

LIVARSA[®]

Better power quality reduces your electricity cost!

ECV[®]

Energy Comparison Value

The **VALIDATED
MEASUREMENT
METHOD**

to calculate
electricity savings



IT'S NICE OF YOU TO TAKE THE TIME!

We know that time is precious. So is energy. That's why we'll get straight to the point: on the following pages we would like to introduce you to the Livarsa concept – our economic energy efficiency solution, which gives you more electricity at your disposal without any additional costs. Electricity you already pay without actually using it.

Based on years of experience and developed know-how as well as in close cooperation with experts from all areas of electrical engineering, we develop tailor-made efficiency solutions for optimising the electrical energy in companies. For you, this means: full-service performance! From planning to installation, we implement your project to increase efficiency and reduce costs as part of our comprehensive partner network.

Permanent research and development in collaboration with universities, colleges and experts in the field have made us the leading system solution provider that companies all over the world now trust.

Take advantage of the opportunity to minimise energy losses in your company with LIVARSA , without additional capital expenditure. At the same time, you can reduce your CO2 emissions, thereby increasing your sustainability and competitiveness.

We look forward to hearing from you!



Salvi Donato – LIVARSA GmbH Switzerland



Mario Ditella – LIVARSA GmbH Germany

3 - 8 % of your electricity is lost



MODERN ELECTRICAL SYSTEMS & MACHINES IMPAIR THE POWER QUALITY. "THE RESULT: HIGHER ENERGY COSTS"

Automation and digitalisation are the drivers behind the future industrial value creation. This also leads to an increase in energy requirements. The electrical current is of central importance. Every manufacturer today ensures that newly developed machines and components are becoming increasingly efficient and thus becoming more powerful. On the one hand, this development leads to optimised consumption. On the other hand, however, the electricity quality and power quality, or the energy transmission, becomes worse. The consequences are significant energy losses in the entire electrical installation: losses that are easy to reduce to a minimum.

This proportion is lost

→ 3-8%

EFFECTIVELY USED ENERGY:

92-97 % OF YOUR PAID ELECTRICITY

Exploit the economic potential.

Energy losses – what we mean

The losses in a company's entire low-voltage network (400 volts) are now estimated by experts to be 3 - 8 percent of the total electrical energy consumption. With a consumption of 1,000,000 kWh, this is 30,000 - 80,000 kWh per year that a company draws without benefiting from it!

Energy losses – the cause

The design of modern electrical devices and machines (non-linear loads) cause distortions in the electrical network. The resistance on the transmission of the current is increased and has a negative effect on the efficiency of the power transmission.

Energy losses – so much potential for savings

At an electricity price of 0.16 euros/kWh and a consumption of 1,000,000 kWh, a company pays between 4,800 and 12,800 euros without having any benefit from it. If this percentage is reduced by 60 percent, for example, this means a saving of 7,680 euros per year. At the same time, the technology is protected and failures of sensitive electronic components are minimised.

Energy losses – how they can be minimized

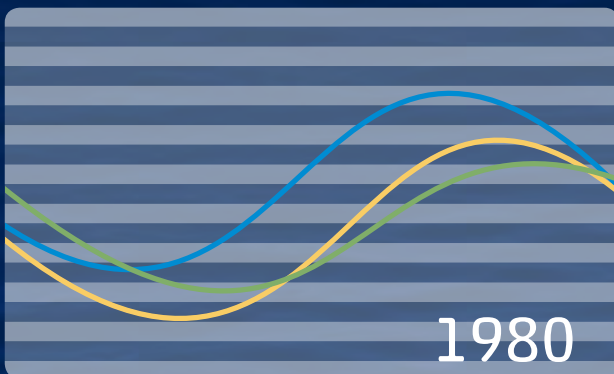
On the basis of known physical laws, it is now possible to reduce the energy losses in an entire electrical consumer network.

This is made possible, among other things, by the combination of proven technology and intelligent control technology.

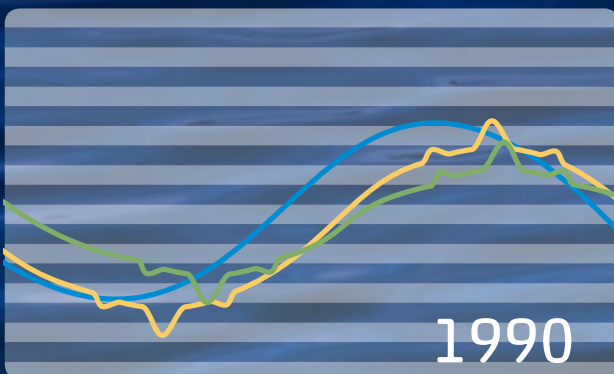
*»We struggle with the need to save energy.
But it is actually about not wasting any.«*

Paul Schibler (1930 - 2015), Swiss Aphorist

Development of power quality since 1980



Harmonics are a specialist term in electrical engineering. Anyone who does not work in the field will find it difficult to understand the term. But it's easy to explain: imagine water and think of a swimming pool where a person is swimming, producing a few gentle waves. Other people enter the water in succession and their movements produces more waves. The water in the pool is becoming restless. "As a result, every swimmer now needs significantly more strength to move forward."

