

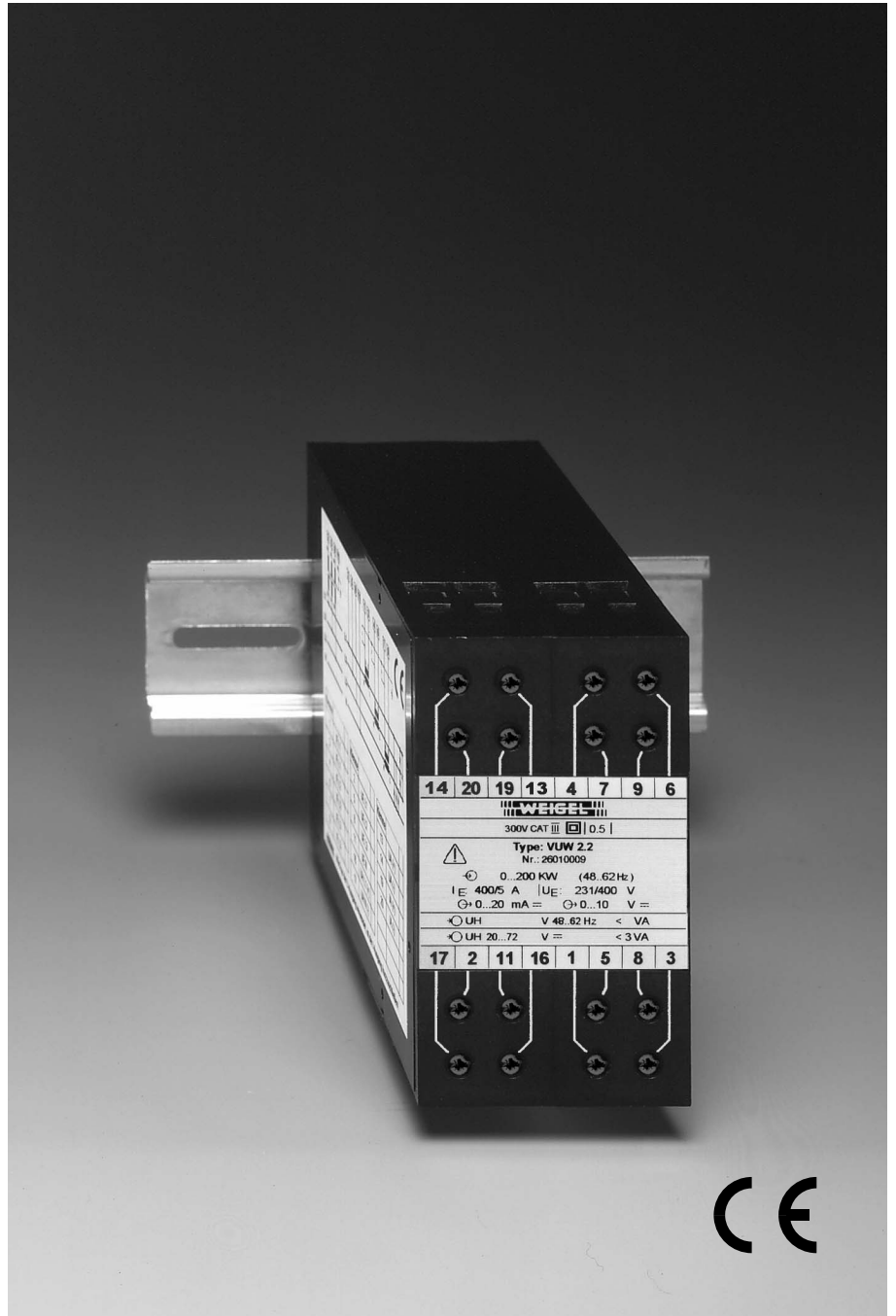
Data Sheet

062.10e

Transducers for Active or Reactive Power

EW 2.2
DGW 2.2
VGW 2.2
DUW 2.2
VUW 2.2
EB 2.2
DGB 2.2
VGB 2.2
DUB 2.2
VUB 2.2

*transducer case
width 45 mm*



WEIGEL

Application

The compact designed Power Transducer **Series 2.2** convert all forms of **active or reactive power** polarity - true into a load independent DC current and an impressed DC voltage. The output signal can be indicated, recorded and/or used for controlling directly at the test point or in measuring facilities located far away.

