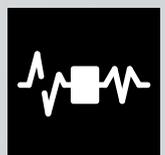


VOLTAGE SAGS ARE THE MOST COMMON CAUSE OF  
EQUIPMENT MALFUNCTIONS IN AUTOMATED INDUSTRY

# OXYGEN

## SAG COMPENSATOR





# ABOUT ORTEA



Founded in 1969, ORTEA SpA is a leading company in manufacturing and engineering Power Quality solutions.

Fifty years in the business and ongoing technical research have made of ORTEA SpA a competitive and technologically advanced company. Close co-operation between design, production and marketing enables to meet the requirements of a constantly growing number of customers. Beside standard production, ORTEA SpA can be extremely flexible in developing and manufacturing special equipment according to User's specification. All this thanks to the experience gained over many years of applied technological development. Such development includes IT tools that enable the technical staff to elaborate electrical and mechanical designs for each «custom product» on a quick and cost-effective basis.

The ORTEA SpA products are installed and working in a large number of countries, and, thanks to strategically positioned offices and distributors, guarantee rapid and competent support.

- ORTEA headquarters (Italy)
- ORTEA branches (Russia, Ivory Coast, Kenya, Thailand, Venezuela)



# QUALITY CERTIFIED

The belief that product quality and Customer satisfaction are the core of a modern organisation, led to the implementation of a certified Company Managing System.

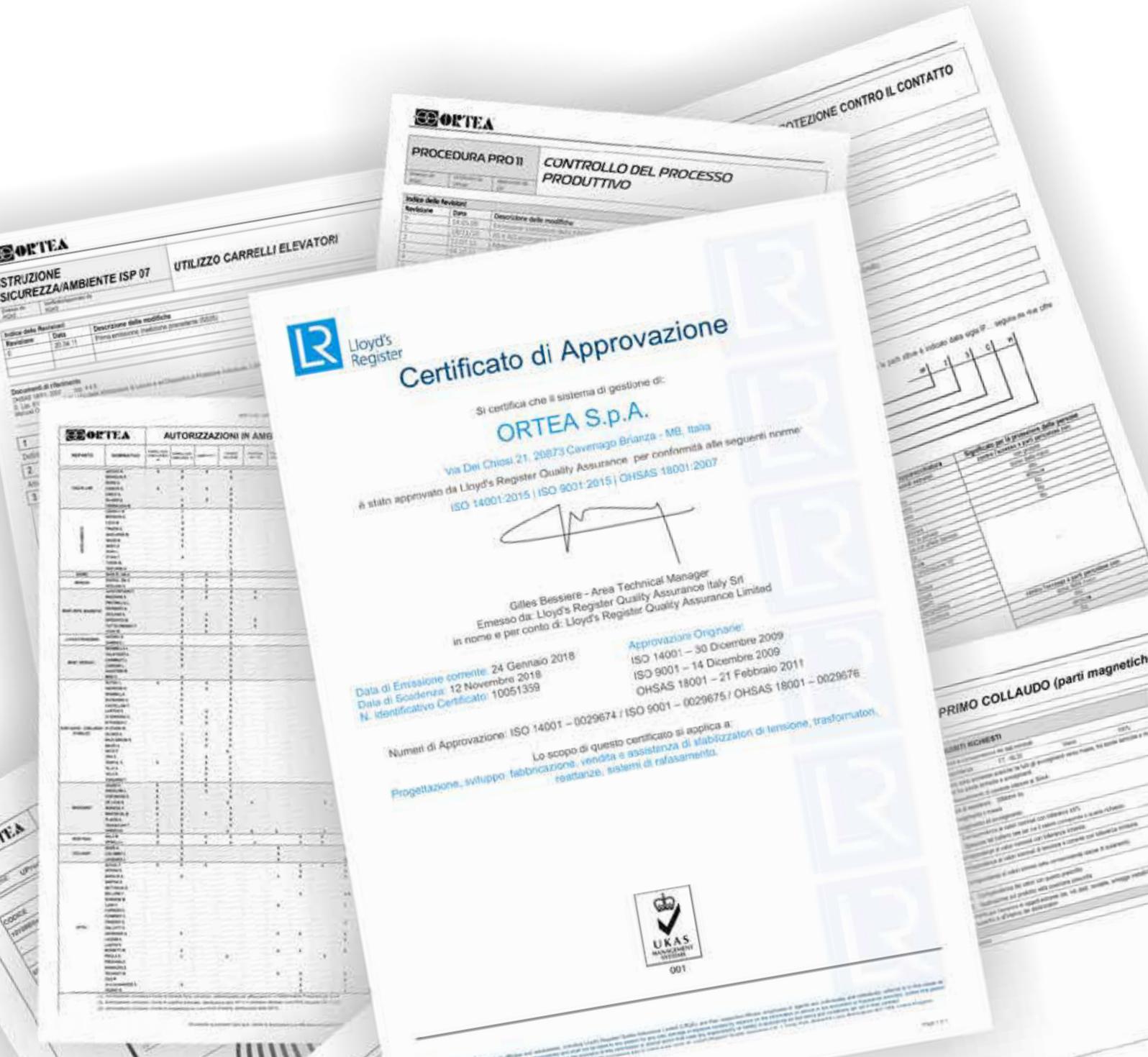
A modern Company that wants to accept the challenge of today's business scenario cannot do so without conforming to standardized organizational criteria.

