

POWER QUALITY





PROBLEMS AND SOLUTIONS

VOLTAGE VARIATIONS WITH



SYMMETRICAL PHASES



ASYMMETRICAL PHASES

Distribution lines, being subject to continuous load variations, cannot guarantee a constant voltage.

Electrical equipment usually operates correctly within a tolerance of at least $\pm 5\%$ of the nominal value.

In fact, power suppliers contractually allow for a variation of $\pm 10\%$. However, this limit is often exceeded due to 'slow variations' (voltage drops caused by undersized lines and overloads), 'overvoltages' (significant increases in the RMS voltage that occur when industries do not consume energy), and 'rapid variations' (voltage drops caused, for example, by the connection of loads such as discharge lamps, welding machines, large electric motors, etc.).

Asymmetry, also known as voltage imbalance, is an issue that affects three-phase networks. It can cause severe damage to equipment but is often overlooked.

For example, a voltage imbalance of 2.3% on a 400 V motor results in a current imbalance of nearly 18%, leading to a temperature increase of 30°C.

VOLTAGE STABILISERS



MINISTAB - STEROSTAB T



MINISTAB - STEROSTAB Y

VOLTAGE SPIKES



These are impulse disturbances of extremely short duration, which are dangerous for the most sensitive equipment as they can reach voltage levels of several thousand volts.

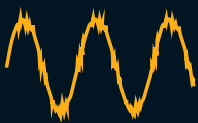
They are caused not only by lightning but also by switching operations on high-voltage lines, the connection of power factor correction capacitors, and the disconnection of loads with high reactive power. Due to their short duration, they cannot be detected with a standard voltmeter and are one of the main causes of faults and malfunctions.

ELECTRONIC LINE CONDITIONERS



MINISTATIC, STEROGUARD

HIGH-FREQUENCY DISTURBANCES



They are caused by sparking in commutator electric motors, the 'corona effect' on high-voltage lines, the starters of neon signs and burners, and the magnetic fields emitted by radio and television broadcasters.

Line noise, also known as HF NOISE, does not affect electromechanical equipment but is often harmful to electronic devices.

INTEGRATED POWER SUPPLIES



SERIE A1 - AO

GALVANIC ISOLATION



This specific feature is used for electrical hazard protection, suppressing electrical noise in sensitive devices, attenuating impulse voltages, or, in general, transferring power between two circuits that must not be electrically interconnected while preventing the transmission of the DC component from one circuit to another.

Isolation transformers provide galvanic isolation; there is no conductive path between the source and the load.

ISOLATION TRANSFORMERS



SERIE ITT - IT

HARMONICS

Harmonics in electrical systems are sinusoidal currents or voltages with frequencies that are integer multiples of the fundamental frequency of the distribution system. By superimposing themselves on the fundamental current and voltage, they cause waveform distortion.

The issues caused by harmonics are numerous and include equipment malfunctions, increased circuit currents, higher energy losses, and acoustic frequency interference, among others.

PASSIVE FILTERS FOR HARMONICS**SERIE PHF - LIF****MOTOR POWER SUPPLY WITH VFD - VSD**

Frequency converters, commonly used to regulate the speed of asynchronous motors, supply the motor with a non-sinusoidal waveform characterized by voltage peaks.

These power supply conditions place both electrical and mechanical stress on the motor, while also worsening EMC emissions and increasing acoustic discomfort.

OUTPUT FILTER**SERIE VTF - SWF****VARIABLE HARMONICS**

Some nonlinear loads generate harmonic content distributed across a broad and variable spectrum in both order and intensity.

Their presence leads to a variety of both instantaneous and long-term effects on electrical equipment and installations.

ACTIVE FILTERS**SERIE AHF****VOLTAGE INTERRUPTIONS**

Although this phenomenon is less frequent, it is the most well-known because it is perceived by everyone. It can occur in production plants or distribution lines, or be scheduled for technical interventions.

Additionally, there are very short power losses, known as 'micro-interruptions,' caused by short circuits or network switching, which can damage electronic equipment and lead to production downtime.

UNINTERRUPTIBLE POWER SYSTEMS**MINIPOWER STEROPOWER****VOLTAGE DIP**

A voltage dip is defined as a temporary, unpredictable, and random reduction of the supply voltage to a value between 90% and 5% of the nominal voltage.

The causes of voltage dips vary and can include faults in the power grid, malfunctions in electrical installations, and transient overloads such as the inrush current of large motors or the connection of high-power loads. A voltage dip propagates from higher voltage levels to lower ones, meaning that, in many cases, the load experiencing the issue is connected to a voltage level lower than where the dip originated.

VOLTAGE DIP COMPENSATOR**STEROCOMP**

VOLTAGE STABILISERS

MINISTAB - STEROSTAB



POWER QUALITY THROUGH STABILISED VOLTAGE

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.

