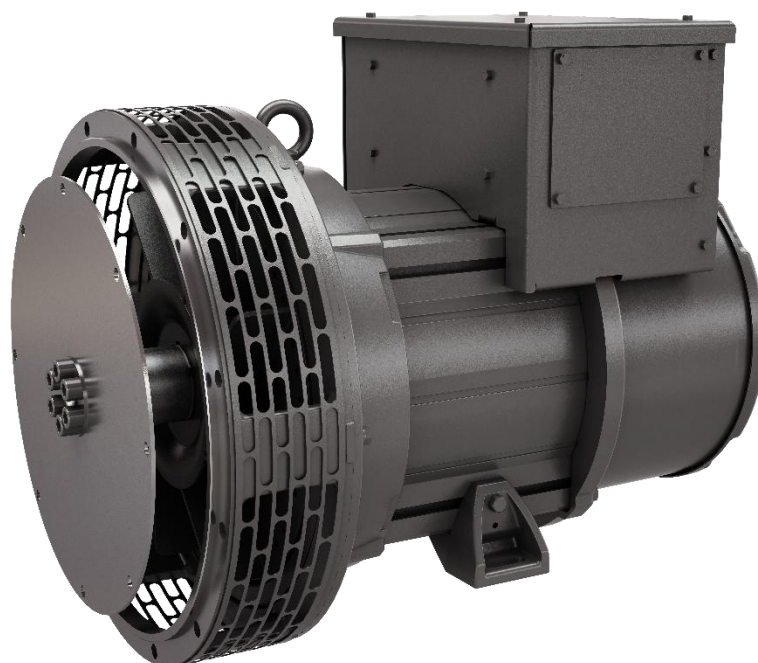


Synchronous Alternators

AW10 Line

Installation, Operation and Maintenance Manual





Installation, Operation and Maintenance Manual

Model: AW10

Document: 19578410

Language: English

Revision: 01

September 2026

Dear customer,

Thank you for purchasing the WEG alternator. It is a product developed with levels of quality and efficiency that guarantee excellent performance.

Electrical energy plays an extremely important role in the comfort and well-being of humanity. As the alternator is responsible for generating this energy, it needs to be identified and treated as a machine, whose characteristics involve certain precautions, including storage, installation, operation and maintenance.

Every effort has been made to ensure that the information contained in this manual is accurate regarding the configurations and use of the alternator.

Therefore, we recommend carefully reading this manual before installing, operating or maintaining the alternator to ensure safe and continuous operation of the alternator and guarantee your safety and that of your installations. If any doubts persist, consult WEG.

Always keep this manual close to the alternator so that it can be consulted whenever necessary.



ATTENTION

1. It is essential to follow the procedures contained in this manual for the warranty to be valid;
2. The alternator installation, operation and maintenance procedures must be carried out by qualified people.



NOTES

1. Reproduction of the information in this manual, in whole or in part, is permitted as long as the source is cited;
2. If this manual is lost, an electronic copy can be obtained from the website www.weg.net or another printed copy can be requested from WEG.

WEG EQUIPAMENTOS ELÉTRICOS S.A.

TABLE OF CONTENTS

1	INTRODUCTION	11
1.1	SAFETY WARNINGS IN THE MANUAL	11
1.2	NOMENCLATURE	12
2	GENERAL INSTRUCTIONS	13
2.1	QUALIFIED PEOPLE	13
2.2	SECURITY INSTRUCTIONS	13
2.3	PERSONAL PROTECTIVE EQUIPMENT (PPE)	13
2.4	STANDARDS	13
2.5	ENVIRONMENTAL FEATURES	14
2.5.1	Harsh and/or marine environments	14
2.6	OPERATING CONDITIONS	14
3	RECEIVING, STORAGE AND HANDLING	15
3.1	RECEIVING	15
3.2	HANDLING	15
3.3	STORAGE	15
3.3.1	Storage in sheltered environment	15
3.3.2	Storage in unsheltered environment	15
3.3.3	Long-term storage	16
3.3.3.1	Storage location	16
3.3.3.1.1	Storage in sheltered environment	16
3.3.3.1.2	Storage in unsheltered environment	16
3.3.3.2	Separate parts	16
3.3.3.3	Space heaters	16
3.3.3.4	Insulation resistance	16
3.3.3.5	Exposed machined surfaces	17
3.3.3.6	Bearings	17
3.3.3.6.1	Shielded bearings	17
3.3.3.7	Terminal box	17
3.3.3.8	Inspections and records during storage	17
3.3.3.9	Maintenance plan during storage	18
3.3.3.10	Start-up preparation	18
3.3.3.10.1	Cleaning	18
3.3.3.10.2	Checking of insulation resistance	18
3.3.3.10.3	Others	18
4	INSTALLATION	19
4.1	INSTALLATION LOCATION	19
4.2	ROTATION DIRECTION	19
4.3	PROTECTION DEGREE	19
4.4	COOLING	19
4.4.1	Removing the flange protection	19
4.5	INSULATION RESISTANCE	20
4.5.1	Safety instructions	20
4.5.2	General considerations	20
4.5.3	Measurement on the stator winding	20
4.5.4	Measurement on rotor winding, exciter and accessories	20
4.5.5	Minimum insulation resistance	21
4.5.6	Evaluation and preservation of windings	21
4.5.7	Conversion of measured values	21
4.6	PROTECTION	21
4.6.1	Thermal protection	21
4.6.1.1	Temperature limits for windings	22
4.6.1.2	Thermal protections for bearings	22
4.6.1.3	Alarm and shutdown temperatures	22
4.6.2	Space heater	22

4.6.3	Voltage regulator protection	23
4.6.4	Diodes protection	23
4.6.5	Underfrequency protection	23
4.6.6	Maintenance of short-circuit current (only for auxiliary coil and PMG)	23
4.7	VOLTAGE REGULATOR	23
4.8	ELECTRICAL FEATURES	23
4.8.1	Electrical connections	23
4.8.1.1	Main connection	23
4.8.1.1.1	Cables connection	24
4.8.1.2	Grounding	24
4.8.1.3	Connections of the voltage regulator	24
4.8.1.4	Terminal identification	24
4.8.2	Wiring diagrams	25
4.8.2.1	Three-phase alternators - 12 terminals	25
4.8.2.2	Three-phase alternators – 6 terminals	26
4.8.2.3	Three-phase alternators with single-phase connection – 12 terminals	27
4.8.2.4	Voltage regulator electrical connections	27
4.8.3	Accessories wiring diagrams	28
4.8.4	Stator thermostats	28
4.8.4.1	Bearing thermostats	28
4.8.4.2	Stator thermoresistance	28
4.8.4.3	Bearing thermoresistance	28
4.8.4.4	Space heaters	28
4.9	MECHANICAL ASPECTS	28
4.9.1	Bases and foundations	29
4.9.2	Alignment and leveling	29
4.9.2.1	Alternators with double bearings (B35T or B3T)	29
4.9.2.2	Single Bearing Alternators (B15T)	29
4.9.2.3	Rotor turning	30
4.9.2.4	Alternators with double bearings (B35T / B3T)	30
4.9.2.4.1	Direct coupling	30
4.9.2.4.2	Coupling by pulleys and belts	30
4.9.2.5	Single Bearing Alternator (B15T)	30
4.9.2.5.1	“G” dimension	30
4.9.2.5.2	G dimension change	31
4.10	GENERAL INSTALLATION NOTE	31
5	COMMISSIONING	32
5.1	PRELIMINARY EXAMINATION	32
5.2	INITIAL SPIN	32
5.3	OPERATION	32
5.4	TRIMPOTS ADJUSTMENT	33
5.5	SHUTDOWN	33
5.6	ALTERNATORS IN PARALLEL	33
5.6.1	With each other and/or with the power grid	33
6	MAINTENANCE	34
6.1	SECURITY MEASURES	34
6.2	EMERGENCY GENSETS	34
6.3	CLEANING	34
6.4	NOISE	34
6.5	VIBRATION	34
6.6	BEARINGS	34
6.6.1	Bearing replacement	34
6.6.1.1	Single bearing alternator – B15T	34
6.6.1.2	Double bearing alternator – B35T	34
6.6.1.3	Bearing replacement	35
6.7	EXCITER MAINTENANCE	35
6.7.1	Exciter	35
6.7.2	Test on diode modules	35
6.7.3	Diode modules replacement	35
8	I Installation, operation and maintenance manual – Synchronous Alternators – AW10 Line - Horizontal - 19578410	

6.7.4	Test on varistor	36
6.7.5	Varistor replacement	36
6.8	AIR FLOW	36
6.9	COMPLETE INSPECTION	36
6.10	DISASSEMBLY, ASSEMBLY AND PARTS LIST – AW10 160 AND 180.....	37
6.10.1	Disassembly.....	37
6.10.2	Assembly	37
6.11	TIGHTENING TORQUE FOR SCREWS IN POLYMER COMPONENTS	37
6.12	DISASSEMBLY OF THE AW10 EXCITER ROTOR	38
6.12.1	Procedure for removing the exciter rotor	38
6.13	FOOT POSITION ADJUSTMENT	38
6.14	TERMINAL BOX	39
6.15	MAINTENANCE PLAN.....	40
7	TROUBLESHOOTING	41
8	ENVIRONMENTAL INFORMATION	42
8.1	PACKAGING.....	42
8.2	PRODUCT	42
8.3	HAZARDOUS WASTE	42
9	TECHNICAL ASSISTANTS	42
10	DECLARATION OF CONFORMITY	43
11	WARRANTY	45

1 INTRODUCTION

This manual aims to cover the AW10 line alternators. Alternators with specialties can be supplied with specific documents (drawings, wiring diagram, characteristic curves, etc.). These documents must be carefully evaluated together with this manual, before installing, operating or maintaining the alternator. All procedures and standards contained in this manual must be followed to ensure the proper functioning of the alternator and the safety of the professionals involved in its operation. Observing these procedures is equally important to ensure the validity of the alternator warranty. Therefore, we recommend that you carefully read this manual before installing and operating the alternator. If doubts persist, please refer to WEG.



ATTENTION

When changing the components mentioned in this manual, the alternator manufacturing date must be observed in relation to the manual revision date.

1.1 SAFETY WARNINGS IN THE MANUAL

The following safety warnings are used in this manual:



DANGER

Failure to follow the procedures recommended in this warning may result in considerable material damage, serious injury or death.



ATTENTION

Failure to follow the procedures recommended in this notice may result in material damage.



NOTE

The text of this warning aims to provide important information for the correct understanding and proper functioning of the product.

1.2 NOMENCLATURE

BR 160 S 1 - B 1

VOLTAGE

BR -12 terminals (standard) -480/240V - 460/230V - 440/220V - 416/208V - 380/190V (60 Hz)
400/200V - 380/190V (50Hz)

A -12 terminals (standard) - 480/240V - 460/230V - 440/220V - 416/208V - 380/190V (60 Hz)
440/220V - 415/208V - 400/200V - 380/190V (50Hz)

F - 6 terminals - 600V/60Hz

N - 6 terminals - 600V/50Hz

R - 6 terminals - 690V/60Hz

S - 6 terminals - 690V/50Hz

Z - Other voltages

IEC FRAME

160 - Frame 160

180 – Frame 180

EXCITATION FEATURE

S - Brushless alternator without auxiliary coil and without auxiliary exciter (standard)

I - Brushless alternator with auxiliary coil

P - Brushless alternator with auxiliary exciter (PMG)

INSULATION DEGREE

1 - Degree 1 – Industrial (standard)

2 - Degree 2 - Naval

3 - Degree 3 – Aggressive Environments

COMPLEMENTARY CODE

Code referring to the power (package) of the alternator

QUANTITY OF BEARINGS

1 - Single bearing

2 - Double bearing

2 GENERAL INSTRUCTIONS

Professionals who work with electrical installations, whether in assembly, operation or maintenance, must be permanently informed and up to date on the safety standards and prescriptions that govern the service and are advised to strictly observe them. Before starting any work, it is the responsibility of the person responsible to make sure that everything has been duly observed and to warn operators about the dangers inherent in the task to be performed, and use personal protective equipment appropriate to the mechanical and electrical risks. Alternators of this type, when improperly applied or poorly maintained, or even when intervened by untrained people, can cause serious personal and/or material damage. Therefore, it is recommended that these services are always carried out by qualified people.

2.1 QUALIFIED PEOPLE

Qualified people are understood to be those professionals who, due to their training, experience, level of education, knowledge of relevant standards, specifications, safety standards, accident prevention and knowledge of operating conditions, have been authorized by those responsible for the carrying out the necessary work and that can recognize and avoid possible dangers.

These trained people must also know the first aid procedures and be able to provide such services if necessary.

It is assumed that all commissioning, maintenance and repair work is carried out only by qualified people.

2.2 SECURITY INSTRUCTIONS



DANGER

During operation, this equipment has exposed energized or rotating parts, which may present high voltage or high temperatures.

Therefore, operation with open terminal boxes, unprotected couplings, or incorrect handling, without considering the operating standards, can cause serious personal accidents and material damage.

Those responsible for safety of the facility must ensure that:

- Only qualified people perform installation and operation of equipment;
- These people have in hand this manual and other documents provided with the alternator, as well as perform the work strictly observing the instructions of service, relevant standards and documentation of specific products.

Failure to comply with installation standards and safety may void the warranty.

Equipment for firefighting and first aid notices should be at work in clearly visible and easily accessible places.

Please also notice:

- All technical data about the applications permitted (operating conditions, connections and installation environment) contained in the catalog, documentation of the application, operating instructions, manuals and other documents;
- The specific determinations and conditions to the installation site;
- The use of tools and equipment suitable for handling and transport;
- That protective devices of the individual components be removed before installation.

