

SAFETY CREATES TRUST

TESVOLT PUTS SAFETY FIRST

Take a responsible and safe path into the future with our energy storage systems

Most **TESVOLT** storage systems are **certified by TÜV Rheinland** and are therefore not only some of the most powerful storage systems on the market, but also some of the safest.

Our long-term, trusting collaboration exclusively with accredited partners is part of our **appreciation of quality and safety**. Through our close partnership with Samsung SDI, we can integrate the safest and most powerful battery cells in our storage systems. **Prismatic battery cells from Samsung SDI** have been extensively tried and tested, and have proven reliable for numerous different applications (GWh).

"MADE IN GERMANY" QUALITY – ISO CERTIFICATION 9001:2015

TESVOLT represents continuous quality assurance, from the supplier to the customer. In addition, we are **ISO 9001:2015** certified for the successful implementation of quality management throughout the company.

Our entire production is carried out in Germany. With our unparalleled **"end-of-line" test track** (EoL, see Fig. 1), we test, inspect and cycle every battery cell and battery module before delivery. We thereby ensure that we always install and deliver "fresh" and **100% tested battery modules**.



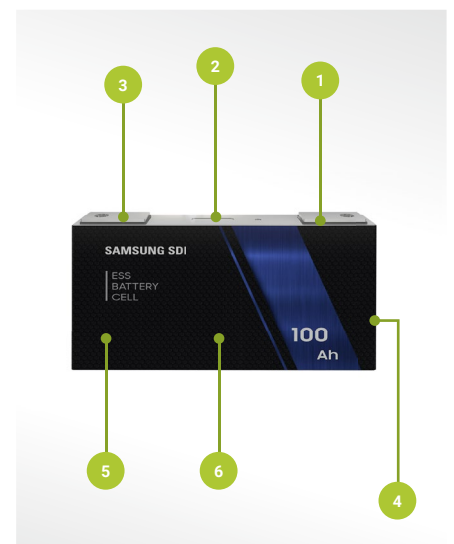
Fig. 1: EoL test track

TESVOLT STORAGE SYSTEMS – SAFETY CHARACTERISTICS

Energy storage systems from **TESVOLT** feature independent, **redundant safety cascades** across all components to ensure the **maximum possible level of safety** according to the state of the art.

BATTERY CELL

	Safety characteristic	Function	Benefit
1	Safety fuse (CID)	Interrupts current in the event of short circuit / overcurrent	Safety by preventing current overload in the cell
2	Safety valve	Predetermined breaking point, opens in the event of overpressure	Safety by creating a pressure balance
3	Overcharge safety device (OSD)	Interrupts the current if a cell is overloaded	Safety by preventing overloading
4	Safety functional layer (SFL)	Ceramic protective layer for thermal resistance, prevents short circuit between anode and cathode	Safety by avoiding ageing mechanisms (dendrite formation or lithium cracking)
5	Nail safety device (NSD)	Protection against short circuit caused by mechanical damage to the cell	Safety by preventing the risk of thermal runaway
6	Robust aluminium housing	Protection against deformation and mechanical damage to the cell	Safety through a robust cell design



BATTERY MODULE

Safety characteristic	Function	Benefit
Safety fuse	An additional safety fuse in the module to further prevent over-current	Safety by preventing current overload in the cells
Measurement concept	The voltage and temperature is determined for each individual cell	Safety by monitoring each individual cell
Robust housing	Protection against external influences and deformation of the cells	Safety through break resistance



BATTERY STORAGE SYSTEM

TESVOLT's certified and award-winning **battery management system APU** (ACTIVE POWER UNIT) is a key component of our safety cascade concept alongside the battery cells and modules mentioned above. The APU continuously monitors and measures the battery cells. This ensures a **"safe operation area"**. Upon leaving this area, the APU switches the entire system to the safe state.

Safety characteristic	Function	Benefit
Continuous measurement concept	Continuous monitoring of the battery cells; detects when the safe operation area is exited. Immediately opens the contactors and switches to a safe state	Operational safety
Continuous plausibility testing	Can I rely on the measured values? Prevents random error events from going undetected	Operational safety
Mechanically and colour coded high-voltage touch guard connector	Poka-yoke principle to protect against injury to the operator/installer, protection against foreseeable misuse, installation protection	Occupational safety
Additional active external switch accessible from the outside	Switch can be actuated from the outside in an emergency (e.g. by fire brigade). Additional "emergency brake" which interrupts the power supply to the contactors and forces them into the safe state	Operational safety



CERTIFICATES AND STANDARDS

IEC: 62619, 62620, 61000, 61010, 61508; UN38.3