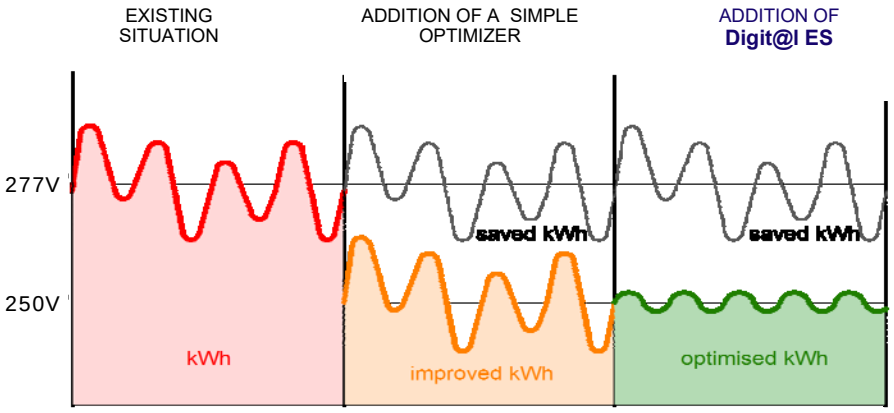
Digit@l ES Energy Saver
Product Ranges 90Amp –6000Amp

Energy Saving from Voltage Reduction

The **Digit@l ES Energy Saver** is a specially designed voltage stabilizer that allows for the voltage received by the distribution system to be adjusted to the voltage for which the load has been designed. **Digit@l ES** optimizes the performance of the supplied equipment, thus obtaining lower consumption, energy saving, cost reduction and longer life expectancy.
While a traditional voltage stabilizer is designed to compensate a variation of the input voltage within a certain range (for example, ±20% of the nominal voltage), **Digit@l ES** is specially developed to reduce the input voltage to a lower level, while still maintaining the stabilizing properties.
Digit@l ES is therefore equally efficient and reliable, but more cost-efficient for this specific purpose.



The standard configuration provides for an output phase voltage adjustable from 250V to 277V accepting an input voltage up to +15% higher than the output voltage.

Digit@l ES is available in three different versions:

BASIC – low to medium rating (90A to 500A) with simple design and control electronics, but cost-efficient and reliable performance.

PLUS – medium rating range (160A to 500A); sophisticated control system, user-friendly control panel with status and alarm signals, local PC connectivity.

ADVANCED– availability of very high rating (up to 6000A); top of the range control system, local display showing setting and working parameters, user-friendly control panel with status and alarm signals, local USB connectivity and possibility of remote control of the unit.

VOLTAGE OPTIMIZATION

- LOAD SUPPLIED AND MAINTAINED AT OPTIMUM VOLTAGE LEVEL
- INDPENDENT MANAGEMENT OF EACH PHASE
- ± 0.5% OUTPUT ACCURACY
- AUTOMATIC & CONTINUOUS OPERATION
- PLUG AND PLAY SOLUTION

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Digit@l ES Energy Saver
BASIC 90—500 Amps

The Digit@l ES BASIC

Can be considered as the entry level energy saving stabilizer.

High performance is combined with design and control features able to satisfy even low budget projects. The main characteristics are listed below:

Selectable output voltage (430V, 460V, 480V)

Microprocessor-based control board for each phase

Independent regulation on each phase

Regulation principle based on the 'rms voltage' and insensitivity to harmonics in the supply

Admitted load range 0 – 100%

Not influenced by the load power-factor

No introduction of harmonic distortion in the output voltage

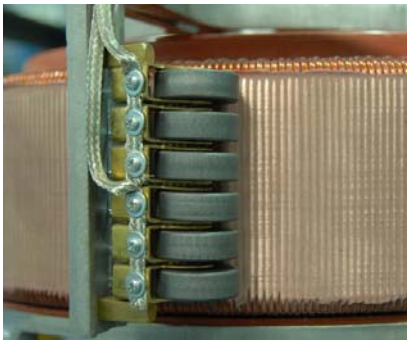
Three-phase and single-phase load admitted

