

VDE FNN: Designing Low-Voltage Networks to be future-proof and customer-friendly

Whether it's the rising number of grid connections, the digitalization of equipment, or the integration of AI: grid operators, industry, and the trades are facing numerous challenges due to current developments in the low-voltage grid. VDE FNN has therefore revised several technical specifications for low-voltage systems effective March 2026 to ensure that future-proofing, feasibility, and market viability go hand in hand. "In doing so, we provide guidance and clarity on specific practical issues, even though some legal aspects are currently unclear — specifically, the European Network Codes," says Dr. Joachim Kabs, Chairman of the Board of VDE FNN.

(Frankfurt am Main, March 24, 2026) The share of renewable energies in total generation rose to over 55 percent in 2025, and despite the ongoing system transformation, Germany's electricity supply remains one of the most stable in the world. With the continued expansion of renewable energy and rising electricity demand driven by advancing electrification and artificial intelligence, it is essential to ensure a secure and resilient energy supply. To this end, controllable consumption devices and generation facilities must meet certain technical requirements in accordance with Section 14a of the Energy Industry Act (EnWG) and perform system-supporting functions. How these requirements are specifically defined and can be implemented in practice is of central importance for grid operators, tradespeople, and grid customers alike. Therefore, VDE FNN has further developed the specifications in the [Technical Connection Rules \(TCR\) for Low Voltage \(VDE-AR-N 4100\)](#) and [Power Generating Plants in the Low Voltage Network \(VDE-AR-N 4105\)](#) and published an update.

From the meter box to digital control for heat pumps, wallboxes, and more.

The focus is on further developing the guidelines for setting up new meter locations. These guidelines are a prerequisite for connecting and digitally controlling generation facilities and consumption devices, such as storage systems, heat pumps, and wallboxes — using smart metering systems. The goal is to establish a uniform industry-wide approach to connecting the communication devices of customer installations in order to avoid regionally specific solutions. For new installations in accordance with Section 14a of the Energy Industry Act (EnWG), the [TCR Low Voltage](#) specifies a mandatory digital interface for control commands based on VDE-AR-E 2829-6-1, with EEBUS recommended as the cross-manufacturer minimum communication standard. For certain installations, relay contact control — the so-called control signal terminal block — is still permitted during a transition phase. “Implementing these requirements is the basis for grid operators to provide reliable congestion management and for grid customers to be assured that their power supply is never at risk,” explains Kabs.

Practical issues: Multiple Grid Connections on a Property and Zero-Net Metering

In addition to the major issues surrounding the maintenance of system stability, the revised TCRs also provide clarity on questions that arise in the day-to-day practice of grid operation. For example, the Low-Voltage TCR describes how multiple grid connections on a single property can be implemented from both an organizational and technical standpoint. The TCR for Generation Facilities on the Low-Voltage Grid answers, among other things, the question of how $P_{AV, E}$ -monitoring can be utilized up to so-called zero feed-in. The advantage: Generation facilities and storage systems can be connected to the grid even when grid capacity is insufficient. This is because $P_{AV, E}$ -monitoring ensures that only the contractually agreed-upon power is fed into the grid. This is the case, for example, when a grid is already operating at full capacity and facilities are to be connected before grid expansion is completed.

Looking ahead: Further adjustments starting in early 2027

All of these challenges are addressed in the updates that have now been published. At the same time, VDE FNN is already working intensively on an expansion of the Low-Voltage Technical Rules (VDE-AR-N 4100/A1), which is scheduled for publication in early 2027 and will further pave the way for the digital control rollout through simplifications. This will also include detailed elaboration of aspects such as the installation of smart metering systems when making changes to existing facilities. “We are preparing many things that are not yet sufficiently defined from a legal standpoint from a technical perspective, so that grid operators are as well-equipped as possible for the future,” says Dr. Joachim Kabs. In doing so, VDE FNN is creating opportunities for action even though the European Commission has not yet presented a revised version of the urgently needed European framework, in particular the Network Code Requirements for Generators (RfG).

About VDE FNN:

The Network Technology and Operation Forum within VDE (VDE FNN) develops the electricity grids with foresight. The aim is to ensure reliable system operation at all times with 100 percent renewable energies. VDE FNN makes innovative technologies practicable and provides answers to the grid technology challenges of tomorrow. Here, various specialist groups with different interests work together on solutions. Its members are over 500 manufacturers, grid operators, suppliers, system operators, authorities, and scientific institutions.

For more information, visit www.vde.com/fnn

About VDE:

VDE, one of the largest technology organizations in Europe, has been regarded as a synonym for innovation and technological progress for more than 130 years. VDE is the only organization in the world that combines science, standardization, testing, certification, and application consulting under one umbrella. The VDE mark has been synonymous with the highest safety standards and consumer protection for more than 100 years.

Our passion is the advancement of technology, the next generation of engineers and technologists, and lifelong learning and career development “on the job”. Within the VDE network more than 2,000 employees at over 60 locations worldwide, more than 100,000 honorary experts, and around 1,500 companies are dedicated to ensuring a future worth living: networked, digital, electrical.

Shaping the e-dialistic future.

The VDE (VDE Association for Electrical, Electronic & Information Technologies) is headquartered in Frankfurt am Main. For more information, visit www.vde.com

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