YOUR COMPREHENSIVE ELECTRICITY COVER

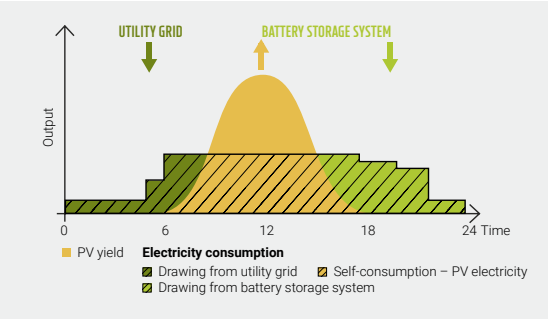
Battery storage systems for agriculture, trade and industry

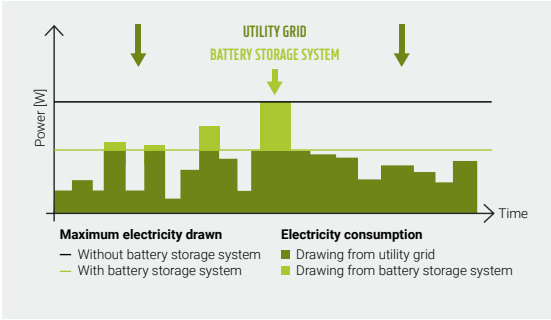
TESVOLT
THE ENERGY STORAGE EXPERTS

PAY OR DO IT YOURSELF?

Use battery storage systems to profit from the energy transition and minimise risk

The transformation of the energy market has made long-term planning security for energy costs all but impossible. Yet every change also brings opportunities. Many have already taken advantage of the energy transition to tap into an attractive business with secure revenue streams with photovoltaic installations, biogas generation and wind power. Now battery storage systems offer the next big opportunity: secure yourself against uncertainties while earning money, and avoid the consequences of potential power outages with emergency power.





Self-consumption optimisation

SELF-CONSUMPTION OPTIMISATION

If the solar yield is greater than the current electricity consumption, the excess is fed into the battery storage system. If the solar yield dips below power requirements, the storage system kicks in and delivers the needed electricity. When it runs out, electricity is drawn from the utility grid. In this way, the self-consumption share can be boosted to 80% or more.

Potential users
Operations with a photovoltaic installation or a suitable roof. E.g. carriers, agriculture, workshops, factories

Physical peak shaving

PHYSICAL PEAK SHAVING

Consumers with load profile measurement primarily pay for the utilised power. Costs are based on the moments when power consumption is the highest, i.e. the peak loads. Battery storage systems can provide stored electricity during peak loads and reduce utility grid consumption. This reduces the connected load and can save thousands of euros per year.

Potential users
Operations with high power consumption and load profile measurement. E.g. quick charging stations, agriculture, workshops, manufacturing

Multi-use

MULTI-USE APPLICATIONS

Multi-use enables the combination of two operational management strategies: self-consumption optimisation (SCO), peak shaving (physical or RLM) and Time of Use (ToU). A storage area can be defined for each of the selected applications depending on specific requirements. For maximum service life and economic efficiency.

Back-up power

INEXPENSIVE BACK-UP POWER

Battery storage systems help ensure a reliable power supply. You can also optimise or completely replace a diesel generator with a battery storage system. In case of a power outage, your battery storage system takes over the power supply and your operation keeps running without interruption.

Potential users
Operations that depend on a reliable power supply. E.g. livestock farming, cold stores

Grid system services

EARN MONEY WITH ANCILLARY SERVICES

TESVOLT battery storage systems can also provide so-called ancillary services. On behalf of your distribution system operator, your battery storage system balances out fluctuations in the utility grid. In return, you are paid according to the type and scope of your services.

Potential users
Operators of larger battery storage systems with a grid connection.

Off-grid

RELIABLE POWER SUPPLY WITHOUT THE UTILITY GRID

You need electricity but there's no grid connection available? In conjunction with a power source such as a photovoltaic installation and/or a CHP, battery storage systems enable the creation of an off-grid system. Battery storage systems can also optimise the consumption of diesel generators.

Potential users
Properties that need electricity but lack a grid connection.

OTHER POTENTIAL APPLICATIONS – WITH THE TS-I HV 80

In addition to the applications described on the previous page, the TS-I HV 80 also opens up other, completely new, options. These give a further significant boost to energy efficiency and the potential for cost savings by using the battery system.

