end).
- For a new unit or after a long period out of service, measure the motor insulation resistance with a megohmmeter; it must be above 1 MΩ.

CHAPTER 06

Operation

Starting, running and stopping the unit according to the procedures is the simplest way to avoid airend oil starvation, motor burnout and false alarms. When the unit is put into service for the first time, or returned to service after a long shutdown, check every item following the "Test Run" procedure.

6.1 Initial Test Run

- 1 Connect the air supply line as required and make sure it is unobstructed, to avoid a rapid pressure build-up (dead-heading) after startup.
- 2 Check whether any pipe fittings, gauge connections or wires have loosened or come off during transport or installation; tighten them if necessary.
- 3 Check that the oil level in the separator tank is between the two marks on the sight gauge. After operation, check the oil level 10 minutes after stopping, when the oil in the system has largely returned to the separator tank; a slightly lower oil level during operation than at standstill is normal.
- 4 Before the test run, add approx. 0.5 L of lubricating oil through the inlet valve and turn the airend by hand several revolutions, to prevent burnout from oil starvation at startup. **Take particular care that no foreign objects fall into the compression chamber.**
- 5 Check the power supply installation. If the phase sequence is wrong or a phase is missing, the controller displays a fault; swap any two power supply wires.
- 6 Check the airend rotation direction: press the start button, then press the emergency stop button after approx. 2 seconds, and confirm that the airend rotates in the direction of the arrow on the airend end face (drive shaft end).
- 7 Press the start button to start operation.
- 8 Observe whether pressure and temperature rise normally and whether the display shows any abnormal indication. If anything is abnormal, press the emergency stop button immediately and inspect.
- 9 Check that the unit loads normally. In case of abnormal noise, abnormal vibration or oil leakage, press the emergency stop button immediately and inspect.
- 10 Check the unload function: the unit should unload automatically when discharge pressure reaches the set upper limit, and load automatically when pressure drops to the set lower limit.

- 11 Check that the discharge temperature remains below 95 °C.
- 12 Press the stop button and check that the compressor stops normally after the delay.
- 13 When everything is normal, start the unit again and press the emergency stop button to check that emergency stop works.

6.2 Daily Operation

- 1 **Drain condensate:** before each startup, slightly open the drain ball valve at the bottom of the separator tank to drain condensate from the bottom of the tank (water is heavier than oil and settles at the bottom); close the valve as soon as oil appears.
- 2 **Check oil level:** check the static oil level and top up if low. Before adding oil, make sure the system is fully depressurized. Never mix different brands of lubricating oil.
- 3 **Turn the airend by hand:** rotate the airend several revolutions by hand; it should turn freely. If it binds, find the cause.
- 4 Switch on the main power supply and open the air supply shut-off valve.
- 5 Press the start button; the compressor starts automatic operation.
- 6 **Operating checks:** the unit is highly automated and generally needs no dedicated attendant, but discharge pressure, discharge temperature, ambient temperature, oil level, voltage and current should be checked and recorded regularly (use the operating log sheet in the Appendix).
- 7 During operation the oil system is filled with hot, pressurized oil; do not loosen oil lines or perform any other hazardous operation. In case of abnormal noise or abnormal vibration, press the emergency stop button immediately and inspect.
- 8 **Stopping:** when work is finished, press the "Stop" button; the compressor unloads, releases internal pressure and stops after a delay. **Use the emergency stop button only in an emergency.**
- 9 Close the shut-off valve and switch off the main power supply.

High-Temperature, High-Humidity and Extreme Cold Environments

Units operating continuously in hot and humid environments must be stopped for at least 10 hours at least once a week, so that condensate can be drained from the lubricating oil and oil emulsification is avoided. In extremely cold environments, ensure that the lubricating oil does not congeal and that water in the cooler and piping does not freeze.

CHAPTER 07

Maintenance

The service life of an air compressor depends on how well it is maintained. Most failures of costly components such as the airend, bearings and separator element result from poor management of the oil, filters and cooling. Inspect and service the machine regularly at the intervals given in this chapter to eliminate potential problems before they develop. KayDrill accepts no liability for consequences arising from maintenance not performed as required by this manual.

