modasa Energy

Volvo T4F Engine Generator
Perkins T4F Engine Generator

EN

# OPERATOR'S MANUAL

V.03.2401 07-2024 ©Motores Diesel Andinos S.A. - Modasa

**Copyright notice**

© Copyright 2024 by Motores Diesel Andinos S.A. - Modasa
All rights, including copying and distribution rights, are reserved.
This publication may be photocopied by the original purchaser of the machine. Any other type of reproduction is prohibited without express written permission from Motores Diesel Andinos S.A. - Modasa.
Any type of reproduction or distribution not authorized by Motores Diesel Andinos S.A. Modasa represents an infringement of valid copyrights. Violators will be prosecuted.

**Trademarks**

All trademarks referenced in this manual are the property of their respective owners.

**Manufacturer**

Manufacturer Motores Diesel Andinos S.A. - Modasa
Legal Address: Car. Antigua Panamericana Sur Km. 38.2 Lote. 3 Fnd. las Salinas
District/City: Lurín
Department: Lima, Perú
Tel: +51 (1) 615 8500
Website: www.modasa.com.pe

**Original instructions**

This Operator's Manual presents the original instructions. The original language of this Operator's Manual is Spanish.

Thank you for choosing this quality built Modasa stationary generator designed for coupling with trailers. We are pleased that you've placed your confidence in the Modasa brand. When operated and maintained according to the instructions in this manual, your Modasa generator will provide many years of dependable service.

This manual contains safety information to make you aware of the hazards and risks associated with stationary generators and how to avoid them. As Modasa may not necessarily know all the applications this generator could be used for, it is important that you read and understand these instructions thoroughly before attempting to start or operate this equipment. Save these original instructions for future reference.

Additionally, thank you for choosing a Modasa Energy product. Our generators are meticulously designed to deliver superior performance, ensure efficient operation, and offer years of reliable service with proper maintenance. The details provided in this manual are precise as per the products manufactured at the time of publication. Modasa Energy reserves the right to implement technical updates, rectifications, and product enhancements at any given time without prior notice.

Use this page to record important information about your unit.

| | |
|---|---|
| **Unit Model No.** | |
| **Unit Serial No.** | |
| **Engine Model No.** | |
| **Engine Serial No.** | |
| **Generator Model No.** | |
| **Generator Serial No.** | |
| **Date Purchased (Date of Purchase)** | |

**Machine Documentation**

- From this point forward in this documentation, Modasa Energy will be referred to as Modasa.
- Always keep a copy of the Operator's Manual with the machine.
- Use the separate Parts Book supplied with the machine to order replacement parts.
- If you are missing any of these documents, please contact Modasa Energy to order a replacement or visit www.modasa.com.pe
- When ordering parts or requesting service information, be prepared to provide the machine model number, item number, revision number, and serial number.

**Expectations for information in this Manual**

- This manual provides information and procedures to safely operate and maintain the Modasa Energy model(s) mentioned above. For your safety and to reduce the risk of injury, carefully read, understand, and observe all instructions described in this manual.
- Modasa Energy expressly reserves the right to make technical modifications, even without notice, which improve the performance or safety standards of its machines.
- The information contained in this manual is based on machines manufactured up until the time of publication. Modasa Energy reserves the right to change any portion of this information without notice.
- The illustrations, parts, and procedures in this manual refer to Modasa Energy factory-installed components. Your machine may vary depending on the requirements of your specific region.

**California Proposition 65 Warning**

Engine exhaust, some of its constituents, and certain vehicle components contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

**Laws Pertaining to Spark Arresters**

NOTICE: State Health Safety Codes and Public Resources Codes specify that in certain locations, spark arresters must be used on internal combustion engines that use hydrocarbon fuels. A spark arrester is a device designed to prevent accidental discharge of sparks or flames from the engine exhaust. Spark arresters are qualified and rated by the United States Forest Service for this purpose. To ensure compliance with local laws concerning spark arresters, please consult the engine distributor or the local Health and Safety Administrator.

# Table of Contents


**1.Safety Information** 10

1.1. Read the Manual 11
1.2. Obtaining Services 11
1.3. Safety Rules 11
1.4. Safety Symbols Used in this Manual 11
1.5. Machine Description and Intended Use 12
1.6. Safety Guidelines for Operating the Machine 13
1.6.1. Operator Training 13
1.6.2. Operator Qualifications 13
1.6.3. Application Area 13
1.6.4. Safety Devices, Controls, and Attachments 14
1.6.5. Safe Operating Practices 14
1.6.6. Personal Protective Equipment (PPE) 14
1.6.7. After Use 14
1.7. Service Safety 15
1.7.1. Service Training 15
1.7.2. Precautions 15
1.7.3. Machine Modifications 15
1.7.4. Replacing Parts and Labels 15
1.7.5. Cleaning 15
1.7.6. Electrical Service Safety 16
1.7.7. Cooling System Safety 16
1.8. Operator Safety while Using Internal Combustion Engines 16
1.8.1. Operating Safety 16
1.8.2. Refueling Safety 17
1.9. Safety Guidelines for Mobile Generators 17
1.9.1. Installing as Backup Power 18
1.9.2. General Safety 18
1.9.3. Ground Connection 18
1.10. Safety Guidelines for Towing the Machine 18
1.11. Safety Guidelines for Lifting the Machine 19

**2. General Information** 20

2.1. Generator Plate 21
2.2. Diesel Engine 21
2.3. Engine Electrical System 21
2.4. Cooling System 21
2.5. Alternator 21
2.6. Fuel Tank and Frame 21
2.7. Vibration Isolation 22
2.8. Muffler and Exhaust System 22
2.9. Genset Controller 22
2.9.1. Operational Guidelines for Genset Controllers 22
2.9.2. Recommendations 22
2.9.3. DSE Modules 22
2.9.3.1. DSE 7320 Module 22
2.9.3.1.1. Controller Description 22
2.9.3.1.2. Control Buttons 23

## Table of Contents


2.9.1.3. Operating Modes 24
2.9.1.3.1. Manual Mode 24
2.9.1.3.2. Automatic Mode 24
2.9.1.3.3. Test Mode 24
2.9.2. DSE 8610 Module 25
2.9.2.1. Controller Description 25
2.9.2.2. Control Buttons 25
2.9.2.3. Operation Modes 26
2.9.2.3.1. Manual Mode 26
2.9.2.3.2. Automatic Mode 26
2.9.4. Controller Modes 27
2.9.4.1. MANUAL Mode 27
2.9.4.2. AUTO Mode 27
2.9.4.3. STOP/RESET Mode 27
2.9.5. Operator Pages 27
2.9.5.1. Home Page 27
2.9.5.2. Generator Page 27
2.9.5.3. Alarms Page 27
2.9.5.4. ECU DTC Page 28
2.9.5.5. Event Log Page 28
2.9.5.6. Serial Port Page 28
2.9.5.7. Program File Information Page 28
2.9.5.8. About Page 28
2.9.5.9. Maintenance Alarms 28
2.9.6. Genset Controller with Paralleling (If equipped) 28
**2.10. Protection Switch 28**
**2.11. Engine After Treatment Monitoring 28**

**3. Transport and Set-Up 30**

**3.1. Transport 31**
3.1.1. Lifting the Generator 31
3.1.2. Towing the Generator 32
3.1.2.1. Hitch and Coupling Guidelines 32
3.1.2.2. Preparing Unit for Towing 33
3.1.3. Forklift 33
3.1.4. Dragging the Unit (Skid-Mounted Units Only) 33
**3.2. Grounding the Generator 33**
3.2.1. External Grounding 34
3.2.2. Internal Grounding 34
**3.3. Cable Selection 34**

**4. Preparation and Verification 36**

**4.1. Overview 37**
**4.2. Pre-Start Checklist 37**
**4.3. Using an External Battery Charger. 38**
**4.4. Manually Starting the Unit 38**
**4.5. AUTO (Remote) Starting the Unit 39**
4.5.1. Remote Start Terminal Block 39

# Table of Contents


4.6. Check Engine Oil Level 39
4.7. Check Coolant Level 39
4.8. Clean Instruments in Control Panel 39
4.9. Check Fuel 39
4.10. Check Interior 40
4.11. Check Belt Tension 40

5. Operation and Monitoring 41

5.1. Fine Tuning the Voltage 42
5.1.1. Voltage Regulator 42
5.2. Main Circuit Breaker 42
5.3. Connection Lugs 42
5.3.1. Connecting to Lugs 42
5.4. Cam Lock Connections (If equipped) 43
5.5. Convenience Receptacles 44
5.5.1. Correct Receptacle Use (If equipped) 44
5.6. Voltage Selector (If equipped) 44
5.7. Link Board (If equipped) 45

6. Shutdown and After-Maintenance 46

6.1. Shutting Down the Unit 47
6.2. Emergency Stop Switch 47

7. Troubleshooting 48

7.1. General Troubleshooting 49
7.2. Circuit Breaker 50
7.3. Circuit protector (CP) for AVR protection 50
7.4. Genset Controller Alarms and Shut-Down Conditions 50
7.4.1. Warning Alarms 50
7.4.2. Shut-down Alarms 50
7.5. Documentation Provided by the Volvo Manufacturer 51
7.5.1. Operator's Manual 52
7.5.2. Service Protocol 52
7.5.3. Product Leaflet 52
7.5.4. Workshop Manual 53
7.5.4.1. Troubleshooting 53
7.5.4.2. Wiring Diagram (EATS) 53
7.5.4.3. DTC (CIM / DCU Optional / Telematics Gateway / EMS) 54
7.5.4.4. Repair & Specification + DTC (EATS T4F) 54
7.5.5. Service and Maintenance Manual 54
7.6 Documentation Provided by Perkins Manufacturer 55
7.6.1. Operator's Manual 55
7.6.2. Service Protocol 55
7.6.3. Product Leaflet 55
7.6.4. Workshop Manual 55
7.6.4.1. Troubleshooting 55
7.6.4.2. Wiring Diagram 56

## Table of Contents


7.6.4.3. Diagnostic Trouble Codes (DTC) 56
7.6.4.4. Repair and Specifications 56
7.6.5. Service and Maintenance Manual 56
7.6.6. Electrical Field Test Procedures 56
7.6.7. Mechanical Test Procedures 56
7.6.8. Starting and Charging Systems 56
7.6.9. General Installation Manual 57

**8. Maintenance 58**

**8.1. Maintenance 59**
**8.2. Daily Walk Around Inspection 59**
**8.3. General Maintenance 60**
**8.4. Fuel Recommendations 61**
**8.5. Adding Fuel 61**
**8.6. Engine Oil Recommendations 62**
8.6.1. Commercial Oils 62
8.6.1.1. Maintenance Intervals for Engines Using Biodiesel 62
8.6.1.2. Lubricant Viscosity Recommendations for Direct Injection (DI) Diesel Engines 63
8.6.2. Aftermarket Oil Additives 63
8.6.3. Oil Analysis 63
**8.7. Coolant Recommendation 64**
**8.8. DEF Recommendations 64**
8.8.1. Specification 64
8.8.2. Spillage 65
8.8.3. Filling the DEF Tank 65
8.8.3.1. DEF Quality 65
8.8.3.2. Cleanliness 65
8.8.3.3. Storage 65
8.8.3.4. Materials Compatibility 65
**8.9. Basic Maintenance Schedule 66**
8.9.1. Preventive Maintenance Service Table – Engine 67
8.9.2. Preventive Maintenance Service Table – Alternator 70
8.9.3. Preventive Maintenance Service Table – Electrical Panel 73
**8.10. Resetting Maintenance Alarms 74**
**8.11. DEF System Maintenance 74**
8.11.1. DEF Testing 74
8.11.2. DEF Tank Cleaning 75
8.11.3. DEF Disposal 75
8.11.3.1. DEF Tank Refilling 75
8.11.4. DEF Storage Guidelines 76
**8.12. DOC, SCR, and DPF Cleaning Operations 76**
**8.13. Diesel Particulate Filter Regeneration 77**
8.13.1. Modes of Regeneration 77
8.13.2. Regeneration Triggers 77
**8.14. Alternator 78**
8.14.1. Windings 78
8.14.2. Bearings 79
**8.15. Battery 79**

## Table of Contents


8.15.1. Battery Specifications 79
8.15.2. Battery Usage Recommendations 79
8.15.3. Checking the Charge 80

**9. Storage** **81**

**9.1. Preparation for Long-Term Storage.** **82**
**9.2. Machine Disposal and Decommissioning** **82**
9.2.1. Preparation 82
9.2.2. Disposal 83

## 1. Safety Information


1.1. Read the Manual

1.2. Obtaining Services

1.3. Safety Rules

1.4. Safety Symbols Used in this Manual

1.5. Machine Description and Intended Use

1.6. Safety Guidelines for Operating the Machine

1.7. Service Safety

1.8. Operator Safety while Using Internal Combustion Engines

1.9. Safety Guidelines for Mobile Generators

1.10. Safety Guidelines for Towing the Machine

1.11. Safety Guidelines for Lifting the Machine

**1.1. Read the Manual**

- If any part of this manual is unclear, please contact your nearest Modasa Energy distributor or reach out to Modasa Energy Technical Service at +(51 1) 615 8500 or visit www.modasa.com.pe for assistance with any questions or concerns.
- The equipment owner holds the responsibility for proper maintenance and safe usage. Adhere to regulations set by the Occupational Safety and Health Administration (OSHA) or equivalent standards. Additionally, ensure that the unit is applied, used, and maintained in line with the manufacturer's instructions and recommendations. Avoid any actions that could compromise safe application and usage, leading to noncompliance with the mentioned codes, standards, laws, and regulations.
- Keep these instructions for future reference. This manual includes crucial guidelines for setting up, operating, and maintaining the unit and battery. ALWAYS provide this manual to anyone operating the machine.

**1.2. Obtaining Services**

- If the unit requires servicing or repairs, reach out to a Modasa Energy Authorized Service Dealer (MEASD) for assistance. Our service technicians are factory-trained and equipped to address all service-related needs. If you need help locating a dealer, please visit www.modasa.com.pe.
- When communicating with an MEASD regarding parts and service, ensure to provide the complete model and serial number of the unit, as indicated on the data decal located on the unit. Document the model and serial numbers in the designated spaces on the front cover of this manual for future reference.

**1.3. Safety Rules**

While the manufacturer strives to address potential hazards, it is impossible to foresee every circumstance. As a result, the warnings in this manual and on tags and decals attached to the unit may not cover all possible risks. If employing a procedure, work method, or operating technique not explicitly recommended by the manufacturer, ensure its safety for others. Additionally, confirm that the chosen procedure, work method, or operating technique does not compromise the safety of the equipment.

**1.4. Safety Symbols Used in this Manual**

In this manual and on tags and decals attached to the unit, you will encounter DANGER, WARNING, CAUTION, and NOTE blocks. These are employed to draw attention to specific instructions related to an operation that may pose a hazard if not executed correctly or with care. Pay close attention to these symbols and their meanings, outlined as follows:

**⚠ DANGER!**

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

**⚠ WARNING!**

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

**⚠ CAUTION!**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

**NOTICE!**

Used without the safety alert symbol, NOTICE indicates a situation which, if not avoided, could result in property damage.

**NOTE:**

Notes contain additional information important to a procedure and will be found within the regular text of this manual.

### 1.5. Machine Description and Intended Use

This machine is a mobile electric power source. The Modasa Energy Mobile Generator consists of a cabinet containing an electric alternator, a fuel tank, and a diesel engine. A control panel, receptacles, and connection lugs are provided on the side of the cabinet. As the engine runs, the generator converts mechanical energy into electric power. The operator connects loads to the electric power receptacles and connection lugs.

This machine is intended for the purpose of supplying electrical power to connected loads. Refer to the product specifications for the output voltage and frequency of this generator, and for the maximum output power limit of this generator.

This machine has been designed and built strictly for the intended use described above. Using the machine for any other purpose could permanently damage the machine or seriously injure the operator or other persons in the area. Machine damage caused by misuse is not covered under warranty.

The following are some examples of misuse:

- Connecting a load that has voltage and frequency requirements that are incompatible with the generator output.
- Overloading the generator with a load that draws excessive power during either continuous running or start-up.
- Operating the generator in a manner that is inconsistent with all federal, state, and local codes and regulations.
- Using the machine as a ladder, support, or work surface.
- Using the machine to carry or transport passengers or equipment.
- Using the machine to tow other machines.
- Operating the machine outside of factory specifications.
- Operating the machine in a manner inconsistent with all warnings found on the machine and in the Operator's Manual.

This machine has been designed and built in accordance with the latest global safety standards. It has been carefully engineered to eliminate hazards as far as practicable (possible) and to increase operator safety through protective guards and labeling.

However, some risks may remain even after protective measures have been taken.

They are called residual risks. On this machine, they may include exposure to:
- Heat, noise, exhaust, and carbon monoxide from the engine.
- Fire hazards from improper refueling techniques.
- Fuel and its fumes.
- Electric shock and arc flash.
- Personal injury from improper lifting of the trailer tongue.
- Typical hazards related to towing a trailer on roads and highways.