IREM PROPOSAL



Ministab and Sterostab are registered names of two series of voltage stabilisers that offer a reliable and tested economic solution to inconveniences caused by voltage fluctuations. The use of voltage stabilisers 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 stabilisers.



VOLTAGE FLUCTUATIONS IN ELECTRICAL POWER SUPPLY

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.

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 stabilisation 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 stabilisers can be supplied in enclosures with protection degree IP00, IP21, IP54 INDOOR, IP54 OUTDOOR



COOLING BY NATURAL AIR CONVECTION, FAN-FREE SYSTEM

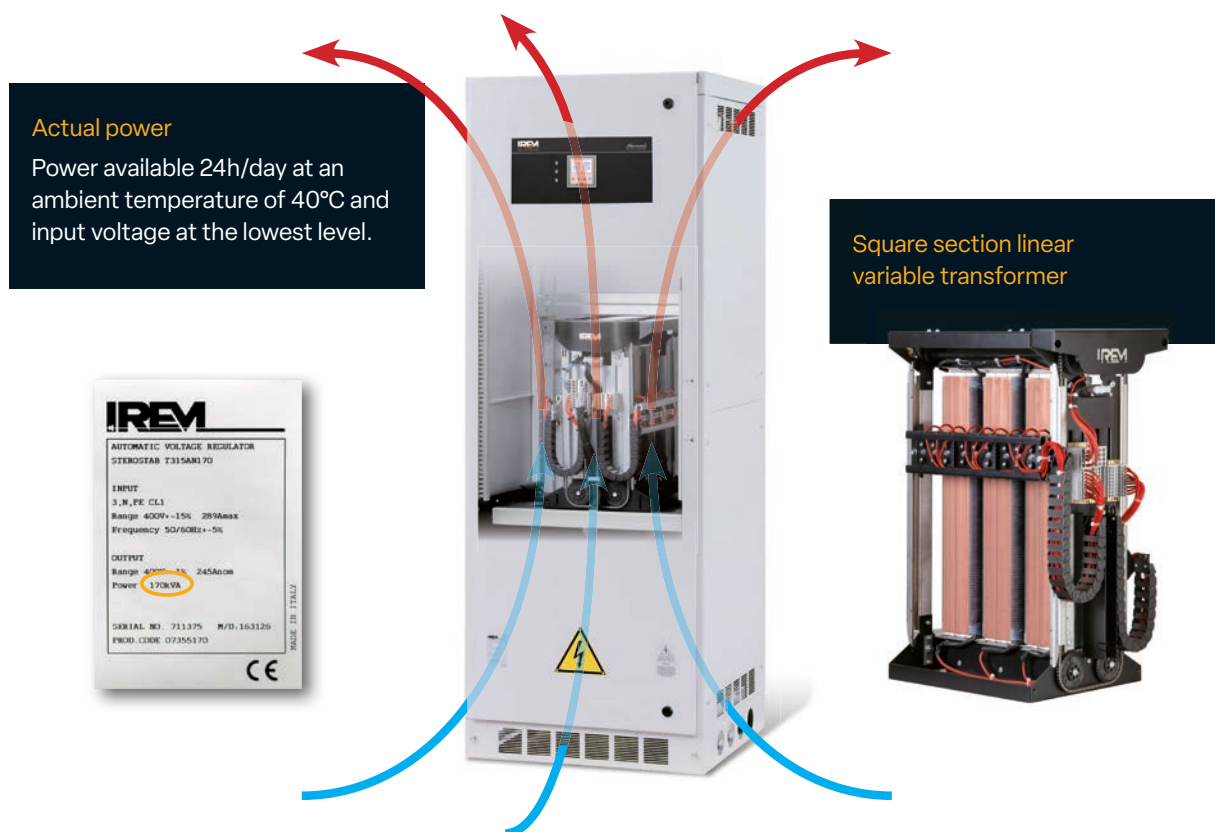
This is the distinctive characteristic of all IREM voltage stabilisers with protection degree IP21; it dramatically increases the reliability as the cooling of the magnetic components and the electronic control boards is ensured by natural convection without fans (fanfree system). Fans and the relevant 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.

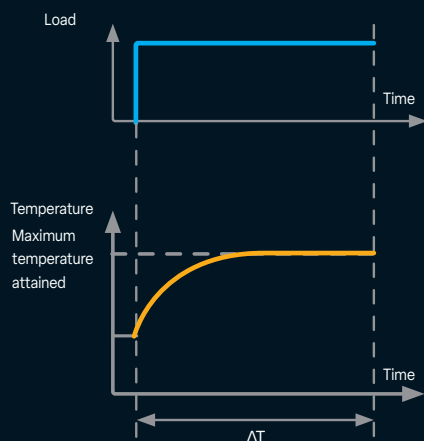
The pictures clearly show that NO fan is used in IREM voltage variable transformers to cool down the contact point between brushes and turns.

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.