The spare parts must be stored in an environment free of vibrations, preventing falls and ensuring that they are protected against aggressive and / or endanger the safety of people.

2.3 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The minimum personal protective equipment recommended for the installation, handling and maintenance of generator sets includes: safety goggles, hearing protection, head protection, safety footwear, gloves and protective clothing suitable against electrical and mechanical risks.

2.4 STANDARDS

Alternators are specified, designed, manufactured and tested in accordance with the following standards:

Table 2-1: Applicable standards

	IEC	NBR	NEMA	ISO
Specification	60034-1	5117	MG1-32-33	
Dimensions	60072	15623	MG1-4	
Tests	60034-2 60034-4	5052	MG1-12	
Protection degrees	60034-5	60034-5	MG1-5	
Cooling	60034-6	60034-6	MG1-6	
Mounting	60034-7	60034-7	MG1-4	
Terminal markings and direction of rotation	60034-8		MG1-2	
Noise limits	60034-9	60034-9	MG1-9	
Thermal protection	60034-11-1			
Mechanical Vibration	60034-14	60034-14	MG1-7	
Mechanical Tolerances		6158	MG1-4	286
Balancing	60034-14		MG1-7	21940-11
Reciprocating Internal Combustion Engine Driven Alternating Current Generating Sets - part 3: Alternating Current Generators for Generating Sets.				8528-3

2.5 ENVIRONMENTAL FEATURES

In accordance with IEC 60034.1, and ABNT 5117, the ambient operating conditions for which the alternators were designed are the following:

1. Ambient temperature: – 15 °C to + 40 °C;
2. Altitude (a.s.l.): up to 1000 m;
3. Environment without the presence of aggressive agents such as: salt air, chemicals, etc.;
4. Environment according to the protection degree of the alternator.

Special conditions of environment are described on the rating plate and specific technical data sheet of the alternator.

2.5.1 Harsh and/or marine environments

The industry standard alternator should not be used in harsh environments, because this action is subject to weather that can cause corrosion of mechanical parts and decrease the insulation resistance of the windings and consequently the burning of the alternator. In these situations, WEG is not responsible for damage that may occur on the alternator, depriving the product warranty according to the warranty terms.



NOTE

Alternators applied in harsh environments should be equipped with additional protection against corrosion and poor insulation, ensuring, when requested, to guarantee performance of the product. Is considered harsh environment: marine environment or with high concentration of salinity and / or high humidity, materials in suspension that can be abrasive, and naval application and environments with high variation of temperature. In these cases, please refer to WEG for correct specification of the alternator to the required application.

2.6 OPERATING CONDITIONS

For the product's warranty term to be valid, the alternator must operate in accordance with the rated data, follow the applicable standards and codes and the information contained in this manual.

3 RECEIVING, STORAGE AND HANDLING

3.1 RECEIVING

All alternators supplied are tested and are in perfect operating condition. Machined surfaces are protected against corrosion. The packaging must be checked immediately after receiving to ensure that it has not suffered any damage during transportation.



ATTENTION

Any damage must be photographed, documented and communicated immediately to the carrier, the insurance company and WEG. Failure to communicate will result in the loss of the warranty.



ATTENTION

Parts supplied in additional packaging must be checked upon receiving.

- When lifting the packaging, the correct lifting locations, the weight indicated in the documentation and/or on the nameplate, as well as the capacity and functioning of the lifting devices must be observed;
- Alternators packed in wooden crates must always be lifted by their own eyebolts or by a suitable forklift, but must never be lifted by their wooden packaging;
- The packaging must never be tipped over. Place on the floor carefully (without causing impacts) to avoid damage to the bearings;
- Do not remove the corrosion protection grease from the shaft end, coupling discs and flange, nor the plugs closing the terminal box holes;
- These protections must stay where they are until final assembly. After unpacking, a complete visual inspection of the alternator must be carried out;
- The shaft locking system should only be removed shortly before installation and stored in a safe place for use in future transport of the alternator.

3.2 HANDLING

- The position 1 of Figure 3.1, represents the correct way to handle the alternators and positions 2 and 3 represent the wrong ways.
- The alternator was designed with eyebolts for lifting. These eyebolts are designed to lift the alternator only; additional loads are not permitted;
- Cables and lifting devices must be appropriate.

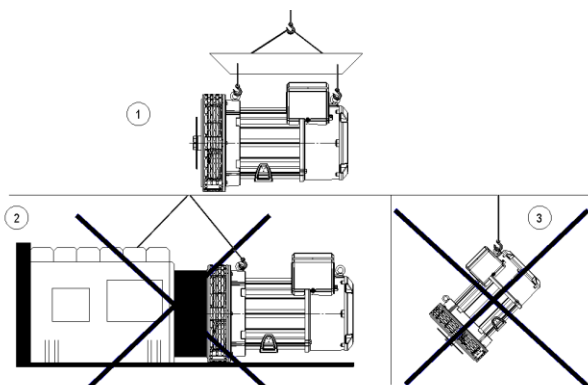


Figure 3.1: Alternator handling



NOTES

- Observe the indicated weight.
- Do not lift or place the alternator on the floor abruptly to avoid damage to the bearings.
- To lift the alternator, only use the eyebolts on it. If necessary, use a crossbeam to protect parts of the alternator.
- The eyebolts on the covers, bearings, terminal box, etc., are only used to handle these components.
- Never use the shaft to lift the alternator.
- To move the alternator, the shaft must be locked with the locking device supplied with the alternator.
- After removing the safety device on the front side, when lifting the alternator, it must not be tilted with the front part downwards, otherwise the rotor will fall.
- Transport the alternator in a horizontal position, without tilting it.
- Always carry the alternator using the two eyebolts.



ATTENTION

Steel cables, clevises and lifting equipment must be suitable and capable of supporting the weight of the alternator, to avoid accidents, damage to the alternator or personal injury. During any lifting operation, prohibit the presence of any person under the load.

3.3 STORAGE

Any damage to the paint or rust protection on the machined parts must be retouched.



ATTENTION

During storage, the space heaters (if any) must remain switched on to prevent water condensation inside the alternator, except for the bearing heaters if the bearings are oil-lubricated.

3.3.1 Storage in sheltered environment

If the alternator is not installed immediately after receipt, it must remain in its packaging and stored in a place protected from moisture, steam, rapid heat exchange, rodents, insects and other agents that could damage the machine. To prevent the bearings from being damaged, the alternator must be stored in vibration-free locations.

3.3.2 Storage in unshoused environment

The alternator must be stored in a dry place, free from flooding and vibration. Repair all packaging damage before storing the alternator, which is necessary to ensure proper storage conditions. Place the alternator on platforms or foundations that guarantee protection against soil moisture and prevent it

from sinking into the ground. Free air circulation must be ensured under the alternator.
The cover or canvas used to protect the alternator against the weather must not be in contact with its surfaces. To ensure free air circulation between the alternator and such covers, place wooden blocks as spacers.

3.3.3 Long-term storage

When the alternator is stored, the empty spaces inside it, in the bearings, terminal box and windings are exposed to air moisture, which can condense. Depending on the type and degree of air contamination, aggressive substances can also penetrate these empty spaces.
As a consequence, after long-term storage, the insulation resistance of the winding may reduce to values below the permissible values. Internal components such as bearings can oxidize and the lubricity of the lubricating agent can be affected. All these influences increase the risk of damage before the alternator operation.



ATTENTION

To avoid losing the alternator warranty, it must be ensured that all preventive measures described in this manual are followed and recorded.

The instructions described below are valid for alternators that are stored for long periods and/or are out of operation for a period of two months or more.

3.3.3.1 Storage location

To ensure the best long-term storage conditions for the alternator for long periods, the location chosen must strictly comply with the criteria described below.

3.3.3.1.1 Storage in sheltered environment

- The environment must be closed and covered;
- The location must be protected against moisture, vapors, aggressive agents, rodents and insects;
- There must be no presence of corrosive gases, such as chlorine, sulfur dioxide or acids;
- The environment must be free from continuous or intermittent vibration;
- The environment must have a ventilation system with air filter;
- Ambient temperature between 5°C and 60°C, with no sudden temperature fluctuations;
- Relative air humidity < 50%;
- Have prevention against dirt and dust deposits;
- Have a fire detection system;
- It must be provided with electricity to power the space heaters (if any).

If any of these requirements are not met at the storage location, WEG suggests that additional protections be incorporated into the alternator packaging during the storage period, as follows:

- Closed wooden box or similar with electrical installation that allows the space heaters (if any) to be energized;
- If there is a risk of infestation and fungus formation, the packaging must be protected in the storage location by spraying or painting it with appropriate chemical agents;
- The packaging preparation must be done carefully by a qualified person.

3.3.3.1.2 Storage in unhoued environment



ATTENTION

It is not recommended to store the alternator in unhoued location.

If storage in an unhoued environment cannot be avoided, the alternator must be packed in specific packaging for this condition, as follows:

- For storage in an unhoued environment, in addition to the packaging recommended for internal storage, the packaging must be covered with protection against dust, moisture and other foreign materials, using a resistant canvas or plastic for this purpose;
- Position the packaging on platforms or foundations that guarantee protection against soil moisture and prevent it from sinking into the ground;
- After the alternator is covered, a shelter must be erected to protect it from direct rain, snow, or excessive heat from the sun.



ATTENTION

Special cases of extended Warranty for storage time will be valid subject to compliance with the requirements of this manual and requirements linked to the extended warranty.

3.3.3.2 Separate parts

- If separate parts have been supplied (terminal boxes, covers, etc.), these parts must be packaged as specified in items 3.3.3.1.1 and 3.3.3.1.2.
- The relative humidity inside the packaging must not exceed 50%.

3.3.3.3 Space heaters

The alternator space heaters (if any) must remain energized during the storage period to prevent moisture condensation inside the alternator (except for the bearing heaters if the bearings are oil-lubricated) and thus ensure that the windings insulation resistance remains at acceptable levels.



ATTENTION

The alternator space heaters must be switched on when it is stored in a place at a temperature < 5°C and/or relative humidity >50%.

3.3.3.4 Insulation resistance

During the storage period, the insulation resistance of the stator, rotor and exciter windings of the alternator must be measured and recorded every three months and before installing the alternator.

Any drops in the insulation resistance value must be investigated.

3.3.3.5 Exposed machined surfaces

All exposed machined surfaces (e.g., the shaft end, flange, coupling disc) are protected at the factory with a temporary protective agent (rust inhibitor). This protective coating must be reapplied at least every 6 months or when it is removed and/ or damaged.

Recommended Product:

Name: Anticorit BW protective oil,
Manufacturer: Fuchs

3.3.3.6 Bearings



ATTENTION

If the alternator bearings need to be opened, disassembled, or reassembled, the work **must be carried out exclusively** by WEG field service engineers or a **WEG-authorized service partner**.

Any intervention by unauthorized personnel may result in bearing misalignment, premature wear, and **will void the product warranty**.

3.3.3.6.1 Shielded bearings

During the storage period, every two months, the shaft locking device must be removed and rotated manually to distribute the grease inside the bearing and keep the bearing in good condition. If the alternator remains stored for more than 2 years, the bearings must be replaced.



ATTENTION

If it is not possible to rotate the alternator shaft, as recommended, check the condition of the bearing before putting the alternator into operation.

3.3.3.7 Terminal box

When the insulation resistance of the alternator windings is measured, the main terminal box and other terminal boxes must also be inspected, especially considering the following aspects:

- The inside must be dry, clean and free from any dust deposits;
- The contact elements must not present corrosion;
- Seals must be in appropriate condition;
- The cables inlet must be correctly sealed according to the machine's degree of protection.

If any of these items are not correct, cleaning or replacement of parts must be carried out.

3.3.3.8 Inspections and records during storage

The stored alternator must be inspected periodically and inspection records must be archived.

The following items must be inspected:

1. Physical damage;
2. Cleaning;
3. Signs of water condensation;
4. Conditions of the protective coating of machined parts;
5. Painting conditions;
6. Signs of harsh agents;
7. Satisfactory operation of space heaters (if any). It is recommended that a signaling or alarm system be installed on site to detect the interruption of power to the space heaters;
8. It is recommended to record the ambient temperature and relative humidity around the machine, the winding temperature, insulation resistance and polarization index;
9. Inspect the storage location so that it complies with the criteria described in item 3.3.3.1.

3.3.3.9 Maintenance plan during storage

During the storage period, alternator maintenance must be performed and recorded in accordance with the plan described in Table 3-1.

Table 3-1- Storage plan

	Monthly	Every two months	Every six months	Every 2 years	Before going into operation	NOTE
Storage Location						
Inspect cleaning conditions		X			X	
Inspect moisture and temperature conditions		X				
Check for signs of harsh agents		X				
Measure vibration level	X					
Packaging						
Inspect physical damage			X			
Inspect inner relative humidity		X				
Replace the desiccant in the package (if any)			X			When necessary
Space heater (if any)						
Check operating conditions	X					
Complete alternator						
Perform external cleaning			X		X	
Perform internal cleaning					X	
Verify painting conditions			X			
Verify the rust inhibitor on exposed parts			X			Replace the inhibitor, if necessary.
Windings						
Measure insulation resistance		X			X	
Measure polarization index		X			X	
Terminal boxes and grounding terminals						
Clean the inside of the terminal boxes				X	X	
Inspect the seals				X	X	
Retighten the connection terminals					X	According to the tightening torques informed in this manual
Shielded rolling bearings						
Rotate the alternator shaft		X				
Replace the bearing				X		

3.3.3.10 Star-up preparation

3.3.3.10.1 Cleaning

- The alternator inside and outside must be free of oil, water, dust and dirt.
- Remove the rust inhibitor from exposed surfaces with a cloth soaked in a petroleum-based solvent;
- Make sure that the bearings and cavities used for lubrication are free from dirt and correctly sealed.

