Energy management

Lovato electric

100% electricity

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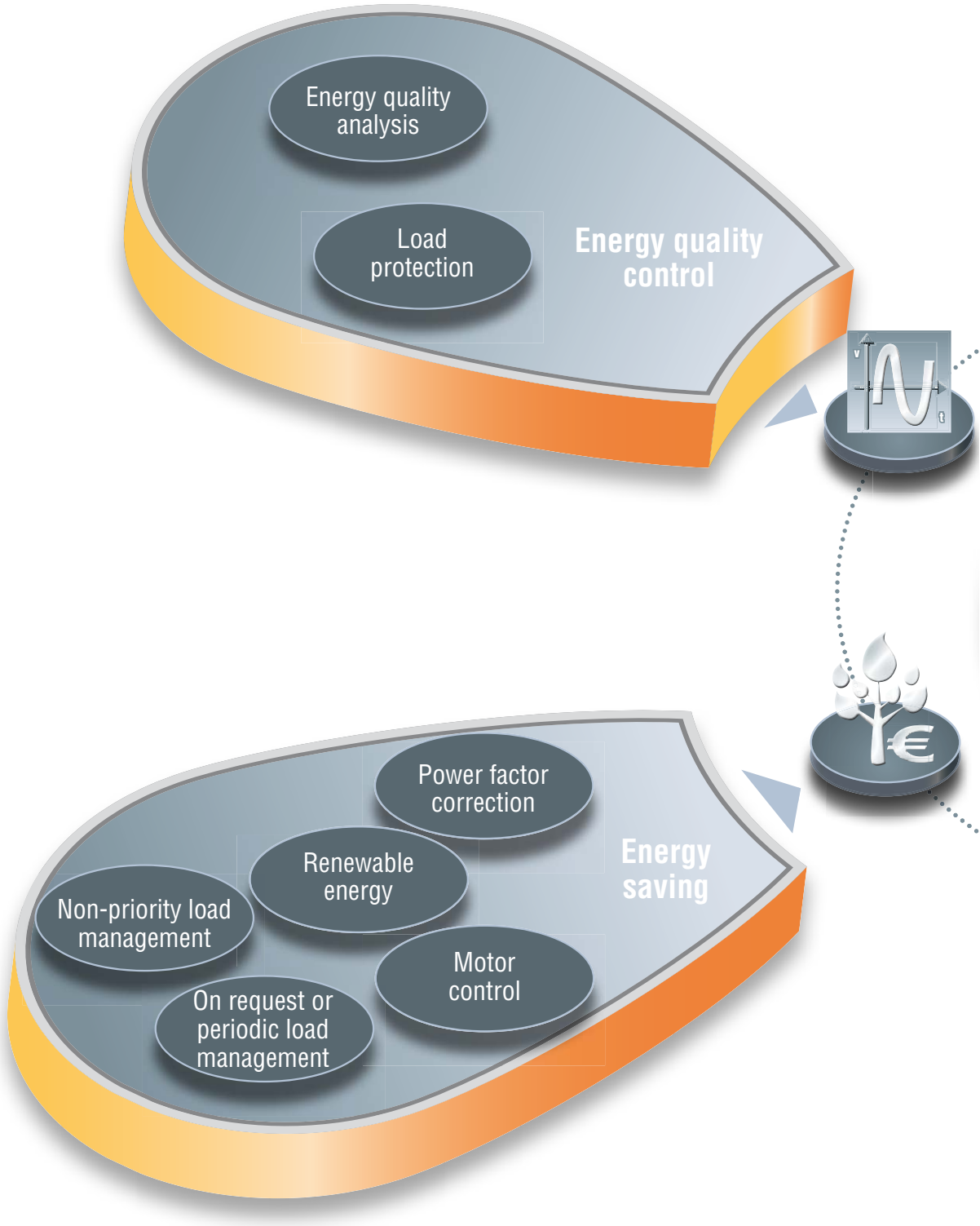
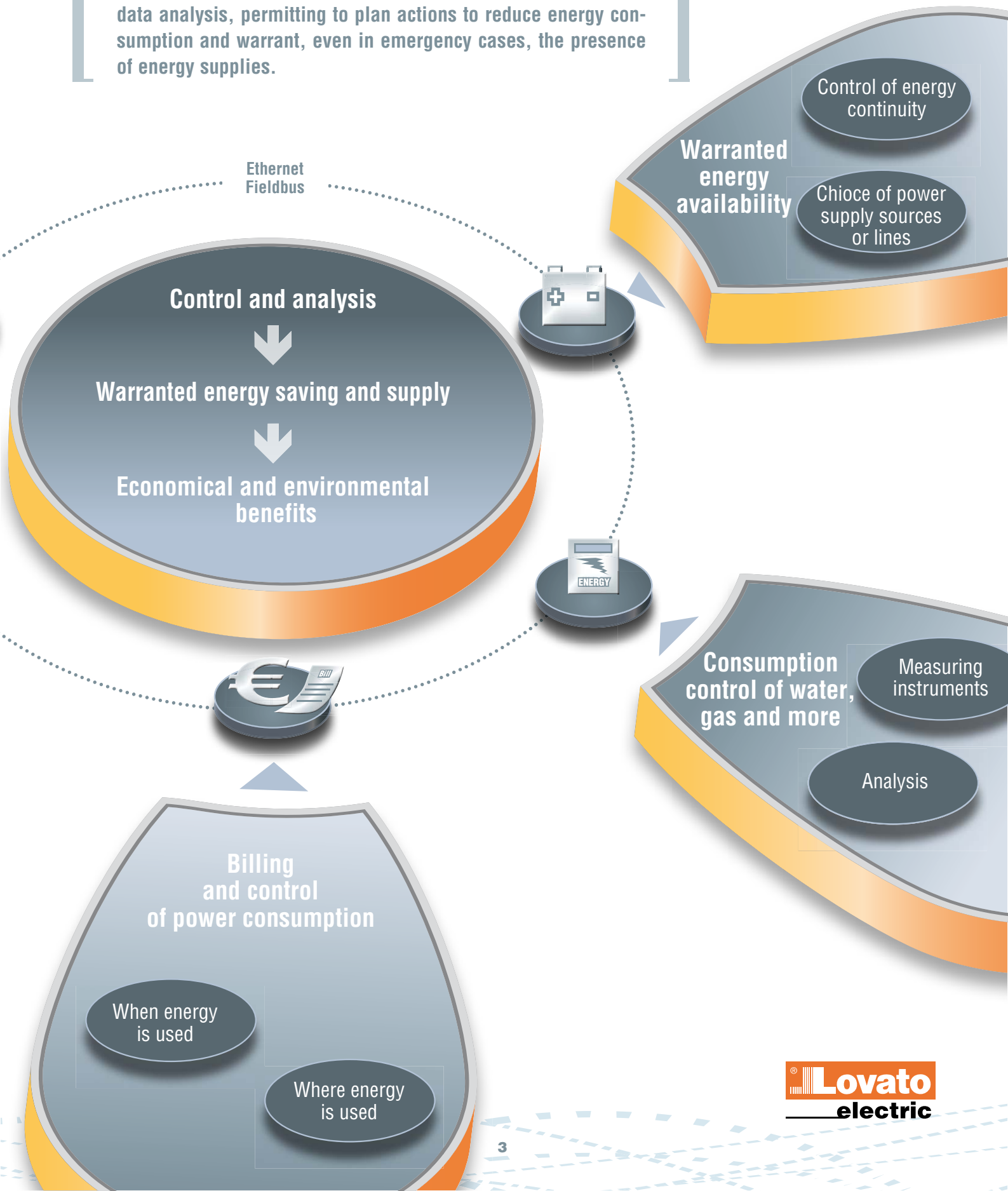
Energy **management**

