

# ENERGY SAVING



# ENERGY SAVING THROUGH ENERGY EFFICIENCY

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

Energy Saving can be achieved both by reducing energy processes so that less work is done, and by optimising 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 behaviour 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, optimisation 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 SAVING

ENERGY EFFICIENCY  
FOR THE ENVIRONMENT:

< CO<sub>2</sub>

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 OPTIMISATION

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 optimisation 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 optimisation 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 “optimisation” devices have fixed voltage regulation, others regulate the voltage automatically electronically. Voltage optimisation systems are usually installed in series with a building’s electrical network, allowing all installed electrical equipment to benefit from an optimised 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 optimisation system ensures that a user receives and pays only for the voltage actually needed and no more, they optimise power quality and generate energy savings.

# ECOSTAB - ECOBUCK VOLTAGE OPTIMISERS



## ENERGY EFFICIENCY IN ELECTRICAL SYSTEMS

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 optimisers are used in various sectors:

- ✓ Industries
- ✓ Services
- ✓ Hotels
- ✓ Catering and Restaurants

## SMART DEVICES FOR ENERGY SAVINGS

IREM Ecostab - Ecobuck Voltage Optimiser is a product dedicated to Power Quality and Energy Saving.

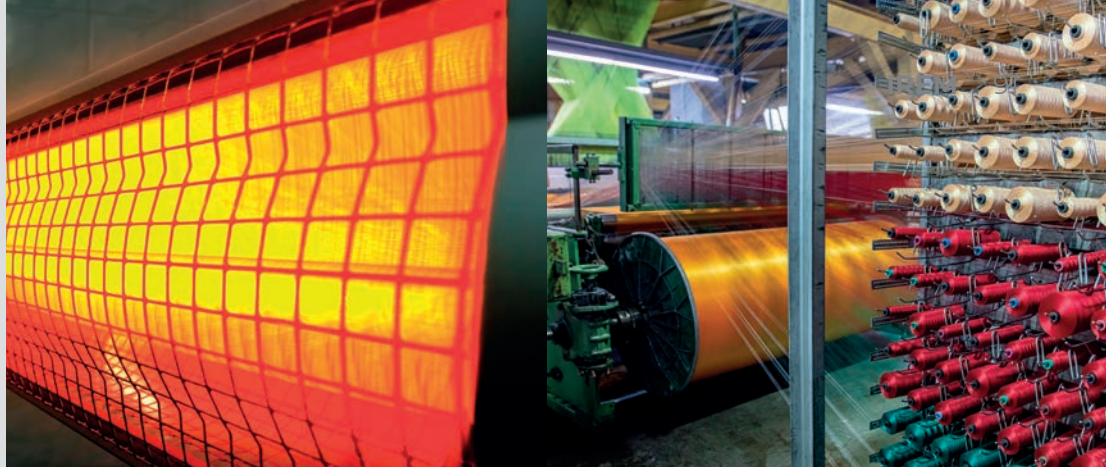
Voltage optimisation is an energy-saving technology that, by operating through systematic and controlled reduction of the grid voltage, reduces the absorption of active and reactive power from the network.

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 Economiser which, by exploiting the principle of voltage optimisation, increases the level of power quality and produces energy savings measured and quantified according to the international reference standard.

## IREM PROPOSAL





## LEADING PRODUCT FOR “TRANSIZIONE 5.0” PLAN

In the context of the Italian market, the “Transizione” 5.0 Plan, established by Article 38 of Decree-Law 19/2024, converted into Law 56/2024, is what many define as the fifth industrial revolution.

As a natural evolution of the incentive plan introduced by “Industria 4.0”, its objective is to support the transition of the production system towards an energy-efficient, sustainable, and renewable energy-based production model.

The incentive, granted in the form of a tax credit, is recognized provided that an energy consumption reduction of at least 3% is achieved for the production facility or, alternatively, at least 5% for the specific process affected by the investment.

It necessarily involves the purchase of an energy efficiency product classified as a 'LEADING' product.

