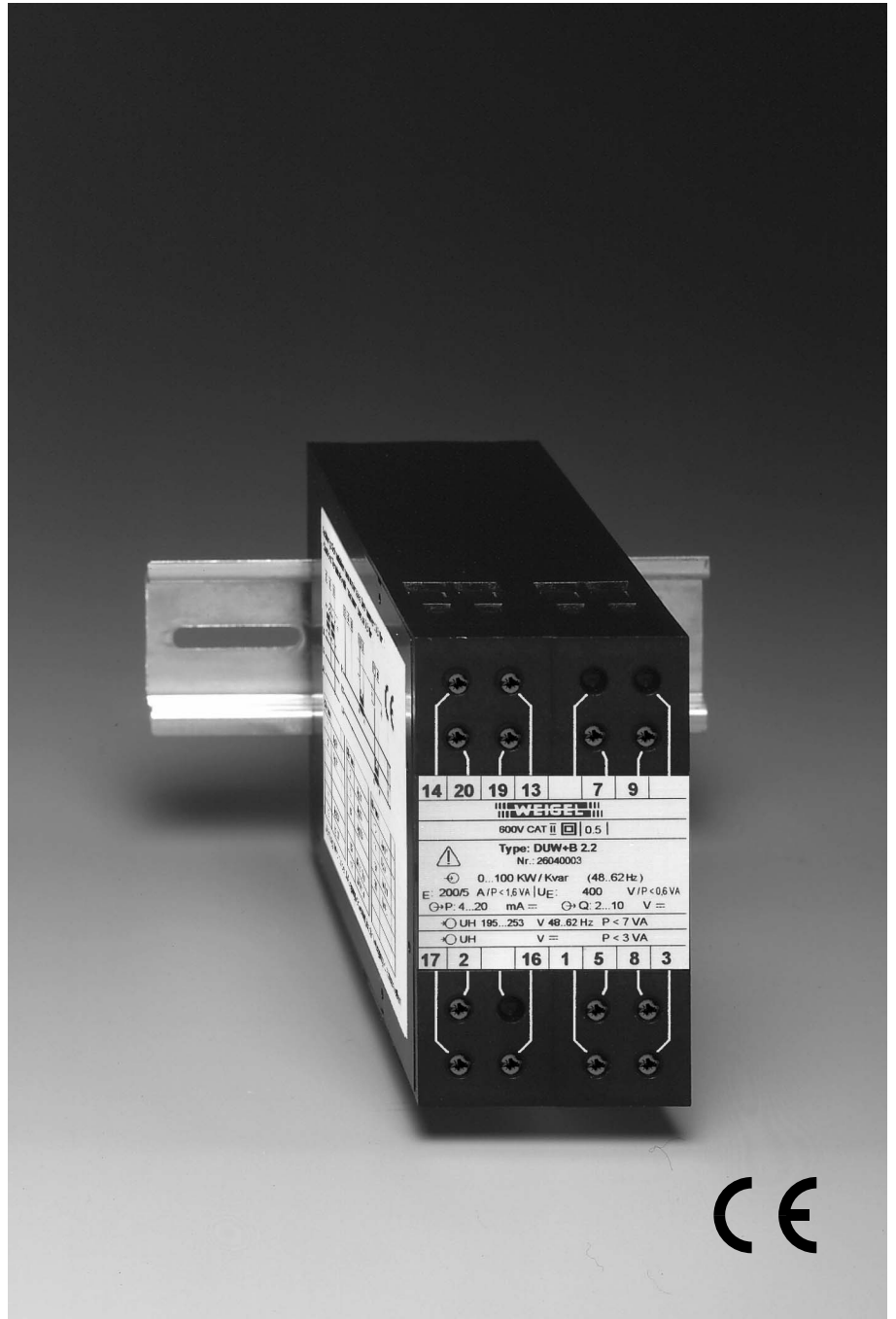


Data Sheet

066.4e

Transducers for Active and Reactive Power

- EW+B 2.2**
- DGW+B 2.2**
- VGW+B 2.2**
- DUW+B 2.2**
- VUW+B 2.2**



Application

The **E/DG/VG/DU/VU W+B 2.2** power transducers convert all forms of **active and reactive power** polarity-true into a load independent DC current or 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 and reactive power transducers includes all types both for **single-phase AC (EW+B 2.2)** and **3-phase 3-wire** or **3-phase 4-wire** power supply systems of **balanced** or **unbalanced** loads (**DGW+B 2.2, VGW+B 2.2** or **DUW+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 accept 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.