7.1 Three Key Areas of Maintenance

1. **Oil:** use the correct oil, keep the correct level, change it on time, and keep water and dust out;
2. **Filters:** replace the air filter, oil filter, separator element when due or when clogged – do not wait for them to fail;
3. **Cooling:** keep the coolers clean, the thermostatic valve working properly and the fan and belts in good condition, so that the discharge temperature remains stable within the normal range.

All maintenance work must be carried out with the machine stopped, the drive and power supply isolated, all system pressure relieved and the machine fully cooled down, and in compliance with the maintenance safety rules in Chapter 1. After maintenance, complete the maintenance record in the appendix and reset the corresponding item under "Maintenance parameter reset" on the controller.

7.2 KayDrill Service Kits

KayDrill provides a standard service kit for each model, in three levels based on accumulated running hours: **500 h, 1500 h and 2500 h** (500 / 2000 / 4000 h for some models; refer to the service kit labeling for the specific model). A service kit consists of the following parts:

Table 7-1 Service Kit Contents

Section	Parts included	Replacement
A Compressor	Separator element, compressor oil filter, compressor air filter element (incl. safety element), compressor oil	Every service level
C Electrical controls and valves	Air-water separator, temperature sensor, pressure sensor, high-pressure regulating valve, solenoid valves, etc.	2500 h major service

Order service kits directly from KayDrill or your local dealer, quoting the model and serial number. The parts are selected to match the airend and oil, ensuring the quality of the maintenance.

7.3 Inspection and Maintenance Intervals

Table 7-2 Inspection and Maintenance Schedule

Item	Daily	Weekly / 50 h	500 h	1500 h	2500 h	Remarks
Drain separator tank condensate	Drain					Before start-up or after shutdown and cooling
Compressor oil level	Check					Check sight gauge after shutdown
Air filter restriction indicator, dust ejector valve	Check	Clean main element				Check every shift in high-dust conditions
Leaks, loose parts, abnormal noise	Check					Oil, air and electrical connections
Compressor oil, oil filter, separator element, air filter element (Section A)			Replace	Replace	Replace	New machine: first at 300–500 h; shorten in harsh conditions
Cooler external surfaces	Visual	Clean				More often in hot, dusty areas
Safety valve	Manual test weekly				Calibrate	Verify set pressure annually per local regulations
Scavenge line orifice, check valve; minimum pressure valve, thermostatic valve				Check and clean	Check	Check at any time if a related fault occurs
Hoses, clamps, anti-vibration mounts	Visual		Check and tighten		Replace as needed	Aged high-pressure hoses must be replaced
Sensors, solenoid valves, regulating valve (Section C)					Replace	Major service
Airend belt (belt-driven models)			Check tension			—

Motor bearing grease				Regrease	Approx. every 12 months / 4000 h, per motor nameplate
Electrical system, wiring, earthing		Check and tighten		Full inspection	By a qualified electrician
Portable Tyres, axle, towing equipment, parking brake		Check			Always check before relocation

If the running hours are not reached, replace the compressor oil and separator element at least once a year. High ambient temperature, high humidity and heavy dust significantly shorten the life of the oil, separator element and oil filter; replace them earlier as conditions require.

7.4 Compressor Oil

The lubricating oil has a decisive effect on the performance and service life of an oil-injected screw compressor. Inferior or incorrect oil can cause carbon deposits or emulsification, clogging the oil circuit and causing valves to malfunction; in severe cases the whole system fails and the air end is destroyed. It also reduces separation efficiency and shortens the life of the separator element and oil filter.

Table 7-3 KayDrill Compressor Oils

Oil	Specification	Application
ZH compressor oil	KayDrill dedicated compressor oil, red drum	Low- and medium-pressure models
ZD compressor oil	KayDrill dedicated high-pressure compressor oil, grey drum	High-pressure two-stage models (mainly above 20 bar)
ZB compressor oil	Dedicated to small electric units	Small-capacity electric units
Low-temperature compressor oil	Order from KayDrill	Ambient temperature below -5 °C (mandatory below -10 °C)

The service kit and on-machine labels shall prevail for the oil to be used on each model. A suitable compressor oil must have: high oxidation resistance and high-temperature stability, low sludge formation, low foaming tendency and good air release, a flash point above 200 °C, a pour point at least 5 °C below the lowest ambient operating temperature, good corrosion protection and a long service life.

