

Genset Model: DB-18GF
400V | 1500rpm | 50Hz

18kW/22.5kVA Open /Silent Type Diesel Generator Set



| | | | |
|----------------------|-----------------------------------|--------------------|--------------------------|
| Standby power | 20kW/25kVA | Prime power | 18kW/22.5kVA |
| Engine | Cummins | Alternator | Shanghai Stamford |
| | 4B3.9-G11 | | GR180E |
| Controller | SmartGen HGM6110N-4G-G | | |

Configuration Features

| | |
|--|--|
| Engine: Cummins 4B3.9-G11 , meet GB20891-2014 China Stage II emission requirements | Alternator: Single bearing, IP23 protection, H class insulation |
| 50°C original water radiator, cooling fan, with fan safety cover | Air filter, fuel filter, oil filter |
| Chassis and vibration absorber | Standard control panel (integrated) |
| 24V charging generator | Gas exhaust bellows, gas exhaust elbows, industrial silencers and standard parts for connections |
| Electronic Governor | Random data set, factory test report |
| Maintenance-free lead-acid batteries and battery connection cables | |

Genset Model: DB-18GF**400V | 1500rpm | 50Hz****Different voltage level**

| Voltage V | Frequency Hz | Phase | Power factor | Standby Current A | Standby power | Prime Power |
|-----------|--------------|-------|--------------|-------------------|---------------|--------------|
| 440/254 | 50 | 3 | 0.8 | 29.5 | 20kW/25kVA | 18kW/22.5kVA |
| 415/240 | 50 | 3 | 0.8 | 31.3 | 20kW/25kVA | 18kW/22.5kVA |
| 400/230 | 50 | 3 | 0.8 | 32.4 | 20kW/25kVA | 18kW/22.5kVA |
| 380/220 | 50 | 3 | 0.8 | 34.2 | 20kW/25kVA | 18kW/22.5kVA |

Prime power (PRP): is available for an unlimited number of annual hours in variable load application, in accordance with GB/T 2820 (equiv ISO 8528); A 10% overload capacity is available for a period of 1 hour within a 12-hour period of operation.

Standby power (ESP): is the maximum power limit for emergency use and cannot be overloaded, i.e. the fuel cut-off power.

Sales Commitment:

- ① All products supplied by our company are brand new. Each unit undergoes strict factory test (with factory test reports provided), and we offer both on-site acceptance (at the production floor) and remote video conference acceptance.
- ② Warranty: 1 year or 1,000 cumulative running hours, or 15 months from the date of shipment to the first user (i.e. long-term non-installation and use), whichever comes first. Reply troubleshooting solutions by phone or video within 20 minutes, and provide remote video or on-site training for operators.
- ③ Services and accessories for Dingbo product are available from our headquarters.
- ④ Deliver goods as per the delivery date and quality requirements stipulated in the contract, and accept priority to production for urgent needs.
- ⑤ Provide 100% output power as per the contract requirements, and ensure that diesel engine, alternator, radiator, etc. are original and authentic products.
- ⑥ Strictly execute every stipulation of the contract signed and sealed by both parties.

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400V | 1500rpm | 50Hz

Engine Specifications

| | | |
|--|---|---------|
| Manufacturer & engine Model | Cummins 4B3.9-G11 | |
| Air intake system: | Turbocharging and Air-to-Air Intercooling | |
| Fuel System: | WF A Direct Injection | |
| Cylinders no. & Type: | 4 cylinders, in-line | |
| Displacement: | 3.9L | |
| Bore x Stroke: | 102×120 mm | |
| Compression Ratio: | 18.0:1 | |
| Engine Speed: | 1500rpm | |
| Engine minimum power: | 20kW/27hp | |
| Engine maximum power: | 22kW/29hp | |
| Governor system: | Electronic Governor | |
| Noise: | 100dB | |
| Exhaust system | | |
| Exhaust Gas Flow | 4.3m ³ /min | |
| Exhaust Gas Temperature: | 410°C | |
| Maximum Back Pressure | 10kpa | |
| Air intake/ Exhaust system | | |
| Maximum Intake Air Restriction: | 5kPa | |
| Gas Flow Rate: | 2 m ³ /min | |
| Exhaust Gas Flow Rate: | 136 m ³ /min | |
| Fuel system | | |
| Fuel Consumption @ 100%prime power | 236g/kW·h | 7.0 L/h |
| Fuel Consumption @ 75%prime power | 253g/ kW·h | 5.6 L/h |
| Fuel Consumption @ 50%prime power | 305g/ kW·h | 4.3 L/h |
| Lubrication system | | |
| Minimum Required Lube System Capacity: | 11 L | |
| Engine Oil Consumption rate: | ≤4g/kwh | |
| Sump Oil Capacity: | 8.9~9.5 L | |
| Cooling System | | |



| | |
|---|-------|
| Coolant Capacity - Engine Only: | 21L |
| Maximum Top Tank Temperature for Prime Power: | 104°C |

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Alternator Specifications

Meet BS5000, VDE0530, NEMA MG1-22, IEC34, CSA C22 and AS1359 standards

Technical Data

| | |
|------------------------------------|------------------------|
| Phase: | 3 |
| Wire connecting method: | Y type, 3 phase 4 wire |
| Bearing: | 1 |
| Power Factor: | 0.8 |
| Protection: | IP23 |
| Altitude requirements: | ≤1000m |
| Exciter type: | Brushless Self-Excited |
| Insulation/temperature rise class: | H/H |
| Waveform TIF: | <50 |
| Waveform THF: | <2% |
| Rated Capacity: | 22.5kVA |
| Efficiency: | 81.4% |

Genset Technical Specifications

| | |
|--|-------|
| Voltage adjustment rate: | ≥±5% |
| State voltage regulation rate: | ≤±1% |
| Transient voltage deviation (100% sudden power reduction): | ≤+25% |
| Transient voltage deviation (100% sudden power reduction): | ≤-20% |
| Voltage stability time (100% sudden power reduction): | ≤6S |
| Voltage stability time (sudden power increase): | ≤6S |
| Frequency adjustment rate: | 0-5% |
| Steady-state frequency band: | ≤1.5% |
| Transient frequency deviation (100% sudden power reduction): | ≤+12% |
| Transient frequency deviation (sudden power increase): | ≤-10% |
| Frequency stability time (100% sudden power reduction): | ≤5S |
| Frequency stability time (sudden power increase): | ≤5S |

ATS function and selection of diesel generator sets

The ATS (Automatic Transfer Switch) of a diesel generator set is a critical device for ensuring continuous power supply. Its primary function is to initiate an automatic start command to the backup power source upon failure of the main power source (utility power). Once the generator set successfully starts, the ATS automatically transfers the electrical load to the standby power source (the diesel generator set), ensuring critical loads remain powered without interruption. The following is a detailed introduction to ATS:

1. Core Functions of ATS

- **Automatic Main Power Monitoring:** Continuously monitors the utility power supply for abnormalities in voltage and frequency stability.
- **Automatic Generator Start Command:** Initiates generator startup upon detection of utility power failure, under-voltage, or unstable frequency.
- **Automatic Load Transfer to Backup Power:** Transfers electrical loads to the generator after it reaches rated voltage and frequency.
- **Automatic Utility Power Restoration:** Switches loads back to the utility supply upon its recovery, then initiates sequential generator shutdown (including cool-down).
- **Backfeed Prevention:** Ensures complete electrical isolation between utility and generator sources to eliminate backfeed hazards to the grid or equipment.

2. Composition Structure of ATS

- **Switch Body:** Dual-Power Switching Mechanism (featuring mechanical interlock design to prevent simultaneous closure).
- **Control module:** Microprocessor or PLC, used for logical judgments and sequence control.
- **Sensors:** Detect voltage, frequency, phase and other parameters.
- **Operation interface:** Manual/automatic switch button, status indicator light, alarm function.
- **Communication interface (optional):** Supports remote monitoring (such as Modbus, RS485).

