Data Sheet
3KDE485000R1001

Power Transducer Series 50

PTA50, PTV50, without power supply;
PTM50, with power supply;
PTK50-1, PTK50-3, configurable;
PTD50 display for power current variables

Power transducers with excellent cost-performance ratio

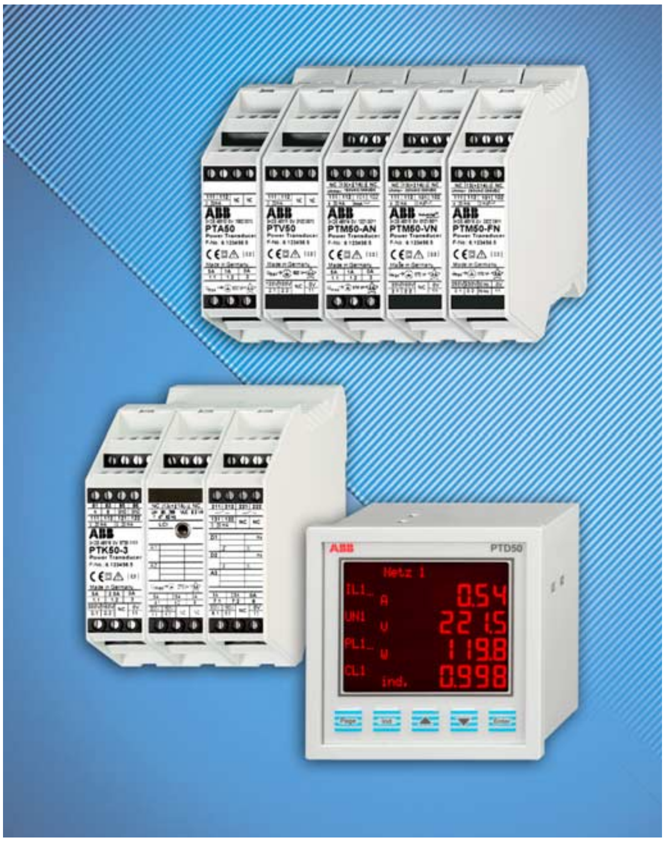
Advanced technology
- all inputs complying with overvoltage category III and degree of pollution 2
- outputs separated from inputs through double insulation, meeting the requirements for extra-low voltage (PELV)
- accuracy class 0.3

Dual measuring ranges
- for all current ranges and
- for nearly all voltage ranges

Configurable measuring variables (PTK 50-1/-3)
- for U, I, P, Q, S, cosφ, sinφ, φ, f with 2 or 3 analog outputs
- up to 4 limit values, 2 counters, several characteristic curves

Interface
- RS 232 or RS 485 (optional)

Display
- up to 16 measuring values, 4 limit values (configurable via the transducer)
- power supply and connection to the transducer through jack plug



Safe, reliable, compact and economical

Glossary of terms and definitions

Aaron circuit
In a 3-wire, 3-phase mains, the total of all wire currents is always zero. As a result, it is possible to use only two current converters and calculate the third current value. This kind of circuit using two current converters instead of three is called an Aaron circuit.

Accuracy (class)
The accuracy is the measure for equivalent transfer of an input signal to an output. The accuracy of a measuring transducer is specified by an accuracy class. The POWER 50 series transducers are in accordance with accuracy class 0.3. This means the deviation of the output signal equivalent to the input signal is max. 0.3 % referred to the rated input and output values.

Active power
Electrical power resulting from the multiplication of the instantaneous current and voltage values. This method also takes into account a possible phase shift (see apparent power).

Aggregate quantities
Aggregate quantities are derived quantities like
- Limit value max. or min.: a signal is output when the given value is exceeded or fallen below.
- Totalizer: Counting and integrating of values, e.g. the integration of power, resulting in electrical energy.

Alternating current
A current which periodically changes its intensity and direction dependent on the time. The actual value is indicated by the RMS value. See also: Single phase mains, Connection methods.

Alternating voltage
A voltage which changes its value and direction dependent on the time. The actual value is indicated by the RMS value. See also: Single phase mains, Connection methods.

Apparent power
Apparent power (S) is the power resulting from the multiplication of current and voltage without taking into account any possible phase angle. Apparent power is composed of active power (P) where current and voltage are in phase, and reactive power (Q) where a 90° phase shift occurs between current and voltage.

From this results: $S \cdot \cos \varphi = P$ and $S \cdot \sin \varphi = Q$.

Arithmetic mean
The arithmetic mean is the calculated mean value, i.e. the weighted mean of the instantaneous values. For pure sinusoidal quantities this value is equal to 0. However, the procedure permits to filter direct current portions out of an alternating current quantity.

For a rectified pure sinusoidal signal the arithmetic mean is $2/\pi = 0.637$ of the peak value.

The root mean square (RMS) value for a sinusoidal signal is equal to $1/\sqrt{2} = 0.707$ of the peak value. As a result, a coefficient of correction (= form factor) of 0.707/0.637 = 1.11 is required for the arithmetic mean of the RMS value.

Note that this measuring procedure with a coefficient of correction of 1.11 is only suitable for pure sinusoidal signal. If harmonics are present, a maximum error of F[%] = harmonic wave [%] / ordinal number may occur.

Basic insulation
The basic insulation is the minimum required insulation (air gap or creeping distance) resulting from insulation coordination.

Binary output: see Output signal, Digital output signal

Binary output signal: see Output signal, Digital output signal

Bus
A data link to which several devices can be connected and which is used to transmit data to/from the devices.

Calibration factor
The calibration factor is relevant for power measurement and indicates the ratio of the measuring range to the rated input values, e.g. measured quantity 200 W in a single-phase mains, rated input values: current = 1 A; voltage = 230 V; calibration factor = 200 W/(1 A x 230 V) = 0.87. Typically, the calibration factor is a number between 0.5 and 1.5. Major deviations from this indicate dimensioning errors.

Capacitive
Capacitive stands for a phase shift between the current and voltage where the current leads the voltage.
For capacitive power the energy direction has to be considered as well. See also: 4-quadrant operation.

Catalog number
The catalog number is a number for unambiguous identification of the device type and version.

Example for Series 50 devices:

Preferred type	**3KDE48514**	**0L**	102100
Normal type	**3KDE48514**	**0V**	102100
Type	**3KDE48514**		
Preferred type		**0L**	
Normal type		**0V**	
Version details			102100

If items with special ordering features have been selected from the list, the respective numbers must be added as plain text to the catalog number.

When ordering a preferred type, the version details need not be added to the catalog number. When ordering the preferred type the device is delivered with the catalog number of the normal type. This is intended to simplify the type identification according to the ordering details. The hardware and software versions are reverse compatible. A higher revision number indicates a higher revision level.

CE
The CE marking indicates that the device complies with the regulations and harmonized standards of the European Community. Devices which are put into circulation in the EC countries must be marked with this sign and comply with the respective regulations.

Characteristic
The characteristic is a graphical representation of the output signal as a function of the input signal. It is usually linear, e.g. an input signal of 0...1 A results in a 0...20 mA output signal. For some applications, a zoom effect is wanted for the initial or final value.

Example 1: The lower part of the current range is to be represented with an especially high resolution. The 0...2 A input signal shall be spread to a 0...16 mA output signal, whereas the remaining range of 2...5 A is to be represented as 16...20 mA. Hence: Input: 0...2...5 A; Output: 0...16...20 mA.

Example 2: The upper part of the voltage range is to be represented with an especially high resolution. The 0...80 V input signal is represented as a 0...4 mA output. The range of 80...120 V is represented with 4...20 mA. Hence: Input: 0...80...120 V; Output: 0...4...20 mA.

The point where the gradient of the curve changes is called its kink point.

Connection methods
Power transducers can be connected in different ways. A distinction is made between the following connection alternatives:

- Single-phase AC current;
  current and voltage measured in the same phase.
- Three-wire, three-phase current, balanced load;
  current measured in one phase, voltage measured between three phases.
- Three-wire, three-phase current, unbalanced load;
  current measured in two phases, voltage measured in between three phases.
- Four-wire, three-phase current balanced load;
  current and voltage measured in the same phase.
- Four-wire, three-phase current unbalanced load
  current measured in three phases, voltage measured between three phases.

Crest factor
The crest factor of a measuring signal is the ratio of the peak value to the RMS value (e.g. 1.41 for sinusoidal). For a transducer this is the overload range specified for the input transformers. A transducer with a crest factor 3 and a measuring range 0...5 A can still reliably measure a signal with a 15 A peak value. The same transducer can measure a 3 A signal with crest factor 5. However, it cannot be converted arbitrarily, but is limited for high frequencies and short-term high signals. The specified crest factor of a transducer always refers to the upper range value.

Current (AC): see Alternating current

Current (DC): see Direct current

Curve shape: see Characteristic

Dead zero: see Live zero/Dead zero

Degree of pollution
Classification according to the degree of expected pollution. A higher code number indicates a higher degree of pollution. Devices that are installed in cabinets or control rooms must meet the requirements of the Degree of pollution 2.

Direct current
A current that flows in only one direction and has an essentially constant value, provided that the voltage and load remain the same.

Direct voltage
A voltage that does not change its value or direction provided that the source and load remain the same.

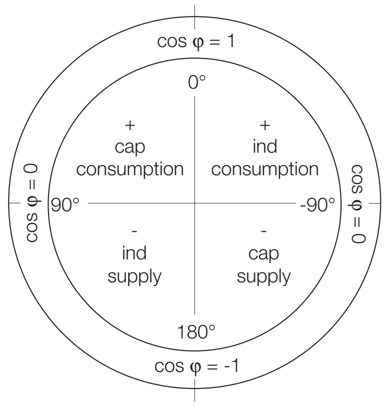
Display
The display is an accessory part for parameterizable transducers of the POWER 50 series. It is available as a panel instrument with a 96 mm x 96 mm front panel and a mounting depth of 70 mm (120 mm incl. jack plug). It has a separate power supply and can be installed e.g. in a cabinet front, with the transducer itself accommodated inside the cabinet. A universal cable is used to link the parameterizable transducer and the display. The universal cable has a length of 5 m and jack plugs on each side. On the transducer side, the jack plug is plugged into the LCI socket on the front.

On the display side, the jack plug is plugged to the LCI 1 socket on the display rear. The LCI 2 socket is used to connect the parameterization cable, with a transducer-display link already existing.