Customer satisfaction, product quality and responsible occupational practices are the basis on which the Company's activities can be consolidated. Ortea understood this a long time ago: the first ISO 9001 approval dates back to 1996.

Today ORTEA SpA Integrated Managing System is approved by Lloyd's Register according to the main Standards:

- ISO9001 (Quality management systems).
- ISO14001 (Environmental management systems).
- OHSAS18001 (Occupational health & safety management systems).

This means that ORTEA SpA can ensure that its performance is optimized in terms of internal process management, commitment towards environmental issues and attention to health & safety at work within the frame of a single Managing System.



# ORTEA POWER QUALITY SOLUTIONS

Companies are more and more sensitive to Power Quality issues because they can cause troubles and damages to equipments and processes, up to interrupting the production cycle.

ORTEA SpA, with his brands ORTEA, ICAR and ENERSOLVE, offers a unique range of products and services for Power Quality and Energy Efficiency of low voltage electrical networks: voltage stabilisers, sag compensator, power factor correction systems, dry type transformers and active harmonic filters.

VOLTAGE VARIATION	VOLTAGE STABILISERS	ORTEA
SAGs/DIPs	SAG COMPENSATOR	ORTEA
EXCESSIVE REACTIVE POWER	POWER FACTOR CORRECTION SYSTEMS	ICAR
UNPROTECTED LOADS	LV TRANSFORMERS	ORTEA
HARMONIC POLLUTION	ACTIVE HARMONIC FILTERS	ICAR
WASTE OF ENERGY	ENERGY EFFICIENCY SMART DEVICES	ENERSOLVE





## EXPERIENCE

In its 50 years of business, ORTEA SpA (founded in 1969) has gained experience and know-how that enabled continuous growth and evolution. This never-ending process has allowed the Company to assume a leading role worldwide in designing and manufacturing voltage stabilisers, lv transformers and power factor correction systems.



## RELIABILITY

Thanks also to its long-established Quality System, ORTEA SpA can ensure the production of reliable and long lasting products, each one of them accurately tested.



## FLEXIBILITY

In addition to the standard production, the extremely flexible organization of ORTEA SpA is able to develop and manufacture cost-effective special equipment based on the Customer's specification.



## SPEED

ORTEA SpA can manage the purchasing orders very quickly. Review of offer/order, design, production planning, manufacturing and strict test routines: all the processes have been analysed and optimised in order to eliminate idle time and shorten delivery terms.





## RESEARCH & DEVELOPMENT

ORTEA SpA invests a considerable amount in R&D concerning new products and technology. It is acknowledged that modern challenges in a globalised and competitive market can be won only when you're "ahead of time".

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## SYNERGY

Co-operation between Headquarters, Subsidiaries, Distributors and Customers aimed at a careful analysis of markets and demand enable ORTEA SpA the development of up-to-date products. By working together, marketing, design, production and after-sales service allow the Company to meet the necessities set forth by an increasingly globalised and competitive market.

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## AFTER-SALES

The continuous monitoring and analysis of requests and claims carried out by the after-sales service enables the improvement the quality of both products and service to the Customer. ORTEA SpA after-sales organization can act quickly, providing for precise issue analysis, supply of advise and know-how and , if necessary, provision of spare parts in order to solve any anomaly.

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## QUALITY

Aiming at providing for the best quality, the manufacturing process includes checks during production and detail test sessions for each equipment. The approved Integrated Managing System ensures the control of every manufacturing phase, starting from checking the components at reception and ending with the best package in relation to the transport type.

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# VOLTAGE IS NEVER PERFECT

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**60% OF POWER QUALITY COSTS ARE CONSEQUENCE OF VOLTAGE SAGS**

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**OXYGEN: THE SOLUTION**

Modern industry is becoming more automated and the sensitivity of processes to Power Quality events is increasing.

It is generally recognized that quality is an important aspect of the electricity service. Not only low prices are important, also high-quality matters to customers.

Price and quality are often complementary aspects; together they define the value that customers derive from consuming electricity.

In practice the voltage is never perfect.

If the quality of electricity supplied to the plants drops below a certain level, equipment no longer works properly and customers are likely to experience problems.

Sensitive industry sectors may incur a Power Quality cost up to 4% of their turnover, with about 60% of those costs caused by voltage SAGs and short interruptions (source: Leonardo Energy).

The cost of a voltage SAG is usually lower than the cost of an interruption, either short or long, but SAGs are much more frequent.

