



KAYDRILL SERVICE DOCUMENTATION

Screw Air Compressor Operation & Maintenance Manual

Diesel-Driven Units

For KayDrill diesel-driven 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

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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 (Diesel-Driven Units) applies to KayDrill diesel-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 diesel-driven 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. Diesel engine maintenance must be performed strictly in accordance with the engine manufacturer's warranty manual; otherwise the engine warranty is automatically voided.
4. 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. The surface of the exhaust pipe between the diesel engine turbocharger and the muffler can exceed 300 °C; never place flammable or explosive materials nearby.
- 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 Fire and Explosion Prevention

- Do not remove the anti-static grounding straps inside the machine; doing so creates a risk of fire and explosion. Before use, connect the machine with a ground wire to a steel rod driven into the ground to ensure reliable grounding.
- Do not weld on the separator tank, oil lines, diesel tank or fuel lines; the heat causes internal carbon buildup and fire. When welding elsewhere on the machine, turn off the main power switch and the controller protection switch and unplug the engine ECU connector; otherwise high current will damage the engine and compressor electrics.
- Do not refuel through the diesel tank filler while the engine is running. On models with an external filler, refueling through the external filler is permitted while running; wipe up any spilled diesel promptly. Open flames and sparks are strictly prohibited during refueling and in the refueling area.
- Any fuel leak must be eliminated before starting. Inspect the engine exhaust pipe heat shield regularly and replace it immediately if damaged.
- Clean dust and oil from the surface of the sound-absorbing foam promptly; replace it if detached or damaged, and keep it away from hot components.
- Do not store gloves, towels, waste paper, oily rags, plastics or other combustible materials inside the machine. Equip the machine with adequate fire extinguishers and inspect them regularly.

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.
- Diesel engine coolant is hot and under pressure. Before checking the coolant, stop the engine and wait until the filler cap is cool enough to be turned by bare hand, then open it slowly.
- **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 a diesel engine, 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 diesel-driven units consists of the series, power, operating condition(s) and engine brand. Example: **CM430-34/26-36/18K**:

Table 2-1 Diesel-driven unit model designation

Segment	Meaning
CM / LGCY	Diesel-driven screw air compressor. CM = M flagship series; LGCY = LG series
430	Diesel engine power (horsepower, HP)
34/26	Condition 1: free air delivery 34 m ³ /min, rated discharge pressure 26 bar
36/18	Condition 2 (dual-condition models): 36 m ³ /min @ 18 bar, selectable on the control panel
K / X / none	Diesel engine brand: K = Cummins, X = Xichai, no suffix = Yuchai
B (e.g. CM220B)	Economy version with the same power and performance class

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, diesel engine model and power, 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	−10 °C to +50 °C. Below 0 °C, follow "Operation in Cold Conditions" in Chapter 6; from −15 °C to −10 °C an engine coolant heater is required for starting
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
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 diesel engine via a highly flexible coupling
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, speed control cylinder
Diesel engine system	Diesel engine, engine air filter, fuel tank and fuel filters, radiator and charge air cooler, muffler, batteries and starter motor
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

