



ANALOG PANEL METERS

GMW – We make your values visible

We provide our customers with our products the entire spectrum to solution all Eco-Management tasks and thus tools for sustainable use of electrical energy. As a complete provider we also realize the whole project from A to Z, the project consulting, commissioning, training and up to maintenance operations.

Basic Serie

Vario Serie

Square Panel Meters

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Analogue Panel Meters

New Safety Standards EN 61010-1:2001, CE Identification

When selling a product within the European Union the CE Identification on the product, the packaging or the instruction manual is compulsory. The CE declaration of conformity confirms compliance with European regulations (low voltage directive, EMC directive).

The CE Identification is not addressed to the consumer primarily; it is addressed to the controlling institution of the market. The requirements of the harmonisation directive are derived by the market controlling institution by using the CE identification.

Standards, that are to be used compulsorily, are mentioned in the low voltage directive 73/23 EWG:

Norm DIN EN 60051

Safety Norm EN 61010-1:2001 (VDE 0411-1:2002, IEC 61010-1:2002)

For protection against dangerous body currents, the clearance and creepage distances at the same operating voltages had to be increased in comparison to earlier standards. Thus the safety of the user is further increased.

By introducing complex changes in the former design of panel meters, in particular of analog panel meters, GMW meets the demands of EN 61010-1:2001. This development is protected by the European Patent EP1 508 786 A2.

All offered analog panel meters comply with this standard.

Category of measurement and operating voltage

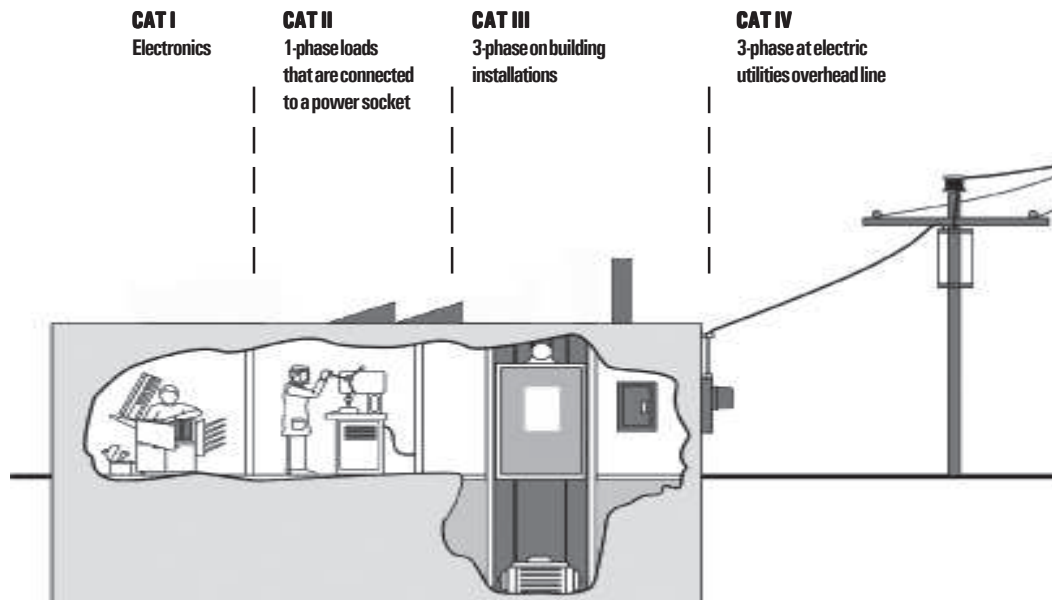
- CAT I** Measurements in circuits that are not connected directly to the mains supply (e.g. secondary site of over voltage-proof power supply units, batteries)
- CAT II** Measurements in circuits that are connected directly to a low voltage mains supply by plugs (e.g. household appliances, office machines)
- CAT III** Measurements on building installations
- CAT IV** Measurement at power sources for low voltage

Panel meters are primarily used in building installation. Therefore they are to be labelled with CAT III and the allowable operating voltage, e.g. CAT III 600V.

The operating voltage between the earth and the terminal connections of the meter is measured. Example:

A panel meter that is labelled with "CAT III 600V" can be used to measure up to 1000 V in a 3-phase system.

The maximal external conductor voltage against earth accounts for 600 V.



Analogue Panel Meters

IEC-, EN-, DIN-, VDE-Standards and Regulations for Electrical Meters

Regulations and Standards

Our meters and indicator/controllers comply with the regulations of the European Guidelines 73/23/EWG and 89/336/EWG. This is confirmed by the compliance with the following standards:

- IEC/EN 61010-1/A2, VDE 0411-1/A1 (Safety Regulations)
- IEC 60 051/EN 60 051/DIN EN 60 051 (Meters with Scale Display)
- EN 50 081-2: 1993 EMC (Emitted Interference, Industries)
- EN 50 082-2: 1995 EMC (Interference Resistance, Industries)

Given below are the most important regulations for the fabrication and the required properties of electrical meters.

Accuracy

The accuracy of a meter or an accessory is given by the limits of basic errors and influence effects.

An occurring error, when meter and/or accessories is/are operated under reference conditions (Tab. I-1 DIN EN 60 051) is referred to as intrinsic error in contrast to the influence error when the instrument is not operated under reference conditions, but within the limits of its nominal range of use (Tab. II-1 DIN EN 60 051).

Our meters and indicator/controllers correspond to class 1.5 as long as no other class is mentioned for certain types. If possible our meters can be produced for a higher class of accuracy (class 1).

The class is given on the scale, e.g.:

1.5 class sign for error in indication, expressed in percent of reference value.

The reference value corresponds to the upper measuring range value with the following exceptions:

- the sum of electrical values, that correspond to both limits of the measuring range. This applies only when both the mechanical and the electrical zero point are located within the scale range

- 90 electrical degrees for power factor meters

The reference value corresponds to:

- the sum of electrical values, that correspond to both limits of the measuring range, independent from the algebraic sign. This applies only when both the mechanical and the electrical zero point are located within the scale range;
- a quadrant with phase meters;
- the difference of resistance values of both limits of the measuring range. This applies for resistance meters with linear scales;
- the scale-length with instruments (e.g. resistance meters) with non-linear scale, that have no separate linear scales;
- the nominal value for accessories.

Scale and Pointer Types

The scales and pointers of our measuring instruments comply with DIN 43 802, part 2 through 4.

Protection per DIN VDE 0470, Part 1 (EN 60 529)

Our measuring instruments and limit transducers comply with the following protection class per DIN VDE 0470, part 1 (EN 60529), if not stated different:

IP 52 for front of housing

IP 00 for clamps

IP 10 for clamps with mounted terminal cover

Safety Regulations

Our measuring instruments comply with DIN EN 61 010-1 (IEC 1010-1) and are designed for:

- Category of Over voltage III (CAT III / CAT II)
- Pollution Degree 2
- Operating Voltage = Maximum value of nominal voltage above earth (effective value of direct voltage or alternating voltage), see table below.

Type	Nominal Voltage			
	3-Phase- 4-Wire-System	3-Phase- 3-Wire-System	Outer to Neut. Cond.	
EQB 72 EQB 72/U6 DQB 72 MQB 72 MEQB 72 DQB 72 MV FQB 72 DLQB 72	EQB 96 EQB 96/U6 DQB 96 MQB 96 MEQB 96 DLMQB 96 DQB 96 MV FQB 96 DLQB 96	600 / 1000 V	1000 V	600 V
V-AQS 72 V-PQS 72 V-MQS 72	V-AQS 96 V-PQS 96 V-MQS 96			
V-PQ 72-250 V-FZQS 72	V-PQ 96-250 V-FZQS 96 V-LM 96			
AQS 144 PQS 144 MQS 144	V-LM 96-250 V-LM 96-250 PQ 144-250			
EQB 48 DQB 48	AQS 48 W PQS 48 W V-LF 96	230 / 400 V	500 V	300 V
MQB 48 DQB 48 MV DLQB 48 FQB 48 FkN 2	V-MQS 48 V-PQ 48-250 FZQS 48 W VMAQS 72 VMAQS 96			
PF 48x24 ¹⁾ PFF 72x24 ¹⁾ PF 72x36 ²⁾ PFFN 96x24 ²⁾	PFF 00 ¹⁾ PFF 0 PFFN 96x24 M ²⁾ PFFN 96x48 M ²⁾ PFFN 96x48 M ²⁾			150 V
DPR 144 F KODPR 144 F	PF 144x72 KODPR 144 SE			

1) Operating Voltage 100 V

2) Operating Voltage 600 V

Meters with dial illumination, with prot. cur. transformer and for marine applications	}	reduced operating voltage!
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Analogue Panel Meters

Technical Description - General Overview

Vibration and Mechanical Shock Resistance

Influence factors for vibration and shock have been set forth in DIN EN 60 051. Our measuring instruments comply with these requirements and are available as follows (see respective data sheet for individual availability):

Mechanical Stress	Shock Resistance	Vibration Resistance
Standard model	15 g 11 ms	1.5 g 5 ... 55 Hz
Enhanced requirements. LN56	30 g 11 ms	2.5 g 5 ... 55 Hz
Enhanced requirements. LN55 (Vario-Series only)	50 g 11 ms	5.0 g 5 ... 55 Hz

Effects of Vibration and Shock

Unless otherwise specified, class 1 and higher measuring instruments and Accessories must withstand the following shock and vibration test, to which they are subjected during the course of type testing:

Vibration Test

Vibration testing must be performed with the following specifications:

- Sweep frequency range:
10 Hz – 55 Hz – 10 Hz
- Wave amplitude: 0.15 mm
(corresponds to 1.5 g at 50 Hz)
- Number of sweep cycles: 5
- Sweep velocity:
1 octave per minute

The vibration plane is vertical and the measuring instrument is mounted to the vibration table in its usual operating position.

Shock Test

The shock test must be performed with the following specifications:

- Peak acceleration:
 - a) 147 m/s² (15 g)
 - b) 490 m/s² (50 g)
- No further explanation is required for peak acceleration value a). The manufacturer must indicate a peak acceleration value of 490 m/s² for value b).
- Waveshape: semi-sinusoidal
- Number of shocks: 3 shocks each in both directions for 3 mutually perpendicular axes (a total of 18 shocks)
- Shock duration: 11 ms

The measuring instrument must be secured such that one of the three axes corresponds to the direction of motion of the rotational axis of the measuring mechanism. After completion of this test, an additional measuring error of 100% of the error class rating may not be exceeded.

Scale and Pointer Types

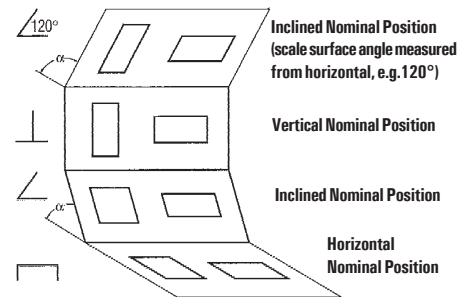
Scale and pointer types for quadrant and circular scales are defined in DIN 43 802, parts 2 through 4 (as of size 48 x 48 mm), as well as for horizontal and vertical scales (as of size 48 x 24 mm).

Our square and rectangular panel meters with edgewise scale are in compliance with these standards.

Reference Values and Influence Error

Position of Use

The nominal position of use is generally indicated with a positioning mark. The reference range includes every position between the horizontal and vertical for instruments which do not include a positioning mark. The nominal range of use includes all positions within 5° in any direction from the reference position and influence error (in addition to indication error) may not exceed 50% of the corresponding class rating.



Specification of a Nominal Position
Range also possible, e.g. Horizontal to Vertical Nominal Position

Operating Temperature Range

Unless otherwise specified, class 0.5 through class 5 instruments must be operated at an ambient temperature within a range of -25 to +40 °C in order to prevent permanent damage during continuous operation.

Range for storage temperature: -25 ... +55 °C

Ambient Temperature Sensitivity

Unless otherwise specified, the reference temperature for class 0.5 through class 5 instruments is 23 °C ± 2 °C.

The nominal range of use is equal to reference temperature ± 10 °C. Additional error within this temperature range may not be exceed the error class rating.

Climate-Proof Measuring Instruments

In their "tropic resistant" versions, our measuring instruments are specially well suited for:

- Moisture endangered areas in the temperate zones
- Indoor use in dry tropics
- Indoor use in the wet tropics, during which condensation or seepage water, which may be caused by air-conditioning, must be avoided

Range of Application (Climatic Demands)

Climatic Demands	standard	tropic resistant
Operating Temperature	-25 °C ... +40 °C	-25 °C ... +55 °C
Relative Humidity: annual mean 30 days per year remaining days	≤ 65% (at 21 °C) ≤ 85% (at 25 °C) ≤ 75% (at 23 °C)	≤ 75% (at 21 °C) ≤ 95% (at 25 °C) ≤ 85% (at 23 °C)
Condensation	none	none

- **Worldwide sales and service**

- **All panel meters can be supplied ex stock¹⁾**
Shunt resistors without protective cover (nominal current up to 1.5 kA)
ASK 31.3 / ASK 412.4 current transformers (Class 1. 50-60 Hz)
¹⁾ "Conditions of delivery for manufactures and performances of electrical industry" are applied

- **Moving-iron panel meters: lower measuring range value equal to 20% of upper measuring range value**

- **Power meters, power factor meters and frequency meters include built in electronic converters**
Allows for precise power measurement even for 3-phase four-wire systems with unbalanced load

- **Interchangeable scales for all panel meters**
Scale replacement is quick and simple with no loss of accuracy

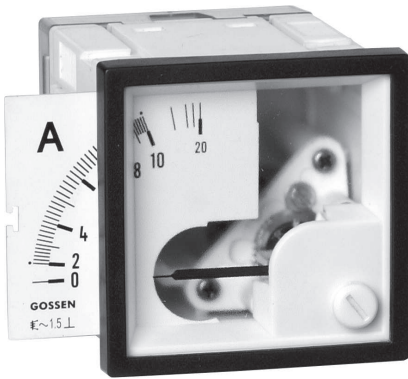
- **Interchangeable front frame and windows for all panel meters**

- **Anti-glare glass and terminal cover is included as standard equipment with all panel meters**
Back of hand and finger contact safety in accordance with BGV A3

- **Screw terminals with self-lifting terminal clips for all panel meters –**
Screws can be turned with cross-head or standard screw drivers

Basic Series • Square Panel Meters

Technical Description



Square panel meters per DIN 43 700 with quadrant scale, matt black or matt gray (RAL 7037) front frame per DIN 43 718

Available Models:

Front Dimensions	48 x 48	72 x 72	96 x 96
		see page	
Moving-iron panel meters	10	10	10
Bimetal-ammeters	12	12	12
Moving-iron bimetal ammeters	–	14	14
Moving coil panel meters for DC	16	16	16
Power meters	20	20	18
Power factor meters	–	–	22
Pointer-type frequency meters	–	24	24

Interchangeable Scale

Scale replacement is quick and simple with no loss of accuracy. The permanently affixed closure flap need to be opened, and the scale can be pulled out and removed.

Terminal Connection

M4 screw terminals with self-lifting terminal clips simplify clamping of connector wires. Terminal screws can be turned with cross-head or with standard screw drivers.

Housing

The rugged polycarbonate housing is self-extinguishing and drip-proof per UL94V-0.

Window material: anti-glare silicate glass.

Front frame and window can be easily replaced.

Mounting

All mounting fasteners are resistant to excessive vibration and shock.

Safety Precautions

- ⇒ Instruments with damaged front frame or window must be disconnected from the mains.
- ⇒ Adequate safety clearance must be maintained to control panel fasteners and to sheet metal housings if non-insulated (stripped) connector wires are used.
- ⇒ The terminal block cover must be snapped into place after the connector wires have been clamped in order to assure back of hand and finger contact safety in accordance with BGV A3.
- ⇒ Scale may only be replaced under voltage-free conditions.
- ⇒ Front frames and windows may only be replaced under voltage-free conditions.

Basic Series • Square Panel Meters

Technical Description - Measuring Systems

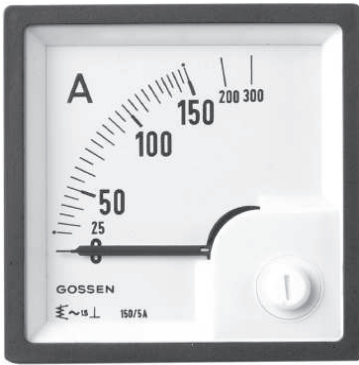
	Moving-Coil Movement	Moving-Iron Movement	Bimetal Movement
Application	Measurement of direct current or direct voltage Precision measurement of average value Power and power factor $\cos \phi$	Measurement of alternating current or alternating voltage True RMS measurement	Measurement of alternating current and direct current True RMS measurement The integrated slave pointer indicates the highest attained value
Bearings	Rugged pivot bearings with spring-loaded jewels	Rugged pivot bearings with spring-loaded jewels	Rugged bronze bearings
Damping • Overshoot • Response Time	Eddy-current damping $\leq 15\%$ of scale length ≤ 1 s per DIN EN 60 051-1	Viscous damping $\leq 15\%$ of scale length ≤ 2 s per DIN EN 60 051-1	Thermal, time-delayed, for display of mean effective value 15 min.. alternatively 8 min.
Reference Conditions • Frequency	45 Hz ... 65 Hz	45 Hz ... 65 Hz	45 Hz ... 65 Hz
Nominal Range of Use • Frequency		Ammeter: 45 Hz ... 65 Hz Voltmeter: 45 Hz ... 65 Hz	≤ 400 Hz
Scale Characteristics	nearly linear	Lower measuring range value is approx. 20% of upper measuring range value. Ammeters with double overload scale	
Measuring Range	see technical data	see technical data	see technical data
Overload Capacity • Continuous • Short Term: Current Measurement Voltage Measurement	1.2 x rated value 10 x rated value, 1 s $2 \times U_N, 5$ s	1.2 x rated value $10 \times I_N, 1$ s ($I_{max} = 50$ A) $2 \times U_N, 5$ s	1.2 x rated value $10 \times I_N, 1$ s ($I_{max} = 50$ A)
Connection	Screws M5 ¹⁾ Bolt M6 if measuring input > 15 A and ≤ 40 A	Screws M5 ¹⁾ Bolt M6 if measuring input > 15 A and ≤ 40 A Bolt M8 if measuring input > 40 A and ≤ 60 A	Screws M5 ¹⁾
Power Consumption	see technical data	Ammeters: approx. 0.65 VA (5 A) Voltmeters: approx. 2.5 VA (250 V)	1 A : ≤ 1.5 VA 5 A : ≤ 2.5 VA

1) M4 at casing 48x48 mm

See individual technical data for technical description of frequency meters, active and reactive power meters and power factor meters

Basic Series • Square Panel Meters

For Alternating Current or Voltage 45 ... 50 ... 60 ... 65 Hz



EQB 72

Description

Analog Panel Meter with Moving-Iron Movement and Spring-Loaded Pivot Bearings

Display

Scale Division Coarse-fine

Pointer Knife-edge pointer per DIN

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL94V-0

Mounting Fasteners Screw Clamp

Scale Interchangeable scales
⇒ Scales may only be replaced under voltage-free conditions!

Replaceable Front frames and glass windows
⇒ Scales may only be replaced under voltage-free conditions!

Terminals M4 screw terminals with self-lifting terminal clips. Screws can be turned with cross-head or standard screw drivers.
Bolt M6 if measuring input > 15 A and ≤ 40 A
Bolt M8 if measuring input > 40 A and ≤ 60 A

Contact Protection Finger-safe terminal cover included

Moving-Iron Movement, 90° scale white, imprint black
Narrow front frame matt black per DIN 43 718, anti-glare glass

Front Dimensions mm Type	48 x 48 EQB 48	72 x 72 EQB 72	96 x 96 EQB 96
Scale length mm	42	63	97
Accuracy Class	1.5	1.5	1.5
Max. Weight (Standard Model)	0.1 kg	0.2 kg	0.25 kg
Max. Operating Voltage	300 V	600 V	600 V
Test Voltage	3.5 kV	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 52	IP 52	IP 52

Power Consumption

Connection	Measuring Input	Power Consumption
direct	Current	approx. 0.6 VA
direct	Current	≥ 15 A
to transformer	Current	sec.: 1 A or 5 A
		approx. 0.8 VA
		approx. 0.6 VA
direct	Voltage	approx. 2.5 VA
to transformer	Voltage	10 V ... 600 V
		sec.: 100 V or 110 V
		approx. 2.5 VA

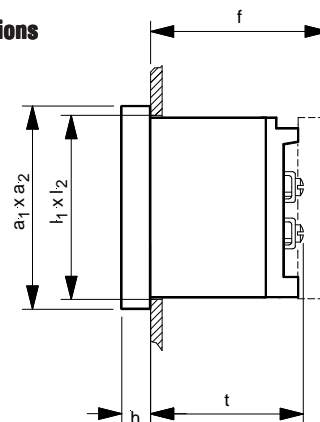
Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23°C ± 2°C
Position of Use	control panel vertical ± 1°
Frequency	45 ... 65 Hz
Other	DIN EN 60051

Nominal Range of Use Limits

Frequency	for alternating Current 45 ... 65 Hz for alternating Voltage 45 ... 65 Hz
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Basic Dimensions



Front in mm	Nominal Dimensions		Cutout Dimensions, mm l ₁ x l ₂	Installation Depth Including Terminals (t), mm M4	Installation Depth Including Full Cover (f), mm
	a ₁ x a ₂	h			
48 x 48	48 x 48	5.5	45 ^{+0.6} x 45 ^{+0.6}	53	66
72 x 72	72 x 72	5.5	68 ^{+0.7} x 68 ^{+0.7}	53	66
96 x 96	96 x 96	5.5	92 ^{+0.8} x 92 ^{+0.8}	53	66

Basic Series • Square Panel Meters

For Alternating Current or Voltage 45 ... 50 ... 60 ... 65 Hz



Moving-iron movement, 90° scale white, imprint black
Narrow front frame matt black per DIN 43 718, anti-glare glass

Range	Scale ¹⁾	Type Order No.	EQB 48 ↓	EQB 72 ↓	EQB 96 ↓
1.5 / 3 A	1.5 / 3 A		48015 30000 B	72015 30000 B	96015 30000 B
2.5 / 5 A	2.5 / 5 A		48025 50000 B	72025 50000 B	—
4 / 8 A	4 / 8 A		48048 00000 B	72048 00000 B	—
6 / 12 A	6 / 12 A		48612 00000 B	72612 00000 B	96612 00000 B
10 / 20 A	10 / 20 A		48102 00000 B	72102 00000 B	96102 00000 B
15 / 30 A	15 / 30 A		48153 00000 B	72153 00000 B	96153 00000 B
20 / 40 A	20 / 40 A		—	72204 00000 B	—
25 / 50 A	25 / 50 A		48255 00000 B	72255 00000 B	96255 00000 B
30 / 60 A	30 / 60 A		—	72306 00000 B	—
40 / 80 A	40 / 80 A		—	72408 00000 B	96408 00000 B
50 / 100 A	50 / 100 A		—	72501 00000 B	—
60 / 120 A	60 / 120 A		—	72601 20000 B	96601 20000 B
1 / 2 A	0 – 50 / 100 A		48125 01000 B	72120 50100 B	96120 50100 B
1 / 2 A	0 – 60 / 120 A		48126 01200 B	72120 60120 B	96120 60120 B
1 / 2 A	0 – 100 / 200 A		48121 00200 B	72120 10020 B	96120 10020 B
1 / 2 A	0 – 150 / 300 A		48121 50300 B	72120 15030 B	96120 15030 B
1 / 2 A	0 – 200 / 400 A		48122 00400 B	72120 20040 B	96120 20040 B
1 / 2 A	0 – 250 / 500 A		48122 50500 B	72120 25050 B	96120 25050 B
1 / 2 A	0 – 400 / 800 A		48124 00800 B	72120 40080 B	96120 40080 B
1 / 2 A	0 – 600 / 1200 A		48126 00120 B	72120 60012 B	96120 60012 B
1 / 2 A	0 – 800 / 1600 A		48128 00160 B	72120 80016 B	96120 80016 B
1 / 2 A	0 – 1000 / 2000 A		48121 00020 B	72120 10002 B	96120 10002 B
1 / 2 A	0 – 1200 / 2400 A		48121 20024 B	72120 12002 B	96120 12002 B
1 / 2 A	0 – 1500 / 3000 A		48121 50030 B	72120 15003 B	96120 15003 B
1 / 2 A	0 – 2000 / 4000 A		48122 00040 B	72120 20004 B	96120 20004 B
5 / 10 A	0 – 50 / 100 A		48510 50100 B	72510 50100 B	96510 50100 B
5 / 10 A	0 – 60 / 120 A		48510 60120 B	72510 60120 B	96510 60120 B
5 / 10 A	0 – 100 / 200 A		48510 10020 B	72510 10020 B	96510 10020 B
5 / 10 A	0 – 150 / 300 A		48510 15030 B	72510 15030 B	96510 15030 B
5 / 10 A	0 – 200 / 400 A		48510 20040 B	72510 20040 B	96510 20040 B
5 / 10 A	0 – 250 / 500 A		48510 25050 B	72510 25050 B	96510 25050 B
5 / 10 A	0 – 400 / 800 A		48510 40080 B	72510 40080 B	96510 40080 B
5 / 10 A	0 – 600 / 1200 A		48510 60012 B	72510 60012 B	96510 60012 B
5 / 10 A	0 – 800 / 1600 A		48510 80016 B	72510 80016 B	96510 80016 B
5 / 10 A	0 – 1000 / 2000 A		48510 10002 B	72510 10002 B	96510 10002 B
5 / 10 A	0 – 1200 / 2400 A		48510 12002 B	72510 12002 B	96510 12002 B
5 / 10 A	0 – 1500 / 3000 A		48510 15003 B	72510 15003 B	96510 15003 B
5 / 10 A	0 – 2000 / 4000 A		48510 20004 B	72510 20004 B	96510 20004 B
10 V	10 V		—	72000 00010 B	96000 00010 B
60 V	60 V		—	72000 00060 B	96000 00060 B
100 V	100 V		48000 00100 B	72000 00100 B	96100 00000 B
120 V	120 V		—	72120 00000 B	96120 00000 B
150 V	150 V		48150 00000 B	—	—
250 V	250 V		48250 00000 B	72250 00000 B	96250 00000 B
300 V	300 V		—	—	96300 00000 B
500 V	500 V		48500 00000 B	72500 00000 B	96500 00000 B
600 V	600 V		—	72600 00000 B	96600 00000 B
750 V	750 V		—	—	96750 00000 B

1) Specify unlisted scales in clear text

2) max. operating voltage to earth fault 300 V without charges available:

EQB 72 range 5 / 30 A (6-fold overload)

EQB 96 range 1 / 1,2 A (1,2-fold overload)

EQB 96 range 5 A (no overload)

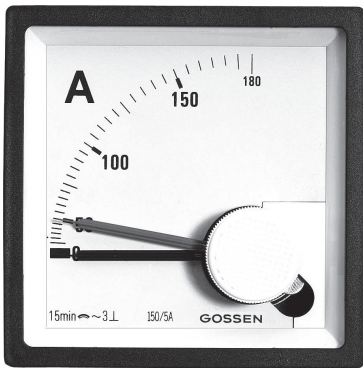
EQB 96 range 5 / 6 A (1,2-fold overload)

EQB 96 range 5 / 15 A (3-fold overload)

EQB 96 range 5 / 30 A (6-fold overload)

Basic Series • Square Panel Meters

For Alternating Current



MQB 72

Bimetal-movement, 90° scale white, imprint black
Narrow front frame matt black per DIN 43 718, anti-glare glass

Front Dimensions mm Type	48 x 48 MQB 48	72 x 72 MQB 72	96 x 96 MQB 96
Scale Length mm	42	63	97
Accuracy Class	3	3	3
Max. Weight (standrad model)	0.1 kg	0.2 kg	0.25 kg
Max. Operating Voltage	300 V	600 V	600 V
Test Voltage	3.5 kV	5.8 kV	5.8 kV
Front Housing Panel Protection	IP 52	IP 52	IP 52

Description

Analog Panel Meter with Bimetal Movement

Display

Scale Division Coarse-fine

Pointer Beam pointer with knife-edge
 Red slave pointer for display of maximum value
 Reset button for slave pointer can be locked

Mechanical Design

Housing Material Polycarbonate, self extinguishing and drip-proof per UL94V-0

Mounting Fasteners Screw Clamp

Scale Interchangeable Scales
 ⇒ Scales may only be replaced under voltage-free conditions!

Replaceable Front frames and glass windows
 ⇒ May only be replaced under voltage-free conditions!

Terminals M5 screw terminals with self-lifting terminal clips.
 Screws can be turned with cross-head or standard screw drivers.

Contact Protection Finger-safe terminal cover included

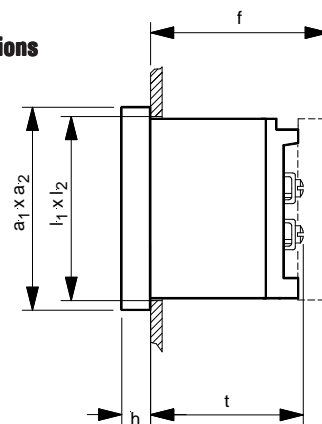
Power Consumption

Connection	Measuring Input		Power Consumption
to transformer	Current	sec.: 1 A or 5 A	approx. 2.2 VA

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23°C ± 2°C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60051

Basic Dimensions



Front in mm	Nominal Dimensions		Cutout Dimensions, mm l ₁ x l ₂	Installation Depth Including Terminals (t), mm M4	Installation Depth Including Full Cover (f), mm
	a ₁ x a ₂	h			
48 x 48	48 x 48	5.5	45 ^{+0.6} x 45 ^{+0.6}	53	66
72 x 72	72 x 72	5.5	68 ^{+0.7} x 68 ^{+0.7}	53	66
96 x 96	96 x 96	5.5	92 ^{+0.8} x 92 ^{+0.8}	53	66

Basic Series • Square Panel Meters

For Alternating Current



Bimetal-movement, 90° scale white, imprint black
Narrow front frame matt black per DIN 43 718, anti-glare glass

Range	Scale ¹⁾	Type Order No.	MQB 48 ↓	MQB 72 ↓	MQB 96 ↓
5 / 6 A, 8 or 15 min.	0 – 50 / 60 A				
5 / 6 A, 8 or 15 min.	0 – 60 / 72 A				
5 / 6 A, 8 or 15 min.	0 – 100 / 120 A				
5 / 6 A, 8 or 15 min.	0 – 150 / 180 A				
5 / 6 A, 8 or 15 min.	0 – 200 / 240 A				
5 / 6 A, 8 or 15 min.	0 – 250 / 300 A				
5 / 6 A, 8 or 15 min.	0 – 400 / 480 A				
5 / 6 A, 8 or 15 min.	0 – 600 / 720 A				
5 / 6 A, 8 or 15 min.	0 – 800 / 960 A				
5 / 6 A, 8 or 15 min.	0 – 1000 / 1200 A				
5 / 6 A, 8 or 15 min.	0 – 1200 / 1440 A				
5 / 6 A, 8 or 15 min.	0 – 1500 / 1800 A				
1 / 1.2 A, 8 or 15 min.	0 – 50 / 60 A				
1 / 1.2 A, 8 or 15 min.	0 – 60 / 72 A				
1 / 1.2 A, 8 or 15 min.	0 – 100 / 120 A				
1 / 1.2 A, 8 or 15 min.	0 – 150 / 180 A				
1 / 1.2 A, 8 or 15 min.	0 – 200 / 240 A				
1 / 1.2 A, 8 or 15 min.	0 – 250 / 300 A				
1 / 1.2 A, 8 or 15 min.	0 – 400 / 480 A				
1 / 1.2 A, 8 or 15 min.	0 – 600 / 720 A				
1 / 1.2 A, 8 or 15 min.	0 – 800 / 960 A				
1 / 1.2 A, 8 or 15 min.	0 – 1000 / 1200 A				
1 / 1.2 A, 8 or 15 min.	0 – 1200 / 1440 A				
1 / 1.2 A, 8 or 15 min.	0 – 1500 / 1800 A				

All panel meters available with the following configurations:
 Front Dimensions: 48 x 48, 72 x 72, 96 x 96
 Connected to 1 / 1.2 A or 5 / 6 A transformer
 Response Time: 8 min. or 15 min.
 Scale as requested

Please note ordering example below:

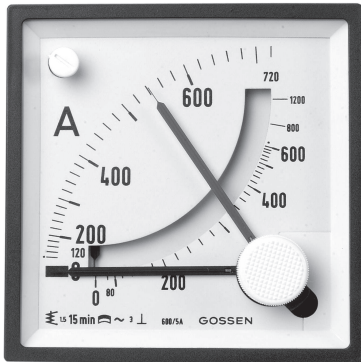
1) Specify unlisted scales in clear text

Ordering Example:

Type MQB 96	Text for purchase order: Range 5 / 6 A, Scale 0 – 100 / 120 A, 15 min.
------------------------------	---

Basic Series • Square Panel Meters

For Alternating Current



MEQB 96

Moving-iron bimetal movement, 90° scale white, imprint black
Narrow front frame matt black per DIN 43 718, anti-glare glass

Front Dimensions mm		72 x 72	96 x 96
Type		MEQB 72	MEQB 96
Scale Length mm	Moving-Iron Movement	63	97
	Bimetal-Movement	42	72
Accuracy Class	Moving-Iron / Bimetal Movement	1.5 / 3	1.5 / 3
Max. Weight (standard model)		0.2 kg	0.29 kg
Max. Operating Voltage		600 V	600 V
Test Voltage		5.8 kV	5.8 kV
Front Housing-Panel Protection		IP 52	IP 52

Description

Analog Panel Meter with Moving-Iron and Bimetal Movements

Display

Scale Division Coarse-fine

Pointer Beam pointer with knife-edge
 Red slave pointer for display of maximum value
 Reset button for slave pointer can be locked

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL94V-0

Mounting Fasteners Screw Clamp

Scale Interchangeable scales
 ⇒ Scales may only be replaced under voltage-free conditions!

Replaceable Front frames and glass windows
 ⇒ May only be replaced under voltage-free conditions!

Terminals M4 screw terminals with self lifting terminal clips.
 Screws can be turned with cross-head or standard screw drivers.

Contact Protection Finger-safe terminal cover included

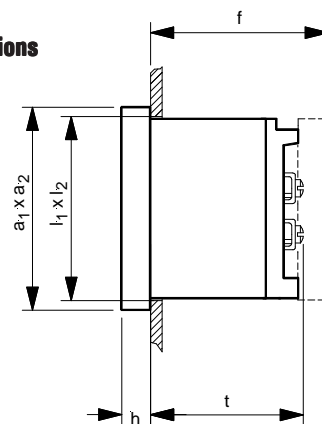
Power Consumption

Connection	Measuring input		Power Consumption
to transformer	Current	sec.: 1 A or 5 A	approx. 2.6 VA

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23°C ± 2°C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60051

Basic Dimensions



Front in mm	Nominal Dimensions		Cutout Dimensions, mm l ₁ x l ₂	Installation Depth Including Terminals (t), mmM4	Installation Depth Including Full Cover (f), mm
	a ₁ x a ₂	h			
72 x 72	72 x 72	5.5	68 ^{+0.7} x 68 ^{+0.7}	53	66
96 x 96	96 x 96	5.5	92 ^{+0.8} x 92 ^{+0.8}	53	66

Basic Series • Square Panel Meters

For Alternating Current



Moving-iron bimetal movement, 90° scale white, imprint black
Narrow front frame matt black per DIN 43 718, anti-glare glass

Range	Scale ¹⁾	Type Order No.	MEQB 72 ↓	MEQB 96 ↓
5 / 6 A, 8 or 15 min.	0 – 50 / 60 A			
5 / 6 A, 8 or 15 min.	0 – 60 / 72 A			
5 / 6 A, 8 or 15 min.	0 – 100 / 120 A			
5 / 6 A, 8 or 15 min.	0 – 150 / 180 A			
5 / 6 A, 8 or 15 min.	0 – 200 / 240 A			
5 / 6 A, 8 or 15 min.	0 – 250 / 300 A			
5 / 6 A, 8 or 15 min.	0 – 400 / 480 A			
5 / 6 A, 8 or 15 min.	0 – 600 / 720 A			
5 / 6 A, 8 or 15 min.	0 – 800 / 960 A			
5 / 6 A, 8 or 15 min.	0 – 1000 / 1200 A			
5 / 6 A, 8 or 15 min.	0 – 1200 / 1440 A			
5 / 6 A, 8 or 15 min.	0 – 1500 / 1800 A			
1 / 1.2 A, 8 or 15 min.	0 – 100 / 120 A			
1 / 1.2 A, 8 or 15 min.	0 – 150 / 180 A			
1 / 1.2 A, 8 or 15 min.	0 – 200 / 240 A			
1 / 1.2 A, 8 or 15 min.	0 – 250 / 300 A			
1 / 1.2 A, 8 or 15 min.	0 – 400 / 480 A			
1 / 1.2 A, 8 or 15 min.	0 – 600 / 720 A			
1 / 1.2 A, 8 or 15 min.	0 – 1000 / 1200 A			

All panel meters available with the following configurations:
 Front Dimensions: 72 x 72, 96 x 96
 Connected to 1 / 1.2 A or 5 / 6 A transformer
 Response Time: 8 min. or 15 min.
 Scale as requested

Please note ordering example below:

1) Specify unlied scales in clear text

Ordering Example:

Type MEQB 72	Text for purchase order Range 5 / 6 A, Scale 0 – 800 / 960 A, 15 min.
------------------------	---

Basic Series • Square Panel Meters

For Direct Current or Direct Voltage



DQB 96

Description

Analog Panel Meter with Core-Magnet Moving-Coil Movement and Spring-Loaded Pivot Bearings

Display

Scale Division Coarse-fine

Pointer Beam pointer with knife-edge

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL94V-0

Mounting Fasteners Screw Clamp

Scale Interchangeable Scales
⇒ Scales may only be replaced under voltage-free conditions!

Replaceable Front frames and glass windows
⇒ May only be replaced under voltage-free conditions!

