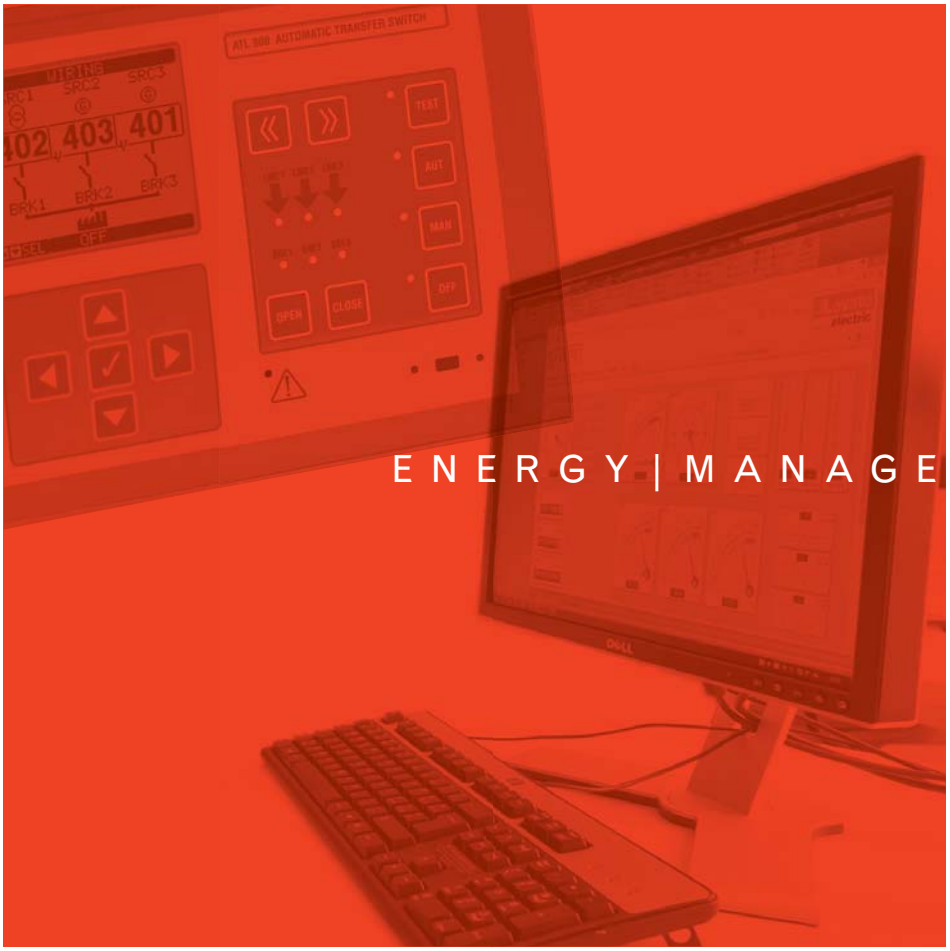

ENERGY | MANAGEMENT

PRODUCTS AND SOLUTIONS
FOR ENERGY EFFICIENCY

Lovato electric

ENERGY AND AUTOMATION

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ENERGY | MANAGEMENT

PRODUCTS AND SOLUTIONS
FOR ENERGY EFFICIENCY

CONTENTS

1.1 MONITORING AND ENERGY SAVING

Efficient energy management is essential to industry as it offers a way to reduce costs and improve sustainability. These objectives are also requirements of management standard EN ISO 50001 and technical standard EN 16247-1/2/3/4:2012, which determine how companies should monitor their energy consumption in order to improve energy performance.

In the field of **energy monitoring and energy saving**, LOVATO Electric offers to key players like energy service companies (ESCOs), energy managers, technical studios and maintenance companies a wide range of **hardware solutions** (multimeters, energy meters, variable speed drives, automatic power factor controllers, etc.) **and software** (SCADA Synergy) to monitor energy supplies like electricity, water, gas and air in a simple and economical manner. The system offered by LOVATO Electric is based on permanent monitoring and the construction of baselines as starting points for the continuous verification of a plant's energy efficiency.

The system permits the implementation of **a permanent monitoring plan** to ensure the continuous supervision of significant data, the acquisition of useful process information and the assignment of correct energy weightings to individual products and services.

For more details, visit **em.LovatoElectric.com**

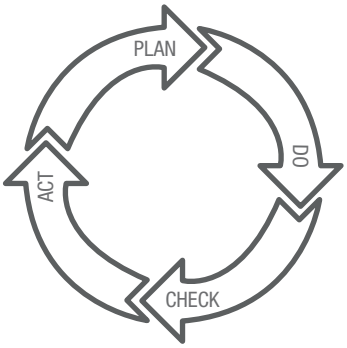
1.2 REFERENCE STANDARDS

The main objective of energy efficiency in industry is to continuously reduce energy consumption and any costs associated with it. This means improving the relationship between the services, goods and any energy, both produced or consumed to produce them (Directive 2006/32/CE).

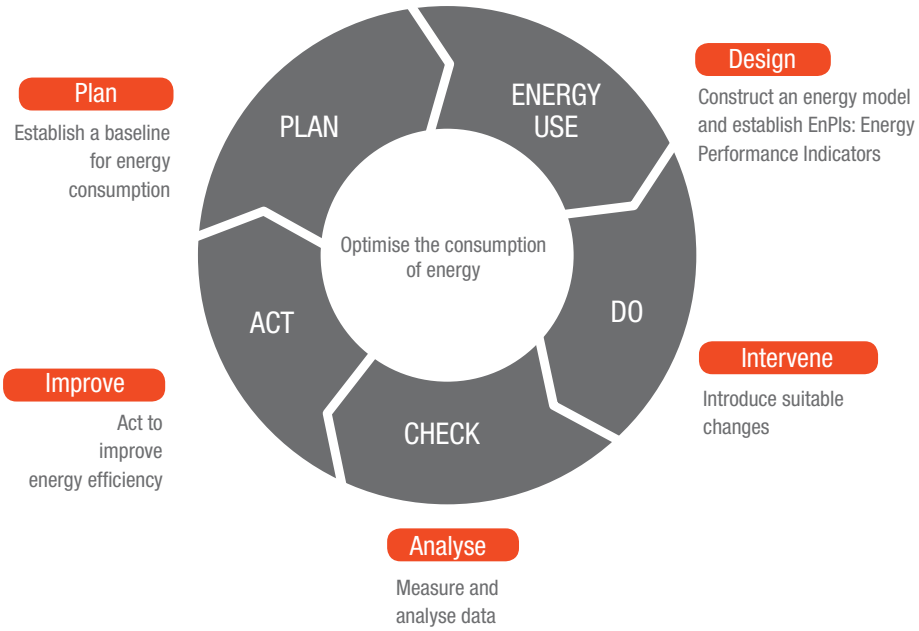
$$\text{Efficiency} = \frac{\text{services, goods and energy produced}}{\text{energy consumed}}$$

In a well-organised industrial or service organisation, energy efficiency needs to be improved in a continuous, coordinated and interactive manner. This requires a **systematic approach** involving all levels of the organisation.

The standard that provides the necessary framework is EN ISO 50001:2011 "Energy management systems - requirements with guidance for use". This standard also integrates effectively with the ISO 9001 quality and ISO 14001 environmental management systems. As with other management systems, ISO 50001 establishes different phases for planning (and measuring), implementation, verification of results, and continuous improvement actions.



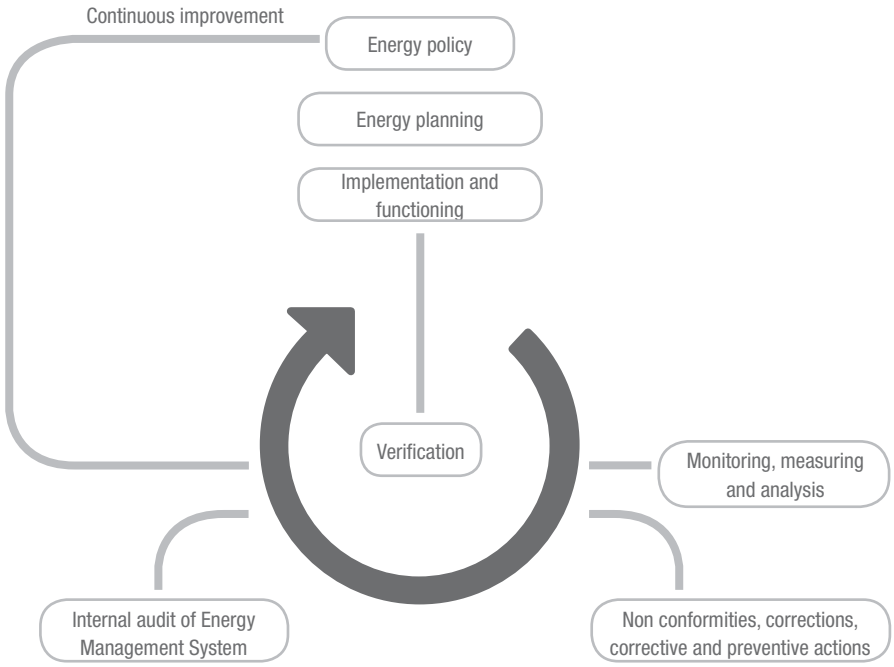
Continuous improvement



ISO 50001 standard requires the implementation of an Energy Management System as a fundamental prerequisite for remaining competitive by optimising costs and resources.

The continuous improvement of the Energy Management System described by the Plan-Do-Check-Act model (the Deming cycle) can only be effective if key energy data is constantly collected and analysed. Synergy **web-based supervision and energy management software** provides all the functionalities needed to monitor and manage electrical energy systems simply and effectively. Synergy lets you perform an accurate **review** of energy data and obtain a precise **evaluation** of your Energy Performance Indicators (EnPIs).

Model of the energy management system according to EN ISO 50001: 2011



- **Energy policy:** definition of objectives, resources, investments and planning of energy optimisation.
- **Energy planning:** the identification and implementation of activities designed to improve energy efficiency and to meet the targets set by applicable legislation.
- **Implementation and functioning:** the carrying out of improvement activities according to the planning established in the energy policy.
- **Verification:** the control of performance through continuous monitoring by a measurement and analysis system referred to the requirements of applicable legislation.
- **Monitoring, measuring and analysis:** the creation of a baseline (starting point), the identification of main loads, the definition of EnPIs (Energy Performance Indicators), and the comparison of actual and planned consumption for listed loads.
- **Non-conformities, corrective actions:** detection of failures in activities and targets and subsequent interventions to correct the activities and meet the targets concerned.
- **Internal audit of the Energy Management System:** the assessment of the organisation's energy efficiency according to European standard EN 16247-1/2/3/4.

1.3 ELEMENTS OF ENERGY EFFICIENCY

Energy efficiency = reduction of operating costs

- How much do I consume?
- Where do I consume?
- How is consumption distributed over the day?
- How is consumption distributed over cost centres?
- What type of energy do I consume?
- Is the continuity of production compromised by the quality and reliability of energy?
- What loads are most critical?
- What should I change?
- How should I change it?

Reducing the energy bill

Reducing needless consumption
Saving energy while maintaining output

Optimising consumption
Consuming when it costs less

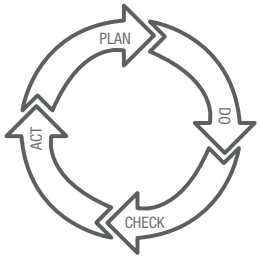
Avoiding penalties

Energy quality
Ensure a 100% supply

Monitoring and analysing is therefore the first step

Continuous monitoring

Continuous improvement



1.4 SUMMARY

The **smart management of energy resources** can be a major competitive advantage for any modern company; as it does not only permit significant savings in operating costs and also improves environmental performance.

Smart energy management requires the **thorough analysis of consumption habits** and the implementation of one-off and progressive actions to derive significant savings from targeted investments.

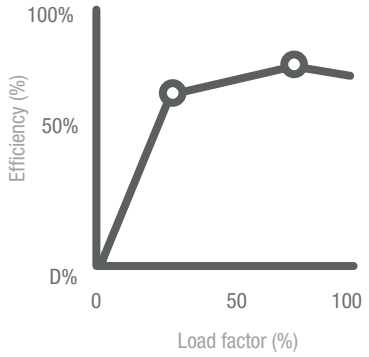
One essential aspect of this process is the **continuous monitoring** of consumption and the analysis of consumption data.
This can only be achieved by combined and **integrated software and hardware systems** tailored to meet the needs of the Energy Manager.
Such systems are also indispensable to the energy audits for large and energy-hungry enterprises by the law.

The key areas targeted by the process are:

- using no more energy than necessary
- flattening off demand
- avoiding penalties
- identifying mains supply disturbances

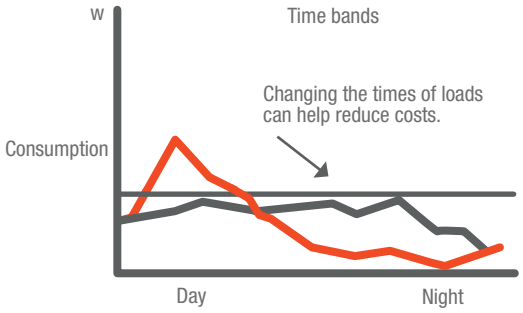
Using no more energy than necessary

In order to use no more energy than is strictly necessary, it is important to modulate the speed of motors under highly variable load conditions, check and maintain power transmission systems to reduce losses, use only high efficiency motors and lights, and ensure that motors are correctly sized for all applications (reduction of active energy).