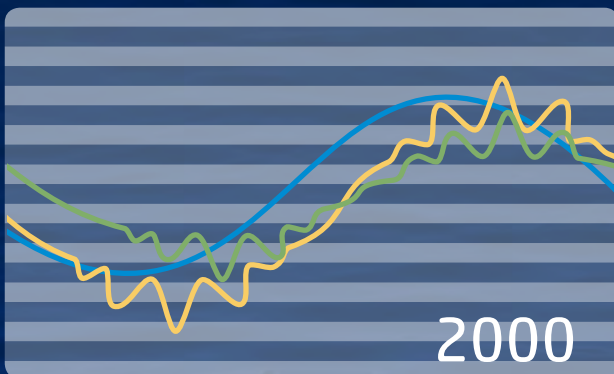


We have learned: the more waves, the more effort/strength/power is needed. The same is true in a power grid. The more electrical and non-linear loads are connected within a network, the more harmonics are generated and influence the power loss, so that the energy requirement increases. A better electricity and power quality means that the harmonics are smooth, resulting in less energy loss.

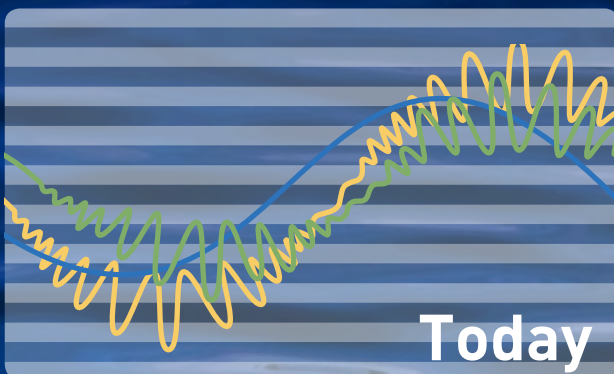
LEGENDE

- Voltage
- Active power
- Current

More harmonics = higher energy requirement



With the worldwide increasing demand for energy-efficient solutions, which can only be implemented by the use of power electronics, the issue of harmonic distortion is becoming more and more problematic. Today, almost all electrical devices connected to the electrical network are non-linear consumers. This means that more and more harmonic currents are being generated. As a result of this problem, the power supply is increasingly reaching its limits.



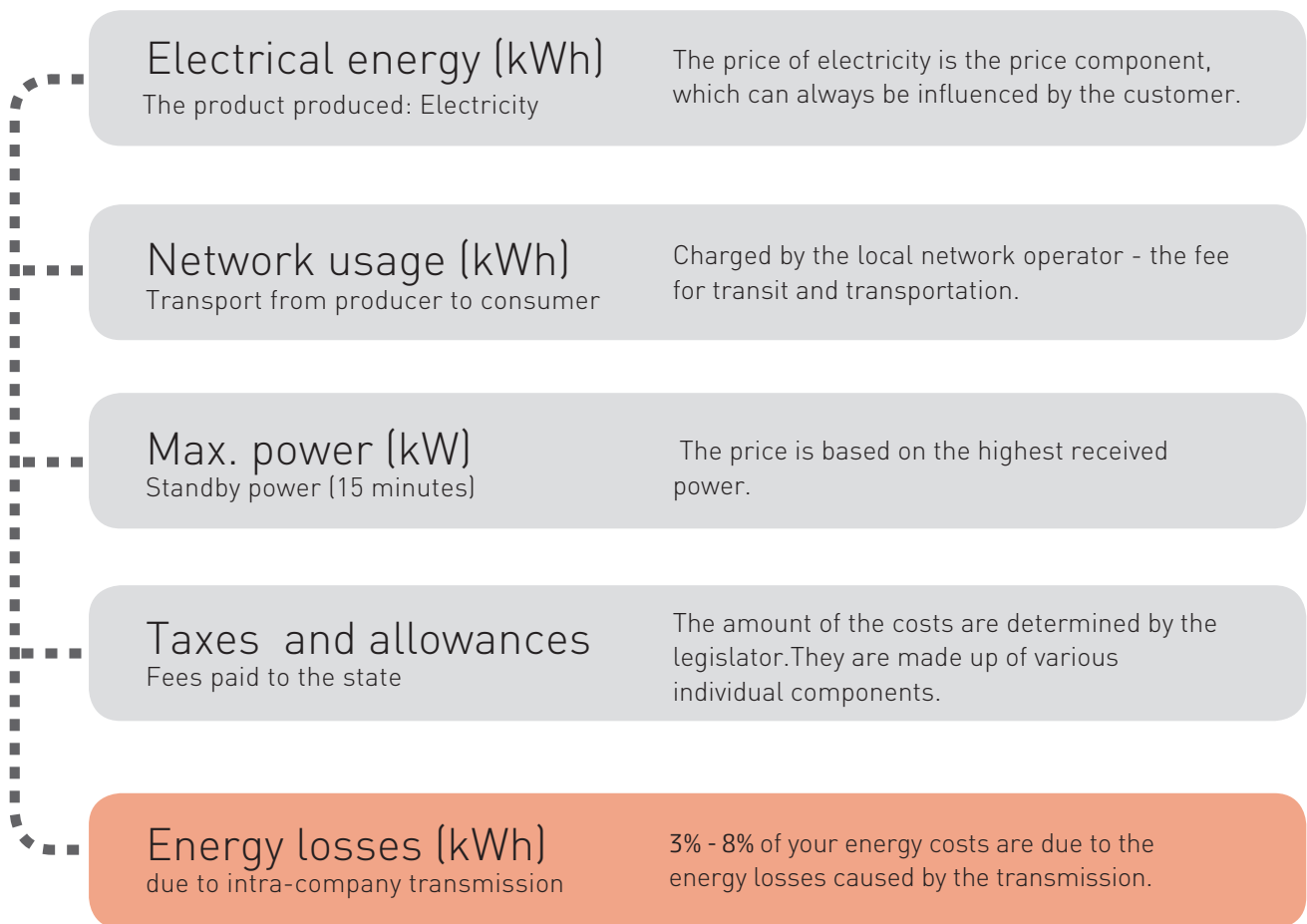
It has long been known that insufficient power quality leads to faults in operations and in electrical systems. If these influences and faults are minimised, it has a positive effect not only on operational safety, but also on the power consumption.