3.3.3.10.2 Checking of insulation resistance



ATTENTION

Before putting the alternator into operation, the winding insulation resistance must be measured, as per item 3.3.3.4 of this manual.

3.3.3.10.3 Others

Follow the other procedures described in item 5 of this manual before putting the alternator into operation.

4 INSTALLATION

4.1 INSTALLATION LOCATION

Alternators must be installed in easily accessible locations, which allow periodic inspections, local maintenance and, if necessary, their removal for external services. The following environmental characteristics must be ensured:

- Alternators must receive fresh, clean air and the installation location must allow easy exhaustion of air from the equipment's operating environment, avoiding air recirculation;
- It must be avoided that the alternator sucks in smoke from the diesel motor exhaust, as soot is electrically conductive and reduces the useful life of the insulation and can cause the alternator to burn;
- The installation of other equipment or walls must not hinder or obstruct alternator ventilation;
- The space around and above the alternator must be sufficient for its maintenance or handling;
- The environment must be in accordance with the degree of protection of the alternator.



NOTE

For alternators with a single bearing, the shaft locking device (used to protect the rotor/stator assembly against damage during transport) must be removed only shortly before coupling it to the driving machine.

4.2 ROTATION DIRECTION

Standard AW10 line alternators can only operate in clockwise rotation direction (viewed from the alternator shaft end – Drive End). The phase sequence is adjusted to the clockwise rotation direction (viewed from the alternator shaft end - Drive End). The alternator terminals are marked in such a way that the sequence of terminals 1, 2 and 3 coincides with the sequence of phases R, S and T or L1, L2 and L3, when the rotation direction is clockwise. The AW10 line fans are unidirectional; if the alternator needs to be operate in counterclockwise direction, it is necessary to replace the fan with a bidirectional model.



ATTENTION

The wrong phase sequence can cause damage to equipment powered by the alternator. In the case of operation in parallel with other alternators and/or the power grid, they must have the same phase sequence.

4.3 PROTECTION DEGREE

It is essential for the proper performance of the alternator and its durability, that the degree of protection of this equipment in relation to the installation environment is observed. The standard alternator of the AW10 line has IP23 protection degree (protected against penetration of solid objects greater than 12mm and against water splashes with a maximum inclination of 60°).

4.4 COOLING

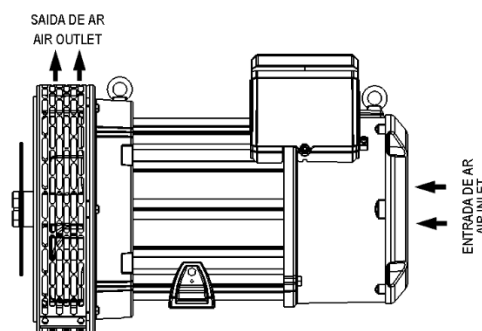


Figure 4.1: Cooling system

The fan is installed on the drive-end side, next to the rotor. The air enters on the non-drive-end side and exits through the radial openings in the cover/flange on the drive-end side.

4.4.1 Removing the flange protection

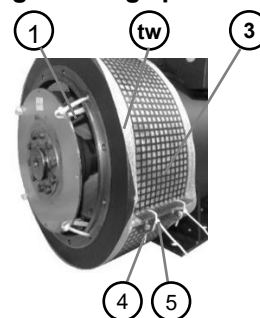


Figure 4.2: Flange protection

Legend of Figure 4.2

1. Flange
2. Flange protection
3. Grille
4. Screw
5. Cable Tie



ATTENTION

The protection (2), placed between the ventilation grille (3) and the flange (1), is an integral part of the packaging and must be removed when installing the alternator, so as not to harm its cooling during operation, according to the procedure as follow:

- Cut the cable ties (5) that fix the protective grille;
- Remove the grille and flange protection;
- Reinstall the ventilation grille, fixing it with the screws (4).

4.5 INSULATION RESISTANCE

4.5.1 Safety instructions



DANGER

Before measuring the insulation resistance, the alternator must be stopped and disconnected from the load and the voltage regulator must be disconnected. The winding being tested must be connected to the frame and ground for a period until the residual electrostatic charge is removed. Failure to follow these procedures could result in personal injury.

4.5.2 General considerations

When the alternator is not immediately placed into operation, it must be protected against moisture, dirt and high temperature, thus avoiding that the insulation resistance

The insulation resistance of the windings must be measured before entry into operation. If the environment is too humid, it is necessary to check it periodically during storage. It is difficult to determine rules for the real value of insulation resistance of a machine, since it varies with environmental conditions (temperature, humidity), conditions of machine cleaning (dust, oil, grease, dirt) and quality and conditions the insulating material used. The evaluation of periodic monitoring records is useful to conclude whether the engine is ready to operate.



NOTE

The insulation resistance must be measured using a MEGOHMMETER.

4.5.3 Measurement on the stator winding

The test voltage on the alternator stator windings shall be as per Table 4-1 in accordance with the IEEE43 standard.

Table 4-1: Voltage for measuring the insulation resistance

Rated winding voltage (V)	Insulation resistance test Direct voltage (V)
< 1000	500
1000 - 2500	500 - 1000
2501 - 5000	1000 - 2500
5001 - 12000	2500 - 5000
> 12000	5000 - 10000

Before measuring on stator winding, check the following:

- If all load cables are disconnected;
- If the voltage regulator is disconnected.
- If the alternator frame and unmeasured windings are grounded;
- If the winding temperature has been measured;
- If all temperature sensors are grounded.

The measurement of the insulation resistance of the stator windings must be performed in the main terminal box.

The meter (megohmmeter) must be connected between the alternator frame and the winding. The frame must be grounded and the 3 phases of the stator winding remain connected to the neutral point, as per Figure 4.3:

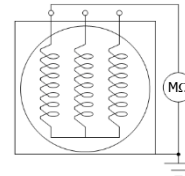


Figure 4.3: Measurement in 3 phases

Whenever possible, each phase should be isolated and tested separately. Separate testing allows comparison between phases. When one phase is tested, the other two phases must be grounded on the same frame ground, as per Figure 4.4.

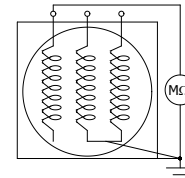


Figure 4.4: Measurement in separate phases

4.5.4 Measurement on rotor winding, exciter and accessories

Measurement on rotor winding:

- Disconnect the rotor cables from the diodes set;
- Connect the insulation resistance meter (megohmmeter) between the rotor winding and the alternator shaft. The measuring current must not pass through the bearings.

Measurement on main exciter stator winding.

- Disconnect the power cables from the exciter;
- Connect the insulation resistance meter (megohmmeter) between the exciter stator winding (terminals I and K) and the alternator frame.

Measurement on main exciter rotor winding:

- Disconnect the exciter rotor cables from the diodes set;
- Connect the insulation resistance meter (megohmmeter) between the exciter rotor winding and the alternator shaft. The measuring current must not pass through the bearings.

Measurement on stator winding of the auxiliary exciter (PMG) – if any:

- Disconnect the cables that connect the auxiliary exciter to the voltage regulator;
- Connect the insulation resistance meter (megohmmeter) between the stator winding of the auxiliary exciter and the alternator frame.



ATTENTION

The test voltage for the rotor, main exciter, auxiliary exciter and space heater must be 500 Vdc and other accessories 100 Vdc. Measuring insulation resistance of thermal protectors is not recommended.

In machines that are already in operation, higher insulation resistance values can be obtained compared to the initial commissioning values.

Comparison with values obtained in previous tests on the same machine, under similar load, temperature and humidity conditions serves as a better indication of insulation conditions than the value obtained in a single test, with any sudden reduction being considered suspicious.

4.5.5 Minimum insulation resistance

Table 4-2: Minimum insulation resistance

	Minimum I.R. (referred to 40°C)
Stator voltage ≤ 1000 V	5 MΩ
Stator voltage > 1000 V	100 MΩ
Rotor and exciter	5 MΩ

4.5.6 Evaluation and preservation of windings

Table 4-3: Assessment of Insulation Resistance "I.R."

Un	I.R.	Insulation Status	Procedure
≤1000V	< 5 MΩ	Critical*	Cleaning and drying
	5 up to 100 MΩ	Acceptable	Periodic monitoring
	> 100 MΩ	Normal	Normal operation
>1000V	< 100 MΩ	Critical*	Cleaning and drying
	100 up to 500 MΩ	Acceptable	Periodic monitoring
	> 500 MΩ	Normal	Normal operation

*The alternator must not operate in this condition



NOTE

The data from Table 4-3 serve as a reference. It is recommended to record all insulation resistance measurements taken on the alternator and keep a history of these measurements. Any sudden reduction in recorded values must be investigated.

Insulation resistance is influenced by the presence of moisture and dirt in the insulating material. If the measured insulation resistance is lower than the values informed in Table 4-2, before the alternator is put into operation, the windings must be carefully inspected, cleaned and, if necessary, dried in accordance with the procedure below:

- Dismantle the alternator by removing the rotor and bearings;
- Place the components that have windings with low insulation resistance in an oven and heat them to a temperature of 130°C, remaining at this temperature for at least 8 hours.
- Check whether the insulation resistance achieved is within acceptable or normal values, as per Table 4-3, otherwise, consult WEG.



DANGER

Immediately after measuring the insulation resistance, ground the winding to avoid accident.

4.5.7 Conversion of measured values

The insulation resistance must be referred to 40°C. If the measurement is taken at a different temperature, it will be necessary to refer the reading to 40°C, using the approximate correction provided by the curve of Figure 4.5, in accordance with the IEEE43 standard. The correction of the insulation resistance reading to 40°C is done by the relation:

$$R_{40} = Kt \cdot Rt$$

Where:

Rt = insulation resistance at temperature "t".

Kt = Correction factor for insulation resistance as a function of winding temperature, as shown in the graph of the Figure 4.5.

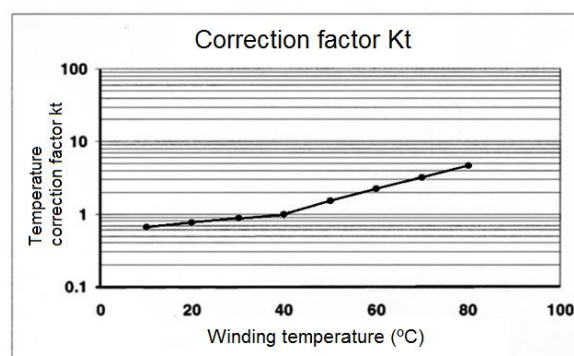


Figure 4.5: Coefficient of insulation resistance variation with temperature

The values used to generate the curve of Figure 4.5 are shown in Table 4-4.

Table 4-4: Correction factors for insulation resistance with the temperature

t (°C)	Kt factor
10	0.7
20	0.8
30	0.9
40	1.0
50	1.5
60	2.3
70	3.3
80	4.6

4.6 PROTECTION

4.6.1 Thermal protection

The alternators have, when requested by the customer, protection devices against over-temperature rise, installed in the main stator coils and/or bearings, as follows:

Thermostat (bimetallic) - Bimetallic type thermal detectors, with normally closed silver contacts that open when they reach the triggering temperature. Thermostats can be connected in series or independently according to the wiring diagram.

Thermistors (PTC or NTC type) - Thermal detectors, composed of semiconductors that vary their resistance abruptly when they reach the triggering temperature. The thermistors can be connected in series or independently according to the wiring diagram.



NOTE

Thermostats and thermistors must be connected to a control unit that will stop the alternator or activate a signaling device.

Thermoresistance (PT-100) - It is a calibrated resistance element. Its operation is based on the principle that the electrical resistance of a metallic conductor varies linearly with temperature. The detector terminals must be wired to a control panel, which includes a temperature gauge.



NOTE

RTD type thermoresistances allow absolute temperature monitoring. With this information, the relay can read the temperature, as well as set parameters for alarm and shutdown according to pre-defined temperatures.

The following formula is used to convert the measured ohmic resistance value of the thermoresistances Pt-100 type.

$$\text{Formula: } \frac{\Omega - 100}{0.386} = ^\circ\text{W}$$

Where: Ω = ohmic resistance measured on Pt-100

The protective devices, when requested, are listed in the specific wiring diagram for each alternator. Failure to use these devices is the user's sole responsibility, but may void the warranty in case of damage.

4.6.1.1 Temperature limits for windings

The temperature of the hottest point of the winding must be kept below the thermal class limit of the insulation. The total temperature is composed of the sum of the ambient temperature and the temperature rise (ΔT), plus the difference between the average temperature of the winding and the winding hottest point. The ambient temperature is defined by standard at maximum of 40°C. Above this value, working conditions are considered special. The Table 4-5 shows the numerical values and composition of the allowable temperature of the winding hottest point.

Table 4-5: Insulation class

Insulation class		F	H
Ambient temperature	°C	40	40
T = temperature rise (resistance method)	°C	105	125
Difference between the hottest point and the average temperature	°C	10	15
Total: temperature of the hottest point	°C	155	180



ATTENTION

If the alternator operates with winding temperatures above the thermal class limit values, the useful life of the insulation and, consequently of the alternator, is significantly reduced, or may even cause the alternator to burn out.

4.6.1.2 Thermal protections for bearings

The temperature sensors installed in the bearings (if any) serve to protect them from damage due to overtemperature operation.

4.6.1.3 Alarm and shutdown temperatures

Alarm and shutdown temperatures must be parameterized as low as possible. These temperatures can be determined based on test results or through the alternator operating temperature.