3. ATS Operational Sequence

1. **Monitoring Stage:** ATS continuously monitors the utility power status.
2. **Start Signal Trigger:** Upon utility power failure, after a programmable time delay (to avoid false triggering by momentary fluctuations), the ATS sends a start signal to the generator.
3. **Transfer Stage:** After generator stabilization (typically within 5~30 seconds), the ATS disconnects the utility power and transfers the loads to the generator supply.
4. **Retransfer Stage:** When utility power is restored and stabilized, the ATS switches the load back to utility power. The generator then operates under no-load condition for cooling before shutting down.

4. Types of ATS

- **Open transition type (Break-Before-Make):** Disconnects the primary power before connecting the backup source, resulting in a brief power interruption (milliseconds), suitable for general loads.
- **Closed Transition type (Make-Before-Break):** Short overlapping power supply (synchronous detection required), seamless switching, suitable for precision equipment (such as data centers, medical facilities).
- **Delayed Transition type:** avoid frequent switching (such as instantaneous faults such as lightning strikes).
- **Manual Priority Type:** Allows manual intervention in the switching process.

5. Key parameters for selection

- **Rated current/voltage:** match the load power and system voltage (e.g. 400V, 63A).
- **Switching time:** Typically 10-30 seconds (including generator start-up time); faster in critical scenarios (e.g. within 5~10 seconds).
- **Poles:** 3 poles (three-phase electricity) or 4 poles (with neutral line switching).
- **Certification standards:** Compliant with safety regulations such as IEC 60947-6-1, UL 1008, etc.
- **Environmental adaptability:** Protection class (e.g., IP65), operating temperature range.

6. Application Scenarios

- **Data centers and hospitals:** places with extremely high requirements for power supply continuity.
- **Factories and commercial buildings:** avoid production interruptions or equipment damage.
- **Communication base stations:** rely on generators when there is no stable utility power in remote areas.
- **Emergency power supply system (EPS):** Used in conjunction with UPS to provide long-term backup.

7. Maintenance and precautions

- **Regular Testing:** Simulate utility power failure to verify switching function.
- **Contact Inspection:** Prevent oxidation or wear that could cause poor contact.
- **Battery Backup:** ensure control circuits can still operate during power outages.
- **Phase synchronization:** detect the phase difference between utility power and the generator during switching to avoid shock.

8. Brands

- **High-end:** ASCO, GE Zenith, Socomec
- **Mid-range:** ABB, Schneider, Siemens
- **China Local Brands:** Chint, Delixi, People Electric

9. Comparison with Manual Transfer Switches

- **Manual Transfer Switches:** Require manual operation, incur longer response delays, suitable for non-critical loads.
- **ATS:** Deliver full automation with rapid response, eliminating human error.

Proper ATS selection and maintenance significantly enhance diesel generator system reliability, ensuring seamless power continuity for critical facilities during grid outages

Power Correction Reference at Different Altitudes

- ① Rated power output conditions at standard operating altitude:
 - Below 1000 meters: The generator set operates stably at rated power;
 - 1000 meters to 4000 meters, please refer to the standard operation correction in the table below.
- ② Power correction
 - Below 3000m altitude: Derate 4% per 500m increase
 - Above 3000m altitude: Derate 6% per 500m increase
 - For concurrent high ambient temperatures (>40°C): Apply additional 1.5% derating per °C increase

Impact of Altitude on Diesel Generator Performance::

- ① Decreased combustion efficiency:

For every 1000-meter increase in altitude, atmospheric pressure decreases by 10%, and oxygen content reduces by 6% to 10%. This results in insufficient air intake for naturally aspirated or diesel engines, causing incomplete combustion of diesel fuel. Consequently, power loss can reach 8% to 12%.
- ② Deterioration of startup performance

Reduced air density lowers compression end temperature, potentially causing a 50% decrease in cranking power at 10°C compared to sea-level conditions.
- ③ Reduced cooling system efficiency

The boiling point decreases as altitude increases (reduced to approximately 87% at 4,000 meters altitude), which leads to a 30% drop in heat dissipation efficiency;

Based on the above situation, technical measures for adapting to high temperature and altitude:

- ① Opt for a high-altitude air filter, featuring high flow rate, low resistance, and designed for dust-prone environments;
- ② Increase radiator surface area by 20%-30% and upgrade to high-pressure-ratio cooling fans to prevent overheating.
 - Equipped with preheating system: water jacket heater (maintain block temperature > 32°C), fuel pipe Electric Heat Tracing.
 - Low-temperature lubricating oil: Use low-viscosity oils such as SAE 5W-40 to reduce resistance.
 - Shorten maintenance intervals: air filter replacement frequency increased by 50% (due to high dust on the plateau).
 - Coolant monitoring: Use Ethylene glycol mixture (freezing point < -25°C) with regular pH testing to prevent corrosion.

| | | |
|-------------|-------------------------|-------------------------------------|
| Altitude(m) | Power correction factor | Example: 1000KW actual output power |
|-------------|-------------------------|-------------------------------------|

| | | |
|-------|------|--------|
| ≤1000 | 100% | 1000KW |
| 1500 | 96% | 960KW |
| 3000 | 88% | 880KW |
| 4000 | 76% | 760KW |

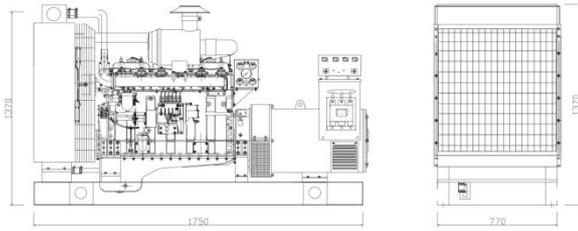
Standard Configuration

| | | |
|--|---|--|
| Auto-Start Control System: Dingbo LCD display controller supports real-time parameters display (voltage, frequency, running time, etc.) and fault alarm (speed governing failure, high coolant temperature, under-voltage, etc.) | Smoke exhaust system (to the muffler): within 6 meters | Accompanying data: factory test report for diesel generator, Operation manual, certificate of conformity, etc. |
| Oil drain valve: oil pipe in and out of the engine | Maintenance-free battery and battery connecting wire: 80A | Circuit breaker: Yangzhou Shuoyang 63A |
| Vibration-damper | Battery box | Base frame: Made of carbon steel Q235B/Q355B (≥6mm thick plate) |
| Cummins engine 4B3.9-G11 | Shanghai Stamford alternator GR180E | Hot-dip galvanized chassis |
| Original Cummins 4B3.9-G11 40°C/50°C Radiator | Float Charging | |

Optional Equipment

| | | |
|--|--------------------------------|--|
| Daily fuel tank | Rainproof generator | Remote control module |
| Anti-condensation heater | Super silent canopy generator | Parallel and grid-connected systems |
| Spare parts | Silent canopy generator | Switchgear |
| ATS Automatic Transfer Cabinet | Silent canopy air inlet filter | Oil-water separator(C3930942 FS1280) |
| Fuel Filter (7931063 FF5052) | Trailer generator | Fire extinguisher |
| Remote monitoring system | Oil filter(C3908616 FS3349) | External rainproof socket |
| Tracked intelligent control base frame | Air filter(KW1524) | Self-elevating 360° illumination tower (Optional Power Configurations) |

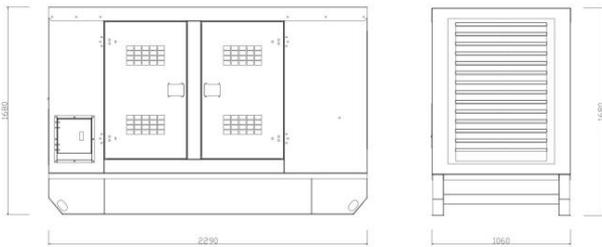
Dimension and weight



Open Type

Dimension(L x W x H): **1750×770×1370 mm**

Weight: 730kg



Silent canopy type

Dimension(L x W x H): **2290×1060×1680 mm**

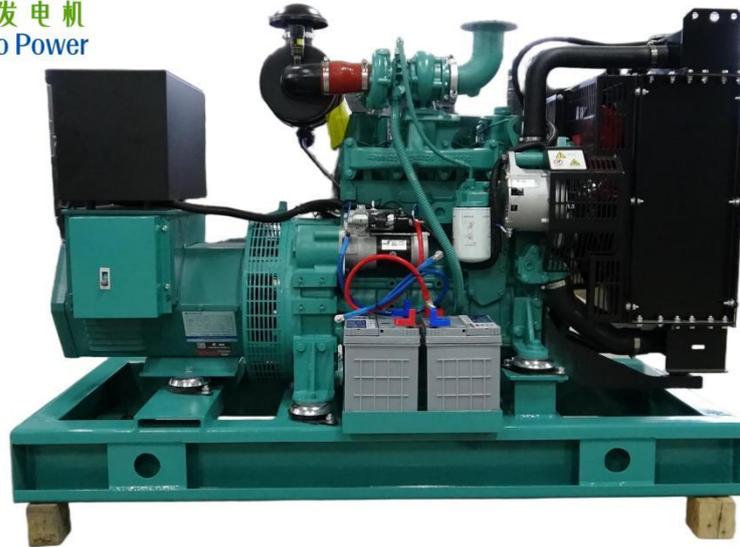
Weight: 1250kg

This data sheet is for reference only and subject to change without notice.

