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Made in Italy. Since 1947.

MASTER IN POWER CONTROL

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Printed by Stamperia Artistica Nazionale
Created by Brief and Mood
99533655.03

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POSITIVE ENERGY, WITHOUT INTERRUPTION. SINCE 1947.

Is an Italian company specialised in designing and manufacturing electromechanical and electronic equipment for mains power control and energy generation. Its offer is divided into three product lines:

Power Quality:

Power quality and Energy Saving;

Hydro Power:

Hydroelectric turbines, Distribution and Regulation Switchboards;

Power Lighting:

Power supplies and Igniters for discharge lamps for professional applications.

Over 70 years of experience, wo production plants, a philosophy based on "quality upgrading" as the company's primary concern and direct export exceeding 70% of the global turnover are a warranty of continuity and development.

"Quality is our first responsibility and customer satisfaction is our pride. The environment is our social objective, the safety and health of the individual is our duty".

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OUR HISTORY

Is an Italian company, founded in 1947, worldwide leader in design and manufacture of equipment for the control and generation of electric energy.

Its products are used in various sectors such as: Power Quality, Energy Saving, Hydroelectric and Professional Lighting.

Its brilliant founder, Mario Celso, as a boy passionate of electrical engineering and cinema, in the late 40's succeeded to realize his childhood dream creating the first electromechanical rectifier for carbon arcs used in cinema projection.

From this first rectifier, a comprehensive line of products dedicated to power and strike gas discharge lamps will take shape.

Soon the production is enhanced with the introduction of voltage stabilisers, starting a line of products designed to develop quickly to a full range of equipment able to solve the mains power problems.

ISO 9001
since 1991

ISO 14001
since 2000

BS OHSAS 18001
since 2014

In the 50's in addition to the energy management, it enters the field of machines for the production of energy: the first hydroelectric turbines, capable of generating renewable energy exploiting the head and flow of water streams are designed and produced .

In 1992, Mario Celso receives the Scientific and Technical Award for his technological contribution to the development of the film industry from the Academy of Motion Picture Arts and Sciences in Los Angeles

Today, it is a protagonist on the international markets. The constant investments in research and development allow to maintain the highest quality standards by continuing to develop innovative products capable to meet the demands of prestigious customers.

Quality, Safety and Environment are Corporate Values that it has pursued since its foundation as the basis of its organization and its development.

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MASTER IN POWER CONTROL

Power protection and energy saving

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SUMMARY

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VOLTAGE STABILISERS

Voltage Stabilisers are the most reliable solution to problems related to voltage variations in the electric network.

The electric energy producers generate a correct voltage. However, failures on the distribution lines, atmospheric discharges, continuous load variations and disturbances generated by the users make it impossible to guarantee always a steady voltage within the tolerance bandwidth stipulated in the supply contract. Very often this tolerance is insufficient for more sensitive equipment.

Other times the mains voltage reaches levels that exceed the foreseen rated value by 15, 20 or even 30%.

Increasingly, there is a reduction in the Power Quality level of the electrical energy made available to the end user.

Voltage stabilisers guarantee users with perfectly regulated voltage.

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POWER SUPPLY AND PROFESSIONAL USERS

The voltage fluctuations are particularly treacherous interferences since they are not seen and can only be detected by using specific instrumentation. When such interferences are present, the electrical equipment seems to maintain correct operation but disguises serious problems that at times are beyond repair. Even an ordinary light bulb, if overpowered by 10%, continues to give light, but halves its operating life; if underpowered by the same percentage it loses 30% of its brightness. The situation becomes much more serious in the case of voltage variations on more complicated equipment:

- ✔ a laser cutting machine undergoes changes in the "laser beam mode", resulting in cutting burrs or the shutting off of the beam;
- ✔ an electric drive causes undesired changes in the speed of the powered motor and damage to the data storage and power terminals;
- ✔ an "electromedical" device gives incorrect results, wastes expensive reagents and loses the samples to be analysed.

PROPOSAL

They are registered names of two series of voltage stabilizers that offer a reliable and tested economic solution to inconveniences caused by voltage fluctuations. The use of voltage stabilizers increases the level of power quality and represents a real investment because the elimination of the inconveniences means a reduction in costs and an increase in productivity. Very often it is only necessary to avoid a few minutes machine downtime or just one failure to repay the cost of the voltage stabilizers.

They are particularly suitable for applications that require:

- ✔ high reliability. For example they can be installed in areas with difficult access, subject to critical environmental conditions due to cold, high temperatures, humidity, atmospheric discharges;
- ✔ capability to compensate wide mains voltage variations. This is a typical requirement of equipment installed in areas that are far from the distribution transformer substation and in fast developing countries;
- ✔ high precision of the stabilised voltage. Ideal condition for calibration and inspection stands, electric furnaces, professional lighting equipment;
- ✔ voltage stabilization of high power users or with high inrush currents like e.g. motors, air conditioners, compressors, pumps;
- ✔ simple and limited maintenance. Very important feature where it is difficult to find qualified personnel for servicing;
- ✔ wide range of models. According to the ambient conditions, the voltage stabilizers can be supplied in enclosures with protection degree IP00, IP21, IP54 INDOOR, IP54 OUTDOOR.

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Warranty: 5 years

Natural convection:
fan-free for IP21 versions.

Heavy duty power: the declared performance is always ensured in the most severe and critical conditions (continuous service at nominal power with minimum input voltage, highest input current and at the declared ambient temperature).

Voltage stabilizers are electromechanical devices with electronic control designed to ensure stabilized powering to single-phase and three-phase loads of small and medium powers.

OPERATION:

Voltage stabilizer is equipped with a control circuit that constantly monitors the line voltage at true voltage (RMS) and compares it with the pre-set voltage value to be kept constant.

The architecture of voltage stabilizer allows to achieve high values of regulation speed and stabilization accuracy.

The choice of adopting the booster configuration for the entire range, avoids the presence of mobile contacts in series to the line, makes the equipment insensitive to the load power factor, prevents the introduction of harmonic distortions and allows to achieve high efficiency levels, resulting in reduced heat dissipation and minimization of operating costs in relation to the benefits obtained.

CHARACTERISTICS:

- ✔ Multi range: one model meets 4 levels of compensation and power
- ✔ Toroidal variable autotransformer
- ✔ Power range: from 1 to 350 kVA
- ✔ Compact dimensions: "case" for single-phase M and three-phase T models, "tower" for three-phase Y models.

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Voltage stabilizers are electromechanical devices with electronic control designed to ensure stabilized powering to single-phase and three-phase loads of high and very high power.

OPERATION:

Voltage stabilizer is equipped with a control circuit that constantly monitors the line voltage at true voltage (RMS) and compares it with the pre-set voltage value to be kept constant.

The architecture of voltage stabilizer allows to achieve high values of regulation speed and stabilization accuracy. The choice of adopting the booster configuration for the entire range, avoids the presence of mobile contacts in series to the line, makes the equipment insensitive to the load power factor, prevents the introduction of harmonic distortions and allows to achieve high efficiency levels, resulting in reduced heat dissipation and minimization of operating costs in relation to the benefits obtained.

The internal equalization system of the medium and large power units, which is essential to equalize the currents in the various branches of the regulation system, is of breakdown type therefore without resistive elements characterizing the dissipative distribution system.

CHARACTERISTICS:

- ✔ Linear square section variable autotransformer with rolling contacts
- ✔ Power range: from 3 to 8000 kVA
- ✔ Modular system for high power models to facilitate transport, handling and installation.

Warranty: 5 years

Natural convection: fan-free for IP21 versions.

Heavy duty power: the declared performance is always ensured in the most severe and critical conditions (continuous service at nominal power with minimum input voltage, highest input current and at the declared ambient temperature).

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COOLING BY NATURAL AIR CONVECTION, FAN-FREE SYSTEM

This is the distinctive characteristic of all voltage stabilisers with protection degree IP21;
it dramatically increases the reliability as the cooling of the magnetic components and the electronic control boards is ensured by natural convection without fans (fa-free system). Fans and the relevant filters must be constantly checked, cleaned and periodically replaced.

Moreover, the absence of fans avoids sucking of dust which would deposit on the copper tracks reducing the contact surface between the electro-graphite rolls and the voltage transformer tracks. As a consequence, this would cause roughness, sparks and copper smelting, phenomena that in the long run would damage the component and reduce its life expectancy.

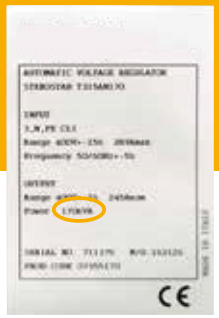
The pictures clearly show that NO fan is used in voltage variable transformers to cool down the contact point between brushes and turns.

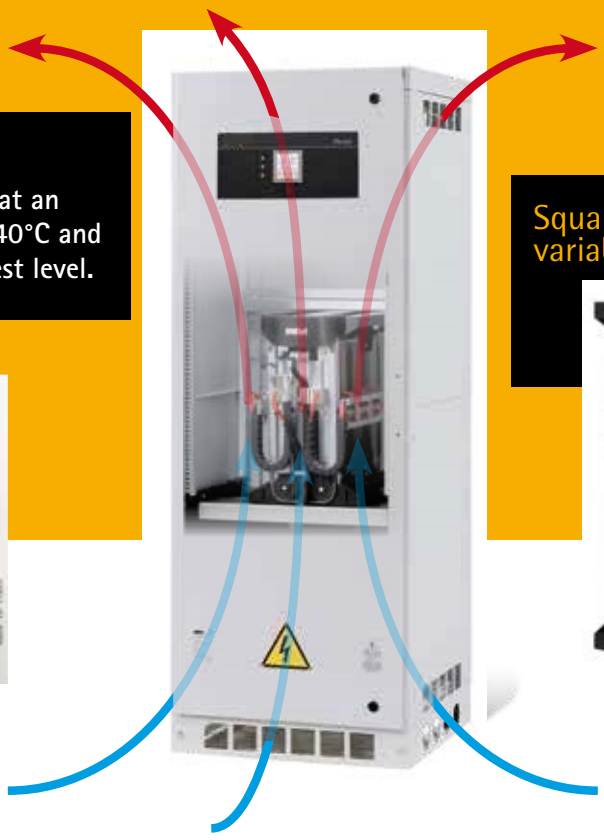
This is possible thanks to the thermal dissipation being the result of:

- ✔ the correct sizing and the high permeability of the magnetic cores;
- ✔ the low density of current flowing through the windings of the variable transformers, and consequently the reduced thermal dissipation;
- ✔ the square section of the linear variable transformers.

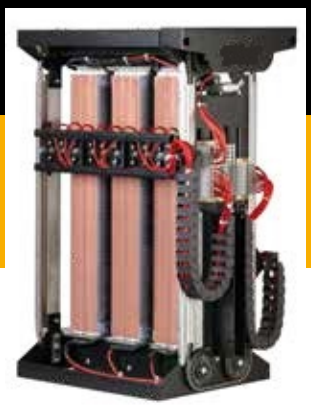
Actual power

Power available 24h/day at an ambient temperature of 40°C and input voltage at the lowest level.





Square section variable transformer



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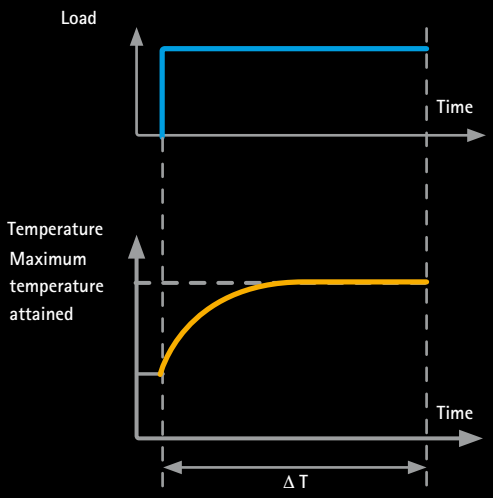
DECLARED POWER ON HEAVY DUTY

The fundamental parameter of a voltage stabiliser is the nominal power expressed in kVA and indicated in the product name plate. It represents the maximum power that the equipment can deliver. However, the power of a voltage stabilizer must be contextualized with reference to the service class, to the input voltage fluctuations and to the ambient temperature.



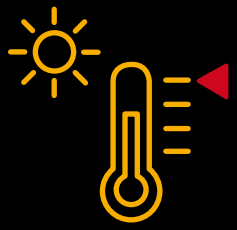
THE SERVICE CLASS.

All voltage stabilizers are designed and manufactured to operate in continuous service, intended as the most demanding service at nominal power for unlimited time. In other words: voltage stabilizers are sized to work continuously with 100% duty-cycle and the materials used bear the maximum power expected for unlimited time.

INPUT VOLTAGE FLUCTUATIONS.

A voltage stabilizer is characterized by the ability to compensate for the fluctuations in the mains voltage and to supply the connected load at a constant voltage and close to the nominal value. The most heavy working condition is in presence of the minimum mains voltage in input.

All voltage stabilizers are characterized by the ability to stabilize the output voltage when the mains is in the worst conditions for unlimited time and without any degradation of performance.



THE AMBIENT TEMPERATURE.

Electric machines are characterized by energy losses produced during energy transformation, which occur in the form of heat.

The cooling of an electric machine occurs through the phenomenon of transmission of the heat produced inside the equipment to an element at a lower temperature.

The most reliable cooling mechanism is when the machine is immersed in the air, at the ambient temperature, without forced ventilation elements (fan-free). The fan-free natural air convection cooling system typical of IREM voltage stabilizers in IP21 version requires that the energy losses are reduced to the minimum value allowed by the technology, using qualified materials and adopting a generous sizing criterion.

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HIGHLIGHTS

WARRANTY

Extended warranty to 5 years.

NATURAL CONVECTION

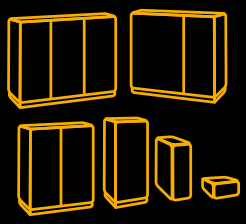
In the voltage stabilisers with IP21 protection degree, cooling is ensured by natural convection only. The total absence of fans (fan-free) increases the reliability of the product dramatically and makes the use of filters, which would need constant maintenance, unnecessary.

RELIABILITY

The criteria used to size the electrical and electronic parts of all voltage stabilisers guarantee the greatest reliability. The declared performance is always ensured in the most several and critical conditions for unlimited time (heavy duty): nominal power with minimum input voltage, highest input current and at the declared ambient temperature.

FIT & FORGET

Voltage stabilisers are characterized by long life, no degradation of performance over the time and reduced maintenance requirements, thanks to the robustness of construction and the high quality of the materials used. They are characterized by a reliability (MTBF) of more than 500,000 hours.



BROAD RANGE

Single-phase and three-phase voltage stabilisers from 1 kVA up to 8000 kVA.

Voltage range from 110V to 500V.

All the voltage stabilisers are available in symmetrical configuration ±10%, ±15%, ±20%, ±25%, ±30% and in asymmetrical configuration -35% +15%.

Different configurations are available on request.

TAILOR MADE

The whole range of voltage stabilisers has a very high level of customization, both in terms of electrical characteristics as well as mechanical and aesthetic. A staff of technicians specially dedicated to "special" projects can satisfy the most demanding requests.

SHORT DELIVERY TIMES

The particular architecture of voltage stabilisers allows to satisfy in a short time even the most demanding project, reducing design and production times. Moreover, the modular system used for higher power models simplifies transport and reduces time and cost.