Flattening off demand

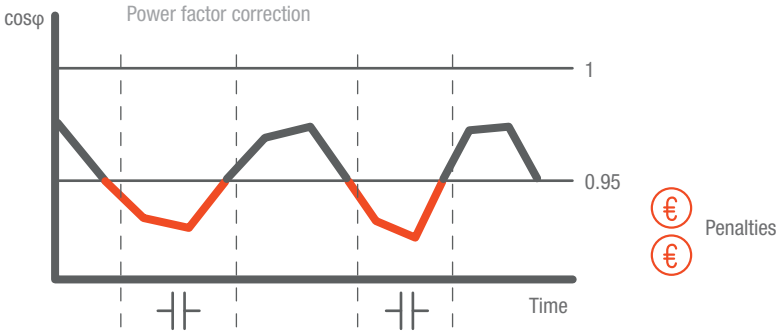
To flatten off the demand for energy, the first thing to do is identify what loads can be controlled in order to eliminate consumption peaks and the unnecessary costs associated with them (this reduces costs for available/used power calculated over a maximum average of 15 minutes, measured monthly or at other periods). Loads can also be transferred to less expensive time bands.



Coloured line = billed consumption

Avoiding penalties

Energy companies apply higher rates to users who operate at power factors under predefined levels (excess reactive energy costs). Low power factors are the result of inductive loads and/or harmonic distortion and demand specific remedies, usually in the form of power factor correction.



Identifying mains supply disturbances

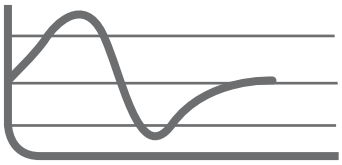
Another important step is the identification of disturbances in the mains supply that might compromise production (energy quality according to EN 50160). Voltage dips, voltage fluctuation and harmonics can cause delicate equipments to fail and halt the production process. It is therefore important to understand the conditions under which disturbances occur.

ENERGY QUALITY COUNTERS

DIPS	5
SWELLS	1
POWER DROPOUTS	8
POWER DROPOUTS > 180S	6
VOLTAGE OUT OF RANGE	1
FREQUENCY OUT OF RANGE	0

OFFICES LOG FOR WEEK 4 - 2016

WAVE FORM ANALYSERS



WAVEFORM No. 1 L1 of 28/01/16, 11:54:53

2.1 SUPERVISION AND ENERGY MANAGEMENT

The first purpose of a **monitoring system** is to collect production and consumption data for energy supplies like electricity, water, gas and air. System design starts with the identification of the measuring devices (hardware) needed to monitor key parameters and communicate with the supervision system (software).

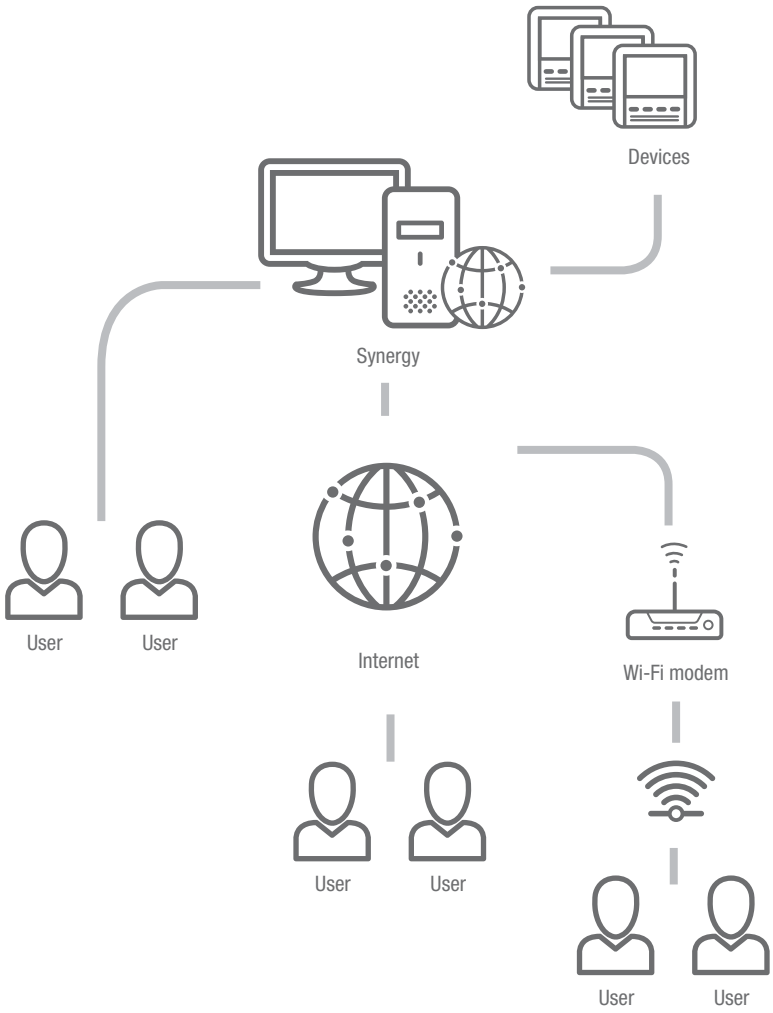
Monitoring systems can identify **key plant indicators** (energy performance indicator, EnPIs), abnormal consumption trends and targets. They can also compare performance levels and perform other functions.
To monitor and manage systems **simply and effectively,** LOVATO Electric has created Synergy web-based supervision and energy management software. Synergy software monitors electrical quantities and environmental and process data (functioning states, alarms, etc.) from LOVATO Electric devices with a communication port, controls loads and sets parameters. For more details, visit **em.LovatoElectric.com/Synergy**

Functionalities of Synergy

- Communication with all LOVATO Electric measurement and control products, via serial, Ethernet or modem ports (see detail in section 5.1)
- Consultation of instantaneous values
- Creation of custom graphic pages
- Data saving in log files
- Energy consumption reports
- Graphic display of trends
- Automatic reports for consumption periods (e.g. time bands) in analytical and graphic format
- Alarm management, local and via e-mail
- Energy quality analysis
- Field equipment parameterisation
- Access level management.

Server-multiclient system

The structure and applications of Synergy are based on an MS SQL relational database system. Synergy can be consulted through most popular browsers, and is compatible with various platforms and operating systems. These characteristics make Synergy highly versatile and simultaneously accessible to a large number of users/workstations via intranets, VPNs or the Internet.



Simple, guided, intuitive configuration

Using Synergy does not require any particular computer expertise since specific tools are provided to guide users through the configuration of device networks, graphic pages, data log reports and charts in a simple and intuitive way.

Interfaceable products

An up-to-date list of LOVATO Electric products that can interface with Synergy software is available at: **em.LovatoElectric.com/Synergy**

Code	Description
DME	Energy meters
DMG	Measuring instruments
RGK	Engine and generator controllers
ATL	Automatic transfer switch controllers
DCR	Automatic power factor controllers
LRD	Micro PLCs
VF/VL/VE	Variable speed drives
ADX	Soft starters
PMVF	Interface protection system (IPS)

System requirements

Operating systems and supported browsers

- Windows 7, Windows 8.1 Pro, Windows 10 Pro, Windows Server 2008R2 std., Windows Server 2012 (R2) std.
- 32bit or 64bit. Server systems must have framework .NET 3.5 active
- MS IExplorer, Google Chrome, Mozilla FireFox (latest versions of the browsers are highly recommended).

PC/Server hardware requirements

- Dual core CPU, 2 GHz
- 4GB RAM
- 60GB hard disk (disk size depends on the volume of data to be stored)
- SVGA 1024x768, colore 16bit
- RJ45 LAN Ethernet card
- Communication ports of an adequate type and number: Ethernet, RS485 serial, RS232 serial or modem.

Synergy is an application based on services (SQL and web), therefore it is not recommended the usage of laptops due to limited hardware and software performances.

2.2 CONFIGURATION

The programming of Synergy is simple, intuitive and guided by dedicated tools. The configuration of device networks, graphic pages, data logs, trend charts and customised reports does not require any particular expertise in information technology.

Languages

Synergy comes with a number of **pre-installed languages**: English, Italian, Spanish, French, Polish and Russian. Other languages can be added to meet specific needs. For an up-to-date list of available languages, go to: **em.LovatoElectric.com/Synergy**

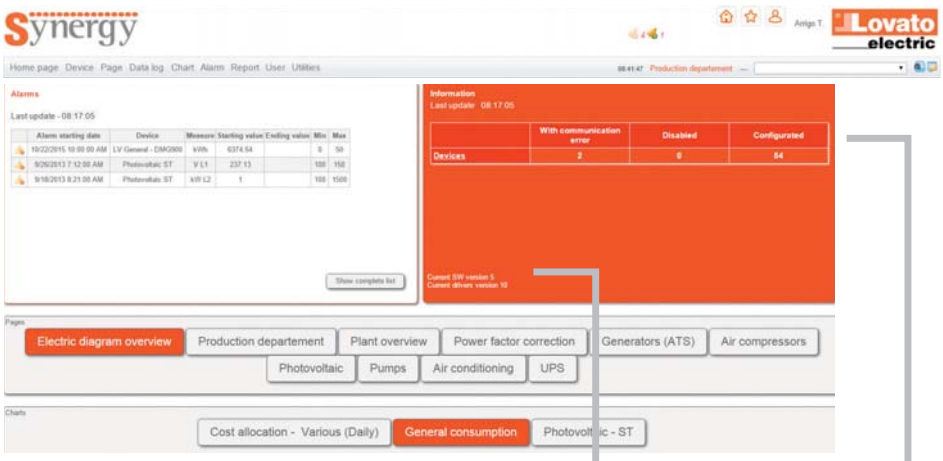
Access levels

Synergy permits access by a large number of users at **three different privilege levels**:

Administrator	Super users	Users
complete access to all functionalities	viewing of field devices defined by the administrator, the creation/modification of graphic pages and reports, and the export and editing of device parameters	viewing of field devices and device pages defined by the administrator

Home page of Synergy

The Synergy home page summarises key diagnostic information and permits immediate verification of the state of the system.



List of last 10 alarms

Links to favourite graphic pages

Links to favourite trend charts

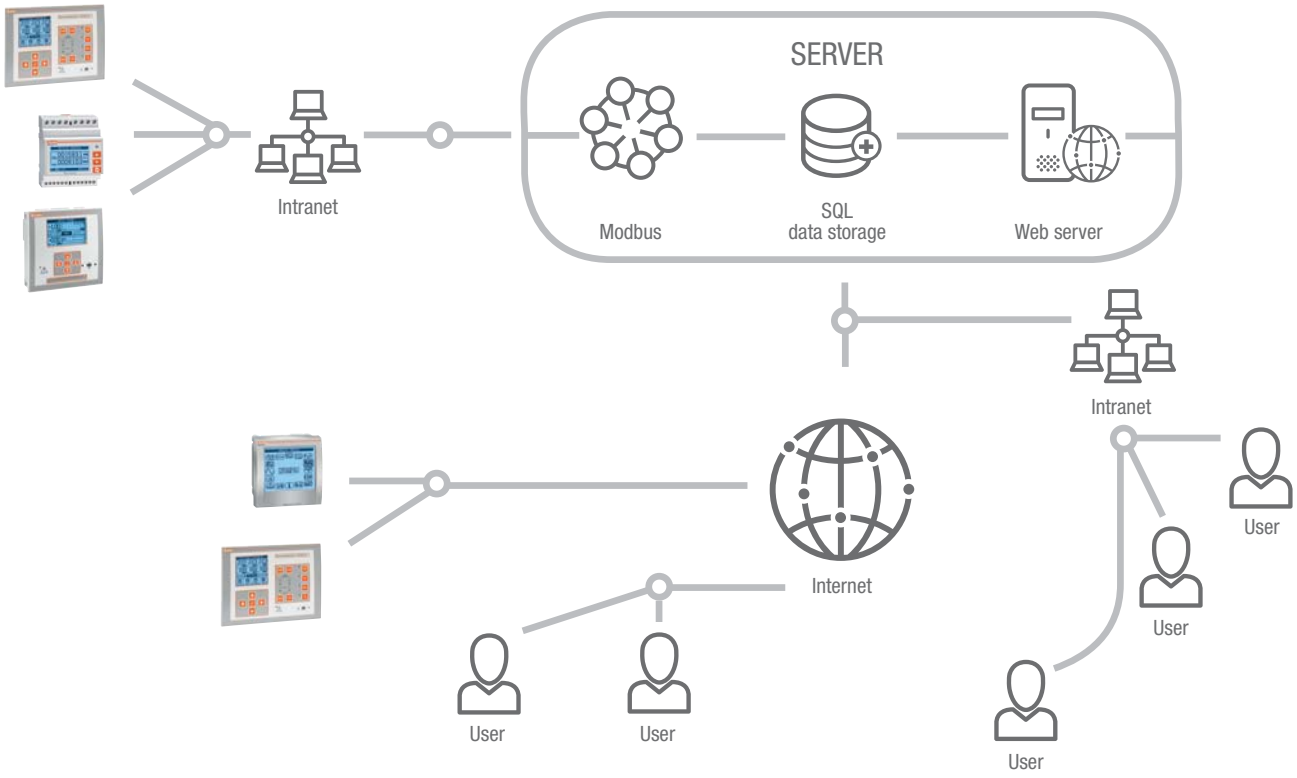
Software and driver versions

Summary of states of communication channels and devices

Communication networks and channels

Synergy interfaces only with LOVATO Electric products. The software is able to simultaneously manage **various communication channels** (different TCP/IP addresses, RS232, RS485 and Ethernet communication ports), each **independently configured** (e.g. for protocol and speed). In addition to physical connections in cabled networks, Synergy can also connect to analog and GSM/GPRS modems.

Modbus RTU, Modbus ASCII and Modbus TCP/IP protocols are all available.
LOVATO Electric products connected directly to an Ethernet network can also work with dynamic TCP/IP addresses, permitting the use of a single static IP address for the server.