1.18kW Open Type Diesel Genertaoor Set with Cummins engine 4B3.9-G11 and Shanghai Stanford alternator GR180E

Introduction of Manufacturing Process and Structural Design

 顶博发电机
Dingbo Power



① Base and frame

(1) Material and Strength: The welded base is made of ≥ 6 mm thick high-strength carbon steel (Q235B/Q355B). The thickness of the bottom reinforcing ribs is $\geq 50\%$ of the main body. Employs Complete Joint Penetration (CJP) welds compliant with AWS D1.1 / GB 50661 standards. The sampling rate for Ultrasonic Testing (UT) of welds is $\geq 20\%$.

(2) Dimensional Accuracy: Base frame flatness ≤ 0.5 mm/m, anchor bolt hole positional deviation $\leq \pm 1.0$ mm, ensuring unit levelness ≤ 0.5 mm/m.

(3) Vibration Damping Integration: The base built in anti-vibration rubber pads (Shore hardness 70 ± 5). The shock absorber mounting surface is pre-compressed to 10% of the static load to eliminate tolerance. The horizontal displacement limit gap is 3~5mm.

② Surface treatment and spraying requirements

These are crucial, as they directly affect the corrosion resistance, service life, and appearance quality of the units. Below are detailed requirements and suggestions:

[1] Surface Treatment Requirements (Pre-treatment)

(1) Degreasing: Use specialized alkaline cleaning agents or solvents to thoroughly remove contaminants such as oil, grease, cutting fluids, and rust preventive oil from the surface of the chassis steel. Ensure a hydrophilic surface is achieved (indicated by a continuous, unbroken water film).

(2) Rust removal: Preferred method: Sandblasting or shot blasting treatment.

Grade: Reaches Sa 2.5 (Very Thorough Blast Cleaning). Standard: The steel surface shall be free from visible grease, dirt, mill scale, rust, paint coatings, and foreign matter. Any remaining traces shall consist only of slight stains in the form of spots or streaks.

Abrasives: Steel shot, steel grit, or a mixture of these abrasives is recommended. The abrasives should be clean, dry, and free of oil contamination.

Roughness: After sandblasting, a specified surface roughness (Rz) should be achieved, typically within the range of 40-70 μm (1.6-2.8 mil). This helps enhance the mechanical interlocking and adhesion between the coating and the substrate.

③ **Spraying requirements (coating system)**

Adopt a high-performance anti-corrosion coating system, consisting of at least a double-layer coating of primer + topcoat.

1. primer:

Type: Two-component epoxy zinc-rich primer is the preferred choice.

Advantages: Provides excellent cathodic protection (sacrificial anode), extremely strong adhesion, excellent rust protection and chemical resistance. The zinc powder content in zinc-rich primer (based on dry film) should generally be $\geq 70\%$.

Alternatives: Two-component epoxy zinc phosphate primer.

Advantages: Provides excellent rust protection performance and adhesion; exhibits good compatibility with various topcoats. Zinc-free formulation makes it more environmentally friendly, generating less welding fumes, which is suitable for occasions with restrictions on zinc powder or as a substitute for zinc-rich primer.

Dry Film Thickness: 60 - 80 μm (2.4 - 3.2 mil).

2. Dry Film Thickness: (optional, highly recommended for heavy corrosion protection or harsh environments):

Type: Two-component epoxy (micaceous iron) intermediate coat.

Advantages: Provides excellent shielding effect (blocks water vapor and oxygen penetration), increases overall coating thickness, and improves corrosion resistance and durability. Flake pigments (such as mica iron oxide) can effectively extend the penetration path of corrosive media.

Dry film thickness: 50 - 70 μm (2.0 - 2.8 mil). Together with primer + topcoat, forms a complete protective system.

3. Topcoat:

Type: Two-component polyurethane topcoat is the preferred choice.

Advantages: Excellent weather resistance (good retention of gloss and color), outstanding abrasion resistance, good chemical resistance (including resistance to minor oil stains and fuels), good decorative appearance and gloss.

Alternatives: Two-component acrylic polyurethane topcoat or high performance alkyd enamel.

Acrylic polyurethane has weather resistance close to that of polyurethane, and its cost may be slightly lower.

High-performance alkyd enamel has low cost and easy application, but its weather resistance, abrasion resistance, and chemical resistance (especially oil resistance) are far inferior to polyurethane. It is suitable for less demanding applications or indoor environments.

Dry Film Thickness: 50 - 70 μm (2.0 - 2.8 mil).

Color: Typically medium gray, dark gray, yellow, red, or other industry-standard colors for construction machinery are selected or customer-specified colors. The specific color is determined based on customer requirements or the manufacturer's standard color chart.

4. Total dry film thickness:

Minimum requirement: $\geq 160 \mu\text{m}$ (6.3 mil). Recommended target thickness: 180 - 220 μm (7.1 - 8.7 mil).

It is essential to ensure that all areas, especially those prone to corrosion such as corners, welds, recesses, bolt holes, and cut edges, meet the specified film thickness requirements. Particular attention should be paid to spraying techniques or performing pre-coating in these critical zones.

④ **Spray Process Specifications**

1. Environmental Control:

Temperature: Both the substrate temperature and ambient temperature should be within the range specified in the coating product instructions (typically above 5°C for epoxy paint and above 10°C for polyurethane paint).

Humidity: Relative humidity should generally be < 85%. Construction should be avoided during rainy, foggy, snowy weather or when condensation occurs on surfaces.

Ventilation: Provide good ventilation to ensure solvent evaporation, while avoiding direct strong airflow on the painted surface to prevent issues such as dry spray and orange peel.

2. Mixing and Induction Time: Strictly adhere to the precise ratio of Component A (base material) and Component B (hardener) as specified in the Technical Data Sheet (TDS) provided by the coating supplier.

Thoroughly mix using a power mixer until uniform.

After mixing, two-component coatings must undergo Induction Time before Spray Application.

3. Spray Application method:

Preferred method: Airless spraying, with high efficiency, uniform film thickness, good appearance, and excellent coverage, particularly well-suited for large-scale applications.

Auxiliary: Brush or roller coating. Pre-coating is performed on areas difficult to spray such as welds, corners, bolt holes, and complex structures to ensure adequate coating coverage and thickness at these critical areas.

Avoid dry spraying (The paint mist does not wet the substrate sufficiently).

4. Film thickness control:

During and after Spray Application, use wet film thickness gauges and dry film thickness gauges to perform multi-point measurements (as required by relevant standards such as ISO 19840 or SSPC-PA2) to ensure compliance with the specified dry film thickness (DFT).

Areas with insufficient film thickness must be repainted in time.

5. Recoating Interval: Strictly adhere to the minimum and maximum recoating intervals specified in the paint supplier's TDS.

When the maximum overcoat interval is exceeded, the existing coating surface must be profiled (such as scraping or light sandblasting) and thoroughly cleaned before the next coat of paint can be sprayed.

