THE ISSUE

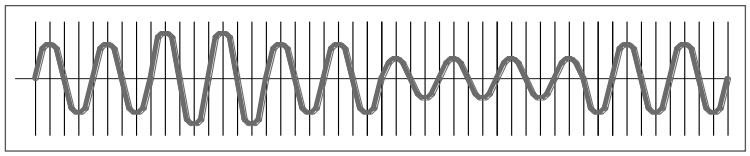
The availability of steady voltage supply is critical for a number of situations involving voltage sensitive equipment. Whether because of the unreliability of the energy distribution or the presence of electronically controlled machinery and systems, high quality voltage supply regardless of the incoming fluctuation is very often the key for ensuring efficiency and reliability to the final user.

Disrupted production, loss of data security failure, machinery faults, inaccurate information and domestic inconvenience are only a few examples of possible problems caused by unstable supply.
Of course, all this means increased costs.

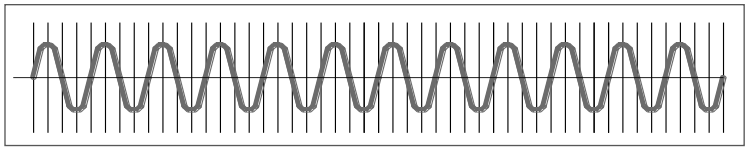
The voltage stabiliser has proved to be an efficient *solution* in order to prevent from potentially dangerous situation due to input voltage instability.

THE ELECTRODYNAMIC DIGIT@L VOLTAGE STABILISER

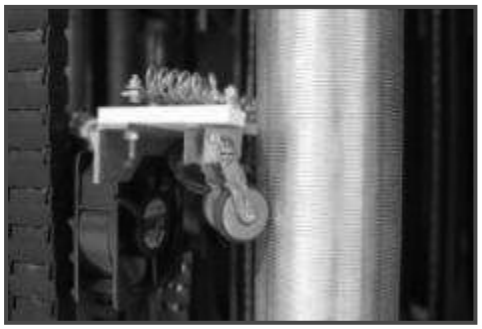
A voltage stabiliser is a device able to respond to changes in the voltage level on the input line caused by sags (due to undersized distribution lines, connection of large loads to the network, ground faults, etc.) and surges (generated by disconnection of large loads, increased voltage at the generating plant, atmospheric events, etc.) The duration of such phenomena depends on their cause and is not easily predictable. Sags are generally more common especially where the distribution is not wide and efficient.



The result of the stabiliser operation is a steady output voltage for the load.

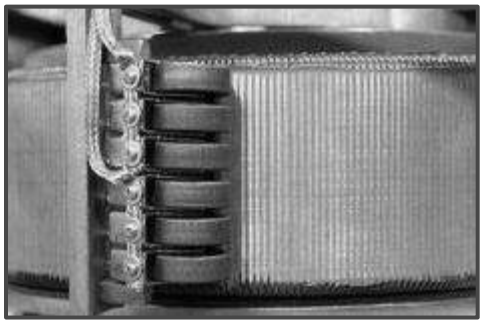


The voltage stabiliser is made essentially of buck-boost transformer, voltage regulator and electronic control. By means of the **digitally controlled** system, the stabiliser is able to compensate for a widely fluctuating incoming voltage stabilising it within a **±0.5%** accuracy range in relation to the rated value.
Based on a **microprocessor** sampling the output voltage at high frequency, the control system operates the voltage regulator motors in order to guarantee the voltage stability.
The voltage regulator is an autotransformer with variable transformer ratio, effectively performing the voltage adjustment. Depending on the rated power of the stabiliser, the regulator can be columnar or toroidal.



columnar voltage regulator

Over 40 years' experience and continuous investment in research and development have led to what is ORTEA stabilisers' main feature: the columnar voltage regulator with electro-graphite rollers. This is one of the main components in a series of digital voltage stabilisers whose power rate goes up to 6000kVA.



toroidal voltage regulator

Thanks to the experience gained with columnar regulators, the same technology has been applied to toroidal regulators. Carbon rollers have replaced common brushes, thus dramatically improving the overall performance.