A maximum of 4 values and a freely definable text line can be indicated on the display at the same time. The value, the relevant mnemonic description and the dimension (unit) can be indicated. Additionally, the aggregate values may be indicated, depending on the transducer type. Which data is to be displayed is set on the respective transducer.

Electrical quantities, Phase Angle φ
The phase angle φ is the shift between current and voltage zero crossing.

Electrical quantities, cos φ
The power factor is the ratio of the active power to the apparent power; cos φ = active power / apparent power. As can be seen in the illustration below, the power factor can only be measured in clockwise direction.



Electrical quantities, Frequency
Alternating current and voltage continuously reverse the direction and intensity, usually resulting in a sinusoidal wave. The change-over from a positive maximum value over a negative maximum value to the next positive maximum value is called a period = π. The number of periods per second is the frequency.

Electrical quantities, Power factor/Active power factor: see Electrical quantities, cos φ

Electrical quantities, Reactive power factor: see Electric quantities, sin φ

Electrical quantities, sin φ
The reactive power factor sin φ is the ratio of the reactive power to the apparent power
sin φ = reactive power / apparent power

Functional extra low voltage
An extra low voltage with safe separation from other current circuits through double insulation or double air gaps or creeping distances .
PELV = Protective extra low voltage.
Selv-e = Separated extra low voltage earthed.

Fundamental wave
The sinusoidal wave resulting from the frequency rating of an AC current / AC voltage.

Harmonic
In AC mains there is a fixed frequency, the fundamental sinusoidal wave, with, e.g. 50 Hz. External influences may cause distortions of this sinusoidal wave. These distortions can be considered as sinusoidal signals with a multiple frequency of the fundamental wave. Waves with a frequency that is a multiple of the fundamental wave are called harmonics (the 3rd./5th./7th. harmonic), or upper harmonic waves, or harmonic oscillation.

Harmonic oscillation: see Harmonic

Harmonic waves: see Harmonic

Inductive
Inductive stands for a phase shift between the current and the voltage where the current lags the voltage. For inductive power measurement the energy direction has to be considered as well. See also: 4-quadrant operation.

Input limiting: see Overload capability

Input quantity: see Measured quantity

Insulation class II: see Protective insulation

Insulation coordination
Rating of an insulation (air gaps and creeping distances) dependent on the voltage and environmental conditions (degree of pollution, transient noise voltages, air pressure, humidity).

Kink point: see Characteristic

LCI
The socket for the "Local Communication Interface" on the transducer or display. The LCI corresponds to an RS232 interface, but uses different signal levels.

Live zero/dead zero
If the output circuit of a transducer shall also be monitored, the characteristic curve is usually started with an input signal of 0 and with an active output signal. This means at this point there is a difference between a 0 input signal and an interruption of the output circuit.

Live zero: Input: 0...1 A; Output: 4...20 mA. Only possible for transducers with power supply, since an active output signal must be provided with a "0" input.

Dead zero: Input: 0...1 A; Output 0...20 mA. This is also possible for transducers without power supply.

Load, Input circuit
All connected devices, including transducers, act as a load. This must be taken into account, especially if they are to be connected to non-high-wattage circuits, e.g. the outputs of current or voltage converters. A higher load connected to a current or voltage converter would limit the load transfer ability in the same dimension. Transmitters with additional power supply constitute a smaller load in the measuring circuits than 2-wire transmitters deriving their power from the measured signal.

Load, Output circuit
Analog output signals are usually current signals (max. rated value 20 mA), but in some cases also voltage signals (max. rated value 10 V).

The permissible load depends on the output current rating. For 20 mA it amounts to 15 V/20 mA ≤ 750 Ω; for 10 mA it amounts to 15 V/10 mA ≤ 1,500 Ω. The highest accuracy is reached with high output current ratings.

For analog voltage outputs the external resistance is in parallel with the internal resistance. The specified accuracy is only applicable for the given load value. With an open output circuit the output voltage for POWER 50 transducers is limited to 30 V.

Mains type: see Connection method

Mains synchronization
Measuring equipment for switching together 2 separate mains.

The following requirements must be met:
- same frequency (possibly little deviation)
- same phase (possibly little deviation)
- same voltage level (possibly little deviation)

This is required to keep compensation currents that may occur at the switching moment as small as possible.

Measured quantity
Measured quantities are variables that are measured. Measured quantities of power transducers are current, voltage, or current and voltage. All other electrical quantities can be derived from these. In some cases it is also possible to select aggregate quantities. Power transducers of the POWER 50 series are designed for current and voltage and the rated frequency 50/60Hz. For non-parameterizable devices the rated value or measured quantity range must be specified in the order.

Parameterizable devices have adjustable ranges for the measured “Rated current” and “Rated voltage” and for other settable electrical quantities. Within these ranges, the rated value can be set, provided that the specified accuracy and overload limits are observed. For current and voltage settings above the given adjustment range lie in the overload range. To achieve a high accuracy, a measured value close to the rated value should be selected. The best accuracy is achieved with the upper range value.

Measuring system or method
The measuring system or method is the method including the circuitry or program selected for evaluating the input quantities.

Nominal value: see Rated value

Output limiting
Power transducers permit linear transmission of output signals up to 120 % of the rated input signal. For an input signal of 0 to 100 V and an output signal of 0 to 20 mA this means that 24 mA are provided at the output for a 120 V input signal. For higher input signals the output signal is no longer proportional to the input.

Output limiting is required for some subsequent devices. As a result, transducers of the POWER 50 series are limited to 1.8 x the rated output value or 1.25 x the rated output value. This value is settable for parameterizable devices.

Output signal, Analog output signal
The measured quantity of a transducer is converted to a proportional direct current or direct voltage signal.

Output signal, Bipolar output signal
If the analog output signal shall also indicate the direction of flow (this is not possible for AC current or voltage), a bipolar output signal is used.

Example: For active power (supply or consumption) the output signal is -20...0...+20 mA for a measured quantity of -25...0...+25 MW. Usually, the output signal sign is negative for power generation.

Output signal, Digital output signal
Usually, aggregate values like limit values (as static signal) or counter values (as pulse signal) are output via digital outputs. The transducers of the POWER 50 series use (open collector) transistor outputs as digital outputs.

A special type of digital output is the serial bus interface. The bus connector is optionally available for parameterizable devices. Information and data can be transmitted to and from the device via the bus connector (see also: Interface).

Output signal, Unipolar output signal
The analog output signal is unipolar for AC current or AC voltage measurement. Example: For a measured quantity of 0...1 A an analog output signal of 0...20 mA is output.

Overload capability
Power transducers may be overloaded to a specific degree. This means that a current higher than the input current rating may be applied to the input for a short time or permanently. Refer to the Technical data section for the respective overload specifications. Always observe the maximum permissible voltage values of the input variables.

Overvoltage category
Classification into categories according to the height of the expected transient overvoltages. A higher code number means a higher transient voltage. The measuring circuits of devices that are usually connected to standard mains or secondary circuits of current or voltage converters have to meet the requirements of Overvoltage category III.

Parameterizable transducers
Parameterizable transducers are provided with a communication interface. A PC with a special parameterization software is used to change the parameter settings of the measured values and to select the quantities for the analog outputs.

Parameterization, Parameter definitions
Parameterizable devices must be set up (parameterized) for a certain application. The advantage of these devices is that the customer can make these settings and can flexibly adapt the devices according to his needs. A parameterization software and a PC link cable are needed for device parameterization. These items are available as accessories for the respective devices.

Parameterization, Parameterization cable
Special link cable with level converter for connecting parameterizable POWER 50 transducers to a PC.

Parameterization, Parameterization software
A special parameterization software is available. It is called “R&C Process Data Management" and has the following components:
– Device Configuration
– Process Data Visualization
– MODBUS OPC Server
– Data Archiving

Parameterization, Custom Parameterization
The customer can parameterize the devices according to his needs by using the parameterization program, and can take full advantage of the parameterization feature.

Parameterization, Customized Parameterization in factory
The customer can order a pre-parameterized device for a special application, with pre-defined parameters (extra charge). The parameterization form must be filled-in and added to the order in this case.

Peak value
A peak value is a periodically recurring positive and negative maximum value. You can calculate the RMS value for a rectified sinusoidal value by using the formula RMS value = peak value / $\sqrt{2}$ (see also: RMS value)

Peak value measurement is not useful for RMS value measurement. However, the peak value is quite important for the crest factor.

PELV: see Functional extra low voltage

Phase voltage
Voltage between two wires of a single-phase mains, or between a phase and the neutral point in a three-phase mains. The voltage between two phases of a three-phase mains is called a line-to-line voltage or delta voltage.

Phase angle: see Electrical quantities, Angle φ

Power
Power is the product of current and voltage. A distinction is made between active power, reactive power and apparent power.

Power consumption/Motor operation
If not otherwise specified in the order, active power transducers are calibrated for power consumption in factory. In case of a bidirectional energy flow (consumption and generation), power consumption produces an output signal with a positive sign.

Power generation/Generator operation
If not otherwise specified in the order, active power transducers are calibrated for power consumption in the factory. In case of a bidirectional energy flow (consumption and generation), power supply produces an output signal with negative sign.

Protective insulation
Devices with protective insulation meet the requirements of Insulation class II. They must be fully surrounded by non-conducting (i.e. insulating) materials and must be provided with a double insulation or double air gaps or creeping distances in accordance with the insulation coordination.

PTA50
POWER 50 series AC power transducer for current, without additional power supply.

PTK50-1
Configurable POWER 50 series power transducer with 2 analog ouputs, for measuring current, voltage, active/reactive/apparent power of 1-phase AC current, 4-wire 3-phase current with equal load, sin φ, cos φ, φ and frequency with different characteristic curves, 2 limit values.

PTK50-3
Configurable POWER 50 series power transducer with 3 analog outputs, for measuring current, voltage, active/reactive/apparent power of 1-phase and 3-phase AC current with balanced or unbalanced load, sin φ, cos φ, φ and frequency, with different characteristic curves, 4 limit values, 4 counters, 2 digital outputs (counters or limit values).

PTM50-AN
POWER 50 series AC power transducer for current, with additional power supply and true RMS value measurement.

PTM50-AS
POWER 50 series AC power transducer for current, with additional power supply.

PTM50-FN
POWER 50 series AC power transducer for frequency, with additional power supply.