Management of interfaced products

A summary of key data from monitored products is provided in the **control menu**. A simple indicator also shows whether the devices are communicating correctly and the time of the last data acquisition by the system.

To optimise data traffic on communication networks, Synergy cyclically acquires only the data needed for the selected data logs and whatever additional data is required by the active graphic page. The menu allows users to **edit the internal parameters** of the various products, save them to hard disk and re-load them in order to duplicate the same configuration on other devices.

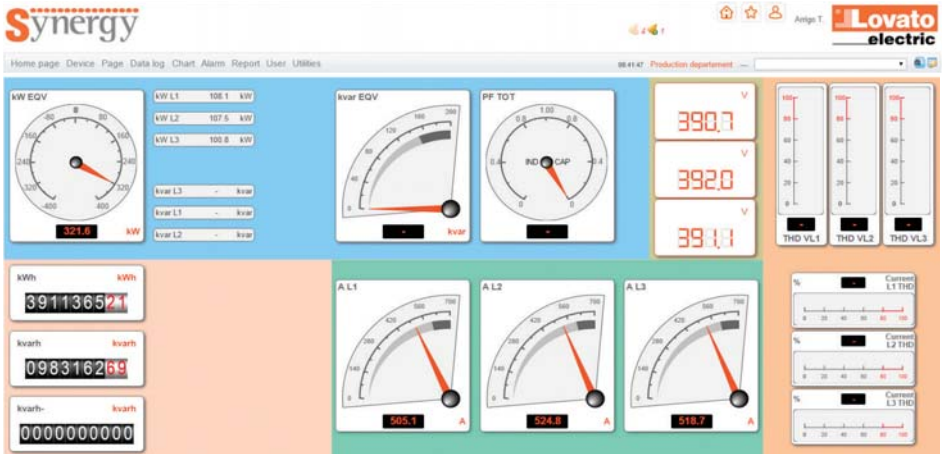
2.3 INTERFACE

Synergy permits the creation of an unlimited number of pages to **monitor the system in real time**. Static images and dynamic objects of various types can easily be added to create graphic pages with system overviews and detailed synoptic and/or topographic representations of the electrical network. Buttons are available to send commands to field systems (provided suitable actuators are in place) and to navigate between pages.

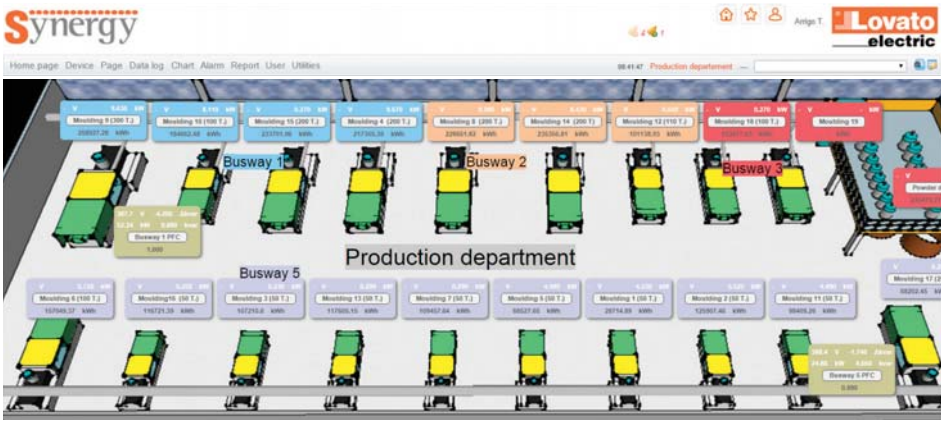
The dynamic objects available are:

- 90° and 270° analog instrument
- digital instrument
- digital instrument with vertical or horizontal bar charts
- 10-digit counter
- simple label or label with dynamic image
- standard or reduced multi-measurement panel
- dedicated panel for power factor controllers
- dedicated panel for generating sets
- single measurement trend chart
- harmonics chart
- control and/or page navigation buttons.

Generic multimeter

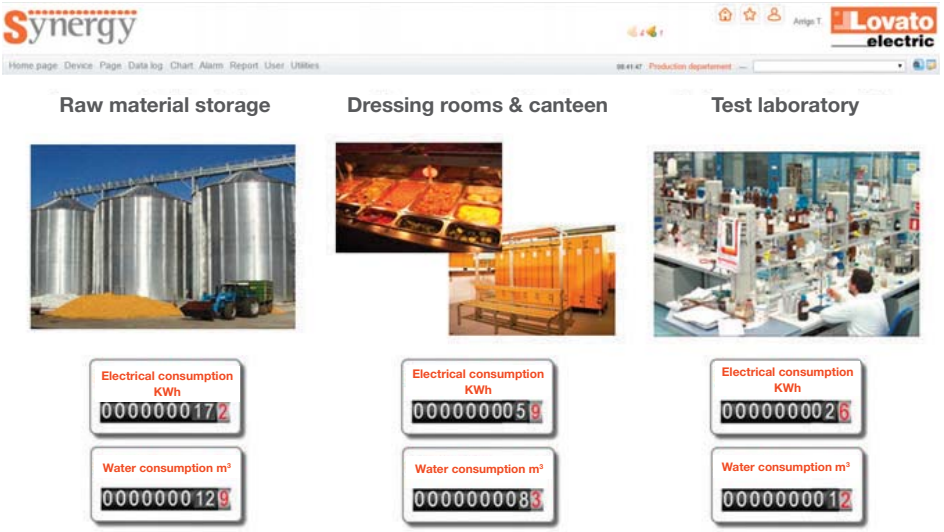


Production department

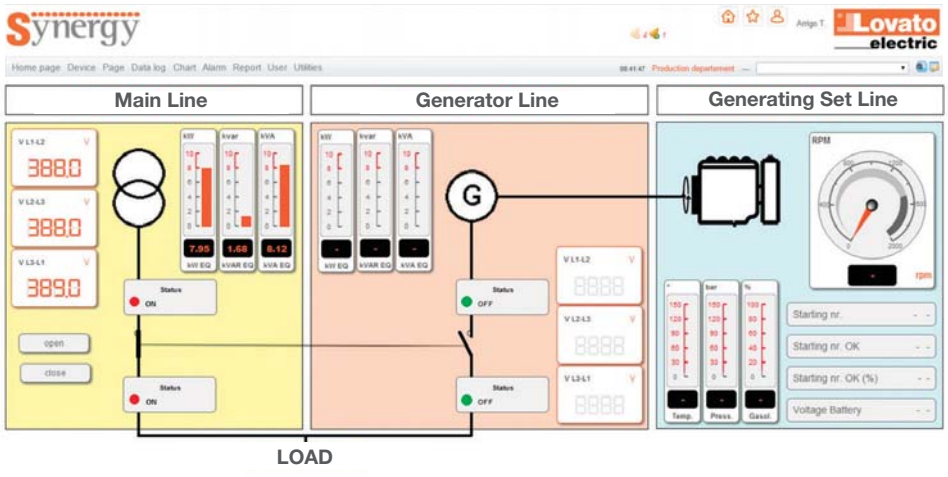


Single line layout of an electrical system

Electrical/water consumption in a food processing company



Mains/generating set switching system



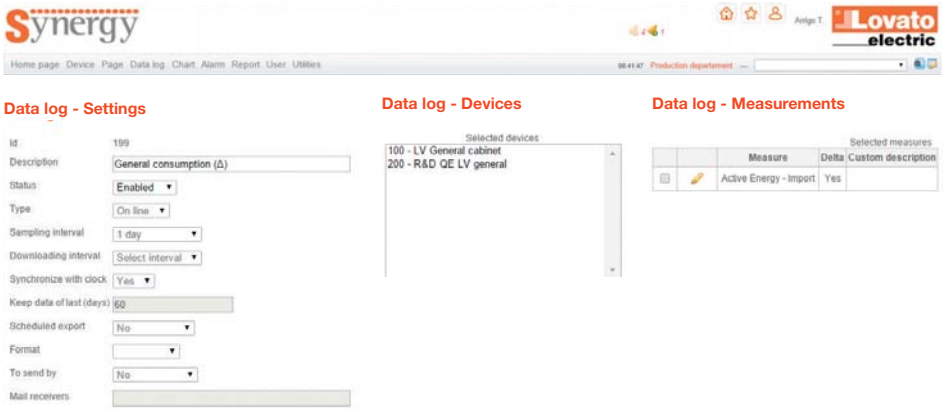
Data logs

Synergy lets you save data from field devices into **an unlimited number of data logs**, each fully configurable and customisable. Data can be grouped by power line, by department/area or by sampling time (e.g. values for electricity or gas consumption every 60 minutes, mean active power every 15 minutes, active power and current every 10 seconds). The measurements read from devices can also be used to create virtual meters with fields designed to show information that is not readily available from the system (e.g. total consumption for an area or the actual cost of consumption).

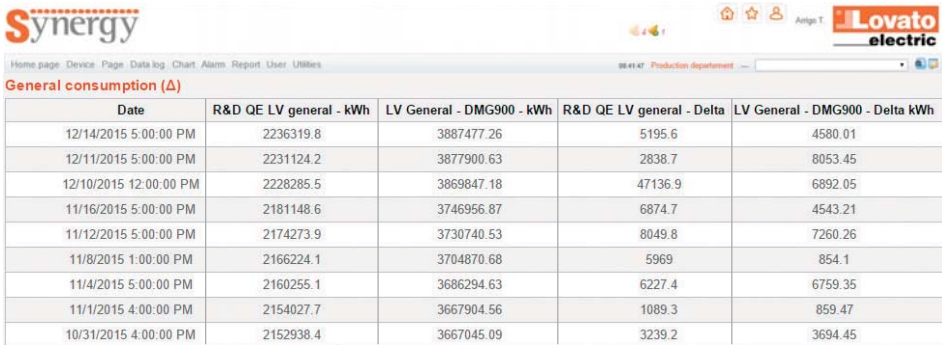
Logs can be exported manually at any time in standard Excel or text format. Alternatively, automatic exports can be scheduled at custom intervals (daily, weekly or monthly) and saved to a hard disk or sent via e-mail/FTP.

If the communication network is not fully reliable, **off-line data logs** can be used on devices equipped with memory expansion modules (EXM10 30 or EXP10 30) to save data directly. This is particularly useful to monitor critical loads that demand continuous data recording. Synergy automatically recovers information from these memory modules to update its internal logs.

Data log - Settings



Data log - Records



Date	R&D QE LV general - kWh	LV General - DMG900 - kWh	R&D QE LV general - Delta	LV General - DMG900 - Delta kWh
12/14/2015 5:00:00 PM	2236319.8	3887477.26	5195.6	4580.01
12/11/2015 5:00:00 PM	2231124.2	3877900.63	2838.7	8053.45
12/10/2015 12:00:00 PM	2228285.5	3869847.18	47136.9	6892.05
11/16/2015 5:00:00 PM	2181148.6	3746956.87	6874.7	4543.21
11/12/2015 5:00:00 PM	2174273.9	3730740.53	8049.8	7260.26
11/8/2015 1:00:00 PM	2166224.1	3704870.68	5969	854.1
11/4/2015 5:00:00 PM	2160255.1	3686294.63	6227.4	6759.35
11/1/2015 4:00:00 PM	2154027.7	3667904.56	1089.3	859.47
10/31/2015 4:00:00 PM	2152938.4	3667045.09	3239.2	3694.45

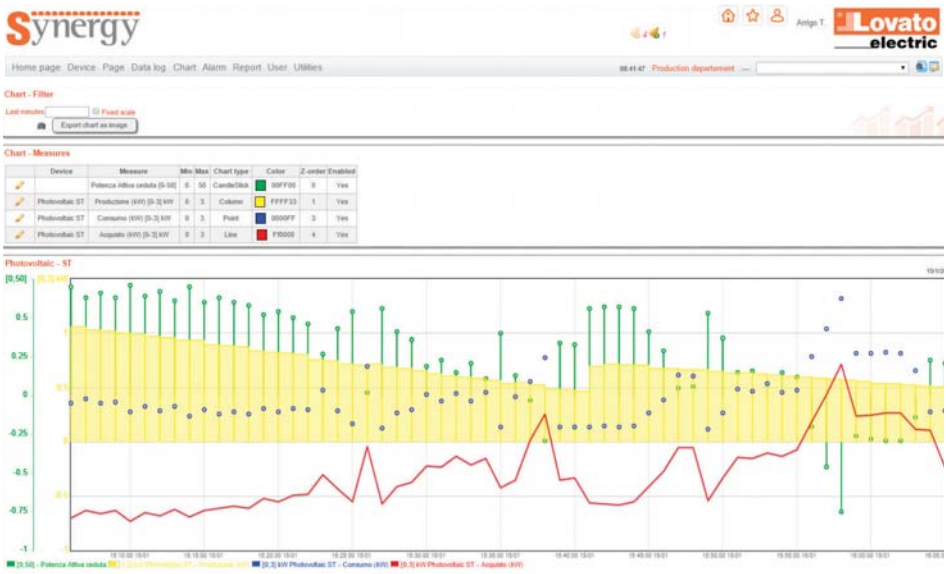
Trend charts

Data saved to logs can also be displayed in graphic form.

Line chart

Chart period, chart type (lines, bars, dots, candle sticks), colours and scale can be changed quickly and easily. Attractive charts can be created to suit specific analysis requirements.

Multi-functional chart



Alarms

Each quantity recorded in a data log can be associated with **one or more alarms**. An upper and lower limit, a reference calendar (for enabling/disabling), display in trend charts and automatic e-mail notification options can also be set.

If alarm limits are exceeded, Synergy records the anomaly and flags it up in the header. The home page lists the last 10 alarms, while the alarm menu permits the display of detailed information, alarm acknowledgement and alarm log consultation.