GENERATION CONTROL

To achieve optimal utilisation of power generation capacity, the storage system controls when power sources are switched on and off. It's possible, for example, to start or stop combined heat and power units or diesel generators in addition to the renewable sources – depending on the state of charge of the battery. This ensures that only as much power as is needed at a given moment is generated, but also never too little. This, in turn, ensures that energy is neither wasted nor unnecessarily drawn from the utility grid.

LOAD CONTROL

In simple terms, automatic load control means that loads are switched off when they are not needed at a given moment. For instance, unnecessary use of expensive utility grid electricity can be avoided in periods of increased power needs. Another example is power outages, when the entire system has to rely on emergency power from the battery storage system. In this case, the automatic shutdown of all unneeded loads ensures maximum utilisation of the stored electricity – or the renewable sources if the wind or PV installation is generating power at the time in question. This application can be used to control charging stations as well.

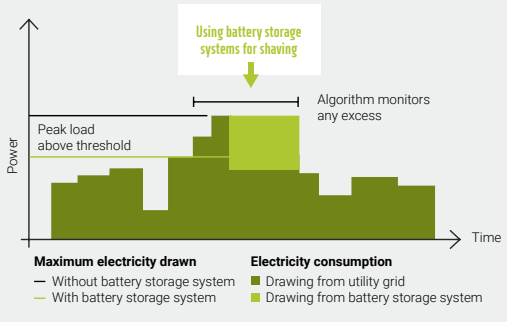
FORECAST-BASED CHARGING

If more PV electricity is being produced than consumed at a given moment (e.g. on sunny days with a fully charged battery storage system), the surplus electricity can be fed into the public utility grid in exchange for payment. By law, however, the output of the PV installation must in some cases be curtailed, which results in curtailment losses: surplus solar energy is wasted. This is uneconomical. To avoid this, forecast-based charging is useful.
The TESVOLT Energy Manager evaluates weather forecast data, battery capacity and the current state of charge. The algorithm determines a strategy for the control of the storage system, for example for the following 24 hours.

RLM PEAK SHAVING

With physical peak shaving (PS), every consumption peak that occurs is simply covered by electricity from the battery storage system, while the system involved in registering load profile measurement (RLM) works at 15-minute intervals to ensure greater accuracy and therefore also greater efficiency.

The maximum consumption peak tolerated by the supplier is circumvented because the amount of electricity consumed is registered over a period of 15 minutes to permit short peak loads. The TESVOLT Energy Manager only comes into play when the average consumption is in danger of exceeding the maximum tolerated peak value within the 15-minute interval.



Background:
Where annual consumption exceeds 100,000 kWh, consumption is charged at the kilowatt-hour rate for each kWh and the demand rate per maximum kWh required within 15 minutes. If the maximum average power level is exceeded within a 15-minute interval, the customer/consumer then has to pay their energy supplier a higher demand rate over the whole year.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WHAT CHARACTERISES A GOOD STORAGE SYSTEM?

RAPID DISCHARGE (1C)

Essential for high power levels. If the C-rate is too low, the storage system has to be very large to provide the required power. This ultimately makes the storage system unnecessarily expensive.

HIGH EFFICIENCY AND LOW STAND-BY LOSSES

Some energy is "lost" in each storage process. The storage system efficiency indicates how much of the energy in the storage system can be taken out of it. This value should be well over 90%, while stand-by losses should be no greater than 5 watts.

FLEXIBLE EXTENSION AND EXCHANGE

As a rule, batteries can only be exchanged or added in the first few months after commissioning. Systems in which batteries can be added or replaced at any time are better.

HIGHEST SAFETY STANDARDS

For storage systems, make sure the battery is monitored on the cell level as this is the only way to detect the need for maintenance at an early stage. The battery cells should also come from a reputable source. Established manufacturers offer cells that will not ignite even if damaged.

INTELLIGENT BATTERY MANAGEMENT

Monitoring each individual battery cell is essential to guaranteeing maximum performance, safety and durability. This ensures that all cells are optimally charged and discharged at all times and that potential errors are detected in good time.

HIGH CYCLE STABILITY AND LIFESPAN

Battery storage systems are subjected to wear with each charge cycle. There is therefore a specified number of full charge cycles for a storage system before it goes below a certain residual capacity. There is also a lifespan in calendar years that specifies the maximum lifetime in years.

WHAT DOES THAT MEAN, EXACTLY?

