Traditionally, power quality monitoring is only conducted as a reaction to trouble such as device failure, plant malfunctions, process interruptions or communication breakdowns. However, all these problems cost money and nobody wants to experience the same thing again just to be able to create a corresponding record for analysis. Therefore, the biggest advantage of continuous power quality monitoring is that users put themselves in a position to proactively build up their knowledge thus increasing system availability.

DRANETZ PQ3K / PQ5K helps to detect trouble before it can do any damage and to provide data for the identification of the root cause in case an event actually occurs. DRANETZ PQ3K / PQ5K is a Class A device according to the IEC 61000-4-30 Ed.3 power quality standard. It can thus provide reliable and comparable information for regulatory agencies, negotiations with energy suppliers or internal quality control. Conformity reports on various standards can be generated directly via the website of the device.
**CLEAR**

- High resolution, colour TFT display for the pin-sharp indication of measured data
- Consistently visible status information (alarms, password protection, data recording, time/date and much more)
- Clear Design

**INTUITIVE**

- Language-specific plain text menu navigation
- Topical arrangement of measured value information for quick data access
- Service area for maintenance and commissioning

**MULTIFUNCTIONAL**

- Certified power quality monitoring according to IEC 61000-4-30 Ed. 3, class A
- Acquisition of energy consumption: Meters and load profiles
- Plant condition monitoring

**FLEXIBLE**

- Applicable in all network configurations without hardware variance
- Freely selectable measured variables for mean values and meters
- Freely definable alarm conditions with summary alarm and recording

**SCALABLE**

- Combinable device design (functionality, interfaces, I/Os, auxiliary energy)
AVOIDING POWER QUALITY PROBLEMS - THROUGH CONTINUOUS MONITORING

Disruptions of the energy supply may result in production or equipment outages. Often people do not react until great financial damage has been caused. Yet, many of these incidents could be avoided if the signs were recognised in the continuous monitoring of the situation.

Any form of power quality monitoring provides both a statistical evaluation allowing the comparison with standards (e.g. EN 50160) or supply contracts as well as records of events in the grid (e.g. voltage dips). This facilitates the analysis of causes and effects.

<table>
<thead>
<tr>
<th>POWER QUALITY EVALUATION</th>
<th>DESCRIPTION</th>
<th>BENEFIT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Statistical evaluation</strong></td>
<td>All relevant parameters of the supply voltage are monitored, statistically averaged and compared to specified values. This way, one can either prove compliance or call attention to possible problems. In addition to the voltages, also magnitude, harmonic content and unbalance of currents are recorded. But, a statistical evaluation is carried out only if corresponding limit values exist, for example for harmonics in IEEE 519.</td>
<td>Verification of the compliance with standards (e.g. EN 50160) or contracts between energy suppliers and energy consumers. Users may adapt the specified values as they desire. By observing changes in the results, one can detect any deterioration of power quality early on and identify the causes. Introduced improvements can be verified immediately.</td>
</tr>
<tr>
<td><strong>Recording of malfunctions</strong></td>
<td>All voltages are monitored for disturbances, such as dip, interruption or swell. These incidents are registered as event. A statistical evaluation is not required because there is no limitation for such events. An event recording comprises the waveshape of all voltages and currents upon occurrence of the event as well as the course of the corresponding RMS half cycle values for the entire duration of the event (max. 3 min.).</td>
<td>The evaluation of malfunction recording lets you identify the cause of the malfunction and - at best - establish a correlation with the events witnessed (such as outage of control systems or equipment). Suitable remedies may then be derived.</td>
</tr>
</tbody>
</table>

POWER QUALITY DATA EXCHANGE

DRANETZ PQ3K / PQ5K stores the acquired power quality data in the standardized Power Quality Data Interchange Format (PQDIF) according to IEEE 1159.3.