PTM50-VN
POWER 50 series AC power transducer for voltage, with additional power supply and true RMS value measurement.

PTM50-VS
POWER 50 series AC power transducer for voltage with additional power supply.

PTV50
POWER 50 series AC power transducer for voltage without additional power supply.

Rated current: see Rated value

Rated frequency: see Rated value

Rated power: see Rated value

Rated value
The rated value or nominal value corresponds to the set point of a quantity. For ranges, e.g. a measuring range (from 0...rated value), the rated value is the high limit. Values above the rated value are overload values. Measured quantities can also be specified as ranges (e.g. 20... 40 V; 45...50 Hz; -50...+50 MW).

Rated voltage: see Rated value
The line-to-line voltage or delta voltage in a 3-phase mains.

R&C Process Data Management: see Parameterization, Parameterization software

Reactive power
Inductive or capacitive elements in a current circuit produce reactive power. As a result, a phase shift between current and voltage occurs (i.e. the zero crossings do no longer occur at the same time). Reactive power cannot be used for mechanical work and, thus, should be minimized as far as possible by taking the appropriate compensation measures.

Seen from the mathematical point of view, reactive power is the product of current, voltage and sin φ.

Response time
The response time is the time period after which the digital output (switching output) responds after a step function on the input.

RMS value
The root means square (RMS) value is the energy content of a signal with an arbitrary curve shape. It produces on an ohmic load the same temperature rise as a direct current of the same (current) intensity. Seen from the mathematical point of view, the pure RMS value is given by the following formula:

$$\text{RMS value} = \sqrt{\frac{1}{T} \times \int_0^T \text{value}^2 dt}$$

For the pure sinusoidal signal, squaring results in a sinusoidal signal of double frequency, with the minimum value on the zero line. The square of the RMS value is half the peak-peak value of this squared quantity, i.e. the RMS value is the peak value $/\sqrt{2}$ of the single quantity.

RMS value = peak value$/\sqrt{2}$
(Example: RMS value = 230 V; peak value = 325 V).

For digital devices the integral value is achieved by summing instantaneous values on a time scale. If these values are first squared, then averaged over the time, and finally submitted to square root extraction, the real RMS value is achieved.

Root mean square value see RMS value

RS232 is a serial interface for a point-to-point connection with standardized signals**.**

RS485 is a serial interface for a bus link with standardized signals.

Selv-e: see Functional extra low voltage

Settling time
The settling time is the time which the output needs after a step function on the input to reach the (99%) right signal.

Sinusoidal quantity
A sinusoidal quantity is a pure AC fundamental wave without harmonics.

Single-phase mains: see Connection methods

Star voltage (Y-voltage): see Phase voltage

Three-phase current: see Three-phase mains, Connection methods

Three-phase mains: see Connection methods

Transducers
Transducers convert physical quantities like pressure, temperature or current into a standard output signal. For a physical input signal an equivalent output signal can be derived as a standard signal (usually in mA, e.g. 0...20 mA; also in V, e.g. 0...10 V).

Transducers, AC power transducers
Transducers for AC power quantities. The measured quantity is indicated through the rated value or nominal value
(e.g. $I_{rated} = I_{nom}$ or $U_{rated} = U_{nom}$).

Transducers, AC power transducers for current
AC current is the input quantity. An equivalent analog output (mA/V) signal is derived from the AC input current.

Transducers, AC power transducer for current and voltage
AC current and AC voltage are the input quantities. An equivalent analog output signal (mA/V) can be derived from these input signals. Advanced digital transducers also provide output signals equivalent to frequency as well as all quantities that can be derived from current and voltage like phase angle φ, cos φ, sin φ, apparent power, active power, reactive power.

Transducers, AC power transducers for frequency
Either AC current or AC voltage is the input quantity. An output signal for the frequency is derived from this input quantity. The accuracy of frequency measurement depends on the input quantity. Therefore, the input signal should be as close to the rated value as possible. Since the voltage is usually constant, whereas the current in most cases is not, normally voltage is used as the input quantity for frequency measurement. In order to provide a reference between the output signal and the measuring range, the frequency range to be measured (e.g. 45...55 Hz = 0...20 mA) must be specified in addition to the input rating.

Transducer, AC power transducers for power
AC current and AC voltage are the input quantities. An analog output signal (mA/V) equivalent to the power is generated for these input quantities. Usually, advanced digital transducers can provide these equivalent signals not only for current, voltage and power, but also for all derivable quantities

Transducers, AC power transducers for voltage
AC voltage is the input quantity. An equivalent analog output signal (mA/V) can be derived from the AC input voltage.

Transducers, analog
Analog transducers analogously process the physical input signal. These devices are designed for exactly one task.

Transducers, digital
Digital transducers provide signal conditioning of an analog input signal by means of a microprocessor. Parameterizable transducers allow the user to set the input quantity within a given range, to select functions from a given range, and to set the output signal quantity as an equivalent to the selected input quantity or a quantity derived from it.

Transducers without power supply
Transducers without power supply derive the energy for the output circuits from the input quantities. As a result, the input circuit load is correspondingly high. The output signal can only be an active signal when an input signal is available. As a result, the output signal can only range from 0... (dead zero).

Transducers with power supply
The output circuits of transducers with power supply are powered separately and, therefore, only have a minor input circuit load.

The output signal may also be active when no input signal is available yet (live zero).

Transducers, 2-wire
Transducers without power supply or transducers deriving their power form the (externally supplied) output circuit.

Transducers, 4-wire
Transducers with separate power supply.

Transformers
Current or voltage transformers are required for power transducers when input currents or voltages exeed the range limits. When ordering analog devices or parameterizing digital devices, specify the transmission ratio of the current and voltage transformers to ensure that the measured values refer to the primary variables.

Transformers, Current transformers
Power transducers can only handle currents up to a specific intensity. Higher currents have to be transformed into a lower intensity – usually 1 A or 5 A – by using a current transformer. Example: 2.400 A/1 A. This specification is called the transmission ratio of the transformer.

Transformers, Voltage transformers
Power transducers can only handle voltages up to a specific height. Higher voltages have to be transformed into a lower voltage value – usually 100 V – by using a voltage converter. Example: 110.000 V/100 V. This specification is called the transmission ratio of the transformer.

Transmission ratio: see Transformers, Current transformers, Voltage transformers

Voltage, Max. permissible values
The maximum permissible voltage values (between the terminals and against ground) of the input quantities must be observed, independent of the transducer's overload capabilities. Refer to the Technical data section for details.

Voltage (AC): see Alternating voltage

Energy
Energy is the electrical power integrated over the time, measured in Wh (or kWh, MWh).

4-quadrant operation
The current, voltage or power can be illustrated in a vector diagram (see also: Electrical quantities, cos φ). You can consider, e.g., the energy consumption axis (pure active power) over the energy consumption area (active power and inductive reactive power portion) up to the energy consumption (pure inductive reactive power)/energy supply (pure capacitive reactive power) inflection point and continue over the energy supply (active power and capacitive reactive power portion) up to the energy supply axis (pure active power).

From here, you can achieve the full circle by heading over the inductive energy supply up to the energy supply (inductive reactive power)/energy consumption (capacitive reactive power) inflection point and from there over the capacitive energy consumption to the energy consumption (active power) axis.

Standards and regulations

The following standards and regulations were considered when designing, manufacturing and testing POWER 50 power transducers.

DIN EN 60 688 (April 2002)
  Messumformer für die Umwandlung von Wechselstromgrößen in analoge oder digitale Signale
IEC 60688: 2001
  Electrical measuring transducers for converting a.c. electrical quantities to analogue or digital signals
DIN EN 60529 (Sept. 2000); VDE 0470 Teil 1 (Sept. 2000)
  Schutzarten durch Gehäuse (IP-Code)
IEC 60529: 1989 + A1: 2000
  Degrees of protection provided by enclosures (IP Code)
DIN VDE 0100-410 (Jan. 1997) (PELV)
  Errichten von Starkstromanlagen mit Nennspannungen bis 1000 V
  Teil 4: Schutzmaßnahmen
  Kapitel 41: Schutz gegen elektrischen Schlag
IEC 60364-4-41: 2001-08
  Electrical installations of buildings
  Part 4-41: Protection for safety –
  Chapter 41: Protection against electric shock
DIN EN 61140 (Aug. 2001); VDE 0140 Teil 1 (Aug. 2001)
  Schutz gegen elektrischen Schlag
  Gemeinsame Anforderungen für Anlagen und Betriebsmittel
IEC 61140: 1997
  Protection against electric shock
  Common aspects for installation and equipment

DIN EN 60947-1 (Dez. 1999) + /A1 (Aug. 2001)
Niederspannungsschaltgeräte
Teil 1: Allgemeine Festlegungen
IEC 60947-1: 1999 (mod) + Corrigendum 1999 + /A1 (2000)
Low-voltage switchgear and controlgear
Part 1: General rules
DIN EN 60721-3-3 (Sept. 1995) + /A2 (Juli 1997)
Klassifizierung von Umweltbedingungen
Klasse 3 Klassen von Umwelteinflußgrößen
und deren Grenzwerte
Hauptabschnitt 3: Ortsfester Einsatz, wettergeschützt
IEC 60721-3-3: 1994 + /A2 (1996)
Classification of environmenttal conditions –
Part 3: Classification of groups of environmental parameters and their severities –
Section 3: Stationary use at weatherprotected locations
DIN VDE 0110-1 (April 1997) + Beiblatt 1 (März 2000)
+ Beiblatt 2 (Aug. 1998)
Isolationskoordination für elektrische Betriebsmittel
in Niederspannungsanlagen
Teil 1: Grundsätze, Anforderungen und Prüfungen

IEC 60664-1: 2000-04
Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests

DIN EN 61 010 Teil 1 (März 2001)
Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte
Teil 1: Allgemeine Anforderungen

IEC 61010-1: 2001
Safety requirements for electrical equipment for measurement, control and laboraty use;
Part 1: General requirements

DIN EN 61558-1 (Juli 1998) + /A1 (Nov. 1998)
Sicherheit von Transformatoren, Netzgeräten und dergleichen
Teil 1: Allgemeine Anforderungen und Prüfungen
IEC 61558-1: 1998-07
Safety of power transformers, power supply units and similar –
Part 1 General requirements and tests
DIN EN 50178 (April 1998)
Ausrüstung von Starkstromanlagen mit elektronischen Betriebsmitteln
DIN EN 61326 (März 2002)
Elektrische Betriebsmittel für Messtechnik, Leittechnik und Laboreinsatz
EMV-Anforderungen
IEC 61326/A2: 2000
Electrical Equipment for measurement, control and laboratory use – EMC requirements
Part 1: General requirements
73/73/EEC (14.04.2000)
Low-voltage directive
89/336/EEC (14.12.2000)
EMC directive

NAMUR Recommendations:

NE06 (01.07.97)	Standardized electrical signals and questions related to instrumentation
NE43 (18.01.94)	Standardization of the signal level for the breakdown information of digital transmitters
NE53 (18.12.95)	Software of field devices and signal processing devices with digital electronics
NE21 (01.08.91)	Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.

