

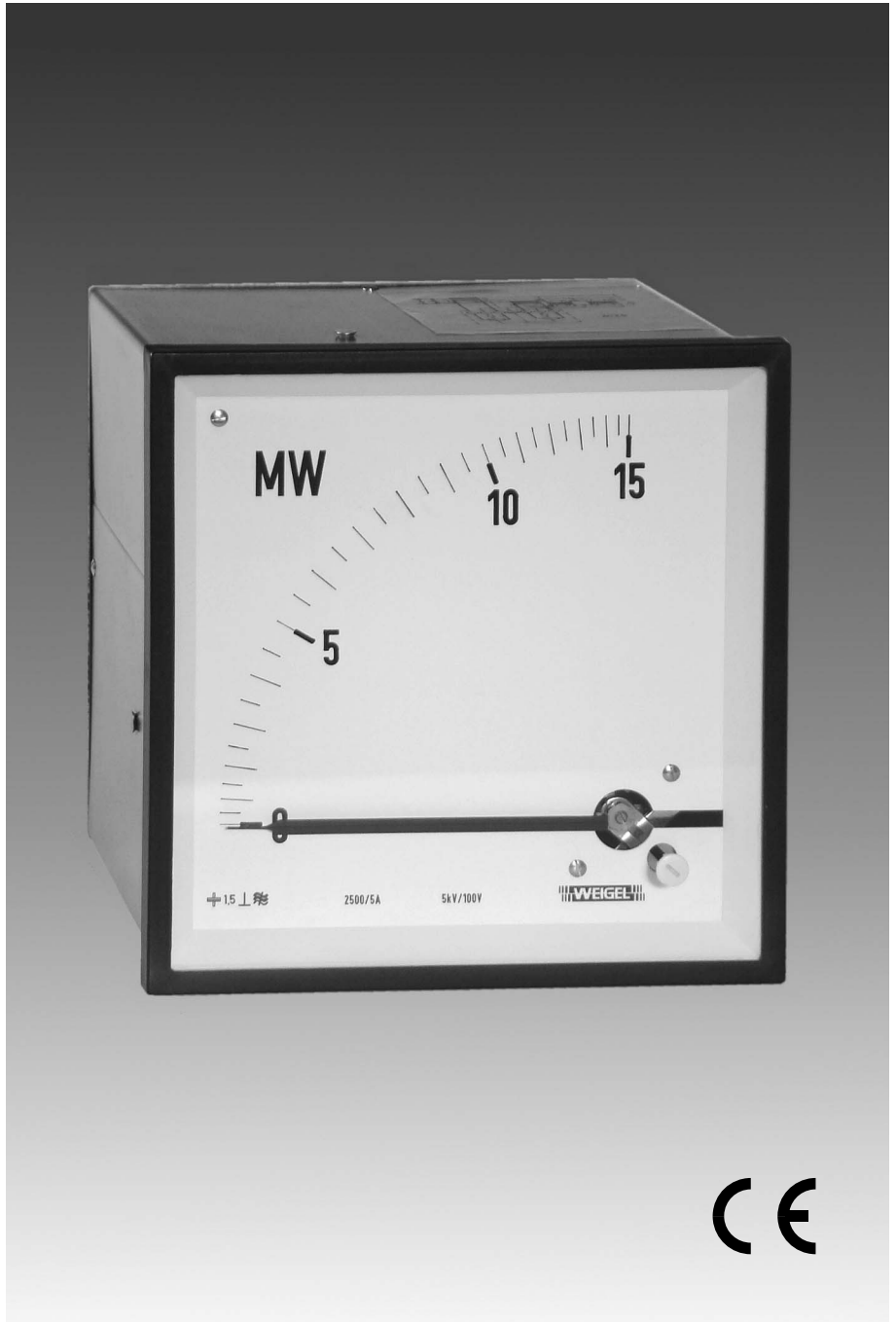


Data Sheet

M Series
070.D.101.05

Analog Meters Electrodynamic Watt and VAr Meters 90° Dial

LDQ 144



WEIGEL

Application

The power meters **LDQ 144** (M series) with electrodynamic movement can be used for the following supply systems: DC circuits, single phase AC, 3 phase balanced load, 3 or 4 wire, 3 phase unbalanced load, 3 or 4 wire

They measure power on sinusoidal current, however, with restrictions for phase angle controls.

