



Transducers

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Transducer Survey

| Type | Function | Output config. | Auxiliary | Case | Page |
|---------------------|---------------------------|------------------------|-------------------------------------|------|------|
| AC Voltage | | | | | |
| DU 120 | AC voltage | A | Self powered | C1 | 13 |
| DU 121 | AC voltage | A, B, C, D | 92 – 138 V AC | C1 | 13 |
| DU 122 | AC voltage | A, B, C, D | 184 – 276 V AC | C1 | 13 |
| DU 123 | AC voltage | A, B, C, D, E, F, G, H | 8 – 20 V (40 V) DC | C3 | 14 |
| DU 124 | AC voltage | A, B, C, D, E, F, G, H | 18 – 80 V AC/DC | C3 | 14 |
| DU 125 | AC voltage | A, B, C, D, E, F, G, H | 80 – 276 V AC/DC | C3 | 14 |
| DUE 123 | Earth leak | A, B | 8 – 20 V (40 V) DC | C3 | 14 |
| DUE 124 | Earth leak | A, B | 18 – 80 V AC/DC | C3 | 14 |
| DUE 125 | Earth leak | A, B | 80 – 276 V AC/DC | C3 | 14 |
| AC Current | | | | | |
| DI 120 | AC current | A | Self powered | C1 | 17 |
| DI 121 | AC current | A, B, C, D | 92 – 138V AC | C1 | 17 |
| DI 122 | AC current | A, B, C, D | 184 – 276 V AC | C1 | 17 |
| DI 123 | AC current | A, B, C, D, E, F, G, H | 8 – 20 V (40 V) DC | C3 | 18 |
| DI 124 | AC current | A, B, C, D, E, F, G, H | 18 – 80 V AC/DC | C3 | 18 |
| DI 125 | AC current | A, B, C, D, E, F, G, H | 80 – 276 V AC/DC | C3 | 18 |
| DC Voltage | | | | | |
| DUD 123 | DC voltage | A, B, C, D, I, K, L | 8 – 20 V (40 V) DC | C3 | 20 |
| DUD 124 | DC voltage | A, B, C, D, I, K, L | 18 – 80 V AC/DC | C3 | 20 |
| DUD 125 | DC voltage | A, B, C, D, I, K, L | 80 – 276 V AC/DC | C3 | 20 |
| DC Current | | | | | |
| DID 123 | DC current | A, B, C, D, I, K, L | 8 – 20 V (40 V) DC | C3 | 20 |
| DID 124 | DC current | A, B, C, D, I, K, L | 18 – 80 V AC/DC | C3 | 20 |
| DID 125 | DC current | A, B, C, D, I, K, L | 80 – 276 V AC/DC | C3 | 20 |
| Frequency | | | | | |
| DF 03-04 | 2-wire, ph/n or ph/ph | A, B | 19 – 58 V AC/DC 88 – 264 V AC/DC | C3 | 23 |
| Power Factor | | | | | |
| DPF 13-14 | 1E, 3-wire, balanced load | A, B, I, K, L | 19 – 58 V AC/DC 88 – 264 V AC/DC | C3 | 25 |

| Active Power | | | | | |
|---------------------|--|---------------|--------------------|----|----|
| DP 123 | 1E, 1-phase/2-wire, (ph/n) | A, B, I, K, L | 8 – 20 V (40 V) DC | C3 | 29 |
| DP 124 | 1E, 1-phase/2-wire, (ph/n) | A, B, I, K, L | 18 – 80 V AC/DC | C3 | 29 |
| DP 125 | 1E, 1-phase/2-wire, (ph/n) | A, B, I, K, L | 80 – 276 V AC/DC | C3 | 29 |
| DP 133 | 1E, 3-wire, balanced load | A, B, I, K, L | 8 – 20 V (40 V) DC | C3 | 30 |
| DP 134 | 1E, 3-wire, balanced load | A, B, I, K, L | 18 – 80 V AC/DC | C3 | 30 |
| DP 135 | 1E, 3-wire, balanced load | A, B, I, K, L | 80 – 276 V AC/DC | C3 | 30 |
| DP 143 | 1E, 4-wire, (ph/n), balanced load | A, B, I, K, L | 8 – 20 V (40 V) DC | C3 | 31 |
| DP 144 | 1E, 4-wire, (ph/n), balanced load | A, B, I, K, L | 18 – 80 V AC/DC | C3 | 31 |
| DP 145 | 1E, 4-wire, (ph/n), balanced load | A, B, I, K, L | 80 – 276 V AC/DC | C3 | 31 |
| DP 233 | 2E, 3-wire, unbalanced load | A, B, I, K, L | 8 – 20 V (40 V) DC | C3 | 32 |
| DP 234 | 2E, 3-wire, unbalanced load | A, B, I, K, L | 18 – 80 V AC/DC | C3 | 32 |
| DP 235 | 2E, 3-wire, unbalanced load | A, B, I, K, L | 80 – 276 V AC/DC | C3 | 32 |
| DP 333 | 3E, 3- or 4-wire, unbalanced load, without connected neutral | A, B, I, K, L | 8 – 20 V (40 V) DC | C4 | 33 |
| DP 334 | 3E, 3- or 4-wire, unbalanced load, without connected neutral | A, B, I, K, L | 18 – 80 V AC/DC | C4 | 33 |
| DP 335 | 3E, 3- or 4-wire, unbalanced load, without connected neutral | A, B, I, K, L | 80 – 276 V AC/DC | C4 | 33 |
| DP 343 | 3E, 4-wire, unbalanced load | A, B, I, K, L | 8 – 20 V (40 V) DC | C4 | 34 |
| DP 344 | 3E, 4-wire, unbalanced load | A, B, I, K, L | 18 – 80 V AC/DC | C4 | 34 |
| DP 345 | 3E, 4-wire, unbalanced load | A, B, I, K, L | 80 – 276 V AC/DC | C4 | 34 |

| Reactive Power | | | | | |
|-----------------------|-----------------------------|---------------|--------------------|----|----|
| DQ 133 | 1E, 3-wire, balanced load | A, B, I, K, L | 8 – 20 V (40 V) DC | C3 | 38 |
| DQ 134 | 1E, 3-wire, balanced load | A, B, I, K, L | 18 – 80 V AC/DC | C3 | 38 |
| DQ 135 | 1E, 3-wire, balanced load | A, B, I, K, L | 80 – 276 V AC/DC | C3 | 38 |
| DQ 233 | 2E, 3-wire, unbalanced load | A, B, I, K, L | 8 – 20 V (40 V) DC | C3 | 39 |
| DQ 234 | 2E, 3-wire, unbalanced load | A, B, I, K, L | 18 – 80 V AC/DC | C3 | 39 |
| DQ 235 | 2E, 3-wire, unbalanced load | A, B, I, K, L | 80 – 276 V AC/DC | C3 | 39 |

Transducer Survey

| Type | Function | Output config. | Auxiliary | Case | Page |
|---|---|----------------|--------------------|------|------|
| Reactive Power | | | | | |
| DQ 333 | 3E, 3- or 4-wire, unbalanced load without connected neutral | A, B, I, K, L | 8 – 20 V (40 V) DC | C4 | 40 |
| DQ 334 | 3E, 3- or 4-wire, unbalanced load without connected neutral | A, B, I, K, L | 18 – 80 V AC/DC | C4 | 40 |
| DQ 335 | 3E, 3- or 4-wire, unbalanced load without connected neutral | A, B, I, K, L | 80 – 276 V AC/DC | C4 | 40 |
| DQ 343 | 3E, 4-wire, unbalanced load | A, B, I, K, L | 8 – 20 V (40 V) DC | C4 | 41 |
| DQ 344 | 3E, 4-wire, unbalanced load | A, B, I, K, L | 18 – 80 V AC/DC | C4 | 41 |
| DQ 345 | 3E, 4-wire, unbalanced load | A, B, I, K, L | 80 – 276 V AC/DC | C4 | 41 |
| Active and Reactive Power Combined | | | | | |
| DPQ 133 | 1E, 3-wire, balanced load | A, B, I, K, L | 8 – 20 V (40 V) DC | C4 | 45 |
| DPQ 134 | 1E, 3-wire, balanced load | A, B, I, K, L | 18 – 80 V AC/DC | C4 | 45 |
| DPQ 135 | 1E, 3-wire, balanced load | A, B, I, K, L | 80 – 276 V AC/DC | C4 | 45 |
| DPQ 143 | 1E, 4-wire, (ph/n), balanced load | A, B, I, K, L | 8 – 20 V (40 V) DC | C4 | 46 |
| DPQ 144 | 1E, 4-wire, (ph/n), balanced load | A, B, I, K, L | 18 – 80 V AC/DC | C4 | 46 |
| DPQ 145 | 1E, 4-wire, (ph/n), balanced load | A, B, I, K, L | 80 – 276 V AC/DC | C4 | 46 |
| DPQ 233 | 2E, 3-wire, unbalanced load | A, B, I, K, L | 8 – 20 V (40 V) DC | C4 | 47 |
| DPQ 234 | 2E, 3-wire, unbalanced load | A, B, I, K, L | 18 – 80 V AC/DC | C4 | 47 |
| DPQ 235 | 2E, 3-wire, unbalanced load | A, B, I, K, L | 80 – 276 V AC/DC | C4 | 47 |
| DPQ 333 | 3E, 3- or 4-wire, unbalanced load, without connected neutral | A, B, I, K, L | 8 – 20 V (40 V) DC | C4 | 48 |
| DPQ 334 | 3E, 3- or 4-wire, unbalanced load , without connected neutral | A, B, I, K, L | 18 – 80 V AC/DC | C4 | 48 |
| DPQ 335 | 3E, 3- or 4-wire, unbalanced load, without connected neutral | A, B, I, K, L | 80 – 276 V AC/DC | C4 | 48 |
| DPQ 343 | 3E, 4-wire, unbalanced load | A, B, I, K, L | 8 – 20 V (40 V) DC | C4 | 49 |
| DPQ 344 | 3E, 4-wire, unbalanced load | A, B, I, K, L | 18 – 80 V AC/DC | C4 | 49 |
| DPQ 345 | 3E, 4-wire, unbalanced load | A, B, I, K, L | 80 – 276 V AC/DC | C4 | 49 |

| Type | Function | Output config. | Auxiliary | Case | Page |
|-----------------------------------|--|---------------------|--------------------|------|------|
| DC to Pulse Rate Converter | | | | | |
| DIF 123 | DC to Pulse rate, converter uni-polar input | A, B (input) | 8 – 20 V (40 V) DC | C3 | 52 |
| DIF 124 | DC to Pulse rate, converter uni-polar input | A, B (input) | 18 – 80 V AC/DC | C3 | 52 |
| DIF 125 | DC to Pulse rate, converter uni-polar input | A, B (input) | 80 – 276 V AC/DC | C3 | 52 |
| DIF 143 | DC to Pulse rate, converter uni-polar in, double out | A, B (input) | 8 – 20 V (40 V) DC | C3 | 52 |
| DIF 144 | DC to Pulse rate, converter uni-polar in, double out | A, B (input) | 18 – 80 V AC/DC | C3 | 52 |
| DIF 145 | DC to Pulse rate, converter uni-polar in, double out | A, B (input) | 80 – 276 V AC/DC | C3 | 52 |
| DIF 243 | DC to Pulse rate, converter bi-polar input | I, K, L (input) | 8 – 20 V (40 V) DC | C3 | 52 |
| DIF 244 | DC to Pulse rate, converter bi-polar input | I, K, L (input) | 18 – 80 V AC/DC | C3 | 52 |
| DIF 245 | DC to Pulse rate, converter bi-polar input | I, K, L (input) | 80 – 276 V AC/DC | C3 | 52 |
| Pulse Counter | | | | | |
| DCR 01 | Impulse counter uni-polar | | | C1 | 52 |
| DCR 02 | Impulse counter bi- polar | | | C1 | 52 |
| Resistance/Temperature | | | | | |
| DR 133 | Pot | A, B, C, D | 8 – 20 V (40 V) DC | C3 | 55 |
| DR 134 | Pot | A, B, C, D | 18 – 80 V AC/DC | C3 | 55 |
| DR 135 | Pot | A, B, C, D | 80 – 276 V AC/DC | C3 | 55 |
| DR 223 | 2-wire | A, B, C, D | 8 – 20 V (40 V) DC | C3 | 55 |
| DR 224 | 2-wire | A, B, C, D | 18 – 80 V AC/DC | C3 | 55 |
| DR 225 | 2-wire | A, B, C, D | 80 – 276 V AC/DC | C3 | 55 |
| DR 333 | 3-wire | A, B, C, D | 8 – 20 V (40 V) DC | C3 | 55 |
| DR 334 | 3-wire | A, B, C, D | 18 – 80 V AC/DC | C3 | 55 |
| DR 335 | 3-wire | A, B, C, D | 80 – 276 V AC/DC | C3 | 55 |
| DR 433 | Temp. | A, B, C, D, I, K, L | 8 – 20 V (40 V) DC | C3 | 55 |
| DR 434 | Temp. | A, B, C, D, I, K, L | 18 – 80 V AC/DC | C3 | 55 |
| DR 435 | Temp. | A, B, C, D, I, K, L | 80 – 276 V AC/DC | C3 | 55 |
| Level Detector | | | | | |
| DGM 10 | Level detector aux: AC | 93.5 - 121V AC | | C2 | 57 |
| DGM 11 | Level detector aux: AC | 187 - 242V AC | | C2 | 57 |
| DGM 12 | Level detector aux: DC | 20 - 30 V DC | | C2 | 57 |

GENERAL DESCRIPTION AND TECHNICAL DATA

In this catalogue, Cewe Instrument presents "BLUE MODULE", a wide range of Transducers for DIN-rail and panel mounting.

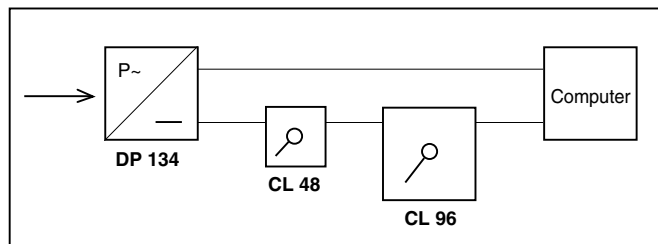
Thanks to high performance and high reliability e. g. a MTBF of 40 years for current transducers, Cewe Instrument transducers have obtained a wide clientele. The transducers are used by industries and power companies in around 40 countries in Europe as well as in all parts of the world. Cewe Instrument's transducer are also produced on licence in China.

Below follows general information on electrical measuring transducers with examples of application, definition of terms and some common data for Cewe Instrument transducers. For each group of transducers then follows

an explanation of working principle, block diagram, and general data.

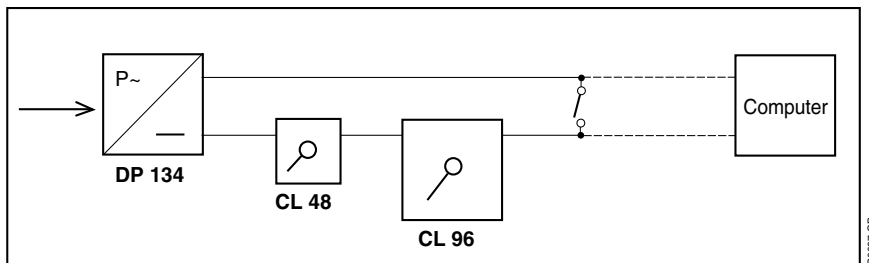
The output from our transducers are within certain limits independent of load. The load limits are given in a data sheets. The load independence is obtained by a certain feedback of the output signal to the amplifier. These transducer characteristics give great advantages among which the most important are mentioned below.

1. Measuring values can be transmitted over relatively long distances.
2. Within the framework of the permitted output signal loadings, several measuring or registration units can be connected simultaneously to the same transducer. No special tuning is required.



3. No adjustment for wire resistance need to be made in connected instruments.
4. The actual wiring is simple and inexpensive in that thin wires can be used for output signals.

5. Individual instruments or other measuring or registration units can be disconnected from a circuit after short-circuiting their connection wires. The signal and the remaining units in the circuit remain unaffected which simplifies service.

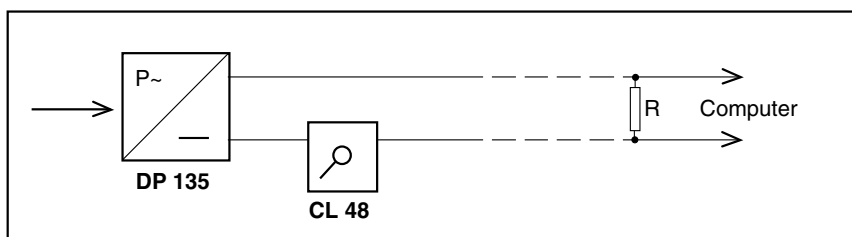


6. Maximum open circuit output voltage is low, 20 V, which means that the output circuit can be opened without any precautions.
7. They have a wide range of applications because of their high accuracy and the fact that they are approved in accordance with interference tests IEC 255 -5 and -6, for input and output signals.

Certain A/D-converters and controllers require a positive input signal. For this purpose it is useful to have a zero displacement in power measurements with both positive and negative power. Cewe Instrument's transducers can be produced with zero displacement up to 50 % of the measuring range.

Example: Measuring range 100-0-100 kW, output signal 4 – 12 – 20 mA where 4 mA = -100 kW, 12 mA = 0 kW and 20 mA = +100 kW.

See page 11 output signal L.

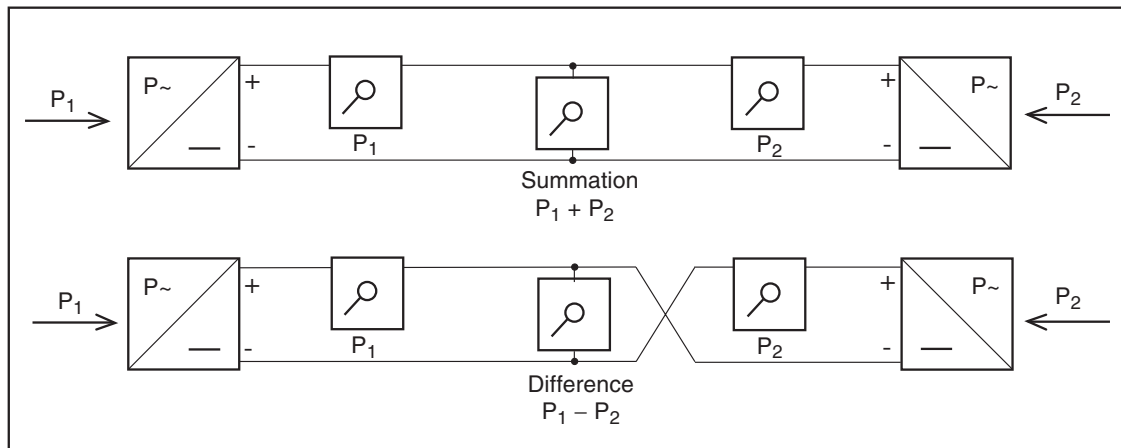


*Example:
Connection to a
computer.*

Addition or subtraction of outputs

Summation or different measurements are made by connecting the outputs according to the figures below. This is possible because the outputs are potential free.

Cewe Instrument's power transducers are adapted for both summation and different measurements. Other Cewe Instrument transducers can be used for summation measurements.



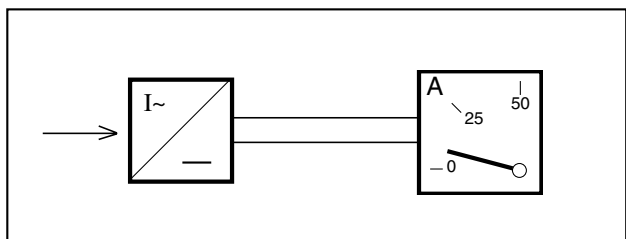
Live-Zero output

Using a measuring transducer with a nominal output of 0 – 20 mA, there can be an uncertainty when the output is zero, whether the in-put quantity is zero or there is a faulty transformer, transducer or connector. To avoid this we produce transducers with a live zero out-put. This output is normally 4 – 20 mA for an input of 0 – 100 %. These live zero output transducers are frequently used in process technology, but could also be used in power distribution instrumentation.