Active alarms

Last update - 08:17:05

	Alarm starting date	Device	Measure	Starting value	Ending value	Min	Max
	10/22/2015 10:00:00 AM	LV General - DMG900	kWh	6374.54		0	50
	9/26/2013 7:12:00 AM	Photovoltaic ST	V L1	237.13		100	150
	9/18/2013 8:21:00 AM	Photovoltaic ST	kW L2	1		100	1500

Reports

Reports let you **process data** from logs and highlight significant values for all measured quantities (minimum, average, maximum and differential values) and for predetermined time bands (hours, days and months).
To display information in a more intuitive manner, you can also display reports **graphically** as pie charts or bar charts. For each chart you can also generate **automatic reports** for every day of the week or every month of the year, **and export them** manually or automatically at customisable intervals in standard Excel or text format, save them to hard disk or send them by e-mail/FTP.

Time bands

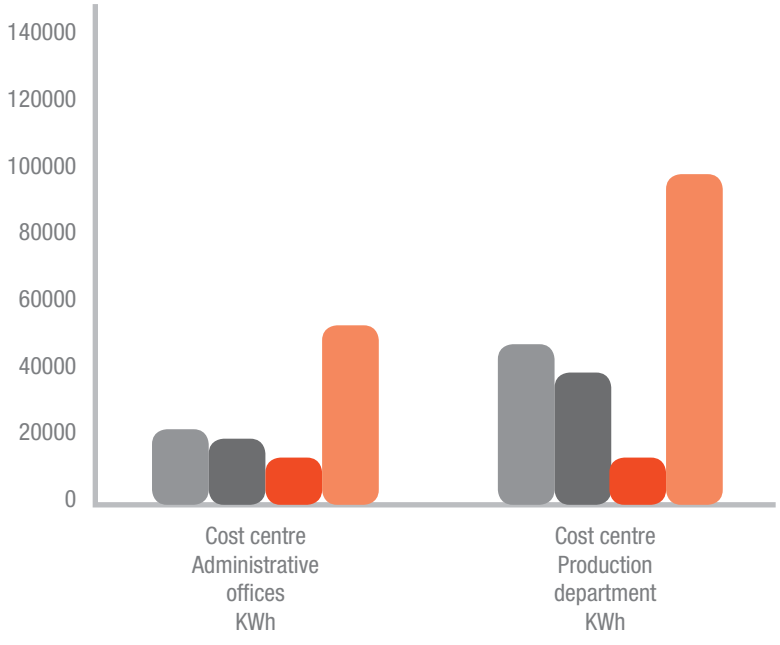
Tariff bands	Days	Hours
F1	Monday to Friday	8:00 - 19:00
F2 Week day	Monday to Friday	0:00 - 8:00 and 19:00 - 24:00
F2 Holiday	Saturday and Sunday	0:00 - 24:00

Data reports

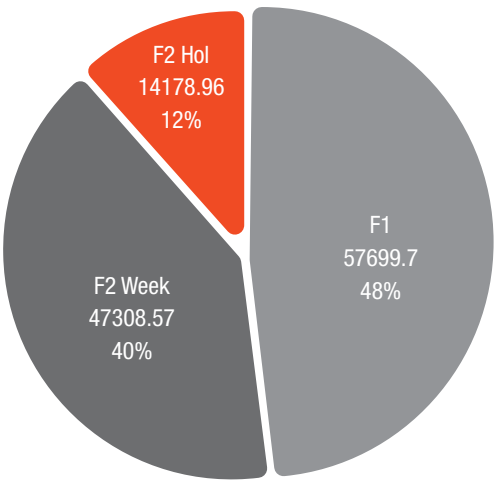
General consumption (time ranges) From 10/1/2015 To 12/31/2015 — 12/18/2015 1:50:42 PM

Data log-Device-Measure	F1 (L-V 8-20)	F2 lav (L-V 0-8 / 20-24)	F2 fest (S-D)	Total
General consumption (Δ)-R&D QE LV general-kWh	38474.7	37747.74	27588.26	103810.7
General consumption (Δ)-LV General - DMG900-kWh	137743.57	132242.39	38795.18	308781.14
Total	176218.27	169990.13	66383.44	

Bar chart



Cost centre - Production department - kWh
27/07/2015 15:28:00



2.4 LICENCES

To use Synergy , simply order the **installation software** (which also lets you enable one LOVATO Electric device) and whatever additional licences you need, according to the number of devices that you wish to monitor.

Additional licences can also be added as needed at a later date. In this way the monitored system can be expanded over time, satisfying both present and future needs.

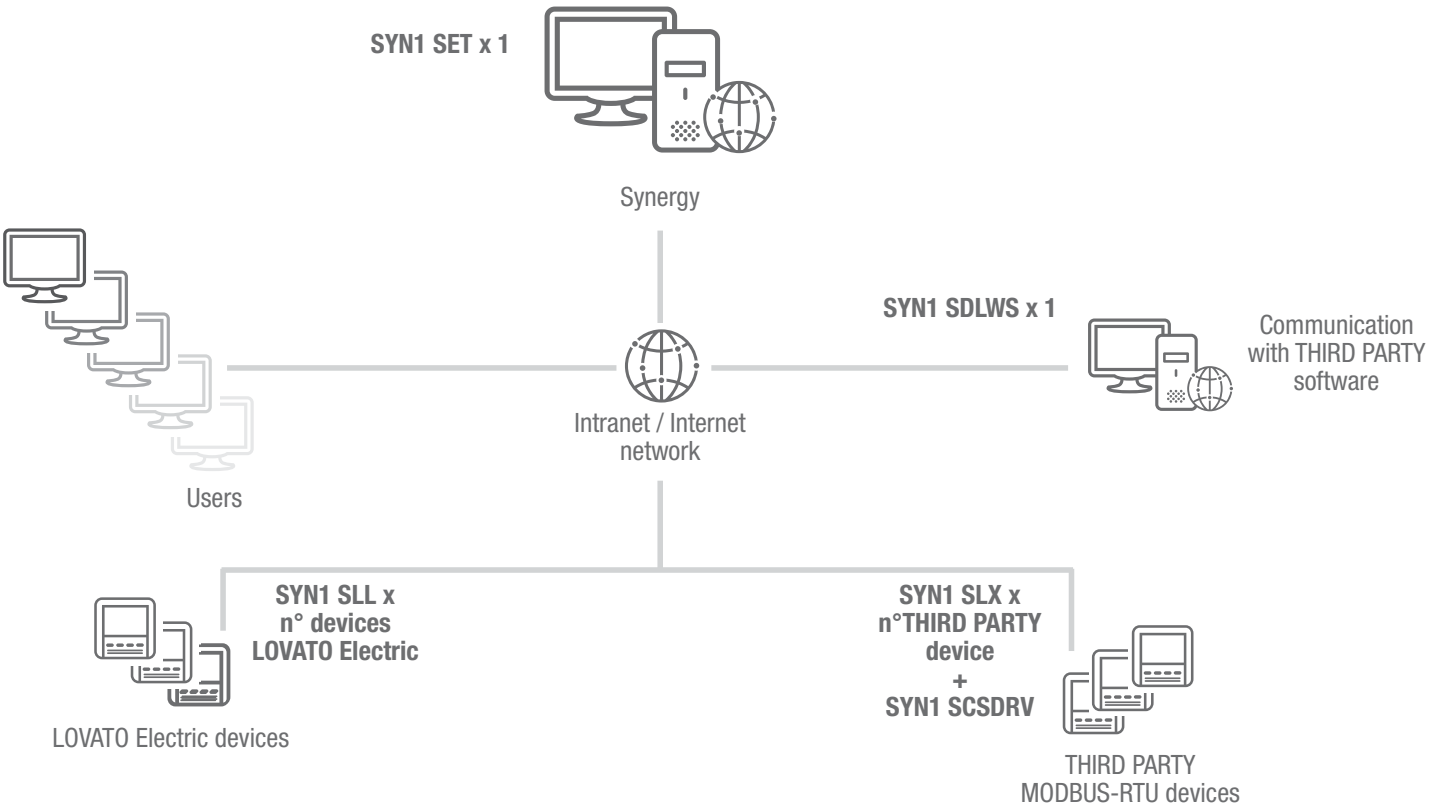
Supervision software

Synergy

Licences for enabling other devices

Licenza

Order code	Description	Details
SYN1 SET	Supervision and energy management software	Installation on PC with server function and Windows operating system. Customization, measurement, monitoring and control via web by sending e-mail notifications or FTP file. Monitoring of one LOVATO Electric device included. Permanent licence purchasing
SYN1 SLL	SYNERGY licence for LOVATO Electric device	Monitoring function for each LOVATO Electric device equipped by MODBUS-RTU communication port. Permanent licence for single device
SYN1 SLX	SYNERGY licence for THIRD PARTY devices	Monitoring function for each THIRD PARTY device equipped by MODBUS-RTU communication port. Permanent licence for single device
SYN1 SDLWS	Licence to access to SYNERGY database	Access function by WEB API to SYNERGY MS SQL database by THIRD PARTY software. Permanent licence for single device
SYN1 SLM	Licence to access to SYNERGY updates	Access to SYNERGY updates (e.g. compliant with new operating systems and new SYNERGY features for each LOVATO Electric or THIRD PARTY devices)



3.1 "READY TO USE" ENERGY MANAGEMENT

Synergy cloud

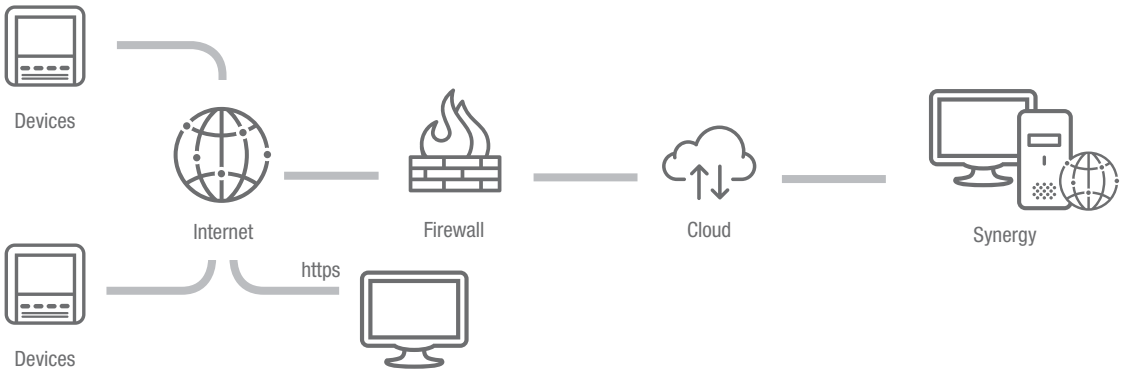
The Synergy cloud solution is specially designed to make the Synergy software functions described above accessible via PC or tablet from the **cloud.LovatoElectric.com** Internet portal.
With Synergy cloud, you can check data for measured energy quantities and view the states of LOVATO Electric measurement and/or control devices **without installing the software** and without a physical server. This saves on server purchasing, configuration and maintenance costs and eliminates commissioning times and expenses too.

The cloud portal **is extremely simple and self-configuring** and meets the measurement requirements of most energy managers. Various sampling scenarios were identified in the development process, and can be assigned to individual devices in the way most appropriate to the needs of the user.
For more details on LOVATO Electric products that can be monitored along with possible scenarios assigned during registration, please consult the product guide section of the **cloud.LovatoElectric.com** website.

Field devices communicate with the cloud server using Modbus protocol rules. A Master Modbus is set up in the cloud to collect data from the field devices (slave Modbus). Field devices are configured as clients to the server and therefore do not require a public static IP address, only I/O access to the Internet.

Security

Data security is guaranteed by **HTTPS encryption** with certification between server and client PC, by daily **backups** of collected data and by **a latest generation firewall** for server access.



Characteristics

The main characteristics of Synergy cloud are:

- Extremely intuitive interface: no specialist technical background required
- Data access from anywhere in the world via the Internet and common browsers
- Specially designed to match users' requirements (selection of measurement scenarios)
- Low data traffic thanks to the excellent economy of the protocol used (Modbus)
- Instantaneous data acquisition from various devices, even located in different sites
- Simple and clear reporting of all energy data
- No investment in software, databases or servers
- High data security thanks to HTTPS and daily backups
- Automatic updates included
- Limited subscription cost.

3.2 SUBSCRIPTIONS

A range of monitoring scenarios are available for each connected device. These scenarios define the values monitored and the type of information generated (device web pages, on-line measurements, data logs, charts, reports, etc.).
The user is free to modify the default measurement scenarios, web pages, data logs and reports. The user can also create sub-users and assign specific access privileges to them.
The skills needed to manage the system can be acquired by downloading the tutorial from the video section of **em.LovatoElectric.com** and/or by following the free courses at LOVATO Electric.

Whatever scenario is selected, provided the default configuration is maintained, energy efficiency data is kept on line for at least a year and measurement data (e.g. V, I, PF, kW) for at least two months. The automatic monthly export function allows collected data to be sent by e-mail for archiving. To view the options offered by the various scenarios, visit **cloud.LovatoElectric.com.**

Synergy Cloud meets basic requirements by providing a preconfigured product that allows users to view and collect data, and also meets more complex requirements involving the complex customisation of data processing functions, graphic interfaces, creation of sub-users, etc.