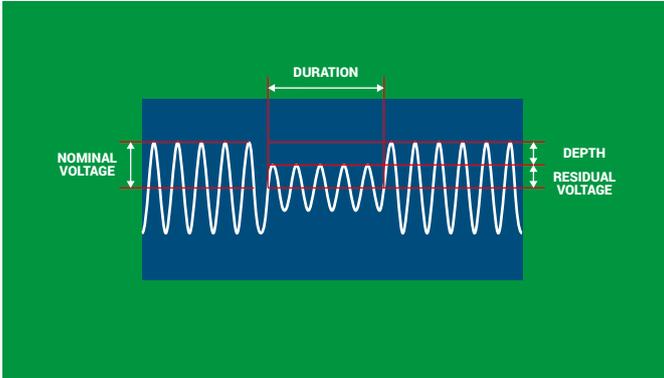
An interruption will affect all (unprotected) services, SAGs may affect only those that are most sensitive.

Many businesses require voltage or power conditioning rather than battery back-up power, provided by UPS system. In those cases where back-up power is unnecessary, a voltage conditioner provides superior protection and additional power quality functions, such as protecting against over/under voltage, voltage fluctuations, SAGs. Moreover protecting a whole plant by UPS, which can guarantee SAGs immunity, may be very costly, due to battery and maintenance costs.

Oxygen: the right solution.

# WHAT ARE VOLTAGE SAGS?

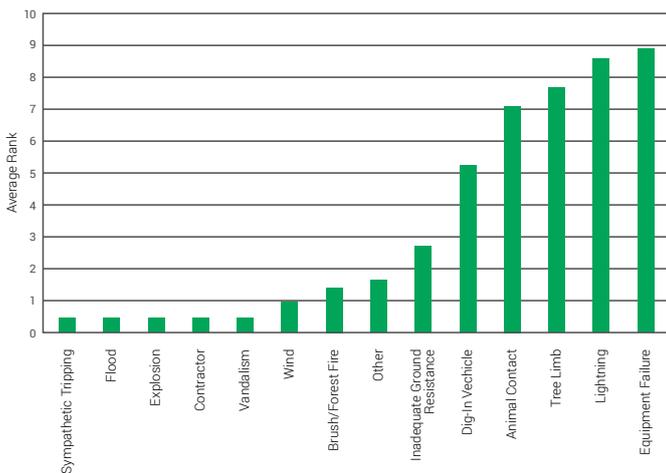
A voltage SAG is a temporary reduction of the Voltage RMS below a specific threshold at an electrical supply line point.



Generally voltage SAG happens when the residual voltage decreases between 10 and 90 percent of nominal voltage for one-half cycle to one minute. Voltage SAG duration is considered within 10ms up to 1min. The great deal of Voltage SAG have a duration lower than 1 second and a residual voltage higher than 40% of the rated value.

## VOLTAGE SAGS CAUSES

Voltage SAGs are generally caused by faults in the public network or in the installations of network users, in some cases by transient overloads due to the starting of large motors or the insertion of large loads.



Voltage SAG causes, source EPRI, Electric Power Research Institute.

Motor drives, including variable speed drives, are particularly susceptible.

Data processing and control equipment is also very sensitive to voltage SAGs and can suffer from data loss and extended downtime.

**SAG STARTS WHEN VOLTAGE GOES LOWER THAN 90% OF NOMINAL VALUE AND ENDS WHEN VOLTAGE RESUME ABOVE THIS VALUE**

**SAGS ARE IMPREVEDIBLE AND RANDOM**

**MOST VOLTAGE SAGS LAST  
LESS THAN ONE SECOND  
AND HAVE A RESIDUAL  
VOLTAGE EXCEEDING 40%**

**VOLTAGE SAG COST  
IS NORMALLY LOWER  
THAN A VOLTAGE SUPPLY  
INTERRUPTION ONE,  
BUT THE FIRST IS BY FAR  
MORE FREQUENT**

## WHERE DO THE VOLTAGE SAGS COME FROM?

- The voltage SAG propagates from the higher voltage levels to the lower ones, the load is often connected to a voltage level lower than the point of failure.
- Faults in the network cause deep voltage SAGs if they occur near loads.
- According to an Italian CESI study, the incidence of voltage SAGs is much greater in the case of an aerial MV network than with underground cables.

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## RELEVANCE OF VOLTAGE SAGS

The more modern the equipment is and the more electronics is required, the more serious are the problems caused through voltage SAG. With the increasing number of regenerative energy sources, energy sags, fluctuations and frequency deviations also increase.

Example of costs due to voltage SAGs:

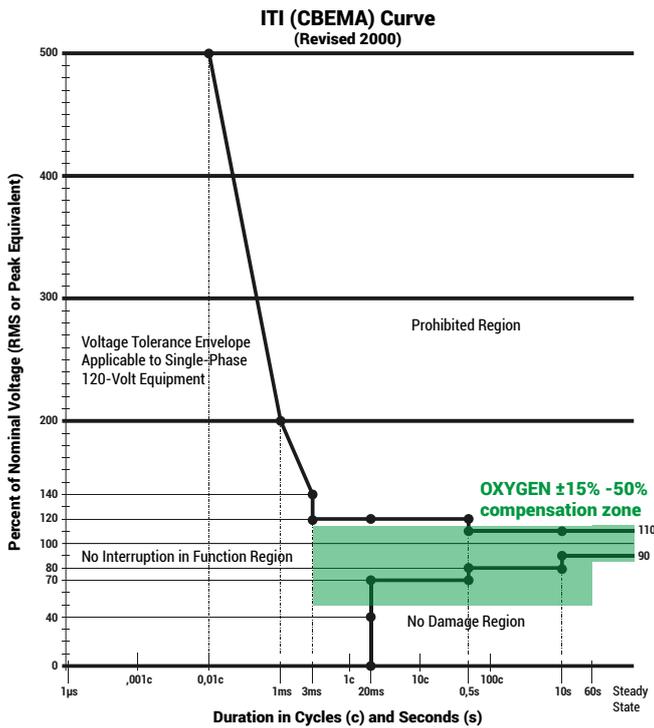
- Costs for unproductive personnel due to the sudden termination of the production cycle.
- Costs for raw materials and production lost.
- Costs for damages and/or malfunctions of machineries (repairs to them, temporary hire of new ones).
- Penalties caused by contractual shortcomings.
- Sanctions for damage to the environment.
- Increase in general insurance costs.

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## IMMUNITY OF EQUIPMENT TO DISTURBANCES COMING FROM THE NETWORK

Temporary increase of RMS voltage at a point of electrical supply line and above a specific threshold.  
Curve developed by ITIC (Information Technology Industry

Council) and CBEMA (Computer and Business Equipment Manufacturers' Association) allows to understand the capabilities and limitations of computers and business equipment and their voltage stability requirements.



## TROUBLES COME:

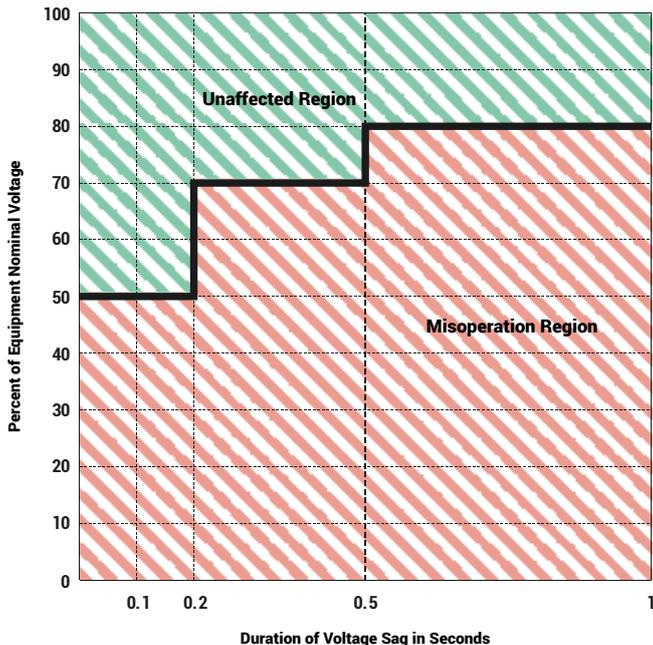
- LOWER THAN 90% OF NOMINAL VOLTAGE AND STARTING FROM 10 SEC
- ABOVE 110% OF NOMINAL VOLTAGE AND STARTING FROM 0.5 SEC

## (CBEMA)

SEMI, the industry association for the semiconductor industry, has developed the SEMI F47 voltage SAG immunity standard.

SEMI F47 is important because semiconductor plants require high levels of POWER QUALITY due to the sensitivity of equipment and process controls.

They must tolerate sags to 50% of equipment nominal voltage for duration of up to 200ms, sags to 70% for up to 0.5 seconds, and sags to 80% for up to 1.0 second.



**THE EQUIPMENT MUST BE ABLE TO CONTINUOUSLY OPERATE WITHOUT INTERRUPTION DURING CONDITIONS IDENTIFIED IN THE AREA ABOVE THE DEFINED SOLID BLACK LINE**



# OXYGEN

Oxygen, thanks to a suitable sizing of the power components and a remarkable response speed (<3 milliseconds) is able to face lowering (SAG) of the grid voltage of a maximum duration of one minute.

The energy required is taken directly from the network. Current models are able to cover network downing up to 50% of the nominal value (-50%).

The voltage compensation on the buck/boost primary winding is performed by IGBT static switches controlled by a microcontroller. The microcontroller system monitors the output voltage and determines the opening or closing of the IGBT contacts ensuring the best regulation.

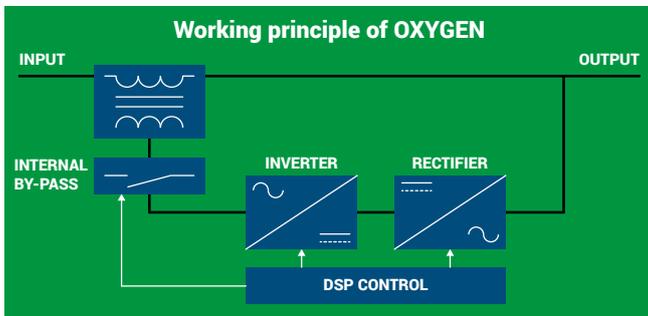
The use of the double conversion technology guarantees the insulation from the disturbances and the distortions of the network and, together with the help provided by the electrolytic capacitors, makes it possible to build machines for high power loads.