Never Mix Oils

When topping up or changing oil, always use compressor oil of the same manufacturer and grade. Never mix ZH with ZD, or oils of different brands. When changing to another grade, drain all old oil, flush the oil circuit, and replace the oil filter and separator element at the same time. Never use oil beyond its service interval: degraded oil loses lubricity, shortens bearing life and easily causes high-temperature shutdowns; a reduced flash point may even cause the oil to self-ignite and destroy the compressor.

■ Topping Up Oil

During operation, the oil level should be within the green zone of the sight gauge (or between the two marks). Too much oil impairs oil separation and increases oil carry-over; too little oil impairs lubrication and cooling. When the oil level reaches the red zone or the lower mark:

- 1 Stop the machine, isolate the power supply and relieve system pressure;
- 2 Open the separator tank filler port and top up with the same grade of compressor oil to the specified level;
- 3 Tighten the filler plug, start the machine and check, and record the top-up.

■ Changing Oil

- 1 Start the unit and run it unloaded for a short time to raise the oil temperature and lower its viscosity for easier draining; then stop the machine.
- 2 While about 0.1 MPa of pressure remains in the separator tank, slowly open the drain valve at the bottom of the separator tank and the drain plug of the oil cooler (oil drains quickly under pressure and will spray if opened too fast). All old oil must be completely drained from the separator tank, piping and cooler.
- 3 Close the drain valve, refit the drain plug and replace the oil filter.
- 4 Fill with sufficient new oil through the filler port (if necessary, partly through the inlet valve port).
- 5 Start the machine and run it loaded for 3–5 minutes; after stopping, check the oil level and adjust as necessary. Dispose of used oil properly and record the oil change.

System cleaning: after two years of operation, it is recommended to clean the oil circuit: after filling with new oil and running for 6–8 hours, change the oil again immediately to thoroughly remove residual sludge and carbon deposits from the system. This will extend the life of the new oil.

7.5 Air Filter

The air filter is the first line of defence against dust entering the airend. It prevents premature wear of the rotors and bearings, and reduces the load on the separator element and oil filter. Counterfeit or inferior filter elements can seriously damage the machine.

A restriction indicator is fitted at the air filter outlet (or the controller displays "Air filter clogged"). When the yellow piston of the indicator reaches the red zone, the main element must be serviced or replaced; press the reset button after replacement.

- 1 Stop the machine, isolate the power supply and relieve system pressure.
- 2 Open the filter end cover and remove the main element.
- 3 Cleaning: blow off dust with dry compressed air at no more than 0.5 MPa **from the inside outwards**; alternatively, tap the end faces of the element gently to remove accumulated dust. Never wash the element with water, strike it hard or blow it directly with high-pressure air.
- 4 Inspect the element for damage. Replace it if it is damaged or if the restriction remains high after cleaning. Clean out any dirt from the housing.
- 5 Apply a thin, even layer of grease to the sealing face of the main element and reassemble in reverse order, ensuring a proper seal so that unfiltered air cannot bypass into the airend.
- 6 Record the maintenance.

Caution

- Never clean the safety element – replace it only; replace the safety element whenever the main element is replaced.
- Squeeze the dust ejector valve a few times daily to discharge accumulated dust.
- During cleaning or replacement, prevent foreign objects from falling into the inlet valve, as this could seize and destroy the airend.
- Never operate without the main element. Shorten cleaning and replacement intervals in harsh conditions; in extremely dusty conditions, a pre-filter may be fitted.

7.6 Oil Filter

On a new machine, replace the oil filter after the first 300–500 h of operation, then at the scheduled maintenance intervals and at every oil change. Replace it earlier if the controller displays "Oil filter clogged".

- 1 Stop the machine, isolate the power supply and relieve system pressure.
- 2 Using a filter wrench, slowly unscrew the old filter counterclockwise. Catch residual oil in a container to prevent it from running onto the frame.