Transducer – Indicating instrument

As previously mentioned the transducer output is a DC signal and from that follows that one or several moving-coil instruments often serve as the indicating part.

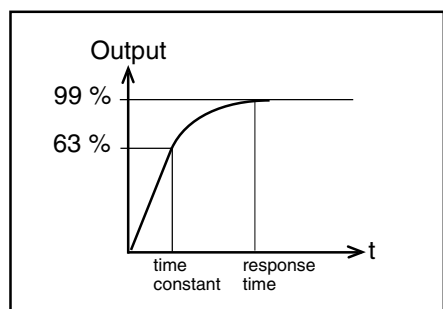
In power distribution technology moving-iron instruments are used for indication and measurements. The moving-iron is suppressed in the range 0 – 20 %, while it is practically linear from 20 to 100 %. If a good A.C. measurement in the range 0 – 20 % is needed, the combination transducer – moving-coil instrument is a suitable choice.



Response time

The standard response time is 300 ms. A response time of 50 ms is available as an option. (Except for DF and DPF) Other response times on request.

In this catalogue the concept response time is used to characterize the time performance of the transducer. Time constant is often used in other cases. The diagram below makes clear the difference between response time and time constant.



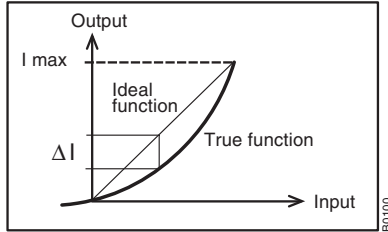
Ripple

The maximum ripple on the output is < 1 % of the output signal (fs) for transducers in class 0.5. The max. ripple for transducers in class 0.2 is < 0,5 %.

GENERAL DESCRIPTION AND TECHNICAL DATA

Linearity

A transducer is linear when the output is proportional to the input. A deviation from a linear function is called a non-linearity error and is expressed as a percentage of a range in our data sheets.



$$\text{Non linearity} = \frac{\Delta I_{\text{out}}}{I_{\text{out max}}} \times 100 [\%]$$

Auxiliary supply voltage

Cewe Instrument transducers – with some exceptions – are designed for 110 V A.C. or 230 V A.C. $\pm 20\%$ auxiliary supply voltage. Further information on this can be found in the preamble of each transducer type description.

Cewe Instrument transducers are also manufactured with a switched power supply in two ranges; 18 – 80 V AC/DC and 80 – 276 V AC/DC, and as an option for 8 – 20 V DC. In case of auxiliary supply with a DC voltage the connection is unaffected by the polarity.

Types DU 120 and DI 120 do not require an auxiliary power supply.

The accuracy class

Nominal accuracy class 0.5. Optional 0.2

Cewe Instrument transducers are calibrated to a nominal accuracy value with a maximum error of 0.1% for class 0.2 transducers, and 0.2% for class 0.5 transducers. The reference conditions are a power factor of 1.0.

Additional class number factors which influence the accuracy are:

Auxiliary supply voltage variations

The auxiliary supply voltage can be varied within wide limits, without any appreciable affection of the measuring accuracy. Measurement error is less than 0,1 % of measuring range.

Temperature variations

Cewe Instrument transducers are calibrated at an ambient temperature of $+23^{\circ}\text{C}$. At other temperatures a temperature error has to be added. This error varies between different transducer types. The temperature dependence is separately given in each data sheet.

Phase angle variations

The phase angle between the current and the voltage is of great importance when measuring the power. The additional error obtained when the phase angle varies is small and is expressed within the indicated class number as a % of the full output signal at $\pm 90^{\circ}$. The values can be found in the product data sheet for the transducer concerned.

Casing

The casing is made of self-extinguishing polycarbonate.

Tropical design

In environments with a high temperature, high relative humidity and corrosive atmosphere the tropical design gives a good protection.

| Standard design | Tropical design |
|---|---|
| Relative humidity max 85% for max 60 days per year. | Relative humidity max 95% for max 30 days per year. |
| Otherwise max 75% | Otherwise max 85% |
| Year average max 65% | Year average max 75% |

Mounting position

The measuring transducers can be mounted in any arbitrary position. The mounting position does not affect the measuring accuracy.

Temperature range

Under general data for each transducer type, the three temperature ranges are given: working temperature $-10 - +55^{\circ}\text{C}$, function temperature $-20 - +65^{\circ}\text{C}$ and storage temperature $-65 - +80^{\circ}\text{C}$.

Working temperature range imply the temperature range within which the given data are valid.

Function temperature range imply the transducer functions within this range, but can show a somewhat higher temp. coefficient.

Storage temperature range imply that the transducer stands to be stored within this temperature interval without being damaged.

Mounting

The transducers are mounted easily and quickly on DIN rail type DIN EN 50022 35.

A plastic DIN rail, Art No. 4025, can be supplied for mounting single transducers. The rail can easily be cut to the correct length for the relevant case size. See page 59.

Connections

The screw terminals are located on the front of the transducer and have a so-called self-opening washer, which facilitates assembly.

The terminals can accept a maximum conductor area of $2 \times 2.5 \text{ mm}^2$. The transducers are always supplied with protection against accidental contact.

Forms of enclosure (Protection degrees)

| | |
|---------------|---------|
| Case seal | = IP 51 |
| Terminal part | = IP 20 |

Standards

Cewe Instrument measurement transducers are tested according to the standards of the EMC Directive and according to IEC 255-5 and -6 (SS 436 1503 PL 4) "Interference environmental classes and test regulations for electronic apparatuses in control equipment for power stations".

The transducers are manufactured to IEC 60688-2.2.

EMC directives

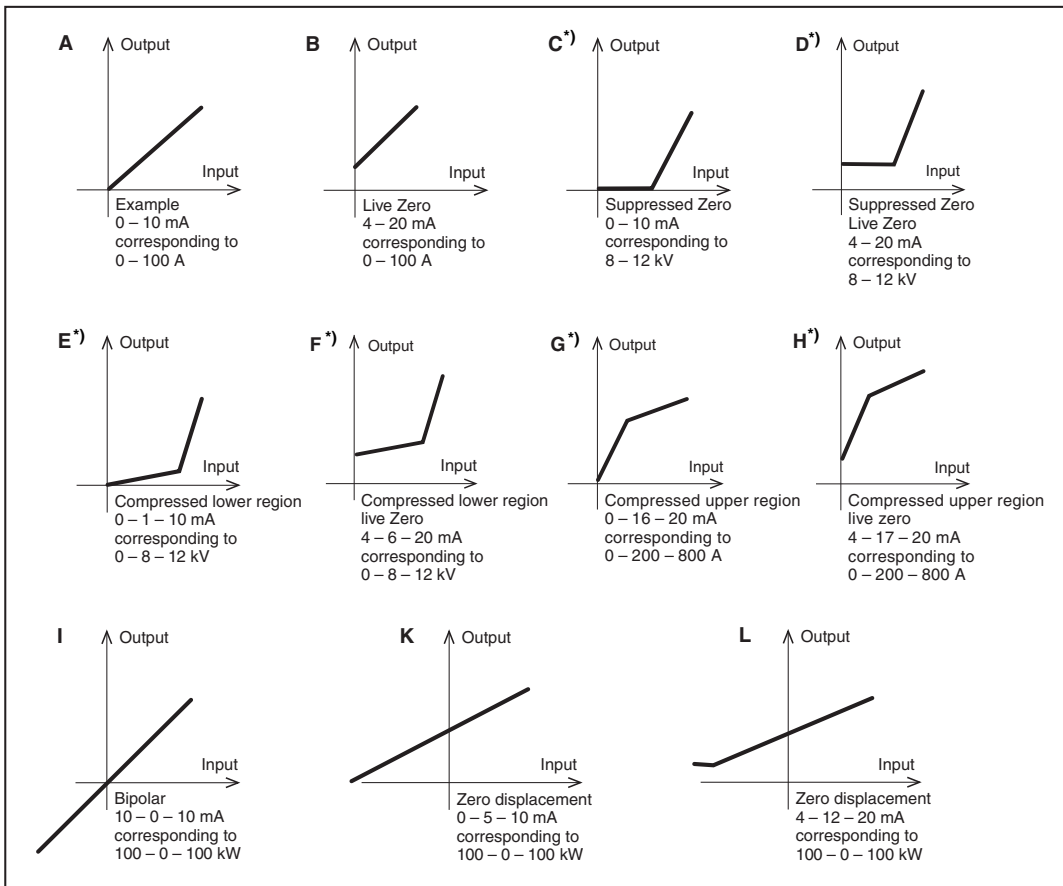
| | | |
|-------------|-----------|----------------|
| EN61000-6-3 | Emissions | light industry |
| EN61000-6-4 | Emissions | heavy industry |
| EN61000-6-1 | Immunity | light industry |
| EN61000-6-2 | Immunity | heavy industry |

LVD directive

| | |
|-----------|--------|
| EN61010-1 | Safety |
| IEC664-1 | Safety |

For all transducers that are connected to transformers, the secondary side of the transformer must be provided with a protective earth.

Output signals



*) Normally the knee point should not be closer than 20 % to the end value.

The maximum load resistance (at current output) is calculated from the formula:

$$R_{L \max} [\text{k}\Omega] = \frac{15 [\text{V}]}{\text{Output; [mA]}}$$

TRANSDUCCERS DU FOR AC VOLTAGE

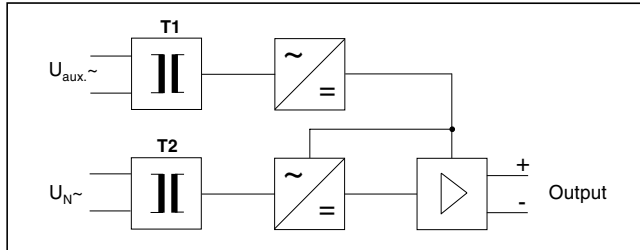
Transducers type DU transforms sinusoidal AC voltage to a proportional load independent DC signal. The input signal can be connected either directly to the transducer, or via a transformer (VT).

Transducer type DU 120 does not require auxiliary supply.

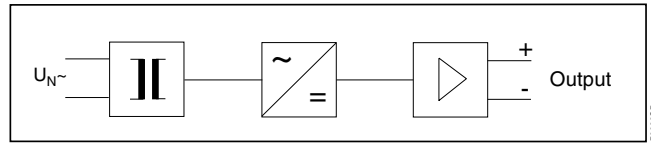
Dimensions and weights

See page 58

DU 121 to DU 125



DU 120



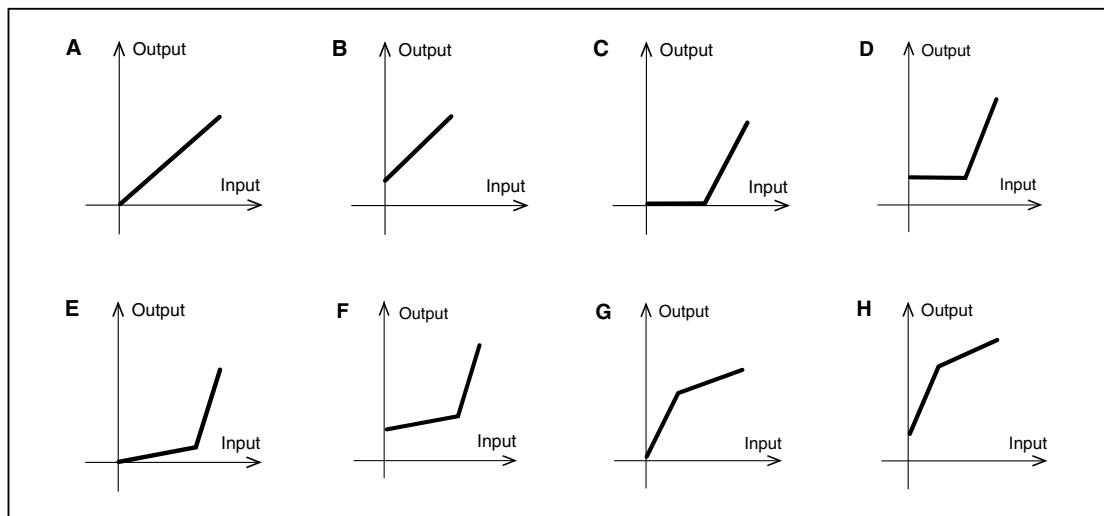
Output

| Accuracy class | 0.5 | 0.2 ^{*)} (Option) | ^{*)} Not DU 120 |
|---|---|---|--------------------------|
| Nominal accuracy | 0.2 | 0.1 | |
| Non-linearity | < 0.2 % | < 0.1 % | |
| Load dependence | < 0.05 % | < 0.05 % | |
| Response time | < 300 ms | < 300 ms | |
| Aux. supply dependence | < 0.1 % for $\Delta U_{aux.} \pm 20 \%$ | < 0.1 % for $\Delta U_{aux.} \pm 20 \%$ | |
| Temperature coefficient | < 0.1 %/10°C | < 0.1 %/10°C | |
| Max open circuit output voltage | 20 V | 20 V | |
| Max output signal by overload ^{*)} | 125% | 125% | |

General data

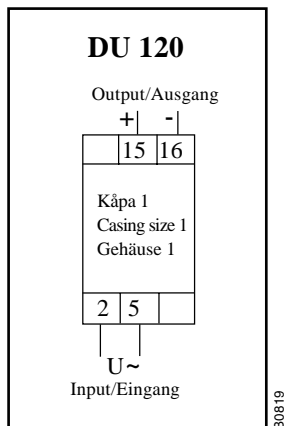
| | |
|----------------------|---|
| Working temp. range | -10 – +55°C |
| Function temp. range | -20 – +65°C |
| Storage temp. range | -65 – +80°C |
| Test voltage | 3.7 kV at $U_N \leq 300 \text{ V}$ 5.55 kV at $300 \text{ V} < U_N \leq 600 \text{ V}$ |
| Overload | 1.2 x U_N continuously, varistor protection 1.5 x U_N |

Output signals^{**)}



^{**)} The availability of output signal per type, see page 13 and 14

TRANSDUCERS DU FOR AC VOLTAGE



Connection

DU 120

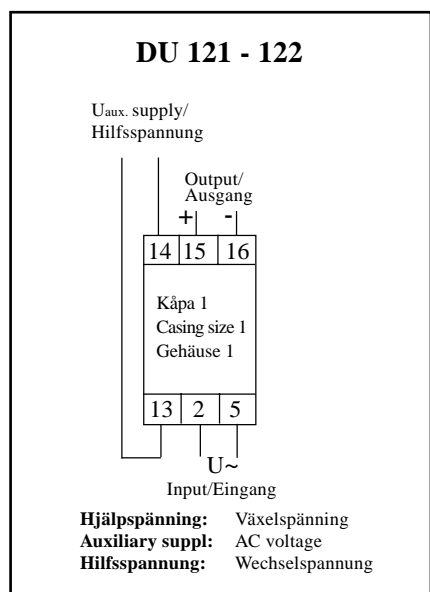
Input

| | |
|-------------------------|------------------------------|
| Input voltage (U_N) | 0 – 40...525 V ¹⁾ |
| Burden | < 1.2 VA |
| Frequency | 50, 60, 400 Hz |

Does not require auxiliary supply.

| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A | 0 – 15 k Ω |
| 2.5 mA | A | 0 – 6.0 k Ω |
| 5 mA | A | 0 – 3.0 k Ω |
| 10 mA | A | 0 – 1.5 k Ω |
| 20 mA | A | 0 – 750 Ω |

¹⁾ Other values on request.



Connection

DU 121 to 122

Input

| | |
|-------------------------|------------------------------------|
| Input voltage (U_N) | 0 – 40...600 V ¹⁾ |
| Burden | 1 mA x U_N |
| Frequency | 16 ^{2/3} , 50, 60, 400 Hz |

| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, C, D | 0 – 15 k Ω |
| 2.5 mA | A, B, C, D | 0 – 6.0 k Ω |
| 5 mA | A, B, C, D | 0 – 3.0 k Ω |
| 10 mA | A, B, C, D | 0 – 1.5 k Ω |
| 20 mA | A, B, C, D | 0 – 750 Ω |
| 5 V | A, B, C, D | ≥ 2 k Ω |
| 10 V | A, B, C, D | ≥ 2 k Ω |

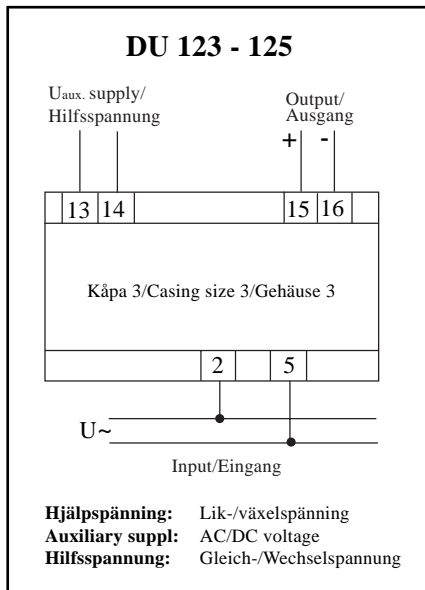
Auxiliary voltage

| Unit ²⁾ | Voltage | Frequency | Burden |
|--------------------|----------------|------------|--------|
| 1 | 92 – 138 V AC | 45 – 65 Hz | 2 VA |
| 2 | 184 – 276 V AC | 45 – 65 Hz | 2 VA |

¹⁾ Other values on request.

²⁾ Third digit in the type designation, shows type of auxiliary supply.

TRANSDUCCERS DU FOR AC VOLTAGE



Connection

- ¹⁾ Other values on request.
²⁾ Third digit in the type designation, shows type of auxiliary supply.

DU 123 to 125

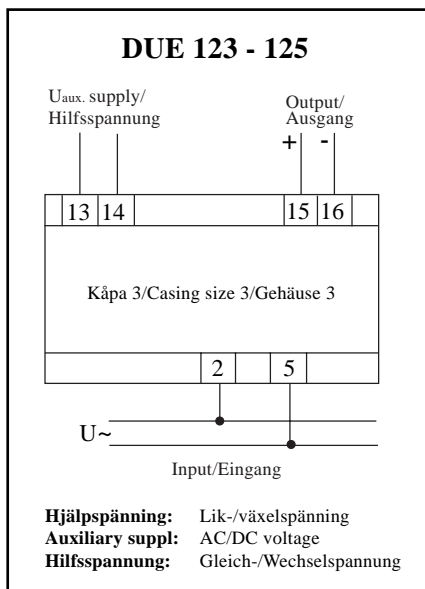
Input

| | |
|---------------------------------|---|
| Input voltage (U _N) | 0 – 40...600 V ¹⁾ |
| Burden | 1 mA x U _N |
| Measuring range | 0.2 – 0.99 x U _N |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

| Output rated value ¹⁾ | Output signal | Load resistance R _L |
|----------------------------------|------------------------|--------------------------------|
| 1 mA | A, B, C, D, E, F, G, H | 0 – 15 kΩ |
| 2.5 mA | A, B, C, D, E, F, G, H | 0 – 6.0 kΩ |
| 5 mA | A, B, C, D, E, F, G, H | 0 – 3.0 kΩ |
| 10 mA | A, B, C, D, E, F, G, H | 0 – 1.5 kΩ |
| 20 mA | A, B, C, D, E, F, G, H | 0 – 750 Ω |
| 5 V | A, B, C, D, E, F, G, H | ≥ 2 kΩ |
| 10 V | A, B, C, D, E, F, G, H | ≥ 2 kΩ |

Auxiliary voltage

| Unit ²⁾ | Voltage | Frequency | Burden |
|--------------------|--------------------|------------------|------------|
| 3 | 8 – 20 V (40 V) DC | DC | 2.5 W |
| 4 | 18 – 80 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |
| 5 | 80 – 276 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |



Connection

- ¹⁾ Other values on request.
²⁾ Third digit in the type designation, shows type of auxiliary supply.