The storage principle provides daily PQDIF files containing either statistical data, histograms or event recordings. The creation is done shortly after midnight for the past day. All these files may also be generated manually via the service menu of the device at any time for the ongoing day.
### Avoiding power quality problems

<table>
<thead>
<tr>
<th>MONITORED VOLTAGE PHENOMENON</th>
<th>CAUSES</th>
<th>POSSIBLE CONSEQUENTIAL PROBLEMS</th>
</tr>
</thead>
</table>
| Mains frequency              | • Loss of power generators  
                              • Large load changes | • Instability of the mains power supply |
| Magnitude of supply voltage  | • Changes in grid load      | • Disruption of equipment  
                              • System shut-down  
                              • Loss of data |
| Flicker and rapid voltage changes (RVC) | • Frequent load changes  
                              • Start of engines | • Flickering lighting  
                              • Impairment of the performance of exposed people |
| Supply voltage dips and swells | • Large load changes  
                              • Short circuit, contact to earth  
                              • Thunderstorm  
                              • Power supply overload  
                              • Feed-in of renewable energies such as wind or photovoltaic energy | • Disruption of equipment such as control or drive systems  
                              • Operational interruption  
                              • Data loss in control systems and computers |
| Voltage interruptions        | • Short circuit  
                              • Blown fuses  
                              • Component failures  
                              • Planned supply interruption | • Production stoppage  
                              • Process interruptions  
                              • Data loss in control systems and computers |
| Supply voltage unbalance     | • Uneven load on phases due to one or two-phase consumers | • Current in the neutral conductor  
                              • Overload / overheating of equipment  
                              • Increase of harmonics |
| Voltage harmonics            | • Non-linear loads such as frequency converters, rectifiers, switching power supplies, arc furnaces, computers, fluorescent tubes etc. | • Reduction of machine efficiency  
                              • Increased energy losses  
                              • Overload / overheating of equipment  
                              • Current in the neutral conductor |
| Voltage interharmonics, mains signalling voltage on the supply voltage | • Frequency converters and similar control devices | • Flicker  
                              • Malfunction of ripple control |

**Current (magnitude, harmonics, interharmonics, events)**

In parallel with the voltages the corresponding current values are recorded in the same manner.
# MEASURED VALUES

<table>
<thead>
<tr>
<th>MEASURED VALUE GROUP</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INSTANTANEOUS VALUES</strong></td>
<td>Transparent monitoring of present system state</td>
</tr>
<tr>
<td>V, I, IMS, P, Q, S, PF, LF, QF ...</td>
<td>Fault detection, connection check, sense of rotation check</td>
</tr>
<tr>
<td>Angle between voltage phasors</td>
<td>Determination of grid variable variance with time reference</td>
</tr>
<tr>
<td>Min/max of instantaneous values with time stamp</td>
<td></td>
</tr>
<tr>
<td><strong>EXTENDED REACTIVE POWER ANALYSIS</strong></td>
<td>Reactive power compensation</td>
</tr>
<tr>
<td>Total reactive power, fundamental frequency, harmonics</td>
<td>Verification of specified power factor</td>
</tr>
<tr>
<td>( \cos \phi ), ( \tan \phi ) of fundamental frequency with min values in all quadrants</td>
<td></td>
</tr>
<tr>
<td><strong>HARMONICS ANALYSIS (ACCORDING TO IEC 61000-4-7)</strong></td>
<td>Evaluation of the thermic load of equipment</td>
</tr>
<tr>
<td>Total harmonics content THD V/I and TDD I</td>
<td>Analysis of system perturbation and consumer structure</td>
</tr>
<tr>
<td>Individual harmonics V/I up to 50th</td>
<td></td>
</tr>
<tr>
<td><strong>IMBALANCE ANALYSIS</strong></td>
<td>Equipment overload protection</td>
</tr>
<tr>
<td>Symmetrical components (positive, negative, zero sequence system)</td>
<td>Failure/earth fault detection</td>
</tr>
<tr>
<td>Imbalance (derived from symmetrical components)</td>
<td></td>
</tr>
<tr>
<td>Deviation from V/I mean value</td>
<td></td>
</tr>
<tr>
<td><strong>ENERGY BALANCE ANALYSIS</strong></td>
<td>Preparation of (internal) energy billing</td>
</tr>
<tr>
<td>Meters for the demand/supply of active/reactive power, high/low tariff, meters with selectable fundamental variable</td>
<td>Determination of energy consumption versus time (load profile) for energy management or energy efficiency verification</td>
</tr>
<tr>
<td>Power mean values active/reactive power, demand and supply, freely definable mean values (e.g. phase power, voltage, current and much more)</td>
<td>Energy consumption trend analysis for load management</td>
</tr>
<tr>
<td>Mean value trends</td>
<td></td>
</tr>
<tr>
<td><strong>OPERATING HOURS</strong></td>
<td>Monitoring of service and maintenance intervals of equipments</td>
</tr>
<tr>
<td>3 operating hour counters with programmable running condition</td>
<td></td>
</tr>
<tr>
<td>Operating hours of the device</td>
<td></td>
</tr>
<tr>
<td><strong>POWER QUALITY</strong></td>
<td></td>
</tr>
<tr>
<td>Parameters according to IEC 61000-4-30, Class A</td>
<td></td>
</tr>
<tr>
<td>Chap. 5.1 Power frequency</td>
<td></td>
</tr>
<tr>
<td>Chap. 5.2 Magnitude of supply voltage</td>
<td></td>
</tr>
<tr>
<td>Chap. 5.3 Flicker</td>
<td></td>
</tr>
<tr>
<td>Chap. 5.4 Supply voltage dips / swells</td>
<td></td>
</tr>
<tr>
<td>Chap. 5.5 Voltage interruptions</td>
<td></td>
</tr>
<tr>
<td>Chap. 5.7 Supply voltage unbalance</td>
<td></td>
</tr>
<tr>
<td>Chap. 5.8 Voltage harmonics</td>
<td></td>
</tr>
<tr>
<td>Chap. 5.9 Voltage interharmonics</td>
<td></td>
</tr>
<tr>
<td>Chap. 5.10 Mains signalling voltage on the supply voltage</td>
<td></td>
</tr>
<tr>
<td>Chap. 5.11 Rapid voltage changes (RVC)</td>
<td></td>
</tr>
<tr>
<td>Chap. 5.12 Underdeviation and overdeviation</td>
<td></td>
</tr>
<tr>
<td>Chap. 5.13 Current (magnitude, harmonics, interharmonics)</td>
<td></td>
</tr>
</tbody>
</table>