Off-set zero power meters can be ordered in order to measure forward (export) and reverse (import) power flow.

The power meters are housed in pressed steel cases suitable to be mounted in switchboards, control panels, machine tool consoles and/or mosaic grid panels.

Functional Principle

Air-cored electrodynamic movement, pivot suspension. Spring loaded jewel bearings and silicon oil damping for vibration and shock resistance.

Mechanical Data

case details	square case suitable to be mounted in control / switchgear panels or mosaic grid panels, stackable
material of case	pressed steel
material of window	glass ▶
colour of bezel	black (similar to RAL 9005) ▶
position of use	vertical $\pm 5^\circ$ ▶
panel fixing	screw clamps
panel thickness	1 ... 15 mm
mounting	stackable next to each other
terminals ▶	
voltage-path and current-path ≤ 4 A	hexagon studs, M3 screws and wire clamps C6
current-path > 4 A	hexagon studs, M5 screws and wire clamps C10

dimensions	LDQ 144
bezel	□ 144 mm
case	□ 137 mm
depth	116 mm
panel cutout	□ 138 ⁺¹ mm
weight approx.	1.2 kg

Electrical Data

measuring unit	active or reactive power
frequency range	40 ... 100 Hz ▶
overload capacity (acc. to DIN EN 60 051 - 1)	
continuously	1.2 times rated voltage / current
5 s max.	2 times rated voltage 10 times rated current
power consumption	
per voltage path	approx. 18 – 20 mA
per current path	
type EW 1, EB 1, DW 1, DB 1, VW 1, VB 1	approx. 2 VA
DW 2, DB 2, VW 3, VB 3	approx. 3 VA
measurement category	CAT III
operating voltage	refer to Measuring Ranges
pollution level	2
enclosure code	IP 52 case front side ▶ IP 00 for terminals without protection against accidental contact IP 20 for terminals protected against accidental contact

Measuring Ranges

type	active /	reactive power
single phase AC system	EW 1	EB 1
3 phase 3 wire system, balanced load	DW 1	DB 1
3 phase 4 wire system, balanced load	VW 1	VB 1
3 phase 3 wire system, unbalanced load	DW 2	DB 2
3 phase 4 wire system, unbalanced load	VW 3	VB 3

selection of measuring range ▶

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

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

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

Select full-scale values between 0.6 and 1.2 times the calculated apparent power, preferable from DIN series 1 – 1,2 – 1,5 – 2 – 2,5 – 3 – 4 – 5 – 6 – 7,5 – 8 or any decimal multiple of these numbers.

example

For a system of 230/400 V and a primary transformer current of 250 A, the calculated power for the LDQ 144 VW3 will be

– as the highest full-range value

$$P_S = U \cdot I \cdot \sqrt{3} \cdot 1,2$$

$$P_S = 400 \text{ V} \cdot 250 \text{ A} \cdot \sqrt{3} \cdot 1,2$$

$$P_S = 207,6 \text{ kW}$$

standard value: 200 kW

– as the lowest full-range value

$$P_S = U \cdot I \cdot \sqrt{3} \cdot 0,6$$

$$P_S = 400 \text{ V} \cdot 250 \text{ A} \cdot \sqrt{3} \cdot 0,6$$

$$P_S = 103,8 \text{ kW}$$

standard value: 120 kW

rated voltage	DW/DB 1, DW/DB 2	VW/VB 1, VW/VB 3
EW/EB 1	3 phase 3 wire	3 phase 4 wire
single phase AC	system	system
system		
57.7 V	100 V	57.7/100 V ¹⁾
63.5 V	110 V	63.5/110 V ¹⁾
100 V ⁴⁾		
110 V ⁴⁾		
120 V	208 V ²⁾	120/208 V ¹⁾
127 V	220 V ²⁾	127/220 V ¹⁾
208 V		
230 V	400 V ²⁾³⁾	230/400 V ¹⁾
240 V	415 V ²⁾³⁾	240/415 V ¹⁾
254 V	440 V ²⁾³⁾	254/440 V ¹⁾
289 V	500 V ²⁾³⁾	289/500 V ¹⁾

rated current

$$1 \text{ A} ⁴⁾$$

$$5 \text{ A} ⁴⁾$$

1) external series resistor for types VW3, VB3

2) external series resistor for types DW2, DB2

3) external series resistor for types DW1, DB1

(supplied with the meter)