DUE 123 to 125, Earth leak

Input

| | |
|---------------------------------|---|
| Input voltage (U _N) | 0 – 40...600 V ¹⁾ |
| Burden | 1 mA x U _N |
| Measuring range | 0.2 – 0.99 x U _N |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

| Output rated value ¹⁾ | Output signal | Load resistance R _L |
|----------------------------------|---------------|--------------------------------|
| 1 mA | A, B | 0 – 15 kΩ |
| 2.5 mA | A, B | 0 – 6.0 kΩ |
| 5 mA | A, B | 0 – 3.0 kΩ |
| 10 mA | A, B | 0 – 1.5 kΩ |
| 20 mA | A, B | 0 – 750 Ω |
| 5 V | A, B | ≥ 2 kΩ |
| 10 V | A, B | ≥ 2 kΩ |

Auxiliary voltage

| Unit ²⁾ | Voltage | Frequency | Burden |
|--------------------|--------------------|------------------|------------|
| 3 | 8 – 20 V (40 V) DC | DC | 2.5 W |
| 4 | 18 – 80 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |
| 5 | 80 – 276 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |

TRANSDUCERS DU FOR AC VOLTAGE

Ordering form DU

| DU (Voltage AC) | | Default | Example 1 | Example 2 |
|------------------------|----------------------|---------|--------------|--------------|
| Type: | <input type="text"/> | | DU 122 | DU 122 |
| Accuracy: | <input type="text"/> | cl. 0.5 | 0.5 | 0.5 |
| Transf. ratio voltage: | <input type="text"/> | | 11000/110 V | 11000/110 V |
| Frequency: | <input type="text"/> | 50 Hz | 50 Hz | 50 Hz |
| Measuring range: | <input type="text"/> | | 0-13,2 kV | 0-8-12 kV |
| Input signal: | <input type="text"/> | | 0-132 V | 0-88-132 V |
| Output: | <input type="text"/> | | 4-20 mA | 0-1-10 mA |
| Output curve: | <input type="text"/> | | B | E |
| Response time: | <input type="text"/> | 300 ms | 300 ms | 300 ms |
| Auxiliary supply: | <input type="text"/> | | 184-276 V AC | 184-276 V AC |

TRANSDUCCERS DI FOR AC CURRENT

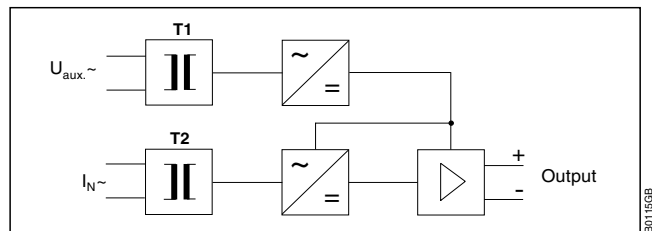
Transducers type DI transform sinusoidal AC current to a proportional load independent DC signal. The input signal can be connected either directly to the transducer, or via a transformer.

Transducer DI 11 does not require auxiliary supply.

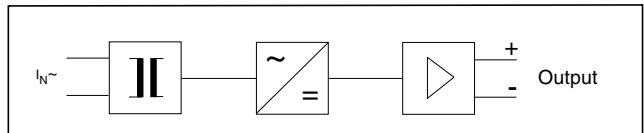
Dimensions and weights

See page 58

DI 121 to DI 125



DI 120



Output

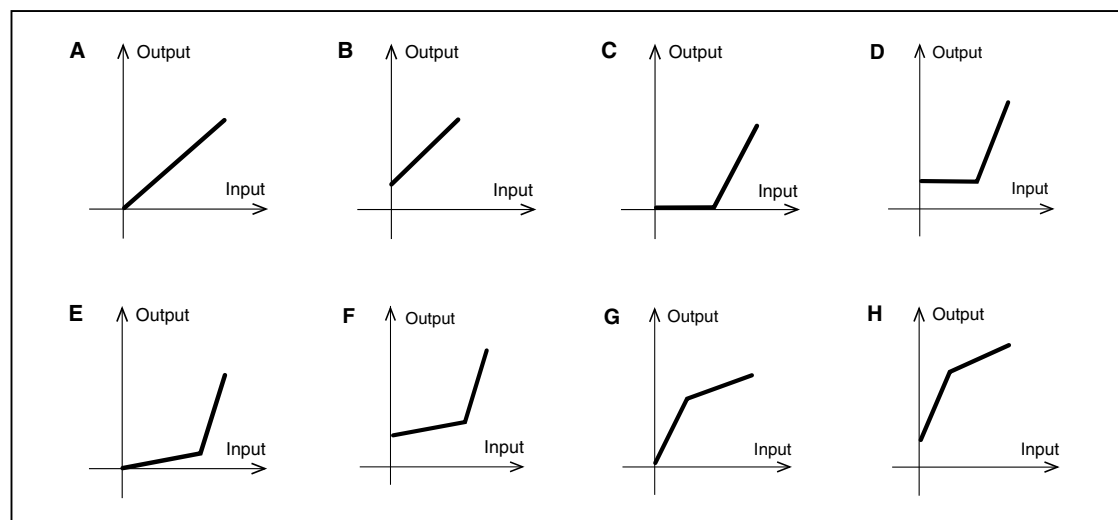
| Accuracy class | 0.5 | 0.2 ^{*)} (Option) |
|---|---|---|
| Nominal accuracy | 0.2 | 0.1 |
| Non-linearity | < 0.2 % | < 0.1 % |
| Load dependence | < 0.05 % | < 0.05 % |
| Response time | < 300 ms | < 300 ms |
| Aux. supply dependence | < 0.1 % for $\Delta U_{aux.} \pm 20 \%$ | < 0.1 % for $\Delta U_{aux.} \pm 20 \%$ |
| Temperature coefficient | < 0.1 %/10°C | < 0.1 %/10°C |
| Max open circuit output voltage | 20 V | 20 V |
| Max output signal by overload ^{*)} | 125% | 125% |

^{*)} Not DI 120

General data

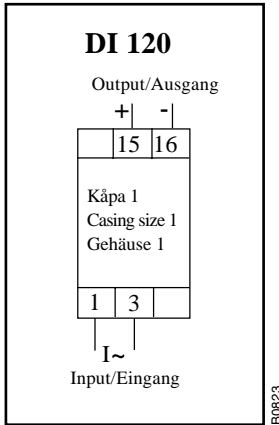
| | |
|----------------------|---|
| Working temp. range | -10 – +55°C |
| Function temp. range | -20 – +65°C |
| Storage temp. range | -65 – +80°C |
| Test voltage | 3,7 kV Standard ($U_N \leq 300 \text{ V}$), 5,55 kV, Option ($300 \text{ V} < U_N \leq 600 \text{ V}$) |
| Overload | 2 x I_N continuously, 10 x I_N during 10 s, 40 x I_N during 1 s |

Output signals^{**)}



^{**)} The availability of output signal per type, see page 17 and 18

TRANSDUCCERS DI FOR AC CURRENT



Connection

DI 120

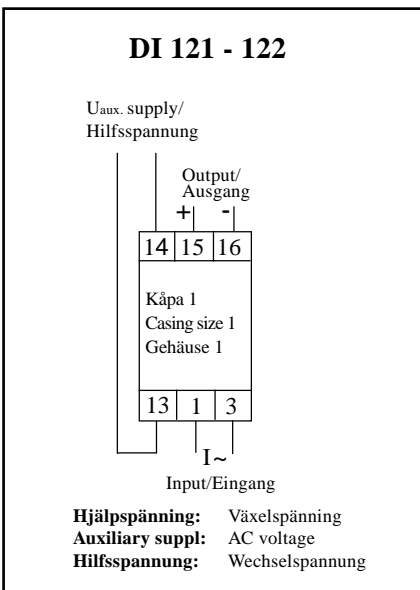
Input

Input current (I_N) 1.0, 1.2, 5.0, 6.0 A¹⁾
 Burden < 0,25 to < 1.2 VA
 Frequency 50, 60, 400 Hz

Does not require auxiliary supply.

| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A | 0 – 15 k Ω |
| 2.5 mA | A | 0 – 6.0 k Ω |
| 5 mA | A | 0 – 3.0 k Ω |
| 10 mA | A | 0 – 1.5 k Ω |
| 20 mA | A | 0 – 750 Ω |

¹⁾ Other values on request.



Connection

DI 121 to 122

Input

Input current (I_N) 1.0, 1.2, 2.0, 2.4, 5.0, 6.0 A¹⁾
 Burden < 0.04 to < 0.2 VA
 Frequency 16^{2/3}, 50, 60, 400 Hz

| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, C, D | 0 – 15 k Ω |
| 2.5 mA | A, B, C, D | 0 – 6.0 k Ω |
| 5 mA | A, B, C, D | 0 – 3.0 k Ω |
| 10 mA | A, B, C, D | 0 – 1.5 k Ω |
| 20 mA | A, B, C, D | 0 – 750 Ω |
| 5 V | A, B, C, D | \geq 2 k Ω |
| 10 V | A, B, C, D | \geq 2 k Ω |

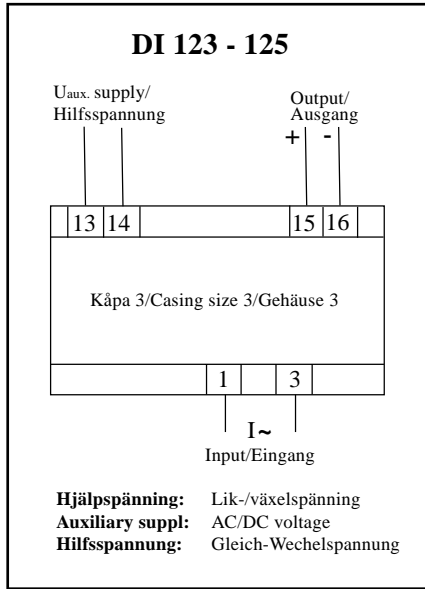
Auxiliary voltage

| Unit ²⁾ | Voltage | Frequency | Burden |
|--------------------|----------------|------------|--------|
| 1 | 92 – 138 V AC | 45 – 65 Hz | 2 VA |
| 2 | 184 – 276 V AC | 45 – 65 Hz | 2 VA |

¹⁾ Other values on request.

²⁾ Third digit in the type designation, shows type of auxiliary supply.

TRANSDUCCERS DI FOR AC CURRENT



Connection

DI 123 to 125

Input

| | |
|---------------------------------|--|
| Input current (I _N) | 1.0, 1.2, 2.0, 2.4, 5.0, 6.0 A ¹⁾ |
| Burden | < 0.04 to < 0.2 VA |
| Frequency | 16 ²⁾ / ₃ , 50, 60, 400 Hz |

| Output rated value ¹⁾ | Output signal | Load resistance R _L |
|----------------------------------|------------------------|--------------------------------|
| 1 mA | A, B, C, D, E, F, G, H | 0 – 15 kΩ |
| 2.5 mA | A, B, C, D, E, F, G, H | 0 – 6.0 kΩ |
| 5 mA | A, B, C, D, E, F, G, H | 0 – 3.0 kΩ |
| 10 mA | A, B, C, D, E, F, G, H | 0 – 1.5 kΩ |
| 20 mA | A, B, C, D, E, F, G, H | 0 – 750 Ω |
| 5 V | A, B, C, D, E, F, G, H | ≥ 2 kΩ |
| 10 V | A, B, C, D, E, F, G, H | ≥ 2 kΩ |

Auxiliary voltage

| Unit ²⁾ | Voltage | Frequency | Burden |
|--------------------|--------------------|------------------|------------|
| 3 | 8 – 20 V (40 V) DC | DC | 2.5 W |
| 4 | 18 – 80 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |
| 5 | 80 – 276 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |

¹⁾ Other values on request.

²⁾ Third digit in the type designation, shows type of auxiliary supply.

Ordering form DI

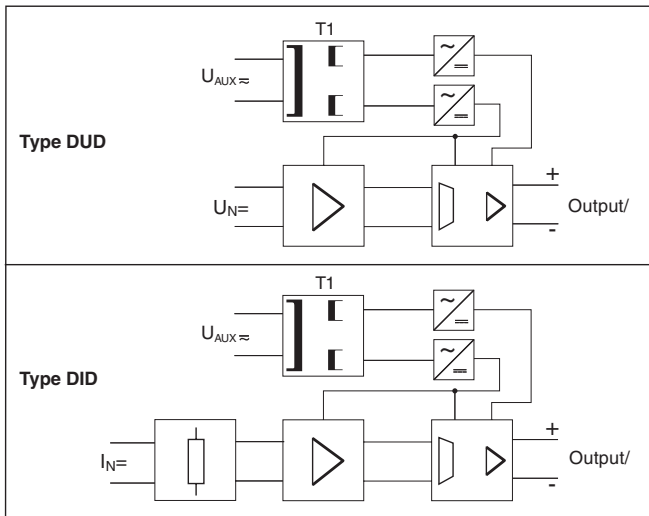
| DI (Current AC) | Default | Example 1 | Example 2 |
|------------------------|---------|----------------|-----------|
| Type: | | DI 125 | DI 120 |
| Accuracy: | cl. 0.5 | 0.5 | 0.5 |
| Transf. ratio current: | | 100/5 A | 100/5 A |
| Frequency: | 50 Hz | 50 Hz | 50 Hz |
| Measuring range: | | 0-120 A | 0-120 A |
| Input signal: | | 0-6 A | 0-6 A |
| Output: | | 4-20 mA | 0-20 mA |
| Output curve: | | B | A |
| Response time: | 300 ms | 300 ms | 300 ms |
| Auxiliary supply: | | 80-276 V AC/DC | — |

TRANSDUCERS DUD FOR DC VOLTAGE AND DID FOR DC CURRENT

Transducers type DUD and DID are used to measure DC voltage and DC current that are converted into a proportional load-independent galvanic isolated DC voltage or DC current signal.

Dimensions and weights

See page 58



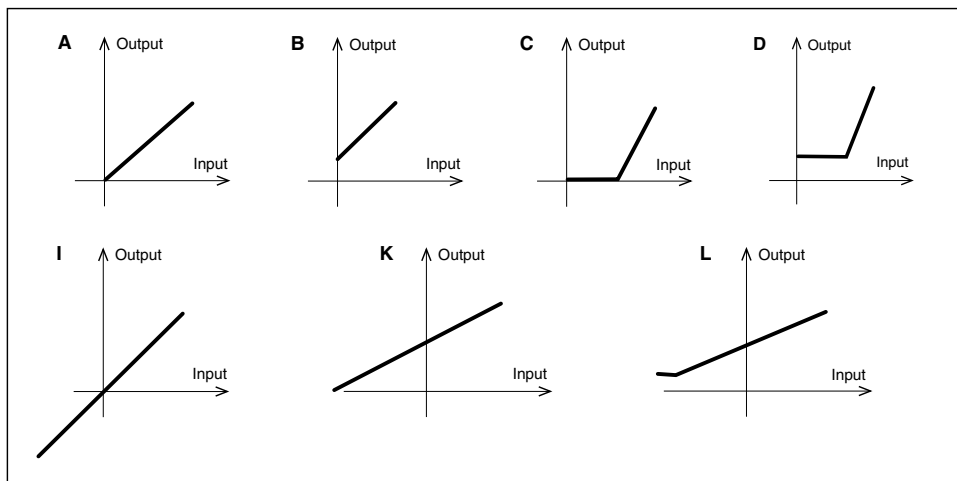
Output data

| Accuracy class | 0.5 | 0.2 (Option) |
|---|---------------|----------------|
| Linearity error | < 0.2 % | < 0.1 % |
| Load-dependence | < 0.05 % | < 0.05 % |
| Response time (0-99%) | 50 – 100 ms | 50 – 100 ms |
| Auxiliary voltage dependence | < 0.1 % | < 0.1 % |
| Temperature dependence | < 0.1 %/10 °C | < 0.06 %/10 °C |
| Max voltage with open output | 20 V | 20 V |
| Max output signal with over-driven input signal | ≤ 125 % | ≤ 125 % |
| Ripple (peak-to-peak) | < 1.0 % | < 0.5 % |

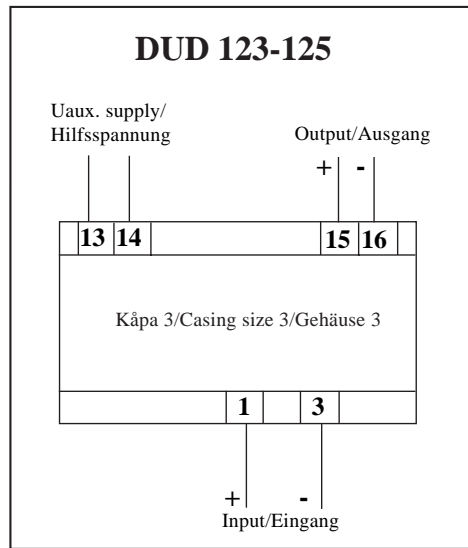
General data

| | |
|----------------------|----------------|
| Working temp. range | -10 – +55 °C |
| Function temp. range | -20 – +65 °C |
| Storage temp. range | -65 – +80 °C |
| Test voltage | 5.55 kV, 50 Hz |

Output signals



TRANSDUCERS DUD FOR DC VOLTAGE AND DID FOR DC CURRENT



Connection

DUD 123 to 125, DC voltage

Input data

Measured voltage (U_N) 0 – 60 mV.....0 – 600 V
 Input resistance 40 k Ω /V measuring range 0 – 0,5 V
 10 k Ω /V measuring range 0 – 600 V

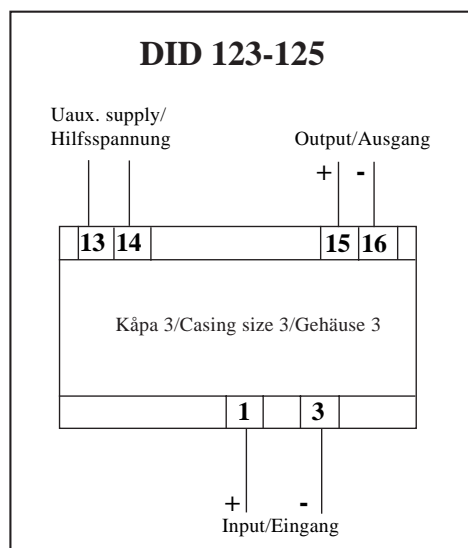
| Output signal ¹⁾ | Curve | Load resistance R_L |
|-----------------------------|---------------------|-----------------------|
| 0 – 1 mA | A, B, C, D, I, K, L | 0 – 15 k Ω |
| 0 – 2 mA | A, B, C, D, I, K, L | 0 – 7.5 k Ω |
| 0 – 2,5 mA | A, B, C, D, I, K, L | 0 – 6.0 k Ω |
| 0 – 5 mA | A, B, C, D, I, K, L | 0 – 3.0 k Ω |
| 0 – 10 mA | A, B, C, D, I, K, L | 0 – 1,5 k Ω |
| 0 – 20 mA | A, B, C, D, I, K, L | 0 – 750 Ω |
| 4 – 20 mA | A, B, C, D, I, K, L | 0 – 750 Ω |
| 0 – 1 V | A, B, C, D, I, K, L | ≥ 2 k Ω |
| 0 – 2 V | A, B, C, D, I, K, L | ≥ 2 k Ω |
| 0 – 5 V | A, B, C, D, I, K, L | ≥ 2 k Ω |
| 0 – 10 V | A, B, C, D, I, K, L | ≥ 2 k Ω |

Auxiliary voltage

| Unit ²⁾ | Voltage | Frequency | Burden |
|--------------------|--------------------|------------------|------------|
| 3 | 8 – 20 V (40 V) DC | DC | 2.5 W |
| 4 | 18 – 80 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |
| 5 | 80 – 276 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |

¹⁾ Other values on request.

²⁾ Third digit in the type designation, shows type of auxiliary supply.