Up to 100% load unbalance admitted

Toroidal voltage regulators

Thermal sensor on the control card;

Output class II SPD protection from transients;



Digit@l ES BASIC

Digit@l ES Energy Saver

PLUS 160 – 500Amps

The Digit@l ES PLUS

The control system is more sophisticated than the BASIC model with Main characteristics:

- PC selectable output voltage (from430-480V)
- Control card fitted with a DSP microprocessor.
- Independent regulation on each phase
- Regulation principle based on the 'rms voltage' and insensitivity to harmonics in the supply.
- Insensitivity to the load power factor.
- Admitted load range 0 – 100%
- Not influenced by the load power-factor
- No introduction of harmonic distortion in the output voltage
- Up to 30% harmonic content admitted on the load current.
- Three-phase and single-phase load admitted

Digit@l ES PLUS with manual bypass

DSP microprocessor-based control board

The control board runs the voltage stabilizer by regulating each phase independently.

The board also monitors the output currents and generates an alarm in case of overcurrent.

Under normal working conditions, the output voltage is maintained stable with accuracy equal to ±0.5% in relation to the rated voltage.

The control of the stabilizer uses software that digitizes all the parameters (full digital control).

The board is fitted with a **DSP** microprocessor (**D**igital **S**ignal **P**rocessor) that reads line voltage, settings, motor currents and inputs and drives directly the motor by imposing direction and speed. On the basis of the motor current, the board also activates the protections against overload and short-circuit for the motor itself.

The following components are connected to the base board:

User interface LED signalling board

Super-capacitor boards for adjusting to minimum voltage position in case of blackout

Protections for Digit@l ES PLUS

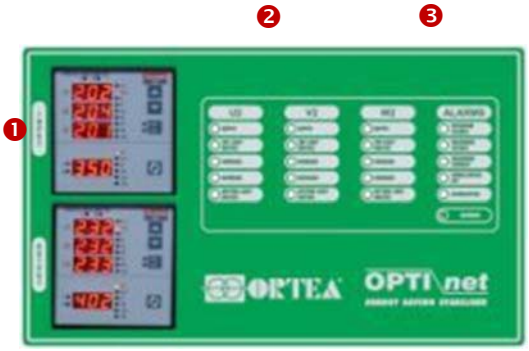
Protection	In case of	Achieved through
Voltage reset to the minimum value	Black-out	Super-capacitor banks mounted on the base board
Motor rotation stop	Motor overloaded	Base board control
Motor rotation stop	Motor short-circuit	Base board control
Overload on the voltage regulator	Excessive current flowing through the regulator	Circuit breaker with thermal and magnetic release.
Roof fans activation	Ambient temperature increase	Adjustable thermostat
Protection of auxiliary circuits	Circuit overload	Fuses
Base board protection	Board overload	Fuses
Overvoltage	Transients & spikes	Output Class II SPDs

External Control Panel

The panel provides the stabilizer status via data and alarms.

❶ Instrumentation

Input and output digital multimeters. Each multimeter is provided with an RS485 output for PC connection. The readings are sequentially displayed by pressing the instrument's push-buttons.



❷ Phase LEDs

Position (from the top)	Colour	Function
1	blinking	Card supplied and functioning
2	red	Increase limit switch
3	yellow	DC motor in increasing mode
4	yellow	DC motor in decreasing mode
5	red	Decrease limit switch

❸ Alarm LEDs

Position (from the top)	Function
1	Output voltage below the set minimum threshold
2	Output voltage above the set maximum threshold
3	Output current above the set maximum threshold
4	Stabilisation OFF
5	Internal overheating

Any abnormal functioning generates an acoustic alarm that can be silenced by pressing the relevant button below the alarm LEDs.