6. Curing:

The coating needs to be fully cured (usually several days) under specified environmental conditions (temperature, humidity) to achieve optimal performance. During curing, exposure to water, oil contamination, and mechanical damage should be avoided.

⑤ Quality Inspection

1. Surface cleanliness: Visual inspection after sandblasting, reaching Sa2.5 standard (no oil, no dirt, no oxide scale, no rust, only slight spots/streaks are allowed).

2. Roughness: Use a roughness meter to spot check when necessary to ensure it is within the range of 40-70 μ m.

3. Adhesion: After the coating is fully cured, conduct adhesion testing according to standards (such as ISO 4624 pull-off method or ASTM D3359 tape Test). The pull-off result should be ≥ 5 MPa (700 psi) to be qualified.

4. Dry film thickness: Perform multi-point measurements according to standard, ensuring the total DFT $\geq 160\mu$ m, with over 90% of measurement points achieving or exceeding the specified minimum thickness, and no points falling below 80% of the specified thickness.

5. Appearance: The coating should be continuous, uniform, and smooth (or possess the specified texture as required), free from noticeable defects such as sagging, blistering, pinholes, cracking, missed spray, dry spray, orange peel, or foreign particles. The color shall conform to the required specifications.

⑥ Packaging and transportation protection

After the chassis coating is completed, during storage and transportation, removable rubber or plastic corner protectors/sleeves should be installed on vulnerable areas such as edges, corners, and protrusions that are prone to impact damage.

Avoid using packaging materials that are easy to fade or react with paint (such as low-quality wrapping film) to directly contact the paint surface.

Ensure the chassis is securely strapped during transport to prevent friction or collision between chassis units or with other hard objects.

Summary of key points:

Sandblasting to Sa 2.5 grade + appropriate roughness is the basis of corrosion protection longevity. Two-component epoxy zinc-rich primer + two-component polyurethane topcoat constitutes the standard high-performance, durable coating system. For severe environments, add an epoxy intermediate coat.

Total Dry Film Thickness (DFT) $\geq 160\mu\text{m}$. Ensure adequate thickness of critical areas like corner welds (apply pre-coating).

Grind sharp edges to a radius $\geq 2\text{mm}$ ($R\geq 2\text{mm}$).

Strictly control application conditions and process parameters (mixing ratio, induction time, recoat interval, film thickness).

Strictly conduct quality inspections (surface cleanliness, roughness, adhesion, film thickness, appearance).

Suggestions:

Guangxi Dingbo Generator Set Manufacturing Co.,Ltd, selects industrial protective coating products from well-known brands.

Designate to experienced and qualified coating construction teams.

Strictly follow the product technical specifications (TDS) and construction guidelines provided by the coating supplier.

Following the above requirements can ensure that the chassis of the open-type diesel generator set possesses excellent corrosion resistance and long-lasting protection, enabling it to perform reliably even in relatively harsh operating environments.

If you have specific coating brand preference, environmental conditions at the project site (such as coastal high-salt-fog, corrosive gases in chemical areas, etc), or stricter specification requirements (like ISO 12944 C4/C5 environmental ratings), you can customize the product in Guangxi Dingbo Generator Set Manufacturing Co., Ltd.

The open type diesel generator set of Cummins engine 4B3.9-G2, pair with copy Stamford alternator integrates manufacturing processes that combine precision engine manufacturing, alternator electromagnetic design, and whole set machine assembly technology. The core process can be divided into the following four steps:

1. Engine Manufacturing Process (Cummins 4B3.9-G11)**1. Core component manufacturing**

Cylinder Block and Cylinder Head: Made of high-strength cast iron. The cylinder liner surface are processed with plateau honing technology, to form a micron-level mesh oil storage pattern which significantly reduces the risk of oil leakage and improves wear resistance.

Crankshaft and Camshaft: Made of forged steel, subjected to heat treatment and dynamic balancing calibration (residual unbalance $\leq 1 \text{ g}\cdot\text{cm}$) to ensure stability at high rotational speeds.

Integrated design: The cylinder block integrates multifunctional components (such as cooling water channels and oil circuits), reduces 40% of connectors, and improves structural rigidity and fault tolerance.

2. Fuel and Governing System

- Equipped with WF A-type in-line high-pressure fuel pump, combined with an electronic governor (steady-state fluctuation rate of $\pm 0.25\%$), to achieve precise fuel injection control, and fuel consumption rate is as low as $216 \text{ g/kW}\cdot\text{h}$.

- Holset wastegate optimizes turbocharger response, improving low-speed torque.

3. Assembly and testing

- Key bolts (such as cylinder head and crankshaft bolts) are tightened according to standard torque (such as crankshaft bolt torque $120 \pm 5 \text{ N}\cdot\text{m}$) and marked with anti-loosening marks.

- Complete cold test (no load) and hot test (load test) to verify the oil pressure ($\geq 345 \text{ kPa}$) and cooling system sealing.

2. Alternator production process (Shanghai Stamford GR180E)

1. Stator manufacturing

Core Processing: Utilizes 0.35 mm silicon steel laminations stamped and stacked. The outer circumference is then turned (with a machining allowance of 0.5–1 mm) to ensure core-to-stator frame concentricity $\leq \varphi 0.05 \text{ mm}$, reducing electromagnetic vibration.

Winding process: Features a 2/3-pitch skewed slot winding design to suppress third harmonics and minimize voltage waveform distortion ($\text{THD} \leq 8\%$). Coils employ Class H mica-powder tape insulation, multi-glue molded and cured, with a temperature resistance of 180°C .

2. Rotor and excitation system

- The salient pole rotor is dynamically balanced (Grade G2.5) and paired with an AVR (Automatic Voltage Regulator) module, to achieve a $\pm 1\%$ steady-state voltage regulation and supports 100% instantaneous load.

- Brushless excitation design, the rotating rectifier is sealed in the rotor to avoid carbon brush wear.

3. Anti-corona treatment

The slot section is coated with low-resistance anti-corona paint, and the end section is covered with high-resistance anti-corona tape to prevent partial discharge under high electric field, meeting the environmental requirements of altitude $\leq 1000 \text{ m}$.

3. Assembly and testing process

1. Power coupling:

- The diesel engine and alternator are directly connected through the SAE flywheel housing and high-elastic coupling, with coaxiality calibration $\leq 0.05\text{mm}$ to reduce vibration transmission.

2. Control system integration:

- Equipped with an LCD controller for real-time monitoring of voltage, frequency, and oil pressure. Supports remote fault diagnosis (e.g., SMS alerts).

- Optional ATS (Automatic Transfer Switch) cabinet enables seamless switching between utility power and generator power.

3. Whole machine performance test:

Load Test: 0-100% step load testing to verify transient voltage regulation ($\leq -15\%/+20\%$) and frequency recovery time (≤ 3 seconds).

Endurance Test: 12-hour continuous operation (including 1 hour at 110% overload), monitoring temperature rise, emissions, and abnormal vibration.

Summary

This open type genset achieves reliable power supply through high-precision power coupling (Cummins integrated diesel engine + Shanghai Stanford brushless alternator), strict thermal management (enclosed water cooling + IP23 protection) and intelligent control (AVR voltage regulation + LCD monitoring), and is suitable for communication base stations, construction site backup power supply and other scenarios. Its core technological advantages are:

- ① Failure rate control (40% parts reduction of diesel engine + brushless generator design);
- ② Power quality optimization (voltage distortion $\leq 8\%$, frequency fluctuation $\leq 1.5\%$);
- ③ Environmental adaptability (supports -40°C cold start, full power output at an altitude of 1000m).

2. 18KW Silent Canopy Diesel Genertaor Set with Cummins engine 4B3.9-G2 Shanghai Stamford alternator

Introduction of Manufacturing Process and Structural Design



Use at an ambient temperature above 50°C



Use at an ambient temperature below 40°C

A. Structure design for silent canopy

1. Shape and size design

- Rectangular structure: adopts a rectangular design (The size of DB-18GF:1700×730×1130mm), taking into account space efficiency and manufacturing process ability. The enclosure length must accommodate the diesel engine, generator, silencing system, and ventilation ducts (inlet chamber + exhaust chamber length).