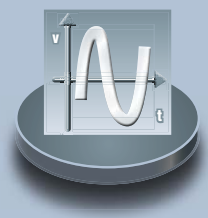


LOVATO Electric offers a complete solution for a rational management of energy consumption owing to products capable of monitoring the power system and a modern management of loads and consumption of an installation.

An important competitive advantage which today can distinguish a Company on the market is its capability to manage, in an intelligent way, available energy resources to obtain significant advantages in terms of operating cost reduction and, at the same time, to protect the environment surrounding it. These results are the outcome of constant monitoring and subsequent data analysis, permitting to plan actions to reduce energy consumption and warrant, even in emergency cases, the presence of energy supplies.



Energy Quality Control



The monitoring of energy quality is finalised to:

- **Verify that the energy received from the Power Utility is conform to the minimum requirements for a correct operation of its installation**
- **Control the compliance with EN 50160 standard requirements for energy quality**
- **Protect loads from eventual problems deriving from the mains supply.**

The EN 50160 standard defines the characteristics the supply waveforms must have and specifically refer to:

- Limits of frequency variation related to its rated value
- Maximum and minimum values admissible for the voltage
- Limits of rapid supply voltage variations
- Flicker effects and specifically the voltage rms oscillation although this remains within admissible minimum and maximum values
- Voltage interruptions and specifically temporary power loss
- Asymmetry among phase voltages in multi-phase systems
- Harmonic and interharmonic voltages.