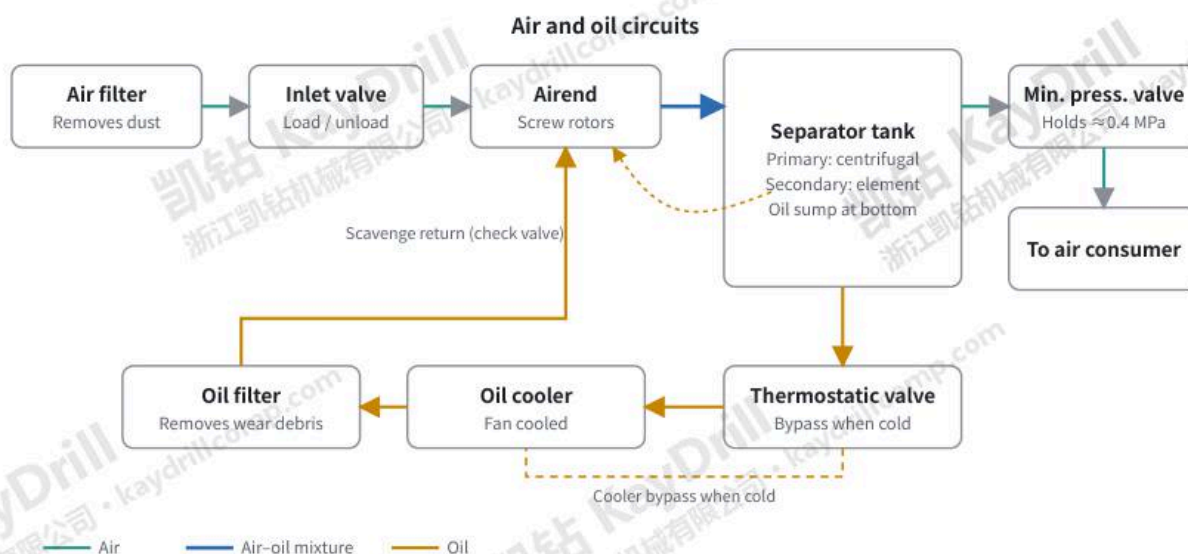


Figure 3-1 Air and oil circuit schematic

■ 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

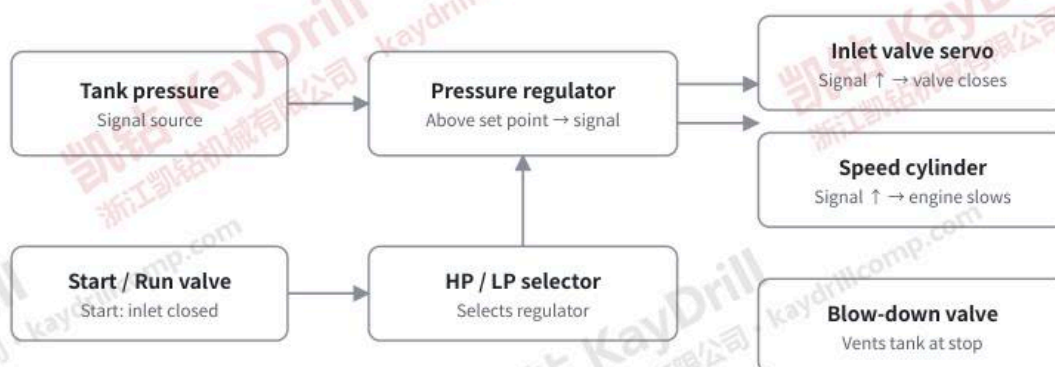
Component	Function and key points
Air filter	Dry paper element with a filtration rating of approx. 10 μm , preventing premature rotor wear and premature clogging of the oil filter and separator element. A restriction indicator is fitted at the outlet: when the indicator piston enters the red zone, service 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 °C and is fully open at approx. 76 °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 °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. Some two-stage models have an additional interstage safety valve
Temperature sensor	PT100 platinum resistance sensor measuring airtend 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

Combined Pressure and Speed Regulation

The control system of diesel-driven units automatically adjusts the inlet valve opening and engine speed according to air demand, keeping the compressor operating between the set maximum and minimum discharge pressures. Control is achieved through changes in compressed air pressure:



Less demand → tank pressure rises → inlet closes + engine slows → output matches demand

Figure 3-2 Pneumatic control schematic of diesel-driven units

- 1 Start:** Before starting, the inlet valve, load solenoid valve and bypass solenoid valve are all closed. After starting, the separator tank quickly builds up approx. 5 bar; in the unloaded state, tank pressure is maintained at 8–10 bar to ensure normal oil supply.
- 2 Loading:** Turn the load/unload switch to the load position. The load solenoid valve is energized and opens, air from the separator tank is admitted to the inlet valve, the inlet valve opens fully, the engine runs at high speed and the compressor begins to deliver air.
- 3 Regulation:** As system pressure approaches the set pressure, the inlet valve gradually closes or opens, and engine speed decreases or increases accordingly. When air demand increases and pressure drops, the inlet valve opens wider and engine speed rises; when air demand decreases

and pressure rises, the inlet valve closes further and engine speed drops; when air consumption stops, the inlet valve closes completely and the engine runs at low speed.

