mecc alte

Totally Focused. Totally Independent.

EN

User manual

Self-regulating Alternators

T16F
T20F-P
T20FS-P
ET16F
ET20F-P

Operating and maintenance instructions

Code: TF series
Revision: 00
Data: 06/2025

Translation of original language

CE

The world's largest independent producer of alternators 1 – 5,000kVA

Index

1 General information: purpose of the manual

This manual is intended to provide support and guidance during the stages of work on the alternator. It contains information on the use, maintenance and handling of faults and malfunctions providing indications for the most adequate behavior to the correct use and to the correct operation of the machine as specified by the Manufacturer. This manual is an essential safety requirement and it must accompany the alternator throughout its life cycle. It is indispensable to store this manual and to make it available to everyone involved in using and servicing the alternator.

MECC ALTE S.p.A. is not responsible or liable for any damages suffered by people or things as a result of improper use not indicated in this manual and by failure to comply with the specifications of the technical characteristics table pertaining to every model.

1.1 Intended Users

This manual is intended for the authorized personnel adequately trained to operate this kind of product.

Warning

The operators must not carry out operations reserved to maintenance technicians or to specialized technicians. The Manufacturer disclaims all responsibility for damages suffered as a result of failure to comply with this warning.

1.2 Professional Profiles Involved

Below we describe the professional profiles who may operate the alternator based on the kind of activity to be carried out.

Handler

Authorized skilled personnel able to safely lift and handle the alternator. The operator is not authorized to carry out maintenance operations.

Mechanical Maintenance Technician

A qualified technician able to carry out the installation, adjustment, maintenance and ordinary repair operations required. Not allowed to carry out operations with the power on.

Electrical Maintenance Operator

A qualified technician in charge with all the electrical works of connection, adjustment, maintenance and repair. Authorized to carry out operations with the power on.

Field Service Technician

A qualified technician provided by the manufacturer to carry out complex operations in special cases or, anyway, as previously agreed with the user.

1.3 Manual use and storage

Warning

Read this manual carefully before starting up the alternator or carrying out any operation on it. If you do not read it you might not be able to recognize potential hazardous situations that may lead to death or serious injuries inflicted to yourself or to others.

This manual is intended to provide all the information required for a correct use of the alternator and its most autonomous and safest possible management.
It is mandatory for all the users and the maintenance technicians to carefully read the instructions contained in this manual and in all possible annexes, before carrying out any operation on the product.
In case of doubts on the correct interpretation of the information reported in the documentation, please contact the manufacturer for clarifications.

Caution

Keep this manual and all its annexes in good condition, legible and complete in all its parts. Keep the documentation close to your alternator, in an accessible place known to all the operators and maintenance technicians and, more generally, to everyone who for various reasons should operate the alternator.

Warning

Keep the manual in its original condition. It is forbidden to rewrite, change or remove pages from the manual and their contents. The manufacturer disclaims all responsibility for any potential damages to people, animals or things as a result of failure to comply with the instructions and with the operational modalities described in this manual.

This manual is an integral part of the alternator and it must be stored for future reference.

Caution

This manual must be delivered together with the alternator in case the alternator is transferred/sold to another user.

Caution

In case the manual is lost or damaged ask for a copy from the Manufacturer indicating its identification data: document name, code, revision number and issue date.

1.4 How to consult the manual

- The manual is divided in chapters, paragraphs and subparagraphs listed in the table of contents: an easy way to find any topic of interest.
- The symbols used provide direct knowledge on the kind of information expressed by each symbol. For instance the symbol:

  
  This symbol indicates a NOTE.

1.4.1 Description of the symbols/pictographs in the manual

Below you will find the various symbols used in the manual to highlight information of particular importance or the intended recipients of the specific pieces of information.

Danger

The risks described in this manner indicate a HIGH LEVEL of hazard that, unless avoided, could cause severe injuries or death.

Warning

The risks described in this manner indicate an INTERMEDIATE LEVEL of hazard that, unless avoided, could cause severe injuries or death.

Caution

The risks described in this manner indicate a LOW LEVEL of hazard that, unless avoided, could cause minor or moderate injuries.


This symbol indicates a NOTE; a fundamentally important piece of information or in-depth explanation.


This symbol indicates a CROSS REFERENCE; the presence of a module, of a drawing or of an annexed document that should be consulted and, if required, filled in.

1.5 Reference Regulations and Directives

List of the reference regulations and directives used for the design and construction of the alternator.
Directives

- Machinery Directive 2006/42/EC.
- Low Voltage Directive 2014/35/EC.
- EMC Directive 2014/30/EC.

Applicable Harmonized Technical Standards

- EN ISO 12100 (2010) : Safety of machinery – General principles of design – Risk assessment and risk reduction
- EN 60034-1 : Rotating Electrical Machines - Part 1 : Rating and performance.
- EN 60204-1: Safety of machinery. Electrical equipment of machines. Part 1: General Requirements
- EN61000-6-3 : Electromagnetic Compatibility (EMC) Part 6-3: Generic Standards - Emission standard for Residential, Commercial and Light-industrial Environments.
- EN61000-6-2 : Electromagnetic Compatibility (EMC) Part 6-2: Generic Standards - Immunity for industrial environments

Applicable Technical Standards

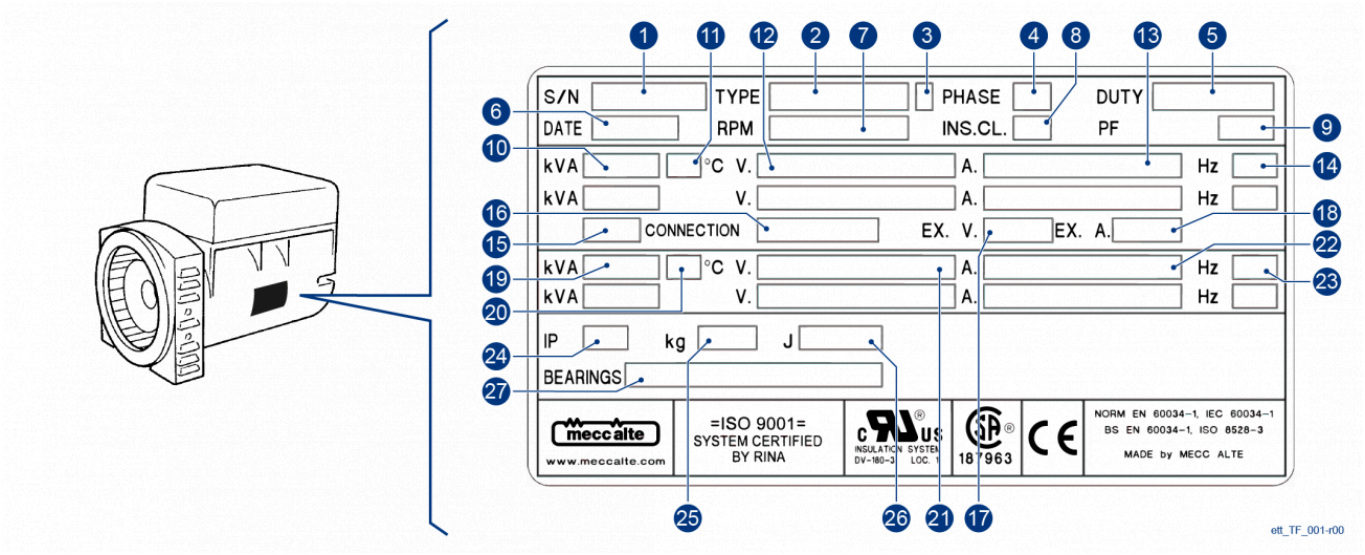
- EN 60034-2 : Method for determining losses and efficiency
- EN 60034-5 : Classification of degrees of protection (IP).
- EN 60034-6 : Methods of cooling (IC)
- EN 60034-7 : Types of construction (IM code)
- EN 60034-8 : Terminal markings and direction of rotation
- EN 60034-9 : Noise limits
- EN 60034-14 : Mechanical vibration limits
- EN 60085 : Classification of insulating materials
- ISO 1940-1 : Balance quality requirements of rigid rotors

Technical standards to be applied by the installer

- ISO 8528-9 : Reciprocating internal combustion engine driven alternating current generating sets Part 9: Measurement and evaluation of mechanical vibrations.

1.6 Marking data

Alternator Nameplate



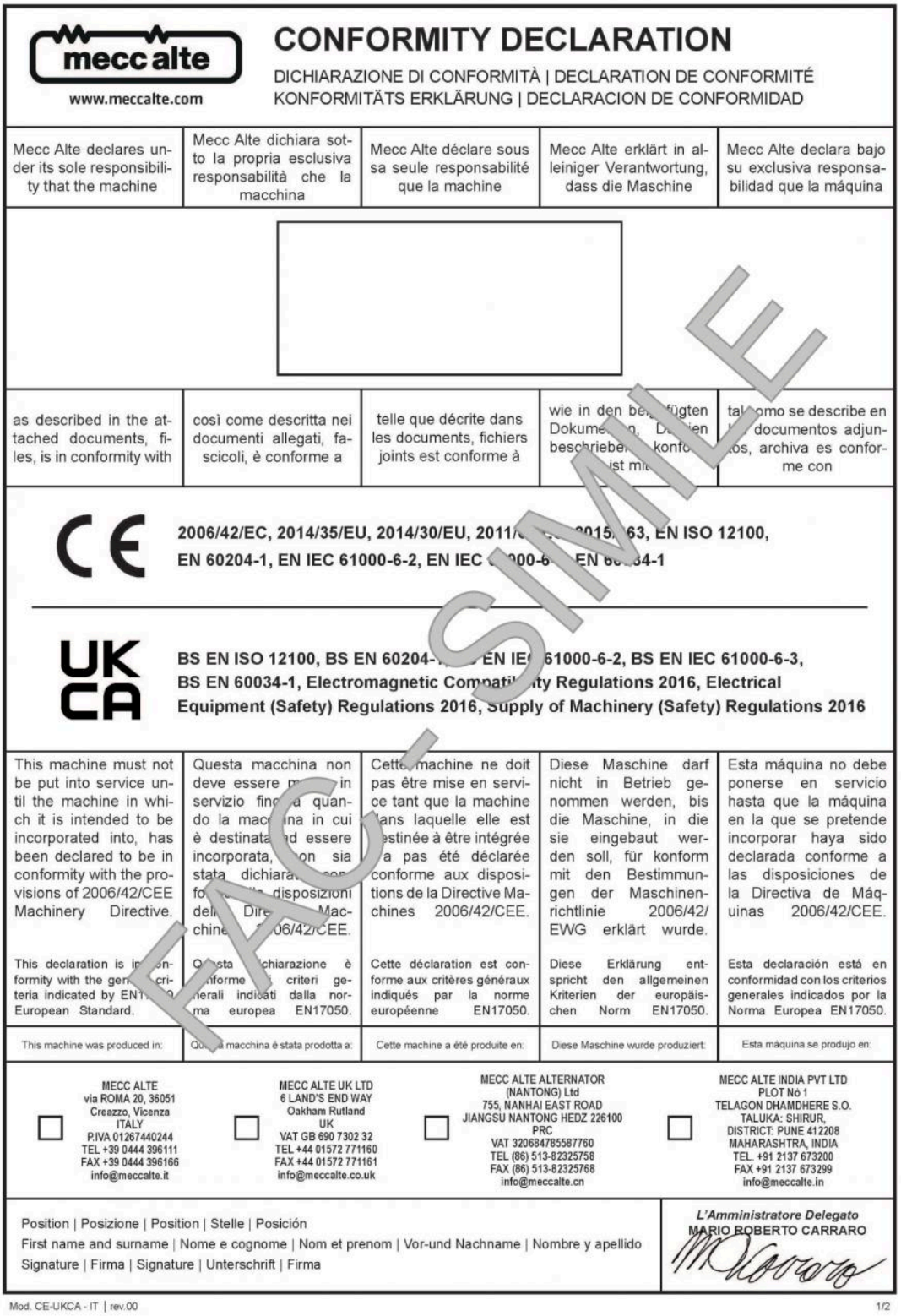
1. Serial number
2. Model
3. Revision index
4. Phase number
5. Service type
6. Manufacture month / year
7. Nominal speed
8. Insulation class
9. Power factor
10. Nominal power related to temperature (11)
11. Maximum ambient temperature
12. Nominal Voltage
13. Nominal Current
14. Nominal Frequency
15. Nominal characteristics class
16. Connection type
17. Excitation Voltage
18. Excitation Current
19. Power related to temperature (20)
20. Ambient temperature
21. Nominal Voltage
22. Current related to power (19)
23. Nominal Frequency
24. Protection Rating
25. Total weight
26. Moment of inertia
27. Bearing type

Ask for a new nameplate if the one attached to the alternator cannot be read anymore.

The nameplate is affixed on the alternator in the position indicated in the figure.

1.7 Declaration of Conformity

Below a copy of the declaration of conformity of the product. The original is placed inside the terminal box of every alternator. A true copy may be requested in case of loss.



mecc alte
www.meccalte.com

CONFORMITY DECLARATION

DICHIARAZIONE DI CONFORMITÀ | DECLARATION DE CONFORMITÉ
KONFORMITÄTS ERKLÄRUNG | DECLARACION DE CONFORMIDAD

Mecc Alte declares under its sole responsibility that the machine	Mecc Alte dichiara sotto la propria esclusiva responsabilità che la macchina	Mecc Alte déclare sous sa seule responsabilité que la machine	Mecc Alte erklärt in alleiniger Verantwortung, dass die Maschine	Mecc Alte declara bajo su exclusiva responsabilidad que la máquina
as described in the attached documents, files, is in conformity with	così come descritta nei documenti allegati, fascicoli, è conforme a	telle que décrite dans les documents, fichiers joints est conforme à	wie in den beigefügten Dokumenten, Dateien beschrieben, konform ist mit	tal como se describe en los documentos adjuntos, archiva es conforme con

CE **2006/42/EC, 2014/35/EU, 2014/30/EU, 2011/ 2015/ 63, EN ISO 12100, EN 60204-1, EN IEC 61000-6-2, EN IEC 000-6 EN 60 34-1**

UK CA **BS EN ISO 12100, BS EN 60204- EN IE 61000-6-2, BS EN IEC 61000-6-3, BS EN 60034-1, Electromagnetic Compati ity Regulations 2016, Electrical Equipment (Safety) Regulations 2016, Supply of Machinery (Safety) Regulations 2016**

This machine must not be put into service until the machine in which it is intended to be incorporated into, has been declared to be in conformity with the provisions of 2006/42/CEE Machinery Directive.	Questa macchina non deve essere m in servizio fin a quando la macchina in cui è destinata nd essere incorporata, on sia stata dichiara con fo alle disposizioni del Dire Macchine 006/42/CEE.	Cette machine ne doit pas être mise en service tant que la machine dans laquelle elle est destinée à être intégrée a pas été déclarée conforme aux dispositions de la Directive Machines 2006/42/CEE.	Diese Maschine darf nicht in Betrieb genommen werden, bis die Maschine, in die sie eingebaut werden soll, für konform mit den Bestimmungen der Maschinenrichtlinie 2006/42/EWG erklärt wurde.	Esta máquina no debe ponerse en servicio hasta que la máquina en la que se pretende incorporar haya sido declarada conforme a las disposiciones de la Directiva de Máquinas 2006/42/CEE.
This declaration is in onformity with the ge cri teria indicated by EN European Standard.	Questa chiarazione è nforme criteri generali indicati dalla norma europea EN17050.	Cette déclaration est conforme aux critères généraux indiqués par la norme européenne EN17050.	Diese Erklärung entspricht den allgemeinen Kriterien der europäischen Norm EN17050.	Esta declaración está en conformidad con los criterios generales indicados por la Norma Europea EN17050.
This machine was produced in:	Questa macchina è stata prodotta a:	Cette machine a été produite en:	Diese Maschine wurde produziert:	Esta máquina se produjo en:

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Position | Posizione | Position | Stelle | Posición
First name and surname | Nome e cognome | Nom et prenom | Vor-und Nachname | Nombre y apellido
Signature | Firma | Signature | Unterschrift | Firma

L'Amministratore Delegato
MARIO ROBERTO CARRARO

Mod. CE-UKCA - IT | rev.00

1/2

RESIDUAL RISKS LIST

The manufacturer MECC ALTE took all possible precautions to construct the generator following all safety regulations and present applicable Safety Norms.
The instruction manual explains step by step all indications required in point 1.7.4 (user instructions) of the Machines Directive and all users are specifically asked to read it carefully in order to avoid wrong operations which, even though simple, could cause damage to persons. If all instructions given are followed, no residual risks are left; however, one has to pay attention to the warnings given :

1) move carefully the generator (packed and unpacked)
2) the coupling of the generator with the drive-machine and the electrical connections should be performed by skilled personnel
3) do not touch the generator during function and immediately after being stopped since some parts of the generator could be hot
4) in case of generator with permanent magnets, take proper precautions and keep appropriate distance.