Terminals M4 screw terminals with self-lifting terminal clips.
Screws can be turned with a cross-head or standard screw drivers.
Bolt M6 if Measuring input > 15 A and ≤ 40 A

Contact Protection Finger-safe terminal cover included

Moving-coil movement, 90° scale white, imprint black
Narrow front frame per DIN 43 718, anti-glare glass

Front Dimensions mm Type	48 x 48 DQB 48	72 x 72 DQB 72	96 x 96 DQB 96
Scale Length mm	42	63	97
Accuracy Class	1.5	1.5	1.5
Max. Weight (standard model)	0.1 kg	0.2 kg	0.25 kg
Max. Operating Voltage	300 V	600 V	600 V
Test Voltage	3.5 kV	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 52	IP 52	IP 52

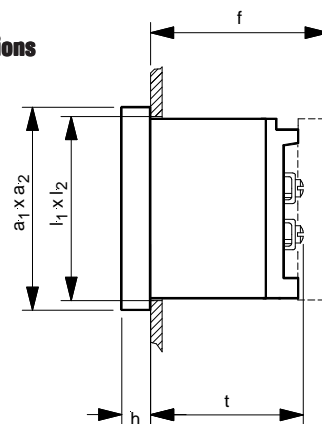
Internal Resistance / Voltage Drop / Power Consumption

Measuring Input	Ri			Tolerance
	DQB 48	DQB 72	DQB 96	
1 mA	250 Ω	150 Ω	150 Ω	± 10 %
20 mA	2 Ω	1.5 Ω	1.5 Ω	± 10 %
4 ... 20 mA	180 Ω ... 60 Ω			
Connection to shunt	Power consumption approx. 7 mA Lead resistance 0.06 Ω (calibrated)			± 10 % ± 10 %
1 A ... 60 A	Voltage Drop approx. 60 mV			± 10 %
≥ 1 V	approx. 1000 Ω/V			± 10 %

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23°C ± 2°C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60051

Basic Dimensions



Front in mm	Nominal Dimensions		Cutout Dimensions, mm l ₁ x l ₂	Installation Depth Including Terminals (t), mmM4	Installation Depth Including Full Covers (f), mm
	a ₁ x a ₂	h			
48 x 48	48 x 48	5.5	45 ^{+0.6} x 45 ^{+0.6}	53	66
72 x 72	72 x 72	5.5	68 ^{+0.7} x 68 ^{+0.7}	53	66
96 x 96	96 x 96	5.5	92 ^{+0.8} x 92 ^{+0.8}	53	66

Basic Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 90° scale white, imprint black
Narrow front frame per DIN 43 718, anti-glare glass

Range	Scale ¹⁾	Type Order No.	DQB 48 ↓	DQB 72 ↓	DQB 96 ↓
1 mA	0 – 100 % ²⁾		48010 00000 B	72010 00000 B	96010 00000 B
1 – 0 – 1 mA	100 – 0 – 100 % ²⁾		48101 00000 B	72101 00000 B	96101 00000 B
20 mA	0 – 100 % ²⁾		48200 00000 B	72002 00100 B	96002 00100 B
0/4 – 20 mA	0 – 100 % ²⁾		48420 00000 B	72420 00000 B	96420 00000 B
15 A	15 A		–	72015 00000 B	96015 00000 B
25 A	25 A		–	72025 00000 B	96025 00000 B
40 A	40 A		–	72040 00000 B	96040 00000 B
Connection to shunt ... A/60 mV ³⁾					
60 mV	0 – 10 A		48006 00010 B	72006 00010 B	96006 00010 B
60 mV	0 – 15 A		48006 00015 B	72006 00015 B	96006 00015 B
60 mV	0 – 25 A		48006 00025 B	72006 00025 B	96006 00025 B
60 mV	0 – 40 A		48006 00040 B	72006 00040 B	96006 00040 B
60 mV	0 – 60 A		48006 00060 B	72006 00060 B	96006 00060 B
60 mV	0 – 100 A		48006 00100 B	72006 00100 B	96006 00100 B
60 mV	0 – 150 A		48006 00150 B	72006 00150 B	96006 00150 B
60 mV	0 – 200 A		48006 00200 B	72006 00200 B	96006 00200 B
60 mV	0 – 250 A		48006 00250 B	72006 00250 B	96006 00250 B
60 mV	0 – 400 A		48006 00400 B	72006 00400 B	96006 00400 B
60 mV	0 – 600 A		48006 00600 B	72006 00600 B	96006 00600 B
60 mV	0 – 1000 A		48006 01000 B	72006 01000 B	96006 01000 B
60 mV	0 – 1200 A		48006 01200 B	72006 01200 B	96006 01200 B
60 – 0 – 60 mV	60 – 0 – 60 A		48600 60600 B	72600 60600 B	96600 60600 B
60 – 0 – 60 mV	100 – 0 – 100 A		48600 60100 B	72600 60100 B	96600 60100 B
10 V	10 V		48101 01010 B	72001 00000 B	96001 00000 B
25 V	25 V		48252 52525 B	72002 50000 B	96002 50000 B
40 V	40 V		48404 04040 B	72004 00000 B	96004 00000 B
60 V	60 V		48606 06060 B	72006 00000 B	96006 00000 B
500 V	500 V		–	72050 00000 B	96050 00000 B

1) Specify unlisted scales in clear text

2) Scales with special design available for an extra charge

3) Connection to shunt ... A/150 mV with measuring range 150 mV or 150 - 0 - 150 mV also available (plus extra charge for special measuring range);
 Specify in clear text in order designation

Basic Series • Square Panel Meters

For Direct Current or Direct Voltage



DQB 96-250

Description

Analog Panel Meter with Core-Magnet Moving-Coil Movement and Spring-Loaded Pivot Bearings

Display

Scale Division Coarse-fine

Pointer Beam pointer with knife-edge

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL94V-0

Mounting Fasteners Screw Clamp

Scale Interchangeable Scales
⇒ Scales may only be replaced under voltage-free conditions!

Replaceable Front frames and glass windows
⇒ May only be replaced under voltage-free conditions!

Terminals M4 screw terminals with self-lifting terminal clips. Screws can be turned with a cross-head or standard screw drivers.

Contact Protection Finger-safe terminal cover included

Moving-coil movement, 250° scale white, imprint black
Narrow front frame per DIN 43 718, anti-glare glass

Front Dimensions mm	72 x 72	96 x 96
Type	DQB 72-250	DQB 96-250
Scale Length mm	107	153
Accuracy Class	1.5	1.5
Max. Weight (standard model)	0.2 kg	0.25 kg
Max. Operating Voltage	600 V	600 V
Test Voltage	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 52	IP 52

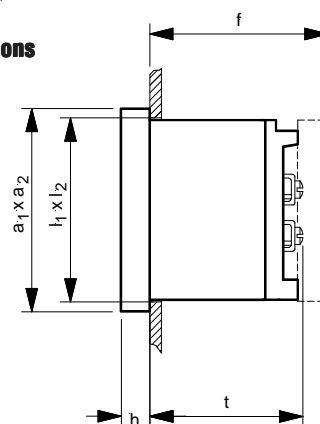
Internal Resistance / Voltage Drop / Power Consumption

Measuring Input	R _i		Tolerance
	DQB 72-250	DQB 96-250	
1 mA	550 Ω	550 Ω	± 20 %
20 mA	3.25 Ω	3.25 Ω	± 20 %
4 ... 20 mA	180 Ω ... 60 Ω		± 20 %
Connection to shunt ≥ 10 A, 60mV	Power consumption approx. 10 mA Lead resistance 0.06 Ω (calibrated)		± 10 %
≥ 4 V	approx. 1000 Ω/V		± 10 %

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23°C ± 2°C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60051

Basic Dimensions



Front in mm	Nominal Dimensions		Cutout Dimensions, mm l ₁ x l ₂	Installation Depth Including Terminals (t), mmM4	Installation Depth Including Full Covers (f), mm
	a ₁ x a ₂	h			
72 x 72	72 x 72	5.5	68 ^{+0.7} x 68 ^{+0.7}	53	66
96 x 96	96 x 96	5.5	92 ^{+0.8} x 92 ^{+0.8}	53	66

Basic Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 250° scale white, imprint black
Narrow front frame per DIN 43 718, anti-glare glass

Range	Scale ¹⁾	Type Order No.	DQB 72-250 ↓	DQB 96-250 ↓
1 mA	0 – 100 % ²⁾		72250 11007 B	96250 11009 B
1 – 0 – 1 mA	100 – 0 – 100 % ²⁾		72250 10110 B	96250 10110 B
20 mA	0 – 100 % ²⁾		72250 20100 B	96250 20100 B
0/4 – 20 mA	0 – 100 % ²⁾		72250 42010 B	96250 42010 B
Connection to shunt ... A/60 mV ¹⁾				
60 mV	0 – 100 A		72250 60100 B	96250 60100 B
10 V ³⁾	10 V		72250 10107 B	96250 10109 B
10 - 0 - 10 V ³⁾	10 - 0 - 10 V		72250 10010 B	96250 10010 B

1) Specify unlisted scales in clear text

2) Scales with special design available for an extra charge

3) Voltmeters also deliverable:

- With range from 0 - 4 V up to 0 - 600 V (additional charge)

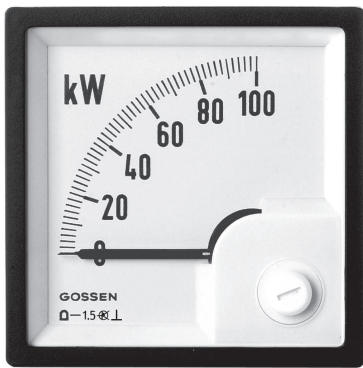
- Zero point at center (additional charge)

- Scale with special design (additional charge)

Specify in clear text in order designation

Basic Series • Square Panel Meters

For Active Power or Reactive Power



DLMQB 96

Description

Analog panel meter with core-magnet moving-coil movement and built in power converter for active and reactive power. Depending upon type of system and power, the power converter consists of one, two or three multipliers. The multipliers function in accordance with the TDM process (time division multiplier). The output signals from the multipliers are added and fed to the moving coil mechanism.

Display

Scale Division Coarse-fine

Pointer Beam pointer with edge-knife

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL94V-0

Mounting Fasteners Screw Clamp

Scale Interchangeable Scales
⇒ Scales may only be replaced under voltage-free conditions!

Replaceable Front frames and glass windows
⇒ May only be replaced under voltage-free conditions

Terminals M4 screw terminals with self-lifting terminal clips. Screws can be turned with a cross-head or standard screw drivers.

Contact Protection Finger-safe terminal cover included

Moving-coil movement, 90° scale white, imprint black
Narrow front frame matt black per DIN 43718, anti-glare glass

Front Dimensions mm Type	96 x 96 DLMQB 96
Scale Length mm Accuracy Class Max. Weight (standard model) Max. Operating Voltage Test Voltage Front Housing-Panel Protection Input Meter	97 1.5 0.56 kg 600 V 5.8 kV IP 52 1 mA

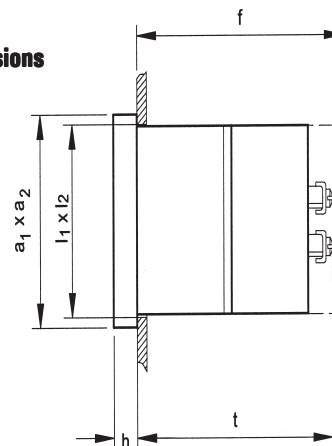
Power Consumption

Connection	Power Consumption
Current Path Voltage Path	approx. 0.2 VA ≤ 4.3 VA

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature Position of Use Frequency Current Components Voltage Components Warm-Up Time Other	23°C ± 2°C control panel vertical ± 1° 50 Hz ± 2 % 20 ... 120% of rated value 98 ... 102% of rated value ≥ 5 min. DIN EN 60051

Basic Dimensions



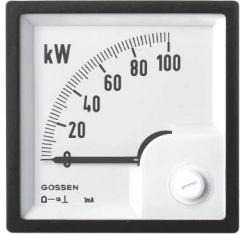
Front in mm	Nominal Dimensions $a_1 \times a_2$	h	Cutout Dimensions, mm $l_1 \times l_2$	Installation Depth Including Terminals (t), mm M4	Installation Depth Including Full Covers (f), mm
96 x 96	96 x 96	5.5	$92^{+0.8} \times 92^{+0.8}$	117	126

Basic Series • Square Panel Meters

For Active Power or Reactive Power



Moving-coil movement, 90° scale white, imprint black
Narrow front frame matt black per DIN 43 718, anti-glare glass

Type	Oder No.	Front Dimensions 96 x 96 mm
DLMQB 96 – P1 W	55004 73100 B	 <p style="text-align: right;">DLMQB 96</p>
DLMQB 96 – P3 Wg	55004 73110 B	
DLMQB 96 – P3 Wu	55004 73120 B	
DLMQB 96 – P4 Wg	55004 73130 B	
DLMQB 96 – P4 Wu	55004 73140 B	
DLMQB 96 – P1 B	55004 73150 B	
DLMQB 96 – P3 Bg	55004 73160 B	
DLMQB 96 – P3 Bu	55004 73170 B	
DLMQB 96 – P4 Bg	55004 73180 B	
DLMQB 96 – P4 Bu	55004 73190 B	

Ordering Example:

DLMQB 96 P4 Wu 0–60 kW 400 V 100/5 A

Type ————
Power 4-Wire ————
Unbalanced Load Active Power
(Unbalanced Load Reactive Power) ————
Range ————
Nominal Voltage ————
Transformer ————

Notes concerning the Determination of Measuring Ranges

The upper measuring range should be a standard value per DIN 43 701: 1 – 1.2 – 1.5 – 2 – 2.5 – 3 – 4 – 5 – 6 – 7.5 – 8 and corresponding powers of ten. The upper measuring range value must lie within a range of 0.5 to 1.2 times apparent power.

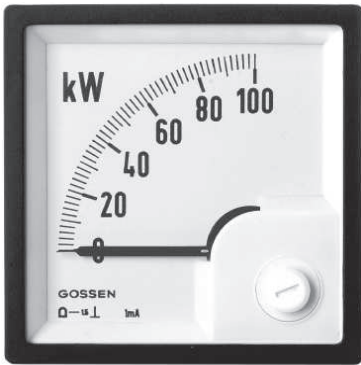
Apparent power P_s is calculated from the primary values from the current and voltage transformers:

- Single-Phase AC $P_s = U \times I$
- Three Phase $P_s = U \times I \times \sqrt{3}$

where U equals phase-to-phase voltage.

Basic Series • Square Panel Meter

For Active Power or Reactive Power



DQB 72

Moving-coil movement, 90° scale white, imprint black
Narrow front frame matt black per DIN 43718, anti-glare glass

Front Dimensions mm Type	48 x 48 DQB 48	72 x 72 DQB 72	96 x 96 DQB 96
Scale Length mm	42	63	97
Accuracy Class	1.5	1.5	1.5
Max. Weight (standard model)	0.1 kg	0.2 kg	0.25 kg
Max. Operating Voltage	300 V	600 V	600 V
Test Voltage	3.5 kV	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 52	IP 52	IP 52
Input Meter	1 mA	1 mA	1 mA

Description

Analog panel meter with 1 mA core-magnet moving-coil movement and **separate measuring converter** for active and reactive power in a separate housing. Depending upon type of system and power the measuring converter consists of one, two or three multipliers. The multipliers function in accordance with the TDM process (time division multiplier). The output signals from the multipliers are added and fed to the moving coil mechanism.

Display

Scale Division Coarse-fine

Pointer Beam pointer with edge-knife

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL94V-0

Mounting Fasteners Screw clamp

Scale Interchangeable scales
⇒ Scales may only be replaced under voltage-free conditions!

Replaceable Front frames and glass windows
⇒ May only be replaced under voltage-free conditions!

Terminals M4 screw terminals with self-lifting terminal clips. Screws can be turned with a cross-head or standard screw drivers

Contact Protection Finger-safe terminal cover included

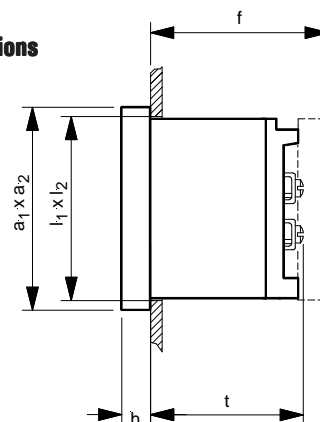
Power Consumption

Connection	Power Consumption
Current Path Voltage Path	approx. 0.2 VA ≤ 4.3 VA

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23°C ± 2°C
Position of Use	control panel vertical ± 1°
Frequency	50 Hz ± 2 %
Current Components	20 ... 120% of rated value
Voltage Components	98 ... 102% of rated value
Warm-Up Time	≥ 5 min.
Other	DIN EN 60051

Basic Dimensions



Front in mm	Nominal Dimensions		Cutout Dimensions, mm l ₁ x l ₂	Installation Depth Including Terminals (t), mm M4	Installation Depth Including Full Covers (f)mm
	a ₁ x a ₂	h			
48 x 48	48 x 48	5.5	45 ^{+0.6} x 45 ^{+0.6}	53	66
72 x 72	72 x 72	5.5	68 ^{+0.7} x 68 ^{+0.7}	53	66
96 x 96	96 x 96	5.5	92 ^{+0.8} x 92 ^{+0.8}	53	66

Basic Series • Square Panel Meters

For Active Power or Reactive Power



Moving-coil movement, 90° Scale white, imprint black
Narrow front frame matt black per DIN 43718, anti-glare glass

Type	Order No. for separate measuring converter	Front Dimensions
DQB. . . . MV-P1 W	41004 73100 B	<p>DQB 96 96 x 96 mm</p>
DQB. . . . MV-P3 Wg	41004 73110 B	
DQB. . . . MV-P3 Wu	41004 73120 B	
DQB. . . . MV-P4 Wg	41004 73130 B	
DQB. . . . MV-P4 Wu	41004 73140 B	
DQB. . . . MV-P1 B	41004 73150 B	
DQB. . . . MV-P3 Bg	41004 73160 B	
DQB. . . . MV-P3 Bu	41004 73170 B	
DQB. . . . MV-P4 Bg	41004 73180 B	
DQB. . . . MV-P4 Bu	41004 73190 B	

Ordering Example:	
DQB 72	MV P4 Wu 0-60 kW 400 V 100/5 A
Type	Measuring Converter
Power 4-Wire	Unbalanced Load Active Power (Unbalanced Load Reactive Power)
Range	Nominal Voltage
Transformer	

DQB 72	96 x 96 mm
DQB 72	72 x 72 mm
DQB 48	48 x 48 mm

Notes concerning the Determination of Measuring Ranges

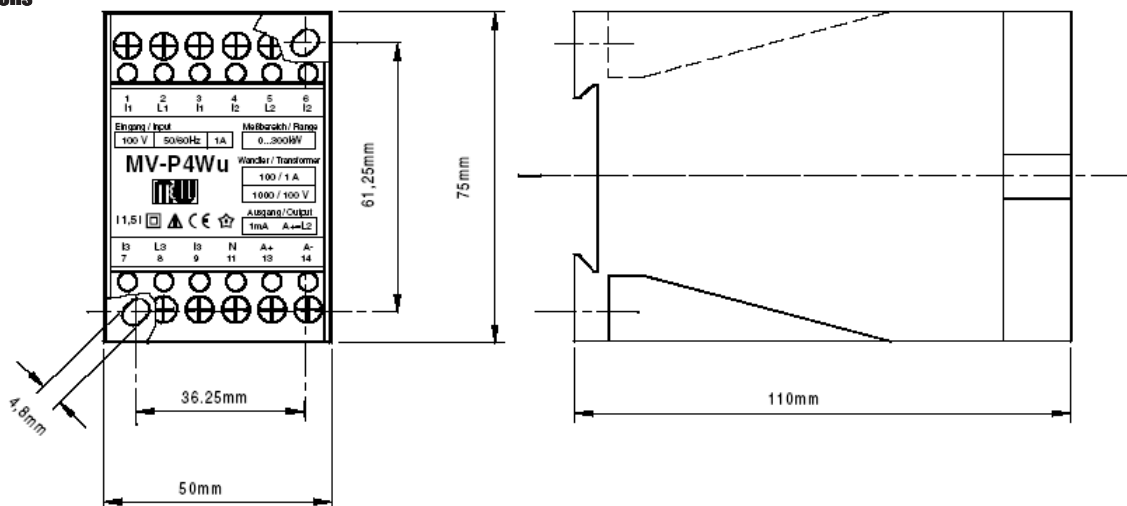
The upper measuring range should be a standard value per DIN 43 701: 1 – 1.2 – 1.5 – 2 – 2.5 – 3 – 4 – 5 – 6 – 7.5 – 8 and corresponding powers of ten. The upper measuring range value must lie within a range of 0.5 to 1.2 times apparent power. Apparent power P_s is calculated from the primary values from the current and voltage transformers:

- Single-Phase AC $P_s = U \times I$
- Three Phase $P_s = U \times I \times \sqrt{3}$

where U equals phase-to-phase voltage.

Separate Measuring Converter

Basic Dimensions



Basic Series • Square Panel Meter

For Power Factor



DLQB 96

Description

Analog panel meter with core-magnet moving-coil movement and built in power factor converter. The power factor converter determines the phase angle between current and voltage. $\cos \phi$ is displayed at the moving-coil movement.

Display

Measuring Range CAP 0.5 ... 1 ... 0.5 IND

Scale Division Coarse-fine

Pointer Beam pointer with edge-knife

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL94V-0

Mounting Fasteners Screw clamp

Scale Interchangeable scales
⇒ Scales may only be replaced under voltage-free conditions!

Replaceable Front frames and glass windows
⇒ May only be replaced under voltage-free conditions!

Terminals M4 screw terminals with self-lifting terminal clips. Screws can be turned with a cross-head or standard screw drivers

Contact Protection Finger-safe terminal cover included

Moving-coil movement, 90° scale white, imprint black
Narrow front frame matt black per DIN 43 718, anti-glare glass

Front Dimensions mm Type	96 x 96 DLQB 96
Scale Length mm Accuracy Class* Ma.Weight (standard model). Max. Operating Voltage Test Voltage Front Housing-Panel Protection	97 2.5 0.32 kg 600 V 3.5 kV IP 52

*referred to measuring range

Power Consumption

Connection	Power Consumption
Current Path	≤ 0.5 VA
Voltage Path	≤ 2.5 VA

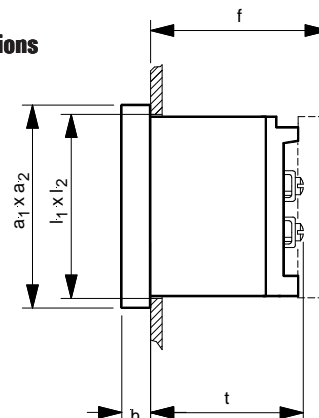
Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1°
Frequency	50 Hz ± 0.1 Hz
Current Components	95 ... 100 % of rated value
Voltage Components	98 ... 102 % of rated value
Waveshape	sine. distortion factor ≤ 1%
Warm-Up Time	≥ 5 min.
Other	DIN EN 60051

Nominal Range of Use Limits

Frequency	single phase AC 3-wire system	49 Hz ... 51 Hz 45 Hz ... 65 Hz

Basic Dimensions



Front in mm	Nominal Dimensions		Cutout Dimensions, mm l ₁ x l ₂	Installation Depth Including Terminals (t), mm M4	Installation Depth Including Full Covers (f), mm
	a ₁ x a ₂	h			
96 x 96	96 x 96	5.5	92 ^{+0.8} x 92 ^{+0.8}	53	66

Basic Series • Square Panel Meter

For Power Factor

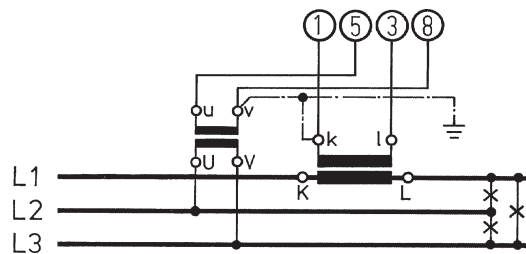


Moving-coil movement, 90° scale white, imprint black
 Narrow front frame matt black per DIN 43 718, anti-glare glass

Range	Scale	Type Order No.	DLQB 96 ↓
400 V, 1 A	0.5 ... 1 ... 0.5 cos ϕ		96051 05300 B
400 V, 5 A	0.5 ... 1 ... 0.5 cos ϕ		96051 05400 B

Schematic Diagram

3-Phase 3-Wire, Balanced Load



Basic Series • Square Panel Meter

For Frequency (Pointer-Type Frequency Meters)



FQB 96

Description

Analog panel meter with core-magnet moving-coil movement and built in frequency converter.

Anzeige

Scale Division Coarse-fine

Pointer Beam pointer with edge-knife

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL94V-0

Mounting Fasteners Screw clamp

Scale Interchangeable scales
 ⇒ Scales may only be replaced under voltage-free conditions!

Replaceable Front frames and glass windows
 ⇒ May only be replaced under voltage-free conditions!

Terminals M4 screw terminals with self-lifting terminal clips. Screws can be turned with a cross-head or standard screw drivers

Contact Protection Finger-safe terminal cover included

Moving-coil movement, 90° scale white, imprint black
Narrow front frame matt black per DIN 43 718, anti-glare glass

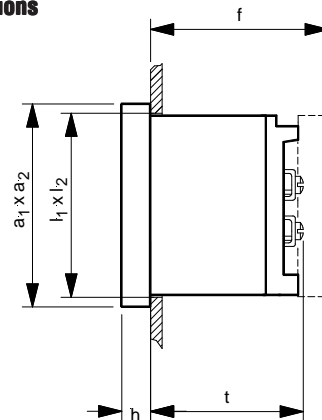
Front Dimensions mm	72 x 72	96 x 96
Type	FQB 72	FQB 96
Scale Length mm	63	97
Accuracy Class*	1	1
Max. Weight (standard model)	0.20 kg	0.28 kg
Power Consumption approx.	5 mA	5 mA
Max. Operating Voltage	600 V	600 V
Test Voltage	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 52	IP 52

*referred to upper measuring range

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23°C ± 2°C
Position of Use	control panel vertical ± 1°
Input Voltage	rated value of voltage
Waveshape	sine
Warm-Up Time	≥ 5 min.
Other	DIN EN 60051

Basic Dimensions

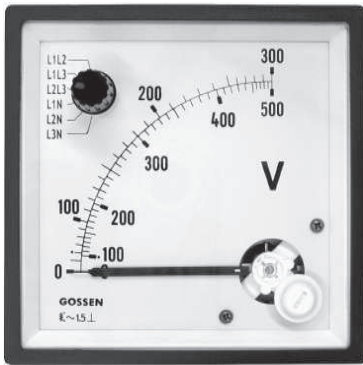


Front in mm	Nominal Dimensions		Cutout Dimensions, mm l ₁ x l ₂	Installation Depth Including Terminals (t), mm M4	Installation Depth Including Full Covers (f), mm
	a ₁ x a ₂	h			
72 x 72	72 x 72	5.5	68 ^{+0.7} x 68 ^{+0.7}	53	66
96 x 96	96 x 96	5.5	92 ^{+0.8} x 92 ^{+0.8}	53	66

Range	Scale	Type Order No.	FQB 72 ↓	FQB 96 ↓
47 ... 50 ... 53 Hz	47 ... 50 ... 53 Hz (230 V)		72475 05313 B	96475 05312 B
57 ... 60 ... 63 Hz	57 ... 60 ... 63 Hz (230 V)		72576 35763 B	96576 35763 B
45 ... 50 ... 55 Hz	45 ... 50 ... 55 Hz (230 V)		72455 05523 B	96455 54555 B
55 ... 60 ... 65 Hz	55 ... 60 ... 65 Hz (230 V)		72556 06523 B	96556 55565 B
45 ... 50 ... 55 Hz	45 ... 50 ... 55 Hz (415 V)		72455 05541 B	96455 05541 B
55 ... 60 ... 65 Hz	55 ... 60 ... 65 Hz (450 V)		72556 06545 B	96556 06545 B

Basic Series • Special Panel Meters

For Alternating Voltage 45 ... 50 ... 60 ... 65 Hz



EQB 96/U6

Description

Voltmeter with selector switch

6 Positions without zero position

L1-L3, L2-L3, L1-L2

L1-N, L2-N, L3-N

Analog panel meter with moving-iron movement and spring-loaded pivot bearing

Display

Scale Division Coarse-fine

Pointer Knife-edge pointer per DIN

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL94V-0

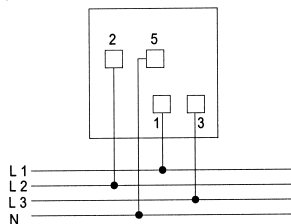
Mounting Fasteners Screw clamp

Replaceable Front frames and glass windows
⇒ May only be replaced under voltage-free conditions!

Terminals M4 screw terminals with self-lifting terminal clips. Screws can be turned with a cross-head or standard screw drivers

Contact Protection Finger-safe terminal cover included

Schematic Diagram



Moving-iron movement, 90° scale white, imprint black
Narrow front frame per DIN 43 718, anti-glare glass

Dimensions mm	72 x 72	96 x 96
Type	EQB 72/U6	EQB 96/U6
Scale Length mm	63	97
Accuracy Class	1.5	1.5
Max. Weight	0.22 kg	0.27 kg
Max. Operating Voltage	300 V	300 V
Test Voltage	3.5 kV	3.5 kV
Front Housing-Panel Protection	IP 52	IP 52

Power Consumption

Connection	Measuring Input	Power Consumption
direct	Voltage Phase-Phase 120 V ... 500 V	approx. 2.5 VA

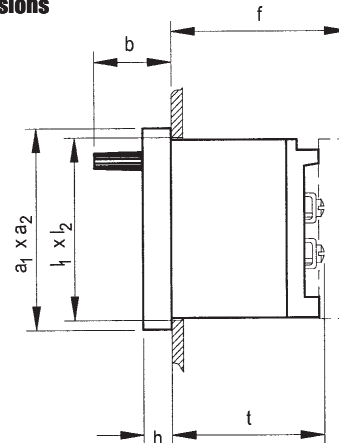
Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23°C ± 2°C
Position of Use	control panel vertical ± 1°
Frequency	45 ... 65 Hz
Other	DIN EN 60051

Nominal Range of Use Limits

Frequency	for alternating current 45 ... 65 Hz
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Basic Dimensions

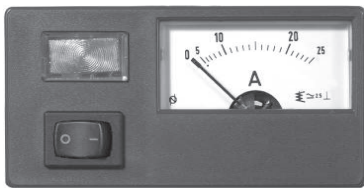


Front in mm	Nominal Dimensions		Cutout Dimensions, mm l ₁ x l ₂	Installation Depth Including Terminals (t), mm M4	Installation Depth Including Full Covers (f), mm	Selector Switch (b)
	a ₁ x a ₂	h				
72 x 72	72 x 72	5.5	68 ^{+0.7} x 68 ^{+0.7}	53	66	20
96 x 96	96 x 96	5.5	92 ^{+0.8} x 92 ^{+0.8}	53	66	20

Range	Scale	Type Order No.	EQB 72/U6 ↓	EQB 96/U6 ↓
500 V	500 V		72500 67250	96500 69650

Basic Series • Special Panel Meters

For Direct or Alternating Current or Voltage 15 ... 45 ... 65 ... 100 Hz



FkN 2

Moving-iron movement, 105° vertical or horizontal scale white, imprint black with grey flange, similar to RAL 7024, Switch 2 A / 250 V and lamp 230 V white

Front Dimensions mm Type	96 x 48 FkN2 vertical scale*	48 x 96 FkN2 horizontal scale*
Scale Length mm	32	32
Accuracy Class	2.5	2.5
Max. Weight(standard model)	0.15 kg	0.15 kg
Max. Operating Voltage	300 V	300 V
Test Voltage	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 52	IP 52

* Specify in clear text

Description

Analog panel meter with moving-iron movement

Display

Scale Division WN-division

Pointer Tube pointer

Mechanical Design

Housing Material Thermoplast, white (ABS)

Mounting Fasteners Clamp bolt with milled nut

Scale permanently mounted

Window Plexiglas 7 N, antistatic coating (PMMA)

Terminals Terminal board 2.5 mm² and M4 - M6 screw terminals

Contact Protection Finger-safe terminal cover included

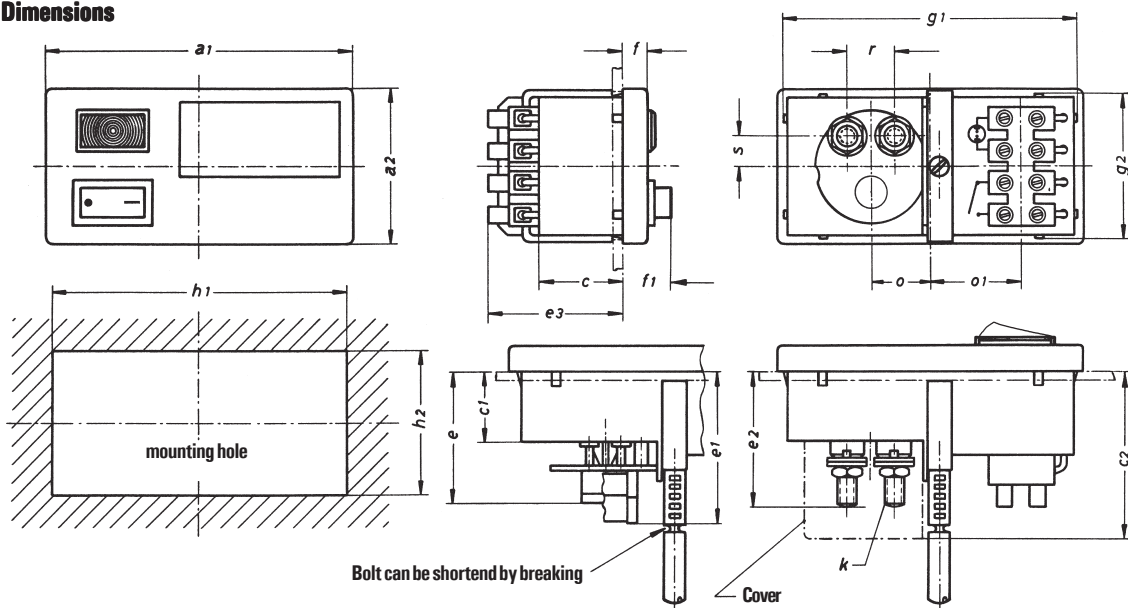
Power Consumption

Measuring Input	Power Consumption
Direct or Alternating Voltage	approx. 3.5 VA

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature Position of Use Other	23°C ± 2°C control panel vertical ± 1° DIN EN 60051

Basic Dimensions



Type	a1	a2	c	c1	c2	e		e2		e3	f	f1	g1	g2	h1	h2	k			o	o1	r		s
						4 - 300V	400 - 600V	upto 14 A	15 - 25 A								26 - 40 A	upto 14 A	15 - 25 A			26 - 40 A	upto 25 A	
FkN 2	96	48	26.3	21.7	51.7	41	46	31	36.5	42.5	8	15	91.5	45	92±0,3	45+0,3	M 4	M 5	M 6	18.7	28.5	13	15	9.5

Basic Series • Special Panel Meters

For Direct or Alternating Current or Voltage 15 ... 45 ... 65 ... 100 Hz



Moving-iron movement, 105° vertical or horizontal scale white,
imprint black with grey flange, similar to RAL 7024,
Switch 2 A / 250 V and lamp 230 V white

	Scale ¹⁾	Type Order No.	FkN 2 ↓ Horizontal Scale ¹⁾	FkN 2 ↓ Vertical Scale ¹⁾
Direct or Alternating Current				
Range:				
0 – 100 ... 600 mA ¹⁾	in accordance with measuring range		N59999	N59999
1 ... 10 A ¹⁾	in accordance with measuring range		N59999	N59999
15 A	15 A		N51301	N51300
25 A	25 A		N51303	N51302
40 A	40 A		N51305	N51304
Alternating Current				
Connection to Current Transformer				
sec. .../1 A	... ¹⁾		N51287	N51286
Connection to Current Transformer				
sec. .../5 A	... ¹⁾		N51295	N51294
Direct or Alternating Voltage				
Range:				
4 ... 150 V ¹⁾	in accordance with measuring range		N52555	N52555
250 V	250 V		N51329	N51328
Alternating Voltage				
Connection to Voltage Transformer				
sec. .../100 V	... ¹⁾		N51325	N51324
Connection to Voltage Transformer				
sec. .../110 V	... ¹⁾		N52555	N52555

1) Specify in clear text

Accessories / Spare parts	Order No.
Snap-lock cover for FkN 2	N24656
Lamp for FkN 2	220 V AC 110 V AC
	N07346 N10816
Switch for FkN 2	48343 86110

VARIANTS AND SPECIAL DESIGNS

	Identification / Order No.
GENERAL VARIANTS	+ ↓
Heightened Requirements	
Resistance to Vibration above 2.5 g to 5 g (only for measuring range ≥ 1 mA and ≥ 400 mV)	LN58
Tropic resistant	LB4
Frontpanel: IP 54, terminals: IP 00	LH21
Special Measuring Range	
Unlisted Measuring Range	DC...