- Device type PQI-A FI2 (IEC 62586-1)
- Independent and accredited laboratory: Federal Institute of Metrology METAS. Tested at both 230V / 50Hz and 120V / 60Hz.
- Thanks to the certification according to IEC 62586-2 (standard for verifying compliance with IEC 61000-4-30) the device can serve as a reliable and comparable source of information for regulatory agencies, for negotiations with energy suppliers or for internal quality control.
- Generation of compliance reports by means of the device website.
- Improving the quality and reliability of the mains supply.
- Identifying causes of disruptions.
DATA RECORDING

Apart from the automatic recording of power quality statistics, the high-performance data logger provides the following recording options:

- **PERIODIC DATA**
  This feature allows to record the time course of measured variables. Averaged measurements or meter contents serve as base and are saved in regular intervals. Typical applications are the acquisition of load profiles (intervals of 10s to 1h) or the determination of the energy consumption from the difference of meter readings. For both categories pre-defined courses are available, based on the system power values, and as well courses for freely selectable basic quantities. For further processing periodic data can be exported in Excel format for a definable time range.

- **EVENTS**
  Here the occurrence of events or alarms is recorded in form of a list with time information. A distinction is made between self-defined events (such as ON/OFF of limit states or monitoring functions) which the user can classify as alarm or event and the so-called operator list in which system events such as changes of the device configuration, reset operations, powering the device and many more are held.

- **PQ EVENTS**
  The occurrence of monitored PQ events is available in list form with the most important information about the events. Each entry can be directly selected to switch to the graphical event presentation. There the courses of the RMS half-cycle values and the waveshape during the disturbance are available, divided into presentations of all voltages, all currents and mixed displays.

Event lists, PQ event recordings, mean value courses (load profiles) and meter readings may be displayed directly at the device or via the device webpage.

MONITORING AND ALARMING

The instrument supports the on-site analysis of acquired measured data in order to initiate directly immediate or delayed actions. This facilitates the protection of equipment and also monitoring of service intervals.

The following items are available:
- 12 limit values
- 8 monitoring functions with 3 inputs each
- 1 collective alarm as a combination of all monitoring functions
- 3 operating hour counters with definable running conditions

The available digital outputs may be used directly for the transmission of limit values and monitoring functions as well as the resettable summary alarm.

A text may be allocated to each monitoring function and can be used for both the alarm and event list in the data logger.
OPERATION AND ANALYSIS

OPERATION
The local operation at the device itself and the access via web interface are structured identically. One can access the available measured data, parametrise the instrument or use the service functions via the language-specific, topically structured menu navigation. The status bar at the top right, uniformly shows the statuses of alarm monitoring, the password protection system, the data recording and the UPS as well as time and date.

Apart from the details of the PQ statistics, all data are available via both the local GUI and the WEB interface of the device.