The range of active or reactive power transducers includes all types both for **single-phase AC (EW/EB 2.2)** and **3-phase 3-wire or 3-phase 4-wire** power supply systems of **balanced or unbalanced loads (DGW/B 2.2, DUW/B 2.2 resp. VGW/B 2.2, VUW/B 2.2)**.

It is possible to connect more than one indicator, recorder, controller, computer etc. to the output circuit provided the total impedance does not exceed the rating.

Power supply is effected by a separate auxiliary voltage input. Inputs, output and auxiliary voltage input are **galvanically isolated from each other**. The output is **short-circuit proof** and **safe against idling**.

The transducers comply with safety requirements and are tested for interference immunity.

The transducers are designed to be mounted in machines/systems. Regulations for installation of electrical systems and equipment have to be observed.

Operating Principle

Transformers in the current circuits and dividers in the voltage circuits adapt the signals which are transferred to an A/D converter via multiplexer.

A **true 3-phase** conversion of the current and voltage inputs guarantees an absolutely correct measuring results within the specified accuracy class, independent of the operating conditions of the power supply network.

A microprocessor analyzes and multiplies the digitalized signal in real time. Depending on application and network structure, the required output value is computed and transferred to a D/A converter which passes the signal via an optocoupler for galvanic isolation to the output stages.

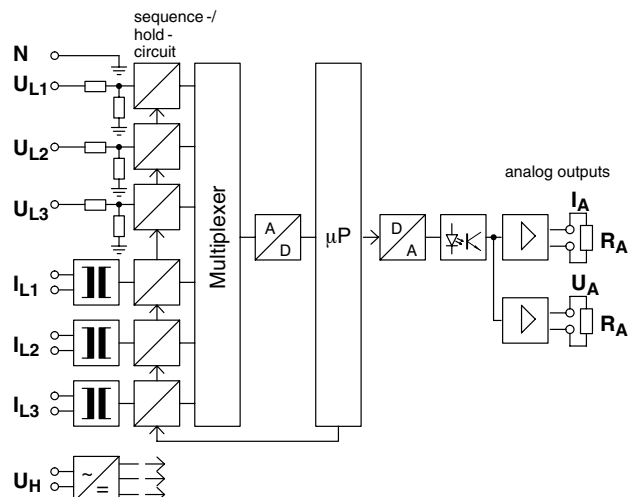
The output amplifier issues the output quantity as a load independent DC current and an impressed DC voltage.

The outputs *must not* be connected to each other.

Optionally, the measured value can be inquired via a **serial interface (RS232/RS485)**, also switching signal can be produced. ▶

Block Circuit Diagram

(3-phase 4-wire unbalanced load system)



General Technical Data

| | | | |
|----------------------|--|-----------|-----------|
| case details | projecting case clamping to TH 35 DIN rail according to DIN EN 60 715 | | |
| material of case | ABS/PC black self-extinguishing to UL rating 94 V-0 | | |
| terminals | screw-terminals | | |
| wire cross-section | 4 mm ² max. | | |
| enclosure code | IP 40 case IP 20 terminals | | |
| dielectric test | 2210 V all circuits to case 3536 V measuring circuit and auxiliary voltage to output 1330 V currents to each other and to voltages | | |
| operating voltage | 300 V (rated voltage phase to zero) | | |
| class of protection | II | | |
| measurement category | CAT III | | |
| pollution level | 2 | | |
| dimensions WxHxL | 45 mm x 80 mm x 115 mm | | |
| weight | EW/EB 2.2 DGW/B 2.2 VGW/B 2.2 | DUW/B 2.2 | VUW/B 2.2 |
| approx. | 0.27 kg | 0.29 kg | 0.31 kg |