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OVERVIEW

M — SINGLE-PHASE

M M	1-45 kVA
S M	15-350 kVA

T Y — THREE-PHASE

M T	common regulation of the 3 phases	3.5-32 kVA
S T	common regulation of the 3 phases	22-800 kVA

M Y	independent regulation of each phase	3-120 kVA
S Y	independent regulation of each phase	45-8000 kVA

	Single-phase		Three-phase			
General features	M M	S M	M T	S T	M Y	S Y
Toroidal variable transformer	•	-	•	-	•	-
Linear square section variable transformer	-	•	-	•	-	•
Natural air convection - fan-free	vers.IP21	vers.IP21	vers.IP21	vers.IP21	vers.IP21	vers.IP21
Forced ventilation with fans	vers.IP54	vers.IP54	vers.IP54	vers.IP54	vers.IP54	vers.IP54
Forced ventilation with air conditioner	vers.IP54	vers.IP54	vers.IP54	vers.IP54	vers.IP54	vers.IP54
Electronic control	•	•	•	•	•	•
Output accuracy: ±1% RMS	•	•	•	•	•	•
Harmonic distortion	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%
Admitted load variation up to 100%	•	•	•	•	•	•
Admitted overload: 200% x 1 mn	•	•	•	•	•	•
Ambient temperature: -10°C +40°C	•	•	•	•	•	•
Storage temperature: -20°C +60°C	•	•	•	•	•	•
Relative humidity: 95% non-condensing	•	•	•	•	•	•
Standard / Optional fittings						
Pilot lamps	•	•	•	•	•	•
Tropicalised control boards	•	•	•	•	•	•
Digital voltmeter	•	•	•	•	•	•
Digital network analyser	•	•	•	•	•	•
Input/output selector	•	•	•	•	•	•
Wheels	•	•	•	•	•	•
Alarm LEDS	•	•	•	•	•	•
Cl.I lightning arresters	•	•	•	•	•	•
Cl.II surge arresters	•	•	•	•	•	•
Short circuit protection	•	•	•	•	•	•
Overload protection	•	•	•	•	•	•
Over/under voltage protection	•	•	•	•	•	•
Reversed phase sequence / phase failure protection	•	•	•	•	•	•
Over temperature protection	•	•	•	•	•	•
Soft start	•	•	•	•	•	•
Functional by-pass	•	•	•	•	•	•
Maintenance by-pass	•	•	•	•	•	•
Galvanic separation	•	•	•	•	•	•
Neutral-point reactor	•	•	•	•	•	•
Input/output adapting transformer	•	•	•	•	•	•
Attenuation of common and transverse mode noise	•	•	•	•	•	•
Harmonic filter	•	•	•	•	•	•
Smart management of the plant	•	•	•	•	•	•
Modular system from Y326 upwards	-	-	-	-	-	•
Remote control	•	•	•	•	•	•
Storage of electrical parameters and alarms	•	•	•	•	•	•

• = standard
• = optional
- = not available

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OPTIONAL FITTINGS

ATTENUATION OF VOLTAGE SPIKES

This function is performed by means of surge arresters which protect both the AVR and the load against overcurrent of atmospheric origin and overvoltages.

The following protection devices are available:

a. Class I lightning arresters (IEC 62305) wave form 10/350µs 150kA total, 8/20 µs 150kA total, Up < 1.3kV, reaction time <100ns.

b. Combined class I+II surge arresters (IEC 62305), wave form 10/350µs 25kA total, 8/20 µs 120kA total, Up < 1.1kV, reaction time <100ns.

c. Class II surge arresters (IEC 60364-4-44), wave form 8/20µs 120kA total, Up < 1.3kV, reaction time <25ns.

d. Class III surge protection device (IEC 60364-4-44) wave form 8/20µs and 1,2/50µs 60kA total, Up < 1.2kV, reaction time <50ns.

SHORT CIRCUIT PROTECTION

Ensured by means of thermal magnetic circuit breaker or fuses in input.

OVERLOAD PROTECTION

Ensured by means of thermal magnetic circuit breaker, current relay or fuses in output.

OVER/UNDER VOLTAGE PROTECTION

Ensured by voltage relay with load cut-off by means of thermal magnetic circuit breaker or contactor.

REVERSED PHASE SEQUENCE / PHASE FAILURE PROTECTION

Voltage monitoring relay with load cut-off by means of thermal magnetic circuit breaker or contactor.

OVER TEMPERATURE PROTECTION

✔ A sensor detects when the temperature exceeds the alarm threshold in the most critical point of the AVR. The signal can

✔ either activate the automatic by-pass or

✔ disconnect the AVR through a contactor or a thermal magnetic circuit breaker.

SOFT START

Guarantees the supply of a stabilized voltage even in the first cycles of operation subsequent to a blackout. It is common, in fact, that following a blackout the lines supply very high voltages for a limited period.

The soft start protection can be implemented according to two methods to be defined in relation to the installation context and the type of load supplied:

✔ Through a power circuit that includes command and switching devices capable of connecting the load only when the voltage value at the output of the stabilizer is correctly restored and in tolerance. The command is implemented by a power contactor controlled by a timed relay.

✔ Through an auxiliary circuit that includes control and implementation devices capable of regulating the output voltage at the minimum value and then progressively rising to the nominal value. The command is implemented by the same system of regulation of the variable autotransformer powered by capacitors. In no case are used accumulators that require periodic replacement interventions.

FUNCTIONAL BY-PASS

In the unlikely event of a failure of the AVR, the load will be directly powered from the mains. The internal functional by-pass is performed by:

a. manual by-pass switch capable to withstand a current equal to or higher than the max input current of the AVR

b. 3 contactors which can be

✔ automatically activated when the sensors detect a critical operating condition or in case of AVR failure,

✔ manually activated by service people for maintenance purposes,

✔ activated by the remote control centre through the supervision software (password protected).

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MAINTENANCE BY-PASS

It is installed in a separate cabinet. The load is directly connected to the mains ensuring the operation in case of maintenance. It is performed by a manual by-pass switch capable to withstand a current equal to or higher than the max input current of the AVR.

GALVANIC SEPARATION

Besides ensuring galvanic isolation of the system, attenuating common-mode disturbances and creating a "clean neutral", it also allows, when necessary, to transform the nominal supply voltage to the voltage value required by the load.

NEUTRAL-POINT REACTOR

It is a magnetic component designed to create a reference neutral point in those three-phase systems where this is not available or is unstable.

INPUT/OUTPUT ADAPTING TRANSFORMER

It allows to adapt the nominal mains voltage to the value required by the load.

ATTENUATION OF COMMON MODE AND TRANSVERSE MODE NOISE

Ensured by EMI / RFI filters consisting of blocking coils and capacitors, it is able to attenuate high frequency noise.

HARMONIC FILTER

It realizes the reduction of the harmonic current components generated by non-linear or variable loads, it can be active or passive to be chosen according to the spectrum of harmonics present in the system.

SMART MANAGEMENT OF THE PLANT

a. Automatic switching on a reserve stabiliser

When an anomaly is detected in the operation of the stabilizer, the supervision module automatically transfers the load to the reserve stabilizer.

b. Automatic switching to an emergency line

The AVR is connected to an emergency line when an abnormal condition of the main power supply is detected by the supervision module.

c. Device for unprivileged load switching-off

Automatically switches off unprivileged loads in case of AVR overload or to achieve energy saving.

d. Control module for programmed switching-on / off of loads

Capable to handle up to 8 lines, each of them can undergo 8 changes of state in 24 hours.

MODULAR SYSTEM FROM Y326

The three-phase voltage stabilizers of large power (from model Y326) are made of functional units in order to facilitate transport, handling, positioning and installation. Each functional unit corresponds to the relative single-phase section that will be connected to the system. The connection to the system of this type of voltage stabilizer does not require further interconnections between the units and is therefore very similar to the connection of a voltage stabilizer made in a single unit.

REMOTE CONTROL

It allows remote monitoring of electrical parameters as well as acquisition of real-time information and historical data. The analysis of this information and of any alarm signal and functional status allows to prevent the intervention of the automatic protection systems of the stabilizer that would otherwise cause the interruption of the process or, in the absence of these, to take action to remove the cause of the alarm conditions.

Communication via Internet modem (LAN or Mobile).

STORAGE OF ELECTRICAL, PHYSICAL AND ALARM STATUS PARAMETERS

It remotely allows the display, via web on PC, smartphone, web viewers and tablets, of data coming from the voltage stabilizer.

The web display of the electrical parameters of the voltage stabilizer is divided into two macro areas: real-time data and historical data. Historical data can be displayed on a freely selectable period in a column chart, the data thus displayed can be arranged in tabular format and exported to CSV for processing in Excel or another application tool.

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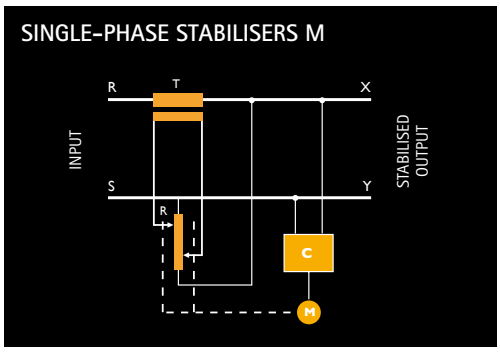
1PH VOLTAGE STABILISERS
M MODELS

M M SINGLE-PHASE 1-45 KVA
S M SINGLE-PHASE 15-350 KVA

M S



T = series transformer (booster)
R = variable autotransformer
C = electronic control circuit
M = servomotor

GENERAL CHARACTERISTICS

Mains	Single-phase
Nominal input voltage	220V or 230V or 240V (**)
Nominal output voltage	220V or 230V or 240V (**)
Output accuracy	±1% RMS
Frequency	50/60 Hz ±5%
Admitted load variation	0 to 100%
Admitted overload	10 times the nominal power during 10 ms, 5 times during 6 s, 2 times for 1 minute
Harmonic distortion	<0.1%
Efficiency	>98.5%
Cooling	natural air convection (fan-free system)
Colour	black or RAL 7035 (depending on model)
Protection degree	IP21
Installation	indoor
Standard fittings	digital voltmeter, pilot lamps, tropicalised control boards

(**) to be specified on the order. Different voltage values available on request.

OPTIONAL FITTINGS

SHORT CIRCUIT PROTECTION
OVERLOAD PROTECTION
OVER/UNDER VOLTAGE PROTECTION
SOFT START
MANUAL OR AUTOMATIC BY-PASS
DIGITAL NETWORK ANALYSER DISPLAYING THE ELECTRICAL PARAMETERS
ISOLATION TRANSFORMER
ADAPTING TRANSFORMER
SURGE ARRESTERS
IP54 INDOOR OR OUTDOOR VERSION

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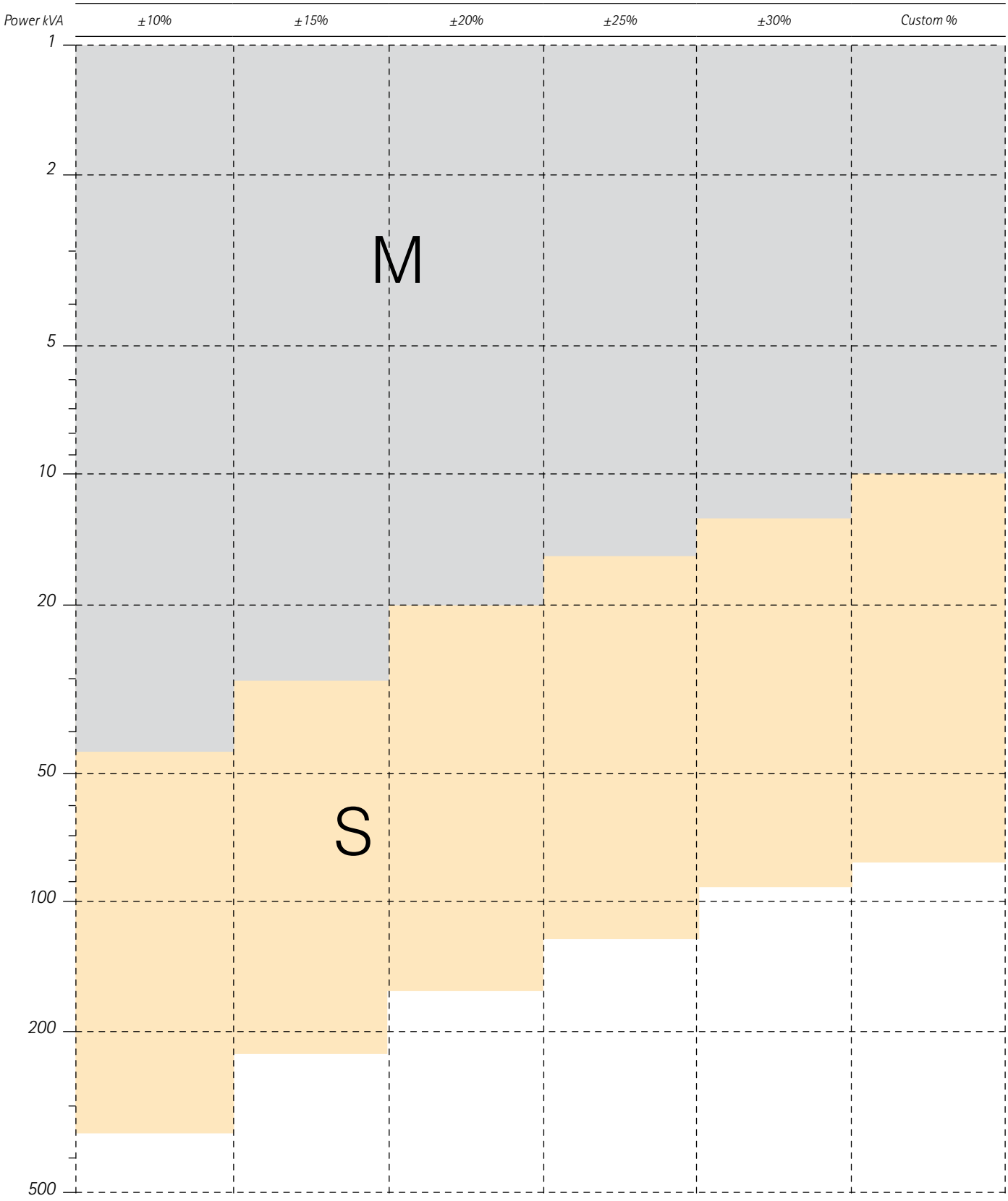
VOLTAGE STABILISERS - M MODELS



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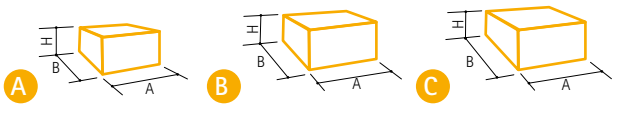
VOLTAGE STABILISERS
M M
SINGLE-PHASE 230V 50/60 HZ, PROTECTION DEGREE IP21

Model	*Rated power (KVA)*	*Voltage variation (±%)*	*Response time (ms/V)*	*Output accuracy (±%)*	*Fittings*	*Protection degree IP*	*Dimensions (mm) a x b x h*	*Net weight (kg)*	*Case*
M204E	1	±30	13	±1	CG, L	21	350x400x290	20	A
	1,5	±25	14						
	2	±20	15						
	2,5	±15	18						
M204E-3.5	3,5	±10	25		L				
M206E	2.,5	±30	20	±1	CG, L	21	350x400x290	30	A
	3	±25	13						
	4	±20	16						
	5	±15	19						
M206E7	7	±10	30		L				
M208E	3,3	±30	24	±1	CG, L	21	350x400x290	37	A
	4,5	±25	25						
	6	±20	17						
	7,5	±15	21						
M208E10	10	±10	28		L				
M210E	6	±30	24	±1	CG, L	21	450x560x400	65	B
	8	±25	15						
	10	±20	16						
	15	±15	21						
M210E24	24	±10	35		L				
M211E	9	±30	16	±1	CG, L	21	450x560x400	70	B
	12	±25	19						
	15	±20	22						
	22	±15	22						
M211E35	35	±10	36		L				
M212E	12	±30	20	±1	CG, L	21	450x680x400	110	C
	15	±25	23						
	20	±20	24						
	30	±15	27						
M212E45	40	±10	40		L				

Fittings GC: range selector terminal block
L: pilot lamp
Optional fittings V: digital voltmeter (M2..EV models)

Note: models with different power, and/or different input range, and/or different output accuracy can be quoted on demand

Voltage stabilisers are designed to deliver the declared power permanently (24/7) under the worst operating conditions, i.e. at full load, at minimum input voltage and max input current and at the declared ambient temperature.