Annual subscriptions available (365 days)

Licence

Order code	Description	Details
SYN1 CLL	SYNERGY Cloud licence LOVATO Electric device	Enabling of supervision function for each LOVATO Electric device equipped with MODBUS-RTU communication port. Annual subscription license (365 days) for each device
SYN1 CLX	SYNERGY Cloud licence THIRD-PARTY device	Enabling of supervision function for each THIRD-PARTY device equipped with MODBUS-RTU communication port. Annual subscription license (365 days) for each device
SYN1 SDLWS	License to access the SYNERGY database	Enabling of WEB API access to Synergy's MS SQL database by third-party software. Annual subscription license (365 days) for each device

4.1 SERVICES OFFERED Synergy AND Synergy cloud

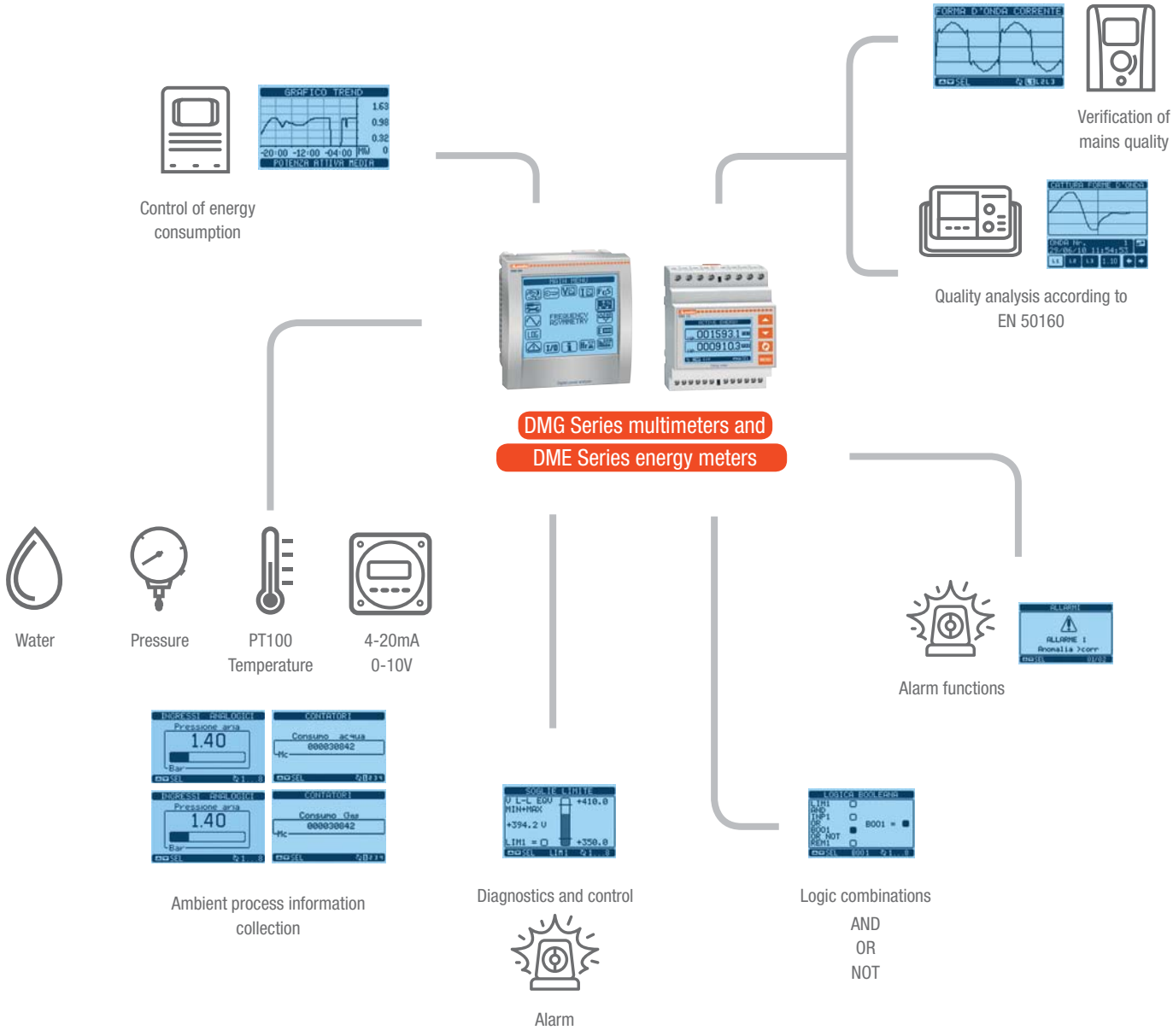
SYN1 SCS00	SYNERGY Technical Support	SYNERGY support based on customer needs. Cost per hour
SYN1 SCS11	SYNERGY commissioning at the customer's premises	SYNERGY support on site including: – verification of device configuration – verification of communication between SYNERGY and the devices – SYNERGY configuration based on customer needs – costs of travel, board and lodging and assessment of the hours of work needed for the activities described above. Cost per intervention
SYN1 SCSDRV	SYNERGY driver development for THIRD-PARTY devices	SYNERGY support for the development of the THIRD-PARTY driver for dialogue between SYNERGY and THIRD-PARTY devices for up to 5 measures, subject to feasibility check by LOVATO Electric Technical Support. Cost per driver
SYN1 TRAINING	Course for use of SYNERGY	Introduction to energy management. Measuring devices: range and selection criteria with description of a case. Key features of SYNERGY monitoring and supervision software: architecture and access, channels, tools, charts, data logs, pages and users. Practical exercises. For more details visit the EVENTS section on the portal **www.LovatoElectric.com**. Cost to be agreed at the offer stage

5.1 ACQUISITION OF CONSUMPTION DATA

The acquisition of energy consumption data from the field is key to obtain the correct and accurate information necessary to identify potential energy savings.
With this in mind, LOVATO Electric offers a **complete range of measuring instruments** and **energy meters** for modular or panel installation, single or three phase applications, networked or stand-alone configurations.

Some devices **can also be expanded** to acquire digital or analog signals from the field in order to monitor different energy supplies.

Measuring devices can be combined flexibly to meet the needs of any system. To complete the package, LOVATO Electric offers a range of standard and precision type, solid core and split core current transformers. For special needs, consult the catalogue or the **www.LovatoElectric.com** website, where detailed information on all of our products is available.



5.2 SUMMARY TABLES

MODULAR

ELECTRICAL PULSE NETWORK

DME CD

DME D110 T1

DME D300 T2

DME D310 T2

INSTALLATION				
Type	Data concentrator pulse counter	Energy meter	Energy meter	Energy meter
Connection		Single phase	Three phase	Three phase and single phase
Switching		direct 40 A	direct 63 A	TA
INTEGRATED INTERFACES				
RS485	•	-	-	-
Static digital outputs	-	1	2	2
Digital inputs	8 (expandable to 14)	-	1	1
COMMUNICATION EXPANSIONS				
RS 485	Integrated	-	-	EXM10 12
Ethernet	EXM10 13	-	-	EXM10 13
RS485 Gateway / 3G Modem	EXM M3G 01	-	-	EXM M3G 01
INPUT/OUTPUT EXPANSIONS				
2 digital inputs + 2 static outputs	EXM10 00	-	-	EXM10 00
2 digital inputs + 2 5A/250VAC outputs	EXM10 01	-	-	EXM10 01
4 digital inputs + 2 5A/250VAC outputs	EXM10 02	-	-	-
SPECIAL EXPANSIONS				
Data loggers	EXM10 30	-	-	EXM10 30
OTHER CHARACTERISTICS				
Gateway function[1]	•	-	-	-
THD measurement	-	-	-	-
Analysis of harmonics	-	-	-	-
Programmable alarms	-	•	•	•
Energy counting	-	•	•	•
Hour counter	-	•	•	•
SPECIAL VERSIONS	-	MID	- MID - UTF	- MID - UTF with TA up to 3,000A

Notes

1 Gateway function: converts signals from an RS485 network to Ethernet (maximum 10 concatenated devices)

N.B. For an up-to-date list of expansion modules, visit www.lovatoeletric.com

MODULAR
RS485 - ETHERNET NETWORK




	DME D121	DME D330	DMG 210	DMG 300
INSTALLATION				
Type	Energy meter	Energy[2] meter	Multimeter	Multimeter
Connection	Single phase	Three + single phase	Three + single phase	Three + single phase
Switching	direct 63A	TA	TA	TA
INTEGRATED INTERFACES				
RS485	•	•	•	-
Static digital outputs	-	-	-	-
Digital inputs	-	-	-	-
COMMUNICATION EXPANSIONS				
RS485	Integrated	Integrated	Integrated	EXM10 12
Ethernet	-	-	-	EXM10 13
GSM/GPRS	-	-	-	-
RS485 Gateway / 3G Modem	EXC M3G 01	EXC M3G 01	EXC M3G 01	EXC M3G 01
ADDITIONAL INPUTS/OUTPUTS				
2 digital inputs + 2 static outputs	-	-	-	EXM10 00
2 digital inputs + 2 5A/250VAC outputs	-	-	-	EXM10 01
4 digital inputs + 2 5A/250VAC outputs	-	-	-	EXM10 02
2 analog inputs	-	-	-	-
SPECIAL EXPANSIONS				
Data loggers	-	-	-	EXM10 30
Energy quality (EN50160)	-	-	-	-
OTHER CHARACTERISTICS				
Gateway function[1]	-	-	-	•
THD measurement	-	-	•	•
Analysis of harmonics	-	-	-	2..31°
Programmable alarms	-	-	-	•
Energy counting	•	Three + single phase[2]	•	•
Hour counter	•	Three + single phase[2]	•	•

Notes

1 Gateway function: converts signals from an RS485 network to Ethernet (maximum 10 concatenated devices)

2 DME D330: three single phase loads can be monitored separately, with energy and hour counts per phase

N.B. For an up-to-date list of expansion modules, visit www.lovatoeletric.com

RECESSED 96X96mm
RS485 - ETHERNET NETWORK



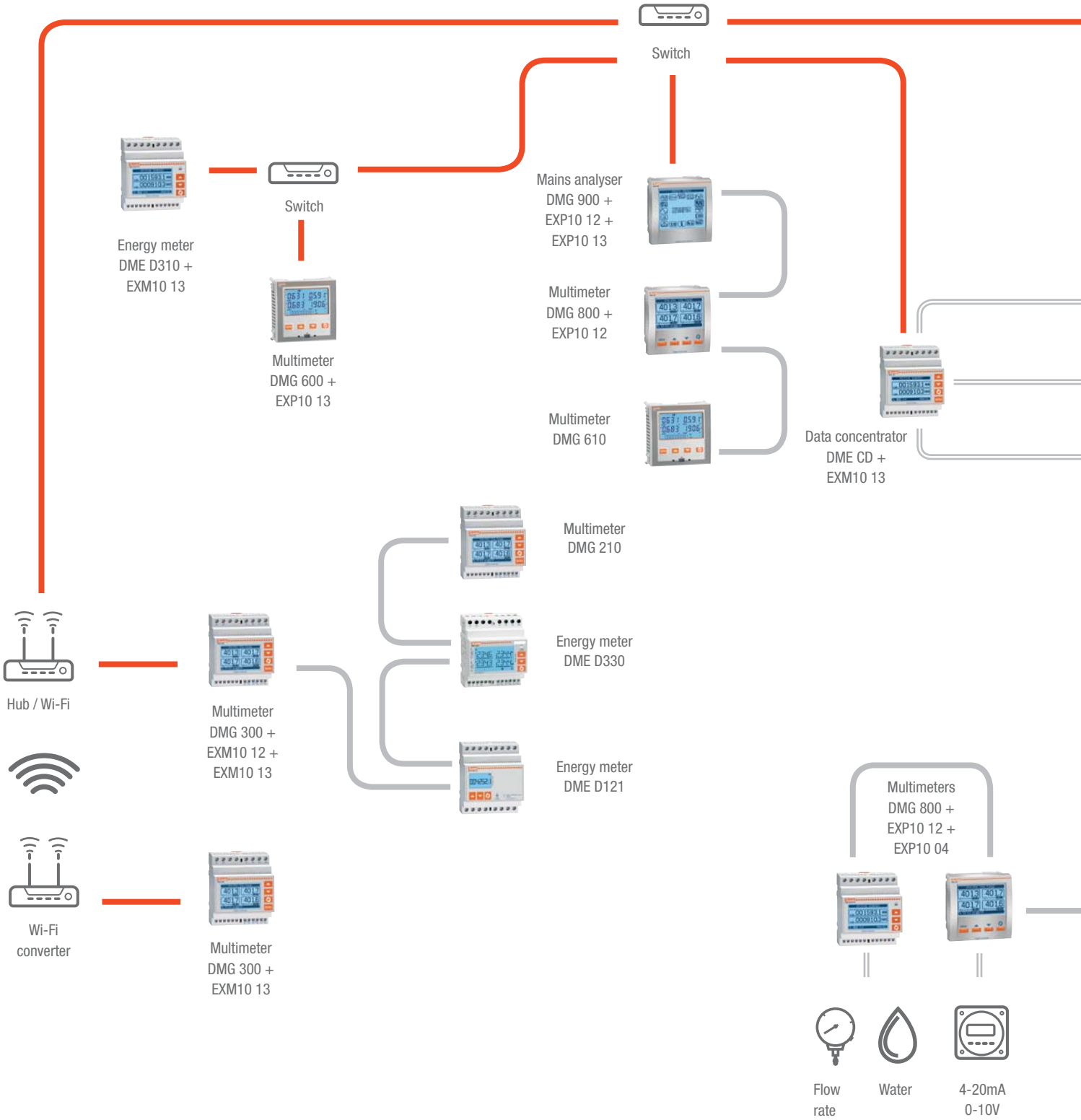

	DMG 600	DMG 610	DMG 800	DMG 900
INSTALLATION				
Type	Multimeter	Multimeter	Multimeter	Multimeter
Connection	Three + single phase	Three + single phase	Three + single phase	Three + single phase
Switching	TA	TA	TA	TA
INTEGRATED INTERFACES				
RS485	-	•	-	-
Static digital outputs	-	-	-	-
Digital inputs	-	-	-	-
COMMUNICATION EXPANSIONS				
RS 485	EXP10 12	EXP10 12	EXP10 12	EXP10 12
Ethernet	EXP10 13	EXP10 13	EXP10 13	EXP10 13
GSM/GPRS	-	-	-	EXP10 15
RS485 Gateway / 3G Modem	EXM M3G01	EXM M3G01	EXM M3G01	EXM M3G01
ADDITIONAL INPUTS/OUTPUTS				
4 static inputs	EXP10 00	EXP10 00	EXP10 00	EXP10 00
+ 4 static outputs	EXP10 01	EXP10 01	EXP10 01	EXP10 01
2 digital inputs + 2 5A/250VAC outputs	EXP10 02	EXP10 02	EXP10 02	EXP10 02
2 5A/250VAC outputs	EXP10 03	EXP10 03	EXP10 03	EXP10 03
2 analog inputs	-	-	EXP10 04	EXP10 04
2 analog outputs	-	-	EXP10 05	EXP10 05
SPECIAL EXPANSIONS				
Data loggers	-	-	EXP10 30	EXP10 30
Energy quality (EN 50160)	-	-	-	EXP10 31
OTHER CHARACTERISTICS				
Gateway function[1]	-	-	•	•
THD measurement	•	•	•	•
Analysis of harmonics	2..15°	2..15°	2..31°	2..63°
Programmable alarms	•	•	•	•
Energy counting	•	•	•	•
Hour counter	•	•	•	•