The alarm temperature can be adjusted to 10°C above the alternator operating temperature at full load considering the highest ambient temperature in the location. The temperature values set for shutdown must not exceed the maximum permissible temperatures as per Table 4-6 and Table 4-7.

Table 4-6: Maximum stator temperature - continuous duty

STATOR WINDING		
Insulation Class	Maximum temperatures of protection setting (°C)	
	Alarm	Shutdown
F	140	155
H	155	180



ATTENTION

Alternators used in emergency (standby) systems can have temperature rise of up to 25°C above the temperature in continuous operation, in accordance with Nema standards MG-1-22.40 and MG-1-22.84. Using the alternator under these conditions reduces the useful life of the alternator.

Table 4-7: Maximum bearing temperature

BEARINGS	
Maximum temperatures of protection setting (°C)	
Alarm	Shutdown
110	120



ATTENTION

Alarm and shutdown temperature can be defined based on experience, but must not exceed the maximum values indicated in Table 4-6 and Table 4-7.

4.6.2 Space heater

When the alternator is equipped with space heater to prevent water condensation during long periods of non-operation, these must be programmed to always be energized immediately after the alternator shutdown and de-energized before the alternator comes into operation. The dimensional drawing and a specific nameplate on the alternator indicate the value of the supply voltage and power of the installed space heaters. Make sure that the bearings contain oil before energizing the bearing heaters.



ATTENTION

If the space heaters are energized while the machine is in operation, the winding may be damaged.

4.6.3 Voltage regulator protection

The voltage regulator has a protection fuse, with overcurrent protection function.



ATTENTION

Failure to use the specified fuse may cause the burn out of the voltage regulator and, consequently, of the stator winding. This defect is not covered by the warranty.

If the fuse blows, it must be replaced with another of the same value, so that the alternator operates properly protected.

The fuse protects the alternator and voltage regulator in the following situations:

1. Loss of reference (sensing) of the voltage regulator;
2. Connection of the auxiliary coil cables in short-circuit, carried out in the coil output cables themselves or through a wrong connection in the voltage regulator;
3. Connection of voltage regulator output terminals in short-circuit;
4. Operation at low speed (used to warm up the diesel motor), mainly with the U/F function of the voltage regulator disabled, depending on the operating condition (speed, regulator adjustment and others);
5. In the event of damage to the voltage regulator (power element burnout or internal reference failure in the comparison circuits).

The fuse does not activate in the event of short-circuit in the alternator phases. In these cases, the protection must be provided with a relay, allowing the motor starting and protection sensitization.

4.6.4 Diodes protection

The diodes are protected against overvoltage and/or voltage surges, as per Table 4-8.

If these components fail, they must be replaced.

Table 4-8: Diode protections

	Varistor	Capacitor
AW10	✓	✓
Assembly type	THT	THT
Item (WEG)	10049848	10391625
Features	1W, 745Vdc, 550Vac 210J/2ms	0.1µf, 2000Vdc, 630Vac

4.6.5 Underfrequency protection

Underfrequency protection prevents overcurrent in the auxiliary coil windings and alternator excitation circuit. This protection is adjusted using the U/F *trimpot* of the voltage regulator.

4.6.6 Maintenance of short-circuit current (only for auxiliary coil and PMG)

WEG alternators AW10 line has an auxiliary coil as an option, which is inserted into the slots of the main stator, isolated from the main winding. This coil's function is to supply the voltage regulator power circuit and maintain the alternators short-circuit current.



NOTE

1. The standard design is *shunt*, only machines with auxiliary coil and PMG support short circuit maintenance.
2. Due to the fact that the alternator maintains a high I_{sc} , a protection device must be installed in which the maximum overcurrent time does not exceed 20s, otherwise the alternator will burn out.
3. To maintain the short-circuit current above $3.0 \times I_n$, consult WEG.

4.7 VOLTAGE REGULATOR

The purpose of the electronic voltage regulator is to keep the alternator voltage constant, regardless of the load. It may be mounted in the alternator terminal box or on the control panel.

If the side of the AVR in the junction box is reversed from the factory arrangement, the AVR must be rotated by 180° in relation to the central position of the bracket.



ATTENTION

Check the voltage regulator manual for the identification of terminals, wiring diagram and adjustment *trimpots*.

A wrong connection could mean the burning of the regulator and/or alternator windings. Defects caused by this reason are not covered by the warranty.

4.8 ELECTRICAL FEATURES

4.8.1 Electrical connections

The electrical connections of the alternator are responsibility of the end user and must be performed by qualified people. The wiring diagrams are shown in item 4.8.2.

4.8.1.1 Main connection

The main cable connections must be performed in accordance with the diagrams contained in this manual, using tightening torque as per Table 4-9 for fixing the cables.

Table 4-9: Tightening torque of the terminal screws for fixing the main cables

Thread Diameter	Tightening torque (Nm)
M5	4 - 5
M6	8 - 9
M8	19 - 21
M10	38 - 42
M12	67 - 73
M16	143 - 157



NOTE

The tightening torques of electrical terminal connections are informed in the alternators terminal board.

- Make sure that the section and insulation of the connection cables are appropriate for the alternator current and voltage;
- Before making electrical connections between the alternator and the load or power grid, it is necessary to carefully check the winding insulation resistance, as per item 4.5.

4.8.1.1.1 Cables connection

To obtain an effective electrical contact, the connection of the cables to the terminal board pins must comply with the following configuration:

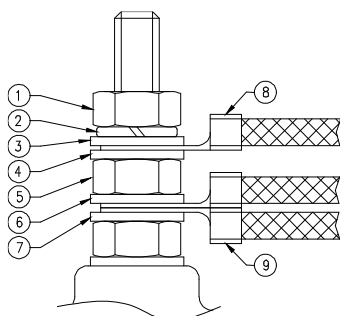


Figure 4.6: Connecting the cables

Legend of Figure 4.6:

1. Steel nut
2. Steel pressure washer
3. Flat steel washer
4. Flat brass washer
5. Brass nut
6. Flat brass washer
7. Flat steel washer
8. Power grid cable connection terminal
9. Alternator cable connection terminal



ATTENTION

This configuration is valid for connecting the cables directly to the terminal board pins. Brass washers and nuts must not be replaced with others with different material, as this may impair the contact of the connection cables.

4.8.1.2 Grounding

Alternators must always be grounded with a cable of suitable section, using the threaded hole located on the back flange.



Figure 4.7: Grounding

4.8.1.3 Connections of the voltage regulator

The electronic voltage regulator leaves the factory electrically connected to the alternator's rated voltage.



ATTENTION

When there is a change in the connections of the alternator's main terminals to change the voltage in the single-phase delta connection, the connections of the voltage regulator sensing voltage cables must also be changed according to the specific wiring diagram.

4.8.1.4 Terminal identification

Main terminals (stator phase connection cables)

1 up to 12, N

Connection terminals on the voltage regulator

F+ (red) and F- (black) - Main exciter field

Cables for AVR SES-17 and SES-37 (standard):

V or N1 (brown) - Single-phase sensing voltage.

U (green) - Common to supply of the power circuit and the single-phase sensing voltage of the regulator.

N (yellow) - Supply to the voltage regulator power circuit.

Cables for AVR RTA300:

E1/E2 (brown) and E3 (green) - Single-phase sensing voltage.

X1 (green), X2 (brown) - Supply to the voltage regulator power circuit.

Z1 (green and yellow), Z2 (yellow) - Supply circuit for auxiliary coil.

AX1 (blue), AX2 (gray) and AX3 (orange) - auxiliary exciter - supply to the voltage regulator power circuit - machines with PMG.

N (white) - Single-phase sensing voltage (GPA)

Cables for AVR's GRTA-2D, K38L and K38P1:

E1 or E2 (brown) - Single-phase sensing voltage.

E3/4 (green) - Common to supply of the power circuit and the single-phase sensing voltage of the regulator.

3 (yellow) - Supply to the voltage regulator power circuit.

4.8.2 Wiring diagrams

4.8.2.1 Three-phase alternators - 12 terminals

WIRING DIAGRAM		Star series (access to neutral)		Star parallel (access to neutral)		Delta series	
VOLTAGE (V)							
60Hz	L - L	380 - 416	440 - 460 - 480	190 - 208	220 - 230 - 240	220 - 240 - 254 - 266 - 277	
	L - N	220 - 240	254 - 266 - 277	110 - 119	127 - 132 - 139	—	
	N - U (Sensing)	190 - 208	220 - 230 - 240	190 - 208	220 - 230 - 240	220 - 240 - 254 - 266 - 277	
50Hz	L - L	380 - 400 - 415* - 440*		190 - 200 - 208* - 220*		220 - 230 - 240* - 254*	
	L - N	220 - 230 - 240* - 254*		110 - 115 - 119* - 127*		—	
	N - U (Sensing)	190 - 200 - 208* - 220*		190 - 200 - 208* - 220*		220 - 230 - 240* - 254*	
*Voltages only available on alternators with voltage code "A"							
TERMINAL BOARD		8 pins		8 pins		8 pins	



ATTENTION

- The alternator is supplied with the voltage regulator connected to operate with the alternator's rated characteristics:
 - In the event of maintenance or change of the alternator's electrical connections, correctly connect cables **U**, **V** and **N** to the voltage regulator, as follows:
 - Cables **V** and **N** refer to the voltage regulator sensing voltage. (**N1 is a direct jumper on the AVR for low sensing voltages**).
 - **U** and **V** cables refer to the voltage regulator power supply.
 - In alternators with 12 terminals, always connect the **U** and **V** cables of the regulator that are connected to the alternator to the **U** and **V** terminals of the voltage regulator, regardless of the type of connection or the alternator rated voltage.
- In these cases, the N1 terminal of the voltage regulator must not be used.**
- For voltage regulator models other than the SES-17 and SES-37, it is necessary to check the connections in the AVR manual.

4.8.2.2 Three-phase alternators – 6 terminals

WIRING DIAGRAM		Star		Delta	
		VOLTAGE (V)			
60Hz	L - L	600	690	346	398
	L - N	346	398	-	-
	(N or V) - U (Sensing)	600 (V)	690 (V)	346 (V)	398 (V)
50Hz	L - L	600	690	346	398
	L - N	346	398	-	-
	(N or V) - U (Sensing)	600 (V)	690 (V)	346 (V)	398 (V)
TERMINAL BOARD		8 pins		8 pins	



ATTENTION

- The alternator is supplied with the voltage regulator connected to operate with the alternator's rated characteristics:
- In case of maintenance or change of the alternator connection, correctly connect the N1 or V, N and U cables to the voltage regulator, as follows (**N1 is a direct jumper on the AVR for low sensing voltages**):
 - Cables **N1** or **V** and **U** refer to the voltage regulator sensing voltage.
 - Cables **U** and **N** refer to the voltage regulator power supply.
- In WEG alternators with a single voltage of 160 to 300V, always connect the **N** and **U** cables of the alternator to the **N** and **U** terminals of the voltage regulator, according to the diagrams above;
- In WEG alternators with a single voltage of 320 to 600V, always connect the **V** and **U** cables of the alternator to the **V** and **U** terminals of the voltage regulator, according to the diagrams above.
- For voltage regulator models other than the SES-17 and SES-37, it is necessary to check the connections in the AVR manual.

4.8.2.3 Three-phase alternators with single-phase connection – 12 terminals

WIRING DIAGRAM		Single-phase Zig-zag parallel	Single Phase Zig-zag Series	Single-phase delta
		VOLTAGE (V)		
60Hz	L – L	190 - 240*	440 - 480*	220 - 240*
	L–N	95 - 120*	220 - 240*	110 - 120*
	N - V	190 - 240*	220 - 240*	220 - 240*
50Hz	L – L	190 - 230*	380 - 400*	190 - 200*
	L–N	95 - 115*	190 - 200*	95 - 100*
	N - V	190 - 230*	190 - 200*	190 - 200*
*Voltages only available on alternators with voltage code "A"				
TERMINAL BOARD		8 pin	8 pin	8 pin



ATTENTION

- N1 - V – Reference voltage for the voltage regulator (See voltage regulator manual).
- **(N1 is a direct jumper on the AVR for low reference voltages)**
- For the single-phase triangle connection, regulator cables N and V, originally connected to main cables 12 and 7, must be removed from their original position. Reconnect these cables as follows:
 - V cable on main cable 8
 - Cable N on main cable 1, as per diagrams above.
- Observe the single-phase power specified in the catalogue.
- For voltage regulator models other than the SES-17 and SES-37, it is necessary to check the connections in the AVR manual.

4.8.2.4 Voltage regulator electrical connections

- To perform correctly the electrical connections between the alternator and the voltage regulator, consult the voltage regulator manual.
- The model of voltage regulator depends on the characteristics of the alternator and the desired application, therefore, the electrical connections to the alternator and the identification of the terminals may differ from one model to another.
- The voltage regulator manual is supplied with the alternator.
- The AW10 standard alternator has shunt excitation.
- Alternators with auxiliary coil are optional.
- Alternators with auxiliary exciter are special and should be manufactured on request to WEG.
- When using a transformer to adapt the voltage regulator sensing voltage, this transformer cannot be installed inside the alternator's main terminal box.