- 3 Clean the sealing face of the filter head, check that the new filter and its seal are intact, and apply a thin film of clean compressor oil to the seal.
- 4 Screw on the new filter clockwise by hand. Do not overtighten with a wrench.
- 5 Start the machine and check for leaks; after stopping, recheck the oil level and record the replacement.

7.7 Separator Element

The performance of the separator element directly determines the oil content of the discharge air. Under normal conditions, replace it at the scheduled intervals (first replacement at 300–500 h on a new machine), and at least once a year if the running hours are not reached. Its life is greatly reduced by poor oil quality or heavy environmental contamination. Replace it promptly if any of the following occurs:

- The oil content in the compressed air line increases noticeably;
- The differential pressure across the separator element exceeds 0.12–0.15 MPa (the difference between the separator tank pressure gauge reading and the delivery pressure), or the controller displays "Separator clogged";
- The main motor current increases noticeably; the discharge temperature or oil consumption rises abnormally.

▲ DANGER

A severely clogged separator element presents a risk of fire and explosion. Never use it beyond its service interval.

A **spin-on separator element** is replaced in the same way as the oil filter. Replace an **internal separator element** as follows:

- 1 Stop the machine, isolate the power supply and make sure the system is completely depressurized.
- 2 Remove the piping on the separator tank cover (including the line from the minimum pressure valve outlet to the aftercooler) and the scavenge line.
- 3 Remove the cover bolts, lift off the cover and take out the old separator element. Inspect and remove sludge and carbon deposits from the tank and scavenge line, and prevent any dirt from falling into the separator tank.
- 4 Fit the new separator element and gaskets. The staple-type metal conductive clips on the upper and lower gaskets of the separator element flange discharge static electricity and **must not be removed**.

- 5 Refit the scavenge line so that its lower end is 2–3 mm from the bottom of the separator element: if too high, oil will not be returned; if too low, it will damage the filter media.
- 6 Tighten the cover bolts evenly in a diagonal pattern and refit the piping in reverse order; start the machine, check for leaks and record the replacement.

7.8 Coolers

When the coolers are dirty or clogged, the compressor oil temperature rise, and in severe cases the unit shuts down on high temperature. Clean the coolers regularly according to the environment so that the unit always runs at the ideal temperature.

- 1 Stop the machine, isolate the power supply, relieve system pressure and open the cleaning cover of the air duct.
- 2 Blow compressed air through the cooler in the direction opposite to the cooling air flow, holding the nozzle at about 90° to the fins. Do not use high-pressure air, as it may damage the fins. If very dirty, spray with degreaser first, then blow out.
- 3 If the cooler still cannot be cleaned, remove it and soak or flush it with cleaning solution, using a soft brush if needed. **Never use a wire brush.** An oil cooler that is clogged internally must be removed and cleaned chemically.
- 4 Refit the cover.

7.9 Draining Condensate

Regularly draining the condensate from the bottom of the separator tank is **very important**: at best the compressor oil will emulsify and deteriorate; at worst the airend will be severely starved of oil within minutes of a winter start-up and will seize.

Table 7-4 Draining Intervals

Relative air humidity at site	Draining interval
≥ 50% (coastal areas, rainy season, etc.)	Once a day
30%–50%	At least once every 3 days
< 30%	Once a week

Procedure: stop the machine and isolate the power supply. Allow the machine to cool fully and the condensate to settle (about 60 minutes after shutdown, preferably in the morning before start-up), then slowly open the ball valve at the bottom of the separator tank to drain the water. Close the valve as soon as oil appears.

7.10 Safety Valve and Minimum Pressure Valve

Safety valve: if the control system fails and the pressure rises to the safety valve opening pressure, the safety valve opens automatically to relieve pressure and closes again once the pressure drops. A safety valve that fails to open allows the machine to run overpressurized; one that fails to close discharges large amounts of oil and compressed air. Both are serious safety hazards. Once a week, with the machine at full load (close to rated discharge pressure), pull the safety valve lever gently to test it; it is working correctly if air is discharged. Check the set pressure annually in accordance with local regulations. **Adjustment or repair of the safety valve must be carried out by a qualified organization.**

Minimum pressure valve: maintains the separator tank pressure at or above the specified minimum, ensuring effective oil separation and oil supply pressure, and prevents compressed air from flowing back from the network after shutdown. The holding pressure is set at the factory. If it changes after prolonged use, adjust it with the adjusting nut on the valve or contact KayDrill after-sales service.