Inputs

| | | |
|---------------------------------------|---|----------------|
| input quantity | sinusoidal AC current and sinusoidal AC voltage | |
| measurable quantity | P _E active or reactive power | |
| type | active power | reactive power |
| single-phase AC system | EW 2.2 | EB 2.2 |
| 3-phase 3-wire system balanced load | DGW 2.2 | DGB 2.2 |
| 3-phase 4-wire system balanced load | VGW 2.2 | VGB 2.2 |
| 3-phase 3-wire system unbalanced load | DUW 2.2 | DUB 2.2 |
| 3-phase 4-wire system unbalanced load | VUW 2.2 | VUB 2.2 |
| measuring range | 0 ... P _N or -P _N ... 0 ... P _N P _N = (0.3 ... 1.5) · P _S | |

The apparent power P_S is calculated from primary ratings of current and voltage transformers:

$$\text{single phase AC} \quad P_S = U \cdot I$$

$$\text{3-phase system} \quad P_S = \sqrt{3} \cdot U \cdot I$$

rated input voltage U_{EN} ▶ 0 ... 50-519 V

rated input current I_{EN} ▶ 0 ... 0,5-5 A

operating voltage 519 V max.

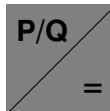
modulation range 1.2 U_{EN} or 1.2 I_{EN}

overload limits 1.2 U_{EN}, 1.2 I_{EN} continuously
2 U_{EN}, 10 I_{EN} max. 1 s

frequency range 48 ... 62 Hz ▶

power consumption approx. 0.25 mA each voltage circuit
I² · 0.01 Ω each current circuit

▶ extras on request



Transducers for Active or Reactive Power

Outputs

current output

| | | |
|--------------------|----------|--|
| output current | I_A | load independent DC current (0 ... 20 mA) ♦ |
| rated current | I_{AN} | 0 ... 20 mA or 4 ... 20 mA |
| load range | R_A | 0 ... 10 V / I_{AN} |
| current limitation | | to approx. 120% of end value to 100 ... 140% of end value on request ♦ |

voltage output

| | | |
|----------------|----------|-------------------------------------|
| output voltage | U_A | impressed DC voltage (0 ... 10 V) ♦ |
| rated voltage | U_{AN} | 0 ... 10 V or 2 ... 10 V |
| load | R_A | $\geq 4 \text{ k}\Omega$ |

| | |
|-----------------|---------------------------------------|
| load error | $\leq 0.1\%$ based on 50% load change |
| residual ripple | $\leq 1\%_{\text{rms}}$ |
| response time | approx. 500 ms |
| idling voltage | $\leq 15 \text{ V}$ |

Also, bipolar output quantities are possible using power supply units **H4** and **H5** (e.g. -20 ... 0 ... 20 mA). ♦

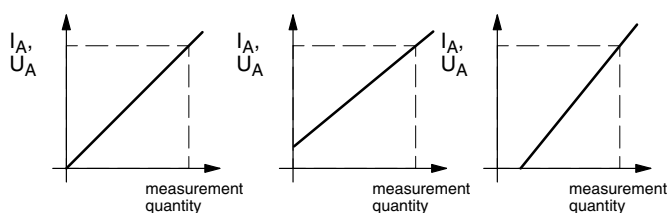
If the voltage output only will be used, short-circuit the current output !

Input and outputs are galvanically isolated.

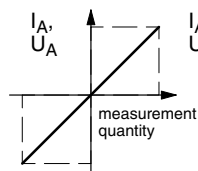
Conversion Characteristics

examples

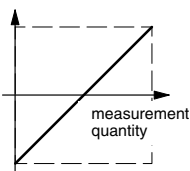
standard



incoming and outgoing



bipolar output



Auxiliary Supply

| power supply unit | auxiliary voltage | power consumption |
|-------------------|--------------------------------------|-------------------|
| H1 *) | 230 V~ (195 ... 253 V), 48 ... 62 Hz | < 7 VA |
| H2 | 115 V~ (98 ... 126 V), 48 ... 62 Hz | < 4 VA |
| H3 | 24 V= (20 ... 72 V) | < 3 VA |
| H4 | 20 ... 100 V= or 20 ... 70 V~ | < 3VA |
| H5 | 90 ... 357 V= or 65 ... 253 V~ | < 4 ... 7 VA |