LISTA RISCHI RESIDUI

La MECC ALTE ha fatto tutto il possibile per fabbricare il generatore con il massimo della conoscenza sulle sicurezze a Suo possesso e consultando tutte le Direttive e Norme attualmente applicabili.
Il manuale d'uso ed istruzione riporta passo-passo tutte le indicazioni richieste dal punto 1.7.4 (istruzioni d'uso) della Direttiva Macchine ed è fatta specifica richiesta di leggerlo attentamente cosi' da non incorrere in operazioni errate che, se pur minime, possono causare danni a persone.
Se vengono rispettate tutte le indicazioni fornite, non rimangono particolari rischi residui, ma solamente delle attenzioni che sono

1) movimentare il generatore con accortezza (imballato e disimballato)
2) far accoppiare il generatore alla macchina di trascinamento e far collegare elettricamente lo stesso, da personale adeguatamente istruito
3) non toccare il generatore durante il funzionamento e subito dopo l'arresto dello stesso, in quanto vi potrebbero essere parti del generatore a temperature elevate
4) se il generatore presenta magneti permanenti all'interno, prendere le dovute precauzioni e mantenere le giuste distanze.

LISTE DES RISQUES RÉSIDUELS

La société Mecc Alte a pris toutes ses précautions pour fabriquer les alternateurs avec le maximum de sécurité à sa connaissance, et en consultant toutes les directives et normes actuellement applicables.
Le manuel d'utilisation et d'instruction explique point par point toutes les indications requises au point 1.7.4 (instruction d'utilisation) de la Directive des Machines, et tous les utilisateurs sont spécifiquement sollicités à lire avec attention afin d'éviter toutes fausses opérations qui, même minimes, peuvent être dangereuses pour l'utilisateur. Si toutes les instructions données sont suivies, il n'y a aucun risque résiduel particulier, mais seulement quelques précautions à prendre qui sont :

1) manipuler l'alternateur avec prudence (emballage et désemballage)
2) effectuer l'accouplement entre l'alternateur avec le système d'entraînement et les connections électriques par du personnel qualifié
3) ne pas toucher l'alternateur durant son fonctionnement et aussitôt après son arrêt, car certaines pièces peuvent encore être à température élevée
4) Dans le cas d'un générateur à aimants permanents, prendre les précautions appropriées et garder une distance appropriée.

LISTE DER NACHBLEIBENDEN GEFAHREN

Der Hersteller MECC ALTE hat alle möglichen Vorsichtsmaßnahmen bei der Herstellung des Generators nach geltenden Sicherheitsvorschriften und den z.Zt. anwendbaren Sicherheitsnormen eingehalten.
Die Bedienungsanleitung erklärt schrittweise alle Indikatoren die in Pkt.1.7.4 (Gebrauchsanweisung) der Maschinenbauvorschrift gefragt sind.
Alle Anwender werden dringend gebeten, diese Hinweise zu lesen, um auch den kleinsten Fehler zu vermeiden, der Personenschaden verursachen könnte. Bei genauer Beachtung der Vorschriften verbleibt kein Risiko; jedoch müssen die folgenden Warnungen beachtet werden :

1) den Generator (verpackt und unverpackt) vorsichtig transportieren
2) die Kopplung des Generators mit der Antriebsmaschine und die elektrischen Verbindungen nur durch qualifiziertes Personal ausführen lassen
3) den Generator während des Betriebs und kurz nach dem Abstellen nicht berühren, da Teile des Generators heiß sein können
4) Bei Generatoren mit Dauermagneten sind entsprechende Vorsichtsmaßnahmen zu treffen und ein angemessener Abstand einzuhalten.

LISTA DE LOS RIESGOS RESIDUALES

La MECC ALTE ha hecho todo el posible para fabricar el generador con los máximos conocimientos sobre seguridad en su poder, y consultando todas las directivas y normas actualmente aplicables.
El manual de uso e instrucciones explica paso a paso todas las indicaciones requeridas por el punto 1.7.4 (instrucciones de uso) de la Directiva Máquinas, y hace una particular solicitud de leer atentamente el mismo, de manera de evitar operaciones erradas, que si bien mínimas, podrían provocar daños a las personas. Si son respetadas todas las indicaciones dadas, prácticamente no quedan riesgos residuales, a parte los siguientes puntos:

1) manipular el generador con cuidado (embalado y desembalado)
2) acoplar el generador con la máquina que da el movimiento primario, y conectar eléctricamente el mismo, por personal adecuadamente calificado
3) no tocar el generador durante el funcionamiento, así como, inmediatamente después que el mismo se detiene, debido a que podrían existir partes del generador a altas temperaturas
4) en caso de generador con imanes permanentes, tome las debidas precauciones y mantenga la distancia apropiada.

1.8 Support

For any inquiry on the use, the maintenance or a request of replacement parts, the buyer must contact the Manufacturer directly (or the help desk if present), specifying the alternator identification data indicated on the nameplate.
The Customer may resort to the technical and commercial support provided by the area representatives or by foreign branches, which are in direct contact with MECC ALTE S.p.A. and have their addresses and contact data indicated on the back cover.
In case of fault or an insurmountable inconvenience, the Customer may contact directly the headquarters using the following data:

PHONE NUMBER (Landline):	+ 39 0444 396111
E-MAIL:	aftersales@meccalte.it
WEBSITE:	www.meccalte.com
MAILING ADDRESS:	MECC ALTE S.p.A Via Roma 36051 Creazzo, Vicenza Italy

In case of ownership transfer or company transfers of the alternator you should always inform the manufacturing company or your reference help desk.

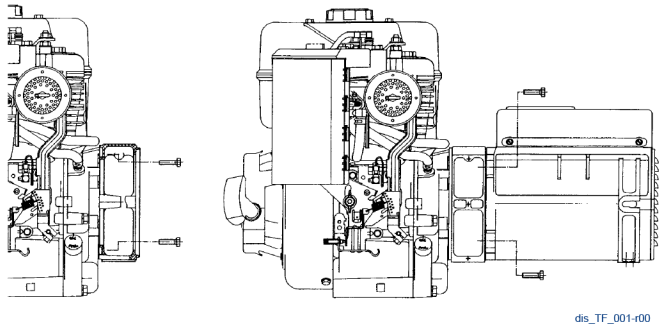
1.9 Glossary

System:	System means, in brief, the drive motor and the alternator.
Installer:	A person / company that is in charge of building the "Fully assembled Machine" and/or installing it at the user's premises.
Fully Assembled Machine:	It is the name of the complete machine mainly made up of a "drive motor" and the alternator.
Drive motor:	It is the motor to which the alternator is connected. The manual also defines it as the "drive machine".
PPE:	Personal Protective Equipment.

2 Presentation of the alternator

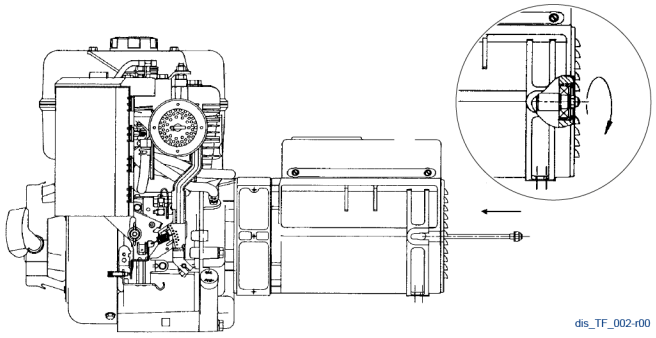
The alternators of the TF series are brush-type with compound regulation on all three phases, 2-pole, and offer high operational reliability.
The covers are made of high-strength die-cast aluminum alloy, and the shaft is made of C45 steel with a compensating ring.
The protection rating is IP23 (higher protection ratings can be achieved on request).
Insulation if of class H standard.
The windings are impregnated with tropicalized epoxy resins.
The electromagnetic compatibility tests were carried out in compliance with the standard specifications, with the neutral wire connected to ground.

2.1 General description and operating principle



Couple flange to engine, fixing it with the appropriate M8 screws.
Secure the machine body to the flange using the appropriate M8 screws.

Apply a tightening torque of 21 ± 7% Nm.



Screw the central tie rod into its seat.
Lock the central tie rod with the M8 nut.

Apply a tightening torque of 21 ± 7% Nm.

Plug the hole on the terminal box lid with the proper cap.

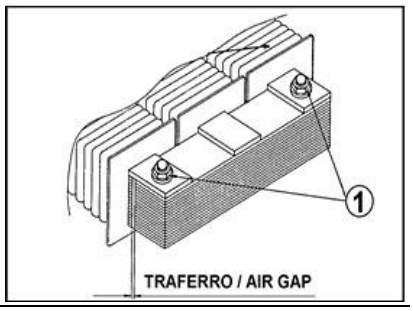
IMPORTANCE OF SPEED

Frequency and voltage are directly dependent on the rotational speed; therefore, it is necessary to keep it as constant as possible at its nominal value under any load. The speed regulation system of the drive motors generally shows a slight speed drop between no load and full load; therefore, it is advisable to set the no-load speed to about 3÷4% above the nominal speed.

NO-LOAD VOLTAGE ADJUSTMENT T16F - T20F

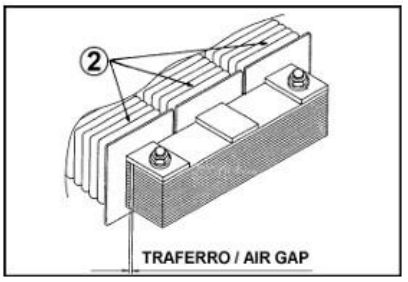
To adjust the no-load voltage on the T16F and T20F, act on the air gap of the regulation transformer as follows:

- set the motor no-load speed to 4% above the nominal speed;
- apply for a few seconds a load not less than 30% of the nominal power;
- loosen the locking nuts “1”,
- increase the air gap to raise the voltage or decrease it to lower the voltage;
- tighten the locking nuts “1” securely.



LOAD VOLTAGE ADJUSTMENT

To adjust the voltage under load, it is possible to act on the number of turns “2” of the regulation transformer. Note that with a balanced load, there is normally an overvoltage which, in the case of a cold machine, can reach up to +5% with power factor 0.8 and up to +10% with power factor 1. These voltage surges are generally halved within the first 10 minutes of generator operation. If you wish to decrease the voltage, remove one turn per column from the transformer and then check whether the new load voltage is satisfactory. If not, repeat the operation until the desired value is reached.



Useful tips:
to achieve lower voltage deviation between no load and full load regardless of power factor and engine speed deviation, the generator should be loaded, and the speed adjusted until the desired voltage is obtained. If the generator does not self-excite, it will be necessary to re-excite it by applying for a few seconds a DC voltage of 10÷50 Vdc at the rectifier bridge output, taking care to respect the polarity (red +, green -).

NO-LOAD VOLTAGE ADJUSTMENT ET16F - ET20F

To ensure proper calibration, the regulator is equipped with 3 trimmers, each of which adjusts the parameters VOLT, STAB, and Hz.

- The VOLT trimmer adjusts the output voltage generated by the alternator: turning the trimmer clockwise increases the voltage, while turning it counterclockwise decreases it.
- The STAB trimmer optimizes system performance when the alternator is subjected to sudden load variations: turning it clockwise results in a faster response time but less stable voltage; turning it counterclockwise provides a slower response time and more stable voltage.
- The Hz trimmer adjusts the low-speed protection threshold. When the generator output frequency – and thus speed – drops below a certain threshold (preset to 10%), the regulator reduces the generator output voltage to prevent over-excitation and consequent overheating.

It is generally preset for 50Hz operation; therefore, if operating at 60Hz, the trimmer must be re-calibrated. To do this, decrease the speed by 10% from the nominal, turn the "Hz" trimmer counterclockwise until the voltage drops by about 1%. The protection response is immediate: restore the speed to nominal value. For further information, visit www.meccalte.com in the downloads/instruction manuals section.

TERMINAL CONNECTIONS

According to the electrical diagram, the functions of terminals numbered from 1 to 7 can be summarized as follows:

- terminal 1: negative of the excitation field
- terminal 2: positive of the excitation field
- terminal 3: regulator supply
- terminals 4 and 5: regulator reference voltage
- terminals 6 and 7: common between regulator supply and reference

Identification and connection of reinforced phase (red conductor):
In this generator, the red phase is identified as a reinforced conductor intended for use in single-phase configurations. This phase is indicated in the electrical diagrams 10, where it is marked with the label (ROSSO).
Single-phase configuration (1ph) connection:
In single-phase (1ph) configuration, the load must be connected to terminals V1 and V2 using the reinforced phase (ROSSO) as the sole output point. This configuration utilizes the larger section of the red conductor to supply high single-phase loads.
Three-phase configuration (3ph) connection:
In three-phase (3ph) configuration, the load must be connected to terminals U1, V1, W1 of the generator terminal board as indicated in the diagrams. In this configuration, the reinforced phase (ROSSO) is treated as a standard line phase.

BRUSHES

Brushes are subject to wear and should be checked periodically. The replacement interval depends on the operating conditions. We recommend replacement approximately every 7000 hours.

2.2 Technical Data

2.2.1 Dynamic Data Support (DDS)

For the most up-to-date and detailed technical information, we invite you to visit the support area of the Mecc Alte website:
http://support.meccalte.com/

Here you will find our Dynamic Data Support (DDS), an advanced system for the dynamic generation of technical data sheets. Thanks to an intuitive guided process, you can create a customized sheet by choosing between different available variables and options. This will allow you to obtain data specific to your application and your needs, with automatic calculations updated in real time.

Through the DDS, you can select and configure some technical parameters, while others will be automatically calculated and shown in the generated technical sheet. Among the available data, you will find:

Configurable parameters:

- Frequency
- Type of winding
- Number of phases
- Voltage
- Ambient temperature
- Overtemperature
- Altitude
- International protection class (IP)

Parameters displayed in the technical sheet:

- Overall dimensions
- Noise level
- Weight
- Air volumes
- Resistance of the windings at 20°C ambient temperature

DDS
Dynamic Data Support

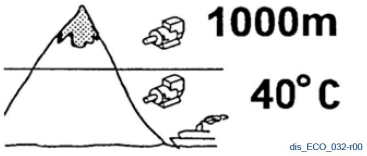
Once you have made your selection, the system will automatically calculate the performance based on the specific variants chosen and will send you the customized technical sheet by email.
Please note that all updated and official technical data are available exclusively within this system. To ensure maximum accuracy of the information, we invite you to always consult the DDS to obtain reliable and updated data in real time.
Furthermore, the family sheets with generic voltages are available at the following link:
https://www.meccalte.com/en/products/alternators

2.2.2 Materials

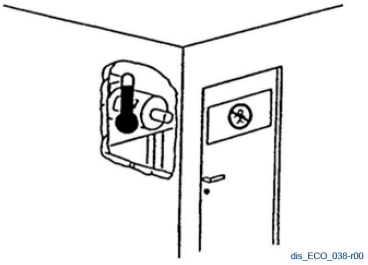
The table below contains the approximate percentages of the materials used in Mecc Alte S.p.A's alternators.

Material	Percentage
Steel Parts	45%
Cast Iron Parts	20%
Copper Parts	20%
Aluminum Parts	10%
Plastic Parts	3%
Electronic parts	2%

2.3 Environmental operating conditions



Max ambient temperature to guarantee the nominal power:	40°C
Max operating altitude to guarantee the nominal power:	Less than 1000 m.



Install the alternator in a well-aired room. Insufficient ventilation may cause overheating and malfunctioning of the alternator.

3 Safety

3.1 General warnings

The alternator may be used only for the purpose for which it was designed and built.

Caution

Alternators of the TF series comply with EC directives 2006/42 and related amendments; therefore, they pose no risk to the operator if installed, used, and maintained in accordance with Mecc Alte instructions and provided that safety devices are kept in perfect working order.

Danger

Install the alternator only after having read and understood all the sections of this manual.

Danger

Do no operate it while under the influence of intoxicating agents that might delay reaction time such as, for instance, alcohol or drugs.

Danger

The alternator installation, operation and maintenance technicians must be adequately qualified specialists who know the characteristics of the alternators.

Warning

Adequate work clothing is recommended. Avoid wearing chains, bracelets, scarves and cumbersome clothing, long hair must be tied.

Warning

Do not neutralize, remove, alter or otherwise render ineffective any safety, protection or control device of the alternator.

Warning

Maintain the work areas and the routes defined for the installation of the alternator always free from materials and/or elements that may hinder the movement of or cause accidents to the operator.

Caution

The work area must always be adequately lit.