This SAG Compensator can operate with a load variation range for each phase from 0 to 100%, it is not affected by the power factor of the load and it can work with or without the neutral wire (on request).

Oxygen can operate with different input and, consequently, output voltage (380V or 415V) from the nominal one (400V).

The main components are:

- IGBT microcontroller-based electronic control boards running the system in terms of regulation and alarm management. They compare the output voltage value to the set one: if a difference is detected, they generate the compensation necessary to bring back the output voltage to the nominal value (provided that said difference falls in the working range).
- Conversion units (AC/DC rectifier and DC/AC inverter):  
Rectifier: it converts the phase to neutral voltage of the AC mains into DC voltage by means of a fullycontrolled IGBT bridge. The rectifier is sized in order to supply the inverter at full load.  
Inverter: it converts the DC voltage coming from the rectifier into AC voltage, stabilised in amplitude. The inverter uses the same IGBT technology as the rectifier.
- Internal by-pass static switch enabling load supply in case of fault condition.
- Buck/boost transformer adding or subtracting the voltage necessary to compensate for the mains fluctuation.
- Touch Display.



The user interface is created using a multilingual "touch panel" (10"); through the selection menu, it is possible to display electrical values and set the operating parameters. It is also possible to communicate with the electronic component via the RS485 serial bus using the Modbus protocol.

The standard cabinet is metallic with RAL9005 color and IP21 protection degree.

# APPLICATIONS

Voltage SAGs and interruptions disturb many types of device connected to the network. They are the most frequent cause of power quality problems.

The most sensitive applications are:



## ELECTRONICS INDUSTRY

Sensitive machinery, semiconductor.



## FOOD & BEVERAGE

High speed bottling, packaging lines.



## CONTINUOUS PRODUCTION LINES

Printing, steelworks, paper mills, petrochemicals, fibre and film, automotive.



## MEDICAL

Sensitive medical equipment, Hospitals.



## PHARMACEUTICAL

Packaging lines, continuous processes.



## COMPUTER EQUIPMENT

Data processing centres, banks, telecommunication.

**SAG CORRECTION UP TO -50%  
WITH CONTINUOUS ONLINE  
REGULATION UP TO ±15%**  
Correction in less than 3 milliseconds.

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**HIGH EFFICIENCY**  
>98% at nominal power.

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**INDUSTRIAL DESIGN**  
Designed for standard industrial loads with admitted overload as of 150% for 1 minute (at nominal input voltage).

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**MODULAR CONSTRUCTION**  
Fast & Easy maintenance.

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**WITHOUT ENERGY STORAGE**  
Minimum maintenance and increased reliability.

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**INTERNAL BY-PASS**  
Internal by-pass static switch enabling load supply in case of fault condition.

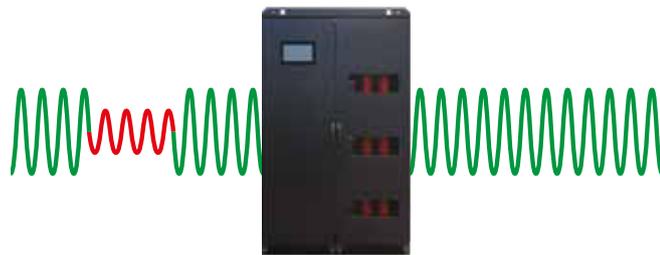
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**CONNECTIVITY**  
Modbus TCP/IP.

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**MULTILINGUAL TOUCH SCREEN  
INTERFACE**  
Easy to understand with simple user controls, events log.

## KEY BENEFITS



Protection from the most common Power Quality problem.

Voltage SAGs are the most common cause of equipment malfunctions in automated industry. SAGs correction up to -50% for 1 min.

Economical solution: no maintenance and operation costs.

No battery energy storage required. Efficiency >98%.

Compared to a UPS...

Oxygen solution is specific for voltage SAGs with considerable benefits in terms of:

- Reduced cost.
- Less maintenance.
- Smaller footprint and occupied space.
- No specific climate room or air conditioning required.

Application example



■ Giallo: without Oxygen - ■ Blu: with Oxygen

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# TECHNICAL FEATURES

## INPUT

Available nominal voltage*	380-400-415V (440-460-480V 60Hz only)
Maximum supply voltage	Max continuous voltage +10%
Frequency	50Hz ±5% or 60Hz ±5%
Power system	3 phases + N (no neutral wire on request)

## OUTPUT

Voltage	The same of input nominal voltage (output voltage can be adjusted)
Admitted load variation	Up to 100%
Admitted load imbalance	50%
Admitted overload	150% for 1 minute (at nominal input voltage)

## PERFORMANCE

Efficiency	>98%
SAG correction response	<3 milliseccs
Output voltage accuracy	±0,5%
SAG correction accuracy	±4%
Continuous regulation range	Oxygen 10-40: ±10%, Oxygen 15-50: ±15%

SAG correction capability	Input	Output	Time
Oxygen 10-40	-40%	100%	1 minuto
	-50%	90%	45 secondi
	-60%	80%	36 secondi
Oxygen 15-50	-50%	100%	1 minuto
	-60%	90%	45 secondi