*) standard

Galvanic isolation between input, output and auxiliary voltage

♦ extras on request

Accuracy at Reference Conditions

accuracy class 0.5 ($\pm 0.5\%$ of end value)
 temperature coefficient $\leq 0.02\%/K$
 valid for standard products and a life-period of 1 year maximum

reference conditions

| | |
|---------------------|--|
| input voltage | $U_{EN} \pm 0.5\%$ |
| power factor | $\cos \varphi = 1$ |
| frequency | 50 ... 60 Hz |
| wave form | sine curve, distortion factor $\leq 0.1\%$ |
| auxiliary voltage | $U_{HN} \pm 1\%$, 48 ... 62 Hz |
| ambient temperature | $23^\circ\text{C} \pm 1K$ |
| warm-up | $\geq 5 \text{ min}$ |

Environmental

| | |
|-----------------------------|--|
| climatic suitability | climatic class 3 to VDE/VDI 3540 sheet 2 |
| operating temperature range | -10 ... +55°C |
| storage temperature range | -25 ... +65°C |
| relative humidity | $\leq 75\%$ annual average, non-condensing |

Rules and Standards

| | |
|----------------------|--|
| DIN EN 60 529 | Enclosure codes by housings (IP-code) |
| DIN EN 60 688 | Electrical measuring transducers converting AC quantities into analog or digital signals |
| DIN EN 60 715 | Dimensions of low voltage switching devices: standardized DIN rails for mechanical fixation of electrical devices in switchgears |
| DIN EN 61 010-1 | Safety requirements for electrical measuring, control and laboratory equipment Part 1: General requirements |
| DIN EN 61 326-1 | Electrical equipment for measurement, control and laboratory use – EMC requirements Part 1: General requirements |
| VDE/VDI 3540 sheet 2 | Reliability of measuring and control equipment (classification of climates for equipment and accessories) |

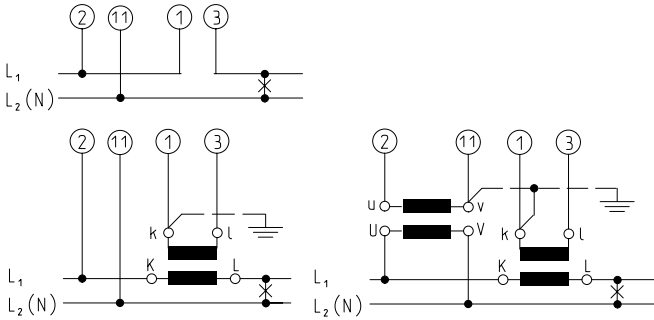
Extras (on Request)

- with buckled characteristic curve
- with switching output
- with additional galvanically isolated output to measure a second measurable quantity
- with output limitation
- with RS232 and RS485 interface (to be used alternatively) to digitally inquire different measuring values
- frequency range 15 ... 18 Hz, 98 ... 102 Hz