Connection

DID 123 to 125, DC current

Input data

Measuring current (I_N) 0 – 1 mA.....0 – 200 mA
 Shunt voltage max 0,15 V

| Output signal ¹⁾ | Curve | Load resistance R_L |
|-----------------------------|---------------------|-----------------------|
| 0 – 1 mA | A, B, C, D, I, K, L | 0 – 15 k Ω |
| 0 – 2 mA | A, B, C, D, I, K, L | 0 – 7.5 k Ω |
| 0 – 2,5 mA | A, B, C, D, I, K, L | 0 – 6.0 k Ω |
| 0 – 5 mA | A, B, C, D, I, K, L | 0 – 3.0 k Ω |
| 0 – 10 mA | A, B, C, D, I, K, L | 0 – 1,5 k Ω |
| 0 – 20 mA | A, B, C, D, I, K, L | 0 – 750 Ω |
| 4 – 20 mA | A, B, C, D, I, K, L | 0 – 750 Ω |
| 0 – 1 V | A, B, C, D, I, K, L | ≥ 2 k Ω |
| 0 – 2 V | A, B, C, D, I, K, L | ≥ 2 k Ω |
| 0 – 5 V | A, B, C, D, I, K, L | ≥ 2 k Ω |
| 0 – 10 V | A, B, C, D, I, K, L | ≥ 2 k Ω |

Auxiliary voltage

| Unit ²⁾ | Voltage | Frequency | Burden |
|--------------------|--------------------|------------------|------------|
| 3 | 8 – 20 V (40 V) DC | DC | 2.5 W |
| 4 | 18 – 80 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |
| 5 | 80 – 276 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |

¹⁾ Other values on request.

²⁾ Third digit in the type designation, shows type of auxiliary supply.

TRANSDUCERS DUD FOR DC VOLTAGE AND DID FOR DC CURRENT

Ordering form DUD

| DUD (Voltage DC) | | Default | Example |
|-------------------|----------------------|---------|----------------|
| Type: | <input type="text"/> | | DUD 125 |
| Accuracy: | <input type="text"/> | cl. 0.5 | 0.5 |
| Input signal: | <input type="text"/> | | 0-60 mV |
| Output: | <input type="text"/> | | 0-20 mA |
| Output curve: | <input type="text"/> | | A |
| Response time: | <input type="text"/> | 300 ms | 300 ms |
| Auxiliary supply: | <input type="text"/> | | 80-276 V AC/DC |

Ordering form DID

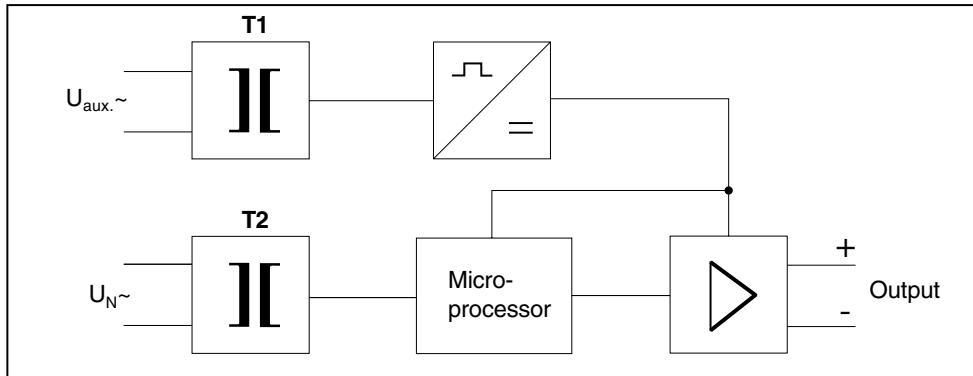
| DID (Current DC) | | Default | Example |
|-------------------|----------------------|---------|---------------|
| Type: | <input type="text"/> | | DID 124 |
| Accuracy: | <input type="text"/> | cl. 0.5 | 0.5 |
| Input signal: | <input type="text"/> | | 4-20 mA |
| Output: | <input type="text"/> | | 4-20 mA |
| Output curve: | <input type="text"/> | | B |
| Response time: | <input type="text"/> | 300 ms | 300 ms |
| Auxiliary supply: | <input type="text"/> | | 18-80 V AC/DC |

TRANSDUCERS DF FOR FREQUENCY

Transducers type DF are used for the measurement of the frequency of an AC voltage and transforms it into a proportionally load independent DC signal. The input can be connected directly or via a transformer.

Dimensions and weights

See page 58



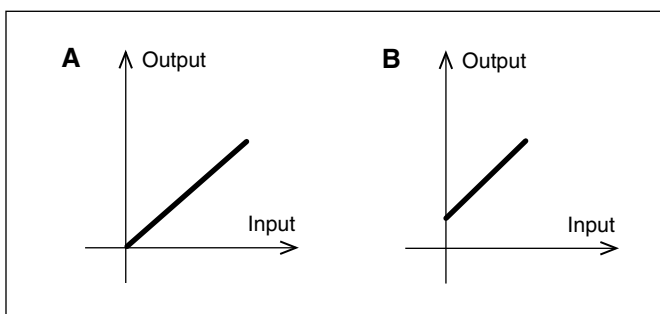
Output

| | |
|---------------------------------|----------------------------------|
| Accuracy class | 0.1 |
| Non-linearity | < 0.05 % |
| Load dependence | < 0.05 % (within load limits) |
| Response time | < 300 ms |
| Aux. supply dependence | < 0.1 % for $U_{aux.} \pm 20 \%$ |
| Temperature coefficient | < 0.2 %/ 10°C |
| Max open circuit output voltage | 20 V |

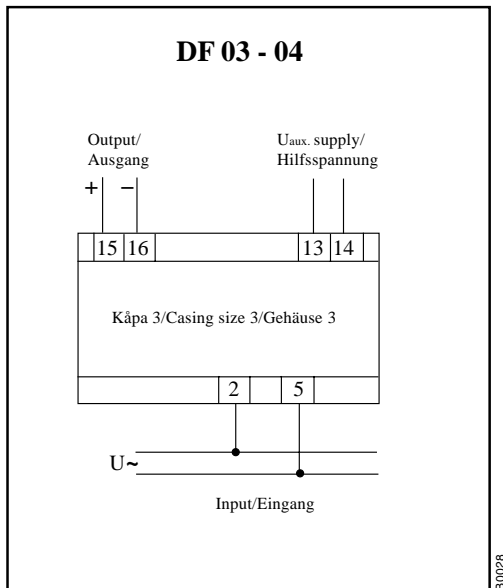
General data

| | |
|----------------------|---------------------------------|
| Working temp. range | -10 – +55°C |
| Function temp. range | -20 – +65°C |
| Storage temp. range | -65 – +80°C |
| Test voltage | 2 kV, 50 Hz |
| Overload | Max 540 V (varistor protection) |

Output signals



TRANSDUCERS DF FOR FREQUENCY



Connection

DF 03, 04

Input

| | |
|-------------------------|----------------------------------|
| Input voltage (U_N) | 60...500 V |
| Working range | $(40 - 120) \times U_N$ |
| Burden | $\leq 0,6 \text{ mA} \times U_N$ |
| Measuring range | $\pm 10\% - \pm 50\% U_N$ |

Auxiliary supply

| | |
|---------|------------------|
| Voltage | 88 – 264 V AC/DC |
| Burden | < 2.0 VA/<3.0 W |
| Voltage | 19 – 58 V AC/DC |
| Burden | < 2.0 VA/< 3.0 W |

Measuring range

| |
|------------|
| 45 – 55 Hz |
| 48 – 52 Hz |
| 55 – 65 Hz |
| 58 – 62 Hz |

| Output signal ¹⁾ | Curve | Load resistance R_L | Type |
|-----------------------------|-------|--------------------------|-------|
| 0 – 10 mA | A | 0 – 1.5 k Ω | DF 03 |
| 0 – 20 mA | A | 0 – 750 Ω | DF 03 |
| 4 – 20 mA | B | 0 – 750 Ω | DF 04 |
| 0 – 10 V | A | $\geq 2 \text{ k}\Omega$ | DF 03 |

¹⁾ Other values on request.

Ordering form DF

| DF (Frequency) | Default | Example |
|-------------------|---------|----------|
| Type: | | DF 03 |
| Accuracy: | cl. 0.1 | 0.1 |
| Measuring range: | | 48-52 Hz |
| Voltage: | | 110 V |
| Output: | | 0-10 mA |
| Output curve: | | A |
| Auxiliary supply: | | 110 V DC |

TRANSDUCERS DPF FOR POWER FACTOR

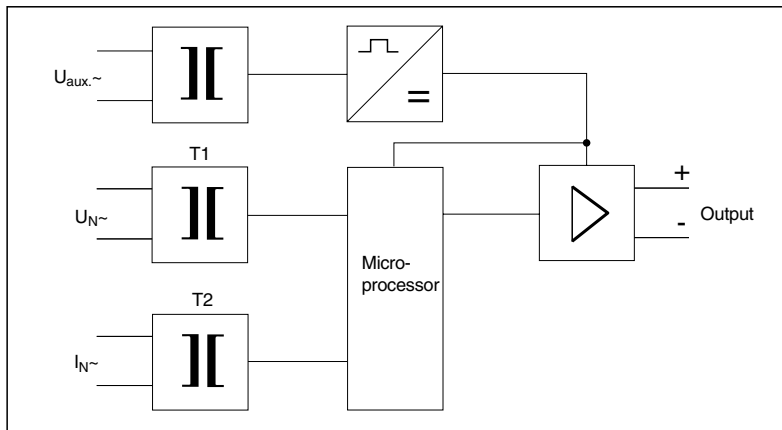
Transducers type DPF are connected to 3-phase, 3-wire symmetric load for the measurement of power factor, which value is transformed to a proportionally load independent output signal.

Input voltage and input current can be connected either directly or via transformers.

The transducer type DPF requires separate auxiliary supply. If required, the measuring voltage can also be used as auxiliary supply under condition that this lies within the given tolerance.

Dimensions and weights

See page 58



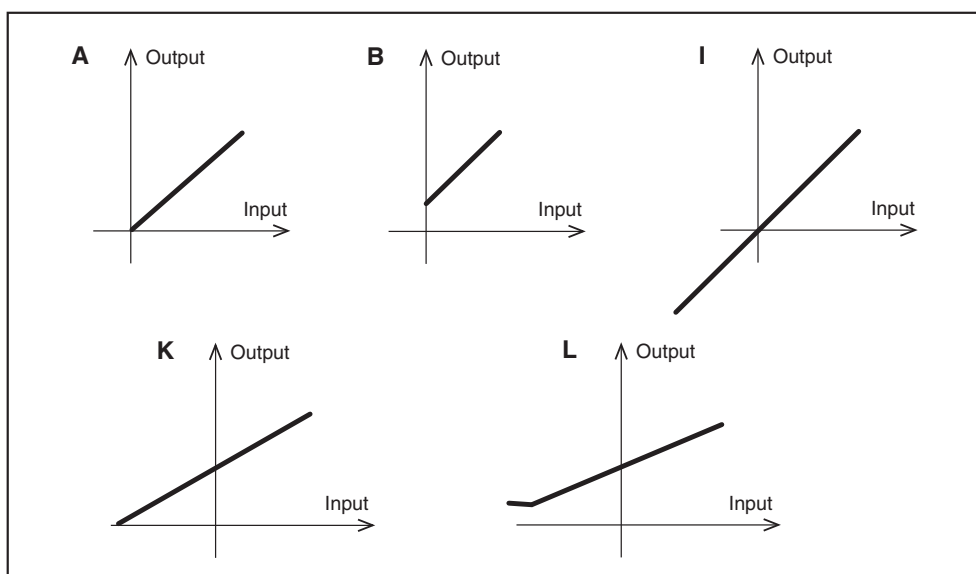
Output

| | |
|---------------------------------|---------------------------------|
| Accuracy class | 0.5 |
| Non-linearity | < 0.1 % |
| Load dependence | < 0.05 % (within bad limits) |
| Response time | < 300 ms |
| Aux. supply dependence | < 0.1 % for $U_{aux.} \pm 20\%$ |
| Temperature coefficient | < 0.2 %/10°C |
| Max open circuit output voltage | 20 V |

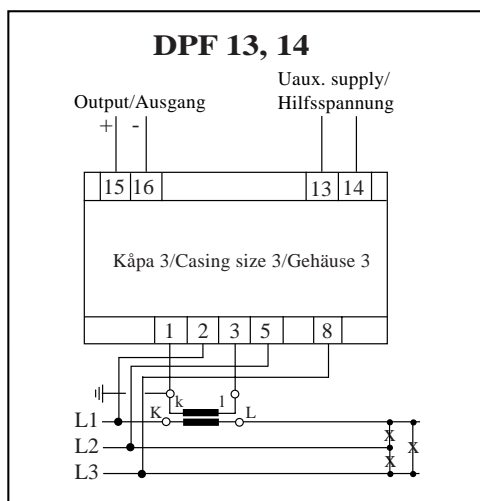
General data

| | |
|----------------------|---------------------------------|
| Working temp. range | -10 – +55°C |
| Function temp. range | -20 – +65°C |
| Storage temp. range | -65 – +80°C |
| Test voltage | 2 kV, 50 Hz |
| Overload | Max 540 V (varistor protection) |

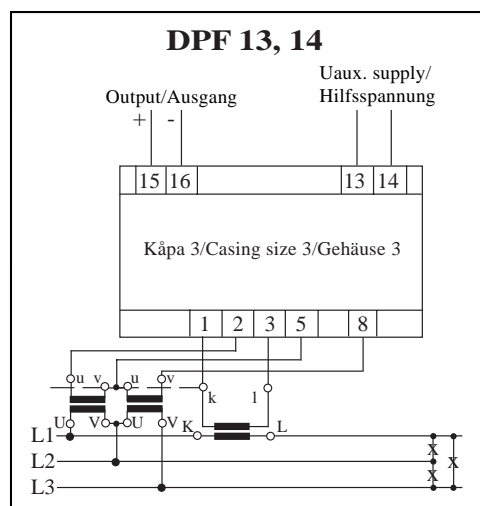
Output signals



TRANSDUCCERS DPF FOR POWER FACTOR



Connection



Connection

DPF 13, 14

Input

| | |
|-------------------------|---------------------------|
| Input voltage (U_N) | 110.. .500 V (40-120%) |
| Working range | (40 – 120%) x U_N |
| Burden | <0.6 mA per phase x U_N |
| Input current (I_N) | 1, 2, 5 A |
| Working range | (10 – 130%) x U_N |
| Burden | < 0.2 VA per phase |

Auxiliary supply

| | |
|---------|------------------|
| Voltage | 88 – 264 V AC/DC |
| Burden | < 2.0 VA/<3.0 W |
| Voltage | 19 – 58 V AC/DC |
| Burden | < 2.0 VA/< 3.0 W |

Measuring range

Cos ϕ

| |
|-----------------------|
| Cap 0.5 – 1 – 0.5 Ind |
| Cap 0.8 – 1 – 0.8 Ind |
| Cap 0.5 – 1 |
| Cap 0.8 – 1 |
| 1 – 0.5 Ind |
| 1 – 0.8 Ind |

| Output signal ¹⁾ | Curve | Load resistance R_L | Type |
|-----------------------------|---------------|-----------------------|--------|
| 0 – ± 10 mA | A, B, I, K | 0 – 1.5 k Ω | DPF 13 |
| 0 – ± 20 mA | A, B, I, K | 0 – 750 Ω | DPF 13 |
| 4 – 20 mA | A, B, I, K, L | 0 – 750 Ω | DPF 14 |
| 0 – ± 10 V | A, B, I, K | ≥ 2 k Ω | DPF 13 |

¹⁾ Other values on request.

Ordering form DPF

| DPF (Power factor) | Default | Example |
|--------------------|---------|-------------------|
| Type: | | DPF 13 |
| Accuracy: | cl. 0.5 | 0.5 |
| Voltage: | | 110 V |
| Current: | | 5 A |
| Frequency: | 50 Hz | 50 Hz |
| Measuring range: | | 0.5-1-0.5 cos phi |
| Output: | | 10-0-10 mA |
| Output curve: | | I |
| Auxiliary supply: | | 230 V AC |

TRANSducers DP, DQ AND DPQ FOR ACTIVE AND REACTIVE POWER

Transducer type DP, DQ and DPQ measures the active (P) and reactive (Q) A.C.-power and converts these into proportional load-independent DC current signals. The measurement principle for multiplication of the current and the voltage is based on the TDM (Time-Division-Multiplication) method. The measurement principle also takes account of the curve form error and the phase angle difference ($\Delta\varphi = 0 - 360^\circ$) between the current and the voltage and gives the true power value (true RMS) as its result. In transducer DPQ the signal outputs (P) and (Q) are galvanically separated from one another.

The measurement voltage and measurement current can be connected directly to the transducer or via measurement transformers. The permitted value for the scale factor shall lie within the range 0.3 – 1.8 and shall be defined by the scale factor formula. The current may not exceed 10 A.

$$\text{Scale factor} = \frac{\text{Measuring range [W or Var]}}{\text{Nominal apparent power [VA]}} \quad (\text{Normally } 0.3 - 1.8)$$

General data

| | |
|----------------------|--|
| Working temp. range | -10 – +55°C |
| Function temp. range | -20 – +65°C |
| Storage temp. range | -65 – +80°C |
| Test voltage | 5.55 kV, 50 Hz (measurement input – signal/outputs) 3.7 kV, 50 Hz (auxiliary voltage input – signal/outputs) 1.5 kV, 50 Hz (signal output (P) – signal output (Q)) |
| Overload | 1.2 x U_N continuous, varistor protection 1.5 x U_N 2 x I_N continuous, 10 x I_N during 10 s, 40 x I_N during 1 s |

Dimensions and weights

See page 58

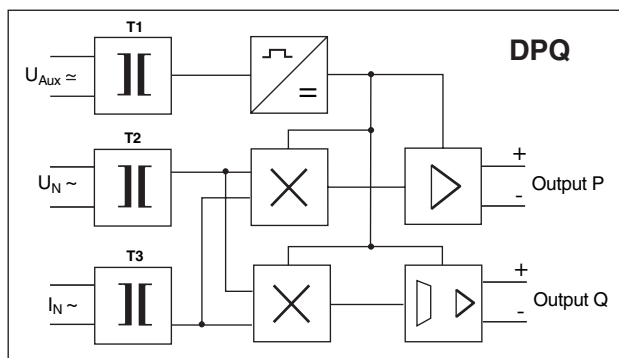
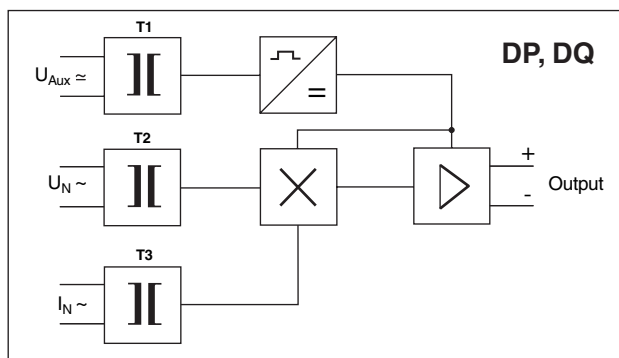
Output data

| Accuracy class | 0.5 | 0.2 (option) |
|------------------------------------|--------------|--------------|
| Nominal accuracy | 0.2 | 0.1 |
| Linearity error | < 0.2 % | < 0.1 % |
| Load-dependence | < 0,05 % | < 0,05 % |
| Response time (T_{99}) | < 300 ms | < 300 ms |
| Auxiliary voltage dependence | < 0.1 % | < 0.1 % |
| Temperature dependence | < 0.2 %/10°C | < 0.2 %/10°C |
| Max voltage with open output | 20 V | 20 V |
| Max output signal with over-driven | | |
| Input signal | $\leq 125\%$ | $\leq 125\%$ |

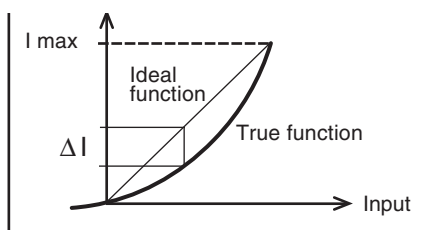
Linearity

A transducer is linear when the output is proportional to the input. A deviation from a linear function is called a non-linearity error and is expressed as a percentage of a range in our data sheets.

