

ZB132

ZBC132

ZB180

Installation, Operation and Maintenance Manual

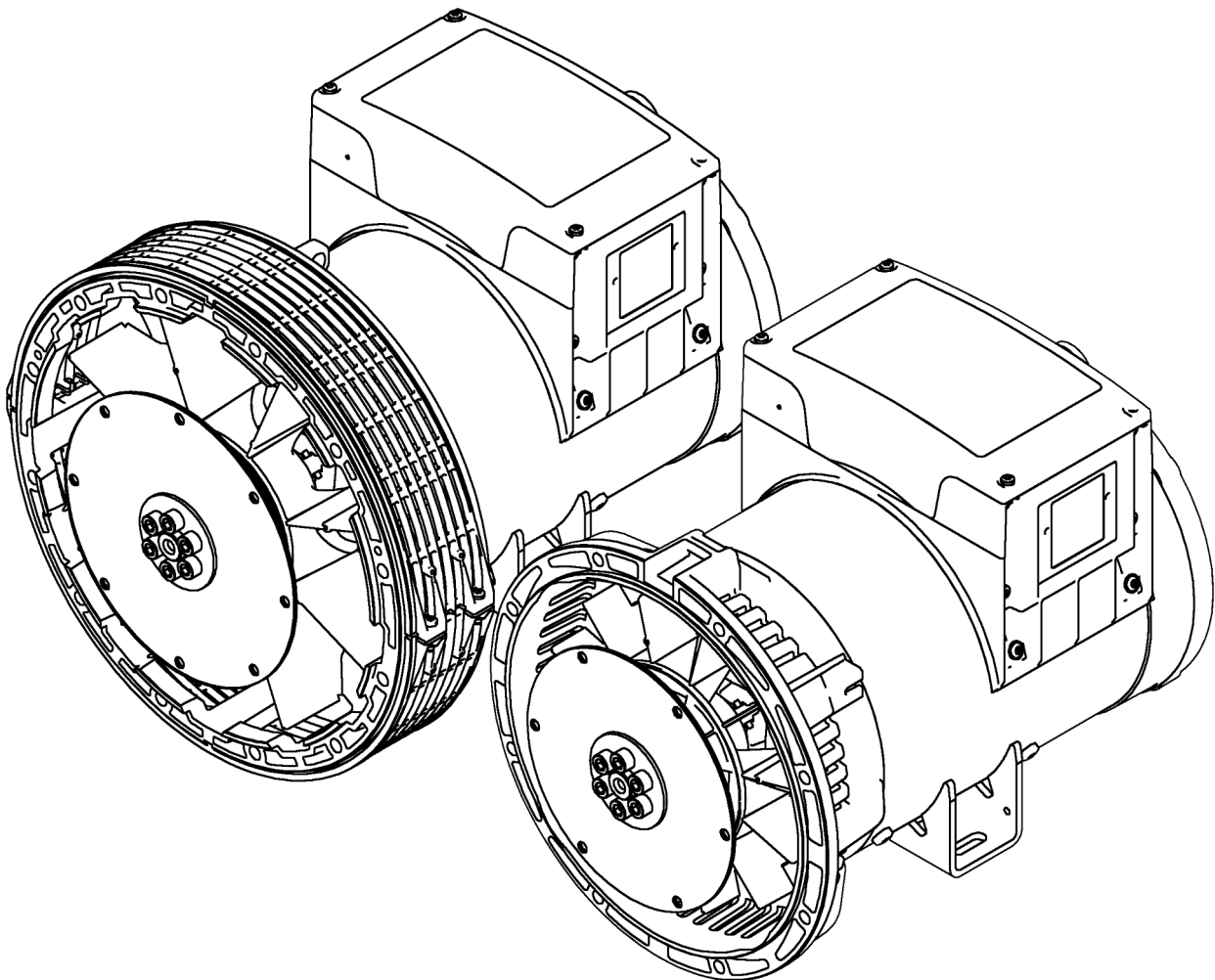


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1 Introduction

Esteemed Client, this manual enclosed to the product you have purchased contains important information for the installation, use, and maintenance of these alternators. Prepared for use by qualified technical personnel, this manual must absolutely be read and comprehended before proceeding to any type of operation. The manual must be conserved in a safe place where it can be easily accessed for rapid consultation whenever required. The instructions it contains must always be complemented by respect for the laws in force regarding workplace safety and accident prevention in the nation of use.

The original language of the manual is Italian; the contents in the English, German, French, and Spanish languages are authorized translations: NSM declines all liability for discrepancies derived from unauthorized translations.

The unauthorized copy of this manual is prohibited. The information it contains is subject to modifications and/or integrations and for such reason cannot be considered binding. Users are advised to check our website periodically for the issue of updates.

1.1.1 Symbols

The following conventions have been adopted in the printing of this manual in order to emphasize its parts and/or sections of particular importance:

Notes

These operations may damage the alternator

These operations may pose safety risks to operators and property

1.1.2 Warnings

Rotating electrical machines pose potential risk due to the presence of rotating parts and live parts which may reach elevated temperatures during subsequent operations under load.

As a result, the operation of the alternator described below, which as has been already mentioned is reserved solely to qualified technical personnel, must be conducted in respect of the following provisions:

- Personal Protective Equipment (PPE) in compliance with national workplace safety and accident prevention regulations must be provided
- The machine can be placed in conditions of safety only after first scrupulously checking to make sure that its installation and electrical/mechanical connections have been made to state-of-the-art perfection in respect of the instructions provided in this manual
- Personnel must never be present near the unit when it is operating. Work clothing that poses risks of getting caught in machine parts (such as belts, laces, etc...) must never be worn
- When high temperatures are reached, personnel must be very careful to avoid accidental contact, and the presence of flammable substances in the vicinity must be absolutely avoided. If fire ever breaks out, only powder or CO₂ type extinguishers must be used
- All maintenance/repair activities must be conducted only when the system is not operating and only after appropriate measures against its accidental starting have been taken

Personnel must always bear in mind that inappropriate use, inadequate maintenance, and the removal and/or disabling of safety devices can pose serious risk of injury and damage.

1.1.3 Appropriate Use

These alternators are designed and constructed for the generation of electric power whenever necessary, and may therefore be applied to the following uses:

- Electrical power supply in temporary sites
- Electrical power supply in permanent sites
- Electrical power supply with fixed installation (for residential/commercial/industrial use)
- Electrical power supply management (cogeneration, etc...)
- Commercial vehicles (road transport/refrigeration, etc...)
- Industrial vehicles (earthmoving machinery, cranes, etc...)

Any other use not expressly specified must be considered inappropriate and therefore unauthorized

2 General Description

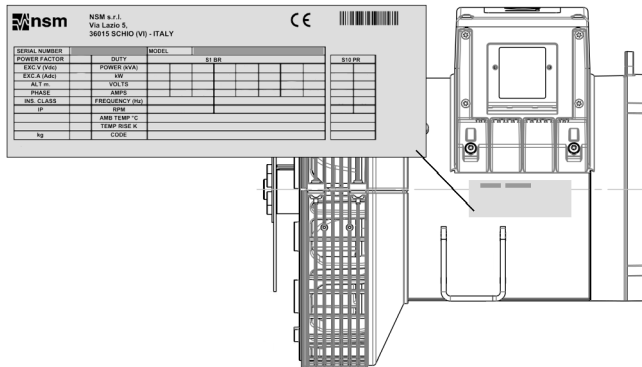
ZB/ZBC series alternators are 4 poles brushless, self-regulated alternators built in compliance with LVD and EMC Directive guidelines and the technical regulations provided in the DoC (Declaration of Conformity), a copy of which has been enclosed to the manual.

Such conformity ensures that the alternators pose no risk to operators whenever they are installed, used, and serviced in accordance with the instructions provided and whenever the safety devices provided are maintained in perfect working efficiency.