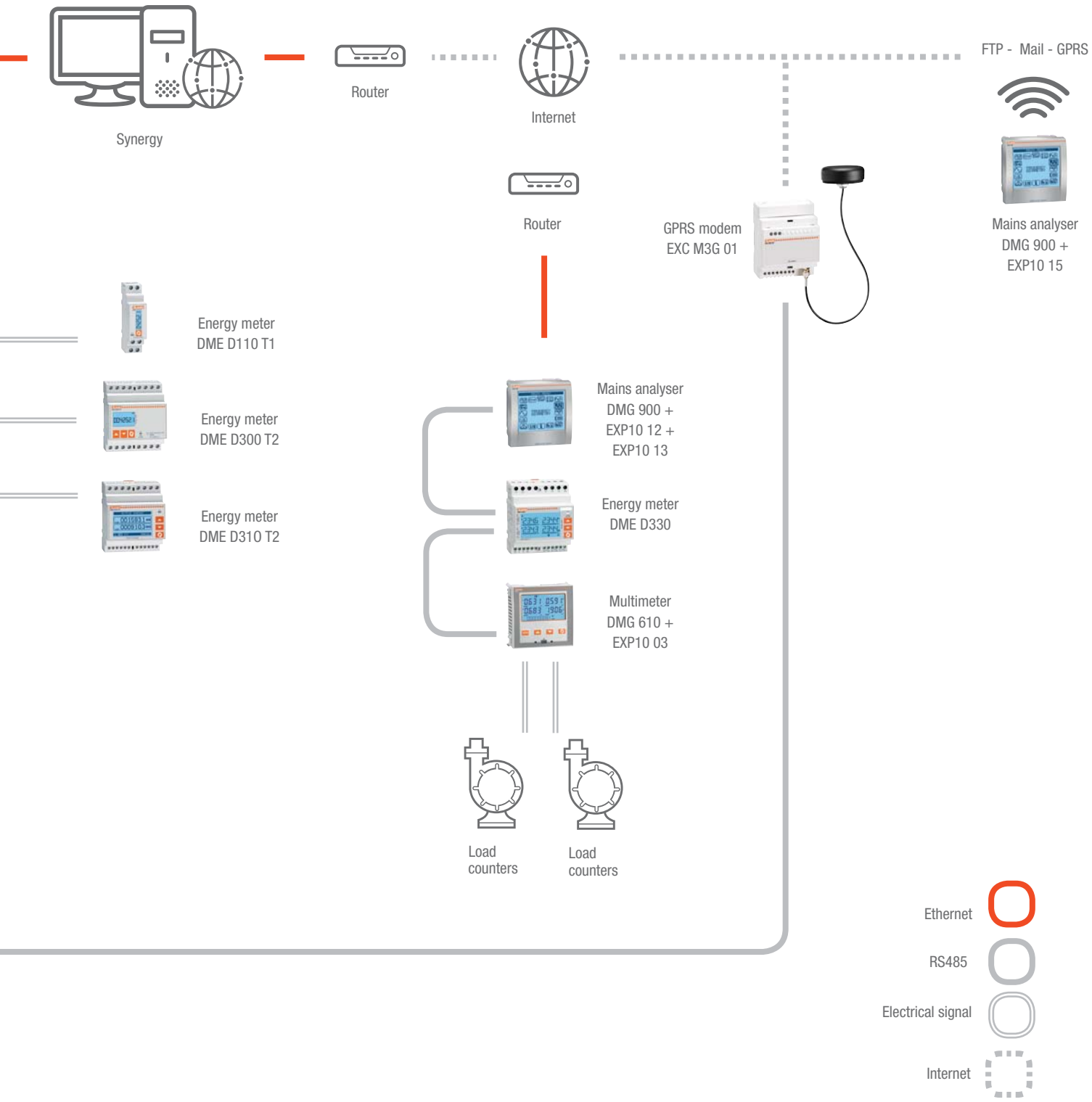
Notes

1 Gateway function: converts signals from an RS485 network to Ethernet (maximum 10 connected devices)

N.B. For an up-to-date list of expansion modules, visit www.lovatoeletric.com

5.3 TYPICAL SCHEMATIC




Synergy
Router
Internet
FTP - Mail - GPRS
Router
GPRS modem
EXC M3G 01
Mains analyser
DMG 900 +
EXP10 15
Energy meter
DME D110 T1
Energy meter
DME D300 T2
Energy meter
DME D310 T2
Mains analyser
DMG 900 +
EXP10 12 +
EXP10 13
Energy meter
DME D330
Multimeter
DMG 610 +
EXP10 03
Load
counters
Load
counters
Ethernet
RS485
Electrical signal
Internet

6.1 MONITORING AND CONTROL PRODUCTS

In addition to its monitoring functions, Synergy software can also interface with LOVATO Electric control devices.

Interfaceable devices

Code	Description
RGK	Engine and generator controllers
ATL	Automatic transfer switch controllers
DCR	Automatic power factor controllers
ADX	Soft starters
VF/VL/VE	Variable speed drives
LRD	Micro PLCs
PMVF	Interface protection system (IPS)

For an up-to-date list of LOVATO Electric devices that can interface with Synergy software, visit **em.LovatoElectric.com/Synergy.**

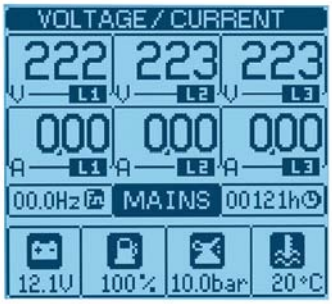
6.2 ENGINE AND GENERATOR CONTROLLERS

For use with generating sets (alternative energy sources used in the event of a power cut) LOVATO Electric has developed the new RGK range of controllers that provides both protection and control functions. In particular:

- generating set functioning, standby, off state and test
- warnings and alarms
- event recording
- reading of mains, generating set and motor process parameters (voltage, current, power, pressures, temperatures, levels, hours of functioning, maintenance and startups).

Range

RGK 610
- Stand alone and automatic mains failure (AMF)
- 1 expansion slot for EXP... modules



Graphic display

RGK 700[1] and RGK 700SA[2]
- Stand alone and automatic mains failure (AMF)
- Integrated RS232
- Integrated CANbus

RGK 800[1] and RGK 800SA[2]
- Stand alone and automatic mains failure (AMF)
- Integrated RS485
- Integrated CANbus
- 3 expansion slot for EXP... modules

RGK 900[1] and RGK 900SA[2]
- Synchronisation between generating sets and with the mains
- Integrated RS485
- Integrated CANbus
- 4 expansion slots for EXP... modules

RGK 900MC
- Synchronisation between a group of generating sets and paralleled mains
- Integrated RS485
- Integrated CANbus
- 4 expansion slots for EXP... modules

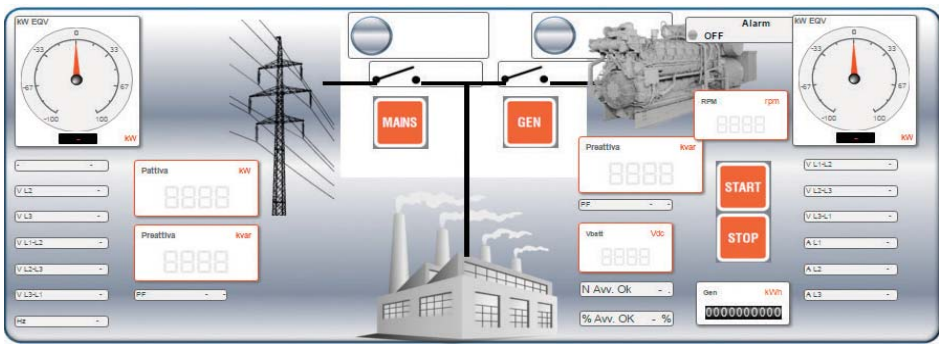
Notes

1 Automatic startup (AMF)

2 Stand-alone (SA)

Integration with Synergy

Synergy is an ideal platform for remote monitoring of generating set functioning processes. Display of all genset controller measurements all on one page gives an immediate overview of the system and allows users to intervene rapidly in the event of a malfunction. Highly flexible Synergy software also lets users create customised pages and synoptics duplicating the functions of the main control keys on RGK controllers.



6.3 AUTOMATIC TRANSFER SWITCH CONTROLLERS

When it is essential to ensure the continuity of a good quality supply of electricity, the only solution is to install a backup generating set with an automatic start system in the event of mains failure or automatic switches to transfer loads from the mains to the generating set and then reconnect them to the mains supply as soon as the problem is resolved.

Graphic display

Range

ATL 610
- Management of 2 energy sources (2 control devices)
- Dual AC/DC supply
- 3 expansion slot for EXP... modules

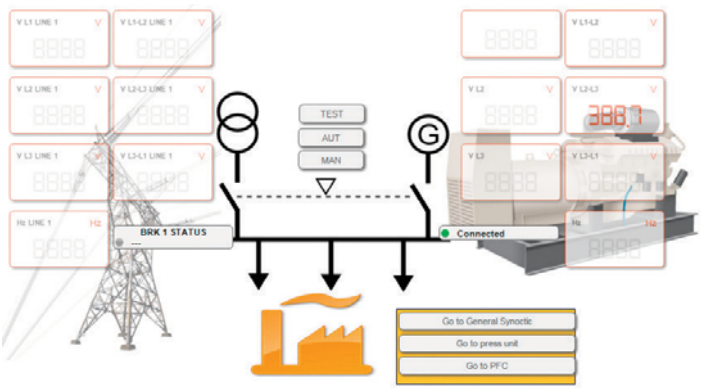
ATL 800
- Management of 2 energy sources and one tie breaker or non priority load (3 control devices)
- Dual AC/DC supply
- 3 expansion slots for EXP... modules
- Integrated RS485
- Switching option with closed transition.

ATL 900
- Management of 3 energy sources and 2 tie breakers (5 control devices)
- Dual AC/DC supply
- 3 expansion slots for EXP... modules
- Direct monitoring of the load's power demand via 4 current inputs (3 phases + neutral) for an optimised switching strategy
- Integrated RS485
- Switching option with closed transition.

Integration with Synergy

Synergy can also be integrated with ATL 800 and ATL 900 automatic transfer switches (through the integrated RS485 communication port) and with ATL 610 switches (via EXP... Series expansion modules). LOVATO Electric automatic transfer switches permit the remote management and control of even complex systems thanks to a large number of configuration options and excellent flexibility in the setting of thresholds, controls, delays and alarms.
Additional control logics can be implemented thanks to the PLC integrated in models ATL 800 and ATL 900.

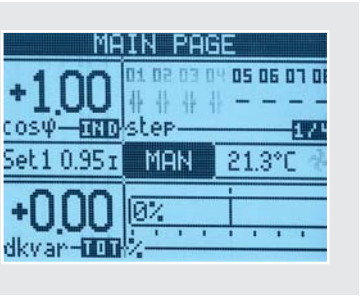
LINE 1



LINE 2

6.4 AUTOMATIC POWER FACTOR CONTROLLERS

Reducing the absorption of reactive energy from the mains delivers immediate savings in cost, reduces losses from dissipation along power lines and also slows down the aging of the power lines themselves.
Most Authorities for Electricity impose strict limits for reactive energy. They also impose penalties for failing to respect requirements and even permits the suspension of supply.



Graphic display

Range

DCRL Series

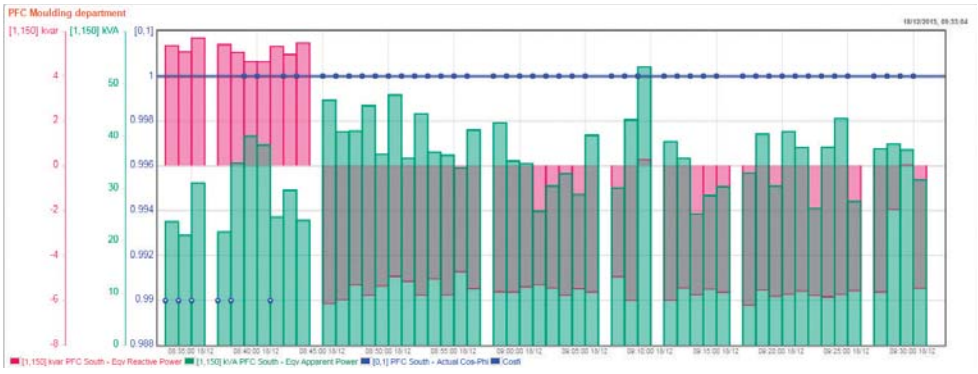
- 3 or 5 steps (96x96mm container), expandable to max 8
- 8 steps (144x144mm container), expandable to max 14
- Backlit icon display
- Expandable with EXP... communication port modules
- Voltage, current, power, and voltage and current harmonic measurements up to the 15th order.