## PROTECTION

Internal automatic by-pass	Thyristor switch with capacity of 150% of model rating
Overvoltage protection	Class I input surge arrester / Class II output surge arrester

## BUCK/BOOST TRANSFORMER

Type	Dry transformer
Frequency	50Hz or 60Hz

## ENVIRONMENT

Operating temperature range	0°C to 40°C (32°F to 104°F)
Operating altitude	< 1000m without derating (for higher altitudes contact us)
Inverter cooling	Forced Ventilation
Transformer cooling	Natural convection
Max relative humidity	<95% (non-condensing)
Pollution degree rating	2

\* Output voltage can be adjusted by choosing one of the indicated values. Such choice sets the new nominal value as a reference for all the stabiliser parameters.

## ENCLOSURE

Protection degree	IP2X (other on request)
Material	Electro-galvanized steel
Finish	Standard epoxy-polyester powder coating textured finish
Colour	RAL 9005
Enclosure access	Hinged doors with key lock

## SERVICE

Diagnostics	Non-volatile event & log
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## USER INTERFACE

HMI	10" colour touch panel, multilingual
Touch panel	Full parameters control, system & voltage event log
Remote duplication	On request by dedicated software connected to the same network (Ethernet)
Communication	Modbus TCP/IP

## POWER QUALITY EVENT MONITOR

Events recorded	Voltage SAG
Events detection	Input voltage
SAG threshold	Continuous (under minimum voltage)

## STANDARDS & CERTIFICATIONS

Quality	ISO9001
Environmental	ISO14001
Health & Safety	OHSAS18001
Marking	CE
Performance	IEC 61439-1/2



All ORTEA equipments are designed and built in compliance with the Low Voltage and Electromagnetic Compatibility European Directives with regard to the CE marking requirements. ORTEA products are built with suitable quality components and that the manufacturing process is constantly verified in accordance with the Quality Control Plans which the Company applies in compliance with the ISO 9001 Standards. The commitment towards environmental issues and safety at work issues is guaranteed by the certification of the Management System according to the ISO14001 and OHSAS18001 Standards. In order to obtain better performance, the products described in the present document can be altered by the Company at any date and without prior notice. Technical data and descriptions therefore do not hold any contractual value.

# OXYGEN RANGE

Type	Rated power	Input voltage range	Max input current (peak)	Output voltage	Rated output current	Eff.	Correction time	Cabinet dimensions*	Weight*
	[kVA]	[V]	[A]	[V]	[A]	[%]	[ms]	WxDxH [mm]	[kg]

Oxygen 10-40   input voltage compensation: $\pm 10\%$ continuous / $-40\%$ for 1 minute (100% nominal output voltage)									
<b>200-10-40</b>	200	360-440	321 (481)	400	289	>98	<3	1200x800x2000	800
<b>250-10-40</b>	250	360-440	401 (601)	400	361	>98	<3	1200x800x2000	900
<b>320-10-40</b>	320	360-440	513 (770)	400	462	>98	<3	1200x800x2000	1150
<b>400-10-40</b>	400	360-440	642 (962)	400	577	>98	<3	1200x1000x2200	1200
<b>500-10-40</b>	500	360-440	802 (1203)	400	722	>98	<3	1200x1000x2200	1400
<b>630-10-40</b>	630	360-440	1010 (1516)	400	909	>98	<3	2600x1400x2200	1600
<b>800-10-40</b>	800	360-440	1283 (1925)	400	1155	>98	<3	2600x1400x2200	1800
<b>1000-10-40</b>	1000	360-440	1604 (2406)	400	1443	>98	<3	4200x1000x2200	2100
<b>1250-10-40</b>	1250	360-440	2005 (3007)	400	1804	>98	<3	4200x1000x2200	2300
<b>1600-10-40</b>	1600	360-440	2566 (3849)	400	2309	>98	<3	4800x1400x2400	3200
<b>2000-10-40</b>	2000	360-440	3208 (4811)	400	2887	>98	<3	4800x1400x2400	3600
<b>2500-10-40</b>	2500	360-440	4009 (6014)	400	3609	>98	<3	4800x1400x2400	4000
<b>3200-10-40**</b>	3200	360-440	5132 (7698)	400	4619	>98	<3	4800x1400x2400	5000