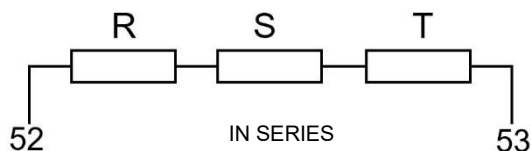
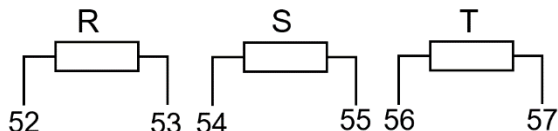
4.8.3 Accessories wiring diagrams

Accessories terminals

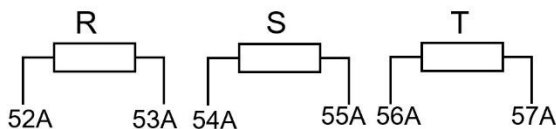
16 to 19 - Space heaters
 20 to 35 - Stator thermoresistance (PT100)
 36 to 51 - Stator thermistors (PTC)
 52 to 67 - Stator thermostats
 68 to 71 - Bearing thermoresistance
 72 to 75 - Bearing Thermistors
 76 to 79 - Bearing Thermostats
 88 to 91 - Thermometers
 94 to 99 - Current Transformers

4.8.4 Stator thermostats

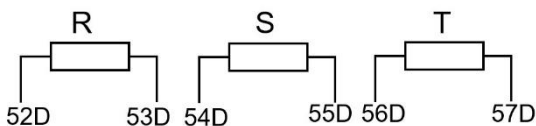
1 per phase



2 per phase

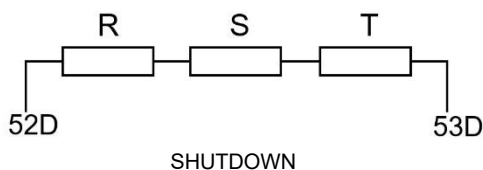
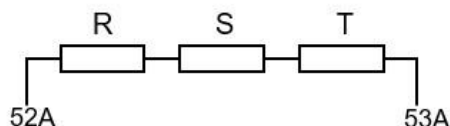


ALARM



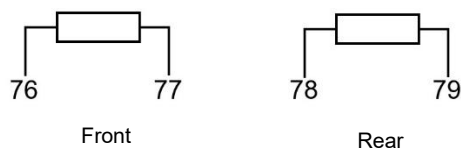
SHUTDOWN

2 per phase in series



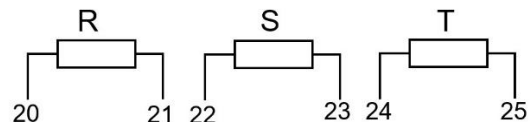
4.8.4.1 Bearing thermostats

1 per bearing

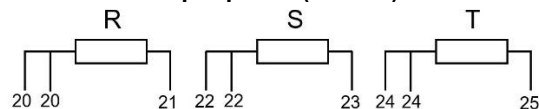


4.8.4.2 Stator thermoresistance

1 per phase



1 per phase (3 wires)



4.8.4.3 Bearing thermoresistance

1 per bearing



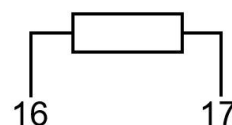
1 per bearing (3 wires)



ATTENTION

When using 2 sensors per phase, the suffixes **A** for alarm and **D** for shutdown are added.
 For alternators supplied with a specific wiring diagram, this has priority over the wiring diagrams in this manual.

4.8.4.4 Space heaters



4.9 MECHANICAL ASPECTS

4.9.1 Bases and foundations

- The sizing of the bases must be carried out in order to provide rigidity to the structure, avoiding amplifications of the vibration levels of the set. The base must have a flat surface against the alternator feet to avoid deformation of the alternator frame.
- The base must always be leveled in relation to the ground (floor). The leveling is achieved by placing shims between the base and floor.
- The client is responsible for the design and construction of the foundation. It must be rigid enough to withstand the circuit forces. To avoid resonance vibrations, the foundation must be designed in such a way that the natural frequency (reed frequency) of the foundation together with the machine is not within $\pm 20\%$ of the operating speed frequency. The customer is also responsible for analyzing the critical lateral and torsional speed of the complete installation.

4.9.2 Alignment and leveling

The alternator must be perfectly aligned with the driving machine, especially in cases of direct coupling.



ATTENTION

Incorrect alignment can cause bearing defects, vibrations and even shaft breakage.

4.9.2.1 Alternators with double bearings (B35T or B3T)

The alternator must be correctly aligned with the driving machine, particularly in cases of direct coupling. Incorrect alignment can cause bearing defects, vibrations and even shaft breakage. Alignment must be done in accordance with the coupling manufacturer's recommendations. It is necessary to align the alternator parallel and angularly, as per Figure 4.8 and Figure 4.9.

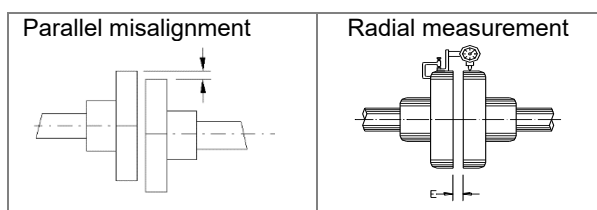


Figure 4.8: Parallel alignment

The Figure 4.8 shows the parallel misalignment of the 2 shaft ends and the practical way of measuring using suitable dial indicators.

The measurement is made at 4 points at 90° , with the two half-couplings rotating together in order to eliminate the effects due to irregularities on the support surface of the dial indicator tip. Choosing the upper vertical point 0° , half of the difference of the dial indicator measurement at the 0° and 180° points represents the vertical coaxial error. This must be corrected appropriately by adding or removing mounting shims. Half of the difference in the dial indicator measurement at the 90° and 270° points represents the horizontal coaxial error.

This gives an indication of when it is necessary to raise or lower the alternator or move it to the right or left on the driven side to eliminate the coaxial error.

Half of the maximum difference of the dial indicator measurement in one full rotation represents the maximum eccentricity.

The maximum allowable eccentricity for rigid or semi-flexible coupling is 0.03 mm.

When flexible couplings are used, values greater than those indicated above are acceptable, but should not exceed the value provided by the coupling manufacturer. It is recommended to maintain a safety margin in these values.

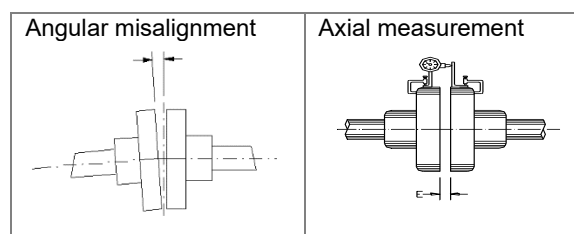


Figure 4.9: Angular alignment

The Figure 4.9 shows the angular misalignment and the practical way of measuring

The measurement is performed at 4 points at 90° , with the two half-couplings rotating together in order to eliminate the effects due to irregularities on the support surface of the dial indicator tip. Choosing the upper vertical point 0° , half of the difference in the dial indicator measurement at the 0° and 180° points represents vertical misalignment. This must be corrected appropriately by adding or removing mounting shims. Half of the difference in the dial indicator measurement at the 90° and 270° points represents horizontal misalignment. This should be adequately corrected with lateral/angular movements of the alternator. Half of the maximum dial indicator measurement difference in one full rotation represents the maximum angular misalignment.

The maximum misalignment allowed for rigid or semi-flexible coupling is 0.03 mm.

When flexible couplings are used, values greater than those indicated above are acceptable, but should not exceed the value provided by the coupling manufacturer. It is recommended to maintain a safety margin in these values.

When aligning/leveling, it is important to take into account the effect of the temperature of the alternator and the driving machine. Different expansion levels of the coupled machines can change the alignment/leveling during operation.

4.9.2.2 Single Bearing Alternators (B15T)

The base must be flat, allowing for correct support of the alternator on it. Whenever possible, vibration isolators (shock absorbers) should be used between the set of alternator + motor and base in order to minimize vibration transmission. When it is not possible to use insulators between the set and base, it is necessary to use the insulator between base and ground. One of the two configurations is recommended, otherwise there will be operation with high levels of vibration.

4.9.2.3 Rotor turning



ATTENTION

The alternator fan must not be used to rotate the shaft, as this could result in damage to the alternator and/or personal injury, especially when the alternator is coupled to the driving machine.

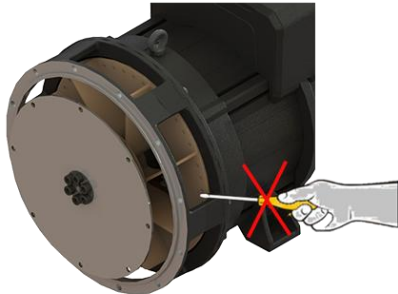


Figure 4.10: Rotor turning

4.9.2.4 Alternators with double bearings (B35T / B3T)

4.9.2.4.1 Direct coupling

Direct coupling should always be preferred, due to the lower cost, reduced space occupied, absence of slippage (belts) and greater safety against accidents. In case of transmission with speed ratio, direct coupling through gearbox is also usual.



ATTENTION

Carefully align the shaft ends, using flexible couplings whenever possible, leaving a minimum gap of 3 mm between the couplings.

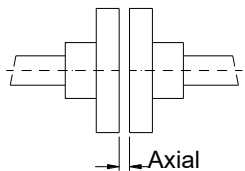


Figure 4.11- Axial gap

4.9.2.4.2 Coupling by pulleys and belts

When a speed ratio is required, belt drive is most often used.

Avoid unnecessary radial efforts on the bearings, placing the shafts parallel to each other and the pulleys perfectly aligned.

Belts that work laterally biased transmit knocks in alternating directions to the rotor, and could damage the bearing backs. Belt slippage can be avoided by applying a resinous material, such as pitch, for example. The tension on the belt should be just enough to prevent slipping during operation.



NOTE

Belt with excess tension, increases the effort on the shaft end, causing vibration and fatigue, which can lead to shaft breakage.

The use of too small pulleys should be avoided; These cause bending in the alternator shaft due to the fact that the tension on the belt increases as the diameter of the pulley decreases.



ATTENTION

Double bearing alternators are manufactured for direct coupled applications. In applications using pulleys and belts, WEG must be consulted to ensure correct application of the alternator.



NOTE

Always use properly balanced pulleys. Avoid leftover shaft keys, as these represent an increase in the unbalanced mass. If these observations are not followed, there will be increased levels of vibration.

4.9.2.5 Single Bearing Alternator (B15T)

4.9.2.5.1 "G" dimension

The alternators leave the factory assembled with discs and flanges according to the customer's request. "G dimension" is the distance between the outer face of the discs in relation to the flange face, as per Figure 4.12:



NOTE

The alternators leave from the factory with the "G" dimension as per Table 4-10.

The genset assembler is responsible for checking whether the "G" measurement is in accordance with the diesel motor used. If "G" dimension is not respected, serious damage to the alternator and diesel motor may occur or, in some cases, it will not be possible to couple the alternator to the diesel motor.

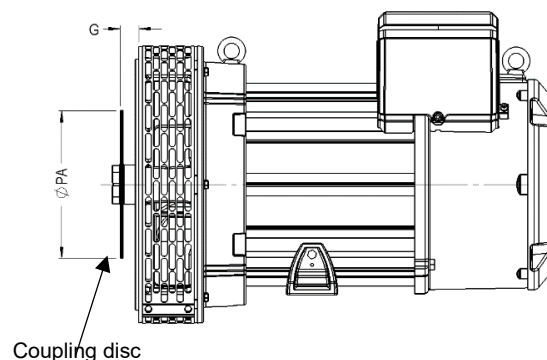


Figure 4.12 – G dimension

Table 4-10: Standard "G" dimensions

ØPA (mm)	Coupling Disc (SAE)	G (mm)
215.9	6.5	30.2
241.3	7.5	30.2
263.4	8	61.9
314.2	10	53.9
352.3	11.5	39.6

■ The ØPA dimension has a tolerance of -0.13 mm

4.9.2.5.2 G dimension change

If it is necessary to change the "G" dimension, the position of the coupling discs (E) must be changed. To do this, simply remove or add the spacer rings (I), as indicated in Figure 4.13.

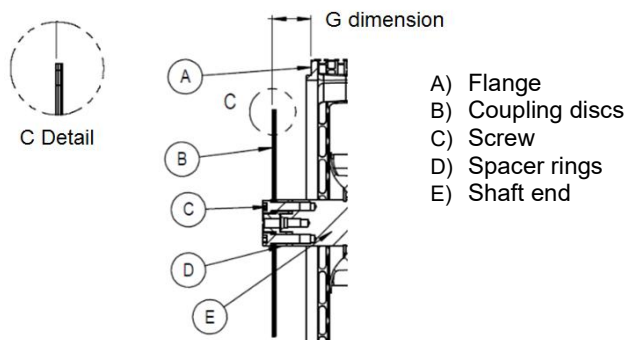


Figure 4.13 - Procedure for changing the G dimension



NOTE

To meet the required flange and disc combination, the flange (A) can also be changed.

The coupling discs must be fastened according to the tightening torques shown in Table 4-11.

Table 4-11: Tightening torques for fixing the coupling discs

Frame	Fixing screw Partial Thread / Blackened	Resistance Class	Tightening torque (*)
160	6xM12x1.75	12.9	120 Nm
180	6xM12x1.75	12.9	120 Nm

* Tightening torques defined according to VDI-2230 standard

- Fix the screws with high torque chemical glue.
- For larger frames, consult WEG.



NOTES

- The tightening torque values presented in Table 4-11 are nominal for final tightening with a torque wrench.
- To pre-tightening (screwdrivers or impact wrenches), must be used maximum 70% of the nominal value.
- During maintenance or replacement of coupling discs, the screws must be replaced with new screws, as specified in Table 4-11.
- FT screws (full thread) should not be used in this application.