To protect yourself and others, make sure you thoroughly read and understand the safety information presented in this manual before operating the machine.

## 1.6. Safety Guidelines for Operating the Machine

### 1.6.1. Operator Training

Before operating the machine:
- Read and understand the operating instructions contained in all manuals delivered with the machine.
- Familiarize yourself with the location and proper use of all controls and safety devices.
- Contact Modasa Energy for additional training if necessary.

When operating this machine:
- Do not allow improperly trained people to operate the machine.
- People operating the machine must be familiar with the potential risks and hazards associated with it.

### 1.6.2. Operator Qualifications

Only trained personnel are permitted to start, operate, and shut down the machine. They must also meet the following qualifications:
- Have received instruction on how to properly use the machine.
- Are familiar with required safety devices.

The machine must not be accessed or operated by:
- Children.
- People impaired by alcohol or drugs hazards associated with it.

### 1.6.3. Application Area

- Be aware of the application area.
- Keep unauthorized personnel, children, and pets away from the machine.
- Remain aware of changing positions and the movement of other equipment and personnel in the application area/job site.
- Identify whether special hazards exist in the application area, such as toxic gases, or unstable ground conditions, and take appropriate action to eliminate the special hazards before using the machine. Be aware of the application area.
- Do not operate the machine in areas that contain flammable objects, fuels, or products that produce flammable vapors.

**1.6.4. Safety Devices, Controls, and Attachments**

Only operate the machine when:
- All safety devices and guards are in place and in working order. All controls operate correctly.
- The machine is set up correctly according to the instructions in the Operator's Manual. The machine is clean.
- The machine's labels are legible.

To ensure safe operation of the machine:
- Do not operate the machine if any safety devices or guards are missing or inoperative.
- Do not modify or defeat the safety devices.
- Only use accessories or attachments that are approved by Modasa Energy.

**1.6.5. Safe Operating Practices**

When operating this machine:
- Remain aware of the machine's moving parts. Keep hands, feet, and loose clothing away from the machine's moving parts.
- Do not operate a machine in need of repair.
- Do not consume the operating fluids used in this machine. Depending on your machine model, these operating fluids may include water, wetting agents, fuel (gasoline, diesel, kerosene, propane, or natural gas), oil, coolant, hydraulic fluid, heat transfer fluid (propylene glycol with additives), battery acid, or grease.

**1.6.6. Personal Protective Equipment (PPE)**

Wear the following Personal Protective Equipment (PPE) while operating this machine:
- Close-fitting work clothes that do not hinder movement.
- Safety glasses with side shields.
- Hearing protection.
- Safety-toed footwear.

In addition, before servicing or maintaining the machine:
- Tie back long hair.
- Remove all jewelry (including rings).

**1.6.7. After Use**

- Stop the engine when the machine is not being operated.
- Close the fuel valve on engines equipped with one when the machine is not being operated.
- Ensure that the machine will not tip over, roll, slide, or fall when not being operated.
- Store the machine properly when it is not being used. The machine should be stored in a clean, dry location out of the reach of children.
- This information is applicable to Modasa Energy products.

## 1.7. Service Safety

**1.7.1. Service Training**

Before servicing or maintaining the machine:
- Read and understand the instructions contained in all manuals delivered with the machine.
- Familiarize yourself with the location and proper use of all controls and safety devices.
- Only trained personnel shall troubleshoot or repair problems occurring with the machine.
- Contact Modasa Energy for additional training if necessary.

When servicing or maintaining this machine:
- Do not allow improperly trained people to service or maintain the machine. Personnel servicing or maintaining the machine must be familiar with the associated potential risks and hazards.

**1.7.2. Precautions**

When servicing or maintaining the machine:
- Read and understand the service procedures before performing any service on the machine.
- All adjustments and repairs must be completed before operating the machine. Do not operate the machine with a known problem or deficiency.
- All repairs and adjustments shall be completed by a qualified technician.
- Turn off the machine before performing maintenance or making repairs.
- Remain aware of the machine's moving parts. Keep hands, feet, and loose clothing away from the machine's moving parts.
- Re-install the safety devices and guards after repair and maintenance procedures are complete.

**1.7.3. Machine Modifications**

When servicing or maintaining the machine:
- Use only accessories/attachments that are approved by Modasa Energy. Do not defeat safety devices.
- Do not modify the machine without the express written approval of Modasa Energy.

**1.7.4. Replacing Parts and Labels**

- Replace worn or damaged components.
- Replace all missing and hard-to-read labels.
- When replacing electrical components, use components that are identical in rating and performance to the original components.
- When replacement parts are required for this machine, use only Modasa Energy replacement parts or those parts equivalent to the original in all types of specifications, such as physical dimensions, type, strength, and material.

**1.7.5. Cleaning**

When cleaning and servicing the machine:
- Keep the machine clean and free of debris such as leaves, paper, cartons, etc.
- Keep the labels legible.

When cleaning the machine:
- Do not clean the machine while it is running.
- Never use gasoline or other types of fuels or flammable solvents to clean the machine. Fumes from fuels and solvents can become explosive.

**1.7.6. Electrical Service Safety**

- Make sure clothing and shoes are dry, stand on a dry wooden platform or rubber insulating mat, and use tools with insulated handles when servicing the machine.
- Do not allow water to accumulate around the base of the machine. If water is present, move the machine and allow the machine to dry before servicing.
- Do not pressure wash the control panel, generator end, or any other electrical components when cleaning the machine.

**1.7.7. Cooling System Safety**

- Do not attempt to open the radiator cap while the unit is running or before the engine has cooled down. Severe burns may result!
- Engine coolant is toxic to humans and animals. Clean up spills and dispose of waste engine coolant in accordance with local environmental regulations.

**1.8. Operator Safety while Using Internal Combustion Engines**

**⚠ WARNING!**

Internal combustion engines present special hazards during operation and fueling. Failure to follow the warnings and safety standards could result in severe injury or death.

- Read and follow the warning instructions in the engine owner's manual and the safety guidelines below.

**⚠ DANGER!**

Exhaust gas from the engine contains carbon monoxide, a deadly poison. Exposure to carbon monoxide can kill you in minutes.

- NEVER operate the machine inside an enclosed area, such as a tunnel, unless adequate ventilation is provided through such items as exhaust fans or hoses.

**1.8.1. Operating Safety**

When running the engine:
- Keep the area around the exhaust pipe free of flammable materials.
- Check the fuel lines and the fuel tank for leaks and cracks before starting the engine. Do not run the machine if fuel leaks are present or the fuel lines are loose.

When running the engine:
- Do not smoke while operating the machine.
- Do not run the engine near sparks or open flames.
- Do not touch the engine or muffler while the engine is running or immediately after it has been turned off.
- Do not operate a machine when its fuel cap is loose or missing.
- Do not start the engine if fuel has spilled or a fuel odor is present. Move the machine away from the spill and wipe the machine dry before starting.

**1.8.2. Refueling Safety**

When refueling the engine:
- Clean up any spilled fuel immediately.
- Refill the fuel tank in a well-ventilated area.
- Re-install the fuel tank cap after refueling.
- Use suitable tools for refueling (for example, a fuel hose or funnel).

When refueling the engine:
- Do not smoke.
- Do not refuel a hot or running engine.
- Do not refuel the engine near sparks or open flames.

**1.9. Safety Guidelines for Mobile Generators**

**⚠ DANGER!**

Carbon monoxide. Using a generator indoors CAN KILL YOU IN MINUTES. Generator exhaust contains carbon monoxide (CO). This is a poison you cannot see or smell. If you can smell the generator exhaust, you are breathing CO. But even if you cannot smell the exhaust, you could be breathing CO.

- NEVER use a generator inside homes, garages, crawlspaces, or other partly enclosed areas. Deadly levels of carbon monoxide can build up in these areas. Using a fan or opening windows and doors does NOT supply enough fresh air.
- ONLY use a generator outside and far away from windows, doors, and vents. These openings can pull in generator exhaust.
- Even when you use a generator correctly, CO may leak into the home. ALWAYS use a battery-powered or battery-backup CO alarm in the home.
- If you start to feel sick, dizzy, or weak after the generator has been running, move to fresh air RIGHT AWAY. See a doctor. You could have carbon monoxide poison.

**⚠ WARNING!**

Electrocution hazard. Machines that generate electric power present special hazards while the engine is running. These include the risk of electrocution or severe electrical shock.

- Read and follow the instructions in this Operator's Manual.

**⚠ WARNING!**

Back feed from the generator into the public power distribution systemcan cause serious injury or death to utility workers!

- Connections to a building's electrical system must be made by a qualified electrician and comply with all applicable laws and electrical codes.

**1.9.1. Installing as Backup Power**

Special hazards exist when installing this machine as a backup power supply. Improper connection of the generator to a building's electrical system can allow electrical current from the generator to back feed into utility lines. This may result in electrocution of utility workers, fire, or explosion.

If connected to a building's electrical system, the generator must meet the power, voltage, and frequency requirements of the equipment in the building. Differences in power, voltage, and frequency requirements may exist and improper connection may lead to equipment damage, fire, and personal injury or death.

**1.9.2. General Safety**

- Do not use evaporative starting fluids to start the engine. They are highly explosive.
- Do not store items such as excess oil, rags, or tools on top of or inside the machine. These items are a fire hazard and can restrict cooling air.
- Ensure that electrical cords attached to the machine are in serviceable condition without cuts, cracks, or exposed wires.
- Do not route electrical cords over vibrating or hot parts of the machine.
- Do not stand on the machine.
- Do not enclose or cover the machine when it is in use orwhen it is hot.

**1.9.3. Ground Connection**

The generator must be connected to a good earthen ground for proper operating safety. A central "equipment ground" is provided at the customer connection lugs. This point is connected directly to the generator set base. All other system grounds are connected to this central point. Ground the generator in accordance with the standards defined in national, state, and local regulations.

**1.10. Safety Guidelines for Towing the Machine**

When towing the machine:

- Do not tow the machine if the towing vehicle's hitch or the trailer's coupler are damaged.
- Do not tow the machine if any of the trailer's lug nuts are missing.
- Do not tow the machine if the trailer's tires have less than 1.5 mm (1/16 inch) of tread.
- Do not tow the machine unless the trailer's brakes are functioning properly.
- Do not exceed the trailer manufacturer's speed limitations.

When towing the machine:

- Only tow the machine when the trailer's lug nuts are properly torqued. Only tow the machine when the trailer's tires are properly inflated. Only tow the machine when all trailer lights are functioning correctly. Only tow the machine when the trailer's safety chains are connected to the towing vehicle in a crisscross pattern.
- Maintain extra distance between the towing vehicle and other vehicles.
- Avoid soft shoulders, curbs, and sudden lane changes. Abide by all licensing requirements for your area.

If you have not driven a towing vehicle with a trailer before, practice turning, stopping, and backing up the towing vehicle with a trailer in an area away from traffic. Only drive the towing vehicle with a trailer when you are confident in your ability to do so.

**⚠ WARNING!**

Back feed from the generator into the public power distribution system can cause serious injury or death to utility workers!

- Obey the trailer manufacturer's instructions and the instructions below to reduce the risk of an accident.

### 1.11. Safety Guidelines for Lifting the Machine

When lifting the machine:

- Make sure slings, chains, hooks, ramps, jacks, forklifts, cranes, hoists, and any other type of lifting device used are attached securely and have enough weight-bearing capacity to lift or hold the machine safely. See section Technical Data for machine weight.
- Remain aware of the location of other people when lifting the machine.
- Only use the lifting points and tie-downs described in the Operator's Manual.
- Make sure the transporting vehicle has sufficient load capacity and platform size to safely transport the machine.

To reduce the possibility of injury:

- Do not stand under the machine while it is being lifted or moved.
- Do not get onto the machine while it is being lifted or moved.

## 2. General Information


2.1. Generator Plate

2.2. Diesel Engine

2.3. Engine Electrical System

2.4. Cooling System

2.5. Alternator

2.6. Fuel Tank and Frame

2.7. Vibration Isolation

2.8. Muffler and Exhaust System

2.9. Genset Controller

2.10. Protection Switch

2.11. Engine After Treatment Monitoring

**2.1. Generator Plate**

Each generator is equipped with an information plate, typically affixed to the tank or frame. This plate holds essential details for identifying the generator and its operational characteristics, including model, serial number, output specifications such as nominal voltage and frequency, power output in KVA and KW, service type, maximum working altitude in meters above sea level, and more.

1. Serial Number: Uniquely identifies the generator, crucial for ordering replacements, inspections, or warranty repairs.
2. Model: Identifies the factory configuration for power selection.
3. Parts List (L. P.): Comprises components used in generator manufacturing.
4. Power: ISO 8528 and ISO 3046 standards define three power types:

- Continuous Power (COP): The generator's continuously deliverable power without hourly usage limits. Allows a 10% overload only for regulation purposes, not for regular power supply.
- Prime Power (PRP): The maximum power available for a variable power cycle that the generator can deliver for an unlimited number of hours annually. The average power over 24 hours should not exceed 80% of the prime power value. Permits a 10% overload only for transientloads, not for normal installation power supply.

**2.2. Diesel Engine**

The engine is an industrial, high-performance, 4-stroke, compression-ignition type, equipped with accessories ensuring a reliable power supply. These accessories may include a drycartridge-type air filter, a turbocharger installed in the generator set, and a mechanical or electronic engine speed regulator. Depending on the generator model, the engine may have injection or electronic control.

**2.3. Engine Electrical System**

The engine's electrical system is negative ground and operates at 12 or 24 VDC, depending on the generator's size. The system includes an electric starter motor, one or more batteries with support, and an alternator for battery charging. Most generators come with lead-acid batteries, but other types can be installed upon request.

**2.4. Cooling System**

Comprising a radiator, a high-capacity fan, a thermostat, a circulating pump, and anticorrosive coolant. The alternator's cooling system includes an internal fan to cool its components. In generator cooling, air is drawn in from the alternator side, passing along it, then along the engine, and finally pushed through the radiator.

**2.5. Alternator**

Electrical output is generated by a shielded alternator, splash protected with standard IP23, self-excited and self-regulated, precisely coupled to the diesel engine. The terminal box is located at the top of the alternator.

**2.6. Fuel Tank and Frame**

The engine and alternator are coupled and mounted on a robust steel frame, including a fuel tank. It has drainage connectors for purging after extended use or as deemed necessary by the operator. A larger capacity tank can be installed to meet customer runtime requirements per regulations.

Standard units are equipped with the following fuel system components:

- Single wall fuel tank
- Engine fluid containment
- Engine fluid containment sensor

**2.7. Vibration Isolation** The generator is equipped with four or six vibration isolators designed to reduce engine-transmitted vibrations to the foundations supporting the generator. These isolators are placed between the engine-alternator base and the frame.

**2.8. Muffler and Exhaust System** The exhaust muffler is supplied separately for subsequent installation in the case of open generators. The muffler and exhaust system reduce engine noise emissions, directing exhaust gases outside and extinguishing combustion flames. In soundproof generators, the muffler is typically installed inside the generator's enclosure.

**2.9. Genset Controller** The Genset Controller, a crucial component, delivers real-time operational insights by overseeing both generator and engine functions. It triggers an automatic shutdown in the presence of specific faults, displays fault data, and maintains a log of up to 250 performance events. The controller's versatility allows for programming automated genset start and stop sequences based on schedules, fault occurrences, or load demands.

**2.9.1. Operational Guidelines for Genset Controllers** Gensets can be managed through the control module located on their electrical panels. Various models are available, catering to customer requirements and providing distinct features. The following outlines the functionality of the modules. Refer to the equipment manual for more details on controller usage.

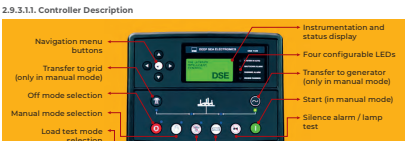
**2.9.2. Recommendations**

- Before initiating the genset, conduct a thorough check:
- Confirm the equipment's oil level.
- Verify the fuel level.
- Inspect the condition and charge of the batteries.
- Ensure adequate openings for air intake.
- Verify proper gas exhaust outside.
- Check the status of fuel and air filters.