7.11 Electric Unit Maintenance

- **Motor grease:** regrease with the grease type and at the intervals specified on the motor nameplate (generally about every 12 months or 4000 h). When the controller displays "Grease service time reached", regrease promptly and reset.
- **Electrical inspection:** a qualified electrician must regularly check that terminals, contactor contacts and earthing are tight and in good condition, and measure the three-phase voltage and current for balance.
- **Belts** (belt-driven models): check tension and wear every 500 h; replace as a matched set if worn or cracked.
- **Cooling fan:** check the fan blades and fan motor to ensure correct operation.

7.12 Waste Disposal

Used lubricating oil, oil filters, air filter elements, separator elements must be disposed of in accordance with local environmental regulations. Do not dump them.

CHAPTER 08

Troubleshooting

When a fault occurs, do not dismantle components at random. First read the controller alarm messages and operating data, analyse the cause based on the operating principle, and start with the simplest and most common causes.

8.1 Troubleshooting Principles

1. **Record first:** note the alarm name, time of occurrence, and the pressure, temperature, voltage, current, ambient temperature and running hours at the time. An accumulated fault log helps identify recurring problem areas.
2. **Outside before inside:** check external factors such as oil level, filter elements, coolers, power supply, and piping first, then valves and sensors, and consider the airend only last.
3. **Verify readings:** if a reading is abnormal, compare it with a mechanical gauge or infrared thermometer to rule out sensor and wiring faults.
4. **Reset only after rectification:** do not repeatedly reset and force a restart before the cause has been found.

Repair Safety

- Repairs to the compressor system must be carried out only after system pressure has been relieved, the drive switched off and the main power switch isolated. Maintenance personnel must wear appropriate personal protective equipment.
- Electrical system repairs must be carried out by KayDrill after-sales personnel or a qualified electrician.
- The airend is a precision component. If it fails, it must be returned to the factory or repaired by specialists designated by KayDrill. Use genuine KayDrill parts.

8.2 Common Compressor Faults

Table 8-1 Compressor Faults and Remedies

Symptom	Possible cause	Remedy
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Insufficient air delivery, pressure below normal	1. Air demand exceeds unit capacity 2. Air filter clogged 3. Inlet valve malfunctioning, remains partly closed 4. Separator element clogged 5. Inverse proportional valve / regulating valve incorrectly set or faulty 6. Load solenoid valve faulty 7. Leaking safety valve or other piping	1. Check air consumers; add a compressor if necessary 2. Clean or replace air filter element 3. Remove, repair, clean and grease; replace parts if necessary 4. Replace separator element 5. Readjust settings; repair or replace 6. Repair; replace if necessary 7. Repair; replace safety valve if it does not seal
Unit does not unload; pressure rises until safety valve blows	1. Unload pressure set too high 2. Load solenoid valve failed 3. Inlet valve does not close; cylinder diaphragm ruptured 4. Leak in control system 5. Blow-down valve does not operate or flow too low 6. Pressure sensor failed 7. Controller faulty	1. Readjust 2. Replace 3. Repair inlet valve; replace diaphragm 4. Check hoses and fittings; seal or replace 5. Repair blow-down valve; increase blow-down flow moderately 6. Replace 7. Repair; replace if necessary
Unit does not load; pressure does not build up	1. Load solenoid valve or circuit faulty 2. Piping leak; low separator tank pressure 3. Proportional valve faulty 4. Inlet valve or cylinder malfunctioning 5. Minimum pressure valve malfunctioning	1. Repair solenoid valve and circuit; replace with new part 2. Locate leaks; seal or replace leaking pipe 3. Clean or replace 4. Repair or replace 5. Dismantle and check valve seat and check disc; replace if worn
High discharge temperature, high-temperature shutdown	1. Insufficient oil 2. Incorrect or aged oil 3. High ambient temperature, poor ventilation, hot air recirculation 4. Oil filter clogged 5. Oil cooler dusty outside or clogged inside 6. Thermostatic valve failed 7. Fan or belt fault; fan start temperature set too high 8. Separator element clogged 9. Temperature sensor failed, loose wiring	1. Check oil level; top up with the same grade 2. Check oil grade; change oil 3. Improve ventilation; keep machine away from walls and other compressors; lower room temperature 4. Replace oil filter 5. Clean cooler fins; if clogged inside, remove and clean chemically or contact KayDrill 6. Repair or replace thermostatic valve 7. Repair fan and belt; adjust setting 8. Replace separator element 9. Compare with infrared thermometer; repair or replace sensor
Discharge temperature below normal, oil emulsification	1. Low ambient temperature 2. Prolonged unloaded or low-load operation 3. Thermostatic valve failed (stuck open) 4. Temperature sensor failed	1. Raise fan start temperature 2. Increase air demand, or fit a bypass blow-off valve to avoid prolonged unloaded running 3. Repair thermostatic valve 4. Replace temperature sensor; if oil has emulsified, change oil immediately