DCRG SERIES

- 8 steps (144x144mm container), expandable to max 32
- Expandable with 3 slots for EXP... modules to add communication, GSM/GPRS, Profibus ports
- Backlit graphic display (128x80 pixels)
- Voltage, current, power, energy and voltage and current harmonic measurements up to the 30th order.
- Event logging
- Suitable for dynamic power factor correction, and the power factor correction of single phases in three phase systems
- DCRG 8IND: version for capacitive reactive power factor correction.

Integration with Synergy

Power factor correction systems are essential in industries with solar energy networks,
and where reactive power absorption remains constant while active power absorption falls when energy is produced by the solar photovoltaic system. Under such conditions, power factor correction systems help to maximise return on investment.
Remote supervision of power factor correction panels using DCR series automatic power factor controllers connected to Synergy via EXP... communication modules, makes it possible to verify system state in real time, optimise the planning of system maintenance, and verify residual capacitor power and the number of connections made by the switches.



6.5 SOFT STARTERS

Limiting the starting current of electric motors is essential to avoid over-current and to extend motor life by reducing thermal and mechanical stress. Starting current peaks also lead to increased energy consumption by the system. LOVATO Electric's soft starters permit the gradual starting and stopping of even large motors (up to 630 kW) with two or three controlled phases, thus reducing the problems associated with motor starts and stops. ADXL soft starters are two phase control devices with an integrated bypass, and feature an icon display and NFC connectivity for quick and easy configuration even from a smartphone or tablet. They are ideal for simple “plug and play” applications, thanks to an installation wizard, and for high-performance applications that demand both motor control and protection.

LCD display

Range

ADXL SERIES

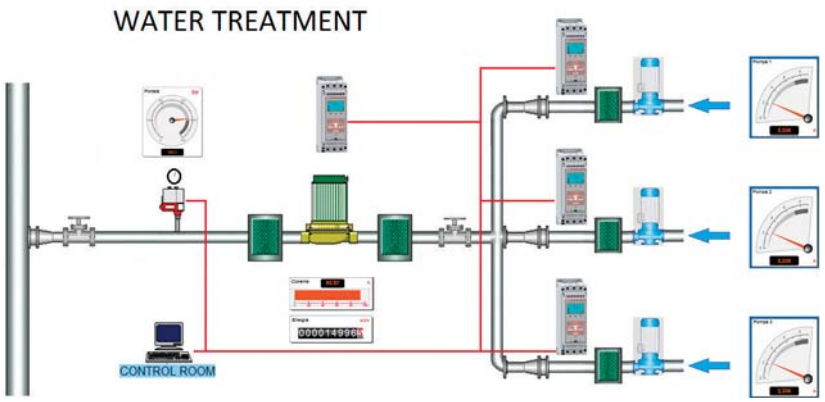
- Two controlled phases
- Backlit icon LCD display
- Rated Ie current of starter from 30 to 320A
- Rated motor output 15...160kW (400VAC)
- Versions up to 600VAC available
- Reduced voltage starter with torque control and integrated bypass relay
- Limited maximum starting current
- Remote control via PC
- Optical port for programming, data downloads and diagnostics
- NFC connections for parameter programming
- Modbus-ASCII, Modbus-RTU and Modbus-TCP communication protocols
- EXC 1042 optional RS485 communication module.

ADX SERIES

- Three controlled phases
- Backlit LCD display
- Heavy duty
- Rated Ie current of starter from 17 to 1200A
- Rated motor output 7.5...630kW (400VAC)
- Reduced voltage starter with torque control
- Integrated bypass relay up to 245A
- Provision for external bypass relay from 245A to 1200A
- Limited maximum starting current
- Remote control via PC
- Modbus (Modbus-RTU) communication protocol
- Integrated RS485

Integration with Synergy

Thanks to Modbus-RTU standard communication protocol and compatibility with Synergy supervision software, starter state and all available measurements (maximum current, L1 current, L2 current, L3 current, torque, mean line voltage, total active power, total PF, motor thermal state, start temperature) can be constantly monitored.



6.6 VARIABLE SPEED DRIVES

Variable speed drives play a key role in energy management as they provide an extremely efficient way of controlling electric motors. They:

- eliminate start-up current peaks
- minimise reactive power due to phase variation between voltage and current
- control motor speed.

In particular, in applications where one quantity has to be kept constant, such as water or air pressure, the drive's integrated PID controller runs the electric motor at the speed best suited to demand from the load, and stops it when it is not needed.

IE2 COMPLIANT

Drive efficiency is 25% higher than the reference value for the IE class.

Range

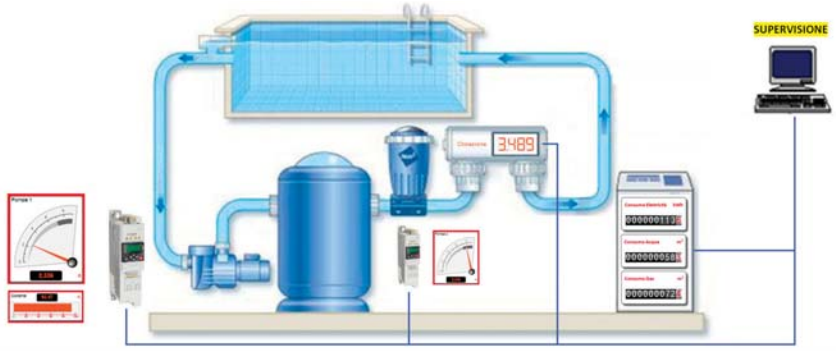
VE1 and VFNC3
- Single phase power supply 200...240VAC
- Three phase motor power 0.2...2.2kW (230V)
- Compliant with IEC/EN 61800-3 standard, cat. C1 or cat. C2.

VFS15
- Three phase power supply 380...500VAC
- Three phase motor power 0.4...15kW (400V)
- Compliant with IEC/EN 61800-3 standard, cat. C2 or cat. C3

VLB3
- Three phase power supply 400...480VAC
- Three phase motor power 0.4...30kW (400V)
- Compliant with IEC/EN 61800-3 standard, cat. C2 or cat. C2
- LCD display with complete description of programming parameters.

Integration with Synergy

All the families of variable speed drives in the LOVATO Electric catalogue have an integrated RS485 communication port with Modbus-RTU protocol for direct interfacing with Synergy.
Synergy can be used to monitor quantities like:
- motor speed
- motor drive frequency
- alarm states.



6.7 MICRO PLCs

Micro PLCs for the monitoring and control of low and medium complexity automation are a useful addition to energy management systems as they are so easy to install in machines and plant control panels and allow users to:

- measure process and ambient parameters like:
  - states/alarms of switching and control equipment
  - pressures, flow rates, temperatures, levels
- control local automation
- control loads on set days or at predefined times
- actuate switching equipment remotely.

Our Micro PLCs can be programmed with:

- 31 time/date timers
- 31 timed relays
- 31 counters (e.g. for number of operations, scheduled maintenance)
- comparators and many other useful automation functions.

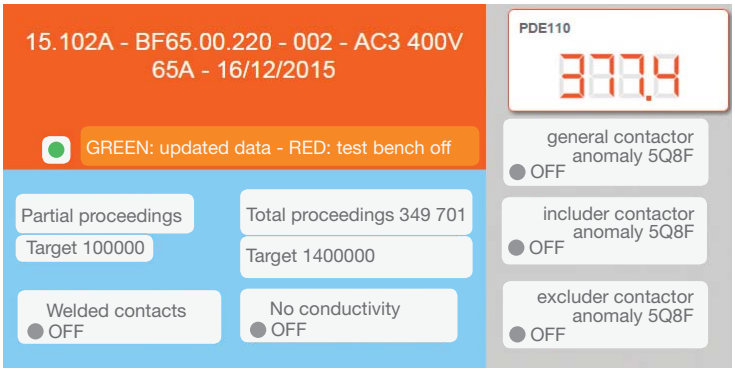
LRD20R D024 P1

LRD20R D024 P1

- Integrated RS485
- 12 inputs (including 4 configurable as analog 0…10V) and 8 relay outputs
- Depending on plant requirements, the number of inputs/outputs can be increased by adding the relevant expansion modules.

Integration with Synergy

The states of digital inputs and outputs and the values of the analog voltage, current and temperature inputs all be viewed in the web pages of Synergy. The “data register” can be used to modify most of the values micro PLC based systems. Internal logic allows users to send commands and force the states of digital outputs.



6.8 INTERFACE PROTECTION SYSTEM (IPS)

Interface protection systems (IPS) limit voltage and frequency in **parallel connections** between a local electricity generating system (e.g. photovoltaic systems, cogeneration systems, etc.) and the mains supply.

LOVATO Electric offer a choice of PMVF 30 systems (designed to CEI 0-16 standard, December 2012 edition), PMVF 20 and PMVF 50 systems (designed to CEI 0-21 standard, June 2012 edition).

Graphic display

Range

Approved to CEI 0-16, December 2012 edition

PMVF 30
- Rated control voltage: measurements via VT in MV or directly in LV
- Auxiliary voltage: 100... 400VAC/110...250 VDC.

PMVF 30 D048
- Rated control voltage: measurements via VT in MV or directly in LV
- Auxiliary voltage: 12...48VDC.

Approved to CEI 0-21, December 2012 edition.

PMVF 20
- Rated control voltage: 230VAC/400VAC
- Auxiliary voltage: 100...400VAC/110...250VDC.

PMVF 20 D048
- Rated control voltage: 230VAC/400VAC
- Auxiliary voltage: 12...48VDC.

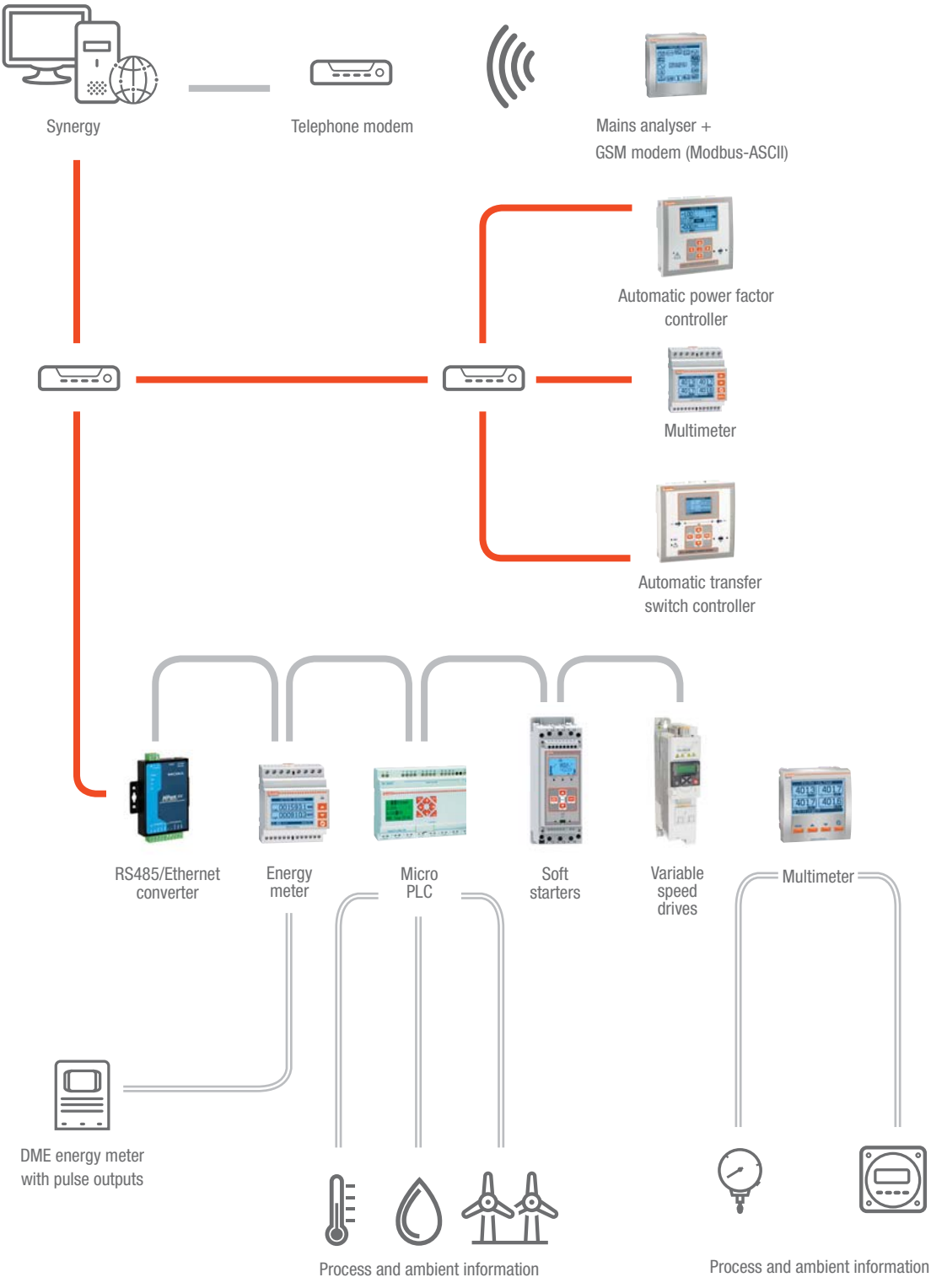
PMVF 51
- Rated control voltage: 230VAC/400VAC
- Auxiliary voltage: 100...400VAC/110...250VDC.