4) also for use on voltage transformer

▶ also refer to "Options"



Analog Meters Electrodynamic Watt and VAr Meters 90° Dial

Scaling

pointer	bar / knife-edge pointer
pointer deflection	0 ... 90°
scale characteristics	practically linear
scale division	coarse-fine
scale length	146 mm

Accuracy at Reference Conditions

accuracy class 1.5 according to DIN EN 60 051 - 1 ♦

reference conditions

ambient temperature	23°C
position of use	nominal position ±1°
input	rated measuring value
voltage	rated voltage
frequency	50 Hz ±2% ♦
wave form	sinusoidal, distortion factor <5%
others	DIN EN 60 051 - 1

influences

ambient temperature	23°C ±2K
position of use	nominal position ±5°
frequency	40 ... 50 Hz ... 100 Hz
power factor	0.5 ind ... 1 ... 0.5 cap
stray magnetic field	0.5 mT

Environmental

climatic suitability	climatic class 2 according to VDE/VDI 3540, sheet 2 ♦
operating temperature range	-25 ... +40°C ♦
storage temperature range	-25 ... +65°C
relative humidity	≤ 75% annual average, non-condensing
shock resistance	15 g, 11 ms ♦
vibration resistance	2.5 g, 5 ... 55 Hz ♦

Rules and Standards

DIN 43 718	Measurement and control; front-frames and frontpanels of measurement and control equipment; principal dimensions
DIN 43 802	Line scales and pointers for indicating electrical measuring instruments; general requirements
DIN 16 257	Nominal positions and position symbols used for measuring instruments
DIN EN 60 051	Direct acting indicating analogue electrical measuring instruments and their accessories
-1	Part 1: Definitions and general requirements common to all parts
-3	Part 3: Special requirements for wattmeters and varmeters
-9	Part 9: Recommended test methods
DIN EN 60 529	Enclosure codes by housings (IP-code)
DIN EN 61 010 - 1	Safety requirements for electrical measuring, control and laboratory equipment Part 1: General requirements

♦ for other ratings refer to "Options"

DIN EN 61 326 - 1	Electrical equipment for measurement, control and laboratory use – EMC requirements Part 1: General requirements
DIN IEC 61 554	Panel mounted equipment – Electrical measuring instruments – Dimensions for panel mounting
VDE/VDI 3540 sheet 2	reliability of measuring and control equipment (classification of climates) (non-condensing)

Options

measuring range

rated voltage	400; 415; 440; 500 V in EW1, EB1 models (operating voltage 600 V) on request
rated current	deviating from 1 A or 5 A, exceeding 5 A up to 25 A (except types DW2, DB2, VW3, VB3)
2 nd current range	in the ratio 1 : 2 only (except types DW2, DB2, VW3, VB3)
accuracy class	1.0 with fine scale division (as far as practicable)
calibration	for a definite frequency 100 ... 400 Hz
off-set zero	to measure reverse and forward power flow, pointer deflection left and right from zero
in case of active power:	reverse power flow on the right side forward power flow on the left side
reactive power:	reverse power flow inductive on the right side reverse power flow capacitive on the left side

case

window	non-glaring glass
colour of bezel	gray (similar to RAL 7037)
index marking pointer	red, front adjustable
position of use	horizontal or as specified 15...165°

performance

increased mechanical loads	shock 30 g, 11 ms vibration 5 g, 5 ... 55 Hz
climatic suitability	limited use in the tropics climatic class 3 according to VDE/VDI 3540, sheet 2
with operating temperature range	-10 ... +55°C

marine application	non-certified
enclosure code	IP 54 splash-water protected front

accessories

terminal protection against accidental contact	full-sized rear cover or protective sleeves SW6 / SW10
terminals	connector blades 6.3 x 0.8

dial

blank dial	pencil marked initial and end values
scale division and figuring	0 ... 100%, deviating from standard series; captions optional
2 nd scale division	including figuring
additional lettering	"reverse power flow – forward power flow" or as specified e.g. "generator"
additional figuring	to be specified
coloured marks	red, green or blue for important scale values
coloured sector	red, green or blue within scale division
logo on the dial	none or as specified

Preference Meter Types

The table below refers to standard measuring ranges for 230/400 V systems with secondary current transformer ratings N/1 A or N/5 A.