High oil content in discharge air, high oil consumption	1. Oil level too high 2. Scavenge check valve orifice or scavenge line clogged 3. Discharge pressure too low (prolonged low-pressure, high-flow operation) 4. Separator element damaged 5. Minimum pressure valve spring fatigued, does not hold pressure	1. Drain excess oil 2. Dismantle and clean scavenge orifice and scavenge line 3. Raise unload pressure setting; avoid prolonged low-pressure operation 4. Replace separator element 5. Replace minimum pressure valve spring or valve
Oil mist emitted from air filter at shutdown	1. Inlet valve leaking, non-return function failed 2. Shutdown under load	1. Check valve seat and disc for wear or cracks, replace if necessary; also replace air filter element and safety element 2. Unload before stopping as specified; check whether inlet valve is sticking
Frequent load/unload cycling	1. Piping leak 2. Load/unload pressure differential too small 3. Unstable air demand	1. Repair 2. Reset, generally to 0.1 MPa or more 3. Increase air receiver volume
Safety valve blows	1. System overpressure (see "Unit does not unload") 2. Separator element clogged, tank pressure too high 3. Safety valve itself faulty	1. Check control system as described above 2. Check separator differential pressure; replace separator element 3. Have it calibrated or replaced by a qualified organization

8.3 Electrical Faults on Electric Units

When a fault occurs on an electric unit, first follow the messages on the display. The fault cause can be viewed under "Operating parameters → Current faults / Fault history". For example, if "Temperature sensor failure 170 °C" is displayed, check mainly whether the temperature sensor wiring is broken or the sensor is damaged.

Table 8-2 Electrical Faults and Remedies on Electric Units

Symptom	Possible cause	Remedy
Unit does not start	1. Fuse blown 2. Voltage too low 3. Incorrect phase sequence, phase loss 4. Poor contact in start button 5. Emergency stop button not reset 6. Motor fault 7. Control circuit fault 8. Airend seized 9. Restart lockout delay active	1. Have an electrician repair or replace 2. Check supply voltage 3. Swap any two supply phases; check fuses, contactors and cables 4. Repair or replace 5. Reset emergency stop button 6. Have an electrician repair 7. Check power cables and all connections 8. With power isolated, turn by hand; if it does not turn, contact KayDrill after-sales service 9. Wait for the countdown to finish

Running current too high, compressor shuts down (overload)	1. Voltage too low 2. Discharge pressure set too high 3. Incorrect oil grade; oil too thick at low temperature 4. Separator element clogged, high internal pressure 5. Mechanical fault such as damaged airend bearings	1. Check power supply; use larger cables or adjust supply 2. Check and adjust unload pressure 3. Check oil grade; change oil 4. Replace separator element 5. Isolate power and turn by hand to diagnose; contact KayDrill after-sales service
Running current below normal	1. Air demand too high 2. Air filter clogged 3. Inlet valve malfunctioning (e.g. sticking) 4. Inverse proportional valve incorrectly adjusted	1. Check air demand; add a compressor if necessary 2. Clean or replace 3. Check operation of inlet valve cylinder and piston 4. Adjust setting
Phase loss, current imbalance	Supply phase loss, blown fuse, burnt or poorly contacting contactor contacts, loose cable terminals, open circuit inside motor	Measure three-phase voltage and current step by step; replace damaged components; tighten connections
Locked rotor, short circuit	Excessive load, worn bearings, starting under load; short circuit or incorrect rated current setting	Isolate power and turn by hand to check; confirm inlet valve is closed at start-up; have an electrician repair
Fan not running	Fan motor, contactor or wiring fault	Repair fan motor and control circuit