It also guarantees compliance with regulations governing "industrial" electromagnetic emissions and immunity standards. Whenever compliance with obligations specified for residential, commercial, and light industry areas is required, specific solutions must be adopted through the use of supplementary components.

2.1.1 Identification

A nameplate bearing the alternator's rated data is applied on the alternator frame. The alternator's serial number and model must always be provided in all communication with the Service Dept. or authorized service centers.



2.1.2 Technical Features

The ZB/ZBC series identifies 4 poles brushless alternators constructed to IP21 Protection.

These Insulation Class H machines self-excited by built-in excitation units equipped with AVR (Automatic Voltage Regulator) guarantee $\pm 0,5\%$ accuracy output voltage.

A detailed list of their technical characteristics is provided in the appendix.

2.1.3 Derating

The alternators are designed and constructed for operation at temperatures from -15° to $+ 40^{\circ}\text{C}$ and maximum altitude of 1000m ASL, the conditions at which they deliver the performance specified on the nameplate. Outside this range, power must be derated as indicated in the table provided in the appendix.

Whenever operation at temperatures of less than -15°C is foreseen, certain components must be constructed in specific materials other than standard.

Whenever installation inside a closed cabinet is foreseen, measures must be taken to ensure that the temperature of the cooling air sucked by the alternator remains within the range above, while also making sure that the alternator does not suck in the hot exhaust air from the endothermic engine and providing a minimum distance of 50mm between the alternator's suction vent and the nearest surface. The space in front of the air exhaust vents must always be kept free from obstacles that may obstruct the flow of air.

Inadequate cooling caused by insufficient cooling air flow may lead to overheating and damage to the alternator.

3 Preliminary Operations

3.1.1 Precautions for Use

Once again, personnel must remember that electrical rotating machines pose potential risk, and the contents of Paragraph "1.1.2 Warnings" must always be borne in mind.

3.1.2 Preliminary Checks

When the machine is received, we recommend first checking the alternator's integrity to make sure that it has not undergone damage during shipping and handling.

Any and all defects observed must be promptly reported to our Service Dept.

3.1.3 Handling

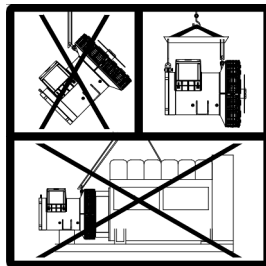
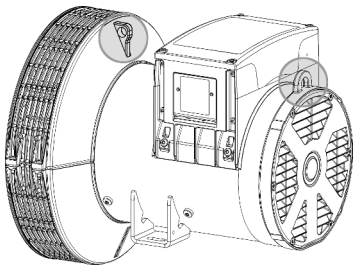
The machine must be handled only after taking all the measures necessary to avoid injury to personnel and damage to property.

- The alternator must be moved using only adequate equipment and the two lifting points provided: one on the no drive end bracket, the other on the coupling flange

Warning! Moving the alternator using inadequate equipment or without taking the necessary precautions poses risk of serious damage and/or injury.

- Single-bearing alternators must be lifted and moved while keeping the machine in horizontal position in order to prevent the rotor from dropping out with the resulting damage to the same and risks to personnel

The lifting points provided must be used to lift only the alternator and not the entire gen-set.



3.1.4 Storage

Whenever the alternator is not placed into immediate operation, it must be stored under cover in a dry and clean place, with protection against accidental impact and vibration.

Prior to placing the alternator into operation after extended periods of storage or whenever signs of humidity or condensate are seen, check the level of insulation between the windings and to earth. The test must be conducted by a qualified technician with a suitable instrument and test voltage between 500V and 1000V. Prior to conducting the test, the automatic voltage regulator must first be disconnected. The test voltage must be applied for 1 minutes, after completing the check the level of insulation between all the windings has to be higher than 5M Ω , otherwise the alternator must be dried using one of the following options:

- inside an oven at 60-70°C temperature for around 6 hours
- by circulating inside it a suitable value of electrical current taken from an auxiliary source
- using for a few hours some common electrical heaters, placed near the intake of air (the grid must be removed) and flow towards the windings
- if the generator is coupled to the engine, make it to work in no-load condition for a few hours (disconnect the AVR)

The insulation test must then be repeated and the results obtained must be checked for adequacy. ($\geq 5\text{M}\Omega$)

4 Installation

Warning! Erroneous operations on the alternator may cause serious injury to personnel and damage to the machine. All operations on electrical and/or mechanical parts must always be performed only by qualified technical personnel.

4.1.1 Preliminary Operations

- Prior to installation, check to make sure that the characteristics of the alternator are compatible with those of the gen-set it will serve
- The alignment of single-bearing alternators is very important because the vibrations induced by the coupling of the engine and the alternator can reach levels that compromise gen-set operation. For this reason, the gen-set designer must take every measure necessary to ensure correct alignment and assembly, providing a solid base and adopting adequate vibration-dampers in order to keep vibration levels within the range specified by Standard ISO 8528-9. In order to avoid damage to the alternator fan, the latter must never be used to rotate the shaft, especially when engine and alternator are already coupled
- Some adhesive stickers that signal risks may be applied to the alternator, others are provided as standard for application at the genset manufacturer's responsibility
- We recommend installing the circuit breaker switch near the alternator
- The gen-set must be installed in a room with sufficient space to ensure an adequate exchange of indoor and outdoor air
- It is very important to make sure that the alternator's air suction and exhaust vents are never obstructed or positioned in ways that permit the suction of hot air produced by the engine or other sources of heat
- Sufficient space must be provided around the machine for easy inspection and maintenance

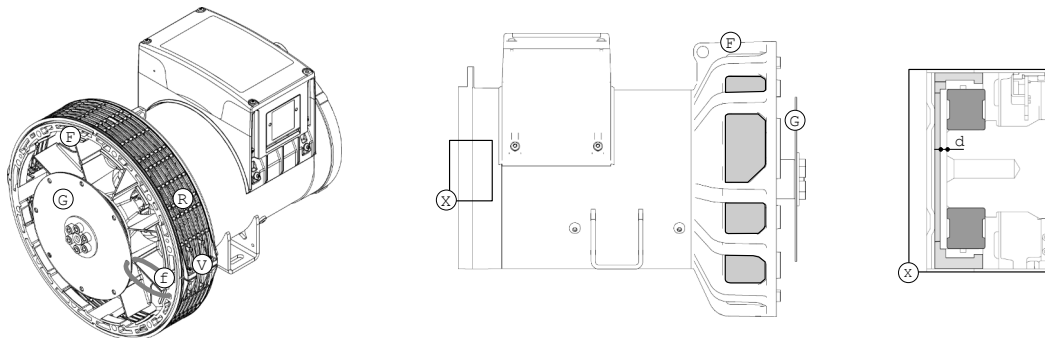
Mechanical coupling

WARNING: when turning the alternator-engine shaft, absolutely never apply leverage to the alternator fan.

WARNING: the vibration emitted by the gen-set must comply with the provisions of Standard ISO 8528-9.