As part of innovation projects aimed at reducing energy consumption, the IREM Ecostab and Ecobuck energy economisers fall under Annex A – Group 2 (Systems for Quality Assurance and Sustainability) – Point 8.

Therefore, they qualify as a 'LEADING' energy efficiency intervention.

Interconnected with the company's production management system or supply network and meeting the additional requirements specified in the aforementioned annex, the IREM Ecostab and Ecobuck energy economisers enable access to the final benefits of the “Transizione5.0” Plan.

These energy-saving devices systematically and controllably reduce and stabilise the grid voltage, leading to lower energy consumption while improving Power Quality by reducing both active and reactive power absorption of the system.

Sites equipped with an IREM Ecostab - Ecobuck voltage optimisation 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 optimiser 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 economiser output. These multimeters are characterized by:

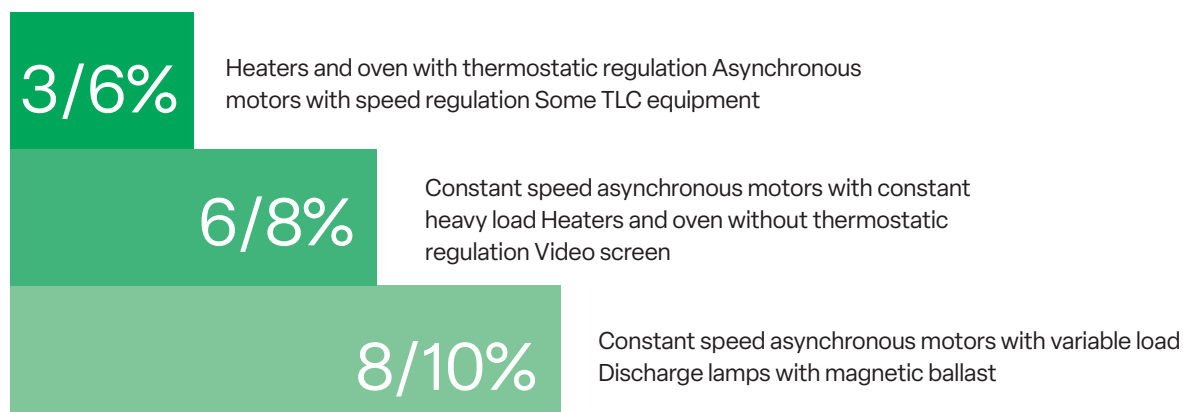
- ✓ 128x80 pixel LCD graphic display, backlit;
- ✓ 4 keys for display and programming;
- ✓ Simple and fast navigation;
- ✓ Texts for measurements, programming and messages in 5 languages;
- ✓ True RMS Measurements (TRMS);
- ✓ Continuous data acquisition;
- ✓ High accuracy.