I_N [A]	P_N [kW][kvar]	
	types EW/B 1	types DW/B 1 VW/B 1 DW/B 2 VW/B 3
connection	calibration factor 0,87	calibration factor 0,72
direct 1	0,2	0,5
direct 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
or any decimal multiple of these numbers	or any decimal multiple of these numbers	or any decimal multiple of these numbers

Watt and VAR Meters of this preference list offer advantage for users inasmuch as these meters are stocked semifinished to ensure that customers receive fast delivery.

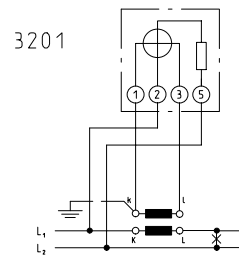
Connections

The most common connection diagrams are shown below; additional diagrams on request. Key letter "a": external series resistor box

Single-element Wattmeter

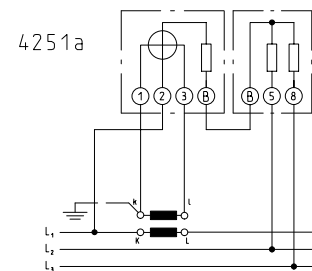
single phase AC

type **EW 1**



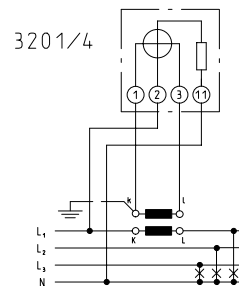
3 phase 3 wire balanced load

type **DW 1**



3 phase 4 wire balanced load

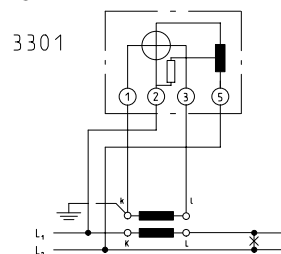
type **VW 1**



Single-element VAR Meter

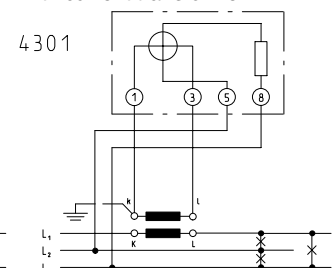
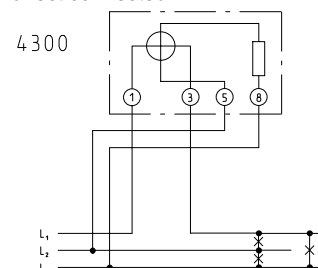
single phase AC