Digit@l ES Energy Saver

ADVANCED 400 – 6000Amps

Digit@l ES ADVANCED

Characteristics

- Output voltage reduced and stabilized to the desired value with ±0.5% accuracy
- High power availability
- High reliability and ruggedness
- Overload capacity up to 2 x In
- Inrush current capacity up to 10 x In
- use with asymmetrical input supply and single-phase loads or un-balanced three-phase loads;
- functionality based on the 'rms voltage' and not on average voltage. This type of control can supply the load with a correctly stabilized voltage even with non-sinusoidal waveform input. Such waveforms are caused by the presence of (for example) part wave rectifiers, transformers with saturated core, non-linear loads, pulses, transients, etc.

Digit@l ES ADVANCED

- regulation performed independently on each single phase (with reference to the neutral, which must be available and connected);
- fully functioning with load charge variable from 0 to 100% and 100% phase unbalance.
- up to 30% harmonic content admitted on the load current.
- insensitivity to the load power factor
- no harmonic distortions generated on the output voltage
- absence of batteries and consequent easy storage and handling
- remote monitoring

Main components and working principle

The main components of the unit are a three-phase 'buck/boost' transformer, a motorised three-phase autotransformer with continuously variable transformer ratio (voltage regulator) and a microprocessor-based control system.
The control system refers the output voltage value to the set nominal value If the voltage is outside the accuracy range (±0.5%), the control drives the voltage regulator gear-motor. By doing so the regulator rollers change their position thus varying the voltage drawn and supplied to the buck/ boost transformer primary winding. When the secondary voltage of the buck/boost transformer is in phase or in opposition to the supply, the voltage drawn from the regulator is added or subtracted to the supply voltage, thus compensating the variations.

Digit@l ES Energy Saver
ADVANCED 400 – 6000Amps

DSP microprocessor-based control board

The control board runs the voltage stabilizer by regulating each phase independently. The board also monitors the output currents and generates an alarm in case of overcurrent. Under normal working conditions, the output voltage is maintained stable with accuracy equal to ±0.5% in relation to the rated voltage. The control of the stabilizer is performed totally through software that digitizes all the parameters (full digital control). The board has two **DSP** microprocessors (**D**IGITAL **S**IGNAL **P**ROCESSOR): the first one works as a controlling CPU and the second as a measuring CPU.

Using both microprocessors, the board reads line voltage, settings, motor currents and inputs then drives each motor directly by imposing direction and speed. On the basis of the motor current, the board also activates the protections against overload and short-circuit for the motor itself.

The base board controls also the activation of the roof fans.

A third microprocessor (Called a bodyguard CPU) supervises the output voltage by detecting and signalling abnormal situations

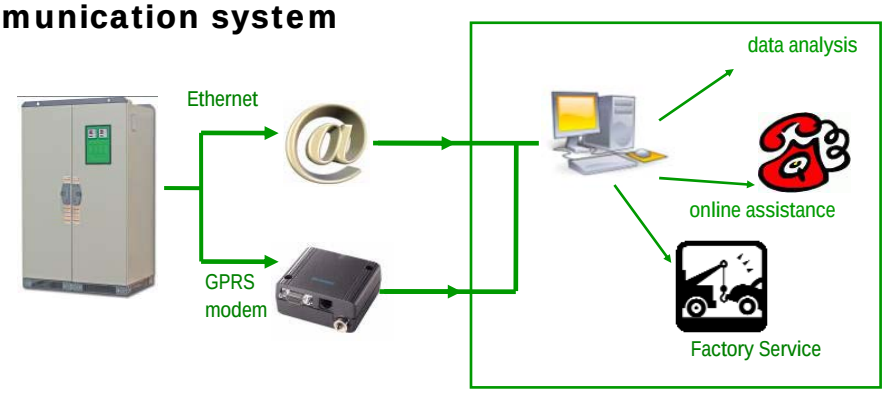
The following components are connected to the base board:

- communication board for establishing the remote communication of working mode data via Ethernet connection or GPRS modem
- User interface LED signalling board
- Super-capacitor boards for adjusting to minimum voltage position in case of blackout.
- Every **Digit@l ES ADVANCED** can be monitored locally via a PC connection or remotely through the remote communication card.
- USB ports allow for easy download of the data stored in the base board memory and update of the relevant software version.