ZB / ZB-1 alternators

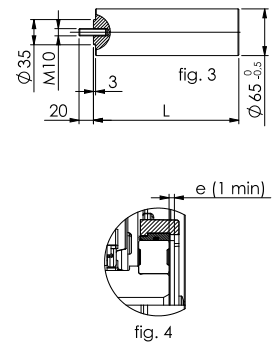
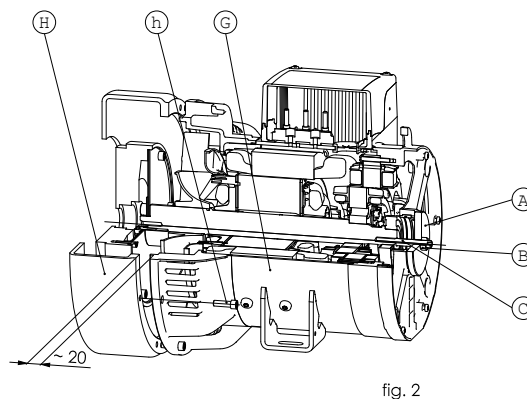
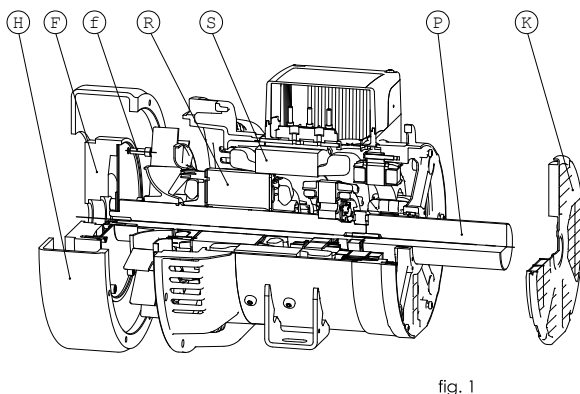
- 1) Remove the cable tie **f** that locks the rotor to the flange **F**
- 2) Remove the alternator flange protection grids **R** by unscrewing the 4 screws **V**
- 3) Key the alternator flange **F** onto the engine flange in alignment with the holes on the alternator joint disk **G** and those of the engine flywheel seat
- 4) Fasten the alternator flange to the engine with the appropriate tightening torque related to the used screws (not supplied)
- 5) Fasten the alternator joint to the flywheel after accessing it from the flange openings using the appropriate screws (not supplied, minimum yield class 55N/mm²)
- 6) Reassemble the screen **R** by tightening the 4 screws (tightening torque about 3Nm)
- 7) Make sure that there is a distance **d** of at least 1,5mm between the bearing and its seat (detail **X**)
- 8) Fasten the alternator-engine unit to the frame using vibration-dampers adequate to the weight and frequencies generated by the gen-set



We recommend making an extension rod **P** (fig. 3) of adequate length **L** to be screwed into the end of the rotor.

- 1) Remove the air inlet grid **K** (fig. 1)
- 2) Partially remove the rotor **R** by tapping the end of the extension rod **P** (fig. 1) with a plastic mallet, taking care not to cause the rotor **R** to completely come out of the stator **S**. Completely remove the rotor **R** from the stator **S** only if strictly necessary. The extension rod **P** can be used to keep all the components in axial alignment during both the removal and the assembly phase, in this way lowering the risk of damaging the windings
- 3) Bring the disk of the rotor **R** to the flywheel **F**, taking care to correctly line up the holes in which to insert the fixing screws **f** (fig. 1). Use screws of minimum 8.8 (metric) or minimum grade 5 (UNC) resistance class
- 4) Insert the disk of the rotor **R** into the housing on the flywheel **F** and then screw down all the fixing screws **f** (fig. 1). The recommended tightening torques are shown in the respective table
- 5) Bring the fixed part of the alternator **G** to a distance of approx. 20mm from the cover **H** (fig. 2)
- 6) Remove the extension rod **P**, insert at the end of the rotor a tie rod **C** (M10, of minimum 80mm length), insert a disk **A** (minimum outer \varnothing 90mm; minimum inner \varnothing 10,5mm; minimum thickness 10mm) in the tie rod. Then insert a M10 nut **B** on the tie rod (fig. 2)
- 7) Line up the holes of the engine bell housing **H** with those on the alternator **G**; screw in the nut **B** in order to complete the alternator's approach (fig. 2), dedicating extra attention to the correct alignment of the bell housing/alternator and the bearing on its housing. For this operation, insert and partially screw down the screws **h**
- 8) Complete the assembly by fastening the alternator to the engine using the fixing screws **h** (fig. 2). The recommended tightening torques are shown in the respective table
- 9) Remove the tie rod **C**, the disk **A**, and the nut **B**, making sure that there is a certain amount of play **e** between the bearing and the housing shoulder (fig. 4)
- 10) Reassemble the air inlet grid **K**

Screw Diam.	Torque [Nm]
M5	5,5
M6	9,7
M8	23
M10	43
5/16"-18	20
3/8"-16	36



5 Electrical Connections

Three phase alternators are provided with clockwise rotation direction (seen from the coupling side) in order to produce a U-V-W cyclical phase sequence. Whenever the inversion of the phases is necessary, contact our Service Dept. for the correct execution of the operation. Unless specified otherwise, they are delivered with star connection.

Single phase alternators are provided, unless specified otherwise, with dual voltage connection.

The wiring diagrams and the other possible connections are illustrated in Appendix.

Warning! Erroneous operations on the alternator may cause serious damage and injury to the personnel involved. Operations on electrical components must always be performed only by qualified technical personnel.

Prior to proceeding to any modification and/or making the electrical connections, make sure that:

- x there are no parts under voltage
- x the alternator casing is at room temperature
- x the gen-set can in no way be started accidentally or automatically

Erroneous connection can lead to the serious malfunction of the alternator and even cause serious injury and damage.

WARNING: in order to change electrical connections, the alternator's terminals must be shifted and reconnected, and for such reason it is very important to:

- x Position the terminals of the alternator and/or load lines in the alignment indicated in the illustration below without inserting nuts or washers
- x Tighten the nuts on the terminal board to the correct tightening torque [ZB132 6,5Nm, ZB180 14Nm ($\pm 5\%$)]
- x Remember to shift the AVR "sensing" connection and related Dip Switches as shown in each wiring diagram
- x Re-bundle the cables using the respective cable ties in order to keep them from vibrating and/or touching sharp edges or cutting parts
- x Make the electric connections to the loads using cables of section adequate to the current and length and type of laying

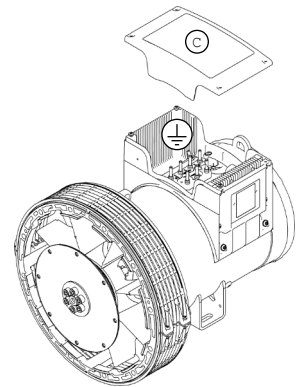
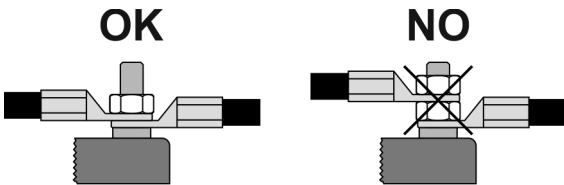
Connections

- Unscrew the 4 screws that fasten the cover **C** and remove it
- Drill the holes necessary for the assembly of the cable clamps, being careful not to damage the cables in the terminal box
- Make the electrical connections as described in the wiring diagram

A threaded pin has been provided near the terminal board for the earthing connection. Earth the system using a conductor of adequate section in respect of the standards and regulations in force.

The alternator is delivered with the neutral wire NOT connected to its casing.

It is the responsibility of the gen-set manufacturer and/or the final client to make any necessary earthing/grounding/neutral/protection devices connections in respect of the regulations in force and the type and place of application and to prevent possible damages during its work.



Inappropriate cables or erroneous connections can cause dangerous overheating and lead to permanent damage.

Erroneous earthing or protective device connections pose serious risks to the personnel involved.

6 Startup

The following control operations must be performed prior to starting the gen-set:

- Check the correctness of the mechanical coupling and all electrical connections
- Make sure that all the nuts on the terminals are screwed down tightly
- Make sure that the gen-set is equipped with the appropriate protective devices
- Make sure that the air vents/safety guards are correctly assembled

After the gen-set has been started, listen closely for any anomalous noises that may indicate incorrect coupling/alignment between the engine and the alternator.