Technical data

Type		**PTA50**	**PTV50**	**PTM50-AS**	**PTM50-VS**
Catalog number		**3KDE48510**	**3KDE48511**	**3KDE48512**	**3KDE48513**
Input					
Current	Standard value	1 A/5 A		1 A/5 A	
	Available	0.1/0.5...2.4/12 A			
	Internal power consumption per phase	≤ 1.6 VA		≤ 0.15 VA	
	Overload rating, permanent	2 x I_{nom} 2)		2 x I_{nom}	
	Overload rating,1 second	30 x I_{nom}; max. 200 A 2)		30 x I_{nom}; max. 200 A 2)	
	Number of phases	1		1	
Voltage	Standard value		100/120 V		100/120 V
	Available		10/12...250/300...600 V		
	Internal power consumption per phase		≤ 2.1 VA		≤ 1 mA x U_{nom}
	Overload rating, permanent		1.5 x U_{nom} 2)		1.5 x U_{nom}
	Overload rating,1 second 1)		4 x U_{nom} 2)		4 x U_{nom} 2)
	Number of phases 1)		1		Terminal: 300/600 V
	1) Observe max. voltage		Terminal: 300/600 V		Against ground: 570 V
			Against ground: 600 V		1
Frequency	Nominal frequency	50/60 Hz ± 10 %	50/60 Hz ± 10 %	50/60 Hz ± 10 %	50/60 Hz ± 10 %
	Adjustable range				
	Minimum span				
Characteristic		sinusoidal	sinusoidal	sinusoidal	sinusoidal
Power supply		without	without		
	80...265 V (45...65 Hz)/80...300 V DC			yes < 2.0 VA	yes < 2.0 VA
	19...72 V (45...65 Hz)/19...100 V DC			no	no
Transient response					
Error limits		0.3 %	0.3 %	0.3 %	0.3 %
for frequency and angle measurement					
for frequency and angle measurement					
Response time		0.2 s	0.2 s	0.2 s	0.2 s
Residual ripple		≤ 0.7 % (peak-peak)	≤ 0.7 % (peak-peak)	≤ 0.7 % (peak-peak)	≤ 0.7 % (peak-peak)
Reference conditions, ambient temperature		23 °C ± 1 %	23 °C ± 1 %	23 °C ± 1 %	23 °C ± 1 %
	Frequency	f_{nom} ± 2 %	f_{nom} ± 2 %	f_{nom} ± 2 %	f_{nom} ± 2 %
	Curve shape	sinusoidal	sinusoidal	sinusoidal	sinusoidal
	Output load, current	375 Ω ± 1 %	375 Ω ± 1 %	375 Ω ± 1 %	375 Ω ± 1 %
	Output load, voltage	200 kΩ	200 kΩ	200 kΩ	200 kΩ
Influences, ambient temperature		≤ 0.5 %/10 K	≤ 0.5 %/10 K	≤ 0.5 %/10 K	≤ 0.5 %/10 K
	Overranging	1.2-fold: ≤ 0.4 %	1.2-fold: ≤ 0.4 %	1.2-fold: ≤ 0.4 %	1.2-fold: ≤ 0.4 %
	Curve shape	F[%] = harmonic wave [%]/	F[%] = harmonic wave [%]/	F[%] = harmonic wave [%]/	F[%] = harmonic wave [%]/
		ordinal number	ordinal number	ordinal number	ordinal number
	External magnetic field	≤ 1 % up to 400 A/m	≤ 1 % up to 400 A/m	≤ 1 % up to 400 A/m	≤ 1 % up to 400 A/m
	Power supply	not applicable	not applicable	≤ 0.05 %	≤ 0.05 %
Output					
Function of input quantities		I (current)	U (voltage)	I (current)	U (voltage)
Analog outputs		1	1	1	1
Current	Standard value	0...20 mA	0...20 mA	4...20 mA	4...20 mA
	Available	0...max. 20 mA	0...max. 20 mA		
	Current limiting	max. 1.8 x I_{nom}	max. 1.8 x I_{nom}	max. 1.8 x I_{nom}	max. 1.8 x I_{nom}
	Load	≤ 15 V/I_{nom}	≤ 15 V/I_{nom}	≤ 15 V/I_{nom}	≤ 15 V/I_{nom}
		(≤ 750 Ω with 20 mA)	(≤ 750 Ω with 20 mA)	(≤ 750 Ω with 20 mA)	(≤ 750 Ω with 20 mA)
Voltage	Available	0...max. 10 V	0...max. 10 V		
	Voltage limiting	30 V with R = ∞	30 V with R = ∞		
	Load	R ≥ 100 kΩ	R ≥ 100 kΩ		
Characteristic		linear	linear	linear	linear
Binary outputs		no	no	no	no
PC interface		no	no	no	no
Display connectable		no	no	no	no
Bus interface (RS 485, MODBUS RTU)		no	no	no	no

2) under reference conditions

PTM50-AN	**PTM50-VN**	**PTM50-FN**	**PTK50-1**	**PTK50-3**
3KDE48514	**3KDE48515**	**3KDE48516**	**3KDE48517**	**3KDE48518**
1 A/5 A			1...2.5 A/2...5 A	1...2.5 A/2...5 A
0.1/0.5...2.4/12 A			2.4...6 A/4.8...12 A	2.4...6 A/4.8...12 A
≤ 0.15 VA			≤ 0.15 VA	≤ 0.15 VA
2 x I_{nom}			2 x I_{nom}	2 x I_{nom}
30 x I_{nom}; max. 200 A[2)]			40 x I_{nom}; max. 200 A	40 x I_{nom}; max. 200 A
1			1	3
	100/120 V	100/120 V	75...150...300 V	75...150...300 V
	10/12...250/300...600 V	10/12...250/300...600 V	150...250...600 V	150...250...600 V
	≤ 1 mA x U_{nom}	≤ 1 mA x U_{nom}	≤ 1 mA x U_{nom}	≤ 1 mA x U_{nom}
	1.5 x U_{nom}	1.5 x U_{nom}	1.5 x U_{nom}	1.5 x U_{nom}
	4 x U_{nom}[2)]	4 x U_{nom}[2)]	4 x U_{nom}	4 x U_{nom}
	Terminal: 300/600 V	Terminal: 300/600 V	Terminal: 300/600 V	Terminal: 300/600 V
	Against ground: 570 V	Against ground: 570 V	Against ground: 270/570 V	Against ground: 270/570 V
	1	1	1	3
50/60 Hz ± 10 %	50/60 Hz ± 10 %	50/60 Hz ± 10 %	50/60 Hz ± 10 %	50/60 Hz ± 10 %
		30...80 Hz	30...80 Hz	30...80 Hz
		2 Hz	2 Hz	2 Hz
any	any	any	any	any
yes < 2.0 VA	yes < 2.0 VA	yes < 2.0 VA	yes 3.7 W/5.3 VA	yes 4.5 W/6.3 VA
yes < 2.0 VA	yes < 2.0 VA	yes < 2.0 VA	yes 3.8 W/6 VA	yes 4.8 W/8.3 VA
0.3 %	0.3 %	0.3 %	0.3 %	0.3 %
		≥ 0.8 x U_{rated}: 0.3 %	≥ 0.8 x $U(I)_{rated}$: 0,3 %	≥ 0.8 x U_{rated}: 0,3 %
		≥ 0.6 x U_{rated}: 0.5 %	≥ 0.6 x $U(I)_{rated}$: 0.5 %	≥ 0.6 x U_{rated}: 0.5 %
0.4 s	0.4 s	0.4 s	0.4 s...5 s	0.4 s...5 s
≤ 0.7 % (peak-peak)	≤ 0.7 % (peak-peak)	≤ 0.7 % (peak-peak)	≤ 0.7 % (peak-peak)	≤ 0.7 % (peak-peak)
23 °C ± 1 %	23 °C ± 1 %	23 °C ± 1 %	23 °C ± 1 %	23 °C ± 1 %
f_{nom} ± 2 %	f_{nom} ± 2 %	f_{nom} ± 2 %	f_{nom} ± 2 %	f_{nom} ± 2 %
sinusoidal	sinusoidal	sinusoidal	sinusoidal	sinusoidal
375 Ω ± 1 %	375 Ω ± 1 %	375 Ω ± 1 %	375 Ω ± 1 %	375 Ω ± 1 %
200 kΩ	200 kΩ	200 kΩ		
≤ 0.5 %/10 K	≤ 0.5 %/10 K	≤ 0.5 %/10 K	≤ 0.5 %/10 K	≤ 0.5 %/10 K
1.2-fold: ≤ 0.4 %	1.2-fold: ≤ 0.4 %	1.2-fold: ≤ 0.4 %	1.2-fold: ≤ 0.4 %	1.2-fold: ≤ 0.4 %
up to crest factor 3.6	up to crest factor 3.6	up to crest factor 3.6	up to crest factor 3.6	up to crest factor 3.6
≤ 0.05 %	≤ 0.05 %	≤ 0.05 %	≤ 0.05 %	≤ 0.05 %
≤ 1 % up to 400 A/m	≤ 1 % up to 400 A/m	≤ 1 % up to 400 A/m	≤ 1 % up to 400 A/m	≤ 1 % up to 400 A/m
≤ 0.05 %	≤ 0.05 %	≤ 0.05 %	≤ 0.05 %	≤ 0.05 %
I (current)	U (voltage)	f (frequency)	I, U, f, φ, cos φ, sin φ, P, Q, S	I, U, f, φ, cos φ, sin φ, P, Q, S
1	1	1	2 (bipolar)	3 (bipolar)
4...20 mA	4...20 mA	4...20 mA	configurable	configurable
0...max. 20 mA	0...max. 20 mA	0...max. 20 mA	-20...0...20 mA	-20...0...20 mA
max. 1.25 x I_{nom}	max. 1.25 x I_{nom}	max. 1.25 x I_{nom}	max. 1.25 x I_{nom}	max. 1.25 x I_{nom}
≤ 15 V/I_{nom}	≤ 15 V/I_{nom}	≤ 15 V/I_{nom}	≤ 15 V/I_{nom}	≤ 15 V/I_{nom}
(≤ 750 Ω with 20 mA)	(≤ 750 Ω with 20 mA)	(≤ 750 Ω with 20 mA)	(≤ 750 Ω with 20 mA)	(≤ 750 Ω with 20 mA)
0...max. 10 V	0...max. 10 V	0...max. 10 V		
30 V with R = ∞	30 V with R = ∞	30 V with R = ∞		
R ≥ 100 kΩ	R ≥ 100 kΩ	R ≥ 100 kΩ		
linear	linear	linear	configurable	configurable
no	no	no	no	2
no	no	no	yes	yes
no	no	no	yes	yes
no	no	no	optionally	optionally