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 stabiliser must be contextualized with reference to the service class, to the input voltage fluctuations and to the ambient temperature.

THE SERVICE CLASS.

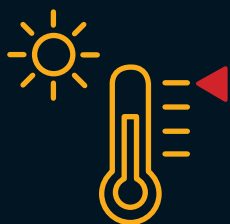
All IREM voltage stabilisers are designed and manufactured to operate in continuous service, intended as the most demanding service at nominal power for unlimited time. In other words: IREM voltage stabilisers are sized to work continuously with 100% duty-cycle and the materials used bear the maximum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



INPUT VOLTAGE FLUCTUATIONS.

A voltage stabiliser 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 stabilisers are characterized by the ability to stabilise 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 stabilisers 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 stabilisers are electromechanical devices with electronic control designed to ensure stabilised 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 stabilisers are electromechanical devices with electronic control designed to ensure stabilised 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 stabiliser is equipped with a control circuit that constantly monitors the line voltage at true voltage (RMS) and compares it with the preset voltage value to be kept constant.

The architecture of IREM voltage stabiliser allows to achieve high values of regulation speed and stabilisation 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 minimisation of operating costs in relation to the benefits obtained.

MINISTAB - STEROSTAB OVERVIEW

M SINGLE-PHASE

T - Y THREE-PHASE

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

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

General features	Single-phase		Three-phase			
	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	vers.IP21	vers.IP21	vers.IP21	vers.IP21	vers.IP21	vers.IP21
Forced ventilation with fans	vers.IP54	vers.IP54	vers.IP54	vers.IP54	vers.IP54	vers.IP54
Forced ventilation with air conditioner	vers.IP54	vers.IP54	vers.IP54	vers.IP54	vers.IP54	vers.IP54
Electronic control	•	•	•	•	•	•
Output accuracy: ±1% RMS	•	•	•	•	•	•
Harmonic distortion	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%
Admitted load variation up to 100%	•	•	•	•	•	•
Admitted overload: 200% x 1 mn	•	•	•	•	•	•
Ambient temperature: -10°C +40°C	•	•	•	•	•	•
Storage temperature: -20°C +60°C	•	•	•	•	•	•
Relative humidity: 95% non-condensing	•	•	•	•	•	•
Standard / Optional fittings						
Pilot lamps	•	•	•	•	•	•
Tropicalised control boards	•	•	•	•	•	•
Digital voltmeter	•	•	•	•	•	•
Digital network analyser	•	•	•	•	•	•
Input/output selector	•	•	•	•	•	•
Wheels	•	•	•	•	•	•
Alarm LEDES	•	•	•	•	•	•
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:

- Class I lightning arresters (IEC 62305) wave form 10/350 μ s 150kA total, 8/20 μ s 150kA total, $U_p < 1.3$ kV, reaction time < 100 ns.
- Combined class I+II surge arresters (IEC 62305), wave form 10/350 μ s 25kA total, 8/20 μ s 120kA total, $U_p < 1.1$ kV, reaction time < 100 ns.
- Class II surge arresters (IEC 60364-4-44), wave form 8/20 μ s 120kA total, $U_p < 1.3$ kV, reaction time < 25 ns.
- Class III surge protection device (IEC 60364-4-44) wave form 8/20 μ s and 1,2/50 μ s 60kA total, $U_p < 1.2$ kV, reaction time < 50 ns.

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 stabilised 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 stabiliser 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 bypass is performed by:



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

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 stabiliser, the supervision module automatically transfers the load to the reserve stabiliser.
- 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 stabilisers 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 singlephase section that will be connected to the system.

The connection to the system of this type of voltage stabiliser does not require further interconnections between the units and is therefore very similar to the connection of a voltage stabiliser 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 stabiliser 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 stabiliser.

The web display of the electrical parameters of the voltage stabiliser 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

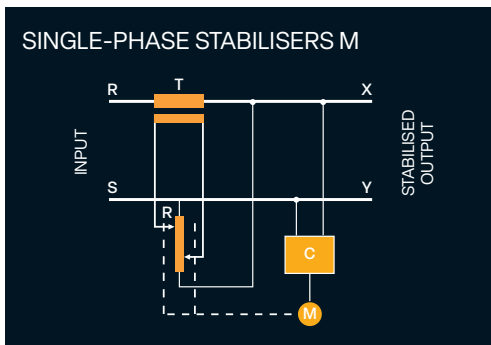


MINISTAB

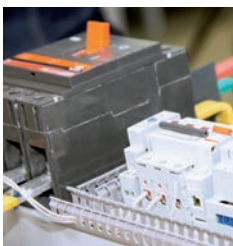
STEROSTAB

GENERAL CHARACTERISTICS

Mains	Single-phase
Nominal input voltage	220V or 230V or 240V (Different voltage values available on request)
Nominal output voltage	220V or 230V or 240V (Different voltage values available on request)
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	RAL 9005 (black) or RAL 7035 (grey)
Protection degree	IP21
Installation	indoor
Standard fittings	digital voltmeter, pilot lamps, tropicalised control boards