LOVATO Electric products	Function
DMG... 	Analyzers and digital multimeters for: - Voltage waveform analysis - Current waveform analysis - Total harmonic distortion - Single harmonic analysis up to 63° order
EX... 	Expansion modules for data and event recording related to power distribution system with time stamp
EXP... 	Expansion module for verification of EN 50160 conformity, data and event recording with time stamp
EX... 	Expansion modules to communicate recorded data to a PC (USB, RS232, RS485, Ethernet and Profibus)
PMV... 	Voltage monitoring relays for load protection against minimum or maximum voltage and phase sequence, phase loss and asymmetry problems
PMA... 	Current monitoring relays for load protection against minimum or maximum current and cosphi problems
PMF... 	Frequency monitoring relays for load protection against minimum or maximum frequency problems

Digital power analyzers

Expansion modules

USB - RS232

Point to point connection

RS485 - Ethernet - Profibus

Network connection

The above-given parameters can be kept under control only by instruments with high calculation capability, integrated with appropriate expansion modules. These modules can include a storage memory with real time clock and can produce a detailed report on the power energy status of the system.

Reports with graphs and tables which describe the state of the power distribution system

VOLTAGE

FROM DATE	TO DATE	IN-SERVICE TIME	MIN	MAX	RESULT
26/10/2009	28/11/2009	100%	223 VAC	232 VAC	OK
02/12/2009	09/12/2009	98%	225 VAC	233 VAC	OK

POWER FREQUENCY

FROM DATE	TO DATE	IN-SERVICE TIME	MIN	MAX	RESULT
26/10/2009	28/11/2009	100%	49.56 Hz	51.41 Hz	OK
02/12/2009	09/12/2009	98%	49.34 Hz	51.38 Hz	OK

SEVERITY

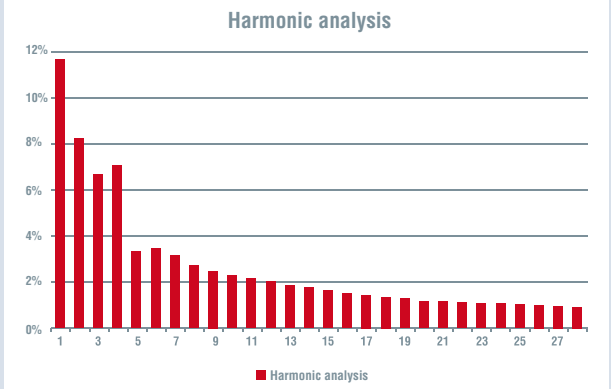
FROM DATE	TO DATE	IN-SERVICE TIME	Plt ≤ 1 (min 95% time)	RESULT
26/10/2009	28/11/2009	100%	98%	OK
02/12/2009	09/12/2009	98%	94%	ERR

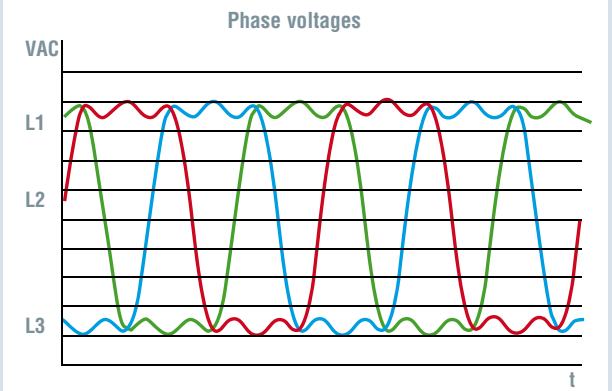
VOLTAGE DIPS

FROM DATE	TO DATE	IN-SERVICE TIME	N (<1s)	N (>1s)	RESULT
26/10/2009	28/11/2009	100%	45	7	OK
02/12/2009	09/12/2009	98%	10	2	OK

ASYMMETRY

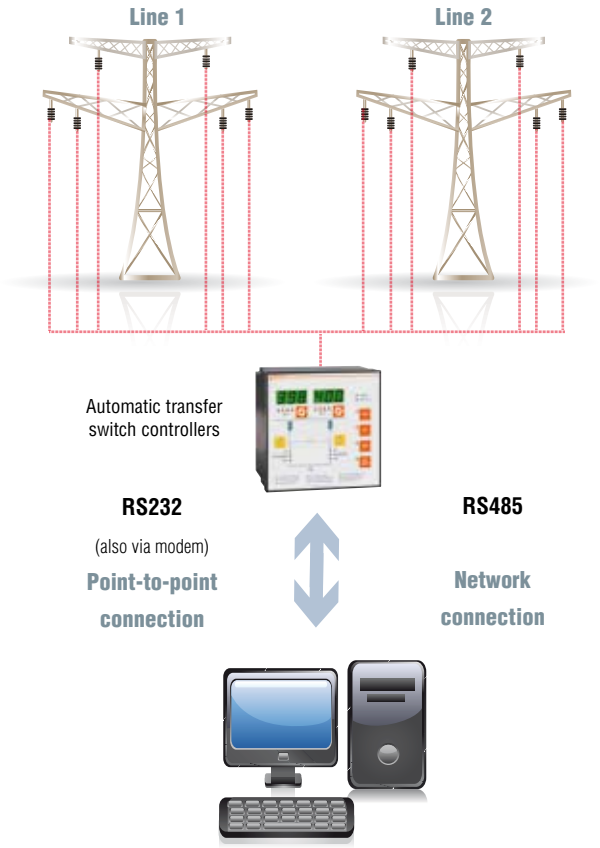
FROM DATE	TO DATE	IN-SERVICE TIME	MIN	MAX	RESULT
26/10/2009	28/11/2009	100%	0.10%	0.20%	OK
02/12/2009	09/12/2009	98%	0.11%	0.18%	OK