4.10 GENERAL INSTALLATION NOTE



NOTE

The user is responsible for installing the alternator. WEG is not responsible for damages to the alternator, associated equipment and installation, occurring due to:

- Excessive vibrations transmitted;
- Precarious facilities;
- Alignment faults;
- Inadequate storage conditions;
- Failure to follow instructions before start-up;
- Incorrect electrical facilities.

5 COMMISSIONING

- The alternator leaves from the factory with a lock on the shaft or disc for better transport safety. Before putting it into operation, this lock must be removed.
- The connection of the terminals respects the nominal characteristics of the alternator nameplate.
- To make voltage and frequency adjustments, consult the voltage regulator manual.

5.1 PRELIMINARY EXAMINATION

Before starting up or after a long period of non-operation, check:

1. If the alternator is clean and that the packaging materials and protective elements have been removed;
2. If the connecting parts of the coupling are in perfect condition and properly tightened and greased where necessary;



NOTE

The alternator bearings must not be removed, disassembled, or reassembled by anyone other than WEG or a WEG-authorized service partner. Throughout the entire service life of the motor, any maintenance activity involving the bearings — including inspection, removal, or reinstallation — must be performed exclusively by WEG field service engineers or authorized repair partners. Failure to comply may result in misalignment, premature wear, or voiding of warranty

3. If the alternator is aligned;
4. If the thermal protectors, grounding and space heater cables are connected. (if any);
5. If the windings insulation resistance has the prescribed value;
6. If all objects such as tools, measuring instruments and alignment devices have been removed from the alternator work area;
7. If the alternator is correctly fixed;
8. If the electrical connections are in accordance with the alternator wiring diagram;
9. If the voltage regulator is correctly connected and adjusted, in accordance with its installation manual;
10. If the power grid conductors are properly connected to the main terminals, so as to prevent a short-circuit or loosening;
11. If the alternator is properly grounded;
12. Manually rotate the set to check that there is no interference in the air gap. When activating the alternator at no load, it should rotate lightly and without strange noises;
13. If the air inlets and outlets are unobstructed;
14. If the "G" dimension is in accordance with the specification for the diesel motor to be coupled (for single-bearing alternators).

5.2 INITIAL SPIN

In addition to following the safety instructions mentioned in item 2.2 of this manual, to put the alternator into operation for the first time, the following procedure must be adopted:

- a) Make sure that the alternator terminals are disconnected from the load by removing the fuses on the panel or placing the switch or circuit breaker in the "off" position;
- b) Disconnect the alternator space heaters (if any) before putting it into operation;
- c) Turn off the voltage regulator (removing the fuse);
- d) Rotate the set and check that there are no strange noises;
- e) Activate the alternator up to rated speed and check noise, vibration and all protective devices.

5.3 OPERATION

After following the procedures described previously:

- a) Stop the alternator and turn on the voltage regulator (placing the fuse).
- b) Activate the genset until it reaches the rated speed.
- c) Make the necessary adjustments. The voltage regulator manual describes the function of the *trimpots* for adjusting the alternator's electrical quantities and the procedures for making these adjustments.
- d) Close the main circuit breaker, apply load and monitor the alternator voltage, current and frequency, making sure they are in accordance with the specified values.
- e) Check the vibration and temperature levels of the set. If there is a significant variation in the vibration of the set between the initial condition and after thermal stability, it is necessary to reevaluate the alignment / leveling of the genset.



ATTENTION

All measuring and control instruments must be constantly monitored, so that any changes in operation can be detected and corrected.

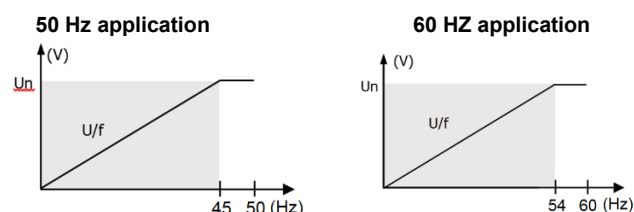
5.4 TRIMPOTS ADJUSTMENT

The voltage regulator *trimpots* are pre-adjusted during alternator tests at the factory. After testing at the factory, the U/F and S *trimpots* are sealed, indicating that these quantities are pre-adjusted. If it is necessary to make new adjustments using these *trimpots*, the voltage regulator manual must be consulted.



ATTENTION

The voltage regulator's Underfrequency protection must be set on the U/F *trimpot* to 90% of the rated frequency (it is already set at the factory).



5.5 SHUTDOWN

- Before stopping the alternator, open the main circuit breaker to disconnect the load;
- If the alternator is equipped with a space heater, make sure that they remain energized while the alternator is stopped;
- Make sure that the bearings contain oil before energizing the bearing heaters.



DANGER

Even after de-excitation, there is still voltage on the machine terminals, so only after the equipment has completely stopped is it possible to carry out any work. It constitutes a risk of death if you do not pay attention to the described above.

5.6 ALTERNATORS IN PARALLEL

5.6.1 With each other and/or with the power grid

Minimum conditions to operate the alternators in parallel, not including the driving machine control:

- The alternator must have the same operating voltage as the other alternator or the power grid;
- The voltage regulator must allow alternator operation in parallel;
- It is recommended to add a parallelism CT (In/5) of 5 to 10 VA on the phase that is not used as reference for the voltage regulator and make the electrical connection according to the voltage regulator manual.
- Having a panel suitable for protection and operation of the alternator in parallel.
- The synchronization and adjustment of active power must be imposed by the speed control of the primary machines.

If high neutral currents appear, use a grounding coil or open the neutral connection of one of the alternators. This happens mainly when the alternators are not the same or when they supply loads with a high harmonic content.



ATTENTION

This type of installation must be carried out by a specialized technical staff. For transient parallel operations (e.g. load ramp) in which the alternator will operate in a simple mode after the parallel period, the parallelism CT must be short-circuited, as it is unnecessary in this operation.

6 MAINTENANCE

Maintenance procedures must be followed to ensure the good performance of the equipment. The frequency of inspections will essentially depend on local application conditions and the service duty.

Failure to comply with one of the items listed below may result in a reduction in the alternator useful life, unnecessary stops and/or damage to the facilities.

6.1 SECURITY MEASURES

Maintenance and repair work must follow the safety procedures detailed in section 2 in order to avoid the risk of accidents.



DANGER

After a period of operation, certain parts of the alternator can reach high temperatures which can cause serious injury and death from burns. There is a risk of fire when hot surfaces come into contact with flammable objects. Make sure that no combustible materials or flammable surfaces come into contact with or are stored near the alternator.

6.2 EMERGENCY GENSETS

Alternators used in emergency gensets, depending on humidity degree in the installation site, must receive load of 2 to 3 hours each month.

6.3 CLEANING

The frame, shutters, grilles and air baffles must be kept clean, without accumulation of oil or dust on the outside, to facilitate heat exchange with the environment. Also, the alternators inside must be kept clean, free from dust, debris and oil. To clean them, you must use brushes or clean cotton cloths. If the dust is not abrasive, compressed air blasting must be used, blowing the dirt from the air baffle and eliminating any accumulation of dust contained on the fan blades and frame. Debris impregnated with oil or moisture can be cleaned with cloths moistened with suitable solvents. The terminal box must have clean terminals, without oxidation, in perfect mechanical condition and without grease or verdigris.

6.4 NOISE

Noise should be observed at regular intervals of 1 to 4 months. In the event of an anomaly, the alternator must be stopped and the causes must be investigated and solved.

6.5 VIBRATION

Maximum vibration level for the alternator under load: according to ISO 8528-9.



ATTENTION

After tighten or disassemble any screw of the machine, it is necessary to apply Loctite. Exceeding the ISO 8528-9 specifications will have a detrimental effect on the life of the bearings and other components, and will invalidate the alternator warranty.

6.6 BEARINGS

The bearing temperature control is also part of the routine maintenance of alternators. The temperature rise should not exceed 60°C, measured on the outer ring of the bearing. The temperature can be permanently controlled with thermometers, placed on bearing outside, or with built-in thermo elements (optional). The alarm and shutdown temperatures for the bearings can be adjusted respectively to 110°C and 120°C.

Shielded or sealed bearings do not allow relubrication.

These must be replaced when they reach 20,000 operating hours or 30 months, whichever comes first.

Table 6-1: Bearing data

Frame	Bearing	Bearing
160	DE	6211 ZZ-C3 (*)
	NDE	6209 ZZ-C3 (*)
180	DE	6313 ZZ-C3 (*)
	NDE	6210 ZZ-C3 (*)

(*) - Type ZZ shielded bearings can be replaced by type 2RS or DDU sealed bearings.

6.6.1 Bearing replacement



ATTENTION

For safety reasons, bearing replacement must be carried out with the alternator disconnected from the driving machine.

6.6.1.1 Single bearing alternator – B15T

Frames 160 and 180

1. To disassemble the alternator, remove the air inlet cover (15);
2. Remove the exciter rotor, according to item 6.12;
3. Remove coupling disc (if any);
4. Remove front flange or front cover, mark the position of the flange or cover with the flange support. This will guarantee the original and ideal alignment between the two pieces.
5. Remove the complete rotor, in a horizontal position, using a pendulum;
6. Replace the bearing;
7. Insert the main rotor without the EPT rotor, with the help of a pendulum, taking due care not to damage the winding or cables;
8. Assemble the exciter rotor;
9. Install the air inlet cover.
10. Assemble the flange or front cover according to the position marked during disassembly;
11. Assemble the coupling discs, ensuring their alignment;
12. Before reconnecting the alternator, observe the points in the item 5.

6.6.1.2 Double bearing alternator – B35T

To change the bearings in the double bearing alternator, it is necessary to disassemble the alternator completely.

6.6.1.3 Bearing replacement

Bearing disassembly must always be done using suitable tools (bearing puller).

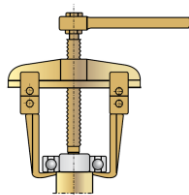


Figure 6.1: Device for removing bearing



ATTENTION

A bearing should only be removed from the shaft when is absolutely necessary

Instructions:

1. The puller claws must be applied to the side face of the bearing inner ring to be dismantled or to an adjacent part.
2. Before assembling the new bearings, the shaft seats must be cleaned and lightly lubricated.
3. The bearings must be heated to a temperature between 50°C and 100°C to facilitate assembly.
4. Bearings must not be subjected to shocks, drops, storage with vibration or humidity, as these may cause marks on the internal races or balls, reducing their useful life.

6.7 EXCITER MAINTENANCE

6.7.1 Exciter

For a proper performance of its components, the alternator exciter must be kept clean. Check the insulation resistance of the main exciter and auxiliary exciter windings (if any) periodically to determine their insulation conditions, following the procedures described in this manual.

6.7.2 Test on diode modules

Diode modules are components that have great durability and do not require frequent testing. If the alternator presents a defect that indicates a failure in the diodes or an increase in field current for the same load condition, then the diodes must be tested according to the following procedure:

1. Loosen the connections of all diodes with the exciter rotor winding;
2. Using an ohmmeter, measure the resistance of each diode according to the Figure 6.3. Positive cable (red) at the anode and the common cable (black) at the cathode to measure in the conduction direction.



NOTE

When testing the diodes, observe the polarity of the test terminals in relation to the diode polarity. The diode polarity is indicated by an arrow on its frame.



Current conduction must only occur in the anode-cathode direction, that is, in the direct polarization condition.

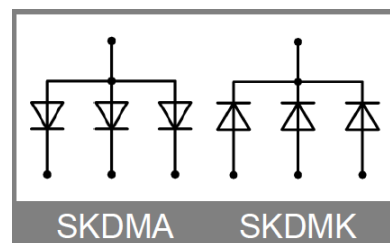


Figure 6.2: Polarization of diode modules

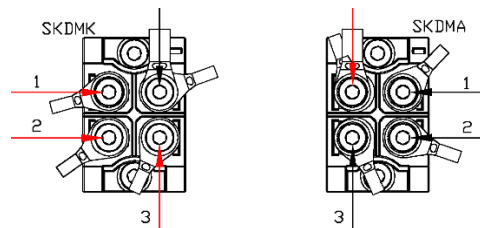


Figure 6.3: Position of the tips for diode modules conduction
The diode is considered good when it has low ohmic resistance (up to $\pm 100 \Omega$) in its direct direction and high resistance (approx. $1 M\Omega$) in the opposite direction. Defective diodes will have ohmic resistance of 0Ω or greater than $1 M\Omega$ in both measured directions. In most cases, the ohmmeter method of testing diodes is sufficient to identify diode failures. However, in some extreme cases it may be necessary to apply the rated blocking voltage and/or current circulation to detect diode failure. Due to the efforts required for these tests, in case of doubt, it is recommended the diode modules replacement.

6.7.3 Diode modules replacement

To access the diode modules and be able to replace them, you must:

- Remove the rear shutter.
- To replace the diode modules, proceed as follows;
- Disconnect the module that will be replaced;
 - Loosen the screws that fix the module on the exciter rotor support and remove it;
 - Apply thermal paste to the heatsink of the new module, $40 \mu m \pm 25\%$ (Figure 6.4).
 - Install the new diode module with the embossed marking facing the varistor side ($\rightarrow$), tightening the fixing screws on the base, which is fixed to the exciter rotor, with a torque wrench respecting the tightening torques of the Table 6-2);
 - Make the cable connections to the module, tightening them with a torque wrench, respecting the tightening torques of the Table 6-2 and the connection order as per Figure 6.6.