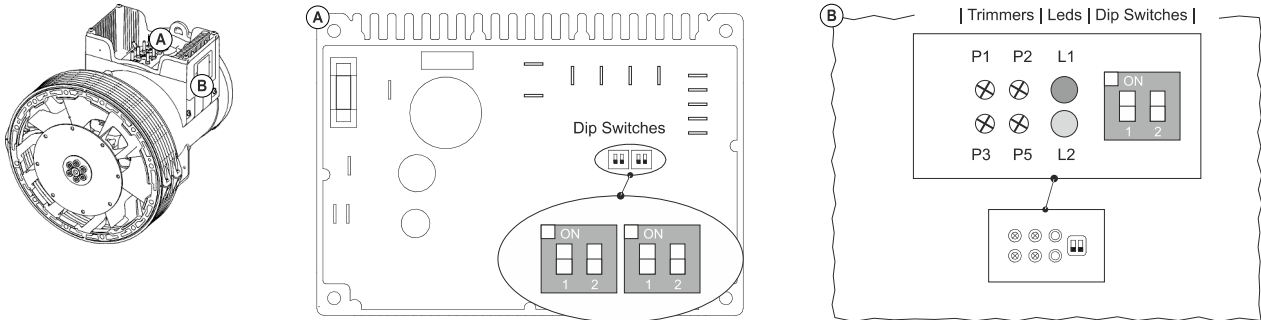
WARNING! The gen-set must be installed in an area that is sufficiently spacious to ensure adequate exchange of indoor and outdoor air.

7 Automatic Voltage Regulator (AVR)

The generator is equipped with a digital voltage regulator placed inside the terminal board box: the A side is accessible removing the plastic cover on top of the machine; to get the B one there is a slot on the terminal board box, and it is sufficient to remove its protective cover (the slot can be placed on left or right side, depending on customer configuration).

The A side is the section dedicated to arrange (if needed) the electrical connections by setting appropriated configuration of the dip switches (in according to the connections on the terminal board).

The B side hosts the trimmers for a possible tuning of the generator, the leds that report the state of operation and the dip switches related to the output frequency.



During normal operating the yellow led L1 is turned ON while red one L2 is turned OFF.

The AVR features adjustable anti-oscillation circuits that enable use with a wide range of loads and internal protection circuits that also permit operation at lower than rated speeds, even if operation at such speeds is discouraged because it leads to overload conditions for the alternator's entire excitation components. When such conditions arise, underspeed protection is triggered, the led L1 lights up (Warning W0), and the output voltage decreases. The protection will reset as soon as the engine speed will go back to a value close to the nominal one.

For 3 phase alternators, in the event of great imbalance of the voltages, due to unbalanced load, the AVR will report this condition by means of led L2, which will blink 1 time (Warning W1): the output voltages will be limited to avoid to get close to dangerous values; the alarm will reset after removing the causes of the unbalanced load.

A light and prolonged overload is reported by a 2 time blinking of led L2 (W2): the AVR will limit the excitation current (and consequently voltage and power); the alarm will reset after removing the reason of the overload.

High temperature of the AVR (from 70°C to 85°C) is reported by a 3 time blinking of led L2 (W3): the AVR will apply a derating, limiting the excitation current (and consequently voltage and power); the alarm will reset when the temperature decreases under 70°C.

A short circuit or a heavy overload will turn in a serious condition, reported by the led L2 always ON and 1 time blinking of led L1 (alarm A1) and an abruptly drop of the voltage.

A lack of sensing connection or an electrical connection that the AVR is not able to identify, is reported by the led L2 always ON and 2 time blinking of led L1 (alarm A2) and an abruptly drop of the voltage.

A temperature increase over 85°C will turn in a serious condition, reported by the led L2 always ON and 3 time blinking of led L1 (alarm A3) and an abruptly drop of the voltage.

The same situation (alarm A4, with 4 time blinking of led L1 an abruptly drop of the voltage) will arise in the event of an unbalanced load for a long time.

The alarms A1-2-3-4 can be removed just restoring normal operating conditions: switch off the genset and then restart it after having removed the causes of the alarm.

As an additional form of protection, a fuse (5x20mm >250V, 8A T) is provided.

It is also possible to adjust the voltage from remote, by means of an optional external potentiometer Re (100 kΩ), as detailed in the following sections.

Led	Status	Warning / Alarm *	Cause	AVR action	Warning / Alarm reset **
L1 L2	ON OFF	---	<ul style="list-style-type: none"> None (regular operation) 	---	---
L1	blinking	W0	<ul style="list-style-type: none"> Underspeed operation 	Decreases the output voltage	Auto
L2	1x blinking	W1	<ul style="list-style-type: none"> Unbalanced voltages (due to unbalanced load) 	Limits the output voltage	Auto
L2	2x blinking	W2	<ul style="list-style-type: none"> Prolonged overload High winding temperature Wrong P5 setting 	Limits the excitation current (and consequently voltage and power)	Auto
L2	3x blinking	W3	<ul style="list-style-type: none"> High AVR temperature (from 70°C to 85°C) 	Limits the excitation current (and consequently voltage and power)	Auto
L1 L2	1x blinking ON	A1	<ul style="list-style-type: none"> Heavy overload or short-circuit 	Abruptly drops the voltage	Manual
L1 L2	2x blinking ON	A2	<ul style="list-style-type: none"> Lack of sensing connection or unidentified electrical connection 	Abruptly drops the voltage	Manual
L1 L2	3x blinking ON	A3	<ul style="list-style-type: none"> AVR temperature > 85°C 	Abruptly drops the voltage	Manual
L1 L2	4x blinking ON	A4	<ul style="list-style-type: none"> Unbalanced voltages for a long time (due to unbalanced load) 	Abruptly drops the voltage	Manual

* Warning W0 (L1 blinking) can co-exists with warning W1-W2 or W3

** Auto: alarm stops after removing the causes that triggered it

Manual: a switch-off of the gen-set and a subsequent restart is necessary, after having removed the causes that triggered it (wait 10 seconds once the causes have been removed before restarting).

Never for any reason substitute the fuse provided for the AVR with any other of different size or type, and never for any reason bypass such fuse using improvised solutions that invalidate the warranty.

Setting the output voltage higher than the rated value may damage the alternator or the system which is connected to.

7.1.1 Adjustment Trimmers

The device is properly calibrated in NSM at the moment of final inspection: whenever additional adjustments are required, the protective casing can be removed and the trimmers from P1 to P5, placed on the B side of the AVR, can be used to tune the calibration as described below

These operations must always be performed by qualified personnel only.

Adjust the trimmers gently using an appropriate screwdriver. Once the minimum / maximum limit-switch value has been reached, do not force further.

P1 Output voltage

This permits a wide adjustment of the voltage. Whenever finer adjustment is desired, or whenever remote voltage control is required, an external potentiometer "Re" (100kΩ) must be added

P2 Stability

Adjust fluctuations of the output voltage by gradually turning this trimmer clockwise

P3 Droop

It is usually rotated as counter-clockwise as possible (zero droop). It is used only for special applications

P4

(Not available, intentionally reported for numerical sequence)

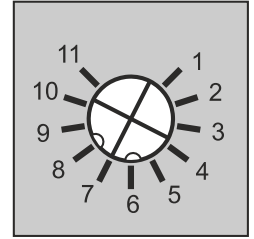
P5 Max kVA

Overload limit calibration, calibrated in NSM at moment of final inspection

P5 trimmer value must never be changed without first contacting our Technical Office.
Depending on the alternator model it must be set in the correct specific position, as detailed below.

	ZB 132 *	ZB-1 132 *	ZB 180	ZB-1 180	
P5					P5
3½		SB-1			3½
4		SA-1 MB-1			4
5			SC LA LC XA		5
6	XSA XSB SA		MB MC MA	SC MB MC	6
7	SB MA MB				7

P5



* Note: same settings apply to ZBC

7.1.2 Dip Switches

Various Dip Switches are located on the AVR, related to the electrical connections (side A) or to the output frequency (side B).