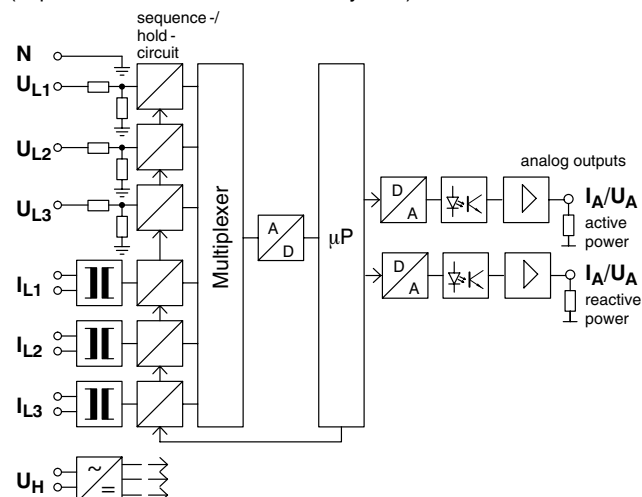
The output amplifier issues the output quantity as a load independent DC current and an impressed DC voltage.

The outputs must not be connected to each other.

Optionally, the measured value can be inquired an **RS 485 interface**, 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 DIN mounting rail (to DIN EN 50 022 – 35)		
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	2.2 kV all circuits to case 3.7 kV measuring circuit and auxiliary voltage to output 1.4 kV currents to each other and to voltages		
operating voltage	600 V		
class of protection	II		
excess voltage category	CAT II		
pollution level	2		
dimensions WxHxL	45 mm x 80 mm x 115 mm		
weight	EW+B 2.2	DUW+B 2.2	VUW+B 2.2
	DGW+B 2.2		
	VGW+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 and reactive power

type

single-phase AC system	EW+B 2.2
3-phase 3-wire system balanced load	DGW+B 2.2
3-phase 4-wire system balanced load	VGW+B 2.2
3-phase 3-wire system unbalanced load	DUW+B 2.2
3-phase 4-wire system unbalanced load	VUW+B 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 ... 50-600 V

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

operating voltage 600 V max.

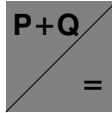
modulation range 1.2 U_{EN} or 1.2 I_{EN}

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 2 mA ± 10% each voltage circuit
≤ 0.1 VA each current circuit for I_{EN} = 1 A
≤ 1.6 VA each current circuit for I_{EN} = 5 A

▶ extras on request



Transducers for Active and 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 ≥ 4 k Ω

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

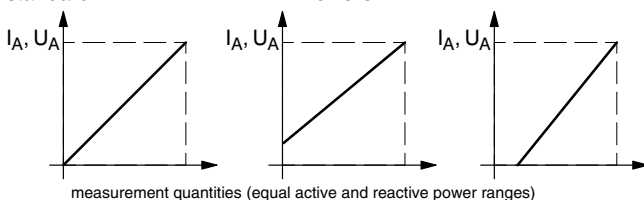
Also, bipolar output quantities are possible using power supply units **H4** and **H5** (e.g. -20 ... 0 ... 20 mA). ♦

Input and outputs are galvanically isolated.

