ORION PLUS

THREE-PHASE VOLTAGE STABILISERS

USER MANUAL
MAT200 August 2021

Annexed:

DATA SHEET
SCHEMATICS
DIGITAL MULTIMETRE HANDBOOK

CONFORMITY DECLARATION

The Manufacturer,

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under its own responsibility and in the person of its Legal Representative

DECLARES

that the products:

3-PHASE VOLTAGE STABILISERS

identified with the name:

ORION PLUS (code SPxxxxxxxxxxxx)

provided that they are installed, maintained and used for the purpose for which they have been designed and built according to good professional practice and in conformity with the Manufacturer's instructions,

COMPLY

with the requirements contained in the CE EUROPEAN DIRECTIVES:

- **2014/30/EU** (**EMC DIRECTIVE**)
- **2014/35/EU** (**LOW VOLTAGE DIRECTIVE**)
- **2011/65/EU** (**ROHS RECAST**)

as complying with the relevant parts of the Harmonised Standards:

- **EN 61439-1** (LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES. PART 1: GENERAL RULES)
- **EN 61439-2** (LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES. PART 2: POWER SWITCHGEAR AND CONTROLGEAR ASSEMBLIES

The Manufacturer also

DECLARES

that the units are built with suitable quality components and that the manufacturing process is constantly verified in accordance with the Quality Control Plans which the Company applies in compliance with the **ISO9001:2015** Standard.
The Company's commitment towards environmental issues and safety at work matters is guaranteed by the certification of the Management System according to the ISO14001:2015 and **ISO45001:2018** Standards.

The General Sales Conditions, which include the warranty terms, can be downloaded either via the QR code or from the website www.next.ortea.com

1 INTRODUCTION

This Manual contains the information necessary to ensure correct operation of the unit, efficient maintenance program, avoidance of incorrect use and safety for the personnel involved with the unit performance. The voltage stabilisers described in this manual must be used exclusively for the purpose for which they have been designed and manufactured. Installation must be done according to the instructions provided with this handbook. Any other use has to be considered as inappropriate and therefore dangerous. The Manufacturer shall not to be held liable for any damage to people and belongings due to incorrect use or installation. In case of doubt and for any other necessity, please contact the nearest authorised Service Centre. This Manual is as an integral part to the unit and the instructions therein must be carefully followed. File this manual and all the attached documentation for further consultation in a place available and known to the user and the maintenance personnel and keep it for the entire life of the unit.

1.1 INFORMATION PROPERTY

This Manual (including any attached document) is covered by copyright and the Manufacturer maintains all the reserved rights. It is compulsory to inform the Manufacturer's Head Office and ask for authorisation before proceeding with any release or reproduction. The Manufacturer shall not be held liable or responsible in any way for unauthorised copies, alterations or additions to the text or to the illustrated parts of this document. Any modification involving company logo, certification symbols, names and official data is strictly forbidden.

In order to obtain better performance, the product described in the present handbook can be altered at any date and without prior notice.

1.2 REFERENCE NORMATIVE

The units described in this Manual are designed and built in compliance with:

- 2014/35/EU (Low Voltage European Directive)
- 2014/30/EU (Electromagnetic Compatibility European Directive)
- applicable parts of the EN61439-1/-2 (Low-voltage switchgear and controlgear assemblies) Harmonised Standard

Furthermore, the Manufacturer's Managing System is compliant and duly approved according to:

- ISO9001:2015 (Quality)
- ISO14001:2015 (Environmental issues)
- ISO45001:2018 (Health & Safety at work)

⚠ ***WARNING*** *INFORMATION AND INSTRUCTIONS PROVIDED BY THIS MANUAL ADD TO AND NEITHER REPLACE NOR AMEND ANY STANDARDS, REGULATIONS, DECREES, DIRECTIVES OR LAWS CONCERNING ENVIRONMENTAL AND SAFETY AT WORK AWARENESS ENFORCED BOTH INTERNATIONALLY AND IN THE COUNTRY OF INSTALLATION.*

1.3 DEFINITIONS

⚠ ***WARNING*** *MESSAGE RELEVANT TO POTENTIALLY HAZARDOUS SITUATIONS WHICH MIGHT INDUCE MINOR INJURIES IF IGNORED OR NEGLECTED. THE SAME SIGNAL CAN BE USED TO HIGHLIGHT HAZARDS WHICH MIGHT CAUSE DAMAGE TO THE UNIT OR TO POINT OUT IMPORTANT INFORMATION.*

⚠ ***DANGER*** ***MESSAGE RELEVANT TO POSSIBLE OR PROBABLE HAZARDOUS SITUATIONS WHICH MIGHT INDUCE SERIOUS OR EVEN FATAL HARM IF IGNORED OR NEGLECTED.***

Note *Additional information to better understand the unit operation.*

2 ENVIRONMENTAL NOTES

Note *Units weighing more than 2000kg do not enter the scope of the 2012/19/EU WEEE Directive (Waste of Electric and Electronic Equipment) as they can be identified as large fixed industrial equipment. Nevertheless, although they do not bear the relevant symbol on their nameplates, it is recommendable to follow the Directive's guidelines concerning a responsible disposal at the end of their working life.*

With reference to the 2012/19/EU WEEE Directive (Waste of electric and electronic equipment), please be aware that the products described in this manual have been produced after August 13th 2015. When applicable, the WEEE symbol (beside) on the product label and / or accompanying documents means that used electrical and electronic equipment must not be mixed with general household or municipal waste. At the end of their useful life, these products must be disposed of via suitable channels. Please refer to the current legislation in force in the Country of installation.

Professional users in the European Union must contact their dealer or supplier for further information.

The symbol is only valid in the European Union (EU). For disposal in countries outside of the European Union please contact the local authorities or dealer and ask for the correct method of disposal.

Disposing of this product correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

The product does not contain CFCs, HCFCs, asbestos, fuel, PCB, PCT, liquids or gaseous substances. Please recycle the packaging materials (cardboard and/or wood). At the end of the service, before disposing of the unit, remove the nameplate and make the appliance unusable by cutting the internal connections.

3 HEALTH & SAFETY

3.1 NOTES FOR THE OPERATOR

⚠ ***DANGER*** ***THE VOLTAGE INSIDE THE EQUIPMENT IS DANGEROUS. ACCESS TO THE COMPONENTS FOR INSTALLATION, SETTING, INSPECTION AND MAINTENANCE MUST BE GRANTED ONLY TO QUALIFIED PERSONNEL IN CHARGE OF IT AND INFORMED OF THE RELEVANT RISKS. BEFORE STARTING ANY OPERATION, DISCONNECT THE UNIT FROM THE MAINS.***

The following safety general instructions are based on experience and common sense, but cannot describe or foresee all the possible situations. Basic safety procedures must be continuously applied and known by whoever operates on the unit. In order to ensure full knowledge of properties and characteristics of the unit, this Manual must be read and comprehended by those who supervise, maintain and run the unit.

- Check that the unit is always properly earthed.
- Warn anybody who might be in the vicinity before energizing the unit.
- Always operate in good lighting.
- Do not allow unauthorized personnel to operate on the unit for no reason whatsoever.
- Always use suitable safety means such as isolating tools and footboards, isolating gloves, etc.
- NEVER operate the unit without the provided protections against accidental contact, unless specifically indicated in the maintenance instructions in this Manual. However, controls and maintenance routines that require the protections to be removed shall be under the User's full responsibility.
- Do not climb on top of the enclosure.
- Do not accumulate goods around or above the enclosure.

The unit is housed in an enclosure with screwed in panels. In normal working conditions, the unit must operate only when the enclosure is completely closed and cannot be accessed without opening the cubicle with specific means. The protection against direct contact is therefore inherently obtained. Any anomaly or alarm indication must be promptly signaled.