Attention! If You are going to change the factory setting be very careful to set them correctly.

Correct settings are reported later in the wiring diagram of this manual and also in the quick reference label stuck on the bottom side of the terminal box cover.

Adjust the Dip Switch gently using an appropriate screwdriver: once the ON-OFF position has been reached, do not force further.

Warning! To avoid severe damages and/or injuries, setting must always be made when the gen-set is not working

8 Maintenance

Warning! Erroneous operations on the alternator may cause serious injury to personnel and damage to the machine. All operations on electric and/or mechanical parts must always be performed only by qualified technical personnel.

Prior to proceeding to any maintenance and cleaning operations, make sure that:

- x There are no parts under voltage
- x The alternator casing is at room temperature
- x The genset can in no way be started accidentally or automatically

Inadequate inspection and maintenance can lead to the serious malfunction of the alternator and even cause serious injury and damage.

Regularly make sure that:

- All lock nuts and terminal clamps are tightly screwed down; loose connections in the latter can cause significant overheating of the cables
- There are no anomalous noises or excessive vibrations
- The alternator's air suction and exhaust vents are always clean and unobstructed
- There is no excessive deposit of dirt/residue on the voltage regulator or windings. Clean with compressed air when necessary

The bearings are lubricated for life and for such reason require no maintenance (approx. 20000 working hours under normal conditions of use). Their replacement is advised only when the entire gen-set is overhauled (after 20000 working hours) or whenever abnormal noises are heard.

WARNING! Never use excessive quantities of water or solvent when cleaning the gen-set, and always make every effort to prevent contact between these cleaning substances and the windings in order to avoid damaging the latter.

Use only original parts for maintenance and repair: the failure to do so releases NSM from all liability regarding the safety and satisfactory operation of the alternator and invalidates the warranty.

9 Troubleshooting

No-load voltage absent

- Demagnetized machine: with the alternator in rotation, apply 4,5÷12,0V DC voltage (respect polarity!) for one second between the AVR F1 and F2 terminals. We recommend connecting a 5x20mm 8A-250V fuse in series to one of the two conductors that goes from the direct current source to the F1 and F2 terminals
- AVR fuse blown: replace it
- Defective AVR: replace it
- Winding anomaly: check the resistances (see table); replace defective component
- Insulation defect: proceed to oven drying
- Erroneous connections: check them

No-load voltage very low

- Engine speed too low: calibrate it to 1560-1575rpm (50Hz alternator) or 1860-75rpm (60Hz alternator)
- Trimmer P1 in erroneous position: adjust its position
- Defective AVR: replace it
- Winding anomaly: check the resistances (see table); replace defective component
- Dip Switches in wrong position; check them
- Inexisting or erroneous AVR connections: check them

No-load voltage too high

- Trimmer P1 in erroneous position: adjust its position
- Defective AVR: replace it
- Dip Switches in wrong position; check them
- Inexisting or erroneous AVR connections: check them

Load voltage very low

- Engine slowdown: undersized engine
- Possible overload: check output current and LED signals
- Trimmer P3 in erroneous position: rotate counter-clockwise as far as possible
- Defective AVR: replace it

Load voltage very high

- Defective AVR: replace it

Unbalanced voltage (3 phase alternators)

- winding anomaly: check the resistances values (see table); replace defective component
- unbalanced load: check connections (phase cable missing) and load integrity

Unstable voltage

- Trimmer P2 not calibrated: rotate it until stable voltage is reached
- Defective AVR: replace it
- Trigger of Alarm A4: switch off and restart the gen-set

The fuse has blown

- Erroneous AVR connection: check it
- Voltage value set too high: adjust it using trimmer P1
- Dip Switches in wrong position; check them
- Defective AVR: replace it
- Possible overload: check current and LED signals
- Make sure that size and type of fuse are correct

Machine overheating

- Air suction/exhaust vents clogged in both alternator and canopy if present: disassemble and clean
- Possible overload: check output current and LED signals
- Alternator suction air temperature too high: check and apply respective downgrading

Machine makes too much noise

- Bearings worn-out: replace them
- Defective coupling: check and repair
- Inadequate or damaged vibration-damping supports can cause excessive vibration: replace them

Alarms reported by L1/L2 LEDs

- Check table at section 7

10 Demolition and Scrapping

These operations must always be performed solely by qualified personnel.

Although the demolition of the alternator does not pose any particular risk or danger, its composite materials must be scrapped in respect of the regulations in force without dispersing any into the environment.

We recommend sorting the materials to be eliminated for recovery (electronic components, copper, aluminum, plastic, etc...).

11 Warranty

- 1) NSM warrants the absence of defects and the proper manufacturing and quality of its products for 12 months from NSM invoice date. During that period NSM engages in repairing or replacing, at its option (at its charge) at its premises, all those parts which failed without any other type of liability, direct or indirect.
- 2) The decision about warranty operating time approval is NSM's exclusive right and is subjected to a previous examination of the failed parts which will have to be forwarded free of charge (carriage paid) to NSM, Schio (VI) Italy for analysis; NSM responsibility will be limited to the repairing/replacing of defective product and it will not include the refunding of any possible damage, both direct or indirect, coming from the defect found. In any case NSM decision is not subjected to appeal and it is definitive.
- 3) Any claim must contain description of the goods, date of invoice, a full report of the defect found and Serial Number of the machine (see adhesive label).
- 4) All possible expenses concerning travel, board, transport and labour for assembly and disassembly of the alternator from its prime mover are always at the buyer's charge, also in case of inspection for estimation.
- 5) An exception is for continuous duty machines or for hire use, for those the warranty is limited to 1.000 working hours or to 6 months from date of invoice, whichever comes first.
- 6) It is excluded any other responsibility and liability of NSM for further damage or loss, direct or indirect, coming from use or from impossibility to use the machine, either partial or total.
- 7) Concerning machines and/or components sent to NSM to be checked, in case we do not receive any answer from the customer after one month from written information through "Repairing Report" sent from NSM to the customer, NSM will not be responsible any longer for the safe keeping of customer's goods in its possession.
- 8) WARRANTY WILL BE VOID if during said period the following anomalies should occur:
 - A) inadequate storage;
 - B) repairing or modification by unauthorised personnel;
 - C) use or maintenance conditions which do not conform with the instructions established by NSM;
 - D) wrong installation or application other from what the product was meant for;
 - E) use in zones with particular climatic condition, demanding the adoption of modifications to the cooling apparatus;
 - F) overload or use in applications different from ones the product was supplied for.
- 9) Warranty coverage will be suspended till the client has totally covered all due amounts and whenever the client, for whatever reason, is late in payments.
Present warranty annuls and replaces any other warranty.