DoD
Depth of discharge – indicates the maximum discharge depth of a storage system. Many storage systems cannot be fully discharged, which means that not all of the energy in the storage system is available for use. Good storage systems have a depth of discharge of 100%.

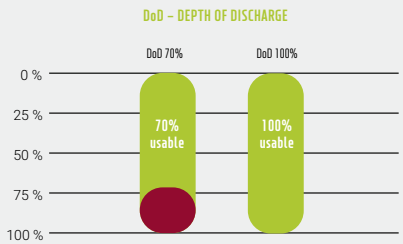
Full cycle
A full cycle is a single instance of complete charging and discharging of a storage system. In practice, this involves totalling partial charges and discharges. One of the ways the lifespan of a storage system is specified is with a number of full cycles.

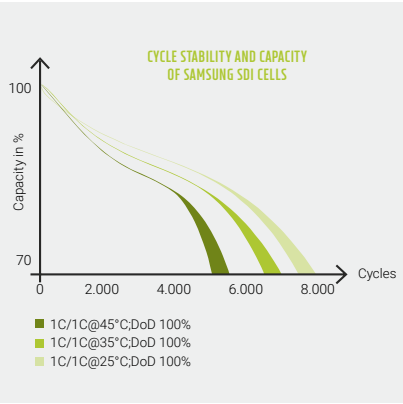
C-rate
This indicates how quickly a storage system can be charged or discharged. 1C means that a storage system can be fully charged or discharged within an hour. A storage system with 0.5C requires two hours for the same, while for 2C it takes just half an hour.

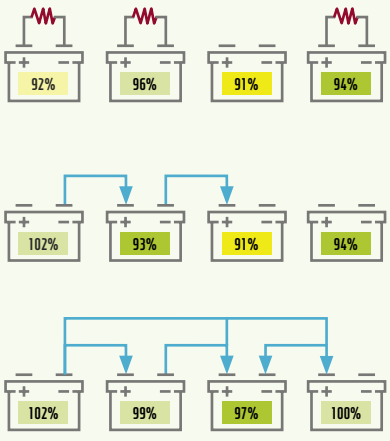
LCOS
Levelised cost of storage – describes the cost for a kilowatt hour of energy charged into a battery storage system and drawn back out of it. The lifespan and number of cycles, the maximum depth of charge and the system efficiency are the determining factors here.

Li-NMC
Lithium-nickel-manganese-cobalt-oxide – abbreviated as Li-NMC, is a cell chemistry characterised by high energy density, high performance and long lifespan.

SoH
State of health indicates the health of the battery as well as the percentage of the initial battery capacity still usable in the current charge cycles. How fast the battery ages depends in part on the quality of the battery, as well as the balancing process used.







PASSIVE BALANCING
Efficiency: 0%, balancing current: 0.05 A
High losses

UNIDIRECTIONAL BALANCING
Efficiency: 70–90%, balancing current: 3.0 A
Moderate losses

ACTIVE BATTERY OPTIMIZER
Efficiency: > 90%, balancing current: 5.0 A
Low losses

HOW DOES CELL BALANCING WORK?

Cells age at different rates. These differences between the cells have a negative impact on the charging and discharging behaviour of the battery. Cell balancing attempts to minimise these differences as much as possible. In **passive balancing**, all cells are brought to the level of the weakest cell by having the stronger ones burn off energy. In **unidirectional balancing**, stronger cells charge any weaker subsequent cells. Thanks to the **Active Battery Optimizer**, balancing is carried out between all battery cells within the battery module and even between the different battery modules.

POWER IS GOOD, PERFORMANCE IS BETTER

1. FUTURE-PROOF

Through revolutionary ABO battery management, battery modules of TESVOLT storage systems can be upgraded or replaced without incurring problems or efficiency losses even after years of service.

2. ULTIMATE PROFITABILITY

The batteries of TESVOLT storage systems have an efficiency of up to 98%, a round-trip efficiency including battery inverter of up to 94% and their self-consumption is just 5 W. Thanks to their long lifespan and high cycle stability, TESVOLT storage systems boast above-average economic efficiency.

3. MAXIMUM SAFETY

The prismatic battery cells used by TESVOLT can even be pierced by a metal spike without the cell igniting. And if errors do occur at some point, ABO battery management reliably detects defects in good time.

4. HIGH PERFORMANCE WITHOUT COMPROMISE

ABO battery management and premium battery cells enable rapid charging and discharging. The 1C continuous power rating enables professional use in trade, agriculture and industry.