Warranted Energy **Availability**

When it is fundamental to warrant the continuity of electric power, an emergency power supply system needs to be made and must intervene when the main line no longer respects the minimum requirements imposed. In these cases, equipment is required to be capable of managing, in an independent way, the transfer of a power supply line to another one and, to be more precise, connect the loads to a standby emergency system whenever required and restore the connection to the main system once critical conditions are resolved and terminated.



LOVATO Electric products	Function
ATL...	Automatic transfer switch controllers for: - Monitoring the main system - Starting the standby emergency system - Switching loads from the main system to the standby - Restoring normal conditions once criticality is over
RGK20 RGK30	Engine protection controllers
RGK40 RGK50	Stand alone generating set protection and controllers
RGAM... RGK60	Automatic mains failure (AMF) generating set protection and controllers
BCE...	Automatic battery chargers
BF... B...	Contactors mechanically interlocked for change-over systems.
GA... GE...	Switch disconnectors and motorised changeover switches

ATL series automatic transfer switch controllers monitor the main power line, switching the load over to a secondary standby line the moment in which the minimum requirements of the main one are no longer readily available. In the case when the secondary line is powered by a generating set, the transfer switch controller controls the request to start and stop the generator. Thanks to the appropriate software, measurements, done on both lines, can be viewed on a PC screen; data and events can be collected in printable or exportable tables, using the most common PC formats. In addition, programming of all the parameters can be made onboard or even remotely using the support of analog and GSM modems. The virtual representation of the device front plate permits operators to work on a PC as if they were directly in front of the controller.

RS232

(also via modem)

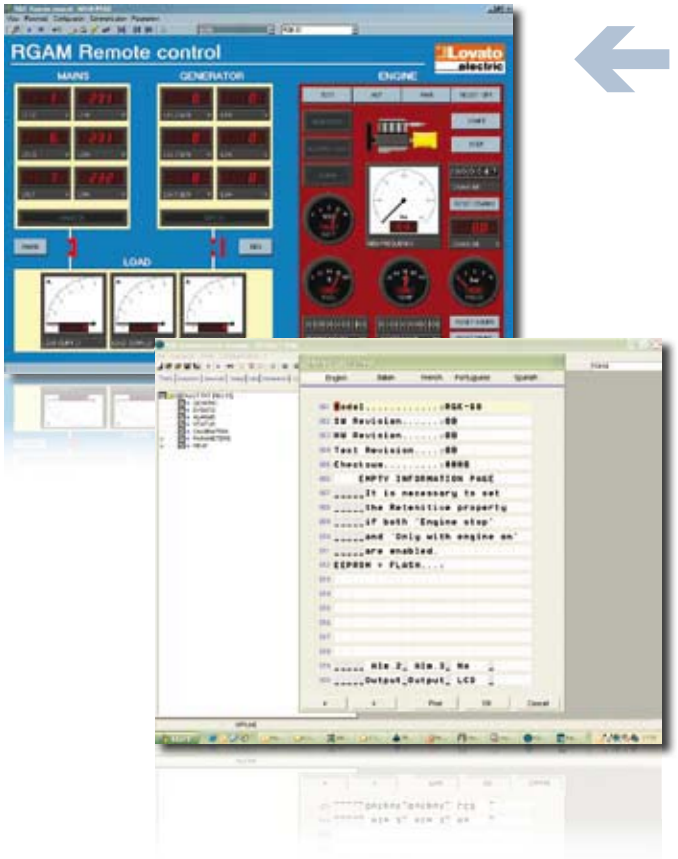
Point-to-point connection

RS485

Network connection

Engine protection controllers

Generating set protection and controllers



When a generating set is installed, RG series controllers are capable of (depending on the model used): controlling engine starting and stopping, carrying out the necessary controls and operating whenever alarm conditions take place. The most advanced models also include the AMF (Automatic Mains Failure) function to automatically transfer the load from the main line over to the emergency standby generator. In these models, the main and emergency standby systems are monitored to warrant the limits, programmed by the user, are maintained.