8.4 When to Contact KayDrill After-Sales Service

- Abnormal noise or sticking of the airend, or a persistently high discharge temperature after external factors have been confirmed normal;
- The same alarm recurs after common causes have been eliminated;
- Factory settings such as the safety valve, oil injection rate or pressure protection values need to be adjusted;
- Failure of a major component within the warranty period – do not dismantle it yourself, as this may affect the warranty.

When contacting us, please have ready: the model and serial number, accumulated running hours, alarm messages and photos, the pressure and temperature readings at the time, and the most recent maintenance record.

CHAPTER 09

Storage and Extended Shutdown

When a machine stands idle for a long period, lubricating oil drains from the surfaces of moving parts and moisture enters the system, increasing wear and corrosion at the next start-up. In seasons and regions where temperatures fall below 0 °C or humidity is high, follow this chapter strictly.

9.1 Routine Storage

- Park the machine on level, dry, well-ventilated and covered ground, protected from rain; **Portable** apply the parking brake and chock the wheels to prevent movement; store the accessories supplied with the machine properly together with it.
- When storing in hot or humid areas, increase inspection and maintenance.

9.2 Shutdown for More Than One Month

- 1 Wrap the controller, electrical cabinet and other electrical equipment in plastic film or oiled paper to keep out moisture.
- 2 Completely drain the condensate from the oil cooler and aftercooler to prevent freeze damage in winter.
- 3 Rectify any existing faults so that the machine is ready for future use.
- 4 After two or three days, drain the condensate from the separator tank, oil cooler and aftercooler again.

9.3 Shutdown for More Than Three Months

In addition to the above measures:

- 1 Before shutdown, change to new compressor oil and run the machine for about 30 minutes so that an oil film covers the internal parts; after two or three days, drain the condensate from the separator tank and oil cooler.
- 2 Seal all openings such as the air inlet and discharge outlet to keep out moisture and dust.
- 3 If possible, move the machine to a dry, dust-free location for storage.

9.4 Returning to Service

- 1 Remove all plastic film, oiled paper and opening seals from the machine.

- 2 Measure the motor insulation resistance; it must be above 1 MΩ.
- 3 Check the oil level and condition; emulsified or deteriorated oil must be changed. Check the belts, hoses and filter elements.
- 4 Turn by hand to confirm that the airend is not sticking; add a small amount of compressor oil through the inlet valve.
- 5 Start the machine following the procedure in Chapter 6 "Initial Test Run", and run it unloaded for 10–15 minutes before loading.

9.5 Decommissioning

When the machine reaches the end of its service life and is taken out of use:

- 1 Isolate the power supply and disconnect the compressor from the mains;
- 2 Disconnect the compressor outlet from the air network and release all pressure;
- 3 Drain the condensate, lubricating oil, and dispose of the waste in accordance with local environmental regulations.

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Unit Information and After-Sales Service

Item	Entry
Model	
Serial number	
Manufacture date / delivery date	
Motor power / voltage	
Dealer / telephone	

Zhejiang Kaizuan Machinery Co., Ltd. • After-Sales Service

Service hotline: +86 570 8878277 Fax: +86 570 8878230

E-mail: service@kaydrill.com Website: www.kaydrillcomp.com

Address: No. 25 Lulin Middle Road, Qujiang District, Quzhou, Zhejiang, China

When contacting after-sales service, please provide the model, serial number, accumulated running hours, and the fault symptoms or alarm messages.



After-Sales Service, Always Ready

Reliable Power • Every Site • Every Time

Sales +86 570 8878277

Fax +86 570 8878230

Web www.kaydrillcomp.com

E-mail service@kaydrill.com

Address No. 25 Lulin Middle Road, Qujiang District, Quzhou, Zhejiang, China

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