5. STRONG PARTNERSHIP

TESVOLT collaborates with strong partners. For our cells, we work closely with Samsung SDI. In the area of external system components, we collaborate with SMA – the German market leader for inverters.

6. MAXIMUM LIFESPAN

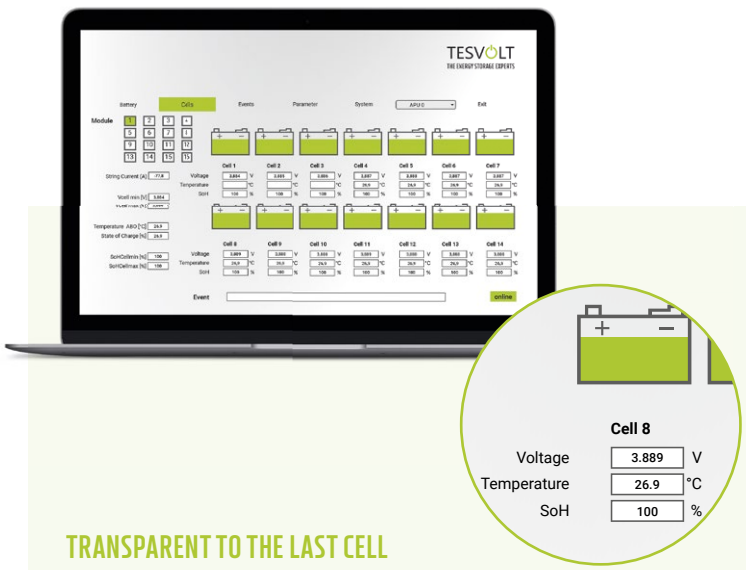
With the intelligent ABO battery management system, every battery cell is always optimally charged and discharged. For this reason, and thanks to the use of premium battery cells, TESVOLT storage systems are designed for a 30-year lifespan and 8,000 cycles.

THE LOOK OF A WINNER

An outstanding battery storage system is more than the sum of its parts
Every single battery cell in a storage system determines its performance, its lifespan and safety. For this reason, we use only the highest-quality components – such as prismatic high-performance cells from our partner Samsung SDI.

We have also developed a battery controller that eliminates the typical problems of lithium-ion battery storage systems. The TESVOLT Active Battery Optimizer (ABO) monitors the charging and discharging of every single cell. This makes it possible to achieve safety, performance, a long lifespan and battery efficiency of up to 98%.

Through the totality of their characteristics, TESVOLT battery storage systems are among the most advanced products on the market. And that's not just our opinion, as a number of honours, such as the Hugo Junkers Award, the Smarter E Award and the German Entrepreneur Award, demonstrate.



TRANSPARENT TO THE LAST CELL

Every TESVOLT storage system can be monitored continuously using BatMon software. This software visualises the status not only of the entire system but also all battery modules and each individual cell. So you can be absolutely sure at all times that your storage system is functioning reliably. Yet should the unexpected ever occur, any anomalies or defects can be detected and rectified quickly. **How you benefit: With TESVOLT ABO, you are able to switch battery modules without a drop in efficiency, even after many years.**

ACTIVE POWER UNIT – APU

This is part of the battery management system, enabling communication with the other devices in the system and monitoring the safety of the battery system.

BATTERY MODULE WITH ACTIVE BATTERY OPTIMIZER – ABO

In addition to the cells, the battery module also includes an Active Battery Optimizer. The ABO monitors and controls charging and discharging in each individual cell.