RGK... controllers are equipped with a contextual HELP key, which gives the user a help message, on the graphic display, to assist with controller configuration and alarm situations. Using the proper configuration software, each single text (therefore also help messages), viewed on the graphic display, can be customised and all the parameters, inputs, outputs and alarms can be programmed.

Lastly, the controllers can be remotely monitored and controlled as if one was directly in front of their reyboards.

Energy **Saving**

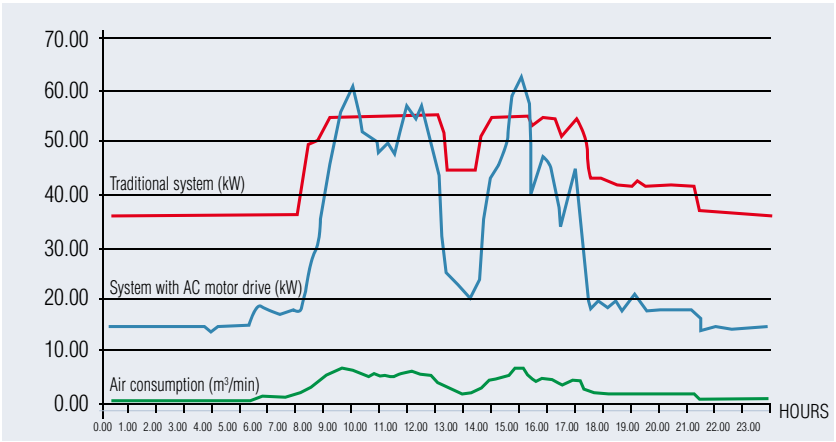
In a context when energy saving for economical and environmental reasons is ever more sensitive, strategies and means aimed for energy optimisation acquire greater importance every day.
Therefore, it is necessary to study systems in order to not waste energy that is produced, either be it derived from renewable (solar, wind, ...) or traditional (oil, gas, methane, ...) sources.

Soft starters


AC motor drives

ADX series soft starters allow to start and stop motors, even high rated ones up to 630kW, by limiting the problems deriving from mechanical wear or current peaks. These last mentioned are one of the causes for increased energy consumption by the system.
The ADX... permits to overcome these problems by supervising the motor starting, demanding a limited peak current from the source, providing additional motor control (torque, boost, ...) and protection (over temperature, prolonged starting, ...) features. Since equipped with programmable starting parameters, configurable digital and analog inputs and outputs, these products can all be remotely controlled by a appropriate software.

Should there be a need for variable speed controls, LOVATO Electric can offer a line of **VF series motor drives**. By using these drives, remarkable advantages can be obtained with regards to energy consumption.
For example in traditional ventilation systems, airflow is modulated by adjusting the opening of an outgoing shutter to maintain the motor speed constant; to be more precise, consuming the same power regardless of the airflow demand and, to the extent of an absurd situation, with the motor running and the shutter completely closed.
Instead by eliminating the shutter, airflow can be modulated by varying the speed, (to the extent of stopping the motor), based on the actual need, if it is controlled by a VF series motor drive.
Another typical application is compressor duty for which energy saving can be obtained by using motor drives rather than traditional direct-on-line or star-delta starters, to the extent that the cost of the new system can be recuperated in a short time, transforming it into a true investment. The below-given graph shows an example of how this takes place, during a workday on a production line; the horizontal axis is the 24 hours of a day.
Against the same air consumption (green line), the kW consumption of a compressor is shown with direct-on-line starting (red line) and one controlled by motor drive (blue line), capable of adjusting the motor speed in relation to the actual air demand. The area extended below each red and blue curve represents total energy consumption of the respective systems. Therefore, the great advantage of using motor drives can be quickly noted in this application.



LOVATO Electric products	Function
ADX...	Soft starters for motor starting and stopping with current limitation control
VF...	AC motor drives for motor starting and stopping with peak current, speed and motor parameter controls
TM...	Time relays for delayed switching on and off of devices
LRD...	Programmable logic relays for delayed switching on and off of devices. Controls for switching on and off of devices
DME..	Energy meters for energy consumption count
DMG...	Digital multimeters and power analyzers for energy consumption recording and harmonic distortion control Switching on and off control of device
DCR...	Automatic power factor controllers to limit reactive energy exchanged by the system
PSL	Switching power supplies to increase energy efficiency

Multimeters and power analyzers

DMG series multimeters and power analyzers and DME series energy meters permit to quantify the energy flowing in the system. If located in opportune places, it allows locating the consumptions in such a way as to have a clear situation of where energy is being used. This permits to plan specific interventions where the most important consumptions are taking place and useless waste of energy is detected in the systems which are not working or not being used. In addition, DMG... are capable of monitoring energy in all four quadrants (imported and exported energy) and also supply details about harmonic distortion on voltage and currents, responsible of useless energy consumption as well as potential disturbance on some types of machinery. Harmonic components, with significant percentage rates, can be possibly identified thanks to the harmonic analysis up to the 63° order, total harmonic distortion (THD) and by examining the system (for instance, selectively activating machinery present on the controlled line) and remedied with suppressors or other solutions only where they are necessary.