$$\text{Non linearity} = \frac{\Delta I_{\text{out}}}{I_{\text{out max}}} \times 100 [\%]$$



Fundamental circuit



TRANSDUCERS DP FOR ACTIVE POWER

Product range summary

The models of measuring transducers available for measuring the active power are shown in the table. Configuration of the measuring transducer with regard to the output rated value and the desired functional curve are shown in the tables and diagram on page 28 – 34.

| Designation | Number of measuring elements | System | Auxiliary supply | Casing size |
|-------------|------------------------------|-----------------------------------|--------------------|-------------|
| DP 123 | 1 | 1E, 1.phase/2-wire, (ph/n) | 8 – 20 V (40 V) DC | 3 |
| DP 124 | 1 | 1E, 1.phase/2-wire, (ph/n) | 18 – 80 V AC/DC | 3 |
| DP 125 | 1 | 1E, 1.phase/2-wire, (ph/n) | 80 – 276 V AC/DC | 3 |
| DP 133 | 1 | 1E, 3-wire, balanced load | 8 – 20 V (40 V) DC | 3 |
| DP 134 | 1 | 1E, 3-wire, balanced load | 18 – 80 V AC/DC | 3 |
| DP 135 | 1 | 1E, 3-wire, balanced load | 80 – 276 V AC/DC | 3 |
| DP 143 | 1 | 1E, 4-wire, (ph/n), balanced load | 8 – 20 V (40 V) DC | 3 |
| DP 144 | 1 | 1E, 4-wire, (ph/n), balanced load | 18 – 80 V AC/DC | 3 |
| DP 145 | 1 | 1E, 4-wire, (ph/n), balanced load | 80 – 276 V AC/DC | 3 |
| DP 233 | 2 | 2E, 3-wire, unbalanced load | 8 – 20 V (40 V) DC | 3 |
| DP 234 | 2 | 2E, 3-wire, unbalanced load | 18 – 80 V AC/DC | 3 |
| DP 235 | 2 | 2E, 3-wire, unbalanced load | 80 – 276 V AC/DC | 3 |
| DP 333 | 3 | 3E, 3-wire or 4-wire | 8 – 20 V (40 V) DC | 4 |
| DP 334 | 3 | 3E, 3-wire or 4-wire | 18 – 80 V AC/DC | 4 |
| DP 335 | 3 | 3E, 3-wire or 4-wire | 80 – 276 V AC/DC | 4 |
| DP 343 | 3 | 3E, 4-wire, unbalanced load | 8 – 20 V (40 V) DC | 4 |
| DP 344 | 3 | 3E, 4-wire, unbalanced load | 18 – 80 V AC/DC | 4 |
| DP 345 | 3 | 3E, 4-wire, unbalanced load | 80 – 276 V AC/DC | 4 |

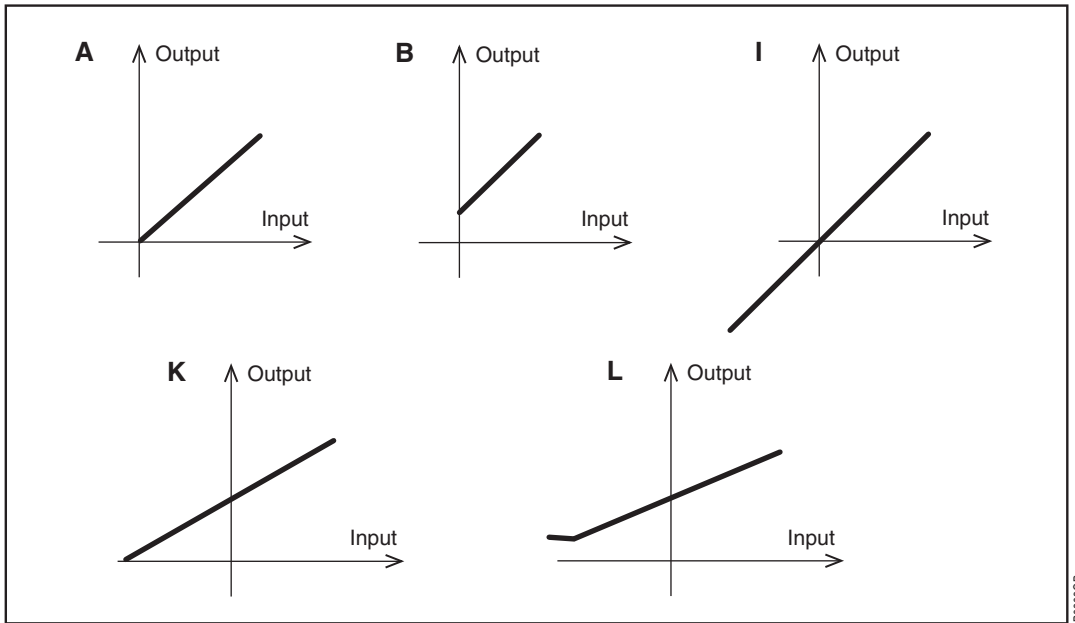
Auxiliary voltage

| Unit*) | Voltage | Frequency | Burden |
|--------|--------------------|------------------|------------|
| 3 | 8 – 20 V (40 V) DC | DC | 2.5 W |
| 4 | 18 – 80 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |
| 5 | 80 – 276 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |

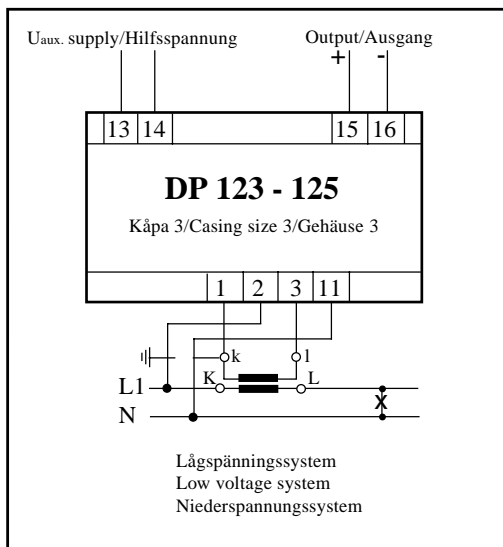
*) Third digit in the type designation, shows type of auxiliary supply.

TRANSDUCERS DP FOR ACTIVE POWER

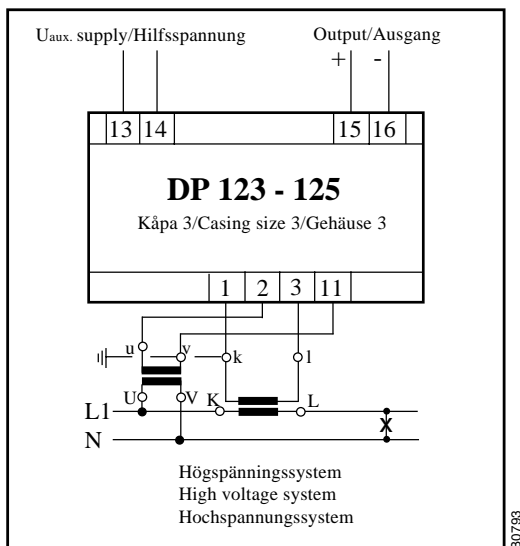
Output signals



TRANSDUCERS DP FOR ACTIVE POWER



Connection



Connection

DP 123 to 125

Input data

| | |
|-------------------------------|---|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

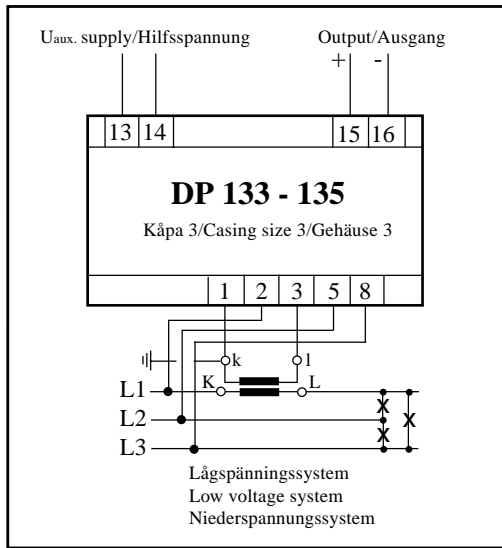
The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

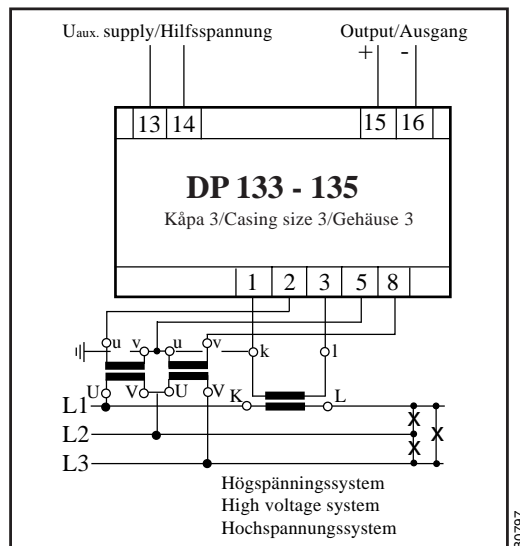
| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1.5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

¹⁾ Other values on request.

TRANSDUCERS DP FOR ACTIVE POWER



Connection



Connection

DP 133 to 135

Input data

| | |
|-------------------------------|------------------------------------|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² /3, 50, 60, 400 Hz |

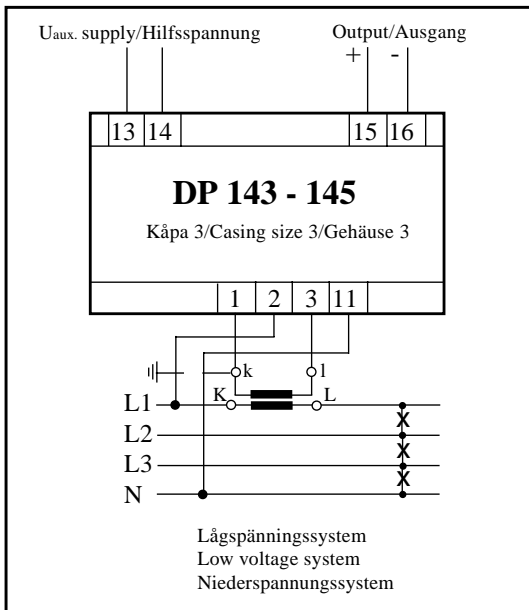
The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

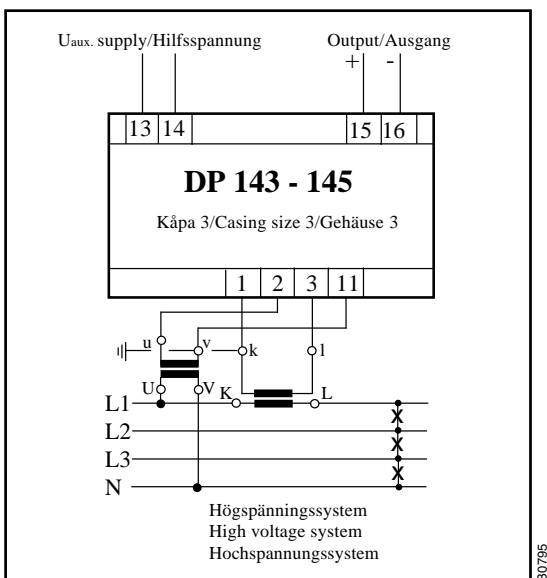
| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1.5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

¹⁾ Other values on request.

TRANSDUCERS DP FOR ACTIVE POWER



Connection



Connection

DP 143 to 145

Input data

| | |
|-------------------------------|---|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

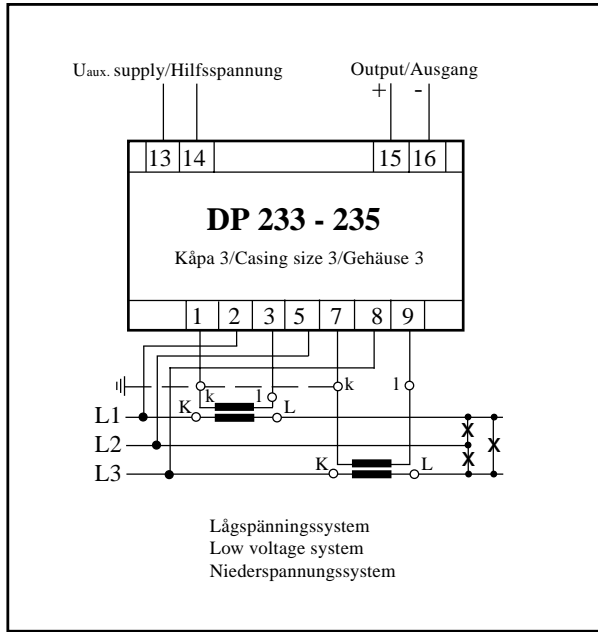
The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1.5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

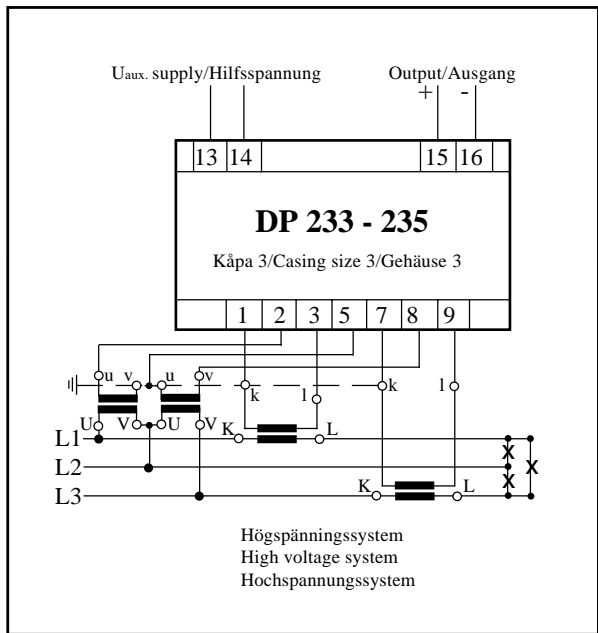
¹⁾ Other values on request.

TRANSDUCERS DP FOR ACTIVE POWER



B0798

Connection



B0799

Connection

DP 233 to 235

Input data

| | |
|-------------------------------|---|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

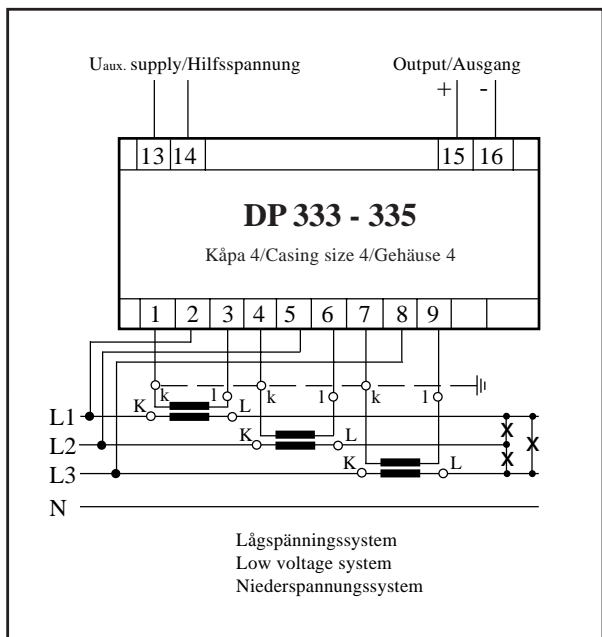
The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1.5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

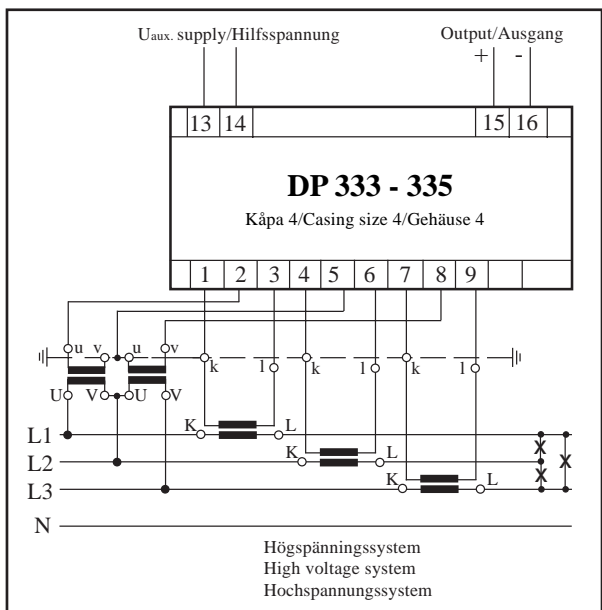
¹⁾ Other values on request.

TRANSDUCERS DP FOR ACTIVE POWER



B0851

Connection



B0852

Connection

DP 333 to 335

Input data

| | |
|-------------------------------|------------------------------------|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² /3, 50, 60, 400 Hz |

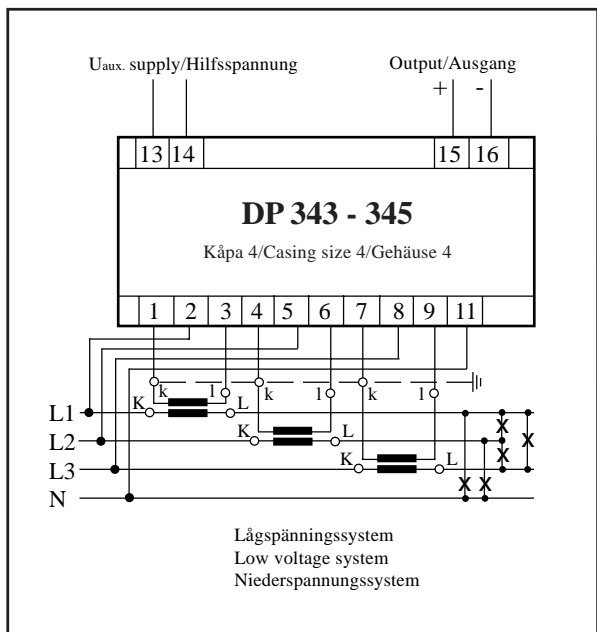
The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1.5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

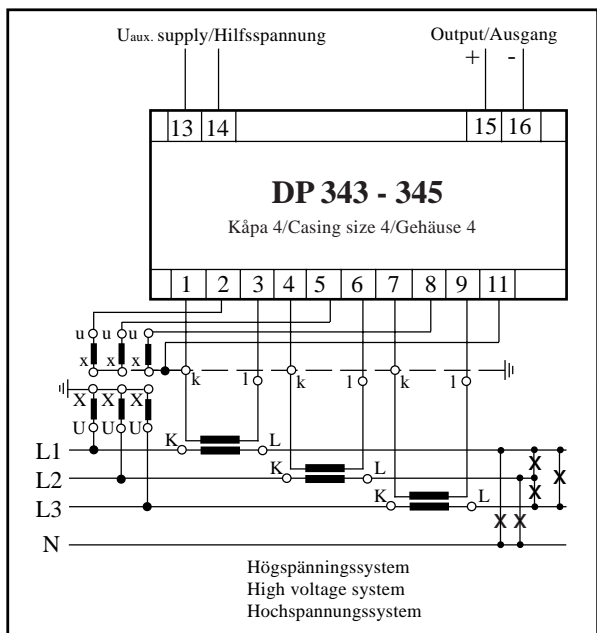
¹⁾ Other values on request.

TRANSDUCCERS DP FOR ACTIVE POWER



B0800

Connection



B0801

Connection

DP 343 to 345

Input data

| | |
|-------------------------------|---|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1,5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

¹⁾ Other values on request.