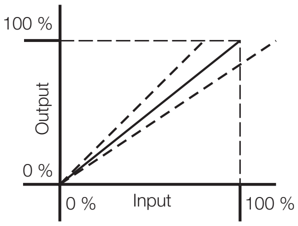
2) under reference conditions

Technical data (continued)

Type	**PTA50**	**PTV50**	**PTM50-AS**	**PTM50-VS**
Catalog number	**3KDE48510**	**3KDE48511**	**3KDE48512**	**3KDE48513**
Housing				
Made of plastic, hardly flammable, halogen-free	yes, to VL94-V2	yes, to VL94-V2	yes, to VL94-V2	yes, to VL94-V2
Connections				
Current (solid/flexible)	6.0/4.0 mm^2		6.0/4.0 mm^2	
Others (solid/flexible)	2.5/2.5 mm^2	2.5/2.5 mm^2	2.5/2.5 mm^2	2.5/2.5 mm^2
Type of protection				
Housing	IP 40	IP 40	IP 40	IP 40
Terminals	IP 20	IP 20	IP 20	IP 20
Weight	approx. 235 g	approx. 235 g	approx. 135 g	approx. 145 g
Standards and regulations				
Basic standard for power transducers	DIN EN 60688/IEC 60688	DIN EN 60688/IEC 60688	DIN EN 60688/IEC 60688	DIN EN 60688/IEC 60688
Safety information to DIN EN 61010-1/IEC 61010-1				
Test voltage input against output	5.55 kV, 50/60 Hz	5.55 kV, 50/60 Hz	5.55 kV, 50/60 Hz	5.55 kV, 50/60 Hz
Voltage across input terminals	≤ 300/600 V	≤ 300/600 V	≤ 300/600 V	≤ 300/600 V
Voltage against ground	≤ 600 V, double insulation	≤ 600 V, double insulation	≤ 570 V, double insulation	≤ 570 V, double insulation
Overvoltage category Inputs	III	III	III	III
Outputs	II	II	II	II
Degree of pollution	2	2	2	2
Output circuits are functional extra-low				
voltage circuits to DIN VDE 0100-410				
(PELV) for input voltages	≤ 600 V	≤ 600 V	≤ 570 V	≤ 570 V
The safe isolation of theses circuits meets the				
requirements to DIN EN 61140/IEC 61140				
EMC and radio suppression:				
DIN EN 61326/IEC 61326 Class A	yes	yes	yes	yes
Climatic category to DIN IEC 721 or DIN EN 60721-3-3				
Ambient temperature	3K5 -20...+60 °C	3K5 -20...+60 °C	3K5 -20...+60 °C	3K5 -20...+60 °C
Storage temperature	2K4 -40...+80 °C	2K4 -40...+80 °C	2K4 -40...+80 °C	2K4 -40...+80 °C
Mechanical capability to DIN IEC 68-2-27 and 68-2-6				
Shock	30 g, 11 ms	30 g, 11 ms	30 g, 11 ms	30 g, 11 ms
Vibration	2 g, 5...150 Hz	2 g, 5...150 Hz	2 g, 5...150 Hz	2 g, 5...150 Hz

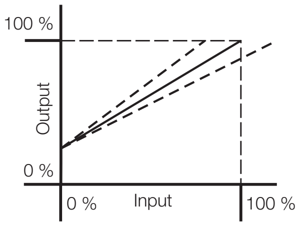
PTM50-AN **3KDE48514**	**PTM50-VN** **3KDE48515**	**PTM50-FN** **3KDE48516**	**PTK50-1** **3KDE48517**	**PTK50-3** **3KDE48518**
yes, to VL94-V2	yes, to VL94-V2	yes, to VL94-V2	yes, to VL94-V2	yes, to VL94-V2
6.0/4.0 mm^2			6.0/4.0 mm^2	6.0/4.0 mm^2
2.5/2.5 mm^2	2.5/2.5 mm^2	2.5/2.5 mm^2	2.5/2.5 mm^2	2.5/2.5 mm^2
IP 40	IP 40	IP 40	IP 40	IP 40
IP 20	IP 20	IP 20	IP 20	IP 20
approx. 135 g	approx. 145 g	approx. 145 g	max. 225 g	max. 430 g
DIN EN 60688/IEC 60688	DIN EN 60688/IEC 60688	DIN EN 60688/IEC 60688	DIN EN 60688/IEC 60688	DIN EN 60688/IEC 60688
5.55 kV, 50/60 Hz	5.55 kV, 50/60 Hz	5.55 kV, 50/60 Hz	5.55 kV, 50/60 Hz	5.55 kV, 50/60 Hz
≤ 300/600 V	≤ 300/600 V	≤ 300/600 V	≤ 300/600 V	≤ 300/600 V
≤ 570 V, double insulation	≤ 570 V, double insulation	≤ 570 V, double insulation	≤ 270 V / 570 V double insulation	≤ 270 V / 570 V double insulation
III	III	III	III	III
II	II	II	II	II
2	2	2	2	2
≤ 570 V	≤ 570 V	≤ 570 V	≤ 270 V / 570 V double insulation	≤ 270 V / 570 V double insulation
yes	yes	yes	yes	yes
3K5 -20...+60 °C	3K5 -20...+60 °C	3K5 -20...+60 °C	3K5 -20...+60 °C	3K5 -20...+60 °C
2K4 -40...+80 °C	2K4 -40...+80 °C	2K4 -40...+80 °C	2K4 -40...+80 °C	2K4 -40...+80 °C
30 g, 11 ms	30 g, 11 ms	30 g, 11 ms	30 g, 11 ms	30 g, 11 ms
2 g, 5...150 Hz	2 g, 5...150 Hz	2 g, 5...150 Hz	2 g, 5...150 Hz	2 g, 5...150 Hz

Characteristic

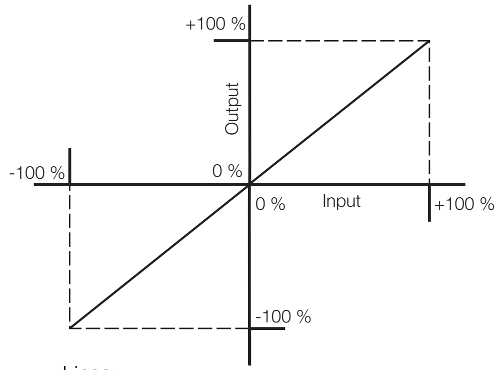


Linear

PTA50, PTV50, PTM50-..
PTK50-1, PTK50-3

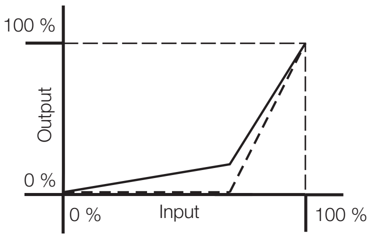


Linear
Live-zero
PTM50-..
PTK50-1, PTK50-3

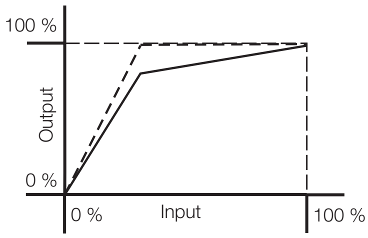


Linear
bipolar

PTK50-1, PTK50-3

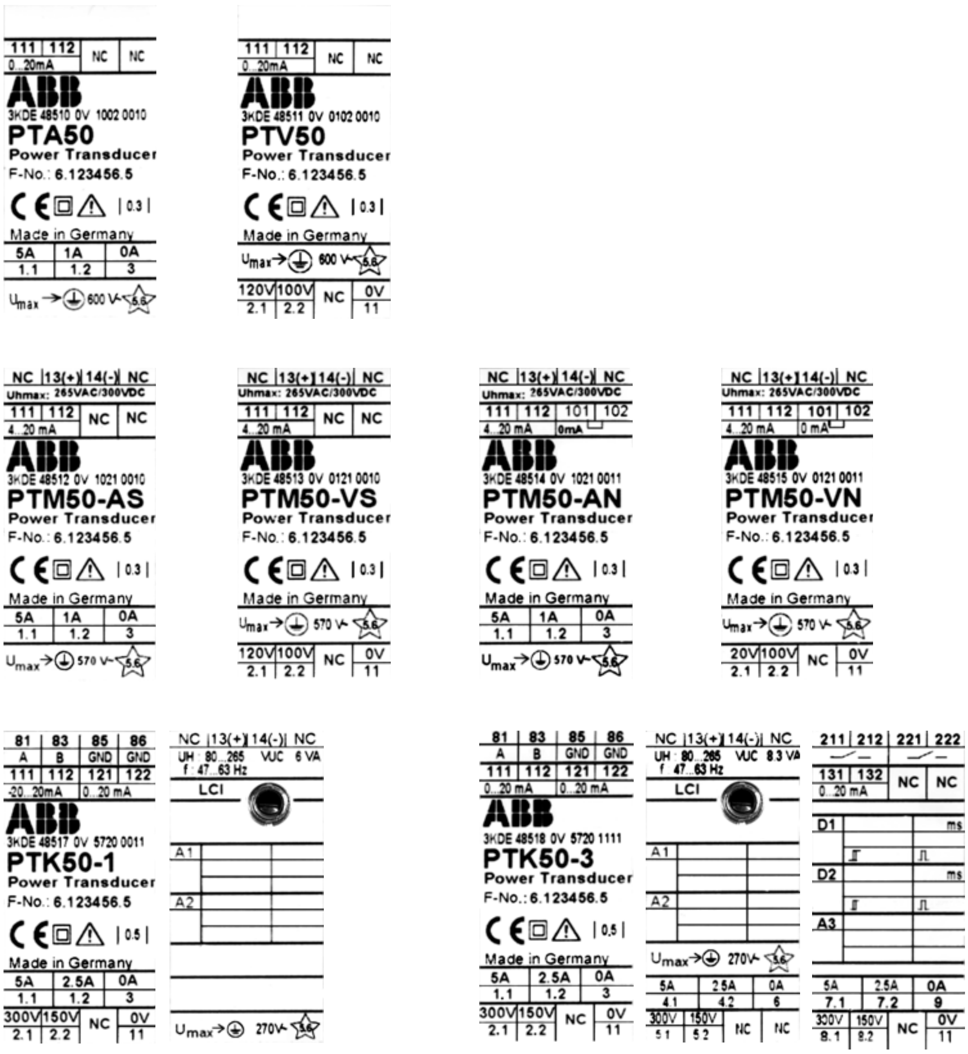


Extended end range
PTK50-1, PTK50-3



Extended start range
PTK50-1, PTK50-3

Connection diagrams (device)