The control system is factory-adjusted and normally requires no adjustment. Dual-condition models can select between two pressure settings using the high/low pressure selector.

CAUTION

Keep all doors closed during operation to prevent dust and moisture from entering the control system. When ambient temperature is below 2 °C, open the heating ball valve of the control system insulated box to raise the internal temperature of the control system and prevent ice blockage.

3.5 Diesel Engine Systems

Table 3-2 Diesel engine systems

System	Description and precautions
Power transmission	The diesel engine drives the male rotor of the airend through a highly flexible coupling, and the male rotor drives the female rotor. The airend and engine are mounted on anti-vibration mounts
Engine air intake	If the primary element fails, the safety element provides only brief protection. Replace a failed primary element immediately, together with the safety element; otherwise bearing seizure, cylinder scoring and turbocharger damage may result. Regularly inspect the intake hoses and rubber seals. Never operate without the primary element
Cooling and lubrication	Consists of the charge air cooler, radiator and piping. The charge air cooler cools the turbocharged intake air to increase power; the radiator cools the engine coolant and has a drain plug at the bottom. Inspect and replace the silicone hoses of the cooling system regularly: aged or damaged coolant hoses can cause coolant loss and cylinder scoring, and leaking charge air hoses cause power loss
Fuel system	Consists of the fuel filters and fuel tank; the fuel tank provides approx. 8 hours of operation. The fuel filters ensure that fuel supplied to the engine is free of contaminants, water and air. Drain water from the primary fuel filter (water separator) daily
Exhaust silencing system	Reduces engine noise and prevents hot exhaust gas from leaking into the unit. The surface temperature of the piping between the turbocharger and the muffler can exceed 300 °C. Close the rain cap after shutdown to keep rain out of the muffler
Electrical control system	Consists of the charging alternator, start/stop relays, main power switch, batteries, starter motor, load/unload switch, solenoid valves and controller; it mainly serves to start the engine and power the regulation system

Starter motor operating rules

- Do not crank for more than 5 seconds at a time, and wait at least 2 minutes between attempts. If the engine fails to start after 3–5 consecutive attempts, stop and identify the cause before trying again.
- After the machine stops, wait at least 60 seconds before turning off the battery master switch; otherwise the engine ECU may fail to save its data, causing false alarms such as low voltage at the next start.
- Never turn off the main power switch during operation, and avoid repeated use of the emergency stop button; otherwise the ECU program may be lost or electrical components may burn out.

CHAPTER 04

Controller and Instruments

The controller is the "brain" of the unit: it monitors pressure, temperature, coolant temperature, oil pressure and engine speed, 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 Diesel-Driven Unit Control Panel

Diesel-driven units use the LEC001 controller together with analog gauges and digital displays, giving a central view of the engine and compressor operating status. Parameter settings, maintenance interval settings and maintenance timer resets are password-protected; please contact KayDrill after-sales service.

Table 4-1 Diesel-driven unit instruments and displays

Instrument	Function	Shutdown function
Tachometer / hour meter	Displays engine speed and accumulated operating hours (120-tooth speed sensor, luminous dial). Maintenance intervals are based on accumulated operating hours	Display only; no alarm or shutdown
Coolant temperature gauge	Displays engine coolant temperature; analog, luminous dial	Alarm only, no shutdown
Engine oil pressure gauge	Displays engine oil pressure; analog, luminous dial	Alarm only, no shutdown
Discharge pressure gauge	Displays compressor discharge pressure; fitted with a pressure switch	Alarm and shutdown on overpressure
Discharge temperature display	Digital display of airend discharge temperature	Alarm and shutdown on overtemperature

Table 4-2 Protection functions and alarm values

Item	Action
Engine coolant temperature	Monitored from power-on. The alarm lamp lights when coolant temperature is $\geq 98-100$ °C; the alarm clears automatically when the temperature drops below 95 °C
Discharge temperature	Monitored from power-on. The unit shuts down immediately when discharge temperature is ≥ 115 °C (pre-alarm at 110 °C); the unit can be restarted only after the temperature drops below 110 °C and the alarm clears