**2.9.3. DSE Modules**

**2.9.3.1. DSE 7320 Module**

**2.9.3.1.1. Controller Description**




**2.9.3.1.2. Control Buttons**

- **Stop/Reset:** This button places the module in stop/reset mode, clearing any alarm conditions, provided that the activation criteria are removed. If the engine is running and the module is in stop mode, the controller automatically instructs the transfer unit to remove the load from the generator, de-energizes the fuel supply, and stops the engine. If there is a remote start signal in this mode, it will not occur.
- **Manual:** This mode allows the operator to manually control the generator. In this mode, the start button triggers the engine to start and operate without a load. If the generator is running without a load in manual mode and there is a remote start signal, the module instructs the transfer unit to load the generator. When the remote start signal is removed, the generator will continue with the load until the Stop/Reset or Auto button is pressed.
- **Auto:** This button places the module in automatic mode, allowing it to control the generator function automatically. The module monitors the remote start input and the grid supply status. Once a start request is made, the equipment will start automatically and be loaded. Upon removing the start signal, the module will automatically transfer the load from the generator and stop the engine, observing the stop delay timer and cooling timer as needed. The module then waits for the next start event.
- **Test:** This button puts the module in test mode, allowing loaded tests on the generator. It responds to the Start button, starting the engine, and the generator takes a load.
- **Start:** This button is only active in Stop/Reset and Manual modes. Pressing it starts the engine, operating either in idle mode (in manual mode) or under load (in test mode).
- **Alarm Mute / LED Test:** This button silences the audible alarm and lights up notification LEDs as a test.
- **Transfer to Generator:** Allows the operator to transfer the load to the generator (only in manual mode).
- **Transfer to Grid:** Allows transferring the load to the grid (only in manual mode).
- **Navigation Menu:** Used to navigate through the control module screen.

### 2.9.3.1.3. Operating Modes

**2.9.3.1.3.1. Manual Mode**

Used to start and stop the generator set.
Activated by pressing the Manual button. To initiate the starting sequence, press the Start button, and to transfer the load, make a load request, which can be done:
- By pressing the Transfer to Generator button.
- With an electrical grid supply out of limits.
- With a remote start signal.
- By activating the ignition programmer.

To restore load to the electrical grid, press the Transfer to Grid button, or press the Auto button to return to automatic mode.
To stop the generator, press the Stop button.

**2.9.3.1.3.2. Automatic Mode**

This mode is activated by pressing the Auto button: an LED indicator will confirm the start of the mode. In this mode, the generator controls its start and stop without operator intervention. The starting sequence begins with a start request, which can be:
- With an electrical grid supply out of limits.
- With a remote start signal.
- By activating the ignition programmer.

Once the engine is running, the warm-up timer will activate (if selected), allowing the engine to stabilize before taking the load.
If all start requests disappear, the shutdown sequence will begin.
The transfer timer operates to ensure that the start request is eliminated; if there is another load request during the cooling timer period, the system will resume loading.
The cooling time allows the system to cool sufficiently before stopping, after this time, the engine stops.

**2.9.3.1.3.3. Test Mode**

To initiate the starting sequence, press the Start button.

Once the engine is running, the warm-up timer starts (if selected), allowing the engine to stabilize before taking the load.

The load will be automatically transferred from the electrical grid to the generator.

To stop the system immediately, press the Stop button, or press Auto to repeat the start requests and stop timers before starting the shutdown sequence.

### 2.9.3.2. DSE 8610 Module

#### 2.9.3.2.1. Controller Description


**2.9.3.2.2. Control Buttons**

- **Stop / Reset:** Activating this button puts the module in Stop/Reset mode, eliminating any alarm conditions for which activation criteria have been cleared. If the engine is running and the module is in stop mode, it will automatically instruct the switching device to unload the generator (Close Generator becomes inactive if used). Fuel supply is cut off, and the engine stops. If a remote start signal is present while operating in this mode, it will not initiate.
- **Manual:** This mode allows manual control of generator functions. Once in this mode, the module responds to the start button, which starts the engine and unloads it. If the engine is running without a load in manual mode and a remote start signal is present, the module instructs the switching device to load the generator (Close Generator is activated if used). Once the remote start signal is removed, the generator remains loaded until selecting Stop/Reset or Auto modes.
- **Auto:** Pressing this button puts the module in automatic mode, allowing it to control the generator's function. The module monitors the remote start input and the grid supply status; once a start request is made, the equipment will start automatically and go into load. Upon removing the start signal, the module will automatically transfer the generator load and close the descent, observing the stop delay timer and cooling timer as needed. The module will wait for the next start event.
- **Start:** This button is only active in Stop/Reset and Manual modes; pressing it starts the engine and operates it either in idle (in manual mode) or under load (in test mode).
- **Silence Alarm / LED Test:** This button silences the audible alarm and illuminates the notification LEDs for testing.
- **Transfer to Generator:** Allows the operator to transfer load to the generator (only in manual mode).
- **Open Generator:** Allows the operator to open the generator switch (only when in manual mode).
- **Navigation Menu:** Used to navigate through the control module screen.

### 2.9.3.2.3. Operation Modes

**2.9.3.2.3.1.Manual Mode**

In Manual mode, activated by pressing the button, an LED indicator next to the button confirms this action. This mode allows the operator to start and stop the unit manually and, if necessary, change the load state of switching devices.

In this mode, the device does not start automatically; to initiate the start sequence, press the Start button. The fuel relay is energized, and the engine is activated. If the engine fails to start during the starting attempt, it disengages for the crank rest duration, after which the next start attempt is made. If this continues to happen, the start sequence will end, and the screen will display "Fail to Start."

In manual mode, the load is not transferred to the generator unless a load request is made, which can come from various sources:

- Pressing the transfer to generator button.
- From the DSE 8660 network controller or another DSE 8610 controller via the MSC link.
- Activation of an auxiliary input configured for remote start under load.
- Activation of the built-in exercise planner (if configured for loaded runs).

If the common bus is measured as a "dead" bus, the load switch closes; if measured to be a "live" bus, synchronization takes place before the switch is closed. Once the load has been transferred to the generator, the load switch will not open automatically unless:

- Pressing the Open Generator button (only DSE 8610/DSE 8660).
- Returning to automatic mode.

In manual mode, the device will continue to operate until the stop button is pressed (the device will stop immediately) or the automatic button is pressed; the unit will observe all start requests in automatic mode and stop timers before starting the auto-mode stop sequence.

**2.9.3.2.3.2. Automatic Mode**

This mode is activated by pressing the Auto button: an LED indicator next to the button confirms this action. The mode allows the generator to operate entirely automatically, starting and stopping as needed, without operator intervention.

If a start request is made, this sequence will begin. Start requests can come from the following sources:

- An auxiliary input configured for remote start under load or load.
- A grid supplies out of limits,
- A request from the DSE 8660 network controller or another DSE 8610 controller through the MSC link,
- Activation of the built-in task scheduler,
- Instruction from external devices for remote telemetry using the RS232 or RS485 interface.

To allow for "false" start requests, such as grid voltage drops, the start delay timer begins; there are individual start delay timers for each of the different types of start requests.

If all start requests are cleared during the start delay timer, the unit will return to a standby state. If there is still a start request at the end of the start delay timer, the fuel relay is energized, and the engine is activated.

The return delay timer works to ensure that the start request has been permanently removed and is nota short-term removal. If another start request is made during the cooling period, the unit will resume loading; if there are no start requests at the end of the return delay timer, the load breaker opens, and the cooling timer starts, allowing the unit to run without a load and cool down before stopping. This is particularly important when turbochargers are installed on the engine. If the unit is called to load again before the cooling timer has expired, the engine's operating operation will restart. When the cooling timer expires, the unit stops.

**2.9.4. Controller Modes**

**2.9.4.1. MANUAL Mode** Full operator control of unit start-up, shutdown, and generator load functions.

**2.9.4.2. AUTO Mode** Automated unit start-up, shutdown, and generator load functions. Utilizes remote start connections and a customizable schedule.

**2.9.4.3. STOP/RESET Mode** Unloads the generator, clears active alarms, shuts down the unit, deactivates the Engine Start button, halts AUTO mode automation, with the controller power remaining ON.

**2.9.5. Operator Pages** Operator pages provide various data for unit monitoring, diagnosis, and troubleshooting:

- Home Page
- Status Page
- Engine Page
- Generator Page
- Alarm Page
- Ecu Dtc Page
- Event Log Page
- Serial Port Page
- Program File Information Page
- About Page

Note: Operator pages are view-only; no settings can be added, modified, or deleted.

**2.9.5.1. Home Page** Automatically displayed after controller inactivity or when no other page is selected, the Home Page's content varies based on the unit's state.

**2.9.5.2. Generator Page** This page presents real-time generator data, including voltage, frequency, current, power factors, and more.

**2.9.5.3. Alarms Page** Displays active warnings, alarms, and engine DTCs.

**2.9.5.4. ECU DTC Page** Shows active ECU DTCs; press ▶ to view previous ones.

**2.9.5.5. Event Log Page** Displays current and past alarms; capacity is 250 events.

**2.9.5.6. Serial Port Page** Shows RS232 serial port information and, if connected, modem details.

**2.9.5.7. Program File Information Page** Displays controller information, including model unit, program file name, and version.

**2.9.5.8. About Page** Provides general information about the unit and controller.

**2.9.5.9. Maintenance Alarms** Indicate expired regular-maintenance intervals. Resolve by performing the indicated service and resetting the corresponding interval:
1.Display the Engine page.
2.Scroll until the appropriate service interval is highlighted.
3.Press and hold the Engine STOP/RESET Mode button until ###* hr service changes to 0 hr service.

*Displayed value varies depending on the highlighted service interval.

**2.9.6. Genset Controller with Paralleling (If equipped)** If configured for parallel operation, the controller has specific paralleling functions. Operating guidelines include connecting only to other paralleling-equipped units, verifying correct operation before parallel operation, and ensuring units are suitable for the load.

**2.10. Protection Switch** To safeguard the power generator, a thermal switch, tailored to the model and electrical power requirements, is incorporated.
Its role is to disconnect the electrical system in the event of an overload or short circuit in the electrical grids connected to the power generator.

**2.11. Engine After Treatment Monitoring** Modasa's unit incorporates advanced emission control technologies, including an exhaust gas recirculation cooler (EGR), diesel oxidation catalyst (DOC), diesel particulate filter (DPF), and selective catalyst reduction system (SCR), aligning with Tier 4 Final EPA emissions standards.

For easy access to the After Treatment Status page:

1. Use arrow buttons (▲, ▶,▼, or ◀) to navigate to Maintenance pages.
2. Onthe Engine tab, press ▼to scroll until the After Treatment Status page appears.

The After Treatment Status page features four key areas conveying critical information to operators, each with its set of indicators:

- **HEST** Lamp (High Exhaust System Temperature): This area shows a regeneration indicator above 'HEST LAMP - SOLID' when the unit undergoes exhaust catalyst regeneration. Expect elevated exhaust temperatures during this process.
- **DPF** Regeneration Lamps: Depending on the selected Engine Type in the module's configuration, the Engine section may include the DPF Regeneration Lamps page.
- **Diagnostic Codes & Events:** This area indicates an engine alarm with 'ALARM - SOLID' when a critical condition arises. The displayed text varies based on the specific alarm condition.

## 3. Transport and Set-Up

3.1. Transport

3.2. Grounding the Generator

3.3. Cable Selection

Before attempting to set up, transport, or operate your new generator, read the entire Operator'sManual.

Your generator is ready for use after being properly set up with the recommended oil and fuel. If you encounter any issues with setting up your towable generator, contact your authorized dealer.

This section outlines the factors to consider for the correct and safe installation of the generator: Installation, operation, and transport are simplified when the generator is equipped with a canopy, which can be of two types:

- The first type is a canopy that fits the generator. Customers can request a rainproof canopy designed for noise reduction, with elements for hoisting or transport using forklifts, among other features, based on their needs.
- The other type is a container like those used for maritime cargo. These can also be requested to be waterproof, noise-resistant, or other features required by the customer.

These canopies provide several advantages, including easy transport, minimal installation work, protection against natural elements (suitable for outdoor operation), protection against unauthorized handling of parts, and a noise reduction system.

## 3.1. Transport

**⚠ WARNING!**

When loading and unloading the unit, be sure to use the lifting bail located at the top center of the unit.

- Never get under the unit when lifted.
- Never lift the unit while in operation.
- If the unit is transported by truck, fasten it with chains at the front eye and rear stand. Also, be sure to place a set of chocks against the front and rear of each wheel.

The frame of the Modasa generator is specially designed for easy movement. Various methods and means of transport can be used for the transfer of soundproof generators.

### 3.1.1. Lifting the Generator

For generators that will be lifted by cranes or other hoisting equipment, specially designed fastening elements can be requested from the factory. When hoisting, consider the following:

- Secure cables or lifting slings in the designated hoisting holes.
- Tension the cables slightly.
- Ensure proper fixation of the lifting cables and the equipment's solidity. Lift the generator slowly, direct it to the chosen operating location, and stabilize it.
- Deposit it slowly on the ground.
- Release tension from the lifting cables, then release and remove them.

Warnings:

- Never lift the generator from the engine or alternator.
- Ensure that the lifting equipment and support structure are in good condition and have the appropriate capacity to support the weight of the generator.
- Check the condition of slings or cables before use.
- Keep all personnel away from the lifting area when the generator is suspended.
- It is recommended not to hoist the generator in windy conditions. Whenever possible, keep the generator horizontal during the maneuver, which should be performed by qualified personnel.

Before lifting the unit, make sure to check the lifting bail for any cracks, loose bolts, etc.

1. Connect the hook of the crane or shackle with the lifting bail eye fitted at the top center of the unit. Ensure there is no person standing around the unit. Then perform the hoisting operation.
2. Select a truck or crane with capacity sufficient for the weight and size of the unit. See Specifications.
3. Never hang anything from the generator while lifting. The bail is designed to carry only the weight of the generator.

### 3.1.2. Towing the Generator

**⚠ WARNING!**

Before towing the machine, make sure to check and confirm the following points. Failure to follow the instructions below could result in serious injury or death.

- Proper tire air pressure.
- Tire lug nuts are not loose.
- Tires are not worn or damaged.
- Ensure that the end of the drawbar is securely connected to the coupler of the towing vehicle.
- Ensure there is no damage to the towing vehicle and the drawbar of the machine.
- Be sure to keep hands and fingers away from any part of the coupling device when coupling or uncoupling a drawing device to a drawbar.
- Be sure the height of the hitch is adjusted so that the trailer is level while connected to the towvehicle.
- Make sure to drive the towing vehicle safely.

When towing the unit, it's crucial to adhere to guidelines and prepare the unit appropriately.

### 3.1.2.1. Hitch and Coupling Guidelines

- Ensure the towing vehicle's hitch and coupling are rated equal to or greater than the trailer's Gross Vehicle Weight Rating (GVWR).
- Confirm compatibility between the trailer hitch and coupling, ensuring secure fastening.
- Do not tow the trailer with defective parts; regularly inspect the hitch and coupling for wear or damage.
- Cross safety chains under the tongue for added security.
- Before towing, check and distribute the trailer weight evenly across all tires. Adjust the trailer tongue angle for level towing, especially on trailers with adjustable height hitches.

**3.1.2.2. Preparing Unit for Towing**

1. Turn off the engine.
2. Use the tongue jack to adjust the trailer onto the towing vehicle's hitch. Lock the hitch coupling and attach safety chains or cables, raising the tongue jack for maximum ground clearance.
3. Lubricate grease fittings on leveling jacks for optimal operation.
4. Connect the trailer wiring harness to the towvehicle, ensuring properfunctionality of directional and brake lights.
5. Confirm all doors and hoods are securely latched.
6. Check and adjust all tires to the correct pressure.
7. Inspect wheel lugs, tightening or replacing any loose or missing ones. If a tire was serviced or replaced, ensure lugs are properly tightened.
8. Verify adequate levels of axle oil baths for safe towing.

**NOTE:**

Maintain a grease film on the coupler for longevity and a noise-free experience.

**3.1.3. Forklift**

- Place the forklift arms under the frame, ensuring that only the crosspieces rest on the arms.
- Lift and maneuver the generator slowly.
- Deposit the generator in its unloading place.

Warnings:

- Verify the load capacity of the forklift. Ensure that the forklift is in good condition.
- Consider that, due to its size, the generator may obstruct the driver's view.
- If possible, operate in reverse to have a better view of the transit area.
- The forklift operator must be a qualified driver.

**3.1.4. Dragging the Unit (Skid-Mounted Units Only)**

**⚠ CAUTION!**

This procedure is exclusive to skid-mounted units; do not attempt on trailer-mounted units.

1. Attach a suitable chain to each D-Ring located at the front and rear of the machine.
2. Connect the chains to a suitable tow vehicle.

**NOTE:**

D-Rings are not designed for lifting the entire generator; their purpose is to facilitate dragging the generator on the skid frame.

**3.2. Grounding the generator**

**⚠ WARNING!**

When loading and unloading the unit, be sure to use the lifting bail located at the top center of the unit.

To ground the unit effectively:

1. Use a mallet to firmly install a grounding rod into the ground, placing itwithin 5 feet (1.5 m) of the unit's grounding terminal.
2. Connect the grounding rod cable to the grounding terminal.

### 3.2.1. External Grounding

At the customer connection terminal lugs, a ground connection is present, serving the purpose of electrically grounding the Modasa generator when necessary tomeet compliance with the National Electrical Code and other federal, state, and local regulations. To determine specific grounding requirements in your region, it is advisable to consult with a qualified electrician, electrical inspector, or the local agency responsible for electrical compliance.

- For generators used at construction sites, additional regulations specific to the site may apply.
- Certain areas mandate the registration of generators with local utility companies.