PQ EASY-REPORT

- PDF creation via WEB interface of the device
- Selectable report duration
- Selectable report scope (overview, statistic details, event overview)
- Direct compliance assessment of standards EN 50160, IEC 61000-2-2 / 2-4 / 2-12, GB/T, IEEE 519 or customer specific limits
- Customer specific logo in the report

CERTIFIED POWER QUALITY MONITORING

- Independent certification by Federal Institute of Metrology
- Device type PQI-A F12 acc. IEC 62586-1
- Proven at 230V / 50 Hz and 120V / 60Hz
- Flicker meter class F1
- Flagging concept: Multiphase approach in accordance with IEC 61000-4-30

Thanks to the certification according to IEC 62586-2 (standard for verifying compliance with IEC 61000-4-30) the device can serve as a reliable and comparable source of information for regulatory agencies, for negotiations with energy suppliers or for internal quality control.
### TECHNICAL DATA

**INPUTS**

<table>
<thead>
<tr>
<th><strong>Nominal Current</strong></th>
<th>1 ... 5 A (max. 7.5 A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>7.5 A</td>
</tr>
<tr>
<td>Overload capacity</td>
<td>10 A permanent</td>
</tr>
<tr>
<td></td>
<td>100 A, 5x1 s, interval 300 s</td>
</tr>
</tbody>
</table>

**Nominal Voltage**

<table>
<thead>
<tr>
<th><strong>PQ3K:</strong></th>
<th>480 V LN, 832 V LL (sinusoidal)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PQ5K:</strong></td>
<td>520 V LN, 900 V LL (sinusoidal)</td>
</tr>
</tbody>
</table>

**Overload capacity**

<table>
<thead>
<tr>
<th><strong>PQ3K:</strong></th>
<th>480 V LN, 832 V LL permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PQ5K:</strong></td>
<td>520 V LN, 900 V LL permanent</td>
</tr>
</tbody>
</table>

**Nominal frequency**

| 42 ... 50 ... 58 Hz, 50.5 ... 60 ... 69.5 Hz |

**Sampling rate**

18 kHz

**Power Supply Variants**

Nominal voltage

- 100...230 V AC/DC (PQ5K)
- 110…200 V AC, 110…200 V DC (PQ3K)
- 24…48 V DC (PQ3K / PQ5K)

**Consumption**

- ≤ 27 VA, ≤ 12 W (PQ5K)
- ≤ 30 VA, ≤ 13 W (PQ3K)

**Uninterruptible Power Supply (UPS)**

Type (3.7 V)

- VARTA Easy Pack EZPaclk, UL listed MH16707

**Types of Connection**

- Single phase or split phase (2-phase system)
- 3 or 4-wire balanced load
- 3-wire balanced load (2U, 1I)
- 3-wire unbalanced load, Aron connection
- 3 or 4-wire unbalanced load
- 4-wire unbalanced load, Open-Y

**I/O-INTERFACE**

**Analog Outputs**

- Linearisation: Linear, kinked
- Range: ± 20 mA (24 mA max.), bipolar
- Accuracy: ± 0.2 % von 20 mA
- Burden: ≤ 500 Ω (max. 10 V/20 mA)

**Relays**

- Contacts: Changeover contact
- Load capacity: 250 V AC, 2 A, 500 VA; 30 V DC, 2 A, 60 W

**Digital Inputs Passive**

- Nominal voltage: 12/24 V DC (30 V max.)

**Digital Inputs Active**

- Open circuit voltage: ≤ 15 V

**Digital Outputs**

- 2, Standard
- Nominal voltage: 12/24 V DC (30 V max.)

**Fault Current Monitoring**

For grounded systems (optional)

- Number of channels: 2 (2 measurement ranges each)
- Measurement range 1 (1A)
  - Measuring transformer: 1/1 up to 1/1000 A
  - Alarm limit: 30 mA up to 1000 A
- Measurement range 2 (2mA)
  - Measuring transformer: Residual current transformer 500/1 up to 1000/1 A
  - Alarm limit: 30 mA up to 1 A

**Temperature Inputs**

- 2, Standard

**Number of Channels:** 2

**Measurement Sensor:** P1100 / PTC; 2-wire

**Basic Uncertainty according IEC/EN 60688**

- Voltage, current: ±0.1 %
- Power: ±0.2 %
- Power factor: ±0.1°
- Frequency: ±0.01 Hz
- Imbalance U, I: ±0.5 %
- Harmonic: ±0.5 %
- THD U, I: ±0.5 %
- Active energy: Class 0.5S (IEC/EN 62 053-22)
- Reactive energy: Class 0.5S (IEC/EN 62 053-24)

