POWER QUALITY

IREM
Made in Italy. Since 1947.

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Made in Italy. Since 1947.

www.irem.it

IREM: POSITIVE ENERGY, WITHOUT INTERRUPTION. SINCE 1947.

IREM is an Italian company specialised in designing and manufacturing electromechanical and electronic equipment for mains power control and energy generation. IREM 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, two 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".

OUR HISTORY

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

IREM 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

ISO 9001
since 1993

ISO 14001
since 2000

ISO 45001
since 2014

equipment able to solve the mains power problems.

In the 50's in addition to the energy management, IREM 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, IREM 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 IREM has pursued since its foundation as the basis of its organization and its development.

HIGHLIGHTS

WARRANTY

5-year extended warranty for voltage stabilizers and power conditioners with IP21 protection degree.

RELIABILITY

The criteria used to size the electrical and electronic components of all IREM products guarantee high reliability.

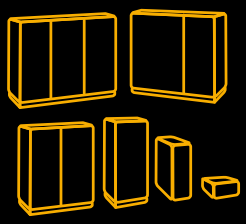
The declared performances always refer to the most severe and restrictive conditions of use: continuous duty at nominal power with minimum input voltage and maximum ambient temperature.

NATURAL CONVECTION

In equipment with IP21 degree of protection, cooling is obtained only by natural convection in air. The total absence of fans (IREM fan-free system) significantly increases the reliability of the product by avoiding the use of filters that require constant maintenance.

FIT & FORGET

IREM products are characterized by long life, absence of degradation of performance over time and reduced need for maintenance, thanks to the robust construction and the high quality of the materials used, which determines an extremely high reliability (MTBF).



WIDE RANGE

Single-phase and three-phase voltage stabilizers with powers between 1kVA and 8000 kVA. Voltage range from 110 V to 500 V. All voltage stabilizers are available in symmetric configuration ±10%, ±15%, ±20%, ±25%, ±30% and in asymmetrical configuration -35% +15%.

Other configurations are possible on request.

TAILOR MADE

The whole range of IREM products 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 IREM equipment 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.

SUMMARY

POWER QUALITY

There is no formal (or univocal, academic, etc.) definition of the term "Power Quality", however it is customary to refer to "Power Quality" such as the suitability of electricity to power the user appliances.

"Power Quality" is intrinsically linked to the interaction between the electrical system power supply and loads; the term refers both to the voltage quality and the current quality.

Any deviation from the ideal power conditions manifested in voltage, current or frequency deviations – which is the cause of failure or malfunction of a powered equipment – constitutes a problem of "Power Quality".

Poor Power Quality inevitably causes problems to motors, drive devices, lighting systems and computer networks.

Many users of process plants and equipment underestimate the effects of poor "Power Quality", which in terms of downtime, lack of productivity, data loss and damages to the equipment can be truly remarkable.

A reduced "Power Quality" can also give rise to unexpected high electricity costs and cause the application of penalties due to power supply network pollution.

Users with internal power quality problems, responsible for the network "pollution", end up damaging other users connected to the network node and adversely affect the ability of substations to meet the quality requirements of the power supply.

The interdependence between the different systems only increases the vulnerability of the equipment to Power Quality problems, every plant and every company also have strategic systems for their business and any Power Quality problem can determine their interruption of operation at any time.

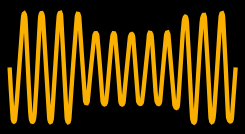
PROTECTION AGAINST MAINS POWER FAULTS

A wide range of devices is available to improve the power quality and ensure the best protection to professional equipment highly sensitive to electrical disturbances.
As a matter of fact, any equipment needs a correct powering to ensure its performance.
When this condition is not complied with, there are failures, errors and premature ageing.
To protect sensitive equipment, it is possible to have recourse to several devices which, depending on their characteristics, complexity and cost, ensure different levels of efficacy.
The choice should be made by assessing the degree of protection required, the entity of failures and the direct and indirect costs these may cause. It is therefore useful to know the most common electrical faults in order to adopt the most adequate protection and avoid inefficiency and failures.

THE CHOICE OF THE "RIGHT" PROTECTION

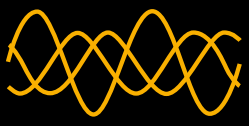
THE PROBLEM

SYMMETRICAL VOLTAGE VARIATIONS



Being subject to continual load variations, distribution lines are unable to supply perfectly even voltage levels. This is why any electrical equipment is built to accept shifts of at least ±5% as to the nominal value. As a matter of fact, electricity boards contractually provide for fluctuations up to ±10%. However, this limit is often exceeded due to "slow variations" (voltage drops caused by under-dimensioned lines and overloads), "over-voltages" (considerable increases of the mains voltage value arising when industries drastically cut down their energy consumption), "fast variations" (drops caused by the connection of equipment such as: discharge lamps, punching machines, electric motors, etc.).

ASYMMETRICAL VOLTAGE VARIATIONS

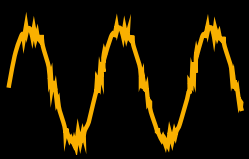


Asymmetry, otherwise called voltage imbalance, is a problem affecting three-phase networks, it can cause serious damage to equipment, but is often overlooked. For example, a 2.3% voltage imbalance on a 400 V motor results in a current imbalance of almost 18%, causing a temperature rise of 30 ° C.

VOLTAGE SPIKES

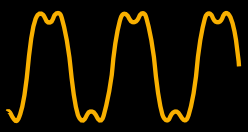
These are very brief pulse disturbances extremely dangerous for the most sensitive equipment since the voltage values may reach thousands of volts. They are caused by several events, like e.g. switching of high voltage lines, connection of power factor correction capacitors, lightning, disconnection of loads with high reactive powers, and also by lower power loads such as photocopy machines and air conditioners connected to the same line powering the sensitive equipment. Spikes are not detectable by means of an ordinary voltmeter due to their short duration; however they are one of the main causes of failures and malfunctions.

HIGH FREQUENCY DISTURBANCES



They are very common and easily detected by anyone watching TV. They are the cause of the "snowstorm" effect and those fastidious lines that sometimes appear on the screen. They are caused by the sparks generated in the AC commutator motors, the "corona effect" on the high voltage lines, the igniters of luminous signs and burners, and by the magnetic fields irradiated by radio and TV stations. Line disturbances, also known as HF noise, do not generally create problems on electromechanical equipment, but can often damage a sensitive electronic equipment.

HARMONIC DISTORTIONS



The harmonics in electrical systems are electrical currents or sinusoidal electrical voltages that have a frequency equal to an integer multiple of the frequency of the distribution system, called the fundamental frequency.

By overlapping the Fundamental Current and the Fundamental Voltage respectively, they cause the distortion of the waveform. When powering an electrical equipment in alternating current, it is expected that since the voltage has a sinusoidal shape, the current absorbed by the load is also sinusoidal, this is true only for some types of loads or linear loads, but not for non-linear loads in which the relationship between current and voltage is no longer represented by a straight line. The extent of the deformation is defined by a parameter called total harmonic distortion of current THDi%. The drawbacks caused by the harmonics are manifold and include the malfunction of equipment, the increase in currents in the circuits, the increase in losses, noise frequency interference etc.

VARIABLE HARMONICS

In addition to the above already described, some non-linear loads determine a harmonic content distributed over a very wide spectrum, therefore variable both in the harmonic order and in intensity.

The drawbacks are even wider and lead to a variety of instantaneous and long-term effects on both electrical equipment and systems.

BLACKOUTS

This is the most obvious event (though less frequent) because everybody perceives it. It may happen accidentally on production plants or distribution lines, or it can be programmed to reduce energy consumption.

There are also micro-interruptions, which may last between microseconds and a few tenths of milliseconds, caused by short circuits or line switching. These faults are not noticed by electromechanical equipment, but they can cause damage to an electronic equipment. The switching power supplies used in almost any electronic

equipment can normally compensate interruptions lasting a few milliseconds, but a longer blackout can cause loss of data, program cancellations and system failures.

THE SOLUTION

VOLTAGE STABILISERS

Suitable for any type of load, they deliver a "true RMS" stabilised output voltage, even when strong harmonic distortions are present on the line.

MINISTAB - STEROSTAB M

Single-phase voltage stabilisers.

MINISTAB - STEROSTAB T

Three-phase voltage stabilisers with common regulation of the 3 phases.

MINISTAB - STEROSTAB Y

Three-phase voltage stabilisers with independent regulation of each phase.

ELECTRONIC LINE CONDITIONERS

MINISTATIC

These models offer a high protection level for sensitive electronic equipment connected to lines disturbed by voltage variations, high frequency interferences and voltage spikes.

ELECTRODYNAMIC LINE CONDITIONERS

STEROGUARD

They ensure the highest protection level to high power sensitive equipment connected to electrical mains perturbated by voltage variations, high frequency interferences and voltage spikes.

INTEGRATED POWER SUPPLIES

SERIE AI - AO

They provide protection against various electrical phenomena and ensure the rational power supply of the radio transmission and telephone communication equipment. The integrated power supplies can be installed at the base of the 19" rack cabinets widely used in the industrial, telecommunications and IT fields.

ISOLATION TRANSFORMERS

SERIE IT

They provide galvanic separation between the power supply network and the load, implement overvoltage protection, create the distribution system with isolated neutral and can also adapt the voltage to the functional values of the system.

PASSIVE FILTERS
SERIE PHF

They attenuate the harmonic content poured into the network by some types of user devices. Passive filters are characterized by the presence of only passive elements such as capacitances, inductances and resistances, they are simple and robust in construction and do not require commissioning and maintenance operations. They have the operating limit of working with a certain number of harmonics classically associated with the actuation of frequency changers (VFD), the most significant are the fifth (250 Hz), the seventh (350 Hz), the eleventh (550 Hz), the thirteenth (650 Hz).

ACTIVE FILTERS
SERIE AHF

The active filter is able to automatically eliminate the current harmonics present in the network within a wide range of frequencies. By exploiting electronic technology, it is able to introduce a counter harmonic system capable of canceling those present on the network. The active filter has the advantage of simultaneously filtering dozens of different harmonics and does not involve design costs for sizing.

UNINTERRUPTIBLE POWER SYSTEMS (UPS)
MINIPOWER - STEROPOWER

The double conversion on-line uninterruptible power supplies adopt PWM technology with IGBT and a latest generation microprocessor control. They guarantee high performance with perfectly sinusoidal output waveform.

PROBLEM: MAINS FAULT	SOLUTION: IREM
Symmetrical Voltage Variations	Voltage Stabilisers T series
Asymmetrical Voltage Variations	Voltage Stabilisers Y series – M series
Voltage Spikes	Line Conditioners Integrated Power Supplies Isolation Transformers
High Frequency Disturbances	Line Conditioners Integrated Power Supplies Isolation Transformers
Harmonic Distortions	Passive Filters
Variable Harmonics	Active Filters
Blackouts	UPS

MINISTAB - STEROSTAB
VOLTAGE STABILISERS

IREM Ministab and Sterostab 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.

IREM Ministab and Sterostab voltage stabilisers guarantee users with perfectly regulated voltage.




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 computer can be damaged or make unpredictable errors;
- ✔ 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.

IREM PROPOSAL

Ministab and Sterostab 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.

Ministab and Sterostab 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

COOLING BY NATURAL AIR CONVECTION, FAN-FREE SYSTEM

This is the distinctive characteristic of all IREM 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.

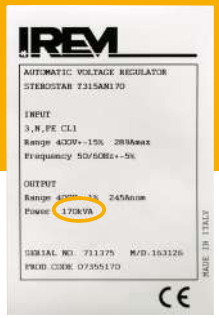
The pictures clearly show that NO fan is used in IREM voltage variable transformers to cool down the contact point between brushes and turns.

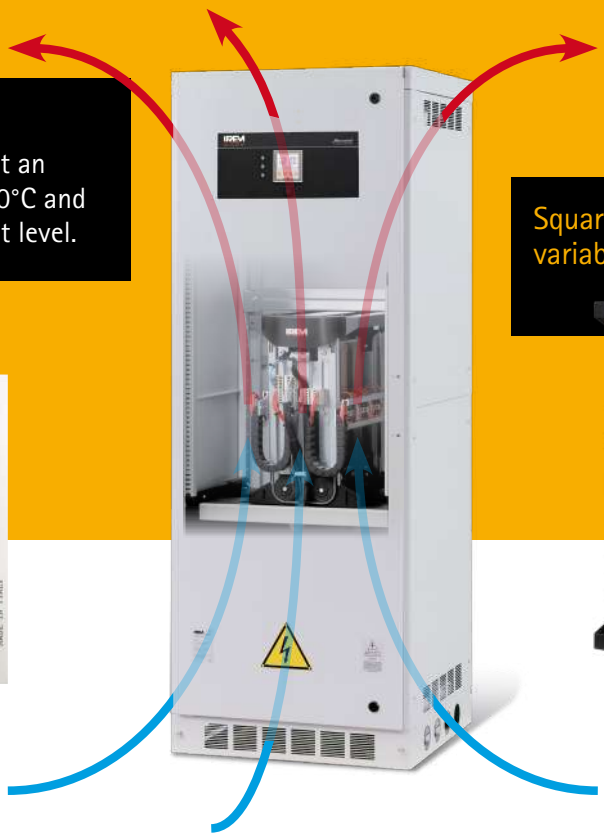
This is possible thanks to the thermal dissipation being the result of:

- ✔ 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.

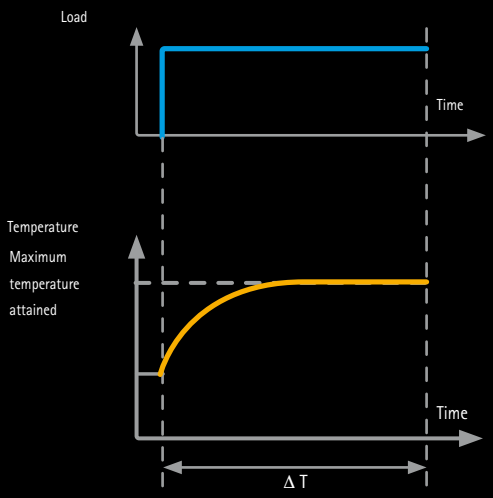




Square section linear variable transformer

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.



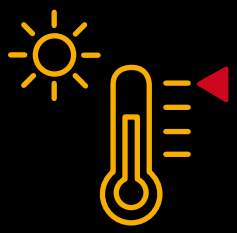
THE SERVICE CLASS

All IREM 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: IREM 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 heaviest working condition is in presence of the minimum mains voltage in input.

All IREM 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.

MINISTAB - STEROSTAB

IREM Ministab 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.

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.

IREM Sterostab 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.

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).

Operation:

IREM 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 IREM 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.

MINISTAB - STEROSTAB OVERVIEW

M SINGLE-PHASE

Ministab M	1-45 kVA
Sterostab M	15-350 kVA

T Y THREE-PHASE

Ministab T	common regulation of the 3 phases	3.5-32 kVA
Sterostab T	common regulation of the 3 phases	22-800 kVA
Ministab Y	independent regulation of each phase	3-120 kVA
Sterostab Y	independent regulation of each phase	45-8000 kVA

	Single-phase		Three-phase			
General features	**Ministab M**	**Sterostab M**	**Ministab T**	**Sterostab T**	**Ministab Y**	**Sterostab Y**
Toroidal variable transformer	•	-	•	-	•	-
Linear square section variable transformer	-	•	-	•	-	•
Natural air convection - fan-free	IP21 version	IP21 version	IP21 version	IP21 version	IP21 version	IP21 version
Forced ventilation with fans	IP54 version	IP54 version	IP54 version	IP54 version	IP54 version	IP54 version
Forced ventilation with air conditioner	IP54 version	IP54 version	IP54 version	IP54 version	IP54 version	IP54 version
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

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

It 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 accumulators used that require periodic replacement.

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).

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
   It 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

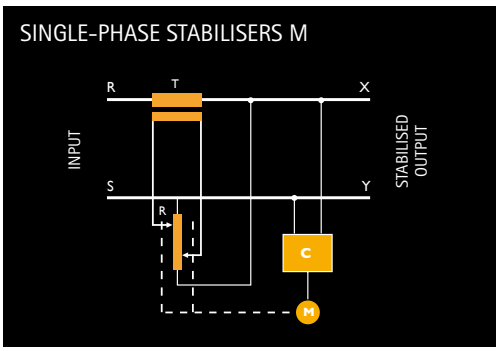
It remotely allows the display, via web on PC, smartphone, web viewers and tablets, of data coming from the voltage stabilizer.

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.