Programmable logic relays

Time relays

Automatic power factor controllers

Switching power supplies

TM series programmable time relays permit that a specific utility does not remain active for a time longer than necessary. The classic example is represented by a lighting system where some zones need to be activated only for a time needed to cross a hall or room while people pass through (staircase lighting timer).

Another example is hand dryers in washrooms which are used only for a very brief time. In all cases in which energy saving does not depend on the users' awareness, the automatic delayed switch-off systems warrant that some devices are not activated needlessly. Instead where a more-complex operating logic is needed, the **LRD series programmable logic relays** have control functions, typical of small PLCs, using Boolean logic, timers, counters, comparators and calendar management.

These functions allow the use of the utilities only after the satisfaction of specific logic conditions, also connected to the period of the year (for instance, the external lights of the outside area of a company property which need to switch on only in the winter when it gets dark earlier and personnel is still working).

If the logic combinations needed are not too articulated, Boolean logic contained in **DMG series measuring insturments** is already enough to warrant a good control of the systems.

Power factor correction covers a fundamental role for energy optimisation in installations. In actual fact, excessive values of the reactive component of energy implies a high energy dissipation on transmission lines due to current flow effectively unnecessary for a correct operation of the system. Since power supply authorities make consumers pay for this consumption indirectly, by applying penalties on power factor which must remain within established contract limits, LOVATO Electric can offer power factor controllers for correction to achieve this optimisation. To cover all these market requirements, there are controllers capable of switching capacitor banks composed of 5 up to 12 steps.

The use of power supplies based on switching technology instead of traditional products with linear technique provides for a better exploitation of drawn energy thanks to the high efficiency characterised by this technology. In the best cases, efficiency can undergo a significant percentage increase when comparing the use of a linear power supply to a switching type.

LOVATO Electric has a wide selection of products ranging from 5W to 960W power ratings, with the possibility of connecting them in series and parallel to obtain output powers and voltages other than the rated values.

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Billing and Control of power consumption

MID (Directive 2004/22/EC)

- **Energy meters have the purpose of active energy measurement for invoicing the consumption.**
- **In Europe, each measuring instrument which data is used for a monetary transaction (billing) MUST BE COMPULSORILY CERTIFIED according to the MID directive.**

CE M10

The energy meter is designed to be electrically safe and provide accurate measurements (type test certificate).

CE M10

The MID certification warrants that:

The energy meter is made to be electrically safe and provide accurate measurements (conformity certificate of the production).

In addition to active energy count, other measurements of electrical parameters are viewed on a white-backlight LCD with top-quality reading even in poor light conditions, measured currents reach high values and the meters have very compact housings. The expandability with EXM… modules allows to add many features (inputs, outputs, communications, memory).

The accuracy class 1 for energy measurements is warranted by the high-level of instrument performance.

LOVATO Electric products	Function
DME.. 	Energy meters for consumed energy count
DMG… 	Multimeters and power analyzers for consumed energy count and harmonic distortion control

Energy meters

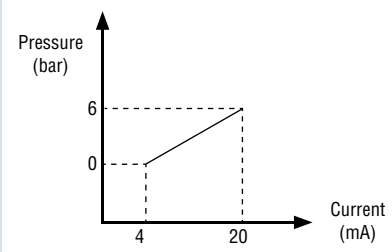
Consumption Control
of water, gas and more

The EX... expansion modules provides the DMG multimeters the capability to also measure non-electrical quantities.

LOVATO Electric products	Function
DMG... 	Multimeters and power analyzers for pulse and analog signal engineering
EX... 	Expansion modules to: • Read pulse counts (energy, water, ...) • Read analog signals (pressure, temperature, ...)

On DMG series digital multimeters, appropriate expansion modules can be installed to transpose analog signals and digital pulses coming from the field into progressive measurements for easy user reading.

Analog signals coming from traditional transducers (4-20mA, 0-10V, ...) are elaborated by applying an engineering function which identifies the value of the physical quantity corresponding to the minimum and maximum analog signal.



Digital power analyzers

Instead, digital pulses are "weighed" by associating a given quantity to each of what is being measured; for instance, a pulse from a water meter can correspond to 10m³ of liquid.

The option to add a complete description and unit of measure, using free text, to a view page, provides for an immediate interpretation of the data. This can then be recorded in a database to cross with other measurements coming from the field and thoroughly elaborate, in this way, the energy analysis of the system.