Caution

Keep the floor in the operating area always clean and dry to prevent the forklift truck from sliding sideways when in movement.

Danger

Never operate the alternator with wet hands and objects when it is energized.

Warning

Do not lean on and do not step onto the alternator.

Warning

At the end of each operation that involved removal of the safeguards, put them back and make sure that the correct positioning and efficiency are restored.

Danger

Keep the alternator at a safe distance from flammable materials.

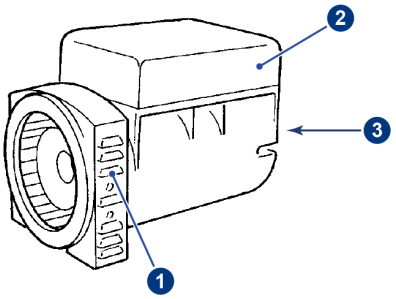
Danger

The alternators, when working, release heat even to a high level based on the power being generated. Before touching it wait for the alternator to cool off.

Danger

Working alternators are noisy (see paragraph 2.2). Install the alternator in insulated rooms and wear earmuffs to operate it.

3.2 Alternator safety devices



dis_SF_031-r00

The safety devices of the alternator are:

1. Protective net on the front shield.
2. Cover of terminal box.
3. Back latch.

Danger

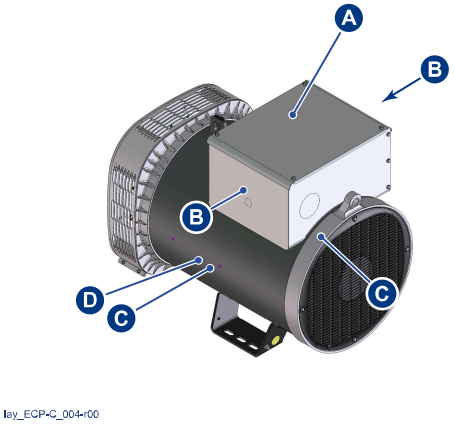
During the operation of the alternator the safeguards must always be closed.

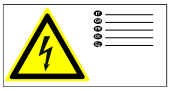
3.3 Safety tags

Caution

Do not remove under any circumstances the tags attached to the alternator.

The following safety tags are attached to the machine



Pos.	Targa	Codice	Descrizione
A		XXX	Leggere il manuale di istruzioni prima di rimuovere i coperchi
B		XXX	Pericolo generico
C		XXX	Pericolo elettricità
D		XXX	Pericolo superficie calda

Caution

The labels must be replaced if they are worn out or cannot be read anymore.

3.4 Personal Protective Equipment

Caution

The staff in charge with the operation of the alternator must wear the personal protective equipment (PPE) indicated in the table below.

PPE	Operation
	Always wear
	Maintenance or lifting the alternator or its components.

Caution

The operator must observe the accident prevention regulations in force in the specific country where the alternator is used.

Caution

The PPE assigned may not be altered.

The manufacturer disclaims all responsibility for any potential damages caused to people by failure to use the PPE.

3.5 Residual risks

The alternator presents the following residual risks:

Danger

Burning risk. The working alternator may release heat even to a high level.

Before touching the alternator wait for it to cool off.

Caution

Risk of crushing while lifting.

Do not stand under the suspended load, do not come close to it, use adequate PPE.

4 Transport, handling and storage

Alternators of the TF series are shipped by land on pallets, by sea in fumigated wooden crates. Other shipping methods are available upon customer request.
The cases shipped by sea are covered with nylon to avoid salt infiltration that could compromise the correct operation of the alternator.
Any potential replacement parts are however shipped in cardboard packing that is disposed of according to the local regulations.
Packing is always accompanied by a packing list.
Transportation of the packing to the installation place will be provided by the customer.

Upon delivery of the alternator check against the delivery note that there are no missing parts and/or damages; in case there are any, immediately inform the carrier, the insurance company and the reseller or Mecc Alte.

4.1 General warnings

Warning
The instructions of this chapter must be strictly followed when lifting the alternator.

Warning
Use adequate, tested and certified lifting devices.

Warning
Lifting and transportation must be carried out by members of staff who were trained for this purpose.

Warning
To carry out any lifting, transportation and handling operation wear the PPE indicated by the regulations (see paragraph 3.4).

Warning
When lifting the alternator with the forklift truck keep its forks at the longest possible distance one from the other so as to prevent the alternator from falling or sliding off.

Always make sure that the devices and means for packing materials removal, the alternator and any disassembled part are suitable and undamaged.

4.2 Packing materials lifting and transportation

Danger

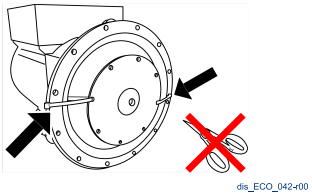
Pay attention during all transportation and movement operations. Do not stand under suspended loads.

Warning

Check the packing or the documentation attached to it for the weight to lift, the predefined anchor points and use suitable equipment for the lifting.

4.3 Unpacking

Unpack the alternator carefully without breaking/damaging the packing materials. Both the cases (equipped with metal hinges so that they may be folded) and the pallet must be returned to Mecc Alte.



Once the single-bearing alternator is unpacked do not cut the tie strips of the rotor to prevent it from sliding.

4.4 How to dispose of the packing materials

Please recycle the packing materials in accordance with the applicable regulations in the country where the alternator is installed.

4.5 Alternator Movement

Unpacked alternators must always be handled hooking the eyebolts to a lifting device.

For the weight of the alternator see paragraph 2.2

Caution

Lift the alternator to a height not exceeding 30 cm.

Do not add any other load. The eyebolts are only designed for the lifting of the alternator. Do not use the alternator eyebolts to lift the fully assembled machine.

Danger

Once it is coupled to the drive motor, to lift the alternator you must follow the instructions provided by the manufacturer of the fully assembled machine.

4.6 Storage

In case of storage, the alternators, be them packed or not, must be stored in a cool, dry place away from vibrations and never exposed to the elements.

The bearings require special maintenance but it is advisable to turn the shaft around once or twice a month to prevent contact corrosion and grease hardening; before startup, where regular lubrication is required, you must also lubricate it.

After being stored always check the insulation state.

Warning

The insulation test must be carried out by a qualified technician.

Warning

Before carrying out the test you must disconnect the voltage regulator.

If the result of the test is too low (less than 5 MΩ) you will have to dry the alternator by blowing 50-60 C° pressurized air into the air intakes and exhausts of the alternator.
Normally, alternator coming out of Mecc Alte always have insulation values above 500MΩ.

5 Installation instructions / coupling with driving engine

Warning

The final installer is in charge with assembling all the safeguards (disconnect switches, safeguards against direct and indirect contact, safeguards against overcurrent and overvoltage, emergency stop and so on) required to make the machine and the user system comply with the European and International Safety Regulations.

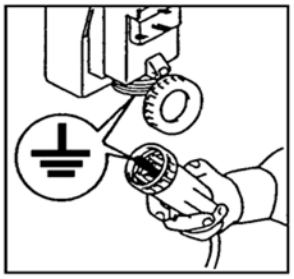
The installation and first startup operations of the fully assembled machine must be carried out by qualified personnel.

Danger

Working alternators are noisy (see paragraph 2.2). Install the alternator in insulated rooms and wear earmuffs to operate it.

5.1 Installation Setup

The alternator must be grounded before installation.Please ensure that the grounding system is effective and it complies with the directives of the country where the alternator will be installed.



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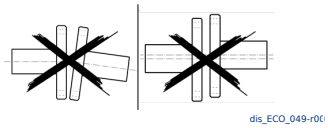
The alternator is designed and built to be installed in well-ventilated environments.

See paragraph 2.3

Danger

Install the alternator in a well-aired room. Insufficient ventilation may cause overheating and malfunctioning of the alternator.

Please ensure that the base of the alternator and of the drive motor is calculated so as to support the weight of all potential stresses caused by the operation.



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The installer is in charge with correctly coupling the alternator to the drive motor and all the other measures required to guarantee the correct operation of the alternator and to avoid anomalous stresses that might damage the alternator (such as vibrations, misalignments, various kinds of mechanical stresses).

5.2 Unpacking and disposal of packaging

Danger
Pay attention during all transportation and movement operations.

Danger
Do not stand under suspended loads.

Carefully remove the packing.

Please recycle the packing materials.

5.3 Mechanical coupling

The coupling of the alternator to the drive motor must be carried out by the end user. It is carried out at his sole discretion, but it must:

- Be realized in accordance with the safety regulations in force.
- Ensure the ideal operating conditions for the alternator (air temperature below 40 °C and air vents not blocked).
- Ensure easy access for its verification and maintenance.
- Be assembled on a strong base able to hold the total weight of the alternator and the drive motor.
- Observe the assembly tolerances.

Control the correct fastening of the discs to the alternator rotor.

See paragraph 8.6

Imprecise alignment may cause vibrations and damages to the bearings.

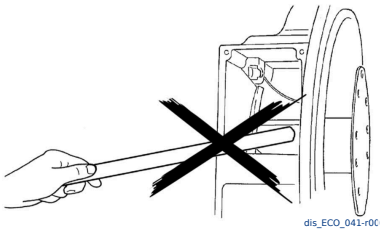
Moreover, it is advisable to check the compatibility of the torsional characteristics of the motor / alternator (to be carried out by the customer).

Please see the related technical documentation.

These values are calculated so as to prevent excessive shaft flexure. The load that may be supported by the bearings is statically and dynamically higher than the one supported by the shaft, however, the presence of excessive vibrations or adverse environmental conditions may reduce the bearing's life or lead to a lower maximum allowable load in proportion to the bearing's life.

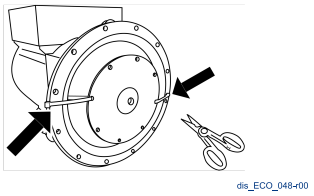
During the assembly and disassembly stages of the net, make sure you hold it in position with your hands so as to prevent the elastic net from hitting the operator or anyone else nearby.

In case of single-bearing alternators, during the drive motor coupling stage make sure the rotor does not slip out by keeping the alternator in a horizontal position. Remove the rotor fastening system, if present.



During the mechanical coupling procedures do not use the fan as a lever to turn the rotor.

5.3.1 Alternator Preparation



1. In case of single-bearing alternators remove the safety straps from the rotor. After this operation make sure the rotor does not slip out when handling it.
2. Remove the anti rust protective paint from the flange and, if it is a double-bearing alternator, also from the shaft.
3. In case the alternator was stored for more than one year, before startup lubricate the bearings again if they are not sealed (see paragraph 8.4.1).

5.3.2 Compensation for thermal expansion

The compensation of thermal expansion is particularly important for the single-bearing generators inasmuch as they are connected directly to the motor and a perfect alignment is essential so as to guarantee the intended useful life of the bearings. In case of double-bearing generators the importance of this aspect depends on the type of motor-generator coupling.
Operating temperatures have a significant impact on the alignment tolerances and must be taken into consideration. Because of them, actually, during the operation, the alternator shaft may be in a different position than its position when powered off.
A compensation of the alignment may therefore be required and it depends on the operating temperatures, on the coupling type, on the distance between the two machines and so on.
The two more important types of thermal expansion to take into consideration are:

- Vertical thermal expansion
- Axial thermal expansion

Vertical thermal expansion
This thermal expansion may cause variations of the radial tolerance value and it may be calculated using the following formula:

$$\Delta H = \alpha \times \Delta T \times H$$

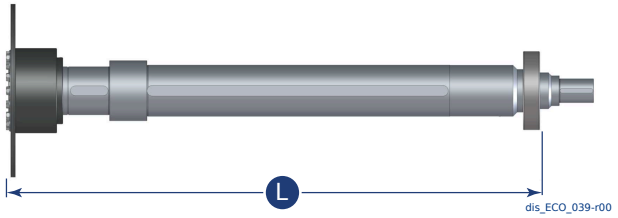
ΔH Variation of height.
α = Coefficient of thermal expansion (value $\alpha = 10 \times 10\text{-}6\ K\text{-}1$ may be used).
ΔT = Difference between the alignment temperature and the operating temperature.
H = Axle height.

Axial thermal expansion

The axial thermal expansion value may diminish the axial tolerance between the two shafts.
It is a very important value inasmuch as, when the whole system reaches a uniform temperature, a very narrow non-operating tolerance may lead to an axial force that may burden the bearings damaging them or causing them to break.
The following formula may be used to calculate it:

$$\Delta L = \alpha \times \Delta T \times L$$

ΔL = Variation of the shaft length.
α = Coefficient of thermal expansion (value $\alpha = 10 \times 10\text{-}6\ K\text{-}1$ may be used).
ΔT = Difference between the alignment temperature and the operating temperature.



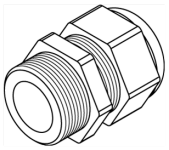
L = Shaft length, calculated between the bearing and the drive motor coupling discs.

The variation of the axial tolerance is calculated by relating the axial thermal expansion of the alternator to that of the motor.

6 Electrical connection

The operation must be carried out by an electrical maintenance technician.

The electrical connection shall be provided by the end user and it is carried out at his sole discretion



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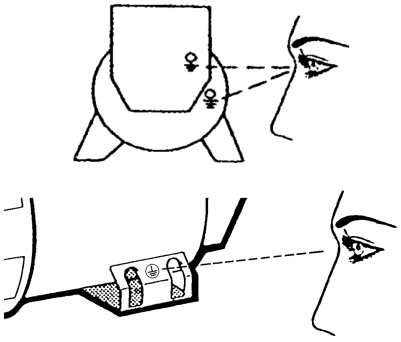
For the entry into the terminal box it is advisable to use cable glands and cable reliefs in compliance with the specifications of the user country.

The jumpers supplied with the TF series must be used in case of rewiring only where specified.

See "12 terminal connections" table in this chapter.



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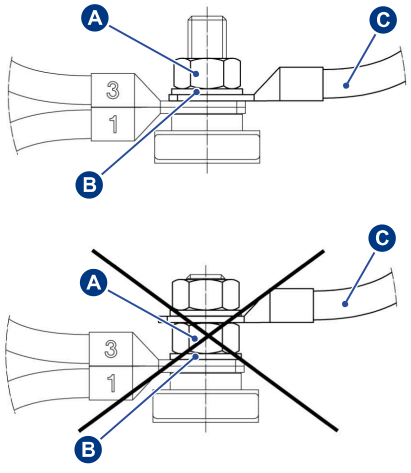
The alternators must always be grounded with a grounding conductor of an appropriate size. Use one of the two dedicated terminals (internal/external).



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For the electrical connection use adequate cables, sized on the basis of the alternator power. Make the connections to the terminals as shown in the figure.
A) Hexagon nut
B) Plain washer
C) User cable

Once the connection was made check the terminal tightening torques that must comply with the instructions given in chapter 8.6.

When the connection is finished reassemble the cover of the terminal box.

The user power cables must be wired and supported adequately so as not to cause mechanical stress on the terminal block of the alternator.

7 Initial start-up instructions

This paragraph only reports the instructions for the initial startup of the alternator. You may find further instructions in the manual of the fully assembled machine.

Warning

The startup, operation and stop maneuvers must be carried out by adequately qualified personnel who has read and understood the safety and technical specifications indicated in this manual.

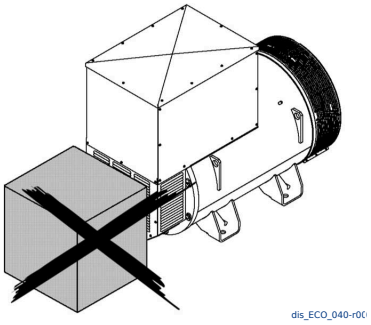
The tools for system startup, operation and stop shall be provided by the installer.

Check the alignment on the fully assembled machine.

- Check the fastening of the machine to the base with the related tightening torques and the robustness of the base.

Check the tightening torques of the terminal connections and their positioning. See paragraph 8.6.

Before the startup of the fully assembled machine you must make sure that:



- The cooling air intake and exhaust vents are always unobstructed. For the cooling air volumes required see paragraph 2.2.
- The intake side is away from heat sources. However, if not specifically agreed, the temperature of the cooling air must be equal to the room temperature and anyway lower than 40 °C. The alternator may operate at higher temperatures with an appropriate derating.

Before the start-up of the alternator, it is required to measure the winding insulation (which should be greater than 5MΩ (as per paragraph 4.6)

During the initial startup that must be carried out at lower speed, the installer will have to make sure there are no anomalous noises. In case of anomalous noises stop the system immediately and make adjustments to improve the mechanical coupling.

The rotors of the Mecc Alte alternators and the alternators themselves comply with the regulations (see paragraph 1.5). This means that the vibrations generated by the Mecc Alte alternators are very limited and compliant with the regulations.
Potential excessive vibrations are ascribable to the drive motor or to an erroneous motor-alternator coupling and they may cause damages or even breaks to the bearings.