3.2 NOTES FOR MAINTENANCE

⚠ ***DANGER*** ***BEFORE ANY MAINTENANCE OR REPAIRING ROUTINE, DISCONNECT THE UNIT BY OPENING THE UPSTREAM GENERAL BREAKER AND LOCK IT WITH A PADLOCK, THE KEYS OF WHICH MUST BE KEPT BY THE MAINTENANCE SUPERVISOR UNTIL THE END OF THE PROCEDURE.***

- Do not perform maintenance while the unit is working. Only setting or checking operations through the provided instrumentation are allowed.
- Whenever possible, do not use hands instead of suitable tools to work on the unit.
- Do not use bars, cables, plates or internal components as support or handhold.
- Check that mechanical and electrical connections are properly tightened at the end of the maintenance routine.
- Do not remove, alter or damage nameplates, warnings of any identification tags or labels.
- Before re-energising, always restore the protection that might have been removed for maintenance.

In case of doubts on the operational features or on the necessary maintenance procedures, please contact the Manufacturer or an authorised Service Centre.

Tampering on the unit relieves the Manufacturer from any responsibilities and makes the User solely responsible towards the competent bodies concerning accident prevention. The Manufacturer disclaims all responsibility for:

- failure to follow the specified instructions
- modification (even slight) performed on the unit resulting in altering its operational features
- failure to comply with the health and safety at work measures
- use of not original spare parts (unless specifically authorized by the Manufacturer)

During maintenance and repairing procedures, the enclosure is likely to be open. Consequently, some residual dangers persist, due to the impossibility of eliminating the sources as implicit in the working procedures.

DANGER	INDICATIONS
CRUSHING	Handling the unit must be done exclusively by means of the tools described in the relevant chapter. Handling and lifting operations must be carried out by skilled and trained personnel only.
ELECTROCUTION	During normal working operation, the danger does not exist. Carry out maintenance routines only after having disconnected the unit. Should it be necessary to test an energized unit, segregate the area so that only skilled personnel can operate, still in compliance with all the health and safety requirements set forth by the Rules and Regulations enforced in the Country of installation.
FIRE	Open the upstream interrupting device and use CO_2 fire extinguishers. Do not use water to extinguish fire.
HUMAN ERROR	Installation, start-up, setting, inspection, maintenance and repairing operations must be carried out by skilled, qualified and authorized personnel only, informed of the relevant risks. Read this Manual carefully and thoroughly before operating on the unit. Altering its configuration or replacing one or more of its parts without the Manufacturer's authorization is strictly forbidden.
FAILURE TO CARRY OUT MAINTENANCE	Carry out the maintenance routine as prescribed in this Manual. The Manufacturer shall not be held liable in any way for damage to people and belongings caused by failure in performing maintenance on the unit.
LACK OF INFORMATION	While carrying out the maintenance routine, ensure that the unit cannot be energised without the maintainer's awareness. To this purpose, padlock the upstream interrupting device and affix warning signs.

3.3 BEHAVIOUR

The personnel dealing with the unit shall operate strictly in conformity with the requirements set forth by the health and safety at work Rules and Regulations enforced in the Country of installation. Provided that everything is carried out according

to the instructions in this Manual, the unit is designed in order to work and be maintained without risks for people or the environment. The voltage stabiliser is an automatic equipment that does not require maneuvering or command drives. However, personnel dealing with it must be aware of its characteristics, functioning features, signals and alarm indications, maintenance routines and troubleshooting procedures. The full comprehension of this Manual is therefore critical.

⚠ ***DANGER*** *TAMPERING AND/OR UNAUTHORISED REPLACEMENT OF ONE OR MORE COMPONENTS, USING ACCESSORIES, TOOLS OR MATERIAL NOT RECOMMENDED AND/OR NOT APPROVED BY THE MANUFACTURER MIGHT BE DANGEROUS AND CAUSE ACCIDENTS. SAID ACTIONS RELIEVE THE MANUFACTURER FROM ANY CIVIL AND/OR PENAL RESPONSIBILITIES.*

3.3.1 Correct behaviour

The User is protected against the risks related to the unit operation. The correct use allows for fully and safely exploiting its performance and can be obtained by:

- following the instructions provided by this use and maintenance Manual
- paying attention to the provided warnings and danger indications
- respecting the recommended maintenance frequency and keeping a record of the performed interventions
- disconnecting the unit in case of inspection, maintenance or repairing routines
- using suitable PPEs (Personal Protective Equipment) when dealing with the unit
- promptly informing the supervisor about operating anomalies (suspected malfunctioning, incorrect operation or failure; excessive noise; etc.) and if necessary putting the unit out of order.

3.3.2 Incorrect behaviour

Any use that contrasts with what stated above and any of the operations listed below can be defined as 'incorrect':

- arbitrary alteration of the working parameters. In case changes are required, please contact the Manufacturer or an authorized Service Centre
- use of improper of unsuitable energy sources
- unit operated by insufficiently trained personnel
- failure to comply with the maintenance instructions or incorrect maintenance
- use of unsuitable or unauthorized not original spare parts
- alteration of the safety devices and/or unit tampering
- performance of inspection, maintenance or repairing routines without disconnecting the unit

⚠ ***WARNING*** *THE MANUFACTURER SHALL NOT BE HELD LIABLE DUE TO ANY DAMAGE TO PEOPLE AND BELONGINGS ARISING FROM INCORRECT USE AS ABOVE DEFINED.*

The microprocessor-based control system detects data and anomalies, generating several alarms displayed by means of the LEDs on the external control panel. The alarms are generally accompanied by an acoustic signal.

⚠ ***WARNING*** *EXCLUDING OR BYPASSING IN ANY WAY THE ALARMS IS STRICTLY FORBIDDEN. THE MANUFACTURER DISCLAIMS ALL RESPONSIBILITY ON THE UNIT SAFETY IN CASE OF FAILURE TO RESPECT SAID BAN.*

3.4 PERSONAL PROTECTIVE EQUIPMENT (PPE)

While dealing with the unit, the user must have and use suitable PPEs, in conformity with the safety requirements enforced in the Country of installation and with the relevant European Directives. The Manufacturer strongly recommends dressing suitably, avoiding clothes that might be caught up, wide sleeves, synthetic material, scarves and ties. Necklaces, bracelets, metallic wristwatches and similar object should also be avoided. In the table below, the recommended PPEs are listed:

		USER	MAINTAINER	DANGER	CONSEQUENCE
	SAFETY SHOES	✹	✹	Bumping, tripping, slipping, crushing limbs	Bruises, abrasions, cuts, sprains, dislocations, fractures
	SAFETY GLOVES	✹	✹	Contact with sharp surfaces or edges	Bruises, abrasions, cuts
	SAFETY DIELECTRIC GLOVES		✹	Contact with live parts when testing an energized unit	Electrocution
	HELMET		✹	Bumps to the head in the presence of suspended loads or work inside the enclosure	Bruises, abrasions, cuts, concussion, fractures
	VISOR/GLASSES		✹	Contact with liquids and projectile	Eye injury, eyesight loss or limitation
	ANTI-ARC VISOR		✹	Contact with projectile and radiation from electric arc	Eye injury, eyesight loss or limitation
	ANTI-DUST MASK		✹	Particulate and/or dust inhalation	Respiratory disorders

⚠ ***WARNING*** *A VISITOR CAN APPROACH A WORKING UNIT ONLY IF THE LATTER IS COMPLETELY CLOSED. SHOULD THE INTERNAL COMPONENTS BE SHOWN, REGARDLESS OF THE PROTECTION AGAINST ACCIDENTAL CONTACT, THE UNIT WILL HAVE TO BE SWITCHED OFF. OTHERWISE, THE VISITOR SHALL BE MAINTAINED AT A SAFETY DISTANCE BY MEANS OF PHYSICAL BARRIERS.*

4 HANDLING

4.1 PACKAGING

The units can be packaged either in cardboard boxes strapped to a pallet and wound in plastic film or in a wooden crate with seaworthy vacuum bag. Each unit is provided with a label indicating nominal data, consignee data and purchasing order details. The package bears the usual pictograms (☂ ; 🍷 ; ⇅) and, in case of wooden crate, the indication of the lifting points for chains or fork-lift trucks. With cardboard box packaging, anti-shock and anti-tilting indicators are also affixed.