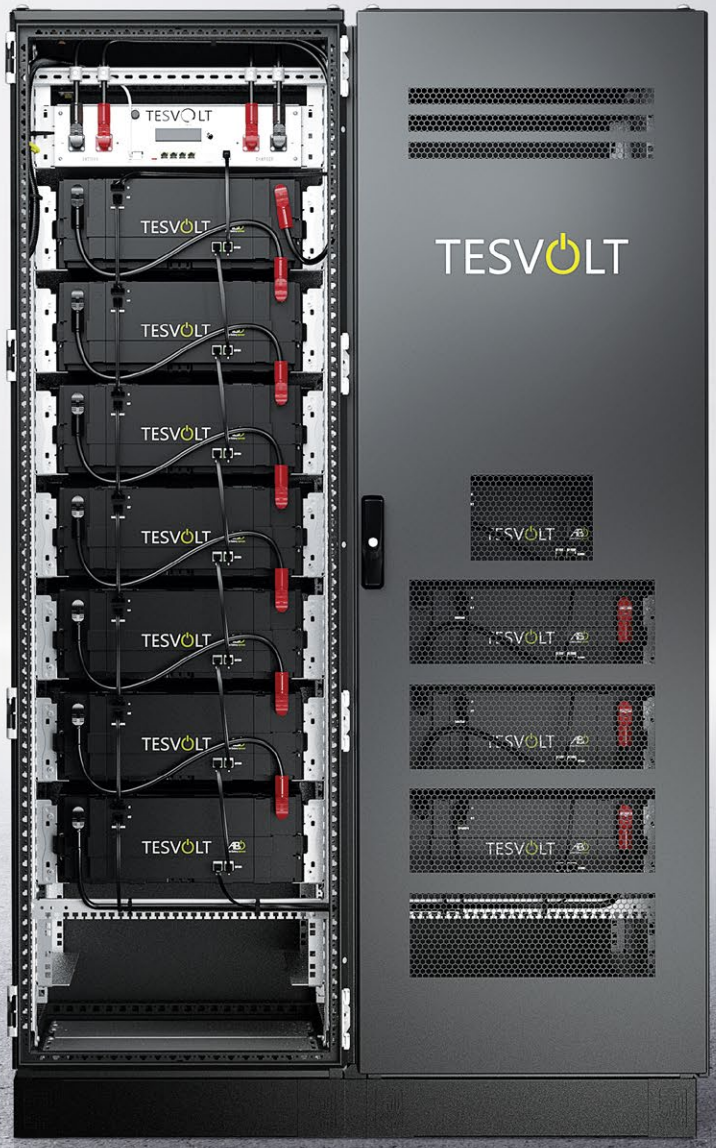
BATTERY CELL

TESVOLT exclusively uses prismatic lithium-NMC cells from SAMSUNG SDI. They are long-lasting, powerful and extremely safe.

+ Minimal stand-by losses
+ Maximum safety
+ Optimised for SMA systems

+ Quick, active balancing
+ Full transparency
+ Can be replaced at any time

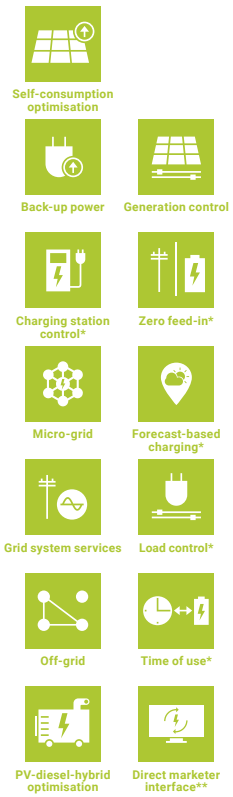
+ Long-lasting
+ Extremely safe
+ Powerful



HIGH ECONOMIC EFFICIENCY IN A SMALL SPACE

The right battery storage system for every situation

Our broad product portfolio covers the full range of applications for energy storage systems.
Our storage systems work with low and high voltages, can be connected to all power sources and offer flexible rescaling and expansion.



TS 48 V – THE FLEXIBLE ONE

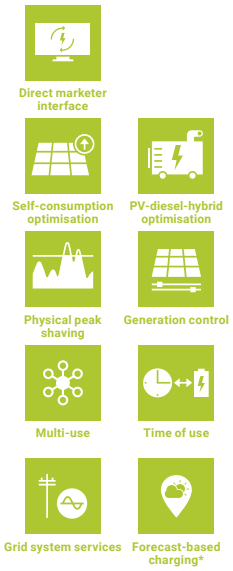
The TS 48 V is a flexible lithium battery storage system for use in enclosed spaces. It is available in three different cabinet sizes up to 48 kWh. The size can be selected in 4.8 kWh increments and an Active Power Unit (APU) can control a maximum of 16 battery modules.

TESVOLT TS 48 V storage systems can be used off-grid or linked to the grid and connected in single- or three-phase setups.