Engine pressure	oil	Not monitored after power-on until the engine starts; the display shows 0 MPa and the alarm lamp is lit. Monitoring begins after starting and the alarm lamp goes out automatically. The alarm lamp lights when oil pressure is below 0.15 MPa; this does not trigger shutdown— stop the unit manually at once and inspect
Discharge pressure		Monitored after starting. Alarm and shutdown when pressure exceeds the pressure switch setting (e.g. 15.5 kgf/cm ² , set per model)
Speed and hour meter		Hour counting and speed display begin after starting; display only, no alarm or shutdown

For ECU fault codes of electronically controlled diesel engines, refer to the engine manufacturer's manual.

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.
- It is recommended to connect a high-temperature, high-pressure hose of approx. 10 m length to the G3/4 ball valve at the discharge outlet, for routine blowing of dust and debris from inside the unit.

5.4 Grounding and Fire Precautions

- Before use, connect the unit with a grounding cable to a steel rod driven into the ground to ensure reliable grounding; do not remove the static conductive strap inside the unit.
- Provide adequate fire-extinguishing equipment near the unit; do not store flammable materials inside the unit.
- Confirm that there are no leaks in the fuel system.

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 Operation in Low Temperatures

Diesel-driven units can operate normally at ambient temperatures from -10°C to $+50^{\circ}\text{C}$. At ambient temperatures from -15°C to -10°C , an engine coolant heater is required for starting; for units not equipped with a coolant heater, contact KayDrill to have one fitted. **Do not cut power to the coolant heater while it is operating; disconnect power only after the heater indicator turns green.**

▲ DANGER: Below 0°C , check for frozen condensate before startup

When the ambient temperature is below 0°C , the drain ball valve of the separator tank must be opened before startup to check for frozen condensate at the bottom of the tank. Starting the unit without this check can cause airend oil starvation and ultimately airend seizure. The user is responsible for any losses resulting from failure to perform this check.

Select engine oil, diesel fuel, coolant and compressor oil according to the ambient temperature as shown in the tables below. Ambient temperature refers to the lowest temperature within a 24-hour day.

Table 6-1 Engine oil selection

Oil grade (CH-4 or higher)	15W-40	10W-30	5W-20
Minimum ambient temperature	$\geq -5^{\circ}\text{C}$	$\geq -15^{\circ}\text{C}$	$\geq -30^{\circ}\text{C}$

Table 6-2 Diesel fuel grade selection

Diesel grade	No. 0	No. -10	No. -20	No. -35	No. -50
Minimum ambient temperature	$\geq 4^{\circ}\text{C}$	$\geq -5^{\circ}\text{C}$	$\geq -14^{\circ}\text{C}$	$\geq -29^{\circ}\text{C}$	$\geq -44^{\circ}\text{C}$

Table 6-3 Coolant (antifreeze / anti-corrosion) selection

Coolant freezing point	-20°C	-30°C	-35°C	-40°C
Minimum ambient temperature	$\geq -10^{\circ}\text{C}$	$\geq -20^{\circ}\text{C}$	$\geq -25^{\circ}\text{C}$	$\geq -30^{\circ}\text{C}$

Table 6-4 Screw compressor oil selection

Compressor oil		KayDrill standard compressor oil (ZH / ZD)	KayDrill low-temperature compressor oil
Minimum temperature	ambient	$\geq -5^{\circ}\text{C}$	$\geq -30^{\circ}\text{C}$

When the ambient temperature is below -10°C , the compressor oil must be changed to the low-temperature type; otherwise starting difficulties or even airend seizure may result. The oil and coolant specifications filled at the factory are shown on the label on the unit; unless otherwise specified, units are shipped with the standard-temperature configuration.