SINGLE-PHASE VOLTAGE STABILISERS M MODELS

MINISTAB M 1-45 KVA
STEROSTAB M 15-350 KVA

MINISTAB STEROSTAB



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

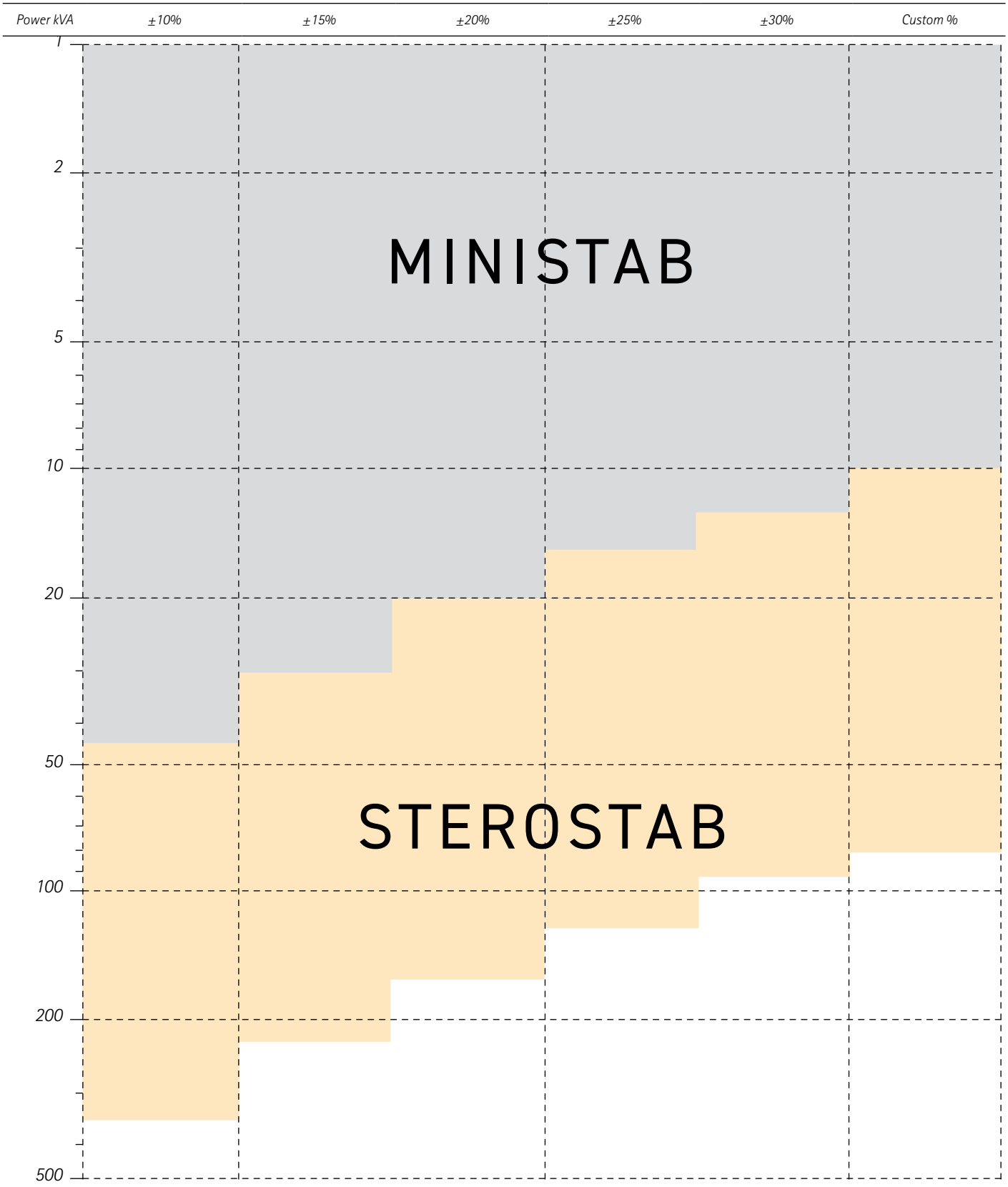
ISOLATION TRANSFORMER

ADAPTING TRANSFORMER

SURGE ARRESTERS

IP54 INDOOR OR OUTDOOR VERSION

VOLTAGE STABILISERS - M MODELS



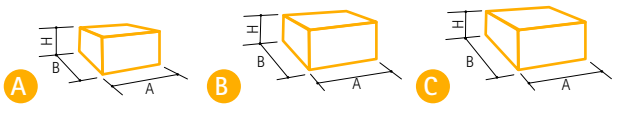
VOLTAGE STABILISERS
MINISTAB M
SINGLE-PHASE 230V 50/60 HZ, PROTECTION DEGREE IP21

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	45	±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.

IREM 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.



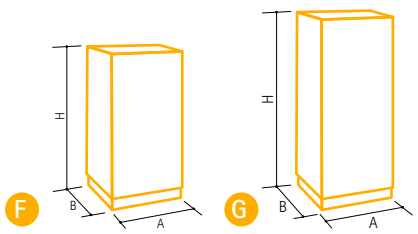
VOLTAGE STABILISERS
STEROSTAB M
SINGLE-PHASE 230V 50/60 HZ, PROTECTION DEGREE IP21

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.

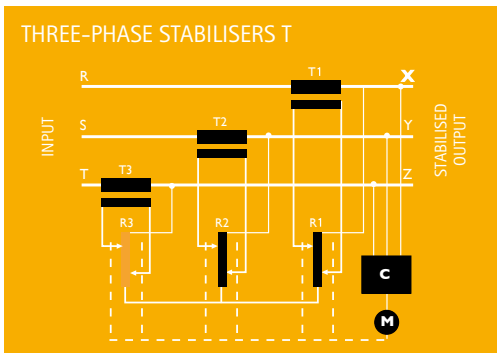
IREM voltage stabilisers are designed to deliver the declared power permanently (24/7) under the worst operating conditions, i.e. at full load, at minimum input voltage and max input current and at the declared ambient temperature.



THREE-PHASE VOLTAGE STABILISERS
T MODELS
COMMON REGULATION OF THE 3 PHASES

MINISTAB T 3.5-32 KVA
STEROSTAB T 2-800 KVA

MINISTAB STEROSTAB



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

GENERAL CHARACTERISTICS

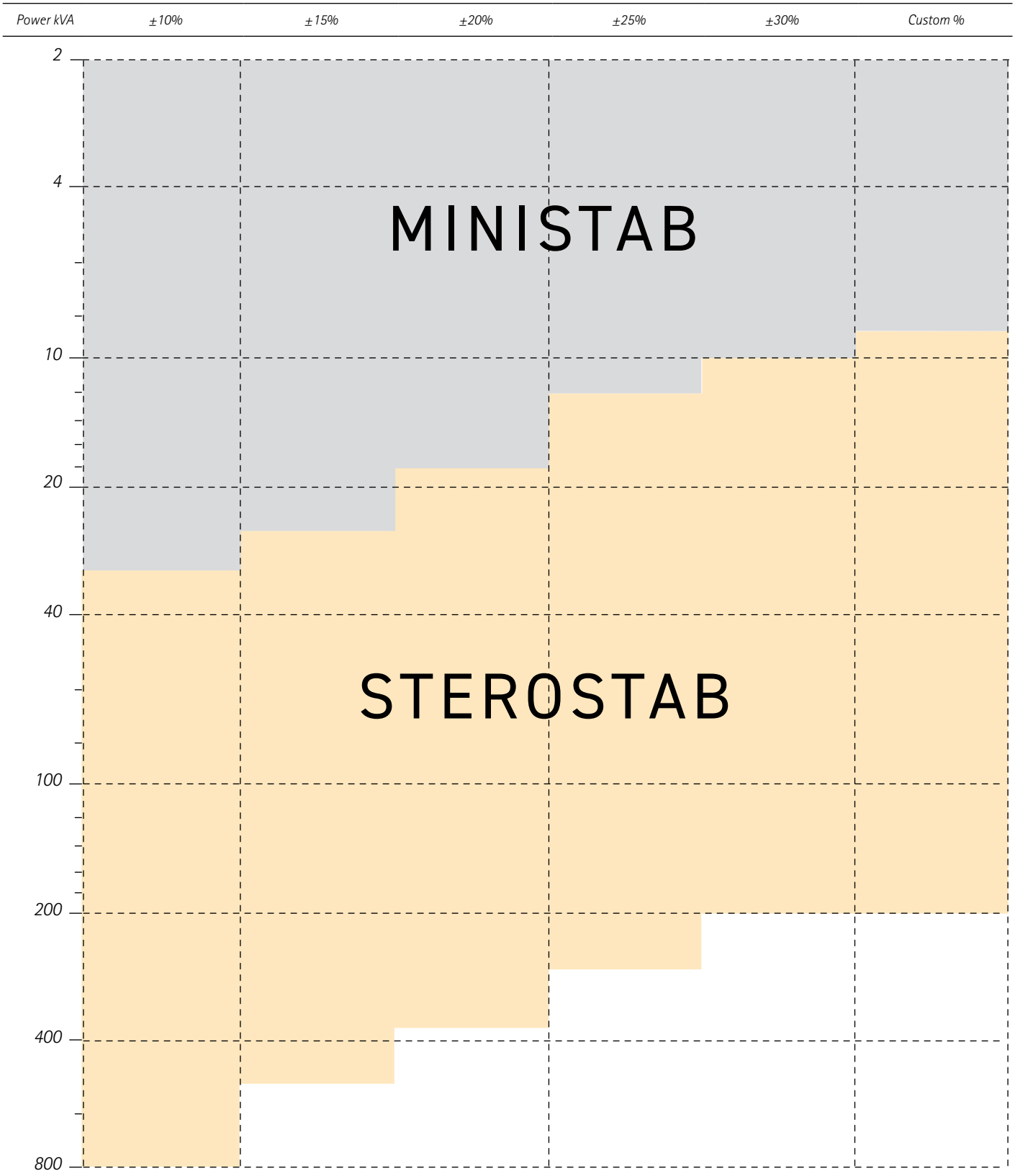
Mains	Three-phase
Nominal input voltage	380V or 400V or 415V (**)
Nominal output voltage	380V or 400V or 415V (**)
Output accuracy	±1% RMS
Frequency	50/60 Hz ±5%
Admitted load variation	0 to 100%
Admitted load unbalance	up to 50%
Admitted overload	10 times the nominal power during 10 ms,i 5 times during 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

VOLTAGE STABILISERS - T MODELS



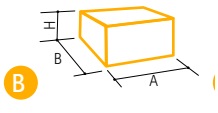
VOLTAGE STABILISERS
MINISTAB T
COMMON REGULATION OF THE THREE PHASES
THREE-PHASE 400V 50/60 HZ PROTECTION DEGREE IP21

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.

IREM 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.

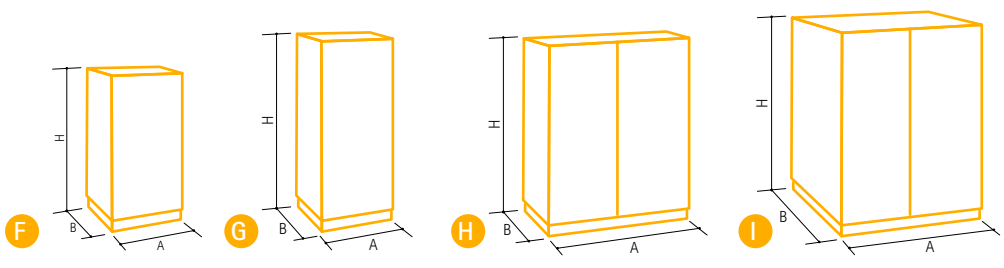


VOLTAGE STABILISERS
STEROSTAB T
COMMON REGULATION OF THE THREE PHASES
THREE-PHASE 400V 50/60 HZ PROTECTION DEGREE IP21

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.
IREM 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.

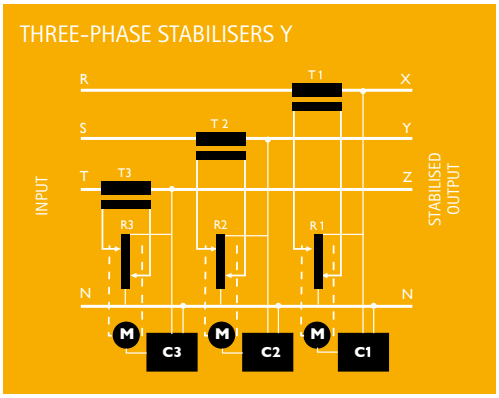


THREE-PHASE VOLTAGE STABILISERS Y MODELS

INDEPENDENT REGULATION OF EACH PHASE

MINISTAB Y 3-120 KVA
STEROSTAB Y 45-8000 KVA

MINISTAB STEROSTAB



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

GENERAL CHARACTERISTICS

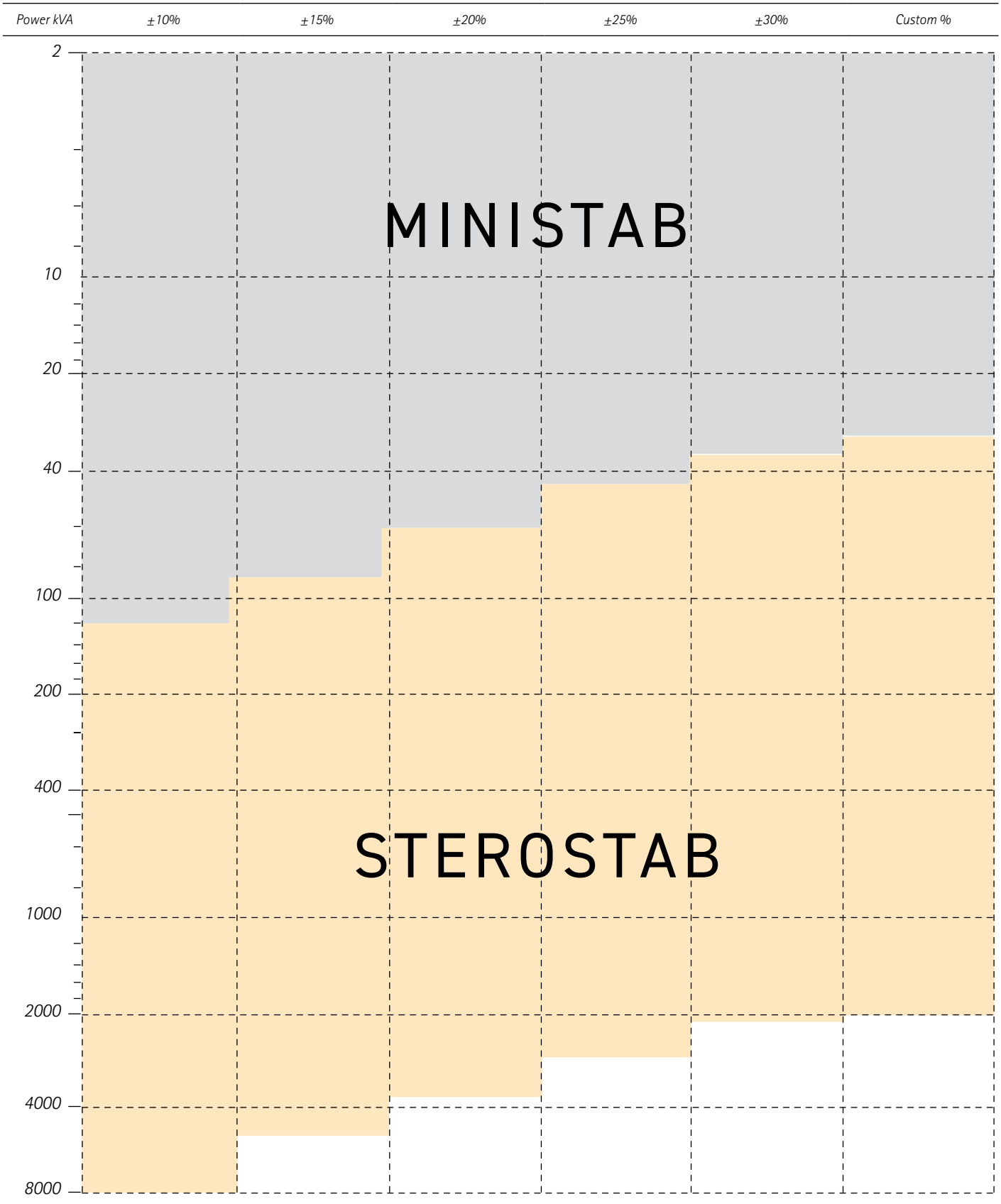
Mains	Three-phase
Nominal input voltage	380V or 400V or 415V (**)
Nominal output voltage	380V or 400V or 415V (**)
Output accuracy	±1% RMS
Frequency	50/60 Hz ±5%
Admitted load variation	0 to 100%
Admitted load unbalance	up to 100%
Admitted overload	10 times the nominal power during 10 ms, 5 times during 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

VOLTAGE STABILISERS - Y MODELS



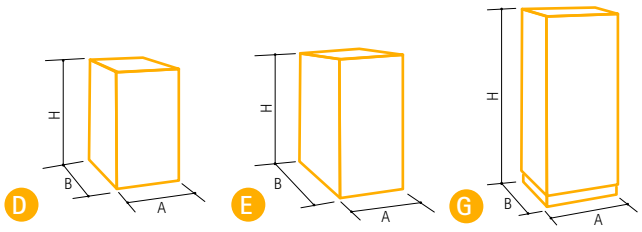
VOLTAGE STABILISERS
MINISTAB Y
INDEPENDENT REGULATION OF EACH PHASE
THREE-PHASE 400V 50/60 HZ PROTECTION DEGREE IP21

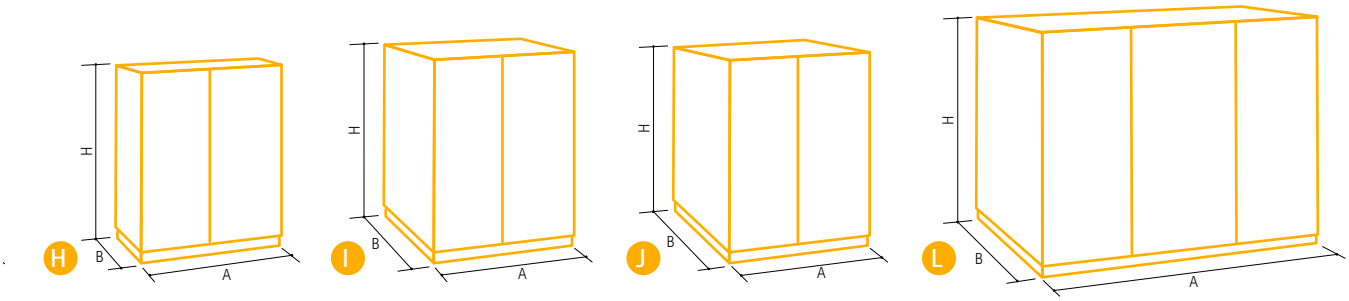
Model	*Rated power (KVA)*	*Voltage variation (±%)*	*Response time (ms/V)*	*Output accuracy (±%)*	*Fittings*	*Protection degree IP*	*Dimensions (mm) a x b x h*	*Net weight (kg)*	*Case*
Y304ES	3	±30	8	±1	V, GC, L, R	21	350x580x890	90	D
	4	±25	9						
	6	±20	10						
	8	±15	13						
Y304ES10	10	±10	16		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.