- Functional Zoning: Divided into an air inlet side (alternator end) and an air exhaust side (diesel engine end). The air inlet area must be larger than the radiator heat dissipation area. the standard soundproof wind speed is $\leq 8\text{m/s}$, and the super silent type is $\leq 6\text{m/s}$ to avoid secondary wind noise.

Access Doors: An operation door with a tempered glass viewing window is located at the generator end. Maintenance doors are provided on both sides for operations such as replacing three filters (air, fuel, oil) and maintaining the battery. Door edges feature EPDM (ethylene propylene diene monomer) sealing strips with a compression set $\leq 30\%$.

2. Noise reduction system design

- Multi-layer Composite Soundproof Wall: adopts the structure of "shell steel plate (2-3mm) - damping layer (butyl rubber) - sound-absorbing cotton (50-300mm polyester fiber) - perforated interior panel ($\varphi 3\text{mm}$ aperture)", with a total thickness of 150-500mm, and a typical thickness of 200mm for 20kW genset.

- Labyrinth ventilation channel: The inlet/exhaust port has a labyrinth structure with three layers of sound-absorbing material, which extends the airflow path to enhance noise reduction and controls the wind speed $\leq 5\text{m/s}$.

Exhaust Silencing: Utilizes impedance compound silencer (multi-cavity expansion type), ensuring back pressure $\leq 5\text{kPa}$ and providing insertion loss $\geq 15\text{dB}$ @200Hz.

3. Auxiliary function integration

Bottom Fuel Tank: Integrated 8-hour fuel tank, raising the unit height for easier operation.

- Rain and dust proof: Rain and Dust Protection: Air inlets/outlets fitted with fixed or motorized louvers and air-spring sealed windows. Rain gutters on enclosure top and self-draining holes at the bottom.

- Safety devices: an emergency stop button is installed outside the box, and the internal exhaust pipes wrapped with ceramic fiber mat (650°C heat-resistant).

B. Material selection:

Component, Material Type, Specifications/Performance Requirements.

| Inside/outside the box | Galvanized steel (Q235/SPCC) | Thickness: 2-3mm |

| Damping layer | Butyl rubber or asphalt based damping pads | Thickness 2-5mm, elongation at break $\geq 300\%$ |

| Muffler layer | Environmentally friendly polyester fiber cotton/melamine foam | Density $\geq 80\text{kg/m}^3$, NRC ≥ 0.95 |

| Interior panels | Perforated aluminum sheet/galvanized perforated sheet | Aperture $\varnothing 3\text{mm}$, opening area rate 30% |

| Seals | Ethylene Propylene Diene Monomer(EPDM) | Temperature resistance $-50^{\circ}\text{C}\sim 150^{\circ}\text{C}$, Compression set $\leq 30\%$ |

| Shock absorbing component | Rubber shock absorber | Lifespan $\geq 20,000$ hours |

C. Production process

1. Sheet Metal Fabrication

- Laser cutting: Steel plates are precisely cut according to the drawings, with a tolerance of $\pm 0.5\text{mm}$.
- Bending & Forming: Corners are bent using a press brake ($R \leq 1\text{mm}$). Box body seam connections are fully welded and ground smooth for sound leak-proofing.

2. Noise Reduction Structure Assembly

- Press-bond multiple layers in sequence: outer shell \rightarrow spray damping adhesive \rightarrow attach sound-absorbing cotton \rightarrow fix perforated plate.
- Embed fiberglass wool within noise-attenuating channels, featuring a wedge-shaped tip design to enhance low-frequency sound absorption coefficient ($125\text{Hz} \geq 0.8$).

3. Functional component integration

-Shock absorber installation: Silicone rubber pads are installed between the diesel engine and the base, and calibrate the coaxiality of the alternator coupling to $\leq 0.05\text{mm}$.

- Exhaust system: The muffler is flexibly connected to the exhaust pipe to avoid vibration transmission.

D. Surface treatment and spraying process

1. Pretreatment

- Degreasing & Phosphating: Alkaline degreasing → Water rinsing → Surface conditioning → Zinc phosphating (coating weight: $2\text{-}3\text{ g/m}^2$), to enhance coating adhesion.

- Drying: Forced drying in an oven room at 80°C for 10 minutes.

2. Electrostatic powder spraying

- Powder type: epoxy polyester mixed type (TGIC-Free), Weather resistance $\geq 1,000$ hours (QUV test).

- Process Parameters: Spray gun voltage 60-90kV, atomizing air pressure 0.5-0.8MPa, curing conditions $180^\circ\text{C} \times 20$ mins, film thickness 80-120 μm .

- Special Treatment: spray epoxy zinc-rich primer (zinc content $\geq 80\%$) + polyurethane wear-resistant topcoat on the bottom of the box to resist stone chip impact.

3. Quality Control Points

- Clean the spray gun electrode regularly to avoid electrical leakage caused by paint adhesion.

- Coating hardness $\geq 2\text{H}$ (pencil hardness), salt spray resistance > 500 hours, complying with the GB 15607-2023 explosion-proof requirements.

E. Noise reduction performance verification

| | | | |
|--------------------------------|------------------------------------|-------------------------------------|--------------------|
| Noise reduction measures | Technical Parameters | Result | |
| Sound insulation of enclosure | 32dB(A) @500Hz | Block airborne sound transmission | |
| Sound-Absorbing Cotton NRC | 0.95 (Full frequency range) | Reverberation Noise Reduction | $\geq 20\text{dB}$ |
| Vibration Damper Efficiency | Vibration transmissibility $< 5\%$ | Structure-Borne Noise | |
| Attenuation $\geq 15\text{dB}$ | | | |
| Whole-Machine Noise | at 1 meter $\leq 85\text{dB(A)}$ | at 7 meters $\leq 75\text{dB(A)}$, | compliant ISO 8528 |

Summary: Core advantages of silent canopy

- **Ultra-low noise:** Through composite sound insulation wall + labyrinth ventilation + impedance muffler, noise level $\leq 65\text{dB}$ at 7m (exceeds the national standard requirement of $\text{LP7m} \leq 85\text{dB}$).

- **Environmental Adaptability:** IP23 protection class. Supports cold start at -40°C (requires equip with anti-condensation heater).
- **Long life design:** Galvanized steel sheet + anti-corrosion electrostatic spray coating, ensures the canopy lifespan >15 years; shock absorber fatigue resistance $\geq 20,000$ hours, 6mm thick galvanized steel plate provides exceptional rust and corrosion resistance; air intakes feature dual-stage filtration (filter element + mesh screen) to prevent sand/dust ingress and block wildlife entry.
- **Process Innovations:** laser cutting/bending to ensure sealing; zinc phosphating + epoxy zinc-rich primer for double rust prevention; sound-absorbing cotton and perforated plate combination to optimize acoustic performance.

3. Generator Room Design and Requirements For 18KW Diesel Generator Set

A. Installation environment core requirements

1. Ventilation and Heat Dissipation

- Air inlet/exhaust design:

- Sufficient air inlets are required at the alternator end (area ≥ 1.5 times the radiator cooling area), and efficient exhaust outlets are required at the diesel engine end (area ≥ 1.5 times the radiator area).

- Inadequate air intake will lead to incomplete combustion, carbon deposition, and reduced load capacity. Insufficient exhaust ventilation will cause oxygen deficiency in the room, affecting unit performance.

- Exhaust pipe specifications:

- Smoke exhaust pipe diameter \geq muffler outlet diameter, elbows ≤ 3 pcs, tilted 5° – 10° to prevent rainwater backflow; Vertical installation requires a rain cover.

- Exhaust back pressure $\leq 10\text{kPa}$, to ensure smooth exhaust gas discharge.

2. Space and layout

- Equipment spacing:

- Reserve a 1-1.5m maintenance passage around the unit and a 1.5-2m space on the top (no stacking of debris allowed).

- The distance between multiple units is $\geq 2.5\text{m}$ to avoid thermal interference.

- Foundation requirements:

- The concrete foundation must be level (calibrated with a level tool). Install special shockproof pads or bolts between the unit and the foundation.