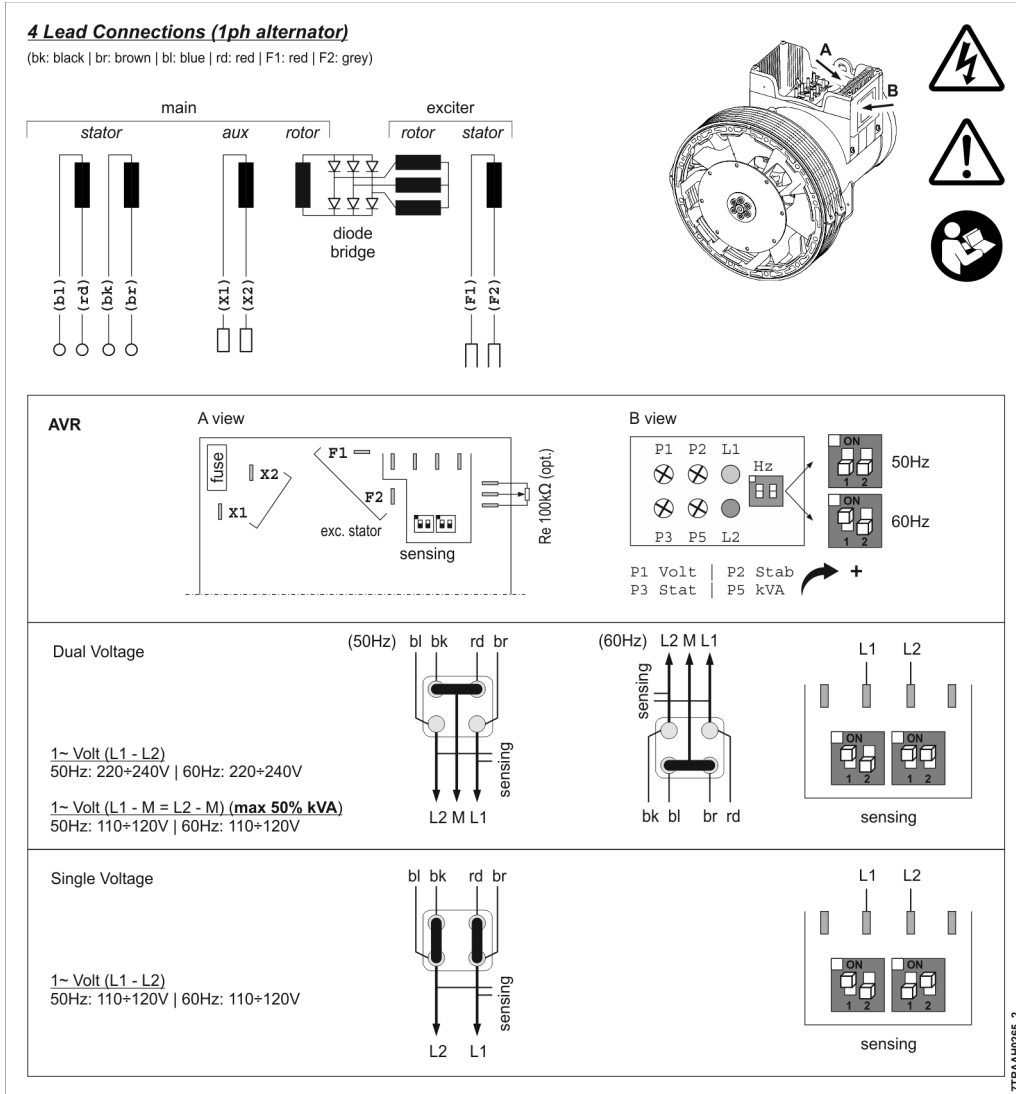
GENERAL PROCEDURE OF WARRANTY

- 1) Report to the Service Department by e-mail or fax before the machine or the part are sent to NSM for carrying out checks, advising: description of the goods, date of invoice, a full report of the defect found and Serial Number of the machine (see adhesive label)
- 2) Dispatch free of charge (carriage paid) to the Service Department of NSM, Schio (VI) Italy, of the machine or part for which the intervention or check are required.
In case the machine is sent for check, it will have to be complete with all its original pieces
- 3) Service Department will check the machine or the part received and should the warranty be approved, will be NSM's care to send back to the customer the machine or the part, repaired or replaced, free of charge, transport not included

12 Appendix

12.1.1 Wiring diagram

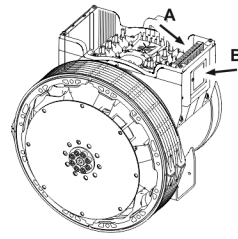
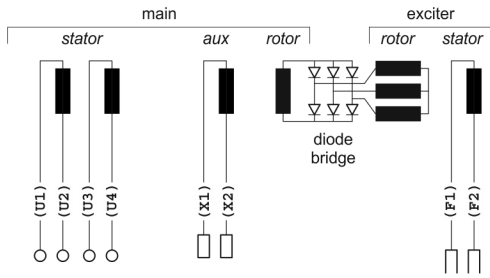
Single-phase 4 wires (ZB132-1, ZBC132-1)



Single-phase 4 wires (ZB180-1)

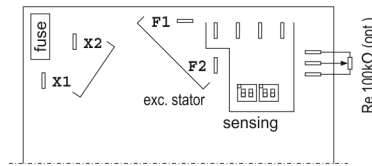
4 Lead Connections (ZB180 1ph alternator)

(X: yellow | F1: red | F2: grey)

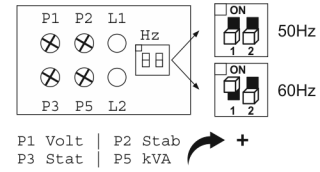


AVR

A view



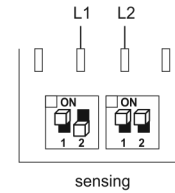
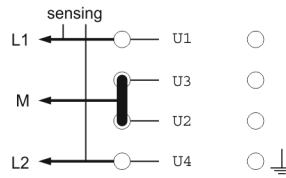
B view



Dual Voltage

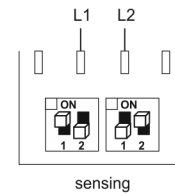
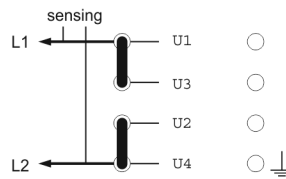
1~ Volt (L1 - L2)
50Hz: 220+240V | 60Hz: 220+240V

1~ Volt (L1 - M = L2 - M) (max 50% kVA)
50Hz: 110+120V | 60Hz: 110+120V



Single Voltage

1~ Volt (L1 - L2)
50Hz: 110+120V | 60Hz: 110+120V

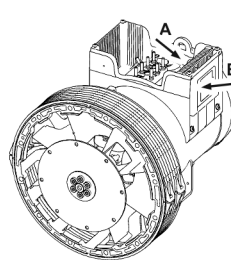
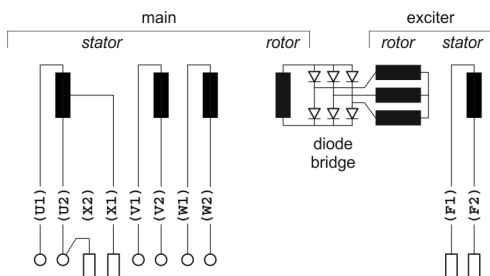


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Three-phase 6 wires (ZB, ZBC132)

6 Lead Connections (3ph alternator)

(U: black | V: brown | W: white | X: yellow | F1: red | F2: grey)

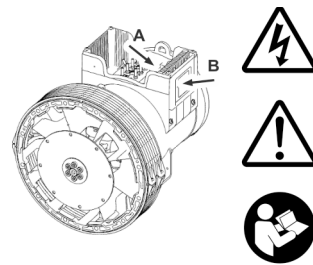
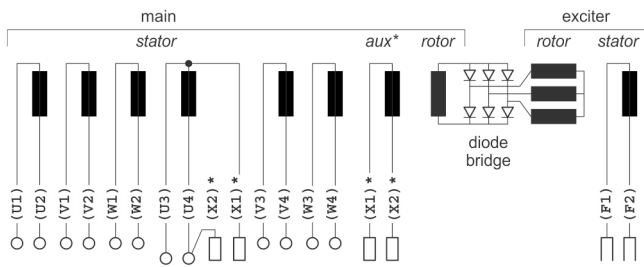