The installer is responsible for following the regulations when assessing and measuring the vibrations on the fully assembled machine (see paragraph 1.5).

After the initial startup

After the initial startup of the fully assembled machine it is necessary to carry out the following verifications:

- Make sure everything works correctly.
- Monitor the vibration level and potential high temperatures of the windings and of the bearings.

In case the alternator, during operation, goes into protection mode for anomalous voltage, troubleshot the fault before initiating another startup.

See "Problems, causes and solutions" chapter 9.

8 Maintenance

8.1 General warnings

Warning

Before performing any maintenance, carefully read chapter 3 "Safety" of this manual.

Warning

The authorized operators are only allowed to carry out the works they are specifically qualified for on the alternator and wear the required PPE (personal protective equipment).

Warning

Always disconnect the alternator from power supplies before carrying out any maintenance and/or replacement operation.

Warning

The alternators, when working, release heat even to a high level based on the power being generated. Before touching it wait for the alternator to cool off.

Danger

It is forbidden to pass through or stand under the alternator during the lifting and transportation stages.

It is advisable for the maintenance technician to keep a register of all the interventions.

The TF series alternators are built to operate without maintenance for a long time.
The maintenance interventions on the Mecc Alte alternator are divided into ordinary and extraordinary.

8.2 Maintenance summary table

8.2.1 Ordinary maintenance summary table

Acronyms of the intervention types: E = Electrical; M = Mechanical

Type	Description	Periodicity	Reference
M	External and internal cleaning of the alternator	Every 15 days	8.3.6
M	General Cleaning	Every 400 hours	8.3.1
M	Visual Inspection	Every 2500 hours	8.3.2
M	Verification of winding state	Every 2500 hours	8.3.3
M	Verification of correct alternator operation	Every 2500 hours	8.3.4
M	Tightening torque check	Every 2500 hours	8.3.5

8.2.2 Extraordinary maintenance summary table

Acronyms of the intervention types: E = Electrical; M = Mechanical; S = Software

Type	Description	Periodicity	Reference
M	Maintenance of bearings and possible replacement	Every 4000 hours	8.4.1
E	Winding state and diode bridge fastening check	Every 8000 hours / 1 year	8.4.2
M	Cleaning of windings	Every 20000 to 25000 hours	8.4.4

8.2.3 Summary table of maintenance operations in case of failure

Acronyms of the intervention types: E = Electrical; M = Mechanical

Type	Description	Periodicity	Reference
E	Check and possible replacement of diode bridge	-	8.5.1
M	Mechanical disassembly for inspection	-	8.5.2
M	Mechanical assembly	-	8.5.3
E	Main stator windings voltage test	-	8.5.4

8.3 Routine maintenance

Ordinary maintenance means the set of operations that are carried out on a regular basis.
Their purpose is to maintain the alternator in good operational state.

Caution
Carry out ordinary maintenance with accuracy and as often as specified by the manufacturer.

8.3.1 General Cleaning

The intervention described in this paragraph refers only to the alternator, the frequency proposed must be adapted to the actual conditions and the frequency of use.

Danger
Disconnect the alternator from the power supplies. The drive motor must be off and unplugged from its power supplies.

Warning
Never use liquids or water.

Warning
Never clean the internal electrical components of the terminal box with pressurized air because short circuits or other malfunctions may occur.

Warning
Move close to the alternator only when it has zero power supply and it is at room temperature. It is only now that you may clean it on the outside with pressurized air.

Carry out general cleaning of the alternator and the surrounding area.
During the cleaning check the state and make sure that the various parts of the alternator are undamaged.
In case of anomalies or damages contact the maintenance technician for a potential intervention/replacement.

8.3.2 Visual Inspection

Type of intervention	Operator	Periodicity
		 Every 2500 hours.
PPE to wear		**Materials and equipments**
		Workshop tools.

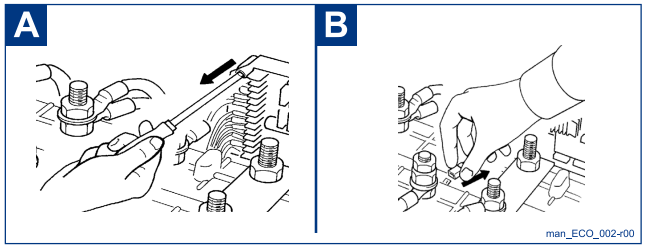
- Check for the presence of anomalies such as cracks, rust, leakages and any other anomalous event.
- Check the tightening of the power cables and of the regulator cables.
- Check the state of the insulations of the power cables and of the regulator cables (overtemperature, rubbing).

8.3.3 Verification of winding state

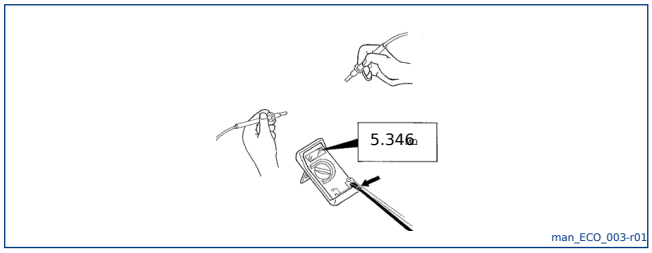
Type of intervention	Operator	Periodicity
		 Every 2500 hours.
PPE to wear		**Materials and equipments**
		"Megger" Tester or similar to 500V in continuous voltage.

Danger

Disconnect the alternator from the power supplies. The drive motor must be off and unplugged from its power supplies.



Before carrying out the verification disconnect the voltage regulator (fig. A), the radio interference filters (fig. B) and all the other potential devices electrically connected to the windings to check.



Measure insulation resistance to ground.
The measured value of resistance to ground of all the windings must be higher than 5MΩ.

If the value is lower than 5MΩ dry the windings with a jet of hot air at 50-60°C. Direct the jet of air into the air intakes and exhausts of the alternator.

8.3.4 Verification of correct alternator operation

Type of intervention	Operator	Periodicity
		 Every 2500 hours.
PPE to wear		**Materials and equipments**
		Workshop tools.

Check whether the alternator operates regularly without noises or anomalous vibrations.
In presence of noises and/or vibrations, check:

- The balancing of the rotor.
- The condition of the alternator bearings. Replace them if necessary (see par. 8.4.1).
- The alignment of the couplings.
- The potential presence of stresses in the heat engine.
- The potential presence of stresses in the anti-vibration supports.
- The functional data (see alternator nameplate par. 1.6).

8.3.5 Tightening torque check

Type of intervention	Operator	Periodicity
		 Every 2500 hours.
PPE to wear		**Materials and equipments**
		The torque wrench.

Danger

Disconnect the alternator from the power supplies. The drive motor must be off and unplugged from its power supplies.

- Check the tightening status of the bolts (see par. 8.6).
- Check the electrical connections.

8.3.6 External and internal cleaning of the alternator

Type of intervention	Operator	Periodicity
		Every 15 days

PPE to wear

Materials and equipments

- Industrial vacuum cleaner equipped with dust filter
- Antistatic brushes
- Compressed air (not to be used on the active parts of the wound components, according to the methods indicated below).

Method of intervention:
For cleaning the external and internal surfaces of the alternator, it is recommended to use industrial vacuum cleaners in order to avoid the movement of dust and any residues inside the slots of the windings, a condition that could compromise the levels of electrical insulation.

The use of compressed air to clean the windings and internal parts is not recommended because:
- It can push dirt into the winding slots, reducing the effectiveness of the electrical insulation;
- If it does not come from systems equipped with dryers (for example mobile compressors without water separators), it can contain condensation and introduce humidity into the electrical components, with the risk of contamination and reduction of insulation.

The use of compressed air should be avoided or limited exclusively to cleaning external surfaces, provided that:
- The air comes from systems equipped with a dryer and suitable filters;
- The pressure used is controlled to avoid mechanical damage to external components;
- It is not directed directly towards openings, slots or ventilation grilles, to avoid the entry of dust into the alternator and active components.

The use of any type of pressure washer and cleaning liquids near the alternator is absolutely prohibited. The standard protection level of the alternator is IP23 and therefore using liquids could cause anomalies or even short circuits.

The intervention periodicity indicated refers to critical environmental conditions. Adapt the periodicity based on the actual conditions of use.

8.4 Extraordinary maintenance

Caution

Carry out extraordinary maintenance with accuracy and as often as specified by the manufacturer.

Warning

All the maintenance intervals described below refer to a normal use of the alternator. In case it is used in more severe conditions (high humidity, temperature or dust) it is necessary to check it more often.

8.4.1 Maintenance of bearings and possible replacement

Type of intervention	Operator	Periodicity
		 Every 4000 hours
PPE to wear		**Materials and equipments**
		SKF LGMT2 or ENS or equivalent greases.

Danger

Disconnect the alternator from the power supplies. The drive motor must be off and unplugged from its power supplies.

- Check the state of the bearings.
- Lubricate the bearings if they are equipped with a lubricator.

Bearing lubrication table

Alternator	TYPE	Bearing type		Lubrication interval hours		Grease grams	
		Coupling side	Opposite coupling side	Coupling side	Opposite coupling side	C.S.	O.C.S.
T16F	Standard	6205-2RS	6203-2Z C3	- (*)	- (*)	-	-
T20F-P	Standard	6306-2RS	6205-2RS	- (*)	- (*)	-	-
T20FS-P	Standard	6306-2RS	6205-2RS	- (*)	- (*)	-	-
ET16F	Standard	6205-2RS	6203-2Z C3	- (*)	- (*)	-	-
ET20F-P	Standard	6306-2RS	6205-2RS	- (*)	- (*)	-	-

* Sealed bearings: it is not necessary any maintenance during their entire operating life; in normal working conditions the estimated life is about 30,000 hours.
** In normal working conditions the regreaseble bearings have an estimated life of about 40,000 hours.

For possible replacement, follow the instructions given in paragraph 8.5.2.

It is mandatory to verify, for all machines equipped with a grease nipple, that the required lubrication intervals are respected. In fact, re-greasable bearings need to work ONLY if suitably lubricated.

8.4.2 Check winding condition

Type of intervention	Operator	Periodicity
		 Every 8000 hours / 1 year
PPE to wear 		Materials and equipments Workshop tools.

Danger

Disconnect the alternator from the power supplies. The drive motor must be off and unplugged from its power supplies.

Remove the back grid of the alternator for visual inspection of the windings and to check the fastening of the diode bridge.
If the windings are dirty or oily clean them with pressurized air.
In case problems of other kind are detected you must disassemble the alternator to solve them.

8.4.3 Copy of the alarms of the digital regulator

Type of intervention	Operator	Periodicity
		 Every 8000 hours / 1 year
PPE to wear 		Materials and equipments Personal Computer + interface + dedicated software.

Danger

Disconnect the alternator from the power supplies. The drive motor must be off and unplugged from its power supplies.

Mecc Alte's digital regulator are equipped with a special connector that allows you to download the data related to the recorded alarms.
Download this data to check the potential presence of anomalies and, if any, solve them.

8.4.4 Cleaning of windings

Type of intervention	Operator	Periodicity
		Every 20000 to 25000 hours.
PPE to wear		Materials and equipments
		Cleaning tools

Danger

Disconnect the alternator from the power supplies. The drive motor must be off and unplugged from its power supplies.

Caution

If the system operates in a dusty environment, the cleaning operations must be carried out more frequently.

Cleaning must be carried out using adequate products.

Disassemble the alternator for general cleaning.

In such case it is advisable to replace the bearings for an optimization of the maintenance interventions for the entire group.

The windings must be cleaned using a low pressure jet of hot water at a temperature below 80 °C or using adequate highly-evaporable solvents suitable for the cleaning of electrical windings.

These solvents allow an adequate cleaning without damaging the insulation of the windings.

When the cleaning is finished it is advisable to check if there are any signs of overheating and potential traces of carbonizations.

After the drying process at approximately 60-80°C is finished you must check again the insulation resistance of the windings.

In case you notice a degradation of the winding paint, paint them again.

8.5 Maintenance in case of failure

8.5.1 Check and possible replacement of diode bridge

Type of intervention	Operator	Periodicity
		
PPE to wear		**Materials and equipments**
		Workshop tools.

Danger

Disconnect the alternator from the power supplies. The drive motor must be off and unplugged from its power supplies.

Alternators of the TF series are equipped with diodes.
Each individual diode can be easily checked with a multimeter set specifically for diode testing. Completely disconnect the cables and check each diode in both directions. In case of one or more failures, it is advisable to replace the entire diode. When reinstalling the diode, it is recommended to respect the polarity.
In order to simplify the access to the diode bridge we recommend to remove the main rotor (if the alternator is not coupled with the engine) or the non drive end bracket. In this last case it is sufficient to unscrew the stay bolts and use a special extractor to remove the bracket.

Necessary equipment :
A. 12V battery
B. 12V-21W lamp (or arternatively 6.8Ω - 30W resistance)
C. Voltmeter (for instance, multimeter on scale VOLT d.c)

before performing the following actions, it is necessaty to disconnect the 2 cables connecting the main rotor to the diode bridge (+ and -).

Test of the diodes on the “negative”
-) Connect the equipment, as it is pointed out in the picture A
-) Fix the cable connected to the lamp to the negative terminal of the bridge, as it is pointed out in the picture A
-) Connect the terminal “Probe” (Y) to the point A1, A2, and A3 in sequence to check the diodes 1,2 e 3 respectively; check the readings on the voltmeter in relation with what is reported on the table.

Test of the diodes on the “positive”
-) Connect the equipment, as it is pointed out in the picture B
-) Fix the cable connected to the negative terminal of the battery to the positive terminal of the bridge, as it is pointed out in the picture B
-) Connect the terminal “Probe” to the point A4, A5, and A6 in sequence to check the diodes 4,5 e 6 respectively; check the readings on the voltmeter in relation with what is reported on the table.

8.5.2 Mechanical disassembly for inspection

Type of intervention	Operator	Periodicity
		

PPE to wear	Materials and equipments
	Workshop tools.

Danger

Disconnect the alternator from the power supplies. The drive motor must be off and unplugged from its power supplies.

Summary Disassembly Procedure.

Front Cover	To remove the front cover gently tap with a rubber mallet.
Rotor	The rotor is extracted from the front side; in performing this operation care must be taken to ensure the rotor does not fall. During this operation you must be very careful not to damage the rotor windings.
Back cover	To dismantle the rear bracket, it must be secured to a suitable lifting system and an extractor must be used. With the extractor, the shaft must be pushed until the bearing comes out completely from its seat.
General Inspection	Examine every component (windings: exciter, auxiliary winding, stator and rotor) to check the presence of damages. Carefully check whether the crimp connectors are damaged.
Stator/Frame Inspection	• Carry out a visual inspection of the stator and of the frame. • Remove all dirt and dust. • Repair all potential damages to the windings. • Inspect the cable terminals and make sure they comply with the applicable regulations.
Shaft Inspection	Examine the shaft and the housings for the keys to check the presence of any sign of corrosion, burrs or wear. Clean them and, if necessary polish them. If the degree of wear of the shaft is too high, take it to a service center for repair or replacement.

Front/Back bearing disassembling

- The bearings must be removed using the appropriate extractors.
- The sizes of the bearings must be measured accurately to check the presence of excessive wear.
- In case of excessive wear or anomalous noises / vibrations, replace them.

Electrical Inspections

Check the cable terminals and make sure they guarantee good contact. Make sure there are no signs of corrosion and/or oxidation.

Check whether the cable sheath is undamaged. If there are damage signs, repair or replace the cable.

Using adequate tools, check the resistance, the continuity and the insulation of the following windings (see paragraph 8.5.4):

- Main Stator.
- Auxiliary Winding.
- Main rotor.
- Exciter Stator.
- Exciter Rotor.
- Thermal probes (if present).

Check whether the diodes and the varistor are damaged.

All the measurement tools must be calibrated.

Insulation checks

Check the insulation resistance of the following windings:

Main Stator:	• Between phases and between phases and ground. • Between phases and the auxiliary winding. • Between auxiliary winding and ground.
Main rotor and exciter rotor:	• Between winding and ground.
Exciter Stator:	• Between winding and ground.

See par. 8.5.4

The internal windings of the machine might need accurate cleaning. Use an appropriate solvent or hot water. Dry them and, if necessary, impregnate them again.