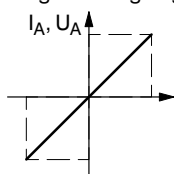
Conversion Characteristics

examples

standard

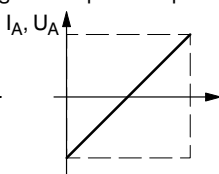


incoming and outgoing

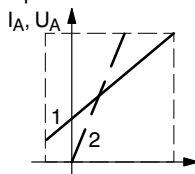


measured quantities (equal active and reactive power ranges)

bipolar output



option



measured quantities (not equal active and reactive power ranges); example:
 1 active power -10 ... 0 ... 100 kW / 4 ... 20 mA
 2 reactive power 0 ... 50 kvar / 0 ... 10 V

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 $23^\circ C \pm 1K$

warm-up ≥ 5 min

Environmental

climatic suitability

climatic class 3 to VDE/VDI 3540 sheet 2

operating

-10 ... +55°C

temperature range

storage

-25 ... +65°C

temperature range

relative humidity

$\leq 75\%$ annual average, non-condensing

Rules and Standards

DIN EN 50 022

mounting rails

DIN EN 60 688

electrical measuring transducers converting AC quantities into analog or digital signals

DIN EN 61 010

safety requirements for electrical measuring-, control- and laboratory equipment

DIN EN 61 326

electrical accessories for control technology and laboratory use

mains feedback, electromagnetic compatibility (EMC), interference immunity, interference emittance

DIN VDE 0470-1

enclosure codes by housings (IP-code)

VDE/VDI 3540 sheet 2

reliability of measuring and control equipment (classification of climates for equipment and accessories)

Extras (on Request)

- with output limitation

- with RS485 interface to digitally inquire different measuring values

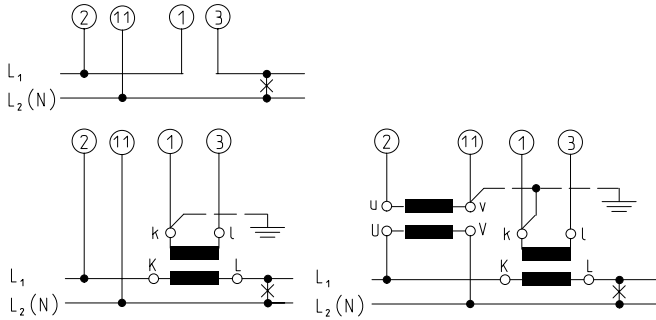
- frequency range 15 ... 18 Hz, 98 ... 102 Hz