4.2 RECEPTION

At reception, check the integrity of the packaging and the absence of evident damage occurred during transport. If the unit does not require immediate installation, store it with its original packaging. Once the good condition of the delivery has been established, unpack the unit and check it. In the unlikely event of damage, notify the Manufacturer in writing immediately.

4.3 STORAGE

Should the unit be stored, ensure that it is kept sheltered from rain or snow, excessive humidity, adverse climatic conditions (atmospheric pollution, saline atmosphere, parasites, etc.) at a temperature between -5°C and 40°C.

4.4 MOVING THE UNIT

⚠ ***WARNING*** *THE UNIT MUST BE KEPT IN VERTICAL POSITION, AS INDICATED ON THE PACKAGING. LAYING IT DOWN INTO A HORIZONTAL POSITION MIGHT SERIOUSLY DAMAGE THE INTERNAL COMPONENTS, ALTER THE MECHANICAL STABILITY AND COMPROMISE THE FUNCTIONALITY.*

Unloading and moving operations are under the User's responsibility. Take the utmost care in order to avoid damage to whoever might be around the unit, to the unit itself and to belongings or other equipment on the installation site.
Unloading and moving operations can be performed via cranes fitted with chains or lifting brackets or fork-lift trucks
The lifting devices must be suitable to the unit weight, in good conditions and regularly checked and maintained.
If required by the weight distribution inside the cabinet, the lifting points are highlighted by means of stickers (black arrow on yellow field).

⚠ ***DANGER*** ***HANDLING OPERATIONS MUST BE CARRIED OUT ONLY BY AUTHORISED, SUITABLY TRAINED PERSONNEL PROVIDED WITH THE NECESSARY PERSONAL PROTECTIVE EQUIPMENT (PPE). ALWAYS OPERATE IN CONFORMITY WITH THE SAFETY AT WORK RULES AND REGULATIONS ENFORCED IN THE COUNTRY OF INSTALLATION AND WITH THE INSTRUCTION MANUALS OF THE TOOLS USED. THE MANUFACTURER SHALL NOT BE HELD LIABLE FOR ANY DAMAGE THAT MIGHT OCCUR TO PEOPLE OR BELONGINGS DUE TO FAILURE IN COMPLYING WITH WHAT STATED ABOVE DURING UNLOADING AND MOVING OPERATIONS.***

5 STABILISER DESCRIPTION

Please refer to the attached Data Sheet for a complete list of the technical characteristics.
This handbook deals only with the standard units. If optional devices such as by-pass switch, circuit breakers, etc. are provided, please refer to the attached relevant technical sheets.
The units, designed and built in compliance with the European Directives concerning CE marking (Low Voltage Directive and Electromagnetic Compatibility Directive), can be used in both A and B environments according to EN61439-1/2 and are supposed to be connected between mains and user. The main features are:

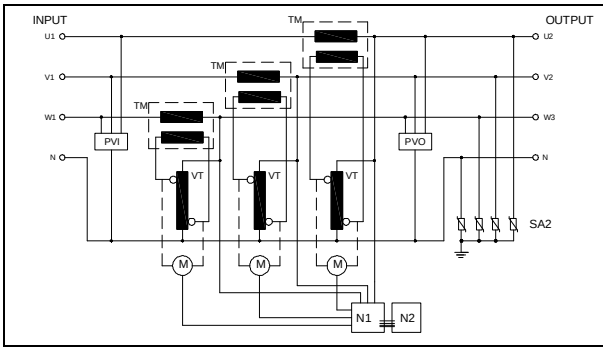
- use with asymmetrical input supply and single-phase loads or unbalanced three-phase loads;
- operation based on the 'rms voltage' and not on the average one. This type of control can supply the load a correctly stabilised voltage even with non-sinusoidal waves;
- *regulation performed independently on each single phase (referring to the neutral, which must be available and connected;*
- fully functioning with load charge variable from 0 to 100% and 100% phase unbalance.
- up to 30% harmonic content admitted on the load current. With higher percentage, nominal power must be de-rated.
- insensitivity to the load power factor
- absence of generation of noticeable harmonic distortions in the output voltage.

5.1 MAIN COMPONENTS AND WORKING PRINCIPLE

The main components are:

- three-phase 'buck/boost' transformer
- motorised three-phase autotransformer (or 3 single-phase ones) with continuously variable transformer ratio (voltage regulator)
- electronic control card which runs the system in terms of regulation and alarm management.
- electronic signalling card (connected to the control card)

A representation of the system is shown in the picture below. The control circuit compares the output voltage value to the adjusted one. When the percentage variation is too high, the control drives the voltage regulator motor. By doing so the regulator rollers change their position thus varying the voltage drawn and supplied to the buck/boost transformer primary winding. Being the secondary voltage of the buck/boost transformer in phase or in opposition to the supply, the voltage drawn from the regulator is added or subtracted to the mains voltage, thus compensating its variations



PVI	Input digital multimetre
TM	Buck/boost transformer
VT	Voltage regulator
M	DC motor
N1	Control card
N2	LED card
PVO	Output digital multimetre
SA2	Class II SPD

5.2 PROTECTIONS

PROTECTION	IN CASE OF	ACHIEVED THROUGH
VOLTAGE RESET TO THE MINIMUM VALUE	Black-out	Electrolytic capacitors or supercapacitor banks mounted on the control card
MOTOR ROTATION STOP	Motor overloaded	Control card
MOTOR ROTATION STOP	Motor short-circuit	Control card
OVERLOAD ON THE VOLTAGE REGULATOR	Excessive current flowing through the regulator	Control card. While the protection is active, the red alarm LED 'Stabilisation off' on the front panel is on.
REGULATOR ROLLERS OVERTEMPERATURE	Overheating	Thermal probe on the central roller of each roller group.
ROOF FANS ACTIVATION	T ambient > 35°C	Adjustable thermostat
VOLTMETER LINES AND MOTOR SUPPLYING CIRCUITS	Circuit overload	Fuses
CONTROL CARD PROTECTION	Card overload	Two 5x20 10A delayed fuses
OVERVOLTAGE	Transients & spikes	Output Class II SPDs

The intervention of any of the above mentioned protections (except for the fuses) is signalled by luminous and acoustic alarms. One or more lamps installed inside the enclosure switch on when the door supporting the control panel is open.

5.2.1 Regulator overcurrent protection

The protection is automatically controlled by the control card which intervenes when the regulator rollers are overcharged by a high current. When this situation is detected, the control card drives the regulator rollers to a safe position.
If the input voltage is lower than the target output voltage, the latter coincides with the input voltage. If the input voltage is higher than the target output voltage, the latter coincides with the target voltage. When the alarm condition stops, the unit goes back automatically to the regular working mode. In case of control card failure, the regulator rollers are driven to the minimum output voltage position. The output voltage shall be decreased (in relation to the input voltage) of the maximum percentage allowed for by the nominal data.