### 3.2.2. Internal Grounding

The following components, prone to becoming energized (such as the fuel tank, engine, generator housing, control panel, enclosure, and trailer), are bonded (connected) to the frame of the Modasa machine:

- Exposed, conductive, noncurrent-carrying components.
- The grounding wires associated with the machine's power outputs (receptacles, lugs, and camlocks) are also bonded (connected) to the machine's frame.
- The neutral of the generator stator winding is similarly bonded (connected) to the machine's frame.

### 3.3. Cable Selection

When choosing a cable:

- Choose a cable with an adequate diameter, considering the permissible current on the cable and the distance from the generator to the load.
- If the current to the load exceeds the cable's permissible current, it may lead to overheating and cable burnout. Similarly, if the cable is too thin for the length, the input voltage to the load may drop, causing a decrease in the machine's performance.
- A simplified three-phase three-wire formula can be used to calculate voltage drop or cross-sectional area of the cable based on cable length and working current. Select a cable length and thickness to ensure the voltage drop remains below 5%.

| Output system | Voltage drop | Cross-Sectional Area of Cable | e: Voltage drop (V)<br>e1: Voltage drop between outside line or one line of each phase and neutral line<br>A: Cable thickness (mm×2)<br>L: Cable length (m)<br>I: Working current (A) |
|---|---|---|---|
| Three-phase 3-wire Type | e = 30.8 x L x I / 1000 x A | A = 30.8 x L x I / 1000 x e | |
| Three-phase 4-wire Type | e = 17.8 x L x I / 1000 x A | A = 30.8 x L x I / 1000 x e1 | |

The following tables show the relations between the cable length and the cable thickness (nominal cross-sectional area) suited to the working current. (Based on the condition that working voltage is 200 V, with a voltage drop of 10V.)

- Single-Conductor Cable (Unit: in² (mm²))

| Length (Length) (ft (m)) / Current | 164 (50) | 246 (75) | 328 (100) | 410 (125) | 492 (150) | 656 (200) |
|---|---|---|---|---|---|---|
| 50A | 0.01 (8) | 0.02 (14) | 0.03 (22) | 0.03 (22) | 0.05 (30) | 0.06 (38) |
| 100A | 0.02 (22) | 0.05 (30) | 0.06 (38) | 0.08 (50) | 0.08 (50) | 0.09 (60) |
| 150A | 0.06 (38) | 0.06 (38) | 0.08 (50) | 0.09 (60) | 0.12 (80) | 0.16 (100) |

- Three-Conductor Cable (Unit: in² (mm²))

| Length (Length) (ft (m)) / Current | 164 (50) | 246 (75) | 328 (100) | 410 (125) | 492 (150) | 656 (200) |
|---|---|---|---|---|---|---|
| 50A | 0.02 (14) | 0.02 (14) | 0.03 (22) | 0.03 (22) | 0.05 (30) | 0.06 (38) |
| 100A | 0.06 (38) | 0.06 (38) | 0.06 (38) | 0.08 (50) | 0.08 (50) | 0.09 (60) |
| 150A | 0.03x2 (22x2) | 0.03x2 (22x2) | 0.06x2 (38x2) | 0.06x2 (38x2) | 0.06x2 (38x2) | 0.08x2 (50x2) |

## 4. Preparation and Verification


4.1. Overview

4.2. Prestart Checklist

4.3. Using an External Battery Charger

4.4. Manually Starting the Unit

4.5. AUTO (Remote) Starting the Unit

4.6. Check Engine Oil Level

4.7. Check Coolant Level

4.8. Clean Instruments in Control Panel

4.9. Check Fuel

4.10. Check Interior

4.11. Check Belt Tension

**4.1. Overview**

Modasa's engine offers the flexibility to initiate start-up either in low-idle mode or at the standard operating speed of 1,800 rpm. In colder climates, it is advisable to commence the engine in low-idle mode, allowing it to idle for approximately one minute. This procedure facilitates the warming of the engine oil before ramping up the engine speed and applying any load. It's crucial to note that the breaker cannot be closed while the engine is in low-idle condition to prevent the application of a load.

1. Ensure the removal of all loose packaging materials from the Modasa machine.
2. Inspect the machine and its components for any signs of damage. If visible damage is detected, refrain from operating the machine and promptly contact your Modasa dealer for assistance.
3. Conduct an inventory check to confirm the presence of all items included with the machine, ensuring that loose components and fasteners are duly documented.
4. Attach any component parts that are not already in place.
5. Add the necessary fluids, such as fuel, engine oil, and battery acid, as applicable.
6. Transport the machine to its designated operating location.

Safety Guidelines:

- Avoid surpassing the power output capacity of the generator, as this could result in damage to tools or the generator itself. Refer to the Technical Data for guidance.
- When utilizing the generator as a standby or alternative power source, verify that the voltage and phase rotation of the line connections align with those of the utility lines. Mismatched phase rotation and voltage may lead to incorrect operation of equipment connected to the generator, creating potentially unsafe conditions.
- Adhere to the rated current limit of each receptacle; do not exceed it.
- Ensure the bonding bar between ground connections always remains in position, unless otherwise determined by a qualified electrician.

**4.2. Prestart Checklist**

Prestart Checklist Prior to starting the unit, Modasa underscores the importance of a comprehensive prestart checklist applicable to both manual and remote start-ups. A warning emphasizes the risks associated with attempting to start or operate a unit in need of repair or scheduled maintenance, highlighting potential severe consequences.

The checklist includes:

- Check for damage that may have occurred during towing or travel to the jobsite. Repair any damage.
- Make sure that the generator is level.
- Thoroughly understanding and adhering to all safety guidelines.
- Performing daily and periodic maintenance tasks.
- Verifying the unit's level position.
- Ensuring no water is present inside, on, or near the unit, addressing the issue if necessary.
- Properly grounding the unit following local, state, and National Electrical Code (NEC) guidelines.
- Confirming that all circuit breakers are switched to the OFF position.
- Inspecting and addressing any issues with electrical cords, promptly repairing, or replacing damaged ones.
- Verifying the correct levels of oil, coolant, DEF, and fuel, in accordance with the OEM engine manual.

- Ensuring secure battery connections.
- Checking engine fan belt tension and condition.
- Inspecting the engine fan belt guard.
- Examining the engine exhaust system for any loose or rusted components.
- Confirming that all covers are securely in place.
- Verifying the tightness and correctness of all electrical connections at the connection lugs, if equipped.
- Ensuring that the link board is correctly set to the desired voltage and is locked.
- Verifying that the emergency stop switch is pulled out.
- Confirming that the radiator and surrounding shroud are clear of debris.
- Turning the battery disconnect switch ON.
- Opening the fuel shutoff valve.

### 4.3. Using an External Battery Charger

For charging the batteries, Modasa provides a step-by-step guide, including connecting the battery charger to a power source and following safety measures to avoid sparks. The importance of disconnecting jumper cables immediately after the engine starts is highlighted.

1. Connect battery charger to a power source.
2. Switch the battery disconnect switch to ON, completing the circuit of the batteries connected in series. This will allow charging of both batteries on the generator.
3. Connect the POSITIVE (+) cable of the battery charger to the positive post of the battery that is connected directly to the (+) post of the starter.
4. Connect the NEGATIVE (-) cable of the battery charger to the grounding lug on the frame located directly below the BDS as seen in the image.
5. Turn the charger to the correct voltage setting and charging current.
6. Start the engine. Disconnect jumper cables immediately after engine starts.

### 4.4. Manually Starting the Unit

Modasa emphasizes the critical safety aspects whenmanually starting the unit, acknowledging the potential dangers of asphyxiation due to carbon monoxide emissions and warning against touching hot surfaces. Additionally, the risk of fire from flammable fuel and vapors is highlighted, cautioning against indoor operation.

To manually start the generator:

1. Switch the battery disconnect switch to the ON position.
2. Press the AUTO/MANUAL mode button to initiate MANUAL mode.
3. Press the green Engine START (I) button on the controller to begin the engine startup process, provided there are no engine faults. A voltage display during startup may differ from the set voltage on the selector switch.
4. If the engine fails to start initially, a 15-second pause occurs for starter cooldown. The controller shows MANUAL MODE - CRANK REST, attempting two more cranks for a total of three cycles.
5. If the engine still doesn't start after three cycles, the controller displays a fail-to-start alarm. The sequence can be retried after a minimum two-minute starter cooldown by pressing the ENTER button to clear the alarm and reset the controller.
6. When the engine starts, its behavior aligns with the low-idle switch (LIS) position.

7. Before applying a load, inspect the generator for issues such as noise, vibration, and leaks in coolant, oil, DEF, and fuel.
8. Verify the AC output voltage and the correct frequency (Hz) on the Generator page, typically around 60 Hz with no connected loads, depending on the engine governing type.
9. Switch the main circuit breaker to ON (I) and add loads by switching the respective circuit breaker to the ON (I) position. A slight change in engine sound when applying a load is nor

### 4.5. AUTO (Remote) Starting the Unit

**4.5.1. Remote Start Terminal Block**

The remote start terminal block facilitates the connection for a remote start switch, allowing unit startup through a remote dry-contact closure switch. It's crucial to ensure the contacts of any linked remote switch are open before starting in AUTO mode. Connect the switch leads to the two unused terminals on the remote start terminal block, located inside the control box on the rear panel. Access the terminal block by opening the control panel box.

**4.6. Check Engine Oil Level**

Ensure the unit is level before checking the oil level. If checking after operation, wait over 10 minutes post-engine shutdown. Procedures:

1. Pull out the engine oil level gauge and wipe it clean.
2. Fully re-insert the gauge, then pull it out again. Normal oil level is between LOW and FULL.
3. If below LOW, add engine oil through the filler port.

- Change oil if dirty.
- Avoid overfilling beyond FULL to prevent reduced engine output.

**4.7. Check Coolant Level**

- Inspect the coolant level in the surge tank; refill if below the limit to keep it above LOW.
- If surge tank is excessively low or empty, check and refill both the radiator and surge tank.

**⚠ CAUTION!**

When opening the radiator cap, release internal pressure before completely opening it. Failure to do so may cause steam to escape, leading to scalding.

**4.8. Clean Instruments in Control Panel**

- Before operation, examine the control panel for accumulated dust, sand, or dirt.
- Clean with compressed air when necessary, wearing protective eyewear.

**4.9. Check Fuel**

Prior to initiating operation, ensure to verify the remaining fuel level to prevent fuel shortages during operation. If necessary, drain any condensate accumulated at the base of the fuel tank.

- Refuel the tank outdoors in a well-ventilated area.
- Avoid filling fuel up to the filler level, as this can lead to fuel flow and containment issues due to limited expansion volume. Vibration during movement or transportation may result in fuel spillage.
- When using an external fuel tank, note that the Fuel Level indication on the monitor may not accurately reflect the actual fuel level.

CAUTION:
- Absolutely avoid bringing lit cigarettes and/or matches near the fuel.
- Due to its extreme flammability, exercise caution to prevent fuel fires.
- Refuel only after the engine is turned off, and never leave an open fuel can near the machine. Spills should be wiped up completely.
- Avoid using alcohol-based cleaning fluids, as they can degrade surface visibility and, in the worst case, lead to cracking and fuel leaks.

**4.10. Check Interior**

Regularly inspect the generator's interior for dust and flammable materials.

CAUTION:
- Use appropriate personal protective equipment, including a helmet, safety glasses, earplugs, safety shoes, gloves, and a mask. Periodically clear the generator's interior of flammable materials like wood chips, dead leaves, and wastepaper, especially near the heated exhaust muffler and pipe.
- Keep a fire extinguisher nearby for unexpected fire incidents.
- It's advisable to have a list of emergency contact numbers for doctors, ambulance services, and the fire department.

**4.11. Check Belt Tension**

Adjust the alternator belt using the following procedure:
Loosen the mounting bolts and nuts of the alternator to facilitate belt adjustment.
Procedure:
1. Visually inspect the belt for cracks, wear, or other damage.
2. Adjust belt tension by loosening the alternator mounting bolts andnuts. While slightly pressing the center of the belt, adjust tension byloosening the fitting bolt to achieve a deflection between 6 and 6.5mm (98 N).
3. If there is any oil or coolant on the belt, thoroughly wipe it off duringservicing.
- Refer to the engine instruction manual for detailed belt adjustment instructions.

WARNING:
- Ensure the engine is stopped before adjusting belt tension.
- Disconnect the negative (–) side cable from the battery.
- When the machine is running, there is a risk of the Operator'shand getting caught in the belts, leading to serious injury.
- Stop the engine before conducting inspections and maintenance near the cooling fan.
- Running machinery poses a risk of the Operator'shand getting caught in the fan, causing serious injury.

**NOTICE!**

Over-tensioning the belt can result in shaft breakage and reduced bearing life, while excessive looseness may lead to premature belt breakage or machine damage due to overheating.

## 5. Operation and Monitoring

5.1. Fine Tuning the Voltage

5.2. Main Circuit Breaker

5.3. Connection Lugs

5.4. CamLock Connections (If equipped)

5.5. Convenience Receptacles

5.6. Voltage Selector (If equipped)

5.7. Link Board (If equipped)

**5.1. Fine Tuning the Voltage**

Modasa provides guidance on fine-tuning voltage output within a range of ±10%, applicable while the engine is running, and the breaker is closed at the load connection. It is crucial to note that this procedure is exclusive to non-parallel capable machines; those set up with parallel controls will not respond to voltage adjustments when the breaker is closed.

**5.1.1. Voltage Regulator**

The voltage regulator, responsible for regulating current into the exciter field, controls the generator's output. While typically adjusted before factory shipment and not frequently requiring further tuning, the voltage regulator plays a pivotal role in maintaining stable voltage levels.

**5.2. Main Circuit Breaker**

Positioned on the unit's backside, between the control panel and AC distribution panel, the main circuit breaker (MLCB) manages power distribution. When the MLCB is switched OFF (O), power is cut to the connection lugs and optional cam lock receptacles. It's safe to switch ON (I) after making connections and allowing the unit to reach normaloperating conditions.

Convenience receptacles operate independently of the MLCB, each protected by individual circuit breakers. Even if the MLCB is OFF (O), these receptacles may still provide power. Various conditions, such as generator circuit overload or open doors, can trip the MLCB. It's essential to resolve these issues before switching the breaker back ON (I). Note that convenience receptacles remain powered when the MLCB is OFF (O), controlled by their respective circuit breakers.

**5.3. Connection Lugs**

Modasa emphasizes critical safety measures when dealing with connection lugs, located on the unit's backside behind the lug box door. These lugs serve as connection points for external loads. Key precautions include the use of approved switchgear for isolation, avoiding disabling or modifying safety switches, ensuring the main circuit breaker and battery disconnect switch are OFF before connections, and engaging only trained and licensed electricians for wiring tasks. Adherence to National Electrical Code (NEC), state, and local regulations is imperative to prevent potential hazards and equipment damage.

**5.3.1. Connecting to Lugs**

When establishing connections to the lugs, ensure safe and proper cable routing through the bottom opening of the door. Use a hex wrench to securely tighten cable connections, avoiding direct connections to the lugs without following this specific process. Take note of the permanent conductor between the generator (stator winding) and the frame.

The connection lug door is equipped with safety interlock switches. Opening the door while the unit is in operation triggers these switches, resulting in the main circuit breaker tripping, the voltage regulator being disabled, and the unit shutting down. To maintain operational safety, the unit must be grounded, with the initial bonding of the generator neutral to the ground during factory shipment. If the generator is serving as a standby power source, the bonding plate must be removed. Compliance with the National Electrical Code (NEC), state, and local regulations is essential during installation.

When selecting a cable, consider its diameter based on load capacity and the distance from the generator to the load. Use terminals for connection and ensure secure fastening.

- After verifying the phase number and voltage of the load, make correct connections.
- Install a load switch between the output terminal and the load to control load on/off. Do not directly switch the load using the generator's circuit breaker, as it could damage the circuit breaker.
- Connect the connecting cable to the load, ensuring that the output terminals do not touch each other.

**⚠ WARNING!**

When removing or connecting a cable to change the load, switch OFF the circuit breaker and then proceed with the work. The operator must retain the key during operation.

**⚠ WARNING!**

When using a connecting cable for the load, do not use a cable with a damaged sheath or inappropriate insulation for the voltage. Ensure secure connections between each cable terminal and input/output terminal to prevent slackening during operation, which could lead to a fire or electric shock accident.

### 5.4. CamLock Connections (If equipped)

For units equipped with cam lock connections, safety precautions are essential. The main circuit breaker and battery disconnect switch must be turned OFF before making any connections. It's crucial to use approved switchgear to isolate the generator and prevent electrical back feed, ensuring safety and preventing equipment damage.

Connections to cam lock receptacles should be made by plugging power cables equipped with series 16 taper nose 400 A, 600 V cam lock plugs. Secure the connection by rotating the plug half a turn to the right. The unit's backside, below the connection lugs, hosts the cam lock connections, which are color-coded based on the destination country. Decals above the connection lugs describe the cam locks and their corresponding colors, following a specific convention based on the unit's configuration for a particular nation.