THE LIVARSA ENERGY SOLUTION STARTS HERE:

WITH THE INSTALLATION OF THE EPplus SYSTEM, HARMONICS IN THE NETWORK ARE REDUCED TO A MINIMUM AND THE ENERGY QUALITY IS OPTIMISED TO A MAXIMUM.

Composition of your electricity costs

HOW DOES YOUR ELECTRICITY BILL COME TOGETHER? The price of electricity that you pay to your supplier as a customer is made up of several components. Many business owners know what their electricity costs are, but often do not know that there is an important item missing from the bill: energy losses are paid for but not shown on the bill.



EXAMPLE CALCULATION

ANNUAL ELECTRICITY COSTS 565,760 €

- Reduction of energy losses by 3.7%

= annual saving of 20,933 €

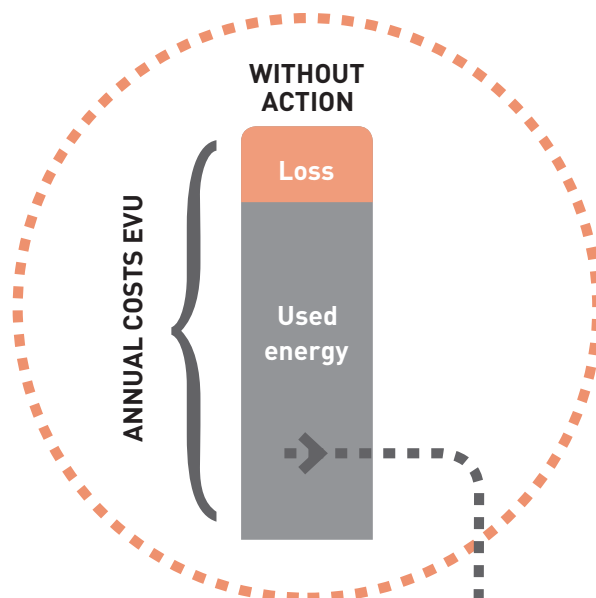
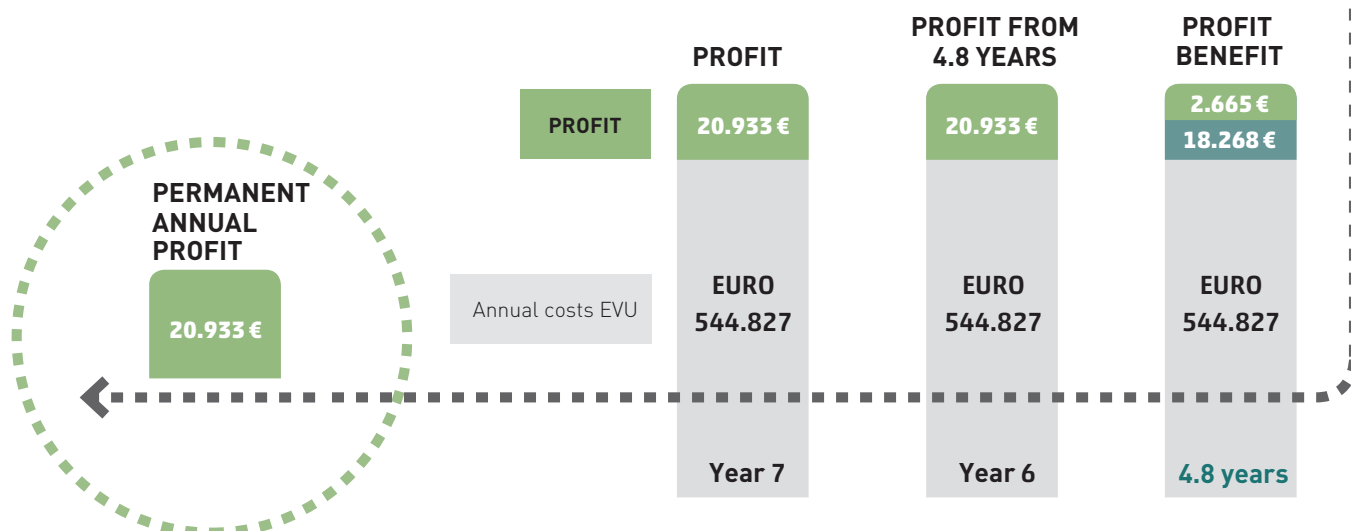
Financing model without investment