APPLY A LAYER OF THERMAL PASTE TO THE MODULE HEATSINK
 $40 \mu m \pm 25\%$

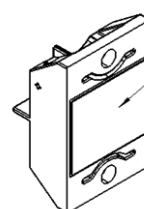


Figure 6.4: Application of thermal paste on the diode module

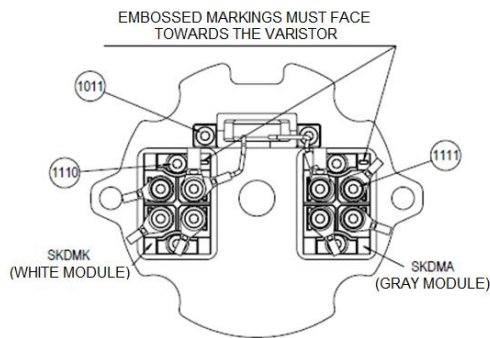


Figure 6.5: Installation position of diode modules

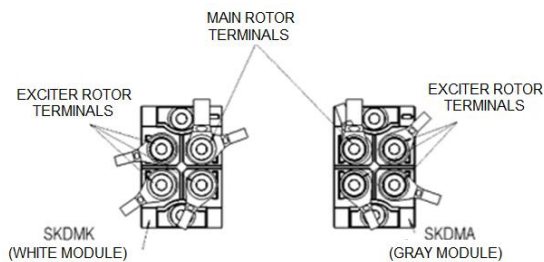


Figure 6.6: Cable connection position on diode modules



ATTENTION

It is essential that the indicated tightening torques be respected so that the diodes are not damaged during assembly.

Table 6-2: Diodes tightening torque

Screw position (mm)	Thread (mm)	Torque wrench (mm)	Tightening torque (Nm)
1110 (module screw)	M4	3	1.4 ± 15%
1111 (diodes screw)	M4	3	1.4 ± 15%
1011 (varistor screw)	M4	3	1.2 ± 15%

Table 6-3: Table of used diodes

WEG designation	Technical feature
SKDMA 75	AND Diode module 75A / 1.200V SKDMA
SKDMK 75	CTD Diode module 75A / 1.200V SKDMK

6.7.4 Test on varistor

The varistor is the device installed between the two diode modules and is intended to protect the diodes against overvoltage.

To test the varistor operating conditions, an ohmmeter can be used.

The resistance of a varistor must be very high ($\pm 20,000$ ohm).

If the varistor is damaged or if the resistance is very low, it must be replaced.

6.7.5 Varistor replacement

To replace the varistor, WEG recommends proceeding according to the following guidelines:

1. Replace the damaged varistor with a new one identical to the original, as per Table 4-8;
2. To replace the varistor, loosen the screws that secure it to the diode modules;
3. When removing the varistor, carefully observe how the components were assembled so that the new varistor is installed in the same way;
4. Before assembling the new varistor, make sure that all contact surfaces of the components are clean, leveled and smooth to ensure perfect contact between them;
5. Fix the new varistor by tightening the terminals that hold it to the diode modules, tightening them with a torque wrench, respecting the tightening torques of the Table 6-2. Observe the silicone filling in the new varistor compartment.

6.8 AIR FLOW

The alternator's air inlets and outlets must be kept unobstructed so that heat exchange is efficient. If there is a deficiency in heat exchange, the alternator will overheat and may damage the winding (burning of the alternator).



NOTE

If filters are installed in the air inlet, inspect daily, clean or replace if necessary.

6.9 COMPLETE INSPECTION

The frequency of inspections must be defined depending on the environment where the alternator is installed. The more aggressive the environment (dirt, oil, salt air, dust, etc.) the interval between revisions should be shorter, as follows:

- Clean dirty windings with a brush or paint-brush;
- Use a cloth dampened with suitable solvents to remove grease, oil and other dirt from the winding;
- Dry with dry air;
- Pass compressed air through the ventilation channels on the stator sheet package, rotor and bearing.



NOTE

Compressed air should always be used after cleaning, never before.

- Drain the condensed water;
- Clean the inside of the terminal boxes;
- Measure insulation resistance.



ATTENTION

Failure to carry out complete checks on the alternators will cause dirt to accumulate inside. Operating under these conditions may reduce useful life, cause undesirable downtime and additional costs for equipment recovery.

6.10 DISASSEMBLY, ASSEMBLY AND PARTS LIST – AW10 160 AND 180

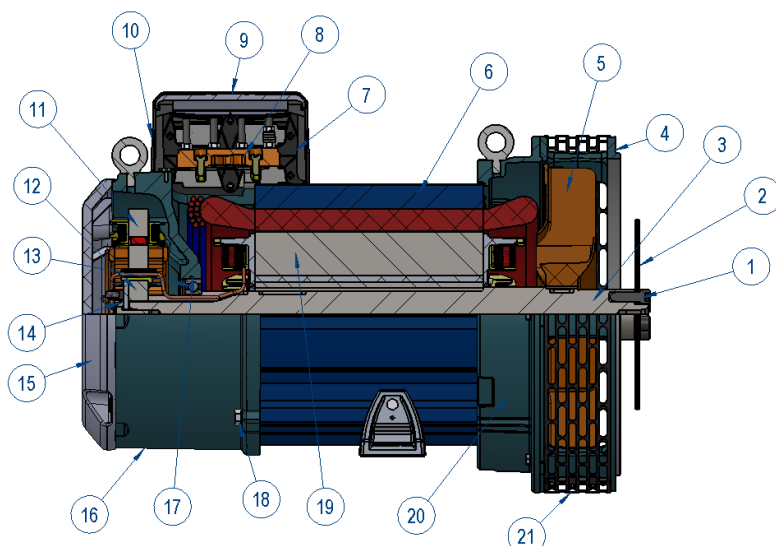


Figure 6.1- AW10 alternator

1. Disc fixing screw
2. Coupling discs
3. Shaft
4. Flange
5. Fan
6. Main stator
7. Voltage regulator
8. Terminal board
9. Terminal box cover
10. Terminal box and integrated side cover
11. Exciter stator
12. Exciter rotor
13. Rear bearing
14. Diodes
15. Air inlet cover
16. Rear cover
17. O'ring
18. Tie Rods
19. Main rotor
20. Flange support
21. Protective grille

6.10.1 Disassembly

- 1 To disassemble the alternator, remove the air inlet cover (15);
- 2 Remove the exciter rotor, according to item 6.12;
- 3 Remove coupling disc (if any);
- 4 Remove front flange or front cover, mark the position of the flange or cover with the flange bracket. This will guarantee the original and ideal alignment between the two pieces.
- 5 Remove the complete rotor, in a horizontal position, using a pendulum;
- 6 Release the AVR cables and remove the terminal box;
- 7 Release the main connection cables from the terminal board;
- 8 Remove the support with the terminal board;
- 9 Release the tie rods. When removing the tie rods, the rear cover and flange support will become loose and may fall;
- 10 Remove flange support using a rubber hammer;
- 11 Remove rear cover using a rubber hammer;
- 12 Remove the feet only if necessary.

- 8 Assemble the exciter rotor
- 9 Install the air inlet cover
- 10 Mount the support with the terminal board, according to the alternator electrical diagram and voltage regulator manual;
- 11 Assemble terminal box;
- 12 Make the connections of the main cables, exciter and voltage regulator, make sure that all connections of the main cables, voltage regulator and exciter are correct;
- 13 Assemble the flange or front cover according to the position marked during disassembly;
- 14 Assemble the coupling discs, ensuring their alignment;
- 15 Before reconnecting the alternator, observe the points in the item 5;

6.11 TIGHTENING TORQUE FOR SCREWS IN POLYMER COMPONENTS

For polymer components that need to be assembled and disassembled during installation or possible maintenance, apply the recommended torque for the screws, as shown in the table below:

Table 6-4: Tightening torques

Component	Tightening torque (Nm)
Connection box cover (9)	1,8 ± 15%
Air inlet cover (15)	
Connection box (10)	
AVR mounting bracket (7)	1,5 ± 15%

6.10.2 Assembly

- 1 Check that the machined fitting parts of the flange support, flange and rear cover are clean and oxidation-free;
- 2 Place the flange support vertically with the fitting part of the stator package facing upwards.
- 3 With the main stator in a vertical position, place it on the flange support.
- 4 Position the rear cover, taking due care with the main stator and exciter stator cables to avoid damaging them;
- 5 Assemble the tie rods, tightening in "X", observing the specified torque of 40 Nm and apply chemical lock;
- 6 Position the alternator horizontally;
- 7 Insert the main rotor without the EPT rotor, using a pendulum, taking due care not to damage the winding or cables;

6.12 DISASSEMBLY OF THE AW10 EXCITER ROTOR

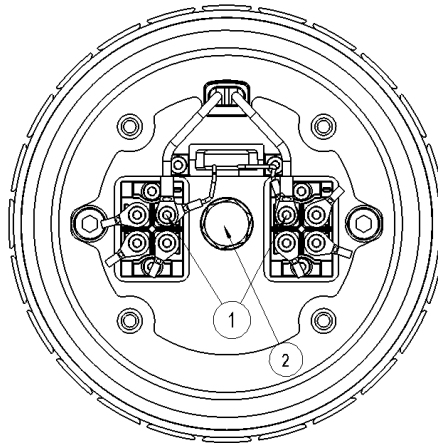


Figure 6.2 - AW10 Exciter Rotor

6.12.1 Procedure for removing the exciter rotor

1. Remove the screws (1) that fix the rotor terminal;
2. Remove the screw (2) that fixes the exciter rotor;
3. Remove the exciter rotor, taking care not to damage the rotor cables.

6.13 FOOT POSITION ADJUSTMENT

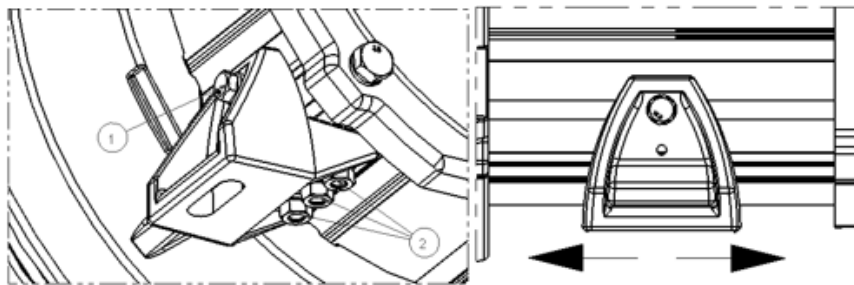


Figure 6.3- Foot position adjustment

The AW10 160 and 180 alternator allows the foot position adjustment in the axial direction. To perform the adjustment, if necessary, simply loosen the front and bottom screws on the foot and move them to the desired position and fix them again, applying tightening torque.20N.m. It is important to remember that the machine's vibration limits must follow according to item 6.5 of this manual.



NOTE

After moving the feet, paint the exposed area with acrylic paint that matches the color of the machine.

6.14 TERMINAL BOX

When removing the terminal box cover for the connection/disconnection of power supply cables and accessories, the following precautions must be taken:

- Ensure that, when removing the screws, the cover does not cause damage to the installed internal components.
- If it is necessary to move the box, use only the lifting eye to avoid any type of damage.
- For motors with terminal boards, grounding, and connection pins, make sure that the tightening torques comply with the values specified in Table 6-5.
- Check that the cables do not come into contact with surfaces with sharp edges or corners.
- Take the necessary precautions to preserve the original degree of protection, as indicated on the motor nameplate. Cable entries for power supply and control must always be equipped with components (such as cable glands and conduits) that comply with local standards and regulations.
- Ensure that the pressure relief window, when present, is intact. The sealing gaskets of the terminal box must be in good condition for reuse and correctly positioned to guarantee the degree of protection.

Table 6-5: Tightening torques for connection elements and current conductors [Nm]

Type of screw and joint	Terminal block		Grounding		Connection pin
	Carbon steel	Stainless steel	Carbon steel	Stainless steel	Brass and electrolytic copper
Screw class	4.8 / 5.8	A2 - 70 A4-70	4.8 / 5.8	A2 - 70 A4-70	3.6 / 4.6
M 3,5	-	-	-	-	0,8
M 4	1 a 1,5	-	1,5 a 3	1,5 a 3	1,2
M 5	3 a 5	3 a 5	3 a 5	3 a 5	2
M 6	5 a 10	5 a 8,5	5 a 10	5 a 8,5	3
M 8	10 a 18	10 a 18	10 a 18	10 a 18	6
M 10	28 a 40	28 a 40	28 a 40	28 a 40	10
M 12	45 a 70	45 a 60	45 a 70	45 a 60	15,5
M 14	75 a 110	75 a 100	-	-	25
M 16	115 a 170	115 a 170	115 a 170	115 a 170	30
M 20	-	-	-	-	52
M 24	-	-	-	-	80
M 30	-	-	-	-	150
M 33	-	-	-	-	197
M 36	-	-	-	-	252

*WPR-6328 PT – TABLE 6 – Tightening Torque for Terminal Board Fixing Screws 1) (Carbon Steel – Class 8.8 / 12.9)

**WPR-6328 PT – TABLE 11 – Tightening Torque for Grounding Screws (Carbon Steel – Class 8.8 / 12.9)

***DIN 46200 – Connection Pins, Current-Carrying Conductors up to 1600 A (Copper)

6.15 MAINTENANCE PLAN

Checks and maintenance tasks to be performed	Daily	Every 250h	Every 1,500h	Every 4,500 h
Observe strange noises when the alternator is moving	x			
Inspect ventilation (air flow)	x			
Inspect air filters (if any), clean or replace if necessary.	x			
Check insulation resistance		x		
Check and retighten all screws and connection terminals		x		
Check vibration and noise levels		x		
Inspect bearings		x		
Inspect voltage regulator connections		x		
Clean the alternator internally and externally			x	
Inspect the operation and connections of accessories			x	
Inspect the diodes			x	
Inspect varistors (if any)			x	
Replace bearings ²				
Complete alternator inspection				x

1. The bearing(s) must be replaced every 20,000 hours.



NOTE

The checks and tasks described in the table above must be performed according to item 6 of this manual.