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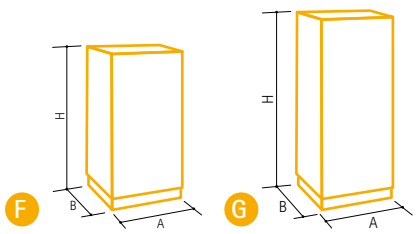
VOLTAGE STABILISERS
S M
SINGLE-PHASE 230V 50/60 HZ, PROTECTION DEGREE IP21

Model	*Rated power (KVA)*	*Voltage variation (±%)*	*Response time (ms/V)*	*Output accuracy (±%)*	*Fittings*	*Protection degree IP*	*Dimensions (mm) a x b x h*	*Net weight kg)*	*Cabinet*
M213AN15	15	±30	10	±1	V, L	21	650x650x1300	187	F
M213AN20	20	±25	12						
M213AN25	25	±20	14						
M213AN35	35	±15	16						
M213AN60	60	±10	37						
M214AN24	24	±30	18	±1	V, L	21	650x650x1300	235	F
M214AN30	30	±25	19						
M214AN40	40	±20	32						
M214AN55	55	±15	24						
M214AN90	90	±10	54						
M216AN30	30	±30	18	±1	V, L	21	650x650x1800	280	G
M216AN40	40	±25	19						
M216AN55	55	±20	21						
M216AN75	75	±15	27						
M216AN120	120	±10	39						
M217AN45	45	±30	22	±1	V, L	21	650x650x1800	340	G
M217AN60	60	±25	24						
M217AN80	80	±20	26						
M217AN110	110	±15	29						
M217AN180	180	±10	31						
M218AN60	60	±30	20	±1	V, L	21	650x650x1900	455	G
M218AN80	80	±25	21						
M218AN100	100	±20	23						
M218AN150	150	±15	26						
M218AN240	240	±10	31						
M219AN90	90	±30	23	±1	V, L	21	650x650x1900	670	G
M219AN120	120	±25	26						
M219AN160	160	±20	28						
M219AN230	230	±15	30						
M219AN350	350	±10	32						

Fittings V: digital voltmeter
L: pilot lamp

Note: models with different power, and/or different input range, and/or different output accuracy can be quoted on demand.

Voltage stabilisers are designed to deliver the declared power permanently (24/7) under the worst operating conditions, i.e. at full load, at minimum input voltage and max input current and at the declared ambient temperature.



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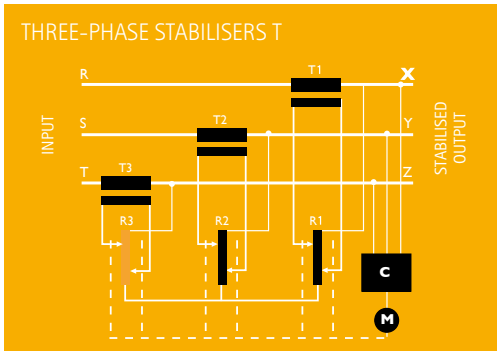
3PH VOLTAGE STABILISERS T MODELS
COMMON REGULATION OF THE 3 PHASES

M T THREE-PHASE 3.5-32 KVA S T
THREE-PHASE 22-800 KVA

M S



T = series transformer (booster)
R = variable autotransformer
C = electronic control circuit
M = servomotor

GENERAL CHARACTERISTICS

Mains	Three-phase
Nominal input voltage	380V or 400V or 415V (**)
Nominal output voltage	380V or 400V or 415V (**)
Output accuracy	±1% RMS
Frequency	50/60 Hz ±5%
Admitted load variation	0 to 100%
Admitted load unbalance	up to 50%
Admitted overload	10 times the nominal power during 10 ms, 5 times during 6 s, 2 times for 1 minute
Harmonic distortion	<0,1%
Efficiency	>98,5%
Cooling	natural air convection (fan-free system)
Colour	black or RAL 7035 (depending on model)
Protection degree	IP21
Installation	indoor
Standard fittings	digital voltmeter, pilot lamps, tropicalised control boards

(**) to be specified on the order. Different voltage values available on request.

OPTIONAL FITTINGS

SHORT CIRCUIT PROTECTION
OVERLOAD PROTECTION
OVER/UNDER VOLTAGE PROTECTION
REVERSED PHASE SEQUENCE / PHASE FAILURE PROTECTION
SOFT START
MANUAL OR AUTOMATIC BY-PASS
DIGITAL NETWORK ANALYSER DISPLAYING THE ELECTRICAL PARAMETERS
ISOLATION TRANSFORMER
ADAPTING TRANSFORMER
SURGE ARRESTERS
IP54 INDOOR OR OUTDOOR VERSION

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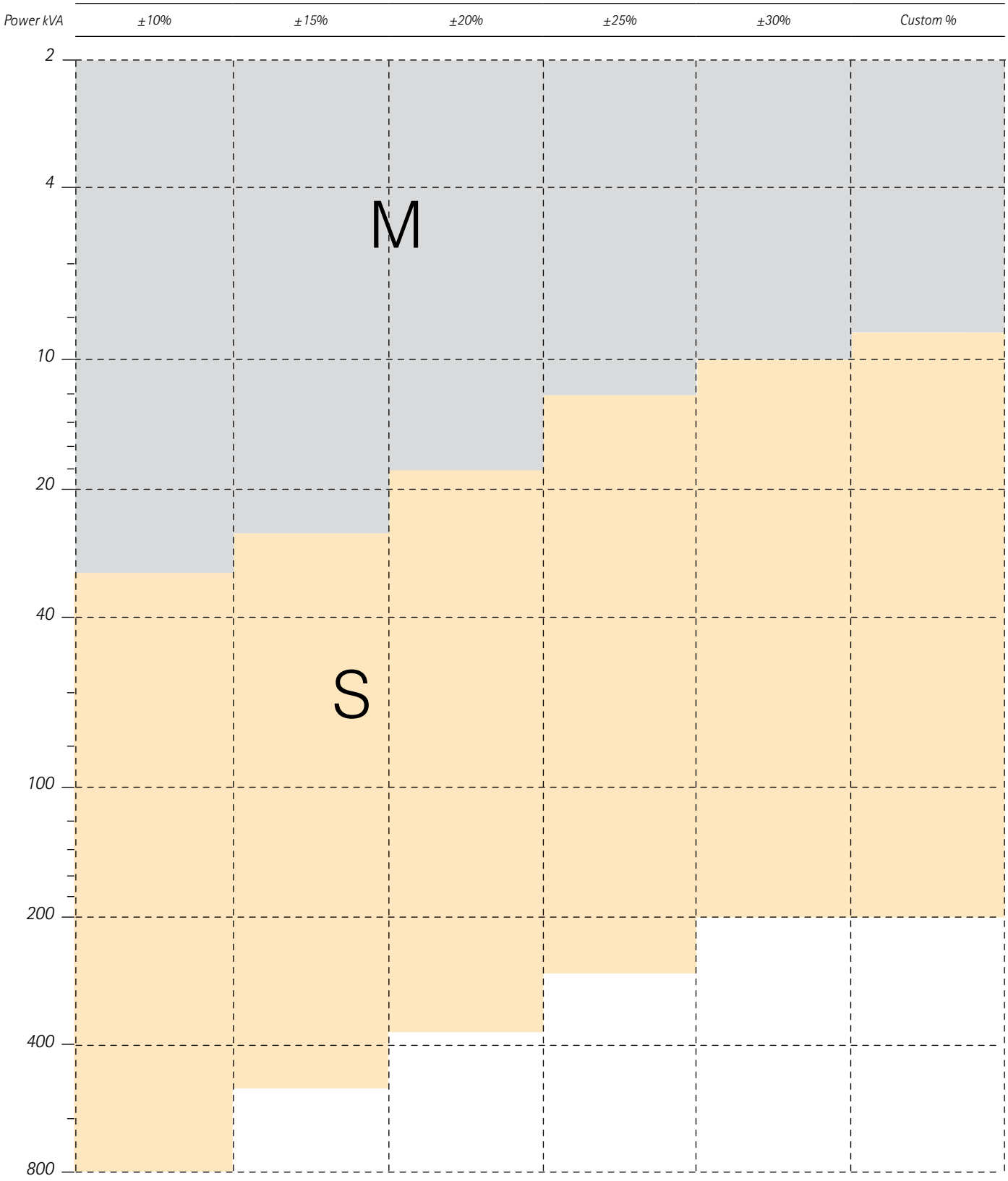
VOLTAGE STABILISERS - T MODELS



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VOLTAGE STABILISERS

M T COMMON REGULATION OF THE THREE PHASES

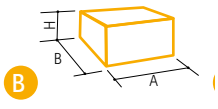
THREE-PHASE 400V 50/60 HZ PROTECTION DEGREE IP21

Model	*Rated power (KVA)*	*Voltage variations (±%)*	*Response time (ms/V)*	*Output accuracy (±%)*	*Fittings*	*Protection degree IP*	*Dimensions (mm) a x b x h*	*Net weight (kg)*	*Case*
T304E	3.5	±30	13	±1	CG, L	21	450x560x400	75	B
	4	±25	15						
	6	±20	16						
	8.5	±15	20						
T304E10	10	±10	30		L				
T306E	7	±30	13	±1	CG, L	21	450x560x400	85	B
	8	±25	15						
	12	±20	16						
	15	±15	21						
T306E22	22	±10	33		L				
T308E	10	±30	15	±1	CG, L	21	450x560x400	110	B
	12	±25	16						
	18	±20	18						
	25	±15	23						
T308E32	32	±10	30		L				

Fittings GC: range selector terminal block
L: pilot lamp
Optional fittings V: digital voltmeter (T3..EV models)

Note: models with different power, and/or different input range, and/or different output accuracy can be quoted on demand.

Voltage stabilisers are designed to deliver the declared power permanently (24/7) under the worst operating conditions, i.e. at full load, at minimum input voltage and max input current and at the declared ambient temperature.



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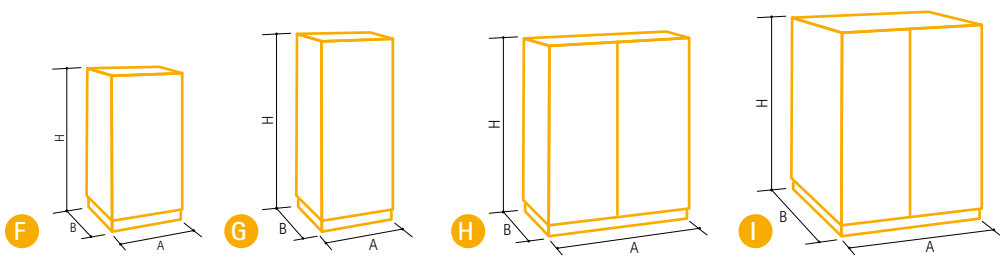
VOLTAGE STABILISERS

S T COMMON REGULATION OF THE THREE PHASES THREE-PHASE 400V 50/60 HZ PROTECTION DEGREE IP21

Model	*Rated power (KVA)*	*Voltage variation (±%)*	*Response time (ms/V)*	*Output accuracy (±%)*	*Fittings*	*Protection degree IP*	*Dimensions (mm) a x b x h*	*Net weight (kg)*	*Cabinet*
T310AN22	22	±30	10	±1	V, L	21	650x650x1300	250	F
T310AN30	30	±25	11						
T310AN40	40	±20	13						
T310AN55	55	±15	14						
T310AN90	90	±10	28						
T312AN35	35	±30	6	±1	V, L	21	650x650x1300	280	F
T312AN45	45	±25	15						
T312AN60	60	±20	12						
T312AN80	80	±15	16						
T312AN120	120	±10	23						
T314AN45	45	±30	10	±1	V, L	21	650x650x1300	355	F
T314AN60	60	±25	14						
T314AN80	80	±20	13						
T314AN120	120	±15	17						
T314AN185	185	±10	22						
T315AN70	70	±30	14	±1	V, L	21	650x650x1800	415	G
T315AN90	90	±25	18						
T315AN120	120	±20	23						
T315AN170	170	±15	24						
T315AN270	270	±10	36						
T316AN95	95	±30	12	±1	V, L	21	1100x650x1800	630	H
T316AN120	120	±25	13						
T316AN160	160	±20	17						
T316AN230	230	±15	17						
T316AN370	370	±10	22						
T318AN140	140	±30	14	±1	V, L	21	1100x650x1800	760	H
T318AN180	180	±25	16						
T318AN250	250	±20	21						
T318AN350	350	±15	23						
T318AN560	560	±10	27						
T319AN200	200	±30	21	±1	V, L	21	1100x900x1900	1160	I
T319AN270	270	±25	23						
T319AN370	370	±20	26						
T319AN500	500	±15	29					1250	
T319AN800	800	±10	32						

Fittings V: digital voltmeter
L: pilot lamp

Note: models with different power, and/or different input range, and/or different output accuracy can be quoted on demand.
Voltage stabilisers are designed to deliver the declared power permanently (24/7) under the worst operating conditions, i.e. at full load, at minimum input voltage and max input current and at the declared ambient temperature.



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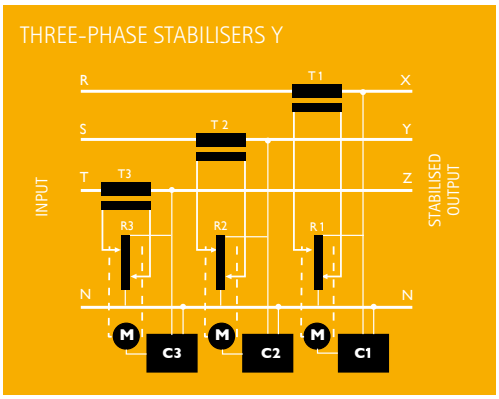
3PH VOLTAGE STABILISERS Y MODELS
INDEPENDENT REGULATION OF EACH PHASE

M Y THREE-PHASE 3-120 KVA
S Y THREE-PHASE 45-8000 KVA

M S



T = series transformer (booster)
R = variable autotransformer
C = electronic control circuit
M = servomotor

GENERAL CHARACTERISTICS

Mains	Three-phase
Nominal input voltage	380V or 400V or 415V (**)
Nominal output voltage	380V or 400V or 415V (**)
Output accuracy	±1% RMS
Frequency	50/60 Hz ±5%
Admitted load variation	0 to 100%
Admitted load unbalance	up to 100%
Admitted overload	10 times the nominal power during 10 ms, 5 times during 6 s, 2 times for 1 minute
Harmonic distortion	<0.1%
Efficiency	>98.5%
Cooling	natural air convection (fan-free system)
Colour	black or RAL 7035 (depending on model)
Protection degree	IP21
Installation	indoor
Standard fittings	digital voltmeter, pilot lamps, tropicalised control boards

(**) to be specified on the order. Different voltage values available on request.