HOW IT WORKS: Our "No Cost financing model" is transparent and simple. It allows you to realise your LIVARSA project without committing any further capital by using the savings achieved for a contractually defined period of time for depreciation. At the end of the specified period - in the example it is about 5 years - your company will benefit completely from all future savings. This allows you to convert your electrical energy losses into profits.

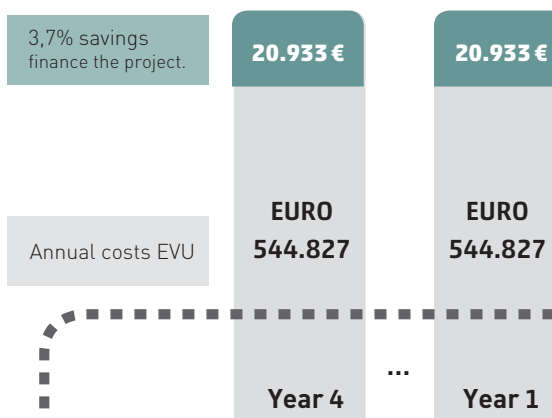
QUICK EFFECTS: The benefits of the LIVARSA solution become visible immediately after implementation. You will benefit from better power quality, reduced CO2 emissions and other technical advantages.

NO PROCUREMENT COSTS, NO ADDITIONAL WORK

In summary, you do not have any additional costs. You use the savings during the 4.8-year depreciation phase for the project with an annual benefit of €20,933.00 until the project is written off and paid in a fixed time. You can therefore be sure that you will not be taking any risks with the investment. The savings effect is guaranteed – the project is actually self-financing.



AFTER IMPLEMENTATION OF THE MEASURE 1ST - 4TH YEAR



The Livarsa energy efficiency concept

ENERGY TRANSMISSION IN THE ELECTRICAL NETWORK

With our efficiency solution, the focus is on the transmission of energy throughout the entire electrical network. Manufacturers are developing ever more efficient and powerful drives and machines with new technologies that can cause asymmetric interference and thus lead to a load on the internal power supply networks. The result of these loads can be simple faults, but also defective control boards, which result in production downtimes due to machine standstill or considerable energy losses.

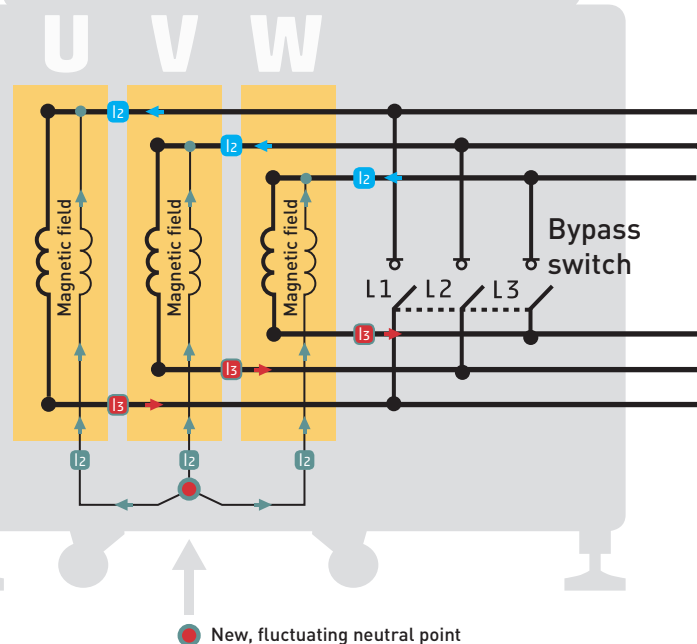
Every device and every system - so-called consumers - used in a company has been optimized in its development by the manufacturer in terms of energy efficiency. By itself, a device can be reduced in consumption, but, within a network, the individual devices that do not work together often lead to a completely different situation. LIVARSA considers the sum of the devices as a single electrical consumer (starting with the HV transformer), which needs to be improved.