Oxygen 15-50   input voltage compensation: $\pm 15\%$ continuous / $-50\%$ for 1 minute (100% nominal output voltage)									
<b>200-15-50</b>	200	340-460	340 (577)	400	289	>98	<3	1200x800x2000	1150
<b>250-15-50</b>	250	340-460	425 (722)	400	361	>98	<3	1200x1000x2200	1200
<b>320-15-50</b>	320	340-460	543 (924)	400	462	>98	<3	1200x1000x2200	1400
<b>400-15-50</b>	400	340-460	679 (1155)	400	577	>98	<3	2600x1400x2200	1600
<b>500-15-50</b>	500	340-460	849 (1443)	400	722	>98	<3	2600x1400x2200	1800
<b>630-15-50</b>	630	340-460	1070 (1819)	400	909	>98	<3	2600x1400x2200	1900
<b>800-15-50</b>	800	340-460	1359 (2309)	400	1155	>98	<3	4200x1000x2200	2300
<b>1000-15-50</b>	1000	340-460	1698 (2887)	400	1443	>98	<3	4800x1400x2400	3200
<b>1250-15-50</b>	1250	340-460	2123 (3609)	400	1804	>98	<3	4800x1400x2400	3600
<b>1600-15-50</b>	1600	340-460	2717 (4619)	400	2309	>98	<3	4800x1400x2400	4000
<b>2000-15-50**</b>	2000	340-460	3396 (5774)	400	2887	>98	<3	4800x1400x2400	5000

The values listed in the tables are referred to 400V nominal voltage

\* Size and Weight may change

\*\* Available only for 480V / 60Hz

## Optional accessories

Input automatic circuit breaker

Short circuit output protection

Manual maintenance by-pass

Input isolating transformer

EMI/RFI filters

# OXYGEN K RANGE

Type	Rated power	Input voltage range	Max input current (peak)	Output voltage	Rated output current	Eff.	Correction time	Cabinet dimensions*	Weight*
	[kVA]	[V]	[A]	[V]	[A]	[%]	[ms]	LxPxH [mm]	[kg]

Oxygen 10-40   input voltage compensation: $\pm 10\%$ continuous / $-40\%$ for 1 minute (100% nominal output voltage)									
200-10-40K	200	360-440	321 (481)	400	289	>98	<3	1600x800x2000	925
250-10-40K	250	360-440	401 (601)	400	361	>98	<3	1600x800x2000	1025
320-10-40K	320	360-440	513 (770)	400	462	>98	<3	1600x800x2000	1275
400-10-40K	400	360-440	642 (962)	400	577	>98	<3	1800x1000x2200	1370
500-10-40K	500	360-440	802 (1203)	400	722	>98	<3	1800x1000x2200	1570
630-10-40K	630	360-440	1010 (1516)	400	909	>98	<3	3200x1400x2200	1800
800-10-40K	800	360-440	1283 (1925)	400	1155	>98	<3	3200x1400x2200	2000
1000-10-40K	1000	360-440	1604 (2406)	400	1443	>98	<3	4800x1000x2200	2300
1250-10-40K	1250	360-440	2005 (3007)	400	1804	>98	<3	5400x1000x2200	2930
1600-10-40K	1600	360-440	2566 (3849)	400	2309	>98	<3	6000x1400x2400	3840
2000-10-40K	2000	360-440	3208 (4811)	400	2887	>98	<3	6000x1400x2400	4300
2500-10-40K	2500	360-440	4009 (6014)	400	3609	>98	<3	6000x1400x2400	5000
3200-10-40K**	3200	360-440	5132 (7698)	400	4619	>98	<3	6800x1400x2400	6200

Oxygen 15-50   input voltage compensation: $\pm 15\%$ continuous / $-50\%$ for 1 minute (100% nominal output voltage)									
200-15-50K	200	340-460	340 (577)	400	289	>98	<3	1600x800x2000	1275
250-15-50K	250	340-460	425 (722)	400	361	>98	<3	1800x1000x2200	1325
320-15-50K	320	340-460	543 (924)	400	462	>98	<3	1800x1000x2200	1525
400-15-50K	400	340-460	679 (1155)	400	577	>98	<3	3200x1400x2200	1770
500-15-50K	500	340-460	849 (1443)	400	722	>98	<3	3200x1400x2200	2000
630-15-50K	630	340-460	1070 (1819)	400	909	>98	<3	3200x1400x2200	2100
800-15-50K	800	340-460	1359 (2309)	400	1155	>98	<3	4800x1000x2200	2500
1000-15-50K	1000	340-460	1698 (2887)	400	1443	>98	<3	6000x1400x2400	3830
1250-15-50K	1250	340-460	2123 (3609)	400	1804	>98	<3	6000x1400x2400	4240
1600-15-50K	1600	340-460	2717 (4619)	400	2309	>98	<3	6000x1400x2400	4650
2000-15-50K**	2000	340-460	3396 (5774)	400	2887	>98	<3	6000x1400x2400	5730

The values listed in the tables are referred to 400V nominal voltage

\* Size and Weight may change

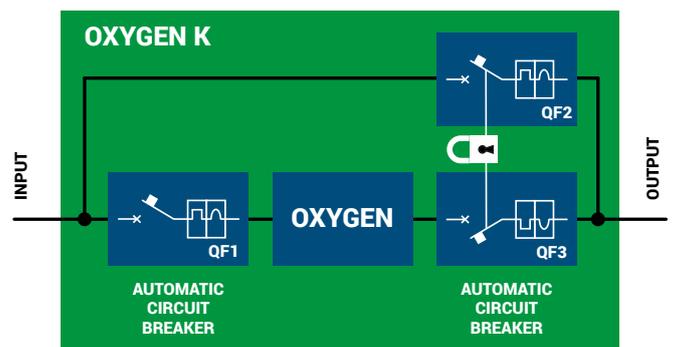
\*\* Available only for 480V / 60Hz

Compared to the standard model, the K model is equipped with:

- Input automatic circuit breaker
- Output automatic circuit breaker
- Manual by-pass line with interlocked automatic circuit breaker

## Optional accessories

- Input isolating transformer
- EMI/RFI filters



# WARRANTY TERMS

## 1.1 Warranty

The purchased equipment is under warranty against any material or workmanship defects that might occur within the terms indicated in the following starting from the date of purchase and for all mechanical, electrical and electronic parts.