IREM 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.





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

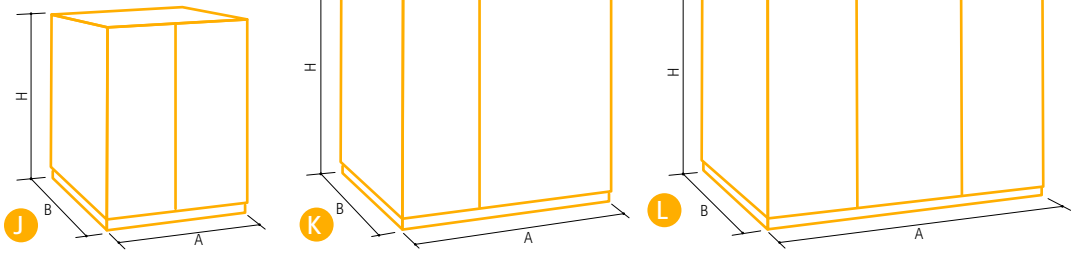
Model	*Rated power (KVA)*	*Voltage variations (±%)*	*Response time (ms/V)*	*Output accuracy (±%)*	*Fittings*	*Protection degree IP*	*Dimensions (mm) a x b x h*	*Net weight (kg)*	*Cabinet*
Y313AN45	45	±30	6						
Y313AN60	60	±25	13						
Y313AN80	80	±20	15	±1	V, L	21	650x650x1800	480	G
Y313AN110	110	±15	17						
Y313AN180	180	±10	23						
Y314AN70	70	±30	8						
Y314AN90	90	±25	22						
Y314AN120	120	±20	18	±1	V, L	21	1100x650x1800	620	H
Y314AN170	170	±15	27						
Y314AN270	270	±10	24						
Y316AN90	90	±30	6						
Y316AN120	120	±25	12						
Y316AN160	160	±20	13	±1	V, L	21	1100x650x1800	650	H
Y316AN230	230	±15	19						
Y316AN370	370	±10	23						
Y317AN140	140	±30	8						
Y317AN180	180	±25	16						
Y317AN250	250	±20	18	±1	V, L	21	1100x650x1800	750	H
Y317AN350	350	±15	22						
Y317AN550	550	±10	33						
Y318AN190	190	±30	11						
Y318AN240	240	±25	12						
Y318AN320	320	±20	15	±1	V, L	21	1100x900x1900	1100	I
Y318AN460	460	±15	16						
Y318AN730	730	±10	24						
Y319AN280	280	±30	16						
Y319AN370	370	±25	11						
Y319AN500	500	±20	14	±1	V, L	21	1100x1300x1800	1360	J
Y319AN700	700	±15	17						
Y319AN1100	1100	±10	27						
Y320AN420	420	±30	9						
Y320AN550	550	±25	14						
Y320AN730	730	±20	13	±1	V, L	21	1100x1300x1900	1850	J
Y320AN1000	1000	±15	18						
Y320AN1500	1500	±10	26						
Y322AN550	550	±30	16						
Y322AN730	730	±25	18						
Y322AN1000	1000	±20	14	±1	V, L	21	2150x1350x2150	2700	L
Y322AN1350	1350	±15	16						
Y322AN2200	2200	±10	29						
Y323AN700	700	±30	16						
Y323AN900	900	±25	18						
Y323AN1200	1200	±20	14	±1	V, L	21	2150x1350x2150	3100	L
Y323AN1700	1700	±15	18						
Y323AN2700	2700	±10	29						
Y324AN800	800	±30	16						
Y324AN1000	1000	±25	18						
Y324AN1400	1400	±20	22	±1	V, L	21	2150x1350x2150	3400	L
Y324AN2000	2000	±15	17						
Y324AN3200	3200	±10	29						

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 1100x1300x1900	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 1100x1300x1900	5700	3 cabinets type 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 2150x1350x2150	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 2150x1350x2150	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 2150x1350x2150	8800	3 cabinets type L
Y342AN2700	2700	±25	20						
Y342AN3600	3600	±20	23						
Y342AN5000	5000	±15	24						
Y342AN8000	8000	±10	27						

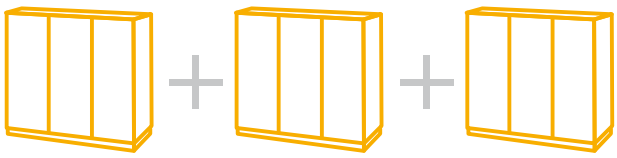
Fittings V: digital voltmeter
L: pilot lamp

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

IREM 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.



IREM MODULAR SYSTEM



IREM 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.

IREM 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.

MINISTATIC-STEROGUARD
LINE CONDITIONERS

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



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 isolation transformer;
- ✔ a voltage regulator.

THE RANGE

The range of IREM 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.


IREM PROPOSAL

MINISTATIC ELECTRONIC LINE CONDITIONERS

IREM 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.

STEROGUARD ELECTRODYNAMIC LINE CONDITIONERS

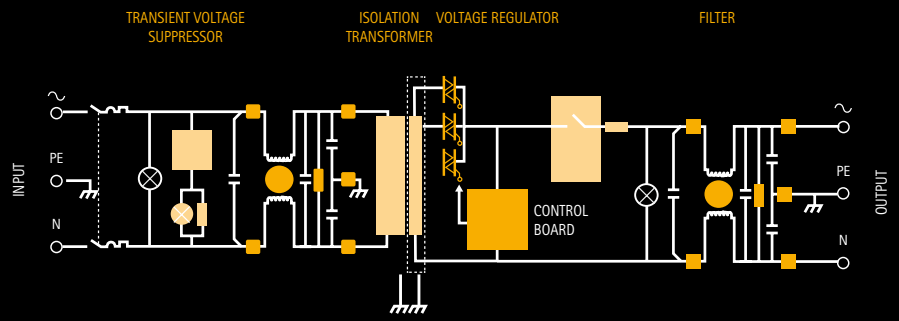
IREM Electrodynamic Line Conditioners provide a maximum level of protection to high power appliances, with high electromagnetic susceptibility, connected to distribution lines disturbed by sudden voltage variations, high frequency interferences and voltage spikes.

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.

MINISTATIC TS - TST
ELECTRONIC LINE CONDITIONERS



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

Possibility to:

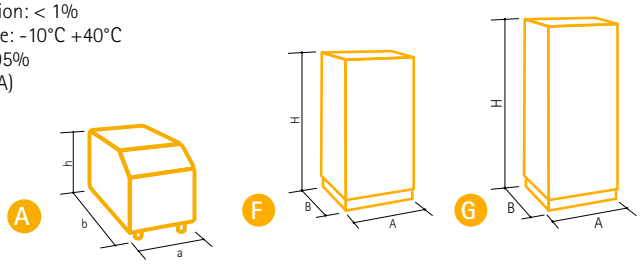
- ✔ connect single-phase 220, 230, 240 or 120 V loads to 500/400V lines without neutral
- ✔ install these units inside electric switchgears or rack units
- ✔ have a range of "universal" appliances capable of delivering a 230V single-phase voltage powered by 440/400/220V 50 and 60 Hz three-phase distribution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

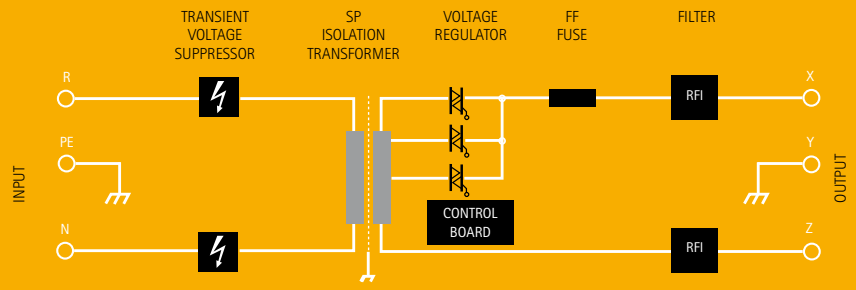
MINISTATIC TS..., TST....ELECTRONIC LINE CONDITIONERS

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, F, SP	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, F, SP, R	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	IM, L, F, PT, SP	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:
CF = Frequency selector (50/60Hz)
CT = Voltage selector
F = EMI filter
FF = Ultra rapid output fuse
L = "Mains on" pilot lamps
PT = Thermal protection
SP = Transient voltage suppressor
R = Rack version
IM = Thermal magnetic circuit breaker (TST mdels)
BT = Over/under voltage protection (optional on TST)

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)





The range of three-phase IREM Ministatic 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 FILTER

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

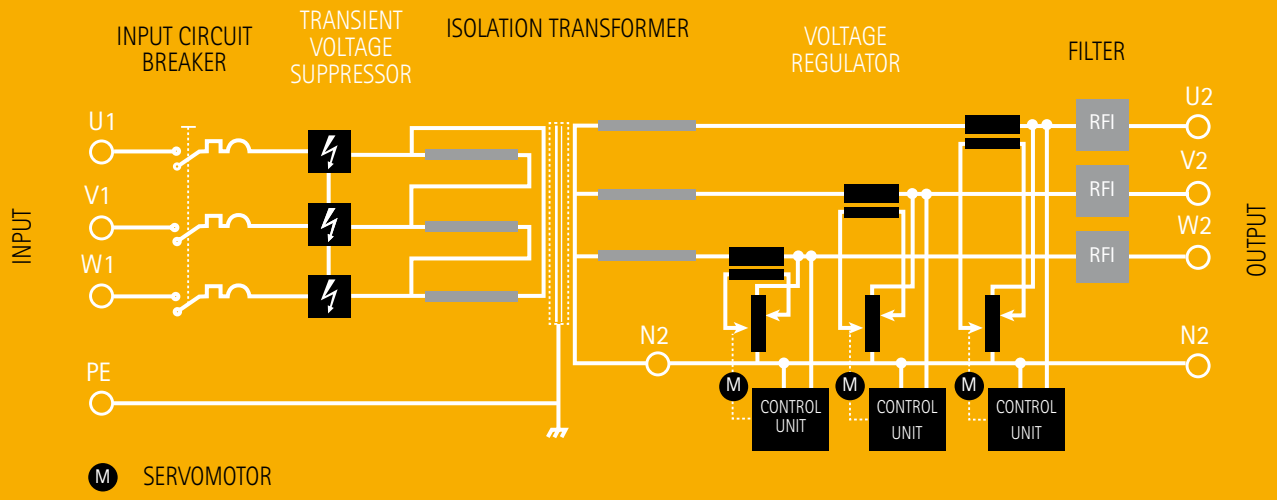
The electronic voltage regulator stabilises the voltage permitting to attain, under every load condition, ±3% output voltage accuracy with very high efficiency without generating any EMI interference. Its main features are:

- ✔ response time lower than 2 ms/volt,
- ✔ insensitivity to load power factor,
- ✔ reduced dynamic impedance (0,5%),
- ✔ high overload capacity (7 to 10 In);
- ✔ 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.

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.

STEROGUARD
ELECTRODYNAMIC LINE CONDITIONERS



IREM Steroguard 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.

STEROGUARD 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	Protection degree IP	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	1100x1300x1800	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	1100x1300x1800	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	1100x1300x1800	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	1100x1300x1800	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 + 1100x1300x1900	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 + 1100x1300x1900	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	1100x1300x1800 + 1100x900x1900	J+I
Y319AC 320	320	462	±25	17				1400+1750		
Y319AC 420	420	606	±20	19				1400+2150	1100x1300x1800 + 1100x1300x1900	2J
Y319AC 580	580	837	±15	22				1400+2400	1100x1300x1800 + 1500x1350x2150	J+K
Y319AC 850	850	1227	±10	27				1400+2900	1100x1300x1800 + 2150x1350x2150	J+L

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

IREM 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.

AI - AO
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.
IREM integrated power supplies series AI can meet the particular needs of the power supply of the telecommunications stations.

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	1 magnetic blow-out lightning arrester					
Insulators class	B					
Isolation class	I					
Fittings	1 input thermal magnetic 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 socket	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 create 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

IREM PROPOSAL

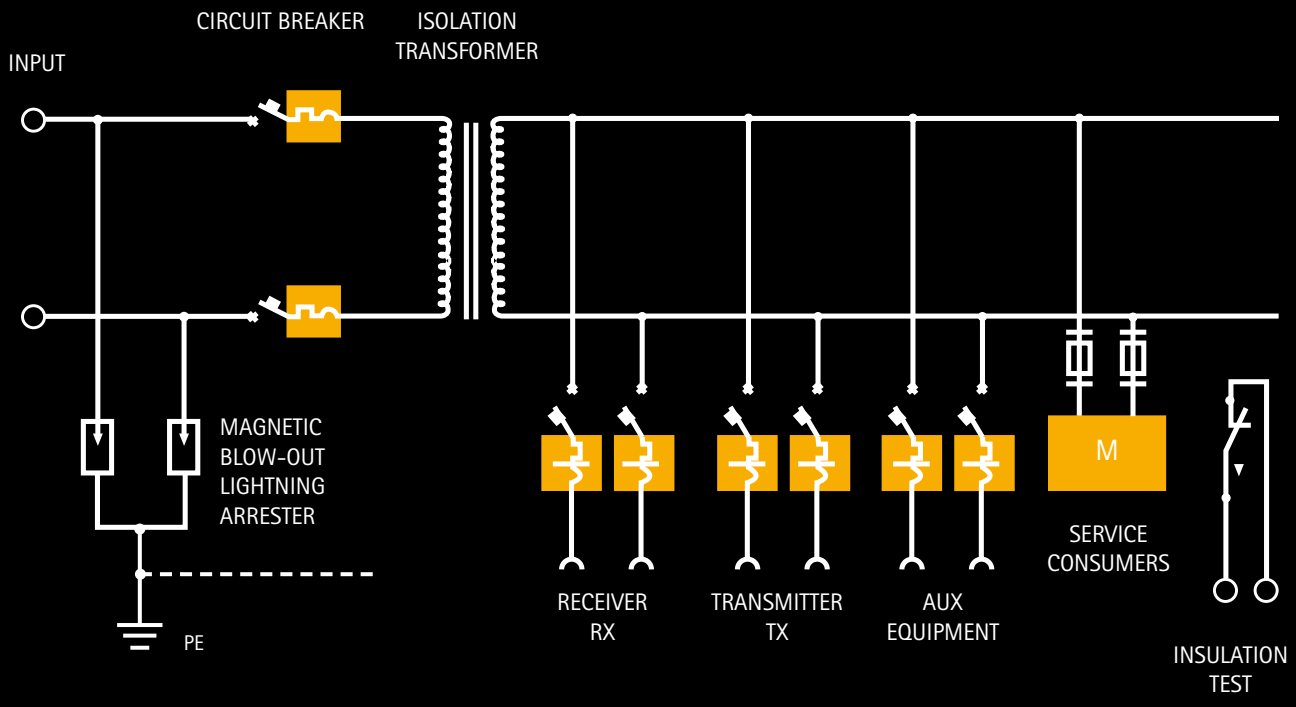
IREM integrated power supplies solve the power quality problems of broadcasting stations in the telecommunications sector. They include safety, protection, distribution, connection and signal devices.

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

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.
- ✔ Any equipment has live parts protected by barriers that can only be removed using tools.
- ✔ The electrical systems are done to perfection.



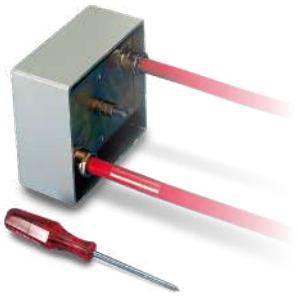
CONTINUITY OF OPERATION

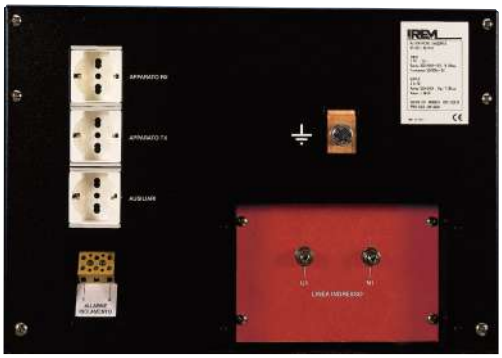
The continuity of operation required by an automatic repeater, often installed in practically inaccessible sites, must satisfy a variety of requirements, ranging from the prevalently technical to the economic, limiting the need for intervention on the equipment.