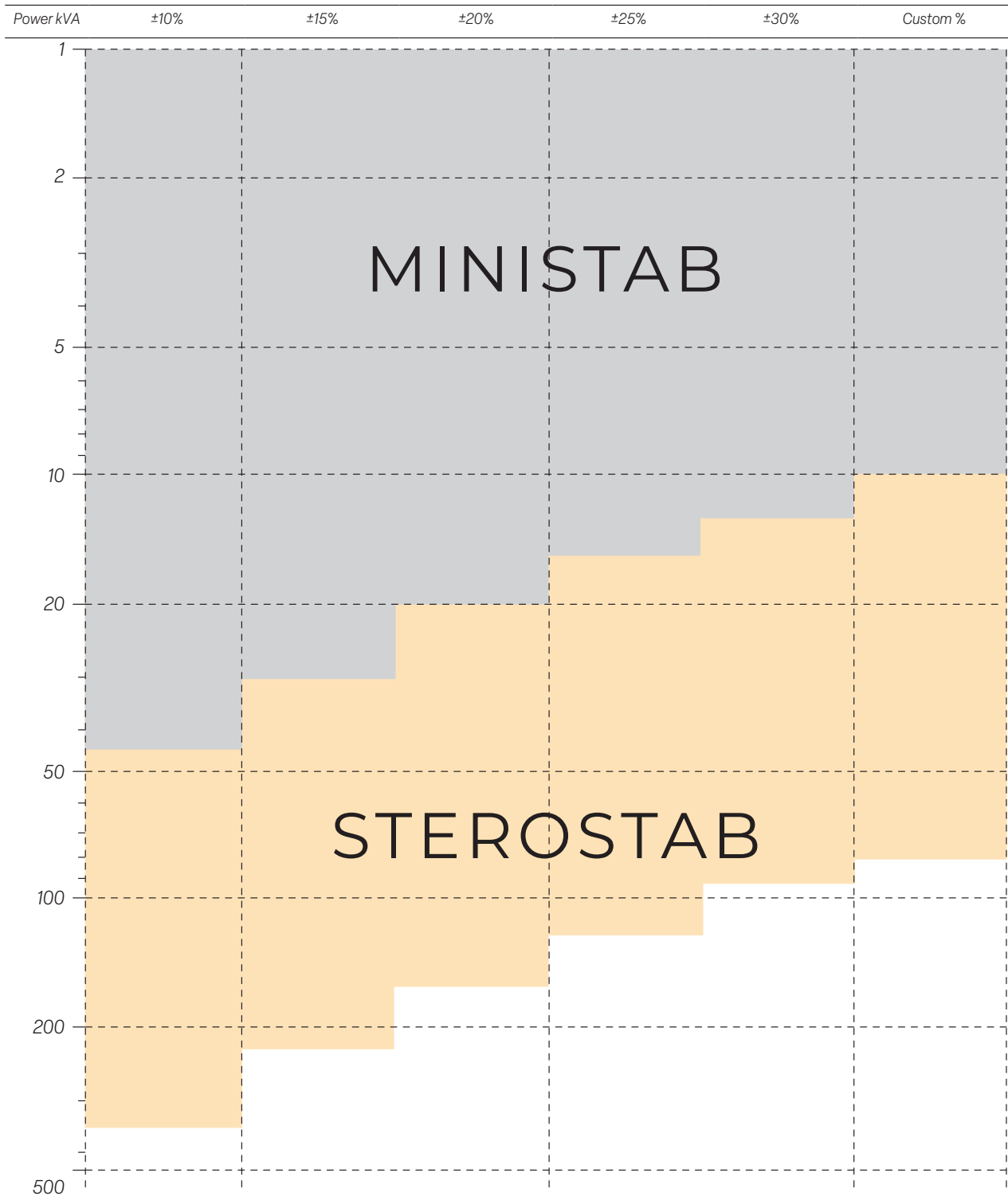
T = series transformer (booster)
R = variable autotransformer
C = electronic control circuit
M = servomotor



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



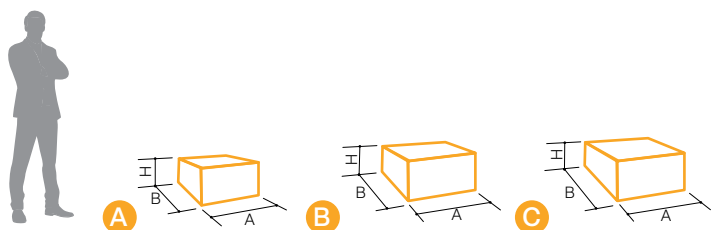
VOLTAGE STABILISERS **MINISTAB M** SINGLE-PHASE 230V 50/60 HZ, PROTECTION DEGREE IP21