* In case the insulation resistance is lower than 100MOhms. consult WEG for further instructions.

* Operating intervals vary depending on the application. Contact technical support to confirm the recommended timelines.

7 TROUBLESHOOTING

Below are listed some possible anomalies that may occur in the alternator in service, as well as the correct procedure for checking and correcting them.

THE ALTERNATOR DOES NOT EXCITE	
ANOMALY	PROCEDURE
Interruption in the auxiliary winding circuit (if any).	▪ Check the union of the auxiliary coil cables in the terminal block, extending to the regulator terminal block and fuse.
Blown fuse.	▪ Replace the fuse (as specified).
Residual voltage too low.	▪ Disconnect the voltage regulator cables and carry out external excitation with a battery of 12 to 20Vdc (negative pole at F- and positive pole at F+), until the excitation process begins. The diesel motor starting battery must not be grounded.
Drive speed is not correct.	▪ Measure speed and regulate it
Interruption in the main excitation circuit.	▪ Check the continuity of the F+ and F- cables, take measurements on all diodes and replace defective diodes or replace the entire set.
Defective relay or other voltage regulator component.	▪ Replace the voltage regulator.
External potentiometer for voltage adjustment broken or interrupted connection.	▪ Check the connections at terminals 11-12 and the potentiometer itself.
Diode protection varistor (if any) is defective.	▪ If it is defective, the varistor must be replaced, or if there is no replacement part, temporarily remove it.
ALTERNATOR DOES NOT EXCITE, UP TO RATED VOLTAGE	
ANOMALY	PROCEDURE
Defective diode module.	▪ Replace the diode module.
Incorrect speed.	▪ Measure the speed of the primary machine and adjust it.
Adjustment below the rated nominal.	▪ Adjust the voltage on the voltage regulator potentiometer or external potentiometer.
Voltage regulator power supply does not match the desired output voltage.	▪ Check that the connections are in accordance with the voltage regulator manual.
AT NO LOAD, THE ALTERNATOR EXCITES UP TO THE RATED VOLTAGE, BUT IT COLLAPSES WITH THE LOAD	
ANOMALY	PROCEDURE
Strong drop in speed.	▪ Check the Diesel selector.
Defective Diode Module.	▪ Replace the diode module.
THE ALTERNATOR, AT NO LOAD, IS EXCITED THROUGH OVER VOLTAGE	
ANOMALY	PROCEDURE
Defective regulator power thyristor	▪ Replace the regulator.
Defective or incorrect regulator power transformer.	▪ Check the voltage ratio / operation.
Voltage regulator power supply does not match the desired output voltage.	▪ Remake the connections. Check the voltage regulator manual.
OSCILLATION IN ALTERNATOR VOLTAGE	
ANOMALY	PROCEDURE
Stability poorly adjusted	▪ Adjust stability on voltage regulator <i>trimpot</i> Stb
Oscillations in the drive machine speed.	▪ Frequent oscillations originate from the drive machine and need to be eliminated.
MECHANICAL ANOMALIES	
ANOMALY	PROCEDURE
Bearing overheating.	▪ Failed bearing, lack of lubrication or excessive axial clearance.
Alternator frame overheating.	▪ Air inlet or outlet partially obstructed or hot air is returning to the alternator, alternator overload or over excitation.
Excessive vibration.	▪ Misalignment, assembly defect or clearance in the coupling.
Sharp voltage drop with subsequent recovery (blinks).	▪ Incorrect stability adjustment, alternator operating simply with parallelism system switched on or momentary overload.



ATTENTION

The machines referenced in this manual are in continuous improvement, therefore the information in this manual is subject to modifications without prior notice.

8 ENVIRONMENTAL INFORMATION

8.1 PACKAGING

Alternators are supplied in cardboard, polymer, wood or metal packages. Those materials are recyclable or reusable and must be properly disposed according to the current regulations of each country. All wood used in the packaging of WEG alternators comes from reforestation and receives anti-fungal treatment.

8.2 PRODUCT

Alternators, under the constructive aspect, are manufactured primarily with ferrous metals (steel, cast iron), nonferrous metals (copper, aluminum) and plastic. The alternator, in general, is a product that has a long service life; however, when it must be disposed, WEG recommends that the materials of the packaging and of the product be properly separated and sent for recycling.

The non-recyclable materials must be properly disposed according to the environmental regulations, i.e., in industrial landfill, co-processed in cement kilns or incinerated. The service providers of recycling, disposal in industrial landfills, co-processing or incineration of waste must be properly licensed by the environmental agency of each state to carry out these activities.

8.3 HAZARDOUS WASTE

Grease and oil waste used to lubricate the bearings should be disposed, according to the instructions of the relevant environmental agencies, because its improper disposal can cause impacts to the environment.

9 TECHNICAL ASSISTANTS

To consult the Service Network, access the website www.weg.net.

10 DECLARATION OF CONFORMITY

EU Declaration of Conformity



Manufacturers:

WEG Equipamentos Elétricos S.A.
Av. Prefeito Waldemar Grubba, 3000
89256-900 - Jaraguá do Sul - SC - Brazil
www.weg.net

WEG MEXICO, S.A. DE C.V

Carretera Jorobas - Tula Km 3.5, Manzana 5,
Lote 1, Fraccionamiento Parque Industrial Huehuetoca,
Municipio de Huehuetoca, C.P. 54680,
CD. de Mexico y Área Metropolitana - Mexico
www.weg.net/mx

WEGeuro - Industria Eléctrica S.A.

Rua Eng Frederico Ulrich,
4470-605 - Maia - Porto - Portugal
www.weg.net/pt
Contact person: Luís Filipe Oliveira Silva Castro Araújo
Authorised Representative in the European Union
(Single Contact Point)

The manufacturer declares under sole responsibility that:

WEG synchronous alternators and their components used for following lines:

AW10

when installed, maintained and used in applications for which they were designed, and in compliance with the relevant installation standards and manufacturer's instructions, comply with the provisions of the following relevant European Union harmonisation legislation, wherever applicable:

Low Voltage Directive	2014/35/EU;
EU Ecodesign Directive	(EU)2019/1781 as amended by Commission Regulation (EU)2021/341; Directive 2009/125/EC;
RoHS Directive	2011/65/EU and its amendments (including Directive 2015/863/EU);
Machinery Directive	2006/42/EC;
EMC Directive	2014/30/EU (electric motors are considered inherently benign in terms of electromagnetic compatibility).

The fulfilment of the safety objectives of the relevant European Union harmonisation legislation has been demonstrated by compliance with the following standards, wherever applicable:

EN 60034-1:2010 + AC:2010/ EN 60034-5:2001 + A1:2007/ EN 60034-6:1993/ EN 60034-7:1993 + A1:2001/ EN 60034-8:2007 + A1: 2014/ EN 60034-9:2005 + A1:2007/ EN 60034-11:2004/ EN 60034-14:2004 + A1:2007/ EN 60204-1:2006 + A1:2009 + AC:2010 and EN 60204-11:2000 + AC:2010

CE marking in: **1998**

* Synchronous alternator designed for use with a voltage rating higher than 1000V are not considered under the scope.
** Low voltage alternators are not considered under the scope and alternators designed for use with a voltage rating higher than 1000V are considered partly completed machinery and are supplied with a

Declaration of Incorporation:

The products above cannot be put into service until the machinery into which they have been incorporated has been declared in conformity with the Machinery Directive.

A Technical Documentation for the products above is compiled in accordance with part B of annex VII of Machinery Directive 2006/42/EC.

We undertake to transmit, in response to a reasoned request by the national authorities, relevant information on the partly completed machinery identified above through WEG authorised representative established in the European Union. The method of transmission shall be electronic or physical method and shall be without prejudice to the intellectual property rights of the manufacturer.

RODRIGO FUMO
FERNANDES:0168323
2909

Assinado de forma digital por
RODRIGO FUMO
FERNANDES:01683232909
Dados: 2024.01.30 14:08:21 -03'00'

Signed for and on behalf of the manufacturer:
Rodrigo Fumo Fernandes
Managing Director

Jaraguá do Sul, January 29th, 2024

DEC0724-Rev00- English 1/



Declaration of Conformity



Manufacturers:

WEG Equipamentos Elétricos S.A.
Av. Prefeito Waldemar Grubba, 3000
89256-900 - Jaraguá do Sul - SC - Brazil
www.weg.net

WEG MEXICO, S.A. DE C.V

Carretera Jorobas - Tula Km 3.5, Manzana 5,
Lote 1, Fraccionamiento Parque Industrial Huehuetoca,
Municipio de Huehuetoca, C.P. 54680,
CD. de Mexico y Área Metropolitana - Mexico
www.weg.net/mx

Authorised Representative in the UK:

WEG (UK) Ltd
Broad Ground Road, Lakeside, Redditch, Worcestershire B98 8YP
Contact person: Patrick O'Neill
(Single Contact Point)
www.weg.net/uk

The manufacturer declares under sole responsibility that

WEG synchronous alternators and their components used for following line:

AW10

when installed, maintained and used in applications for which they were designed, and in compliance with the relevant installation standards and manufacturer's instructions, comply with the provisions of the following relevant United Kingdom statutory requirements, wherever applicable:

Electrical Equipment (Safety) Regulations	S.I. 2016/1101;
The Ecodesign for Energy-Related Products Regulations and Energy Information	S.I. 2021/745;
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations	S.I. 2012/3032;
Supply of Machinery (Safety) Regulations	S.I. 2008/1597 amended by S.I.2011/2157; S.I. 2016/1091 (electric motors are considered inherently benign in terms of electromagnetic compatibility);
Electromagnetic Compatibility Regulations	

The fulfilment of the safety objectives of the relevant United Kingdom statutory requirements has been demonstrated by compliance with the following designated standards, wherever applicable:

EN 60034-1:2010 + AC:2010 / EN 60034-2-1:2014 / EN IEC 60034-5:2020 / EN 60034-6:1993/ EN 60034-7:1993 + A1:2001 / EN 60034-8:2007 + A1:2014 / EN 60034-9:2005 + A1:2007 / EN 60034-11:2004/ EN 60034-12:2017/EN 60034-14:2018 / EN 60034-30-1:2014/EN 60204-1:2018 /EN IEC 60204-11:2019 / EN IEC 63000:2018 and IEC TS 60034-25:2014.

* Synchronous alternator designed for use with a voltage rating higher than 1000V are not under the scope.

Declaration of Incorporation:

The products above cannot be put into service until the machinery into which they have been incorporated has been declared in conformity with the Machinery Directive.

A Technical Documentation for the products above is compiled in accordance with Part 7 (b) of schedule 2 of The Supply of Machinery (Safety) Regulations 2008.

We undertake to transmit, in response to a reasoned request by the national authorities, relevant information on the partly completed machinery identified above through WEG authorized representative established in the United Kingdom. The method of transmission shall be electronic or physical method and shall be without prejudice to the intellectual property rights of the manufacturer.

RODRIGO FUMO
FERNANDES:0168
3232909

Assinado de forma digital por
RODRIGO FUMO
FERNANDES:01683232909
Dados: 2024.01.18 15:14:47
-03'00'

Signed for and on behalf of the manufacturer:

Rodrigo Fumo Fernandes
Engineering Director - Brazil

Jaraguá do Sul, January 17th, 2024

DEC0124 1/1

11 WARRANTY

These products, when operated under the conditions stipulated by WEG in the operating manual for such product, are warranted against defects in workmanship and materials for twelve (12) months from start-up date or eighteen (18) months from manufacturer shipment date, whichever occurs first.

However, this warranty does not apply to any product which has been subject to misuse, misapplication, neglect (including without limitation, inadequate maintenance, accident, improper installation, modification, adjustment, repair or any other cases originated from inadequate applications).

The company will neither be responsible for any expenses incurred in installation, removal from service, consequential expenses such as financial losses nor transportation costs as well as tickets and accommodation expenses of a technician when this is requested by the customer.

The repair and/or replacement of parts or components, when effected by WEG within the Warranty period do not give Warranty extension, unless otherwise expressed in writing by WEG.

This constitutes WEG's only warranty in connection with this sale and is in lieu of all other warranties, expressed or implied, written or oral.

There are no implied warranties of merchantability or fitness for a particular purpose that apply to this sale.

No employee, agent, dealer, repair shop or other person is authorized to give any warranties on behalf of WEG nor to assume for WEG any other liability in connection with any of its products.

In case this happens without WEG's authorization, Warranty is automatically cancelled.

LIABILITY

Except as specified in the foregoing paragraph entitled "Warranty Terms for Engineering Products", the company shall have no obligation or liability whatsoever to the purchaser, including, without limitation, any claims for consequential damages or labor costs, by reason of any breach of the express warranty described therein.

The purchaser further hereby agrees to indemnify and hold the company harmless from any causes of action (other than cost of replacing or repairing the defective product as specified in the foregoing paragraph entitled "Warranty Terms for Engineering Products"), arising directly or indirectly from the acts, omissions or negligence of the purchaser in connection with or arising out of the testing, use, operation, replacement or repair of any product described in this quotation and sold or furnished by the company to the purchaser.



WEG Group - Energy Business Unit
Jaraguá do Sul - SC - Brazil
Phone: 55 (47) 3276-4000
energia@weg.net
www.weg.net



NOTES

46 | Installation, operation and maintenance manual – Synchronous Alternators – AW10 Line – Horizontal 19578410



+55 47 3276.4000



energia@weg.net



Jaraguá do Sul - SC - Brazil