■ Handling Waxed Diesel Fuel

If the diesel fuel has not been changed to a lower grade in winter and wax has formed, do not force the engine to start; otherwise large amounts of air will enter the engine and make starting even more difficult. Remedy: ① add low-temperature diesel fuel to the fuel tank; ② warm each fuel filter with a hot-water bag, and once the wax has dissolved, prime the fuel system with the hand pump; ③ then start the unit (preheating is also required below -10°C).

■ Low-Temperature Fuel System (Optional)

Units equipped with the low-temperature fuel system have a large and a small fuel tank: the small low-temperature tank is filled with low-grade diesel fuel and the large tank with No. 0 diesel. Used together with the heater, this allows No. 0 diesel to be used at low temperatures, reducing operating costs. The three-way ball valve on the small tank has two positions: **Position 1** supplies fuel from the large tank; **Position 2** supplies fuel from the small low-temperature tank.

Ambient temperature	Procedure
$> 4^{\circ}\text{C}$ (summer)	Operate with the ball valve in Position 1. Before winter, switch the ball valve to Position 2, start and run for 5 minutes, then stop
$-5^{\circ}\text{C} - 4^{\circ}\text{C}$	Switch on the heater, set the ball valve to Position 2 and start; run for 2 minutes, then stop. Switch the ball valve back to Position 1, prime with the hand pump, then start the unit for normal use; the heater can be switched to the middle setting (keep warm). To stop, switch to Position 2, run for 3 minutes, then stop
$\leq -5^{\circ}\text{C}$	Switch on the heater, set the ball valve to Position 2 and start; run for 10–15 minutes, then stop. Switch the ball valve back to Position 1, prime with the hand pump, then start the unit and use it with the suction fan; the heater can now be switched off. To stop, switch to Position 2, run for 3 minutes, then stop

6.2 Pre-Start Checks

At first use, after running out of fuel or after replacing the fuel filter

Air must first be bled from the fuel system (prime with the hand pump); see "Replacing the Fuel Filter" in Chapter 7.

#	Check item
1	Check all component connections for looseness; tighten any loose connections to prevent oil and air leaks during operation
2	Check electrical components for looseness or damage
3	Engine oil level (dipstick); refer to the engine manual
4	Sufficient fuel in the diesel tank
5	Sufficient coolant in the radiator; level should be at approx. 1/2 of the level indicator
6	Open the drain plug or drain valve under the separator tank, check for and drain condensate, then close tightly
7	Remove dust from the air filter dust collector (squeeze the dust valve a few times)
8	Connect the air supply hose to the air supply ball valve
9	Remove all unrelated objects from around and on top of the unit

6.3 Starting

- 1 Open the ball valve on the air supply line.
- 2 Make sure the load / unload switch is in the **Unload** position.
- 3 Switch on the main power switch; the controller lights up.
- 4 When the ambient temperature is below -10°C , preheat before starting; switch on the coolant heater and start only after the specified temperature is reached; above -10°C this step can be skipped.
- 5 Press the controller start button once. Allow at least 2 minutes between two start attempts.
- 6 After the engine starts, let it idle for 3–5 minutes to warm up, until the system internal pressure reaches 6–9 bar and the compressor oil temperature is above 50°C .
- 7 Check all fittings for oil or air leaks and all drive components for abnormal noise; in case of abnormal noise stop the unit immediately, and do not restart until the fault has been eliminated.
- 8 Check that the oil level in the separator tank is within the safe range; if low, top up with compressor oil of the same brand.
- 9 When idling is normal and stable, turn the load / unload switch to the **Load** position; the compressor begins supplying air.

If the controller shows a fault code after starting, the cause must be identified and the fault eliminated before restarting.

6.4 Stopping

- 1 Switch to the unload position and run unloaded for 1–3 minutes to allow the unit to cool down fully.
- 2 Press the controller "Stop" button once; the system depressurizes automatically and stops after a delay.
- 3 After the unit has stopped, **wait at least 60 seconds** before switching off the battery master switch.

Emergency Stop

The unit has two emergency stops: the emergency stop button on the control panel and the emergency stop button on the engine. Use them only in an emergency. After an emergency stop, reset the emergency stop switch and vent the internal system pressure so that the next start is made without load.