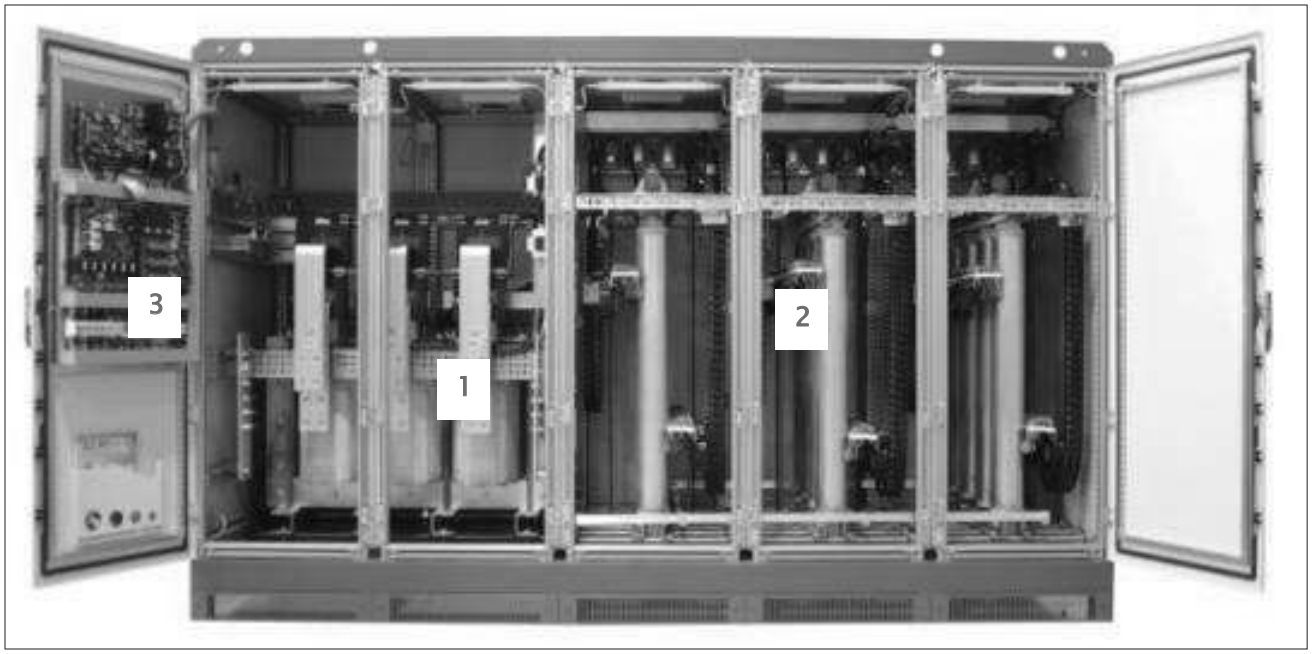
The stabilisers are designed and built in compliance with the 2006/95/EEC (Low Voltage) and 2004/108/EEC (Electromagnetic Compatibility) European Directives concerning the CE marking requirements and can be installed in both type A and type B environments (see IEC60439-1).
The stabiliser is designed to be connected between the mains and the user.

Sirius digital voltage stabilizer with bypass line

The stabilisation takes place on the **'rms' value** of the voltage and is not affected by harmonic distortion in the mains. The stabiliser can operate with a load variation range from 0 to 100% with a regulation speed depending on the input voltage percentage variation and on the design (indicatively, it can vary between 8 and 30msec/V).
The voltage stabiliser is not affected by the load power factor and since regulation is performed without chopping the voltage sine wave, neither an appreciable harmonic distortion nor a phase displacement is introduced on the downstream line. The equipment is housed in an IP21 metal

enclosure with RAL7035 finish. The standard stabilisers are air cooled (naturally or with aided ventilation over a certain temperature.

MAIN COMPONENTS



1. Buck/boost transformer

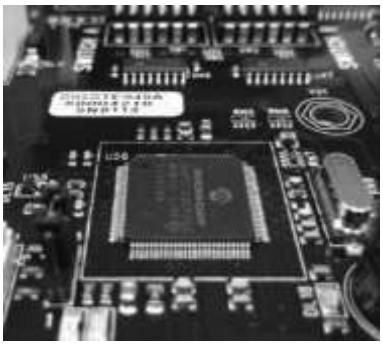
Standard dry-type transformer with the secondary winding connected in series to the mains and the primary winding supplied by the voltage regulator.

2. Voltage regulator

Basically, it is an autotransformer with continuously variable transformer ratio. The voltage intake varies depending on the position of the contacts, therefore the voltage supplied to the transformer primary winding also varies. Being the voltage across the regulator contacts (and consequently that on the secondary winding of the buck/boost transformer) either in phase or in opposition to the supply voltage, it is then added or subtracted to the supply voltage, thus compensating its variations.

3. Auxiliary circuit with microprocessor

The **DSP (Digital Signal Processor)** microprocessor-based control circuit (specifically designed for drives with totally digitalised signal) compares the output voltage value to the reference one ***sampling it 2000 times every second***. When an anomaly is detected, the control drives the voltage regulator gearmotor. By doing so, the regulator rollers change their position thus varying the voltage drawn and supplied to the buck/boost transformer primary winding. The input voltage variation is therefore automatically compensated.
The control system operates so that the output accuracy is ±0.5%.