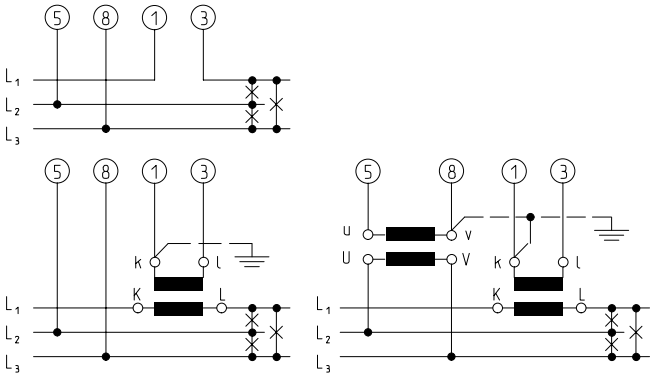
Connection Diagrams

input

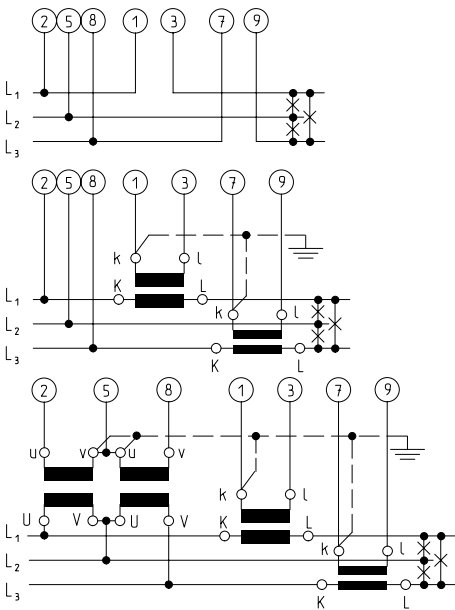
EW/EB 2.2



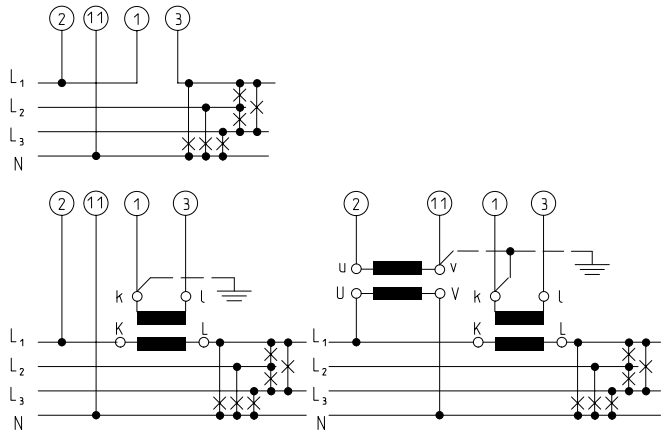
DGW/DGB 2.2



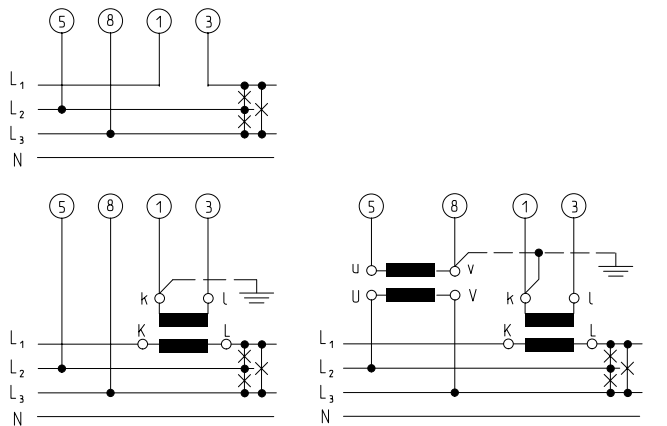
DUW/DUB 2.2



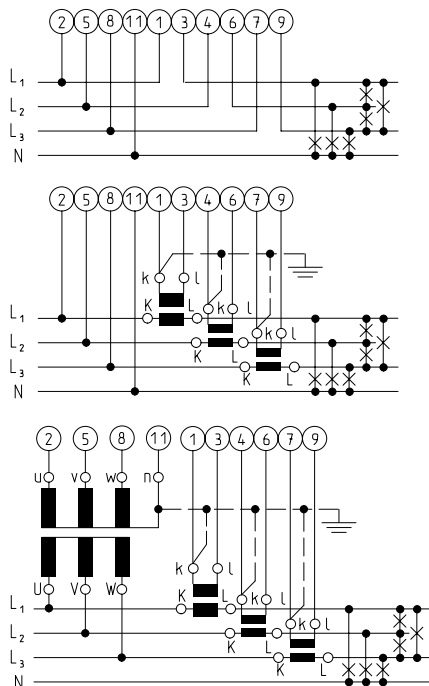
VGW 2.2

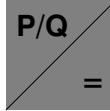


VGB 2.2



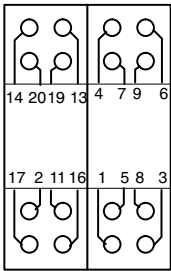
VUW/VUB 2.2





Transducers for Active or Reactive Power

Terminal Assignment

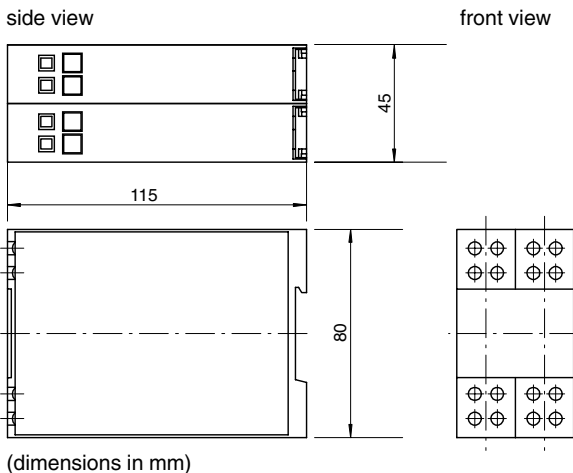


| No. | Function | Transducer | EW EB VGW | DGW DGB VGB | DUW DUB | VUW VUB |
|-----|----------------------|-------------------|-----------------|-------------------|------------|------------|
| 1 | I _E L1 | input current IN | X | X | X | X |
| 3 | I _E L1 | input current OUT | X | X | X | X |
| 4 | I _E L2 | input current IN | — | — | — | X |
| 6 | I _E L2 | input current OUT | — | — | — | X |
| 7 | I _E L3 | input current IN | — | — | X | X |
| 9 | I _E L3 | input current OUT | — | — | X | X |
| 2 | U _E L1 | input voltage | X | — | X | X |
| 5 | U _E L2 | input voltage | — | X | X | X |
| 8 | U _E L3 | input voltage | — | X | X | X |
| 11 | U _E N | input voltage | X | — | — | X |
| 13 | U _A (+) | positive output | X | X | X | X |
| 14 | U _A (-) | negative output | X | X | X | X |
| 19 | I _A (+) | positive output | X | X | X | X |
| 20 | I _A (-) | negative output | X | X | X | X |
| 16 | U _H L1(+) | auxiliary voltage | X | X | X | X |
| 17 | U _H N (-) | auxiliary voltage | X | X | X | X |

I_E current input
 U_E voltage input