▲ DANGER

An emergency stop can cause compressor oil to surge into the separator element, damaging it and leading to oil carry-over; repeated emergency stops may also cause loss of the ECU program and burnout of electrical components. Never switch off the main power switch while the unit is running.

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 and engine filters (air, fuel, oil) 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.

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
B Diesel engine	Engine air filter element (incl. safety element), fuel filter, oil filter, fuel-water separator, coolant, engine oil	Every service level; engine oil also according to the engine manufacturer's intervals

C Electrical controls and valves	Air-water separator, temperature sensor, pressure sensor, high-pressure regulating valve, solenoid valves, etc.	2500 h major service
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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

Engine oil level, coolant level, fuel	Check					—
Drain water from primary fuel filter / fuel-water separator	Drain					—
Engine oil, oil filter			First service at 50 h, then every 250 h (per engine manufacturer)			Replace oil and oil filter together
Engine filters (air, fuel, oil), coolant (Section B)			Replace	Replace	Replace	Shorten with poor fuel quality
Fan belt			First check at 20–50 h, then check tension every 250 h			Replace immediately if worn or cracked
Battery		Check				Check electrolyte and charge before winter
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. For diesel-driven units, also refer to the "Maintenance and Operation Reminder" label on the machine for detailed intervals.

7.4 Daily Checks

Table 7-3 Daily Checks for Diesel-Driven Units

#	Item	Method
1	Any damaged components	Visual
2	Sufficient diesel fuel	Visual (fuel level shown on controller)
3	Sufficient engine coolant	Visual
4	Sufficient engine oil	Check dipstick
5	Sufficient compressor oil	Check sight gauge
6	Oil temperature normal	Controller display
7	Bolts and nuts loose	Visual / wrench
8	Electrical components and wiring intact	Visual
9	Oil lines seeping or leaking	Visual
10	Coolant temperature and oil pressure readings normal	Instrument display
11	Engine speed and hour meter readings normal	Instrument display

12	Instrument panel warning lamps working	Visual
13	Abnormal noise from airend, coupling, fan and other drive components	Listen
14	Dust build-up in air filter	Squeeze dust ejector valve to discharge dust

During every check, pay particular attention to the connecting bolts of the engine, the airend and all rotating and drive components. Tighten any loose bolts immediately.

7.5 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 airend is destroyed. It also reduces separation efficiency and shortens the life of the separator element and oil filter.

Table 7-4 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.

7.6 Air Filter

The air filter is the first line of defence against dust entering the airend and engine. It prevents premature wear of the rotors and bearings, turbocharger and cylinders, 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.

7.7 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.

7.8 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 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.

7.9 Coolers

When the coolers are dirty or clogged, the compressor oil temperature and engine coolant 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.

7.10 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 7-5 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.

7.11 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.

7.12 Diesel Engine Maintenance

Diesel engine maintenance must also comply with the engine manufacturer's operation and maintenance manual. For the first engine service, contact the engine manufacturer's service station at approximately 40 operating hours to have it performed and the data recorded. Failure to perform maintenance as specified automatically voids the engine warranty.

■ Engine Oil

The first service is at 50 h, then change the oil every 250 operating hours, replacing the oil filter at the same time. Check the oil level with the engine dipstick; it should be between "MAX" and "MIN".

■ Coolant

Check the engine coolant level frequently and top up with coolant of the same specification when low. **Never use tap water.** If coolant temperature alarms occur frequently, check the cooler for clogging and check for coolant leaks. Never open the radiator cap while the machine is running; the radiator contains hot, pressurized steam. Allow it to cool fully, then open the cap slowly.

■ Replacing the Fuel Filter

The fuel filter not only removes impurities but, more importantly, separates water from the diesel fuel – water causes corrosion and increased wear in the fuel system and can seize fuel pump components. A clogged fuel filter is indicated by reduced fuel pressure, loss of power and increased fuel consumption. Shorten the replacement interval if fuel quality is poor.