Integration with Synergy

Using Synergy you can also verify the state of **control and management relays** as well as that of the field interface inputs in the IPS. In addition, since all LOVATO Electric IPSs also serve as multimeters, you can monitor the key electrical quantities of the controlled system (V, A, Hz, kW).

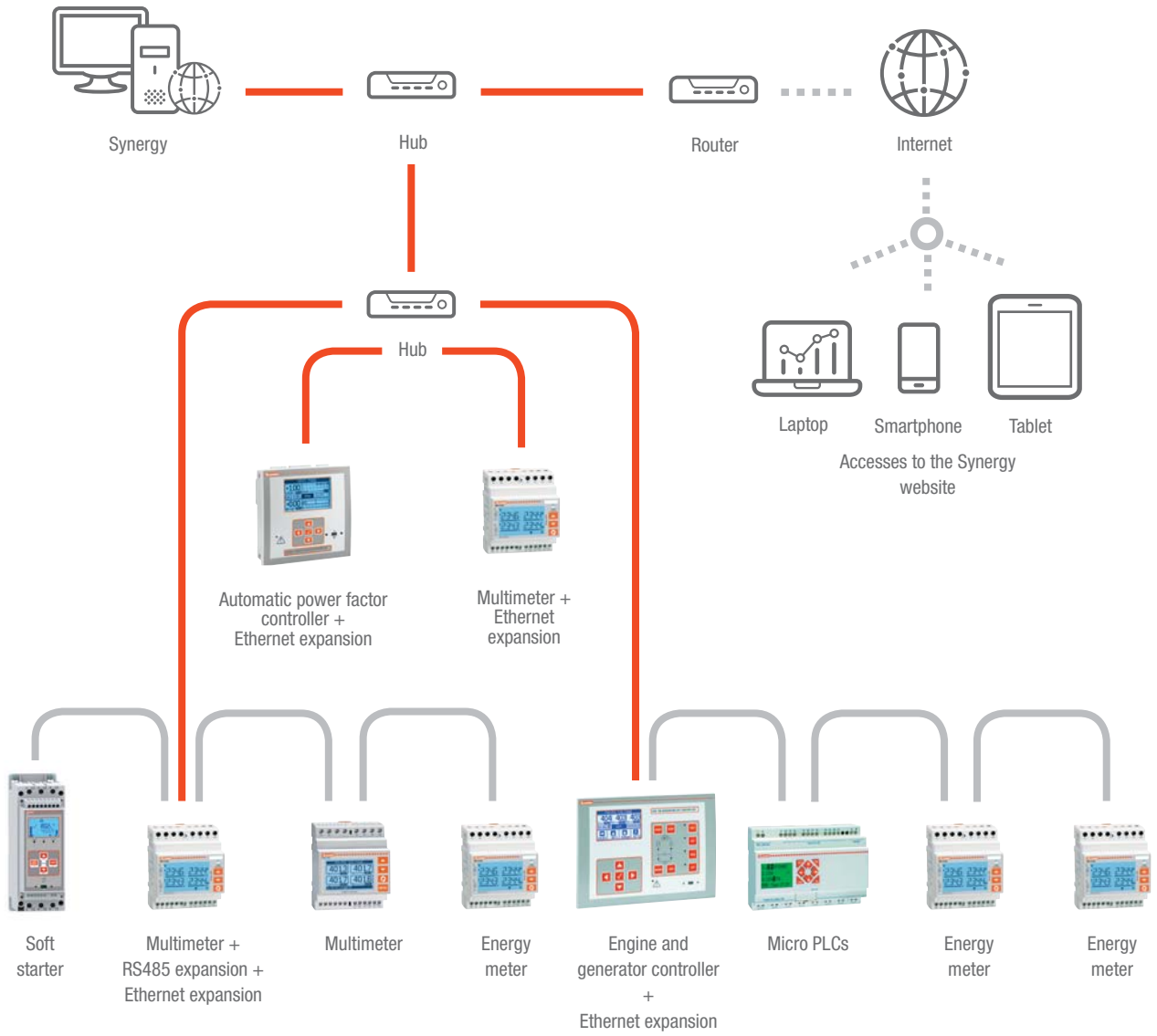
7.1 EXAMPLE

Multi-channel system (Ethernet+RS485+pulse) and intranet access



7.2 EXAMPLE

Multi-channel system (Ethernet+RS485) and internet access



Ethernet

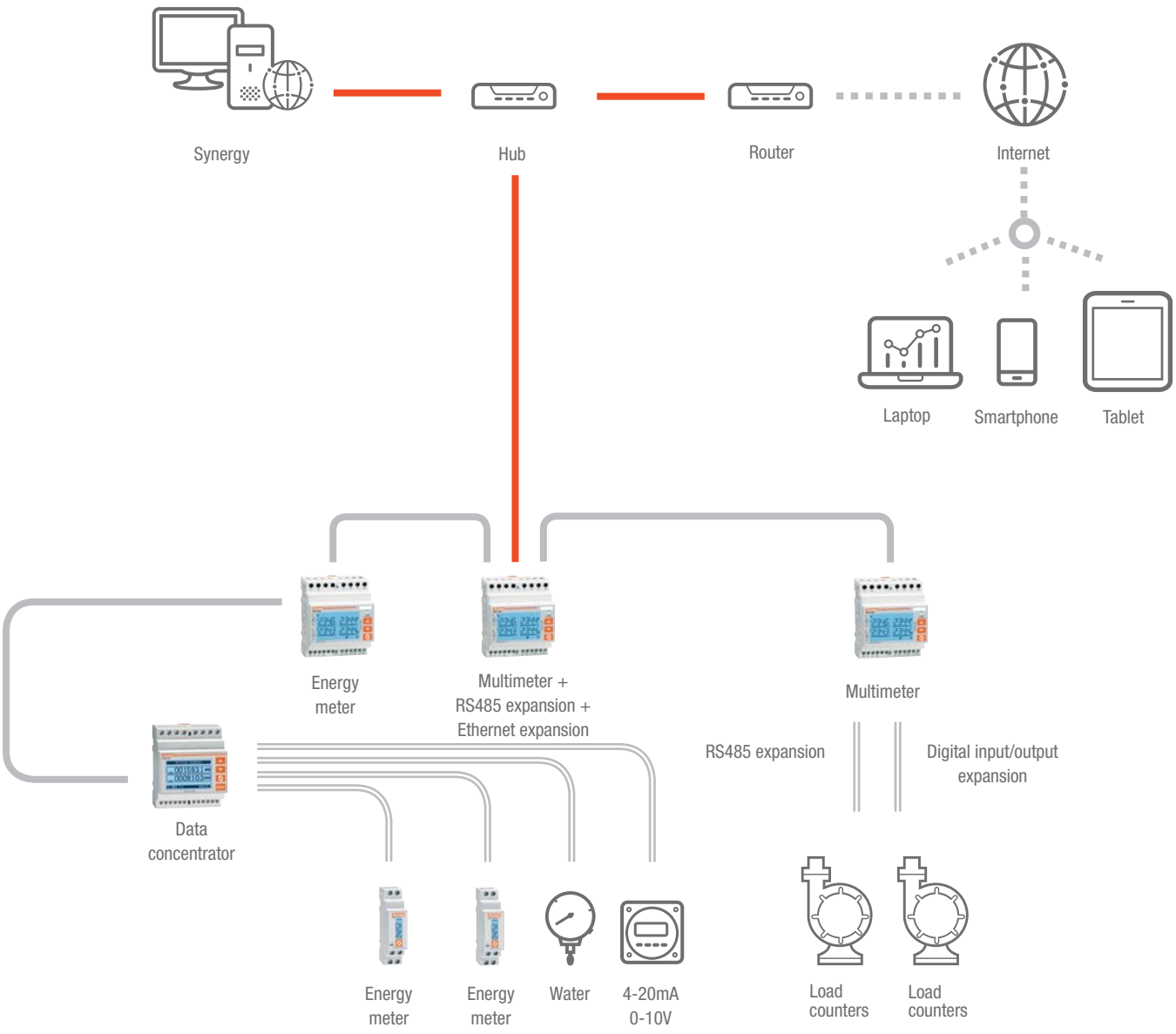
RS485

Electrical

Internet

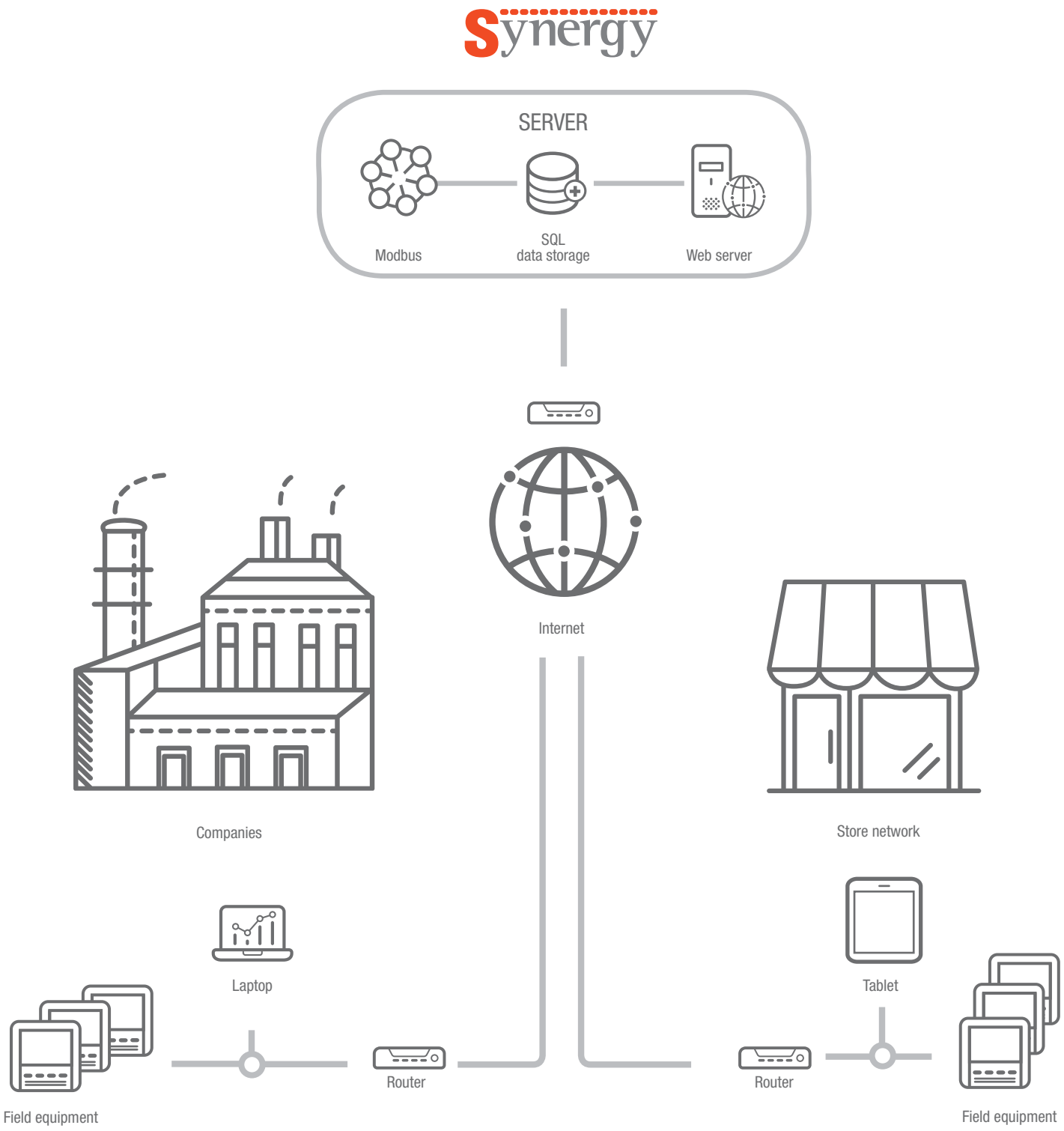
7.3 EXAMPLE

Multi-channel system (Ethernet+RS485+Pulse) and Internet access



7.4 EXAMPLE

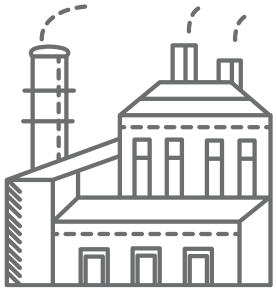
Multi-site system with Internet access



7.5 FIELDS OF APPLICATION

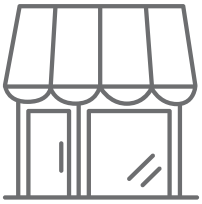
Supervision in factories and shopping centres

- verification of the quality of energy supplied by the grid operator
- total consumption by cost centre
- monitoring of production machines/lines
- monitoring of motor functioning
- monitoring of generating set functioning
- monitoring of power factor correction systems
- monitoring of process/ambient parameters (pressures, flow rates, temperatures).



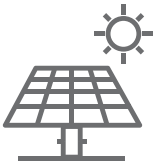
Supervision of mains supplies for stores and small shopping centres

- monitoring of energy consumption (electrical power circuits, air conditioning)
- system diagnosis
- total consumption by cost centre



Supervision of photovoltaic systems

- monitoring of energy
  - produced
  - consumed
  - exchanged (in-out).



Supervision of water mains and wells

- verification of the quality of energy supplied by the grid operator
- energy consumption reports
- monitoring of pump functioning
- monitoring of generating set functioning
- monitoring of process/ambient parameters (pressures, flow rates, temperatures).
- monitoring of remote wells.

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