Basic Series • Square Panel Meters

Special Designs and Spare Parts

VARIANTS AND SPECIAL DESIGNS		
Housing Variants		
Front Frame Colour matt grey (similar to RAL 7037)		MA 11
Adjustable red index pointer (EQB 72/96, DQB 72/96)		PM 001
Adjustable deflection factor dial (MQB 72/96, DQB 72/96)		PK 006
Scale Variants		
Scale Version 0-100 %		GL310 / GMP02
Standard Scale with other measured quantities (1-1.2-1.5-2-2.5-3-4-5-6-7.5 and corresponding powers of ten)		GM999
Special Scale / Special Calibration		
Special Scale (non standard range or calibration to chart or calibration curve)		SD999
One-off charge for special scale printing plate		09000 00004
Marking		
Red marker at: ...		ST991
Coloured Sectors in red, green or blue (other colours on request)		SU991
Additional Scale Inscription (15 characters max.)		SM991
Additional Numbering		SK992
MOVING-COIL VARIANTS		
Zero Point		
Zero point in the middle (except 60 mV meters for shunt connection)		BC2
Resistor Adjustment		
Built in potentiometer for adjustment for voltmeters 1000 Ω /V range from 6 V up to 500 V. Types DQB 72 and DQB 96		MP1
SPARE PARTS		
Interchangeable Scales with Standard Ranges	QB 48	22098 86034 B
	QB 72	22098 86035 B
	QB 96	22098 86055 B
	MEQB 72	22098 86036 B
	MEQB 96	22098 86056 B
Glass Window	QB 48	00480 00000 B
	QB 72	00720 00000 B
	QB 96	00960 00000 B
	MEQB 72	00072 00000 B
	MEQB 96	00096 00000 B
	MQB 48	00004 80001 B
	MQB 72	00007 20001 B
	MQB 96	00009 60001 B
	QB 72 U6	00007 25007 B
QB 96 U6	00009 65009 B	
Mounting Fasteners	Pushing tight type	inclusive
	Screw clip (2 times)	MN 073
	Screw clip (4 times)	MN 074
	leaf spring (2 times)	
	leaf spring (4 times)	
Terminal Cover	QB 48	48000 00000 B
	QB 72	72000 00000 B
	QB 96	96000 00000 B

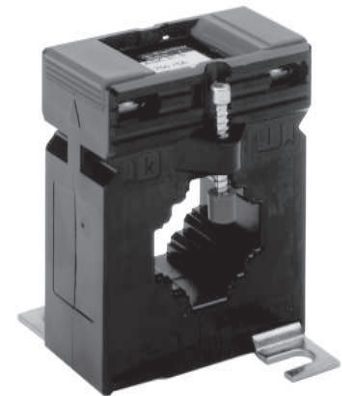
Basic Series • Accessories

Low Voltage Current Transformer Class 1

Current Transformer

Current transformers for direct mounting to bus bars or insulated round conductors.

Application: indirect measurement of sinusoidal alternating current.



ASK 31.3

Type	ASK 31.3	ASK 412.4
For Bars up to	30 x 10 mm 25.4 x 13 mm 2 x 20 x 10 mm	40 x 12 mm 30 x 15 mm —
For Round Conductors to	∅ 26 mm	∅ 30.5 mm
Rated Primary Current	50 to 750 A	50 to 1000 A
Class	1	1
Housing Material	polycarbonate	polycarbonate
Transformer Width	60 mm	70 mm
Weight max.	0.28 kg	0.45 kg

Technical Data, Characteristic Values

Polycarbonate housing per	UL 94 V-0
Angle bracket and rail Screw Clip Screws with insulated protective cover as standard mount (rail Screw Clip Screws only with plug-on current transformer)	
Tightening torque for rail Screw Clip Screws	2 ... 3 Nm
Maximum device voltage U_m (effective value) = max. allowable operating voltage	0.72 kV
Rated short-time alternating withstand voltage (effective value) = test voltage	3 kV
Ambient temperature (operating temperature range)	– 5 ... 40 °C (no condensation)
Design valid for	40 °C ambient temperature and 70 °C bus bar temperature
Rated thermal continuous current	1.0 x I_n
Rated frequency	50 – 60 Hz
Rated thermal short-time current	60 x I_n
Insulation class	E
Overcurrent limiting factor (FS)	FS 5 to 1500 A rated primary current FS 10 from 1600 A rated primary current

Basic Series • Accessories

Current Transformer Class 1

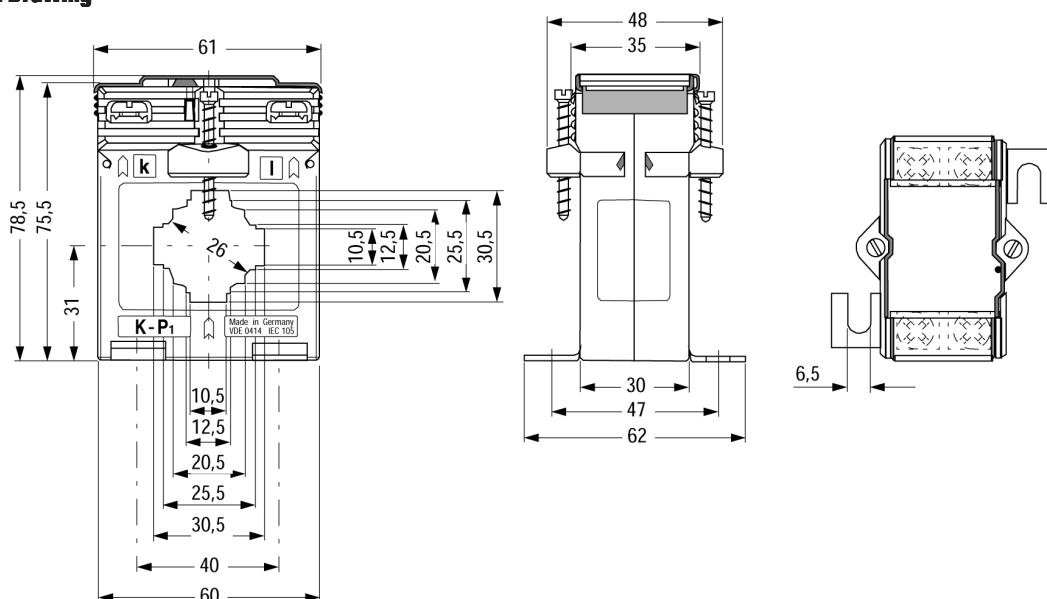
Type ASK 31.3

Primary Conductor	30 x 10 mm 25.4 x 13 mm 2 x 20 x 10 mm
Round Conductor	∅ 26 mm
Transformer Width	60 mm

Rated Primary Current	VA	Sec. 5 A	Sec. 1 A
		Order No. 1715V + ↓	Order No. 1715V + ↓
50	1.0	0100	1100
60	1.0	0110	1110
75	1.5	0120	1120
80	2.5	0130	1130
100	2.5	0140	1140
150	2.5	0150	1150
200	5	0160	1160
250	10	0170	1170
300	10	0180	1180
400	10	0190	1190
500	10	0200	1200
600	10	0210	1210
750	10	0220	1220

Accessories:	Order No.
Adaptor for 35 mm mounting rail to DIN EN 50 022	1722V9010
Protective cover	1722V9110

Dimensional Drawing



Basic Series • Accessories

Current Transformer Class 1

Typ ASK 412.4

Primary Conductor 40 x 12 mm
30 x 15 mm

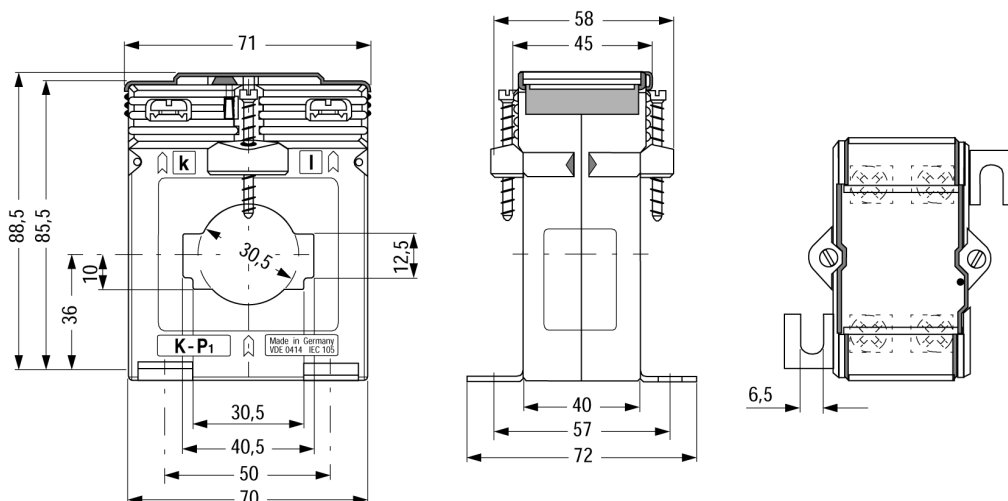
Round Conductor \varnothing 30.5 mm

Transformer Width 70 mm

Rated Primary Current A	VA	Sec. 5 A	Sec. 1 A
		Order No. 1716V + ↓	Order No. 1716V + ↓
50	1.5	0100	1100
60	1.5	0110	1110
75	2.5	0120	1120
80	2.5	0130	1130
100	3.75	0140	1140
150	5	0150	1150
200	10	0160	1160
250	10	0170	1170
300	10	0180	1180
400	10	0190	1190
500	10	0200	1200
600	10	0210	1210
750	10	0220	1220
800	10	0230	1230
1000	10	0240	1240

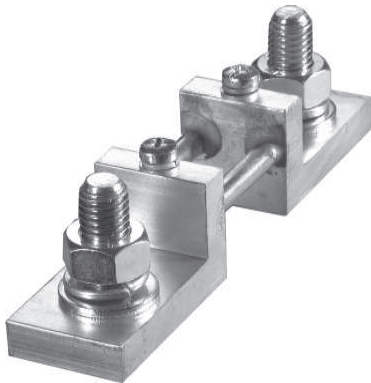
Accessories:	Order No.
Adaptor for 35 mm mounting rail to DIN EN 50 022	1722V9020
Protective cover	1722V9120

Dimensional Drawing



Basic Series • Accessories

Shunt Resistors Class 0.5



Shunt Resistor

Technical Data

Type	60 mV
Accuracy Class per DIN EN 60 051	0.5
Dimensions per	DIN 43 703 ¹⁾
Balancing	An instrument power consumption value of 6 mA is taken into consideration for balancing when shunts are used.

1) Model with insulation base can be screw or snap mounted (for top-hat rail per DIN EN 50022-35), overall length: 140 mm.
Overall height for model with cover is increased to 40.5 mm

Ordering Example

Technical Data	Order No.
Shunt Resistor, Nominal Current: I_N 250 A, Voltage Drop: 60 mV	1700V3340

Nominal Current I_N	Type 60 mV	
	Weight kg. approx.	Order No.
1 A	0.10	1700V3010 ◇
1.5 A	0.10	1700V3030 ◇
2.5 A	0.10	1700V3050 ◇
4 A	0.10	1700V3070 ◇
6 A	0.10	1700V3090 ◇
10 A	0.10	1700V3110 ◇
15 A	0.10	1700V3130 ◇
25 A	0.10	1700V3170 ◇
40 A	0.10	1700V3200
60 A	0.10	1700V3230
100 A	0.10	1700V3280
150 A	0.15	1700V3300
250 A	0.50	1700V3340
400 A	0.70	1700V3370
500 A	1.00	1700V3390
600 A	1.20	1700V3400
1000 A	1.45	1700V3460
40 A	0.10	1700V7200 ◇
60 A	0.10	1700V7230 ◇
100 A	0.10	1700V7280 ◇
150 A	0.15	1700V7300 ◇

◇ On insulating base (screws or snaps onto top-hat rail per DIN EN 50 022-35)

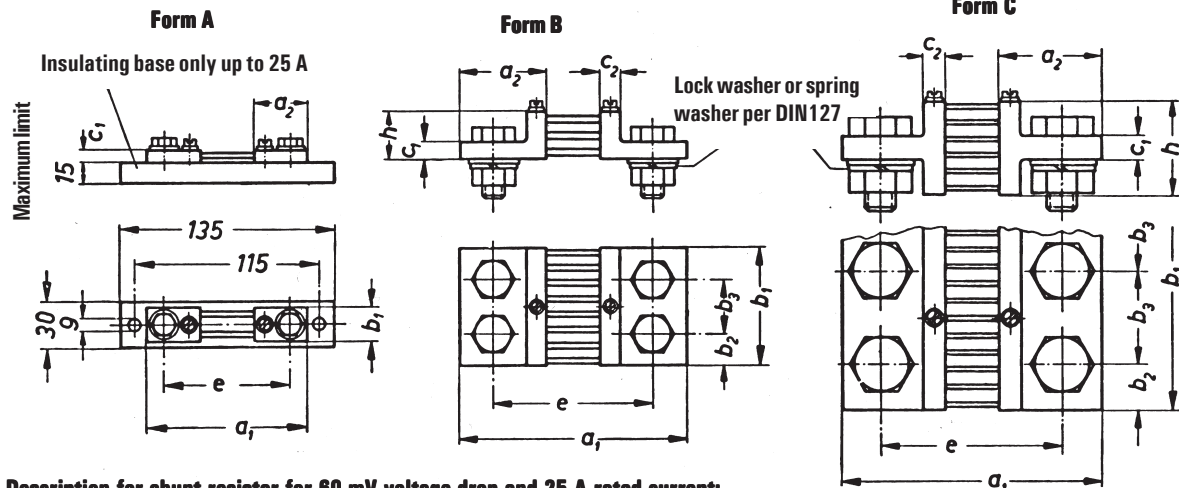
◇ Cover for shunt resistor on insulating base: **Order No. 1700V8210**

Basic Series • Accessories

Shunt Resistors Class 0.5

Drawings to Scale

Dimensions in mm



Description for shunt resistor for 60 mV voltage drop and 25 A rated current:

Shunt Resistor 60/25 DIN 43 703

Voltage Drop mV	Dim.	For rated current in A															
		1	1,5	2,5	4	40	60	250	400	600	1000	1500	2500	4000	6000	10000	15000
60		Form A				Form B				Form C							
	a ₁	90		100	145				165				165	175	185		
	a ₂	28		33	55				65				65	70	75		
	b ₁		20		30	40	60	90	120	120	154	206	310				
	b ₂		—		15	20	30	21	30	30		25					
	b ₃		—		—				48	60	60	52					
	c ₁		8		10				15				25	30			
	c ₂		—		10				10				15	20			
	e		78	80	105				115				115	125	135		
	h		—		30				60				130	170			
150		Form A				Form B				Form C							
	a ₁	90		225	270				290				300		310		
	a ₂	28		33	55				65				70		75		
	b ₁		20	25	30	40	70	90	120		154	206	310				
	b ₂		—		15	20	35	21	30			25					
	b ₃		—		—				48	60		52					
	c ₁		8		10				15				25	30			
	c ₂		—		10				10				15	20			
	e		78	205	230				240				250		260		
	h		—		50				60				130		170		
Number of supply terminals		2x1				2x2				2x3	2x4	2x6					
Hexagonal bolt DIN 933-5		M 5 ⁵⁾ x 12	M 8 ⁵⁾ x 15	M 12 x 40	M 16 x 45	M 20 x 50	M 16 x 45 ²⁾	M 20 x 50 ³⁾	M 20 x 60 ⁴⁾	M 20 x 75	M 20 x 85						
Washer DIN 125 - mild steel		5,3	8,4	13,5	17	21	17	21									
Nut DIN 934-5		—	—	M 12	M 16	M 20	M 16	M 20									
Voltage terminals		2 socket-head cap screws AM 5 x 8 DIN 84-4 and washer 5.3 DIN 433, mild steel															

Unspecified details are to be selected appropriate.

Accuracy class 0.5 per DIN 57 410, rules for measuring instruments.

Shunts exchangeable, if power consumption of measuring instrument connected does not exceed 500 μW.

¹⁾ To maintain a constant contact pressure, place a lock washer or a spring washer between the washer and the nut

²⁾ For 150 mV: bolt M 16 x 60 ³⁾ For 150 mV: bolt M 20 x 60

⁴⁾ For 150 mV: bolt M 20 x 75

⁵⁾ When bolts M 5 and M 8 are available, use preferably M 5 per DIN 267

Vario-Series

Technical Description

Square Panel Meters Rectangular Panel Meters

Square panel meters and rectangular panel meters per DIN 43 700.
Front frame matt black or matt grey (RAL 7037) per DIN 43 718.

Available Models - Square Panel Meters:

Front Dimensions	48 x 48	72 x 72	96 x 96	144 x 144
	see page			
Moving-iron panel meters	36	36	36	36
Bimetal ammeters	44	44	44	44
Moving-iron bimetal ammeters	–	49	49	49
Moving-coil panel meters w. rectifier	54	54	54	54
Moving-coil panel meters for DC	62	62	62	62
Power meters	–	–	78	–
Power factor meters	–	–	82	–
Pointer-type frequency meters	84	84	84	–

Available Models - Rectangular Panel Meters:

Front Dimensions	48 x 24	72 x 36	96 x 48	144 x 72	48 x 18.5	72 x 18.5	72 x 24	96 x 24	144 x 36
	see page								
Moving-coil panel meters for DC	89	89	89	89	97	97	97	97	97
Moving-coil indicator/controller for DC	–	–	105, 111	105	–	–	–	105	105



Interchangeable Scales

Scale replacement is quick and simple with no loss of accuracy. The permanently affixed closure flap at the top, or at the left side of the housing (for 144 x 144 mm panel meters only) need only be opened, and the scale can be pulled out and removed.

Terminal Connections

M4 screw terminals with self-lifting terminal clips simplify clamping of connector wires. Terminal screws can be turned with cross-head or with standard screw drivers.

Except for ammeters with direct connection:

Moving-coil ammeters ≥ 6 A and 40 A/60 A moving-iron ammeters include M 6 bolt terminals, and 100 A moving-iron ammeters have M 8 bolt terminals

Housing

The rugged polycarbonate housing is self-extinguishing and drip-proof per UL94V-0.

Window material: silicate glass

Front frames and glass windows can be easily replaced.

All panel meters are optionally available with a sheet metal housing, **except for** power meters with front panel dimensions of 48 x 48 mm.

Several instruments can be mounted side by side without spacers for space saving installation (the "polycarbonate housing with 2 leaf springs" option is required for meters with front dimensions of 48 x 48 mm).

The housing configuration, as well as a special housing for panel meters with front panel dimensions of 48 x 48 mm (available as an option), allow for installation into the various grid mosaic systems.

Mounting

All mounting fasteners are resistant to excessive vibration and shock (order no. LN56).

The S type screw clamp supplied as standard equipment can be used with polycarbonate and sheet metal housings with a control panel thickness of ≤ 25 mm, and the screw spindle (with 144 x 144 mm panel meters only) for control panel thickness of ≤ 40 mm.

Safety Precautions

- Instruments with damaged front frame or window must be disconnected from the mains.
- Adequate safety clearance must be maintained to control panel fasteners and to sheet metal housings if non-insulated (stripped) connector wires are used.
- The terminal block cover must be snapped into place after the connector wires have been clamped in order to assure back of hand and finger contact safety in accordance with BGV A3.
- Scales may only be replaced under voltage-free conditions.
- Front frames and windows may only be replaced under voltage-free conditions.

Available Options

- Sheet metal housing with screw clamp per B DIN 43835 for control panel thickness of ≤ 40 mm (**except for** power meters and panel meters with front panel dimensions of 48 x 48 mm).
- Polycarbonate housing with front dimensions of 48 x 48 mm for Mauell grid mount, no fasteners
- Polycarbonate housing with 2 leaf springs for standard stress requirements, also suitable for H&B Unibloc and Mauell grid mount for panel meters with front panel dimensions of 72 x 72 mm and 96 x 96 mm (**except for** power meters and panel meters with front panel dimensions of 144 x 144 mm).
- Polycarbonate housing with front panel dimensions of 48 x 48 mm for H&B Unibloc grid with 2 leaf springs (Bronze Springs)
- Polycarbonate housing with 4 leaf springs for heightened stress requirements (**except for** power meters and panel meters with front panel dimensions of 144 x 144 mm).
Advantages of leaf spring mounting:
 - Time saving, front mounting into DIN control panel cutout for control panel thickness of ≥ 1 mm.
 - Front mounting into grid system (see above).
- Polycarbonate housing with Subklew fastener (screw clamp similar to type "S" with cup point) for Subklew grid (**except for** meters with front panel dimensions of 144 x 144 mm).

Vario-Series

Measuring Systems – Technical Description

	Moving-Coil Movement	Moving-Iron Movement	Bimetal Movement
Application	Measuring of direct current or direct voltage Precision measurement of average value With rectifier: Measurement of alternating current or alternating voltage Measurement of rectified value, effective value sinewave display	Measurement of alternating current or alternating voltage True RMS measurement (TRMS)	Measurement of alternating current True RMS measurement (TRMS) The integrated slave pointer indicates the highest attained value
Bearings	Rugged pivot bearings with spring-loaded jewels	Rugged pivot bearings with spring-loaded jewels	Rugged bronze bearings
Damping	Eddy-current damping	Eddy-current damping	Thermal, time-delayed, for display of mean effective value
• Overshoot	≤ 5% of scale length	≤ 5% of scale length	
• Response Time	≤ 2 s per DIN EN 60061-1	≤ 2 s per DIN EN 60061-1	15 min., alternatively 8 min
Reference Conditions			
• Frequency	with rectifier: 45 Hz ... 65 Hz	45 Hz ... 65 Hz	45 Hz ... 65 Hz
Nominal Range of Use			
• Frequency	with rectifier: Ammeter: 40 Hz ... 1000 Hz Voltmeter: 40 Hz ... 10000 Hz	Ammeter: 15 Hz ... 400 Hz Voltmeter: 15 Hz ... 100 Hz	≤ 400 Hz
Scale Characteristics	nearly linear	Lower measuring range value is approx. 10% of upper measuring range value. Ammeter upon request with double overload scale	
Measuring Range	see technical data	see technical data	see technical data
Overload Capacity			
• Continuous	1.2 x rated value	1.2 x rated value	1.2 x rated value
• Short-Term:			
Current Measurement	10 x rated value, 1 s with rectifier:	10 x I _N 5 s 40 x I _N 1 s (max = 250 A)	10 x rated value 1 s (max = 50 A)
Voltage Measurement	2 x rated value, 0.5 s 5 x rated value, 5 s with rectifier: 2 x rated value, 0.5 s	2 x rated value, 5 s	
Connection	see technical description	see technical description	see technical description
Power Consumption	see technical data	Ammeter: 0.4 ... 0.6 VA Voltmeter: approx. 4.0 VA	for rated transformer current: 1 A : approx. 1.6 VA (approx. 1.1 VA for BM 48) 5 A : approx. 2.5 VA (approx. 1.9 VA for BM 48)

See individual technical data for technical description of frequency meters, active and reactive power meters and power factor meters.

Vario-Series • Square Panel Meters

For Alternating Current or Alternating Voltage 15 ... 65 Hz



Moving-iron movement, 90° scale
Narrow front frame per DIN 43 718, matt black



V-AQS 96

Technical Data

Front Dimensions mm Type	48 x 48 AQS 48 W	72 x 72 V-AQS 72	96 x 96 V-AQS 96	144 x 144 AQS 144
Scale Length mm	34	66	94	143
Class	1.5	1.5	1.5	1.5
Weight approx. (kg)	0.15	0.2	0.25	0.7
Power Consumption				
If connected to Voltage Transformer				
sec. /100 V (120 V)	approx. 1.0 VA (1.4 VA)	approx. 1.0 VA (1.4 VA)	approx. 1.0 VA (1.4 VA)	approx. 1.0 VA (1.4 VA)
sec. /110 V (132 V)	approx. 1.4 VA (2.0 VA)	approx. 1.4 VA (2.0 VA)	approx. 1.4 VA (2.0 VA)	approx. 1.4 VA (2.0 VA)
If connected to Current Transformer				
sec. 1 A	approx. 0.25 VA	approx. 0.25 VA	approx. 0.25 VA	approx. 0.25 VA
sec. 5 A	approx. 0.30 VA	approx. 0.30 VA	approx. 0.30 VA	approx. 0.30 VA
Operating Voltage	300 V	600 V	600 V	600 V
Test Voltage	3.5 kV	5.8 kV	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 52	IP 52	IP 52	IP 52
Fasteners (see next page)	Leaf spring	Screw Clip S	Screw Clip S	Screw Clip G
Housing Material	Polycarbonate	Polycarbonate	Polycarbonate	Sheet metal
Interchangeable Scale	yes	yes	yes	no

Description

Analog panel meter with moving-iron movement

Display

Scale Division Coarse-fine
 Pointer Bar indicator with knife-edge

Mechanical Design

Housing Material Polycarbonat, self-extinguishing and drip-proof per
 UL 94 V - 0 or
 Sheet metal housing (see above)
 Sheet metal housings available as option for type V-AQS 72 and
 Type V-AQS 96

Replaceable Front frames and glass windows
 (Interchangeable scales not available for size 144 x 144 mm)
 ⇒ May only be replaced under
 voltage-free conditions!

Terminals M4 (Voltmeter and Ammeter ≤ 9 A)
 M6 (Ammeter > 9 A ... ≤ 60 A)
 M8 (Ammeter > 60 A ... ≤ 100 A)
 Exception AQS 48 W:
 M4 (Ammeter ≤ 25 A)
 M6 (Ammeter > 25 A ... ≤ 40 A)
 M4 screw terminals with self-lifting terminal clips. Screws
 can be turned with a cross-head or standard screw drivers

Contact Protection Available as option

Reference Conditions

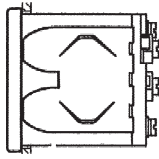
Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60 051

Vario-Series • Square Panel Meters

For Alternating Current or Alternating Voltage 15 ... 65 Hz

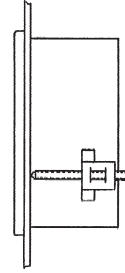


Leaf Spring



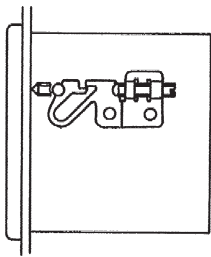
Control panel thickness 1 to 3 mm.
Size 48 x 48 mm, not appropriate for Mauell-Grid.
Also available as option for sizes 72 x 72 and 96 x 96 mm.

Screw Clip S



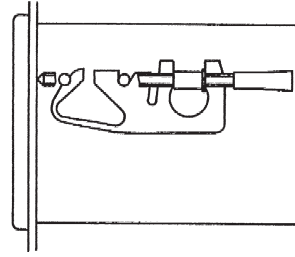
Control panel thickness 1 to 25 mm.
Special screw clamp M4 required for sizes 72 x 72 and 96 x 96 mm.
Also available as option for size 48 x 48 mm, not appropriate for Mauell-Grid.

Screw Clip G



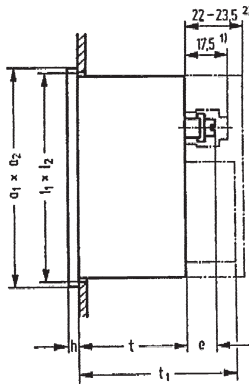
Control panel thickness 1 to 32 mm.
Special screw clamp M4 required for size 144 x 144 mm.

Fastener B DIN 43 835



Control panel thickness 1 to 40 mm.
Screw clamp M4 available as option for:
Sheet metal housings 72 x 72 and 96 x 96 mm with cone head rivets and size 144 x 144 mm.

Basic Dimensions



Dimensions for separate Series Resistor

90 x 36 x 35.5 mm (B x T x H)

Drawing to scale 1402 A 32 (on request).

Drawings to Scale (on request)

0101A258 for size 48 x 48 mm

0101A259 for sizes 72 x 72 and 96 x 96 mm

0101A261 sheet 1 for size 144 x 144 mm

Ordering Example

Panel Meter 96 x 96 mm, 90° Scale, 0 ... 100/200 A

Connection to current transformer sec. 5 A

Type V-AQS 96	Order No. 1604E, BE11, CG100, BU10
-------------------------	--

Front Dimensions mm	Nominal Dimensions mm		Cutout Dimensions mm	Installation Depth mm		Terminals			for 72 x 72 mm 96 x 96 mm 144 x 144 mm
						≤ 9 A	> 9 A ≤ 60 A	> 60 A ⁴⁾ ≤ 100 A ⁴⁾	
	a ₁ x a ₂	h	l ₁ x l ₂	t	t ₁	M4 e	M6 e	M8 e	
48 x 48	48 x 48	5	45 ^{+0.6} x 45 ^{+0.6}	43.5	56 ³⁾	12.5	16	—	
72 x 72	72 x 72	5	68 ^{+0.7} x 68 ^{+0.7}	43.5	—	12.5	16	20	
96 x 96	96 x 96	5	92 ^{+0.8} x 92 ^{+0.8}	43.5	—	12.5	16	20	
144 x 144	144 x 144	8	138 ⁺¹ x 138 ⁺¹	43.5	—	12.5	16	—	48 x 48 mm

1) Single terminal cover

2) Overall terminal cover (22 mm for panel meters with front panel dimensions of 48 x 48 mm only)

3) > 250 V ... 660 V with attached series resistor

4) Not valid for panel meters with front panel dimensions of 144 x 144 mm

Vario-Series • Square Panel Meters

For Alternating Current or Alternating Voltage 15 ... 65 Hz



Moving-iron movement, 90° scale
Narrow front frame per DIN 43 718, matt black

'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. →	AQS 48 W 1670E	V-AQS 72 ¹⁾ 1601E	V-AQS 96 ¹⁾ 1604E	AQS 144 1620E
Alternating Current	+ ↓				
Range:					
0 ... 50 mA	CB50	A	A	A	A
0 ... 100 mA	CB100	A	A	A	A
0 ... 150 mA	CB150	A	A	A	A
0 ... 250 mA	CB250	A	A	A	A
0 ... 400 mA	CB400	A	A	A	A
0 ... 600 mA	CB600	A	A	A	A
0 ... > 0.1 A < 1 A ²⁾	CB...	A	A	A	A
0 ... 1 A	CC1	+	+	+	+
0 ... 1.5 A	CC1.5	+	+	+	+
0 ... 2.5 A	CC2.5	+	+	+	+
0 ... 4 A	CC4	+	+	+	+
0 ... 5 A	CC5	+	+	+	+
0 ... 6 A	CC6	+	+	+	+
0 ... 10 A	CC10	A	A	A	A
0 ... 15 A	CC15	A	A	A	A
0 ... 25 A	CC25	A	A	A	A
0 ... 40 A	CC40	A	A	A	A
0 ... 60 A	CC60	—	A	A	A
0 ... 100 A	CC100	—	A	A	—
0 ... > 1 A < 40 A ²⁾	CC...	A	—	—	—
0 ... > 1 A < 60 A ²⁾	CC...	—	A	A	A
0 ... > 1 A ≤ 100 A ²⁾	CC...	—	A	A	—
Alternating Current					
Con. to Current Transfotmer sec. 1 A	BE10	+	+	+	+
Con. to Current Transfotmer sec. 5 A	BE11	+	+	+	+
Scale:					
0 ... 1 A	CG1	+	+	+	+
0 ... 5 A	CG5	+	+	+	+
0 ... 10 A	CG10	+	+	+	+
0 ... 15 A	CG15	+	+	+	+
0 ... 20 A	CG20	+	+	+	+
0 ... 40 A	CG40	+	+	+	+
0 ... 50 A	CG50	+	+	+	+
0 ... 60 A	CG60	+	+	+	+
0 ... 75 A	CG75	+	+	+	+
0 ... 100 A	CG100	+	+	+	+
0 ... 150 A	CG150	+	+	+	+
0 ... 200 A	CG200	+	+	+	+
0 ... 250 A	CG250	+	+	+	+
0 ... 300 A	CG300	+	+	+	+
0 ... 400 A	CG400	+	+	+	+
0 ... 500 A	CG500	+	+	+	+
0 ... 600 A	CG600	+	+	+	+
0 ... 750 A	CG750	+	+	+	+
0 ... 800 A	CG800	+	+	+	+
0 ... > 1 A < 1 kA ²⁾	CG...	+	+	+	+
0 ... 1 kA	CH1	+	+	+	+
0 ... 5 kA	CH5	+	+	+	+
0 ... 10 kA	CH10	+	+	+	+
0 ... > 1 kA ²⁾	CH...	+	+	+	+

1) For sheet metal housings with cone head rivets please see „Housing Variants“

2) Specify in clear text

Vario-Series • Square Panel Meters

For Alternating Current or Alternating Voltage 15 ... 65 Hz



Moving-iron movement, 90° scale
Narrow front frame per DIN 43 718, matt black

'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. →	AQS 48 W 1670E	V-AQS 72 ¹⁾ 1601E	V-AQS 96 ¹⁾ 1604E	AQS 144 1620E
Alternating Voltage	+ ↓				
Range:					
0 ... 6 V	DC6	A	A	A	A
0 ... 10 V	DC10	A	A	A	A
0 ... 15 V	DC15	A	A	A	A
0 ... 25 V	DC25	A	A	A	A
0 ... 40 V	DC40	A	A	A	A
0 ... 60 V	DC60	A	A	A	A
0 ... 100 V	DC100	A	A	A	A
0 ... 150 V	DC150	A	A	A	A
0 ... 250 V	DC250	A	A	A	A
0 ... 300 V	DC300	A	A	A	A
0 ... 400 V	DC400	A	A	A	A
0 ... 500 V	DC500	A	A	A	A
0 ... 600 V	DC600	—	A	A	A
0 ... 800 V	DC800	—	A	A	A
0 ... 1000 V	DC1000	—	A	A	A
0 ... > 6 V < 1000 V ²⁾	DC...	—	A	A	—
Alternating Voltage					
Connection to Voltage Transformer					
.../100 V sec.	BF12	A	A	A	A
.../110 V sec.	BF15	A	A	A	A
.../100 V Transf. root 3	BF13	A	A	A	A
.../110 V Transf. root 3	BF16	A	A	A	A
.../100 V sec. root 3	BF19	A	A	A	A
.../110 V sec. root 3	BF20	A	A	A	A
Scale:					
0 ... 500 V	DG500	+	+	+	+
0 ... 600 V	DG600	+	+	+	+
0 ... > 500 V < 1 kV ²⁾	DG...	+	+	+	+
0 ... 1 kV	DH1	+	+	+	+
0 ... 3 kV	DH3	+	+	+	+
0 ... 6 kV	DH6	+	+	+	+
0 ... 10 kV	DH10	+	+	+	+
0 ... 15 kV	DH15	+	+	+	+
0 ... 20 kV	DH20	+	+	+	+
0 ... 25 kV	DH25	+	+	+	+
0 ... 30 kV	DH30	+	+	+	+
0 ... > 1 kV ²⁾	DH...	+	+	+	+

1) For sheet metal housings with cone head rivets please see „Housing Variants“

2) Specify in clear text

Vario-Series • Square Panel Meters

For Alternating Current or Alternating Voltage 15 ... 65 Hz



Moving-iron movement, 90° scale
Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.
 Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	AQS 48 W 1670E	V-AQS 72 1601E	V-AQS 96 1604E	AQS 144 1620E	
GENERAL VARIANTS	Identification + ↓					
Measuring Input						
Alternating Current / Voltage	B2	N	N	N	N	
Dir. / Alt. Current and Dir. / Alt. Voltage	B3	A	A	A	A	
Nominal Frequency						
According to list	IK99	N	N	N	N	
... Hz (Frequency in a range of > 65 ... 500 Hz) for Voltmeters ≥ 40 V with standard range and Ammeters ≤ 6 A (please specify frequency)	IK991	A	A	A	A	
... Hz (Frequency in a range of > 65 ... 500 Hz) for Ammeters > 6 A (please specify frequency)	IK992	A	A	A	A	
Screening						
Normal mounting	LF99	N	N	N	N	
Increased stray field protection	LF9	-	A	A	A	
Accuracy						
Class 1.5	IE15	N	N	N	N	
Class 1.0 (only for alternating current / voltage 50 Hz) ¹⁾	IE10	-	-	A	A	
Position of Use						
Control panel vertical	LA1	N	N	N	N	
Control panel horizontal	LA2	+	+	+	+	
Other (Please specify angle between scale and horizontal)	LA999	A	A	A	A	
Special Features						
Normal vibration and shock resistance	LNH99	N	N	N	N	
Suitable for marine use with the following approvals:						
BV 0591 German Navy	} Class 1.5 only Measuring input ≥ 100 mA ≥ 6V	LNH1	-	A ²⁾	A ²⁾	A
German Lloyds		LNH2	A	A	A	A
Vibration resis. 2.5 g, Shock resis. 30 g		LNH56	A ³⁾	A	A	A
Vibration resis. 5 g, Shock resis. 50 g		LNH55	A ⁴⁾	A	A	A ⁵⁾

1) Do not use as supply voltage voltmeter

2) Contains sheet metal housing with cone head rivets (Order No. ML4) and fastener B (Order No. MN11)

3) Available only in combination with screw clip S

4) For Voltmeters and Ammeters ≤ 9 A, only available in combination with Screw Clip S

5) Available only in combination with fastener B DIN 43835

Vario-Series • Square Panel Meters

For Alternating Current or Alternating Voltage 15 ... 65 Hz



Moving-iron movement, 90° scale
Narrow front frame per DIN 43 718, matt black

Please note when ordering:

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 Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	AQS 48 W 1670E	V-AQS 72 1601E	V-AQS 96 1604E	AQS 144 1620E
SCALE VARIANTS	Identification + ↓				
Scale					
In accordance with measuring input	GF99	N	N	N	N
Blank scale (lower and upper value markings, company logos, symbols)	GF24	+	+	+	+
Division and Pointer					
Single division	GD1	N	N	N	N
Double division	GD2	-	A	A	A
Coarse-fine division	SE1	N	N	N	N
Fine division	SE3	-	A	A	A
Beam pointer with knife-edge for single division	RA1	N	N	N	N
Beam pointer with knife-edge for double division	RA2	+	+	+	+
Knife-edge pointer for single division	RA10	-	A	A	A
Knife-edge pointer for double division	RA11	-	A	A	A
Additional Imprint					
Second numbering (specify in clear text)	SK992	A	A	A	A
Inscription:					
Without additional inscription	SM99	N	N	N	N
Inscription ≤ 15 characters German	SM991	A	A	A	A
> 15 characters German	SM992	A	A	A	A
≤ 15 characters other language	SM993	A	A	A	A
> 15 characters other language	SM994	-	A	A	A
(Other language in Latin lettering, specify in clear text)					
Coloured mark red RAL 2002 (Specify in clear text)	ST991	A	A	A	A
Coloured sectors yellow RAL 1021, green RAL 6018 or red RAL 2002 (Specify in clear text)	SU991	A	A	A	A
Scale Characteristics					
Interchangeable scale	SA10	N	N	N	-
Screw mounted scale	SA11	-	A	A	N ¹⁾
Overload					
No overload	BU99	N	N	N	N
1.2 x of rated value ²⁾	BU5	+	+	+	+
2 x of rated value (Ammeter only)	BU10	+	+	+	+
4 x of rated value (Ammeter only)	BU12	-	A ⁴⁾	A ⁴⁾	-
6 x of rated value (Ammeter only)	BU14	-	A	A	-

1) Standard version without extra charge

2) Do not use as supply voltage voltmeter

3) Upper value of measuring range ≤ 9 A

4) Upper value of measuring range ≤ 40 A

Vario Series • Square Panel Meters

For Alternating Current or Alternating Voltage 15 ... 65 Hz



Moving-iron movement, 90° scale
Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

Type	AQS 48 W	V-AQS 72	V-AQS 96	AQS 144	
Order No. ⇒	1670E	1601E	1604E	1620E	
SCALE VARIANTS					
Identification + ↓					
Scale / Pointer Colours					
Scale white; imprint and pointer black	SG99	N	N	N	N
Scale black; imprint and pointer white	SG1	A ¹⁾	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint and pointer yellow	SG2	A ¹⁾	A ¹⁾	A ¹⁾	A ¹⁾
Without scale; pointer black	SG10	+	+	+	-
Without scale; pointer white	SG11	A	A	A	-
Without scale; pointer yellow	SG12	A	A	A	-
<i>Versions without Scales available only for panel meters that are connected to current or voltage transformers</i>					
HOUSING VARIANTS					
Application					
Standard version	LB99	N	N	N	N
Tropic resistant	LB1	A	A	A	A
Protection Class					
Standard (see technical data)	LH99	N	N	N	N
Front housing-panel protection IP54, terminals IP00	LH21	A	A	A	A
Earthquake-proof (possible combination: LH X 99 or LH X 21)	LH10	A	A	A	-
Front Frame Colour					
Matt black	MA2	N	N	N	N
Matt grey RAL 7037	MA11	A	A	A	A
Matt stone grey RAL 7032	MA12	A	A	A	A
Matt light grey RAL 7035	MA14	A	A	A	-
Matt dark beige approx. RAL 1019	MA21	A	A	A	A
Glass Window					
Standard version	MG99	N	N	N	N
Anti-glare glass	MG1	A	A	A	A
Housing					
Standard housing	ML99	N	N	N	N
Sheet metal housing with cone head rivets	ML4	-	A	A	N ²⁾
Fasteners					
2 leaf springs	MN2	N	+	+	-
2 leaf spr. for H&B Unibloc-Grid (bronze springs)	MN4	+	-	-	-
4 leaf springs	MN1	A	A	A	-
Screw Clip S	MN14	A	N ²⁾	N ²⁾	-
Screw Clip G	MN13	-	-	-	N
Fastener B DIN 43 835	MN11	-	A ³⁾	A ³⁾	A
Subklew fastener (screw clip S without cone point)	MN32	-	A	A	-
Without fastener	MN88	+	+	+	+

1) Additional one-off costs for special scale printing on request

2) Standard version without extra charge

3) Available only in combination with Order No. MLX 4 (sheet metal housing with cone head rivets)

Vario-Series • Square Panel Meters

For Alternating Current or Alternating Voltage 15 ... 65 Hz



Moving-iron movement, 90° scale
Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.
 Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

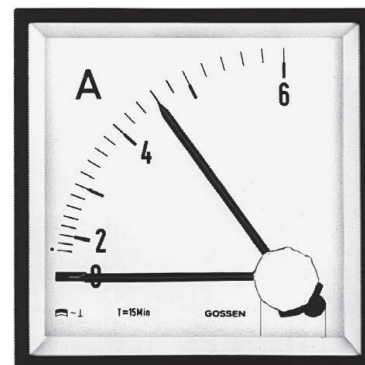
	Type Order No. ⇒	AQS 48 W 1670E	V-AQS 72 1601E	V-AQS 96 1604E	AQS 144 1620E
HOUSING VARIANTS	Identification + ↓				
Identification					
Without identification	MZ99	N	N	N	N
Identification on the back (specify in clear text)	MZ998	A	A	A	A
Constant Display					
Without constant display	PK99	N	N	N	N
Constant display 1-1.5-2-2.5-3-4-5-6-7.5-8-10	PK5	-	A	A	A
Marker Pointer					
Without marker pointer	PM99	N	N	N	N
Adjustable red index pointer	PM1	A	A	A	A
Label Strips					
Without label strip	SS99	N	N	N	N
Inscription on front face (specify in clear text)	SS992	-	A	A	A
Contact Protection					
Without terminal cover	VB99	N	N	N	N
Overall terminal cover	VB2	A	A	A	A
Single terminal cover (Voltmeter and Ammeter ≤ 9 A or ≤ 25 A for size 48 x 48 mm)	VB1	+	+	+	+

Vario-Series • Square Panel Meters

For Alternating Current



Bimetal movement, 90° scale
Narrow front frame per DIN 43 718, matt black



V-MQS 96

Technical Data

Front Dimensions mm Type	48 x 48 V-MQS 48	72 x 72 V-MQS 72	96 x 96 V-MQS 96	144 x 144 MQS 144
Scale Length mm	34	66	94	143
Class	3	3	3	3
Weight approx. (kg)	0.1	0.2	0.25	0.6
Operating Voltage	300 V	600 V	600 V	600 V
Test Voltage	3.5 kV	5.8 kV	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 52	IP 52	IP 52	IP 52
Fasteners (see next page)	leaf spring	screw clip S	screw clip S	screw clip G
Housing Material	polycarbonate	polycarbonate	polycarbonate	sheet metal
Interchangeable Scale	yes	yes	yes	no

Description

Analog panel meter with bimetal movement

Display

Scale Division Coarse-fine
 Pointer Beam pointer with knife-edge

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL 94 V-0 or sheet metal housing (see above).
 Sheet metal housings available as option for type V-MQS72 and V-MQS96

Replaceable Glass windows, front frames and scales (interchangeable scales not available for panel meters with front panel dimensions of 144 x 144 mm)
 ⇒ May only be replaced under voltage-free conditions!