 The terminal numbering correspond to details in the connection diagrams (to DIN 43 807).

I_A current output
 U_A voltage output
 U_H auxiliary voltage input

Dimensions



Preference Types

The table below shows a listing of standard measuring ranges for voltages of 230/400 V with current ratings of N/1A or N/5A:

| I _{EN} [A] | P _{EN} [kW] | | |
|----------------------------|----------------------------|--|----------------------------|
| | type EW 2.2 EB 2.2 | types DGW/B 2.2 VGW/B 2.2 DUW/B 2.2 VUW/B 2.2 | |
| | calibration factor 0.87 | calibration factor 0.72 | |
| directly connected 1 | 1/5 | 0.2 | 0.5 |
| 5/1 | directly connected 5 | 1 | 2.5 |
| 10/1 | 10/5 | 2 | 5 |
| 15/1 | 15/5 | 3 | 7.5 |
| 20/1 | 20/5 | 4 | 10 |
| 25/1 | 25/5 | 5 | 12.5 |
| 30/1 | 30/5 | 6 | 15 |
| 40/1 | 40/5 | 8 | 20 |
| 50/1 | 50/5 | 10 | 25 |
| 60/1 | 60/5 | 12 | 30 |
| 75/1 | 75/5 | 15 | 37.5 |
| 80/1 | 80/5 | 16 | 40 |
| 100/1 | 100/5 | 20 | 50 |
| 120/1 | 120/5 | 24 | 60 |
| 150/1 | 150/5 | 30 | 75 |
| 200/1 | 200/5 | 40 | 100 |
| 250/1 | 250/5 | 50 | 125 |
| 300/1 | 300/5 | 60 | 150 |
| 400/1 | 400/5 | 80 | 200 |
| 500/1 | 500/5 | 100 | 250 |
| 600/1 | 600/5 | 120 | 300 |
| 750/1 | 750/5 | 150 | 375 |
| 800/1 | 800/5 | 160 | 400 |
| 1000/1 | 1000/5 | 200 | 500 |
| and values of next decades | and values of next decades | and values of next decades | and values of next decades |

The transducers of this preference list offer advantages on site due to the fact that they are calibrated to exactly the same secondary current ratings (calibration factor 0.87 resp. 0.72).