Power supply
13 L + / ~
14 N - / ~

Current
1.1 L1, current, input 1
1.2 L1, current, input 2
3 L1, current, output
4.1 L2, current, input 1
4.2 L2, current, input 2
6 L2, current, output
7.1 L3, current, input 1
7.2 L3, current, input 2
9 L3, current, output

Voltage
2.1 L1, voltage, input 1
2.2 L1, voltage, input 2
5.1 L2, voltage, input 1
5.2 L2, voltage, input 2
8.1 L3, voltage, input 1
8.2 L3, voltage, input 2
11 Neutral point, voltage

Analog outputs
111 analog output 1
112 analog output 1 +
121 analog output 2
122 analog output 2+
131 analog output 3
132 analog output 3+

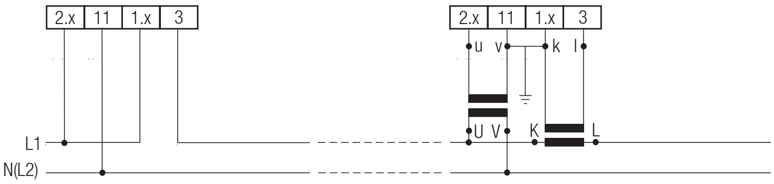
RS 485-interface
81 RXD/TXD A+
83 RXD/TXD B-
85 GND
86 GND

Binary outputs
211 binary output 1
212 binary output 1+
221 binary output 2
222 binary output 2+

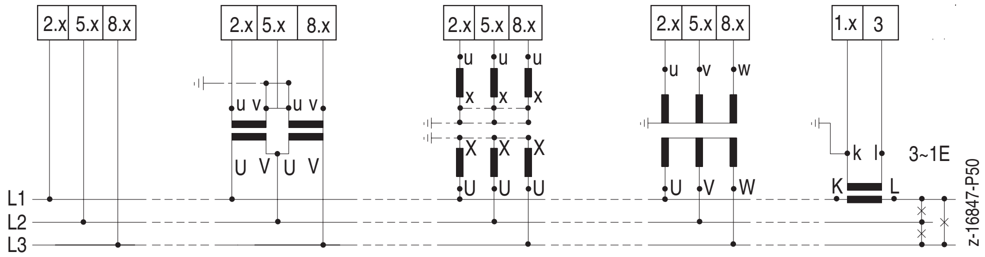
Caution
Terminals 101 and 102 of PTM50-.N transducers are used for changing over the analog output from 0...20 mA (with bridge) to 4...20 mA (without bridge). Bridging of these terminals must be realized on the shortest possible way. No other terminal assignment is permitted.

Connection diagram (system)

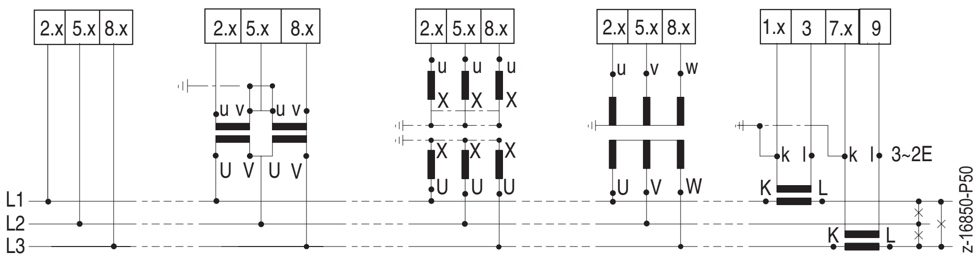
Single-phase AC current (~) [PTA50, PTV50; PTM50-..; PTK50-1; PTK50-3]



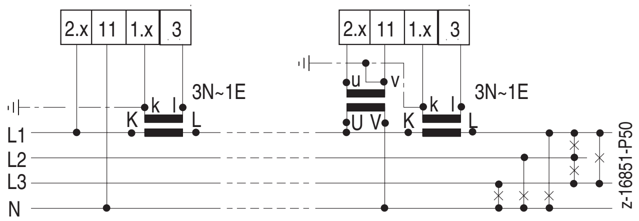
Three-wire, three-phase current with balanced load (3 ~ 1E) [PTK50-3]



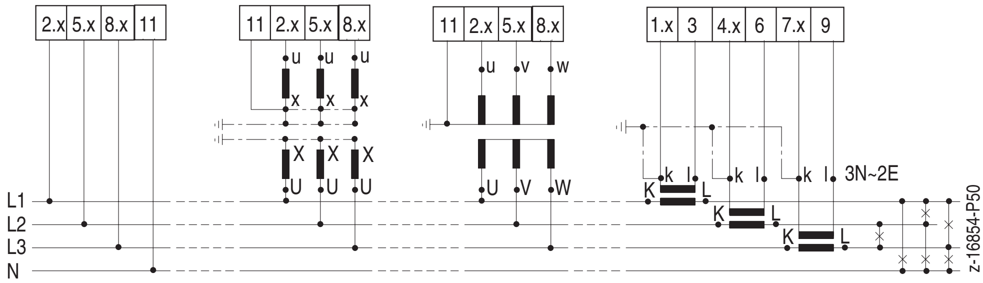
Three-wire, three-phase current with unbalanced load (3 ~ 2E) [PTK50-3]



Four-wire, three-phase current with balanced load (3N ~ 1E) [PTK50-1; PTK50-3]

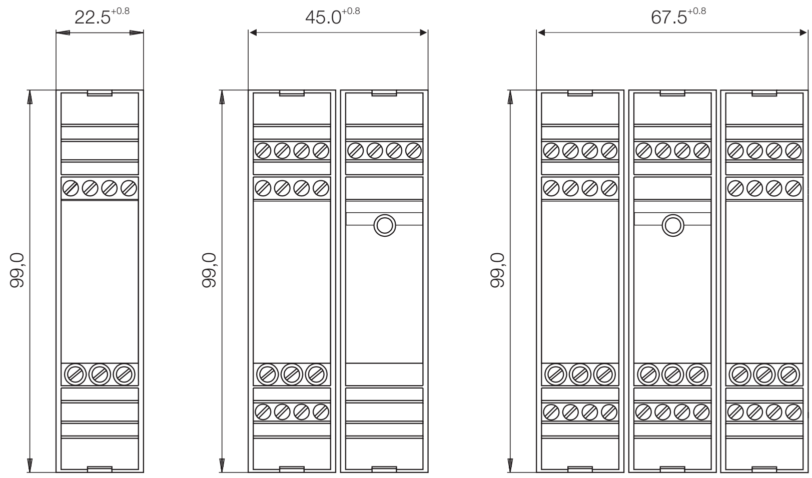


Four-wire, three-phase current with unbalanced load (3N ~ 3E) [PTK50-3]



Dimensional drawings

Front view

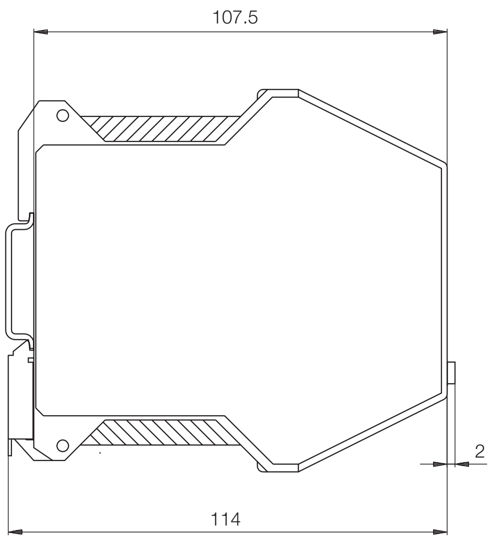


PTA50
PTV50
PTM50-AS
PTM50-AN
PTM50-VN
PTM50-FN

PTK50-1

PTK50-3

Side view



Accessories: Display PTD50

The PTD50 is an external display unit for all configurable POWER 50 series transducers. Its display field has one text line and four value lines, where a value description, the engineering unit and the value itself are indicated. The type and scope of the displayed values depend on the power transducer connected. The values to be displayed by the PTD50 can be configured and saved in the connected transducer by using a PC. Up to four pages can be pre-selected and called as required. For some functions, it is also possible to switch over to aggregate functions.

Push-button functions:

Page	Change page
Ind:	Scroll through aggregate values
Up:	Scroll up
Down:	Scroll down
Enter:	Confirm

Aggregate functions:

< low limit value
> high limit value
C counter

The following operations can be performed on the display unit:

1. Select page for display.
2. Select value/aggregate value for display.
3. Acknowledge limit value violations (single values or in groups).
4. Reset counters (single counters or in groups).
5. Global reset.
6. Reset to initial setting.