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.





CONTROLS AND FUNCTIONS

a. The integrated power supply AI is housed in a 19" rack cabinet. It includes the following components:
a spark-gap magnetic blow-out self-healing lightning arrester. This is an essential component of the integrated power supply.
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/Ω;
- ✔ auto-regenerability. Thanks to this characteristic, the arrester does not need to be replaced, as it happens with other over voltage protection systems.

b. 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 thermal magnetic 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.

c. A single-phase isolation transformer compliant with 61558-2-4 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 IEC socket (only in the 6 kVA model);

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

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).



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 IREM 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 disconnecting 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 disconnecting device.

ITT - IT
LOW VOLTAGE POWER TRANSFORMERS

IREM ITT transformers are low voltage power transformers.

The single-phase, three-phase or three-single-phase transformers are available in a wide range of power and voltage and are specifically designed according to customer requirements and the specific field of application.



These transformers are typically used for:

- ✔ Carry out the functional adaptation of the voltage value of the network in order to allow the power supply of equipment with different voltage values;
- ✔ Achieve high protection against overvoltages and against various disturbances conducted by the network;
- ✔ Obtain the change of the neutral system in particular systems or in the presence of users with high leakage currents or low insulation levels;
- ✔ Obtain the reduction of the short-circuit level in parts of large industrial plants;
- ✔ The power supply of on-board ship distribution systems (on-board ship distribution transformer);
- ✔ Power the high power variable frequency drives;
- ✔ Build frequency converters and uninterruptible power supplies;
- ✔ Making power supplies;
- ✔ Building data center power distribution units (PDUs);
- ✔ Power equipment that cannot be earthed;
- ✔ Power equipment in systems where no current leakage is allowed;
- ✔ Safe power supply of electro-medical equipment;
- ✔ Safe supply of laboratory and test equipment;
- ✔ Generation plants from renewable sources
- ✔ Safe feeding of livestock facilities (poultry farm extractors, pit fans, cooling of stables).

IREM PROPOSAL:

The experience accumulated in the creation of different models, capable of responding to specific contexts of use, has allowed us to accumulate a solid knowledge of the many problems of the various sectors and of the most diverse applications. The design dedicated to each request allows us to offer customized solutions for the following technical requirements:

- ✔ Transformers for powering "K-rating" distorting loads;
- ✔ Reduced inrush current;
- ✔ Multiple high attenuation electrostatic screens;
- ✔ Dielectric insulation for high voltages;
- ✔ Version with class II insulation;
- ✔ Earthquake resistant version for construction;
- ✔ Aluminum or copper windings;
- ✔ Multiple sockets with selector for adapting input and output voltages;
- ✔ Multiple windings;
- ✔ Threshold thermal protection or temperature measurement probes for windings and core;
- ✔ Mineral insulation;
- ✔ Tropicalization treatment for anti-condensation protection;
- ✔ Step-lap core;
- ✔ Integration in enclosures with different degrees of protection.

ISOLATION TRANSFORMERS ITT SERIES

1 PHASE ITT 1XX 1-350 KVA
3 PHASE ITT 3XX 3-1600 KVA

Vector Group	primary	secondary	primary	secondary
Dyn11	1V 1U 1W	2V 2W 2U	1U 1V 1W	2U 2V 2W n
YNyn0	1V 1U 1W	1V 1U 1W	1U 1V 1W N	2U 2V 2W n
Dzn0	1V 1U 1W	2V 2W 2U	1U 1V 1W	2U 2V 2W n

GENERAL FEATURES:

Type	1 Phase, 3 Phase and 3-1 phase
Input Voltage	from 110V to 960V
Output Voltage	from 110V to 960V
Frequency	50/60Hz
K factor (non-linear loads)	4, 9, 13, 20, 25, 50
Insulation Class	I (earth connection) o II (double)
Thermal class of insulating materials	F, H, 200°C
Winding material	Aluminium or Copper
Color	RAL 7035
Protection degree	IP21 or IP31
Cooling	Natural in air
Installation	Indoor (outdoor on request)

OPTIONAL EQUIPMENT:

PROTECTION AGAINST SHORT CIRCUIT

SOVRACCARICO PROTECTION AGAINST OVERLOAD

THRESHOLD THERMAL PROTECTION

ADJUSTMENT SOCKETS

THERMOMETRIC PROBES FOR CORE AND WINDING

MULTIFUNCTIONAL MEASURING INSTRUMENTS

PROTECTION AGAINST OVER VOLTAGE SPD

OPTICAL ACOUSTIC SIGNALS

VACUUM PHASING CAPACITORS

ADDITIONAL ELECTROSTATIC SCREENS

ANTI-FLOW COIL

TROPICALIZING TREATMENT

ANTI-SEISMIC VERSION FOR CONSTRUCTION

MEDICAL USE VERSION

VERSION WITH INTEGRATED REACTANCE

IP54 INDOOR OR OUTDOOR VERSIONS

ISOLATION TRANSFORMERS
ITT 3XX SEIRES
RANGE OVERVIEW Dyn11-K4/AL (CU AVAILABLE ON REQUEST)

								IP00				Box IP21			
Power	MAT	Inrush x In	W0 [W]	Wcc 115°C [W]	Xi %	Vcc %	Rend %	Lenght [mm]	Width [mm]	Height [mm]	Weight [kg]	Lenght [mm]	Width [mm]	Height. [mm]	Tot. Weight [kg]
5	AL	10 ÷ 15	95	245	1,0	4,5	93 ÷ 95	360	190	390	48	510	460	550	20
10	AL	8 ÷ 12	135	480	1,0	4,5	93 ÷ 95	360	250	390	71	510	460	550	20
16	AL	8 ÷ 12	200	685	2,0	4,5	93 ÷ 95	420	280	440	107	630	560	600	25
20	AL	8 ÷ 12	220	755	2,0	4,0	94 ÷ 96	420	320	440	130	630	560	600	25
25	AL	8 ÷ 12	330	670	1,5	3,0	94 ÷ 96	480	280	490	138	630	560	600	25
30	AL	8 ÷ 12	340	850	2,0	3,3	94 ÷ 96	480	300	490	152	630	560	600	25
31,5	AL	8 ÷ 12	340	940	2,0	3,5	94 ÷ 96	480	300	490	152	630	560	600	25
40	AL	6 ÷ 10	320	1000	2,0	3,5	95 ÷ 97	500	340	510	187	860	710	755	45
50	AL	6 ÷ 10	370	1450	3,0	4,0	95 ÷ 97	525	340	570	225	860	710	755	45
60	AL	6 ÷ 10	480	1650	3,0	4,0	96 ÷ 97	560	370	590	253	860	710	755	45
63	AL	6 ÷ 10	480	1850	3,0	4,0	96 ÷ 97	560	370	590	253	860	710	755	45
80	AL	5 ÷ 8	580	1900	3,7	4,2	96 ÷ 97	600	430	590	313	960	820	925	60
100	AL	5 ÷ 8	700	2350	4,7	5,2	96 ÷ 97	690	480	590	373	960	820	925	60
120	AL	5 ÷ 8	650	2850	4,0	4,6	96 ÷ 97	690	480	590	406	960	820	925	60
125	AL	5 ÷ 8	650	3150	4,0	4,9	96 ÷ 97	690	480	590	407	960	820	925	60
160	AL	4 ÷ 7	880	3400	4,9	5,4	96.5 ÷ 97.5	720	500	600	485	1140	870	1055	72
200	AL	4 ÷ 6	1070	3600	4,3	4,8	97 ÷ 98	745	520	620	593	1140	870	1055	72
250	AL	4 ÷ 6	1360	4520	3,6	4,1	97 ÷ 98	750	520	750	732	1200	970	1175	88
300	AL	4 ÷ 6	1500	4800	4,3	4,7	97 ÷ 98	790	540	750	825	1200	970	1175	88
315	AL	4 ÷ 6	1500	5200	4,9	5,2	97 ÷ 98	800	560	750	842	1200	970	1175	88
400	AL	4 ÷ 6	1700	6500	4,4	4,7	97 ÷ 98	880	650	800	1045	1350	1200	1350	125
500	AL	4 ÷ 6	2000	7900	4,9	5,2	97 ÷ 98	900	680	850	1269	1350	1200	1350	125
630	AL	3 ÷ 5	2280	8750	5,5	5,7	97.5 ÷ 98.5	950	730	900	1463	1350	1200	1350	125
800	AL	3 ÷ 5	2900	9000	5,6	5,8	97.5 ÷ 98.5	1100	750	1000	1844	1450	1200	1450	150
1000	AL	3 ÷ 5	3750	11600	4,0	4,1	97.5 ÷ 98.5	1100	850	1100	2285	1600	1500	1700	350
1250	AL	3 ÷ 5	4600	15500	4,0	4,2	97.5 ÷ 98.5	1100	750	1300	2782	1600	1500	1700	350
1600	AL	3 ÷ 5	5200	16000	5,3	5,4	98 ÷ 99	1300	950	1450	3570	1900	1700	2000	500

ISOLATION TRANSFORMERS
ITT 3XX SERIES
RANGE OVERVIEW YNyn0-K4/AL (CU AVAILABLE ON REQUEST)

								IP00				Box IP21			
Power	MAT	Inrush x In	W0 [W]	Wcc 115°C [W]	Xi %	Vcc %	Rend %	Lenght [mm]	Width [mm]	Height [mm]	Weight [kg]	Lenght [mm]	Width [mm]	Height. [mm]	Tot. Weight [kg]
5	AL	10 ÷ 15	95	245	1,0	4,5	93 ÷ 95	360	190	390	48	510	460	550	20
10	AL	8 ÷ 12	135	480	1,0	4,5	93 ÷ 95	360	250	390	71	510	460	550	20
16	AL	8 ÷ 12	200	685	2,0	4,5	93 ÷ 95	420	280	440	107	630	560	600	25
20	AL	8 ÷ 12	220	755	2,0	4,0	94 ÷ 96	420	320	440	130	630	560	600	25
25	AL	8 ÷ 12	330	670	1,5	3,0	94 ÷ 96	480	280	490	138	630	560	600	25
30	AL	8 ÷ 12	340	850	2,0	3,3	94 ÷ 96	480	300	490	152	630	560	600	25
31,5	AL	8 ÷ 12	340	940	2,0	3,5	94 ÷ 96	480	300	490	152	630	560	600	25
40	AL	6 ÷ 10	320	1000	2,0	3,5	95 ÷ 97	500	340	510	187	860	710	755	45
50	AL	6 ÷ 10	370	1450	3,0	4,0	95 ÷ 97	525	340	570	225	860	710	755	45
60	AL	6 ÷ 10	480	1650	3,0	4,0	96 ÷ 97	560	370	590	253	860	710	755	45
63	AL	6 ÷ 10	480	1850	3,0	4,0	96 ÷ 97	560	370	590	253	860	710	755	45
80	AL	5 ÷ 8	580	1900	3,7	4,2	96 ÷ 97	600	430	590	313	960	820	925	60
100	AL	5 ÷ 8	700	2350	4,7	5,2	96 ÷ 97	690	480	590	373	960	820	925	60
120	AL	5 ÷ 8	650	2850	4,0	4,6	96 ÷ 97	690	480	590	406	960	820	925	60
125	AL	5 ÷ 8	650	3150	4,0	4,9	96 ÷ 97	690	480	590	407	960	820	925	60
160	AL	4 ÷ 7	880	3400	4,9	5,4	96.5 ÷ 97.5	720	500	600	485	1140	870	1055	72
200	AL	4 ÷ 6	1070	3600	4,3	4,8	97 ÷ 98	745	520	620	593	1140	870	1055	72
250	AL	4 ÷ 6	1360	4520	3,6	4,1	97 ÷ 98	750	520	750	732	1200	970	1175	88
300	AL	4 ÷ 6	1500	4800	4,3	4,7	97 ÷ 98	790	540	750	825	1200	970	1175	88
315	AL	4 ÷ 6	1500	5200	4,9	5,2	97 ÷ 98	800	560	750	842	1200	970	1175	88
400	AL	4 ÷ 6	1700	6500	4,4	4,7	97 ÷ 98	880	650	800	1045	1350	1200	1350	125
500	AL	4 ÷ 6	2000	7900	4,9	5,2	97 ÷ 98	900	680	850	1269	1350	1200	1350	125
630	AL	3 ÷ 5	2280	8750	5,5	5,7	97.5 ÷ 98.5	950	730	900	1463	1350	1200	1350	125
800	AL	3 ÷ 5	2900	9000	5,6	5,8	97.5 ÷ 98.5	1100	750	1000	1844	1450	1200	1450	150
1000	AL	3 ÷ 5	3750	11600	4,0	4,1	97.5 ÷ 98.5	1100	850	1100	2285	1600	1500	1700	350
1250	AL	3 ÷ 5	4600	15500	4,0	4,2	97.5 ÷ 98.5	1100	750	1300	2782	1600	1500	1700	350
1600	AL	3 ÷ 5	5200	16000	5,3	5,4	98 ÷ 99	1300	950	1450	3570	1900	1700	2000	500

ISOLATION TRANSFORMERS
ITT 3XX SERIES
RANGE OVERVIEW DznO – K4/AL (CU AVAILABLE ON REQUEST)

								IP00				Box IP21			
Power	MAT	Inrush x In	W0 [W]	Wcc 115°C [W]	Xi %	Vcc %	Rend %	Lenght [mm]	Width [mm]	Height [mm]	Weight [kg]	Lenght [mm]	Width [mm]	Height. [mm]	Tot. Weight [kg]
5	AL	10 ÷ 15	95	245	1,0	4,5	93 ÷ 95	360	200	390	49	510	460	550	20
10	AL	8 ÷ 12	135	480	1,0	4,5	93 ÷ 95	420	250	440	95	510	460	550	20
16	AL	8 ÷ 12	200	685	2,0	4,5	93 ÷ 95	420	300	440	110	630	560	600	25
20	AL	8 ÷ 12	220	755	2,0	4,0	94 ÷ 96	480	280	490	150	630	560	600	25
25	AL	8 ÷ 12	330	670	1,5	3,0	94 ÷ 96	480	300	490	152	630	560	600	25
30	AL	8 ÷ 12	340	850	2,0	3,3	94 ÷ 96	480	350	490	165	630	560	600	25
31,5	AL	8 ÷ 12	340	940	2,0	3,5	94 ÷ 96	480	350	490	177	630	560	600	25
40	AL	6 ÷ 10	320	1000	2,0	3,5	95 ÷ 97	500	380	510	193	860	710	755	45
50	AL	6 ÷ 10	370	1450	3,0	4,0	95 ÷ 97	570	350	570	250	860	710	755	45
60	AL	6 ÷ 10	480	1650	3,0	4,0	96 ÷ 97	580	380	590	270	860	710	755	45
63	AL	6 ÷ 10	480	1850	3,0	4,0	96 ÷ 97	600	380	590	275	860	710	755	45
80	AL	5 ÷ 8	580	1900	3,7	4,2	96 ÷ 97	630	430	590	342	960	820	925	60
100	AL	5 ÷ 8	700	2350	4,7	5,2	96 ÷ 97	640	430	600	420	960	820	925	60
120	AL	5 ÷ 8	650	2850	4,0	4,6	96 ÷ 97	690	480	600	434	960	820	925	60
125	AL	5 ÷ 8	650	3150	4,0	4,9	96 ÷ 97	700	480	590	467	960	820	925	60
160	AL	4 ÷ 7	880	3400	4,9	5,4	96.5 ÷ 97.5	740	550	600	524	1140	870	1055	72
200	AL	4 ÷ 6	1070	3600	4,3	4,8	97 ÷ 98	750	550	620	641	1140	870	1055	72
250	AL	4 ÷ 6	1360	4520	3,6	4,1	97 ÷ 98	770	530	740	792	1200	970	1175	88
300	AL	4 ÷ 6	1500	4800	4,3	4,7	97 ÷ 98	820	550	750	882	1200	970	1175	88
315	AL	4 ÷ 6	1500	5200	4,9	5,2	97 ÷ 98	820	600	750	890	1200	970	1175	88
400	AL	4 ÷ 6	1700	6500	4,4	4,7	97 ÷ 98	880	620	800	1100	1350	1200	1350	125
500	AL	4 ÷ 6	2000	7900	4,9	5,2	97 ÷ 98	920	680	900	1400	1350	1200	1350	125
630	AL	3 ÷ 5	2280	8750	5,5	5,7	97.5 ÷ 98.5	960	750	900	1578	1350	1200	1350	125
800	AL	3 ÷ 5	2900	9000	5,6	5,8	97.5 ÷ 98.5	1150	800	1000	1930	1450	1200	1450	150
1000	AL	3 ÷ 5	3750	11600	4,0	4,1	97.5 ÷ 98.5	1150	900	1100	2468	1600	1500	1700	350
1250	AL	3 ÷ 5	4600	15500	4,0	4,2	97.5 ÷ 98.5	1150	900	1300	2980	1600	1500	1700	350
1600	AL	3 ÷ 5	5200	16000	5,3	5,4	98 ÷ 99	1300	1000	1450	3780	1900	1700	2000	500

IT MODELS – BROADCAST
IT SERIES
ISOLATION TRANSFORMERS

IREM IT series isolation transformers have been expressly designed to be used in the telecommunications sector.

The power supply of telephone systems, and radio and television, FM and TV repeaters, has always presented a set of problems and needs that are difficult to solve.