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						
M204E3.5	3.5	±10	25	±1	L	21	350x400x290	20	A
	2.5	±30	20						
M206E	3	±25	13	±1	CG, L	21	350x400x290	30	A
	4	±20	16						
	5	±15	19						
M206E7	7	±10	30	±1	L	21	350x400x290	30	A
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	±1	L	21	350x400x290	37	A
	6	±30	24						
M210E	8	±25	15	±1	CG, L	21	450x560x400	65	B
	10	±20	16						
	15	±15	21						
	24	±10	35						
M210E24	24	±10	35	±1	L	21	450x560x400	65	B
	9	±30	16						
	12	±25	19						
M211E	15	±20	22	±1	CG, L	21	450x560x400	70	B
	22	±15	22						
	35	±10	36						
M211E35	35	±10	36	±1	L	21	450x560x400	70	B
	12	±30	20						
	15	±25	23						
	20	±20	24						
M212E	20	±20	24	±1	CG, L	21	450x680x400	110	C
	30	±15	27						
	45	±10	40						

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**

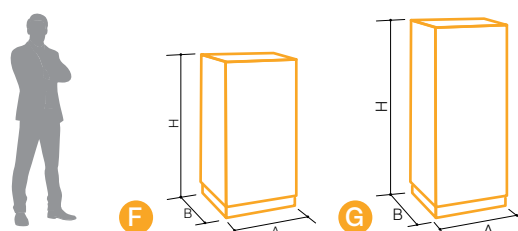
SINGLE-PHASE 230V 50/60 HZ, PROTECTION DEGREE IP21

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	±1	V, L	650x650x1300	235	F	
M214AN24	24	±30	18						
M214AN30	30	±25	19						
M214AN40	40	±20	32						
M214AN55	55	±15	24	±1	V, L	650x650x1800	280	G	
M214AN90	90	±10	54						
M216AN30	30	±30	18						
M216AN40	40	±25	19						
M216AN55	55	±20	21	±1	V, L	650x650x1800	280	G	
M216AN75	75	±15	27						
M216AN120	120	±10	39						
M217AN45	45	±30	22						
M217AN60	60	±25	24	±1	V, L	650x650x1800	340	G	
M217AN80	80	±20	26						
M217AN110	110	±15	29						
M217AN180	180	±10	31						
M218AN60	60	±30	20	±1	V, L	650x650x1900	455	G	
M218AN80	80	±25	21						
M218AN100	100	±20	23						
M218AN150	150	±15	26						
M218AN240	240	±10	31	±1	V, L	650x650x1900	670	G	
M219AN90	90	±30	23						
M219AN120	120	±25	26						
M219AN160	160	±20	28						
M219AN230	230	±15	30	±1	V, L	650x650x1900	670	G	
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

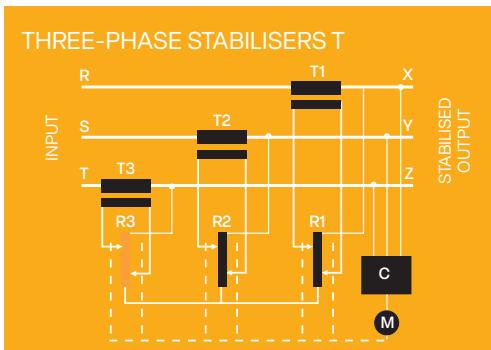


MINISTAB

STEROSTAB

GENERAL CHARACTERISTICS

Mains	Three-phase
Nominal input voltage	380V or 400V or 415V (Different voltage values available on request)
Nominal output voltage	380V or 400V or 415V (Different voltage values available on request)
Output accuracy	±1% RMS
Frequency	50/60 Hz ±5%
Admitted load variation	0 to 100%
Admitted load unbalance	up to 50%
Admitted overload	10 times the nominal power during 10 ms, 5 times during 6 s, 2 times for 1 minute
Harmonic distortion	<0,1%
Efficiency	>98,5%
Cooling	natural air convection (fan-free system)
Colour	RAL 9005 (black) or RAL 7035 (grey)
Protection degree	IP21
Installation	indoor
Standard fittings	digital voltmeter, pilot lamps, tropicalised control boards