- The open-type DB-18GF generator set weighs 730kg; foundation design must reserve 1.5× safety margin for load-bearing capacity.

3. Environment and Safety

-Corrosion Protection: Keep away from sources of acidic/alkaline corrosive gases to prevent corrosion of metal components.

-Explosion and fire prevention: Strictly prohibit flames and smoking in the genset room, equip with dry powder fire extinguishers and a fire sand bucket ($\geq 0.5\text{m}^3$). And the fuel storage room must be isolated.

-Grounding System:

-The unit casing is grounded for protection; The neutral point grounding must be independently established (sharing the utility power grounding grid is prohibited) and equipped with a lightning protection device.

-The utility power switching must be inspected and approved by the power supply authority to prevent backfeeding.

B. Genset room design standards

1. Location and structure

- Location Restrictions:

- Preferred Location: Should be situated on the ground floor or the first/second floor underground. Prohibit Install in the lowest basement floor. Avoid crowded areas, above the toilet and the main entrance and exit.

- Adjacent to the substation to minimize power supply radius (low-voltage lines $\leq 200\text{m}$).

- Building Separation Requirements:

- Fire-resistant wall ≥ 2 hours, floor ≥ 1.5 hours, independent fire partition; The oil storage room is isolated by fire wall + Class A fire door.

2. Fuel storage system specifications

- Fuel storage room design:

- Fuel storage capacity ≤ 8 hours fuel consumption (the fuel consumption of the genset DB-18GF is approx. 4.32L/h@50\% load), and the total volume $\leq 1\text{m}^3$.

- Vent pipes of fuel tanks leads to the outdoors; anti-leakage oil troughs is set on the ground.

- Fuel Supply Logic:

- Grade III hospitals require >24 hours of fuel supply capacity (requiring an external tank); Grade II hospitals require >12 hours.

3. Ventilation & Noise Reduction

-Forced Ventilation:

- Enclosed execution water-cooled units require mechanical air supply/exhaust system, and the air intake volume is calculated as 1.8 times the radiator surface area.
- Exhaust temperature $\leq 60^{\circ}\text{C}$ to avoid heat reflux.
- Noise Reduction Measures:
 - Fill the wall with sound-absorbing cotton ($\text{NRC} \geq 0.95$), and install a silencer on the exhaust pipe; open type units is $102\text{dB}@1\text{m}$, silent canopy unit needs to be reduced to $\leq 65\text{dB}/7\text{m}$.

4. Emergency and auxiliary systems

- Fire Protection Configuration:

- An automatic gas fire extinguishing system is installed in the machine room, and fire hydrants along with emergency lighting are equipped outside the door.

- Control Room Requirements:

- A single unit $\geq 500\text{ kW}$ or multiple units require an independent control room, and the distance between the power distribution panels and the generator units must be maintained ≥ 1.5 meters.

Key requirements for DB—20GF genset room:

| | |
|--------------------------------|---|
| Number of exhaust pipe elbows | $\leq 3\text{pcs}$. |
| Fuel storage room capacity | $\leq 1\text{m}^3$ (approx. 230L diesel). |
| Grounding resistance | $\leq 4\Omega$ (Independent grounding). |
| ** Startup time ** | $\leq 15\text{ Sec}$ (Grade III hospitals). |
| Noise limit (residential area) | $\leq 65\text{dB}/7\text{m}$ (silent canopy). |

Air inlet area $\geq 1.5 \times \text{water radiator}$ ($\approx 0.6\text{m}^2$)

C. Summary: Design points and common problems

– Compatibility design DB-20GF diesel generator set, the overall dimensions $L1700 \times W730 \times H1130\text{mm}$, Lifting holes ($\geq 2 \times \text{dimensions}$) and transportation passages need be reserved.

– Special requirements of hospitals:

– Configure UPS for Grade I special critical loads (such as operating rooms) to make up for the 15-second start-up delay of the generator. The diesel unit is responsible for the backup power supply.

– Fire protection loads must connect to the backup power supply and strictly prohibited from sharing circuits with the emergency power supply.

– Typical error avoidance:

– Avoid smoke exhaust outlets close to the fresh air inlet; ordinary wooden doors are strictly prohibited in the oil storage room; Basement genset room requires moisture-proofing and drainage facilities.

Guangxi Dingbo Generator Set Manufacturing Co.,Ltd, recommends that users entrust qualified and licensed electromechanical design institutes for detailed engineering drawings.

4. Dingbo Cloud Remote Monitoring Management System

Our diesel generator sets are equipped with the "Dingbo Cloud" monitoring and management system, which can remotely manage the diesel generator sets.

Say goodbye to passively waiting to be notified of failures to proactively identifying issues and performing maintenance.

Dingbo Power's newly developed diesel generator sets utilize the Dingbo cloud management system. With customer's authorization, this system manages the operation, fault troubleshooting, and maintenance of customer's generator sets. Customers can remotely monitor and control their units via mobile phones and computers, achieves an integration featuring remote video surveillance, monitoring, management, and service, to enhance management efficiency and business benefits.

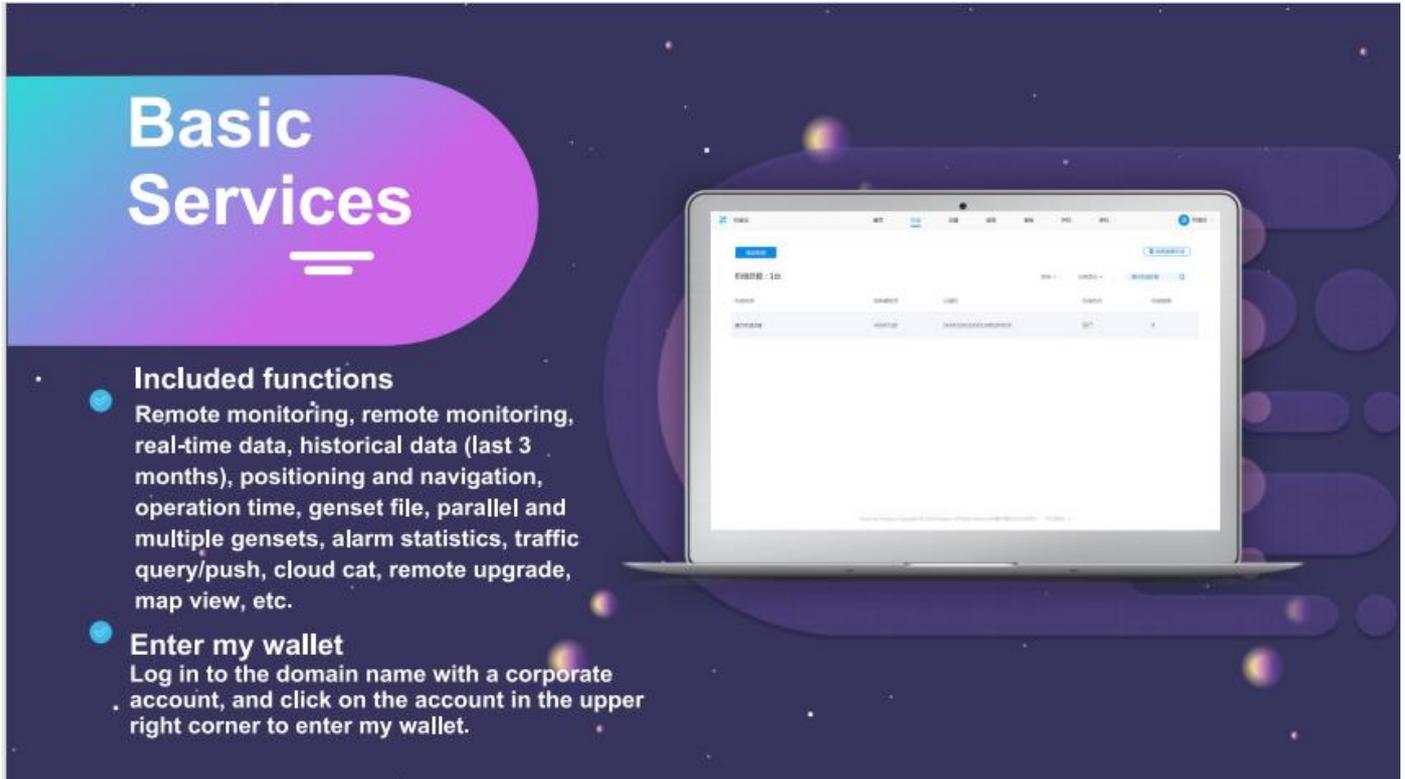
In today's fiercely competitive market, for equipment manufacturers, winning the market and the timeliness and efficiency of after-sales service response are equally important. However, the traditional after-sales service model is that once the equipment or system fails, the user must notify the supplier, who then dispatches a professional engineer to the customer site for repairs. Due to insufficient understanding of diesel generator sets and insufficient professional knowledge by users, the descriptions provided when notifying suppliers may be not accurate enough, which makes it difficult for supplier technicians to make professional judgments. For failures that may require replacement of spare parts, if technicians fail to bring the corresponding spare parts when arrive at the site, the repair time will be extended, which will inevitably cost a lot of manpower and time costs, thereby indirectly causing an increase equipment or system expenses. Therefore, to reduce costs, provide faster service to customers, and minimize their losses, our company has invested substantial human and financial resources in developing the "Dingbo Cloud System", which was officially put into use at the end of 2020. This system offers remote diagnosis and maintenance for customers.