Terminals M4 screw terminals with self-lifting terminal clips. Screws can be turned with a cross-head or standard screw drivers

Contact Protection Available as option

Power Consumption

	Front Dimensions			
	48 x 48	72 x 72	96 x 96	144 x 144
Con. to Transformer sec. 1 A sec. 5 A	ap. 1.1 VA ap. 1.9 VA	ap. 1.1 VA ap. 1.9 VA	ap. 1.1 VA ap. 1.9 VA	ap. 1.1 VA ap. 1.9 VA

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature Position of Use Other	23 °C ± 2 °C control panel vertical ± 1 ° DIN EN 60 051

Overload Capacity

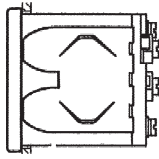
Continuous Short-term	120 % of rated value 10 x of rated value; 1 s (I _{max} = 10 A)
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Vario-Series • Square Panel Meters

For Alternating Current

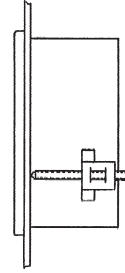


Leaf Spring



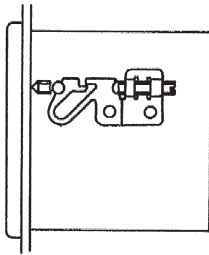
Control panel thickness 1 to 3 mm.
For size 48 x 48 mm, not appropriate for Mauell-Grid.
Also available as option for sizes 72 x 72 and 96 x 96 mm.

Screw Clip S



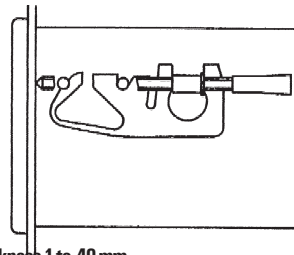
Control panel thickness 1 to 25 mm.
Special screw clamp M4 required for panel meters with front panel dimensions of 72 x 72 and 96 x 96 mm.
Also available as option for size 48 x 48 mm, not appropriate for Mauell-Grid.

Screw Clip G



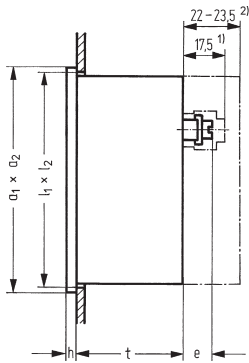
Control panel thickness 1 to 32 mm.
Special screw clamp M4 required for size 144 x 144 mm.

Fasteners B DIN 43 835



Control panel thickness 1 to 40 mm.
Screw clamp M4 available as option for:
Sheet metal housings 72 x 72 and 96 x 96 mm with cone head rivets and size 144 x 144 mm

Basic Dimensions



Dimensions for separate Current Transformer

1 A: 67 x 45 x 90 (B x T x H)
5 A: 67 x 51 x 90 (B x T x H)

Drawings to Scale (on request)

1303 A 2005 H

Ordering Example

Bimetal ammeter 96 x 96 mm
Connection to current transformer 25/5 A
Overload 1.2 x of rated value
Response time 15 min.

Techn. Data V-MQS 96	Order No. 1604M, BE11, BU5, CG25
--------------------------------	--

Front Dimensions mm	Nominal Dimensions mm		Cutout Dimensions mm	Installation Depth t	Terminals M4 e
	$a_1 \times a_2$	h			
48 x 48	48 x 48	5	$45^{+0.6} \times 45^{+0.6}$	43.5	12.5
72 x 72	72 x 72	5	$68^{+0.7} \times 68^{+0.7}$	43.5	12.5
96 x 96	96 x 96	5	$92^{+0.8} \times 92^{+0.8}$	43.5	12.5
144 x 144	144 x 144	8	$138^{+1} \times 138^{+1}$	44.5	12.5

1) Single terminal cover

2) Overall terminal cover (22 mm for panel meters with front panel dimensions of 48 x 48 mm only)

Vario-Series • Square Panel Meters

For Alternating Current



Bimetal movement, 90° scale
Narrow front frame per DIN 43 718, matt black

Note:

Choose only one of the listed measuring inputs.

'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	V-MQS 48 1662M	V-MQS 72 ¹⁾ 1601M	V-MQS 96 ¹⁾ 1604M	MQS 144 1620M
Alternating Current	+ ↓				
Direct Connection					
Range:					
0 ... 1 A	CC1, BU5 ²⁾	+	+	+	+
0 ... 5 A	CC5, BU5 ²⁾	+	+	+	+
Con. to Current Transformer sec. 1 A	BE10, BU5 ²⁾	+	+	+	+
Con. to Current Transformer sec. 5 A	BE11, BU5 ²⁾	+	+	+	+
Scale:					
1 A	CG1	+	+	+	+
5 A	CG5	+	+	+	+
10 A	CG10	+	+	+	+
15 A	CG15	+	+	+	+
20 A	CG20	+	+	+	+
25 A	CG25	+	+	+	+
30 A	CG30	+	+	+	+
40 A	CG40	+	+	+	+
50 A	CG50	+	+	+	+
60 A	CG60	+	+	+	+
75 A	CG75	+	+	+	+
100 A	CG100	+	+	+	+
150 A	CG150	+	+	+	+
200 A	CG200	+	+	+	+
250 A	CG250	+	+	+	+
300 A	CG300	+	+	+	+
400 A	CG400	+	+	+	+
500 A	CG500	+	+	+	+
600 A	CG600	+	+	+	+
750 A	CG750	+	+	+	+
800 A	CG800	+	+	+	+
0 ... > 1 A < 1 kA ³⁾	CG...	+	+	+	+
1 kA	CH1	+	+	+	+
5 kA	CH5	+	+	+	+
10 kA	CH10	+	+	+	+
0 ... > 1 kA ³⁾	CH...	+	+	+	+

1) For sheet metal housings with cone head rivets please see "Housing Variants"

2) Upper scale value = 120% of rated value

3) Specify in clear text

Vario-Series • Square Panel Meters



For Alternating Current

Bimetal movement, 90° scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	V-MQS 48 1662M	V-MQS 72 1601M	V-MQS 96 1604M	MQS 144 1620M
GENERAL VARIANTS					
Identification + ↓					
Response Time					
Response time 15 min.	IB1	N	N	N	N
Response time 8 min.	IB2	+	+	+	+
Overload					
Overload 1.2 x of rated value	BU5	N	N	N	N
Overload 1.2 x of rated value with built in prot. cur. transf. 100 x of rated value / 1s	BU26	-	-	-	A
Overload 1.2 of rated value with built in prot. cur. transf 50 x of rated value / 1s	BU28	-	-	- ¹⁾	-
Overload 1.2 x of rated value with separated prot. cur. transf 100 x of rated value / 1s	BU27	A	A	A	-
Position of Use					
Control panel vertical	LA1	N	N	N	N
Control panel horizontal	LA2	+	+	+	+
Other (Please specify angle between scale and horizontal)	LA999	A	A	A	A
SCALE VARIANTS					
Scale					
In accordance with measuring input	GF99	N	N	N	N
Blank scale (lower and upper value markings, company logos, symbols)	GF24	+	+	+	+
Additional Imprint					
Second numbering (specify in clear text)	SK992	A	A	A	A
Inscription:					
Without additional inscription	SM99	N	N	N	N
Inscription ≤ 15 characters German	SM991	A	A	A	A
> 15 characters German	SM992	A	A	A	A
≤ 15 characters other language	SM993	A	A	A	A
> 15 characters other language	SM994	A	A	A	A
(Other language in Latin lettering, specify in clear text)					
Coloured mark red RAL 2002 (specify in clear text)	ST991	A	A	A	A
Coloured sector yellow RAL 1021, green RAL 6018 or red RAL 2002 (specify in clear text)	SU991	A	A	A	A
Scale / Pointer Colours					
Scale white; imprint and pointer black	SG99	N	N	N	N
Scale black; imprint und pointer white	SG1	A ²⁾	A ²⁾	A ²⁾	A ²⁾
Scale black; imprint und pointer yellow	SG2	A ²⁾	A ²⁾	A ²⁾	A ²⁾
Without scale; pointer black	SG10	+	+	+	-
Without scale; pointer white	SG11	A	A	A	-
Without scale; pointer yellow	SG12	A	A	A	-

1) On request

2) Additional one-off costs for special scale printing on request

Vario-Series • Square Panel Meters

For Alternating Current



Bimetal movement, 90° scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

Type Order No. ⇒	V-MQS 48 1662M	V-MQS 72 1601M	V-MQS 96 1604M	MQS 144 1620M
HOUSING VARIANTS Identification + ↓				
Front Frame Colours				
Matt black	MA2	N	N	N
Matt grey RAL 7037	MA11	A	A	A
Matt stone grey RAL 7032	MA12	A	A	A
Matt dark beige approx. RAL 1019	MA21	A	A	A
Intermediate Frame, Height 3 mm				
Without intermediate frame	MC99	N	N	N
Intermediate frame shiny black	MC1	A	A	-
Intermediate frame shiny grey RAL 7037	MC2	A	A	-
<i>Intermediate frame available only in combination with screw clip S or fastener B DIN 43 835</i>				
Glass Windows				
Standard version	MG99	N	N	N
Anti-glare glass	MG1	A	A	A
Housing				
Standard housing	ML99	N	N	N
Sheet metal housing with cone head rivets	ML4	-	A	A
Mounting				
2 Leaf springs	MN2	N	+	+
4 Leaf springs	MN1	A	A	A
Screw Clip S	MN14	A	N ¹⁾	N ¹⁾
Screw Clip G	MN13	-	-	-
Fastener B DIN 43 835	MN11	-	A ²⁾	A ²⁾
Identification				
Without Identification	MZ99	N	N	N
Identification on the back (Specify in clear text)	MZ998	A	A	A
Constant Display				
Without constant display	PK99	N	N	N
Constant display 1-1.5-2-2.5-3-4-5-6-7.5-8-10	PK5	-	A	A
Contact Protection				
Without terminal cover	VB99	N	N	N
Overall terminal cover	VB2	A	A	A
Single terminal cover	VB1	+	+	+

1) Standard version without extra charge

2) Available only in combination with Order No. MLX 4 (sheet metal housing with cone head rivets)

Vario-Series • Square Panel Meters

For Alternating Current



Moving-iron movement and bimetal movement, 90° scale
Narrow front frame per DIN 43 718, matt black

Technical Data

Front Dimensions mm Type	72 x 72 V-MAQS 72	96 x 96 V-MAQS 96	144 x 144 AMQS 144
Scale Length mm			
Bimetal	66	94	107
Moving-iron	60	81	143
Class			
Bimetal	3	3	3
Moving-iron	1.5	1.5	1.5
Weight approx. (kg)	0.3	0.35	1.3
Operating Voltage	600 V	600 V	600 V
Test Voltage	5.8 kV	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 50	IP 50	IP 50
Fasteners	screw clip S	screw clip S	screw clip S
Housing Material	polycarbonate	polycarbonate	polycarbonate
Interchangeable Scales	yes	yes	yes



AMQS 144



V-MAQS 96

Description

Analog panel meter with moving-iron movement and bimetal movement

Display

Scale Division Coarse-fine
 Pointer Beam pointer with knife-edge

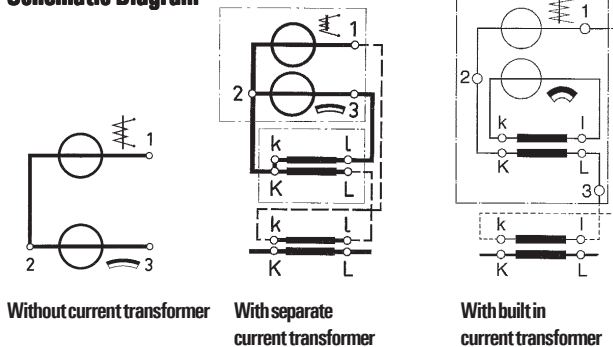
Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL 94 V-0.
 Replaceable Glass window, front frame and scale
 ⇒ May only be replaced under
 voltage-free conditions!
 Terminals M4 screw terminals with self-lifting terminal clips. Screws
 can be turned with a cross-head or standard screw drivers
 Contact Protection Available as option

Power Consumption

	Type		
	V-MAQS 72	V-MAQS 96	V-MAQS 144
Connection to transf.			
sec. 1 A			
Bimetal approx.	1.1 VA	1.1 VA	1.1 VA
Moving-iron approx.	0.25 VA	0.25 VA	0.25 VA
sec. 5 A			
Bimetal approx.	1.9 VA	1.9 VA	1.9 VA
Moving-iron approx.	0.3 VA	0.3 VA	0.3 VA

Schematic Diagram



Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
position of Use	control panel vertical ± 1°
Other	DIN EN 60 051

Overload Capacity of Bimetal Movement

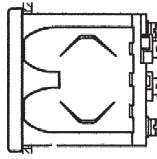
Continuous	120% of rated value
Short-term	10 x of rated value; 1 s (I _{max} = 10 A)

Vario-Series • Square Panel Meters

For Alternating Current

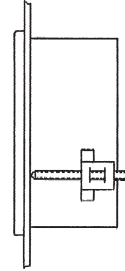


Leaf Spring



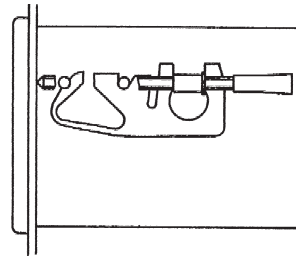
Control panel thickness 1 to 3 mm.
Also available as option for sizes of 72 x 72 and 96 x 96 mm.

Screw Clip S



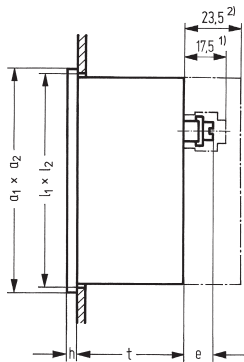
Control panel thickness 1 to 25 mm.
Special screw clamp M4 for sizes 72 x 72 and 96 x 96 mm.

Fastener B DIN 43 835



Control panel thickness 1 to 40 mm.
Screw clamp M4 as option for sizes 72 x 72 and 96 x 96 mm.

Basic Dimensions



Drawings to scale (on request)

0101A259

Dimensions for Current Transformers

1 A: 67 x 45 x 90 (B x T x H)
5 A: 67 x 51 x 90 (B x T x H)

Drawings to Scale (on request)

1303 A 2005 H

Ordering Example

Panel meter 96 x 96 mm, with bimetal and moving-iron movement
Connection to current transformer 25/5 A
Overload 1.2 x of rated value for bimetal movement, 2 x of rated value for moving-iron movement
Response time 15 min.

Techn. Data		Order No. 1606C
V-MAQS 96	Movement I (Bimetal)	1BE11, 1BU5, 1CG225
	Movement II (Moving-iron)	2BE11, 2BW10, 2CG225

Front in mm	Nominal Dimensions		Cutout Dimensions, mm	Installation Depth	Terminals M4 e
	a ₁ x a ₂	h			
72 x 72	72 x 72	5	68 ^{+0.7} x 68 ^{+0.7}	43.5	12.5
96 x 96	96 x 96	5	92 ^{+0.8} x 92 ^{+0.8}	43.5	12.5
144 x 144	144 x 144	8	138 ⁺¹ x 138 ⁺¹	95.0	12.5

1) Single terminal cover
2) Overall terminal cover

Vario-Series • Square Panel Meters

For Alternating Current



Moving-iron movement and bimetal movement, 90° scale
Narrow front frame per DIN 43 718, matt black

Note:

Choose only one of the listed measuring inputs.

'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	V-MAQS 72 ²⁾ 1603C	V-MAQS 96 ²⁾ 1606C	AMQS 144 1622C
Alternating Current¹⁾	+ ↓			
Movement I (bimetal)	1			
Movement II (moving-iron)	2			
	+ ↓			
Direct Connection				
Range:				
0 ... 1 A	...CCA1 ³⁾	+	+	+
0 ... 5 A	...CCA5 ³⁾	+	+	+
Con. to Current Transformer sec. 1 A	...BEA10 ³⁾	+	+	+
Con. to Current Transformer sec. 5 A	...BEA11 ³⁾	+	+	+
Scale:				
0 ... 1 A	...CG1	+	+	+
0 ... 5 A	...CG5	+	+	+
0 ... 10 A	...CG10	+	+	+
0 ... 15 A	...CG15	+	+	+
0 ... 20 A	...CG20	+	+	+
0 ... 25 A	...CG25	+	+	+
0 ... 30 A	...CG30	+	+	+
0 ... 40 A	...CG40	+	+	+
0 ... 50 A	...CG50	+	+	+
0 ... 60 A	...CG60	+	+	+
0 ... 75 A	...CG75	+	+	+
0 ... 100 A	...CG100	+	+	+
0 ... 150 A	...CG150	+	+	+
0 ... 200 A	...CG200	+	+	+
0 ... 250 A	...CG250	+	+	+
0 ... 300 A	...CG300	+	+	+
0 ... 400 A	...CG400	+	+	+
0 ... 500 A	...CG500	+	+	+
0 ... 600 A	...CG600	+	+	+
0 ... 750 A	...CG750	+	+	+
0 ... 800 A	...CG800	+	+	+
0 ... > 1 A < 1 kA ⁴⁾	...CG...	+	+	+
0 ... 1 kA	...CH1	+	+	+
0 ... 5 kA	...CH5	+	+	+
0 ... 10 kA	...CH10	+	+	+
0 ... > 1 kA ⁴⁾	...CH...	+	+	+

- 1) Specify each movement when ordering –
please complement with: **1** for Movement I (bimetal)
2 for Movement II (moving-iron)
- 2) For sheet metal housings with cone head rivets please see "Housing Variants"
- 3) Upper scale value = 120% of rated value
- 4) Specify in clear text

Vario-Series • Square Panel Meters

For Alternating Current



Moving-iron movement and bimetal movement, 90° scale
Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	V-MAQS 72 1603C	V-MAQS 96 1606C	AMQS 144 1622C
GENERAL VARIANTS	Identification + ↓			
Response Time				
Response time 15 min.	IB1	N	N	N
Response time 8 min.	IB2	+	+	+
Overload for Bimetal Movement				
Overload 1.2 x of rated value	BU5	N	N	N
Overload 1.2 x of rated value with built in prot. cur. transf. 100 x of rated value / 1s	2BU26	-	-	+
Overload 1.2 x of rated value with separated prot. cur. transf 100 x of rated value / 1s	1BU27	+	+	-
Overload for Moving-Iron Movement				
Overload 1.2 x of rated value	BW5	N	N	N
Overload 2 x of rated value	BW10	+	+	+
Position of Use				
Control panel vertical	LA1	N	N	N
Control panel horizontal	LA2	+	+	+
Other (Please specify angle between scale and horizontal)	LA999	+	+	+
SCALE VARIANTS				
Scale				
In accordance with measuring input	GF99	N	N	N
Blank scale (lower and upper value markings, company logos, symbols)	GF24	+	+	-
Additional Imprint				
Second numbering (specify in clear text)	SK992	-	A	-
Inscription:				
Without additional inscription	SM99	N	N	N
Inscription ≤ 15 characters German	SM991	A	A	A
> 15 characters German	SM992	A	A	A
≤ 15 characters other language	SM993	A	A	A
> 15 characters other language (Other language in Latin lettering, specify in clear text)	SM994	A	A	A
Coloured mark red RAL 2002 (specify in clear text)	ST991	A	A	A
Coloured sector yellow RAL 1021, green RAL 6018 or red RAL 2002 (specify in clear text)	SU991	A	A	A
Scale / Pointer Colours				
Scale white; imprint und pointer black	SG99	N	N	N
Scale black; imprint und pointer white	SG1	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint und pointer yellow	SG2	A ¹⁾	A ¹⁾	A ¹⁾
Without scale; pointer black	SG10	+	+	-
Without scale; pointer white	SG11	A	A	-
Without scale; pointer yellow	SG12	A	A	-

1) Additional one-off costs for special scale printing on request

Vario-Series • Square Panel Meters

For Alternating Current



Moving-iron movement and bimetal movement, 90° scale
Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

Type Order No. ⇒	V-MAQS 72 1603C	V-MAQS 96 1606C	AMQS 144 1622C
HOUSING VARIANTS			
Identification + ↓			
Front Frame Colours			
Matt black	MA2	N	N
Matt grey RAL 7037	MA11	A	A
Matt stone grey RAL 7032	MA12	A	A
Matt light grey RAL 7035	MA14	A	—
Matt dark beige approx. RAL 1019	MA21	A	A
Intermediate Frame. Height 3 mm			
Without intermediate frame	MC99	N	N
Intermediate frame shiny black	MC1	A	A
Intermediate frame shiny grey RAL 7037	MC2	A	A
<i>Intermediate frame available only in combination with screw clip S or fastener B DIN 43 835</i>			
Glass Window			
Standard version	MG99	N	N
Anti-glare glass	MG1	A	A
Housing			
Standard housing	ML99	N	N
Sheet metal housing with cone head rivets	ML4	A	N ¹⁾
Mounting			
2 Leaf springs	MN2	+	+
4 Leaf springs	MN1	A	A
Screw Clip S	MN14	N	N
Fastener B DIN 43835	MN11	A ²⁾	A ²⁾
Identification			
Without identification	MZ99	N	N
Identification on the back (specify in clear text)	MZ998	A	A
Constant Display			
Without constant display	PK99	N	N
Constant display 1-1.5-2-2.5-3-4-5-6-7.5-8-10	PK5	—	A
Contact Protection			
Without terminal cover	VB99	N	N
Overall terminal cover	VB2	A	A
Single terminal cover	VB1	+	+

1) Standard version without extra charge

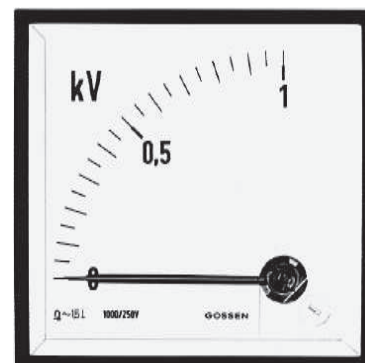
2) Available only in combination with Order No. MLX 4 (sheet metal housing with cone head rivets)

Vario-Series • Square Panel Meters

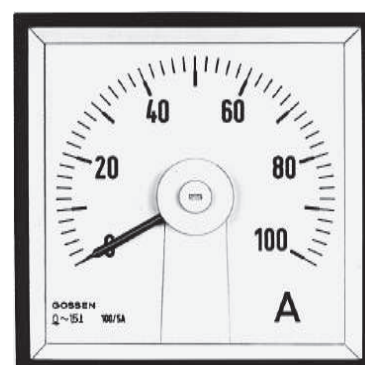
For Alternating Current or Alternating Voltage 40 ... 50 ... 10 000 Hz



Moving-coil movement with rectifier, 90° or 240° scale
Narrow front frame per DIN 43 718, matt black



V-PQS 96



V-PQ 96-250

Technical Data

Front Dimensions mm	48 x 48	72 x 72	96 x 96	144 x 144
Type (90° Scale)	PQS 48 W	V-PQS 72	V-PQS 96	PQS 144
Scale Length mm	40	66	94	143
Type (240° Scale)	V-PQ 48-250	V-PQ 72-250	V-PQ 96-250	PQ 144-250
Scale Length mm	73	113	151	235
Class	1.5	1.5	1.5	1.5
Weight approx. (90° / 240°) (kg)	0.08 / 0.16	0.2 / 0.2	0.25 / 0.25	0.6 / 0.65
Operating Voltage	300 V	600 V	600 V	600 V
Test Voltage	3.5 kV	5.8 kV	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 52	IP 52	IP 52	IP 52
Fasteners (see next page)	leaf spring	screw clip S	screw clip S	screw clip G
Housing Material	polycarbonate	polycarbonate	polycarbonate	sheet metal
Interchangeable Scale	yes	yes	yes	no

Description

Analog panel meter with moving-coil movement and rectifier

Display

Scale Division Coarse-fine
 Pointer Beam Pointer with knife-edge

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL 94 V - 0 or sheet metal housing (see above).

Sheet metal housing available as option for type V-PQS 72, V-PQS 96, V-PQ 72-250 and V-PQ 96-250.

Replaceable Glass windows, front frames and scales (interchangeable scales not available for panel meters with front panel dimensions of 144 x 144 mm)
 ⇒ May only be replaced under voltage-free conditions!

Terminals M4 screw terminals with self-lifting terminal clips. Screws can be turned with a cross-head or standard screw drivers

Contact Protection Available as option

Voltage Drop / Power Consumption

Voltage drop with measuring range < 100 mA: approx. 1.2 V

Power consumption with measuring range ≥ 100 mA: approx. 0.15 VA

Reference Conditions

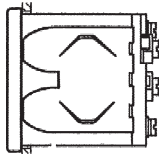
Reference Quantities	Reference Conditions
Wave Shape	sine, distortion factor ≤ 1%
Frequency	50 Hz ± 2 %
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60 051

Vario-Series • Square Panel Meters

For Alternating Current or Alternating Voltage 40 ... 50 ... 10 000 Hz

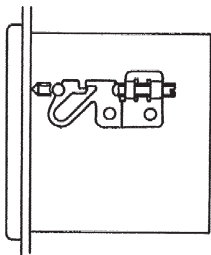


Leaf Spring



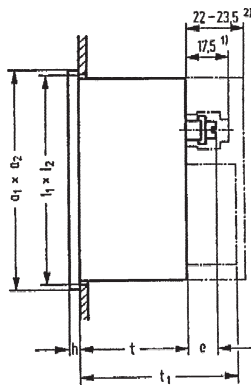
Control panel thickness 1 to 3 mm.
For size 48 x 48 mm, not available for Mauell-Grid.
Also available as option for sizes 72 x 72 and 96 x 96 mm.

Screw Clip G



Control panel thickness 1 to 32 mm.
Special screw clamp M4 required for size 144 x 144 mm.

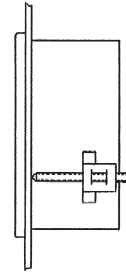
Basic Dimensions



Drawings to Scale (on request)

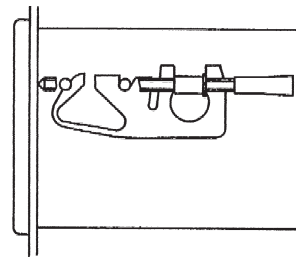
0101A258 for size 48 x 48 mm
0101A259 for sizes 72 x 72 and 96 x 96 mm
0101A261 sheet 1 for size 144 x 144 mm

Screw Clip S



Control panel thickness 1 to 25 mm.
Special screw clamp M4 required for size 72 x 72 and 96 x 96 mm.
Also available as option for size 48 x 48 mm, not available for Mauell-Grid.

Fastener B DIN 43 835



Control panel thickness 1 to 40 mm.
Screw clamp M4 as option for:
Sheet metal housings 72 x 72 and 96 x 96 mm with cone head rivets and size 144 x 144 mm.

Dimensions for separated Saturation Current Transformer

80 x 55 x 31 mm (L x B x H)

Drawing to Scale (on request)

1303A1839H0

Ordering Example

Panel meter 96 x 96 mm
Scale 240°
0 ... 40 V Alternating voltage

Type V-PQ 96-250	Order No. 1605W, DC240
----------------------------	----------------------------------

Front Dimensions mm	Nominal Dimensions		Cutout Dimensions	Installation Depth		Terminals	
	a ₁ x a ₂	h		l ₁ x l ₂	t	t ₁	M4 e
48 x 48	48 x 48	5	45 ^{+0.6} x 45 ^{+0.6}	43.5	61.5 ³⁾	12.5	5.5
72 x 72	72 x 72	5	68 ^{+0.7} x 68 ^{+0.7}	43.5	–	12.5	–
96 x 96	96 x 96	5	92 ^{+0.8} x 92 ^{+0.8}	43.5	–	12.5	–
144 x 144	144 x 144	8	138 ⁺¹ x 138 ⁺¹	44.5	–	12.5	–

1) Single terminal cover

2) Overall terminal cover (22 mm for panel meters with front panel dimensions of 48 x 48 mm only)

3) ≥ 100 mA with attached intermediate transformer (available only for V-PQ 48-250)

Vario-Series • Square Panel Meters

For Alternating Current or Alternating Voltage 40 ... 50 ... 10 000 Hz



Moving-coil movement with rectifier, 90° or 240° scale
Narrow front frame per DIN 43 718, matt black

'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type (90° Scale) Order No. →	PQS 48 W 1670W	V-PQS 72 1601W	V-PQS 96 1604W	PQS 144 1620W
	Type (240° Scale) Order No. →	V-PQ 48-250 1668W	V-PQ 72-250 1602W	V-PQ 96-250 1605W	PQ 144-250 1621W
Alternating Current ¹⁾	+ ↓				
Range:					
0 ... 100 μ A ²⁾	CA100	A	A	A	A
0 ... 150 μ A	CA150	A	A	A	A
0 ... 250 μ A	CA250	A	A	A	A
0 ... 400 μ A	CA400	A	A	A	A
0 ... 600 μ A	CA600	A	A	A	A
0 ... > 100 μ A ... < 1 mA ³⁾	CA...	A	A	A	A
0 ... 1 mA	CB1	+	+	+	+
0 ... 1.5 mA	CB1.5	+	+	+	+
0 ... 2.5 mA	CB2.5	+	+	+	+
0 ... 4 mA	CB4	+	+	+	+
0 ... 6 mA	CB6	+	+	+	+
0 ... 10 mA	CB10	+	+	+	+
0 ... 15 mA	CB15	A	A	A	A
0 ... 25 mA	CB25	A	A	A	A
0 ... 40 mA	CB40	A	A	A	A
0 ... 60 mA	CB60	A	A	A	A
0 ... 100 mA	CB100	A	A	A	A
0 ... 150 mA	CB150	A	A	A	A
0 ... 250 mA	CB250	A	A	A	A
0 ... 400 mA	CB400	A	A	A	A
0 ... 600 mA	CB600	A	A	A	A
0 ... > 1 mA ... < 1 A ³⁾	CB...	A	A	A	A
0 ... 1 A	CC1	A	A	A	A
0 ... 1.5 A	CC1.5	A	A	A	A
0 ... 2.5 A	CC2.5	A	A	A	A
0 ... 4 A	CC4	A	A	A	A
0 ... > 1 A ... < 5 A ³⁾	CC...	A	A	A	A
Connection to Current Transformer ¹⁾					
...A/1A	complement with CG... or CH...	BE10	A	A	A
...A/5A		BE11	A	A	A
...A/1A } Overload		BE22	A	A	A
...A/5A } 1.2 x of rat. val.		BE23	A	A	A
Scale: ↓ →					
1 A	CG1	+	+	+	+
5 A	CG5	+	+	+	+
10 A	CG10	+	+	+	+
15 A	CG15	+	+	+	+
25 A	CG25	+	+	+	+
40 A	CG40	+	+	+	+
60 A	CG60	+	+	+	+
100 A	CG100	+	+	+	+
150 A	CG150	+	+	+	+
250 A	CG250	+	+	+	+
400 A	CG400	+	+	+	+
600 A	CG600	+	+	+	+
0 ... > 1 A ... < 1 kA ³⁾	CG...	+	+	+	+
1 kA	CH1	+	+	+	+
1.2 kA	CH1.2	+	+	+	+
1.5 kA	CH1.5	+	+	+	+
> 1 kA ³⁾	CH...	+	+	+	+

1) For Type PQS 48 W \geq 100 mA with separate intermediate transformer

2) Not possible with 240° scales

3) Specify in clear text

Vario-Series • Square Panel Meters

For Alternating Current or Alternating Voltage 40 ... 50 ... 10 000 Hz



Moving-coil movement with rectifier, 90° or 240° scale

Narrow front frame per DIN 43 718, matt black

'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type (90° Scale) Order No. ⇒	PQS 48 W 1670W	V-PQS 72 1601W	V-PQS 96 1604W	PQS 144 1620W		
	Type (240° Scale) Order No. ⇒	V-PQ 48-250 1668W	V-PQ 72-250 1602W	V-PQ 96-250 1605W	PQ 144-250 1621W		
Alternating Voltage Zero Point at left Range:	+ ↓						
0 ... 2.5 V	DC2.5	A	A	A	A		
0 ... 4 V	DC4	A	A	A	A		
0 ... 6 V	DC6	A	A	A	A		
0 ... 10 V	DC10	A	A	A	A		
0 ... 15 V	DC15	A	A	A	A		
0 ... 25 V	DC25	A	A	A	A		
0 ... 40 V	DC40	A	A	A	A		
0 ... 60 V	DC60	A	A	A	A		
0 ... 100 V	DC100	A	A	A	A		
0 ... 150 V	DC150	A	A	A	A		
0 ... 250 V	DC250	A	A	A	A		
0 ... 400 V	DC400	—	A	A	A		
0 ... 500 V	DC500	—	A	A	A		
0 ... 600 V	DC600	—	A	A	A		
0 ... 800 V	DC800	—	A	A	A		
0 ... 1000 V	DC1000	—	A	A	A		
0 ... > 2.5 V < 1000 V ¹⁾	DC...	A ²⁾	A	A	A		
Alternating Voltage Connection to Voltage Transformer							
.../100 V sec.	complement with DG... or DH...	Overload 1.2 x of rated val.	BF12	A	A	A	A
.../110 V sec.			BF15	A	A	A	A
.../100 V			BF25	A	A	A	A
.../110 V			BF26	A	A	A	A
.../250 V			BF18	A	A	A	A
Scale:							
0 ... 500 V	DG500	+	+	+	+		
0 ... 600 V	DG600	+	+	+	+		
0 ... > 500 V < 1 kV ¹⁾	DG...	+	+	+	+		
0 ... 1 kV	DH1	+	+	+	+		
0 ... 3 kV	DH3	+	+	+	+		
0 ... 5 kV	DH5	+	+	+	+		
0 ... 6 kV	DH6	+	+	+	+		
0 ... 10 kV	DH10	+	+	+	+		
0 ... 15 kV	DH15	+	+	+	+		
0 ... 20 kV	DH20	+	+	+	+		
0 ... 25 kV	DH25	+	+	+	+		
0 ... 30 kV	DH30	+	+	+	+		
0 ... > 1 kV ¹⁾	DH...	+	+	+	+		