Difficulty in reaching the installation sites to carry out technical interventions, exposure to atmospheric discharges as well as the length of the power lines with consequent voltage drops are critical elements that require the use of equipment specifically dedicated to this sector.

IREM PROPOSAL

The series proposed by IREM: RS - ARM - ARM2 have particular characteristics designed for different types of TLC systems.

All the models of IREM IT isolation transformers, to ensure excellent galvanic separation and high attenuation, are characterized by a recessed concentric winding configuration, a low output impedance and the insensitivity to load power factor.

HIGH ATTENUATION ISOLATION TRANSFORMERSWITH OVERVOLTAGE PROTECTION RS SERIES

IREM Isolation Transformers of the RS series are characterized by:

- ✔ the high attenuation of common mode disturbances;
- ✔ the attenuation of overvoltages caused by lightning and switching on the lines

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

HIGH ISOLATION AND ATTENUATION TRANSFORMERS ARM

The Isolation Transformers of the ARM series can:

- ✔ stand high impulse isolation voltages at 50Hz frequency.
- ✔ ensure high attenuation of common mode disturbances.

CLASS II ISOLATION TRANSFORMERS ARM2

The peculiar characteristic of IREM 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 thermal magnetic 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.

PHF - VTF
PASSIVE FILTERS

The PHF series IREM passive filters are characterized by a high capacity to attenuate harmonic disturbances and are designed to be applied in systems where current harmonic distortion must be reduced within defined limits.

The use of passive filters contributes to reduce the thermal and electrical overload caused by harmonic currents in installations that include variable speed motor drives, UPS, power rectifiers and other non-linear three-phase loads.

IREM VTF Passive Filters increase the useful life of the motor winding, protect the motor against voltage peaks and improve operation in inverter-controlled three-phase asynchronous motor drives.

Typical applications include loads present in air conditioning, water treatment, oil sector and industrial automation processes in general.

HARMONICS IN ELECTRIC POWER SUPPLY

High harmonic distortion values and anomalous voltage values of the neutral with respect to the earth potential can cause equipment failures, leading to production downtime and expensive repairs to the electrical distribution network.

It is essential that the user is aware of the expensive problems and dangers associated with high levels of harmonics, especially in consideration of the important increase in the use of non-linear devices.

Harmonic components can significantly affect the electrical distribution network by acting on all of the connected structures and equipment.

Harmonic distortions cause the following problems in an installation:

- ✔ Conductor overtemperatures, in particular the neutral one in presence of single-phase distorted loads;
- ✔ MV/LV Transformer overtemperatures;
- ✔ Harmonic distortion of the voltage caused by the saturation of the MV/LV transformers;
- ✔ Overheating of standard power supply transformers with consequent expensive downtime and repairs or replacement of the transformer;
- ✔ Resonance with other reactive components on the same power line (e.g. power factor correction banks);
- ✔ Poor power factor;
- ✔ Resonance producing overvoltages;
- ✔ Increase in electricity supply costs due to harmonic losses;
- ✔ Interferences in telecommunication systems and equipment;
- ✔ Irregular operation of the control and protection relays;
- ✔ Intervention of automatic circuit breakers and other protective devices;
- ✔ Failure or malfunction of computers, motor drives, lighting circuits and other sensitive loads;

IREM PROPOSAL

Passive Filters (PHF) are additional filters usually installed on the power supply line of the drive.

The filters consist of a combination of inductor (filter inductor) -capacitor inserted in derivation from an asymmetrical series inductor (main inductor). The performance of the passive harmonic filters IREM PHF series are very high: they reduce the harmonic distortion in current from 100% of THDi to typical values lower than 5%; the filters are made up of capacitors that form a resonant circuit with a reactor that has a high impedance path at the fundamental frequency and a low impedance path at higher specific frequencies.

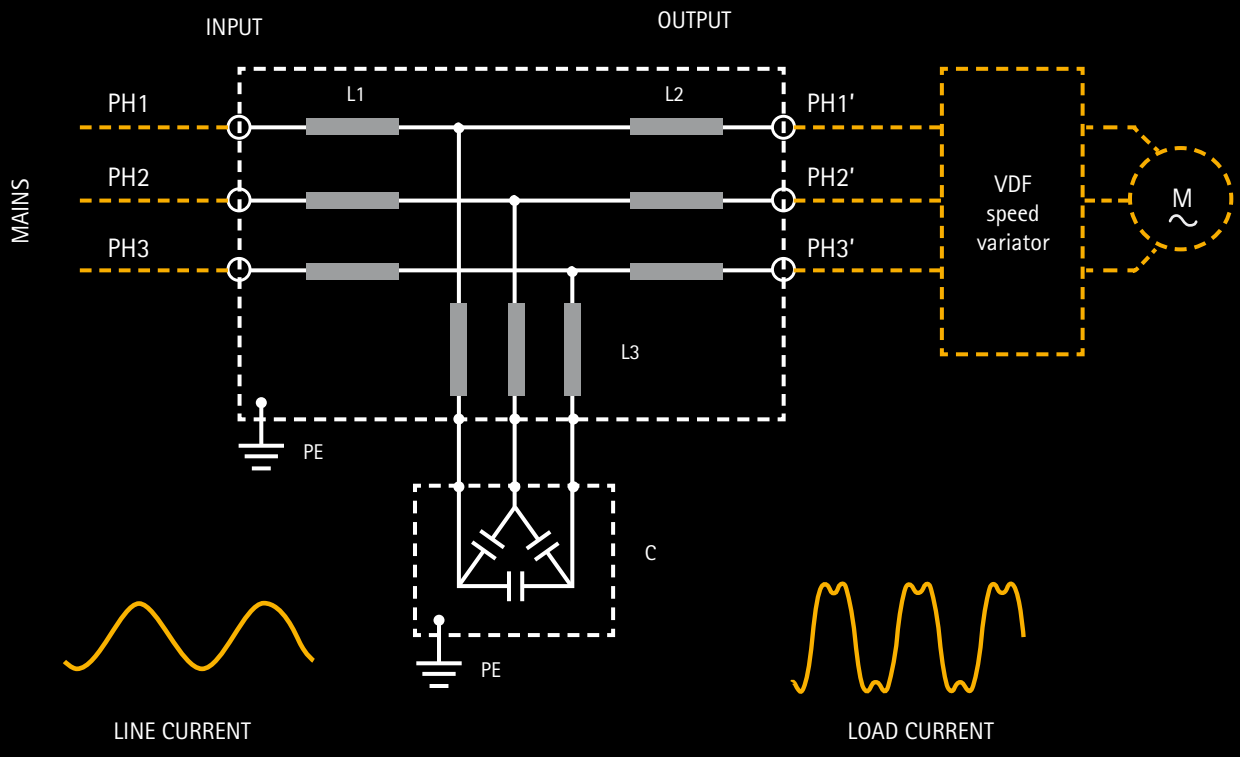
Passive filters are more commonly connected to individual loads in the system rather than to the common coupling point since the application requires a consistent load for effective harmonic mitigation.

The passive harmonic filter is installed in series with the line and therefore must be chosen according to the current absorbed by the load or by the group of loads. IREM passive harmonic filters guarantee excellent attenuation and do not need to be tuned with reference to the impedance parameters of the installation site.

PASSIVE FILTERS FOR HARMONICS
PHF SERIES

GENERAL CHARACTERISTICS

Input voltage	from 380Vac to 480Vac, from 500Vac to 690Vac (HV serie) on demand from 208Vac to 240Vac
Frequency	50Hz or 60 Hz to be defined in order phase
Rated current	from 5A to 750A
Attenuation THDi	<5%
Dielectric test phase - phase	2400 Vdc (2 sec.)
Dielectric test phase - ground	3200 Vdc (2 sec.)
Protection Degree	IP00 integrable in cabinet IP21, IP54 indoor or IP54 outdoor
Overload	4 x Rated current 1 second 2 x Rated current 10 seconds 1.5 x Rated current 10 minutes
Climate class	-40 /+85° C
MTBF at 40°C	250.000 h



PASSIVE FILTERS FOR HARMONICS
PHF SERIES

THREE-PHASES 380-480V 50HZ OR 60HZ PROTECTION DEGREE IP00 (to be integrated in cabinet)

Model	*Voltage (Vac)*	*Current (A)*	*Inductor width (mm)*	*Inductor length (mm)*	*Inductor height (mm)*	*Inductor weight (kg)*	*Capacitor group width (mm)*	*Capacitor group length (mm)*	*Capacitor group height (mm)*	*Cap. group weight (kg)*
PHF-5G	380-480	5	180	145	275	15	75	75	198	1.5
PHF-10G	380-480	10	180	145	275	15	75	75	198	1.5
PHF16G	380-480	16	240	160	385	27	75	75	235	2
PHF-24G	380-480	24	240	160	380	30	75	75	235	2,5
PHF-32G	380-480	32	240	180	380	34	75	75	320	2,5
PHF-38G	380-480	38	300	200	450	47	75	75	320	2,5
PHF-45G	380-480	45	300	200	450	50	85	85	320	4
PHF-60G	380-480	60	300	220	470	63	136	136	276	4,5
PHF-75G	380-480	75	360	210	550	68	116	116	321	5
PHF-90G	380-480	90	360	230	560	80	116	116	321	6
PHF-110G	380-480	110	360	250	565	94	136	432	326	8
PHF-150G	380-480	150	360	350	570	130	210	432	400	8
PHF-180G	380-480	180	480	320	750	150	210	432	400	12
PHF-210G	380-480	210	480	360	765	175	210	412	400	12
PHF-260G	380-480	260	480	350	620	198	338	412	422	12
PHF-320G	380-480	320	480	370	620	250	338	412	422	30
PHF-380G	380-480	380	480	400	620	320	338	412	422	30
PHF-470G	380-480	470	660	370	690	390	338	735	422	40
PHF-580G	380-480	580	660	460	690	490	338	735	422	45
PHF-650G	380-480	650	660	440	790	530	338	735	422	45
PHF-750G	380-480	750	660	460	790	550	338	432	422	48

Model with different voltage, frequency and capacitor capacity available on demand.
IREM Passive Filters are designed to supply the declared current in continuous service and in the most demanding conditions.

PASSIVE FILTERS FOR HARMONICS
PHF- XYZ-HV SERIES
THREE-PHASES 500-690V PROTECTION DEGREE IP00 (to be installed in cabinet)

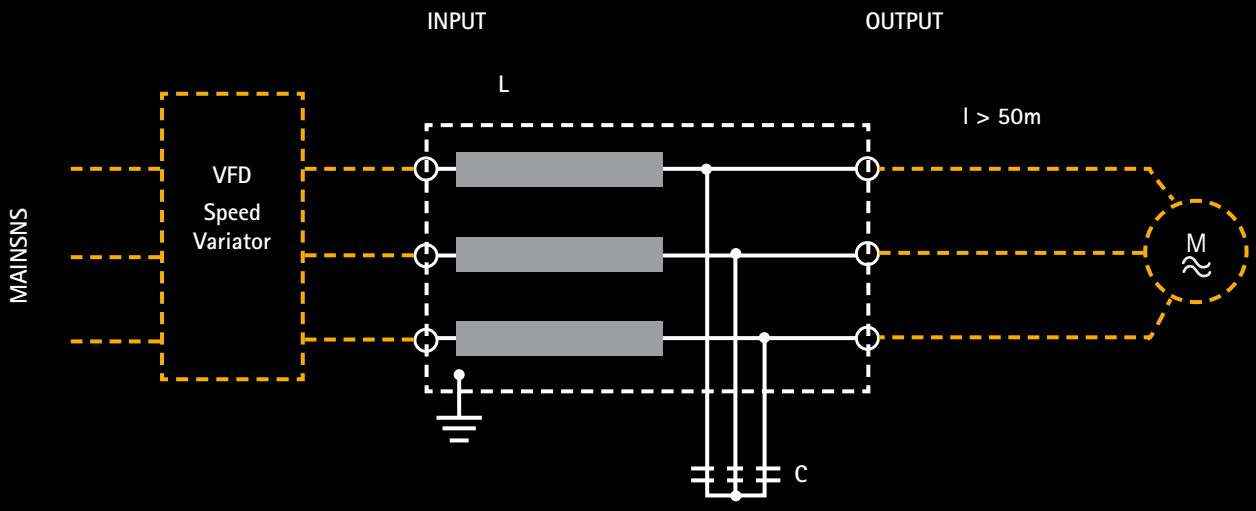
Model	*Voltage (Vac)*	*Current (A)*	*Inductor width (mm)*	*Inductor length (mm)*	*Inductor height (mm)*	*Inductor weight (kg)*	*Capacitor group width (mm)*	*Capacitor group length (mm)*	*Capacitor group height (mm)*	*Cap. group weight (kg)*
PHF-5G-HV	500-690	5	180	120	285	13	59	166	130	1,5
PHF-10G-HV	500-690	10	180	145	275	15	96	96	209	1,5
PHF-16G-HV	500-690	16	240	160	385	27	75	75	235	2
PHF-24G-HV	500-690	24	240	160	380	30	75	75	235	2,5
PHF-32G-HV	500-690	32	240	180	380	34	75	75	235	2,5
PHF-38G-HV	500-690	38	300	200	460	47	75	75	235	2,5
PHF-45G-HV	500-690	45	300	200	460	50	75	75	235	4
PHF-60G-HV	500-690	60	300	220	470	63	96	96	209	4,5
PHF-75G-HV	500-690	75	360	210	550	70	96	96	209	5
PHF-90G-HV	500-690	90	360	230	560	80	96	96	209	6
PHF-110G-HV	500-690	110	360	250	560	96	96	96	209	8
PHF-150G-HV	500-690	150	360	350	570	130	210	432	400	8
PHF-180G-HV	500-690	180	480	320	750	150	210	432	400	12
PHF-210G-HV	500-690	210	480	360	765	175	210	432	400	12
PHF-260G-HV	500-690	260	480	560	620	198	338	410	422	12
PHF-320G-HV	500-690	320	480	370	620	250	338	410	422	30
PHF-380G-HV	500-690	380	480	400	620	320	338	410	422	30
PHF-470G-HV	500-690	470	600	370	690	390	338	725	422	40
PHF-580G-HV	500-690	580	600	460	690	490	338	725	422	45
PHF-650G-HV	500-690	650	600	440	790	530	338	725	422	45
PHF-750G-HV	500-690	750	600	460	790	550	338	725	422	48

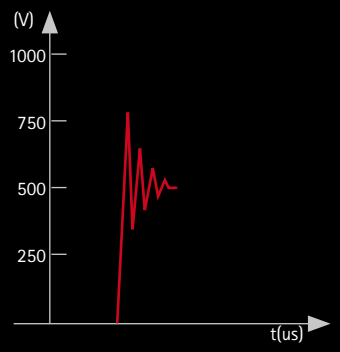
Model with different voltage, frequency and capacitor capacity available on demand.
IREM Passive Filters are designed to supply the declared current in continuous service and in the most demanding conditions.