OPTIONAL FITTINGS

SHORT CIRCUIT PROTECTION
OVERLOAD PROTECTION
OVER/UNDER VOLTAGE PROTECTION
REVERSED PHASE SEQUENCE / PHASE FAILURE PROTECTION
SOFT START
MANUAL OR AUTOMATIC BY-PASS
DIGITAL NETWORK ANALYSER DISPLAYING THE ELECTRICAL PARAMETERS
ISOLATION TRANSFORMER
ADAPTING TRANSFORMER
NEUTRAL-POINT REACTOR
SURGE ARRESTERS
IP54 INDOOR OR OUTDOOR VERSION

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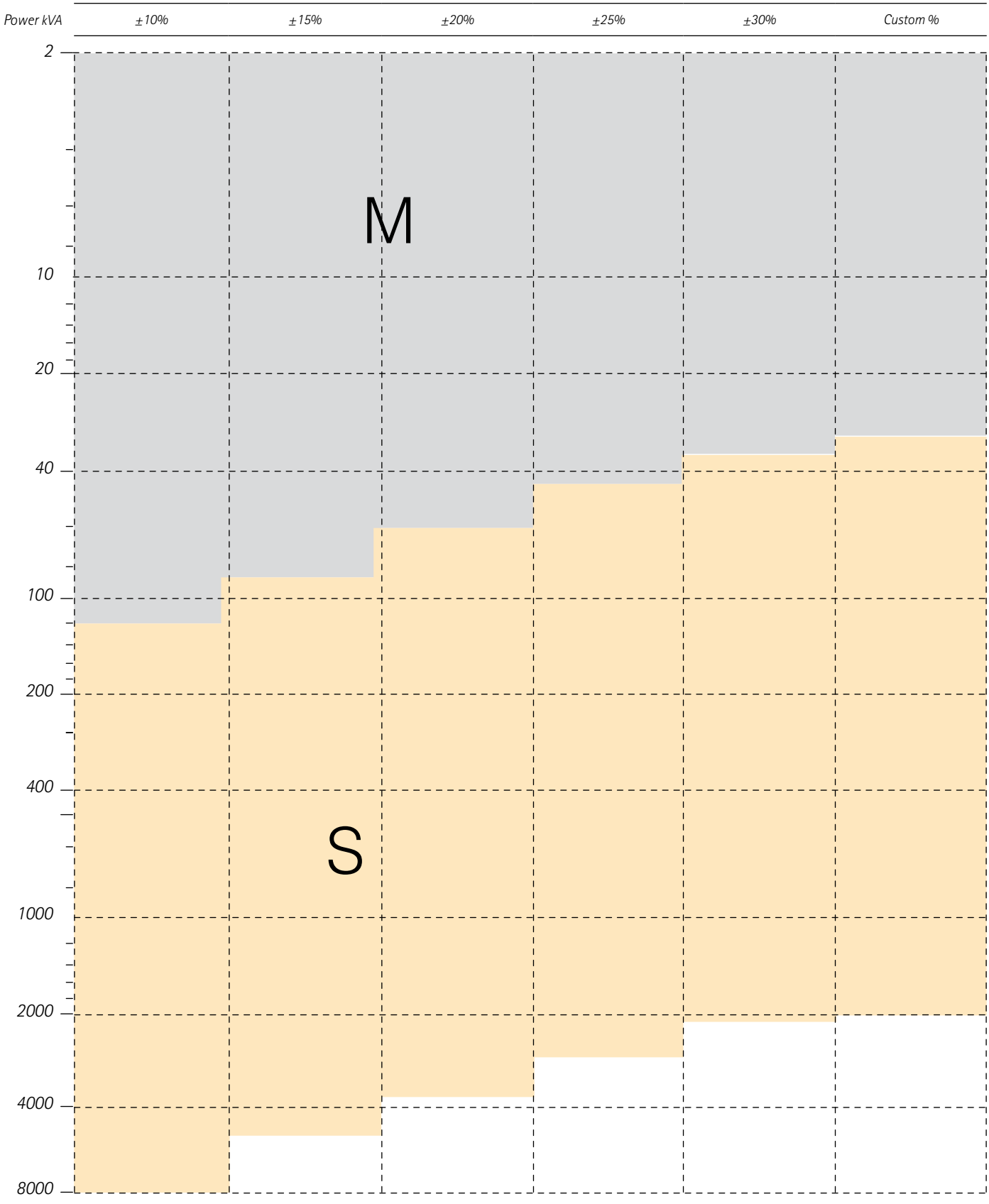
VOLTAGE STABILISERS - Y MODELS



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VOLTAGE STABILISERS

M Y INDEPENDENT REGULATION OF EACH PHASE

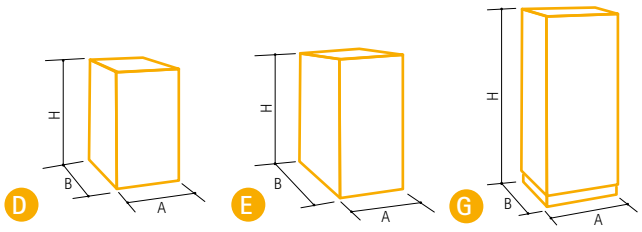
THREE-PHASE 400V 50/60 HZ PROTECTION DEGREE IP21

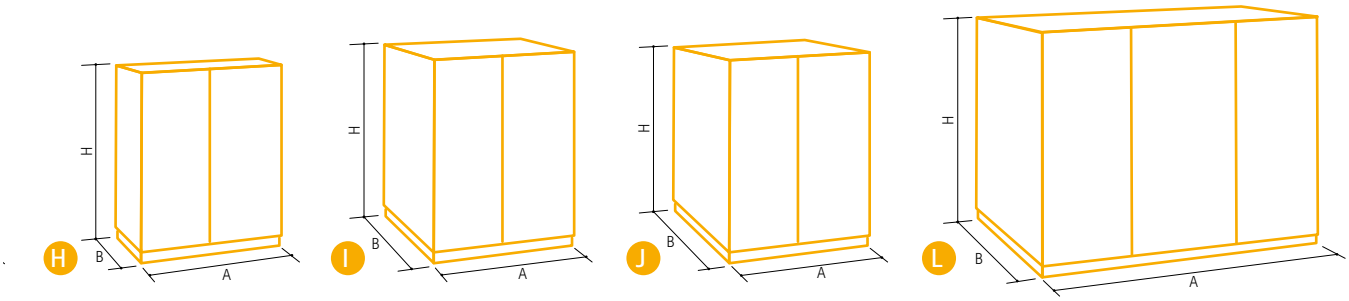
Model	*Rated power (KVA)*	*Voltage variation (±%)*	*Response time (ms/V)*	*Output accuracy (±%)*	*Fittings*	*Protection degree IP*	*Dimensions (mm) a x b x h*	*Net weight (kg)*	*Case*
Y304ES	3	±30	8	±1	V, GC, L, R	21	350x580x890	90	D
	4	±25	9						
	6	±20	10						
	8	±15	13						
Y304ES10	10	±10	16		V, L, R				
Y306ES	7	±30	11	±1	V, GC, L, R	21	350x580x890	110	D
	8.5	±25	12						
	12	±20	9						
	15	±15	13						
Y306ES24	24	±10	17		V, L, R				
Y308ES	10	±30	8	±1	V, GC, L, R	21	350x580x890	120	D
	12	±25	9						
	18	±20	10						
	25	±15	13						
Y308ES30	30	±10	19		V, L, R				
Y310ES	18	±30	10	±1	V, GC, L, R	21	450x800x1200	210	E
	24	±25	10						
	30	±20	10						
	45	±15	12						
Y310ES70	70	±10	18		V, L, R				
Y311ES	27	±30	8	±1	V, GC, L, R	21	450x800x1200	245	E
	35	±25	14						
	45	±20	11						
	65	±15	16						
Y311ES100	100	±10	23		V, L, R				
Y312ES	35	±30	14	±1	V, GC, L, R	21	450x800x1200	330	E
	45	±25	15						
	60	±20	17						
	85	±15	19						
Y312ES120	120	±10	23		V, L, R				

Fittings GC: range selector terminal block
V: digital voltmeter
L: pilot lamps
R: wheels

Note: models with different power, and/or different input range, and/or different output accuracy can be quoted on demand.

Voltage stabilisers are designed to deliver the declared power permanently (24/7) under the worst operating conditions, i.e. at full load, at minimum input voltage and max input current and at the declared ambient temperature.





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VOLTAGE STABILISERS

S Y INDEPENDENT REGULATION OF EACH PHASE THREE-PHASE 400V 50/60 HZ PROTECTION DEGREE IP21

Model	Rated power (KVA)	Voltage variations (±%)	Response time (ms/V)	Output accuracy (±%)	Fittings	Protection degree IP	Dimensions (mm) a x b x h	Net weight (kg)	Cabinet
Y313AN45	45	±30	6	±1	V, L	21	650x650x1800	480	G
Y313AN60	60	±25	13						
Y313AN80	80	±20	15						
Y313AN110	110	±15	17						
Y313AN180	180	±10	23						
Y314AN70	70	±30	8	±1	V, L	21	1100x650x1800	620	H
Y314AN90	90	±25	22						
Y314AN120	120	±20	18						
Y314AN170	170	±15	27						
Y314AN270	270	±10	24						
Y316AN90	90	±30	6	±1	V, L	21	1100x650x1800	650	H
Y316AN120	120	±25	12						
Y316AN160	160	±20	13						
Y316AN230	230	±15	19						
Y316AN370	370	±10	23						
Y317AN140	140	±30	8	±1	V, L	21	1100x650x1800	750	H
Y317AN180	180	±25	16						
Y317AN250	250	±20	18						
Y317AN350	350	±15	22						
Y317AN550	550	±10	33						
Y318AN190	190	±30	11	±1	V, L	21	1100x900x1900	1100	I
Y318AN240	240	±25	12						
Y318AN320	320	±20	15						
Y318AN460	460	±15	16						
Y318AN730	730	±10	24						
Y319AN280	280	±30	16	±1	V, L	21	1100x1270x1800	1360	J
Y319AN370	370	±25	11						
Y319AN500	500	±20	14						
Y319AN700	700	±15	17						
Y319AN1100	1100	±10	27						
Y320AN420	420	±30	9	±1	V, L	21	1100x1270x1900	1850	J
Y320AN550	550	±25	14						
Y320AN730	730	±20	13						
Y320AN1000	1000	±15	18						
Y320AN1500	1500	±10	26						
Y322AN550	550	±30	16	±1	V, L	21	2130x1350x2150	2700	L
Y322AN730	730	±25	18						
Y322AN1000	1000	±20	14						
Y322AN1350	1350	±15	16						
Y322AN2200	2200	±10	29						
Y323AN700	700	±30	16	±1	V, L	21	2130x1350x2150	3100	L
Y323AN900	900	±25	18						
Y323AN1200	1200	±20	14						
Y323AN1700	1700	±15	18						
Y323AN2700	2700	±10	29						
Y324AN800	800	±30	16	±1	V, L	21	2130x1350x2150	3400	L
Y324AN1000	1000	±25	18						
Y324AN1400	1400	±20	22						
Y324AN2000	2000	±15	17						
Y324AN3200	3200	±10	29						

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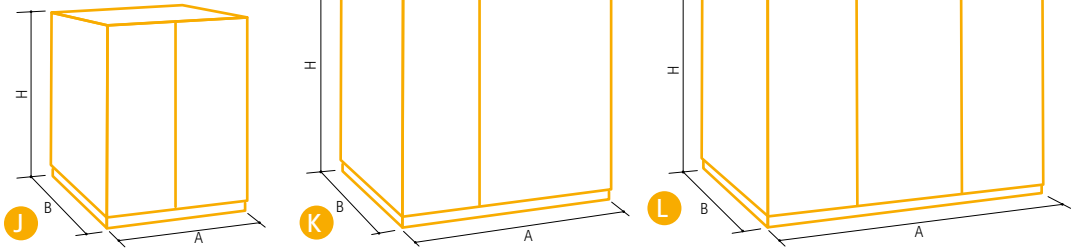
Model	Rated power (KVA)	Voltage variations (±%)	Response time (ms/V)	Output accuracy (±%)	Fittings	Protection degree IP	Dimensions (mm) a x b x h	Net weight (kg)	Cabinet
Y326AN1000	1000	±30	16	±1	V, L	21	3 cabinets 1100x1270x1900	3800	3 cabinets type J
Y326AN1250	1250	±25	18						
Y326AN1700	1700	±20	22						
Y326AN2400	2400	±15	18						
Y326AN3800	3800	±10	29						
Y328AN1100	1100	±30	16	±1	V, L	21	3 cabinets 1100x1270x1900	5200	3 cabinets type J
Y328AN1400	1400	±25	18						
Y328AN1900	1900	±20	22						
Y328AN2700	2700	±15	24						
Y328AN4400	4400	±10	26						
Y330AN1250	1250	±30	16	±1	V, L	21	3 cabinets 1100x1270x1900	5700	3 cabinetstype J
Y330AN1600	1600	±25	18						
Y330AN2200	2200	±20	22						
Y330AN3100	3100	±15	26						
Y330AN5000	5000	±10	29						
Y332AN1400	1400	±30	18	±1	V, L	21	3 cabinets 1500x1350x2150	6300	3 cabinets type K
Y332AN1800	1800	±25	20						
Y332AN2400	2400	±20	23						
Y332AN3400	3400	±15	24						
Y332AN5500	5500	±10	27						
Y334AN1500	1500	±30	9	±1	V, L	21	3 cabinets 1500x1350x2150	6800	3 cabinets type K
Y334AN2000	2000	±25	20						
Y334AN2600	2600	±20	23						
Y334AN3800	3800	±15	24						
Y334AN6000	6000	±15	27						
Y336AN1650	1650	±30	18	±1	V, L	21	3 cabinets 1500x1350x2150	7400	3 cabinets type K
Y336AN2200	2200	±25	20						
Y336AN3000	3000	±20	13						
Y336AN4100	4100	±15	24						
Y336AN6500	6500	±15	27						
Y338AN1800	1800	±30	18	±1	V, L	21	3 cabinets 2130x1350x2150	8000	3 cabinets type L
Y338AN2300	2300	±25	20						
Y338AN3100	3100	±20	23						
Y338AN4500	4500	±15	24						
Y338AN7000	7000	±15	27						
Y340AN2000	2000	±30	18	±1	V, L	21	3 cabinets 2130x1350x2150	8400	3 cabinets type L
Y340AN2500	2500	±25	20						
Y340AN3300	3300	±20	23						
Y340AN4700	4700	±15	24						
Y340AN7500	7500	±10	27						
Y342AN2100	2100	±30	10	±1	V, L	21	3 cabinets 2130x1350x2150	8800	3 cabinets type L
Y342AN2700	2700	±25	20						
Y342AN3600	3600	±20	23						
Y342AN5000	5000	±15	24						
Y342AN8000	8000	±10	27						

Fittings *V: digital voltmeter*
L: pilot lamp

Note: models with different power, and/or different input range, and/or different output accuracy can be quoted on demand.

Voltage stabilisers are designed to deliver the declared power permanently (24/7) under the worst operating conditions, i.e. at full load, at minimum input voltage and max input current and at the declared ambient temperature.



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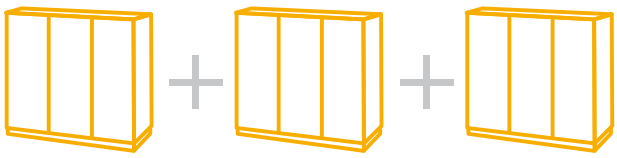
MODULAR SYSTEM



3PH voltage stabilisers (AVR) of higher power (from model Y326) are made in 3 sections in order to facilitate transport, handling, positioning and installation.

This kind of structure has been designed as a solution to problems related to handling of extremely big loads not common in electrical systems.

Voltage stabiliser modular system particularly helps during preparation of the site, avoiding the use of expensive lifting equipment and building of special openings to access the technical room.

The voltage stabiliser is made in separate sections corresponding to the single-phase units which will be connected to the plant.

No further interconnection between the different AVR sections is required, therefore the installation is perfectly similar to the connection of a voltage stabiliser made in one single cubicle.

Each single-phase unit includes all the control and regulation devices that determine its autonomous and independent operation.

In the unlikely event of a failure, this type of design limits the fault propagation, ensuring the best functionality and allows to act in a targeted and selective way on the component without having to operate on the other sections.

In this case the solution allows to contain the periodic maintenance and repair costs.

HIGHLIGHTS

REDUCED SHIPPING COSTS

Smart solution to problems related to handling/shipping of bulky loads.