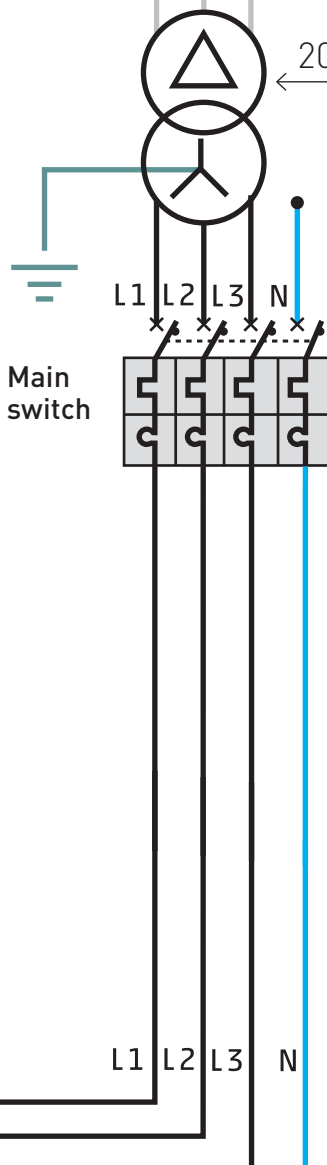
LOSS-RELATED ENERGY TRANSMISSION With the LIVARSA EPplus system:

LIVARSA

Available in power ratings from 50A to 4000A.



Installation after the medium-voltage transformer



THE SYSTEM IS INSTALLED CENTRALLY AND DIRECTLY AFTER THE MEDIUM-VOLTAGE TRANSFORMER. The EPplus system is installed on the low-voltage side at the central feed point in the power supply network of the building or company.



The way in which the induction current / feedback current I_2 is generated and the control possibility to return this opposite to I_1 makes the LIVARSA energy efficiency concept unique.

Consumers

Energy data acquisition & energy monitoring



WHY ENERGY DATA MONITORING?

Energy data monitoring and energy data management are becoming increasingly important due to the constant change in energy supply. In order to become more efficient in the future, solutions are needed that measure and store energy data, but also enable the data to be evaluated and interpreted.

A good example of this is our measuring method ECV™. Almost ten years of research and the evaluation of countless energy data have led to new findings and make an electrical efficiency improvement visible and demonstrable.

Software & connection

Module 1



DATA COLLECTION AND DATA ACCESS

The EPplus system has an energy monitoring system including a precise recording of all electrical energy data in a measuring interval from 2 seconds. Via the internal network, they can connect directly to the EPplus and query all of the electrical data recorded. The energy data and general system messages are stored by means of software for a period of around three months.

Module 2

DATA ARCHIVING AND REMOTE SUPPORT

Module 2 is our standard and part of our projects. It includes power monitoring, remote support and data archiving. The data is stored in a cloud and is available to you at any time. A special software can be used to visualise the savings in kWh as well as the energy costs. The connection to the EPplus system is via the internal IT network or via a SIM data card with modem. You can log in to the system at any time using a web browser with a protected password.

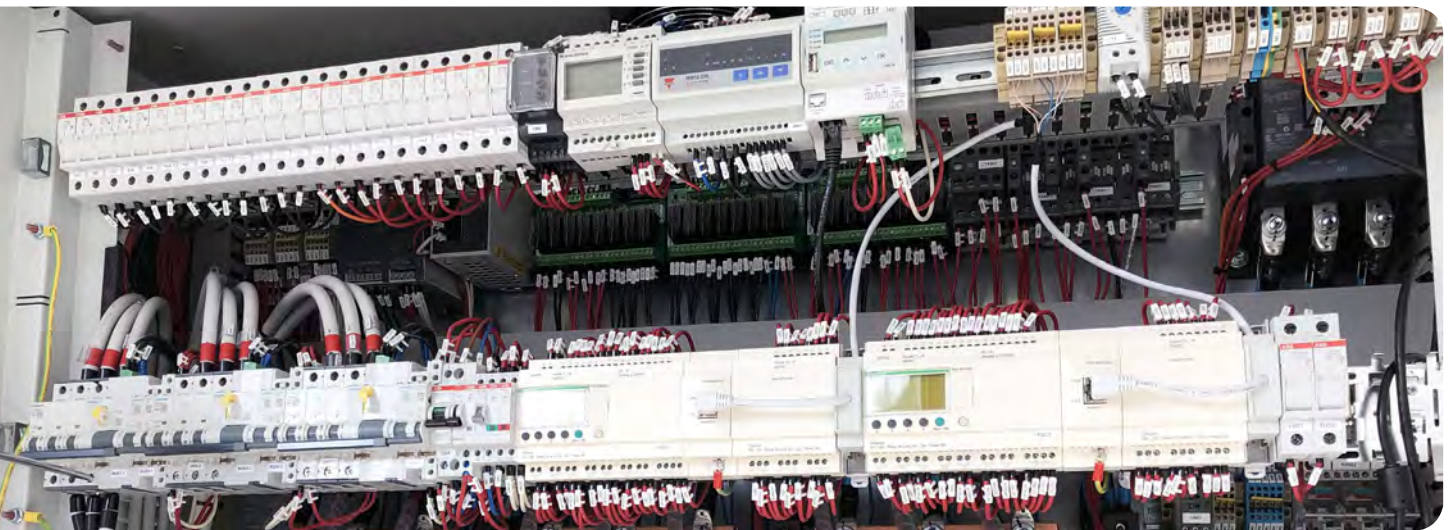


Module 3

ENERGY MANAGEMENT SYSTEMS ISO 50001

The system can be integrated into an existing energy data management via API using existing interfaces. Module 3 of the EPplus system takes over the aggregation of energy data and information – also from several locations. Companies with several national or international locations can use one platform to evaluate and compare energy data.