OUTPUT FILTER dV/dt
VTF SERIES

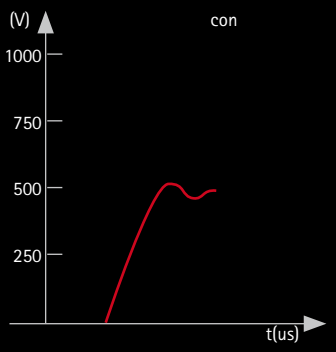
GENERAL CHARACTERISTICS

Input voltage	from 208Vac to 480Vac; from 550Vac to 690Vac HV series;
Output Frequency	0 – 100 Hz
Carrier Frequency	0 – 16 kHz
Rated Current	from 4 to 300A
Dielectric test phase - phase	2400Vdc (2 sec)
Dielectric test phase - ground	3200Vdc (2 sec)
Protection Degree	IP00 integrable in cabinet IP21, IP54 indoor or IP54 outdoor
Saturation Current	1,5 x Nominal Current
Climate class	-40 / +85°C
MTBF at 40°C	250.000 h





Output Voltage VFD



Motor power supply voltage

OUTPUT FILTER dV/dt
VTF SERIES

THREE-PHASES 208-480V PROTECTION DEGREE IP00 (to be installed in cabinet)

Model	*Voltage (Vac)*	*Current (A)*	*Inductor width (mm)*	*Inductor length (mm)*	*Inductor height (mm)*	*Inductor weight (kg)*	*Capacitor group width (mm)*	*Capacitor group length (mm)*	*Capacitor group height (mm)*	*Cap. group weight (kg)*
VTF-2G	208-480	2	150	83	195	2,5	60	130	150	1,15
VTF-4G	208-480	4	150	83	195	2,6	60	130	150	1,15
VTF-6G	208-480	6	150	83	195	2,7	60	130	150	1,15
VTF-8G	208-480	8	150	83	195	2,8	60	130	150	1,15
VTF-12G	208-480	12	150	83	195	2,9	60	130	150	1,15
VTF-16G	208-480	16	150	83	195	3,1	60	130	150	1,15
VTF-20G	208-480	20	150	88	195	3,7	60	130	150	1,15
VTF-25G	208-480	25	150	98	195	4,8	60	130	150	1,15
VTF-32G	208-480	32	150	98	195	5,1	60	130	150	1,15
VTF-38G	208-480	38	180	110	230	6,3	60	130	150	1,15
VTF-45G	208-480	45	180	120	230	7,6	60	130	150	1,15
VTF-60G	208-480	60	180	130	230	9,2	60	130	150	1,15
VTF-75G	208-480	75	180	130	240	9,6	60	130	150	1,15
VTF-90G	208-480	90	180	145	240	11,9	60	130	150	1,15
VTF-110G	208-480	110	240	128,6	290	14,7	60	130	150	1,15
VTF-130G	208-480	130	240	138,6	300	17,5	60	130	150	1,15
VTF-150G	208-480	150	240	158,6	310	22,9	60	130	150	1,15
VTF-180G	208-480	180	240	158,6	310	22,5	60	130	150	1,15
VTF-210G	208-480	210	240	178,6	220	24,3	60	130	150	1,15
VTF-260G	208-480	260	300	182,4	270	28,4	60	130	150	1,15
VTF-320G	208-480	320	300	202,4	270	34,3	60	130	150	1,15
VTF-380G	208-480	380	300	202,4	270	36,0	60	130	150	1,15
VTF-440G	208-480	440	300	222,4	270	49,7	60	130	150	1,15
VTF-500G	208-480	500	360	204,6	320	49,2	60	130	150	1,15
VTF-600G	208-480	600	360	234,6	320	68,0	60	130	150	1,15
VTF-700G	208-480	700	480	280	420	96,2	60	130	150	1,15

OUTPUT FILTER dV/dt
VTF-HV SERIES

THREE-PHASES 550-690V PROTECTION DEGREE IP00 (to be installed in cabinet)

Model	*Voltage (Vac)*	*Current (A)*	*Inductor width (mm)*	*Inductor length (mm)*	*Inductor height (mm)*	*Inductor weight (kg)*	*Capacitor group width (mm)*	*Capacitor group length (mm)*	*Capacitor group height (mm)*	*Cap. group weight (kg)*
VTF-2G HV	550-690	2	150	83	195	2,6	60	130	150	1,15
VTF-4G HV	550-690	4	150	83	195	2,8	60	130	150	1,15
VTF-6G HV	550-690	6	150	83	195	2,9	60	130	150	1,15
VTF-8G HV	550-690	8	150	83	195	3,1	60	130	150	1,15
VTF-12G HV	550-690	12	150	88	195	3,8	60	130	150	1,15
VTF-16G HV	550-690	16	150	98	195	5	60	130	150	1,15
VTF-20G HV	550-690	20	180	110	230	6,2	60	130	150	1,15
VTF-25G HV	550-690	25	180	120	230	7,9	60	130	150	1,15
VTF-32G HV	550-690	32	180	120	230	8,2	60	130	150	1,15
VTF-38G HV	550-690	38	180	130	230	10	60	130	150	1,15
VTF-45G HV	550-690	45	180	145	230	11,9	60	130	150	1,15
VTF-60G HV	550-690	60	240	128,6	280	14,9	60	130	150	1,15
VTF-75G HV	550-690	75	240	138,6	290	17,8	60	130	150	1,15
VTF-90G HV	550-690	90	240	138,6	300	18,8	60	130	150	1,15
VTF-110G HV	550-690	110	240	158,6	300	24,3	60	130	150	1,15
VTF-130G HV	550-690	130	300	152,4	360	28,4	60	130	150	1,15
VTF-150G HV	550-690	150	300	152,4	360	29,5	60	130	150	1,15
VTF-180G HV	550-690	180	300	162,4	360	34	60	130	150	1,15
VTF-210G HV	550-690	210	300	202,4	270	45	60	130	150	1,15
VTF-260G HV	550-690	260	360	194,6	320	51	60	130	150	1,15
VTF-320G HV	550-690	320	360	194,6	320	55	60	130	150	1,15
VTF-380G HV	550-690	380	360	224,6	320	72,5	60	130	150	1,15
VTF-440G HV	550-690	440	360	244,6	320	83,3	60	130	150	1,15
VTF-500G HV	550-690	500	360	254,6	320	86	60	130	150	1,15
VTF-600G HV	550-690	600	480	250	420	106	60	130	150	1,15
VTF-700G HV	550-690	700	480	290	420	134	60	130	150	1,15

AHF
ACTIVE FILTERS

The IREM active filters AHF series, also known as "active harmonic compensators", eliminate harmonics through the generation of a reverse waveform that compensate for distortion.

The active filters of the AHF series ensure optimal suppression of harmonics regardless of the number of loads and their usage profile.

These filters, installed in parallel to the network, are sized to eliminate a specified amount of harmonic current from the system.

Typical applications include loads present in complex industrial plants; in melting, rolling mill and welding plants; in the oil and gas sector; in generation plants, in commercial and residential buildings, in tunnel ventilation systems and in data processing centers.



HARMONICS IN THE POWER SUPPLY

The voltage and current harmonics superimposed on the fundamental have combined effects on the equipment and devices connected to the electrical network.

Voltage harmonics can disturb the control devices used in electronic systems, just think of the errors induced by zero displacement, or disturbances on control devices that use frequencies close to those of the harmonic components.

The electrodynamic forces produced by the instantaneous currents containing harmonics cause vibrations and acoustic disturbances, especially in electromagnetic devices (transformers, reactors, etc.). Furthermore, the presence of harmonics in the rotating fields can produce vibrations in the rotating machines, due to pulsating pairs.

The appliances that give rise to the harmonics are present both in the industrial sector and in the tertiary sector and lately also in the domestic sector: the harmonics are essentially due to non-linear loads or those that give rise to current absorption with a trend different from the supply voltage.

The types of "distorting" load are: power electronics (rectifiers, inverters, etc.), but also welding machines, arc furnaces, speed variators, office equipment, monitors, even devices affected by saturation (transformers) can give rise to harmonics.

The alternators that supply non-linear loads must be derated due to the additional losses created by the harmonic currents.

IREM PROPOSAL

The IREM active harmonic filter AHF series implements a process of compensation of the harmonic content: the harmonic current produced by the load is constantly monitored and an adaptive waveform is generated, that corresponds to the exact shape of the non-linear portion of the load current.

The AHF introduces this adaptive current into the load at the connection point with a reaction time of 50 µs and a response time of 5ms.

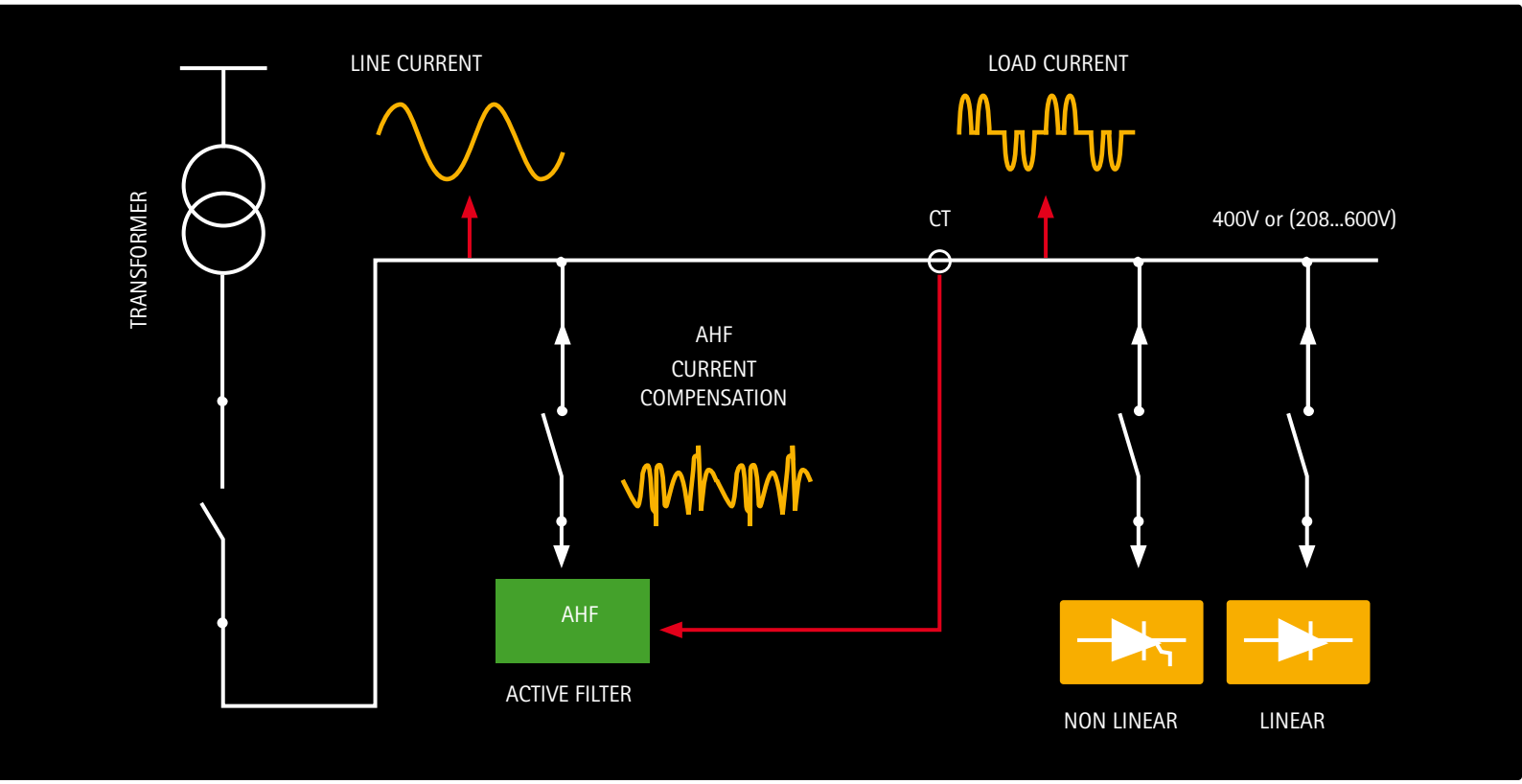
Unlike passive harmonic filters, these filters can provide harmonic mitigation in any load condition up to their nominal capacity.

The active harmonic filter works in parallel and compensates the harmonic content current, it can be chosen for applications consisting of a single or a multiple load of different types.

ACTIVE FILTERS FOR HARMONICS
AHF SERIES

GENERAL CHARACTERISTICS

Input voltage	400Vac, on demand 208Vac, 480Vac and 600Vac
Frequency	50/60 Hz -5/+3% selectable
Harmonic compensation	from 50 to 150A
Efficiency	>97%
Electrical distribution	Three-phase or three-phase with neutral
Current transformer	150:5 - 10.000:5
Harmonics filtering range	from the 2nd to the 50th
Reaction time	<50 µs
Response time	<5 ms
Communication port	RS485, Ethernet
Communication protocol	Modbus, TCP/IP
Interface	color display HMI LCD 4.3 touch screen
Altitude	1500m - above this altitude 1% derating each 100m
Operating temperature	-10°C / + 40°C
Protection degree	IP 20
Noisiness	<56 dB
Color	RAL 7035, light gray



ACTIVE FILTERS FOR HARMONICS
AHF SERIES

THREE PHASE 230V...480V 50HZ OR 60HZ PROTECTION DEGREE IP20 (to be installed in cabinet or rack)

Model	*Voltage (Vac)*	*Current (A)*	*THDi (%)*	*Width (mm)*	*Depth (mm)*	*Height (mm)*	*Weight (Kg)*
AHF.030	230...480	30	60	430	180	530	21
AHF.060	230...480	60	120	430	350	530	40
AHF.100	230...480	100	200	440	300	670	56

IREM Active Filters are designed to be installed in parallel with each other until the current value required by the system is reached.
Available with voltages up to 690Vac.

SAFETY, PROTECTION AND COMMUNICATION

MINIPOWER - STEROPOWER
UNINTERRUPTIBLE POWER SYSTEMS

Minipower and Steropower are double-conversion uninterruptible power supply units ON Line, engineered to ensure highest level of protection for:

- ✔ high-quality machines that manage processes that, if interrupted, would result in considerable damage and/or risks;
- ✔ sensitive electronic equipment used in an industrial environment where, apart from power failure, temporary voltage fluctuations and strong harmonic distortions can occur.

These UPS are therefore particularly suitable for protecting and guaranteeing maximum reliability for "critical mission" devices such as: electromedical equipment, IT systems, telecommunications systems, IT networks, IT applications, industrial automation, and all critical systems in general.




DEDICATED TO PROFESSIONAL USE

The Minipower and Steropower units are outstanding for the following features:

- ✔ microprocessor control to guarantee high reliability
- ✔ cost reduction thanks to high yield and various operating modes
- ✔ filtered, stabilised, reliable voltage with double-conversion On Line technology
- ✔ high overloads (up to 150%)
- ✔ output voltage that can be personalised
- ✔ possibility to program the automatic restart when power is restored
- ✔ control of the input power factor for a sinusoidal absorbed current in phase with the line voltage with a consequential low impact on the mains
- ✔ possibility to modify the parameters via software
- ✔ battery capacity test that can be activated by the user in order to guarantee an extended life span and high reliability
- ✔ high input voltage tolerance. This characteristic is very important because it allows the user to limit use of the batteries to actual black-out situations
- ✔ parameters can be modified via software
- ✔ remote control option
- ✔ on-off sequences can be programmed weekly
- ✔ reduced noise thanks to the use of high-frequency devices and fan speed control
- ✔ can be connected to single-phase mains (UPH models)
- ✔ option of up to 8 units in parallel for parallel redundant (UPH and UPG models).

IREM PROPOSAL





Minipower USF – UPX are on-line double conversion 1PH uninterruptible power supplies available in power range from 1 to 10 kVA.

The UPS of Minipower UPH series are 3PH/1PH models available in power range from 6.5 to 20 kVA, while Minipower UPG are 3PH/3PH models available in power size from 10 to 200 kVA.

HIGHLIGHTS

OPTIONAL GALVANIC ISOLATION

Minipower USF and UPX can be supplied with or without isolation transformer.
The UPS can be used without isolation transformer as this component does not affect the continuity function. The isolation transformer is essential when, due to transients present in the mains, it is necessary to increase the protection level to the load.
The isolation transformers used in IREM UPS are characterised by a low capacitive coupling. The resulting high attenuation allows to "condition" the mains reducing overvoltages and line noise. These disturbances, besides being more frequent that blackouts, have destructive effects for the users.

The isolation transformer is activated also in by-pass condition and allows to create a zero-potential neutral in output.

The models equipped with isolation transformer are also fitted with a thermal magnetic earth leakage circuit breaker.

OPTIMISATION OF THE BATTERIES

The high input voltage tolerance accepted makes it possible to minimize the use of the batteries, thereby increasing efficiency and duration.
Moreover, in case of micro-interruption, the energy necessary is drawn from a condensing unit to further preserve the life of the batteries.

COMMUNICATION

Minipower and Steropower offer advanced communication capacity with all the most frequently used operating systems and network environments, allowing effective and intuitive unit management.

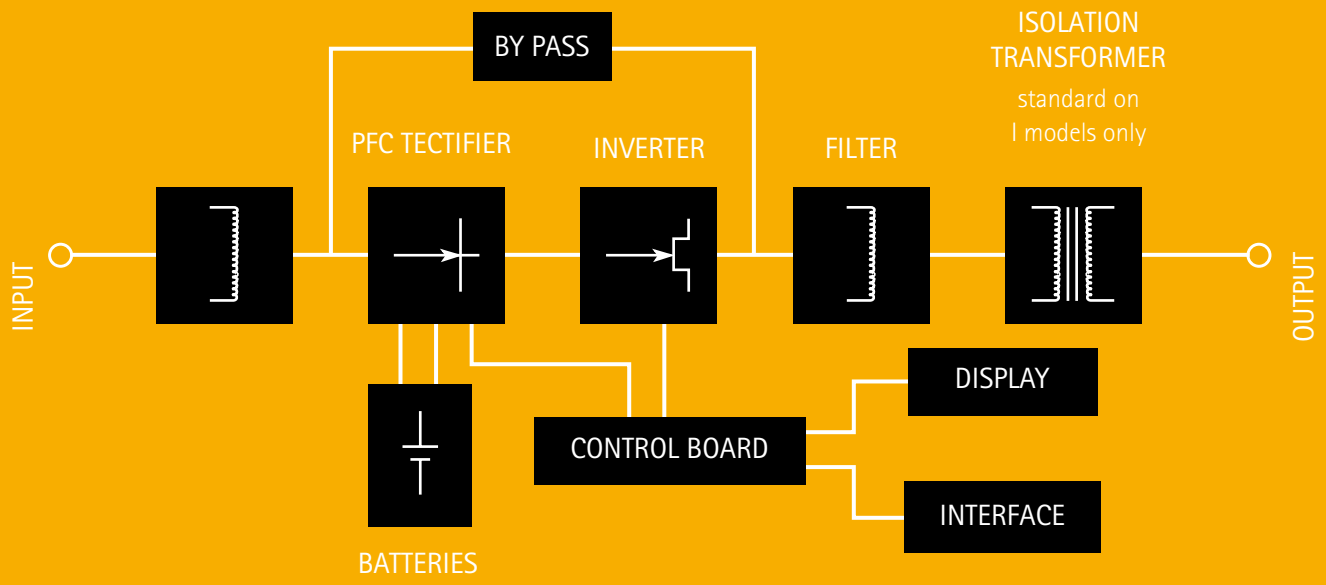
They come complete with:

- ✔ RS232 serial port;
- ✔ USB port;
- ✔ slot for communication card.

CONFORMITY WITH EEC DIRECTIVE

Minipower and Steropower are state-of-the-art equipment conforming to the most recent safety and electromagnetic compatibility regulations. More specifically they meet the requirements established by 2014/30/EU and 2014/35/EU.