1) Specify in clear text

2) 0 ... > 2.5 V < 500 V

Vario-Series • Square Panel Meters

For Alternating Current or Alternating Voltage 40 ... 50 ... 10 000 Hz



Moving-coil movement with rectifier, 90° or 240° scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type (90° Scale) Order No. ⇒	PQS 48 W 1670W	V-PQS 72 1601W	V-PQS 96 1604W	PQS 144 1620W
	Type (240° Scale) Order No. ⇒	V-PQ 48-250 1668W	V-PQ 72-250 1602W	V-PQ 96-250 1605W	PQ 144-250 1621W
MOVEMENT VARIANTS	Identification + ↓				
Nominal Frequency					
Standard (50 Hz)	IK2	N	N	N	N
Nominal Frequency 60 Hz	IK3	A	A	A	A
Calibration for Direct Current (Prot. against reverse pol.)	IK70	A	A	A	A
Nominal Frequency ... Hz ¹⁾ (Frequency within a range of ≥ 40 Hz / < 1 kHz)	IK998	A	A	A	A
Nominal Frequency ... kHz ¹⁾ (Frequency within a range of ≥ 1 kHz / ≤ 10 kHz)	IK999	A	A	A	A
Internal Resistance with Voltmeters					
Standard (see technical data)	IR99	N	N	N	N
Ri approx. 10 kΩ / V (Measuring input ≥ 6 V)	IR10	A	A	A	A
Ri = 1 kΩ / V ± 1% at nom. temperature (Measuring input ≥ 6 V)	IR30	A	A	A	A
Ri = 10 kΩ / V ± 1% at nom. temperature (Measuring input ≥ 6 V)	IR40	A	A	A	A
Potentiometer for Adjustment with Voltmeters					
Voltmeters without potentiometer for adjustment	MP99	N	N	N	N
Voltmeters with potentiometer for adjustment	MP1	—	A	A	A
Adjustment range ± 15 % (Measuring input ≥ 6 V / ≤ 550 V; Ri according to list)					
Position of Use					
Control panel vertical	LA1	N	N	N	N
Control panel horizontal	LA2	+	+	+	+
Other	LA999	+	+	+	+
(Please specify angle between scale and horizontal)					
Special Features					
Normal vibration and shock resistance	LN99	N	N	N	N
Suitable for marine use with the following approvals:					
BV 0591 German Navy	LN1	—	+ ²⁾	+ ²⁾	+
German Lloyds	LN2	+	+	+	+
Vibration resis. 2.5 g, Shock resis. 30 g	LN56	+ ³⁾	+	+	+
Vibration resis. 5 g, Shock resis. 50 g	LN55	+ ³⁾	+	+	+ ⁴⁾

1) Specify in clear text

2) Contains sheet metal housing with cone head rivets (Ident. ML4) and fastener B (Ident. MN11)

3) Available only in combination with screw clip S

4) Available only in combination with fastener B DIN 43835

Vario-Series • Square Panel Meters

For Alternating Current or Alternating Voltage 40 ... 50 ... 10 000 Hz



Moving-coil movement with rectifier, 90° or 240° scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

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	Type (90° Scale) Order No. →	PQS 48 W 1670W	V-PQS 72 1601W	V-PQS 96 1604W	PQS 144 1620W
	Type (240° Scale) Order No. →	V-PQ 48-250 1668W	V-PQ 72-250 1602W	V-PQ 96-250 1605W	PQ 144-250 1621W
SCALE VARIANTS	Identification + ↓				
Scale					
In accordance with measuring input	GF99	N	N	N	N
Blank scale (lower & upper marks, co. logo & symbols)	GF24	+	+	+	+
Scale Characteristics					
Current / Voltage linear	SD1	N	N	N	N
According to curve (not current / voltage linear)	SD6	A	A	A	A
Overload					
No Overload	BU99	N	N	N	N
2 x of rated value with built in sat. cur. transformer	BU20	-	A ^{1) 6)}	A ¹⁾	A
2 x of rated value with separated sat. cur. transformer	BU21	A	A ²⁾	A ^{2) 6)}	-
5 x of rated value with built in sat. cur. transformer	BU34	-	A ^{1) 6)}	A ¹⁾	A
5 x of rated value with separated sat. cur. transformer	BU35	A	A ²⁾	A ^{2) 6)}	-
10 x of rated value with built in sat. cur. transformer	BU44	-	A ^{3) 6)}	A ³⁾	A ⁴⁾
10 x of rated value with separated sat. cur. transformer	BU45	A ⁴⁾	A ⁴⁾	A ^{4) 6)}	-
<i>Saturation current transformer available only for connection to current transformer (Order No. BE10 and BE11) and only for a nominal frequency of 50 Hz or 60 Hz</i>					
Division and Pointer					
Single division	GD1	N	N	N	N
Double division	GD2	A	A	A	A
Coarse fine division	SE1	N	N	N	N
Fine division	SE3	-	A	A	A
Beam pointer with knife-edge	RA1	N	N	N	N
for single division	RA2	+	+	+	+
for double division	RA10	A	A	A	A
Knife-edge pointer	RA11	A ⁶⁾	A	A	A
for single division	RA11	A	A	A	A
for double division	RA40	A	A	A	A
Bar indicator ⁵⁾	RA40	A	A	A	A
Additional Imprint					
Second numbering (specify in clear text)	SK992	A	A	A	A
Inscription:					
Without additional inscription	SM99	N	N	N	N
Inscription ≤ 15 characters German	SM991	A	A	A	A
> 15 characters German	SM992	A	A	A	A
≤ 15 characters other language	SM993	A	A	A	A
> 15 characters other language	SM994	A	A	A	A
<i>(Other language in Latin lettering, specify in clear text)</i>					
Coloured mark red RAL 2002 (specify in clear text)	ST991	A	A	A	A
Coloured sectors yellow RAL 1021, green RAL 6018 or red RAL 2002 (specify in clear text)	SU991	A	A	A	A
Scale Characteristics					
Interchangeable scale	SA10	N	N	N	-
Screw mounted scale	SA11	A	A	A	N
Anti-parallax scale (with bar indicator and single division) ⁵⁾	SA5	A	A	A	A

1) Not available with dial illumination

2) Available only with dial illumination

3) Only for connection to transformer sec. 1 A; Not available with dial illumination

4) Only for connection to transformer sec. 1 A

5) Only with 240° Scale

6) Not available with 240° Scale

Vario-Series • Square Oanel Meters

For Alternating Current or Alternating Voltage 40 ... 50 ... 10 000 Hz



Moving-coil movement with rectifier, 90° or 240° scale

Narrow front frame per DIN 43 718, matt black

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	Type (90° Scale) Order No. ⇒	PQS 48 W 1670W	V-PQS 72 1601W	V-PQS 96 1604W	PQS 144 1620W
	Type (240° Scale) Order No. ⇒	V-PQ 48-250 1668W	V-PQ 72-250 1602W	V-PQ 96-250 1605W	PQ 144-250 1621W
SCALE VARIANTS					
Identification + ↓					
Scale / Pointer Colours					
Scale white; imprint and pointer black	SG99	N	N	N	N
Scale black; imprint and pointer white	SG1	A ¹⁾	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint and pointer yellow	SG2	A ¹⁾	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint white, pointer yellow	SG3	A ¹⁾	A ¹⁾	A ¹⁾	A ¹⁾
Dial Illumination					
Without dial illumination	PA99	N	N	N	N
With direct dial illumination (Plexiglass scale, scale and dial illumination white)	PA1	-	A	A	A
<i>Note: Completion with Order No. PB necessary. (Dial illumination not available for mirror interchangeable scales and mirror screw mounted scales)</i>					
With indirect dial illumination					
Light conductor with mask. dial illumination white	PA6	-	A ²⁾	A ²⁾	A ²⁾
Light conductor with mask. dial illumination red	PA7	-	A ²⁾	A ²⁾	A ²⁾
<i>Note: Completion with Order No. PB necessary. (SG 99 as light conductor with mask not available). Dial illumination available only with screw mounted scale (Order No. SA X 11).</i>					
Voltage for Dial Illumination					
12 V	PB3	-	+	+	+
24 V	PB5	-	+	+	+
28 V	PB6	-	+	+	+
HOUSING VARIANTS					
Application					
Standard version	LB99	N	N	N	N
Tropic resistant	LB1	A	A	A	A
Protection					
Standard (see technical data)	LH99	N	N	N	N
Front housing-panel protection IP54. clamps IP00	LH21	A	A	A	A
Earthquake-proof (possible combination: LH X 99 or LH X 21)	LH10	A	A	A	A
Front Frame Colour					
Matt black	MA2	N	N	N	N
Matt grey RAL 7037	MA11	A	A	A	A
Matt stone grey RAL 7032	MA12	A	A	A	A
Matt light grey RAL 7035	MA14	A	A	A	-
Matt dark beige approx. RAL 1019	MA21	A	A	A	A
Intermediate Frame. Height 3 mm					
Without intermediate frame	MC99	N	N	N	N
Intermediate frame shiny black	MC1	A	A	A	-
Intermediate frame shiny grey RAL 7037	MC2	A	A	A	-
<i>Intermediate frame available only in combination with screw clip S or fastener B DIN 43 835</i>					

1) Additional one-off costs for special scale printing on request

2) Prices on request

Vario-Series • Square Panel Meters

For Alternating Current or Alternating Voltage 40 ... 50 ... 10 000 Hz



Moving-coil movement with rectifier, 90° or 240° scale

Narrow front frame per DIN 43 718, matt black

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Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type (90° Scale) Order No. ⇒	PQS 48 W 1670W	V-PQS 72 1601W	V-PQS 96 1604W	PQS 144 1620W
	Type (240° Scale) Order No. ⇒	V-PQ 48-250 1668W	V-PQ 72-250 1602W	V-PQ 96-250 1605W	PQ 144-250 1621W
HOUSING VARIANTS					
Glass Window					
Standard version	MG99	N	N	N	N
Anti-glare glass	MG1	A	A	A	A
Housing					
Standard housing	ML99	N	N	N	N
Sheet metal housing with cone head rivets	ML4	-	A	A	N ¹⁾
Housing for Mauell-Grid	ML5	+	- ²⁾	- ²⁾	- ³⁾
Housing for H&B Unibloc-Grid	ML6	+ ⁴⁾	- ²⁾	- ²⁾	- ³⁾
Mounting					
2 leaf springs	MN2	N	+	+	-
2 leaf spr. for H&B Unibloc-Grid (bronze springs)	MN4	A	-	-	-
4 leaf springs	MN1	A	A	A	-
Screw Clip S	MN14	A	N ¹⁾	N ¹⁾	-
Screw Clip G	MN13	-	-	-	N
Fastener B DIN 43 835	MN11	-	A ⁵⁾	A ⁵⁾	A
Subklew fastener (Screw Clip S without cone point)	MN32	A	A	A	-
Without fastener	MN88	+ ⁶⁾	+	+	+
Identification					
Without identification	MZ99	N	N	N	N
Identification on the back (specify in clear text)	MZ998	A	A	A	A
Marker Pointer					
Without marker pointer	PM99	N	N	N	N
Adjustable red index pointer	PM1	A	A	A	A
Label Strips					
Without label strips	SS99	N	N	N	N
Label on front face (specify in clear text)	SS992	A	A	A	A
Contact Protection					
Without terminal cover	VB99	N	N	N	N
Overall terminal cover	VB2	A	A	A	A
Single terminal cover	VB1	+	+	+	+

1) Standard version without extra charge

2) Standard housing (ML99) in combination with mounting MN2, also suitable for Mauell-Grid and H&B Unibloc-Grid

3) Standard housing (ML99) in combination with mounting MN11, also suitable for Mauell-Grid and H&B Unibloc-Grid

4) Available only in combination with Order No. MN4 (2 leaf springs for H&B Unibloc-Grid)

5) Available only in combination with Order No. ML4 (sheet metal housing with cone head rivets)

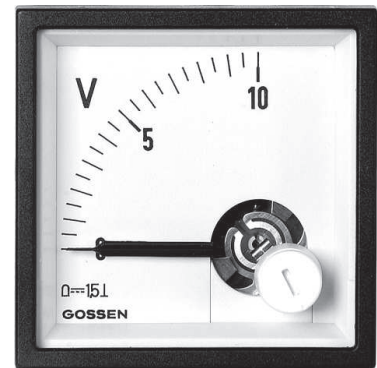
6) ML5 (housing for Mauell-Grid) standard version

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 90° scale
Narrow front frame per DIN 43 718, matt black



PQS 48 W

Technical Data

Front Dimensions mm Type	48 x 48 PQS 48 W	72 x 72 VPQS 72	96 x 96 V-PQS 96	144 x 144 PQS 144
Scale Length mm	40	66	94	143
Class	1.5	1.5	1.5	1.5
Weight approx. (kg)	0.08	0.2	0.25	0.6
Operating Voltage	300 V	600 V	600 V	600 V
Test Voltage	3.5 kV	5.8 kV	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 52	IP 52	IP 52	IP 52
Fasteners (see next page)	leaf spring	screw clip S	screw clip S	screw clip G
Housing Material	polycarbonate	polycarbonate	polycarbonate	sheet metal
Interchangeable Scale	yes	yes	yes	no

Description

Analog panel meter with moving-coil movement

Display

Scale Division Coarse-fine
 Pointer Beam pointer with knife-edge

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL 94 V - 0 or sheet metal housing (see above).
 Sheet metal housing available as option for type V-PQS 72 and V-PQS 96

Replaceable Glass windows, front frames and scales (interchangeable scales not available for panel meters with front panel dimensions of 144 x 144 mm)
 ⇒ May only be replaced under voltage-free conditions!

Terminals M4 (Voltmeter and Ammeter ≤ 4 A) or M6 (Voltmeter > 4 A).
 M4 screw terminals with self-lifting terminal clips. Screws can be turned with a cross-head or standard screw drivers

Contact Protection Available as option

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60 051

Internal Resistance/Voltage Drop/Current Consumption¹⁾

Measuring Range	Front Dimensions mm		Tolerance
	48 x 48 72 x 72 96 x 96	144 x 144	
	R _i	R _i	
100 µA	1943 Ω	2000 Ω	± 20 %
150 µA	1547 Ω	2000 Ω	
250 µA	1233 Ω	1080 Ω	
400 µA	375 Ω	497 Ω	
600 µA	202 Ω	163 Ω	
1 mA	79 Ω	69 Ω	
1.5 mA	37.5 Ω	26.5 Ω	
2 mA	21 Ω	20 Ω	
2.5 mA	11.4 Ω	10.8 Ω	
4 mA	6.7 Ω	7.1 Ω	± 30 %
5 mA	4.8 Ω	6.1 Ω	
6 mA	3 Ω	2.4 Ω	
10 mA	3.4 Ω	1.6 Ω	
15 mA	4 Ω	4 Ω	
20 mA	3 Ω	3 Ω	
4 ... 20 mA	3 Ω	3 Ω	
25 mA	2.4 Ω	2.4 Ω	
> 25 mA	Voltage Drop 60 mV		
Connection to shunt	Current Consumption 6 mA		± 20 %
≥ 60 mV	1000 Ω / V		

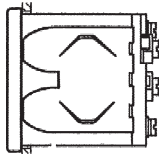
¹⁾ Indicated internal resistance is only valid for instruments with standard accuracy class.
 Please inquire regarding internal resistance (R_i) for moving-coil indicators with mechanical zero point at any desired scale value.

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage

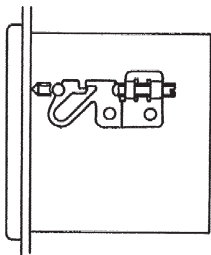


Leaf Spring



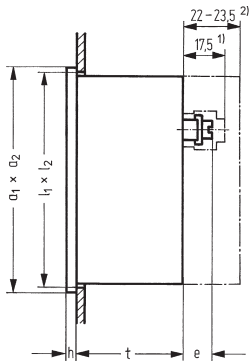
Control panel thickness 1 to 3 mm.
For size 48 x 48 mm, not available for Mauell-Grid.
Also available as option for sizes 72 x 72 and 96 x 96 mm.

Screw Clip G

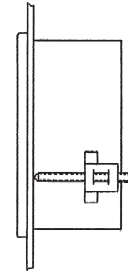


Control panel thickness 1 to 32 mm.
Special screw clamp M4 required for size 144 x 144 mm.

Basic Dimensions

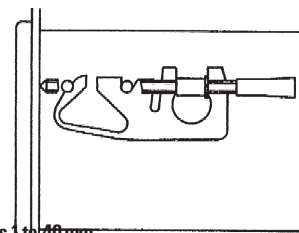


Screw Clip S



Control panel thickness 1 to 25 mm.
Special screw clamp M4 required for size 72 x 72 and 96 x 96 mm.
Also available as option for size 48 x 48 mm, not available for Mauell-Grid.

Fastener B DIN 43 835



Control panel thickness 1 to 40 mm.
Screw clamp M4 as option for:
Sheet metal housings 72 x 72 and 96 x 96 mm with cone head rivets and size 144 x 144 mm

Drawings to Scale (on request)

0101A258 for size 48 x 48 mm
0101A259 for sizes 72 x 72 and 96 x 96 mm
0101A261 sheet 1 for size 144 x 144 mm

Ordering Example

Panel meter 96 x 96 mm
90° Scale
0 ... 40 V Direct Voltage

Type V-PQS 96	Order No. 1604P, DC240
-------------------------	----------------------------------

Front Dimensions mm	Nominal Dimensions		Cutout Dimensions	Installation Depth	Terminals	
	$a_1 \times a_2$	h			$l_1 \times l_2$	≤ 4 A
48 x 48	48 x 48	5	$45^{+0.6} \times 45^{+0.6}$	43.5	M4 e	M6 e
72 x 72	72 x 72	5	$68^{+0.7} \times 68^{+0.7}$	43.5	12.5	18
96 x 96	96 x 96	5	$92^{+0.8} \times 92^{+0.8}$	43.5	12.5	18
144 x 144	144 x 144	8	$138^{+1} \times 138^{+1}$	44.5	12.5	18

1) Single terminal cover

2) Overall terminal cover (22 mm for panel meters with front panel dimensions of 48 x 48 mm only)

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 90° scale

Narrow front frame per DIN 43 718, matt black

'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	PQS 48 W 1670P	V-PQS 72 1601P	V-PQS 96 1604P	PQS 144 1620P
Direct Current	+ ↓				
Range:					
0 ... 100 μ A	CA100	A	A	A	A
0 ... 150 μ A	CA150	A	A	A	A
0 ... 250 μ A	CA250	A	A	A	A
0 ... 400 μ A	CA400	A	A	A	A
0 ... 600 μ A	CA600	A	A	A	A
0 ... > 100 μ A ... < 1 mA ¹⁾	CA...	A	A	A	A
0 ... 1 mA	CB1	+	+	+	+
0 ... 1.5 mA	CB1.5	+	+	+	+
0 ... 2.5 mA	CB2.5	+	+	+	+
0 ... 4 mA	CB4	+	+	+	+
0 ... 5 mA	CB5	+	+	+	+
0 ... 6 mA	CB6	+	+	+	+
0 ... 10 mA	CB10	+	+	+	+
0 ... 15 mA	CB15	+	+	+	A
0 ... 20 mA	CB20	+	+	+	A
0 ... 25 mA	CB25	+	+	+	A
0 ... 40 mA	CB40	+	+	+	A
0 ... 50 mA	CB50	+	+	+	A
0 ... 60 mA	CB60	+	+	+	A
0 ... 100 mA	CB100	+	+	+	A
0 ... 150 mA	CB150	+	+	+	A
0 ... 250 mA	CB250	+	+	+	A
0 ... 400 mA	CB400	+	+	+	A
0 ... 600 mA	CB600	+	+	+	A
0 ... > 1 mA ... < 1 A ¹⁾	CB...	A	A	A	A
4 ... 20 mA ²⁾	BC10	A	A	A	A
0 / 4 ... 20 mA ³⁾	BC25	A	A	A	A
0 ... 1 A	CC1	+	+	+	A
0 ... 1.5 A	CC1.5	+	+	+	A
0 ... 2.5 A	CC2.5	+	+	+	A
0 ... 4 A	CC4	+	+	+	A
0 ... 6 A	CC6	+	+	+	A
0 ... 10 A	CC10	+	+	+	A
0 ... 15 A	CC15	+	+	+	A
0 ... 25 A	CC25	+	+	+	A
0 ... 40 A	CC40	A	A	A	A
0 ... 60 A	CC60	A	A	A	A
0 ... > 1 A ... < 60 A ¹⁾	CC...	A	A	A	A

1) Specify in clear text

2) Mechanical suppressed

3) Electrical suppressed

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 90° scale

Narrow front frame per DIN 43 718, matt black

'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	PQS 48 W 1670P	V-PQS 72 1601P	V-PQS 96 1604P	PQS 144 1620P
Direct Current	+ ↓				
Con. to Shunt					
... A / 60 mV	BE3	+	+	+	A
... A / 150 mV	BE4	+	+	+	A
... A / ... > 60 mV ¹⁾	BE981	A	A	A	A
Scale:					
1 A	CG1	+	+	+	+
1.5 A	CG1.5	+	+	+	+
2.5 A	CG2.5	+	+	+	+
4 A	CG4	+	+	+	+
6 A	CG6	+	+	+	+
10 A	CG10	+	+	+	+
15 A	CG15	+	+	+	+
25 A	CG25	+	+	+	+
40 A	CG40	+	+	+	+
60 A	CG60	+	+	+	+
100 A	CG100	+	+	+	+
150 A	CG150	+	+	+	+
250 A	CG250	+	+	+	+
400 A	CG400	+	+	+	+
500 A	CG350	+	+	+	+
600 A	CG600	+	+	+	+
0 ... > 1 A < 1 kA ¹⁾	CG...	+	+	+	+
1 kA	CH1	+	+	+	+
1.5 kA	CH1.5	+	+	+	+
2.5 kA	CH2.5	+	+	+	+
4 kA	CH4	+	+	+	+
5 kA	CH5	+	+	+	+
6 kA	CH6	+	+	+	+
10 kA	CH10	+	+	+	+
15 kA	CH15	+	+	+	+
> 1 kA ¹⁾	CH...	+	+	+	+
Direct Voltage					
Range:					
0 ... 60 mV	DB60	A	A	A	A
0 ... 100 mV	DB100	A	A	A	A
0 ... 150 mV	DB150	A	A	A	A
0 ... 250 mV	DB250	A	A	A	A
0 ... 400 mV	DB400	A	A	A	A
0 ... 600 mV	DB600	A	A	A	A
0 ... > 60 mV ... < 1 V ¹⁾	DB...	A	A	A	A
0 ... 1 V	DC1	A	A	A	A
0 ... 1.5 V	DC1.5	A	A	A	A
0 ... 2.5 V	DC2.5	A	A	A	A
0 ... 3 V	DC3	A	A	A	A
0 ... 4 V	DC4	A	A	A	A
0 ... 6 V	DC6	A	A	A	A
0 ... 10 V	DC10	A	A	A	A
0 ... 15 V	DC15	A	A	A	A
0 ... 25 V	DC25	A	A	A	A
0 ... 40 V	DC40	A	A	A	A
0 ... 60 V	DC60	A	A	A	A
0 ... 100 V	DC100	A	A	A	A
0 ... 150 V	DC150	A	A	A	A
0 ... 250 V	DC250	A	A	A	A
0 ... 400 V	DC400	A	A	A	A
0 ... 500 V	DC500	A	A	A	A
0 ... 600 V	DC600	A	A	A	A
0 ... > 1 V ... < 600 V ^{1) 2)}	DC...	A	A	A	A
Connection to separate voltage divider ³⁾					
... kV / 25 V (250 μA)	BE76	A	A	A	A

1) Specify in clear text

2) Higher voltages - see voltage dividers, page 129

3) Voltage dividers - see page 129

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 90° scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	PQS 48 W 1670P	V-PQS 72 1601P	V-PQS 96 1604P	PQS 144 1620P
GENERAL VARIANTS	Identification + ↓				
Zero Point					
Zero at left	BC1	N	N	N	N
Zero point at center	BC2	A	A	A	A
Zero point as desired (specify in clear text)	BC20	A	A	A	A
Zero point at left, mech. suppressed (not 4-20 mA) (Max. Suppression 50%; measuring ranges ≥ 250 μA / ≥ 250 mV, Ri 1kΩ/V; specify in clear text)	BC16	A	A	A	A
Internal Resistance with Voltmeters					
Standard (see technical data)	IR99	N	N	N	N
Ri approx. 10 kΩ/V (measuring input ≥ 2 V)	IR10	A	A	A	A
Ri = 1 kΩ / V ± 1 % at nominal temperature (measuring input ≥ 1 V)	IR30	A	A	A	A
Ri = 10 kΩ/V ± 1 % at nominal temperature (measuring input ≥ 2 V)	IR40	A	A	A	A
Potentiometer for Adjustment with Voltmeters					
Voltmeters without potentiometer for adjustment	MP99	N	N	N	N
Voltmeters with potentiometer for adjustment	MP1	-	A	A	A
Adjustment range ± 15 % (Measuring input ≥ 6 V / ≤ 550 V; Ri as listed; Class 1.5 only)					
Lead Resistor when connecting to Shunt Resistors ...A / 60 mV and ...A / 150 mV					
Standard version 0.06 Ω	IG99	N	N	N	N
Differing from 0.06 Ω (specify in clear text)	IG999	A	A	A	A
Limiting values: ...A / 60 mV for class 1.5 max. 1 Ω ...A / 150 mV for class 1.5 max. 7 Ω					
Accuracy					
Class 1.5	IE15	N	N	N	N
Class 1.0 (Measuring input ≥ 100 μA / ≥ 60 mV; with 72 x 72 in combination with fine division and bar indicator with knife-edge only)	IE10	-	A	A	A
Position of Use					
Control panel vertical	LA1	N	N	N	N
Control panel horizontal	LA2	+	+	+	+
Other	LA999	A	A	A	A
(Please specify angle between scale and horizontal)					
Special Features					
Normal vibration and shock resistance	LN99	N	N	N	N
Suitable for marine use with the following approvals:					
German Lloyds	LN2	A	A	A	A
BV 0591 German Navy	LN1	-	A ¹⁾	A ¹⁾	A
BV 3340 German Navy	LN6	-	- ²⁾	- ³⁾	+ ⁴⁾
Vibration resis. 2.5 g, Shock resis. 30 g	LN56	A ⁵⁾	A	A	A
Vibration resis. 5 g, Shock resis. 50 g	LN55	A ⁵⁾	A	A	A ⁶⁾
<div style="display: flex; align-items: center;"> <div style="font-size: 2em; margin-right: 10px;">}</div> <div> <p>Class 1.5 only measuring input ≥ 250 μA</p> <p>≥ 250 mV</p> <p>Connection to shunt ≥ 60 mV</p> </div> <div style="margin-left: 20px;"> <p>} on request</p> </div> </div>					

1) Contains sheet metal housing with cone head rivets (Ident. ML4) and fastener B (Ident. MN11)

2) Type PQS 72 according to special data sheet

3) Type PQS 96 according to special data sheet

4) See special data sheet

5) Available only in combination with screw clip S

6) Available only in combination with fastener B DIN 43835

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 90° scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	PQS 48 W 1670P	V-PQS 72 1601P	V-PQS 96 1604P	PQS 144 1620P
SCALE VARIANTS					
Identification + ↓					
Scale					
In accordance with measuring input	GF99	N	N	N	N
Blank scale with zero point at left (lower/upper value markings, company logos, symbols)	GF24	+	+	+	+
Blank scale with zero point at center (lower/upper value markings, company logos, symbols)	GF28	+	+	+	+
Scale Characteristics					
Current / Voltage linear	SD1	N	N	N	N
According to curve (not current / voltage linear)	SD6	A	A	A	A
Division and Pointer					
Single division	GD1	N	N	N	N
Double division	GD2	A	A	A	A
Coarse-fine division	SE1	N	N	N	N
Fine division	SE3	-	A	A	A
Beam pointer with knife-edge	RA1	N	N	N	N
for single division					
for double division	RA2	+	+	+	+
Knife-edge pointer	RA10	A	A	A	A
for single division					
for double division	RA11	A	A	A	A
Additional Imprint					
Second numbering (specify in clear text)	SK992	A	A	A	A
Inscription:					
Without additional inscription	SM99	N	N	N	N
Inscription ≤ 15 characters German	SM991	A	A	A	A
> 15 characters German	SM992	A	A	A	A
≤ 15 characters other language	SM993	A	A	A	A
> 15 characters other language	SM994	A	A	A	A
(Other language in Latin lettering, specify in clear text)					
Coloured mark red RAL 2002 (specify in clear text)	ST991	A	A	A	A
Coloured sectors yellow RAL 1021, green RAL 6018 or red RAL 2002 (specify in clear text)	SU991	A	A	A	A
Scale Characteristics					
Interchangeable scale	SA10	N	N	N	-
Screw mounted scale	SA11	A	A	A	N ¹⁾
Mirror interchangeable scale	SA8	-	-	A	-
Mirror screw mounted scale	SA9	-	A	A	A
(Mirror interchangeable scales and mirror screw mounted scales together with fine division and beam pointer with knife-edge only)					

1) Standard version without extra charge

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 90° scale

Narrow front frame per DIN 43718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

Type	PQS 48 W	V-PQS 72	V-PQS 96	PQS 144
Order No. ⇒	1670P	1601P	1604P	1620P
SCALE VARIANTS				
Identification + ↓				
Scale / Pointer Colours				
Scale white; imprint and pointer black	SG99	N	N	N
Scale black; imprint and pointer white	SG1	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint and pointer yellow	SG2	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint white, pointer yellow	SG3	A ¹⁾	A ¹⁾	A ¹⁾
Without scale; pointer black	SG10	+	+	-
Without scale; pointer white	SG11	A	A	-
Without scale; pointer yellow	SG12	A	A	-
Versions without scales available only for panel meters that are connected to transformers or shunts				
Dial Illumination				
Without dial illumination	PA99	N	N	N
With direct dial illumination (Plexiglass scale, scale and dial illumination white)	PA1	A	A	A
Note: Completion with Order No. PB necessary. Size 48 x 48: dial illumination available only for ≤ 4 A / ≤ 660 V together with single terminal cover.				
With indirect dial illumination				
Light conductor with mask, dial illumination white	PA6	-	A ²⁾	A ²⁾
Light conductor with mask, dial illumination red	PA7	-	A ²⁾	A ²⁾
Note: Completion with Order No. SG a. PB necessary. (SG 99 as light conductor with mask not available). Dial illumination available only with screw mounted scale (Order No. SA X 11)				
Voltage for Dial Illumination				
12 V	PB3	+	+	+
24 V	PB5	+	+	+
28 V	PB6	+	+	+
HOUSING VARIANTS				
Application				
Standard version	LB99	N	N	N
Tropic resistant	LB1	A	A	A
Protection				
Standard (see technical data)	LH99	N	N	N
Front housing-panel protection IP54, terminals IP00	LH21	A	A	A
Earthquake-proof (possible combination: LH X 99 or LH X 21)	LH10	A	A	A
Front Frame Colour				
Matt black	MA2	N	N	N
Matt grey RAL 7037	MA11	A	A	A
Matt stone grey RAL 7032	MA12	A	A	A
Matt light grey RAL 7035	MA14	A	A	-
Matt dark beige approx. RAL 1019	MA21	A	A	A
Intermediate Frame, Height 3 mm				
Without intermediate frame	MC99	N	N	N
Intermediate frame shiny black	MC1	A	A	-
Intermediate frame shiny grey RAL 7037	MC2	A	A	-
Intermediate frame available only in combination with screw clip S or fastener B DIN 43 835				

1) Additional one-off costs for special scale printing on request

2) Prices on request

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 90° scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	PQS 48 W 1670P	V-PQS 72 1601P	V-PQS 96 1604P	PQS 144 1620P
HOUSING VARIANTS					
Identification + ↓					
Glass Window					
Standard version	MG99	N	N	N	N
Anti-glare glass	MG1	A	A	A	A
Housing					
Standard housing	ML99	N	N	N	N
Sheet metal housing with cone head rivets	ML4	-	A	A	N ¹⁾
Housing for Mauell-Grid	ML5	+	- ²⁾	- ²⁾	- ³⁾
Housing for H&B Unibloc-Grid	ML6	+ ⁴⁾	- ²⁾	- ²⁾	- ³⁾
Mounting					
2 leaf springs	MN2	N	+	+	-
2 leaf springs for H&B Unibloc-Grid (bronze-springs)	MN4	A	-	-	-
4 leaf springs	MN1	A	A	A	-
Screw Clip S	MN14	A	N ¹⁾	N ¹⁾	-
Screw Clip G	MN13	-	-	-	N
Fastener B DIN 43 835	MN11	-	A ⁵⁾	A ⁵⁾	A
Subklew fastener (Screw Clip S without cone point)	MN32	A	A	A	-
Without fastener	MN88	+ ⁶⁾	+	+	+
Identification					
Without identification	MZ99	N	N	N	N
Identification on backside (specify in clear text)	MZ998	A	A	A	A
Constant Display					
Without constant display	PK99	N	N	N	N
Constant display 1-2-3	PK1	A	-	-	-
Constant display 1-1.5-2-2.5-3-4-5-6-7.5-8-10	PK5	-	A	A	A
Marker Pointer					
Without marker pointer	PM99	N	N	N	N
Adjustable red index pointer	PM1	A	A	A	
Label Strips					
Without label strips	SS99	N	N	N	N
Label on front face (specify in clear text)	SS992	A	A	A	A
Contact Protection					
Without terminal cover	VB99	N	N	N	N
Overall terminal cover	VB2	A	A	A	A
Single terminal cover (Voltmeter and Ammeter ≤ 4 A)	VB1	+	+	+	+

1) Standard version without extra charge

2) Standard housing (ML99) in combination with fastener MN2, also suitable for Mauell-Grid and H&B Unibloc-Grid

3) Standard housing (ML99) in combination with fastener MN11, also suitable for Mauell-Grid and H&B Unibloc-Grid

4) Available only in combination with Order No. MN4 (2 leaf springs for H&B Unibloc-Grid)

5) Available only in combination with Order No. ML4 (sheet metal housing with cone head rivets)

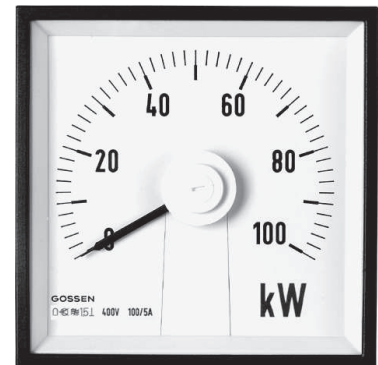
6) ML5 (housing for Mauell-Grid) standard version

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 240° scale
Narrow front frame per DIN 43 718, matt black



V-PQ 96-250

Technical Data

Front Dimensions mm Type	48 x 48 V-PQ 48-250	72 x 72 V-PQ 72-250	96 x 96 V-PQ 96-250	144 x 144 PQ 144-250
Scale Length mm	73	113	151	235
Class	1.5	1.5	1.5	1.5
Weight approx. (kg)	0.16	0.2	0.25	0.65
Operating Voltage	300 V	600 V	600 V	600 V
Test Voltage	3.5 kV	5.8 kV	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 52	IP 52	IP 52	IP 52
Fasteners (see next page)	leaf spring	screw clip S	screw clip S	screw clip G
Housing Material	polycarbonate	polycarbonate	polycarbonate	sheet metal
Interchangeable Scale	yes	yes	yes	no

Description

Analog panel meter with moving-coil movement

Display

Scale Division Coarse-fine
 pointer Beam pointer with knife-edge

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL 94 V - 0 or sheet metal housing (see above).

Sheet metal housing available as option for type V-PQS 72 and V-PQS 96

Replaceable Glass windows, front frames and scales (interchangeable scales not available for panel meters with front panel dimensions of 144 x 144 mm)

⇒ May only be replaced under voltage-free conditions!

Terminals M4 (Voltmeter and Ammeter ≤ 4 A) or M6 (Voltmeter > 4 A).
 M4 screw terminals with self-lifting terminal clips. Screws can be turned with a cross-head or standard screw drivers

Contact Protection Available as option

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ±1°
Other	DIN EN 60 051

Internal Resistance / Voltage Drop / Current Consumption ¹⁾

Measuring Range	Ri	Tolerance
100 μA	10300 Ω	±20%
150 μA	8210 Ω	
250 μA	2870 Ω	
400 μA	1770 Ω	
600 μA	773 Ω	
1 mA	337 Ω	±20%
1.5 mA	167 Ω	
2 mA	97 Ω	
2.5 mA	52 Ω	
4 mA	25 Ω	
5 mA	16.3 Ω	
6 mA	14.2 Ω	±30%
10 mA	3 Ω	
15 mA	6.5 Ω	
20 mA	5 Ω	
4 ... 20 mA	6.5 Ω	
25 mA	6 Ω	Voltage Drop 150 mV Current Consumption 10 mA
> 25 mA Connection to Shunt		
150 mV	75 Ω	±20%
250 mV	125 Ω	
400 mV	200 Ω	
600 mV	300 Ω	
≥ 1 V	1000 Ω/V	

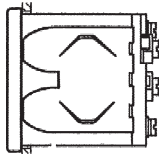
¹⁾ Indicated internal resistance is only valid for instruments with standard accuracy class.
 Please inquire regarding internal resistance (Ri) for moving-coil indicators with mechanical zero point at any desired scale value.