The EPplus system hardware



The EPplus system is a measuring, control and regulating unit composed of the latest and carefully selected electrotechnical components. The lower part of the metal housing contains the transformer (filter), together with the BYPASS.

The entire measuring and control electronics as well as the transmission technology are located in the separate control cabinet. It is designed in such a way that an individual customer solution can be realised depending on the power, size and space available.



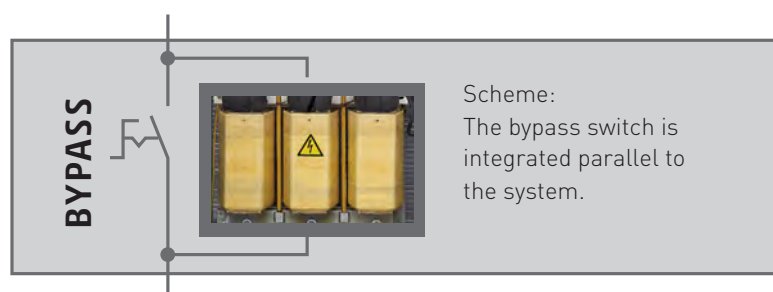
SYSTEM SIZES*	WIDTH / HEIGHT / DEPTH*
EP 500A / 345.00 kVA	1200 x 2100 x 850
EP 600A / 414.00 kVA	
EP 800A / 552.00 kVA	
EP 1000A / 690.00 kVA	1400 x 2300 x 850
EP 1250A / 862.00 kVA	
EP 1400A / 966.00 kVA	
EP 1600A / 1104.00 kVA	1600 x 2300 x 950
EP 1800A / 1242.00 kVA	
EP 2000A / 1380.00 kVA	
EP 2500 A / 1725.00 kVA	1800 x 2570 x 1400
EP 3200A / 2208.00 kVA	
EP 4000A / 2760.00 kVA	

*with a circuit breaker panel, the systems become 500-600 mm wider, depending on the version. Small units from 50A – 400A on request.

In focus: safety & quality

OPERATIONAL SAFETY IS A PRIORITY

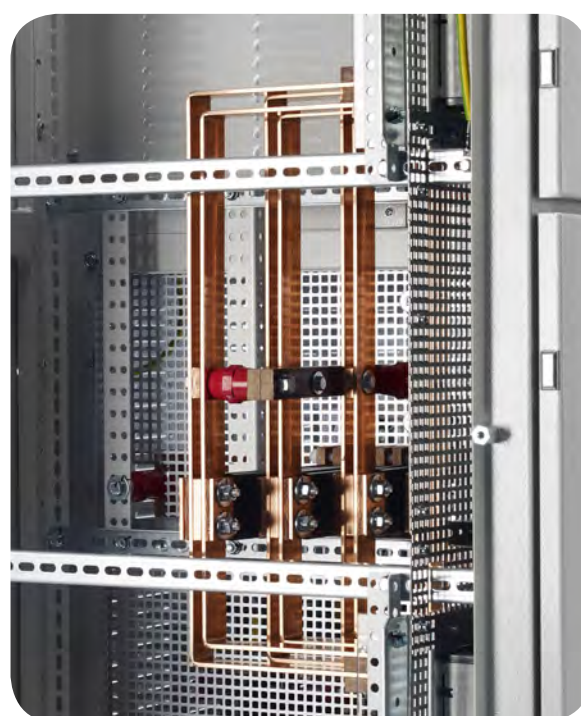
The patented BYPASS system ensures operational safety and uninterrupted switching during operation. This feature allows **the ECV™ measurement methods** to be applied and the savings achieved are accurately established.



Scheme:
The bypass switch is integrated parallel to the system.

VERSION WITH ADDITIONAL CIRCUIT BREAKERS

The LIVARSA EPplus system in the version with integrated circuit breaker can also be easily integrated with one or two medium-voltage transformers operated in parallel. To do this, the cables are routed from the secondary side of the medium-voltage transformer to the new integrated circuit breaker and connected. The EPplus system is then returned to the existing circuit breaker in the low-voltage main distribution (LVMD), with new cables at the output of the EPplus system, and reconnected.



Planning & scheduling

From analysis, conception and implementation to Go Live, we take care of the entire project planning and scheduling. Our experienced installation partners take care of the professional installation into the existing power supply. We ensure that the implementation and the agreed deadlines are met on time.

PROJECT ANALYSIS

In a first step, an initial project assessment is carried out based on the power consumption and past electricity costs as well as the load profile data. It is also checked whether an installation can be implemented and if a suitable installation space is available.

1

PROJECT START

LIVARSA coordinates the entire planning and takes care of the handling and communication with installation partners, energy suppliers, planners, architects and, of course, you too!

2

3

IMPLEMENTATION PHASE

LIVARSA accompanies all work steps from pre-planning, delivery and installation to commissioning, with a network of competent cooperation partners providing support.