8.5.3 Mechanical assembly

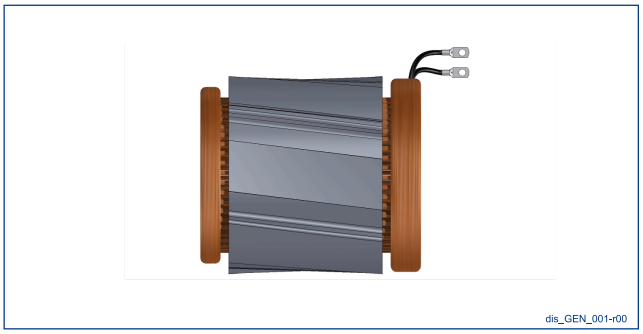
Reassembling bearings	Heat the bearings in an appropriate induction equipment. Insert them into the shaft by pushing them to the end stop against the shoulder. The heating temperature must not exceed the limit imposed by the manufacturer.
Rotor	Reassemble the rotor being very careful not to damage the windings.
Front Cover	To remove the front cover gently tap with a rubber hammer.
Back cover	During the assembling check the voltage of the exciter stator wires to avoid damaging them.
Fixing rod/bolts	To assemble the fixing rods and bolts use new washers and tighten them with the correct tightening torque. In case of double-bearing alternators, once assembled, turn them manually to check whether there are impediments and anomalous noises. In case of single-bearing alternators, this check must be carried out during the test, after the coupling with the drive motor.

8.5.4 Main stator windings voltage test

Type of intervention	Operator	Periodicity
		
PPE to wear		**Materials and equipments**
  		Electrical tools.

Use a multimeter to check all three phases (both L-L and L-N).
When off-load the voltage should be balanced on all three phases with a ± 1% tolerance.
If the voltage is unbalanced, this indicates a problem in the main winding of the stator.
If instead the voltage is balanced on the three phases, then the winding of the stator does not have problems.
If the voltage is lower than 15% of the nominal voltage, there might be a problem with the regulator, in the rotating diode bridge or in the exciter winding.

8.5.4.1 Resistance/Continuity Test

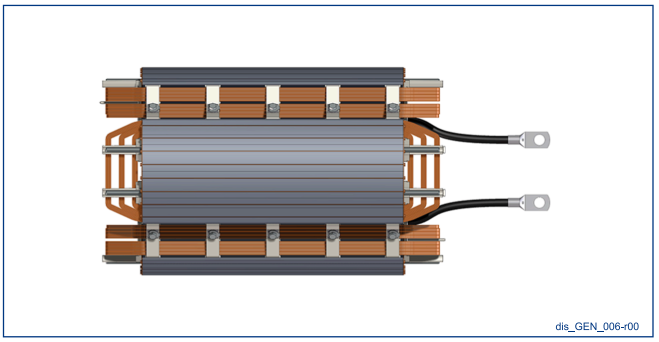


Main Stator

Use an appropriate tool to measure the phase resistance/continuity.

Also check the resistance/continuity of the auxiliary winding between the two red wires coming out of the main stator.

For the values see paragraph 2.2

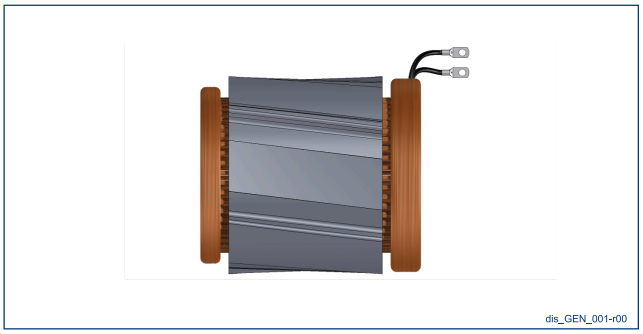


Main rotor

Measure the resistance/continuity of the main rotor using a multimeter.

For the values see paragraph 2.2

8.5.4.2 Insulation test



Main Stator

Completely disconnect the AVR and the connection between neutral and ground before performing this test.

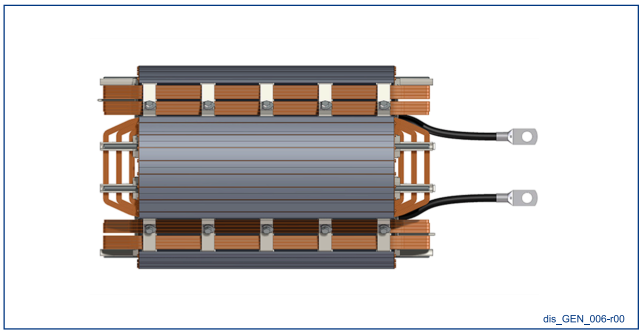
The measurement must be carried out using an insulation tester (Megger) of 500 V.

Check the insulation between phases, between phases and ground, between auxiliary and phases and between auxiliary and ground.

For these alternators, the minimum insulation value is of 5 MΩ.

If the measured insulation resistance is lower, the stator must be cleaned or impregnated and repainted with gray paint EG43, and then dried at 50-60 °C.

If after these operations the value remains low, the stator must be rewound or replaced.



Main rotor

The insulation resistance is measured between phase and ground using an insulation tester (Megger).

For these alternators, the minimum insulation value is of 5 MΩ.

If the insulation resistance is lower, the rotor must be cleaned and, if necessary, impregnated and then dried at 50-60 °C.

If after these operations the value remains low, the rotor must be rewound or replaced.

8.6 General tightening torques

T16F

Application	Screw type		Tightening torque [Nm] ± 7%	Replacement parts cat. reference
Front Cover	M8 x 35	CL. 8.8	21	9
Rear lid	3.5 x 9.5	CL. 8.8	2.8	-
IP2X protection of front cover	3.5 x 9.5	C.L. 8.8	3.3	-
Upper cover	M5 x 14	CL. 4.8	3.3	2
Panel	M5 x 14	CL. 4.8	5	-
Terminal block	M5 x 14	CL. 4.8	3	5
Frame ground	M5 x 10	CL. 4.8	3.3	-

T20F-P

Application	Screw type		Tightening torque [Nm] ± 7%	Replacement parts cat. reference
Front Cover	M8 x 35	CL. 8.8	21	1
IP2X protection front cover (excluding MD35)	3.5 x 9.5	CL. 4.8	3	-
IP2X protection front cover (only on MD35)	5.5 x 13	-	-	-
Back Grid	3.5 x 9.5	CL. 4.8	3	-
Upper cover	M4 x 14	CL. 10.9	3	20
Terminal block	M4 x 14	CL. 10.9	3	6
Cable fastening to terminal block	M5	–	5	-
Frame ground	M4 x 14	CL. 10.9	3	-
Brush	M4 x 14	CL. 10.9	3	8
Transformer panel	M4 x 14	CL. 10.9	3	-
Diode bridge on transformer panel	M5 x 20	CL. 4.8	3.5	-
Transformer on panel	M6 x 60	CL. 8.8	9	-

Flywheel

Application	Screw type		Tightening torque [Nm] ± 7%	Replacement parts cat. reference
Flywheel 6.5	M8 x 25	CL. 8.8	25	-
Flywheel 7.5	M8 x 25	CL. 8.8	25	-
Central tie rod	M8 - 5/16	-	21	22

Optional

Application	Screw type		Tightening torque [Nm] ± 7%	Replacement parts cat. reference
"Thermal probe terminal 50/60Hz transformation"	M4 x 14	CL. 10.9	3	-

T20FS-P

Application	Screw type		Tightening torque [Nm] ± 7%	Replacement parts cat. reference
Front Cover	M8 x 35	CL. 8.8	21	1
IP2X protection front cover (excluding MD35)	3.5 x 9.5	CL. 4.8	3	-
IP2X protection front cover (only on MD35)	5.5 x 13	-	-	-
Back Grid	3.5 x 9.5	CL. 4.8	3	-
Upper cover	M4 x 14	CL. 10.9	3	20
Terminal block	M4 x 14	CL. 10.9	3	6
Cable fastening to terminal block	M5	–	5	-
Frame ground	M4 x 14	CL. 10.9	3	-
Brush	M4 x 14	CL. 10.9	3	8
Transformer panel	M4 x 14	CL. 10.9	3	-
Diode bridge on transformer panel	M5 x 20	CL. 4.8	3.5	-
Transformer on panel	M6 x 60	CL. 8.8	9	-

Flywheel

Application	Screw type		Tightening torque [Nm] ± 7%	Replacement parts cat. reference
Flywheel 6.5	M8 x 25	CL. 8.8	25	-
Flywheel 7.5	M8 x 25	CL. 8.8	25	-
Central tie rod	M8 - 5/16	-	21	22

Optional

Application	Screw type		Tightening torque [Nm] ± 7%	Replacement parts cat. reference
"Thermal probe terminal 50/60Hz transformation"	M4 x 14	CL. 10.9	3	-

ET16F

Application	Screw type		Tightening torque [Nm] ± 7%	Replacement parts cat. reference
Front Cover	M8 x 35	CL. 8.8	21	9
Rear lid	3.5 x 9.5	CL. 8.8	2.8	-
IP2X protection of front cover	3.5 x 9.5	C.L. 8.8	3.3	-
Upper cover	M5 x 14	CL. 4.8	3.3	2
Panel	M5 x 14	CL. 4.8	5	-
Terminal block	M5 x 14	CL. 4.8	3	5
Frame ground	M5 x 10	CL. 4.8	3.3	-

ET20F-P

Application	Screw type		Tightening torque [Nm] ± 7%	Replacement parts cat. reference
Front Cover	M8 x 35	CL. 8.8	21	1
IP2X protection front cover (excluding MD35)	3.5 x 9.5	CL. 4.8	3	-
IP2X protection front cover (only on MD35)	5.5 x 13	-	-	-
Back Grid	3.5 x 9.5	CL. 4.8	3	-
Upper cover	M4 x 14	CL. 10.9	3	20
Terminal block	M4 x 14	CL. 10.9	3	6
Cable fastening to terminal block	M5	–	5	-
Frame ground	M4 x 14	CL. 10.9	3	-
ASR regulator	M4 x 25	CL. 10.9	3	24
Brush	M4 x 14	CL. 10.9	3	8

Flywheel

Application	Screw type		Tightening torque [Nm] ± 7%	Replacement parts cat. reference
Flywheel 6.5	M8 x 25	CL. 8.8	25	-
Flywheel 7.5	M8 x 25	CL. 8.8	25	-
Central tie rod	M8 - 5/16	-	21	22

Optional

Application	Screw type		Tightening torque [Nm] ± 7%	Replacement parts cat. reference
"Thermal probe terminal 50/60Hz transformation"	M4 x 14	CL. 10.9	3	-

9 Problems, causes and remedies

The alternator does not excite

Causes	Remedies
Low speed	Check speed and set at nominal value
Faulty condenser	Check and replace capacitor
Faulty windings	Check windings resistance
Blown fuse *	Replace the fuse *
Worn brushes *	Replace the brushes *
	For an instant apply on “1” and “ 2”of the electronic regulator a 12 V battery voltage with a 30 Ω resistor in series, respecting the polarities *

* Only ET16F, ET20F-P

The alternator, after excitation, de-excites *

Causes	Remedies
Incorrect or loose connections	Check connection cables as per attached drawings
Faulty regulator	Check and replace regulator

* Only ET16F, ET20F-P

Low no-load voltage

Causes	Remedies
Low speed	Check and adjust speed
Low capacity of condenser	Check and replace capacitor
Worn windings	Check windings resistance
Faulty rotary diodes	Check and replace diodes
Worn brushes *	Replace the brushes *
	Reset voltage potentiometer *

* Only ET16F, ET20F-P

Excessive no-load voltage

Causes	Remedies
Excessive speed	Check and adjust speed
High capacity of condenser	Check and replace capacitor
Faulty regulator *	Replace the regulator *
	Reset voltage potentiometer *

* Only ET16F, ET20F-P

Correct no-load voltage but low under load

Causes	Remedies
Low speed in loaded conditions	Check and adjust speed
Excessive load	Check and reduce load
Short-circuited rotary diodes	Check and replace diodes
Faulty regulator *	Replace the regulator *
Worn brushes *	Replace the brushes *
Current too high, power factor lower than 0.8, speed lower than 4% of rated speed *	

* Only ET16F, ET20F-P

Correct no-load voltage but high under load

Causes	Remedies
Excessive speed in loaded conditions	Check and adjust speed
Faulty regulator *	Replace the regulator *
	Reset voltage potentiometer *

* Only ET16F, ET20F-P

Unstable voltage

Causes	Remedies
Loose contacts	Check connections
Uneven rotation	Check for uniform rotation speed
	Adjust stability of the regulator by turning the "STAB" potentiometer *