- 1 Remove the old fuel filter with a strap wrench.
- 2 Apply a thin layer of oil to the sealing face of the new filter.
- 3 Fill the new filter with clean fuel filtered to 30 µm (never fill with unfiltered fuel).
- 4 Screw on the new filter by hand until tight.
- 5 Operate the hand primer to bleed all air from the fuel system.
- 6 Start the engine and check for leaks. The fuel-water separator is replaced in the same way.

Drain water from the primary fuel filter (fuel-water separator) daily: open the drain valve, let the water out and close it; on models with a hand pump, pump while the valve is open to expel the water.

■ Battery

Battery capacity decreases in winter. Before winter, check the electrolyte level; if it is below the lower mark, add **distilled water** to midway between the marks (do not use ordinary tap water and do not overfill). Adjust the electrolyte specific gravity, check the state of charge and recharge if necessary. Clean the battery terminals and coat them with protective grease. After the machine is stopped, switch off the main battery switch and the work light to prevent discharge.

■ Fan Belt

Check the belt tension after the first 20–50 h of engine operation and every 250 h thereafter: check the belt for wear or cracking; apply a force of 100–110 N at the middle of the belt span – a deflection of 9–15 mm is acceptable; otherwise adjust the tensioner. **A worn or cracked belt must be replaced immediately.**

7.13 Waste Disposal

Used lubricating oil, oil filters, air filter elements, separator elements, engine oil and coolant 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, engine speed, coolant temperature, oil pressure, 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, fuel, 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. For engine-related faults, also refer to the diesel engine operation manual.
- 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 8. Engine does not reach rated speed	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 8. See Diesel Engine Faults
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 Compressor-Side Faults on Diesel-Driven Units

Table 8-2 Faults Specific to Diesel-Driven Units

Symptom	Possible cause	Remedy
Compressor does not start	1. Battery charge low 2. Insufficient oil in airend 3. Condensate frozen at bottom of separator tank at low temperature 4. Diesel engine problem	1. Charge or replace battery 2. Turn by hand a few revolutions before starting; check oil level 3. Follow low-temperature operating requirements; never force a start 4. See Diesel Engine Faults
Unit stops after running for a while	1. High discharge temperature 2. Fan overload 3. Working pressure exceeds rated pressure	1. See "High discharge temperature" 2. Check fan 3. Readjust working pressure
High oil content in discharge air	1. Too much oil 2. Scavenge orifice valve clogged 3. Separator element scavenge (return) line clogged 4. Separator element damaged 5. Repeated emergency stops	1. Drain excess oil 2. Dismantle and clean scavenge orifice valve 3. Dismantle and clean scavenge line 4. Replace separator element 5. Stop the unit as specified
Control system blocked by ice	Ambient temperature below 2 °C ; condensate frozen in control lines	Open the heating ball valve of the control system insulation box

8.4 Diesel Engine Faults

The following are preliminary diagnoses of common faults. For specific engine faults and remedies, the engine manufacturer's operation manual shall prevail. For precision components such as the injection pump and turbocharger, contact the engine manufacturer's service station.

Table 8-3 Common Diesel Engine Faults

Symptom	Possible cause	Remedy
Engine fails to start after several attempts	1. Insufficient diesel fuel 2. Poor-quality or contaminated fuel 3. Fuel filter clogged or damaged 4. Air leak in fuel supply line 5. Battery voltage too low, loose terminals 6. Fuel waxing in winter, clogging strainer or lines 7. Engine oil too viscous for winter use	1. Add diesel fuel 2. Clean fuel tank; replace fuel 3. Clean or replace filter 4. Tighten or replace fuel supply line 5. Charge or replace battery; tighten terminals 6. Use winter-grade (low pour point) diesel, or warm the filter with hot water to melt the wax; bleed air and clean the lines 7. Change to low-viscosity engine oil
Engine stops as soon as the key is released after starting	Loose wire ends, poor contact; stop solenoid cannot reset	Reset stop solenoid; tidy and tighten wire ends
Speed drops when load reaches a certain level, recovers when unloaded	1. Fuel filter clogged 2. Air filter clogged or leak in intake pipe after turbocharger 3. Intercooler clogged 4. Turbocharger, injector or fuel feed pump fault	1. Replace fuel filter 2. Clean or replace filter element; check piping 3. Blow out or clean intercooler 4. Contact engine manufacturer
Rhythmic knocking, black smoke, loss of power	One or more cylinders not firing, injector needle stuck; worn high-pressure pump plunger elements	Contact engine manufacturer for repair
Large speed fluctuations	1. Unstable discharge pressure 2. Insufficient fuel supply	1. Check control system 2. Replace fuel filter
Engine overheating (high coolant temperature)	1. Coolant low or leaking 2. Radiator or intercooler exterior dirty, air duct obstructed 3. Fan belt loose or broken 4. Engine oil level too high or too low 5. Coolant pump damaged 6. Prolonged overload	1. Fill coolant to specified mark; locate leaks 2. Clean radiator; clear the air inlet duct 3. Adjust or replace belt 4. Adjust engine oil to the mark on the dipstick 5. Replace coolant pump 6. Check operating conditions

