Power quality - standards and guidelines

Overview voltage quality standards

Aspects of the quality of care

Quality of care includes the areas of:

- Supply reliability
- Voltage quality
- Quality of service

Overview voltage quality standards

- EN 50160, EN 61000-2-2,-2-4, -2-12
- EN 61000-4-30 Test and measurement methods
- Protection classes according to EN 61010
- Fault record according to VDE-AR-N 4110
- Reporting to the Federal Network Agency

EN 50160, EN 61000-2 -2,-2-4,-2-12

The voltage quality is described in DIN EN 50160/A1 2016-02 for all networks

EN 50160 - Characteristics of voltage in public electricity supply networks - is a European standard that defines and specifies the essential characteristics of the mains voltage at the grid connection point under normal operating conditions.

EN 50160, EN 61000-2 -2,-2-4,-2-12

The most important parameters for the voltage quality are:

- Voltage level
- Frequency
- Waveform
- Disturbances
- Voltage dips and surges
- Fast and slow voltage changes
- Voltage asymmetries
- Harmonics and interharmonics

EN 50160, EN 61000-2 -2,-2-4,-2-12

Network operators make a significant contribution to voltage quality by taking appropriate measures

- Network expansion with increasing network load
- Permanent network monitoring and network management
- Use of high-performance equipment and control systems
- Limitation of the feedback effect of interfering customer devices on the supply voltage

EN 50160, EN 61000-2 -2,-2-4,-2-12

quality of supply an important means of customer retention.

Already today, the energy supply company is obliged to maintain the voltage quality in the course of product liability and according to the specifications of the Federal Network Agency. In addition, the Energy Industry Act requires network operators to report supply disruptions to the Federal Network Agency.

The verification of the supplied voltage quality is the task of the grid operator and is specified in the TAB. This can be carried out by means of PQ measuring devices in the class accuracy class A and NEW class S.

EN 61000-4-30 Test and measurement methods

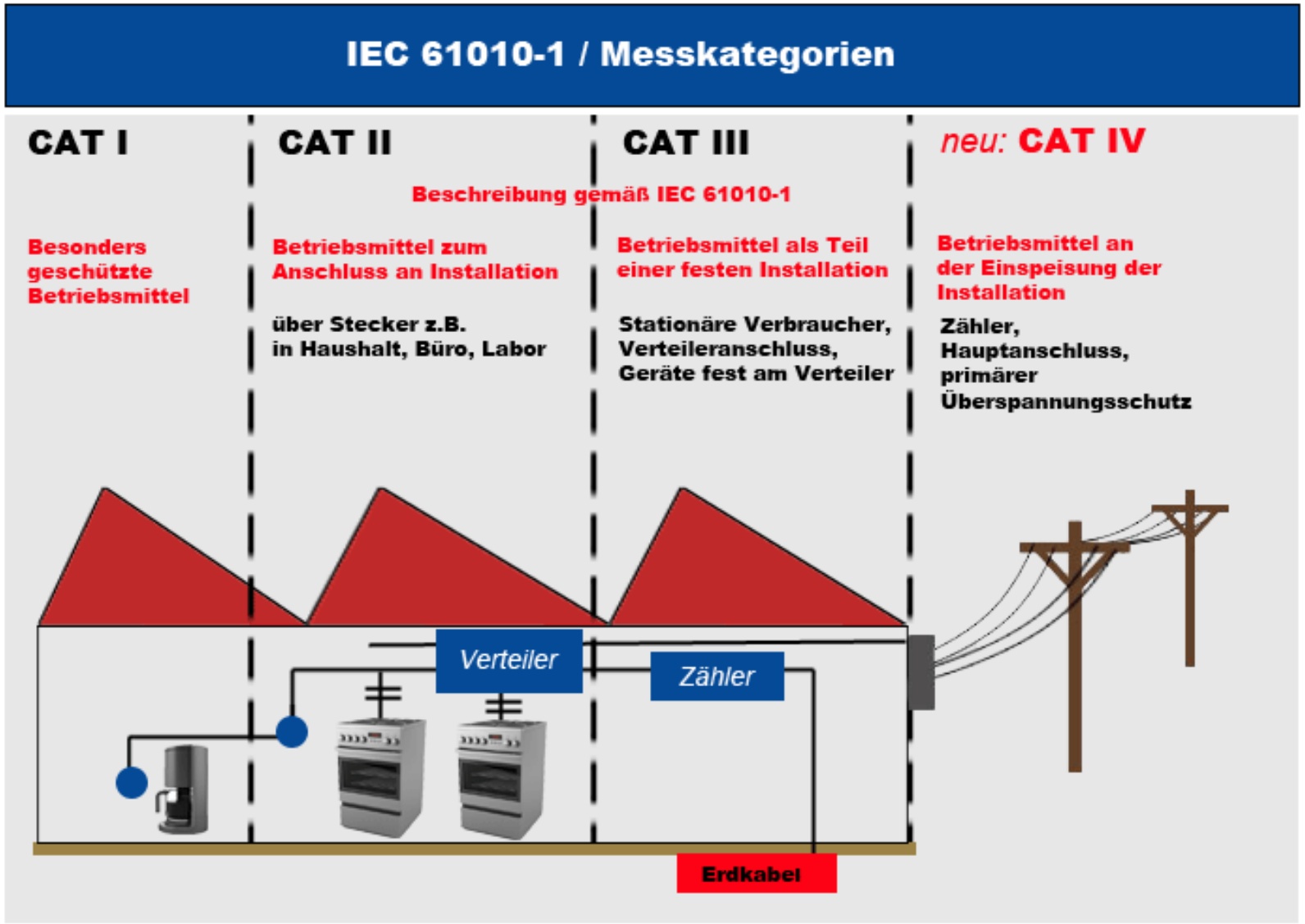
EN 61000-4-30 Test and measurement methods