6 INSTALLATION & COMMISSIONING

⚠ ***DANGER*** ***DO NOT*** *CONNECT IN PARALLEL TO EACH OTHER TWO OR MORE VOLTAGE STABILISERS OUTPUT LINES.*

6.1 SITE CHOICE

The installation site must comply with the basic requirements listed below:

- unless otherwise agreed upon, the ambient temperature must fall in the -25/+45°C range
- unless otherwise agreed upon, the maximum installation altitude is 1000mt a.s.l.
- the floor or surface must be flat and able to withstand the unit's weight;
- the installation room dimensions and the airing system must ensure that the generated heat can be disposed of. Otherwise, a cooling systems must be arranged;
- the lighting system must be suitable for normal operating and maintenance routines;
- the ground circuit must comply with the relevant applicable rules and regulations;

If not previously arranged during the contracting phases, the unit must not be commissioned in case of:

- corrosive, explosive or flammable atmosphere;
- presence of conductive dust in the environment;
- proximity to radiation sources;
- possibility of floods.

Avoid direct heat and contact with liquid, flammable or corrosive materials.

Do not clog the cabinet air outlets and leave 150-200mm clearance to allow for the air to circulate.

Check that anti fire devices are available in the area.

6.2 ELECTRICAL CONNECTION

⚠ ***DANGER*** *THE VOLTAGE STABILISER IS NOT AND MUST NOT BE USED AS A PROTECTING DEVICE FOR NEITHER THE PLANT NOR THE LOADS. THE ELECTRICAL CONNECTION MUST BE CARRIED OUT BY TRAINED AND QUALIFIED PERSONNEL, AWARE OF THE INVOLVED RISKS. ALWAYS USE SUITABLE TOOLS AND PERSONAL PROTECTIVE EQUIPMENT (PPE). THE OPERATIONS MUST BE CARRIED OUT IN CONFORMITY WITH THE RULES AND REGULATIONS ENFORCED IN THE COUNTRY OF INSTALLATION.*

6.2.1 Supply

The supplying line must comply with the nameplate technical data. The unit is not protected against short-circuit or overload. In compliance with the safety regulations in force, the installation should take place in a system fitted with:

- an interrupting device with capacity referred to the maximum input current upstream the unit
- an interrupting device with capacity referred to the output current downstream the unit

The above mentioned circuit breakers are not included in the standard unit, but they can be provided as optional accessories.

Note *The installation of a co-ordinated upstream and/or downstream differential circuit breaker may be done under the site manager's responsibility.* ***Said differential circuit breakers are not included in the unit***

Note *If the load supply continuity is of paramount importance, it is advisable to install a by-pass circuit to allow the load to be fed directly from the mains in case the unit is switched off for maintenance or internal failure.*

Note *If the load is thought to be sensitive to voltages outside the rated tolerance, the addition of an over/undervoltage protection system able to disconnect the load in said conditions is strongly recommended.*

6.2.2 Connections

Note *The cross-section value of the cables/bars for the connection to mains and load falls entirely under the installer's responsibility. The Manufacturer shall not be held liable for any damage that might occur to people or belongings due to an incorrect choice.*

Open the cubicle and locate main parts and connection points. Remove the accidental contact protections. Prepare the connection cables/bars with regard to the current values and make them go through the openings prepared on purpose. The very first operation is to connect the earth wire to the terminal identified by PE, GRD or ⏚.

⚠ ***DANGER*** *THE EARTH CONDUCTOR MUST NEVER BE ELECTRICALLY INTERRUPTED NEITHER INSIDE NOR OUTSIDE THE UNIT.*

The earth wire cross-section must be chosen in conformity to the regulations in force. Therefore, depending on the phase cable cross-section, the earth wire cross-section should respect the values in the table below:

PHASE CABLE CROSS-SECTION S [sqmm]	EARTH WIRE MIN CROSS-SECTION [sqmm]
S ≤ 16	S
16 < S ≤ 35	16
35 < S ≤ 400	S/2
400 < S ≤ 800	200
S > 800	S/4

Note *If a not standardised cross-section is found when applying this data, choose the nearest larger one.*

⚠ ***WARNING*** *FOR THE CORRECT OPERATION OF A THREE-PHASE VOLTAGE STABILISER, THE NEUTRAL WIRE MUST BE AVAILABLE AND CONNECTED TO THE RELEVANT TERMINALS.*

Connect the unit to mains and load, trying to avoid kinks and accidental contact between the cables and the electric components. Make the connections respecting the indications written on the terminations.

⚠ ***WARNING*** *WHEN THE STABILISER IS PROVIDED WITH TWO POSSIBLE FUNCTION MODES (DOUBLE INPUT VOLTAGE VARIATION RANGE), IT IS NECESSARY TO COMPLY WITH THE INDICATIONS ON THE TERMINALS. CHANGING THE INPUT*

VARIATION RANGE MEANS CHANGING THE UNIT RATED POWER AS WELL. THE TWO RANGES ARE ALTERNATIVE TO EACH OTHER AND MUST NOT BE CONNECTED CONTEMPORARILY.

⚠ ***WARNING*** *BE SURE THAT PHASE AND NEUTRAL WIRES ARE CONNECTED TO THE RELEVANT TERMINALS. SWAPPING THE INPUT CONNECTION WITH THE OUTPUT ONE COULD CAUSE SERIOUS DAMAGE.*

Check the tightness of the connections and carefully close the cabinet.

6.3 START-UP

Before starting-up, it is recommendable to check whether haulage and long permanence in a warehouse might have affected the unit. If clear signs of dust, dirt or rust can be detected, follow the instruction given in the Maintenance chapter concerning how to clean the components. Supply the rated voltage. Power circuit, auxiliary circuits, control card and Input/Output digital analysers are energised. The input and output values can now be read on the instruments: check that they comply with the rated ones. The equipment is now ready for use. Connect the load and check on the analyser that the output voltage regulation is steady and that the circulating currents do not exceed the rated values.

6.4 SETTINGS

⚠ ***DANGER*** ***DANGEROUS VOLTAGE IS PRESENT INSIDE THE STABILISER AND THE CONTROL CARD. FOR THIS REASON, ONLY TRAINED AND QUALIFIED PERSONNEL AWARE OF THE INVOLVED RISKS MUST PERFORM THE DESCRIBED SETTINGS. SETTING OPERATION MUST BE PERFORMED ONLY IF STRICTLY NECESSARY. SUITABLE TOOLS AND PROTECTIVE MEANS MUST BE USED WHEN PERFORMING THE DESCRIBED ACTIVITIES. READ THIS HANDBOOK COMPLETELY BEFORE STARTING ANY INTERVENTION ON THE UNIT OR THE CONTROL CARD.***

Note *For a complete reset, the unit must have been switched off for at least five minutes.*

6.4.1 Trimmers

The trimmers are set during the testing session and it is strongly recommended NOT to alter such settings. In case of doubt, please refer to an authorised Service Centre.

6.4.2 Dip switches

⚠ ***WARNING*** *SW1 (DIP 1-2) CAN BE USED ONLY IF THE UNIT NOMINAL VOLTAGE IS ONE AMONG 360V, 380V, 400V OR 415V (RESPECTIVELY CORRESPONDING TO 210V, 220V, 230V AND 240V PHASE-TO-NEUTRAL VOLTAGE). IF THE NOMINAL VOLTAGE IS DIFFERENT, SW1 SETTING MUST NOT BE ALTERED AND THE TARGET VOLTAGE AMENDMENT MUST BE CARRIED OUT VIA SOFTWARE.*