MINIPOWER E STEROPOWER
OPERATING PRINCIPLE



The operating mode can be set manually by the synoptic panel or can be programmed via software.

There are 4 different operating modes:

- ✔ On Line;
- ✔ Economy Mode: selects the Interactive Line technology for cases of low-sensitivity loads. The following make it possible to increase efficiency;
- ✔ Smart Active: with this configuration, the UPS itself decides the operating mode automatically (on-line or line interactive) in function of the network quality;
- ✔ S Rescue: the UPS works only during a black-out (only-emergency mode).

SINGLE-PHASE UPS
MINIPOWER USE - UPX

Model		**USE1.0**	**USE2.0**	**USE3.0**	**UPX 4.0**	**UPX5.0**	**UPX6.0**	**UPX8.0**	**UPX10**
Type		On-line double conversion							
Power [kVA/kW]		1,0/0,9	2,0/1,8	3,0/2,7	4,0/3,6	5,0/5,0	6,0/6,0	8,0/8,0	10/10
Input	*Nominal voltage*	230Vac single-phase							
	Voltage variation	175-280Vac with 100% load			184-276Vac with 100% load				
	Frequency	50/60 Hz ±5%							
Output	*Nominal voltage*	230Vac (208-240Vac selectable)			230Vac single-phase				
	Static variation	±1%			±1,5%				
	Dynamic variation	≤ 5% in 20 ms							
	Frequency	50/60 Hz selectable or self-learning							
	Waveform	Sinusoidal							
	Crest factor	3:1							
	Power factor	0,9			1				
	Intervention time	105%-125% 1 min. / 125%-150% 30 sec. / over 150% 300 ms			105%-110% 10 min. / 110%-133% 1 min. / 133%-150% 5 sec. / over 150% 3 sec.				
By-pass	*Type*	Automatic							
	Intervention time	0 ms							
Battery	*Type*	Inbuilt - sealed lead acid							
	Typical back-up time	13	13	16	9	11	10	10	10
	Typical recharge time	6 hours			4-6 hourse				
Signals	*LCD on front panel*	Mains on, mains off, battery status, fault, battery fault, overload, by pass							
	Acoustic alarms	On battery operation, overload, fault							
Communication		USB/DB9 with RS232, contacts							
Reference Standard	*CE compliance*	2014/35/EU - 2014/30/EU Directives							
	Classification	VFI - SS - 111							
Environment	*Operating conditions*	max humidity 90% non-condensing			max humidity 95% non-condensing				
	Temperature	0-40°C ambient temperature							
	Noise	< 50dB at 1 meter			< 48dB at 1 meter in E+ mode				
Physical characteristics	*Protection degree*	IP20							
	Dimensions [mm]	145x415x215h	190x440x340h	190x470x340h	131x640x448h	131x640x448h	131x640x448h	262x640x448h	262x640x448h
	Net weight [kg]	13	26	28	38	45	46	72	82
	Colour	Black			Black RAL 9005				
Warranty	*Months*	12			12				

These characteristics may be subject to change without notice.

THREE/SINGLE-PHASE UPS
MINIPOWER UPH

Model		**UPH8**	**UPH10**	**UPH15**	**UPH20**
Type		On-line double conversion			
Power [kVA/kW]		8/8	10/10	15/15	20/20
Input	*Nominal voltage*	380-400-415 Vac three-phase +N			
	Voltage variation	320-480Vac			
	Frequency	50/60Hz±5%			
Output	*Nominal voltage*	220-230-240Vac single-phase			
	Static variation	±1,5%			
	Dynamic variation	≤ 5% in 20 ms			
	Frequency	50/60Hz selectable			
	Waveform	Sinusoidal			
	Crest factor	3:1			
	Inverter overload	110% 10 minutes, 130% 1 minute, 150% 5 seconds		110% 10 minutes, 125% 1 minute	
By-pass	*Type*	Automatic			
	Intervention time	0 ms			
	By-pass overload	130% 1 hour, 150% 10 minutes		125% 60 minutes, 150% 10 minutes	
Battery	*Type*	Inbuilt - sealed lead acid			
	Full load back-up time	9	10	10	10
	Typical recharge time	4-6 hours		selectable	
Signals	*LCD on front panel*	Mains on, mains off, battery status, fault, battery fault, overload, by pass			
	Acoustic alarms	On battery operation, overload, fault			
Communication		USB / RS232/ slot for communication interface			
Reference Standard	*CE compliance*	2014/35/EU - 2014/30/EU Directives			
	Classification	VFI - SS - 111			
Environment	*Operating conditions*	max humidity 95% non-condensing			
	Temperature	0-40°C ambient temperature			
	Noise	< 48dB at 1 meter in E+ mode		< 40dB at 1 meter in E+ mode	
Physical characteristics	*Protection degree*	IP20			
	Dimensions [mm]	262x640x448h	262x640x448h	280x840x700h	280x840x700h
	Net weight [kg]	72	84	133	155
	Colour	Black RAL 9005		Anthracite grey RAL 7016	

These characteristics may be subject to change without notice.

THREE-PHASE UPS
STEROPOWER UPG

Model		**UPG10**	**UPG15**	**UPG20**	**UPG30**	**UPG40**
Type		On-line double conversion				
Power [kVA/kW]		10/10	15/15	20/20	30/27	40/36
Input	*Nominal voltage*	380-400-415 Vac three-phase+N				
	Voltage variation	320-480Vac				
	Frequency	40/72Hz				
Output	*Nominal voltage*	380-400-415 Vac three-phase+N (selectable)				
	Static variation	±1,5%			±1%	
	Dynamic variation	±3%				
	Frequency	50/60 Hz (selectable)				
	Waveform	Sinusoidal				
	Crest factor	3:1 (Ipeak/Irms)				
	Power factor	110% 10 minutes, 125% 1 minute				
By-pass	*Type*	Automatic and manual				
	Intervention time	0 ms				
	By-pass overload	125% 60 minutes, 150% 10 minutes				
Battery	*Type*	Inbuilt - sealed lead acid				
	Full load back-up time	20	10	10	10	10
	Typical recharge time	6 hours				
Signals	*LCD on front panel*	Mains on, mains off, battery status, fault, battery fault, overload, by pass				
	Acoustic alarms	On battery operation, overload, fault				
Communication		n.3 slots for communication interface / RS232/USB				
Reference Standard	*CE compliance*	2014/35/EU - 2014/30/EU Directives				
	Classification	VFI - SS - 111				
Environment	*Operating conditions*	max humidity 95% non-condensing				
	Temperature	0-40°C ambient temperature				
	Noise	< 52dB at 1 meter				
Physical characteristics	*Protection degree*	IP20				
	Dimensions [mm]	280x840x700h	280x840x700h	280x840x700h	440x850x1320h	440x850x1320h
	Net weight [kg]	131	133	155	335	350
	Colour	Anthracite grey RAL 7016				
Others		Battery box for extended back-up time, Box for output isolation transformer				

These characteristics may be subject to change without notice.

THREE-PHASE UPS
STEROPOWER UPG

Model		**UPG60**	**UPG80**	**UPG100**	**UPG125**	**UPG160**	**UPG200**
Type		On-line double conversion					
Power [kVA/kW]		60/54	80/72	100/90	125/112,5	160/160	200/200
Input	*Nominal voltage*	380-400-415 Vac three-phase+N					
	Voltage variation	320-480Vac					
	Frequency	40/72Hz					
Output	*Nominal voltage*	380-400-415 Vac three-phase+N (selectable)					
	Static variation	±1%	±1%	±1%	±1%	±1%	±1%
	Dynamic variation	±3%	±3%	±3%	±3%	±3%	±3%
	Frequency	50/60 Hz (selectable)					
	Waveform	Sinusoidal					
	Crest factor	3:1 (Ipeak/Irms)					
	Inverter overload	110% 10 minutes, 125% 1 minute					
By-pass	*Type*	Automatic and manual					
	Intervention time	0 ms					
	By-pass overload	125% 60 minutes, 150% 10 minutes					
Battery	*Type*	External					
	Full load back-up time	Ø	Ø	Ø	Ø	Ø	Ø
	Typical recharge time	6 hours					
Signals	*LCD on front panel*	Mains on, mains off, battery status, fault, battery fault, overload, by pass					
	Acoustic alarms	On battery operation, overload, fault					
Communication		n.3 slots for communication interface / RS232/USB					
Reference Standard	*CE compliance*	2014/35/EU - 2014/30/EU Directives					
	Classification	VFI - SS - 111					
Environment	*Operating conditions*	max humidity 95% non-condensing					
	Temperature	0-40°C ambient temperature					
	Noise	< 63dB at 1 meter				< 50dB at 1 meter	
Physical characteristics	*Protection degree*	IP20					
	Dimensions [mm]	500x850x1600h	500x850x1600h	500x850x1600h	650x840x1600h	850x1050x1900h	850x1050x1900h
	Net weight [kg]	190	200	220	240	450	460
	Colour	Anthracite grey RAL 7016					
Others		Battery box for extended back-up time, Box for output isolation transformer					

These characteristics may be subject to change without notice.

ENERGY SAVING
THROUGH ENERGY EFFICIENCY

The term Energy Saving includes various techniques aimed at reducing the consumption of energy necessary to carry out human activites.

Energy Saving can be achieved both by reducing energy processes so that less work is done, and by optimizing these processes so that, for the same work, less energy is required.

This last way is that of Energy Efficiency.

The term Energy Efficiency indicates the ability of a physical system to obtain a given result by using less energy than other systems called less efficient, generally increasing its efficiency and allowing therefore energy saving and a reduction in operating costs.

"Energy Efficiency" indicates the ability to be able to "do more with less", adopting the best technologies/techniques available on the market and a more conscious and responsible behavior towards energy uses. This therefore implies a more rational use of energy, eliminating waste due to operation and sub-optimal management of simple and complex systems.

The increase in energy efficiency is achieved by implementing forms of intervention that include technological improvements, optimization of energy management and diversification of energy supply. Wastes and energy losses represent the hidden "deposit" we have and that energy efficiency allows us to recover and valorise in order to obtain substantial economic, environmental and social advantages.

For these reasons, energy efficiency is the essential component of a virtuous energy strategy aimed at achieving a safer, more competitive and more sustainable low-energy economy.

Energy efficiency = "Do more with less"

Energy Efficiency
for the environment:

< CO2

Greater energy efficiency makes it possible to use less fossil fuels and therefore to reduce the level of greenhouse gas emissions, which contribute to global warming.

Energy Efficiency
for companies:

< OPERATING COSTS

With the increase in energy efficiency it is possible to reduce the energy expenditure of companies that can reinvest the money saved on core business activities to increase competitiveness on the market.

Energy Efficiency
for the future:

> AVAILABLE ENERGY

Energy Efficiency is the most universally available energy source. The most convenient and cleanest energy is energy that must not be produced or used.

VOLTAGE OPTIMIZATION

The average voltage value of the distribution networks is often greater than the ideal operating value for most electrical equipment.

For example, a 230 V linear load used with a 240 V power supply, absorbs 4.3% current more and it consumes 9% more electricity than the 230 V power supply.

A common but wrong belief relating to voltage optimization is that, reducing the voltage, leads to an increase in the current and, therefore, absorbed power remains unchanged.

This is true for certain types of loads, called constant power; however, most sites have a variety of loads that will benefit to a greater or lesser extent from energy savings by considering the whole site as a single unit.

Voltage optimization is a technique of energy efficiency which, by operating through the systematic and controlled reduction of the network voltage, allows to reduce the absorption from the active and reactive power network.

While some voltage "optimization" devices have fixed voltage regulation, others regulate the voltage automatically electronically. Voltage optimization systems are usually installed in series with a building's electrical network, allowing all installed electrical equipment to benefit from an optimized power supply. High voltage values lead to higher energy consumption than necessary and, consequently, higher electrical costs.

High voltage values are not only expensive, but can also be harmful to equipment. Excessive supply voltage produces noise, heat and further vibrations that stress internal components, in particular motors that are sensitive to overheating and wear out more quickly. The IREM Ecostab – Ecobuck voltage optimization system ensures that a user receives and pays only for the voltage actually needed and no more, they optimize power quality and generate energy savings.

ENERGY SAVING

ECOSTAB - ECOBUCK
VOLTAGE OPTIMISERS

IREM Ecostab - Ecobuck 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 - Ecobuck 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.

APPLICATION FIELDS

The average voltage supply from many national grids around the world is often higher than the ideal operating voltage for most electrical equipment.

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.

IREM voltage optimizers are used in various sectors:

- ✔ Industries
- ✔ Services
- ✔ Hotels
- ✔ Catering and Restaurants

IREM PROPOSAL

Sites equipped with an IREM Ecostab - Ecobuck voltage optimization system often obtain reductions of 5 to 15% in energy consumption, costs and, therefore, in carbon dioxide emissions!

The first step to evaluate the opportunity to install a network optimizer is to monitor and know the input voltage levels: the IREM Ecometer Energy Saving Meter allows you to determine the parameters.

The values displayed are calculated with the method recommended by the VDE-AR-E 2055-1 standard. The savings displayed guaranteeing the precision of the metrological chain of measuring instruments.

The IREM Ecostab - Ecobuck Voltage Optimisers are equipped with 2 digital network analyzers and an additional display that shows the energy savings achieved. These multimeters display all the electrical parameters, such as voltage, current, frequency, power, power factor, total harmonic distortion etc., measured from the mains input, to the economizer output. These multimeters are characterized by:

- ✔ 128x80 pixel LCD graphic display, backlit;
- ✔ 4 keys for display and programming;
- ✔ Simple and fast navigation;
- ✔ Texts for measurements, programming and messages in 5 languages;
- ✔ True RMS Measurements (TRMS);
- ✔ Continuous data acquisition;
- ✔ High accuracy.

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 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.

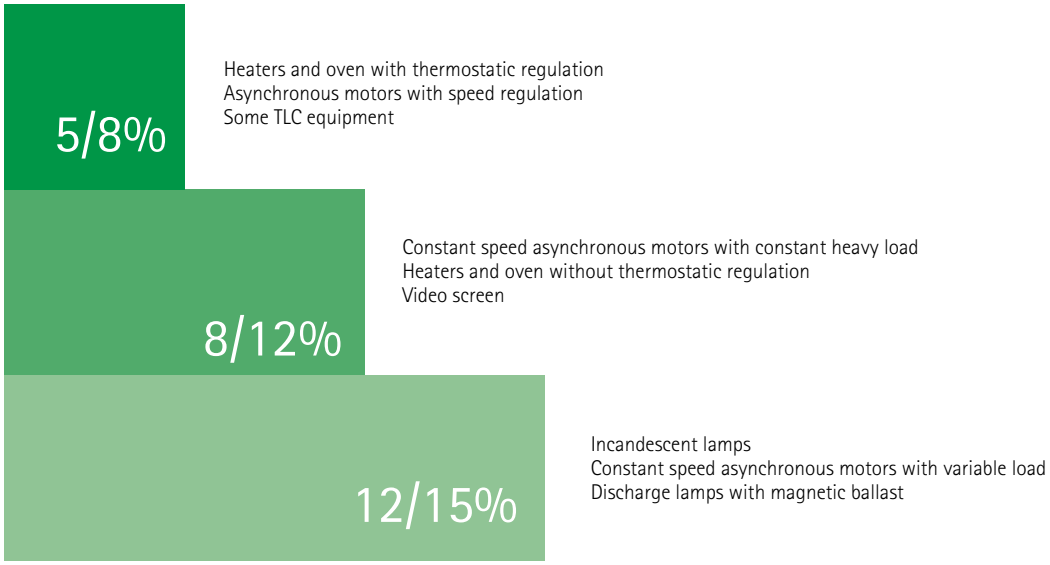
Fluorescent lamps on modern electronic ballasts will use approximately the same power and give the same light.

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.

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 - Ecobuck in connection to motors with stall torque often lower than the maximum deliverable torque;

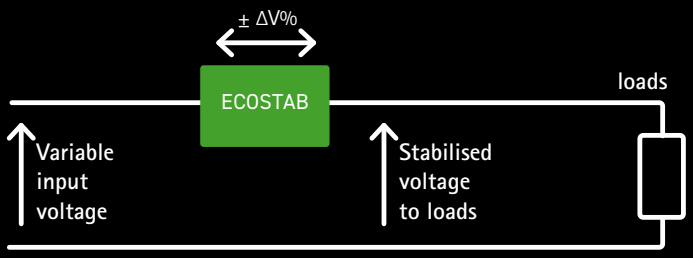
d. Overall consumption of devices powered by the voltage optimizer. The higher the power of the Ecostab - Ecobuck voltage optimiser, the shorter its payback period.

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 - Ecobuck voltage optimisers to some devices to optimise the investment.

Thanks to the energy saved and the optimized power quality, the cost of the voltage optimizer will be usually paid off in a period ranging from 1 to 5 years.

ECOSTAB



ECOSTAB is a voltage stabilizer designed for Energy Saving and capable of improving Power Quality in all mains voltage conditions.