The remote diagnosis and maintenance system has the advantages of real-time remote, shared diagnostic resources, and high efficiency. The realization of these advantages must be based on the "Dingbo Cloud" system. **Once authorized by customers, our company can assist in managing their generator set through the cloud platform. Upon identifying issues, it will be fed back to the after-sales service department in time, and then the technical service personnel stationed at the location of generator set will be dispatched to contact the user's operator for maintenance. If the operators cannot resolve the issue, our professional technicians can provide support through remote video assistance or on-site visits for maintenance and repairs. This enables proactive maintenance rather than passive waiting.**

The main functions of the system include: remote monitoring, remote measuring, real-time data, historical data (in recent 3 months), positioning navigation, operating time, unit archives, parallel multi-machine, alarm statistics, traffic check/push, cloud cat remote upgrade, map viewing, etc.

1. Basic functions

Remote monitoring, remote measuring, real-time data, historical data (in recent 3 months), positioning navigation, operating time, unit archives, parallel multi-machine, alarm statistics, traffic check/push, cloud cat remote upgrade, map viewing, etc.



Basic Services

- Included functions**
 - Remote monitoring, remote monitoring, real-time data, historical data (last 3 months), positioning and navigation, operation time, genset file, parallel and multiple gensets, alarm statistics, traffic query/push, cloud cat, remote upgrade, map view, etc.
- Enter my wallet**
 - Log in to the domain name with a corporate account, and click on the account in the upper right corner to enter my wallet.

2. Remote monitoring

- (1) Remote Monitoring: Engine and alternator status is displayed in "Real-time Status";
- (2) Start/Stop Control: Supports Auto, Stop, Manual, Start, Reset, and Shutdown operations;
- (3) Closing/opening: supports power generation closing/opening, and utility power closing/opening, etc.;
- (4) Identity Authentication: All operations require facial recognition or control code verification.

Remote monitoring

- Remote monitoring**
Engine, generator display see "Real-time status".
- Start and stop control**
Support automatic, shutdown, manual, startup, reset, shutdown, and other operations.
- Closing/opening**
Support operations such as power generation on/off, city power on/off, etc.
- Authentication**
All operations require identity verification through face swipe or control code.

Note: The control code is viewed in the cloud cat information.

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3. Remote measuring

(1) Measuring engine speed, water temperature, oil pressure, coolant level, battery voltage, and charge voltage;

(2) Measuring alternator output power, power factor, three-phase current, three-phase voltage, frequency, etc;

(3) Check the status of the unit through the monitoring controller; control steps require identity verification.

4. Real-time data

(1) Include all data such as cumulative operating hours and maintenance countdown of the engine;

(2) include all collectible and analyzable data such as cumulative electrical energy of the alternator;

(3) Utility power/Busbar three-phase voltage, single-phase voltage, frequency, phase, etc.;

(4) All I/O port inputs/outputs, as well as programmable input/output.

Real-time data

- **Engine**
Including all detailed data such as cumulative running time, maintenance countdown, etc.
- **Alternator**
All detailed data that can be collected and analyzed, including accumulated power.
- **Utility / Busbar**
Three-phase voltage, single-phase voltage, frequency, phase, etc.
- **I/O ports**
Various inputs and outputs, programmable entrances and exits, etc.

Note: The above parameters can be custom edited and displayed, and only the parameters on the cloud are modified, without changing the actual parameters of the genset.

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5. Historical data

- (1) Save the unit's operating data in recent 3 months;
- (2) Support viewing 20 items of data at the same time;
- (3) Support viewing at any date/time period/time;
- (4) Support zoom viewing.

Historical data (The last three months)

- Save genset operating data for the last 3 months.
- Support self-selected 20 data to view at the same time.
- Support optional date/time period/any time to view.
- Support zoom view.

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6. Operating time

- (1) Daily running time: Can check the operational details for the current day and historical days;
- (2) Cumulative running time: Calculate the total accumulated operating time to facilitate maintenance.
- (3) Interval Runtime: can select the date and count the interval running time.

Running time

- Current day running time: You can check the current day and historical running details.
- Cumulative operating hours: statistics on cumulative hours for easy repair and maintenance.
- Interval run time: customizable date, statistics interval time.

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演示机组
运行

远程监控 实时数据 历史数据 视频监控

报警分析 定位导航 运行时间 Run time 云端信息

机组档案

点击运行时间
Click Run Time

7. Check **generator set** archives

- (1) Generator set: Data such as power, speed, voltage, and current are associated with the real-time status;
- (2) Engine: Brand, engine model, power, serial number, manufacturer, and manufacture date;
- (3) Alternator: Brand, alternator model, power, serial number, manufacturer, and manufacture date;
- (4) Controller: Brand, series, model, address, port, baud rate, longitude and latitude, etc. are key parameters for cloud settings.

Genset files

- **Generator sets**
 Power, speed, voltage, current and other data associated with real-time status
- **Engine**
 Brand, model, power, serial number, manufacturer, date, etc.
- **Alternator**
 Brand, model, power, serial number, manufacturer, date, etc.
- **Controller**
 Brand, series, model, address, port baud rate, latitude and longitude, etc. are the key parameters for setting up the cloud.

Note: The genset file will later be associated with the cloud official website to connect the industry chain and develop in-depth applications such as intelligent operation and maintenance, IOT leasing, etc.

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8. Parallel/multi-machine management

(1) Paralleling Management: Established based on the paralleling controller, units cannot be added repeatedly. Internal personal can be added, and external users can be invited via paralleling ID;

(2) Multi-Unit Management: Group management according to different members, regions, customers, etc. Internal personal can be added, and external users can be invited via paralleling ID;

(3) Multi-Unit Monitoring, Single-Unit Control, Unlimited units, multi-personnel management.

(4) Create paralleling/multi-unit groups via App and monitor systems via Web.

9. Alarm statistics:

(1) Statistics: Access statistics for all units under the platform via the bottom-left corner of the homepage;

(2) View current Alarms: Check the total number of alarms, number of units from which they came, and detailed alarm information.

(3) View historical alarms: alarm statistics, curves, and details in recent week, one month, and three months.

Merger machines/multiple machines

- Merge machine management**
Based on the merge machine controller, gensets cannot be added repeatedly. You can add internal personnel or invite others by parallel number.
- Multi-machine management**
Group management according to different members, regions, customers, etc. You can add internal personnel or invite others through group number.
- Multi-machine view, single-machine control, unlimited number, multi-management.**
- App to create merge machines /multiple machines, web side view.**

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9. Remote setting

- (1) Parameters can be remotely set and modified;
- (2) Supports host computer software such as controllers, as well as host computer software such as engines and generators;
- (3) Remote configuration setting via both mobile phone and computer.