REF.	PARAMETRE	POSITION	DEFAULT
SW1 DIP1 SW1 DIP2	Selection of the voltage to be stabilised. If the voltage is set via software, the dip-switched are disabled	DIP1 DIP2 TARGET Vac OFF OFF 210 ON OFF 220 OFF ON 230 ON ON 240	DIP1=OFF DIP2=ON
SW1 DIP3	Enabling of each motor regulation by means of external potentiometers. The full-scale value is set with the software	ON = enabled OFF = disabled	OFF
SW1 DIP4	Acoustic alarms disabling. Internal buzzer and external siren are cut off	ON = acoustic alarms off OFF = acoustic alarms on	OFF
SW1 DIP5 SW1 DIP6	Roller saving function regulation	DIP5 DIP6 behaviour OFF OFF Fast regulation (more movements) ON OFF Fast intermediate OFF ON Slow intermediate ON ON Slow regulation 8fewer movements)	OFF
SW2 DIP7	Minimum regulation enabling. Activates the voltage resetting to the minimum value in case of blackout (even only on one phase) or following the ALL_PHASE_LOSS alarm	ON = enabled OFF = disabled	ON
SW2 DIP8	Min/max voltage alarm enabling. Enables the generation of an alarm in case the output voltage is out of range for a set time.	ON = enabled OFF = disabled	ON
SW2 DIP9	DO NOT ALTER	OFF	OFF
SW2 DIP10	Automatic reset of stored alarms. When enabled, the alarm reset occurs 180 secs after it has disappeared	ON = enables automatic reset OFF = manual reset (push-button)	OFF
SW2 DIP11	Manual bypass command	ON = manual bypass activation OFF = normal operation	OFF

REF.	PARAMETRE	POSITION	DEFAULT
SW2 DIP12	Retrofitting	ON = card to assemble as a spare part on older units OFF = original configuration	OFF

6.5 INSTRUMENTATION

It is made of two digital multimeters able to monitor the electrical parameters on the input line (from the mains) and on the output one (towards the load). Specific instructions on the instruments are provided in the relevant attached document.

7 MAINTENANCE

7.1 FOREWORD

DANGER ***ACCESS TO THE INTERNAL COMPONENTS FOR INSTALLATION, SETTING, INSPECTION AND MAINTENANCE MUST BE GRANTED ONLY TO QUALIFIED PERSONNEL IN CHARGE OF IT AND INFORMED OF THE RELEVANT RISKS. ANY INTERVENTION MUST BE CARRIED OUT IN COMPLIANCE WITH THE HABITUAL RULES ON PERSONAL SAFETY AND USE OF ADEQUATE PROTECTIVE TOOLS.***

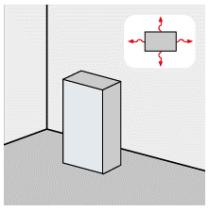
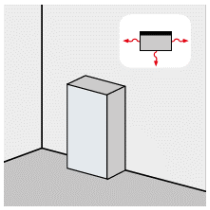
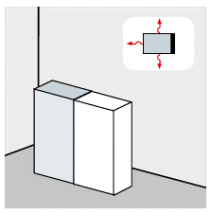
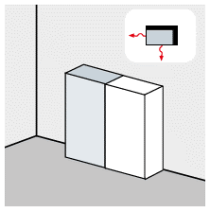
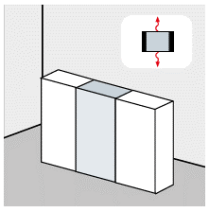
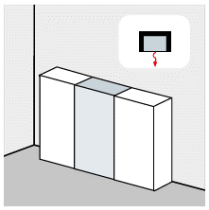
In order to ensure the performance throughout its life, the unit must undergo a simple but regular maintenance scheduling. The recommended frequency Is 12 months, but the maintenance routine ought to be more frequent should it be required by other factors such as polluted environment or heavy duty cycle. Conforming to the recommended maintenance program ensures the correct functioning, thus preventing potentially dangerous failures.

DANGER ***EVERY MAINTENANCE OPERATION MUST BE DONE WHILE THE UNIT IS DISCONNECTED FROM THE MAINS.***

Before proceeding with the maintenance routine, check that the upstream interrupting device (disconnecting switch or circuit breaker) is open. Put on the unit a sign indicating the 'out of order' condition. Be sure that only the personnel necessary to the maintenance operations is dealing with the unit. The tables below resume the maintenance program:

7.2 CONDITIONS FOR MAINTENANCE

Maintenance activities can be performed only if clearances are ensured around the unit.
Beside the front (which is presumed to be clear), at least another side must be available. The possible configurations are:

	4 clear sides Best configuration to perform maintenance.
	Front and sides clear. Maintenance possible (provided that the clearance be at least 800mm).
	Front, rear and 1 side clear. Maintenance possible if at least 800mm are available at the rear and the side.
	Front and 1 side clear. Maintenance possible provided that: 1. clearance at the side is at least 800mm 2. the internal configuration allows access from the clear sides. For more information, please contact the after-sale Service).
	Front and rear clear. Maintenance possible (but potentially difficult) if at least 800mm are available at the rear.
	Only the front is clear. Maintenance impossible. The unit must be moved. Please contact the after-sale Service to agree on how to proceed.

7.3 MAINTENANCE ACTIVITIES

7.3.1 Generalities

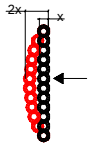
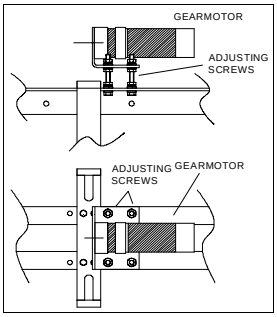
WHAT TO DO	HOW	WHY
Clean transformers and all electro-mechanical components removing dust, dirt and rust	Dry compressed air Dry cloths	Dust accumulation may limit the cooling air flow and cause overheating. Rust may compromise the dielectric properties of materials and components.
Check the correct tightening of the transmission units connections	Tightening tools DO NOT use lubricants for the regulator contacts	Transmission units improperly connected may cause irregular operating and abnormal wear and tear of components
Check that the electrical connections are tight	Tightening tools	Improper electrical connections may cause localised overheating and consequent major failure of the unit
Clean the air inlets at the base of the enclosure	Dry compressed air	Dust accumulation may limit the cooling air flow and cause overheating.

7.3.2 Roof fans

WHAT TO DO	HOW	WHY
Check that the airflow coming out from the turrets is regular. Keep clean the air outlets and the fans.	Dry compressed air Dry cloths	Dust accumulation may limit the cooling air flow and cause overheating.
If necessary, replace defective fans. Warning: the fans are controller by the ambient thermostat. Before proceeding with the replacement, check the temperature threshold that determines the activation.	• disconnect the fan plug; • unscrew and remove the turret from the cabinet roof; • replace the defective fan with an original spare one; • connect the fan plug; • re-position the turret on the roof	Failure of one or more fans may compromise the air circulation inside the enclosure.

7.3.3 Columnar voltage regulator

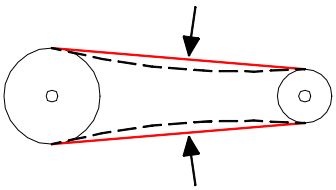
In a columnar regulator the copper track is wound helicoidally on a cylinder. The mobile contacts move vertically on the track thanks to a pinion and chain transmission.