- active and reactive power ranges are **not** equal

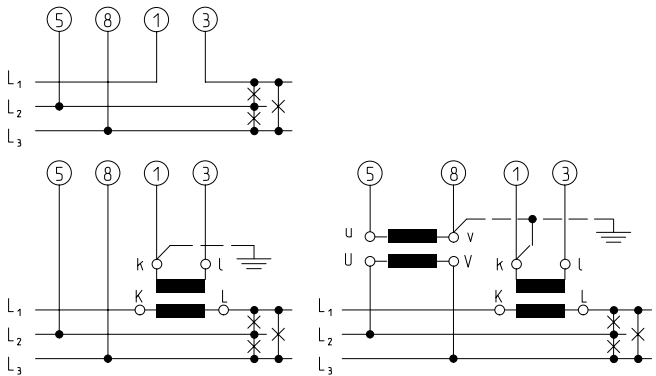
Connection Diagrams

input

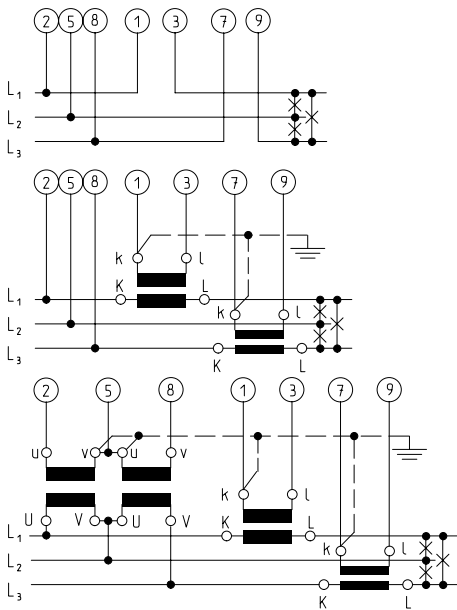
EW+B 2.2



DGW+B 2.2

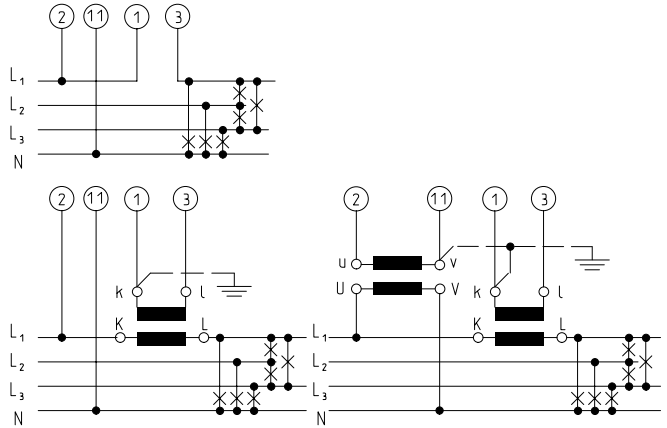


DUW+B 2.2

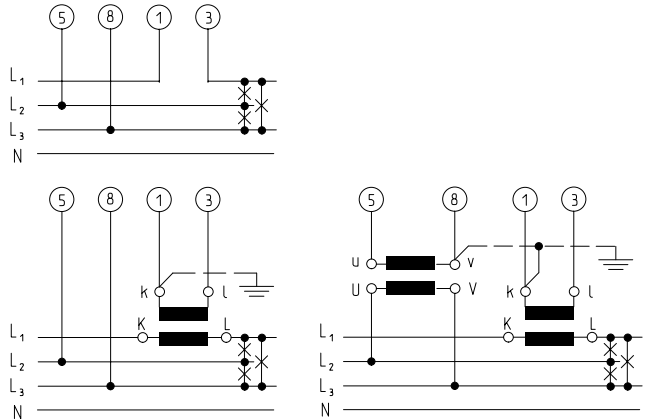


VGW+B 2.2

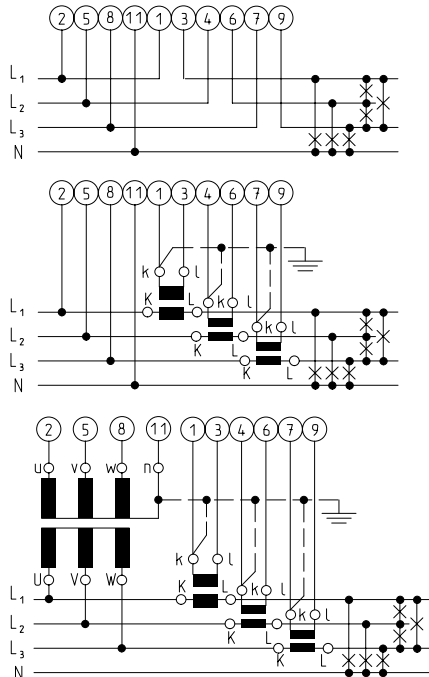
for voltage connection L1-N



for voltage connection L2-L3

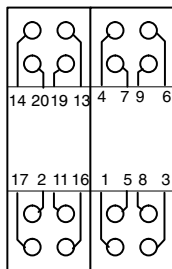


VUW+B 2.2



Transducers for Active and Reactive Power

Terminal Assignment

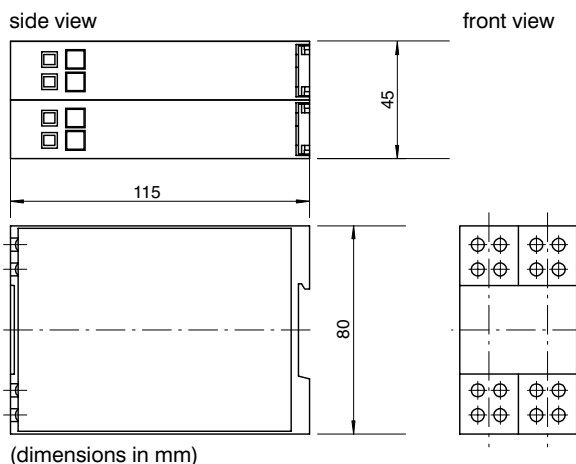


No.	Function	Transducer	EW+B	DGW +B	DUW +B	VUW +B
			VGW +B L1-N	VGW +B L2-L3		
1	I _E L1	input current IN	X	X	X	X
3	I _E L1	input current OUT	X	X	X	X
4	I _E L2	input current IN	-	-	-	X
6	I _E L2	input current OUT	-	-	-	X
7	I _E L3	input current IN	-	-	X	X
9	I _E L3	input current OUT	-	-	X	X
2	U _E L1	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	I _A /U _A (+)	reactive power output	X	X	X	X
14	I _A /U _A (-)	reactive power output	X	X	X	X
19	I _A /U _A (+)	active power output	X	X	X	X
20	I _A /U _A (-)	active power 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], Q _{EN} [kvar]		
	type EW+B 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	
direct - connected 1	0.2	0.5	
direct - connected 5	1	2.5	
10/1	2	5	
15/1	3	7.5	
20/1	4	10	
25/1	5	12.5	
30/1	6	15	
40/1	8	20	
50/1	10	25	
60/1	12	30	
75/1	15	37.5	
80/1	16	40	
100/1	20	50	
120/1	24	60	
150/1	30	75	
200/1	40	100	
250/1	50	125	
300/1	60	150	
400/1	80	200	
500/1	100	250	
600/1	120	300	
750/1	150	375	
800/1	160	400	
1000/1	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 active power rating will be 125 kW for a transducer VUW+B 2.2.

The apparent power ($\cos \psi = 1$) 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 $P_{EN} = 125 \text{ kW}$ (refer to table).