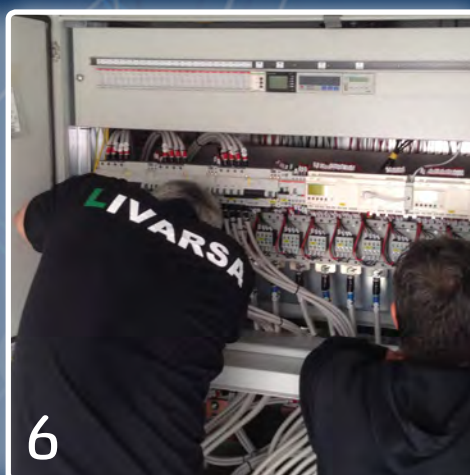
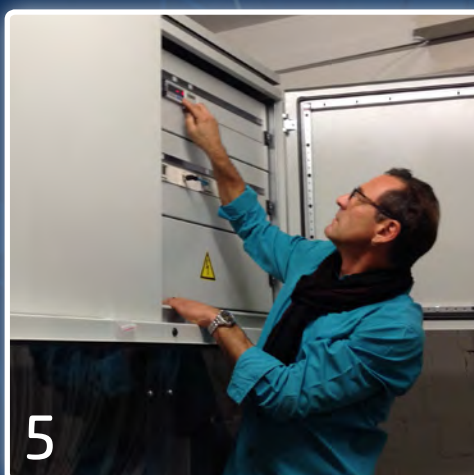
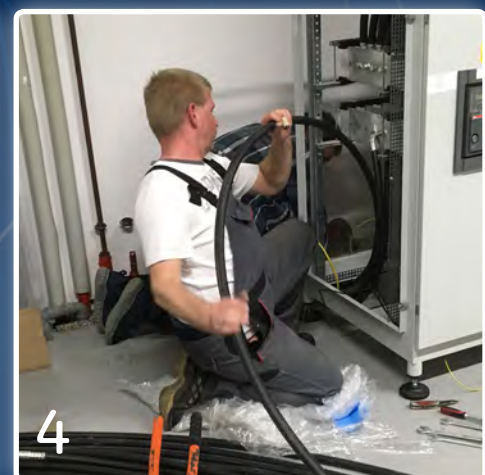
COMMISSIONING

When commissioned, your electrical network starts to work with reduced consumption and optimised efficiency – and for the next 25 years or more.

4

Implementation step-by-step

- 1 Preinstallation meeting
- 2 Delivery to the installation site
- 3 Setting up the system
- 4 Installation by LIVARSA Partner
- 5 Adjustment and verification
- 6 Commissioning of the system
- 7 Training and instruction



Expertise and new technologies

Bringing together experts from the most diverse fields of electrical engineering, the use of the latest technologies, and our long-standing know-how in energy technology have made us the leading company when it comes to achieving an efficiency increase in an entire electrical network. Together with our network partners, we find the optimal solution for every project. We decide which experts we consult on the basis of the respective requirements. This ensures that you can always expect the highest quality right from the planning stage through to the completion of your project.



A strong network of competent experts

THE USER AND HIS INDIVIDUAL CHALLENGES ARE AT THE HEART OF OUR NETWORK. OUR COOPERATION PARTNERS ARE EXPERTS FROM ALL AREAS OF ELECTRICAL & ENERGY TECHNOLOGY

Our strength is in bringing together people with a wide variety of skills and from a wide variety of fields of knowledge and innovative technologies to develop new and solution-oriented business models. For projects with maximum success.



The validated **ECV™** measurement method

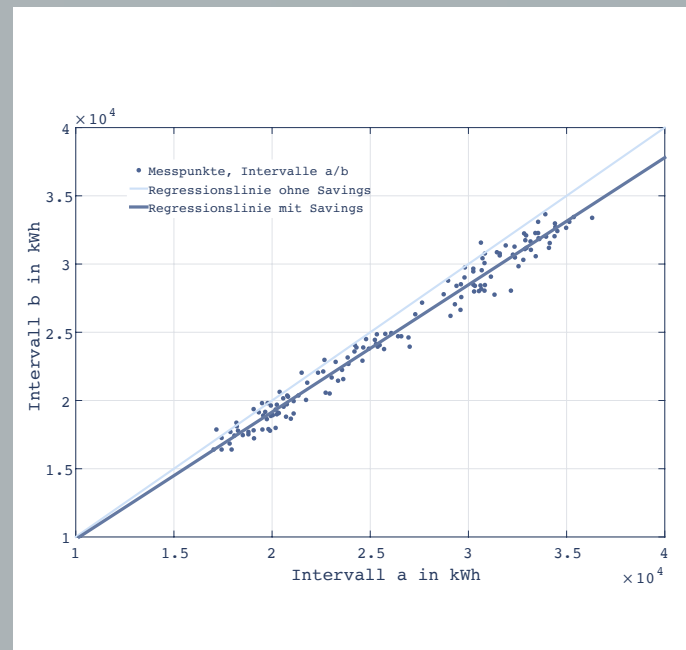
You are always on the safe side with the LIVARSA energy efficiency concept. Because the EPplus system is the first centrally installed energy-saving solution to have its effectiveness verified by a reliable measuring method and by universities. The "Department of Mechanical Engineering and Process Engineering of the Offenburg University of Applied Sciences" officially verified and confirmed the method in 2019.