Technical data

System size: 4.8.–3,686.4 kWh
Inverter: SMA Sunny Island 4.4 M/6.0 H/8.0 H (3.3/4.6/6 kW)

* Only in conjunction with the Home Manager 2.0
** Only in conjunction with the Data Manager



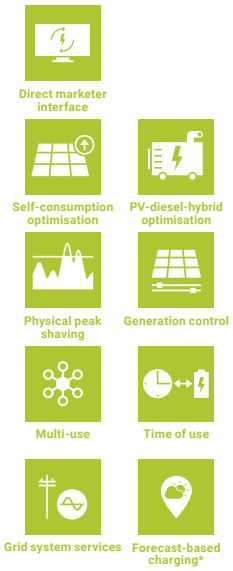
TS HV 70 – THE POWER PACK

The TS HV 70 is a high-voltage lithium battery storage system for installation in enclosed spaces. It is available with a capacity of 67–304 kWh per battery inverter. Up to 20 inverters can be operated in a configuration. Thanks to its high-voltage technology, the TS HV 70 is one of the most economically efficient systems on the market.

TS HV 70 storage systems can be connected to the grid and used to optimise the consumption of diesel generators.

Technical data

System size: 67–6,080 kWh
Inverter: SMA Sunny Tripower Storage 60 (60/75 kVA)



TS HV 70 OUTDOOR – THE WEATHERPROOF ONE

The TS HV 70 Outdoor is a high-voltage lithium battery storage system for installation outdoors. The device features full temperature control and can be used in most climate zones around the world. It is available with a capacity of 67–307 kWh per battery inverter.
Up to 20 inverters can be operated in a configuration. Thanks to its high-voltage technology, the TS HV 70 Outdoor is one of the most economically efficient outdoor systems on the market.

TS HV 70 Outdoor storage systems can be connected to the grid or used to optimise the consumption of diesel generators.

Technical data

System size: 67–6,080 kWh
Inverter: SMA Sunny Tripower Storage 60 (60/75 kVA)

* Only in conjunction with the SMA app

CONTAINER-SIZED POWER

TESVOLT technology on a large scale

Whether in the heat of the desert or permafrost zones, utility grid-connected or off-grid: The TPS flex and TPS-E are extremely robust. Designed as flexible, reliable electricity storage systems for use in rough environmental conditions around the world and for almost any purpose. And of course, they offer all the advantages of a TESVOLT storage system.

TPS-E – THE ECONOMICAL GIANT

The TESVOLT TPS-E is available in the container sizes 20, 40 and 45 ft, is deployable up to 1,300 V DC, black start-capable and highly reliable. Extremely efficient thanks to the DynamiX Battery Optimizer and new Samsung 22 S battery modules. The smart operational management and innovative Eco Cooling System help save up to 30% of operating costs. Special service bonus: option of remote maintenance and monitoring on the cell level, prepared for AI error diagnosis.

Technical data

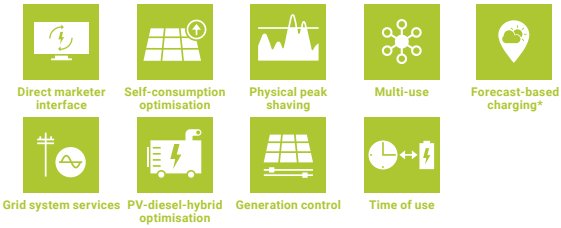
System size: 72 kWh–100 MWh
Inverter: SMA Sunny Central Storage (500– 3,000 kVA)

TPS flex – THE GREAT ALL-ROUNDER

The TESVOLT TPS flex is available as a 10 or 20 ft container, is highly versatile and configurable for individual requirements. Upgrades are possible even after years of service. Thanks to the Active Battery Optimizer without dead times, with 5 A balancing current and just 5 W stand-by loss capacity per battery string, it's a marvel of efficiency. Not to mention long-lasting and quick to charge and discharge. Monitoring on the cell level offers exceptional transparency.

Technical data

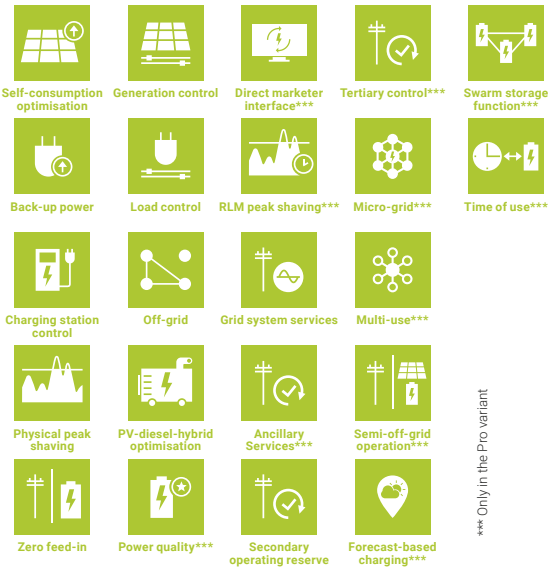
System size: 72–288 kWh
Inverter: SMA Sunny Tripower Storage 60 (60/75 kVA)



All applications of TPS-E are project-based

* Only in conjunction with the SMA app

TOP NOTCH VERSATILITY AND COST EFFICIENCY



TS-I HV 80 – THE ALL-ROUNDER

The new TS-I HV 80 is our first battery storage system with an integrated TESVOLT inverter and innovative TESVOLT Energy Manager.