Changing the transformer connection to 400 A for instance, active power rating results in: $P_{EN} = U \cdot I \cdot \sqrt{3} \cdot 0.72$

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

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

Ordering Guide

type	Transducers for
active and reactive power	
EW+B 2.2	single-phase AC
DGW+B 2.2	3-phase 3-wire system balanced load
VGW+B 2.2	3-phase 4-wire system balanced load
DUW+B 2.2	3-phase 3-wire system unbalanced load
VUW+B 2.2	3-phase 4-wire system unbalanced load
current input	
N/1	1 A
N/5	5 A
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
600	600 V
connection for VGW+B 2.2	
-1	L1-N
-2	L2-L3
measuring range	
xxx	active and reactive power ranges are equal (refer to preference types)
xxx/yyy	active and reactive power ranges are not equal (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)
active power output	
11	0 ... 20 mA
12	0 ... 10 mA
13	0 ... 5 mA
14	4 ... 20 mA
15	-20 ... 0 ... 20 mA (***)
16	-10 ... 0 ... 10 V (***)
17	0 ... 10 V
18	2 ... 10 V
10	special output (**)

reactive power output	
21	0 ... 20 mA
22	0 ... 10 mA
23	0 ... 5 mA
24	4 ... 20 mA
25	-20 ... 0 ... 20 mA (***)
26	-10 ... 0 ... 10 V (***)
27	0 ... 10 V
28	2 ... 10 V
20	special output (**)
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+B 2.2 250/5 400-2 125 F50 11 28 H1

Transducer for active and reactive power, input current 250/5 A, input voltage 400 V, L2-L3 connection, measuring range 0 ... 125 kW/kvar, frequency 50/60 Hz, active power output 0 ... 20 mA, reactive power output 2 ... 10 V, auxiliary supply 230 V AC

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– specifications subject to change without notice; date of issue 03/07 –