<table>
<tr><th>WHAT TO DO</th><th colspan="2">HOW</th><th>WHY</th></tr>
<tr><td>Clean the copper surface in case of clear oxidation or deposit of graphite dust.</td><td colspan="2">Fine abrasive paper (120 type first and 240 type afterwards)
Dry compressed air
Dry clean cloth</td><td>The presence of residual material or oxide on the copper where the rollers run may cause deterioration of the rollers themselves and overheating. The phenomenon is self-supplied so as time goes by, the regulator may suffer major failure.</td></tr>
<tr><td>Clean and possibly lubricate the chain</td><td colspan="2">Grease or spray for cogs and chains</td><td>Ensure the correct movement of transmission units and avoid interruption of the transmission or failure.</td></tr>
<tr><td>Check the chain tension.</td><td> 
</td><td>When manually applying force on the chain side, the displacement should be twice the thickness of chain.</td><td rowspan="2">The pulling chains tension must be such that there are no loosening or interruptions during the inversion of the rotating sense.</td></tr>
<tr><td>if necessary, adjust the chain tension.</td><td> 
</td><td>Lift or lower the plate supporting the gearmotor by means of the fixing bolts and nuts</td></tr>
</table>

WHAT TO DO	HOW	WHY
Check the roller support condition	Lift the roller and check the following points: • uniformity of the force necessary to lift the rollers • continuity and regularity of the movement • uniformity of the contact pressure when the rollers are placed back on the regulator column. Replace any clearly defective guides.	The pressure exercised on the column is critical for the contact to be efficient. If this is not ensured, the current distribution among the rollers is incorrect. Such condition may cause localized overheating and major failure on the regulator.
Check the rollers status.	Lift the roller support and check the roller surface status. They must roll freely while the carriages move and their surfaces must not show any scratches, rubs or flat areas. If it is necessary to replace the rollers, please contact the Service Dept.	Stop of the roller rotation and surface irregularities cause incorrect contact with the copper winding. This determines the circulation of local eddy currents and quick overheating of the area. The phenomenon is self-supplied so as time goes by, the regulator may suffer major failure.

7.3.4 Toroidal voltage regulator

In a toroidal regulator the copper track is wound on a toroidal core. The mobile contacts are fixed on an L-shaped support anchored to the regulator axis and move around the winding.

WHAT TO DO	HOW	WHY
Check that the regulator rollers are not broken, chipped, scratched or irregularly consumed (flat areas)	The rollers must rotate freely while their support moves along the winding. By moving the rollers slowly, check that their movement is smooth and uniform. The width of the contact surface must not be larger than the width of a turn of the winding.	Stop of the roller rotation and surface irregularities cause incorrect contact with the copper winding. This determines the circulation of local eddy currents and quick overheating of the area. The phenomenon is self-supplied so as time goes by, the regulator may suffer major failure.
Check and if necessary adjust the belt tension (when applicable)	Loosen the screws that fix the motor supporting plate. The clamping holes allow for little adjusting movements. Move the plate to adjust the belt tension and tighten the screws back in position. A correct tension allows for a deflection towards the inside equal to 4 or 5 times the thickness of the belt. 	If the belt is too tight there would be too much friction and therefore potential damage to the motor driving the pulley If the belt is too loose it could fall off, thus interrupting the transmission chain and therefore the regulation

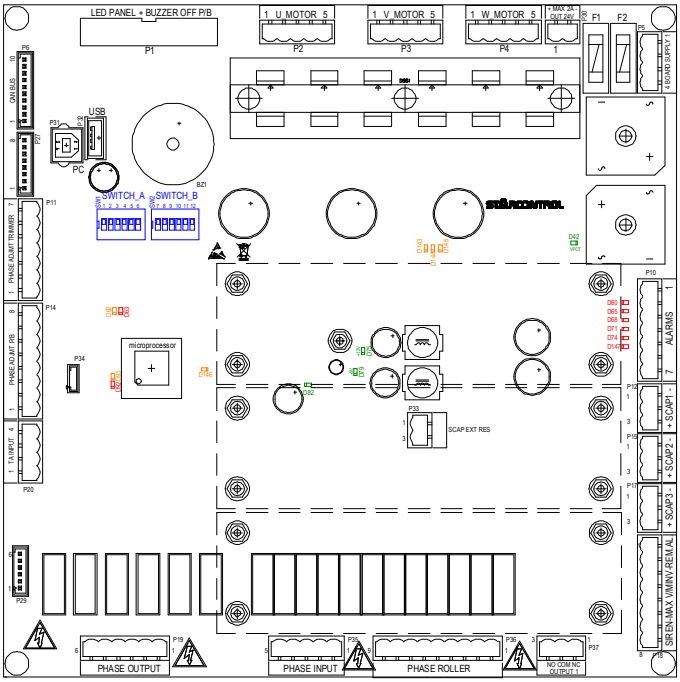
8 CONTROL CARD

The control card runs the voltage stabiliser by regulating each phase independently and also monitors the output currents and generates an alarm in case of overcurrent. Under normal working conditions, the output voltage is maintained stable with an accuracy equal to ±0.5% in relation to the rated voltage. The control is performed totally through a software that digitalises all the parameters (full digital control).
The card is fitted with a DSP microprocessor (DIGITAL SIGNAL PROCESSOR) that works as a *controlling* and *measuring CPU*. By means of this device, the card reads line voltage, settings, motor current and inputs and drives each motor directly by imposing direction and speed. On the basis of the motor current, the card elaborates also the protections against overload and short-circuit for the motor itself. Firmware and operational parameters can be updated by means of a USB drive. The following components are connected to the control card:

- signalling card connected via a flat wire to P2 terminal on the control card;
- supercapacitor banks for adjusting to minimum voltage position in case of blackout (when fitted).

Note *Due to the presence of miniaturised components and possibility of micro-fractures, the card must not be bent.*

Note *For software and parameters updating procedure and means, please contact the Service Dept..*



8.1 PROTECTIONS

8.1.1 Motor stop or overload

The control estimates if the motor is overloaded or either the motor or the relevant kinematic mechanism is blocked. The thermal energy (i.e. the current) released is measured and if the value exceeds a set threshold, an alarm is generated.

8.1.2 Short-circuit

The card is provided with a phase-to-phase short-circuit alarm for each motor. Filtering devices operate in order to avoid unnecessary intervention. The resistance to a short-circuit depends on the nature of the phenomenon.

8.2 CONTROL CARD LEDS

REF.	COLOUR	PARAMETRE	ON	OFF	BLINKING
D62	yellow	CPU activity	CPU blocked	blocked CPU or absent SW	Status OK
D63	red	Active alarm signal	one or more active alarms	No active alarm	Startup status
D93	yellow	CPU programming	-	Normal status	-
D92	red	CPU programming	-	Normal status	-
D60	red	Spare 1 input	active	inactive	-
D65	red	Spare 2 input	active	inactive	-
D68	red	Current alarm input	active	inactive	-
D71	red	Temperature alarm input	active	inactive	-
D74	red	Fan alarm input	active	inactive	-
D147	red	Spare 3 input (NOT USED)	active	inactive	-
D143	yellow	Phase U motor current limitation intervention	Active limitation	Inactive limitation	-
D144	yellow	Phase V motor current limitation intervention	Active limitation	Inactive limitation	-
D145	yellow	Phase W motor current limitation intervention	Active limitation	Inactive limitation	-

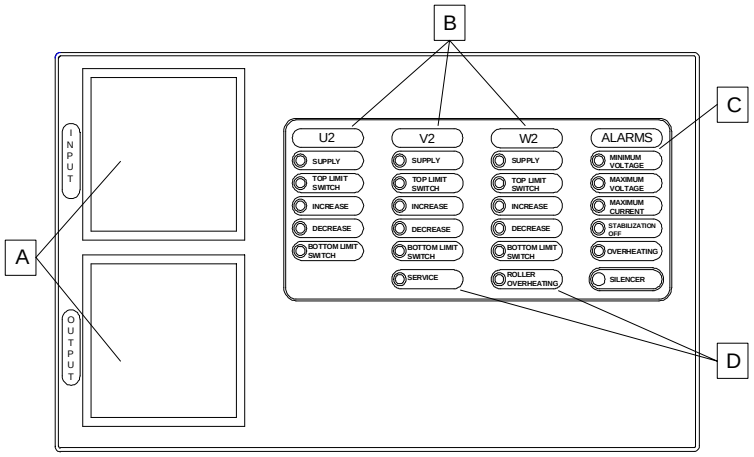
REF.	COLOUR	PARAMETRE	ON	OFF	BLINKING
D42	green	Card supply	28VDC present	28VDC absent	-
D75	green	+12VDC supply	12VDC present	12VDC absent	-
D79	green	+5VDC supply	5VDC present	5VDC absent	-
D82	green	+3,3VDC logic supply	Present	absent	-