TRANSDUCERS DP FOR ACTIVE POWER

Ordering form DP

| DP (Active power) | Default | Example |
|------------------------|---------|------------------|
| Type: | | DP 235 |
| Accuracy: | cl. 0.5 | 0.5 |
| Transf. ratio voltage: | | 11000/110 V |
| Transf. ratio current: | | 100/5 A |
| Frequency: | 50 Hz | 50 Hz |
| Measuring range (P): | | 0-2 MW |
| Output (P): | | 4-20 mA |
| Output curve: | | B |
| Response time: | 300 ms | 300 ms |
| Auxiliary supply: | | 80 - 276 V AC/DC |

TRANSducers DQ FOR REACTIVE POWER

Product range summary

The models of measuring transducers available for measuring the reactive power are shown in the table. Configuration of the measuring transducer with regard to the output rated value and the desired functional curve are shown in the tables and diagram on page 37 – 41.

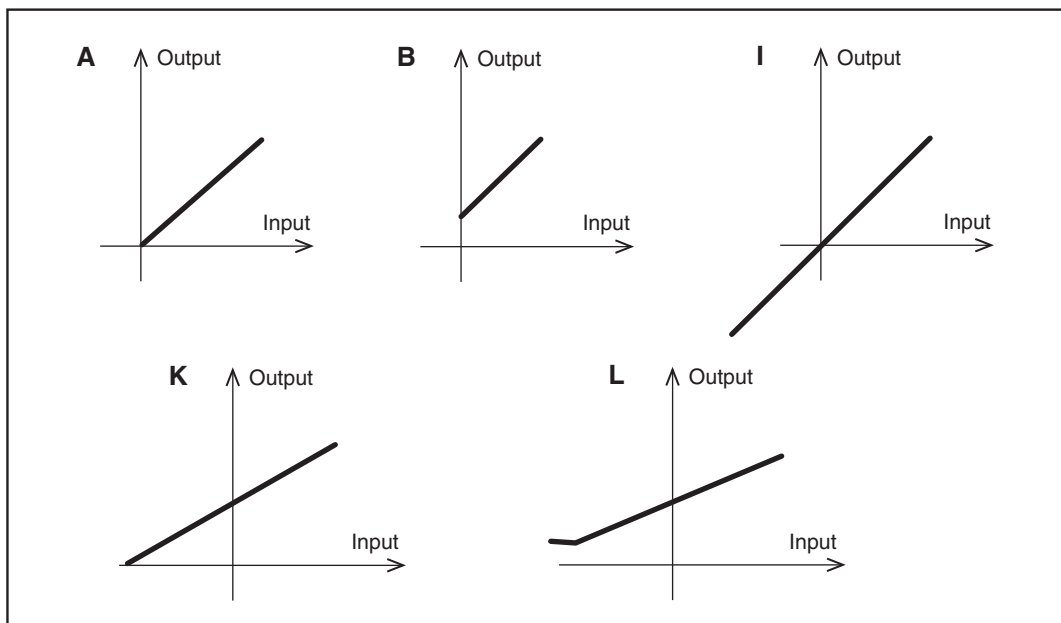
| Designation | Number of measuring elements | System | Auxiliary supply | Casing size |
|-------------|------------------------------|-----------------------------|--------------------|-------------|
| DQ 133 | 1 | 1E, 3-wire, balanced load | 8 – 20 V (40 V) DC | 3 |
| DQ 134 | 1 | 1E, 3-wire, balanced load | 18 – 80 V AC/DC | 3 |
| DQ 135 | 1 | 1E, 3-wire, balanced load | 80 – 276 V AC/DC | 3 |
| DQ 233 | 2 | 2E, 3-wire, unbalanced load | 8 – 20 V (40 V) DC | 3 |
| DQ 234 | 2 | 2E, 3-wire, unbalanced load | 18 – 80 V AC/DC | 3 |
| DQ 235 | 2 | 2E, 3-wire, unbalanced load | 80 – 276 V AC/DC | 3 |
| DQ 333 | 3 | 3E, 3-wire or 4-wire | 8 – 20 V (40 V) DC | 4 |
| DQ 334 | 3 | 3E, 3-wire or 4-wire | 18 – 80 V AC/DC | 4 |
| DQ 335 | 3 | 3E, 3-wire or 4-wire | 80 – 276 V AC/DC | 4 |
| DQ 343 | 3 | 3E, 4-wire, unbalanced load | 8 – 20 V (40 V) DC | 4 |
| DQ 344 | 3 | 3E, 4-wire, unbalanced load | 18 – 80 V AC/DC | 4 |
| DQ 345 | 3 | 3E, 4-wire, unbalanced load | 80 – 276 V AC/DC | 4 |

Auxiliary voltage

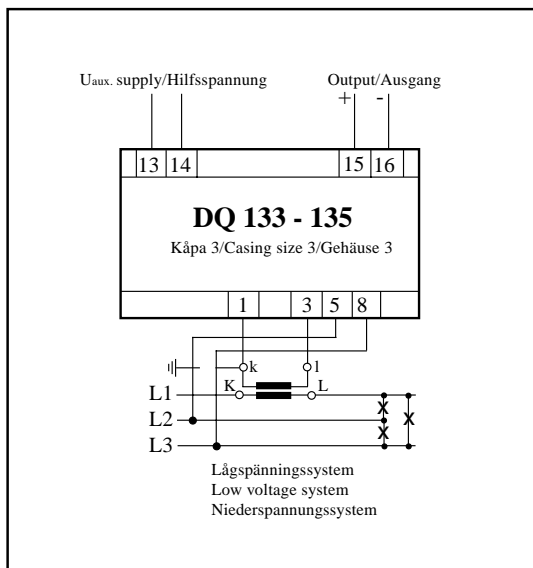
| Unit*) | Voltage | Frequency | Burden |
|--------|--------------------|------------------|------------|
| 3 | 8 – 20 V (40 V) DC | DC | 2.5 W |
| 4 | 18 – 80 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |
| 5 | 80 – 276 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |

*) Third digit in the type designation, shows type of auxiliary supply.

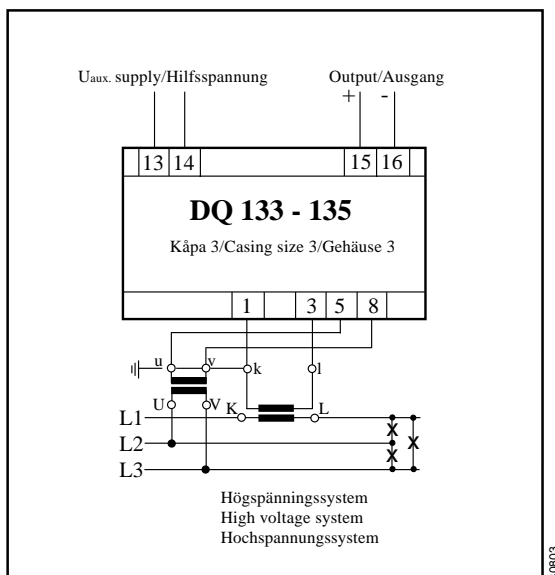
Output signals



TRANSDUCCERS DQ FOR REACTIVE POWER



Connection



Connection

DQ 133 to 135

Input data

| | |
|-------------------------------|------------------------------------|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² /3, 50, 60, 400 Hz |

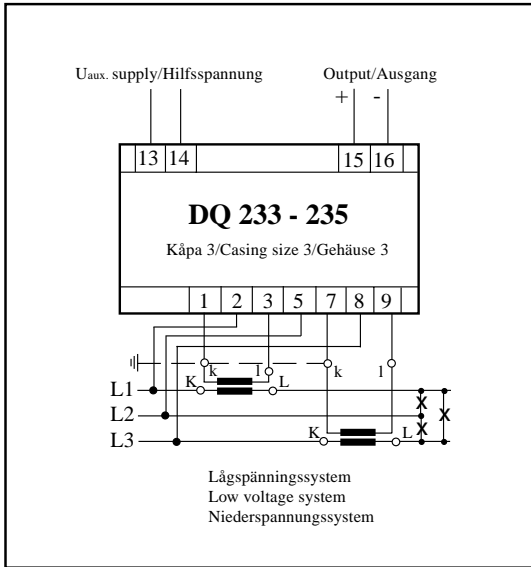
The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

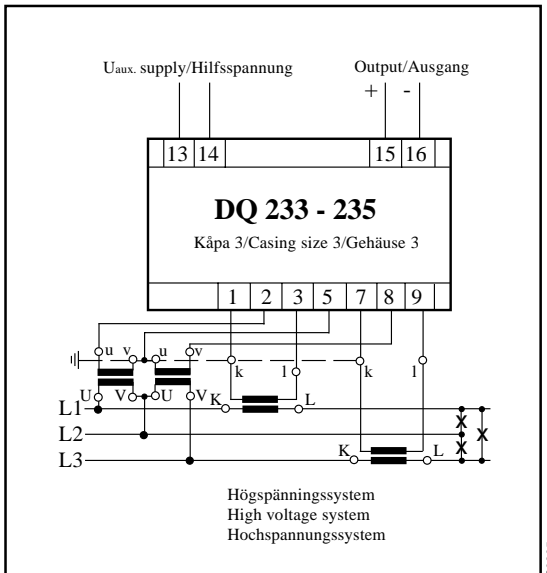
| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1.5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

¹⁾ Other values on request.

TRANSDUCERS DQ FOR REACTIVE POWER



Connection



Connection

DQ 233 to 235

Input data

| | |
|-------------------------------|---|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

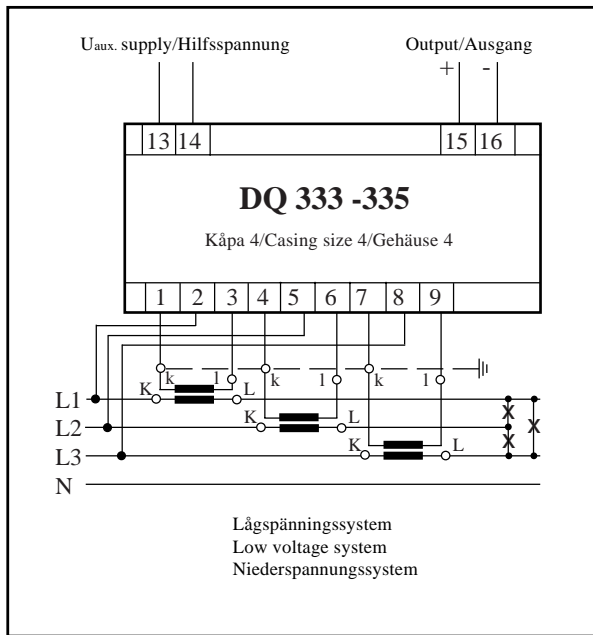
The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1,5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

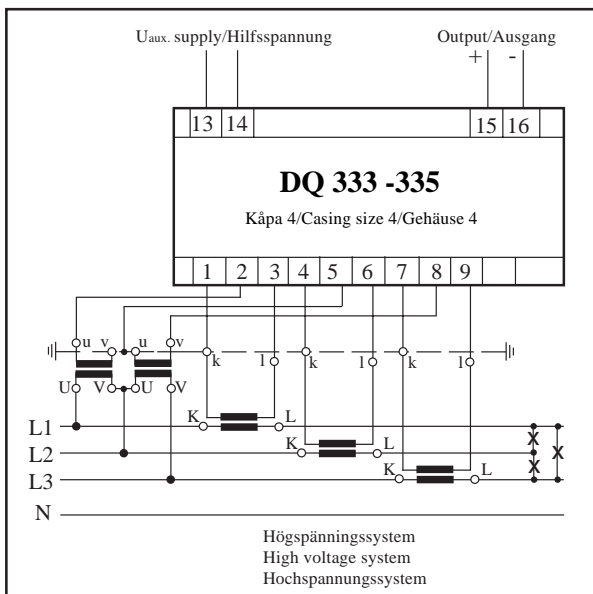
¹⁾ Other values on request.

TRANSDUCERS DQ FOR REACTIVE POWER



E0853

Connection



E0854

Connection

DQ 333 to 335

Input data

| | |
|-------------------------------|---|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

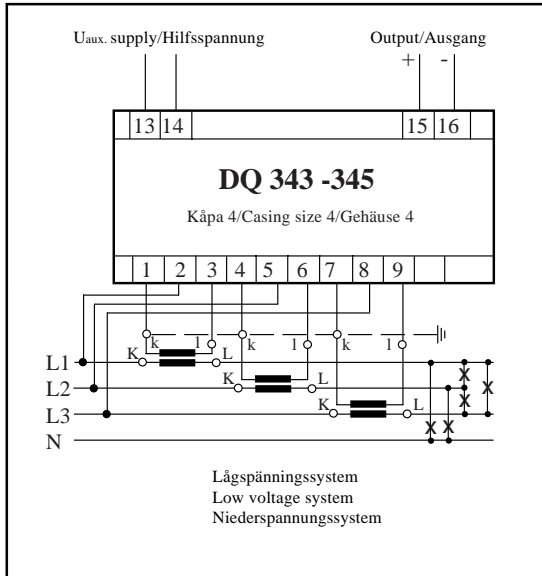
The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

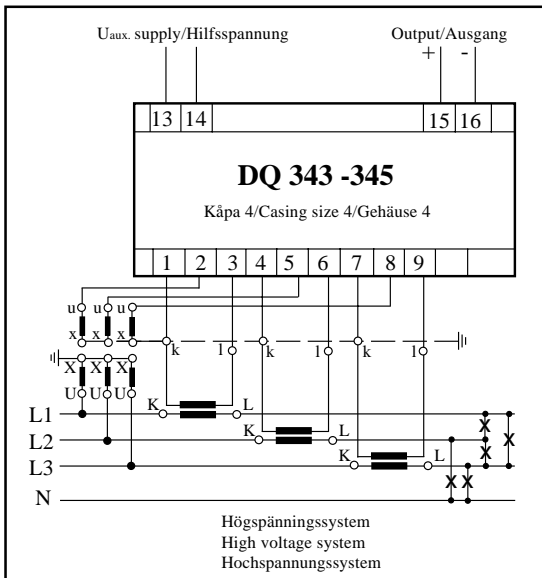
| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1,5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

¹⁾ Other values on request.

TRANSDUCERS DQ FOR REACTIVE POWER



Connection



Connection

DQ 343 to 345

Input data

| | |
|-------------------------------|---|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1,5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

¹⁾ Other values on request.

TRANSDUCERS DQ FOR REACTIVE POWER

Ordering form DQ

| DQ (Reactive power) | | Default | Example |
|------------------------|----------------------|---------|---------------|
| Type: | <input type="text"/> | | DQ 235 |
| Accuracy: | <input type="text"/> | cl. 0.5 | 0.5 |
| Transf. ratio voltage: | <input type="text"/> | | 11000/110 V |
| Transf. ratio current: | <input type="text"/> | | 100/5 A |
| Frequency: | <input type="text"/> | 50 Hz | 50 Hz |
| Measuring range (Q): | <input type="text"/> | | 0-2 Mvar |
| Output (Q): | <input type="text"/> | | 4-20 mA |
| Output curve: | <input type="text"/> | | B |
| Response time: | <input type="text"/> | 300 ms | 300 ms |
| Auxiliary supply: | <input type="text"/> | | 80 - 276 V AC |

TRANSDUCERS DPQ FOR ACTIVE AND REACTIVE POWER

Product range summary

The models of measuring transducers available for measuring the active and reactive power are shown in the table. Configuration of the measuring transducer with regard to the output rated value and the desired functional curve are shown in the tables and diagram on page 44 – 49.

| Designation | Number of measuring elements | System | Auxiliary supply | Casing size |
|-------------|------------------------------|-----------------------------|--------------------|-------------|
| DPQ 133 | 1 | 1E, 3-wire, balanced load | 8 – 20 V (40 V) DC | 4 |
| DPQ 134 | 1 | 1E, 3-wire, balanced load | 18 – 80 V AC/DC | 4 |
| DPQ 135 | 1 | 1E, 3-wire, balanced load | 80 – 276 V AC/DC | 4 |
| DPQ 143 | 1 | 1E, 4-wire, balanced load | 8 – 20 V (40 V) DC | 4 |
| DPQ 144 | 1 | 1E, 4-wire, balanced load | 18 – 80 V AC/DC | 4 |
| DPQ 145 | 1 | 1E, 4-wire, balanced load | 80 – 276 V AC/DC | 4 |
| DPQ 233 | 2 | 2E, 3-wire, unbalanced load | 8 – 20 V (40 V) DC | 4 |
| DPQ 234 | 2 | 2E, 3-wire, unbalanced load | 18 – 80 V AC/DC | 4 |
| DPQ 235 | 2 | 2E, 3-wire, unbalanced load | 80 – 276 V AC/DC | 4 |
| DPQ 333 | 3 | 3E, 3-wire or 4-wire | 8 – 20 V (40 V) DC | 4 |
| DPQ 334 | 3 | 3E, 3-wire or 4-wire | 18 – 80 V AC/DC | 4 |
| DPQ 335 | 3 | 3E, 3-wire or 4-wire | 80 – 276 V AC/DC | 4 |
| DPQ 343 | 3 | 3E, 4-wire, unbalanced load | 8 – 20 V (40 V) DC | 4 |
| DPQ 344 | 3 | 3E, 4-wire, unbalanced load | 18 – 80 V AC/DC | 4 |
| DPQ 345 | 3 | 3E, 4-wire, unbalanced load | 80 – 276 V AC/DC | 4 |

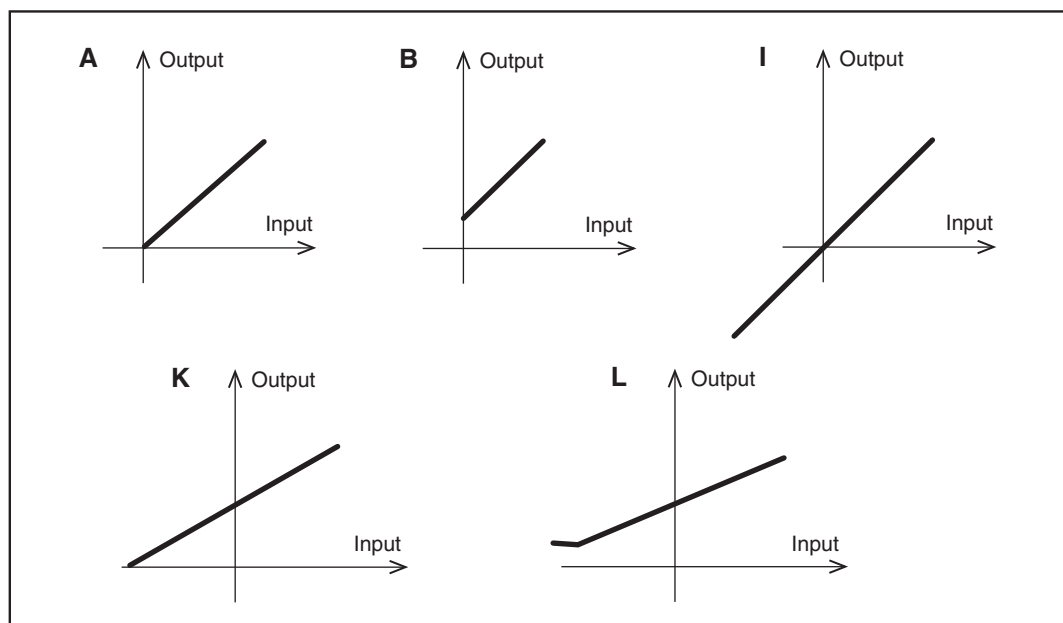
Auxiliary voltage

| Unit*) | Voltage | Frequency | Burden |
|--------|--------------------|------------------|------------|
| 3 | 8 – 20 V (40 V) DC | DC | 2.5 W |
| 4 | 18 – 80 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |
| 5 | 80 – 276 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |

*) Third digit in the type designation, shows type of auxiliary supply.