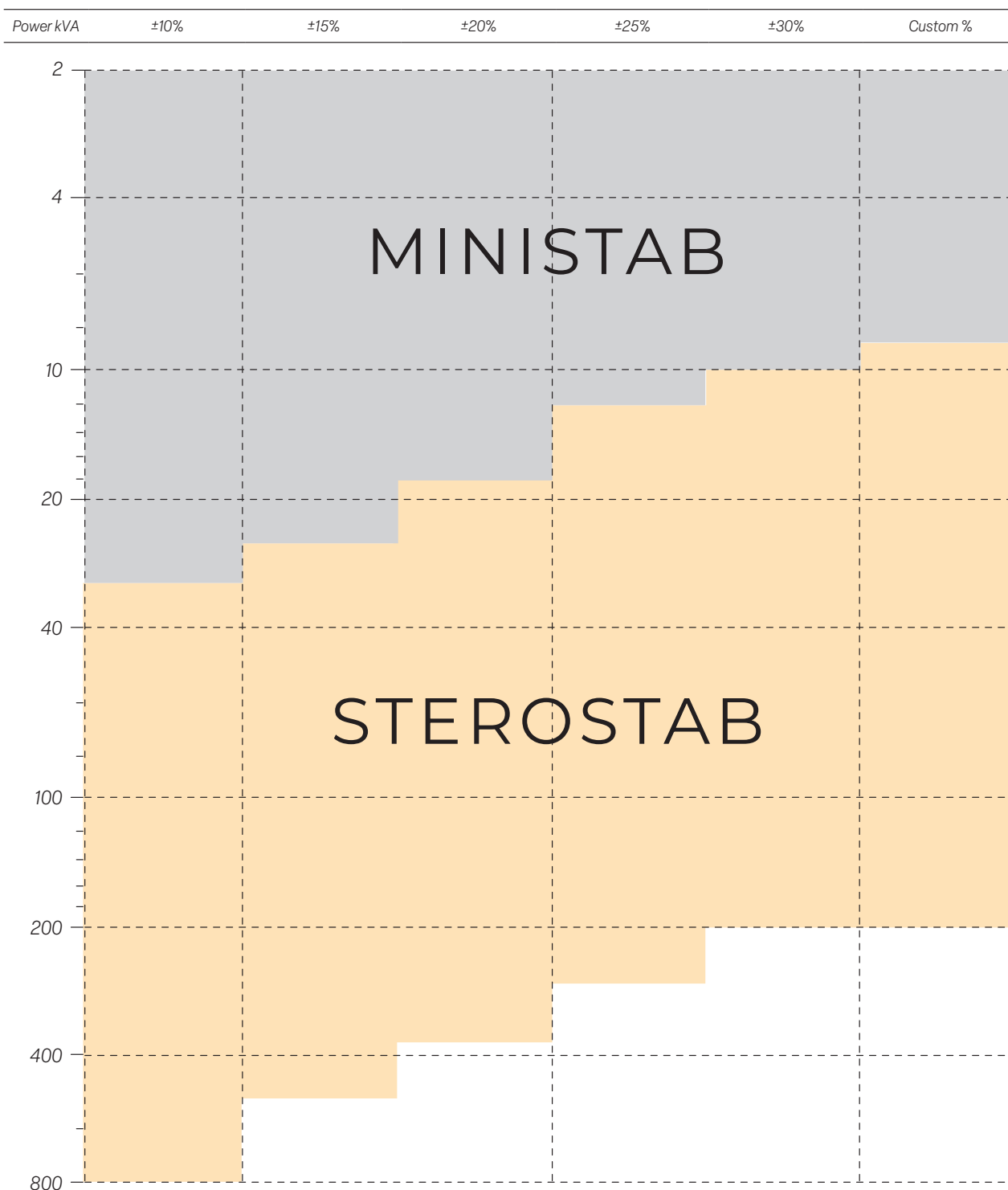
T = series transformer (booster)
R = variable autotransformer
C = electronic control circuit
M = servomotor



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					

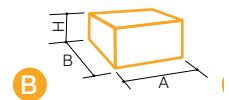
Fittings GC: range selector terminal block

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

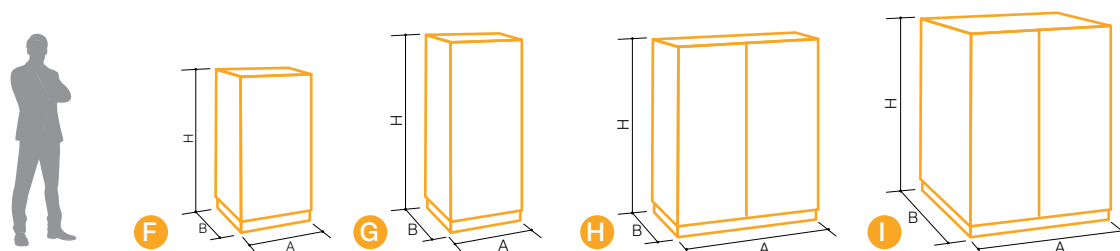
Model	Rated power [KVA]	Voltage variations [±%]	Response time [ms/V]	Output accuracy [±%]	Fittings	Protection degree IP	Dimensions [mm] a x b x h	Net weight [kg]	Cabinet
T310AN22	22	±30	10						
T310AN30	30	±25	11						
T310AN40	40	±20	13	±1	V, L	21	650x650x1300	250	F
T310AN55	55	±15	14						
T310AN90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