REDUCED MAINTENANCE COSTS

Easy intervention on one section ensuring the functionality of the other units.

EASIER HANDLING

Excellent solution avoiding the use of expensive lifting equipment and building of special openings to access the installation room.

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VOLTAGE OPTIMISERS

Voltage Optimiser is a product dedicated to Power Quality and Energy Saving.

Voltage optimization is an energy-saving technology that, by operating through systematic and controlled reduction of the grid voltage, reduces the absorption of active and reactive power from the network.

The average voltage value of the distribution networks is often higher than the ideal operating value for most electrical equipment. Ecostab is the Energy Economizer which, by exploiting the principle of voltage optimization, increases the level of power quality and produces energy savings measured and quantified according to the international reference standard..

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POWER SUPPLY AND PROFESSIONAL USERS

A common misconception about VO is that a reduction in voltage will result in an increase in current and therefore power consumed will remain constant. This is true for certain fixed-power loads, however most sites have a diversity of loads that will benefit to a greater or lesser extent with energy savings aggregating across a site as a whole. The benefit to typical equipment at three phase sites is discussed below.

THREE PHASE AC MOTORS: The three-phase induction motor is one of the most common types of three phase loads and is used in many items of equipment including refrigeration, pumps, compressors, fans, air conditioning, conveyor drives and lifting systems. Overvoltage results in flux saturation of the iron core, wasting energy through eddy currents, increased hysteresis losses. The drawing of excessive current results in excess heat output from copper losses. The additional stress of overvoltage on motors will decrease motor lifetime. Avoiding overvoltage high enough to cause saturation does not reduce the motors running efficiency therefore substantial energy savings can be made through reducing iron and copper losses. However, motors designed for the nominal voltage (e.g. 400V Ph-Ph or 230V Ph-N) should be able to cope with normal variation in voltage within the supply limits (+/-10%) without saturation, so these motors are unlikely to be running in saturation, so savings are small. Reducing voltage to an induction motor will slightly affect the motor speed as slip will increase, but speed is mainly a function of the supply frequency and the number of poles. Motor efficiency is optimum at reasonable load (typically 75%) and at the designed voltage, and will fall off slightly with small variations either side of this voltage. Larger variations affect efficiency more. Very lightly loaded motors with loading of around 25% and small motors benefit most from reducing voltage. Motors driven by variable speed drives will use the same power as before, but may draw more current. It should be noted that with reduced stored energy in the DC Bus capacitors, they may be more vulnerable to power dips.

SWITCHED MODE POWER SUPPLIES: Switched mode power supplies will use the same power as before, but will draw a slightly greater current to achieve this, with slightly increased cable losses, and slight risk of the increased current tripping MCBs.

LIGHTING: When lighting loads are in use for a high proportion of the time, energy savings on lighting equipment is extremely valuable. When voltage is reduced, incandescent lighting will see a large decrease in power drawn, as well as large decrease in light output and an increase in lifetime. Other types of lighting can also benefit from improved power quality, including systems with resistive or reactive ballasts. Fluorescent and discharge lighting is more efficient than incandescent lighting.

Fluorescent lighting with conventional magnetic ballasts will see a reduced power consumption but also a reduced lumen output from the lamp.

Fluorescent lamps on modern electronic ballasts will use approximately the same power and give the same light.

To provide the same wattage at the reduced voltage will require a greater current and increase cable losses.

Lighting controllers and ballasts are responsible for generating high levels of harmonic distortion, which can be filtered with some types of voltage optimiser, therefore reducing the need for lighting controllers. A common concern is that some lighting will fail to strike at lower voltages. This should not occur since the aim of VO is not simply to reduce the voltage as far as possible, but rather to bring it to the service level voltage at which it was designed to operate most efficiently.

HEATING: Heaters will consume less power, but give out less heat. Thermostatically controlled space or water heaters will consume less power while running, but will have to run for longer in each hour to produce the required output, resulting in no saving.

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PROPOSAL

Voltage optimisation is a term given to the systematic controlled reduction in the voltages received by an energy consumer to reduce energy use, power demand and reactive power demand. While some voltage "optimisation" devices have a fixed voltage adjustment, others electronically regulate the voltage automatically. Voltage optimisation systems are typically installed in series to the electrical mains of a building, allowing all its electrical equipment to benefit from an optimised supply.

Overvoltage leads to sites using more electricity than needed, and as a result incurring higher electricity bills. The overvoltage is not only costly but can also be detrimental to equipment. Excess voltage produces additional noise, heat and vibration, causing stress on internal parts, especially to motors which are vulnerable to overheating and wear out more quickly. Voltage optimisation system ensures that a building only receives and pays for the voltage that it actually needs, and no more, optimizes power quality and generates energy savings .

Voltage Optimisers are available in power rating from 8 to 2800 kVA, single-phase and three-phase versions.

VOLTAGE OPTIMISATION (VO):

The average voltage supply from many national grids around the world is often higher than the ideal operating voltage for most electrical equipment like lighting and motors. For example, a 230V linear appliance used on a 240V supply will take 4.3% more current and will consume almost 9% more electricity than at 230V. Sites fitted with a voltage optimisation system often achieve reductions in the region of 5 to 15% for energy consumption, costs and therefore carbon emissions!

The first step to evaluate the profitability of installing a voltage optimiser is to monitor and know your present incoming voltage levels, the IREM Energy Saving Meter allows you to determine this.

Voltage Optimisers of "B" series
are fitted with 2 digital network analysers. These multimeters display all the electrical parameters measured, voltage, current, frequency, power, power factor, THD, etc. from the input mains and at the optimiser output. These multimeters have:

- ✔ Graphic LCD display 128x80 pixel, backlit
- ✔ 4 keys for display and setting
- ✔ quick and easy navigation
- ✔ texts for measurements, settings and messages in 5 languages
- ✔ true RMS measurements (TRMS)
- ✔ seamless data acquisition
- ✔ high accuracy.

Voltage Optimisers of "S" series, besides the standard equipment of the "B" series, are fitted with an additional display showing the energy saving achieved by the VO. The values displayed are calculated according to the method recommended by the VDE-AR-E 2055-1 Standard. The saving is displayed ensuring the accuracy of the metrological chain of measuring instruments.

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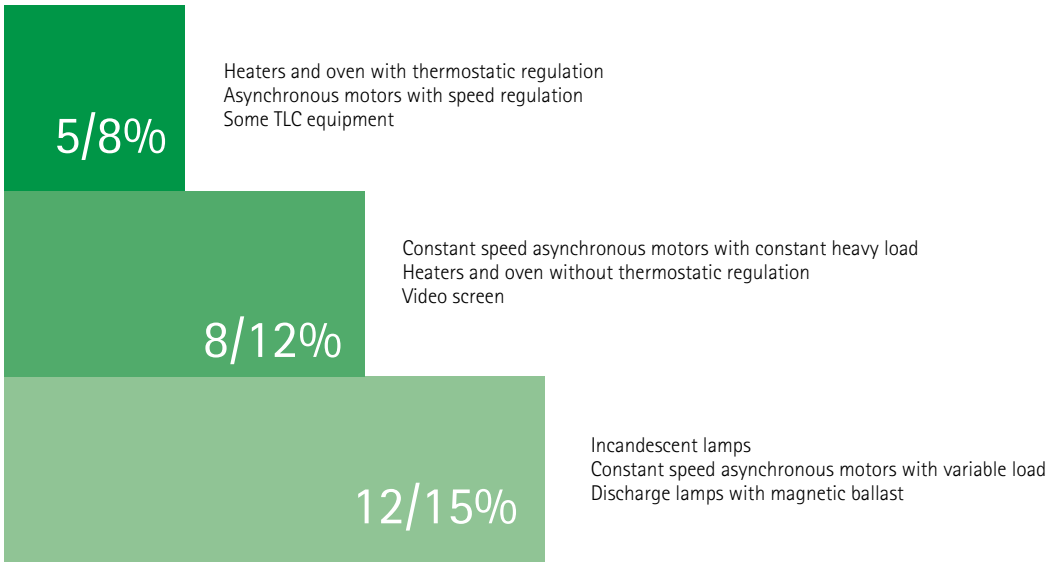
SAVING AND RETURN ON INVESTMENT



There are many factors which contribute to save energy, optimizing the power quality and to reduce the payback period:

a. Mains voltage which is not always close to rated value. Voltage is usually higher late at night: 10% higher than the rated value is a common condition. This level is often exceeded when the user is located near an electric substation. Saving increases to approximately 20% when the voltage exceeds 10% of the rated value.
b. Type of powered device. Some devices allow higher saving than others and some electric devices do not provide any significant saving at all.
c. Device use. The best results are obtained by using Ecostab in connection to motors with stall torque often lower than the maximum deliverable torque.
d. Overall consumption of devices powered by the voltage optimiser. The higher the power of the Ecostab voltage optimiser, the shorter its payback period.

Since not all the appliances and loads ensure the same energy saving, a careful analysis on their use is necessary to predict potential energy saving.

Sometimes, it may be advantageous to limit the use of Ecostab voltage optimisers to some devices to optimise the investment.

Thanks to the energy saved and the optimized power quality, the cost of the voltage optimiser will be usually paid off in a period ranging from two to five years.

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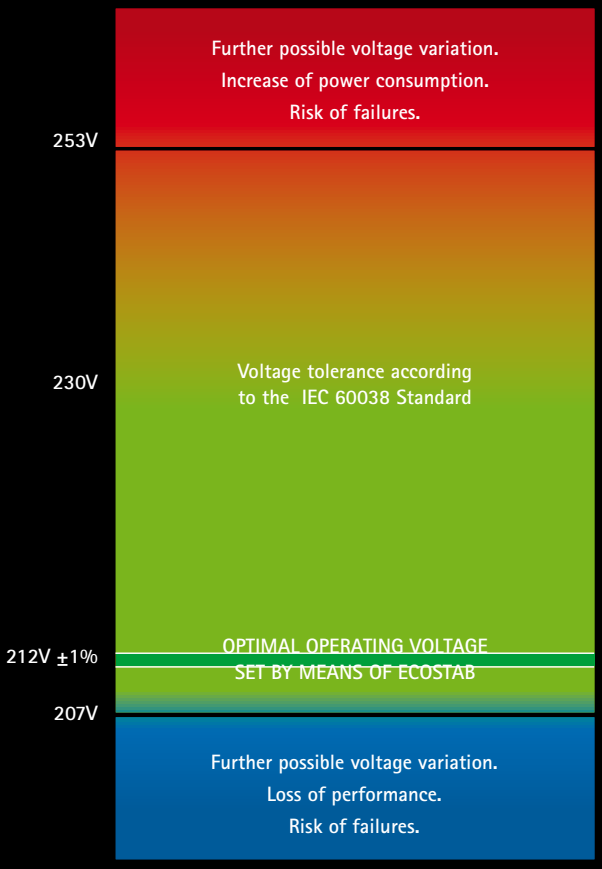
HIGHLIGHTS



By means of potentiometers the OPTIMAL OPERATING VOLTAGE can be set according to the peculiar features of the connected loads. The minimum stabilised voltage is 207V.

The dwindling fossil fuel reserves, the need to reduce carbon dioxide emissions and lower availability of financial resources has spurred energy production from renewable sources and strongly boosted the development of technology for optimising (limiting) electricity consumption.

Voltage optimisers are the ideal solution to optimize power quality and generate energy saving. Voltage optimisers comply with the requirements of IEC 60038 for electric equipment operating tolerances and supply an operating voltage which minimises consumption without impairing performance and extends the useful life.

IEC 60038 establishes that the electric equipment must be able to work correctly at an input voltage within ±10% of the nominal value, that is from 253V to 207V for single-phase devices and from 440V to 360V for three-phase devices.

This is an essential feature for all electric devices because energy producers establish that the supplied voltage may vary within these limits contractually.

As a consequence, if a load is supplied at a value close to the lower operating tolerance limit (-10%) also when the mains voltage assumes the higher value established by contract (+10%), the difference between 253V and 207V in absolute terms is 18%.

This power supply difference allows to:

a. obtain a significant saving of energy;

b. extend the working life of electric equipment. Ecostab voltage optimisers prevent devices from being powered at higher values than the rated voltage. For example, it is a known fact that the life of sodium bulbs is reduced by 50% when they are powered at a voltage 10% higher than their rated value;

c. secure a significant reduction of carbon dioxide emissions. This corresponds to approximately 630 g for every saved kWh of energy.

Voltage optimisers deliver a stabilised voltage which can be set to the minimum tolerance established in IEC 60038, i.e. -8% (212V), therefore within the tolerance prescribed by IEC STANDARD 60038 i.e. -10% (207V). This value is guaranteed also in presence of significant mains voltage variations. Interestingly, these devices are also excellent mains voltage stabilisers.

✔ Standard single-phase models can deliver a variable voltage from 230V to 212V with input voltage between 207-253V range.

✔ Standard three-phase models can deliver a variable voltage from 368/212V to 400/230V with input voltage between 360/207V and 440/253V.

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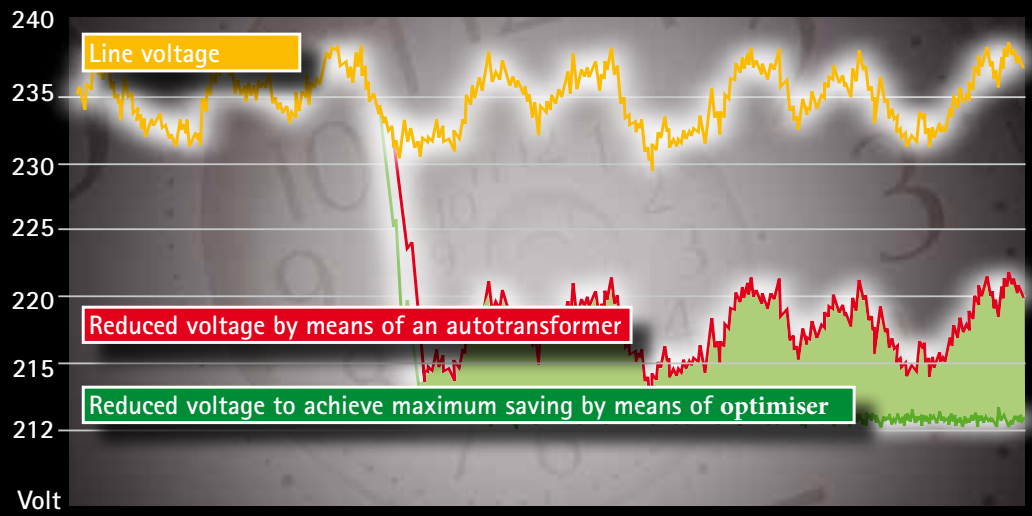

Voltage supply	*Average voltage V*	*Average power kW*	*Saving kW*	*Saving %*
Line voltage	234	159	0	0
Reduced voltage by means of an autotransformer	217	146	13	8.2
Reduced voltage by means of Ecostab	212	142	16,5	10,4

Voltage optimisers capable of broader input voltage variations may be built on demand. These may be needed because voltage may sometimes exceed the 10% tolerance specified in the supply contract.

Automatic voltage stabilisation is a key function that sets voltage optimisers apart from simple autotransformers, which also reduce voltage but cannot guarantee certain savings due to the continuous voltage variations of the mains.

In order to prevent the delivered voltage from dropping excessively low as a consequence of mains fluctuations, autotransformers can never provide maximum savings.

The following diagram shows three different power supply possibilities with average absorbed power and saving for an electric motor.

The area included between the red and the green lines represents the maximum saving achievable by voltage optimiser compared to the autotransformer economisers.