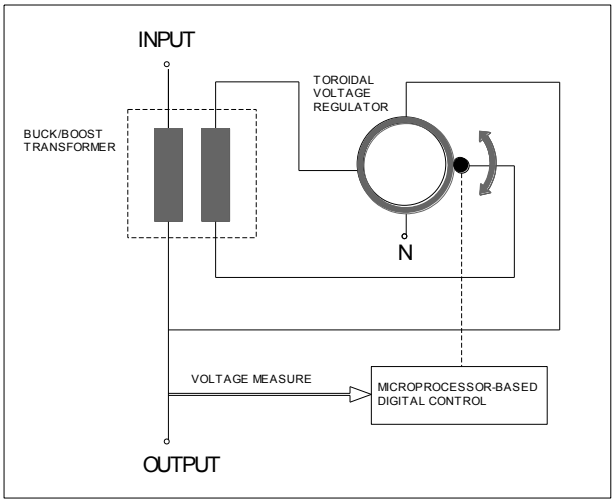


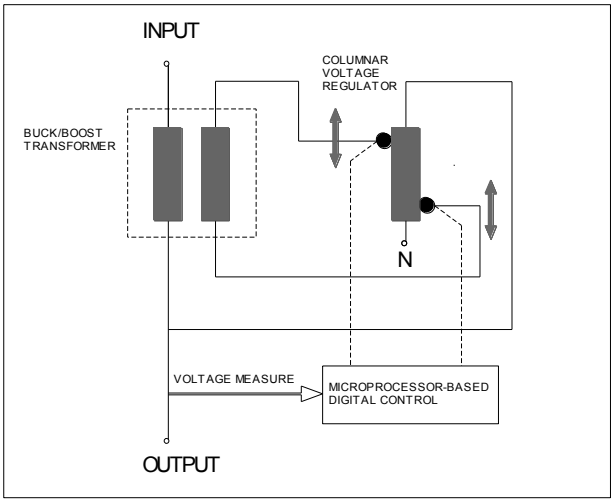
The microprocessor is fitted with the *soft stop* function enabling the regulation to work smoothly even in case of a strong fluctuation.

The voltage stabiliser can operate with input and output voltages different (380V/415V) from the rated voltage (400V). Such setting can be performed at the factory or at the Customer's premises according to the instructions described in the handbook.

On SIRIUS stabilisers the output voltage reference and the main configuration parameters can be remotely set also via Ethernet or GPRS connection from a remote station.

The sketch below shows the basics of an electro-dynamic stabiliser:





FIELDS OF APPLICATION

Ortea's voltage stabilisers are suitable for the widest range of possible applications

CHOICE OF A VOLTAGE STABILISER

Generally speaking, a stabiliser can be chosen on the basis of just a few elements.
Once this info has been established, any other optional requests can be considered separately.

1. Number of phases

The number of phases of a stabiliser depends on the type of load:
Single-phase load: single-phase stabiliser
Combination of several single-phase loads or three-phase loads: three-phase stabiliser or a single-phase stabiliser on each load.
Three-phase load: three-phase stabiliser

2. Rated voltage

Always establish the rated voltage that is supposed to be present at the input and output of the stabiliser. In case of three-phase systems, provide with the line-to-line voltage value.
Since there are different rated voltages around the world, do not assume that the local rated voltage is automatically known.
The standard voltage stabiliser can operate with:

380 – 400 – 415V @ 50Hz
440 – 460 – 480V @ 60Hz

3. Input variation range

It's key information for the choice and the design of the stabiliser.
Establish the amplitude of the oscillation of the input voltage and **always keep a safety margin on such percentage**. The standard production can include stabilisers for symmetrical and asymmetrical input variation range. If the input voltage variation goes beyond the rated range, the difference between real and rated variation is transferred onto the output.

4. Type of regulation

The three-phase voltage stabilisers perform an **independent regulation on each phase** ('Y' model): they admit a 100% input voltage unbalance and a 100% load unbalance.
For special applications, three-phase stabilisers regulating the average value of the three output voltages are also available. This kind of equipment is suitable when the input mains is symmetric and the load is balanced.

5. Rated power

Establish the power required to supply the load system and **consider an extra safety margin** for possible future extensions. In a voltage stabiliser, the power is expressed in kVA, whilst the load power is usually expressed in kW. Remember that the link between these two measuring units is provided by the power factor ($\cos\varphi$): **$kVA = kW/\cos\varphi$**.
Also, remember that:

kVA_{1-ph} = load voltage x load current

kVA_{3-ph} = $\sqrt{3}$ x (phase to phase load voltage) x (load current)

If the power factor and/or the load power in kW cannot be easily established, measure the absorbed currents in order to allow for a correct design of the stabiliser.

All the stabilisers are designed for the maximum input current.

6. Installation

In order to provide with the most suitable machine, it is recommended to provide with the installation conditions. It is necessary to know:

- IP protection degree
- Indoor or outdoor installation
- Installation site altitude and climatic characteristics
- Ambient temperature
- Possible environmental hazards such as aggressive atmosphere, exposure to chemical components and so on.

PRODUCT RANGE