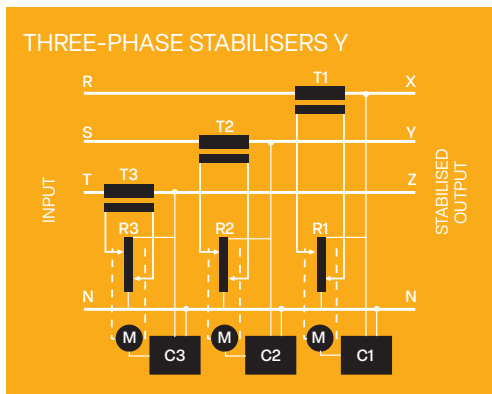


MINISTAB

STEROSTAB

GENERAL CHARACTERISTICS

Mains	Three-phase
Nominal input voltage	380V or 400V or 415V (Different voltage values available on request)
Nominal output voltage	380V or 400V or 415V (Different voltage values available on request)
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	RAL 9005 (black) or RAL 7035 (grey)
Protection degree	IP21
Installation	indoor
Standard fittings	digital voltmeter, pilot lamps, tropicalised control boards



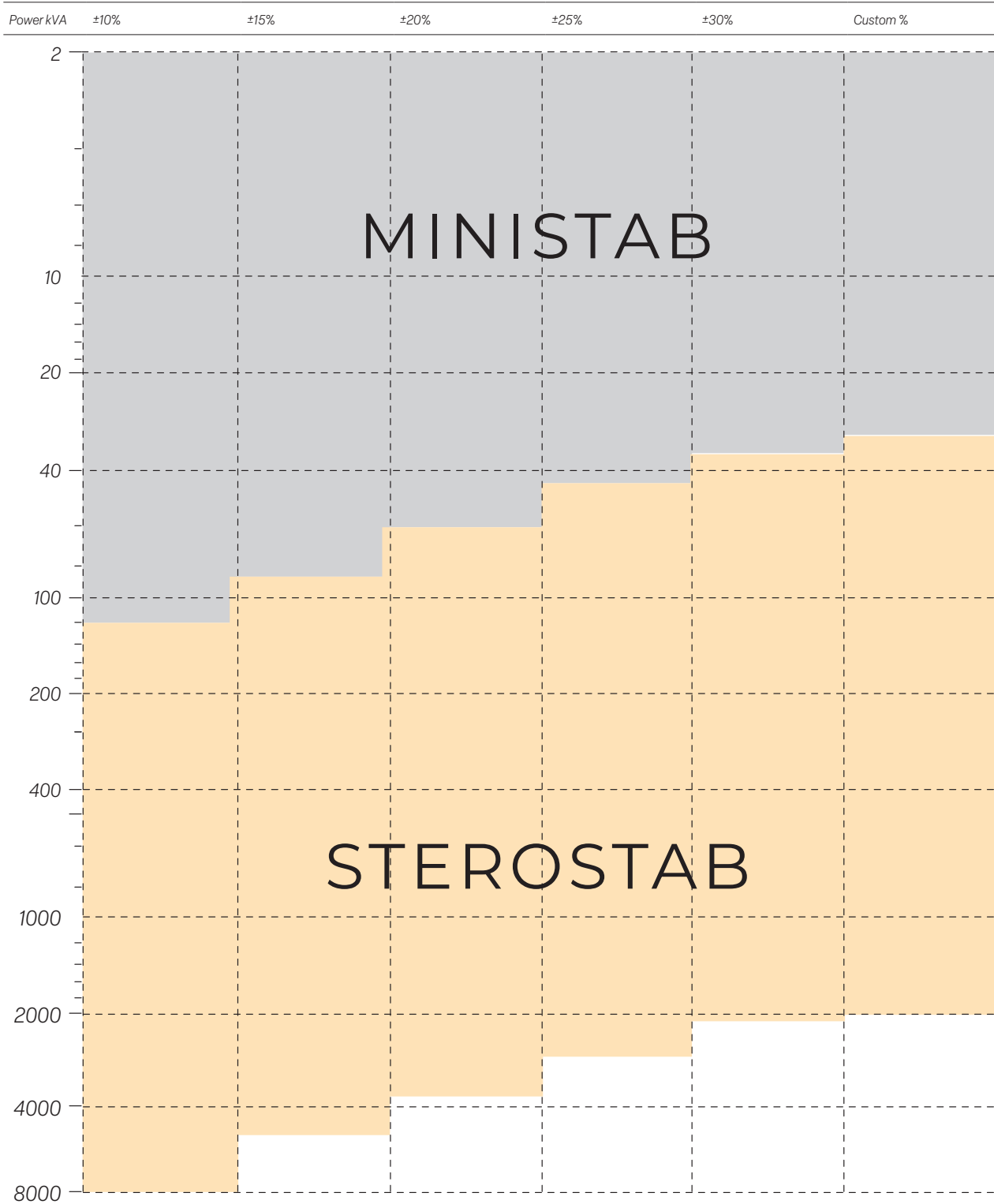
T = series transformer (booster)
R = variable autotransformer
C = electronic control circuit
M = servomotor