8.3 CONTROL CARD TERMINALS

REF.	TYPE	DESCRIPTION
P1	34-pole male flat	Panel interface
P2	6-pole male	Phase U motor
P3	6-pole male	Phase V motor
P4	6-pole male	Phase W motor
P5	4-pole male	Card supply
P6	10-pole AMP MODU2 male	CAN bus
P10	7-pole male	Alarm inputs
P11	7-pole male	Phase regulation potentiometres
P12	3-pole male	supercapacitors
P14	8-pole male	phase regulation push-buttons
P15	3-pole male	supercapacitors
P17	3-pole male	supercapacitors
P18	6-pole male	Alarm outputs
P19	8-pole male	Regulated voltage input – dangerous voltage
P20	4-pole male	Three-phase CT currents input
P30	2-pole male	Output LED card supply
P31	Type B USB	PC connection slave USB
P32	Type A USB	USB drive connection master USB
P33	2-pole male	Connection to external 1ohm resistor for supercapacitor
P34	6-pole 1.255mm connector	CPU programming
P35	5-pole male	Unregulated voltage input – dangerous voltage
P36	9-pole male	Regulator contacts voltage input – dangerous voltage
P37	3-pole male	Alarm outputs (relay)

8.4 EXTERNAL CONTROL PANEL AND SIGNALLING CARD

The panel is the interface towards the user and provides with all the relevant readings and alarm signals. The card is mounted behind the control panel and is connected to the control card via a flat wire.



8.4.1 A – instrumentation

Input and output readings.

8.4.2 B – phase LEDs

The phase indications provided are listed in the table below (starting from the top one):

POSITION	COLOUR	FUNCTION
1	Blinking green	Card supplied and functioning
2	red	Increase limit switch
3	yellow	DC motor in increasing mode
4	yellow	DC motor in decreasing mode
5	red	Decrease limit switch

8.4.3 C– alarm LEDs

Positioned on the right side of the phase signals, the alarm LEDs indicate a malfunctioning situation. Any abnormal condition generates an acoustic alarm as well. The alarm indications provided are listed in the table below (starting from the top one):

POSITION	FUNCTION
1	Output voltage below the set minimum threshold
2	Output voltage above the set maximum threshold
3	Output current above the set maximum threshold
4	Stabilisation OFF (voltage regulator overload)
5	Internal overheating

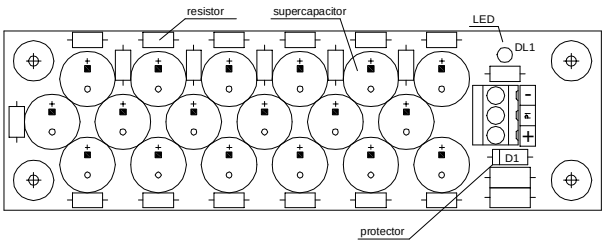
The maximum and minimum voltage alarms on one or more phases are signalled also by the relevant phase control LED colour change from flashing green to fixed orange. A push-button for silencing the alarm is mounted underneath the red LEDs. In case of failure, the relevant LED switches on and the buzzer and an internal siren start. By pressing the silencer for a few seconds, the audible alarms stop whilst the visible one stays on if the failure is permanent. The light reset takes place only when the alarm condition has stopped. Press the push-button for a few seconds in order to switch the LED off. The Dip-switch 4 (see the relevant table) on the control card allows for the audible alarms to be cut out.

8.4.4 D – additional LEDs

POSITION	FUNCTION
SERVICE	ON when the internal counter has reached the set threshold and maintenance is required
ROLLER OVERHEATING	ON if the temperature on the rollers is higher than 90°C (start of the regulator fans)

8.5 SUPERCAPACITOR BANK

The bank is a reservoir of electric energy stored in supercapacitors (high capacity capacitors). The purpose is to supply each gearmotor in blackout condition, so that the voltage regulator can reach its minimum voltage position.
Supercapacitors are used when electrolytic capacitors are not performant enough to carry out said operation (large rating and/or large input variation range).



⚠ ***WARNING*** *THE VOLTAGE AVAILABLE ON THE BANK IS NOT DANGEROUS. HOWEVER, BECAUSE OF ITS FUNCTION, THE CARD STORES ELECTRIC ENERGY AND MIGHT STAY CHARGED EVEN AFTER HAVING BEEN DISCONNECTED FOR A FEW MINUTES. DO NOT SHORT-CIRCUIT THE CARD AND DO NOT POSITION CONDUCTIVE AND/OR METALLIC OBJECTS IN THE VICINITY. ANY RESIDUAL VOLTAGE CAN BE EASILY DETECTED BY MEANS OF THE LED MOUNTED ON THE CARD: WHEN THE LED IS ON, THE CAPACITORS ARE CHARGED AND VOLTAGE IS AVAILABLE.*

Some resistors might be hot. The bank can be regarded as discharged after five minutes from disconnection.
A green LED shows that the bank is supplied and working correctly.
A varistor surge ***ARRESTOR*** intervenes in case of overvoltages.

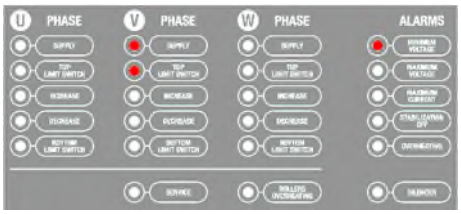
9 ALARMS & SERVICE

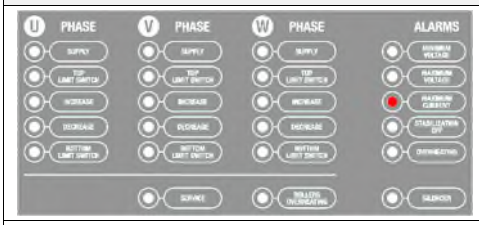
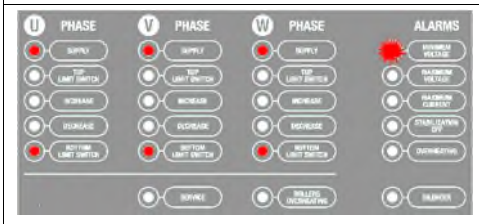
⚠ ***DANGER*** *ACCESS TO THE INTERNAL COMPONENTS MUST BE GRANTED ONLY TO QUALIFIED, TRAINED PERSONNEL IN CHARGE OF IT. ANY OPERATION THAT MIGHT REQUIRE THE UNIT TO BE ENERGISED MUST BE CARRIED OUT IN COMPLIANCE WITH THE HABITUAL RULES CONCERNING PERSONAL SAFETY AND THE USE OF ADEQUATE PROTECTIVE TOOLS.*

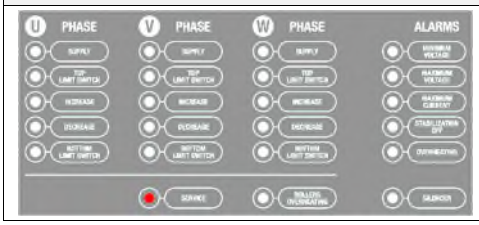
In case of anomalies or failure of any component, check that all the instructions given in this manual have been followed. Interventions must be requested out promptly as soon as the issue arises in order to avoid an aggravation of the problem and the involvement of other components.