Technical data

Housing
Made of plastic, hardly flammable acc. to VL94-2

Connectors
Signal lines:
1 connector on PC side and 1 on power transducer side,
3 mm jack plug, cable length 5 m
Power supply:
5 mm jack plug or 2.5 mm^2 screw terminals

Supply voltage
9...30 V AC/DC

Weight
Display: approx. 250 g; Power unit: approx. 260 g

Type of protection
Front: IP 54; Back: IP 20

Standards and regulations

Climatic category to DIN IEC 721 or DIN EN 60721-3-3

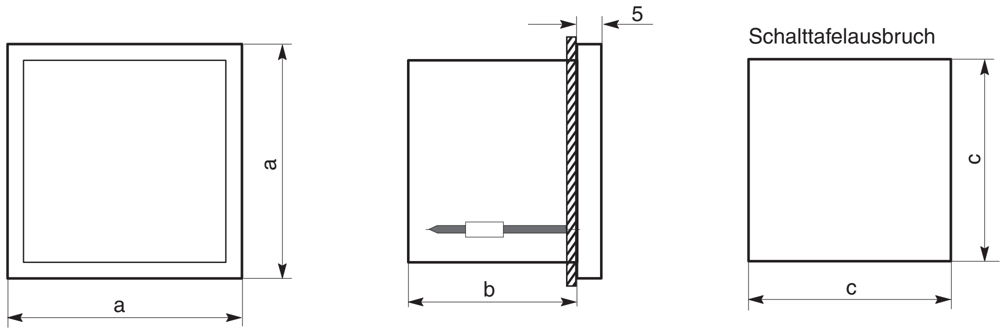
Ambient temperature
3K5 -20...+60 °C

Storage temperature
2K4 -40...+80 °C

Mechanical capability to DIN IEC 68-2-27 and 68-2-6

Shock	30 g, 11 ms
Vibration	2 g, 5...150 Hz

PTD50 display dimensional drawings



Front size (mm) a	h	Panel cutout c	Mounting depth b
96 x 96	6	$92^{+0,8}$ x $92^{+0,8}$	72

Ordering information

			Catalog No.									Code		
Preferred types for sinusoidal variables														
Power transducer PTA50	for current	1)	**3KDE485100L**	1	0	0	2	0	0					
Power transducer PTV50	for voltage	1)	**3KDE485110L**	0	1	0	2	0	0					
Variants for sinusoidal variables														
Power transducer PTA50	for current		**3KDE485100V**		0	0		0	0					
Power transducer PTV50	for voltage		**3KDE485110V**	0		0		0	0					
Rated current		2)												
I_{nom} = 1 A / 5 A				**1**	**0**									
I_{nom} = 1.2 A / 6 A				2	0									
I_{nom} = 2 A / 10 A				3	0									
I_{nom} = 2.4 A / 12 A				4	0									
I_{nom} = x A / 5 • x A				9	0									
$I_{nom}1$ = 0.1...2.4A (x.xxA)		clear text												
$I_{nom}2$ = 0.5...12.0A (xx.xxA)	($I_{nom}2=5 \times I_{nom}1$)	clear text												
Rated voltage		2)												
U_{nom} = 100 V / 120 V				**0**	**1**									
U_{nom} = 110 V / 133 V				0	2									
U_{nom} = 230 V / 250 V				0	3									
U_{nom} = 400 V				0	4									
U_{nom} = 500 V				0	5									
U_{nom} = 600 V				0	6									
U_{nom} = x V/1.2 • x V				0	9									
$U_{nom}1$ = 10...250V (xxx.xV)		clear text												
$U_{nom}2$ = 12...300V (xxx.xV)	($U_{nom}2=1.2 \times U_{nom}1$)	clear text												
> 300...600V (xxx.xV)	(only $U_{nom}2$)	clear text												
Power supply														
without						**0**								
Output signal														
0...20 mA							**2**							
0...10 mA							3							
0...1 mA							4							
0....xx.x mA	0 < xx.x < 20 mA	clear text					6							
0...1 V							7							
0...10 V							8							
0...xx.x V	0 < xx.x < 10 V	clear text					9							
Communication														
without								**0**						
Options														
without									**0**					

Additional ordering information				
		Code		
Certificates				
Quality test certificate DIN 55350-18-4.1.1 (certification of compliance with the order)		CH6		
Quality test certificate DIN 55350-18-4.2.2 with test point protocol	3) 4)	499		

1) for preferred types, the bold-printed Catalog-Nr. including 'L' is sufficient
2) max. allowed voltages: 300/600 V across the terminals, 600 V against ground
3) can only be ordered prior to manufacturing
4) this code No. does not appear on the rating plate of the device or on the device packing

Ordering information

	Catalog No.							Code		
Preferred types for sinusoidal variables										
Power Transducer PTM50-AS for current 1)	**3KDE485120L**	1	0	2	1	0	0			
Power Transducer PTM50-VS for voltage 1)	**3KDE485130L**	0	1	2	1	0	0			
Preferred types for RMS value measurement										
Power Transducer PTM50-AN for current 1)	**3KDE485140L**	1	0	2	1	0	0			
Power Transducer PTM50-VN for voltage 1)	**3KDE485150L**	0	1	2	1	0	0			
Power Transducer PTM50-FN for frequency 1) Measuring range 47.5...52.5 Hz	**3KDE485160L**	0	1	2	1	0	9			
Variants for RMS value measurement										
Power Transducer PTM50-AN for current	**3KDE485140V**		0			0	0			
Power Transducer PTM50-VN for voltage	**3KDE485150V**	0				0	0			
Power Transducer PTM50-FN for frequency	**3KDE485160V**	0				0	9			
Rated current 2)										
I_{nom} = 1 A / 5 A		**1**	**0**							
I_{nom} = 1.2 A / 6 A		2	0							
I_{nom} = 2 A / 10 A		3	0							
I_{nom} = 2.4 A / 12 A		4	0							
I_{nom} = x A / 5 · x A		9	0							
$I_{nom}1$ = 0.1...2.4A (x.xxA) clear text										
$I_{nom}2$ = 0.5...12.0A (xx.xxA) ($I_{nom}2 = 5 \times I_{nom}1$) clear text										
Rated voltage 2)										
U_{nom} = 100 V / 120 V		**0**	**1**							
U_{nom} = 110 V / 133 V		0	2							
U_{nom} = 230 V / 250 V		0	3							
U_{nom} = 400 V		0	4							
U_{nom} = 500 V		0	5							
U_{nom} = 570 V		0	6							
U_{nom} = x V/1.2 · x V		0	9							
$U_{nom}1$ = 10...250V (xxx.xV) clear text										
$U_{nom}2$ = 12...300V (xxx.xV) ($U_{nom}2 = 1.2 \times U_{nom}1$) clear text										
> 300...600V (xxx.xV) (only $U_{nom}2$) clear text										
Power supply										
U_H = 19...72 V, 50/60 Hz, 19...100 V DC				1						
U_H = 80...265 V, 50/60 Hz, 80...300 V DC				**2**						
Output signal										
4...20 mA					**1**					
0...20 mA					2					
0...10 mA					3					
0...1 mA					4					
0...20 mA / 4...20 mA (only PTM50-AN/VN/FN)					5					
xx.x...xx.x mA from xx.x = 0 to ... mA clear text					6					
to xx.x = ... to 20 mA clear text										
0...1 V					7					
0...10 V					8					
xx.x...xx.x V from xx.x = 0 to ... V clear text					9					
to xx.x = ... to 10 V clear text										
Communication										
without						**0**				
Measuring range for Frequency Transducers										
without							0			
xx.x...xx.x Hz from xx.x = 30 to ... Hz clear text							9			
(Difference min. 2 Hz) to xx.x = ... to 80 Hz clear text										

1) for preferred types, the bold-printed Catalog-Nr. including 'L' is sufficient
2) max. allowed voltages: 300/600 V across the terminals, 570 V against ground

Additional ordering information

	Code		
Certificates			
Quality test certificate DIN 55350-18-4.1.1 (certification of compliance with the order)	CH6		
Quality test certificate DIN 55350-18-4.2.2 with test point protocol	499		

Ordering information

		Catalog No.							Code		
Preferred types, all mains variables, RMS value											
Power transducer PTK50-1 1-phase	1)	**3KDE485170L**	5	7	2	0	1	0			
Power transducer PTK50-3 3-phase	1)	**3KDE485180L**	5	7	2	0	1	0			
Variants, all mains variables, RMS value											
Power transducer PTK50-1 1-phase for U, I, f, φ, cos φ, sin φ, P, Q, S in 45 mm standard housing		**3KDE485170V**				**0**					
Power transducer PTK50-3 3-phase for U, I, f, φ, cos φ, sin φ, P, Q, S in 67.5 mm standard housing		**3KDE485180V**				**0**					
Rated current											
I_{rated} = 1...2.5 A / 2...5 A	2)		**5**								
I_{rated} = 2.4...6 A / 4.8...12 A	2)		6								
Rated voltage											
U_{rated} = 75...150 V / 150...300 V	3)			**7**							
U_{rated} = 150...300 V / 300...570 V	2)			8							
Power supply											
UH = 19...72 V AC / 19...100 V DC					1	0					
UH = 80...265 V AC / 80...300 V DC					**2**	**0**					
Communication											
with RS 232 configuration interface							**1**				
with RS 232 configuration interface and RS 485 MODBUS RTU							2				
Options											
without customized configuration								**0**			
with customized configuration								1			

Additional ordering information		Code		
Zertifikate				
Quality test certificate DIN 55350-18-4.1.1 (certification of compliance with the order)		CH6		
Quality test certificate DIN 55350-18-4.2.2 with test point protocol	4) 5)	499		

Accessories		Catalog No.	Code		
Display PTD50					
96 mm x 96 mm for panel mounting, including connection cable between transducer and display (length 5 m)		3KDE485200L003010			
230 V AC wall power supply for PTD50 display		3KDE485010L0001			
Configuration cable for transducer series 50		3KDE485010L0006			
Device Configuraton Tool DRC200	6)	V49830A-0100			

1) for preferred types, the bold-printed Catalog-Nr. including 'L' is sufficient
2) max. permissible voltage: 300/600 V across terminals 570 V to ground
3) max. permissible voltages: 300/600 V across terminals 270 V to ground
4) can only be ordered in advance, i.e. prior to device production
5) this code No. is not printed on the device type plate / packing
6) for process data visualisation, OPC Modbus server and archiving see data sheet 49-8.30 EN

Configuration form for PTK50-1

Please provide the following information which is mandatory for ordering a customized device.