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



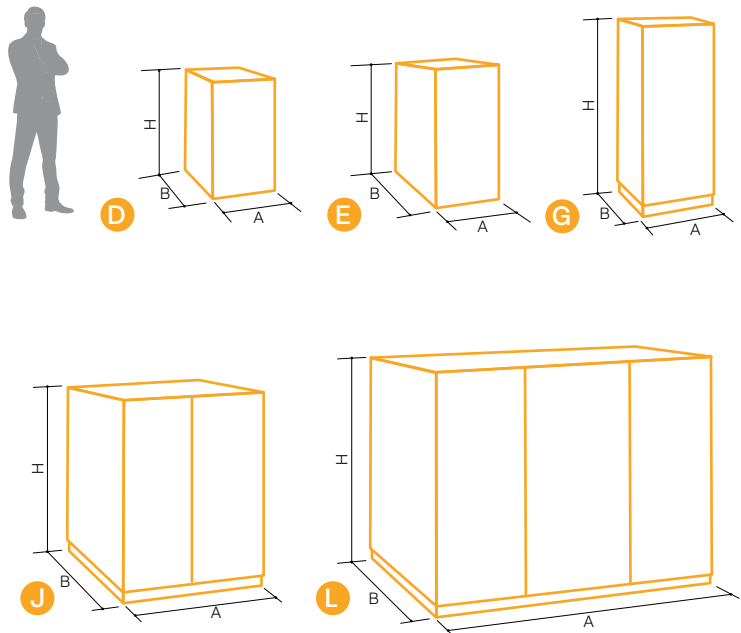
VOLTAGE STABILISERS MINISTAB Y
INDEPENDENT REGULATION OF EACH PHASE
THREE-PHASE 400V 50/60 HZ PROTECTION DEGREE IP21

Model	Rated power [KVA]	Voltage variations [±%]	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						
Y304ES10	8	±15	13		V, L, R				
Y306ES	10	±10	16	±1	V, GC, L, R	21	350x580x890	110	D
	7	±30	11						
	8.5	±25	12						
Y306ES24	12	±20	9		V, L, R				
Y308ES	15	±15	13	±1	V, GC, L, R	21	350x580x890	120	D
	10	±30	8						
	12	±25	9						
Y308ES30	18	±20	10		V, L, R				
Y310ES	25	±15	13	±1	V, GC, L, R	21	450x800x1200	210	E
	30	±10	19						
	24	±25	10						
Y310ES70	30	±20	10		V, L, R				
Y311ES	45	±15	12	±1	V, GC, L, R	21	450x800x1200	245	E
	27	±30	8						
	35	±25	14						
Y311ES100	45	±20	11		V, L, R				
Y312ES	65	±15	16	±1	V, GC, L, R	21	450x800x1200	330	E
	45	±30	14						
	60	±25	15						
Y312ES120	85	±15	19		V, L, R				
	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

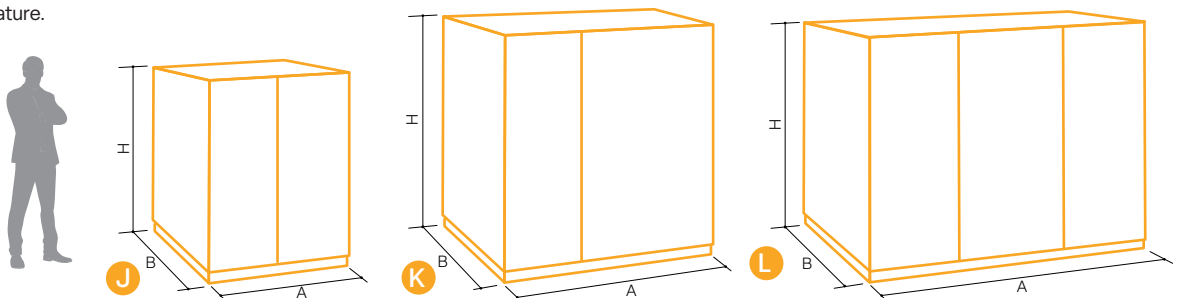
Model	Rated power [KVA]	Voltage variations [%]	Response time [ms/V]	Output accuracy [%]	Fittings	Protection degree IP	Dimensions [mm] a x b x h	Net weight [kg]	Cabinet
Y313AN45	45	±30	6	±1	V, L	21	650x650x1800	480	G
Y313AN60	60	±25	13						
Y313AN80	80	±20	15						
Y313AN110	110	±15	17						
Y313AN180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

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
Y328AN1100	1100	±30	16	±1	V, L	21	3 cabinets 1100x1300x1900	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 singlephase 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.

EASIER HANDLING

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



REDUCED MAINTENANCE COSTS

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