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage

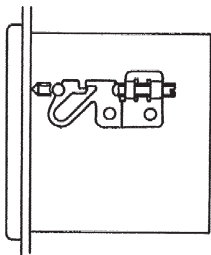


Leaf Spring



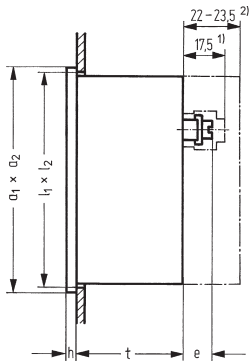
Control panel thickness 1 to 3 mm.
For size 48 x 48 mm, not available for Mauell-Grid.
Also available as option for sizes 72 x 72 and 96 x 96 mm.

Screw Clip G

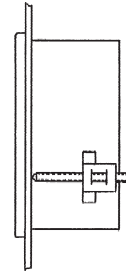


Control panel thickness 1 to 32 mm.
Special screw clamp M4 required for size 144 x 144 mm.

Basic Dimensions

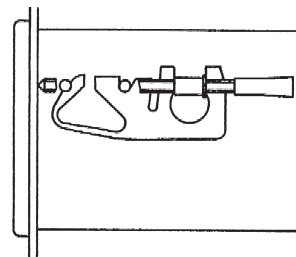


Screw Clip S



Control panel thickness 1 to 25 mm.
Special screw clamp M4 required for sizes 72 x 72 and 96 x 96 mm.
Also available as option for size 48 x 48 mm, not available for Mauell-Grid.

Fastener B DIN 43 835



Control panel thickness 1 to 40 mm.
Screw clamp M4 as option for:
Sheet metal housings 72 x 72 and 96 x 96 mm with cone head rivets and size 144 x 144 mm.

Drawings to Scale (on request)

0101A258 for size 48 x 48 mm
0101A259 for sizes 72 x 72 and 96 x 96 mm
0101A261 sheet 1 for size 144 x 144 mm

Ordering Example

Panel meter 96 x 96 mm
240° Scale
0 ... 40 V Direct Voltage

Type V-PO 96-250	Order No. 1605P, DC240
----------------------------	----------------------------------

Front Dimensions mm	Nominal Dimensions		Cutout Dimensions $l_1 \times l_2$	Installation Depth t	Terminals	
	$a_1 \times a_2$	h			$\leq 4 \text{ A}$	$> 4 \text{ A}$
					M4 e	M6 e
48 x 48	48 x 48	5	$45^{+0.6} \times 45^{+0.6}$	43.5	12.5	—
72 x 72	72 x 72	5	$68^{+0.7} \times 68^{+0.7}$	43.5	12.5	17
96 x 96	96 x 96	5	$92^{+0.8} \times 92^{+0.8}$	43.5	12.5	18
144 x 144	144 x 144	8	$138^{+1} \times 138^{+1}$	44.5	12.5	18

1) Single terminal cover

2) Overall terminal cover (22 mm for panel meters with front panel dimensions of 48 x 48 mm only)

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 240° scale
Narrow front frame per DIN 43 718, matt black

'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. →	V-PQ 48-250 1668P	V-PQ 72-250 ¹⁾ 1602P	V-PQ 96-250 ¹⁾ 1605P	PQ 144-250 1621P
Zero Point at left	+ ↓				
Direct Current					
Range:					
0 ... 100 μ A	CA100	A	A	A	A
0 ... 150 μ A	CA150	A	A	A	A
0 ... 250 μ A	CA250	A	A	A	A
0 ... 400 μ A	CA400	A	A	A	A
0 ... 600 μ A	CA600	A	A	A	A
0 ... > 100 μ A ... < 1 mA ²⁾	CA...	A	A	A	A
0 ... 1 mA	CB1	+	+	+	+
0 ... 1.5 mA	CB1.5	+	+	+	+
0 ... 2.5 mA	CB2.5	+	+	+	+
0 ... 4 mA	CB4	+	+	+	+
0 ... 5 mA	CB5	+	+	+	+
0 ... 6 mA	CB6	+	+	+	+
0 ... 10 mA	CB10	+	+	+	+
0 ... 15 mA	CB15	A	A	A	A
0 ... 20 mA	CB20	A	A	A	A
0 ... 25 mA	CB25	A	A	A	A
0 ... 40 mA	CB40	A	A	A	A
0 ... 50 mA	CB50	A	A	A	A
0 ... 60 mA	CB60	A	A	A	A
0 ... 100 mA	CB100	A	A	A	A
0 ... 150 mA	CB150	A	A	A	A
0 ... 250 mA	CB250	A	A	A	A
0 ... 400 mA	CB400	A	A	A	A
0 ... 600 mA	CB600	A	A	A	A
0 ... > 1 mA ... < 1 A ²⁾	CB...	A	A	A	A
4... 20 mA ³⁾	BC10	A	A	A	A
0/4... 20 mA ⁴⁾	BC25	A	A	A	A
0 ... 1 A	CC1	A	A	A	A
0 ... 1.5 A	CC1.5	A	A	A	A
0 ... 2.5 A	CC2.5	A	A	A	A
0 ... 4 A	CC4	A	A	A	A
0 ... 6 A	CC6	-	A	A	A
0 ... 10 A	CC10	-	A	A	A
0 ... 15 A	CC15	-	A	A	A
0 ... 25 A	CC25	-	A	A	A
0 ... 40 A	CC40	-	A	A	A
0 ... > 1 A ... < 40 A ²⁾	CC...	A	A	A	A
(Max. 4 A with size 48 x 48 mm)					

1) For sheet metal housings with cone head rivets please see "Housing Variants"

2) Specify in clear text

3) Mechanical suppressed

4) Electrical suppressed

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 240° scale

Narrow front frame per DIN 43 718, matt black

'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. →	V-PQ 48-250 1668P	V-PQ 72-250 ¹⁾ 1602P	V-PQ 96-250 ¹⁾ 1605P	PQ 144-250 1621P
Zero Point at left	+ ↓				
Connection to shunt (direct current)					
... A / 60 mV	BE3	+	+	+	A
... A / 150 mV	BE4	+	+	+	A
... A / ... > 60 mV ²⁾	BE981	A	A	A	A
Scale:					
1 A	CG1	+	+	+	+
1.5 A	CG1.5	+	+	+	+
2.5 A	CG2.5	+	+	+	+
4 A	CG4	+	+	+	+
6 A	CG6	+	+	+	+
10 A	CG10	+	+	+	+
15 A	CG15	+	+	+	+
25 A	CG25	+	+	+	+
40 A	CG40	+	+	+	+
60 A	CG60	+	+	+	+
100 A	CG100	+	+	+	+
150 A	CG150	+	+	+	+
250 A	CG250	+	+	+	+
400 A	CG400	+	+	+	+
500 A	CG350	+	+	+	+
600 A	CG600	+	+	+	+
0 ... > 1 A < 1 kA ³⁾	CG...	+	+	+	+
1 kA	CH1	+	+	+	+
1.5 kA	CH1.5	+	+	+	+
2.5 kA	CH2.5	+	+	+	+
4 kA	CH4	+	+	+	+
5 kA	CH5	+	+	+	+
6 kA	CH6	+	+	+	+
10 kA	CH10	+	+	+	+
15 kA	CH15	+	+	+	+
> 1 kA ²⁾	CH...	+	+	+	+
Direct Voltage					
Range:					
0 ... 150 mV	DB150	A	A	A	A
0 ... 250 mV	DB250	A	A	A	A
0 ... 400 mV	DB400	A	A	A	A
0 ... 600 mV	DB600	A	A	A	A
0 ... > 150 mV ... < 1 V ³⁾	DB...	A	A	A	A
0 ... 1 V	DC1	A	A	A	A
0 ... 1.5 V	DC1.5	A	A	A	A
0 ... 2.5 V	DC2.5	A	A	A	A
0 ... 3 V	DC3	A	A	A	A
0 ... 4 V	DC4	A	A	A	A
0 ... 6 V	DC6	A	A	A	A
0 ... 10 V	DC10	A	A	A	A
0 ... 15 V	DC15	A	A	A	A
0 ... 25 V	DC25	A	A	A	A
0 ... 40 V	DC40	A	A	A	A
0 ... 60 V	DC60	A	A	A	A
0 ... 100 V	DC100	A	A	A	A
0 ... 150 V	DC150	A	A	A	A
0 ... 250 V	DC250	A	A	A	A
0 ... 400 V	DC400	-	A	A	A
0 ... 500 V	DC500	-	A	A	A
0 ... 600 V	DC600	-	A	A	A
0 ... > 1 V ... < 600 V ^{3) 4)}	DC...	-	A	A	A
Connection to separate voltage divider ⁵⁾					
... kV / 25 V (250 μA)	BE76	A	A	A	A

1) For sheet metal housings with cone head rivets please see „Housing Variants“

2) Upper value > 60 mV

3) Specify in clear text

4) Higher Voltages - see voltage dividers, page 129

5) Voltage dividers - see page 129

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 240° scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

Type Order No. ⇒	V-PQ 48-250 1668P	V-PQ 72-250 1602P	V-PQ 96-250 1605P	PQ 144-250 1621P
GENERAL VARIANTS				
Identification + ↓				
Zero Point				
Zero point at left	BC1	N	N	N
Zero point at center	BC2	A	A	A
Zero point as desired (specify in clear text)	BC20	A	A	A
Zero point at left, mech. suppressed (not 4-20 mA) (Max. Suppression 20%; measuring ranges ≥ 250 μA / ≥ 250 mV, Ri 1kΩ/V; specify in clear text)	BC16	A	A	A
Internal Resistance with Voltmeters				
Standard (see technical data)	IR99	N	N	N
Ri approx. 10 kΩ/V (measuring input ≥ 4 V)	IR10	A	A	A
Ri = 1 kΩ / V ± 1 % at nominal temperature (measuring input ≥ 1 V)	IR30	A	A	A
Ri = 10 kΩ/V ± 1 % at nominal temperature (measuring input ≥ 4 V)	IR53	A	A	A
Potentiometer for Adjustment with Voltmeters				
Voltmeters without potentiometer for adjustment	MP99	N	N	N
Voltmeters with potentiometer for adjustment	MP1	-	A	A
Adjustment range ± 15 % (Measuring input ≥ 6 V / ≤ 550 V; Ri as listed; Class 1.5 only)				
Lead Resistor when connecting to Shunt Resistors ...A / 60 mV and ...A / 150 mV				
Standard version 0.06 Ω	IG99	N	N	N
Differing from 0.06 Ω (specify in clear text)	IG999	A	A	A
Limiting values: ...A / 60 mV for class 1.5 max. 1 Ω ...A / 150 mV in Klasse 1.5 max. 7 Ω				
Accuracy				
Class 1.5	IE15	N	N	N
Class 1.0 (Measuring input ≥ 100 μA / ≥ 60 mV; with 72 x 72 in combination with fine division and beam pointer with knife-edge only)	IE11	-	A	A
Position of Use				
Control panel vertical	LA1	N	N	N
Control panel horizontal	LA2	+	+	+
Other	LA999	A	A	A
(Please specify angle between scale and horizontal)				
Special Features				
Normal vibration and shock resistance	LN99	N	N	N
Suitable for marine use with the following approvals:				
German Lloyds	LN2	A	A	A
BV 0591 German Navy	LN1	-	+ ¹⁾	+ ¹⁾
BV 3340 German Navy	LN6	-	- ²⁾	- ³⁾
Vibration resis. 2.5 g, Shock resis. 30 g	LN56	A ⁵⁾	A	A
Vibration resis. 5 g, Shock resis. 50 g	LN55	A ⁵⁾	A	A ⁶⁾
				} on request

1) Contains sheet metal housing with cone head rivets (Ident. ML4) and fastener B (Ident. MN11)

2) Type PQS 72-250 according to special data sheet

3) Type PQS 96-250 according to special data sheet

4) See special data sheet

5) Available only in combination with screw clip S

6) Available only in combination with fastener B DIN 43835

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 240° scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	V-PQ 48-250 1668P	V-PQ 72-250 1602P	V-PQ 96-250 1605P	PQ 144-250 1621P
SCALE VARIANTS	Identification + ↓				
Scale					
In accordance with measuring input	GF99	N	N	N	N
Blank Scale (lower/upper value markings, company logos, symbols)	GF28	+	+	+	+
Scale Characteristics					
Current / Voltage linear	SD1	N	N	N	N
According to curve (not current / voltage linear)	SD6	A	A	A	A
Division and Pointer					
Single division	GD1	N	N	N	N
Double division	GD2	A	A	A	A
Coarse-fine division	SE1	N	N	N	N
Fine division	SE3	-	A	A	A
Beam pointer with knife-edge for single division	RA1	N	N	N	N
Knife-edge pointer for double division	RA2	+	+	+	+
Knife-edge pointer for single division	RA10	A	A	A	A
Knife-edge pointer for double division	RA11	-	A	A	A
Bar indicator for single division	RA40	A	A	A	A
Additional Imprint					
Second numbering (specify in clear text)	SK992	A	A	A	A
Inscription:					
Without additional inscription	SM99	N	N	N	N
Inscription ≤ 15 characters German	SM991	A	A	A	A
> 15 characters German	SM992	A	A	A	A
≤ 15 characters other language	SM993	A	A	A	A
> 15 characters other language	SM994	A	A	A	A
(Other language in Latin lettering, specify in clear text)					
Coloured mark red RAL 2002 (specify in clear text)	ST991	A	A	A	A
Coloured sectors yellow RAL 1021, green RAL 6018 or red RAL 2002 (specify in clear text)	SU991	A	A	A	A
Scale Characteristics					
Interchangeable scale	SA10	N	N	N	-
Screw mounted scale	SA11	A	A	A	N ¹⁾
Anti-parallax scale (with bar indicator and single division) ⁵⁾	SA5	A	A	A	A

1) Standard version without extra charge

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 240° scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

Type	V-PQ 48-250	V-PQ 72-250	V-PQ 96-250	PQ 144-250
Order No. ⇒	1668P	1602P	1605P	1621P
SCALE VARIANTS				
Identification + ↓				
Scale / Pointer Colours				
Scale white; imprint and pointer black	SG99	N	N	N
Scale balck; imprint and pointer white	SG1	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint and pointer yellow	SG2	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint white, pointer yellow	SG3	A ¹⁾	A ¹⁾	A ¹⁾
Without scale; pointer black	SG10	+	+	-
Without scale; pointer white	SG11	A	A	-
Without scale; pointer yellow	SG12	A	A	-
Versions without scales available only for panel meters that are connected to transformers or shunts				
Dial Illumination				
Without dial illumination	PA99	N	N	N
With direct dial illumination (Plexiglass scale, scale and dial illumination white)	PA1	-	A	A
Note: Completion with Order No. PB necessary. Size 48 x 48: dial illumination available only for ≤ 4 A / ≤ 660 V together with single terminal cover.				
With indirect dial illumination				
Light conductor with mask, dial illumination white	PA6	-	A ²⁾	A ²⁾
Light conductor with mask, dial illumination red	PA7	-	A ²⁾	A ²⁾
Note: Completion with Order No. SG and PB necessary (SG 99 as light conductor with mask not available). Dial illumination available only with screw mounted scale (Order No. SA X 11)				
Voltage for Dial Illumination				
12 V	PB3	-	+	+
24 V	PB5	-	+	+
28 V	PB6	-	+	+
HOUSING VARIANTS				
Application				
Standard version	LB99	N	N	N
Tropic resistant	LB1	A	A	A
Protection				
Standard (see technical data)	LH99	N	N	N
Front housing-panel protection IP54. clamps IP00	LH21	A	A	A
Earthquake-proof (possible combination: LH X 99 or LH X 21)	LH10	A	A	A
Front Frame Colour				
Matt black	MA2	N	N	N
Matt grey RAL 7037	MA11	A	A	A
Matt stone grey RAL 7032	MA12	A	A	A
Matt light grey RAL 7035	MA14	A	A	-
Matt dark beige approx. RAL 1019	MA21	A	A	A
Intermediate Frame, Height 3 mm				
Without intermediate frame	MC99	N	N	N
Intermediate frame shiny black	MC1	A	A	-
Intermediate frame shiny grey RAL 7037	MC2	A	A	A
Intermediate frame available only in combination with screw clip S or fastener B DIN 43 835				

1) Additional one-off costs for special scale printing on request

2) Prices on request

Vario-Series • Square Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, 240° scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	V-PQ 48-250 1668P	V-PQ 72-250 1602P	V-PQ 96-250 1605P	PQ 144-250 1621P
HOUSING VARIANTS					
Identification + ↓					
Glass Window					
Standard version	MG99	N	N	N	N
Anti-glare glass	MG1	A	A	A	A
Housing					
Standard housing	ML99	N	N	N	N
Sheet metal housing with cone head rivets	ML4	-	A	A	N ¹⁾
Housing for Mauell-Grid	ML5	+	- ²⁾	- ²⁾	- ³⁾
Housing for H&B Unibloc-Grid	ML6	+ ⁴⁾	- ²⁾	- ²⁾	- ³⁾
Mounting					
2 leaf springs	MN2	N	+	+	-
2 leaf springs for H&B Unibloc-Grid (bronze-springs)	MN4	A	-	-	-
4 leaf springs	MN1	A	A	A	-
Screw Clip S	MN14	A	N ¹⁾	N ¹⁾	-
Screw Clip G	MN13	-	-	-	N
Fastener B DIN 43 835	MN11	-	A ⁵⁾	A ⁵⁾	A
Subklew fastener (Screw Clip S without cone point)	MN32	A	A	A	-
Without fastener	MN88	+ ⁶⁾	+	+	+
Identification					
Without Identification	MZ99	N	N	N	N
Identification on backside (specify in clear text)	MZ998	A	A	A	A
Marker Pointer					
Without marker pointer	PM99	N	N	N	N
Adjustable red index pointer	PM1	A	A	A	
Label Strips					
Without label strips	SS99	N	N	N	N
Label on front face (specify in clear text)	SS992	A	A	A	A
Contact Protection					
Without terminal cover	VB99	N	N	N	N
Overall terminal cover	VB2	A	A	A	A
Single terminal cover (Voltmeter and Ammeter ≤ 4 A)	VB1	+	+	+	+

1) Standard version without extra charge

2) Standard housing (ML99) in combination with fastener MN2, also suitable for Mauell-Grid and H&B Unibloc-Grid

3) Standard housing (ML99) in combination with fastener MN11, also suitable for Mauell-Grid and H&B Unibloc-Grid

4) Available only in combination with Order No. MN4 (2 leaf springs for H&B Unibloc-Grid)

5) Available only in combination with Order No. ML4 (sheet metal housing with cone head rivets)

6) ML5 (housing for Mauell-Grid) standard version

Vario-Series • Square Panel Meters

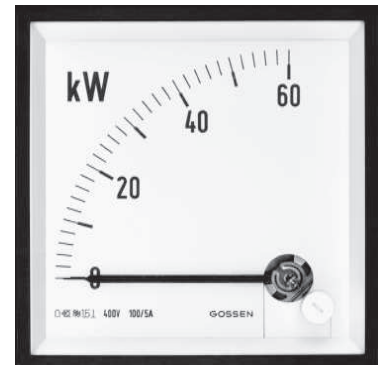
For Active Power or Reactive Power



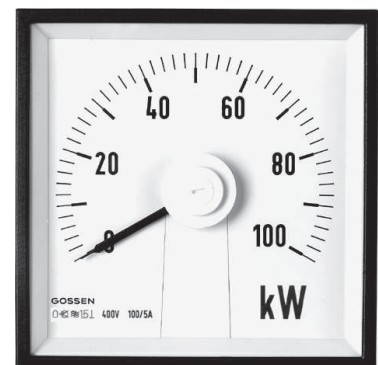
Moving-coil movement with power converter, 90° or 240° scale
Narrow front frame per DIN 43 718, matt black

Technical Data

Front Dimensions mm Type	96 x 96 V-LM 96	96 x 96 V-LM 96-250
Scale Length mm	97	151
Accuracy Class	1.5	1.5
Max. Weight (standard model), kg	0.8	0.8
Power Consumption approx.		
- Current Path	0.2 VA	0.2 VA
- Voltage Path	3 VA	3 VA
Order No.:		
AB1 / AB2 / AB12 / AB5 / AB15	3.5 VA	3.5 VA
AB11	3.4 VA	3.4 VA
AB4 / AB14	3.9 VA	3.9 VA
AB6	4.3 VA	4.3 VA
AB16	4.3 VA	4.3 VA
Nominal Supply Voltage: Outer to Neutral Conductor (= Operating Voltage)	≤ 398 V	
3-Phase-3-Wire-Systems	≤ 690 V	
3-Phase-4-Wire-Systems	≤ 398 / 690 V	
Operating Voltage	600 V	600 V
Test Voltage	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 52	IP 52



V-LM 96



V-LM 96-250

Description

Analog panel meter with core-magnet moving-coil movement and built in power converter for active and reactive power.

Depending upon type of system and power, the power converter consists of one, two or three multipliers. The multipliers function in accordance with the TDM process (time division multiplier). The output signals from the multipliers are added and fed to the moving coil mechanism.

Display

Scale Division Coarse-fine
 Pointer Beam pointer with knife-edge

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL 94V-0
 Mounting Fasteners Standard: Screw Clip S
 Alternative: Subkleb fasteners
 Replaceable Scales, glass windows and front frames
 ⇒ May only be replaced under
 voltage-free conditions!
 Terminals M4 screw terminals with self-lifting terminal clips. Screws
 can be turned with a cross-head or standard screw drivers
 Clamp Identification per DIN 43807
 Contact Protection Finger-safe full cover included

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1°
Frequency	45 ... 65 Hz
Current Component	20 ... 120 % of rated value
Voltage Component	98 ... 102 % of rated value
Warm-up Time	≥ 5 min.
Other	DIN EN 61010-1

Notes Concerning the Determination of Measuring Ranges

The upper measuring value should be a standard value per DIN 43 70:

1 – 1.2 – 1.5 – 2 – 2.5 – 3 – 4 – 5 – 6 – 7.5 – 8

and corresponding powers of ten.

The upper measuring range value must lie within a range of 0.5 to 1.2 times apparent power.

Apparent power P_s is calculated from the primary values from the current and voltage transformers:

- Single-Phase AC $P_s = U \times I$
- Three-Phase $P_s = U \times I \times \sqrt{3}$

where U equals phase-to-phase voltage.

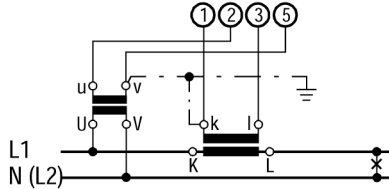
Vario-Series • Square Panel Meters

For Active Power or Reactive Power

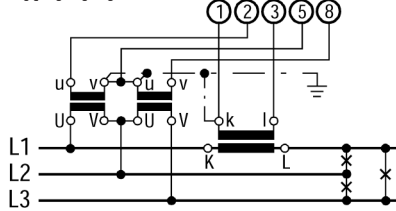


Schematic Diagrams

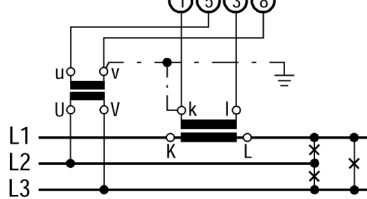
**Single-Phase Alternating Current
Active & Reactive Power**



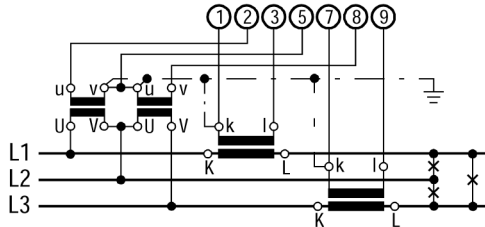
**3-Phase 3-Wire, Balanced Load
Active Power**



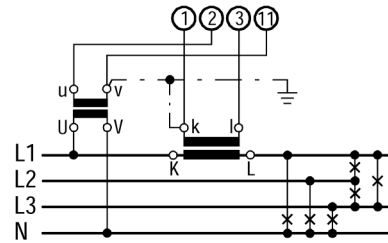
**3-Phase 3-Wire, Unbalanced Load
Reactive Power**



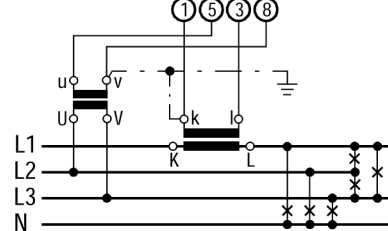
**3-Phase 3-Wire, Balanced Load
Active & Reactive Power**



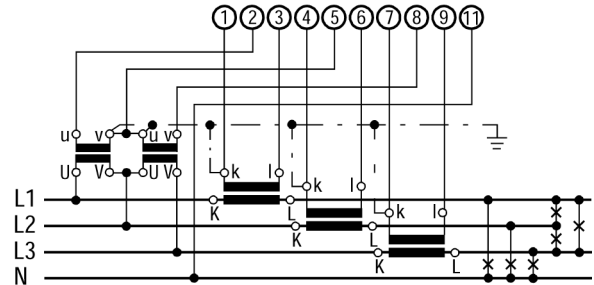
**3-Phase 4-Wire, Balanced Load
Active Power**



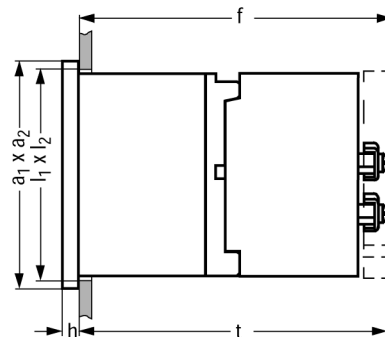
**3-Phase 4-Wire, Balanced Load
Reactive Power**



**3-Phase 4-Wire, Unbalanced Load
Active & Reactive Power**



Basic Dimensions



Front Dimensions mm	Nominal Dimen. mm		Cutout Dimensions mm $l_1 \times l_2$	Order No.	Installation Depth mm	
	$a_1 \times a_2$	h			incl. Terminals t	incl. Full Cover f
96 x 96	96 x 96	5	$92^{+0.8} \times 92^{+0.8}$	AB1/AB11/AB2/AB12/ AB4/AB14/AB5/AB15/ AB6/AB16	117	123

Vario-Series • Square Panel Meters

For Active Power or Reactive Power



Moving-coil movement with power converter, 90° or 240° scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Order No. with the same letter sequence may be chosen. Order No. with Identification N (standard model) can be left out.

An entry with "..." in the Order No. column means that the Order No. must be supplemented with written text.

'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

		Order No. ⇒	Type	V-LM 96 1129D	V-LM 96-250 1115D
		+ ↓	+ ↓	+ ↓	
System Type / Power Type	Voltage Path Terminal				
2-Wire-System					
Active Power, Single Phase AC		AB1		+	+
	to transf. sec.: 100 V	primary voltage: ... V	BF12	DG...	+
		primary voltage: ... kV	BF12	DH...	+
	to transf. sec.: 110 V	primary voltage: ... V	BF15	DG...	+
		primary voltage: ... kV	BF15	DH...	+
	direct 230 V AC		IL323		+
	direct 240 V AC		IL324		+
	direct 400 V AC		IL340		+
Reactive Power, Single Phase AC		AB11		A	A
	direct 230 V AC		IL323		+
	direct 240 V AC		IL324		+
	direct 400 V AC		IL340		+
3-Wire-System					
Active Power, 3-Wire Balanced Load		AB2		A	A
Reactive Power, 3-Wire Balanced Load		AB12		A	A
Active Power, 3-Wire Unbalanced Load		AB4		A	A
Reactive Power, 3-Wire Unbalanced Load		AB14		A	A
	to transf. sec.: 100 V	primary voltage: ... V	BF12	DG...	+
		primary voltage: ... kV	BF12	DH...	+
	to transf. sec.: 110 V	primary voltage: ... V	BF15	DG...	+
		primary voltage: ... kV	BF15	DH...	+
	direct 400 V AC		IL340		+
	direct 415 V AC		IL661		+
	direct 440 V AC		IL344		+
	direct 500 V AC		IL350		+
	direct 690 V AC		IL369		+
4-Wire-System					
Active Power 4-Wire Balanced Load		AB5		A	A
Reactive Power 4-Wire Unbalanced Load		AB15		A	A
Active Power 4-Wire Balanced Load		AB6		A	A
Reactive Power 4-Wire Unbalanced Load		AB16		A	A
	to transf. sec.: 100 V	primary voltage: ... V	BF12	DG...	+
		primary voltage: ... kV	BF12	DH...	+
	to transf. sec.: 110 V	primary voltage: ... V	BF15	DG...	+
		primary voltage: ... kV	BF15	DH...	+
	direct 230 / 400 V AC		IL723		+
	direct 240 / 415 V AC		IL721		+
	direct 254 / 440 V AC		IL722		+
	direct 277 / 480 V AC		IL724		+
	direct 398 / 690 V AC		IL725		+
Current Path Terminal	to transf. sec.: 1 A	primary current: ... A	BE10	CG...	+
		primary current: ... kA	BE10	CH...	+
	to transf. sec.: 5 A	primary current: ... A	BE11	CG...	+
		primary current: ... kA	BE11	CH...	+

Vario-Series • Square Panel Meters

For Active Power or Reactive Power



Moving-coil movement with power converter, 90° or 240° scale
Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Order No. with the same letter sequence may be chosen. Order No. with Identification N (standard model) can be left out.

An entry with "..." in the Order No. column means that the Order No. must be supplemented with written text.

'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

		Order No. + ↓	⇒ Type	V-LM 96 1129D	V-LM 96-250 1115D
Variants					
Zero Point	at left at center 10% of positive upper value	BC2 BC6		N A A	N A A
Upper value of meas. range	(from 0.5 to 1.2 x of reactive power selectable)	NB...		+	+
Scale Division	corresponds to measuring range blank scale (lower/upper val. markings, logos, sym.)	GL98		N +	N +
Position of Use	standard 0 ... 45 degrees from horizontal (bonded glass) 46 ... 89 degrees from horizontal (bonded glass) 91 ... 135 degrees from horizontal	LA11 LA12 LA13		N A A A	N A A A
Applications	standard tropic resistant, climatic category 3	LB4		N A	N A
Protection	standard front panel IP 54, terminals IP00	LH21		N A	N A
Resistance to Vibration/ Marine Applications	standard vibration resistance 2.5 g; shock resistance 30 g marine applications, German Lloyds	LN56 LN8		N A A	N A A
Front Frame	matt black matt grey, RAL 7037	MA11		N A	N A
Glass Window	standard anti-glare anti-glare, with red adjustable index pointer	MG1 MG98		N A A	N A A
Housing and Mounting	standard polycarbonate housing with Subklew fasteners	ML10		N A	N A
Identification	none on the back:	MZ998...		N A	N A
Scale Inscription (Latin lettering)	none ≤ 22 characters, 1 line: ≤ 37 characters, 2 lines: 1 st line (15 characters): ...; 2 nd line (22 char.): ...	SM902... SM911...		N A A	N A A
Additional Numberings	none 2 nd set of numbering black: ... 2 nd set of numbering red (RAL 2002): ...	SK982... SK983...		N A A	N A A
Red Marker (RAL 2002)	none red marker at: ...	ST981...		N A	N A

Ordering Example:

Panel meter for active power for 3-wire-system with unbalanced load,
 Connection to transformer 100/5 A, 400 V, measuring range 0...60 kW, 240° Scale

Type V-LM 96-250	Order No. 1115D, AB4, BE11, CG100, IL340, NB: 0...60 kW
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Vario-Series • Square Panel Meters

For Power Factor



**Moving-coil movement with power factor converter, 90° scale
Narrow front frame per DIN 43 718, matt black**

Technical Data

Front Dimensions Type	96 x 96 mm V-LF 96
Scale Length mm	94
Accuracy Class	1.5
Max. Weight (standard version.), kg	0.54
Power Consumption approx. Current Path	1.0 VA
Voltage Path	3.0 VA
Operating Voltage:	Outer to neutral conductor
	3-Phase-3-Wire-System
	3-Phase-4-Wire-System
	≤ 300V
	≤ 500V
	≤ 277/480 V
Test Voltage	3.5kV
Front Housing-Panel Protection	IP 52

Description

Analog panel meter with core-magnet moving-coil movement and built in power factor converter. The power factor converter determines the phase angle between current and voltage. $\cos \varphi$ is displayed at the moving-coil movement.

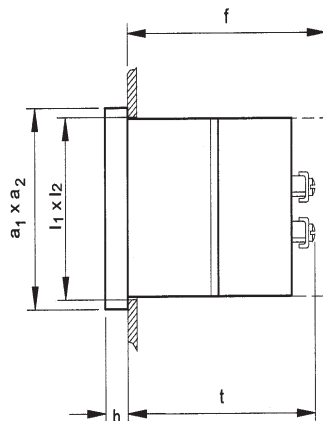
Display

Measuring Range	CAP 0.5 ... 1 ... 0.5 IND
Scale Division	Coarse-fine
Pointer	Beam pointer with knife edge

Mechanical Design

Housing Material	Polycarbonate, self-extinguishing and drip-proof per UL94V-0 or sheet metal housing as option
Mounting Fasteners	Standard: Screw clip S. Options: see next page
Replaceable	Scales, front frames and glass windows ⇒ May only be replaced under voltage free conditions!
Terminals	M4 screw terminals with self-lifting terminal clips. Screws can be turned with cross-head or standard screw drivers.
Contact Protection	Finger-safe full cover included

Basic Dimensions



V-LF 96

Reference Conditions

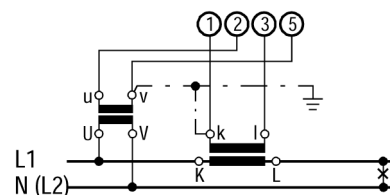
Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2°C
Position of Use	control panel vertical ± 1°
Frequency	50 Hz ± 0.1 Hz
Current Component	95 ... 100% of rated value
Voltage Component	98 ... 102% of rated value
Waveshape	sine, distortion factor ≤ 1%
Warm-Up Time	≥ 5 min.
Other	DIN EN 60051

Nominal Range of Use Limits

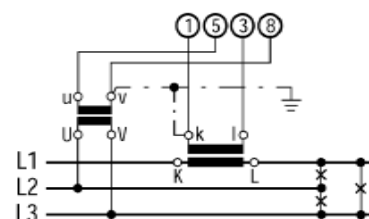
Frequency	45 Hz ... 65 Hz 49 Hz ... 51 Hz for Order No.: AB21
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Schematic Diagrams

Single Phase Alternating Current



3-Phase 3-Wire, Balanced Load



Front in mm	Nom. Dimensions. mm		Cutout Dimensions. mm $l_1 \times l_2$	Installation Depth incl. Terminals M4 mm t	Installation Depth incl. Full cover. mm f
	$a_1 \times a_2$	h			
96 x 96	96 x 96	5	$92^{+0.8} \times 92^{+0.8}$	124 (60 projected)	133

Vario-Series • Square Panel Meters

For Power Factor



Moving-coil movement with power factor converter, 90° scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Order No. with the same letter sequence may be chosen. Order No. with Identification N (standard model) can be left out.

An entry with "..." in the Order No. column means that the Order No. must be supplemented with written text.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

		Type Order No. + ↓	⇒ + ↓	V-LF 96 1129H
System Type / Power Type	Nominal Voltage			
Single Phase Alternating Current		AB21		+
	100 V AC		IL310	+
	110 V AC		IL311	+
	220 ... 240 VAC		IL728	+
3-Wire-System, Balanced Load		AB22		+
	100 V AC		IL310	+
	110 V AC		IL311	+
	380 ... 400 VAC		IL727	+
	415 ... 440 VAC		IL730	+
	500 V AC		IL350	+
Current Path Terminal	at transformer sec.: 1A	BE10		+
	at transformer sec.: 5A	BE11		+
Position of Use	standard			N
	0 ... 45 degrees from horizontal (bonded glass)	LA11		A
	46 ... 89 degrees from horizontal (bonded glass)	LA12		A
	91 ... 135 degrees from horizontal	LA13		A
Application	standard			N
	conditionally tropic resistant, climatic category 3	LB4		A
Protection	standard			N
	front panel: IP 54, terminals IP00	LH21		A
Resistance to Vibration/ Marine Application	standard			N
	vibration resistance 2.5 g; shock resistance 30 g	LN56		A
	German Lloyds	LN8		A
Front Frame	matt black			N
	matt grey, RAL 7037	MA11		A
Glass Window	standard			N
	anti-glare	MG1		A
	anti-glare, with red adjustable set pointer	MG98		A
Housing and Fasteners	standard			N
	sheet metal housing with type S screw clip	ML7		A
	sheet metal housing with type B screw clip	ML8		A
	polycarbonate housing with 2 leaf springs	ML9		A
	polycarbonate housing with 4 leaf springs	ML11		A
	polycarbonate housing with Subklew fasteners	ML10		A
Identification	none			N
	on the back:	MZ998...		A
Scale Inscription (Latin lettering)	none			N
	≤ 22 characters, 1 line:	SM902...		A
	≤ 37 characters, 2 lines: 1 st line (15 characters): ...;			
	2 nd line (22 characters): ...	SM911...		A
Red Marker (RAL 2002)	none			N
	red marker at: ...	ST981...		A

Ordering Example

Panel meter for power factor

3-Wire-System, balanced load,

Connection to transformer sec. 5 A, 500 V

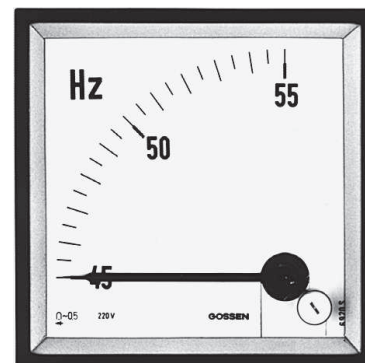
Type V-LF 96	Order No. 1129H, AB22, BE11, IL350
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Vario-Series • Square Panel Meters

For Frequency (Pointer-Type)



Moving-coil movement with frequency converter, 90° scale
Narrow front frame per DIN 43 718, matt black



V-FZQS 96

Technical Data

Front Dimensions mm Type	48 x 48 FZQS 48 W	72 x 72 V-FZQS 72	96 x 96 V-FZQS 96
Scale Length mm	40	66	94
Weight approx. (kg)	0.08 ¹⁾	0.2	0.25
Operating Voltage	300 V	600 V	600 V
Test Voltage	3.5 kV	5.8 kV	5.8 kV
Front Housing-Panel Protection	IP 52	IP 52	IP 52
Fasteners (see next page)	leaf spring	screw clip S	screw clip S
Housing Material	polycarbonate	polycarbonate	polycarbonate
Interchangeable Scale	yes	yes	yes
Frequency Converter	separate	built in	built in

1) plus 0.2 kg (approx.) for separated frequency converter

Description

Analog panel meter with moving-coil movement and built in or separate frequency converter (see above)

Display

Scale Division Coarse-fine
 Pointer Beam pointer with knife edge

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL 94 V - 0 or sheet metal housing (see above).
 Sheet metal housing for type V-ZQS 72 and V-ZQS 96 as option.