type **EB 1**



3 phase 3/4 wire balanced load
direct connected

types **DB 1/ VB 1**
with current transformer



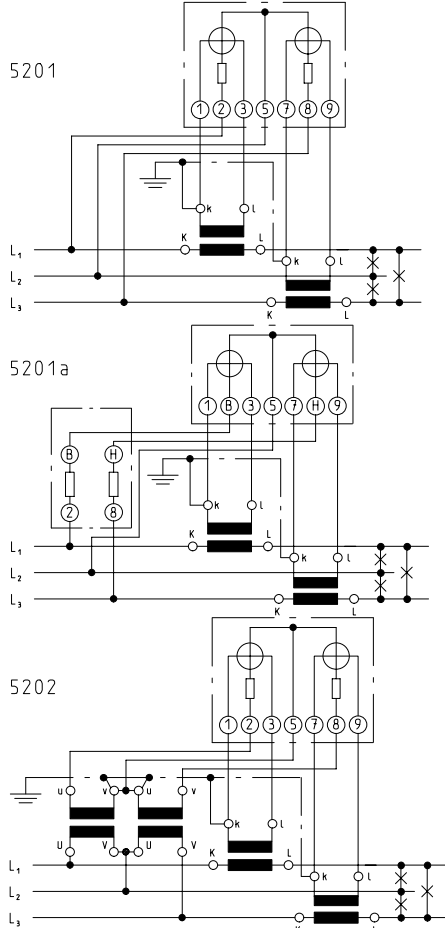


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Double-element Wattmeter

3 phase 3 wire unbalanced load

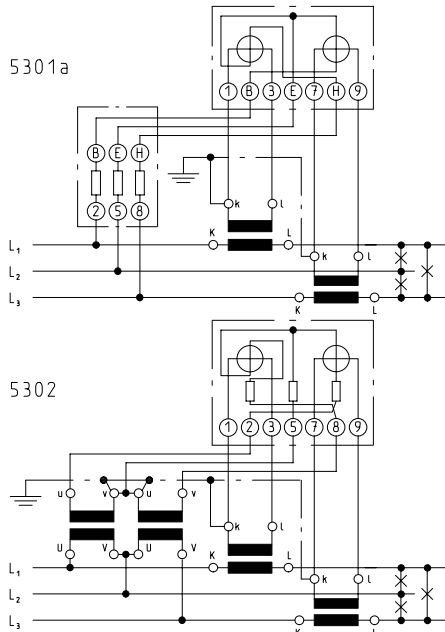
type DW 2



Double-element VAR Meter

3 phase 3 wire unbalanced load

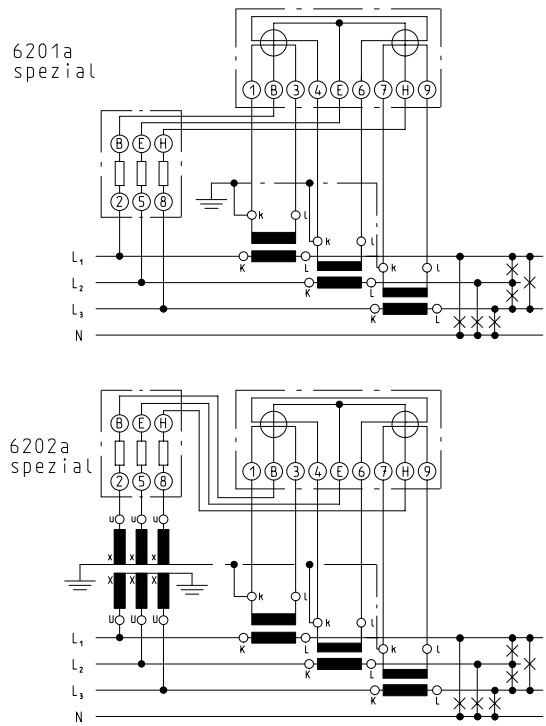
type DB 2



Triple-element Wattmeter

3 phase 4 wire unbalanced load

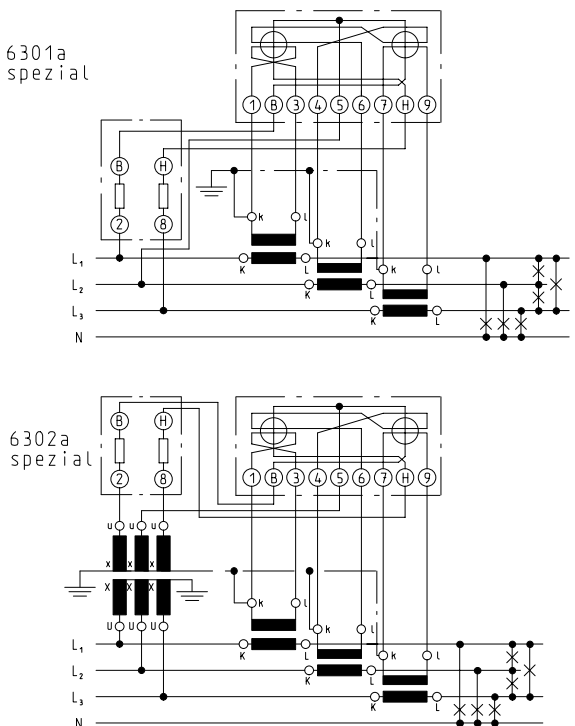
type VW 3



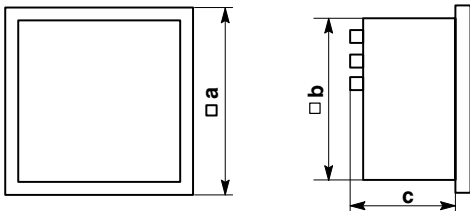
Triple-element VAR Meter

3 phase 4 wire unbalanced load

type VB 3



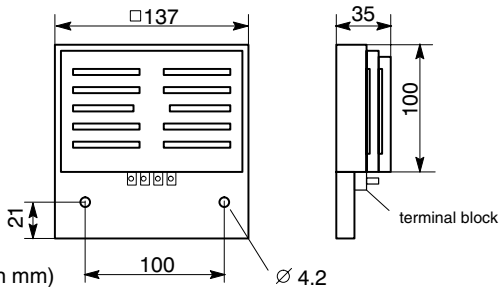
Dimensions



dimensions (in mm) **LDQ 144**

a	144
b	137
c	116

External Series Resistor Box



(scaled in mm) $\varnothing 4.2$

Ordering Information

type LDQ	Electrodynamic Watt and VAr Meters
front dimensions 144	144 mm x 144 mm
type identification	<p>active power (W, kW, MW) single phase AC 3 phase 3 wire balanced load 3 phase 4 wire balanced load 3 phase 3 wire unbalanced load 3 phase 4 wire unbalanced load</p> <p>reactive power (var, kvar, Mvar) single phase AC 3 phase 3 wire balanced load 3 phase 4 wire balanced load 3 phase 3 wire unbalanced load 3 phase 4 wire unbalanced load</p>
EW1	single phase AC
DW1	3 phase 3 wire balanced load
VW1	3 phase 4 wire balanced load
DW2	3 phase 3 wire unbalanced load
VW3	3 phase 4 wire unbalanced load
EB1	single phase AC
DB1	3 phase 3 wire balanced load
VB1	3 phase 4 wire balanced load
DB2	3 phase 3 wire unbalanced load
VB3	3 phase 4 wire unbalanced load
measuring ranges	refer to preceding table
rated voltage	refer to preceding table
rated current	1 A 5 A deviating from 1 A or 5 A (<5 A) ²⁾ >5 A up to 25 A ^{2) 3)}
2nd current range	none ¹⁾ in the ratio 1 : 2