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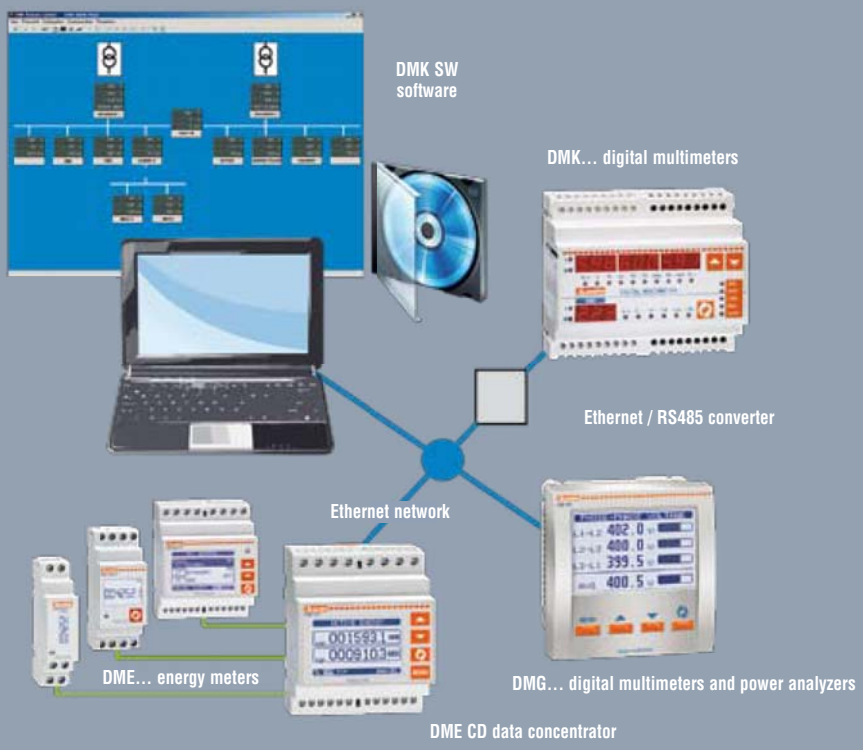
Product **Integration**

Integration with other LOVATO Electric products

The DME series energy meters can be integrated with DMK and DMG series digital multimeters because they have in common:

- Expansion modules
- Digital inputs and outputs
- Communication bus (RS485, Ethernet, USB and RS232)
- Remote control software.

In this way, a network of instruments can be installed to have available all the necessary data for a complete analysis of a power distribution system.



The DMKSW software is intended to simultaneously communicate with DMK, DMG and DME series instruments, permitting to configure a control system which best suits application requirements.

All data collection can thereby be elaborated and stored in a single database to allow a thorough post-processing analysis.

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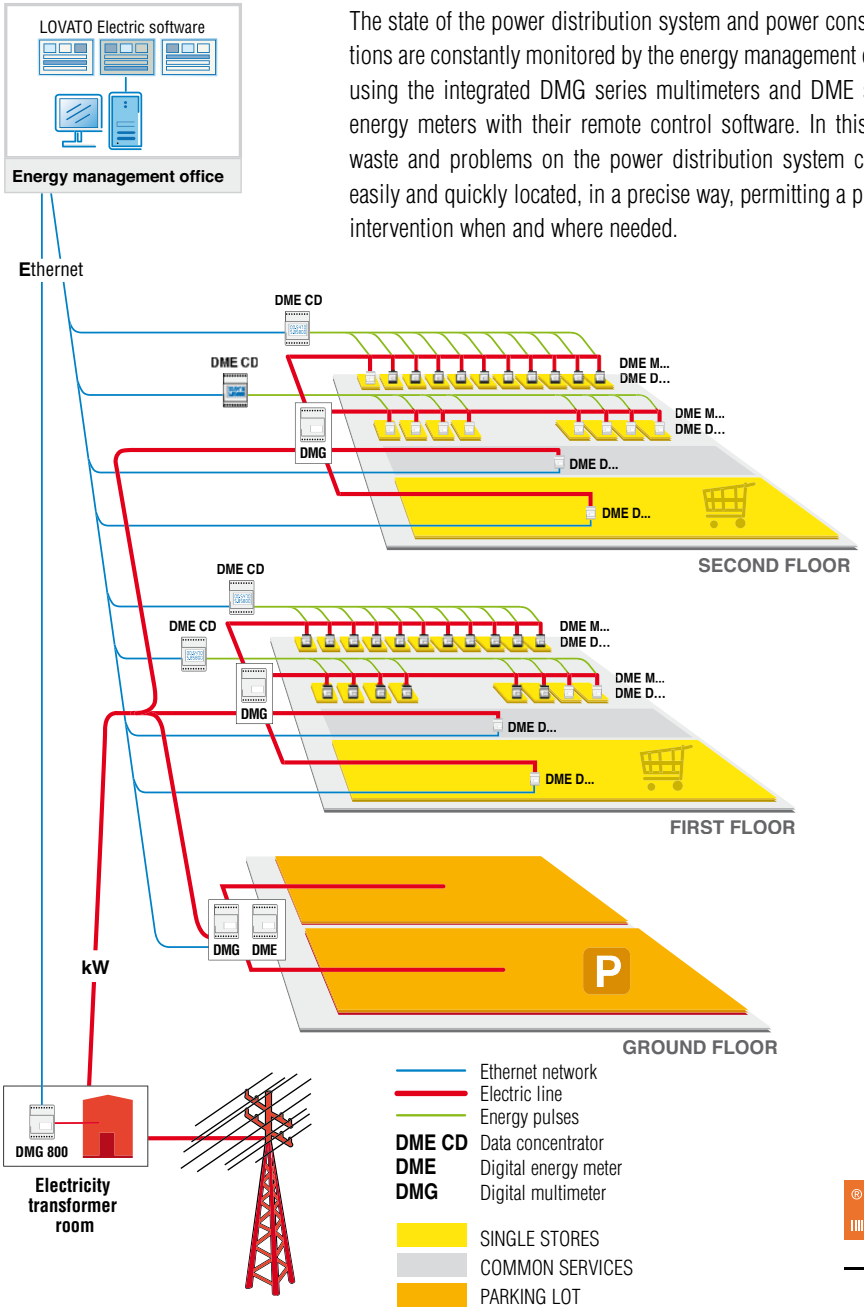
Application
shopping centre