This means, the transducers are interchangeable within the current transformer ratings listed and Watts resulting thereof. They will not have to be recalibrated. Only the type label should be corrected accordingly.

Example:

For a supply system of 230/400 V and a primary transformer current of 250 A, the calculated power rating will be 125 kW for a transducer VUW 2.2.

The apparent power (cos ψ = 1) on the basis of these system data would be:

$$P_S = U \cdot I \cdot \sqrt{3} \cdot \cos \psi$$

$$P_S = 400 \text{ V} \cdot 250 \text{ A} \cdot \sqrt{3} \cdot 1$$

$$P_S = 173 \text{ kW}$$

multiplied by a calibration factor 0.72 results in P_{EN} = 125 kW (refer to table).

Changing the transformer connection to 400 A for instance, power rating results from:

$$P_{EN} = U \cdot I \cdot \sqrt{3} \cdot 0.72$$

$$P_{EN} = 400 \text{ V} \cdot 400 \text{ A} \cdot \sqrt{3} \cdot 0.72$$

$$P_{EN} = 200 \text{ kW (refer to table above)}$$

Ordering Guide

| type | Transducers for Watts or VARs |
|------------------------------|---|
| Active Power | |
| EW 2.2 | single-phase AC |
| DGW 2.2 | 3-phase 3-wire system balanced load |
| DUW 2.2 | 3-phase 3-wire system unbalanced load |
| VGW 2.2 | 3-phase 4-wire system balanced load |
| VUW 2.2 | 3-phase 4-wire system unbalanced load |
| Reactive Power | |
| EB 2.2 | single-phase AC |
| DGB 2.2 | 3-phase 3-wire system balanced load |
| DUB 2.2 | 3-phase 3-wire system unbalanced load |
| VGB 2.2 | 3-phase 4-wire system balanced load |
| VUB 2.2 | 3-phase 4-wire system unbalanced load |
| current input | |
| N/1 | 1 A |
| N/5 | 5 A |
| xx | special current input **) |
| voltage input | |
| 65 | 65 V |
| 100 | 100 V |
| 110 | 110 V |
| 240 | 240 V |
| 400 | 400 V |
| 415 | 415 V |
| 440 | 440 V |
| 500 | 500 V |
| xxx | special voltage input **) |
| measuring range | |
| xxx | to be specified (refer to preference types) |
| input frequency range | |
| F50 | 48 ... 62 Hz (50/60 Hz) *) |
| F16 | 15 ... 18 Hz (16 ² /3 Hz) |
| F100 | 98 ... 102 Hz (100 Hz) |
| Fxxx | special frequency **) |
| output | |
| 11 | 0 ... 20 mA and 0 ... 10 V |
| 12 | 0 ... 10 mA and 0 ... 10 V |
| 13 | 0 ... 5 mA and 0 ... 10 V |
| 14 | 4 ... 20 mA and 2 ... 10 V |
| 15 | -20 ... 0 ... 20 mA and -10 ... 0 ... 10 V ***) |
| 10 | special output **) |
| response time | |
| T1 | 500 ms *) |
| T0 | special rating **) |

| auxiliary supply | |
|------------------|---|
| H1 | AC 230 V (195 ... 253 V), 48 ... 62 Hz *) |
| H2 | AC 115 V (98 ... 126 V), 48 ... 62 Hz |
| H3 | DC 24 V (20 ... 72 V) |
| H4 | DC 20 ... 100 V / AC 20 ... 70 V |
| H5 | DC 90 ... 357 V / AC 65 ... 253 V |

- *) standard
 **) on request, please clearly add the desired specifications.
 ***) only available with **H4** or **H5**

ordering example

| | | | | | | |
|---------|-------|-----|-------|-----|----|----|
| VGW 2.2 | 250/5 | 400 | 125kW | F50 | 11 | H1 |
|---------|-------|-----|-------|-----|----|----|

Watt transducer (active power), input current 250/5 A, input voltage 400 V, measuring range 0 ... 125 kW, frequency 50/60 Hz, output 0 ... 20 mA and 0 ... 10 V, auxiliary supply 230 V AC

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– specifications subject to change without notice; date of issue 12/10 –