During the warranty period, the Manufacturer will repair or replace any defective parts, unless said defects are due to:

- improper handling, storage and/or use;
- wear & tear resulting from normal usage;
- incompetence or negligence on the Buyer's side when installing, running and maintaining the unit;
- interventions performed by or on behalf of the Buyer without written authorization;
- failure to comply with instructions given by the Manufacturer;
- removal, alteration or forgery of the nameplate and the data indicated thereof; and fortuitous or force majeure events such as (but not limited to) fire, earthquake, flood, riot and revolution, war, political instability, terroristic act, strike, etc.).

Moreover, the provided warranty will immediately become null and void in case of:

- failure to comply with the payment terms;
- failure to carry out routine and / or extraordinary maintenance;
- improper use of the equipment; and external phenomena beyond the unit's scope and control.

In case of failure, the Buyer shall contact the Head Office where the Manufacturer will decide whether the repair can be performed on location, or if the equipment has to be shipped to the Manufacturer's facilities or to an after-sale Service Centre authorised by the Manufacturer.

If the repairing intervention can be performed at the Buyer's facility, all the expenses relevant to travelling, boarding and lodging of the Seller personnel shall be at the Buyer's charge, whilst spare parts and labour costs shall be at the Manufacturer's charge. However, the Buyer shall produce copy of the purchasing document (invoice) and report the detected anomaly prior to the intervention.

If the intervention is performed at the Manufacturer's facility, the equipment shall be duly packed and shipped back at the Buyer's expense and risk. The shipment after the repairing operations shall be under the Manufacturer's responsibility. Unless otherwise agreed upon in writing, this warranty does not cover the replacement of the entire equipment under no circumstances whatsoever. Nothing shall be due to the Buyer for the time in which the equipment is left idle. The Buyer may not claim any compensations and/or reimbursements for expenses or indirect damages caused by the equipment failure.

Parts provided as spare parts and/or replacements are subject to the same warranty terms. Repair or replacement of a defective part does not extend the original warranty period on the product as a whole.

The competent place of jurisdiction for any disputes is in Monza (Italy).

## 1.2 Proper use

While the unit is functioning, the operator must be protected from any risks associated with the functioning mode.

The proper / correct use of the equipment allows for full exploitation of its characteristics in complete safety.

For such purpose:

- follow the instructions in the user manual;
- check the integrity of equipment and components;
- comply with instructions and warnings provided;
- check status of preservation and keep maintenance on the equipment under control;
- check the status of cables and electrical connections;
- comply with the nameplate data such as (but not limited to) power, voltage and amperage;
- use the equipment for the purpose intended by the Manufacturer;
- operate the equipment in the environmental conditions for which it was designed;
- cut off the power supply in case of inspection, repair and maintenance;
- use suitable work clothing and personal protective equipment (PPE);
- immediately report any malfunction (bad behaviour, suspicion of rupture, incorrect movement and noise beyond the standard level) to the department manager and switch off the equipment;
- comply with the recommended maintenance frequency, recording every control and comment related to the performed intervention.

## 1.3 Misuse / Improper use

The Manufacturer defines as «misuse / improper use» of the equipment any other than what described in the previous paragraph and in addition to that:

- modification of the operating parameters. Should it be necessary to make any modification to the equipment, the Buyer shall contact the Manufacturer;
- use of unsuitable or inadequate energy sources;
- employment of not adequately trained/skilled personnel to run the unit;
- failure to comply with the maintenance instructions or maintenance incorrectly carried out;
- use of non-original spare parts or unsuitable ones;
- modification and / or tapering with the equipment safety devices;
- performance of control operations, maintenance, or repairs without having first disconnected the energy supply;
- performance of temporary repairs or remedial measures not complying with the instructions.

WARNING. The Manufacturer declines all responsibility for damage to persons or belongings due to improper use as defined above.

## 1.4 Warranty terms

24 months from invoice date.



Companies are more and more sensitive to Power Quality issues because they can cause troubles and damages to equipments.

Our Power Quality solutions:

**VOLTAGE STABILISERS**  
**SAG COMPENSATOR**  
**LV TRANSFORMERS**  
**PFC SYSTEMS**  
**ACTIVE HARMONIC FILTERS**  
**ENERGY EFFICIENCY SMART DEVICES**



### **ORTEA SpA**

Via dei Chiosi, 21  
20873 Cavenago di Brianza MB | ITALY  
tel. +39 02 95 917 800

[www.next.orte.com](http://www.next.orte.com)  
[sales@orte.com](mailto:sales@orte.com)

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