accuracy class	1.5 ¹⁾ 1.0 with fine scale division
calibration	50 Hz ¹⁾ for a definite frequency 100 ... 400 Hz
zero position	reverse or forward power flow only ¹⁾ reverse and forward power flow ²⁾
window	glass ¹⁾ non-glaring glass
colour of bezel	black (similar to RAL 9005) ¹⁾ gray (similar to RAL 7037)
index marking pointer	none ¹⁾ red, front adjustable
position of use	vertical ¹⁾ to special order 15 ... 165° ²⁾
performance loads	shock 15 g, vibration 2.5 g ¹⁾ shock 30 g, vibration 5 g
climatic suitability	class 2, -25 ... +40°C ¹⁾ class 3, -10 ... +55°C
marine application	none ¹⁾ non-certified
enclosure code	IP 52 ¹⁾ IP 54 splash-water protected front
terminal safety protection	none ¹⁾ full-sized rear cover protective sleeves SW6 / SW10
terminals	screws and wire clamps ¹⁾ connector blades 6.3 x 0.8
dial	acc. to measuring range resp. to standard series (1-1.2-1.5-2-2.5-3-4-5-6-7.5-8) ¹⁾ blank dial scale division and figuring 0 ... 100% deviating from standard ²⁾ 2 scale divisions ²⁾ black dial, yellow scale division black dial, white scale division additional lettering "reverse power flow – – forward power flow" additional lettering to be specified ²⁾ additional figuring to be specified ²⁾ coloured marks red, green or blue ²⁾ coloured sector red, green or blue ²⁾
logo	WEIGEL ¹⁾ none OEM logo ²⁾

¹⁾ Standard

²⁾ Please clearly add the desired specifications.

³⁾ types EW/B1, DW/B1, VW/B1 only

Please state transformer ratio and appropriate connection (e.g. summation connection, delta connection) if used on transformers.

ordering example

LDQ 144 VW3 for active power, 3 phase 4 wire unbalanced load, measuring range 0 ... 200 kW, rated voltage 230/400 V_~, rated current 5 A for use on CT 400/5 A, connection diagram No. 6201a, non-glaring window, WEIGEL logo

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