# 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.

 ENERGY SAVING	 POWER QUALITY	 ENERGY SAVING	 POWER QUALITY
<p><b>1 Lighting equipment (large indoor areas, covered parking lots, supermarkets, classrooms, hallways)</b> Low-intensity discharge lamps, fluorescent tubes with standard or high-efficiency ferromagnetic ballasts.</p>		<p><b>1 Permanent magnet motors and DC motors</b> Permanent magnet (PM) motors use magnets to generate rotational force instead of electromagnets. An example of this type of motor is EC motors (Electronically Commutated). These motors are generally not voltage-sensitive, as any variation will be regulated by electronic controls.</p>	
<p><b>2 Lighting equipment (large outdoor areas, industrial buildings)</b> High-intensity discharge lamps, metal halide lamps, high-pressure sodium lamps.</p>		<p><b>2 UPS and backup systems</b> UPS (Uninterruptible Power Supply) units are designed to provide a constant output. UPS systems use a rechargeable battery to act as a buffer against voltage variations. Therefore, equipment connected to a UPS can be classified as non-sensitive to voltage.</p>	
<p><b>3 Small AC motors</b> Small single-phase induction motors with partial, intermittent, or continuous mechanical load at reduced torque.</p>		<p><b>3 IT and office equipment</b> Most IT electronic equipment operates at a fixed voltage level, independent of the power supply. Battery-powered devices typically include a transformer to convert the mains voltage (e.g., 230V AC) to a lower voltage (e.g., 15V DC). For this reason, IT equipment is generally considered non-sensitive to voltage.</p>	
<p><b>4 Medium and large AC motors</b> Three-phase induction motors (medium and large at network voltage). Similar to small motors, although they are less sensitive to voltage reduction.</p>		<p><b>4 LED lighting equipment</b> LEDs (Light Emitting Diodes) allow electricity to pass through a semiconductor, which produces photons (a basic unit of light). LEDs are electronically controlled and, therefore, are not sensitive to normal voltage variations.</p>	
<p><b>5 Industrial process heating machines</b> Continuous infrared tunnel industrial installations (industry, painting processes, bituminous band application processes).</p>			
<p><b>6 Industrial process heating machines</b> Tunnel industrial ovens (food industry, glass industry).</p>			
<p><b>7 Household appliances and similar devices</b> Appliances, especially those that include a resistance not controlled by an operating thermostat, a motor, or a combination of both. Hot air hand dryers, hair dryers, etc.</p>			
<p><b>8 Refrigeration systems</b> An uncontrolled refrigeration system (i.e., start-stop operation) may be voltage-sensitive depending on the type, size, and operating conditions of the system.</p>			
<p><b>9 HVAC</b> Centralized air conditioning systems with suction and recirculation modulation through damper actuators depend on network voltage.</p>			

## SAVING AND RETURN ON INVESTMENT



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

- 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;
- Type of powered device. Some devices allow higher saving than others and some electric devices do not provide any significant saving at all;
- 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;

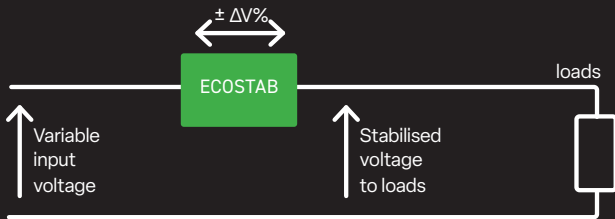
- Overall consumption of devices powered by the voltage optimiser. The higher the power of the Ecostab - Ecobuck voltage optimiser, the shorter its payback period.

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.

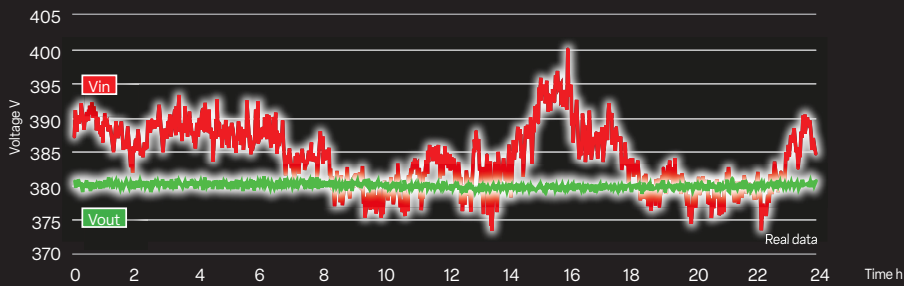
Thanks to the energy saved and the optimised power quality, the cost of the voltage optimiser will be usually paid off in a period ranging from 1 to 5 years.