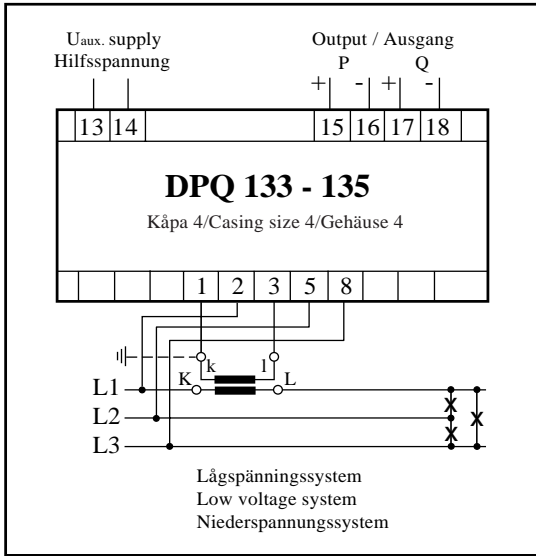
TRANSDUCERS DPQ FOR ACTIVE AND REACTIVE POWER

Output signals

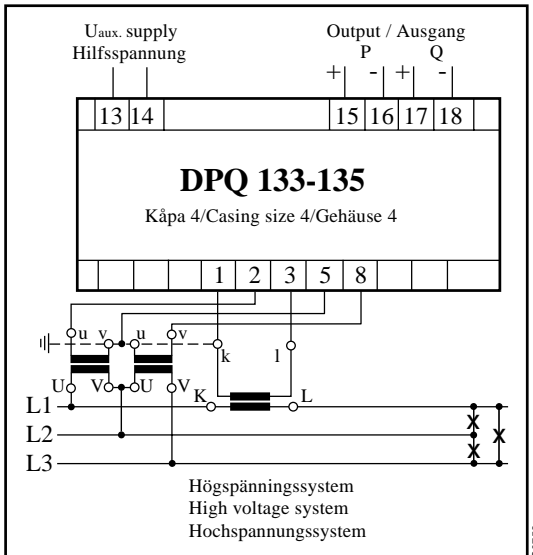


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TRANSDUCERS DPQ FOR ACTIVE AND REACTIVE POWER



Connection



Connection

DPQ 133 to 135

Input data

| | |
|-------------------------------|---|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

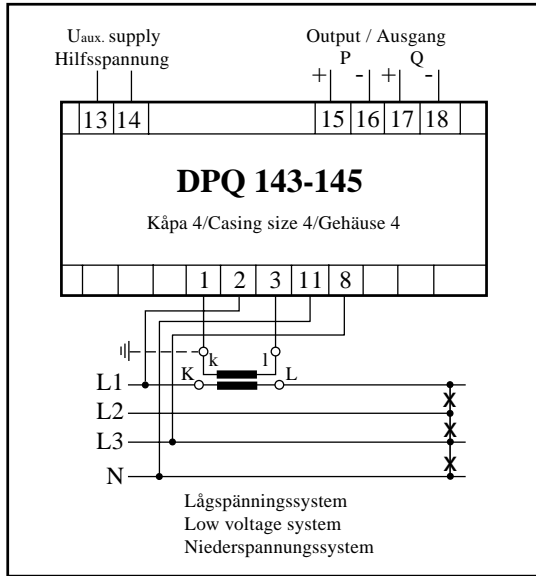
The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

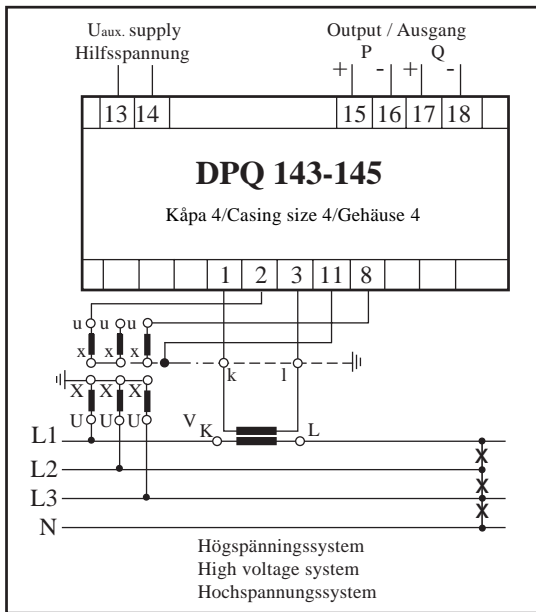
| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1.5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

¹⁾ Other values on request.

TRANSDUCCERS DPQ FOR ACTIVE AND REACTIVE POWER



Connection



Connection

DPQ 143 to 145

Input data

| | |
|-------------------------------|---|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

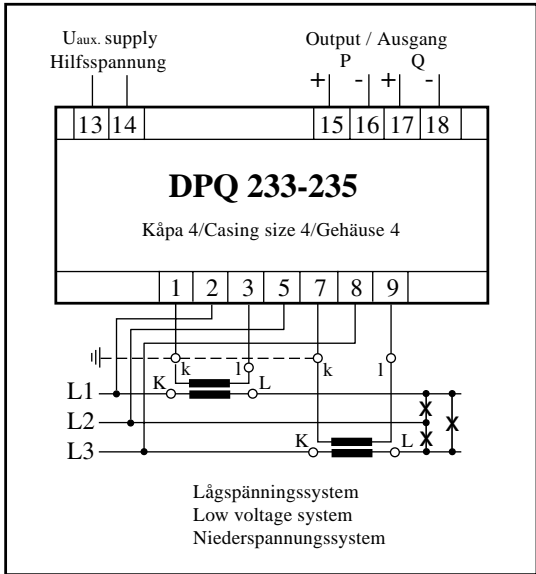
The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

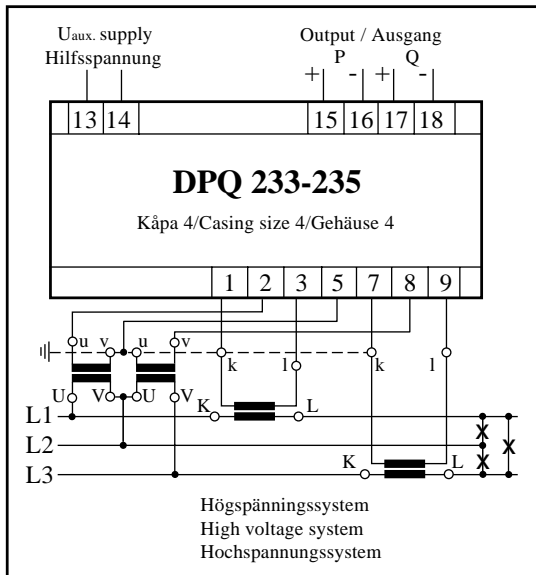
| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1,5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

¹⁾ Other values on request.

TRANSDUCERS DPQ FOR ACTIVE AND REACTIVE POWER



Connection



Connection

DPQ 233 to 235

Input data

| | |
|-------------------------------|---|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

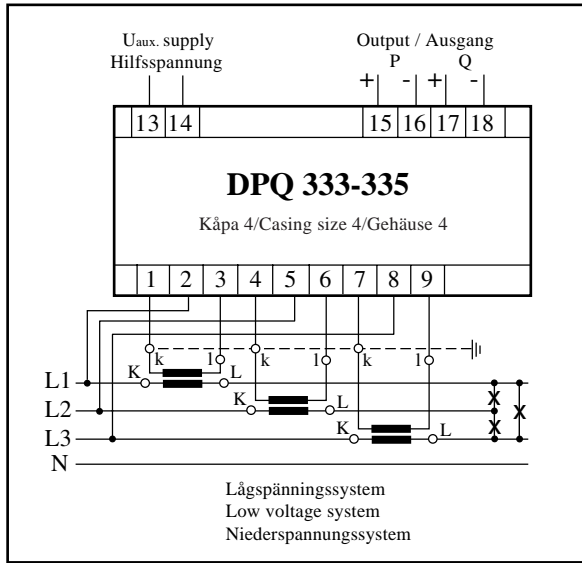
The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

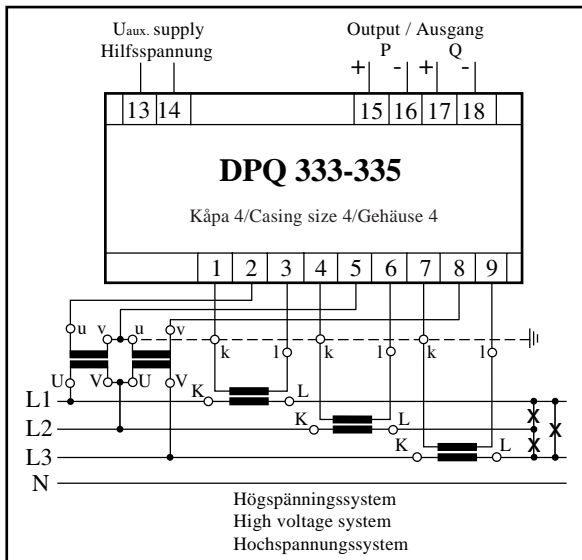
| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1.5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

¹⁾ Other values on request.

TRANSDUCCERS DPQ FOR ACTIVE AND REACTIVE POWER



Connection



Connection

DPQ 333 to 335

Input data

| | |
|-------------------------------|---|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

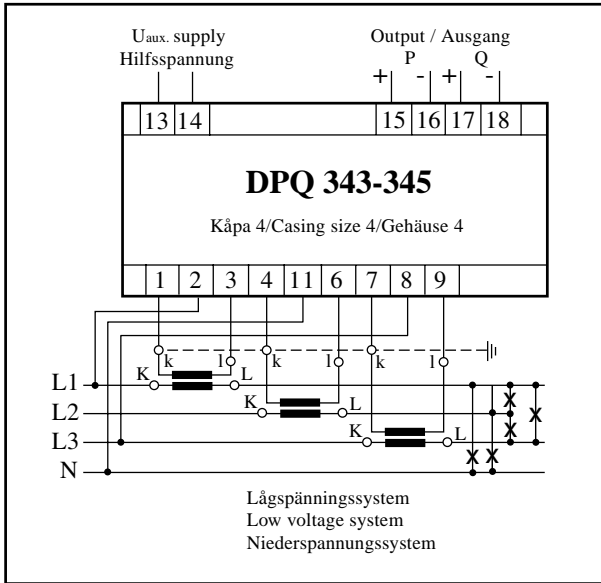
The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

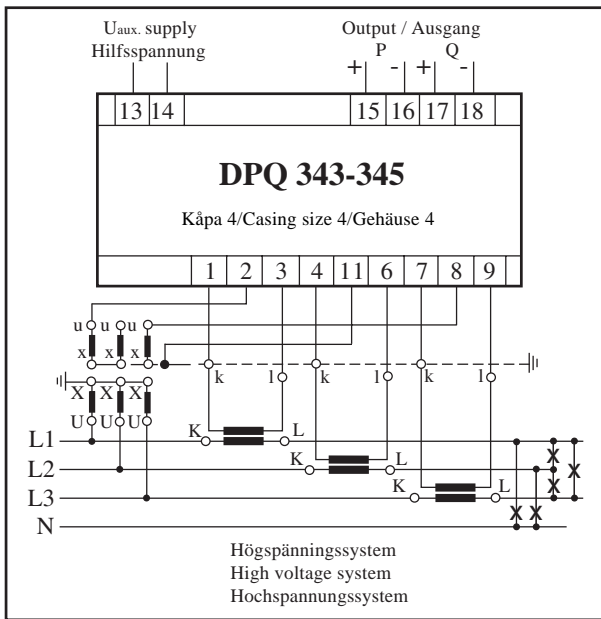
| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1,5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

¹⁾ Other values on request.

TRANSDUCERS DPQ FOR ACTIVE AND REACTIVE POWER



Connection



Connection

DPQ 343 to 345

Input data

| | |
|-------------------------------|---|
| Measurement voltage (U_N) | 40 to 600 V ¹⁾ |
| Internal consumption | 1 mA per phase x U_N |
| Measurement current (I_N) | 1, 2, 5 A ¹⁾ |
| Internal consumption | <0.1 VA per phase |
| Frequency | 16 ² / ₃ , 50, 60, 400 Hz |

The maximum load resistance (at current output) is calculated from the formula:

$$R_L \text{ max [k}\Omega\text{]} = \frac{15 \text{ [V]}}{\text{Output current [mA]}}$$

| Output rated value ¹⁾ | Output signal | Load resistance R_L |
|----------------------------------|---------------|-----------------------|
| 1 mA | A, B, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, I, K, L | 0 – 7,5 k Ω |
| 2,5 mA | A, B, I, K, L | 0 – 6 k Ω |
| 5 mA | A, B, I, K, L | 0 – 3 k Ω |
| 10 mA | A, B, I, K, L | 0 – 1,5 k Ω |
| 20 mA | A, B, I, K, L | 0 – 750 Ω |
| 1 V | A, B, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, I, K, L | ≥ 2 k Ω |

¹⁾ Other values on request.

TRANSDUCERS DPQ FOR ACTIVE AND REACTIVE POWER

Ordering form DPQ

| DPQ (Active and reactive power combined) | Default | Example |
|--|---------|----------------------------------|
| Type: | | DPQ 145 |
| Accuracy: | cl. 0.5 | 0.5 |
| Transf. ratio voltage: | | $11\sqrt{3}$ kV/ $110\sqrt{3}$ V |
| Transf. ratio current: | | 100/5 A |
| Frequency: | 50 Hz | 50 Hz |
| Measuring range (P): | | 0-2 MW |
| Measuring range (Q): | | 0-1 Mvar |
| Output (P): | | 4-20 mA |
| Output (Q): | | 4-20 mA |
| Output curve (P): | | B |
| Output curve (Q): | | B |
| Response time: | 300 ms | 300 ms |
| Auxiliary supply: | | 80-276 V AC&DC |

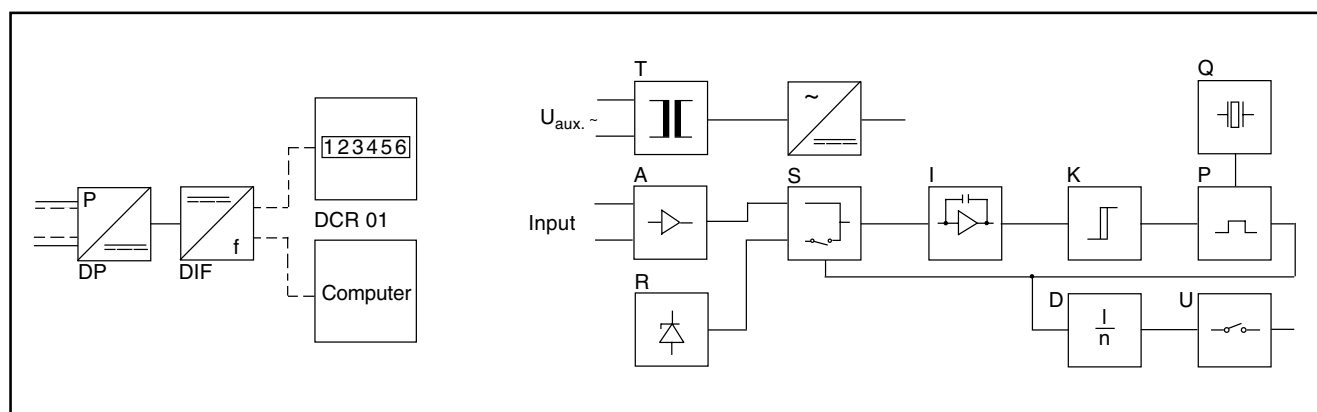
TRANSDUCER DIF AND DCR, DC TO PULSE RATE CONVERTER

Function principle type DIF/DCR

Transducers type DIF converts an analogue DC input signal to a proportional pulse frequency output. The output signal is sent via a relay to the output terminals. The input signal can be either uni-polar or bi-polar. If required, one or two 6-digit mechanical counters in separate casings type DCR can be supplied. The figures on the counters represent the time integral of the input signal. If the input, for example, represents active power, the value on the counters will represent energy (kWh). The energy pulses can of course also be transmitted to an integrator in a computer.

Dimensions and weights

See page 58



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Output

| | |
|-------------------------|---|
| Accuracy class | 0.2 |
| Non-linearity | < 0.1 % |
| Pulse frequency | 0 – 0.0001 Hz (min), 0 – 10 Hz, (max) by pulse time = 40 ms |
| Pulse time | 40, 80, 160 ms, (80 ms standard) |
| Aux. supply dependence | < 0.1 % for $\Delta U_{aux.} \pm 20\%$ |
| Temperature coefficient | < 0.1 %/10°C |

Relay

| | |
|-----------------|----------------------------|
| Contacts | 0.75 A, 350 V, 50 VA |
| Life expectancy | 10 ⁸ operations |

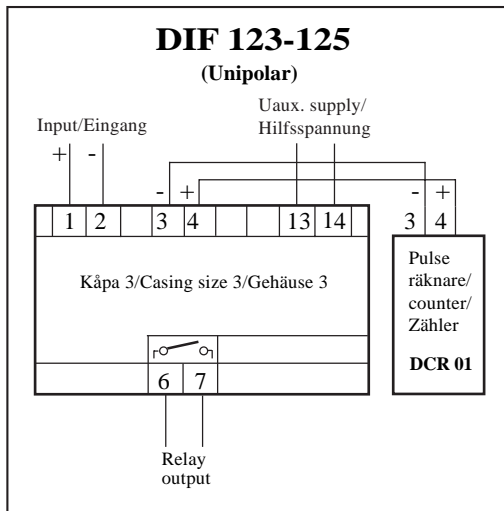
Counter DCR

| | |
|-------------------------|------------------------|
| Number of figures | 6 |
| Max. counting frequency | 6 Hz |
| Min. pulsetime | 80 ms |
| Puls level | 5 V / 14 mA $\pm 10\%$ |

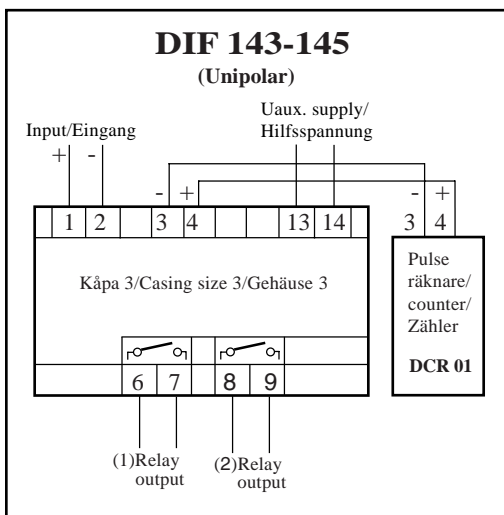
General data

| | |
|----------------------|---|
| Working temp. range | -10 — +55°C |
| Function temp. range | -20 — +65°C |
| Storage temp. range | -65 — +80°C (DIF 123 – 245), -40 – +80°C (DCR 01, 02) |
| Test voltage | 2 kV, 50 Hz |

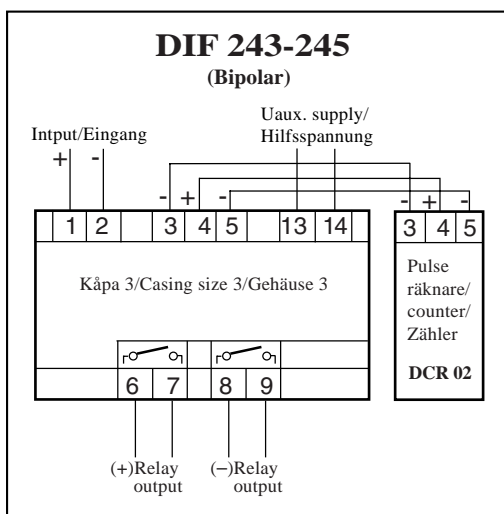
TRANSDUCER DIF AND DCR, DC TO PULSE RATE CONVERTER



Connection



Connection



Connection

DIF 123 to 245

Input

| | | |
|-----------------------------|----------------|---------------|
| (uni-polar) | 0 – 5 mA | DIF 123–145 |
| (uni-polar) | 0 – 10 mA | DIF 123–145 |
| (uni-polar) | 0 – 20 mA | DIF 123–145 |
| (uni-polar) | 4 – 20 mA | DIF 123–145 |
| (uni-polar) | 0 – 10 V | DIF 123–145 |
| (uni-polar) (double output) | 0 – 5 mA | DIF 143–145 |
| (uni-polar) (double output) | 0 – 10 mA | DIF 143–145 |
| (uni-polar) (double output) | 0 – 20 mA | DIF 143–145 |
| (uni-polar) (double output) | 4 – 20 mA | DIF 143–145 |
| (uni-polar) (double output) | 0 – 10 V | DIF 143–145 |
| (bi-polar) | 0 – ± 5 mA | DIF 243 – 245 |
| (bi-polar) | 0 – ±10 mA | DIF 243 – 245 |
| (bi-polar) | 0 – ±20 mA | DIF 243 – 245 |
| (bi-polar) | 4 – 12 – 20 mA | DIF 243 – 245 |
| (bi-polar) | 0 – ±10 V | DIF 243 – 245 |

Auxiliary voltage

| Unit ²⁾ | Voltage | Frequency | Burden |
|--------------------|--------------------|------------------|------------|
| 3 | 8 – 20 V (40 V) DC | DC | 2.5 W |
| 4 | 18 – 80 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |
| 5 | 80 – 276 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |

- 2) Third digit in the type designation, shows type of auxiliary supply.