The state of the power distribution system and power consumptions are constantly monitored by the energy management office, using the integrated DMG series multimeters and DME series energy meters with their remote control software. In this way, waste and problems on the power distribution system can be easily and quickly located, in a precise way, permitting a prompt intervention when and where needed.

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new

2010

Switch disconnectors
for photovoltaic applications

Energy meters

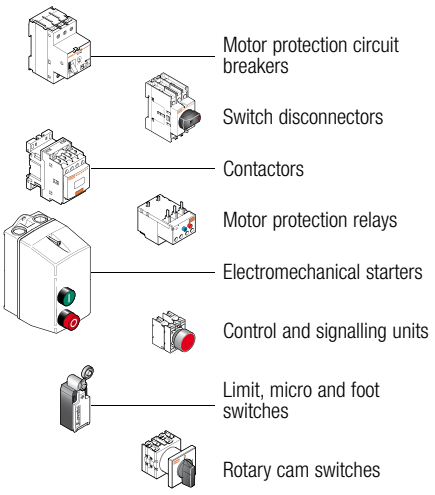
Digital multimeters and
power analyzers

AC motor drives

Automatic transfer
switch controllers

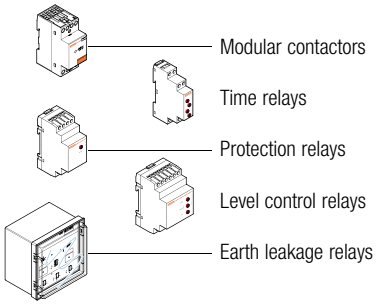
Switching power supplies

PLANET **Switch**



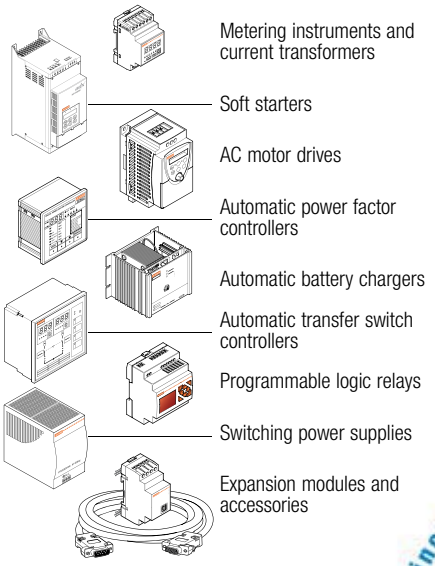
Motor protection circuit breakers
Switch disconnectors
Contactors
Motor protection relays
Electromechanical starters
Control and signalling units
Limit, micro and foot switches
Rotary cam switches

PLANET **Din**



Modular contactors
Time relays
Protection relays
Level control relays
Earth leakage relays

PLANET **Logic**



Metering instruments and current transformers
Soft starters
AC motor drives
Automatic power factor controllers
Automatic battery chargers
Automatic transfer switch controllers
Programmable logic relays
Switching power supplies
Expansion modules and accessories

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