A vital note emphasizes the importance of not disabling or modifying the connection box door safety switch, as doing so poses a severe risk of electrocution leading to death or serious injury.

| Decal | Color - USA | Color - Canada |
|---|---|---|
| L1 | Black | Red |
| L2 | Red | Black |
| L3 | Blue | Blue |
| N (Neutral) | White | White |
| G (Ground) | Green | Green |

**5.5. Convenience Receptacles**

CAUTION: To prevent equipment damage, verify voltage application before adjusting factory settings, as incorrect voltage to a load can lead to damage. The 240/120 VAC twist-lock receptacles are rated at 50 A each, and the 120VAC duplex receptacles are rated at 20 A each with Ground Fault Circuit Interrupt (GFCI) protection. Each convenience receptacle has its circuit breaker, located directly above or next to it. Notably, all receptacles receive powerwhen the generator is running, even if the main circuit breaker is OFF (O).

**5.5.1. Correct Receptacle Use (If equipped)**

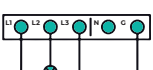
Before switching breakers ON (O), ensure connected equipment is OFF. The machine, equipped with a buck transformer, steps down voltage at the receptacles for proper output at each link board position. Modasa advises against using receptacles in the 600 V position. Depending on the link board setting:

- At 480/277 VAC, 3-phase: GFCI receptacles deliver 120 VAC, twist lock receptacles deliver 240/139 V.
- At 240/120 VAC, 3-phase: GFCI receptacles deliver 120 VAC, twist lock receptacles deliver 240/139 V.
- At 208/120 VAC, 3-phase: GFCI receptacles deliver 120 VAC, twist lock receptacles deliver 208/120 V.
- At 600/346 VAC, 3-phase: Using receptacles in the 600 V position is not recommended.

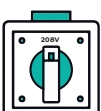
**5.6. Voltage Selector (If equipped)**

Voltage Selector Switch
Three phase 480v

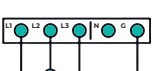

Output terminals
Three phase 480v




Voltage Selector Switch
Three phase 208v

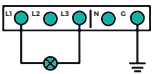



Output terminals
Three phase 208v



Voltage Selector Switch
Singlephase 240v

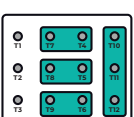

Output terminals
Single phase 240v



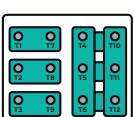

CAUTION:
- Do not manipulate the voltage selector switch during operation. Adjusting the voltage during operation can lead to abnormal voltage on the load side, potentially damaging the load and posing a fire hazard.
- Moreover, it may result in damage to the generator and automatic voltage regulator (AVR).
- Ensure the generator is turned off before utilizing the voltage selector switch.
- Once voltage selection is finalized, secure the voltage selector switch in place to prevent unauthorized operation.

**5.7. Link Board (If equipped)**

480v




208v




CAUTION:
- These are live electrical terminals and contact with them can be fatal. Avoid adjusting the link board during operation, as it may result in abnormal voltage on the load side, risking damage to the load and creating a fire hazard.
- Make sure the generator is switched off before making any adjustments to the link board.
- Once the voltage selection is completed, lock the link board securely to prevent unauthorized handling.

## 6. Shutdown and After-Maintenance

6.1. Shutting Down the Unit

6.2. Emergency Stop Switch

**6.1. Shutting Down the Unit**

1. Before shutdown, inform personnel using generator power, ensuring no hazards arise from accidental equipment shutdown. Steps:
2. Open all circuit breakers (turn to the OFF (O) position) to remove loads.
3. Allow the engine to run for about five minutes to cool down.
4. Press the red engine STOP/RESET (O) button on the controller.
5. After pressing the button, the unit may run for an additional cooldown period controlled by the engine controller.
6. After shutdown, wait for the battery disconnect LED to turn off before switching the disconnect switch to off.

Additional notes:

- The ECU must run for 90 seconds post-shutdown to purge the DEF.
- Avoid switching off the control panel before the controller finishes
- updating to prevent data loss.
- For extended storage, disconnect the battery (refer to the OEM engine
- manual).

**6.2. Emergency Stop Switch**

CAUTION: Avoid using the emergency stop switch for regular shutdown to prevent equipment damage. The red EMERGENCY STOP button, accessible with closed and locked doors, should only be used in emergencies.
Activating this switch overrides the normal shutdown sequence, bypassing the engine cool-down period.

1. Push the button until it locks down to trip the main circuit breaker, disconnect the load, and shut down the engine.
2. The emergency stop fault displays on the control panel.
3. The switch remains closed until pulled out.
4. Only use the emergency stop in emergency situations, not for regular shutdown during normal operation, as it overrides the normal shutdown sequence.

## 7. Troubleshooting


7.1. General Troubleshooting

7.2. Circuit Breaker

7.3. Circuit Protector (CP) for AVR PROTECTION

7.4. Genset Controller Alarms and Shut-Down Conditions

7.5. Documentation provided by the Volvo manufacturer

7.6. Documentation provided by Perkins manufacturer

### 7.1. General Troubleshooting

This data serves as a quick check or verification for straightforward issues that can be identified and addressed. It does not encompass all categories of problems. For more extensive troubleshooting information, refer to the OEM engine manual. Tasks demanding specialized expertise or skills should be conducted by an MEASD.

| Problem | Possible Causes | Solution |
|---|---|---|
| Low fuel level shutdown | Low fuel level | Check fuel level on controller. |
| | Unit not level | Verify unit is sitting level to ensure an accurate reading. |
| | Leaking fuel tank | Check tank for leaks. |
| | Damaged fuel sender or wiring | Check for continuity between sender and engine controller. |
| Low oil pressure shutdown | Low oil level | Check oil level on dipstick. Add oil if necessary. |
| | Leaking oil from engine | Visually inspect the engine for leaks. Restart unit and verify loss of pressure. Immediately stop engine if pressure does not reach 5 psi (34.5 kPa) within five seconds. |
| | Oil pressure sender | See the OEM engine manual to identify corrective action. |
| Low coolant level shutdown | Low coolant level | Allow engine to cool, then check coolant level in radiator. Add coolant if necessary. |
| | Leaking coolant hoses | Inspect hoses for leaks. Repair or replace as necessary. |
| | Leaking engine block or water pump | Visually inspect for leaks. Verify no coolant has mixed with the engine oil (oil will appear milky). See the OEM engine manual for additional information. |
| High coolant temperature shutdown | Low coolant level | Add coolant if necessary. Allow engine to cool, then check cool- ant level in radiator. Restart engine and check coolant temperature (on controller). Immediately stop engine if coolant temperature is 20 °F (99 °C) or higher. |
| | Blockage in radiator | Check radiator shroud and ducting for blockage and remove any foreign matter. |
| | Leakage in coolant hoses, engine block, or water pump | Inspect for visible leaks. Check tension of water pump serpentine drive belt. Remove load on generator and restart engine. Check coolant temperature and immediately stop engine if it starts to overheat. See the OEM engine manual for additional information on engine overheating. |
| Overcrank shutdown | Fuel level low | Check fuel level in tank. Check fuel pump operation. Check air filter for blockage. See the OEM engine manual for additional information. |

**7.2. Circuit Breaker**

- If there is an overload or a short-circuited wire connection, the circuit breaker will trip.
- When the breaker trips, promptly stop the machine, and reset the circuit breaker after identifying and addressing the root cause of the issue.

How to reset:
- To reset the circuit breaker lever, firmly press the lever downward until it securely "clicks" into place.

**7.3. Circuit Protector (CP) for AVR Protection**

The AVR is equipped with a Circuit Protector (CP) to safeguard against overcurrent. It activates under the following conditions:
- The machine is overloaded while the engine speed is still low.
- The output voltage of the machine exceeds the specified voltage.

Symptoms:
- When the CP is triggered, the following symptoms may occur.

1. The voltage will not reach the rated voltage.
2. The voltage is usable, but there is wide voltage fluctuation, and voltage restoration is slow when loaded.

How to reset:
- Reset it by pressing the CP (AVR) button located at the side of the
- breaker plate in the control panel.

**7.4. Genset ControllerAlarms and Shut-Down Conditions**

**7.4.1.Warning Alarms**

Warning alarms signify non-critical conditions that do not impact the Modasa generator system's operation. These alarms are designed to alert the operator to undesirable situations. Warning alarms automatically reset when the fault triggering the condition is resolved.

Warning alarms cover the following scenarios:
- Low fuel level
- High coolant temperature
- Low oil pressure
- Time for maintenance

When a warning alarm is active, the LCD panel indicates the specific warning, the warning LED lights up, and an audible alarm activates. The generator does not shut down. To mute the audible alarm, press the "Horn Reset" button.

**7.4.2. Shut-down Alarms**

Shut-down alarms are persistent and result in the automatic shutdown of the generator. These alarms encompass:
- High coolant temperature
- Low oil pressure
- Overspeed/Underspeed
- Overcrank
- Low coolant level (if applicable)
- Overcurrent

During a shut-down alarm, the LCD panel displays the type of alarm, LEDs illuminate, an audible alarm sounds, and the generator undergoes shutdown. To silence the audible alarm, press the "Horn Reset" button.
After resolving the fault, press "Stop/Reset" to resume operation.

| Variable | Normal | Warning | Shutdown | To Reset |
|---|---|---|---|---|
| Fuel level | >15% | 15% | — | Fill fuel tank. Press "Stop/Reset". |
| Coolant temp. | 85°C±8 | 105°C | 115°C | Add coolant. Press "Stop/Reset". |
| Oil pressure | 60-80 psi | 20 psi | 15 psi | Add engine oil. Press "Stop/Reset". |
| Overspeed | 60 Hz | — | 66 Hz | Press "Stop/Reset". |
| Underspeed | 60 Hz | — | 54 Hz | Press "Stop/Reset". |
| Overcrank | — | — | After 3 attempts | Press "Stop/Reset". |
| Time to maintain | 250 hours | 0 hours | — | Reset genset controller. |
| Coolant level | Above sender | — | Below sender | Add coolant. Press "Stop/Reset". |

### 7.5. Documentation provided by the Volvo manufacturer

A comprehensive suite of manuals is available for download on the Volvo Penta portal (**https://www.volvopenta.com/your-engine/manualsand-handbooks/**), catering to diverse needs in managing, maintaining, and troubleshooting Volvo Penta engines.

From the essential Operator's Manual and Service Protocol to detailed resources such as theWorkshop Manual and specialized manuals like Troubleshooting, Wiring Diagram (EATS), DTC (CIM / DCU Optional / Telematics Gateway / EMS), Repair & Specification + DTC (EATS T4F), and the Service and Maintenance Manual, users can access a wealth of information.

These manuals collectively provide insights into engine operation, safety protocols, product specifications, troubleshooting procedures, electrical systems, and detailed maintenance schedules.

Available for download, this collection empowers users, technicians, and operators with the knowledge needed to ensure optimal performance, adherence to industry standards, and compliance with emission regulations for Volvo Penta engines.

### 7.5.1. Operator's Manual

The Operator's Manual is a comprehensive resource designed to guide users through the operation, maintenance, and troubleshooting of the specified engine model. Beginning with essential sections like the Foreword and Safety Information, the manual emphasizes safety practices.

The Introduction and Presentation provide an overview of the engine and its components, while subsequent chapters cover Engines, Engine Management System (EMS), Exhaust After Treatment System (EATS), Instruments and Controls, Starting and Shutdown procedures, Fault Handling, Maintenance Schedule, and Technical Data. Users will find detailed insights into reading instruments, responding to alarms, maneuvering, and proper engine shutdown procedures.

The manual also includes valuable information on fault handling, tracing, and the Exhaust After Treatment System's warnings and inducements. With specific chapters on maintenance, including lubrication, fuel, cooling, electrical systems, and storage, the Operator's Manual serves as an indispensable guide for ensuring optimal performance and longevity of the engine.

For users seeking in-depth information on specific aspects of the engine, the manual offers detailed chapters on engines, lubrication systems, fuel systems, cooling systems, inlet and exhaust systems, electrical systems, and technical data. Each section is meticulously organized, providing users with a thorough understanding of the engine's functionality and facilitating efficient operation and maintenance practices. Whether navigating the intricacies of the Control Interface Module or understanding the Fault Code Register, the Operator's Manual equips users with the knowledge needed for effective and safe utilization of the specified engine model.

### 7.5.2. Service Protocol

The Service Protocol manual serves as a comprehensive guide for the maintenance and servicing of various Volvo Penta engines. It outlines recommended service intervals, inspection procedures, and specific tasks to be performed at different hour intervals, such as oil and filter changes, coolant checks, and diagnostic tool inspections. Additionally, the manual specifies the conditions for warranty repairs, the use of genuine Volvo Penta filters, and the required oil and fuel quality for optimal engine performance and longevity.

### 7.5.3. Product Leaflet

The Product Leaflet serves as a comprehensive guide for Volvo's diesel engines, offering insights into their performance, reliability, and economic advantages. Highlighting a commitment to low ownership costs, the leaflet underscores the engines' world-class fuel efficiency and dependable exhaust After Treatment Systems, ensuring high uptime without compromising service intervals.

The document emphasizes the ease of installation with Volvo's SCR technology, minimizing the impact on cooling capacity and providing optional equipment for seamless integration into various applications. It further discusses the engines' durability, low noise operation, and optimized power and torque distribution at low rpm, making them versatile and efficient for a range of uses.

The leaflet concludes by detailing the engines' focus on low exhaust emissions, efficient injection, and robust design, showcasing Volvo's dedication to environmentally conscious and fuel-efficient engine solutions. Lastly, it outlines the engines' user-friendly features for easy service and maintenance, making thema reliable choice across different industries.

### 7.5.4. Workshop Manual

The Workshop Manual from Volvo Penta encompasses a range of specialized manuals designed to provide comprehensive support for maintaining, troubleshooting, and repairing their engines. These manuals include detailed guidance on troubleshooting common issues, wiring diagrams specific to the Exhaust After Treatment System (EATS), Diagnostic Trouble Codes (DTC) related to Control Interface Module (CIM), Display Control Unit (DCU Optional), Telematics Gateway, and Engine Management System (EMS).

Additionally, the Repair & Specification + DTC (EATS T4F) manual offers specific details about repairing and maintaining the Exhaust After Treatment System in compliance with Tier 4 Final emission standards. These manuals collectively serve as invaluable resources for technicians, offering step-by-step instructions, diagnostic insights, and specifications to ensure optimal performance and adherence to quality standards for Volvo Penta engines.

### 7.5.4.1. Trouble-shooting

The Troubleshooting manual for Volvo Penta engines is a comprehensive guide that addresses potential issues across various systems. With chapters covering General Diagnostics, Engine, Fuel System, Inlet & Exhaust System, Cooling System, Electrical System, and Transmission, the manual provides detailed procedures for diagnostic tests such as DTC status interpretation, injector tests, SCR system assessments, fan control tests, and steering function evaluations.

Aimed at technicians and operators, this manual serves as a valuable resource for identifying and resolving problems, ensuring the engines operate efficiently and reliably. The inclusion of flow charts, crystal inspections, regeneration procedures, and log parameters enhances its utility for troubleshooting a wide range of concerns.

### 7.5.4.2. Wiring Diagram (EATS)

The Wiring Diagram manual for Volvo Penta engines provides detailed electrical schematics for both the Exhaust After Treatment System (EATS) and the engine. These diagrams serve as comprehensive visual representations of the electrical components and connections within these systems.

Offering a clear overview of the wiring configurations, the manual assists technicians, and operators in understanding the intricate electrical setups, facilitating accurate diagnosis, troubleshooting, and maintenance. It serves as a valuable resource for ensuring the proper functioning and reliability of Volvo Penta engines, aiding in the efficient management of electrical systems for optimal performance.

**7.5.4.3. DTC (CIM / DCU Optional / Telematics Gateway / EMS)**

The DTC (Diagnostic Trouble Code) manual from Volvo Penta provides essential technical information, descriptions, and guidance for diagnosing and resolving issues in their standard model products. The manual includes a list of these products, and the details suchas product designation, serial number, and specifications are crucial for any correspondence related to the product. Intended for use by Volvo Penta workshops and qualified personnel, it assumes a fundamental knowledge of the product and the ability to perform mechanical and electrical work to industry standards.

As Volvo Penta continually evolves its products, the manual serves as a dynamic reference, allowing users to stay informed about changes through service bulletins, ensuring effective troubleshooting and maintenance practices for optimal performance.

**7.5.4.4. Repair & Specification + DTC (EATS T4F)**

The Repair & Specification + DTC manual from Volvo Penta provides a comprehensive resource for maintaining, repairing, and troubleshooting their engines, with a focus on the Inlet and Exhaust System and Emission After-Treatment.

The manual encompasses general information, safety instructions, details about special tools and service tools, and covers aspects like complete vehicle software, fault tracing, fault codes, measurements, VODIA log parameters, VODIA test, cables, fuses, and wiring diagrams. This manual serves as a valuable guide for technicians and personnel, offering essential insights and procedures to ensure optimal engine performance and adherence to emission standards.