3KDE485170V | x | x | x | x | x | 1 |

	Code No.	
Tag No.	-411	[ ] (clear text, max. 31 characters)
Measuring circuit and input circuits	-412	

Measuring circuit

Single-phase alternating current (~)	1
4-wire 3-phase current of equal load (3N ~ 1E)	5

Input circuits

I: connection to x.1 (higher current value)	1
I: connection to x.2 (lower current value)	2
Current transformer primary side	_ _ _ _ _ A
Current transformer secondary side or rated current directly (without current transformer)	_ _ _ , _ A
U: connection to x.1 (higher voltage value)	1
U: connection to x.2 (lower voltage value)	2
Voltage transformer primary side	_ _ _ _ _ V
Voltage transformer secondary side or rated voltage directly (without voltage transformer)	_ _ _ , _ V

Units

Current	kA	**A**	mA
Voltage	kV	**V**	
Frequency		**Hz**	
Angle φ	±	**Deg**	
cos φ	ind., cap.		
sin φ	±		

Power	±	GW	MW	kW	**W**
Reactive power	±	GVAr	MVAr	kVAr	**var**
Apparent power		GVA	MVA	kVA	**VA**
Work	±	GWh	MWh	kWh	**Wh**
Reactive work	±	GVArh	MVArh	kVArh	**varh**
Apparent work		GVAh	MVAh	kVAh	**Vah**

Code for measuring variables (code No.)

Meas. var. Voltage (**V**)	Code	Meas. var. Current (**A**)	Code	Meas. var. Active power (**W**)	Code	Meas. var. Active power factor (_) (sinusoidal)	Code	Meas. var. Active power factor (_) (non-sinusoidal)	Code	Meas. var. Frequency (**Hz**)	Code
U_{L1-N}	UN1	I_{L1}	IL1	P_{L1}	PL1	$\cos\varphi_{L1}$	CL1	PF_{L1}	DL1	f_{L1} current f_{L1} voltage	FC1 FV1
Meas. var. React. power (**Var**) (sinusoidal)	**Code**	**Meas. var.** React. power factor (sinusoidal)	**Code**	**Meas. var.** React. power (**Var**) (non-sinusoidal)	**Code**	**Meas. var.** React. power factor (_) (non-sinusoidal)	**Code**	**Meas. var.** Apparent power (**VA**)	**Code**	**Meas. var.** Phase angle (**Deg**) (sinusoidal)	**Code**
Q_{L1}	QL1	$\sin\varphi_{L1}$	BL1	QN_{L1}	NL1	QF_{L1}	GL1	S_{L1}	SL1	φ_{L1}	AL1

Configuration form for PTK50-1, continued

Analog output circuits

Bipolar analog output			1	2
Measuring variable			Code No. -421	Code No. -422
Code No. of meas. variable				
Start of char. curve	(± value)	1)		
Kink point of char. curve	(± value)	1)		
End of char. curve	(± value)	1)		
Unit				

Analog output			
Start of char. curve	(± value)		
Kink point of char. curve	(± value)		
End of char. curve	(± value)		
Low limit	(± value)		
High limit	(± value)		
Unit ("V" or "mA")			
Response time (0.4...9.9 s)		s	s

When using an analog output as voltage output always connect a resistor into the line between the output terminals.
Example: 20 mA x 500 Ω = 10 V
10 mA x 500 Ω = 5 V
20 mA x 250 Ω = 5 V

The highest accuracy is reached with high current values.

		1	2
Alarm signaling		Code No. -431	Code No. -432
Code No. of meas. variable			
Min. value	(± value)		
Max. value	(± value)		
Unit			
Response time (0.4...9.9 s)		s	s
Hysteresis (0.0...5.0 % of rated value or 180 deg)		%	%
NO contact operation		NO	NO
NC contact operation		NC	NC

1) ind. oder cap. must be entered for cos φ in addition to ±

Configuration form for PTK50-3

Please provide the following information which is mandatory for ordering a customized device. **3KDE485180V** | x | x | x | x | x | 1 |

	Code No.	
Tag No.	-411	[ ] (clear text, max. 31 characters)
Measuring circuit and input circuits	-412	

Measuring circuit

Single-phase alternating current (~)	1
3-wire 3-phase current of balanced load (3 ~ 1E)	2
3-wire 3-phase current of unbalanced load (3 ~ 2E)	4
4-wire 3-phase current of balanced load (3N ~ 1E)	5
4-wire 3-phase current of unbalanced load (3N ~ 3E)	6

Input circuits

I: connection to x.1 (higher current value)	1
I: connection to x.2 (lower current value)	2
Current transformer primary side	[ ][ ][ ][ ][ ] A
Current transformer secondary side or rated current directly (without current transformer)	[ ][ ][ ] , [ ] A
U: connection to x.1 (higher voltage value)	1
U: connection to x.2 (lower voltage value)	2
Voltage transformer primary side	[ ][ ][ ][ ][ ] V
Voltage transformer secondary side or rated voltage directly (without voltage transformer)	[ ][ ][ ] , [ ] V

Units

Current		kA	**A**	mA
Voltage		kV	**V**	
Frequency			**Hz**	
Angle φ	±		**Deg**	
cos φ	ind., cap.			
sin φ	±			

Power	±	GW	MW	kW	**W**
Reactive power	±	GVAr	MVAr	kVAr	**var**
Apparent power		GVA	MVA	kVA	**VA**
Work	±	GWh	MWh	kWh	**Wh**
Reactive work	±	GVArh	MVArh	kVArh	**varh**
Apparent work		GVAh	MVAh	kVAh	**Vah**

Code for measuring value (code No.)

Meas. var. Voltage (**V**)	Code	Meas. var. Current (**A**)	Code	Meas. var. Active power (**W**)	Code	Meas. var. Active power factor (_) (sinusoidal)	Code	Meas. var. Active power factor (_) (non-sinusoidal)	Code	Meas. var. Frequency (**Hz**)	Code
U_{L1-N}	UN1	I_{L1}	IL1	P_{total} (3-ph.)	PP3	$\cos\varphi_{total}$ (3-ph.)	CP3	PF_{total} (3-ph.)	DP3	f_{L1} current	FC1
U_{L2-N}	UN2	I_{L2}	IL2	P_{L1}	PL1	$\cos\varphi_{L1}$	CL1	PF_{L1}	DL1	f_{L2} Strom	FC2
U_{L3-N}	UN3	I_{L3}	IL3	P_{L2}	PL2	$\cos\varphi_{L2}$	CL2	PF_{L2}	DL2	f_{L3} current	FC3
U_{L1-L2}	U12			P_{L3}	PL3	$\cos\varphi_{L3}$	CL3	PF_{L3}	DL3	f_{L1} voltage	FV1
U_{L1-L3}	U13									f_{L2} voltage	FV2
U_{L2-L3}	U23									f_{L3} voltage	FV3
Meas. var. React. power (Var) (sinusoidal)	**Code**	**Meas. var. React. power factor (sinusoidal)**	**Code**	**Meas. var. React. power (Var) (non-sinusoidal)**	**Code**	**Meas. var. React. power factor (_) (non-sinusoidal)**	**Code**	**Meas. var. Apparent power (VA)**	**Code**	**Meas. var. Phase angle (Deg) (sinusoidal)**	**Code**
Q_{total} (3-ph.)	QP3	$\sin\varphi_{total}$ (3-ph.)	BP3	QN_{total}(3-ph.)	NP3	QF_{total} (3-ph.)	GP3	S_{total} (3-ph.)	SP3	φ_{total} (3-ph.)	AP3
Q_{L1}	QL1	$\sin\varphi_{L1}$	BL1	QN_{L1}	NL1	QF_{L1}	GL1	S_{L1}	SL1	φ_{L1}	AL1
Q_{L2}	QL2	$\sin\varphi_{L2}$	BL2	QN_{L2}	NL2	QF_{L2}	GL2	S_{L2}	SL2	φ_{L2}	AL2
Q_{L3}	QL3	$\sin\varphi_{L3}$	BL3	QN_{L3}	NL3	QF_{L3}	GL3	S_{L3}	SL3	φ_{L3}	AL3

Configuration form for PTK50-3, continued

Analog output circuits

Bipolar analog output			1	2	3
Measuring variable			Code No. -421	Code No. -422	Code No. -423
Code No. of meas. variable					
Start of char. curve	(± value)	1)			
Kink point of char. curve	(± value)	1)			
End of char. curve	(± value)	1)			
Unit					

Analog output				
Start of char. curve	(± value)			
Kink point of char. curve	(± value)			
End of char. curve	(± value)			
Low limit	(± value)			
High limit	(± value)			
Unit ("V" or "mA")				
Response time (0.4...9.9 s)		s	s	s

When using an analog output as voltage output always connect a resistor into the line between the output terminals.
Example: 20 mA x 500 Ω = 10 V
10 mA x 500 Ω = 5 V
20 mA x 250 Ω = 5 V

The highest accuracy is reached with high current values.

Binary output circuits

Every binary output can be used as an alarm output (2) **or** pulse output (3).

Binary outputs	1	2
	Code No. -431	Code No. -432
Binary output as pulse output	1	2
Code No. of meas. var. (as for power or current)		
Pulses per value (max. 14,400/h)		
Value		
Unit		

Alarm signaling				
Code No. of meas. variable				
Min. value	(± value)	1)		
Max. value	(± value)	1)		
Unit				
Response time (0.4...9.9 s)			s	s
Hysteresis (0.0...5.0 % of rated value or 180 deg)			%	%
NO contact operation			NO	NO
NC contact operation			NC	NC

Notice!
The R&C Process Data Management (see data sheet 49-8.30 EN) has to be used for configuring the counters, limit values, process image und display PTD50.

1) ind. or cap. must be entered for cos φ instead of ±

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Printed in the Fed. Rep. of Germany (04.05)

3KDE485000R1001 Rev. A

ABB Ltd.
Howard Road, St. Neots
Cambridgeshire, PE19 8EU
UK
Tel: +44 (0) 1480 475321
Fax: +44 (0) 1480 217948

ABB Inc.
125 E. County Line Road
Warminster, PA 18974
USA
Tel: +1 215 674 6000
Fax: +1 215 674 7183

ABB Automation Products GmbH
Borsigstr. 2
63755 Alzenau
Germany
Tel: +49 551 905-534
Fax: +49 551 905-555
CCC-support.deapr@de.abb.com