# ECOSTAB HIGHLIGHTS



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

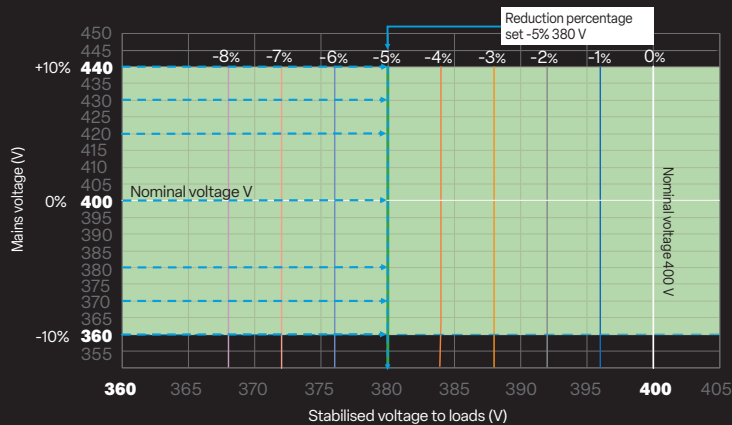
Ecotab supplies the load with a stable voltage having a value less than or equal to the nominal mains voltage. The voltage with which the load is powered can be set through a potentiometer between the nominal value and -8%.



Ecotab 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 ( $\pm 0\%$ ).

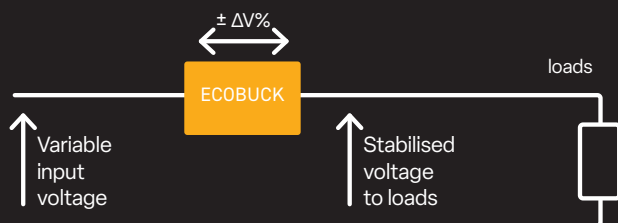
In the entire range of variation of the mains voltage allowed by the standard ( $\pm 10\%$  of the nominal value of 400V) the load is always powered by the Ecotab at the desired voltage, kept stable at  $\pm 1\%$ .



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.

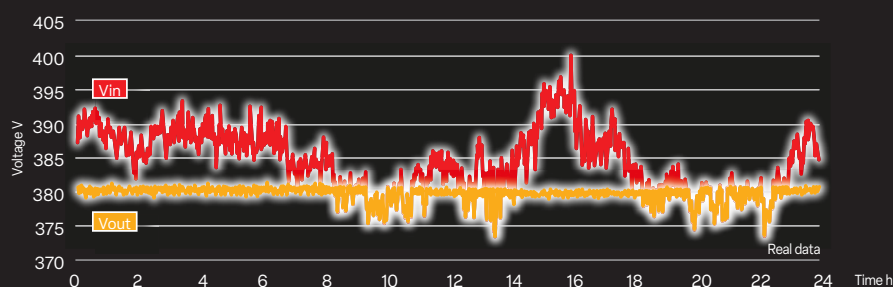
## ECOBUCK HIGHLIGHTS



ECOBUCK is a voltage stabiliser 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.

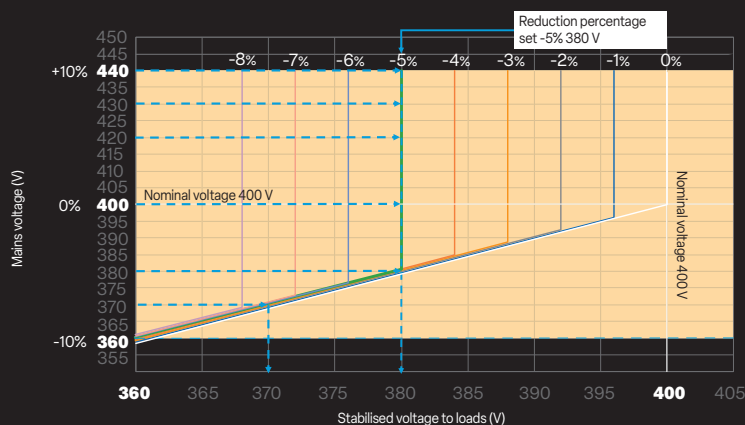
The voltage with which the load is powered can be set through a potentiometer between the nominal value and -8%.