Replaceable Scales, glass windows and front frames
 ⇒ May only be replaced under voltage-free conditions!

Terminals M4 screw terminals with self-lifting terminal clips. Screws can be turned with cross-head or standard screw drivers.

Contact Protection Available as option

Reference Conditions

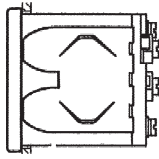
Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60 051

Vario-Series • Square Panel Meters

For Frequency (Pointer-Type)

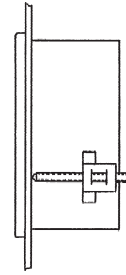


Leaf Spring



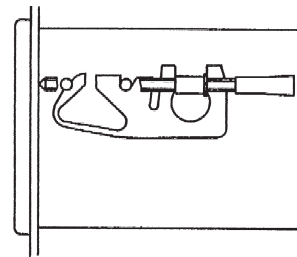
Control panel thickness 1 to 3 mm.
For size 48 x 48 mm, not available for Mauell-Grid.
Also available as option for sizes 72 x 72 and 96 x 96 mm.

Screw Clip S

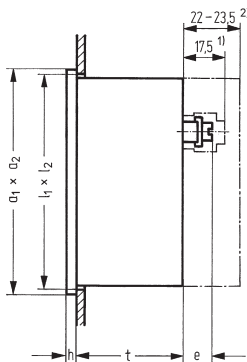


Control panel thickness 1 to 25 mm.
Special screw clamp M4 required for sizes 72 x 72 and 96 x 96 mm.
Also available as option for size 48 x 48 mm, not available for Mauell-Grid.

Fastener B DIN 43 835



Basic Dimensions



Control panel thickness 1 to 40 mm.
Screw clamp M4 as option for:
Sheet metal housings 72 x 72 and 96 x 96 mm with cone head rivets

Drawings to Scale (on request)

0101A258 for size 48 x 48 mm
0101A259 for sizes 72 x 72 and 96 x 96 mm
1325A10 for separated measuring converter
1402A32 for separated series resistance

Ordering Example

Panel meter for frequency (pointer-type), size 96 x 96 mm
90° Scale
Nominal Voltage 230 V, Class 0.5
Measuring Range 45 ... 50 ... 55 Hz

Dimensions for separated Measuring Converter

(for size 48 x 48 only)
120 x 63 x 88 (B/T/H)
Drawing to scale No. 1325 A 10 (on request)

Dimensions for separated Series Resistance

90 x 36 x 35.5 (L x B x H)
Drawing to scale No. 1402 A 32 (on request)

Type V-FZQS 96	Order No. 1604Z, IL323, EH619
--------------------------	---

Front in mm	Nominal Dimensions		Cutout Dimensions	Installation Depth	Terminals M4 e
	a ₁ x a ₂	h			
48 x 48	48 x 48	5	45 ^{+0.6} x 45 ^{+0.6}	43.5	12.5
72 x 72	72 x 72	5	68 ^{+0.7} x 68 ^{+0.7}	43.5	12.5
96 x 96	96 x 96	5	92 ^{+0.8} x 92 ^{+0.8}	43.5	12.5

1) Single terminal cover

2) Overall terminal cover (22 mm for panel meters with front panel dimensions of 48 x 48 mm only)

Vario-Series • Square Panel Meters

For Frequency (Pointer Type)



Moving-coil movement with frequency converter, 90° scale
Narrow front frame per DIN 43 718, matt black

'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

		Type Order No. ⇒	FZQS 48 W ¹⁾ 1670Z	V-FZQS 72 ²⁾ 1601Z	V-FZQS 96 ²⁾ 1604Z
General Value Measuring		+ ↓ + ↓			
Nominal Voltage ³⁾	100–120 V	IL731			
	208–250 V	IL732			
	380–500 V	IL733			
Measuring Range	Class				
48 ... 50 ... 52 Hz ⁴⁾	0.5	EH623	+	+	+
58 ... 60 ... 62 Hz ⁴⁾	0.5	EH629	+	+	+
380 ... 400 ... 420 Hz ⁴⁾	0.5	EH674	+	+	+
45 ... 50 ... 55 Hz ⁵⁾	0.5	EH619	+	+	+
55 ... 60 ... 65 Hz ⁵⁾	0.5	EH626	+	+	+
90 ... 100 ... 110 Hz ⁵⁾	0.5	EH675	+	+	+
180 ... 200 ... 220 Hz ⁵⁾	0.5	EH635	+	+	+
270 ... 300 ... 330 Hz ⁵⁾	0.5	EH638	A	A	A
360 ... 400 ... 440 Hz ⁵⁾	0.5	EH642	+	A	+
15 ... 16.66 ... 18.4 Hz ⁵⁾	0.5	EH617	A	A	A
45 ... 50 ... 60 ... 65 Hz ⁵⁾	1	EH671	+	A	+
40 ... 50 ... 60 Hz ⁵⁾	1	EH618	A	A	A
For static Transducers					
Nominal Voltage	250 V	IL325			
Measuring Range					
300 ... 500 ... 750 Hz	Class 1.5 for 150 ... 250 V Class 2.5 for < 150 ... 60 V and > 250 ... 300 V	EH641	-	-	A
600 ... 1000 ... 1400 Hz		EH646	-	-	A
1 ... 2 ... 3 kHz		EK601	-	-	A
1.8 ... 3 ... 4.2 kHz		EK603	-	-	A
2 ... 6 ... 10 kHz		EK609	-	-	A
6 ... 8 ... 10 kHz		EK608	-	-	A
Weitbereich					
Nominal Voltage ³⁾	100–120 V	IL731			
	208–250 V	IL732			
	380–500 V	IL733			
Measuring Range	Class				
0/10 ... 100 Hz	1.5	EH611	-	-	A
0/10 ... 500 Hz	1.5	EH615	-	-	A
0/0.1 ... 1 kHz	1.5	EK110	-	-	A
0/0.1 ... 10 kHz	1.5	EK210	-	-	A

1) Separated measuring converter

2) For sheet metal housings with cone head rivets please see "Housing Variants"

3) Occuring voltage fluctuations up to ±20% of nominal voltage cause an additional error in indication that is less than half of the class error

4) 72 x 72 with nominal voltage > 120 V separated series resistance, 96 x 96 and 144x144 with nominal voltage > 230 V separated series resistance

5) 72 x 72 with nominal voltage 440 V separated series resistance

Vario-Series • Square Panel Meters

For Frequency (Pointer Type)



Moving-coil movement with frequency converter, 90° scale
Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. →	FZQS 48 W 1670Z	V-FZQS 72 1601Z	V-FZQS 96 1604Z
GENERAL VARIANTS				
Identification + ↓				
Position of Use				
Control panel vertical	LA1	N	N	N
Control panel horizontal	LA2	+	+	+
Other (Please specify angle between scale and horizontal)	LA999	A	A	A
Special Features				
Normal vibration and shock resistance	LN99	N	N	N
Vibration resis. 2.5 g, shock resis. 30 g	LN56	+ ¹⁾	+	+
Suitable for marine use with the following approvals:				
German Lloyds	LN2	A	A	A
Lloyd's Register of Shipping	LN3	-	+	+
SCALE VARIANTS				
Additional Imprint				
Second numbering (specify in clear text)	SK992	A	A	A
Inscription:				
Without additional inscription	SM99	N	N	N
Inscription ≤ 15 characters German	SM991	A	A	A
> 15 characters German	SM992	A	A	A
≤ 15 characters other language	SM993	A	A	A
> 15 characters other language	SM994	A	A	A
(Other language in Latin lettering, specify in clear text)				
Coloured mark red RAL 2002 (specify in clear text)	ST991	A	A	A
Coloured sectors yellow RAL 1021, green RAL 6018 or red RAL 2002 (specify in clear text)	SU991	A	A	A
Scale Characteristics				
Interchangeable scale	SA10	N	N	N
Screw mounted scale	SA11	A	A	A
Scale / Pointer Colours				
Scale white; imprint and pointer black	SG99	N	N	N
Scale black; imprint and pointer white	SG1	A ³⁾	A ³⁾	A ³⁾
Scale black; imprint and pointer yellow	SG2	A ³⁾	A ³⁾	A ³⁾
Scale black; imprint white, pointer yellow	SG3	A ³⁾	A ³⁾	A ³⁾

1) Available only in combination with screw clip S

2) Standard version without extra charge

3) Additional one-off costs for special scale printing on request

Vario-Series • Square Panel Meters

For Frequency (Pointer Type)



**Moving-coil movement with frequency converter, 90° scale
Narrow front frame per DIN 43 718, matt black**

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen.

Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. →	FZQS 48 W 1670Z	V-FZQS 72 1601Z	V-FZQS 96 1604Z
HOUSING VARIANTS				
Identification + ↓				
Application				
Standard version	LB99	N	N	N
Tropic resistant	LB1	A	A	A
Protection				
According to list	LH99	N	N	N
Front housing-panel protection IP54, terminals IP00	LH21	A	A	A
Front Frame Colours				
Matt black	MA2	N	N	N
Matt grey RAL 7037	MA11	A	A	A
Matt stone grey RAL 7032	MA12	A	A	A
Matt light grey RAL 7035	MA14	A	A	A
Matt dark beige approx. RAL 1019	MA21	A	A	A
Intermediate Frame, Height 3 mm				
Without intermediate frame	MC99	N	N	N
Intermediate frame shiny black	MC1	A	A	A
Intermediate frame shiny grey RAL 7037	MC2	A	A	A
<i>Intermediate frame available only in combination with screw clip S or fastener B DIN 43 835</i>				
Glass Windows				
Standard version	MG99	N	N	N
Anti-glare glass	MG1	A	A	A
Housing				
Standard housing	ML99	N	N	N
Sheet metal housing with cone head rivets	ML4	-	A	A
Mounting				
2 leaf springs	MN2	N	+	+
4 leaf springs	MN1	A	A	A
Screw Clip S	MN14	A	N ¹⁾	N ¹⁾
Screw Clip G	MN13	-	-	-
Fastener B DIN 43835	MN11	-	A ²⁾	A ²⁾
Clip Subklew fastener (Screw Clip S without cone point)	MN32	A	A	A
Identification				
Without identification	MZ99	N	N	N
Identification on the back (specify in clear text)	MZ998	A	A	A
Contact Protection				
Without terminal cover	VB99	N	N	N
Overall terminal cover	VB2	A	A	A
Single terminal cover	VB1	+	+	+

1) Standard version without extra charge

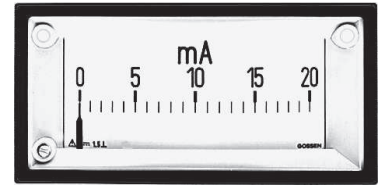
2) Available only in combination with Order No. ML4 (sheet metal housing with cone head rivets)

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, edgewise scale
Narrow front frame per DIN 43 718, matt black



Technical Data

PFN 96 x 48

Front Dimensions Type	48 x 24 PF 48 x 24	72 x 36 PF 72 x 36	96 x 48 PFN 96 x 48	144 x 72 PF 144 x 72
Scale Length mm	29	44	65	96
Class	2.5	1.5	1.5	1.5
Weight approx. (kg)	0.07	0.2	0.45	1.0
Operating Voltage	100 V	600 V	600 V	150 V
Test Voltage	1.5 kV	5.8 kV	5.8 kV	2.2 kV
Front Housing-Panel Protection	IP 50	IP 52	IP 52	IP 50
Fasteners (see next page)	expanding spring	screw spindle	screw spindle	fastener C
Housing Material	sheet metal	polycarbonate	polycarbonate	sheet metal

Description

Analog panel meter with moving-coil movement

Display

Scale Division Coarse-fine
 Exception: special division for 48 x 24 mm meters
 Pointer Beam pointer with knife-edge
 Exception: Bar indicator for 48 x 24 mm meters

Mechanical Design

housing Material Polycarbonate, self-extinguishing and drip-proof per UL 94 V-0
 or sheet metal housing (see above).
 Replaceable Glass windows and front frame
 ⇒ May only be replaced under
 voltage-free conditions!
 Terminals for sizes
 48 x 24 tab connectors 2.8 x 0.8
 72 x 36 tab connectors 6.3 x 0.8 or
 96 x 48 2 x 2.8 x 0.8
 (IP 20 protection)
 144 x 72 terminal clip M 5
 Contact Protection Available as option

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1 °
Other	DIN EN 60 051

Internal Resistance / Voltage Drop / Power Consumption ¹⁾

Measuring Range	Front Dim. mm				Tolerance
	48 x 24	72 x 36	96 x 48	144 x 72	
100 µA	2400 Ω	2180 Ω	1920 Ω	2000 Ω	± 20 %
150 µA	1590 Ω	1040 Ω	2177 Ω	2000 Ω	
250 µA	950 Ω	458 Ω	1965 Ω	1080 Ω	
400 µA	283 Ω	155 Ω	84 Ω	497 Ω	
600 µA	140 Ω	67 Ω	77 Ω	163 Ω	
1 mA	66 Ω	18.5 Ω	76 Ω	69 Ω	
1.5 mA	30 Ω	11 Ω	72 Ω	26.5 Ω	
2 mA	17 Ω	8.5 Ω	75 Ω	20 Ω	
2.5 mA	11.3 Ω	6.5 Ω	90 Ω	10.8 Ω	
4 mA	7 Ω	4.5 Ω	74 Ω	7.1 Ω	
5 mA	5 Ω	5 Ω	60 Ω	5.8 Ω	
6 mA	1.8 Ω	1.3 Ω	51 Ω	2.4 Ω	
10 mA	3.5 Ω	6 Ω	30 Ω	1.6 Ω	
15 mA	4 Ω	4 Ω	20 Ω	4 Ω	
20 mA	3 Ω	3 Ω	15 Ω	3 Ω	
4 ... 20 mA	3 Ω	3 Ω	18 Ω	3 Ω	
25 mA	2.4 Ω	2.4 Ω	12 Ω	2.4 Ω	
Voltage drop at > 25 mA / < 1 A ≥ 1 A	60 mV 60 mV	73 mV	300 mV 90 mV	60 mV 60 mV	± 20 %
Power consumption for connection to shunt (lead resistance 0.06 Ω)	6 mA	6 mA	6 mA	6 mA	
≥ 60 mV / ≤ 400 mV	1 kΩ/V	1 kΩ/V	2.5 kΩ/V	1 kΩ/V	
> 400 mV	1 kΩ/V	1 kΩ/V	1 kΩ/V	1 kΩ/V	

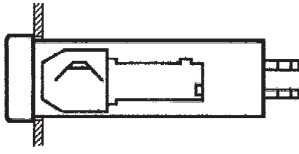
¹⁾ Indicated internal resistance is only valid for instruments with standard accuracy class.
 Please inquire regarding internal resistance (Ri) for moving-coil indicators with mechanical zero
 point at any desired scale value.

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage

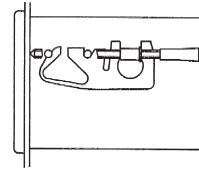


Expanding Springs



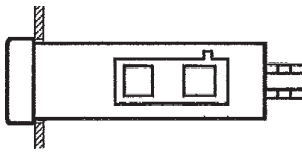
Control panel thickness ≥ 1 mm
 Size 48 x 24 for mounting in DIN-Grid,
 Siemens-Grid M 25 and Kreutzenbeck-Grid

Fastener B DIN 43 835



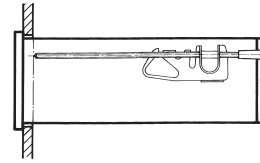
Control panel thickness 1 to 40 mm
 Screw clamp M 4 for size 72 x 36 for mounting in
 DIN-Grid

Catch Spring I



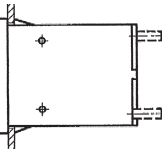
As option for size 48 x 24 for Mauell-Grid,
 H & B Unibloc-Grid and Hein-Grid

Fastener C DIN 43 835



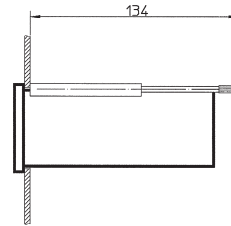
Control panel thickness 1 to 40 mm
 Screw clamp M 5, longer version, for size 144 x 72 for mounting in
 DIN-Grid

Slider



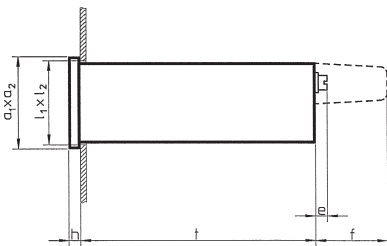
Control panel thickness 1 to 5 mm
 As option for size 48 x 24 for DIN-Grid
 For heightened requirements

Screw Spindle



Control panel thickness up to 40 mm
 Screw spindle for size 96 x 48 for mounting in
 DIN-Grid and all remaining grids

Basic Dimensions



Drawings to Scale (on request)

0101A247 for size 48 x 24
 0101A203 for sizes 72 x 36 and 144 x 72

Ordering Example

Panel Meter 96 x 48 mm
 0 ... 40 V Direct Voltage

Techn. Data Type: PFN 96 x 48	Order No. 1594P, DC40
---	---------------------------------

Front in mm	Nominal Dimensions		Cutout Dimensions $l_1 \times l_2$	Inst. Depth t	Terminals e		Connector contact protection $f =$ overall terminal cover
	$a_1 \times a_2$	h			$\leq 4A$	$> 4A$	
48 x 24	48 x 24	5	$45^{+0.6} \times 22.2^{+0.3}$	65	11	—	31
72 x 36	72 x 36	5	$68^{+0.7} \times 33^{+0.6}$	105	0	0	—
96 x 48	96 x 48	5	$92^{+0.8} \times 45^{+0.6}$	126	0	0	—
144 x 72	144 x 72	8	$138^{+1} \times 68^{+0.7}$	168	4	6	—

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, edgewise scale

Narrow front frame per DIN 43 718, matt black

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No.	⇒	PF 48 x 24 1511P	PF 72 x 36 1505P	PFN 96 x 48 1594P	PF 144 x 72 1584P
	+ ↓					
Landscape	HQ1		N	N	N	N
Portrait	HQ2		+	+	+	+
Zero Point - at left (landscape) - at bottom (portrait)						
Direct Current						
Range:						
0 ... 100 μ A	CA100		A	A	A	A
0 ... 150 μ A	CA150		A	A	A	A
0 ... 250 μ A	CA250		A	A	A	A
0 ... 400 μ A	CA400		A	A	A	A
0 ... 600 μ A	CA600		A	A	A	A
0 ... > 100 μ A ... < 1 mA ¹⁾	CA...		A	A	A	A
0 ... 1 mA	CB1		+	+	+	+
0 ... 1.5 mA	CB1.5		+	+	+	+
0 ... 2.5 mA	CB2.5		+	+	+	+
0 ... 4 mA	CB4		+	+	+	+
0 ... 5 mA	CB5		+	+	+	+
0 ... 6 mA	CB6		+	+	+	+
0 ... 10 mA	CB10		+	+	+	+
0 ... 15 mA	CB15		A	A	A	A
0 ... 20 mA	CB20		A	A	A	A
0 ... 25 mA	CB25		A	A	A	A
0 ... 40 mA	CB40		A	A	A	A
0 ... 50 mA	CB50		A	A	A	A
0 ... 60 mA	CB60		A	A	A	A
0 ... 100 mA	CB100		A	A	A	A
0 ... 150 mA	CB150		A	A	A	A
0 ... 250 mA	CB250		A	A	A	A
0 ... 400 mA	CB400		A	A	A	A
0 ... 600 mA	CB600		A	A	A	A
0 ... > 1 mA ... < 1 A ¹⁾	CB...		A	A	A	A
Mech. suppressed						
4... 20 mA landscape:	BC10		A	A	A	A
4... 20 mA portrait:	BC14		A	A	A	A
Electr. suppressed						
0/4 ... 20 mA landscape:	BC25		A	-	-	A
0/4 ... 20 mA portrait:	BC27		A	-	-	A
0 ... 1 A	CC1		A	A	A	A
0 ... 1.5 A	CC1.5		A	A	A	A
0 ... 2.5 A	CC2.5		A	A	A	A
0 ... 4 A	CC4		A	A	A	A
0 ... 6 A	CC6		A	A	A	A
0 ... 10 A	CC10		-	A	-	A
0 ... 15 A	CC15		-	A	-	A
0 ... 25 A	CC25		-	A	-	A
0 ... 40 A	CC40		-	-	-	A
0 ... 60 A	CC60		-	-	-	A
0 ... > 1 A ... < 6 A ^{1) 2)}	CC...		A	A	A	A

1) Specify in clear text

2) > 1 A / < 25 A with type PF 72 x 36

> 1 A / < 60 A with type PF 144 x 72

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, edgewise scale

Narrow front frame per DIN 43 718, matt black

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	Type Order No.	⇒	PF 48 x 24 1511P	PF 72 x 36 1505P	PFN 96 x 48 1594P	PF 144 x 72 1584P
	+ ↓					
Landscape	HQ1		N	N	N	N
Portrait	HQ2		+	+	+	+
Zero Point - at left (Landscape) - at bottom (Portrait)						
Connection to Shunt (direct current)						
... A / 60 mV	BE3		A	A	A	A
... A / 150 mV	BE4		A	A	A	A
... A / ... > 60 mV ¹⁾	BE981		A	A	A	A
Scale:	CG1		+	+	+	+
1 A	CG1.5		+	+	+	+
1.5 A	CG2.5		+	+	+	+
2.5 A	CG4		+	+	+	+
4 A	CG6		+	+	+	+
6 A	CG10		+	+	+	+
10 A	CG15		+	+	+	+
15 A	CG25		+	+	+	+
25 A	CG40		+	+	+	+
40 A	CG60		+	+	+	+
60 A	CG100		+	+	+	+
100 A	CG150		+	+	+	+
150 A	CG250		+	+	+	+
250 A	CG400		+	+	+	+
400 A	CG500		+	+	+	+
500 A	CG600		+	+	+	+
600 A	CG...		+	+	+	+
0 ... > 1 A ... < 1 kA ¹⁾	CH1		+	+	+	+
1 kA	CH1.5		+	+	+	+
1.5 kA	CH2.5		+	+	+	+
2.5 kA	CH4		+	+	+	+
4 kA	CH6		+	+	+	+
6 kA	CH10		+	+	+	+
10 kA	CH...		+	+	+	+
> 1 kA ^{1) 2)}			+	+	+	+
Direct Voltage						
Range:						
0 ... 60 mV	DB60		A	A	A	A
0 ... 100 mV	DB100		A	A	A	A
0 ... 150 mV	DB150		A	A	A	A
0 ... 250 mV	DB250		A	A	A	A
0 ... 400 mV	DB400		A	A	A	A
0 ... 600 mV	DB600		A	A	A	A
0 ... > 60 mV ... < 1 V ¹⁾	DB...		A	-	-	A
0 ... > 100 mV ... < 600 mV ¹⁾	DB...		A	-	-	-
0 ... 1 V	DC1		A	A	A	A
0 ... 1.5 V	DC1.5		A	A	A	A
0 ... 2.5 V	DC2.5		A	A	A	A
0 ... 3 V	DC3		A	A	A	A
0 ... 4 V	DC4		A	A	A	A
0 ... 6 V	DC6		A	A	A	A
0 ... 10 V	DC10		A	A	A	A
0 ... 15 V	DC15		A	A	A	A
0 ... 25 V	DC25		A	A	A	A
0 ... 40 V	DC40		A	A	A	A
0 ... 60 V	DC60		A	A	A	A
0 ... 100 V	DC100		A	A	A	A
0 ... 150 V	DC150		-	A	A	A
0 ... 250 V	DC250		-	A	A	-
0 ... 400 V	DC400		-	A	A	-
0 ... 500 V	DC500		-	A	A	-
0 ... 600 V	DC600		-	A	A	-
0 ... > 1 V ... < 600 V ^{1) 2)}	DC...		-	A	A	-

1) Specify in clear text

2) For higher voltages see voltage dividers

Vario-Series • Rectangular Panel Meters

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Moving-coil movement, edgewise scale

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Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	PF 48 x 24 1511P	PF 72 x 36 1505P	PFN 96 x 48 1594P	PF 144 x 72 1584P	
Identification + ↓						
GENERAL VARIANTS	Landscape	HQ1	N	N	N	N
	Portrait	HQ2	+	+	+	+
Zero Point						
Zero point at left (landscape)	BC1	N	N	N	N	N
Zero point at bottom (portrait)	BC4	+	+	+	+	+
Zero point at center	BC2	A	A	A	A	A
Zero point as desired (specify in clear text)	BC20	A	A	A	A	A
Zero point at left (landscape), mech. suppressed (not for 4-20 mA)	BC16	A	A	A	A	A
Zero point at bottom (portrait), mech. suppresses (not for 4-20 mA) (max. suppression 20 %; measuring range $\geq 250 \mu\text{A}$ $\geq 250 \text{ mV}$. Ri 1 k Ω /V; specify in clear text)	BC18	A	A	A	A	A
Internal Resistance with Voltmeters						
Standard (see technical data)	IR99	N	N	N	N	N
Ri approx. 10 k Ω /V (measuring input $\geq 2 \text{ V}$; exception: $\geq 5 \text{ V}$ $\leq 150 \text{ V}$ with 96 x 48 a. 72 x 36)	IR10	A	A	A	A	A
Ri = 1 k Ω /V $\pm 1\%$ at nominal temperature (measuring input $\geq 1 \text{ V}$)	IR30	A	-	-	-	A
Ri = 10 k Ω /V $\pm 1\%$ at nominal temperature (measuring input $\geq 2 \text{ V}$)	IR40	A	-	-	-	A
Potentiometer for Adjustment with Voltmeters						
Voltmeter without potentiometer for adjustment	MP99	N	N	N	N	N
Voltmeter with potentiometer for adjustment	MP1	-	-	A	-	A
Adjustment range $\pm 15\%$ (measuring input $\geq 6 \text{ V}$ $\leq 400 \text{ V}$; class 1.5 only; Ri ¹⁾ according to list)						
Lead Resistance when connected to						
Shunts ...A/60 mV a. ...A/150 mV						
Standard version 0.06 Ω	IG99	N	N	N	N	N
Other than 0.06 Ω (specify in clear text), Limiting value: ...A/60 mV for class 1.5 max. 1 Ω ...A/150 mV for class 1.5 max. 7 Ω	IG999	A	A	A	A	A
Accuracy						
Class 2.5	IE25	N	-	-	-	-
Class 1.5 (for sizes 48 x 24 24 x 48 available only in combination with tube pointer)	IE15	A	N	N	N	N
Class 1.0 (measuring input $\geq 40 \mu\text{A}$ $\geq 60 \text{ mV}$)	IE10	-	-	-	-	A
Position of Use						
Control panel vertical	LA1	N	N	N	N	N
Control panel horizontal	LA2	+	+	+	+	+
Other (Please specify angle between scale and horizontal)	LA999	A	A	A	A	A
Special Features						
Normal vibration and shock resistance	LN99	N	N	N	N	N
Suitable for marine use with the following approvals: German Lloyds (class 1.5 only)	LN2	-	-	-	-	A ²⁾
Vibration resis. 2.5 g, shock resis. 30 g	LN56	A ³⁾	A	A	A	A

1) Exception: The standard version (size 96 x 48) of the potentiometer for adjustment has a current consumption of approx. 100 μA

2) 0 ... 1 mA, 0 ... 20 mA, 4 ... 20 mA, $\geq 1.5 \text{ V}$

3) Available only in combination with slider

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		Type Order No. ⇒	PF 48 x 24 1511P	PF 72 x 36 1505P	PFN 96 x 48 1594P	PF 144 x 72 1584P
		Identification + ↓				
SCALE VARIANTS	Landscape	HQ1	N	N	N	N
	Portrait	HQ2	+	+	+	+
Scale						
In accordance with measuring input		GF99	N	N	N	N
Blank scale (lower/upper value markings, company logos, symbols)		GF28	+	+	+	+
Scale Characteristics						
Current / Voltage linear		SD1	N	N	N	N
According to curve (not current / voltage linear)		SD6	A	A	A	A
Division and Pointer						
Single division		GD1	N	N	N	N
Double division		GD2	A	A	A	A
Coarse-fine division		SE1	-	N	N	N
Fine division		SE3	-	-	-	A
Special division		SE5	N	-	-	-
Beam pointer with knife-edge for single division		RA1	-	N	-	N
Beam pointer with knife-edge for double division		RA2	-	-	-	+
Beam pointer with knife-edge for single division and double division		RA4	-	N	N	-
Knife-edge pointer for single division		RA10	-	-	-	A
Knife-edge pointer for double division		RA11	-	-	-	A
Bar indicator for single division		RA40	N	-	-	-
Tube pointer for single division		RA30	A	-	-	-
Tube pointer for double division		RA31	A	-	-	-
Additional Imprint						
Second numbering (specify in clear text)		SK992	A	A	A	A
Inscription:						
Without additional inscription		SM99	N	N	N	N
Inscription ≤ 15 characters German		SM991	A	A	A	A
Inscription > 15 characters German		SM992	A	A	A	A
Inscription ≤ 15 characters other language		SM993	A	A	A	A
Inscription > 15 characters other language		SM994	A	A	A	A
(Other language in Latin lettering, specify in clear text)						
Coloured mark red RAL 2002 (specify in clear text)		ST991	A	A	A	A
Coloured sectors yellow RAL 1021, green RAL 6018 or red RAL 2002 (specify in clear text)		SU991	A	A	A	A

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	Type Order No. ⇒	PF 48 x 24 1511P	PF 72 x 36 1505P	PFN 96 x 48 1594P	PF 144 x 72 1584P
	Identification + ↓				
SCALE VARIANTS	landscape	HQ1	N	N	N
	portrait	HQ2	+	+	+
Scale / Pointer Colours					
Scale white; imprint and pointer black	SG99	N	N	N	N
Scale balck; imprint and pointer white	SG1	A ¹⁾	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint and pointer yellow	SG2	A ¹⁾	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint white, pointer yellow	SG3	A ¹⁾	A ¹⁾	A ¹⁾	A ¹⁾
Dial Illumination					
Without Dial Illumination	PA99	N	N	N	N
With direct dial illumination (Plexiglass scale, scale and dial illumination white)	PA1	-	A	A	A
Note: Completion with voltage Order No. PB necessary.					
Light conductor with mask, dial illumination white	PA6	-	-	-	A ²⁾
Light conductor with mask, dial illumination red	PA7	-	-	-	A ²⁾
Note: Completion with Order No. SG and PB necessary. (SG 99 as light conductor with mask not available)					
Voltage for Dial Illumination					
24 V	PB5	-	+	+	+
28 V	PB6	-	+	+	+

1) Additional one-off costs for special scale printing on request

2) Prices on request

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	Type Order No. ⇒	PF 48 x 24 1511P	PF 72 x 36 1505P	PFN 96 x 48 1594P	PF 144 x 72 1584P
Identification + ↓					
HOUSING VARIANTS Landscape Portrait	HQ1	N	N	N	N
	HQ2	+	+	+	+
Application Standard version conditionally tropic resistant	LB99 LB1	N A	N A	N A	N A
Protection According to list	LH99	N	N	N	N
Front housing-panel protection IP54, clamps IP00	LH21	A	-	-	A
Front housing-panel protection IP54, clamps IP20	LH22	-	A	A	-
Earthquake-proof (possible combination: LH X 99 or LH X 21)	LH10	A	A	A	A
Front Frame Colour Matt black	MA2	N	N	N	N
Matt grey RAL 7037	MA11	A	A	A	A
Matt stone grey RAL 7032	MA12	A	A	A	A
Matt dark beige approx. RAL 1019	MA21	A	A	A	A
Matt light grey RAL 7035	MA14	A	-	A	A
Intermediate Frame, Height 3 mm Without intermediate frame	MC99	N	N	N	N
Intermediate frame shiny black	MC1	A	-	-	-
Intermediate frame shiny grey RAL 7037	MC2	A	-	-	-
<i>Intermediate frame with size 48 x24 available only in combination with shortened expanding spring (MN 24)</i>					
Glass Window Standard version	MG99	N	N	N	N
Anti-glare glass	MG1	A	A	A	A
Fasteners Expanding spring	MN20	N	-	-	-
Shortened expanding spring (necessary when version with intermediate frame)	MN24	+	-	-	-
Catch spring	MN21	+	-	-	-
Subklew (stiled slider)	MN32	+	-	-	-
Slider	MN50	+	-	-	-
Angled slider for APE-Grid	MN51	+	-	-	-
Fastener B DIN 43 835	MN11	-	-	-	-
Screw spindle	MN22	-	N	N	-
Fastener C	MN12	-	-	-	N
Identification Without identification	MZ99	N	N	N	N
Identification on the back (specify in clear text)	MZ998	A	A	A	A
Inscription Stripes Without inscription stripes	SS99	N	N	N	N
Inscription on front face on top (specify in clear text)	SS991	A ¹⁾	-	A ¹⁾	A ¹⁾
Inscription on front face at bottom (specify in clear text)	SS992	A ¹⁾	A ¹⁾	A ¹⁾	A ²⁾
Contact Protection Without terminal cover	VB99	N	N	N	N
Overall terminal cover	VB2	A	-	-	-
Single terminal cover (Voltmeter and Ammeter ≤ 4 A)	VB1	+	+	+	+

1) For landscape only

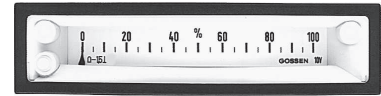
2) For portrait only

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, slim-line scale
Front frame matt black



PFFN 96 x 24

Technical Data

Front Dimensions mm Type	48 x 18.5 PFF00	72 x 18.5 PFF0	72 x 24 PFF 72 x 24	96 x 24 PFFN 96 x 24	144 x 36 DPR 144 F
Scale Length mm	29	50	50	65	96
Class	2.5	2.5	2.5	1.5	1.5
Weight approx. (kg)	0.05	0.09	0.1	0.13	0.5
Operating Voltage	100 V	150 V	100 V	300 V	150 V
Test Voltage	1.5 kV	2.2 kV	1.5 kV	3.5 kV	2.2 kV
Front Housing-Panel Protection	IP 50	IP 50	IP 50	IP 52	IP 50
Fasteners (see next page)	slider	slider	exp. spring	screw spindle	screw spindle
Housing Material	sheet metal	sheet metal	sheet metal	polycarbonate	sheet metal

Description

Analog panel meter with moving-coil movement

Internal Resistance / Voltage Drop / Power Consumption ¹⁾

Display

Scale Division	for sizes 48 x 18.5 72 x 18.5 72 x 24 96 x 24 144 x 36	} Special division
Pointer	for sizes 48 x 18.5 72 x 18.5 72 x 24 96 x 24 144 x 36	} Bar indicator
		Beam pointer with knife-edge
		Beam pointer with knife-edge
Mechanical Design		
Housing Material		Polycarbonate, self-extinguishing and drip-proof per UL 94 V-0 or sheet metal housing (see above).
Replaceable	Glass window and front frame. ⇒ May only be replaced under voltage-free conditions!	
Terminals	for sizes 48 x 18.5 72 x 18.5 72 x 24 96 x 24 144 x 36	tab connectors 2.8 x 0.8 tab connectors 2.8 x 0.8 tab connectors 2.8 x 0.8 tab connectors 6.3 x 0.8 or 2 x 2.8 x 0.8 (IP20 protection) tab connectors 4.8 x 0.8
Contact Protection		available as option (not for 144 x 36)

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60 051

Measuring Range	Front Dimensions mm			Tolerance
	48 x 18.5 72 x 18.5 72 x 24	96 x 24	144 x 36	
100 µA	2400 Ω	1920 Ω	1706 Ω	± 20 %
150 µA	1590 Ω	2177 Ω	1706 Ω	
250 µA	950 Ω	1965 Ω	525 Ω	
400 µA	283 Ω	84 Ω	290 Ω	
600 µA	140 Ω	77 Ω	110 Ω	
1 mA	66 Ω	76 Ω	110 Ω	
1.5 mA	30 Ω	72 Ω	30 Ω	
2 mA	17 Ω	75 Ω	6 Ω	
2.5 mA	11.3 Ω	90 Ω	6 Ω	
4 mA	7 Ω	74 Ω	4 Ω	
5 mA	5 Ω	60 Ω	4 Ω	
6 mA	1.8 Ω	51 Ω	3 Ω	
10 mA	3.5 Ω	30 Ω	3 Ω	
15 mA	4 Ω	20 Ω	4 Ω	
20 mA	3 Ω	15 Ω	3 Ω	
4 ... 20 mA	3 Ω	18 Ω	4 Ω	± 30 %
25 mA	2.4 Ω	12 Ω	2.4 Ω	
Voltage drop at > 25 mA / < 1A ≥ 1A	60 mV 60 mV	300 mV 90 mV	60 mV 60 mV	± 20 %
Power consumption for connection to shunt	6 mA	6 mA	5 mA	
≥ 60 mV / ≤ 400 mV > 400 mV	1 kΩ/V 1 kΩ/V	2.5 kΩ/V 1 kΩ/V	1 Ω/mV 1 kΩ/V	

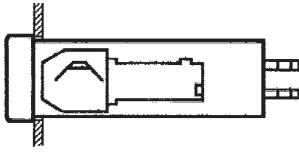
¹⁾ Indicated internal resistance is only valid for instruments with standard accuracy class.
Please inquire regarding internal resistance (Ri) for moving-coil indicators with mechanical zero point at any desired scale value.