9.1 ALARM SIGNALS

Note *With reference to the table below, the REM1 relay is connected to the P37 terminal block and the REM2 relay is connected to the P18 terminal block.*

ALARM SIGNAL	ACTIVE RELAY	ISSUE	POSSIBLE CAUSE	ACTIONS
Blank instrument display	N.A.	NO READING ON THE INSTRUMENTS	Damaged or defective instrument	Replace with spare instrument
			Fuse intervention	Check the supply. Replace the blown fuse with an equivalent one
	REM1 REM2	ROLLER OVERHEATING	Overload on the regulator	Check column surface (colour). Investigate and eliminate the overload source.
			Failure of the thermal probe on the central roller of each roller group	Switch the unit off and check if the thermal probe connection is interrupted. Probes are connected in series.
			Presence of dirt or dust on the regulator surface (incorrect roller contact)	Switch the unit off and clean the regulator following the maintenance procedure.
 SUPPLY & TOP LIMIT SWITCH LEDS (CONCERNED PHASES)	MIN-MAX REM1	MINIMUM VOLTAGE	V_{out} lower than V_{target} beyond the set tolerance (default: 6%)	Check incoming voltage. Wait until the nominal condition is re-established.
 MIN VOLTAGE LED AS CONSEQUENCE			Locked gearmotor	Switch the unit off and try to manually move the carriage and therefore the motor. If necessary, replace with a spare one.
 MIN VOLTAGE LED BLINKING	MIN-MAX REM1	MISSING PHASE(S)	Card signal defective (P30) or mains deficiency	The unit could be working correctly. Check the voltage parameters on the instruments and/or by measuring at the unit I/O terminals. Check that P30 terminal is correctly connected. If necessary replace the card with a spare one.
 SUPPLY & BOTTOM LIMIT SWITCH LED (CONCERNED PHASES)	MIN-MAX REM1	MAXIMUM VOLTAGE	Same as for Minimum voltage but with V_{max} LED	Check incoming voltage. Wait until the nominal condition is re-established.

ALARM SIGNAL	ACTIVE RELAY	ISSUE	POSSIBLE CAUSE	ACTIONS
	MIN-MAX REM1	MAXIMUM CURRENT	I_{out} over set threshold (unit overload)	Adjust the load so that the unit is not overloaded.
			Control card wrong reading (output instrument connector not tightened)	Check the output instrument ammeter connections.
 ALL BLINKING	MIN-MAX REM1	INPUT VOLTAGE SIGNAL FAILURE	Control card issue (terminal P27) or circuit fuses (if present)	Check that P27 terminal is correctly connected and that no fuse has blown. If necessary, replace the card with a spare one.
 MIN VOLTAGE LED BLINKING	MIN-MAX REM1	OUTPUT VOLTAGE SIGNAL FAILURE	Control card issue (terminal P30) or circuit fuses (if present)	Check that P30 terminal is correctly connected and that no fuse has blown. If necessary, replace the card with a spare one.
	REM1	STABILISATION OFF	Overload in the voltage regulator circuit and intervention of the electronic protection ($V_{in} < V_{target} \Rightarrow V_{out} = V_{in}$; $V_{in} > V_{target} \Rightarrow V_{out} = V_{target}$)	Investigate and eliminate the overload source.
	REM1 REM2	INTERNAL OVERHEATING	Temperature measured around the card > 65°C. The system operates in the same way as with the stabilisation off alarm	Check that the air circulation inside the enclosure is not hindered. If necessary, replace a defective fan following the procedure explained in the maintenance chapter.
 SUPPLY LED ORANGE	REM1 REM2	LOCKED GEARMOTOR	Damaged or faulty component. For 13 mins, the system tries to restart the motor (with the LED temporarily turning green). Beyond that time, the alarm stops the regulation.	Switch the unit off and try to manually move the carriage and therefore the motor. If necessary, replace with a spare one.
		SHORT-CIRCUIT ON THE GEARMOTOR	Damaged or faulty component. The alarm stops the regulation without trying to restart it.	Replace with a spare one..
 BOTH BLINKIMG	MIN-MAX REM1	PHASE ROTATION ERROR	Supplying system configuration The system operates in the same way as with the stabilisation off alarm	During installation, connect the card to a PC to check the alarm and adjust the relevant parametre
				During operation the issue is on the supplying line.

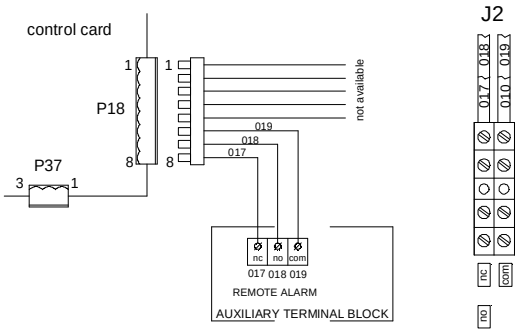
ALARM SIGNAL	ACTIVE RELAY	ISSUE	POSSIBLE CAUSE	ACTIONS
	N.A.	SERVICE REQUIRED	Set total working hours and/or motor movement threshold exceeded	Please contact the Service Dept.

9.2 ALARM SIGNAL TRANSFER

9.2.1 REM1 relay (terminal P18)

The alarm general signal can be transferred to a remote position via the terminals included in the J2 auxiliary terminal block mounted below the electronic control card, to which is connected by means of the P18 terminal (wires 017, 018, 019).
The output contacts are designed for 3Amps maximum current (at 230Vac 50Hz or 24Vdc). The contacts are isolated between each other.

Note *The REM1 Remote Alarm relay on the control card activates when* ***at least one*** *of the alarm conditions listed in the table occurs. The remote signal could therefore indicate the presence of several simultaneous alarms.*



9.2.2 REM2 relay (terminal P37)

The REM2 relay on the control card manages cumulatively four specific alarms already described for the REM1 relay:

- Gearmotor locked due to a short-circuit
- Gearmotor locked due to a mechanical issue
- Overheating on the regulator rollers
- Overheating inside the enclosure

By connecting to the P37 terminal with a suitable connector, these alarm signal can be remoted separately.

Note *The REM2 Remote Alarm relay on the control card activates when* ***at least one*** *of the alarm conditions listed above occurs. The remote signal could therefore indicate the presence of several simultaneous alarms.*

9.3 SERVICE

For any queries (including the request for spare parts) please contact the nearest authorised Service facility or the Manufacturer's Service Dept. always mentioning:

- Type and factory code of the unit
- Serial number
- Purchasing order or Invoice number.

MAINTENANCE LOG

⚠ ***DANGER*** ***ACCESS TO THE INTERNAL COMPONENTS FOR INSTALLATION, SETTING, INSPECTION AND MAINTENANCE MUST BE GRANTED ONLY TO QUALIFIED PERSONNEL IN CHARGE OF IT AND INFORMED OF THE RELEVANT RISKS. ANY INTERVENTION MUST BE CARRIED OUT IN COMPLIANCE WITH THE HABITUAL RULES ON PERSONAL SAFETY AND USE OF ADEQUATE PROTECTIVE TOOLS.***

For a description of the maintenance procedures and frequency, please refer to the relevant Section in the User's Manual.
In case of abnormal situations (such as polluting or aggressive environment, heavy duty cycle, etc.) the maintenance frequency ought to be increased accordingly.

NOMINAL DATA			
TYPE	**CODE**	**SERIAL NUMBER**	**RATING**

ORDINARY MAINTENANCE		
CLEANLINESS	1	GENERAL
	2	VENTILATION AIR INLET
CHECK	3	MECHANICAL FIXTURES
	4	ELECTRICAL CONNECTIONS
	5	FAN OPERATION
	6	VOLTAGE REGULATOR COPPER SURFACE STATUS
	7	VOLTAGE REGULATOR ROLLER SURFACE STATUS
	8	ROLLER SUPPORT STATUS
	9	VOLTAGE REGULATOR CHAIN & VERTICAL GUIDES

RECORD (TICK THE RELEVANT BOX)											
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**COMPANY**	**DATE**	**SIGNATURE**

EXTRAORDINARY MAINTENANCE			
DESCRIPTION	**COMPANY**	**DATE**	**SIGNATURE**

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