Engine oil pressure too low (stop immediately)	1. Incorrect engine oil level 2. Incorrect engine oil grade 3. Engine oil contaminated by fuel or coolant, or diluted by water 4. Oil filter clogged 5. Oil suction pipe loose or seal failed 6. Oil pressure gauge or sensor failed	1. Add or drain engine oil to the specified level 2. Verify oil specification and change oil 3. Locate and repair the leak; change engine oil 4. Replace engine oil and oil filter 5. Replace seals; tighten suction pipe 6. Check and replace
Heavy or black exhaust smoke under load	1. Air filter clogged 2. Air leak between turbocharger and intake pipe 3. Injector or turbocharger faulty 4. Fuel delivery incorrectly adjusted	1. Clean or replace air filter 2. Eliminate air leak 3. Contact engine manufacturer for repair 4. Have it adjusted by a specialist
Rated speed not reached under load	1. Fuel supply restricted 2. Tachometer faulty	1. Clean or replace fuel filter; check fuel lines 2. Replace tachometer

8.5 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.
- After the machine is stopped, switch off the main battery switch and the work light to prevent the battery from discharging.

9.2 Shutdown for More Than One Month

- 1 Completely drain the condensate from the oil cooler and aftercooler to prevent freeze damage in winter.
- 2 Rectify any existing faults so that the machine is ready for future use.
- 3 After two or three days, drain the condensate from the separator tank, oil cooler and aftercooler again.
- 4 Start the unit once a week (at least once a month) and run it unloaded for 3–5 minutes. Fill the fuel tank to prevent rust on the tank walls; disconnect the battery negative terminal.

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.

- 4 Drain the coolant (if antifreeze is not used) and the fuel, isolate the power supply, lock the doors and store the machine in a ventilated, damp-proof location equipped with fire-fighting facilities.

9.4 Returning to Service

- 1 Remove all plastic film, oiled paper and opening seals from the machine.
- 2 Check the oil level and condition; emulsified or deteriorated oil must be changed. Check the belts, hoses and filter elements, battery, coolant and fuel.
- 3 Turn by hand to confirm that the airend is not sticking; add a small amount of compressor oil through the inlet valve.
- 4 Start the machine following the procedure in Chapter 6 "Pre-Start Checks and Starting", 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 and the battery;
- 2 Disconnect the compressor outlet from the air network and release all pressure;
- 3 Drain the condensate, lubricating oil, fuel and coolant, and dispose of the waste in accordance with local environmental regulations.

Appendix

[illegible]

No.	Running hours h	Work performed / parts replaced	Part no.	Qty	Date	Serviced by	Signature
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1						
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Unit Information and After-Sales Service

Item	Entry
Model	
Serial number	
Manufacture date / delivery date	
Engine model / serial number	
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

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This manual is supplied with KayDrill screw air compressors; please keep it with the machine. Products are continuously improved; where the machine differs from this manual, the machine and its labels prevail. Diesel engines shall also be operated and serviced according to the engine manufacturer's manual. No part of this manual may be reproduced without permission. Zhejiang Kaizuan Machinery Co., Ltd. reserves the right of final interpretation.