<p>AVR</p>	<p>A view</p>	<p>B view</p> <p>P1 Volt P2 Stab P3 Stat P5 kVA</p>
<p>Star</p> <p>3~ Volt (L1 - L2 - L3) 50Hz: 380+440V 60Hz: 380+480V</p> <p>1~ Volt (L2 - N) 50Hz: 220+254V 60Hz: 220+277V</p>		
<p>Delta</p> <p>3~ Volt (L1 - L2 - L3) 50Hz: 220+254V 60Hz: 220+277V</p> <p>1~ Volt (L2 - L3) 50Hz: 220+254V 60Hz: 220+277V</p>		
<p>Delta 1 phase</p> <p>1~ Volt (L1 - L2) 50Hz: 220+254V 60Hz: 220+277V</p>		

Three-phase 12 wires (ZB132, ZBC132)

12 Lead Connections

(U: black | V: brown | W: white | X: yellow | F1: red | F2: grey)



* X1, X2, aux: depending on winding type

<p>AVR</p>	<p>A view</p>	<p>B view</p> <p>P1 Volt P2 Stab P3 Stat P5 kVA</p>
<p>Series-Star</p> <p>3~ Volt (L1 - L2 - L3) 50Hz: 380+440V 60Hz: 380+480V</p> <p>1~ Volt (L2 - N) 50Hz: 220+254V 60Hz: 220+277V</p>		
<p>Parallel Star</p> <p>3~ Volt (L1 - L2 - L3) 50Hz: 190+220V 60Hz: 190+240V</p> <p>1~ Volt (L2 - L3) 50Hz: 190+220V 60Hz: 190+240V</p> <p>1~ Volt (L2 - N) 50Hz: 110+127V 60Hz: 110+138V</p>		
<p>Series-Delta</p> <p>3~ Volt (L1 - L2 - L3) 50Hz: 220+254V 60Hz: 220+277V</p> <p>1~ Volt (L2 - L3) 50Hz: 220+254V 60Hz: 220+277V</p>		
<p>Parallel Delta (3~)</p> <p>3~ Volt (L1 - L2 - L3) 50Hz: 110+127V 60Hz: 110+138V</p> <p>1~ Volt (L2 - L3) 50Hz: 110+127V 60Hz: 110+138V</p>		
<p>Double Delta (1~ dual voltage)</p> <p>1~ Volt (L1 - L2) 50Hz: 220+254V 60Hz: 220+277V</p> <p>1~ Volt (L1 - M) 50Hz: 110+127V 60Hz: 110+138V</p> <p>1~ Volt (L2 - M) 50Hz: 110+127V 60Hz: 110+138V</p>		

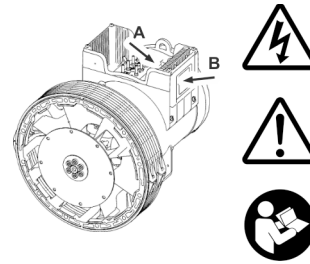
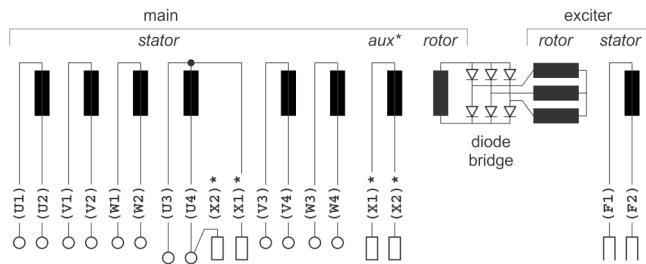
7TR0AH10264_1

Three-phase 12 wires (ZB132, ZBC132)

(single-phase connection optionals)

12 Lead Connections

(U: black | V: brown | W: white | X: yellow | F1: red | F2: grey)



* X1, X2, aux: depending on winding type

AVR

A view

B view

P1 Volt | P2 Stab
P3 Stat | P5 kVA

Parallel Star (1~ 60Hz single voltage)

1~ Volt (L1 - L2)
60Hz: 220+240V

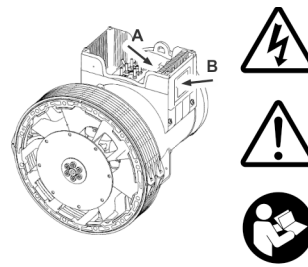
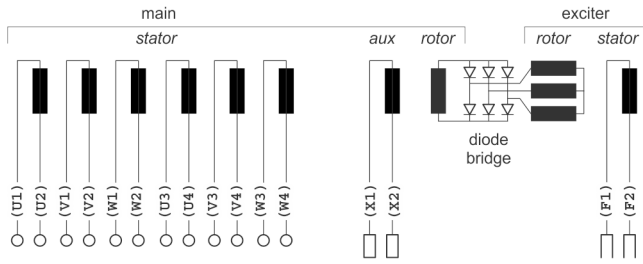
Parallel Delta (1~ single voltage)

1~ Volt (L1 - L2)
50Hz: 110+127V | 60Hz: 110+138V

Three-phase 12 wires (ZB180)

12 Lead Connections

(U: black | V: brown | W: white | X: yellow | F1: red | F2: grey)



AVR	
<p>A view</p>	<p>B view</p> <p>P1 Volt P2 Stab P3 Stat P5 kVA</p>
<p>Series-Star</p> <p>3~ Volt (L1 - L2 - L3) 50Hz: 380+440V 60Hz: 380+480V</p> <p>1~ Volt (L2 - N) 50Hz: 220+254V 60Hz: 220+277V</p>	
<p>Parallel Star</p> <p>3~ Volt (L1 - L2 - L3) 50Hz: 190+220V 60Hz: 190+240V</p> <p>1~ Volt (L2 - L3) 50Hz: 190+220V 60Hz: 190+240V</p> <p>1~ Volt (L2 - N) 50Hz: 110+127V 60Hz: 110+138V</p>	
<p>Series-Delta</p> <p>3~ Volt (L1 - L2 - L3) 50Hz: 220+254V 60Hz: 220+277V</p> <p>1~ Volt (L2 - L3) 50Hz: 220+254V 60Hz: 220+277V</p>	
<p>Parallel Delta (3~)</p> <p>3~ Volt (L1 - L2 - L3) 50Hz: 110+127V 60Hz: 110+138V</p> <p>1~ Volt (L2 - L3) 50Hz: 110+127V 60Hz: 110+138V</p>	
<p>Double Delta (1~ dual voltage)</p> <p>1~ Volt (L1 - L2) 50Hz: 220+254V 60Hz: 220+277V</p> <p>1~ Volt (L1 - M) 50Hz: 110+127V 60Hz: 110+138V</p> <p>1~ Volt (L2 - M) 50Hz: 110+127V 60Hz: 110+138V</p>	

