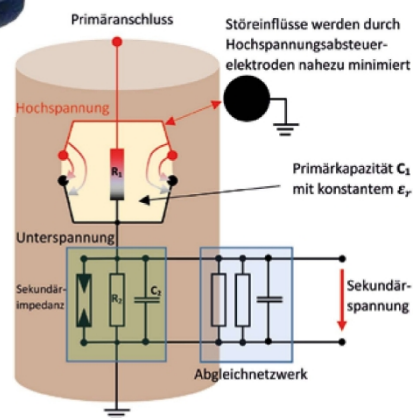


Power Quality Measurements up to 150 kHz

Many experts advocate adopting the limit values from 2 to 150 kHz from the current IEC 61000-2-2 into the EN 50160 for low and medium voltage. MSB AG and **NEO MESSTECHNIK GmbH** offer the measurement technology required for this.



Schematic diagrams of an air-insulated voltage sensor (VSIxx-S). Pictures: MSB AG

"This argument falls short," says Roland Bürger, responsible for business development at MBS AG, which specializes in measuring transducers and sensor technology. Bürger explains that typical large consumers that are directly connected to the medium voltage must equip their transfer points based on the grid operator's TABs. "A DSO that specifies the appropriate equipment has no costs itself and at the same time has permanent monitoring of the customer's system. Limit violations can therefore be detected immediately."

The limits of the converters

Roland Bürger calls for an upgrade in medium voltage in terms of power quality measurement options. While the measuring devices in the low voltage can process the voltage directly, DSOs in the medium and high voltage are dependent on voltage transformers or voltage sensors. "Although the voltage transformers used are only specified for the 50 Hz fundamental oscillation of the grids, they reliably measure frequencies up to 2 kHz in the 10 kV segment - as required by EN 50160," reports Bürger based on his company's own tests. This finding is also confirmed by the guideline for PQ

Measurements of the technical-scientific organization CIGRE / CIRED. "In the 20 kV and 30 kV range, the reliability of the measurement of However, harmonics only exist to a limited extent. Here, information must be obtained from the transducer manufacturer," explains the

MBS specialist. Two-pole voltage transformers, which can still be found in older existing systems, cannot be used to analyze harmonics.

... and the standard

Furthermore, many experts are asking themselves whether measurements up to 2 kHz are still sufficient. Although this measuring range was not increased in EN 50160, which was updated in 2020, the current DIN EN 61000-2-2 already specifies limit values for voltage up to 150 kHz. "In the range

To the technical report from R. Bürger and B. Grasel



In accordance with VDE-AR-N 4110, frequency-controlled voltage transformers up to 9 kHz are already used for feed-in systems. However, a higher frequency range is not possible with inductive voltage transformers," explains Roland Bürger.

RC divider

Voltage sensors designed as RC dividers for medium and high voltages offer an alternative. In the medium voltage range, RC dividers are already used as terminating inserts for T-connectors or as air-insulated support elements. MBS AG has devices for medium voltage up to 150 kHz in its portfolio, which have been optimized for higher frequency applications. RC dividers up to 30 kHz are currently available for high voltage.

Adapted measurement technology

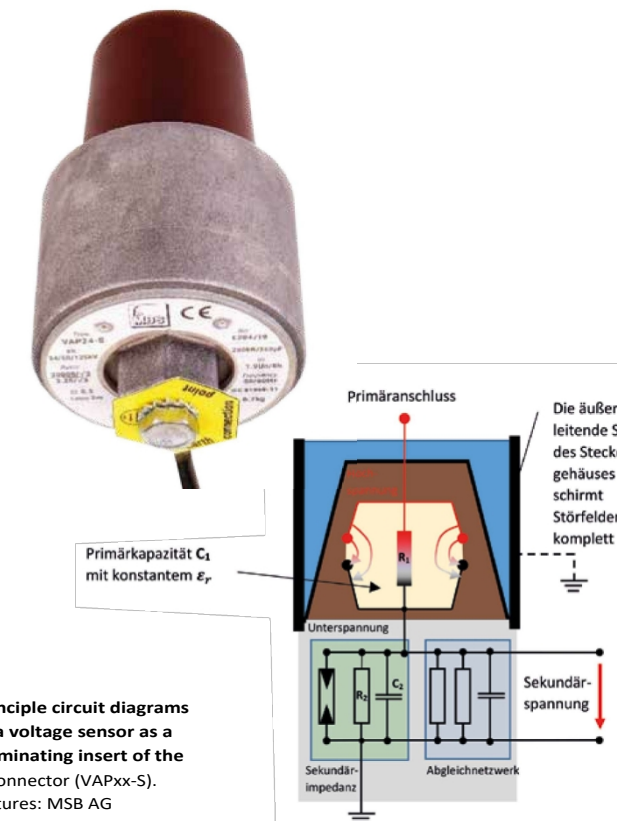
"If energy supply companies use MV sensors for PQ measurements, the smaller secondary signals should definitely be taken into account," adds Bernhard

Grasel, Sales Manager at NEO, based in Zöbern, Austria MEASUREMENT TECHNOLOGY. In contrast to the traditional inductive voltage transformers with 100/√3 V, the voltage sensors only output a small signal up to a maximum of 10/√3 V. In the low-voltage range, the voltage signals are picked up directly from the live conductors. Frequency-optimized high-voltage transformers, which are designed as RC dividers, generally provide 100/√3 V like conventional voltage transformers. This results in a wide range of secondary voltages in the environment of a power supply company. "In order to guarantee sufficient resolution and accuracy, a mobile PQ measuring device should be designed for these different measurement voltages," advises the measurement technology expert. His company has developed the PQA



Mobile PQ measuring device r qAso00H -P with switchable voltage inputs especially for energy supply companies. (Photo: MSB AG)

- FFT analysis up to 500 kHz (voltage & current) in 2 kHz bands (according to the international standard IEC61000-4-30)
- Scope View with 1 MS/s
- 4x voltage measurement / up to 8x current measurement
- Display and recording of the digital PLC data stream
- Two voltage measuring ranges (switchable) of 600 Vp and 10 Vp
- All voltage inputs isolated (CAT 111 1000 V / CAT IV 600 V)
- Direct supply of current sensors from the device



Principle circuit diagrams of a voltage sensor as a terminating insert of the T-connector (VAPxx-S). Pictures: MSB AG

8000H-P is currently the only mobile measuring device that meets these requirements. "It has switchable voltage inputs for 600 Vpeak and 10 or 20 Vpeak. With this option, the grid operator can carry out high-quality PQ measurements at the various voltage levels."

As the input impedance of the voltage channels is 10 MOhm || 2 pF, the measuring device can be used in parallel with conventional voltage transformers in the medium voltage range without the need for an output.

effects on accuracy can be operated in parallel. "For sensors in the medium and high voltage range, the RC dividers are precisely calibrated to the load resistance. An extra terminal for the PQ measuring device is therefore often installed in the high voltage," adds Grasel. When using several measuring devices in different measuring stations, a convenient connection to the ENA SCADA system is possible.

Roland Bürger's conclusion: "From a technical point of view, there is nothing to prevent the limit values from the current IEC 61000-2-2 from being adopted in EN 50160 for low and medium voltage." (pq)

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