TRANSDUCER DIF AND DCR, DC TO PULSE RATE CONVERTER

Ordering form DIF

| DIF DC Frequency transducer | Default | Example |
|-----------------------------|----------------|---------------------|
| Type: | | DIF 01 |
| Accuracy: | cl. 0.2 | 0.2 |
| Pulsetime: | 80 ms | 80 ms |
| Input: | | 0-20 mA |
| Input corresponding value: | | 200 kW |
| Pulse output: | | 10 kWh/pulse |
| Pulse frequency: | | 0.2 Hz |
| Auxiliary supply: | | 110 V AC |

Example:

20 mA = 7200 kW

Pulse output = 10 kWh/pulse

$$\frac{7200 \text{ (kW)}}{3600 \times 10 \text{ (kWh/pulse)}} = 0.2 \text{ Hz}$$

TRANSDUCERS DR FOR RESISTANCE

Type DR 133 to 435

Transducers type DR are used to measure resistance that is converted into a proportional, load-independent galvanic isolated DC voltage or DC current signal. Transducer DR can be connected, for example, to resistance sensors in a two-wire, three-wire or potentiometer circuit.

Measurement principle, three-wire circuit: This eliminates the resistive effect of wiring between the transducer and the sensor. It is essential to use a three-wire circuit with use of Pt100 sensors, and with combination with linearisation, an output signal proportional to the temperature is obtained.

Measurement principle, two-wire circuit: This is used in applications where the resistance of the wiring is negligible relative to R_x .

Potentiometer circuit: Used in conjunction with mechanical moving sensors such as position transmitters.

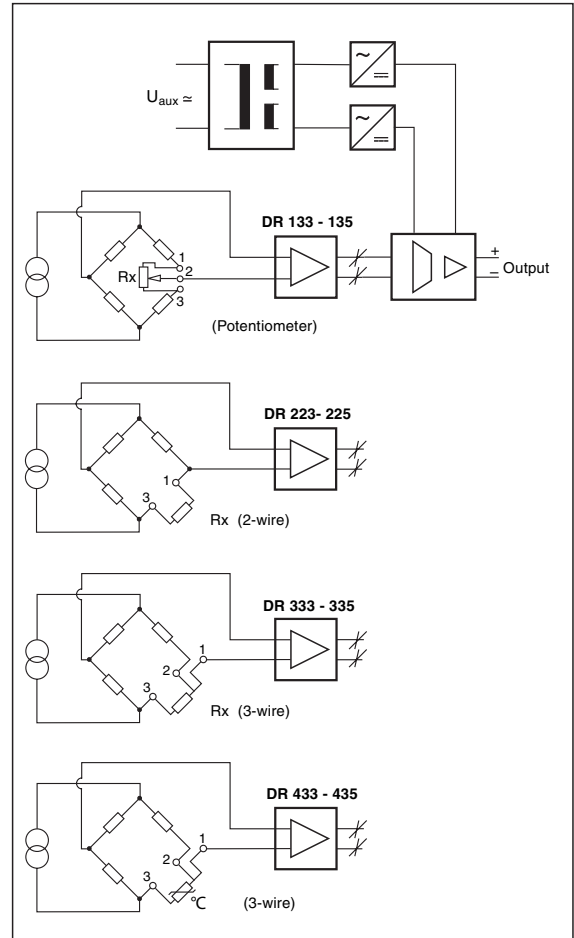
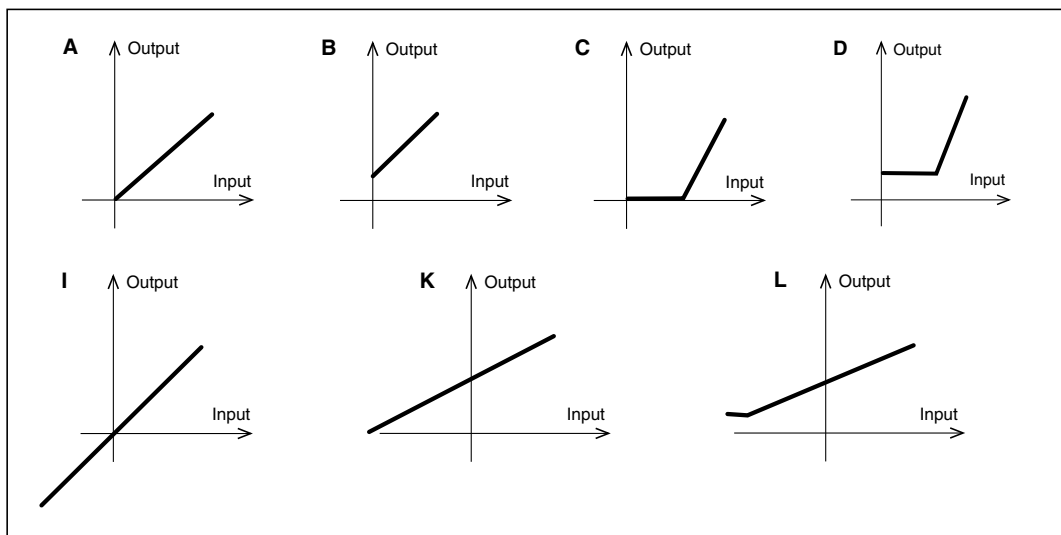
Output data

| Accuracy class | 0.5 | 0.2 (Option) |
|---|--------------|---------------|
| Linearity error | < 0.2 % | < 0.1 % |
| Load-dependence | < 0.05 % | < 0.05 % |
| Response time (0-99%) | 50 – 100 ms | 50 – 100 ms |
| Auxiliary voltage dependence | < 0.1 % | < 0.1 % |
| Temperature dependence | < 0.1 %/10°C | < 0.06 %/10°C |
| Max voltage with open output | 20 V | 20 V |
| Max output signal with over-driven input signal | ≤ 125 % | ≤ 125 % |
| Ripple (peak-to-peak) | < 1.0 % | < 0.5 % |

General data

| | |
|----------------------|----------------|
| Working temp. range | -10 – +55 °C |
| Function temp. range | -20 – +65 °C |
| Storage temp. range | -65 – +80 °C |
| Test voltage | 5.55 kV, 50 Hz |

Output signals

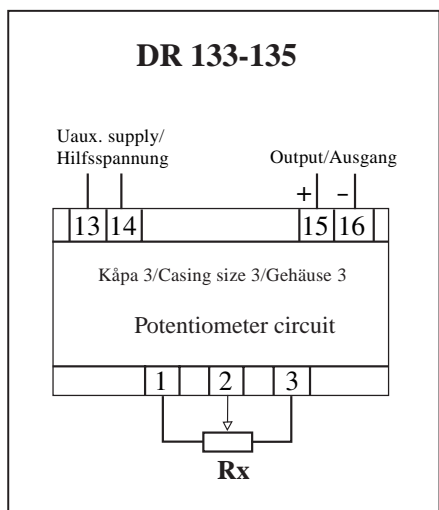


Dimensions and weights

See page 58

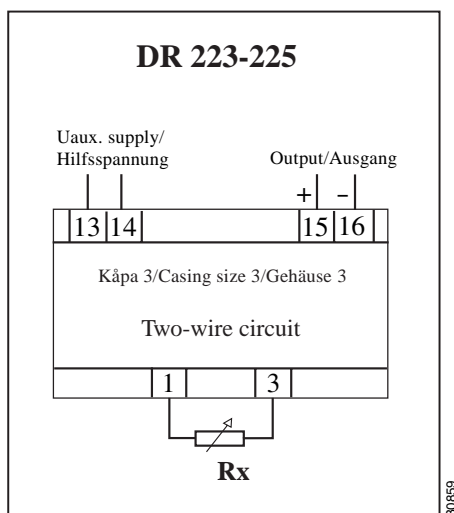
TRANSDUCERS DR FOR RESISTANCE

DR 133-135



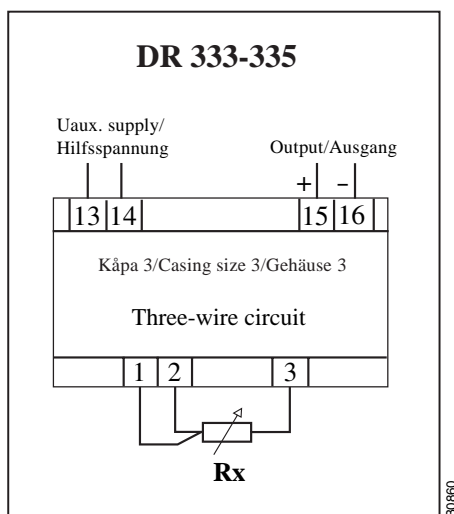
Connection

DR 223-225



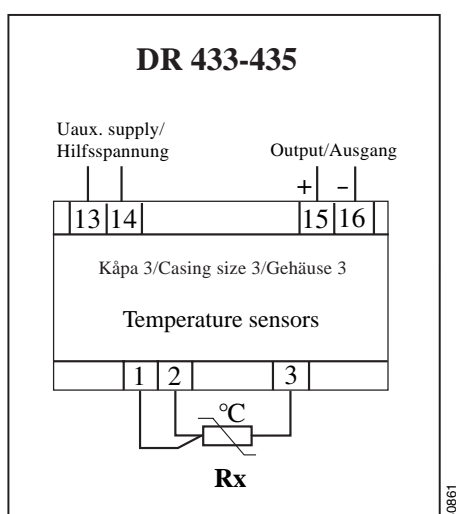
Connection

DR 333-335



Connection

DR 433-435



Connection

DR 133 to 435

Input data

Measuring range (R_x) 0 – 10 Ω , 0 – 10 k Ω
 Measuring current (I_{RX}) 0,2 – 10 mA (measuring range 0 – 10 k Ω)
 10 mA (measuring range 0 – 10 Ω)
 3,5 – 5 mA (PT 100 sensor)

| Output rated value ¹⁾ | Output signal DR 133-335 | Output signal DR 433-435 | Load resistance R_L |
|----------------------------------|--------------------------|--------------------------|-----------------------|
| 1 mA | A, B, C, D | A, B, C, D, I, K, L | 0 – 15 k Ω |
| 2 mA | A, B, C, D | A, B, C, D, I, K, L | 0 – 7.5 k Ω |
| 2,5 mA | A, B, C, D | A, B, C, D, I, K, L | 0 – 6.0 k Ω |
| 5 mA | A, B, C, D | A, B, C, D, I, K, L | 0 – 3.0 k Ω |
| 10 mA | A, B, C, D | A, B, C, D, I, K, L | 0 – 1.5 k Ω |
| 20 mA | A, B, C, D | A, B, C, D, I, K, L | 0 – 750 Ω |
| 20 mA | A, B, C, D | A, B, C, D, I, K, L | 0 – 750 Ω |
| 1 V | A, B, C, D | A, B, C, D, I, K, L | ≥ 2 k Ω |
| 2 V | A, B, C, D | A, B, C, D, I, K, L | ≥ 2 k Ω |
| 5 V | A, B, C, D | A, B, C, D, I, K, L | ≥ 2 k Ω |
| 10 V | A, B, C, D | A, B, C, D, I, K, L | ≥ 2 k Ω |

¹⁾ Other values on request.

Auxiliary voltage

| Unit ²⁾ | Voltage | Frequency | Burden |
|--------------------|--------------------|------------------|------------|
| 3 | 8 – 20 V (40 V) DC | DC | 2.5 W |
| 4 | 18 – 80 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |
| 5 | 80 – 276 V AC/DC | 45 – 65 Hz or DC | 4 VA/2.5 W |

²⁾ Third digit in the type designation, shows type of auxiliary supply.

TRANSDUCERS DR FOR RESISTANCE

Ordering form DR

| DR (Resistance DC) | | Default | Example |
|-----------------------|----------------------|---------|---------------|
| Type: | <input type="text"/> | | DR 134 |
| Measurement principle | <input type="text"/> | | Potentiometer |
| Accuracy: | <input type="text"/> | cl. 0.5 | 0.5 |
| Input | <input type="text"/> | | 15x20 ohm |
| Measuring range: | <input type="text"/> | | |
| Output: | <input type="text"/> | | 0-20 mA |
| Output curve: | <input type="text"/> | | A |
| Response time: | <input type="text"/> | 300 ms | 300 ms |
| Auxiliary supply: | <input type="text"/> | | 18-80 V AC/DC |

| DR (Resistance DC) | | Default | Example |
|-----------------------|----------------------|---------|----------------|
| Type: | <input type="text"/> | | DR 435 |
| Measurement principle | <input type="text"/> | | Temperature |
| Accuracy: | <input type="text"/> | cl. 0.5 | 0.5 |
| Sensor: | <input type="text"/> | | PT 100 ohm/0°C |
| Measuring range: | <input type="text"/> | | 0-100°C |
| Output: | <input type="text"/> | | 0-10 mA |
| Output curve: | <input type="text"/> | | C |
| Response time: | <input type="text"/> | 300 ms | 300 ms |
| Auxiliary supply: | <input type="text"/> | | 80-276 V AC/DC |

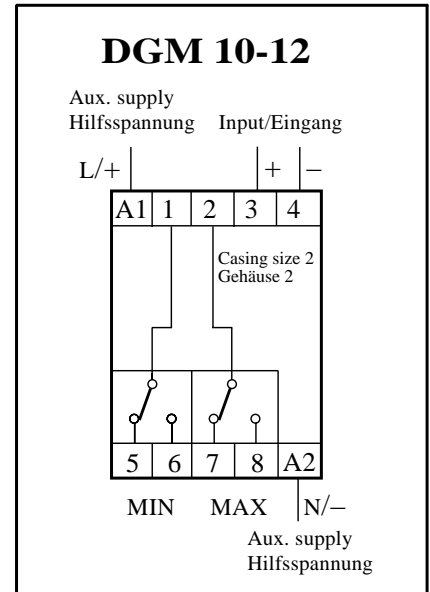


DGM level detector is used to monitor and indicate obtained limit values. Indication is done by means of LEDs simultaneously with potential free two-pole opening or closing relay.

The DGM level detector is equipped with Max- and Min-function. The Max-relay is activated when the max-limit is exceeded and deactivated when the max-limit is underpassed. The function in the Min-relay corresponds - i.e. it is activated when the min-limit is underpassed and deactivated when the min-limit is exceeded.

The DGM level detector is set according to the value to be monitored. This is done by thumb wheels in the level detector front.

The level detector is equipped with a delay for approx. 1 second in order to avoid undesired "switching".



Connection

B0864

General

Operating temperature range -10 - +50°C
Degree of protection IP 40

Dimensions and weights

See page 58

Input data

| Maximum input | Input resistance |
|---------------|------------------|
| 5mA | 220 Ω |
| 20mA | 60 Ω |

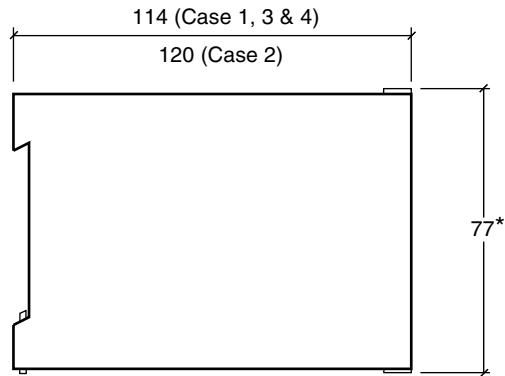
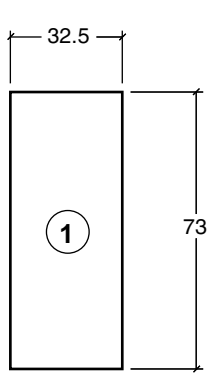
Relays

Number: 2
Contacts: changeover
Load: 230 V AC / 4A or 30 V DC / 60 W
Life: 50 000 switching operations at maximum load
Indication: Relay position is indicated by LED

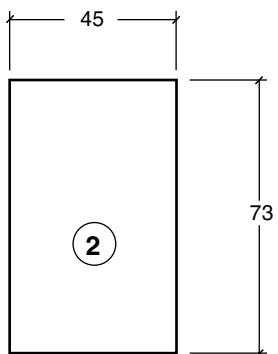
Auxiliary voltage

| Type | Voltage | Frequency | Internal consumption |
|--------|----------------|------------|----------------------|
| DGM 10 | 94 - 121V AC | 45 - 65 Hz | 2 VA |
| DGM 11 | 196 - 253 V AC | 45 - 65 Hz | 2 VA |
| DGM 12 | 20 - 30 V DC | DC | 2.5 W |

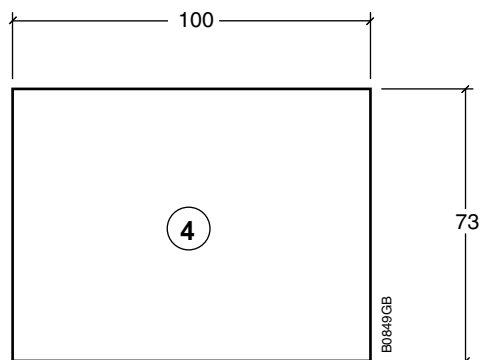
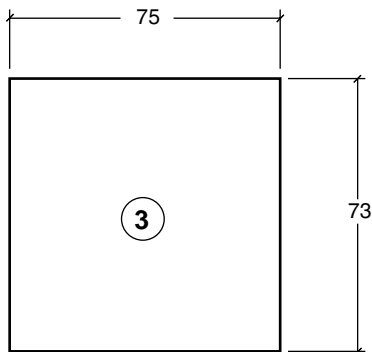
DIMENSIONS AND WEIGHTS



* With terminal protection



○ = Casing size



DIMENSIONS AND WEIGHTS

For mounting the transducers on walls with screws, a plastic DIN rail (Art No. 4025) can be ordered.

The rail can easily be cut to the correct length for the relevant case.



DIN rail Art. No. 4025

| Type | Weight g |
|-------------------|----------|
| DU 120 | 280 |
| DU 121, DU 122 | 260 |
| DU 123 – DU 125 | 340 |
| DUE 123 – DUE 125 | 340 |
| DI 120 | 210 |
| DI 121, DI 122 | 250 |
| DI 123 – DI 125 | 450 |
| DUD 123 – DUD 125 | 320 |
| DID 123 – DID 125 | 350 |
| DF 03 – DF 04 | 350 |
| DPF 13 – DPF 14 | 370 |
| DP 123 – DP 145 | 480 |
| DP 233 – DP 235 | 510 |
| DP 333 – DP 345 | 610 |
| DQ 133 – DQ 135 | 480 |
| DQ 233 – DQ 235 | 510 |
| DQ 333 – DQ 345 | 610 |
| DPQ 133 – DPQ 235 | 420 |
| DPQ 333 – DPQ 345 | 510 |
| DIF 123 - 245 | 520 |
| DCR 01, DCR 02 | 250 |
| DR 133 – DR 435 | 330 |
| DGM 10 – 11 | 330 |
| DGM 12 | 250 |



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