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

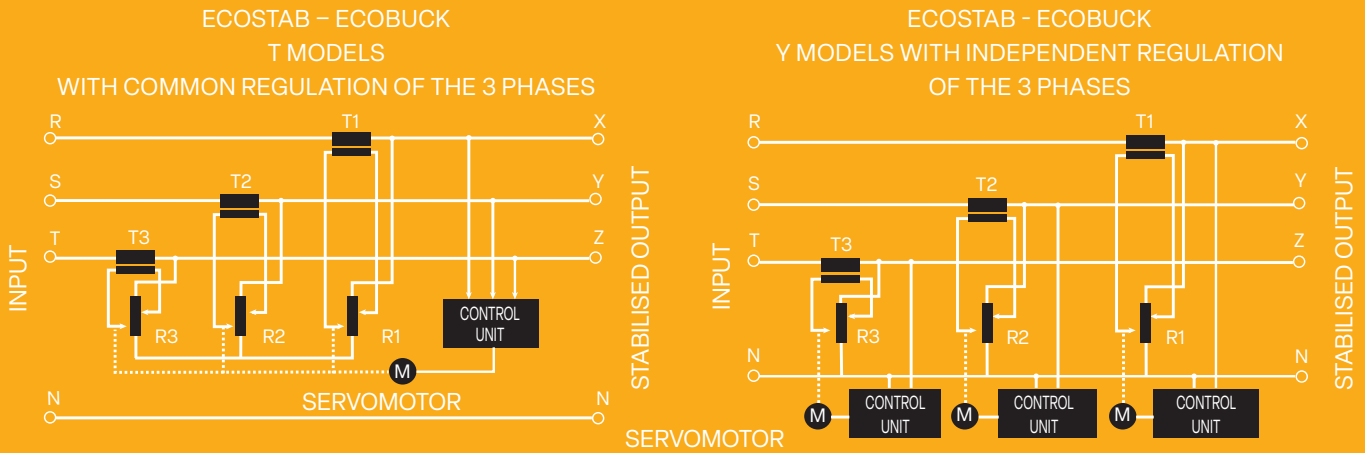
In conditions of voltage lower than the desired value, the Ecobuck does not worsen the supply conditions, simply the load is powered at the voltage it would be powered on if there was no Ecobuck.



The electric user is powered by the Ecobuck with a stabilised 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.

# VOLTAGE OPTIMISERS OPERATING PRINCIPLE



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.

## GENERAL FEATURES

**POWER RANGE.** From 5 to 4000 kVA, in single-phase and three-phase version.

**ACCURACY.**  $\pm 1\%$  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



Figure G

IP21



Figure H



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.

WEB SERVER  
IREMECOSTAB  
remote control system

# ECOSTAB



## ECOSTAB M SINGLE-PHASE 230V 50/60HZ VOLTAGE OPTIMISERS - IP21 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%	450X560X600	45	A
M210EJ12S	12	52			21		450X560X600	65	F
M211EJ20S	20	87			22		450x800x850	80	E
M212EJ25S	25	109			27			120	

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

T308EJ20SR	20	29	±10%	0 to -8%	23	±1%	450X560X600	120	A
T310AJ50SR	50	72			14		650x650x1300	290	F
T312AJ70SR	70	101			16		310		
T314AJ100SR	100	144			17		340		
T315AJ150SR	150	217			24		650x650x1800	450	G
T316AJ200SR	200	289			17		1100x650x1800	610	H
T318AJ300SR	300	433			23		750		
T319AJ400SR	400	577			29		1050	I	
T320AJ500SR	500	722			29		1100x900x1900		1070