11. Remote Lockout:

- (1) Remotely send a command to Lockout the controller, making it unable to work;
- (2) Lockout is only permitted when the genset is in a shutdown state; it must never be performed during operation;
- (3) For safety, remote lockout capability is exclusively configured for enterprise accounts.

5. Routine Maintenance

1. Regular maintenance cycle

| Item | Request | Replacement |
|---------------------------|--|---|
| Oil filter, diesel filter | After 60 hours of first use | Replace CI-4/CK-4 Grade 15W-40oil (9.5L) rotary filter |
| Oil filter, diesel filter | 250 hours or six months | Replace CI-4/CK-4 Grade 15W-40 oil(9.5L) rotary filter |
| fuel filter | 500 hours or 12 months | Dual-stage filter (coarse filtration + fine filtration) |
| Air filter | 1000 hours or safety indicator turns red | Replace when the safety indicator turns red or the pressure difference reaches 725kpa; reduce by half in dusty environments |
| Coolant | 2 years or 4000 hours | Replace 50% ethylene glycol mixture (freezing point - 40°C) with DCA4 corrosion inhibitor to maintain concentration. |

Note: Maintenance and replacement shall be conducted as per the standards in the instruction manual.

2. Key wearing parts

| Item | Replacement cycle | Replace | Brand |
|----------------------------|---|--|------------------|
| V-belts | 1500 hours | Crack/wear > 1.5mm, Preload<350N | Cummins Specific |
| Battery | 2-3years | Starting voltage24V (Normal≥24V) | Genset Specific |
| Fuel Injection Nozzle | 1500 hours-2000 hours | Oil dripping →carbon deposits ,cylinder knocking | Cummins Specific |
| Water pump mechanical seal | 2500 hours-3000 hours | Coolant leakage → cylinder scuffing due to overheating | Cummins Specific |
| Injector seal ring | Replace each time the injector is removed | Diesel penetrates into the oil casing, causing oil dilution and oil level rise | Cummins Specific |
| Turbocharger Bearing | 8000 hours | Abnormal noise/sudden increase in oil consumption (0.5L/100ND) | Cummins Specific |
| Alternator AVR modules | 2 years or 10000 hours | Breakdown and burnout→ Overpressure damage to equipment | Cummins Specific |
| Oil pressure | Replace due to | Abnormal oil pressure unalarmed→ | Cummins |

| | | | |
|----------------------------|----------------------------------|--|------------------|
| sensor | operating failure | poor lubrication→ Bearing seizure→ Bearing damage | Specific |
| Coolant temperature sensor | Replace due to operating failure | False overheat alarm→ False shutdown protection trigger; Failure→ Overheating-induced cylinder scuffing | Cummins Specific |
| Speed sensor | Replace due to operating failure | Signal missing→ engine cannot start or runs erratically | Cummins Specific |

3. Common failure and solution

| Common failure | | Symptom | Cause | Solution |
|----------------------|-------------------------------------|---|---|---|
| Start system failure | Unable to start | The starting motor does not rotate or the speed is insufficient | Low battery voltage(<22V)or the terminals are corroded; Starter relay/contactors failure; Starter motor carbon brush wear | Measuring battery voltage, charging or replacing; Short-circuit test for relay contacts; Replace damaged parts, disassemble and inspect the motor, and replace the carbon brushes. |
| | Turn off immediately after starting | Stop after running for 3-5 seconds | Fuel system air intake Shutdown solenoid valve failure Oil pressure switch failure | Bleed the fuel filter air; Manually hold the solenoid valve to test; Short circuit pressure switcher verification. |
| Fuel system failure | Insufficient power | The speed drops significantly when is loaded | Fuel filter is clogged (pressure difference > 50kPa) Plunger wear in fuel injection pump(fuel supply pressure<18MPa) Poor atomization of the fuel injection nozzle (oil dripping) | replace dual-stage filter (coarse filter + fine filter); Professional pump calibration (adjusting the fuel supply advance angle); Ultrasonic clean fuel injectors |
| | Severe black smoke | Black smoke from the exhaust accompanied by power reduction | Air filter is clogged(pressure difference > 25kPa); Turbocharger oil leak; Abnormal valve clearance (insufficient air intake) | Replace the air filter (pay attention to ISO 5011 standard) ; Check the supercharger axial clearance(should be<0.15mm); Adjust valve clearance (cold engine state: air intake |

| | | | | |
|----------------------------|----------------------------|---|---|--|
| | | | | 0.25mm/ exhaust 0.50mm). |
| Lubrication system failure | Low oil pressure | Warning light is always on (pressure < 0.15MPa) | Oil dilution (of fuel) The clearance of the oil pump gear is too large (> 0.20mm) Main bearing wear | Check the oil viscosity (should be >12cSt at 40°C); Measure the oil pump end clearance (standard 0.05-0.15mm); Need to overhaul and check the bearing. |
| | Abnormal oil consumption | Refill every 100 hours > 1L | Piston ring gap alignment or wear (cylinder pressure < 2.5MPa); Turbocharger oil seal leakage. | Cylinder pressure test; Check the turbocharger vent port for oil residue. |
| Cooling system failure | Water temperature overheat | Water temperature > 95°C alarm | Thermostat stuck (test start temperature 82-88°C); Radiator is clogged (dust accumulation between fins > 50%); Pump impeller corrosion | Boiling water test for thermostat; High-pressure air gun backwashing radiator; Check pump discharge capacity (should be > 80L/min). |
| | Coolant Leakage | | | pump mechanical seal (drip > 3 drops/min need to be replaced); Cylinder head gasket (cylinder head bolt torque needs to be re-tightened to 120±5Nm). |
| Electrical system failure | No power generation | | Testing steps: Measure residual magnetic voltage (should be > 3V AC); Check AVR fuse (usually 5A); Test rotating diode (forward resistance < 1Ω, reverse ∞). | Exciter magnetization (12V battery touches momentarily F+/F-); Replace with the same model AVR (note the voltage regulation accuracy ±1%). |
| | Voltage fluctuations | | Excitation carbon brush bouncing (Replace if length < 15mm); Non-linear load (UPS/inverter) interference. | Polish the slip ring; (roughness Ra ≤ 1.6μm) Install harmonic filter. |

| | | | |
|-----------------------------|-------------------------------|---|--|
| Control system failure | Failure to operate of ATS | Troubleshooting process: Simulate utility power failure (detect PLC output signal); Check the limit switch of the switching motor; Testing mechanical interlocks. | Maintenance points: Monthly manual switching test; Apply conductive paste to contacts. |
| | Frequent protection shutdowns | Key points to check: Oil pressure sensor(resistance changes linearly with pressure) Water temperature sensor (resistance is about 180Ω at 100℃) Overcurrent relay (action value should be 110% of rated current) | |
| Typical mechanical failures | Abnormal vibration | Diagnostic method: Disassemble the coupling and test the engine separately Perform dynamic balancing(vibration value should be<7.1mm/s) | Common causes: Crankshaft bending(radial runou > 0.05mm); Flywheel bolts loose (need to be tightened in diagonal order). |
| | Abnormal exhaust noise | Judgment: Crisp metallic sound: valve clearance is too large. Dull knocking sound: connecting rod bearing clearance exceeds the standard(> 0.10mm). | |

Special Tips:

When performing work involving the high-pressure fuel system, the system must first be depressurized – by loosening the injector end nuts and pumping manually.

The negative pole of the battery must be disconnected before the electronic control system repairment.

The turbocharger must be cooled at idle speed for 3 minutes after shutdown.

Suggest refer to the Cummins 4B3.9-G2 maintenance manual and the Copy Stamford GR180F technical specifications.

Summary: The core maintenance for the 4B3.9-G2 is regularly replacing the three filters and engine oil, while strictly adhering to fuel quality requirements and usage environments. In plateau regions, extreme cold, sandy/dusty conditions, or areas with high salinity, alkalinity, acidity, or elevated temperature/humidity, dedicated kits or custom production options must be selected. Pre-operation checks are mandatory before each use.Recommendation: Conduct a comprehensive performance inspection every 1,500 operating hours.

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