**Interfaces**

**Ethernet**

- Standard
- Physics: Ethernet 100Base TX; RJ45 socket
- Mode: 10/100 MBit/s, full/half duplex, autonegotiation
- Protocols: Modbus/TCP, http, NTP (time synchronisation)

**IEC61850**

- Optional
- Physics: Ethernet 100BaseTX, RJ45 sockets, 2 ports
- Mode: 10/100 Mbit/s, full/half duplex, auto-negotiation
- Protocol: IEC61850, NTP

**PROFINET IO**

- Optional
- Conformance class: CC-B
- Physics: Ethernet 100BaseTX, RJ45-Buchsen, 2 ports
- Mode: 10/100 Mbit/s, full/half duplex, auto-negotiation
- Protocol: PROFINET, LLDP, SNMP

**MODBUS/RTU**

- Standard (PQ5K), optional (PQ3K)
- Physics: RS-485, max. 1200 m (4000 ft)
- Baud rate: 9.6 to 115.2 kBaud

**Time Reference**

- Internal clock
- Clock accuracy: ± 2 minutes/month (15 to 30°C)
- Synchronisation: via NTP server or GPS

**Environmental Conditions, General Information**

- Operating temperature without UPS: −10 up to 30 °C
- Operating temperature with UPS: 0 up to 35 °C
- Storage temperature: −25 to +70 °C
- Temperature influence: 0.5 x basic uncertainty per 10 K
- Long-term drift: 0.5 x basic uncertainty per year
- Application group II (IEC/EN 60688)
- Relative air humidity: <95 % without condensation
- Operating altitude: ≤2000 m above NN
- Measured to be used in buildings!

**Mechanical Properties**

- Housing material: Polycarbonate (Makrolon)
- Flammability class: V-0 according UL94, self-extinguishing, not dripping, free of halogen
- Weight: 800 g (PQ3K), 600g (PQ5K)

**SAFETY**

Current inputs are galvanically isolated from each other.

- Protection class: II (protective insulation, voltage inputs via protective impedance)
- Pollution degree: 2
- Protection: IP54 (front), IP30 (housing), IP20 (terminals)
- Measurement category U: 600 V CAT III, I: 300 V CAT III
### ORDER CODE PQ3K- .... ....

<table>
<thead>
<tr>
<th>1. basic device for panel-mounting</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>With TFT display</td>
<td>1</td>
</tr>
<tr>
<td>2. INPUT I FREQUENCY RANGE</td>
<td>1</td>
</tr>
<tr>
<td>Current transformer inputs, 42 … 50/60 … 69,5 Hz</td>
<td>1</td>
</tr>
<tr>
<td>3. POWER SUPPLY</td>
<td>2</td>
</tr>
<tr>
<td>Nominal voltage 110 … 230 V AC</td>
<td>2</td>
</tr>
<tr>
<td>Nominal voltage 230 V DC</td>
<td>2</td>
</tr>
<tr>
<td>Nominal voltage 200 V AC, 110 … 200 V DC</td>
<td>3</td>
</tr>
<tr>
<td>4. BUS CONNECTION</td>
<td>2</td>
</tr>
<tr>
<td>Ethernet (Modbus/TCP protocol+web server)</td>
<td>2</td>
</tr>
<tr>
<td>5. EXTENSION 1</td>
<td>2</td>
</tr>
<tr>
<td>Without</td>
<td>0</td>
</tr>
<tr>
<td>2 relays</td>
<td>1</td>
</tr>
<tr>
<td>2 analog outputs, bipolar (+20 mA)</td>
<td>2</td>
</tr>
<tr>
<td>4 analog outputs, bipolar (+20 mA)</td>
<td>2</td>
</tr>
<tr>
<td>4 digital inputs passive</td>
<td>1</td>
</tr>
<tr>
<td>4 digital inputs active</td>
<td>1</td>
</tr>
<tr>
<td>Fault current detection, 2 channels</td>
<td>1</td>
</tr>
<tr>
<td>GPS connection module</td>
<td>1</td>
</tr>
<tr>
<td>Temperature monitoring, 2 channels</td>
<td>C</td>
</tr>
<tr>
<td>6. EXTENSION 2</td>
<td>2</td>
</tr>
<tr>
<td>Without</td>
<td>0</td>
</tr>
<tr>
<td>2 relays</td>
<td>1</td>
</tr>
<tr>
<td>2 analog outputs, bipolar (+20 mA)</td>
<td>2</td>
</tr>
<tr>
<td>4 analog outputs, bipolar (+20 mA)</td>
<td>2</td>
</tr>
<tr>
<td>4 digital inputs passive</td>
<td>2</td>
</tr>
<tr>
<td>4 digital inputs active</td>
<td>2</td>
</tr>
<tr>
<td>Fault current detection, 2 channels</td>
<td>2</td>
</tr>
<tr>
<td>GPS connection module</td>
<td>2</td>
</tr>
<tr>
<td>Profinet interface</td>
<td>A</td>
</tr>
<tr>
<td>IEC61850 interface</td>
<td>B</td>
</tr>
<tr>
<td>Temperature monitoring, 2 channels</td>
<td>C</td>
</tr>
<tr>
<td>7. EXTENSION 3</td>
<td>2</td>
</tr>
<tr>
<td>Without</td>
<td>0</td>
</tr>
<tr>
<td>2 relays</td>
<td>1</td>
</tr>
<tr>
<td>2 analog outputs, bipolar (+20 mA)</td>
<td>2</td>
</tr>
<tr>
<td>4 analog outputs, bipolar (+20 mA)</td>
<td>2</td>
</tr>
<tr>
<td>4 digital inputs passive</td>
<td>3</td>
</tr>
<tr>
<td>4 digital inputs active</td>
<td>3</td>
</tr>
<tr>
<td>Fault current detection, 2 channels</td>
<td>3</td>
</tr>
<tr>
<td>GPS connection module</td>
<td>3</td>
</tr>
<tr>
<td>Temperature monitoring, 2 channels</td>
<td>C</td>
</tr>
<tr>
<td>8. TEST CERTIFICATE</td>
<td>2</td>
</tr>
<tr>
<td>Without</td>
<td>0</td>
</tr>
<tr>
<td>Test certificate in German</td>
<td>D</td>
</tr>
<tr>
<td>Test certificate in English</td>
<td>E</td>
</tr>
</tbody>
</table>