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

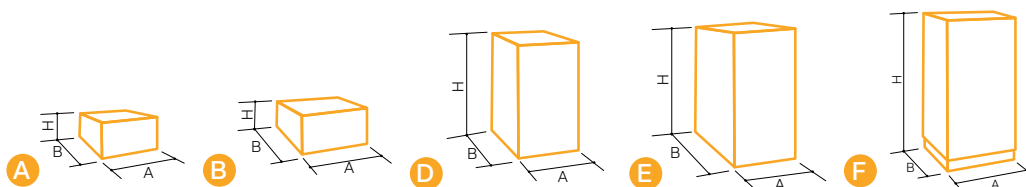
Y308EJ20SR	20	29	±10%	0 to -8%	13	±1%	450X800X1200	150	E
Y310EJ40SR	40	58			12			210	
Y311EJ60SR	60	87			16			240	
Y312EJ80SR	80	115			19			290	
Y313AJ100SR	100	144			17		650x650x1800	800	G
Y314AJ150SR	150	217			27		560	H	
Y316AJ200SR	200	289			19		1100x650x1800		630
Y317AJ300SR	300	433			22		780	I	
Y318AJ400SR	400	577			16		1100x900x1900		1050
Y319AJ600SR	600	866			17		1360	J	
Y320AJ800SR	800	1155			18		1770		
Y320AJ1000SR	1000	1443			18		1840	K	
Y322AJ1250SR	1250	1804			26		2700		
Y323AJ1600SR	1600	2309			18		2130x1350x2240	3100	3 x J
Y324AJ2000SR	2000	2887			17		3610		
Y326AJ2300SR	2300	3320			18		4400		
Y328AJ2500SR	2500	3608	24	5200					
Y330AJ2800SR	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 VERSION

Model "V" Serie "S" - R10	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	
<b>M204EJB8-S10</b>	8	35	R = -10% (40 V)	42	±1%	450x560x600	45	A	
<b>M206EJB15-S10</b>	15	65		42			65		
<b>M208EJB25-S10</b>	25	109		44		80	450x680x430	120	B
<b>M210EJB45-S10</b>	45	196		54					

## ECOBUCK T THREE-PHASE 400V 50/60HZ VOLTAGE OPTIMISERS - IP21 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	
<b>T304EJB25-S10R</b>	25	36	R = -10% (40 V)	46	±1%	450x560x600	80	A	
<b>T306EJB50-S10R</b>	50	72		28			110		
<b>T308EJB75-S10R</b>	75	108		32		185	450x800x850	185	E
<b>T310AJB170-S10R</b>	170	245		34		340	650x650x1300	340	F
<b>T312AJB250-S10R</b>	250	361		48		400	650x650x1300		
<b>T314AJB350-S10R</b>	350	505		34		450	1100x650x1800	450	H
<b>T315AJB530-S10R</b>	530	765		46		790	1100x900x1900	790	I
<b>T316AJB700-S10R</b>	700	1010		58		920	1100x1300x1900	920	
<b>T318AJB1100-S10R</b>	1100	1588		58		1150	1100x1300x1900	1150	J
<b>T319AJB1600-S10R</b>	1600	2309		58		1630	1450x1350x2150	1630	K

## ECOBUCK Y THREE-PHASE 400V + N 50/60HZ VOLTAGE OPTIMISERS - IP21 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	
<b>Y308EJB75-S10R</b>	75	108	R = -10% (40 V)	26	±1%	450x800x1200	180	D	
<b>Y310EJB140-S10R</b>	140	202		24			290		
<b>Y311EJB200-S10R</b>	200	289		32		320	650x650x1800	370	G
<b>Y312EJB250-S10R</b>	250	361		40					
<b>Y313AJB350-S10R</b>	350	505		34		580	1100x900x1900	850	I
<b>Y314AJB550-S10R</b>	550	794		54		790			
<b>Y316AJB700-S10R</b>	700	1010		38		1085	1100x1300x1800	1320	J
<b>Y317AJB1000-S10R</b>	1000	1443		44		1085	2130x1350x2150	2650	K
<b>Y318AJB1400-S10R</b>	1400	2021		32		1320			
<b>Y319AJB2100-S10R</b>	2100	3031		34		2650	2130x1600x2150	2750	
<b>Y320AJB2500-S10R</b>	2500	3031		36		2750	2130x1600x2150	3150	
<b>Y320AJB3200-S10R</b>	3200	4619		36		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.