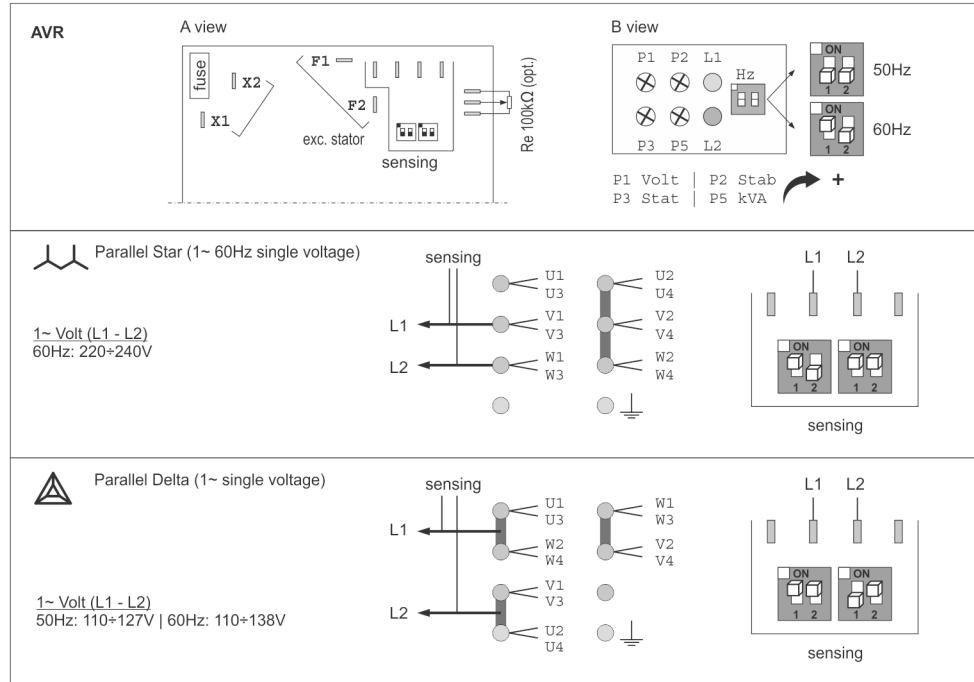
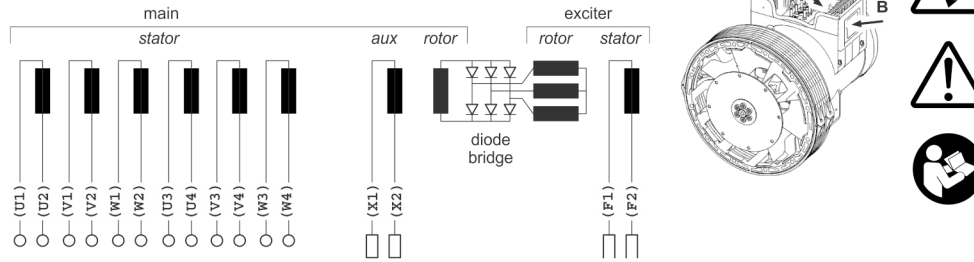
T7RAAH0289

Three-phase 12 wires (ZB180)

(single-phase connection optionals)

12 Lead Connections

(U: black | V: brown | W: white | X: yellow | F1: red | F2: grey)



12.1.2 Technical Features

Number of poles	4			3 phase	1 phase
Overload	110% (1 hour / 6-hour cycle)	Rated P.F.		0,8	1
Short circuit current	> 300% In	T.H.D.			
Voltage accuracy	± 0,5%	ZB132		< 4%	< 5%
Insulation class	H	ZB180		< 3%	< 5%
Protection degree	IP21 (IP23 opt.)	No. of leads		6, 12	4
Rated temperature	-15°C ÷ 40°C				
Excitation system	Self-excited			50Hz	60Hz
Overspeed	2250 rpm	Rated speed		1500rpm	1800rpm
Execution	Brushless	Air flow			
Regulation type	Automatic Voltage Regulator	ZB132 sae 5		3,5 m³/min	4,2 m³/min
AVR model	AVR625D	ZB132 sae 4		5,4 m³/min	6,5 m³/min
NDE bearing type	6207 2RSC3 (ZB132)	ZBC132 sae 4/5		3,5 m³/min	4,2 m³/min
	6208 2RSC3 (ZB180)	ZB180 sae 3		7,9 m³/min	9,5 m³/min

12.1.3 Data Table

(standard configuration)

3ph - 6 wires		1ph - 4 wires				3ph – 12 wires	
KVA	Model	KVA	Model	kVA	Model	kVA	Model
8,0	ZBC132 XSA	5,0	ZBC132 XSA-1	22,0	ZB180 SC-1	30,0	ZB180 SC
10,0	ZBC132 XSB	7,0	ZBC132 XSB-1			35,0	ZB180 MA
12,5	ZBC132 SA	9,0	ZBC132 SA-1	27,0	ZB180 MB-1	40,0	ZB180 MB
15,0	ZBC132 SB	10,5	ZBC132 SB-1	30,0	ZB180 MC-1	45,0	ZB180 MC
18,0	ZBC132 MA					50,0	ZB180 LA
20,0	ZBC132 MB	13,0	ZBC132 MB-1			60,0	ZB180 LC
						72,5	ZB180 XA
8,0 *	ZB132 XSA	6,3 *	ZB132 XSA-1				
10,0 *	ZB132 XSB	8,0 *	ZB132 XSB-1				
14,0 *	ZB132 SA	10,0 *	ZB132 SA-1				
16,0 *	ZB132 SB	12,0 *	ZB132 SB-1				
20,0 *	ZB132 MA						
22,5 *	ZB132 MB	15,0 *	ZB132 MB-1				

* kVA sae 4, lower when sae 5

12.1.4 Derating Table

Altitude [m AMSL]	Ambient Temperature				
	25°C	40°C	45°C	50°C	55°C
< 1000	1,07	1,00	0,96	0,93	0,91
1000 – 1500	1,00	0,96	0,92	0,89	0,87
1500 – 2000	0,96	0,91	0,87	0,85	0,83
2000 – 3000	0,90	0,85	0,82	0,79	0,77

12.1.5 Resistances Table (20°C)

(all values in Ohm)

		Stator *	Rotor	Aux	Exc. Stator	Exc. Rotor
A	ZB / ZBC132 XSA	1,420	11,40	0,75	7,60	4,65
A	ZB / ZBC132 XSB	1,010	13,60	0,53	7,60	4,65
A	ZB / ZBC132 SA	0,700	11,90	0,37	7,60	4,65
A	ZB / ZBC132 SB	0,610	13,00	0,31	7,60	4,65
A	ZB / ZBC132 MA	0,340	14,00	0,18	7,60	4,65
A	ZB / ZBC132 MB	0,280	14,30	0,15	7,60	4,65
	ZB / ZBC132 XSA-1				7,60	4,65
	ZB / ZBC132 XSB-1				7,60	4,65
	ZB / ZBC132 SA-1	0,195	11,90	0,82	7,60	4,65
	ZB / ZBC132 SB-1	0,135	13,00	0,59	7,60	4,65
	ZB / ZBC132 MB-1	0,084	14,30	0,35	7,60	4,65
B	ZB180 SC	0,125	1,59	0,75	6,50	0,48
B	ZB180 MA	0,104	1,60	0,74	6,50	0,48
B	ZB180 MB	0,084	1,75	0,70	6,50	0,48
B	ZB180 MC	0,063	1,47	0,69	6,50	0,48
B	ZB180 LA	0,055	1,63	0,61	5,50	0,48
B	ZB180 LC	0,036	1,57	0,50	5,50	0,48
B	ZB180 XA				5,50	0,48
	ZB180 SC-1	0,045	1,59	0,20	8,20	0,48
	ZB180 MB-1	0,033	1,75	0,13	8,20	0,48
	ZB180 MC-1	0,027	1,47	0,08	8,20	0,48

* A Stator: $R=R_{L-N}$ (Y conn. 6 wires) | B Stator: $R=R_{L-N}/2$ (Y conn. 12 wires)

12.1.6 EU legislation Conformity

Product

ZB132, ZBC132, ZB180

Type

Three-phase Alternator

Serial nr

all

Manufacturer

NSM s.r.l.

Address

Via Lazio 5/b

36015 Schio, Vicenza, Italy

This declaration is issued under the sole responsibility of the manufacturer.

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

2014/35/EU (Low Voltage),

2014/30/EU (EMC)

References to the relevant harmonised standards:

EN IEC 60034-1, EN IEC 61000-6-2, EN IEC 61000-6-4

Product

ZB132-1, ZBC132-1, ZB180-1

Type

Single-phase Alternator

Serial nr

all

Manufacturer

NSM s.r.l.

Address

Via Lazio 5/b

36015 Schio, Vicenza, Italy

This declaration is issued under the sole responsibility of the manufacturer.

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

2014/35/EU (Low Voltage),

2014/30/EU (EMC)

References to the relevant harmonised standards:

EN IEC 60034-1, EN IEC 61000-6-2, EN IEC 61000-6-4