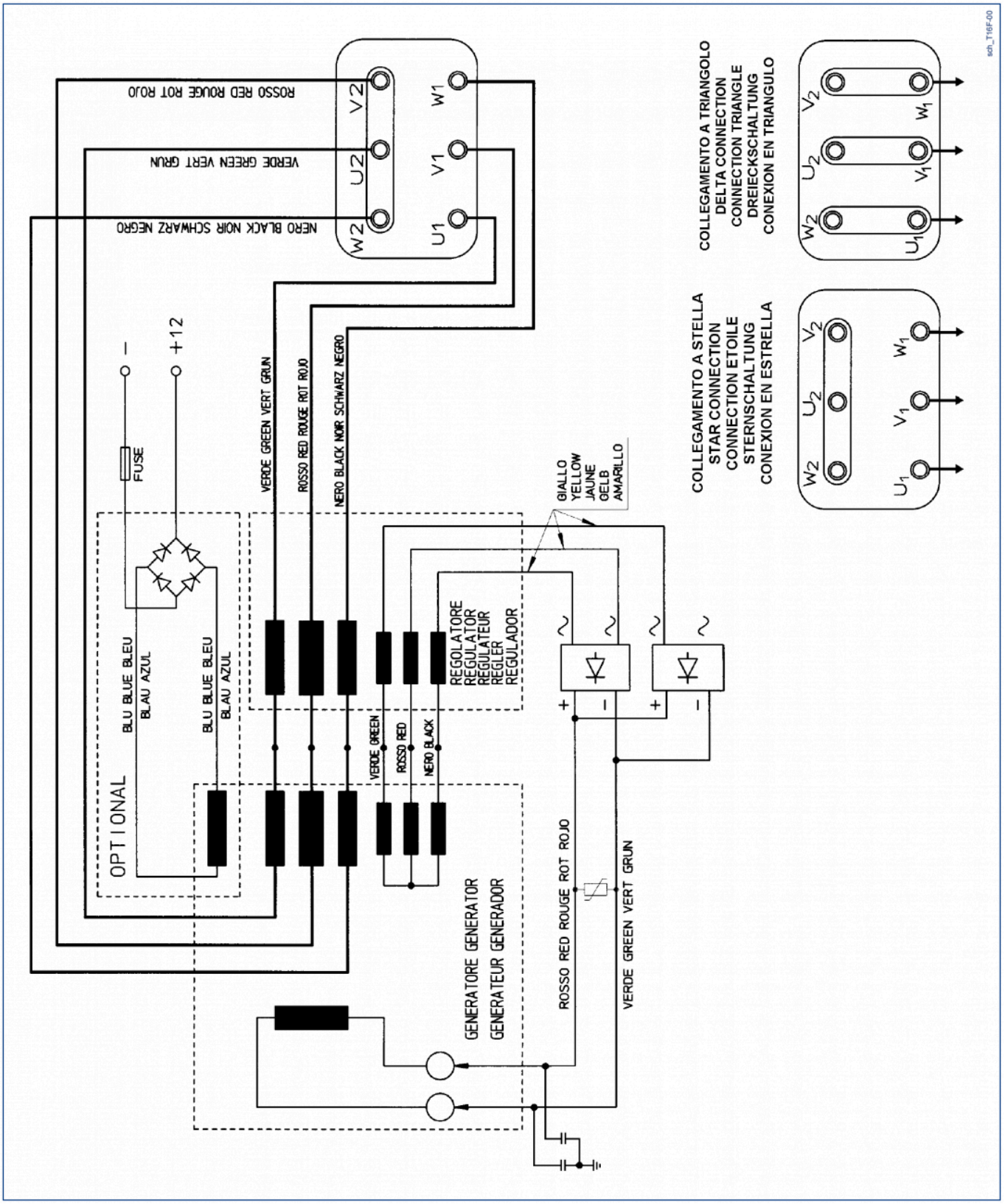
* Only ET16F, ET20F-P

The alternator is noisy

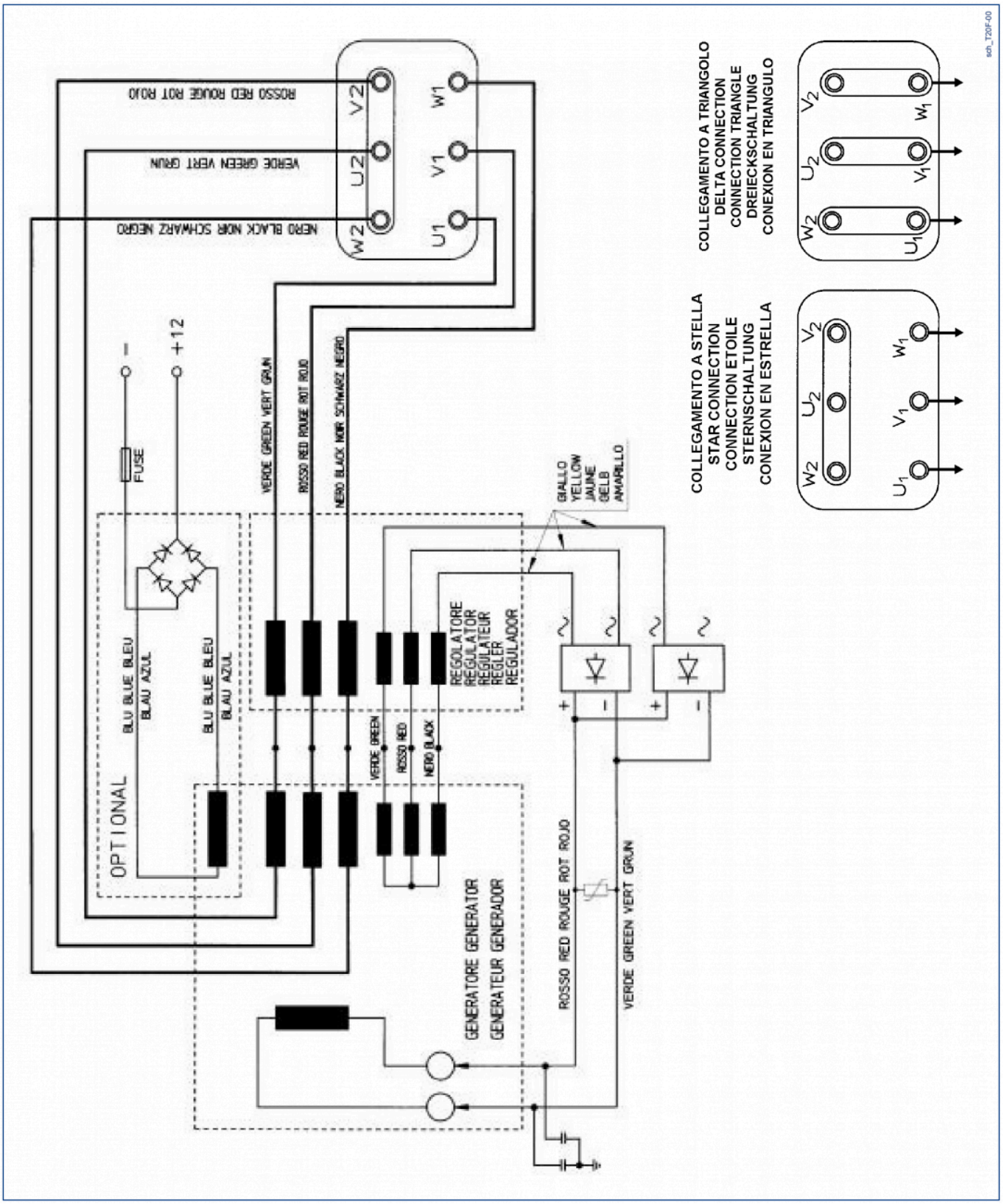
Causes	Remedies
Worn bearings	Replace bearings
Faulty coupling	Check and repair