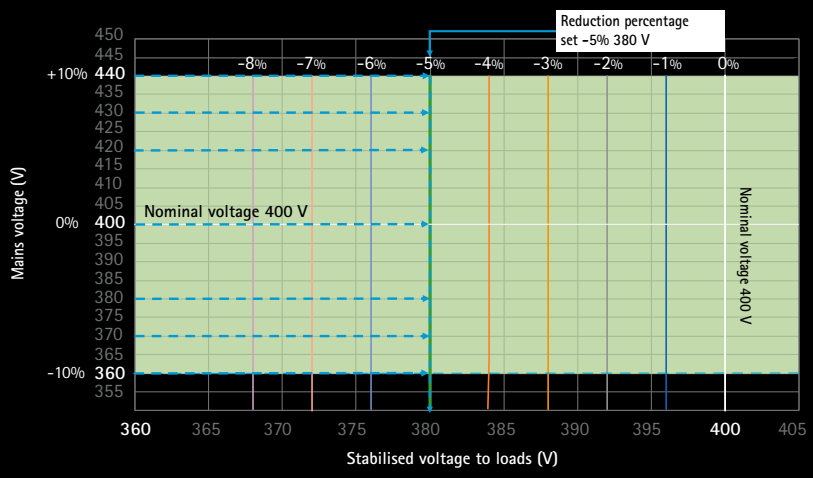
Ecostab supplies the load with a stable voltage having a value less than or equal to the nominal mains voltage.

The voltage with which the load is powered can be set through a potentiometer between the nominal value and -8%.

Ecostab is able to increase or reduce the voltage of the electrical distribution network in order to provide the loads with an optimal voltage, which can be set to a desired value and kept stable.

The desired value is linearly adjustable between a minimum value of 368V (-8%) and a maximum value of 400V (± 0%).

In the entire range of variation of the mains voltage allowed by the standard (± 10% of the nominal value of 400V) the load is always powered by the Ecostab at the desired voltage, kept stable at ± 1%.

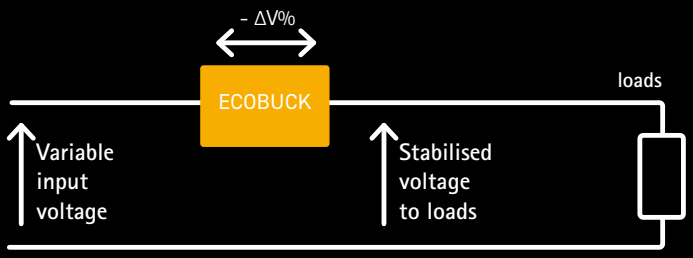


The variations of the mains voltage both in excess and in default are compensated and the supply voltage to the load is kept stable at the set value.

For example, if you want to select a supply voltage to the load of 380V equal to -5% of the nominal voltage of 400V, the selected voltage value is kept constant within the entire range of the input variation between 360V and 440V.

HIGHLIGHTS

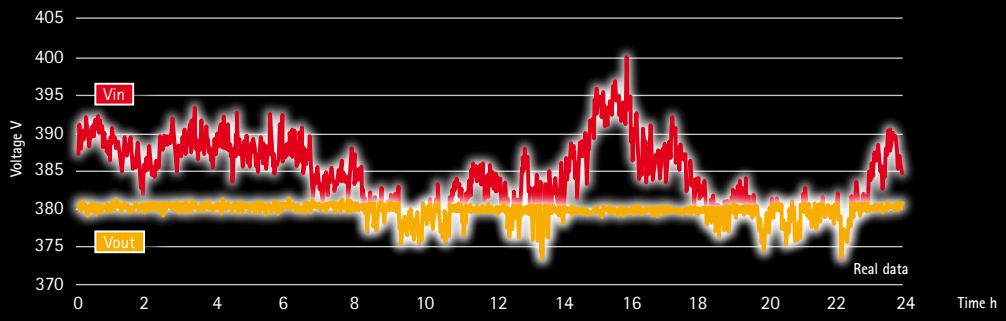
ECOBUCK



ECOBUCK is a voltage stabilizer designed specifically for Energy Saving and capable of improving Power Quality in certain mains voltage conditions.

The Ecobuck supplies the load with a stable voltage having a lower value or at the limit equal to the nominal mains voltage.

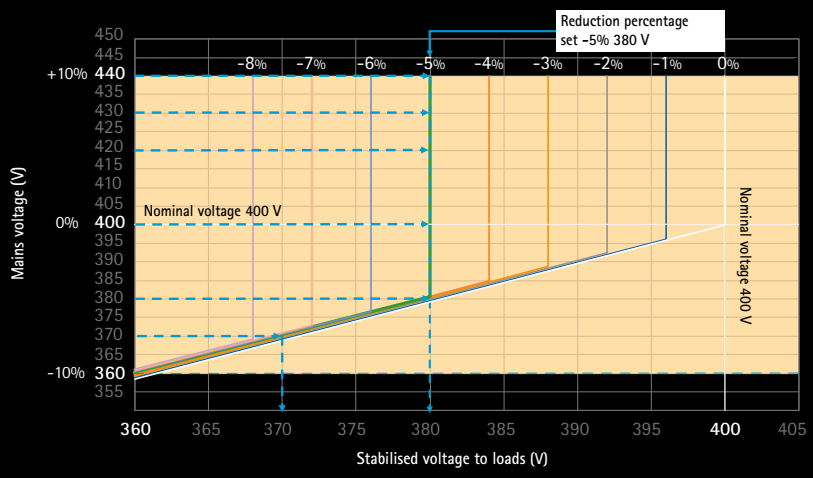
The voltage with which the load is powered can be set through a potentiometer between the nominal value and -8%.



Ecobuck is able to reduce the voltage of the electrical distribution network in order to provide the loads with an optimal voltage, at a value lower than the nominal mains value.

The behavior of the Ecobuck differs from that of the Ecostab only when the mains voltage is less than the desired voltage.

In conditions of voltage lower than the desired value, the Ecobuck does not worsen the supply conditions, simply the load is powered at the voltage it would be powered on if there was no Ecobuck.



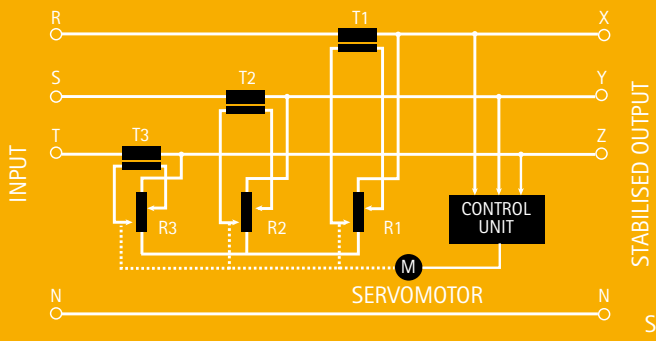
The electric user is powered by the Ecobuck with a stabilized voltage when the mains voltage is greater than the output voltage set on the Ecobuck itself. When the voltage of the electrical network is lower than the set voltage value, the Ecobuck does not make any corrections, consequently the load is powered by the mains voltage. For example, if you want to select a supply voltage of 380V equal to -5% of the nominal voltage of 400V, the selected voltage value is kept constant in the range of the input voltage variation between 380V and 440V.

If the mains voltage drops to 375V, for example, the Ecobuck would deliver 375V to the load. As soon as the mains voltage returns to a value higher than the set value (for example 382V), the Ecobuck returns to operate by adjusting the voltage on the load.

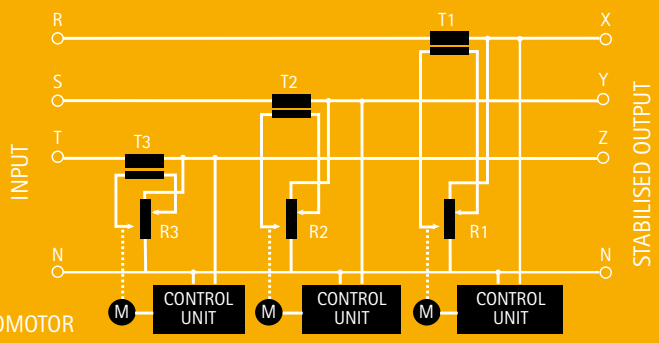
HIGHLIGHTS

VOLTAGE OPTIMISERS
OPERATING PRINCIPLE

ECOSTAB - ECOBUCK
T MODELS
WITH COMMON REGULATION OF THE 3 PHASES



ECOSTAB - ECOBUCK
Y MODELS
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.

Figure G

IP21

Figure H

GENERAL FEATURES

POWER RANGE. From 5 to 4000 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 0.1% in any operating condition.

IMPEDANCE. The installation of an Ecostab - Ecobuck voltage optimiser in a pre-existing plant does not require a new calculation of the protections because the internal impedance of the optimiser ranging from 0.52 to 0.015 Ohm depending on models, does not significantly affect the line impedance.

OPERATING TEMPERATURE. Ecostab - Ecobuck voltage optimisers are designed for operation at a maximum ambient temperature of 40°C in the

Outdoor model

IP54

Indoor model

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. Ecostab - Ecobuck voltage optimisers use the same technology and the same components as Ministab and Sterostab voltage stabilisers, that IREM has been manufacturing for over 60 years. The MTBF exceeding 500,000 hours is the result of IREM 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 and over/under voltage.

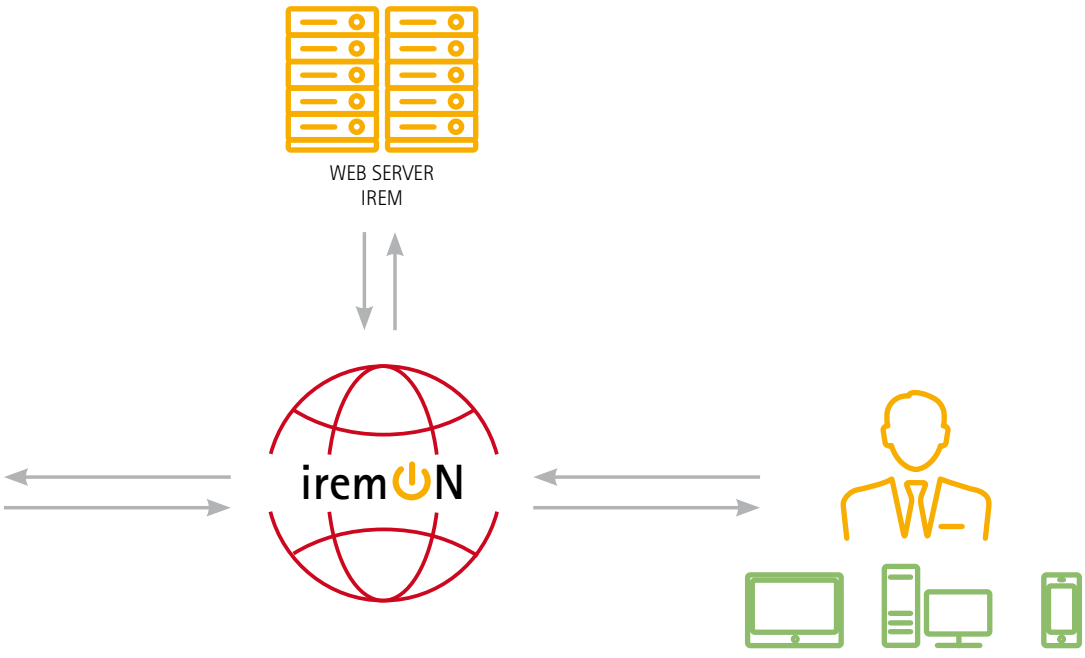
SPECIAL VERSIONS. Ecostab - Ecobuck voltage optimisers can be equipped on demand with special fittings in separate cabinet, like e.g.: maintenance bypass, thermal magnetic circuit breakers, surge/lightning arresters, harmonic filters.

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

COMPLIANCE WITH STANDARDS. Ecostab - Ecobuck 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.

ECOSTAB
remote control system



ECOSTAB

ECOSTAB M SINGLE-PHASE 230V 50/60HZ VOLTAGE OPTIMISERS - IP21 INDOOR VERSION

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	

ECOSTAB T THREE-PHASE 400V 50/60HZ VOLTAGE OPTIMISERS - IP21 INDOOR VERSION

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	

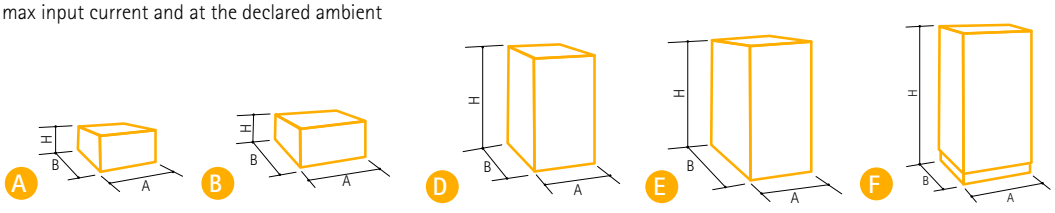
ECOSTAB Y THREE-PHASE 400V + N 50/60HZ VOLTAGE OPTIMISERS - IP21 INDOOR VERSION

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		1100x1300x1800	1360	J
Y320AJ800S	800	1155			18		1100x1300x1900	1770	
Y320AJ1000S	1000	1443			18		1100x1300x1900	1850	
Y322AJ1250S	1250	1804			26		2150x1350x2150	2700	K
Y323AJ1600S	1600	2309			18			3100	
Y324AJ2000S	2000	2887			17			3400	
Y326AJ2300S	2300	3320			18		3 cabinets 1100x1300x1900	3800	3 x J
Y328AJ2500S	2500	3608			24			5200	
Y330AJ2800S	2800	4041			26			5700	

Standard 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

Optional fittings:
- Polycarbonate screen for IP2x protection at open doors (for "AJ" models in cabinet)
- Class II or Class I+II surge arresters
- Connection to the iremON remote service

IREM 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.



ECOBUCK

ECOBUCK M SINGLE-PHASE 230V 50/60HZ VOLTAGE OPTIMISERS - IP21 INDOOR VERSION

Model	Rated power (kVA)	Rated current (Ampere)	Output regulation range	Response time (ms/V)	Output accuracy (±%)	Dimensions (mm) a x b x h	Net weight (kg)	Figure
M204EJB8-S10	8	35	R = -10% (40 V)	42	±1%	450x560x600	45	A
M206EJB15-S10	15	65		42			65	
M208EJB25-S10	25	109		44		450x680x430	80	B
M210EJB45-S10	45	196		54			120	

ECOBUCK T THREE-PHASE 400V 50/60HZ VOLTAGE OPTIMISERS - IP21 INDOOR VERSION

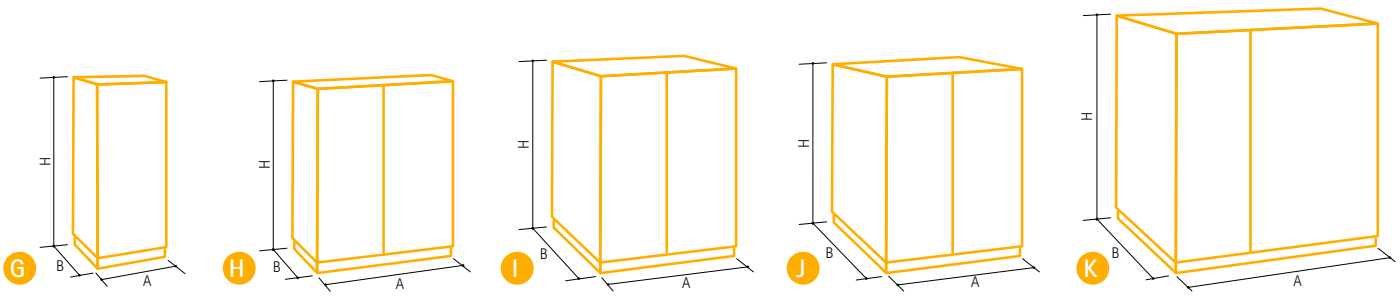
T304EJB25-S10	25	36	R = -10% (40 V)	46	±1%	450x560x600	80	A
T306EJB50-S10	50	72		28			110	
T308EJB75-S10	75	108		32			135	
T310AJB170-S10	170	245		34		650x650x1300	360	F
T312AJB250-S10	250	361		48		650x650x1800	400	G
T314AJB350-S10	350	505		34		1100x650x1800	450	H
T315AJB530-S10	530	765		46			790	
T316AJB700-S10	700	1010		58			850	
T318AJB1100-S10	1100	1588		58		1100x1300x1800	1180	J
T319AJB1600-S10	1600	2309		58		2130x1350x2150	1630	L

ECOBUCK Y THREE-PHASE 400V + N 50/60HZ VOLTAGE OPTIMISERS - IP21 INDOOR VERSION

Y308EJB75-S10	75	108	R = -10% (40 V)	26	±1%	350x580x890	180	D
Y310EJB140-S10	140	202		24		450x800x1200	290	E
Y311EJB200-S10	200	289		32			320	
Y312EJB250-S10	250	361		40			370	
Y313AJB350-S10	350	505		34		650x650x1800	580	G
Y314AJB550-S10	550	794		54		1100x900x1900	790	I
Y316AJB700-S10	700	1010		38		1100x1300x1800	1160	
Y317AJB1000-S10	1000	1443		44			1420	
Y318AJB1400-S10	1400	2021		32		1100x900x1900	1790	J
Y319AJB2100-S10	2100	3.31		34		2150x1600x2240	2650	K
Y320AJB2500-S10	2500	3608		36		2150x1600x2240	2750	
Y320AJB3200-S10	3200	4619		36		2150x1600x2240	3150	

Standard 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
Class II or Class I+II surge arresters
Connection to the iremON remote service
Polycarbonate screen for 2X protection with open doors (for "AJB cabinet models)

IREM 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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