Protection

Protection	In case of	Achieved through
Voltage reset to the minimum value	Black-out	Super-capacitor banks mounted on the base board
Motor rotation stop	Motor overloaded	Base board control
Motor rotation stop	Motor short-circuit	Base board control
Overload on the voltage regulator	Excessive current flowing through the regulator	Base board control. While the protection is active, the red alarm LED 'Stabilization off' on the front panel is on. The base board operates in order to have the output voltage equal to the input voltage.
Sets of roof fans activation	Ambient temperature increase	Thresholds set via PC or local display
Protection of auxiliary circuits	Circuit overload	Fuses
Base board protection	Board overload	Fuses
Protection of the fan relays mounted on the base board	Board overload	Fuses
Overvoltage	Lightning	Input Class I SPDs
Overvoltage	Transients & spikes	Output Class II SPDs

Remote communication system



The communication card manages the remote connection to the voltage stabilizer. The information on the status of the stabilizer can be transferred via Ethernet connection, GPRS modem or locally via a USB drive.
Data can be analyzed from a remote location, which allows for active monitoring the functioning mode and, if necessary, altering the setting of some parameters wherever the unit might be installed.

Downloading and uploading software, data and functioning parameters can be carried out either locally or remotely.

The card is mounted on the rear side of the user interface panel and uses the tools available: local display (showing alarms, setting parameters and connection data); keypad for surfing the menu into which information is organized and USB drives for data exchange and software updating operations

The card consists of two parts:

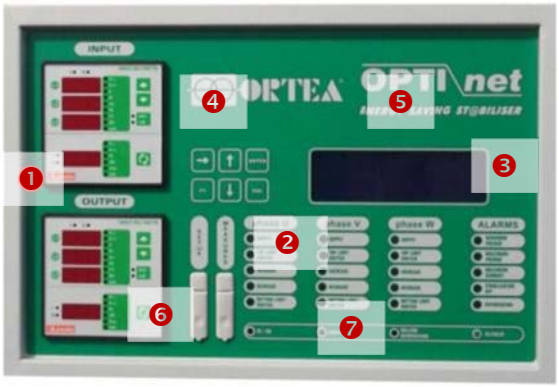
- upper card, which hosts the CPU, the USB line (transferred onto the user interface panel), the Ethernet line and the flash memory for storing data.
- lower card, which supplies the upper card, hosts the RS485 connections to the input/output instruments, interfaces the local display and the GPRS modem, receives the data input from the keypad and hosts a Real Time Clock (RTC).

Digit@l ES Energy Saver
ADVANCED 400 – 6000Amps

External Control Panel

❶ Instrumentation

Input and output digital multimeters for both input and output lines to be monitored. Each multimeter is provided with an RS485 output for PC connection. The readings are sequentially displayed by pressing the instrument's push-buttons.



❷ Phase LEDs

Position (from the top)	Colour	Function
1	blinking green	Card supplied and functioning
2	red	Increase limit switch
3	yellow	DC motor in increasing mode
4	yellow	DC motor in decreasing mode
5	red	Decrease limit switch

❸ Alarm LEDs

Position (from the top)	Function
1	Output voltage below the set minimum threshold
2	Output voltage above the set maximum threshold
3	Output current above the set maximum threshold
4	Stabilization OFF
5	Internal overheating

❹ Keypad

Used to surf through the menus available on the local display.

❺ Display

Shows the stabiliser status indicating alarms, setting parameters and connecting data.

❻ USB ports

Used to update the base board software and down-load the stored data).

❼ Additional LEDs

Position	**Function**
TX/RX	ON when the base board is communicating to a local PC
SERVICE	ON if maintenance is required
ROLLER OVERHEATING	ON if the temperature on the rollers is higher than 90°C

Any abnormal functioning generates an acoustic alarm that can be silenced by pressing the relevant button below the alarm LEDs.

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