Self-consumption optimisation, peak shaving (RLM), back-up power, on- and off-grid use – the TESVOLT TS-I HV 80 is not only the ideal electricity storage system solution for every application, but thanks to power quality technology, it can also improve the local utility grid for the long term. With its multi-use capability, it can simultaneously be used for self-consumption optimisation and RLM peak shaving. And of course, the TS-I HV 80 also boasts all the advantages of our other products: high-end battery cells from the automotive industry, innovative technologies such as the Active Battery Optimizer, flexible retrofittability and a lifespan of up to 30 years.

Technical data

System size: 75–1,360 kWh
Inverter: TESVOLT PCS, 75 kW

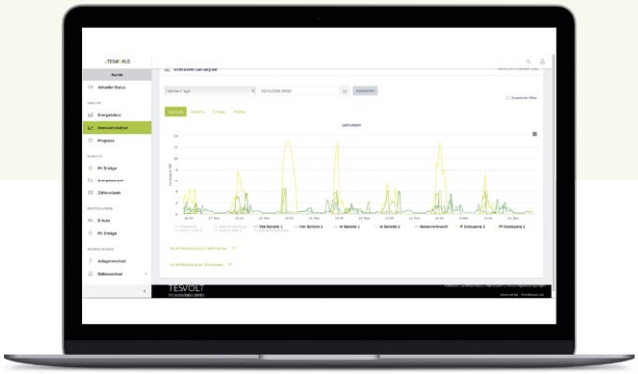
THE FULL SERVICE PACKAGE

TESVOLT ENERGY MANAGER

In combination with the innovative TESVOLT Energy Manager system, the TESVOLT TS-I HV 80 adapts perfectly to the requirements of trade and industry. The TESVOLT Energy Manager enables a wide range of combinable applications as well as the control and monitoring of operational management strategies through a dedicated portal: myTESWORLD.

myTESWORLD

myTESWORLD is the user portal for energy management in the local system. With their personal login, users can execute and monitor all operational management strategies and settings on their computer. Beyond the powerful, free basic version, the fee-based Pro version offers valuable additional functions. These include even greater transparency through minute-by-minute evaluation of data, and the multi-use function, which boosts the cost efficiency of the storage system even more.



TESVOLT PCS INDUSTRIAL INVERTERS

The TESVOLT TS-I HV 80 storage system is equipped with a three-phase battery inverter (TESVOLT PCS) that is optimally integrated in the system. It can be operated in parallel with up to five additional cascaded TESVOLT PCS units.

+ Black start capable

Black start capable for off-grid operation and back-up power for power outages

+ Power quality

Power quality stabilises voltage and frequency while reducing load imbalance, reactive power and harmonics in the local utility grid

+ Modular principle

The TESVOLT PCS consists of up to four IPU inverter modules (of 75 kW each, can be upgraded at any time)

+ Very high control speed

Response time to power requirements in the utility grid in milliseconds

+ Maximum power density

Potential for up to 340 kW with a footprint of just 0.54 m²


ATTENTION
TESVOLT

THEORY IS GOOD, PRACTICE IS BETTER.

Five good examples of how our customers benefit from a storage system

100% ENERGY SELF-SUFFICIENCY

"Thanks to our TESVOLT storage system and solar installation, our carrier is 100% energy self-sufficient. The investment is already amortised after just eight years; after that, electricity costs me nothing", says Martin Gerold, one of the two Managing Directors of Spedition Lutter.

Spedition Lutter
Storage system: TS 48 V
Capacity/output: 48 kWh / 18 kW
System: On-grid, 80 kWp photovoltaic installation
Industry: Carrier, 54 employees
Location: Bönen, Germany

GREEN OFF-GRID SYSTEM

"Our whole operation would not work without the high performance of the TESVOLT storage system. The fast charging and discharging speed was particularly important to us to ensure that the water pumps start up quickly", explains George Zombori, Managing Director of the installation company Unlimited Energy.