**7.5.5. Service and Maintenance Manual**

The Service and Maintenance Manual serves as a comprehensive guide for the upkeep and servicing of Volvo Penta products, offering essential information applicable to standard models. This manual encompasses a range of chapters, including Safety Information, General Information, Chemical Products, Specifications, and detailed sections on Engine, Lubrication System, Fuel System, Exhaust System, Turbocharger Inspection, Charge Air Pipe Leakage Check, SCR System, Nox-sensor Pre/Post SCR, Cooling System, and Long-Term Storage.

The manual provides detailed descriptions and instructions tailored to Volvo Penta products, recognizing potential variations between different models. It includes service intervals, procedures outlined in the maintenance schedule, and highlights the importance of referencing the product designation, serial number, and specifications indicated on engine decals or type plates in all correspondence. The document is designed for use in Volvo Penta workshops and assumes users possess fundamental knowledge, enabling them to perform mechanical and electrical work to industry standards.

Volvo Penta emphasizes its commitment to product development, retaining the right to make changes, and highlights the owner's responsibility for scheduled maintenance to ensure warranty compliance and optimal product performance.

**7.6. Documentation Provided by Perkins Manufacturer**

A comprehensive suite of manuals is available for download on the Perkins portal https://www.perkins.com/en_GB.html, catering to diverse needs in managing, maintaining, and troubleshooting Perkins engines.

From the essential Operator's Manual and Service Protocol to detailed resources such as the Workshop Manual and specialized manuals like Troubleshooting, Wiring Diagram, DTC (CIM / DCU Optional / Telematics Gateway / EMS), Repair & Specification + DTC (EATS T4F), and the Service and Maintenance Manual, users can access a wealth of information.

These manuals collectively provide insights into engine operation, safety protocols, product specifications, troubleshooting procedures, electrical systems, and detailed maintenance schedules.
Available for download, this collection empowers users, technicians, and operators with the knowledge needed to ensure optimal performance, adherence to industry standards, and compliance with emission regulations for Perkins engines.

**7.6.1. Operator's Manual**

Perkins provides a detailed Operator's Manual for each of its engine models, including start-up and shut-down procedures, safe and efficient operation instructions, and preventive maintenance. This manual is essential to ensure that operators fully understand how to use and maintain their Perkins engines.

**7.6.2. Service Protocol**

The Perkins Service Protocol outlines recommended procedures for the maintenance and repair of their engines. It includes information on service intervals, diagnostic procedures, and proper component replacement. This protocol is crucial to ensure engines operate efficiently and safely throughout their lifespan.

**7.6.3. Product Leaflet**

The Perkins Product Leaflet offers a comprehensive description of the product range, highlighting technical specifications, benefits, and applications for each engine model. Perkins is known for providing reliable and high-performance engines for a variety of industrial sectors.

**7.6.4. Workshop Manual**

The Perkins Workshop Manual provides detailed instructions for the repair and maintenance of their engines. This manual includes comprehensive guidelines for performing complex repairs and regular maintenance tasks. By following the workshop manual, technicians can ensure that engines are repaired and maintained according to the highest standards, thereby extending the life of the engine and ensuring optimal performance.

**7.6.4.1. Trouble-shooting**

This section guides technicians in identifying and resolving common issues in Perkins engines. It includes step-by-step procedures to diagnose problems accurately, using both visual inspections and diagnostic tools. Effective troubleshooting minimizes downtime and ensures engines are returned to service quickly and efficiently.

**7.6.4.2. Wiring Diagram**

Detailed electrical schematics are provided to facilitate correct installation and diagnostics of the engine's electrical systems. The wiring diagrams help technicians understand the layout and connections within the engine, ensuring that electrical repairs and installations are performed correctly and safely.

**7.6.4.3. Diagnostic Trouble Codes (DTC)**

This section includes a comprehensive list of error codes and their meanings, which are essential for diagnosing faults in the engine's electronic systems. By referencing the DTC codes, technicians can quickly identify the root cause of issues and implement the necessary repairs or adjustments.

**7.6.4.4. Repair and Specifications**

Detailed instructions for repairing various components of the engine, along with technical specifications, are provided in this section. It includes torque settings, component tolerances, and assembly procedures, ensuring that repairs are performed to the manufacturer's exact standards.

**7.6.5. Service and Maintenance Manual**

The Perkins Service and Maintenance Manual contains essential information for the long-term care and operation of engines. This manual includes recommendations on maintenance intervals, service procedures, and best practices to ensure the longevity and optimal performance of Perkins engines. Regular maintenance as outlined in the manual helps prevent breakdowns and maintains the efficiency and reliability of the engines.

**7.6.6. Electrical Field Test Procedures**

The electrical field test manuals detail procedures for the electrical systems of Perkins engines. They include starter circuit resistance tests, ECM circuit resistance tests, alternator load balance tests, and more. These procedures ensure that the electrical systems of the engines function correctly under various operating conditions, thereby maintaining reliable engine performance.

**7.6.7. Mechanical Test Procedures**

The mechanical test manuals provide procedures for mechanical testing of Perkins engines. These procedures include injector resistance tests, charging and starting system verifications, and general functional tests. These manuals are crucial to ensure engines meet mechanical performance standards and operate reliably, providing a framework for consistent engine evaluation and maintenance.

**7.6.8. Starting and Charging Systems**

The starting and charging systems manuals detail the starting and charging systems of Perkins engines. They include information on the installation and maintenance of starting systems, alternator tests, and recommendations to ensure optimal performance of the engine's electrical system. Proper maintenance of these systems is vital for ensuring reliable engine start-up and electrical power generation.

**7.6.9. General Installation Manual**

The general installation manuals provide detailed instructions for the correct installation of Perkins engines. They include guidelines on engine placement and securing, electrical connections, fuel and cooling systems, and more. These are essential to ensure a proper and safe installation of Perkins engines in various applications, thereby optimizing performance and safety.

## 8. Maintenance


8.1 Maintenance

8.2. Daily walk Around Inspection

8.3. General Maintenance

8.4. Fuel Recommendations

8.5. Adding Fuel

8.6. Engine Oil Recommendations

8.7.Coolant Recommendation

8.8. DEF Recommendations

8.9. Basic Maintenance Schedule

8.10. Resetting Maintenance Alarms

8.11. DEF System Maintenance

8.12. DOC, SCR, and DPF cleaning Operations

8.13. Diesel Particulate Filter Regeneration

8.14. Alternator

8.15. Battery

**⚠ WARNING!**

Hang an 'Under Maintenance' Tag

- Before commencing inspection, switch the machine's circuit breaker to OFF, and then affix the 'Under Inspection' label in a visible location.
- Disconnect the negative (–) side cable from the battery. Neglecting this procedure and having another person start operating the machine during checks or maintenance could result in serious injury.

IMPORTANT: Instructions and Prohibited Work

- Ensure the use of recommended fuel, DEF, oil, grease, or antifreeze.
- Do not disassemble or adjust the engine, compressor, or any part(s) not mentioned in this manual for inspection or maintenance.
- Utilize genuine parts for replacements.
- Any breakdown resulting from the use of unapproved parts or incorrect handling falls outside the scope of the 'WARRANTY.'
- Avoid pouring water or steam on electrical components.
- Position a container or pan beneath the oil port to collect waste liquid, preventing spillage on the floor or inside the machine.
- Ensure that no waste liquid is disposed of on the ground, as it can cause severe environmental contamination. Adhere to local regulations, and if harmful materials such as oil, antifreeze solution, or filters are incorrectly disposed of, the responsible person may face penalties from the authorities.
- Comply with local regulations when disposing of toxic materials such as oil, fuel, coolant (antifreeze), filters, and batteries, among others.

## 8.1. Maintenance

Consistent maintenance is vital for optimal machine performance and prolonged engine/equipment lifespan. Modasa recommends entrusting all maintenance tasks to an MEASD. Routine maintenance, replacement, or servicing of emissions control devices and systems can be undertaken by any repair facility or individual chosen by the owner. To qualify for emissions control warranty service at no cost, the service must be carried out by an MEASD. Refer to the emissions warranty for further information.

Each engine comes with an operation manual for proper maintenance. This section outlines general considerations. Adhering to the manufacturer's recommendations for fuel, oil, coolant, and spare parts is crucial; failure to do so may result in higher maintenance costs and a shortened engine life.

Perform a daily check on the power generator to identify potential faulty or missing parts and arrange for their repair as soon as possible; even seemingly minor defects can lead to significant issues.

## 8.2. Daily walk Around Inspection

**⚠ CAUTION!**

Equipment Damage. Neglecting the daily inspection may lead to unit damage.

- Examine for factors that could impede performance or compromise safety, including (but not limited to) ensuring proper oil, coolant, DEF, and fuel levels, checking for blocked vents, securing all hardware, and verifying electrical connections. If the engine is completely stopped and cool, coolant can be added directly to the radiator.

- Oil can also be added directly to the fill tube. Consult the OEM engine manual for the correct oil viscosity grade, especially under specific operating conditions such as seasonal changes. Do not initiate the unit if the engine oil level is below the add mark on the dipstick. The normal operating level is within the crosshatch pattern between the FULL and ADD markings on the dipstick. Add oil only if the level is below the ADD mark at the bottomof the crosshatch pattern. Avoid overfilling the crankcase.
- Inspect the fan belt for any signs of cracking, fraying, or stretching, and ensure it is correctly seated in the pulley grooves. Replace the belt according to the manufacturer's recommendations.
- Check the containment basin and dispose of any fluid properly.
- Assess the air filter's condition by monitoring the vacuum draw on the filter minder gauge. Replace the air filter when the yellow center bar reaches the red section on the gauge (20 in. H2O).
- Evaluate the condition of electrical cords. Do not operate the unit if insulation is cut or worn through.
- Verify tire pressure, lug nut torque, and axle oil bath levels according to the manufacturer's guidelines. If the unit will be stationary for an extended period, daily checks of the wheels and axles are unnecessary. However, if the unit has been stationary and will be transported, conduct a thorough inspection to ensure the wheels and axles are in proper working order. Inspect the wheel bearings for any unusual wear.

**NOTE:**

If the engine ran out of fuel or the fuel tank was drained, it may be necessary to purge the fuel lines. Consult the OEM engine manual provided with the unit for more information.

### 8.3. General Maintenance

Inadequately maintained equipment poses safety risks. Regular maintenance and occasional repairs are essential for ensuring safe and efficient operation over an extended period. Refrain from conducting routine services, such as oil and oil filter changes or cleaning, unless all electrical components are switched off. Prior to servicing the unit, adhere to the following instructions.

- Confirm the controller power switch is in the OFF (O) position.
- Ensure the battery disconnect switch is OFF (O).
- Verify the circuit breakers are OFF (O).
- Engage (push in) the E-Stop switch.
- Disconnect the negative (-) cable from the battery.
- Attach a DO NOT USE sign to the control panel to signal that the unit is under service, reducing the risk of accidental startup.
- If the unit is linked to a remote start or transfer switch, verify the remote switch is OFF and tagged with a DO NOT USE sign.
- ONLY use a Power washer on the unit's exterior. Avoid power washing any interior components.
- Avoid washing the engine block or fuel tank with a Power washer or steam cleaner, as water may enter the cabinet and damage generator windings or other electrical parts.
- Inspect the coolant system for leaks.
- Check the coolant level, ensuring visibility in the sight-glass on the top tank of the radiator. Refill as necessary.

### 8.4. Fuel Recommendations

**⚠ CAUTION!**

DO NOT use home heating oil or bio-diesel fuel.

This unit is designed to operate with diesel fuel. Follow these guidelines:

- Use only ultra-low-sulfur (15 ppm) diesel fuel.
- Use No. 1 diesel fuel when temperatures are at or below freezing.
- Use No. 2 diesel fuel when temperatures are above freezing.
- In certain regions, climatized fuel—a mix of 1D and 2D—may also be used.

**NOTE:**

D-Rings are not designed for lifting the entire generator; their purpose is to facilitate dragging the generator on the skid frame.

### 8.5. Adding Fuel

**⚠ DANGER!**

Explosion and Fire. Fuel and vapors are highly flammable and explosive. Keep away from fire and sparks. Failure to do so may result in death or serious injury.

**⚠ DANGER!**

Explosion and Fire. Do not overfill the fuel tank, as overfilling may lead to fuel leakage, ignition, or explosion, causing death or serious injury.

NOTE: Prevent dust, foreign matter, or water from entering the fuel tank.

1. Position the unit on a stable, level surface in a well-ventilated area.
2. Ensure the unit is OFF.
3. Remove the fuel fill cap.
4. Fill the tank with diesel fuel up to 0.25 in (6.4 mm) from the bottom of the fill neck to allow for fuel expansion. Install the fuel fill cap.

NOTE: Contain, clean, and dispose of spilled fuel appropriately.

The fuel tank can be filled through the externally mounted fill neck located on the rear corner roadside panel of the machine. The fuel tank level can be monitored on the control panel display, or the analog gauge located on top of the fuel tank near the battery tray on the roadside of the machine. The fill neck can accommodate nozzles up to 1.5" (38mm), but the flow rate should be limited to less than 65 GPM (246 LPM) to prevent fuel blowback. When filling the tank, avoid topping off to prevent fuel spills and ensure proper tank ventilation.

The standard fuel tank lacks fuel containment or a fuel tank drain. If fuel needs to be drained, it should be pumped out into an appropriate container.

The optional fuel tank comes equipped with fuel containment and a rupture basin alarm. This alarm displays a warning on the controller display. Fuel can be drained from the containment basin using the drain plug located at the tank's bottom.

**8.6. Engine Oil Recommendations**

To adhere to the product warranty, follow the guidelines outlined in this manual for servicing the engine oil. The engine comes filled with factory engine oil of a grade recommended by the engine supplier.

Utilize a high-quality detergent oil with the appropriate classification and viscosity suitable for the engine type and ambient temperature conditions. Consult an MEASD or refer to the relevant engine service manual for detailed information.

Ensure the engine is horizontally leveled, and the oil level is between the Min. and Max. marks on the dipstick; if the engine is hot, wait between 3 to 5 minutes after turning off the engine.

1. Always adhere to the recommended oil change interval in the manual and replace the filter simultaneously using genuine parts.
2. Add oil up to the correct level; do not exceed the Max. mark.

Use the fuel, oil, coolant, and filters recommended by the manufacturer; failure to do so may damage the engine and shorten its lifespan. Use only genuine parts that correspond to the brand and model of your engine. While the warranty is valid, the use of genuine parts is mandatory; refer to the Parts section for the part codes.

**8.6.1. Commercial Oils**

Volvo recommends the use of Volvo Diesel Engine Oil for all Volvo engines. Volvo has developed unique oil formulations to ensure full performance and maximize the engine's service life. Consult your Volvo distributor for more details on these multi-grade oils.

IMPORTANT NOTE: Volvo mandates the use of the following engine oil specifications. Failure to use the appropriate specification will reduce the engine's lifespan and affect the After Treatment System.

API CK-4 and ACEAE9 oil categories have the following chemical limits:

- Maximum sulfated ash: 0.1%
- Maximum phosphorous: 0.12%
- Maximum sulfur: 0.4%

These chemical limits are set to preserve the expected life of the engine After Treatment System. The use of unspecified oil can negatively impact the performance of the After Treatment System.

The life of the After Treatment System depends on the accumulation of ash on the filter's surface. Ash is the inert part of the particulate matter collected by the system. A small percentage of particulate matter remains as soot is burnt, eventually clogging the filter, leading to performance loss and increased fuel consumption. Most ash comes from the engine oil consumed during regular operation. To meet the designed product life, using the appropriate engine oil is crucial.

**8.6.1.1. Maintenance Intervals for Engines Using Biodiesel**

Biodiesel can affect the oil change interval. Monitor engine oil condition using Oil Analysis to determine the optimum change interval.

IMPORTANT NOTE: DO NOT use API FA-4 oil in Volvo engines. API FA-4 oil is designed for selected on-highway applications and is NOT intended for off-road applications, including Volvo engines.

IMPORTANT NOTE: Volvo does NOT approve the following engine oils: CC, CD, CD-2, CF-4, CG-4, CH-4, and CI-4.

**8.6.1.2. Lubricant Viscosity Recommendations for Direct Injection (DI) Diesel Engines**

The correct SAE viscosity grade of oil is based on the minimum ambient temperature during cold engine start-up and the maximum ambient temperature during engine operation.

Generally, use the highest oil viscosity available tomeet the start-up temperature requirement.

NOTE: Supplemental heat is recommended for cold soaked starts below 32 °F (0 °C). Cold soaked starts occur when the engine has not been operated for a period, causing the oil to become more viscous due to cooler ambient temperatures.

**8.6.2. Aftermarket Oil Additives**

Volvo discourages the use of aftermarket additives in oil. These additives are unnecessary for achieving the engine's maximum service life and rated performance. Finished oils, consisting of base oils and commercial additive packages, are fully formulated. These additive packages are blended into the base oils in precise percentages to provide finished oils with performance characteristics meeting industry standards.