It specifies procedures for the measurement of voltage quality in 50/60 Hz power supply networks and the interpretation of the measurement results.

Characteristics of the supply voltage are, in addition to frequency and voltage:

- Flicker
- voltage dips, surges and interruptions
- rapid voltage changes
- transient voltages
- unbalance, as well as harmonics and interharmonics

Protection classes according to EN 61010



Protection classes according to EN 61010

Tabelle 2: Sicherheitsklassen nach EN 61010

Kategorie	Betriebs-spannung	Transienten-Prüfung	Testquelle	Anwendung
CAT I	600 V	2500 V	30 Ohm	Für Messungen die keine direkte Verbindung zum öffentlichen Netz haben (Batteriestromkreise, Schutzkleinspannung, elektronische Schaltungen)
CAT I	1000 V	4000 V	30 Ohm	
CAT II	600 V	4000 V	12 Ohm	Für Messungen an Geräten die an einer Haushaltsteckdose angeschlossen sind
CAT II	1000 V	6000 V	12 Ohm	
CAT III	600 V	6000 V	2 Ohm	Messungen innerhalb von Gebäudeinstallation, Unterverteilung, Motoren, Verkabelung etc.
CAT III	1000 V	8000 V	2 Ohm	
CAT IV	600 V	8000 V	2 Ohm	Im öffentl. Netz, in Trafostationen, Freileitungen, Hausanschlüssen
CAT IV	1000 V	12000 V	2 Ohm	

Disturbance diagram according to VDE-AR-N 4110

Since 27.04.2019, the new VDE-AR-N 4110 guidelines for power generation systems on the medium-voltage grid have come into force.

For MV generating plants, the installation of a monitoring device (disturbance recorder system F) is required. These must be able to record and log the voltage quality according to EN 50160 in class A and harmonics up to 9 kHz.

Reporting to the Federal Network Agency

Electricity Grid Access Ordinance - StromNZV

(1) Transmission system operators shall be obliged to publish the following grid-relevant data without delay and in an appropriate manner, at least on their website, and to keep them available for two years:

1. the sum of all electricity deliveries from the transmission system via directly connected transformers and lines to electricity distribution systems and final consumers (vertical system load) with hourly precision in megawatt hours per hour,

2. the annual maximum load and the load curve as a quarter-hourly power measurement,

3. ...

For more, visit https://www.gesetze-im-internet.de/stromnzv/BJNR224300005.html

Reporting to the Federal Network Agency

Electricity Grid Access Ordinance - StromNZV

(2) Operators of electricity distribution systems shall be obliged to publish the following grid-relevant data without delay in an appropriate manner, at least on the Internet:

1. the annual maximum load and the load curve as a quarter-hourly power measurement,

2. the network losses,

3. the total load of the customers not measured in terms of power and the total load of the network losses,

For more, visit https://www.gesetze-im-internet.de/stromnzv/BJNR224300005.html

Practical aspects

IT connection Communication Telecontrol

Environmental conditions

- Readout strategy of power quality values:
- Cyclic readout or alarm-controlled readout
- WAN connection via router with firewall
- Option undirectional read only via LWL or radio (4G)
- Telecontrol connection via telecontrol stations with serial Modbus connection
- Or IEC60870-5-104
- Ensure ISO 27001 with IT department BSI compliance
- Operating and storage temperatures: -25°....+60°C