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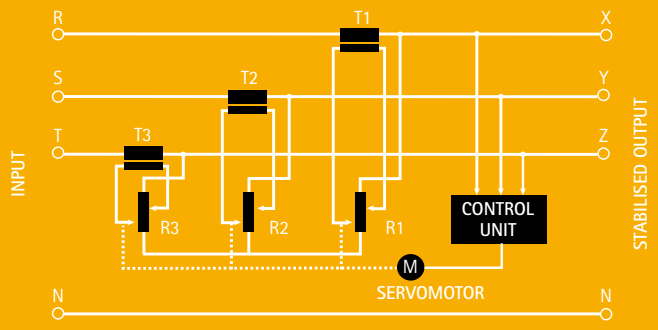
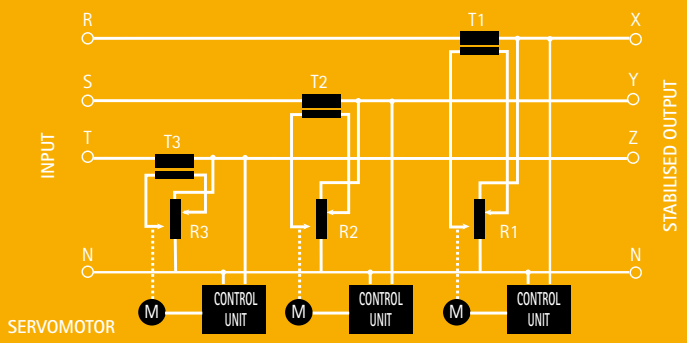
VOLTAGE OPTIMISERS
OPERATING PRINCIPLE

E T WITH COMMON REGULATION OF THE 3 PHASES



E Y WITH INDEPENDENT REGULATION OF THE 3 PHASES



An electronic control circuit detects the voltage delivered by the voltage optimiser and compares it to a reference voltage. If the difference between the output voltage and the reference voltage exceeds the preset tolerance limits, an error signal is generated; this signal may be either negative or positive according to whether the output voltage is lower or higher than the preset value. This signal activates the servomotor which moves the mobile contacts (electrographite rollers / brushes) of the variable autotransformer thus changing the transformation ratio in order to supply the additive or subtractive voltage needed to restore the value within the predetermined limits to the primary winding of the series transformer. The root-mean-square value (RMS) of the output voltage is stabilised and consequently not affected by possible harmonic distortions present in the input mains. This regulation system has the advantage of not having mobile contacts in series to the power supply line.

Fig. G

IP21

Fig. H

GENERAL FEATURES

POWER RANGE. From 8 to 2800 kVA, in single-phase and three-phase version.

ACCURACY. ±1% RMS also in presence of high harmonic distortions.

OVERLOAD CAPACITY. 10 times the rated power for 10 ms, 5 times for 6 s, 2 times for one minute.

EFFICIENCY. Exceeding 98.5%.

POWER FACTOR AND LOAD VARIATION INSENSITIVITY. The accuracy and the regulation speed remain unaltered under any load condition (full load or no load, with inductive or capacitive loads).

FREQUENCY VARIATION INSENSITIVITY.

HARMONIC DISTORTIONS. The harmonic distortion is always maintained within 0.2% in any operating condition.

IMPEDANCE. The installation of an Ecostab voltage optimiser in a pre-existing plant does not require a new calculation of the protections because the internal impedance of the optimiser does not significantly affect the line impedance.

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outdoor model

IP54

indoor model

OPERATING TEMPERATURE. Ecostab voltage optimisers are designed for operation at a maximum ambient temperature of 40°C in the most demanding conditions: continuous duty, full load and minimum input voltage. Models suitable for higher temperatures are manufactured on request.

DEGREE OF PROTECTION. IP00, IP21, IP54 INDOOR and IP54 OUTDOOR.

COOLING SYSTEM. All IP21 models are designed for natural air convection – FAN-FREE.

IP54 models are cooled by fans or by air conditioning depending on the ambient conditions.

RELIABILITY. Voltage optimisers use the same technology and the same components as voltage stabilisers, that it has been manufacturing for over 60 years. The MTBF exceeding 500,000 hours is the result of continuous improvement in technical aspects and production process.

INSTALLATION. The voltage optimiser is installed after the energy counter and before the electric users.

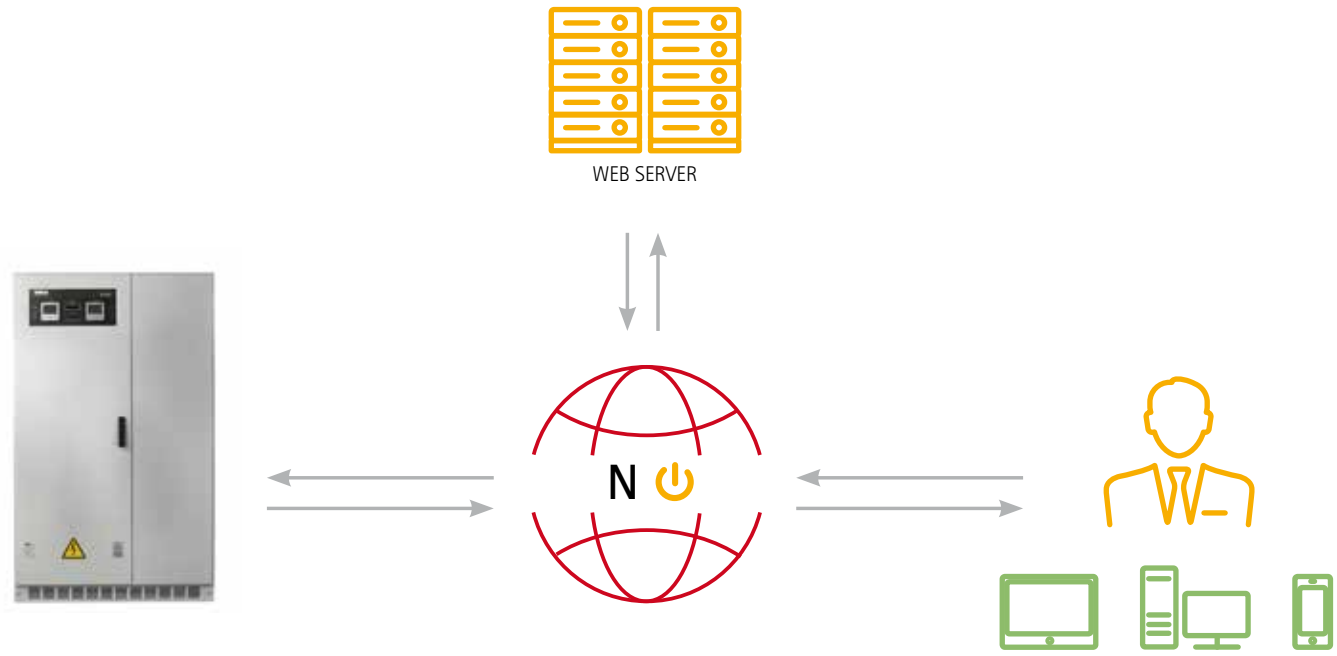
STANDARD FITTINGS. Digital network analyser / energy meter, pilot lamps, potentiometer, alarm indication and dry contacts for connection to an external device for protection against: overload, over/under voltage.

SPECIAL VERSIONS. Ecostab voltage optimisers can be equipped on demand with special fittings in separate cabinet, like e.g.: maintenance bypass, thermal magnetic circuit breakers, surge/lightning arresters, harmonic filters.

REMOTE CONTROL. Ecostab voltage optimisers can be equipped with an optional monitoring system permitting the remote control via ETHERNET, INTERNET, GSM/GPRS.

COMPLIANCE WITH STANDARDS. Ecostab voltage optimisers comply with the following Directives:

- ✔ Electro Magnetic Compatibility 2014/30/UE and following amendments.
- ✔ Low Voltage Electrical Equipment 2014/35/UE and following amendments.



remote control system

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E S

SINGLE PHASE M AND THREE-PHASE T / Y

E M2.S SINGLE-PHASE 230V 50/60HZ VOLTAGE OPTIMISERS - IP21 INDOOR MODELS

Model	Rated power (KVA)	Rated current (Ampere)	Input voltage variation (±%)	Output regulation range (%)	Response time (ms/V)	Output accuracy (±%)	Dimensions (mm) a x b x h	Net weight (kg)	Figure
M208EJ8S	8	35	±10%	0 to -8%	21	±1%	600x350x290	45	A
M210EJ12S	12	52			21		800x450x400	65	B
M211EJ20S	20	87			22			80	
M212EJ25S	25	109			27			120	

E T3.S THREE-PHASE 400V 50/60HZ VOLTAGE OPTIMISERS - IP21 INDOOR MODELS

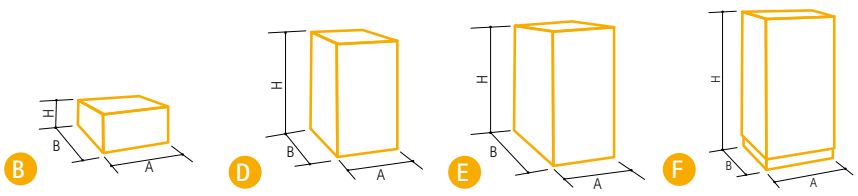
Model	Rated power (KVA)	Rated current (Ampere)	Input voltage variation (±%)	Output regulation range (%)	Response time (ms/V)	Output accuracy (±%)	Dimensions (mm) a x b x h	Net weight (kg)	Figure
T308EJ20S	20	29	±10%	0 to -8%	23	±1%	800x450x400	120	B
T310AJ50S	50	72			14		650x650x1300	250	F
T312AJ70S	70	101			16			280	
T314AJ100S	100	144			17			360	
T315AJ150S	150	217			24		650x650x1800	420	G
T316AJ200S	200	289			17		1100x650x1800	630	H
T318AJ300S	300	433			23			790	
T319AJ400S	400	577			29		1100x900x1900	1150	I
T320AJ500S	500	722			29			1200	

E Y3.S THREE-PHASE + N 400V 50/60HZ VOLTAGE OPTIMISERS - IP21 INDOOR MODELS

Model	Rated power (KVA)	Rated current (Ampere)	Input voltage variation (±%)	Output regulation range (%)	Response time (ms/V)	Output accuracy (±%)	Dimensions (mm) a x b x h	Net weight (kg)	Figure
Y308EJ20S	20	29	±10%	0 to -8%	13	±1%	350x580x890	120	D
Y310EJ40S	40	58			12		450x800x1200	210	E
Y311EJ60S	60	87			16			250	
Y312EJ80S	80	115			19			290	
Y313AJ100S	100	144			17		650x650x1800	480	G
Y314AJ150S	150	217			27		1100x650x1800	620	H
Y316AJ200S	200	289			19			650	
Y317AJ300S	300	433			22			750	
Y318AJ400S	400	577			16		1100x900x1900	1100	I
Y319AJ600S	600	866			17		1100x1270x1800	1360	J
Y320AJ800S	800	1155			18		1100x1270x1900	1770	
Y320AJ1000S	1000	1443			18		1100x1270x1900	1850	
Y322AJ1250S	1250	1804			26		2130x1350x2150	2700	K
Y323AJ1600S	1600	2309			18			3100	
Y324AJ2000S	2000	2887			17			3400	
Y326AJ2300S	2300	3320			18		3 cabinets 1100x1270x1900	3800	3 x J
Y328AJ2500S	2500	3608			24			5200	
Y330AJ2800S	2800	4041			26			5700	

Fittings: Potentiometer to adjust the stabilised output voltage
Digital network analyser and energy meter
Display and storage of saving data in absolute value and %
Communication port: ETHERNET, USB
Alarm indication and dry contacts for connection to an external device for protection against: overload, over/under voltage
Pilot lamps

Voltage optimisers are designed to deliver the declared power permanently (24/7) under the worst operating conditions, i.e. at full load, at minimum input voltage and max input current and at the declared ambient temperature.



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E B
SINGLE PHASE M AND THREE-PHASE T / Y

E M2.B SINGLE-PHASE 230V 50/60HZ VOLTAGE OPTIMISERS - IP21 INDOOR MODELS

Model	Rated power (KVA)	Rated current (Ampere)	Input voltage variation (±%)	Output regulation range (%)	Response time (ms/V)	Output accuracy (±%)	Dimensions (mm) a x b x h	Net weight (kg)	Figure
M208EJ8B	8	35	±10%	0 to -8%	21	±1%	600x350x290	45	A
M210EJ12B	12	52			21		800x450x400	65	B
M211EJ20B	20	87			22			80	
M212EJ25B	25	109			27			120	

E T3.B THREE-PHASE 400V 50/60HZ VOLTAGE OPTIMISERS - IP21 INDOOR MODELS

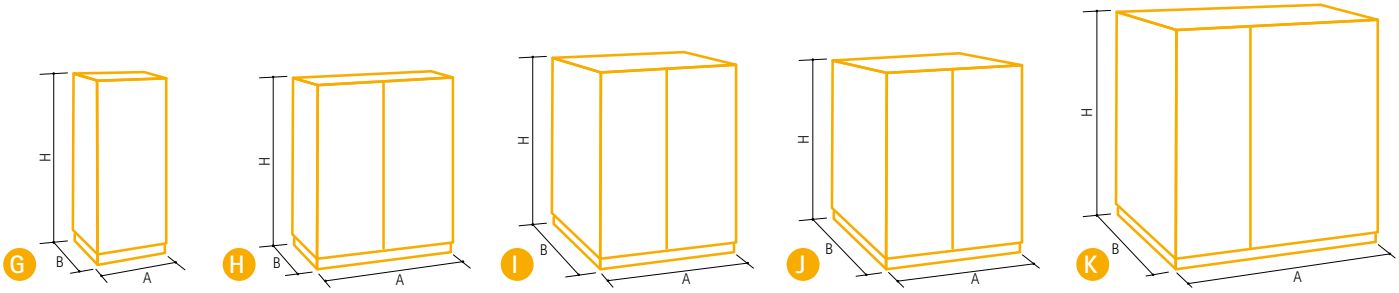
Model	Rated power (KVA)	Rated current (Ampere)	Input voltage variation (±%)	Output regulation range (%)	Response time (ms/V)	Output accuracy (±%)	Dimensions (mm) a x b x h	Net weight (kg)	Figure
T308EJ20B	20	29	±10%	0 to -8%	23	±1%	800x450x400	120	B
T310AJ50B	50	72			14		650x650x1300	250	F
T312AJ70B	70	101			16			280	
T314AJ100B	100	144			17			360	
T315AJ150B	150	217			24		650x650x1800	420	G
T316AJ200B	200	289			17		1100x650x1800	630	H
T318AJ300B	300	433			23			790	
T319AJ400B	400	577			29		1100x900x1900	1150	I
T319AJ500B	500	722			29			1200	

E Y3.B THREE-PHASE + N 400V 50/60HZ VOLTAGE OPTIMISERS - IP21 INDOOR MODELS

Model	Rated power (KVA)	Rated current (Ampere)	Input voltage variation (±%)	Output regulation range (%)	Response time (ms/V)	Output accuracy (±%)	Dimensions (mm) a x b x h	Net weight (kg)	Figure
Y308EJ20B	20	29	±10%	0 to -8%	13	±1%	350x580x890	120	D
Y310EJ40B	40	58			12		450x800x1200	210	E
Y311EJ60B	60	87			16			240	
Y312EJ80B	80	115			19			290	
Y313AJ100B	100	144			17		650x650x1800	480	G
Y314AJ150B	150	217			27		1100x650x1800	620	H
Y316AJ200B	200	289			19			650	
Y317AJ300B	300	433			22			750	
Y318AJ400B	400	577			16		1100x900x1900	1100	I
Y319AJ600B	600	866			17		1100x1270x1800	1360	J
Y320AJ800B	800	1155			18		1100x1270x1900	1770	
Y320AJ1000B	1000	1443			18		1100x1270x1900	1850	
Y322AJ1250B	1250	1804			26		2130x1350x2150	2700	K
Y323AJ1600B	1600	2309			18			3100	
Y324AJ2000B	2000	2887			17			3400	
Y326AJ2300B	2300	3320			18		3 cabinets 1100x1270x1900	3800	3 x J
Y328AJ2500B	2500	3608			24			5200	
Y330AJ2800B	2800	4041			26			5700	

Fittings: Potentiometer to adjust the stabilised output voltage
Digital network analyser and energy meter
Alarm indication and dry contacts for connection to an external device for protection against: overload, over/under voltage
Pilot lamps

Voltage optimisers are designed to deliver the declared power permanently (24/7) under the worst operating conditions, i.e. at full load, at minimum input voltage and max input current and at the declared ambient temperature.