10 Wiring diagrams

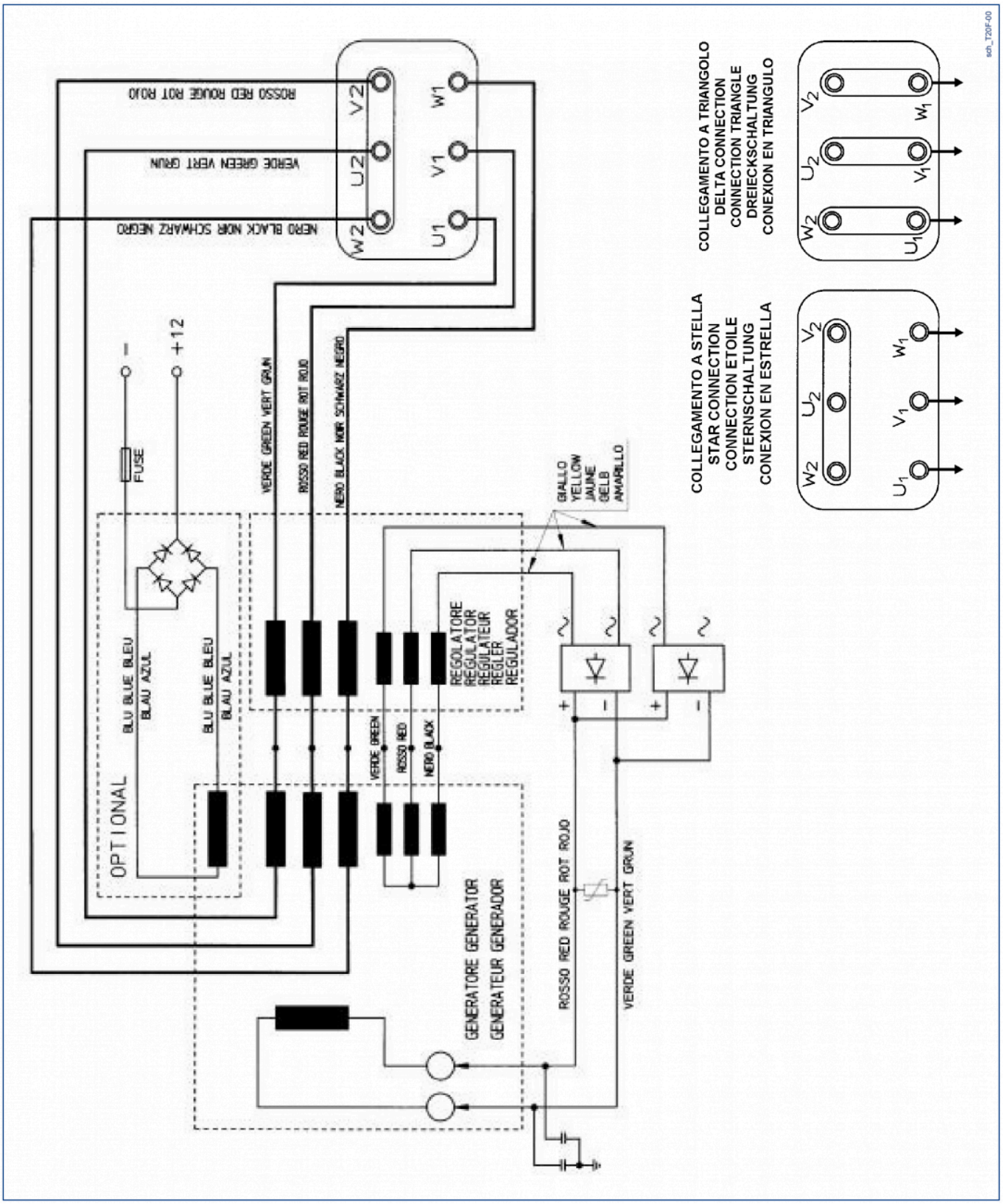
10.1 Wiring diagrams T16F



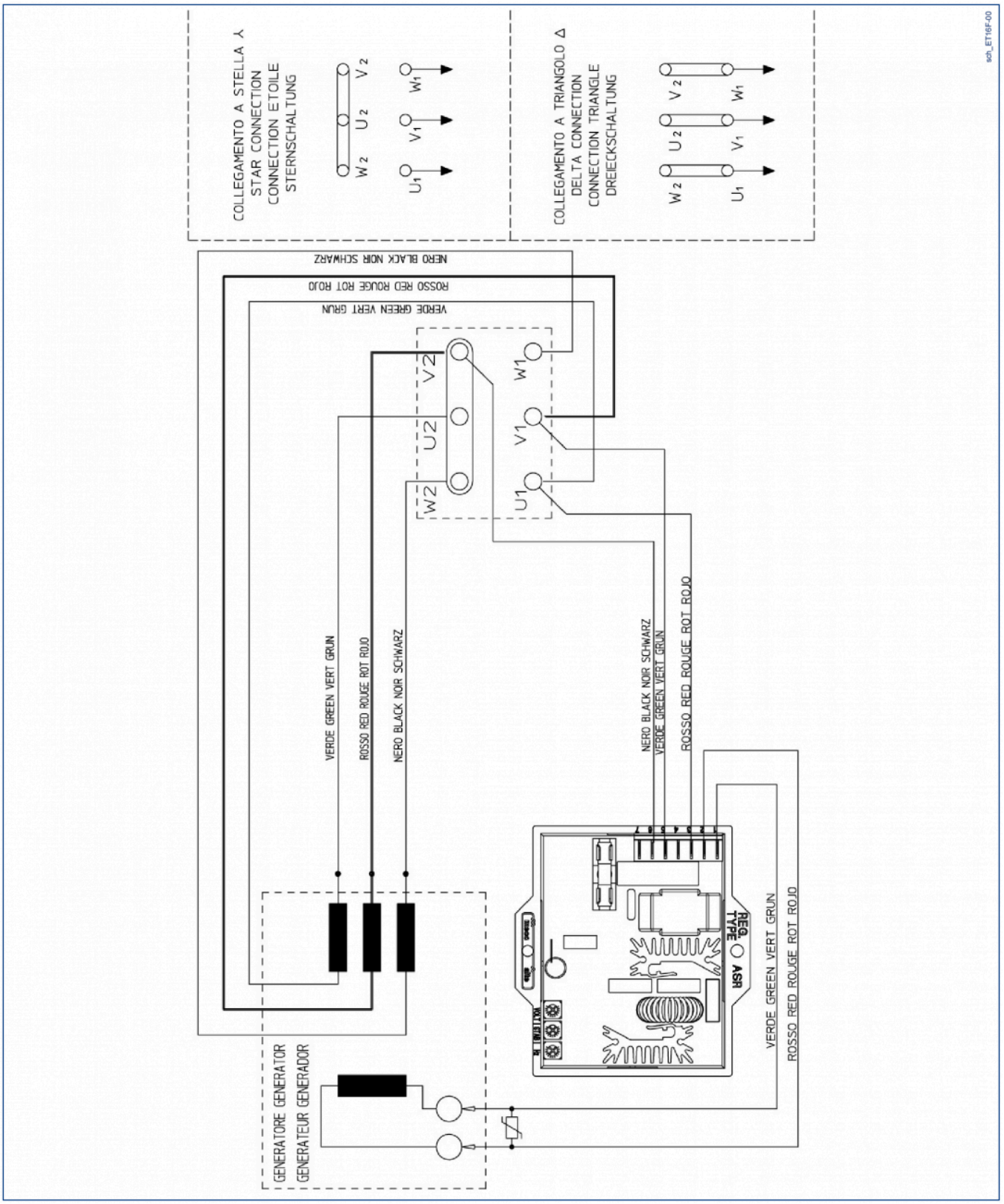
10.2 Wiring diagrams T20F-P



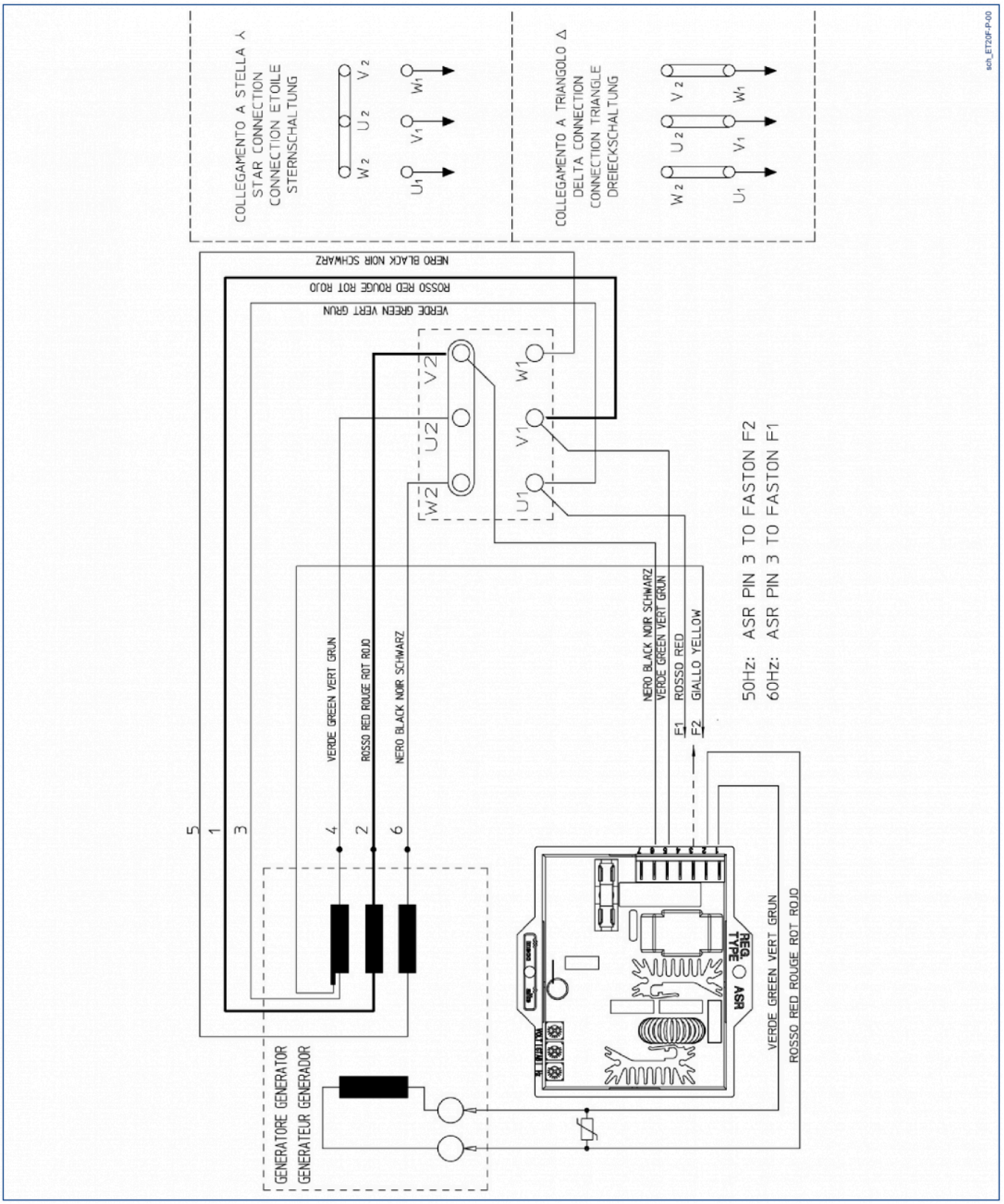
10.3 Wiring diagrams T20FS-P



10.4 Wiring diagrams ET16F

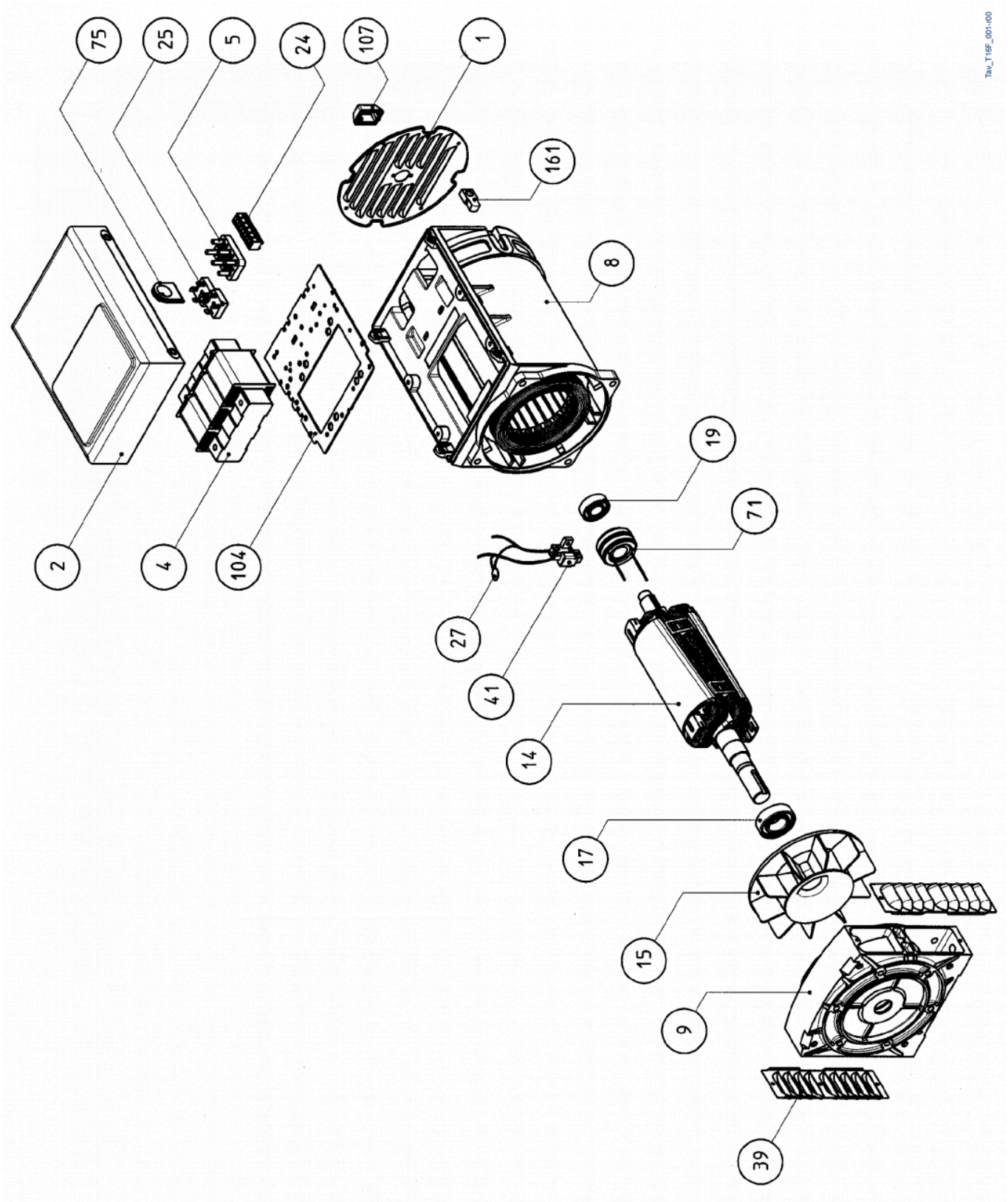


10.5 Wiring diagrams ET20F-P



11 Spare parts

T16F

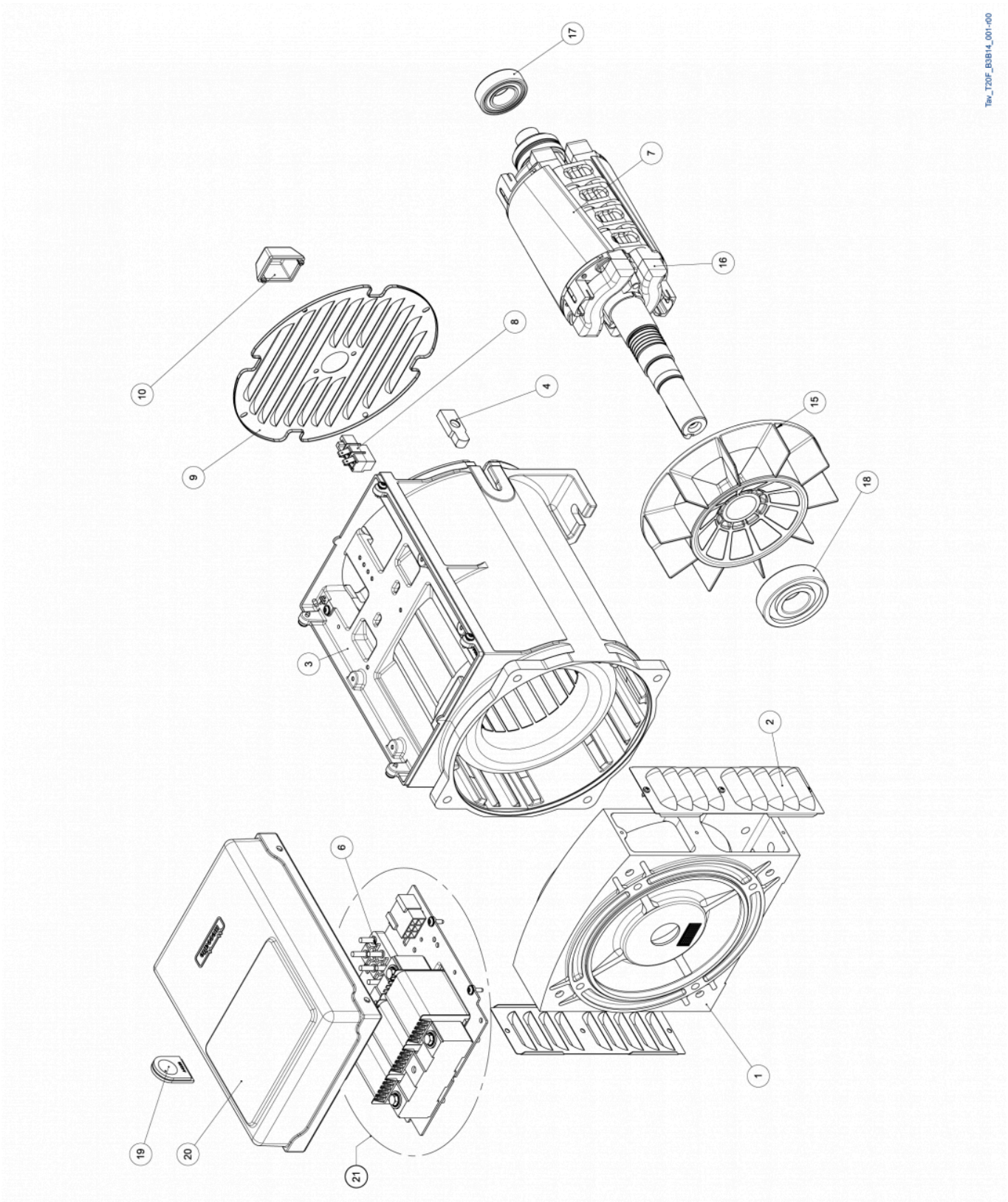


Spare parts list T16F

Item	Name	Item	Name
1	Back latch	24	Auxiliary terminal block
2	Terminal box lid	25	Single-phase rectifier bridge
4	Transformer	27	Varistor
5	Utilization terminal block	29	Securing stud
8	Housing with stator	39	Protection screen
9	Front cover B9	41	Complete brush assembly
9	Drive end bracket B14	71	Slip ring
14	Rotating Inductor	75	Cable gland rubber washer
15	Fan	104	Component holder panel
17	Front bearing 6205-2RS	107	Cap for rear cover
19	Rear bearing 6203-2Z C3	161	Rubber grommet

T20F-P / T20FS-P

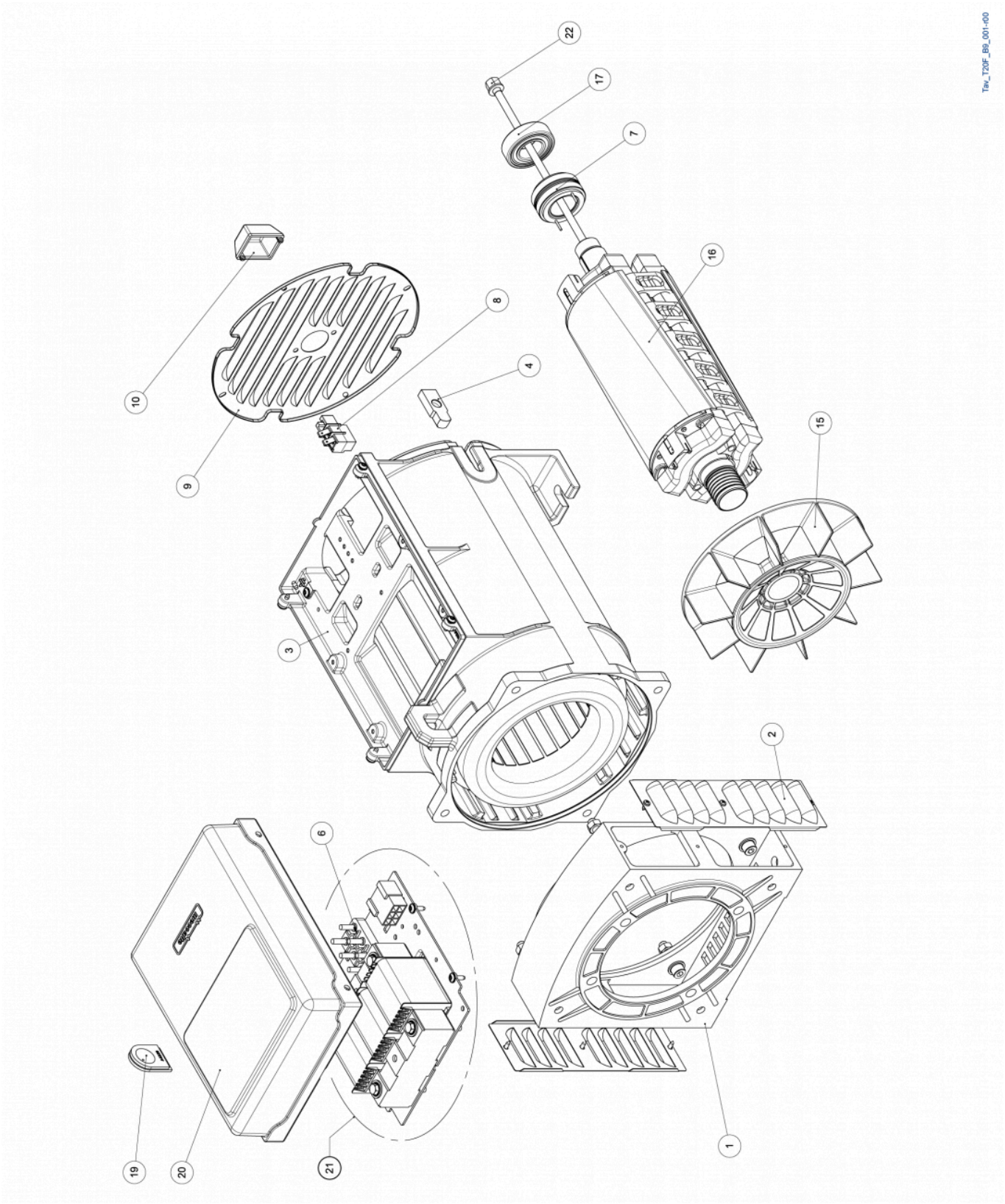
B3B14 (T20F-P / T20FS-P)



Spare parts list B3B14

Item	Name	Item	Name
1	Front Cover	10	Rear cover plug
2	Protection mesh	15	Plastic fan
3	Housing with stator	16	Rotating inductor
4	Rubber grommet	17	Rear bearing 6205/2RS
6	6-pin M5 terminal block	18	Front bearing 6306/2RS
7	Slip ring	19	Cable gland rubber washer
8	Brush assembly	20	Protective cover
9	Back latch	21	Transformer panel

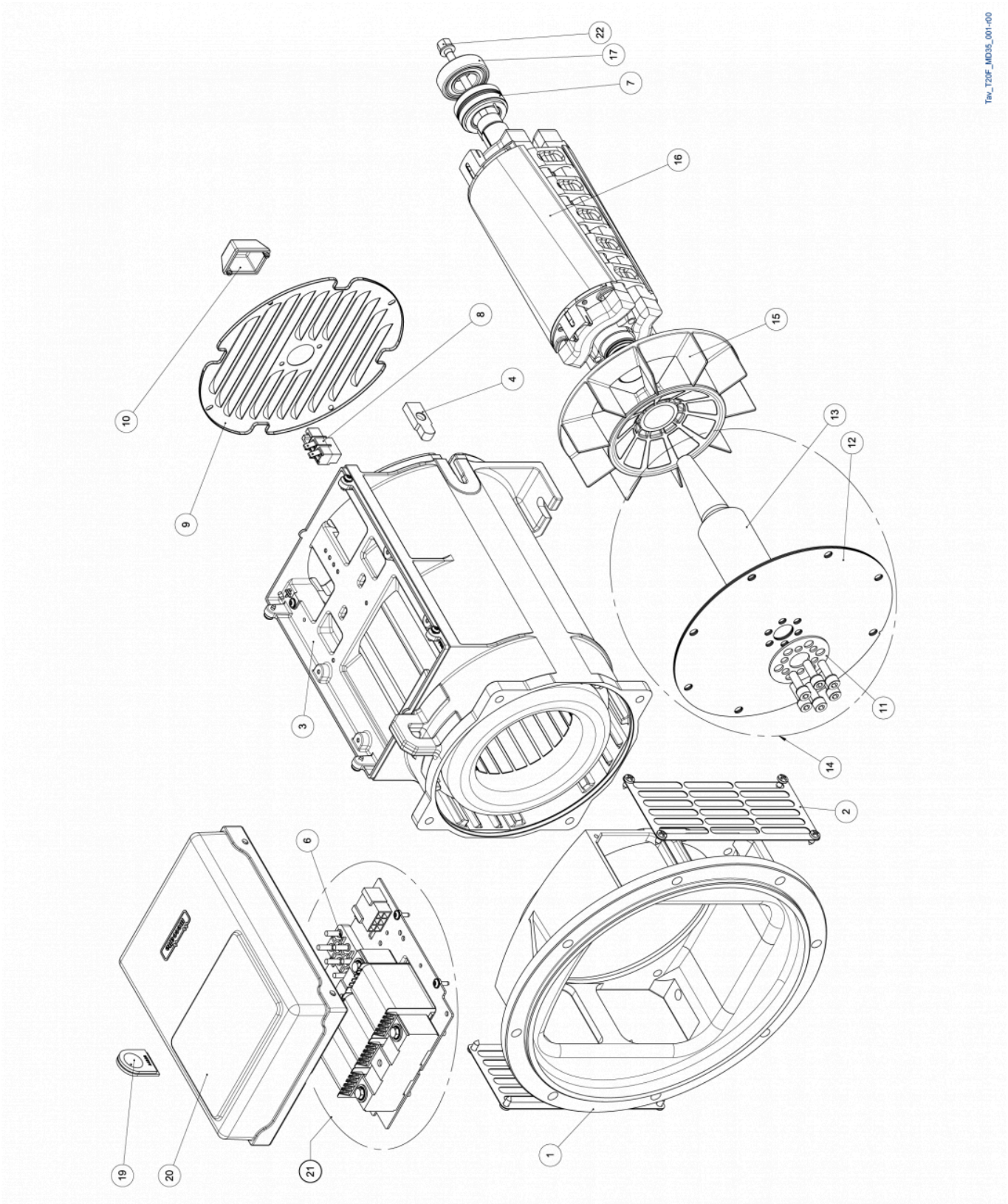
B9 (T20F-P / T20FS-P)



Spare parts list B9

Item	Name	Item	Name
1	Front Cover	10	Rear cover plug
2	Protection mesh	15	Plastic fan
3	Housing with stator	16	Rotating inductor
4	Rubber grommet	17	Rear bearing 6205/2RS
6	6-pin M5 terminal block	19	Rubber cable grommet
7	Slip ring	20	Terminal box lid
8	Brush assembly	21	Transformer panel
9	Rear closure	22	Central tie rod