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### ORDER CODE PQ5K- .... ....

| 1. basic device for top-hat rail mounting | 1 |
| With display                              | 1 |
| With TFT display                          | 1 |
| 2. INPUT I FREQUENCY RANGE                | 1 |
| Current transformer inputs, 42 … 50/60 … 69,5 Hz | 1 |
| 3. POWER SUPPLY                           | 2 |
| Nominal voltage 100 … 230 V AC/DC         | 2 |
| Nominal voltage 24 … 48 V DC              | 2 |
| 4. BUS CONNECTION                         | 2 |
| Ethernet (Modbus/TCP+web server) + RS485 (Modbus/RTU) | 2 |
| 5. UNINTERRUPTIBLE POWER SUPPLY           | 2 |
| Without                                  | 0 |
| With uninterruptible power supply        | 1 |
| 6. EXTENSION 1                           | 2 |
| Without                                  | 0 |
| 2 relays                                 | 1 |
| 2 analog outputs, bipolar (+20 mA)       | 2 |
| 4 analog outputs, bipolar (+20 mA)       | 2 |
| 4 digital inputs passive                 | 2 |
| 4 digital inputs active                  | 2 |
| Fault current detection, 2 channels      | 2 |
| GPS connection module                    | 2 |
| Profinet interface                       | A |
| IEC61850 interface                       | B |
| Temperature monitoring, 2 channels       | C |
| 7. EXTENSION 2                           | 2 |
| Without                                  | 0 |
| 2 relays                                 | 1 |
| 2 analog outputs, bipolar (+20 mA)       | 2 |
| 4 analog outputs, bipolar (+20 mA)       | 2 |
| 4 digital inputs passive                 | 3 |
| 4 digital inputs active                  | 3 |
| Fault current detection, 2 channels      | 3 |
| GPS connection module                    | 3 |
| Temperature monitoring, 2 channels       | C |
| 8. TEST CERTIFICATE                      | 2 |
| Without                                  | 0 |
| Test certificate in German               | D |
| Test certificate in English              | E |

### ACCESSORIES

| Documentation on USB stick | 156 027 |
| Interface converter USB <> RS485 | 163 189 |
| GPS receiver 16x-LVS, configured | 181 131 |

Transformers for fault current detection see accessory current transformers.

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### DIMENSIONAL DRAWING PQ3K

- Panel cut-out

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### DIMENSIONAL DRAWING PQ5K

- Panel cut-out