The savings are measured by the direct comparison of consecutive measurement intervals, which are characterised by a recording time. Here, the time period and interval duration of the comparison measurements are the decisive point for achieving meaningful results. After all: because electric consumers are constantly switched on and off, the energy consumption in a company fluctuates greatly. In addition, there are changing loads as well as day-of-week, seasonal or time of year effects – even fluctuations by the minute when using PV or wind turbines. Due to the resulting strong fluctuations, a reliable efficiency measurement was not possible in a closed low-voltage network before now. The new ECV™ measurement method therefore sets a new milestone in the efficient use of energy in the commercial sector.

Prof. Dr.-Ing. Jörg Bausch of the Offenburg University of Applied Sciences confirms: "Previous measuring methods for the verification of the energy efficiency of a system were usually not able to take the large number of fluctuations in the load profile into account. In the case of long-term measurements that take the entire internal power grid into account, these can sometimes lead to large deviations, which in turn have an impact on the accuracy and thus also on the validity of the savings values.

With the ECV™ measurement method, it is possible to prove and reliably quantify even small savings."

REAL 12-HOUR MEASUREMENT WITH SYSTEM

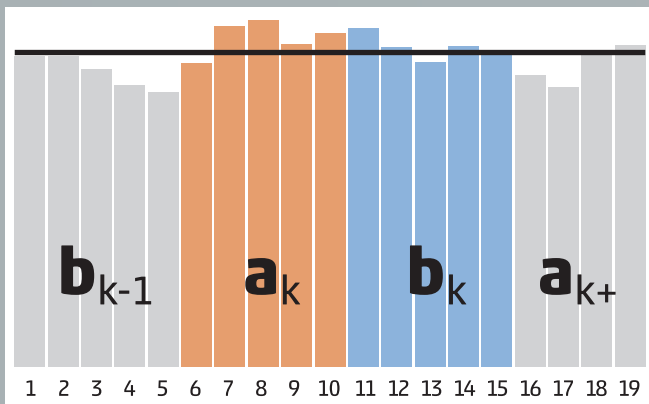


In the example, THE LIGHT BLUE line shows the energy consumption of a company without implemented energy-saving hardware – and thus without any savings effect. The DARK BLUE line, on the other hand, shows the energy consumption when implementing the EPplus system and a savings effect of 4.91%. The assumption that successive 5-minute intervals have the same energy density on average has been confirmed.

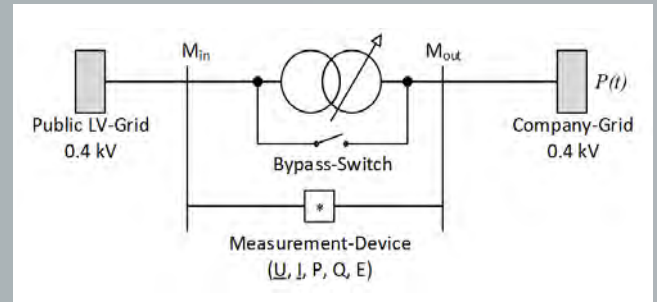
Power savings can be measured precisely for the first time!

SWITCHING PRINCIPLE FOR REVIEW OF THE MEASUREMENT DATA

So far, the new ECVTM measurement method only works in conjunction with the central energy-saving hardware solution offered by LIVARSA. For this purpose, a special bypass switch has been integrated, which is automatically controlled according to the selected interval duration. The principle: the centrally installed energy efficiency solution is switched on and then switched off again for each measurement interval. In this way, two series of measurements are gradually produced - once with and once without switching on the energy efficiency solution.



ECV[®]
Energy Comparison Value
The **VALIDATED**
MEASUREMENT
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The energy saving achieved is thus proven by comparing the energy density of successive intervals.

DISCRETE POWER MEASUREMENT AND INTERVAL PRINCIPLE OF THE LIVARSA MEASUREMENT METHOD

The savings are measured in a direct comparison of successive measurement intervals of the same recording duration (for example, five minutes), which are recorded over a sufficiently long period of time (for example, 72 hours). In this case, the system is switched on and then switched off again for each measuring interval. This results in two time series from the same consumer:

Once without and once with connection of the system. The energy densities of successive intervals, without an energy efficiency device, differ only slightly, so that the two series of measurements strongly correlate with each other. If energy savings are now achieved by using an energy efficiency device, this can be verified and quantified by the energy density of the successive intervals.

» **COMPARATIVE INTERVAL MEASUREMENT MEANS: PROOF OF SAVINGS!** «

Ready for more efficiency?

THEN TEST US! We advise you without obligation – by phone or personally on site in your company. Our reference customers will also be happy to share your experience with you. You can also find at the relevant trade fairs as well as at regular lectures throughout Germany. We look forward to meeting you!

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