There are no standardized tests evaluating the performance or compatibility of aftermarket additives in finished oil. Aftermarket additives may be incompatible with the finished oil's additive package, potentially reducing overall performance. The aftermarket additive may fail to mix with the finished oil, leading to sludge formation in the crankcase. Volvo advises against using aftermarket additives in finished oils.

To ensure optimal performance from a Volvo engine, adhere to the following guidelines:

- Service the engine at the specified interval using new oil and a new oil filter.

**8.6.3. Oil Analysis**

If Oil Analysis is necessary, use the oil sampling valve to obtain engine oil samples. Oil Analysis complements the preventive maintenance program.
Oil Anlaysis serves as a diagnostic tool to assess oil performance and component wear rates. Contamination can be identified and measured through Oil Analysis, including the following tests:

- Wear Rate Analysis monitors engine metal wear, analyzing the amount and type of wear metal (metal wear) in the oil. The increase in the rate of engine wear metal is as crucial as the quantity of engine wear metal.
- Tests are conducted to detect oil contamination by water, glycol, or fuel.
- Oil Condition Analysis determines the loss of oil's lubricating properties. Infrared analysis compares newoil properties with used oil samples, gauging oil deterioration during use. This analysis verifies oil performance according to specifications throughout the entire oil change interval.

### 8.7. Coolant Recommendation

**DANGER!**

Risk of poisoning. Refrain from using your mouth to siphon coolant, as it can lead to severe injury or death.

**WARNING!**

Risk of burns. Wait until the engine has completely cooled before opening the coolant system to avoid serious injury.

**CAUTION!**

Risk of overheating. Avoid using any chromatebased rust inhibitor with propylene glycol-based antifreeze, boosters, or additives, as it may cause overheating and potential equipment damage.

The cooling system must be filled with coolant that safeguards the engine against internal corrosion and freezing as needed based on the climate.

- Never use plain water alone.
- Corrosion inhibitors become less effective over time; hence, the coolant should be replaced.

1. The cooling system should be flushed when replacing the coolant.
2. Refer to the engine manual for instructions on flushing the cooling system.
3. Change the cooling system annually at most or every thousand hours of operation.

NOTE: For additional details, refer to the OEM engine manual.

### 8.8. DEF Recommendations

**CAUTION!**

Equipment damage. Do not modify DEF. Exclusively use approved DEF to prevent equipment damage.

Diesel Exhaust Fluid (DEF) is a liquid injected into the After Treatment System before Selective Catalytic Reduction (SCR). This process causes a chemical reaction in the SCR system, converting Nitrogen Oxide (NOx) molecules in the exhaust into elemental nitrogen and water, thereby reducing engine emissions.

### 8.8.1. Specification

DEF used in Volvo engines must adhere to the ISO specification 22241-1 for quality. Many DEF brands, including those with AdBlue or API certification, meet the ISO specification 22241-1 requirements.

The ISO standard 22241 document series provides information on quality requirements, test methods, handling, transportation, storage, and refilling interface.

**8.8.2. Spillage**

Exercise caution when dispensing DEF. Immediately clean up spills, wiping all surfaces and rinsing with water.

Spilled DEF crystallizes as the liquid's water content evaporates. It can damage paint and metal. In case of a spill, wash the area with water.

Be cautious when dispensing DEF near a recently running engine, as spills on hot components may release ammonia vapors. Avoid inhaling ammonia vapors and refrain from using bleach to clean spills.

**8.8.3. Filling the DEF Tank**

The DEF tank fill cap must be blue. Monitoring the DEF level is crucial; running the DEF tank dry or at a low level can impact engine operation. Due to DEF's corrosive nature, use appropriate materials when filling the tank. Do not top off the DEF tank to ensure proper venting and prevent blockage in the tank's fill neck.

**8.8.3.1. DEF Quality**

Evaluate DEF quality using a refractometer. Ensure DEF adheres to ISO standard 22241-1 with a urea solution concentration of 32.5%.

**8.8.3.2. Cleanliness**

Contaminants can diminish DEF quality and lifespan. It is advisable to filter DEF during dispensing into the DEF tank. Use filters exclusively designed for DEF and compatible with it. Prior to usage, confirm filter compatibility with DEF from the supplier. Mesh-type filters using compatible metals like stainless steel are recommended. Avoid paper (cellulose) and some synthetic filter media due to potential degradation during use.

Exercise caution during DEF dispensing, promptly cleaning spills. Wipe machine or engine surfaces clean and rinse with water. Be careful when dispensing DEF near a recently operated engine, as spills on hot components emit harmful vapors.

**8.8.3.3. Storage**

IMPORTANT NOTE: Avoid storing DEF in direct sunlight.

**8.8.3.4. Materials Compatibility**

DEF is corrosive, requiring storage in tanks made of approved materials. Recommended storage materials include:

Stainless steels:
- 304 (S30400)
- 304L (S30403)
- 316 (S31600)
- 316L (S31603)

Alloys and metals:
- Chromium Nickel (CrNi)
- Chromium Nickel Molybdenum (CrNiMo)
- Titanium

Non-metallic materials:
- Polyethylene
- Polypropylene
- Polyisobutylene
- Teflon (PFA)
- Polyfluoroethylene (PFE)
- Polyvinylidene fluoride (PVDF)
- Polytetrafluoroethylene (PTFE)

Materials NOT compatible with DEF solutions include Aluminum, Magnesium, Zinc, Nickel coatings, Silver and Carbon steel, and Solders containing any of the above. Unexpected reactions may occur if DEF solutions come in contact with any non-compatible material or unknown materials.

**8.9. Basic Maintenance Schedule**

Refer to the original equipment manufacturer's operating manual for a comprehensive list of maintenance requirements. Failure to follow procedures outlined in the OEM engine manual will void the warranty, reduce performance, and lead to equipment damage or premature equipment failure. Maintenance recordsmay be necessary for warranty requests.

NOTE: Consult the OEM engine manual for additional maintenance details.

### 8.9.1. Preventive Maintenance Service Table – Engine

| SERVICE ACTIVITY | SERVICE INTERVAL | | | | | | | | | | | CONSIDERATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Daily | First 50 hours | Every 50 hours | Every 250 hours or 6 months | 500 hours or every 12 months | Every 750 hours | 1000 hours | 1250 hours | 1500 hours | 1750 hours | Every 2000 hours or 24 months | |
| Check oil level | X | | | | | | | | | | | Executor: Operator |
| Record oil pressure | X | | | X | | | | | | | | |
| Check coolant level | X | X | | X | | | | | | | | |
| Check for fluid leaks (fuel, oil, and/or coolant) | X | | | | | | | | | | | |
| Clean or empty the air filter collector | X | X | | X | | | | | | | | |
| Check the air filter indicator | X | | | | | | | | | | | |
| Drain fuel filter sediment | X | | | | | | | | | | | |
| Inspect around the machine (Generator Set/Power Plant) | X | | | | | X | | | | | | |
| Check/Adjust fan and/or alternator drive belt tension | | | X | | X | | | | | | | Executor: Qualified Technician |
| Drain water and sediment from the frame (fuel tank) | | | | X | | | | | | | | Executor: Trained Operator |
| Drain water and sediment from the separator filter | | | | X | | | | | | | | |
| Replace oil filter | | | | | X | X | | | | | | |
| Replace oil | | | | | X | X | | | | | | |
| Replace fuel separator filter | | | | | X | X | | | | | | |
| Replace primary/secondary fuel filter | | | | | X | X | | | | | | |
| Check/Replace heater coolant hoses and clamps | | | | | X | | | | | | | Executor: Qualified Technician |
| Battery replacement | | | | | X | | | | | | X | |
| Check battery electrolyte level | | | | | X | | | | | | | |
| Check fan drive pulley tightness | | | | | X | | | | | | | |

### 8.9.1. Preventive Maintenance Service Table – Engine

| SERVICE ACTIVITY | SERVICE INTERVAL | | | | | | | | | | | CONSIDERATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Daily | First 50 hours | Every 50 hours | Every 250 hours or 6 months | 500 hours or every 12 months | Every 750 hours | 1,000 hours | 1,250 hours | 1,500 hours | 1,750 hours | Every 2,000 hours or 24 months | |
| Replace air filter element | | | | | X | | X | | X | | X | |
| Check/Replace clamps and hoses | | | | | X | | X | | | | | |
| Clean/Wash radiator core | | | | | X | | X | | | | X | |
| Check/Adjust valve clearance (intake-exhaust) | | | | | X | | X | | | | X | |
| Check coolant mixture | | | | | X | | X | | | | | |
| Scan diagnostics (governor system: ECU/ECM) | | | | | X | | X | | X | | X | |
| Clean engine crankcase breather | | | | | X | | X | | X | | X | |
| Replace fan and/or alternator drive belt | | | | | | | X | | | | X | |
| Grease fan drive pulley | | | | | | | X | | | | X | |
| Replace coolant | | | | | | | X | | | | X | Executor: Qualified Technician |
| Check turbocharger axial play | | | | | | | X | | | | X | |
| Inspect water pump | | | | | | | X | | X | | X | |
| Check/Adjust unit injectors | | | | | | | X | | | | | |
| Check/Adjust unit injector rockers | | | | | | | X | | | | | |
| Check protective devices | | | | | | | X | | | | X | |
| Check/Replace shock absorbers (resilient) | | | | | | | X | | | | X | |
| Check governor actuator drive (governor system: electronic) | | | | | | | X | | | | X | |
| Check/Clean Pick-up speed sensor (governor system: electronic) | | | | | | | X | | | | X | |
| Adjust/Replace unit injectors | | | | | | | | | | | X | |

### 8.9.1. Preventive Maintenance Service Table – Engine

| SERVICE ACTIVITY | SERVICE INTERVAL | | | | | | | | | | | CONSIDERATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Daily | First 50 hours | Every 50 hours | Every 250 hours or 6 months | 500 hours or every 12 months | Every 750 hours | 1000 hours | 1250 hours | 1500 hours | 1750 hours | Every 2000 hours or 24 months | |
| Adjust/Replace unit injector rockers | | | | | | | | | | | X | Executor: Qualified Technician |
| Check aftercooler core | | | | | | | | | | | X | |
| Check/Replace alternator | | | | | | | | | | | X | |
| Check/Replace starter motor | | | | | | | | | | | X | |
| Check/Replace turbocharger | | | | | | | | | | | X | |
| Check/Replace water pump | | | | | | | | | | | X | |

- We recommend checking the type of the engine governing system in your generator set, as detailed in the technical data sheet. You can visit our website to obtain the technical data sheet for your equipment (it is freely available) at the following link: **https://www.modasa.com.pe/**
- In case the engine is adapted to operate in a saline environment or near the sea, it is the user's responsibility to inspect the engine components, ensuring that they do not show corrosion or rust and avoiding any defects or premature wear.
- Please note that for more detailed information on the activities to be carried out, it is important to review the manufacturer's engine Operation and Maintenance (O&M) manual.

### 8.9.2. Preventive Maintenance Service Table – Alternator

| System | SERVICE ACTIVITY | Alternator in operation | TYPE: Inspection | TYPE: Test | TYPE: Cleaning | TYPE: Replacement | SERVICE INTERVAL: Commissioning | Every 250 hours or 6 months | Every 1000 hours or 12 months | At 10000 hours or 24 months | At 30000 hours or 60 months |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | X= necessary *= if needed inspection | | | | | | | | | | |
| Alternator | Alternator speed | | x | | | | x | | | | |
| | Bearing arrangement | | x | | | | x | | | | |
| | Coupling arrangement | | x | | | | x | | * | x | |
| | Environmental conditions and cleanliness (corrosion and rust) | | x | | | | x | x | x | x | x |
| | Ambient temperature (inside and outside) | | | x | | | x | x | x | x | x |
| | Complete machine, loose parts, damages, and ground connections | | x | | | | x | x | x | x | x |
| | Protection, screens, warning labels, and safety | | x | | | | x | x | x | x | x |
| | Maintenance access | | x | | | | x | | | | |
| | Rated electrical operating conditions and excitation | x | | x | | | x | x | x | x | x |
| | Vibration | x | | x | | | x | x | x | x | x |
| Wind-rotor | Winding condition | | x | | | | x | x | x | x | x |
| | Insulation resistance of all windings | | | x | | | x | * | * | x | x |
| | Insulation resistance of the rotor, exciter, and PMG | | | x | | | | x | x | | |
| | Temperature sensors | x | | x | | | x | x | x | x | x |
| | Status of dehumidifying resistor | | | x | | | x | x | | * | * |
| | Energization of the dehumidifying resistor | | | x | | | x | x | | * | * |

### 8.9.2. Preventive Maintenance Service Table – Alternator

| System | SERVICE ACTIVITY | Alternator in operation | TYPE: Inspection | TYPE: Test | TYPE: Cleaning | TYPE: Replacement | SERVICE INTERVAL: Commissioning | SERVICE INTERVAL: Every 250 hours or 6 months | SERVICE INTERVAL: Every 1000 hours or 12 months | SERVICE INTERVAL: At 10000 hours or 24 months | SERVICE INTERVAL: At 30000 hours or 60 months |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | X= necessary *= if needed inspection | | | | | | | | | | |
| Bearings | Sealed bearings | | X | | | | X | every 4000 hours | | | |
| | Sealed bearings | | | | | X | | | | * | X |
| | Temperature sensors | X | | X | | | X | X | X | X | X |
| | Bearing temperature | X | | X | | | | | | | |
| Terminal Box | All alternator/user connections and respective wiring | | X | | | | X | X | X | X | X |
| Control and Auxiliaries | AVR VOLTS potentiometer - nominal output voltage adjustment | X | | X | | | X | X | X | X | X |
| | STAB potentiometer adjustment for variable load stability | X | | X | | | X | X | X | X | X |
| | Initial AVR and PFC (Power Factor Controller) configuration | X | | X | | | X | | | | |
| | AVR and PFC (Power Factor Controller) settings | X | | X | | | | X | X | X | X |
| | Assembler's (Modasa) auxiliary connections | | | X | | | X | | X | X | X |
| | Auxiliary connections function | | | X | | | X | X | X | X | X |
| | Synchronization adjustments | | X | | | | X | | | | |
| | Synchronization | X | | X | | | X | X | X | X | X |
| | Stamford anti-condensation heater | | | | | X | | | | * | X |

### 8.9.2. Preventive Maintenance Service Table – Alternator

| System | SERVICE ACTIVITY | Alternator in operation | TYPE: Inspection | TYPE: Test | TYPE: Cleaning | TYPE: Replacement | TYPE: Commissioning | SERVICE INTERVAL: Every 250 hours or 6 months | SERVICE INTERVAL: Every 1000 hours or 12 months | SERVICE INTERVAL: At 10000 hours or 24 months | SERVICE INTERVAL: At 30000 hours or 60 months |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | X= necessary *= if needed inspection | | | | | | | | | | |
| Rectifier | Diodes and varistors | | X | | | | X | X | X | X | |
| | Three-phase rectifier (if included) | | X | | | | X | X | X | X | |
| | Diode and varistor plate | | | | | X | | | | | X |
| | Always check the safety section of the alternator manual before performing any intervention with the alternator | | | | | | | | | | |
| Cooling | Air inlet temperature | X | | X | | | X | X | X | X | X |
| | Air flow (nominal capacity and direction) | X | X | | | | X | | | | |
| | Fan status | | X | | | | X | X | X | X | X |
| | Air filter status (where applicable) | | | X | | | X | X | X | X | X |
| | Air filters (where applicable) | | | | X | X | | | * | * | * |

- For those units conditioned to operate in a saline or coastal environment, all preventive and/or correctiveneasures should be taken. The frequency of these inspections and repairs will depend on the degree of exposure of the equipment.
- Please note that formore detailed information on the activities to be carried out, it is important to review the O&M or owner'smanual of the alternator.