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TOP
PROTECTION

LINE CONDITIONERS

Line Conditioners have been designed to provide the highest level of protection to electrical appliances connected to distribution lines disturbed by sudden voltage variations, HF noises and spikes. Statistically, the phenomena that reduce the power quality of the energy supplied by the network represent more than 95% of electric anomalies that could be the cause of breakdowns and poor operation of any kind of appliance connected to distribution lines.

Line Conditioners guarantee maximum protection to users subject to particular power grid anomalies and drastically increase the level of power quality.

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The Power Conditioners embody four different devices each one devoted to the compensation or attenuation of a specific electrical fault:

- ✔ a suppressor of voltage spikes
- ✔ a line filter
- ✔ a high attenuation isolating transformer
- ✔ a voltage regulator

THE RANGE

The range of Line Conditioners is made up of models with powers that vary from 0.5 to 950 kVA and use two different voltage regulation technologies:

a. static switching technology for loads with single-phase absorption (up to 4 kVA) and three-phase (up to 24 kVA)

b. electrodynamic regulation technology via series transformer and variable autotransformer for loads with three-phase absorption (up to 950 kVA).

The two regulation technologies and the wide range allow the most suitable regulation system to be supplied to meet the specific needs of power quality of various kinds of appliances.

PROPOSAL

ELECTRONIC LINE CONDITIONERS

Electronic Line Conditioners have specific performances to power electronic appliances with medium to low powers that require a particularly high stabilisation speed such as: process and numerical controls, robotics, medical equipment, telecommunications and computers.

The range is made up of standard models with powers ranging from 0.5 to 24 kVA. Furthermore, because the manufacturing criteria make these power conditioners highly versatile, on request, versions can be designed with customised specifications for the most varied applications.

ELECTRODYNAMIC LINE CONDITIONERS

Electrodynamic Line Conditioners provide a maximum level of protection to high power appliances, with high electromagnetic susceptibility, connected to distribution lines disturbed by sudden voltage variations, high frequency interferences and voltage spikes.

The voltage regulation system is made up exclusively of magnetic components capable of supporting loads with high inrush currents. The use of electronic components is limited to mains control and command of the magnetic components that stabilize the voltage. Thanks to these features, the electromechanical line conditioners stand apart for their high electromagnetic immunity and for the reliability characterised by a MTBF longer than 500,000 hours. They are, therefore, particularly suitable to solve power quality problems of electric users like radio-TV transmitters, telephone systems, radar systems, motors, compressors, pumps, medical equipment, machine tools and so on.

Their constructive features ensure that maintenance can be carried out even by technical staff with only a basic knowledge of electrical installations.

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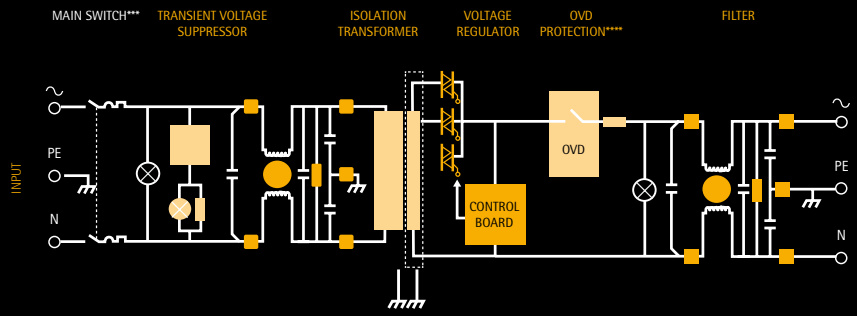
M TS - TST ELECTRONIC LINE CONDITIONERS



*** For TS...GSR models

**** on request for TS.../GS and TS.../GSR

The range of single-phase M TS Electronic Line Conditioners is made up of models with powers ranging from 500 VA to 4 kVA.

Possibility to:

- ✔ connect single-phase 220, 230, 240 or 120 V loads to 500/400V lines without neutral
- ✔ install these units inside electric switchgears or rack units
- ✔ have a range of "universal" appliances capable of delivering a 230V single-phase voltage powered by 440/400/220V 50 and 60 Hz three-phase distribution lines.

M TS..., TST....ELECTRONIC LINE CONDITIONERS

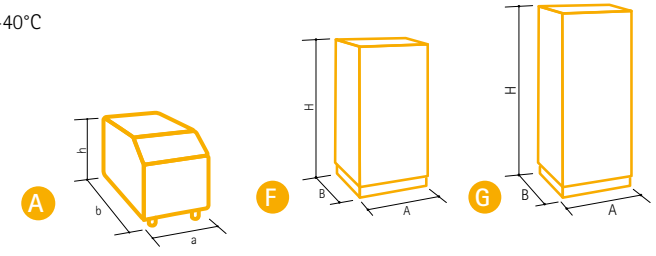
Model	*Power KVA*	*N. of phases*	*Input voltage V*	*Output voltage V*	*Rated current Amp*	*Standard fittings*	*Net weight kg*	*Dimensions mm a x b x h*	*Figure*
TS50/GS	0,5	1	230/400/440 ±15%	230±3%	2,17	FF, CF, CT, M	21	380 x 315 x 216	A
TS75/GS	0,75				3,26		28	380 x 315 x 216	
TS100/GS	1				4,35		39	380 x 360 x 260	
TS200/GS	2				8,7		49	400 x 460 x 295	
TS400/GS	4				17,39		60	400 x 460 x 295	
TS75/GSR	0,75	1	230/400/440 ±15%	230V ±3%	3,26	FF, CF, CT, M	30	482 x 415 x 221	A
TS100/GSR	1				4,35		45	482 x 460 x 266	
TS200/GSR	2				8,7		58	482 x 560 x 310	
TS400/GSR	4				17,39		68	482 x 560 x 310	
TST12N	12	3	400 ±15%	400 ±3%	17,32	I, L, F, M, BT, PT	172	650 x 650 x1300	F
TST18N	18				26		295	650 x 650 x1800	G
TST24N	24				34,64		375	650 x 650 x1800	

Fittings:

I = Main breaker
IM = Thermal magnetic circuit breaker
CF = Frequency selector (50/60Hz)
L = "Mains on" pilot lamps
CT = Voltage selector
F = Input fuse
M = Terminal board connection
FF = Ultra rapid output fuse
BT = Electronic voltage relay (on request)
PT = Thermal protection
O = OVD protection

Other features

Impedance: 0.3 to 11 Ohm depending on models
No-load current: 40 to 700mA depending on models
Total harmonic distortion: < 1%
Operating temperature: -10°C +40°C
Full load efficiency: >95%
Audible noise: <40dB(A)



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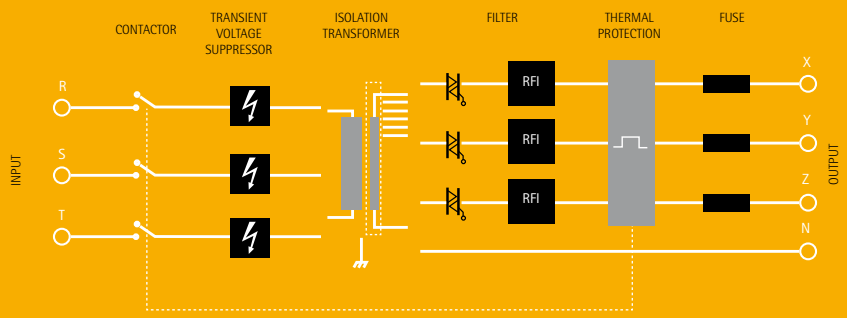

M TST Electronic Line Conditioners is made up of models with power from 12 to 24 kVA.

It is particularly suitable for powering NC machine-tool equipment, automation plants and telecommunications systems.

These line conditioners are fitted with delta-star isolating transformer and create a "real neutral" making it possible to have a single-phase 230V voltage using a three-phase 400V plant without neutral.

GENERAL FEATURES

TRANSIENT VOLTAGE SUPPRESSOR

This device is intended to limit transverse and common mode spikes exceeding the input voltage peak value. Transient voltage protection can also be effective on spikes of atmospheric origin over 6kV.

RFI FILTERS

They attenuate high frequency transverse and common mode interferences over 300 kHz.

ISOLATION TRANSFORMER

It is featured by low output impedance, insensitivity to load power factor, high attenuation and functional and dielectric isolation. The F thermal class transformer has a recessed concentric winding configuration to meet the impedance and power factor requirements. The double shielding allows a common mode attenuation higher than 110 dB up to 350 kHz and an insulation degree in compliance with relevant Standards. The creepage and clearance distances exceed 7 mm. The withstanding overvoltage at 50/60 Hz between primary and secondary exceeds 3750V. The isolation at fulmination pulse voltage is 8 kVolt.

ELECTRONIC VOLTAGE REGULATOR

The electronic voltage regulator stabilises the voltage permitting to attain, under every load condition, ±3% output voltage accuracy with very high efficiency without generating any EMI interference. Its main features are:

- ✔ response time lower than 2 ms/volt,
- ✔ insensitivity to load power factor,
- ✔ reduced dynamic impedance (0,5%),
- ✔ efficiency higher than 99%,
- ✔ "quasi-peak" output voltage sensing circuit which allows "data acquisition" in 10 ms and the compensation of wave form flattening caused by non-linear loads,
- ✔ creepage and clearance distances exceeding 8 mm,
- ✔ mounting of power semiconductors with 2500 Volt internal insulation on isolated heatsinks.

OVERVOLTAGE PROTECTION (ON REQUEST FOR TS.../GS AND TS...GR MODELS)

A safety device which cuts off the load when the output voltage exceeds +14% the nominal voltage for more than 0.4 seconds.

CONFORMITY TO STANDARDS

Ministatic line conditioners conform to the requirements of the most recent Electro Magnetic Compatibility Standards, and particularly 2014/30/UE and 2014/35/UE.

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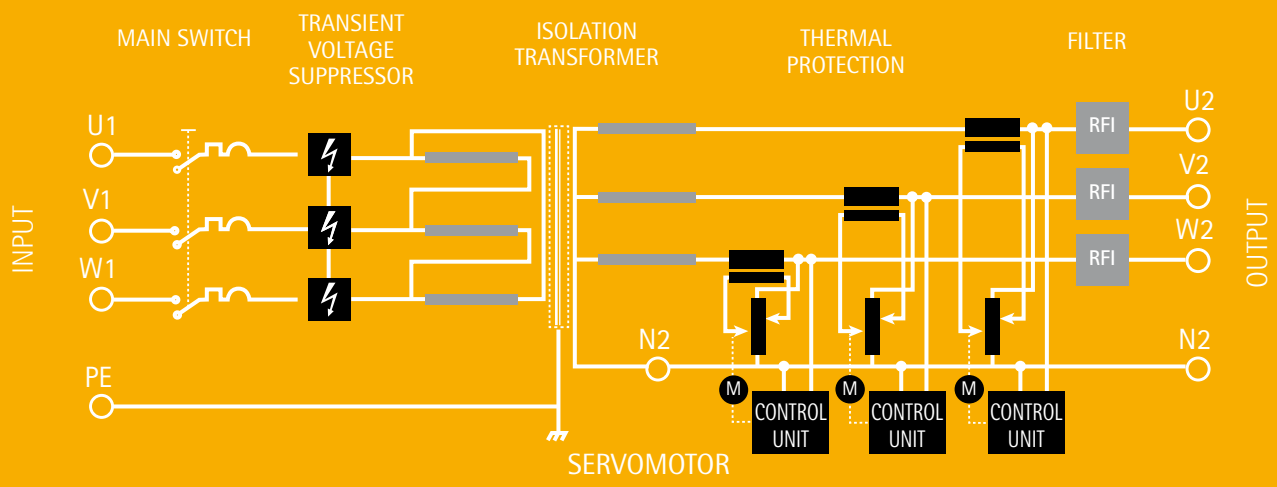
ELECTRODYNAMIC LINE CONDITIONERS



Line Conditioners provide a maximum level of protection to high power appliances, burdened by power quality problems due to high electromagnetic susceptibility, connected to distribution lines disturbed by sudden voltage variations, high frequency interferences and voltage spikes.

The voltage regulation system is made up exclusively of magnetic components capable of supporting electric loads with high inrush currents. The use of electronic components is limited to the control of the mains and of magnetic components stabilising the voltage. Thanks to these features, the electromechanical line conditioners stand apart for their high electromagnetic immunity and for the reliability characterised by a MTBF longer than 500,000 hours. They are, therefore, particularly suitable for powering radio-TV transmitters, telephone systems, radar systems, motors, compressors, pumps, medical equipment, machine tools and so on.

Their constructive features ensure that maintenance can be carried out even by technical staff with only a basic knowledge of electrical installations.

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LINE CONDITIONERS 3PH+N 230/400V 50/60 HZ WITH INPUT ISOLATION TRANSFORMER

Model	Power KVA	Rated current Amp	Voltage variation ±%	Response time ms/V	Accuracy ±%	Standard fittings	Degree of protection IP	Net weight kg	Dimensions mm a x b x h	Figure
Y306AC 6	6	9	±30	11	±1	V, L, HF, PS, IT, I	21	250	650x 650x1300	F
Y306AC 8	8	12	±25	12				250		
Y306AC 10	10	14	±20	14				270		
Y306AC 15	15	22	±15	16				300	650x650x1800	G
Y306AC 18	18	26	±10	19				350		
Y308AC 8	8	12	±30	13	±1	V, L, HF, PS, IT, I	21	330	650x 650x1800	G
Y308AC 12	12	17	±25	14				350		
Y308AC 15	15	22	±20	16				360		
Y308AC 20	20	29	±15	18				370		
Y308AC 25	25	36	±15	18				400		
Y310AC 15	15	22	±30	13	±1	V, L, HF, PS, IT, I	21	420	650x 650x1800	G
Y310AC 20	20	29	±25	14				440		
Y310AC 25	25	36	±20	16				460		
Y310AC 40	40	58	±15	18				500		
Y310AC 60	60	87	±10	21				550		
Y311AC 25	25	36	±30	13	±1	V, L, HF, PS, IT, I	21	540	650x650x1800	G
Y311AC 30	30	43	±25	14				550		
Y311AC 40	40	58	±20	16				560		
Y311AC 60	60	87	±15	18				610		
Y311AC 80	80	115	±10	21				700	1100x650x1800	H
Y312AC 30	30	43	±30	14	±1	V, L, HF, PS, IT, I	21	620	1100x650x1800	H
Y312AC 40	40	58	±25	15				700		
Y312AC 50	50	72	±20	24				720		
Y312AC 70	70	101	±15	33				740		
Y312AC 100	100	144	±10	37				790		
Y313AC 40	40	58	±30	11	±1	V, L, HF, PS, IT, I	21	850	1100x900x1800	I
Y313AC 55	55	79	±25	12				860		
Y313AC 70	70	101	±20	14				930	1100x1270x1800	J
Y313AC 100	100	144	±15	16				950		
Y313AC 140	140	202	±10	18				1270		
Y314AC 60	60	87	±30	11	±1	V, L, HF, PS, IT, I	21	1140	1100x1270x1800	J
Y314AC 80	80	115	±25	12				1180		
Y314AC 100	100	144	±20	14				1280		
Y314AC 140	140	202	±15	16				1290		
Y314AC 240	200	289	±10	18				1510		
Y316AC 80	80	115	±30	11	±1	V, L, HF, PS, IT, I	21	1290	1100x1270x1800	J
Y316AC 100	100	144	±25	12				1350		
Y316AC 140	140	202	±20	14				1500		
Y316AC 200	200	289	±15	16				1560		
Y316AC 280	280	404	±10	18				1770		
Y317AC 120	120	173	±30	15	±1	V, L, HF, PS, IT, I	21	1580	1100x1270x1800	J
Y317AC 160	160	231	±25	16				1610		
Y317AC 200	200	289	±20	17				830+990	1100x650x1800 + 1100x900x1900	H+I
Y317AC 280	280	404	±15	20				830+1250		
Y317AC 420	420	606	±10	26				830+1900	1100x650x1800 + 1100x1270x1900	H+J
Y318AC 160	160	231	±30	11	±1	V, L, HF, PS, IT, I	21	1150+1200	2 x 1100x900x1900	2H
Y318AC 220	220	318	±25	12				1150+1450		
Y318AC 280	280	404	±20	13				1150+1550		
Y318AC 400	400	577	±15	15				1150+1700	1100x900x1900 + 1100x1270x1900	I+J
Y318AC 580	580	837	±10	19				1150+2280	1100x900x1900 + 1500x1350x2150	I+K
Y319AC 250	250	361	±30	16	±1	V, L, HF, PS, IT, I	21	1400+1550	1100x1270x1800 + 1100x900x1900	J+I
Y319AC 320	320	462	±25	17				1400+1750		
Y319AC 420	420	606	±20	19				1400+2150	1100x1270x1800 + 1100x1270x1900	2J
Y319AC 580	580	837	±15	22				1400+2400	1100x1270x1800 + 1500x1350x2150	J+K
Y319AC 850	850	1227	±10	27				1400+2900	1100x1270x1800 + 2130x1350x2150	J+L

Fittings V: digital voltmeter
L: pilot lamps
HF: HF filter
PS: surge arresters
IT: isolation transformer
I: input circuit breaker

LCs are designed to deliver the declared power permanently (24/7) under the worst operating conditions, i.e. at full load, at minimum input voltage and max input current and at the declared ambient temperature.