Avocado farm in Australia
Storage system: TS 48 V
Capacity/output: 48 kWh / 18 kW
System: Off-grid with 53 kWp photovoltaic installation and 160 kWh saltwater batteries
Industry: Agriculture
Location: Western Australia, south of Perth

EARN MONEY WITH ANCILLARY SERVICES

"As one of the first solar farms built with battery storage systems and without state subsidies, we are forging a new path among local authorities and showing that municipalities must play a leading role in energy supply", says Louise Goldsmith, former County Council Leader. (right)

Municipal solar storage system farm
Storage system: 2x TPS 2000
Capacity/output: 4 MWh / 4 MW
System: On-grid with 7.4 MWp photovoltaic installation
Client: West Sussex County Council
Location: Westhampnett, England

BACK-UP POWER

"We are very pleased with the TESVOLT storage system. It has supplied reliable emergency power for our chicken farm during outages and has run smoothly since 2015. We are now planning to expand our storage capacity", says Stefan Beutel, operator of a chicken farm in Eberhardzell, Upper Swabia.

Eberhardzell chicken farm
Storage system: Li 40
Capacity/output: 40 kWh / 18 kW
System: On-grid, photovoltaic installation
Industry: Agriculture
Location: Eberhardzell, Germany

PEAK SHAVING

"When the milking system is running in the mornings and evenings, power consumption spikes, but the solar power system is not running at those times. The battery storage system supplies the power then – that saves a lot of money for expensive peak loads", says Jens Fromm, owner of Seydaland farm.

Seydaland farm
Storage system: TS HV 70
Capacity/output: 67 kWh / 60 kW
System: On-grid, 650 kWp photovoltaic installation and 800 kW biogas installation
Industry: Agriculture
Location: Jessen, Germany

TESVOLT PRODUCTS AND FEATURES

What's your ideal TESVOLT battery storage system?

MODEL \ APPLICATIONS	Self-consumption optimisation	Off-grid	Peak shaving (physical)	Peak shaving (RLM)	Charging station control	Back-up power	Time of use	Power quality	Multi-use (SCO & ToU)
TS 48 V – THE FLEXIBLE ONE					1)		1)		
TS HV 70 – The POWER PACK									
TS HV 70 OUTDOOR – THE WEATHERPROOF									
TS-I HV 80 – THE ALL-ROUNDER		5)		3)	4)		3), 4)	3), 5)	3), 4)
TPS FLEX – THE GREAT ALL-ROUNDER									
TPS-E – THE ECONOMICAL GIANT [5)]									

ARE YOU KEEN TO BENEFIT FROM A STORAGE SYSTEM TOO?

Simply give us a call, send us an email or use the contact form on our website – we'll put you in touch with a TESVOLT specialist partner in your area.

CONTACT US TODAY!
WWW.TESVOLT.COM

Multi-use (PS & ToU)	Multi-use (SCO & PS)	Micro-grid	PV-diesel-hybrid optimisation	Load control	Generation control	Forecast-based charging	Grid system services	Ancillary Services	Zero feed-in	Direct marketer interface	Semi-off-grid operation
				1)		1)			1)	2)	
						6)					
						6)					
3), 4)	3)	3), 4), 5)	4)	4)	4)	3)		3), 5)		3), 4)	3), 4), 5)
						6)					

[1] Only in conjunction with the Home Manager 2.0 [2] Only in conjunction with the Data Manager [3] Only in the Pro variant [4] As of Q3 2021 [5] Project-based [6] Only in conjunction with the SMA app

For all orders placed up to and including 31 December 2021, the Pro version including all Basic functions can be used free of charge for one year from the date of commissioning. Once this free usage lapses, further usage requires an annual, fee-based subscription priced at EUR 3/kWh. Our current terms of use apply.

ABOUT TESVOLT

Daniel Hannemann and Simon Schandert established TESVOLT in the summer of 2014 with a vision to bring affordable, clean energy to every corner of the world. Their aim was to develop and manufacture battery systems that store power from renewable energy sources as efficiently as possible. Given that the biggest energy consumers in many countries are trade and industry, the company focused on storage systems with a large capacity from the very beginning. Today, TESVOLT produces its solutions for commercial storage systems in series and supplies them all around the world.

Your certified TESVOLT specialist partner

PSC SOLAR (UK)

41B OLUTOYE CRESCENT
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