### 8.9.3. Preventive Maintenance Service Table – Electrical Panel

| | SERVICE ACTIVITY | SERVICE INTERVAL | | | | |
|---|---|---|---|---|---|---|
| | X= necessary *= if needed inspection | Monthly | Every 6 months | Every 12 months | Every 18 months | Every 24 months |
| Control Circuit | Inspection of the state (condition)of DN switches | X | | | | |
| | Visualization of the instrumentation on the controller | X | | | | |
| | Inspection of the state of the emergency button | X | | | | |
| | Inspection of the state of the relays | X | | | | * |
| | Inspection of the state of the battery charger | X | | | | |
| | Inspection of the state of expansion modules | X | | | | |
| | Inspection of the state of remote monitoring accessories (Gateway) | X | | | | |
| | Inspection of the state of line fuses | X | | | | * |
| | Connection and interconnection adjustment (terminals) | | X | | | |
| | Controller firmware update | | X | | | |
| | Download of the controller event log | | | X | | X |
| | Internal and external cleaning | | X | | | |
| | Operating test in AUTO mode | X | | | | |
| Power Circuit | Inspection of the state of the ITM | X | | | | |
| | Inspection of the state of the power cable terminals | X | | | | |
| | ON-OFF maneuver of the ITM | X | | | | |
| | ITM bolt readjustment | | X | | | * |
| | ITM plate bolt readjustment | | | | X | * |
| | Neutral plate bolt readjustment | | | | X | * |
| | Nuts and bolts readjustment of grounding points | | | | X | * |
| | Internal and external cleaning | | X | | | |

**8.10. Resetting Maintenance Alarms**

The controller will display a warning message when the unit is due for maintenance or service. Once the unit has been serviced, the appropriate maintenance alarm reminder must be reset. Proceed as follows to reset the maintenance alarms:

1. With the unit shut down, rotate the battery disconnect switch to ON (I). The controller automatically displays the Home Page after initialization.
2. Press ▲, ►, ▼, or ◄ to display the maintenance pages.
3. Simultaneously press and O. The Configuration menu displays.
4. Press ▼ until the Maintenance group is highlighted.
5. Press ► to display the sections. Press ▼ to highlight the Maintenance section.
6. Press ► to display the parameters and highlight the maintenance alarm that requires reset.
7. Press to select the editable parameters. The cursor highlights NOT RESET under the selected maintenance alarm. Press ▲ to highlight RESET.
8. Press to reset the selected maintenance alarm.
9. To perform additional maintenance alarm resets, repeat steps 6–8. NOTE: If the selected maintenance alarm does not require a reset, press ▼ to highlight NOT RESET, then press to return to the parameters section.
10. Press and hold for five seconds to save changes. Press and hold O for five seconds to discard changes made.

**8.11. DEF System Maintenance**

**8.11.1. DEF Testing**

NOTE: Using DEF with the correct concentration is critical to engine and After-Treatment System performance. Extended storage and other conditions can adversely alter the DEF concentration.

If DEF quality is questionable, draw a sample out of the DEF tank or storage tank into a clear container. DEF must be crystal clear. If DEF appears cloudy or has a colored tint, it is likely not within specification. DEF in this condition should not be used. Drain the tank, flush with distilled water, and fill with new DEF. After filling the tank, check DEF concentration.

If the DEF passes the visual and smell tests, check the DEF concentration with a handheld refractometer calibrated to measure DEF.
DEF concentration should be checked when the engine has been stored for extended periods, or if there is suspicion the engine or packaged DEF has been contaminated with water.

Follow the instructions included with either tool to obtain the measurement.

The correct DEF concentration is 32.5% urea. If the DEF concentration is not within specification, drain the DEF tank, flush with distilled water, and fill with new or good DEF. If packaged DEF is not within specification, dispose of DEF packages and replace with new or good DEF.
NOTE: Do not create DEF by mixing agricultural-grade urea with water. Agricultural-grade urea does notmeet the necessary specifications and can damage the After Treatment System.

**8.11.2. DEF Tank Cleaning**

Proceed as follows to clean the DEF tank:
1. Drain DEF tank into a suitable container. See DEF Disposal.
2. Flush DEF tank with distilled water, and fillwith new or good DEF.

**8.11.3. DEF Disposal**

Large amounts of DEF should be contained. If large spills occur, contact local environmental authorities for assistance with clean up.
If a substantial quantity of DEF is not within specification, contact the DEF supplier for assistance with disposal. Do not dump large quantities of DEF onto the ground or send DEF to wastewater treatment facilities.

**8.11.3.1. DEF Tank Refilling**

**⚠ WARNING!**

Personal injury. Avoid prolonged contact with skin. Wash skin thoroughly with soap and water. Remove contaminated clothing and wash before reuse. Seek medical attention if skin becomes irritated. Failure to do so could result in personal injury.

**⚠ CAUTION!**

Equipment Damage. Immediately clean any surfaces with water that come in contact with diesel exhaust fluid. Failure to do so could result in equipment damage.

**NOTE:**

If DEF is filled into the engine fuel tank or another fluid compartment, do not operate the engine until the system is properly purged of DEF. Contact an MEASD immediately to determine how to clean and purge the system.

NOTE: Use only distilled water to rinse components used to deliver DEF. Tap water can contaminate DEF. If distilled water is unavailable, rinse with clean tap water, then thoroughly rinse with ample amounts of DEF.

Reasonable care should be taken when refilling the DEF tank. Verify the DEF tank cap area is free of debris before removing the cap. Wipe clean with a lint-free cloth to remove debris from the tank cap. Seal DEF containers between use to prevent contamination and evaporation. Avoid splashing DEF, and do not allow DEF to come into contact with the skin, eyes, or mouth.

NOTE: Keep anything used to store or dispense DEF clean of dirt and dust. Wash and rinse containers or funnels thoroughly with distilled water to remove contaminants
If an unapproved fluid, such as diesel fluid or coolant, is added to the DEF tank, flush the DEF tank with distilled water and fill with new or good DEF. Contact an MEASD to determine how to clean and purge the system.
If water has been added to the DEF tank, a tank cleaning is necessary. After refilling the tank, check the DEF concentration. The operator must always maintain appropriate DEF levels. Check the DEF level daily and refill the tank as needed. The filling port is identified by a blue-colored cap embossed with the DEF symbol.

### 8.11.4. DEF Storage Guidelines

**WARNING!**

Risk of poisoning. Do not ingest diesel exhaust fluid. Seek medical attention immediately if consumed. Failure to do so could result in serious injury

**WARNING!**

Personal injury. Do not inhale diesel exhaust fluid fumes. If breathing becomes difficult, move to an area with fresh air and seek medical attention immediately. Failure to do so could result in serious injury.

**WARNING!**

Personal injury. Avoid contact with eyes. Flush eyes thoroughly with water and seek medical attention immediately. Failure to do so could result in serious injury.

NOTE: See the Materials Safety Data Sheet (MSDS) for additional information.

DEF freezes at temperatures below 11.5 °F (-11.3 °C). Do not use additives to reduce the freezing temperature. Additives currently available are more corrosive than DEF and will cause component and system degradation and negatively impact reliability. For more information, see the operator manual, or contact a DEF supplier.

DEF quality degrades rapidly at temperatures above 140 °F (60 °C). To maintain emissions compliance, the urea concentration must remain between 31.8–33.2%. Ideal conditions for storage of DEF are:

- Store at temperature range 23–86 °F (-5–30 °C)
- Store in sealed dedicated containers to avoid contamination and evaporation.

Under these conditions, DEF is expected to remain usable for a minimum of 18 months. Storing DEF at higher temperatures can reduce its useful life by approximately six months for every 9 °F (5 °C) above 86 °F (30 °C). Long-term storage in the DEF tank (over 12 months) is not recommended. If long-term storage is necessary, test DEF before operating the engine.

### 8.12. DOC, SCR, and DPF Cleaning Operations

**WARNING!**

Risk of Burn. Stay clear of the exhaust system during operation and exhaust filter cleaning.
Exposure to hot exhaust gases and components could result in serious injury.

The exhaust After Treatment System goes through an automatic cleaning process known as regeneration. Under normal circumstances, regeneration occurs without interrupting the unit operation.

**NOTE:**

Always park the unit in a safe location for elevated exhaust temperatures and check for adequate fuel level before beginning the exhaust after treatment cleaning process. The cleaning cycle can take an extended period (approximately 45 minutes). Cleaning is complete when the regeneration indicator remains off.

**8.13. Diesel Particulate Filter Regeneration**

Regeneration is to increase the exhaust temperature for a given time. The After Treatment Regeneration Device (ARD) creates the heat which makes regeneration possible. The regeneration process is used to remove soot from the DPF, and warm up the Selective Catalyst Reduction (SCR) system. The DPF traps both soot and ash. The ash is removed through a manual cleaning process.

**8.13.1.Modes of Regeneration**

Automatic: The Electronic Control Module (ECM) utilizes various inputs from the engine and the machine to determine the optimal time for conducting automatic regeneration. Automatic regenerations can occur at any point during the engine's operating cycle. The regeneration active indicator will illuminate during the process, and interruptions are acceptable.

NOTE: Automatic adjustments of engine speed may be noticeable during regenerations. If regeneration is in progress and the engine is brought to low idle, the engine speed may stay elevated to support the regeneration.

NOTE: If the machine resumes operation while automatic regeneration is active, the regeneration may be halted. The ECM will continuously monitor inputs to decide the most suitable time to restart the regeneration.

**8.13.2. Regeneration Triggers**

Regeneration may be necessary for the following reasons.

- Soot: The Diesel Particulate Filter (DPF) accumulates soot generated by the engine. Automatic regeneration is triggered to reduce the soot level.
- Start-Up Regeneration: The ECM initiates start-up regeneration after a cold engine start. This regeneration aims to heat the system to the required temperature for Diesel Exhaust Fluid (DEF) dosing to begin.
- SCR Maintenance: Regeneration is performed to upkeep the Selective Catalytic Reduction (SCR) system.
- ARD Maintenance: Regeneration is carried out to maintain the CRS system.

| Type | Reason For Trigger | Strategy | Regen Interval | Duration (Minutes) |
|---|---|---|---|---|
| Primary Triggers (LSR & HSR) | A/T maintenance | Upon cold startup (coolant temp. below 104 °F (40 °C), the A/T will be maintained. Coolant temp. must reach104 F° (40 C°) before regeneration will occur. Shutoff after 17 min. | On cold start up. Frequency depends on how often application starts up cold. | 17 |
| Secondary SMART Triggers (LSR & HSR) | DPF soot level | LSR and HSR enabled at 80% | 10 hours to infinite | 30–45 Max 75 |
| | CRS/Deposit maintenance | Fuel must be cycled through main CRS nozzle at least once every 25 hours. | 25 hours to infinite | 10–20 |
| | Sulfur* | 30 minutes of 842 °F (450 °C)SCR inlet temperature is required every100 hours. Smart timer is incremented or decremented based on logic. | Infinite—other triggers will currently reduce sulfur adequately. | 30 |
| | HC evap* | Model of HC collected in A/T. After prolonged cranking or long- duration idle at low temperature, trigger 932 °F (500 °C) for an ECU predetermined time interval. | Depending on ambient and operating conditions. | Min 2× 797 °F (425°C) Max:30 (de-icing strategy) |

**8.14. Alternator**

During routine maintenance, it is recommended to periodically check the condition of the following elements.

**8.14.1. Windings**

The condition of the windings can be determined by measuring the insulation resistance to ground, which is the ohmic resistance offered by the machine casing to the ground. This resistance is altered in the presence of moisture or dirt in the windings. Therefore, insulation measurement indicates the current state of the winding. The device used for insulation measurements is the megohmmeter or Megger.

The Automatic Voltage Regulator (AVR) card must be disconnected if the generator is of the self-excited type. Regarding the acceptable insulation value of the generator, it is recommended to follow the manufacturer's manual data. In general, the formula R (resistance in megaohms) = nominal voltage in V/nominal power in kVA + 1000 is used. If the insulation resistance is lower, drying is essential. Drying can be done with a fan heater or a similar device through the generator's air inlet and outlet grilles. Another quick and effective method is drying using a resistor heating oven.

If the alternator is impregnated with salts due to operating in coastal areas, it requires special maintenance. In this case, consultation with the workshop is necessary, as this environment quickly degrades the insulation level, which can lead to a short circuit in the generator.

**8.14.2. Bearings**

All bearings are permanently lubricated for maintenance-free operation. During a general inspection, it is recommended to check for wear and possible oil loss and replace them if necessary. It is also suggested to periodically check if they overheat or produce excessive noise during operation. If excessive vibrations are observed after some time, it indicates bearing wear. In such cases, it is advisable to analyze if there are defects or grease loss and replace them if necessary. In all cases, bearings must be replaced after twenty thousand hours of service.

**8.15. Battery**

**8.15.1. Battery Specifications**

Maintenance-free batteries are classified as sealed and non-sealed. The ones used in the generators are non-sealed maintenance-free, meaning they do not require water additions under normal conditions of use. They use Lead-Calcium alloy in the grids, reducing corrosion and internal sulfate of the plates.

They have minimal self-discharge and gasification. Condensed gases return to the cells, further reducing water loss, improving internal current conductivity for ignition, and having 20% more current capacity than Lead-Antimony batteries.

**8.15.2. Battery Usage Recommendations**

Batteries emit flammable gases that can explode. A spark can cause the gases to ignite, resulting in severe or fatal injuries. Ensure proper ventilation when in a confined space and follow appropriate procedures to prevent electrical arcs and/or sparks near batteries.

- Do not smoke when servicing batteries.
- Do not remove battery cables when battery caps are in place. Removing them with the cap in place can cause an explosion resulting in personal injury.
- The battery cap must be removed before performing any service.
- Do not dispose of batteries; return used batteries to a recycling facility.
- When running an engine for short periods only, batteries may not fully recharge.
- If batteries are charged correctly, the ammeter reading should be close to zero.
- All lead-acid batteries contain sulfuric acid that can burn skin and clothing.
- When working with or near batteries, use protective clothing and a mask.

If batteries show water evaporation, refill with distilled water. First, clean the battery to prevent dirt from entering, then remove the caps. Add distilled water until the level is 8 mm above the separators. Replace the separators.

**8.15.3. Checking the Charge**

To check the charge of a battery, a hydrometer is used tomeasure the density of the electrolyte; it should measure from 1.250 to 1.275. Any other reading is incorrect.

| DENSITY | STATUS | VOLTAGE |
|---|---|---|
| 1.100–1.175 | Discharged Battery | 1.57 |
| 1.150–1.175 | Battery with 60% Charge | 12.00 - 12.19 |
| 1.200 – 1.225 | Battery with 80% Charge | 12.20 - 12.40 |
| 1.250 – 1.275 | Battery with 100% Charge | 12.60 |
| 1.300 | Overcharged Battery | 13.00 |

## 9. Storage

9.1. Preparation for Long-term Storage

9.2. Machine Disposal and Decommissioning

Extended storage of Modasa equipment necessitates (needs) proactive maintenance measures. Implementing these steps is crucial for preserving the integrity of machine components, guaranteeing that the equipment remains operational for future use. While not every step may be directly applicable to this specific machine, the fundamental procedures remain consistent.

**9.1. Preparation for Longterm Storage**

When the Modasa machine is expected to be inactive or not in operation for an extended period, particularly exceeding six months, it is essential to take the following steps before storing it in a dry, dust-free environment:

- If the machine is stored outdoors, it should be placed in an enclosure. Avoid leaving it exposed with only a sheet covering the paint for an extended duration, as this can lead to rust.
- Perform the prescribed treatments at least once every three months:

1. Drain the existing lubricant from the engine oil pan. Introduce new lubricant to cleanse the engine's internals. After running it for a period, drain it again.
2. Apply lubricant to each moving part.
3. Ensure the battery is fully charged, disconnect grounding wires, and ideally, remove the battery from the machine for storage in a dry place. (Charge the battery at least once a month.)
4. Drain the coolant and fuel from the machine.
5. Seal the engine's air-intake port and other openings, such as the muffler, using materials like a vinyl sheet, packing tape, etc., to prevent moisture and dust from entering the machine.
6. Check the generator's insulation resistance, ensuring it exceeds 1M Ohms.
7. Address any issues and conduct necessary maintenance to ensure readiness for the next operation.

**9.2. Machine Disposal and Decommissioning**

To ensure environmentally responsible practices and the efficient reuse of materials, Modasa emphasizes proper decommissioning for machines reaching the end of their service life. Disposal should prioritize recycling of components, such as plastic and metal, to reduce landfill usage and preserve valuable natural resources.

Additionally, responsible disposal mitigates environmental risks by preventing the release of toxic chemicals and materials. Certain fluids in the machine, including fuel, engine oil, and grease, may be categorized as hazardous waste in various regions. Prior to decommissioning, it is essential to familiarize oneself with and adhere to local safety and environmental regulations governing the disposal of construction equipment.

**9.2.1. Preparation**

1. Execute the subsequent tasks to ready the machine for disposal.
2. Move the machine: Relocate it to a secure area, minimizing safety risks and unauthorized access.
3. Disable operation: Ensure the machine cannot be operated from the final shutdown until disposal.
4. Fluid drainage: Remove all fluids, such as fuel, engine oil, and coolant.
5. Leak prevention: Seal any fluid leaks.

### 9.2.2. Disposal

Conduct the ensuing tasks for effective machine disposal.

- **Disassembly:** Disassemble the machine, sorting parts by material type.
- **Recyclable parts:** Dispose of recyclable components according to local regulations.
- **Non-hazardous components:** Properly dispose of non-hazardous parts that cannot be recycled.
- **Fluid disposal:** Dispose of waste fuel, oil, and grease following local environmental protection regulations.

modasa Energy


+51 01 615 8500

+51 981 410 854

webinfo@modasa.com.pe

**Administrative Office**
Av. Los Frutales 329, Ate Vitarte, Lima

**Facilities**
Ant. Panamericana Sur Km 38.2, Lurín

www.modasa.com.pe