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DESIGNED
FOR
TLC PLANTS

AI
INTEGRATED POWER SUPPLIES

The supplying of radio and TV radio repeaters has always entailed problems and requirements that are difficult to solve: the most important among them are safety and continuity of operation.

Integrated power supplies series AI can meet the particular needs of the power supply of the telecommunications stations.

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Characteristics/Models	**AI122-1E/R-3**	**AI122-1,6E/R-6**	**AI122-3E/R-10**	**AI122-4EI/R-10**	**AI122-6E/R-25**	**AI122-7,5EC/R-25**
Nominal input voltage	220 / 240 V					
Nominal output voltage	220 / 240 V					
Rated power	1 kVA	1,6 kVA	3kVA	4 kVA	6kVA	7,5 kVA
Voltage drop at full load	<3%					
Full load efficiency	96%					
Operating temperature	-10°C +45°C					
Isolation test voltage	1' at 50Hz					
between input and ground	6500 Vac					
between output and ground	6500 Vac					
between input and output	6500 Vac					
Impulse type insulating voltage (full wave 1,2/50µs)	20 kV					
Overvoltage protection	no. 1 magnetic blow-out lightning arrester					
Insulators class	B					
Isolation class	I					
Fittings	1 input circuit breaker					
	3 output circuit breakers	4 output circuit breakers		6 output circuit breakers	4 output circuit breakers	5 output circuit breakers
	isolation test device					
	3 multistandard sockets	4 multistandard sockets		6 multistandard sockets	3 multistandard sockets	3 multistandard sockets
					1 x 32A IEC309 socke	2 outputs on term. board
Net weight	50 kg	60 kg	70 kg	75 kg	110 kg	120 kg
Dimensions mm	482x554x310				482x554x354	
Protection degree	IP 20					
Reference Standards	CEI EN 60742					

DEDICATED TO PROFESSIONAL USE

The power supply of telephone plants and FM/TV relay stations has always entailed numerous problems and specific needs which are difficult to meet, among them:

- ✔ to assure the safety of operators working on the plants, according to the law;
- ✔ to assure continuity of operation to the plants;
- ✔ to build a compact distribution system for all loads usually present in relay stations;
- ✔ to limit the costs of installation and management;
- ✔ to allow a cheap and effective technical assistance.

PROPOSAL

Integrated power supplies solve the power quality problems of broadcasting stations in the telecommunications sector. They include safety, protection, distribution, connection and signal devices.

All the integrated power supplies of AI range can also be manufactured with class II protection (double insulation).

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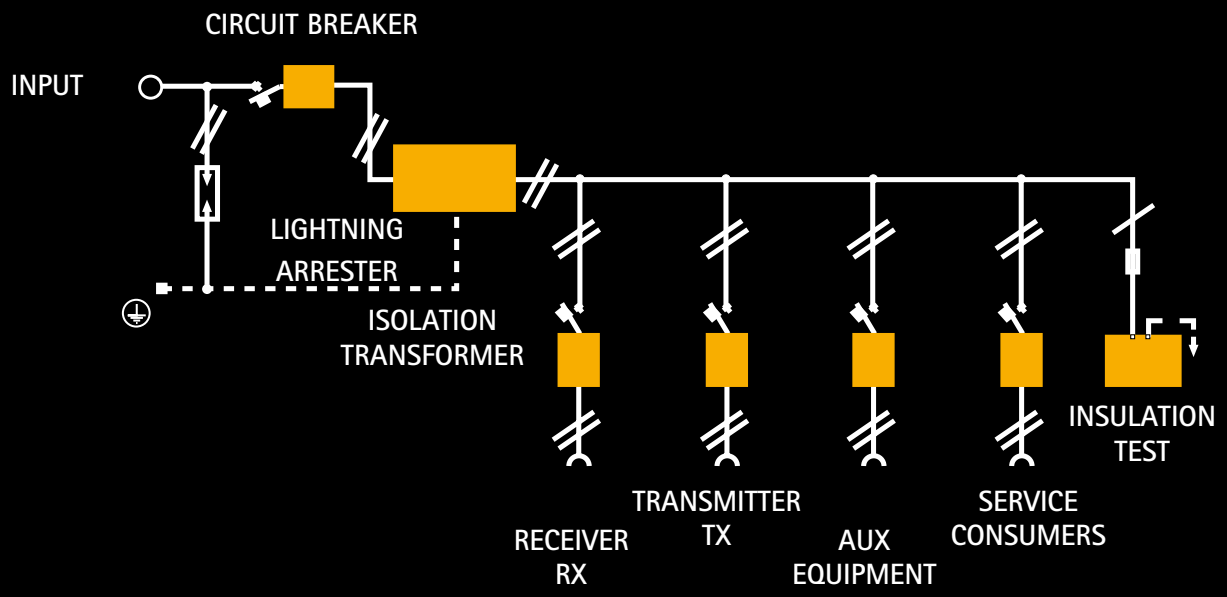
SAFETY OF OPERATORS

To ensure the safety of operators it is also necessary that:

- ✔ The premises hosting the telecommunications equipment are accessible only to specialized personnel.
- ✔ All equipment has live parts protected by barriers that can only be removed using tools.
- ✔ The electrical systems are built in the Rule of Art.



CONTINUITY OF OPERATION

The continuity of operation required by an automatic repeater, often installed in practically inaccessible sites, must satisfy a variety of requirements, ranging from the prevalently technical to the economic, limiting the need for intervention on the equipment.

The first problem to arise, and probably also the most difficult to tackle, is that of protection against atmospheric discharges, practically omnipresent in repeaters on account of the sites they have to be installed in. Due to the coupling of electromagnetic fields and the conduction in cables, the effect of lightning spreads for several kilometres from the impact point.

On the other hand, other forms of protection, for example those against overloads and short circuits, are subject only to suitable dimensioning.

The use of earth leakage trips for protection against direct contacts must be ruled out as even the overcurrents of feeble intensity caused by factors such as merely even inductance can result in untimely opening of the circuit. The importance of the economic aspect lies not only in the costs of making and maintaining the equipment, but also in the question of audience return. In fact, failure to guarantee the customer full operation of the equipment constitutes an interruption of the service and, accordingly, a cost.

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CONTROLS AND FUNCTIONS

The integrated power supply AI is housed in a 19" rack cabinet. It includes the following components:

a. a spark-gap magnetic blow-out lightning arrester. This is an essential component of the integrated power supply.

b. It is characterized by:

- ✔ high precision striking voltage with any overvoltage waveform;
- ✔ restoration of the plant normal operating conditions interrupting the arc current at its first passage through 0 after the exhaustion of the overvoltage wave;
- ✔ capability of withstanding currents with peak value of 100 kA (10/350 µs), charge of 80 As and specific energy of 1,25 MJ/W;
- ✔ auto-regenerability. Thanks to this characteristic, the arrester does not need to be replaced, as it happens with other over voltage protection systems.

c. An input circuit breaker, providing protection against short circuits and acting as main circuit breaker. It has a high magnetic tripping characteristic, avoiding untimely openings following impulse type overcurrents caused by atmospheric discharges. Four magnetothermic circuit breakers to protect the power supply lines of the receiving unit, of the transmitter, of the auxiliary devices and of the service utilities. In order to guarantee a high level of insulation with respect to the metal structure, the five switches are fixed to a high mechanical resistance glass-polyester support.

d. A single-phase isolation transformer compliant with EN60742 Standard, provided with electrostatic shield between the windings. In addition to the galvanic isolation of the users from the line, it also ensures good attenuation against common and transverse mode conducted noise. The connection to the outputs is possible through multistandard sockets and a CEE socket (only in the 6 kVA model);

e. A device signalling breakdown of insulation with relevant contact wired to the terminal board. This device intervenes when the insulation is lower than 100 kΩ.

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HIGH PROTECTION INTEGRATED POWER SUPPLIES (AO)

It is known that the phenomenon of overvoltages can be caused by the switching of large inductive or capacitive loads or in most cases by direct or indirect lightning that occurs during thunderstorms.

In particular, lightning strikes are phenomena of violent discharge that produce very high intensity currents which can reach and exceed 200 kA. Due to the enormous energy developed in short time, these events can be felt with all their destructive potential on components or systems.

In order to express the highest level of performance against the effects of overvoltages with high energy content and ensure the best protection to the most sensitive and strategic users, IREM has developed a High Protection Integrated Power Supply meeting the technical requirements that describe the technical specifications of the "Absorbeur d'Ondes" (AO).

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The High Protection Integrated Power Supply combines in a single equipment various overvoltage protection strategies to provide a protected power supply with a very low residual voltage to the load. The coordinated action of a set of devices that operate selectively for switching, limiting and dissipating the energy transmitted by the overvoltage allows to offer a solution of maximum efficiency and reliability.

The functions of the protection and filter devices are integrated and energetically coordinated and ensure the highest levels of protection.

The performance of High Protection Integrated Power Supplies is validated in an accredited laboratory capable of simulating the direct discharge of a lightning and measuring the residual overvoltage.

The High Protection Integrated Power Supplies are installed in series to the power supply line and upstream of the loads which, in relation to the intrinsic value or the mandatory nature of the function performed, must receive the maximum level of protection.

Among the loads with these characteristics we can consider the radio transmission systems, the control centers of rail, sea and air transport, process equipment, data processing centers, research centers, sensitive infrastructures in general and for defense.

The High Protection Integrated Power Supplies (AO) are typically composed of:

- ✔ Input protection and sectioning device;
- ✔ Lightning arresters for lightning current with discharge capacity of 200kA per pole in 10/350 µs waveform.
- ✔ Isolation transformer with high dielectric strength and electrostatic shield;
- ✔ Protection fuses of the internal power circuit derived from the transformer;
- ✔ Combined surge arresters with discharge capacity of 50kA per pole in 8/20 µs waveform;
- ✔ Air wound series reactor shunted by snabber resistors;
- ✔ Varistor surge arresters in derivation for the fine protection of common and transverse mode in waveform 1.2 / 50 µs.;
- ✔ LCR series filter for protection against high frequency noise;
- ✔ Capacitors for absorption of residual overvoltage;
- ✔ Output protection and sectioning device.

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IT
ISOLATION TRANSFORMERS

Isolation Transformers IT series have been expressly designed to be used in the telecommunications sector. The supply of telecommunication plants has always entailed several problems and specific requirements difficult to meet. The difficulty of reaching the installation sites for service purposes, the exposure to atmospheric discharges and the length of electric lines with consequent voltage drops represent critical elements that require the use of equipment expressly dedicated to this sector.

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DEDICATED TO PROFESSIONAL USE

The operators of TLC plants are well aware of the direct and indirect costs deriving from a poor power supply. As a matter of fact, the costs deriving from service interruption and from "low audience efficiency" must be added to the failures which may occur to the plants.

In order to obtain the maximum economic yield from the service, it is fundamental to build an electric plant assuring a good protection of the transmission plants and the safety of operators employed in plant maintenance. Since the isolation transformer is one of the most important components of the electric plant, the use of a specific product is essential.

PROPOSAL

Isolation Transformers IT series listed in the following pages are particularly designed to meet the specific needs in the telecommunication field. Each series shows peculiar technical features designed for different kinds of TLC systems, always with a view to increasing plant safety and power quality.

The following models are only a small part of what it can offer to meet the requirements of some of the most highly esteemed manufacturers of TLC equipment.

Isolation transformers with different mechanical and electrical features can be manufactured on customer's request.

All IT isolation transformers are characterized by a recessed concentric winding configuration, a low output impedance and the insensitivity to load power factor in order to assure high attenuation and good galvanic separation of the loads from the mains.

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HIGH ATTENUATION ISOLATION TRANSFORMERS WITH OVERVOLTAGE PROTECTION RS SERIES

Isolation Transformers of the RS series are characterized by:

- ✔ high attenuation of common mode disturbances, achieved thanks to a ground-connected electrostatic shield inserted between the windings;
- ✔ attenuation of overvoltages caused by lightning and line commutations. This is obtained by connecting 3 varistors between phases and ground. Each surge arrester is fitted with a device signaling when the varistor is out of order.

TECHNICAL FEATURES

Nominal voltage	UN	200 V~	500 V~
Max. operating voltage	U ~ max	275 V	550 V
Varistor	U ~ max	350 V	745 V
Varistor capacity	C	4000 pF	2000 pF
Nominal leakage current	isN (8/20)	15 kA	15 kA
Max. impulse test current	ismax (8/20)	40 kA	40 kA
Residual UR voltage	is = 1 kA	0.8 kV	1.7 kV
	is = 5 kA	1.0 kV	2.0 kV
	is = 10 kA	1.2 kV	2.3 kV
	isN = 15 kA	1.3 kV	2.5 kV
	ismax = 40 kA	1.9 kV	3.3 kV
Long duration discharge current	isN (2000 ms)	200 A	200 A
Response time	ta	< 25 ns	< 25 ns

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HIGH ISOLATION AND ATTENUATION TRANSFORMERS ARM

Thanks to their peculiar technical features and to the shielding between primary and secondary windings, the Isolation Transformers ARM series can stand high isolation voltages, both impulse type and at 50 Hz. Also this series of isolation transformers is characterized by high attenuation of common mode disturbances.

CLASS II ISOLATION TRANSFORMERS ARM2

The peculiar characteristic of ARM2 Isolation Transformers is their compliance to Standard EN 61558-1, certified by CESVIT-CETACE. Therefore these isolation transformers, being classified as "class II transformers", allow the building of plants assuring both the safety of operators and the continuity of operation of the connected transmission systems. In other words, it is possible to:

- ✔ install only a thermomagnetic circuit breaker without residual-current protection on the line fitted with double-insulation cables, connecting the "delivery point" to the isolating transformer;
- ✔ install specific surge arresters for protection against atmospheric discharges on the primary winding of the transformer. The non-use of residual-current circuit breakers avoids the untimely circuit opening due to very small leakages caused by inductive phenomena.

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