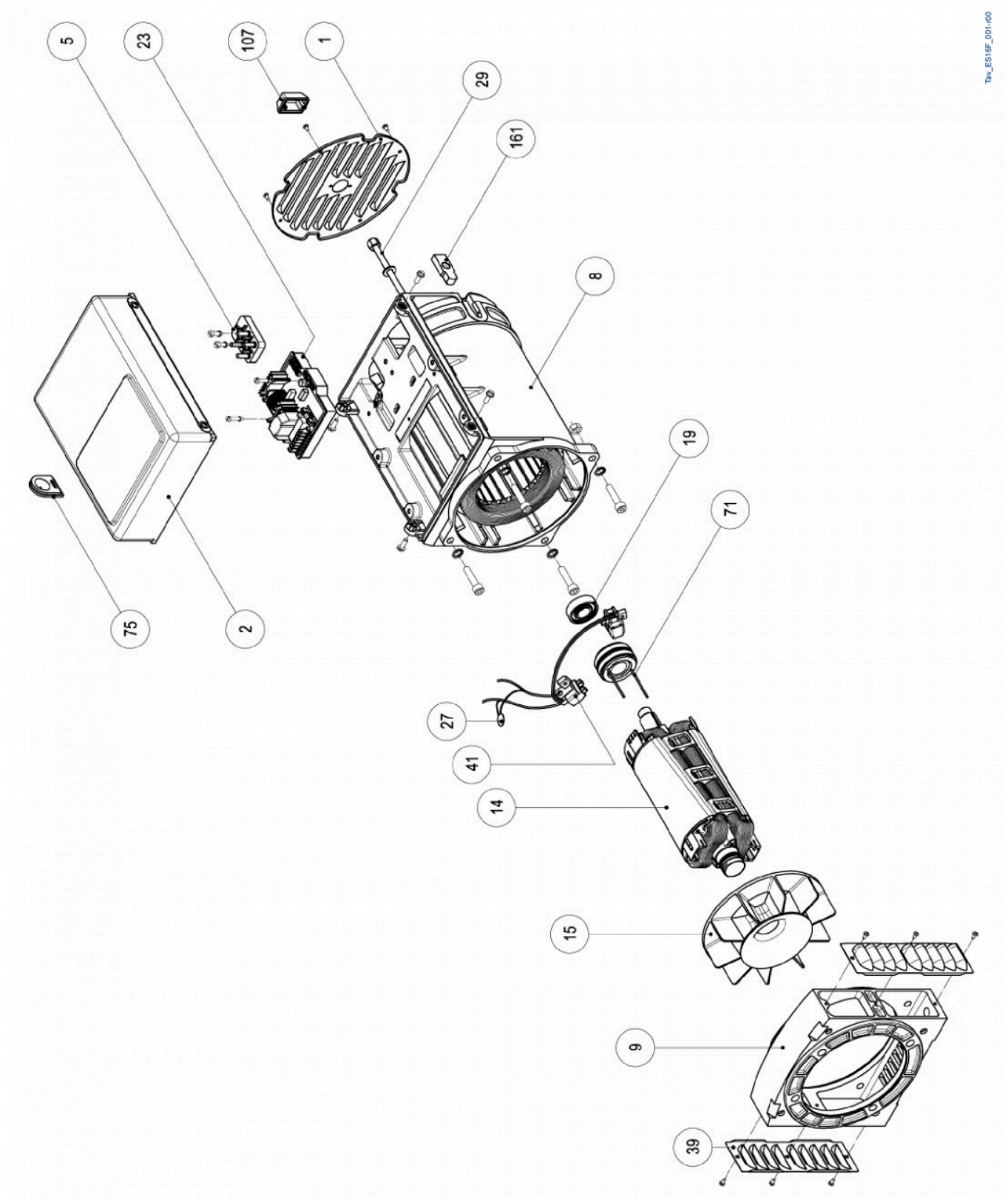
MD35 (T20F-P / T20FS-P)



Spare parts list MD35

Item	Name	Item	Name
1	Front Cover	12	SAE discs
2	Protection mesh	13	Conversion shaft
3	Housing with stator	14	SAE disc kit
4	Rubber grommet	15	Plastic fan
6	6-pin M5 terminal block	16	Rotating inductor
7	Slip ring	17	Rear bearing 6205/2RS
8	Brush assembly	19	Rubber cable grommet
9	Rear closure	20	Cover
10	Rear cover plug	21	Transformer panel
11	Disc blocking ring	22	Central tie rod

ET16F

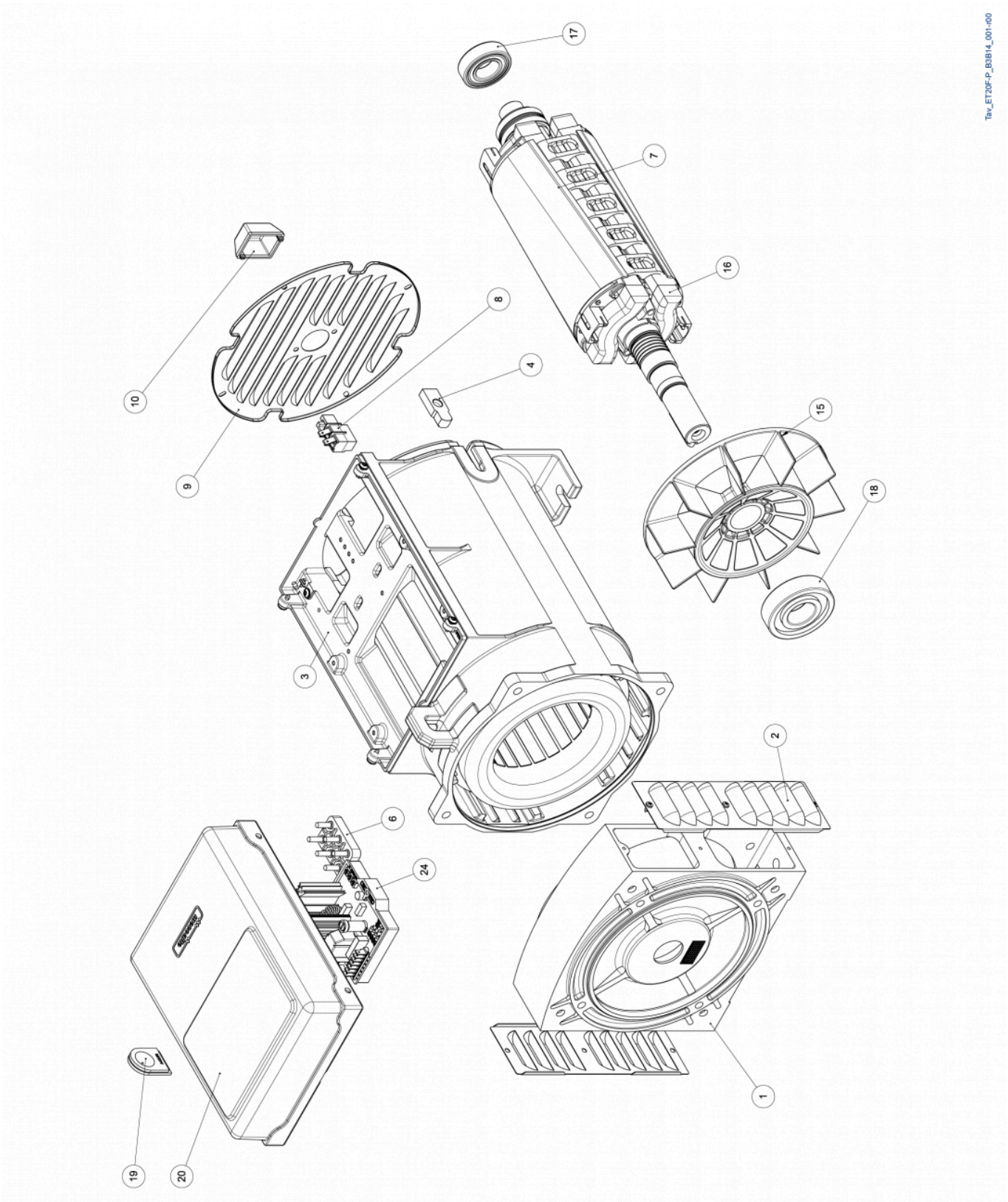


Spare parts list ET16F

Item	Name	Item	Name
1	Grid	23	ASR Electronic Regulator
2	Terminal box lid	27	Varistor
5	Utilization terminal block	29	Securing stud
8	Housing with stator	39	Protection screen
9	Front cover B9	41	Brush gear assembly ET/ES x ASR
9A	Drive end bracket B14	71	Slip ring 50x22x8
14	Rotating Inductor	75	Cable gland rubber washer
15	Fan	107	Grid rubber cap
17	Front bearing 6205-2RS	161	Rubber grommet
19	Rear bearing 6203-2Z C3		

ET20F-P

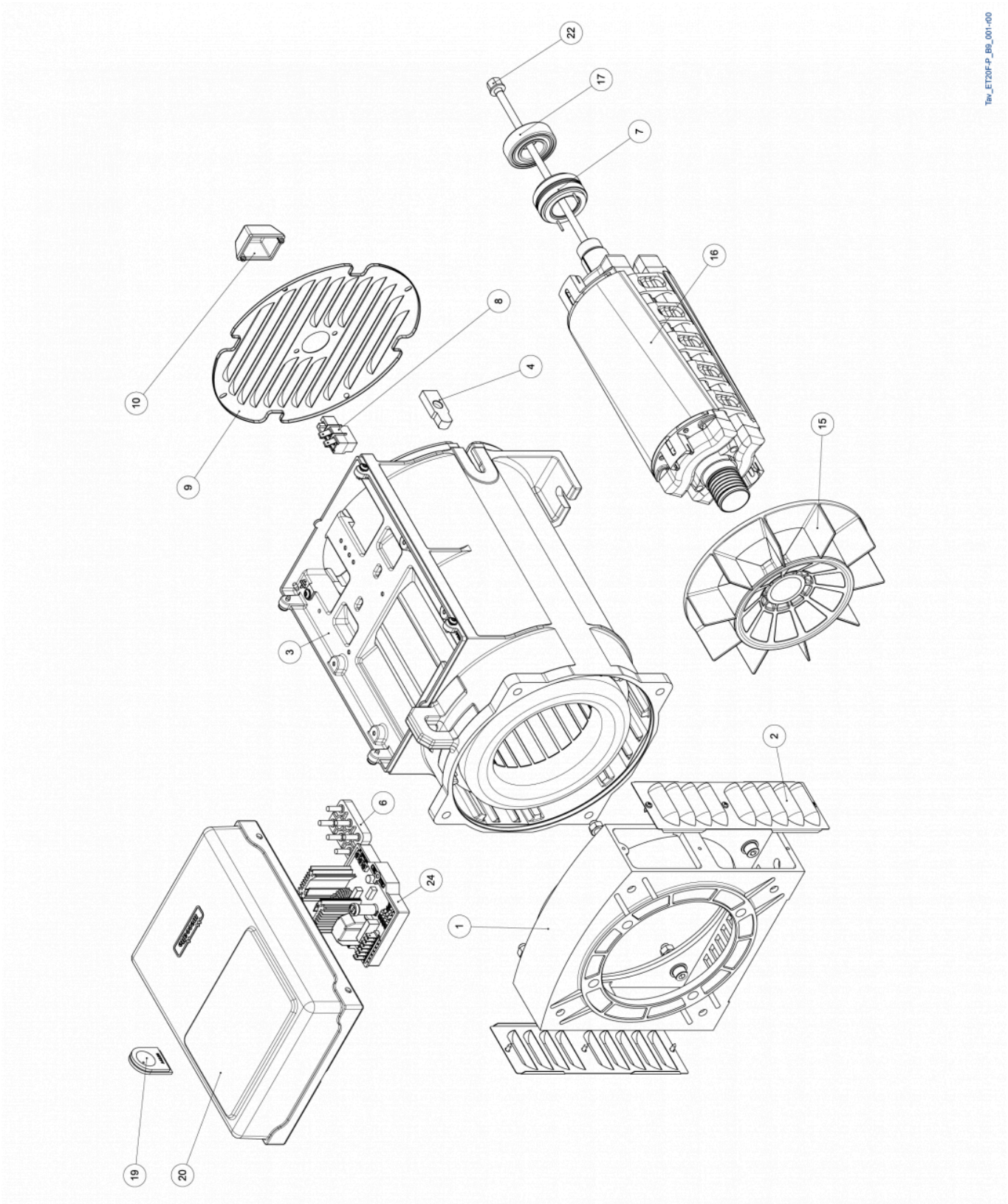
B3B14 (ET20F-P)



Spare parts list B3B14

Item	Name	Item	Name
1	Front Cover	10	Cap for rear cover
2	Protection mesh	15	Plastic fan
3	Housing with stator	16	Rotating Inductor
4	Rubber grommet	17	Rear bearing 6205/2RS
6	6-pin M5 terminal block	18	Front bearing 6306/2RS
7	Slip ring	19	Cable gland rubber washer
8	Brush holder group	20	Protective cover
9	Back latch	24	ASR Electronic Regulator

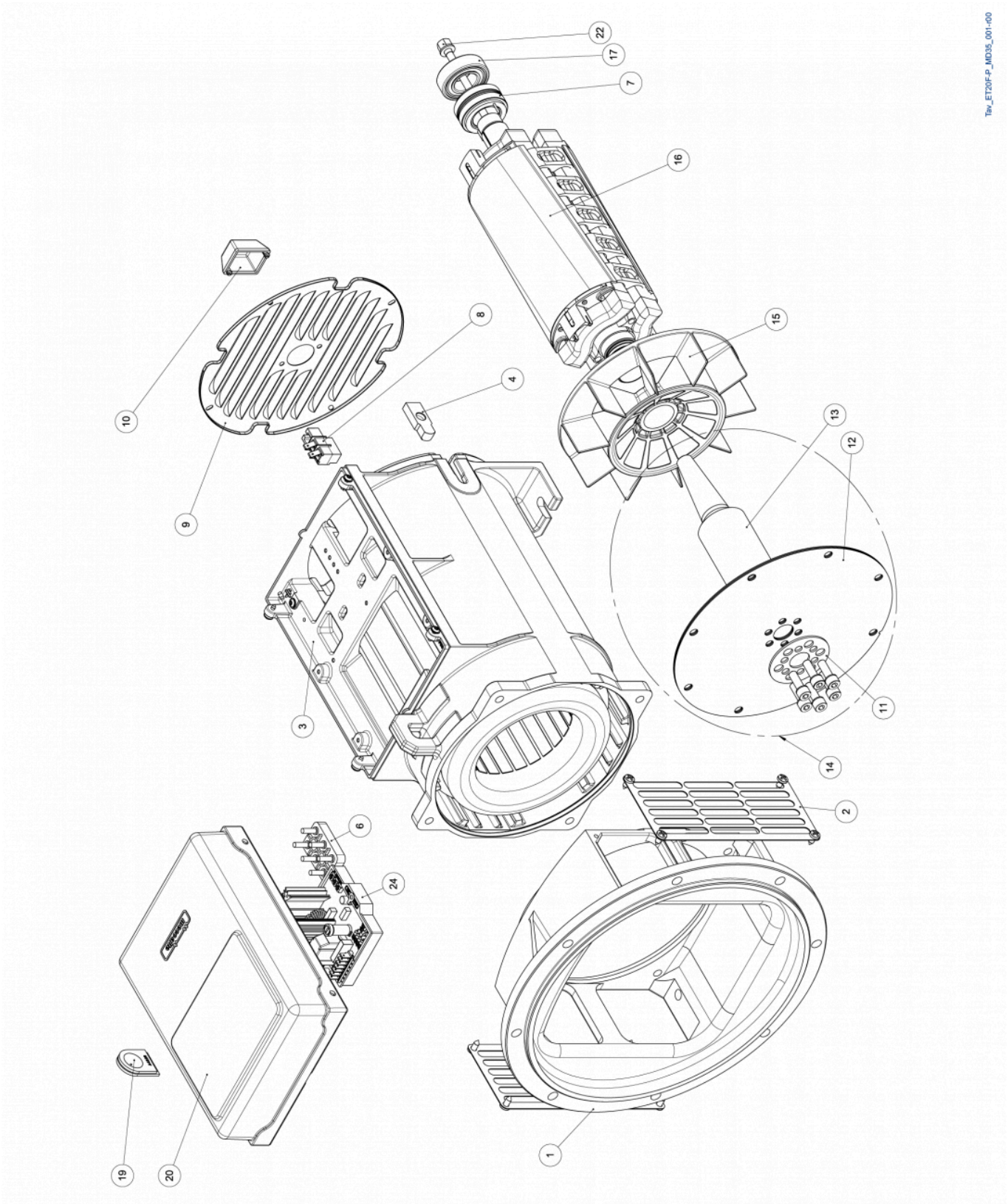
B9 (ET20F-P)



Spare parts list B9

Item	Name	Item	Name
1	Front Cover	10	Cap for rear cover
2	Protection mesh	15	Plastic fan
3	Housing with stator	16	Rotating Inductor
4	Rubber grommet	17	Rear bearing 6205/2RS
6	6-pin M5 terminal block	19	Cable gland rubber washer
7	Slip ring	20	Protective cover
8	Brush holder group	22	Securing stud
9	Back latch	24	ASR Electronic Regulator

MD35 (ET20F-P)



Spare parts list MD35

Item	Name	Item	Name
1	Front Cover	12	SAE discs
2	Protection mesh	13	Conversion shaft
3	Housing with stator	14	SAE disc kit
4	Rubber grommet	15	Plastic fan
6	6-pin M5 terminal block	16	Rotating Inductor
7	Slip ring	17	Rear bearing 6205/2RS
8	Brush holder group	19	Cable gland rubber washer
9	Back latch	20	Protective cover
10	Cap for rear cover	22	Securing stud
11	Disc blocking ring	24	ASR Electronic Regulator

12 Disassembly and disposal

To dispose of the alternator or its components you will have to recycle it, keeping in mind the nature of its various components (for instance: metals, plastic parts, rubber, oil and so on).
You will have to designate specialized companies for this purpose and , however, observe the waste management applicable laws.

Most of the materials used in the alternators can be recycled by specialized waste management companies. The instructions contained in this chapter are recommendations to follow for environmentally sound disposal; the user has the responsibility of observing local regulations.

For indicative percentages of the materials used in Mecc Alte alternators see paragraph 2.2.2.

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