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage

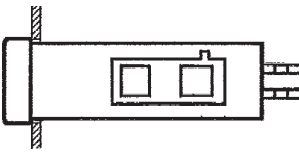


Expanding Springs



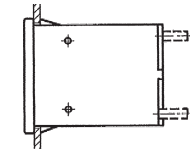
Control panel thickness ≥ 1 mm
 Size 72 x 24 for mounting in DIN-Grid,
 Siemens-Grid M 25 and Kreutzenbeck-Grid

Catch Spring I



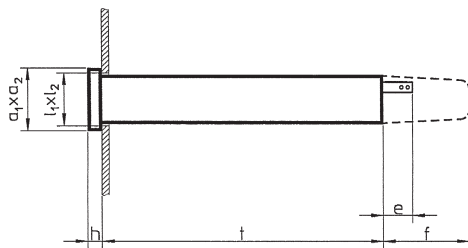
As option for size 72 x 24 for Mauell-Grid,
 H & B Unibloc-Grid and Hein-Grid

Slider

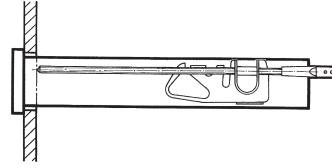


Control panel thickness 1 to 5 mm
 For sizes 48 x 18.5 and 72 x 18.5 for mounting in DIN-Grid,
 Also available as option for size 72 x 24.

Basic Dimensions

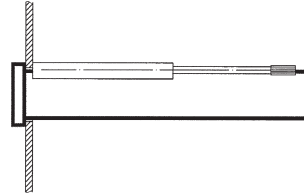


Fastener C DIN 43 835



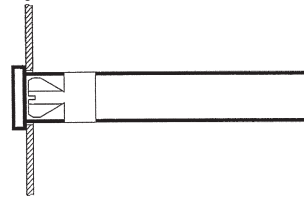
Control panel thickness 1 to 40 mm
 Screw clamp M5, longer version, for size 144 x 36 for mounting in
 DIN-Grid.

Screw Spindle



Control panel thickness up to 40 mm
 Screw spindle for size 96 x 24 for mounting in
 DIN-Grid and all remaining grids.

Clamping Springs



Control panel thickness ≥ 1 mm
 Available as option for size 96 x 24, retractable from front face,
 for mounting in DIN-Grid

Drawing to Scale (on request)

1303A1839H0 for size 96 x 24

Drawing to Scales (on request)

0101A226 for sizes 48 x 18.5 and 72 x 18.5

0101A247 for size 72 x 24

95.207-95 for size 144 x 36

Ordering Example

Size 96 x 24 mm

0 ... 40 V Direct Voltage

Techn. Data Type: PFFN 96 x 24	Order No. 1524P, DC40
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Front in mm	Nominal Dimensions		Cutout Dimensions $l_1 \times l_2$	Inst. Depth t	Terminals e	Contact Protection at Terminals f = Full Contact Protection
	$a_1 \times a_2$	h				
48 x 18.5	48 x 18.5	5	$44.8^{+0.15} \times 17.3^{+0.15}$	56	12	—
72 x 18.5	72 x 18.5	5	$69.3^{+0.15} \times 17.3^{+0.15}$	82	12	—
72 x 24	72 x 24	5	$68^{+0.7} \times 22^{+0.3}$	90	11	31
96 x 24	96 x 24	5	$92^{+0.8} \times 22^{+0.3}$	126	0	—
144 x 36	144 x 36	8	$138^{+1} \times 32.7^{+0.6}$	202	5	—

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, slim-line scale
Front frame matt black

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Front Dim. mm	48 x 18.5	72 x 18.5	72 x 24	96 x 24	144 x 36
Type		PFF 00	PFF 0	PFF 72 x 24	PFFN 96 x 24	DPR 144 F
Order No. ⇒		1194P	1196P	1515P	1524P	21102...
	+ ↓					+ ↓
Landscape	HQ1	N	N	N	N	N
Portrait	HQ2	+	+	+	+	+
Zero Point - at left (landscape)						
- at bottom (portrait)						
Direct Current						
Range:						
0 ... 100 µA	CA100	A	A	A	A	...34240
0 ... 150 µA	CA150	A	A	A	A	...34270
0 ... 250 µA	CA250	A	A	A	A	...34300
0 ... 400 µA	CA400	A	A	A	A	...34320
0 ... 600 µA	CA600	A	A	A	A	...34350
0 ... > 100 µA ... < 1 mA ¹⁾	CA...	A	A	A	A	...31005
0 ... 1 mA	CB1	+	+	+	+	...35110
0 ... 1.5 mA	CB1.5	+	+	+	+	...35120
0 ... 2.5 mA	CB2.5	+	+	+	+	...35130
0 ... 4 mA	CB4	+	+	+	+	...35140
0 ... 5 mA	CB5	+	+	+	+	...35150
0 ... 6 mA	CB6	+	+	+	+	...35160
0 ... 10 mA	CB10	+	+	+	+	...35170
0 ... 15 mA	CB15	A	A	A	A	...35180
0 ... 20 mA	CB20	A	A	A	A	...35190
0 ... 25 mA	CB25	A	A	A	A	...35200
0 ... 40 mA	CB40	A	A	A	A	...35210
0 ... 50 mA	CB50	A	A	A	A	...35220
0 ... 60 mA	CB60	A	A	A	A	...35230
0 ... 100 mA	CB100	A	A	A	A	...35240
0 ... 150 mA	CB150	A	A	A	A	...35270
0 ... 250 mA	CB250	A	A	A	A	...35300
0 ... 400 mA	CB400	A	A	A	A	...35320
0 ... 600 mA	CB600	A	A	A	A	...35350
0 ... > 1 mA ... < 1 A ¹⁾	CB...	A	A	A	A	...31005
Mech. suppressed						
4...20 mA landscape :	BC10	A	A	A	A	...35195
4...20 mA portrait :	BC14	A	A	A	A	...35196
Electr. suppressed						
0/4...20 mA landscape :	BC25	A	A	A	-	...35199
0/4...20 mA portrait :	BC27	A	A	A	-	...35198
0 ... 1 A	CC1	A	A	A	A	...36110
0 ... 1.5 A	CC1.5	A	A	A	A	...36120
0 ... 2.5 A	CC2.5	A	A	A	A	...36130
0 ... 4 A	CC4	A	A	A	A	...36140
0 ... > 1 A ... < 4 A ¹⁾	CC...	A	A	A	A	...31005

1) Specify in clear text

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, slim-line scale

Front frame matt black

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Front Dim. mm	48 x 18.5	72 x 18.5	72 x 24	96 x 24	144 x 36
	Type	PFF 00	PFF 0	PFF 72 x 24	PFFN 96 x 24	DPR 144 F
	Order No. ⇒	1194P	1196P	1515P	1524P	21102...
	+ ↓					+ ↓
Landscape	HQ1	N	N	N	N	N
Portrait	HQ2	+	+	+	+	+
Zero Point - at left (landscape)						
- at bottom (portrait)						
Connection to Shunt (direct current)						
... A / 60 mV	BE3	A	A	A	A	...32230
... A / 150 mV	BE4	A	A	A	A	...32270
... A / ... > 60 mV ¹⁾	BE981	A	A	A	A	...31005
Scale:						
1 A	CG1	+	+	+	+	+
1.5 A	CG1.5	+	+	+	+	+
2.5 A	CG2.5	+	+	+	+	+
4 A	CG4	+	+	+	+	+
6 A	CG6	+	+	+	+	+
10 A	CG10	+	+	+	+	+
15 A	CG15	+	+	+	+	+
25 A	CG25	+	+	+	+	+
40 A	CG40	+	+	+	+	+
60 A	CG60	+	+	+	+	+
100 A	CG100	+	+	+	+	+
150 A	CG150	+	+	+	+	+
250 A	CG250	+	+	+	+	+
400 A	CG400	+	+	+	+	+
500 A	CG500	+	+	+	+	+
600 A	CG600	+	+	+	+	+
0 ... > 1 A ... < 1 kA ¹⁾	CG...	+	+	+	+	+
1 kA	CH1	+	+	+	+	+
1.5 kA	CH1.5	+	+	+	+	+
2.5 kA	CH2.5	+	+	+	+	+
4 kA	CH4	+	+	+	+	+
6 kA	CH6	+	+	+	+	+
10 kA	CH10	+	+	+	+	+
> 1 kA ¹⁾	CH...	+	+	+	+	+
Direct Voltage						
Range: 0 ... 60 mV	DB60	A	A	A	A	...31230
0 ... 100 mV	DB100	A	A	A	A	...31240
0 ... 150 mV	DB150	A	A	A	A	...31270
0 ... 250 mV	DB250	A	A	A	A	...31300
0 ... 400 mV	DB400	A	A	A	A	...31320
0 ... 600 mV	DB600	A	A	A	A	...31350
0 ... > 60 mV ... < 1 V ¹⁾	DB...	A	A	A	-	...31005
0 ... > 100 mV ... < 600 mV ¹⁾	DB...	-	-	-	A	...31005
0 ... 1 V	DC1	A	A	A	A	...33110
0 ... 1.5 V	DC1.5	A	A	A	A	...33120
0 ... 2.5 V	DC2.5	A	A	A	A	...33130
0 ... 3 V	DC3	A	A	A	A	...33135
0 ... 4 V	DC4	A	A	A	A	...33140
0 ... 6 V	DC6	A	A	A	A	...33160
0 ... 10 V	DC10	A	A	A	A	...33170
0 ... 15 V	DC15	A	A	A	A	...33180
0 ... 25 V	DC25	A	A	A	A	...33200
0 ... 40 V	DC40	A	A	A	A	...33210
0 ... 60 V	DC60	A	A	A	A	...33230
0 ... 100 V	DC100	A	A	A	A	...33240
0 ... 150 V	DC150	-	A	-	A	...33270
0 ... 250 V	DC250	-	-	-	A	...33300
0 ... 400 V	DC400	-	-	-	A	...33320
0 ... 500 V	DC500	-	-	-	A	...33340
0 ... 600 V	DC600	-	-	-	A	...33350
0 ... > 1 V ... < 600 V ^{1) 2)}	DC...	-	-	-	A	...31005

1) Specify in clear text

2) For higher voltages see voltage dividers

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, slim-line scale

Front frame matt black

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Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Front Dim. mm	48 x 18.5	72 x 18.5	72 x 24	96 x 24	144 x 36
Type		PFF 00	PFF 0	PFF 72 x 24	PFFN 96 x 24	DPR 144 F
Order No. ⇒		1194P	1196P	1515P	1524P	21102...
	+ ↓					
Landscape	HQ1	N	N	N	N	N
Portrait	HQ2	+	+	+	+	+
GENERAL VARIANTS						
Zero pint at left (landscape)	BC1	N	N	N	N	N
Zero point at bottom (portrait)	BC4	N	N	N	N	N
Zero point at center	BC2	A	A	A	A	A
Zero point as desired (specify in clear text)	BC20	A	A	A	A	A
Zero point at the left (landscape), mech. suppressed (not 4-20 mA)	BC16	A	A	A	A	A
Zero point at bottom (portrait),	BC18	A	A	A	A	A
(Max. suppression 20 %; measuring range $\geq 250 \mu\text{A}$ / $\geq 250 \text{ mV}$, Ri 1 k Ω /V; specify in clear text)						
Internal Resistance for Voltmeters						
Standard (see technical data)	IR99	N	N	N	N	N
Ri approx. 10 k Ω /V (measuring input $\geq 2 \text{ V}$; Exception: $\geq 5 \text{ V}$ / $\leq 150 \text{ V}$ size 96 x 24)	IR10	A	A	A	A	A
Ri = 1 k Ω /V $\pm 1\%$ at nominal temperature (measuring input $\geq 1 \text{ V}$)	IR30	A	A	A	-	A
Ri = 10 k Ω /V $\pm 1\%$ at nominal temperature (measuring input $\geq 2 \text{ V}$)	IR40	A	A	A	-	A
Potentiometer for Adjustment with Voltmeters						
Voltmeters without potentiometer for adjustment	MP99	N	N	N	N	N
Voltmeters with potentiometer for adjustment	MP1	-	-	-	A	-
Adjustment range $\pm 15\%$ (measuring input $\geq 6 \text{ V}$ / $\leq 400 \text{ V}$; Class 1.5 only; Ri according to list ¹⁾)						
Lead Resistor when connecting to						
Shunt resistors ...A/60 mV and ...A/150 mV Standard version 0.06 Ω	IG99	N	N	N	N	N
Differing from 0.06 Ω (specify in clear text).	IG999	A	A	A	A	A
Limiting values: ...A / 60 mV for class 1.5 max. 1 Ω ...A / 150 mV for class 1.5 max. 7 Ω						
Accuracy						
Class 2.5	IE25	N	N	N	-	-
Class 1.5	IE15	A ²⁾	A ²⁾	A ²⁾	N ³⁾	N
Class 1.0 (measuring input $\geq 100 \mu\text{A}$ / $\geq 60 \text{ mV}$)	IE10	-	-	-	-	A
Position of Use						
Control panel vertical	LA1	N	N	N	N	N
Control panel horizontal	LA2	+	+	+	+	+
Other	LA999	A	A	A	A	A
(Please specify angle between scale and horizontal)						
Special Features						
Normal vibration and shock resistance	LN99	N	N	N	N	N
Vibration resis. 2.5 g, shock resis. 30 g	LN56	A	A	A ⁴⁾	A	-

1) Exception: The standard version (size 96 x 48) of the potentiometer for adjustment has a current consumption of approx. 100 μA

2) Available only in combination with tube pointer

3) Standard version without extra charge

4) Available only in combination with slider

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	Front Dim. mm	48 x 18.5	72 x 18.5	72 x 24	96 x 24	144 x 36
Type		PFF 00	PFF 0	PFF 72 x 24	PFFN 96 x 24	DPR 144 F
Order No. ⇒		1194P	1196P	1515P	1524P	21102...
	+ ↓					
Landscape	HQ1	N	N	N	N	N
Portrait	HQ2	+	+	+	+	+
SCALE VARIANTS						
Scale						
In accordance with measuring input	GF99	N	N	N	N	N
Blank scale (lower/upper value markings, company logos, symbols)	GF28	+	+	+	+	+
Scale Characteristics						
Current / Voltage proportional	SD1	N	N	N	N	N
According to curve (not current / voltage proportional)	SD6	A	A	A	A	A
Division and Pointer						
Single division	GD1	N	N	N	N	N
Double division	GD2	A	A	A	A	A
Special division	SE5	N	N	N	N	A
Coarse-fine division	SE1	-	-	-	-	N
Bar indicator for single division	RA40	N	N	N	-	-
Tube pointer for double division	RA31	A	A	A	-	-
Beam pointer with knife-edge for single and double division	RA4	-	-	-	N	-
Knife-edge pointer for single division	RA10	-	-	-	-	N
for double division	RA11	-	-	-	-	A
Additional Imprint						
Second numbering (specify in clear text)	SK992	A	A	A	A	A
Inscription:						
Without additional inscription	SM99	N	N	N	N	N
Inscription ≤ 15 characters German	SM991	A	A	A	A	A
> 15 characters German	SM992	A	A	A	A	A
≤ 15 characters other language	SM993	A	A	A	A	A
> 15 characters other language	SM994	A	A	A	A	A
(Other language in Latin lettering, specify in clear text)						
Coloured mark red RAL 2002 (specify in clear text)	ST991	A	A	A	A	A
Coloured sector yell. RAL 1021, green RAL 6018 or red RAL 2002 (specify in clear text)	SU991	A	A	A	A	A

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	Front Dim. mm	48 x 18.5	72 x 18.5	72 x 24	96 x 24	144 x 36
Type		PFF 00	PFF 0	PFF 72 x 24	PFFN 96 x 24	DPR 144 F
Order No. =>		1194P	1196P	1515P	1524P	21102...
	+ ↓					
Landscape	HQ1	N	N	N	N	N
Portrait	HQ2	+	+	+	+	+
SCALE VARIANTS						
Scale / Pointer Colours						
Scale white; imprint and pointer black	SG99	N	N	N	N	N
Scale black; imprint and pointer white	SG1	-	-	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint and pointer yellow	SG2	-	-	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint white, pointer yellow	SG3	-	-	A ¹⁾	A ¹⁾	A ¹⁾
Dial Illumination						
Without dial illumination	PA99	N	N	N	N	N
With direct dial illumination	PA1	A	A	A	A	-
(Plexiglass scale, scale and dial illumination white)						
Note: Completion with voltage Order No. PB necessary.						
Voltage for Dial Illumination						
24 V	PB5	-	-	-	+	-
28 V	PB6	-	-	-	+	-
24 V (2 x 12 V-lamps connected in series)	PB7	+	+	+	-	-
28 V (2 x 14 V-lamps connected in series)	PB8	+	+	+	-	-

1) Additional one-off costs for special scale printing on request

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Front frame matt black

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Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

Front Dim. mm Type Order No. ⇒	48 x 18.5 PFF 00 1194P	72 x 18.5 PFF 0 1196P	72 x 24 PFF 72 x 24 1515P	96 x 24 PFFN 96 x 24 1524P	144 x 36 DPR 144 F 21102...	
Landscape Portrait	+ ↓ HQ1 HQ2	N +	N +	N +	N +	
HOUSING VARIANTS						
Application						
Standard version	LB99	N	N	N	N	
Tropic resistant	LB1	A	A	A	A	
Protection						
Standard (see technical data)	LH99	N	N	N	N	
Front housing-panel protection IP54, con. IP00	LH21	-	-	A	A	
Front housing-panel protection IP54, con. IP20	LH22	-	-	-	A	
Earthquake-proof (possible combination: LH X 99 or LH X 21)	LH10	-	-	-	A	
Front Frame Colour						
Matt black	MA2	N	N	N	N	
Matt grey RAL 7037	MA11	A	A	A	A	
Matt stone grey RAL 7032	MA12	-	-	A	A	
Matt light grey RAL 7035	MA14	-	-	A	A	
Matt dark beige approx. RAL 1019	MA21	-	-	A	A	
Glass Window						
Standard version	MG99	N	N	N	N	
Anti-glare glass	MG1	A	A	A	A	
Mounting						
Slider	MN50	N	N	A	-	
Expanding spring	MN20	-	-	N	-	
Catch spring	MN21	-	-	+	-	
Screw spindle	MN22	-	-	-	N	
Clamping Spring	MN23	-	-	-	+	
Fastener C	MN12	-	-	-	-	
Subklew (stiled slider)	MN32	-	-	A	-	
Angled slider for APE-Grid	MN51	-	-	A	-	
Identification						
Without identification	MZ99	N	N	N	N	
Identification on the back (specify in clear text)	MZ998	A	A	A	A	
Label Strips						
Without label strips	SS99	N	N	N	N	
Label on front face on top (spec. in clear text)	SS991	-	-	A ¹⁾	A ¹⁾	
Label on front face at bottom (specify in clear text)	SS992	-	-	A ¹⁾	A ¹⁾	
Contact Protection						
Without terminal cover	VB99	N	N	N	N	
Overall terminal cover	VB2	-	-	A	-	
Single terminal cover	VB1	+	+	+	-	

1) Available only for landscape format

Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 2 Limit Contacts



Moving-coil movement, edgewise scale
Narrow front frame per DIN 43 718, matt black



PFN 96 x 24

Technical Data

Front Dimensions mm Type	96 x 24 PFN 96 x 24	96 x 48 PFN 96 x 48	144 x 36 KODPR 144 F	144 x 72 KODPR 144 SE
Scale Length mm	65	65	96	98
Class	1.5	1.5	1.5	1.5
Weight approx. (kg)	0.2	0.5 (at U _H AC) 0.2 (at U _H DC)	0.6	1.1
Sampling	electronic	electronic	electronic	electronic
Relative Switching Speed (max. error as related to scale length)	1 %	1 %	1 %	1 %
Repetition Accuracy (at nom. aux. voltage and 23 °C)	0.1 %	0.1 %	0.1 %	0.1 %
Number of Limits	1 or 2	1 or 2	1 or 2	1 or 2
Min. Limit Separation (of scale length)	3 %	3 %	1.5 %	1.5 %
Output Relay	built in	built in	attachable on back ²⁾	attachable on back ²⁾
Output Contact	1 changeover per limit	1 changeover per limit	1 changeover per limit	1 changeover per limit
Switching Capacity with Restive Load				
Max. Switching Voltage	250 V AC / 250 V DC	250 V AC / 250 V DC	250 V AC / 250 V DC	250 V AC / 250 V DC
Max. Switching Current	6 A AC / 6 A DC	6 A AC / 6 A DC	3 A AC / 3 A DC	3 A AC / 3 A DC
Nominal Switching Capacity	500 VA / 50 W	500 VA / 50 W	750 VA / 50 W	750 VA / 50 W
Service Life at nominal Switching Capacity	> 10 ⁶ switching cycles	> 10 ⁶ switching cycles	> 10 ⁶ switching cycles	> 10 ⁶ switching cycles
Max. Switching Time	500 ms	500 ms	50 ms	50 ms
Auxiliary Voltage (U _H)	24 V DC (20...24...30 V) ¹⁾	24 V DC (20...24...30 V) o. 24 ... 240 V AC. 45...65 Hz	24 V DC (20...24...30 V) ¹⁾	24 V DC (20...24...30 V) ¹⁾
Power Consumption	4 VA / 4.5 W	4 VA / 4.5 W	5 VA / 4 W	5 VA / 4 W
Safety Class	CAT III	CAT III	CAT III	CAT III
Pollution Degree	2	2	2	2
Operating Voltage	300 V	300 V	150 V	150 V
Operating Voltage for Measuring Ranges > 250 V ... ≤ 600 V	300 V	600 V	150 V	150 V
Test Voltage	3.5 kV	5.8 kV	2.2 kV	2.2 kV
Front Housing-Panel Protection	IP 52	IP 52	IP 50	IP 50
Fasteners	screw spindle	screw spindle	screw spindle	screw spindle

1) With separate power supply for following voltages: 24 V AC, 115 V AC and 230 V AC, ± 10 %; see accessories, page 130

2) The Relay module per contact is not included (this must be ordered separately, the Art No.: 69100 00000 can be found on page 136).

Internal Resistance / Voltage Drop / Power Consumption (Values only apply with zero point at left or at bottom)

Measuring Range	Internal Resistance / Voltage Drop / Power Consumption
≥ 100 μA / ≤ 10 mA	≤ 100 mV
> 10 mA / ≤ 6 A	≤ 100 mV
≥ 60 mV / ≤ 1 V	≥ 200 kΩ/V
> 1 V / ≤ 50 V	≥ 10 kΩ/V
> 50 V / ≤ 600 V	≥ 10 kΩ/V
0/4 ... 20 mA	6 Ω ¹⁾
Connection to Shunt	6 mA ²⁾

1) Tolerance ± 30%

2) Tolerance ± 20%

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60 051

Description

Analog indicator/controller with moving-coil movement for direct current or direct voltage

Display

Scale Division Special Division
 Pointer Beam pointer with knife-edge for single and double Division

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL 94 V-0
 Replaceable Glass windows and front frames

⇒ May only be replaced under voltage-free conditions!

Terminals

Tab connectors (IP20 protection) 1 x 6.3 x 0.8 mm,
 2 x 2.8 x 0.8 mm or 4.8 x 0.8 mm

Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 2 Limit Contacts



General Issues

Indicator/controllers are meters with adjustable limits.
 The accuracy of the limits are not influenced by the contacts.
 Our meters and indicator/controllers comply with the regulations of the European Guidelines 73/23/EWG. This is proven by the compliance with the following standards:
 IEC 61010-1/A2 / EN 61010-1/A2 VDE 0411-1/A1 (Safety Regulations)
 IEC 60051/EN 60051/DIN EN 60051 (Meters with Scale Display)
 EN 50081-2: 1993 EMV (Emitted Interference, Industries)
 EN 50082-2: 1995 EMV (Emitted Interference, Industries)
 To protect the movable part of the indicator/controller against shocks, the bearings are spring mounted.

Application

Indicator/controllers display the actual value and energise with the help of one or more limits one or more relays. Their contacts can be used for monitoring, operating or controlling.
 Indicator/controllers are also available with logic output (transistor output).

Sampling

The sampling of the indicator/controllers works contact-free.
 When the pointer reaches the limit the switching operation will be disengaged.

Contacting

The max. contact disengages the switching operation when it overshoots the adjusted scale value. The min. contact disengages the switching operation when it undershoots the adjusted scale value.

Fasteners

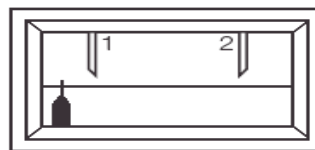
Screw spindle
 (control panel thickness 1 ... 40 mm)

All indicator/controllers cause a permanent contact. This means that the output signal is held up as long as the pointer does not overrun the adjusted limit. The indicator/controllers are available as closed-circuit current model or working current model (see different Order No.).

Closed-Circuit Current Model: When the indicator/controller is not-operated, a voltage is impressed on the relays (output signal H, logic output). The voltage drops as soon as one of the contact marks is undershot or overshoot. The same happens when a power breakdown or an electronic breakdown occurs and no limit is overshoot or undershot (self supervision). A short-term power failure leads to the same effect.

Working Current Model: When the indicator/controller is not-operated the relays are in zero current condition (output signal L, logic output). As soon as one of the limits is overshoot or undershot the relays pick up (output signal H).

Position of Limits



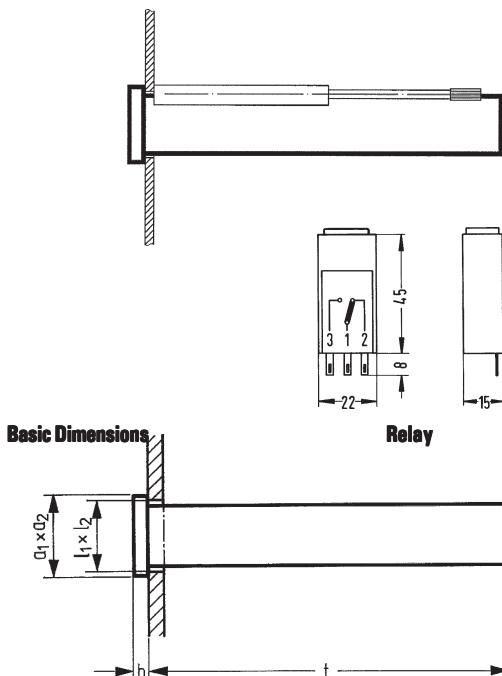
Contact Assignments (Specification for Pfn 144x36 and Pfn 144x72)

Measured Quantity	-	12-
	+	11+
Auxiliary Voltage	DC	- L+
		+ L-
Relay Output	Logic Output	
Limit Contact 1		
Limit Contact 2		
The output contacts are shown in the wiring diagram in the zero current condition	+ terminals are electrically connected within the instrument	

Ordering Example:

Indicator/Controller 96 x 24 mm for direct voltage, landscape scale,
 Measuring range 0 ... 100 V, direct connection, zero point at left,
 Working voltage-version with 2 limit contacts (Max. - Max.)

Techn. Data Type: PFN 96 x 24	Order No. 2524P, AM11, DC100
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Front Dim. mm	Nominal Dimensions		Cutout Dimensions $l_1 \times l_2$	Installation Depth (t) Relay Output	Installation Depth (t) Logic Output
	$a_1 \times a_2$	h			
96 x 24	96 x 24	5	$92^{+0.8} \times 22.2^{+0.3}$	146	126
96 x 48	96 x 48	5	$92^{+0.8} \times 45^{+0.6}$	146	126
144 x 36	144 x 36	8	$137.5^{+0.8} \times 32.5^{+0.6}$	246	202
144 x 72	144 x 72	8	$137.7^{+0.8} \times 67.7^{+0.6}$	248	205

Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 2 Limit Contacts



Moving-coil movement, edgewise scale
Narrow front frame per DIN 43 718, matt black

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

		Type	PFN 96 x 24	PFN 96 x 48	KODPR 144 F	KODPR 144 SE
		Order No. ⇒	2524P	2594P	61102...	65102...
		+ ↓			+ ↓	+ ↓
Landscape		HQ1	N	N	N	N
Portrait		HQ2	+	+	+	+
Limits						
Closed-Circuit Current Model	Max.	AM3	+	+	+	+
	Min.	AM4	+	+	+	+
	Min. - Max.	AM5	A	A	A	A
	Max. - Max.	AM6	A	A	A	A
	Min. - Min.	AM7	A	A	A	A
Working Current Model	Max.	AM8	+	+	+	+
	Min.	AM9	+	+	+	+
	Min. - Max.	AM10	A	A	A	A
	Max. - Max.	AM11	A	A	A	A
	Min. - Min.	AM12	A	A	A	A
Zero Point - left / bottom						
Direct Current						
Range	0 ... 100 µA	CA100	A	A	...34240	...34240
	0 ... 150 µA	CA150	A	A	...34270	...34270
	0 ... 250 µA	CA250	A	+	...34300	...34300
	0 ... 400 µA	CA400	A	+	...34320	...34320
	0 ... 600 µA	CA600	—	+	...34350	...34350
	> 100 µA ... < 1 mA ¹⁾	CA...	A	A	...31005	...31005
	0 ... 1 mA	CB1	+	+	...35110	...35110
	0 ... 1.5 mA	CB1.5	+	+	...35120	...35120
	0 ... 2.5 mA	CB2.5	+	+	...35130	...35130
	0 ... 4 mA	CB4	+	+	...35140	...35140
	0 ... 5 mA	CB5	+	+	...35150	...35150
	0 ... 6 mA	CB6	+	+	...35160	...35160
	0 ... 10 mA	CB10	+	+	...35170	...35170
	0 ... 15 mA	CB15	A	+	...35180	...35180
	0 ... 20 mA	CB20	A	+	...35190	...35190
	0 ... 25 mA	CB25	A	+	...35200	...35200
	0 ... 40 mA	CB40	A	+	...35210	...35210
	0 ... 50 mA	CB50	A	+	...35220	...35220
	0 ... 60 mA	CB60	A	+	...35230	...35230
	0 ... 100 mA	CB100	A	+	...35240	...35240
	0 ... 150 mA	CB150	A	+	...35270	...35270
	0 ... 250 mA	CB250	A	+	...35300	...35300
	0 ... 400 mA	CB400	A	+	...35320	...35320
	0 ... 600 mA	CB600	A	+	...35350	...35350
	> 1 mA ... < 1A ¹⁾	CB...	A	A	...31005	...31005
Electr. suppressed						
	0/4 ... 20 mA landscape	BC25	A	A	...35199	...35199
	0/4 ... 20 mA portrait	BC27	A	A	...35198	...35198
	0 ... 1 A	CC1	A	+	...36110	...36110
	0 ... 1.5 A	CC1.5	A	+	...36120	...36120
	0 ... 2.5 A	CC2.5	A	+	...36130	...36130
	0 ... 4 A	CC4	A	+	...36140	...36140
	0 ... 6 A	CC6	A	+	...36160	...36160
	> 1 A ... < 6 A ¹⁾	CC...	A	A	...31005	...31005

1) Specify in clear text

Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 2 Limit Contacts



Moving-coil movement, edgewise scale

Narrow front frame per DIN 43 718, matt black

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

		Type Order No. ⇒	PFN 96 x 24 2524P	PFN 96 x 48 2594P	KODPR 144 F 61102...	KODPR 144 SE 65102...
Limits	Landscape	+ ↓ HQ1	N	N	+ ↓	+ ↓
	Portrait	HQ2	+	+	+	+
Closed-Circuit Current Model	Max.	AM3	+	+	+	+
	Min.	AM4	+	+	+	+
	Min. - Max.	AM5	A	A	A	A
	Max. - Max.	AM6	A	A	A	A
	Min. - Min.	AM7	A	A	A	A
Working Current Model	Max.	AM8	+	+	+	+
	Min.	AM9	+	+	+	+
	Min. - Max.	AM10	A	A	A	A
	Max. - Max.	AM11	A	A	A	A
	Min. - Min.	AM12	A	A	A	A
Zero Point - left / bottom						
Connection to Shunt (Direct Current)						
	... A / 60 mV	BE3 ¹⁾	A	+	...32230	...32230
	... A / 150 mV	BE4 ¹⁾	A	+	...32270	...32270
	... A / ... > 60 mV ²⁾	BE981 ¹⁾	A	A	...31005	...31005
Scale:	1 A	CG1	+	+	+	+
	1.5 A	CG1.5	+	+	+	+
	2.5 A	CG2.5	+	+	+	+
	4 A	CG4	+	+	+	+
	5 A	CG5	+	+	+	+
	6 A	CG6	+	+	+	+
	10 A	CG10	+	+	+	+
	15 A	CG15	+	+	+	+
	20 A	CG20	+	+	+	+
	25 A	CG25	+	+	+	+
	30 A	CG30	+	+	+	+
	40 A	CG40	+	+	+	+
	50 A	CG50	+	+	+	+
	60 A	CG60	+	+	+	+
	75 A	CG75	+	+	+	+
	100 A	CG100	+	+	+	+
	150 A	CG150	+	+	+	+
	200 A	CG200	+	+	+	+
	250 A	CG250	+	+	+	+
	300 A	CG300	+	+	+	+
	400 A	CG400	+	+	+	+
	500 A	CG350	+	+	+	+
	600 A	CG600	+	+	+	+
	0 ... > 1 A ... < 1 kA ²⁾	CG...	+	+	+	+
	1 kA	CH1	+	+	+	+
	1.5 kA	CH1.5	+	+	+	+
	2.5 kA	CH2.5	+	+	+	+
4 kA	CH4	+	+	+	+	
5 kA	CH5	+	+	+	+	
6 kA	CH6	+	+	+	+	
10 kA	CH10	+	+	+	+	
15 kA	CH15	+	+	+	+	
> 1 kA ²⁾	CH...	+	+	+	+	

1) Complement with CG... or CH...

2) Specify in clear text

Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 2 Limit Contacts



Moving-coil movement, edgewise scale
Narrow front frame per DIN 43 718, matt black

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

		Type	PFN 96 x 24	PFN 96 x 48	KODPR 144 F	KODPR 144 SE
		Order No. ⇒	2524P	2594P	61102...	65102...
		+ ↓			+ ↓	+ ↓
Limits		HQ1	N	N	N	N
		HQ2	+	+	+	+
Closed-Circuit Current Model	Max.	AM3	+	+	+	+
	Min.	AM4	+	+	+	+
	Min. - Max.	AM5	A	A	A	A
	Max. - Max.	AM6	A	A	A	A
	Min. - Min.	AM7	A	A	A	A
Working Current Model	Max.	AM8	+	+	+	+
	Min.	AM9	+	+	+	+
	Min. - Max.	AM10	A	A	A	A
	Max. - Max.	AM11	A	A	A	A
	Min. - Min.	AM12	A	A	A	A
Zero Point - left / bottom						
Direct Voltage						
	Range					
	0 ... 60 mV	DB60	A	A	...31230	...31230
	0 ... 100 mV	DB100	A	A	...31240	...31240
	0 ... 150 mV	DB150	A	A	...31270	...31270
	0 ... 250 mV	DB250	A	+	...31300	...31300
	0 ... 400 mV	DB400	A	+	...31320	...31320
	0 ... 600 mV	DB600	A	+	...31350	...31350
	0 ... > 60 mV... < 1 V ¹⁾	DB...	A	A	...31005	...31005
	0 ... 1 V	DC1	A	+	...33110	...33110
	0 ... 1.5 V	DC1.5	A	+	...33120	...33120
	0 ... 2.5 V	DC2.5	A	+	...33130	...33130
	0 ... 4 V	DC4	A	+	...33140	...33140
	0 ... 5 V	DC5	A	+	...33150	...33150
	0 ... 6 V	DC6	A	+	...33160	...33160
	0 ... 10 V	DC10	A	+	...33170	...33170
	0 ... 15 V	DC15	A	+	...33180	...33180
	0 ... 20 V	DC20	A	+	...33190	...33190
	0 ... 25 V	DC25	A	+	...33200	...33200
	0 ... 40 V	DC40	A	+	...33210	...33210
	0 ... 50 V	DC50	A	+	...33220	...33220
	0 ... 60 V	DC60	A	+	...33230	...33230
	0 ... 100 V	DC100	A	+	...33240	...33240
	0 ... 150 V	DC150	A	+	...33270	...33270
	0 ... 250 V	DC250	A	+	...33300	...33300
	0 ... 400 V	DC400	A	+	...33320	...33320
	0 ... 500 V	DC500	A	+	...33340	...33340
	0 ... 600 V	DC600	A	+	...33350	...33350
	0 ... > 1 V ... < 600 V ¹⁾	DC...	A	A	...31005	...31005

1) Specify in clear text

Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 2 Limit Contacts



Moving-coil movement, edgewise scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen. Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	PFN 96 x 24 2524P	PFN 96 x 48 2594P	KODPR 144 F 61102...	KODPR 144 SE 65102...
	+ ↓ HQ1 HQ2	N +	N +	N +	N +
GENERAL VARIANTS					
Zero Point					
Zero point at left (landscape)	BC1	N	N	N	N
Zero point at bottom (portrait)	BC4	+	+	+	+
Zero point at center	BC2	A	A	A	A
Zero point between bottom and center of scale ¹⁾	BC21	A	A	A	A
Position of Use					
Control panel vertical	LA1	N	N	N	N
Control panel horizontal	LA2	+	+	+	+
Other	LA999	A	A	A	A
(Please specify angle between scale and horizontal)					
OUTPUT VARIANTS					
Relay output	AU1	N	N	N	N
Logic output (open collector)	AU2	+	+	+	+
H = + 24 V (electrically isolated from U _H) L < + 1 V, I ≤ 50 mA (20 mA at U _H AC)					
AUXILIARY VOLTAGE VARIANTS					
24 V DC (20...24...30 V)	IV22	N	N	N	N
24 V AC (21...24...27 V), 45...65 Hz	IV12	A ²⁾	+	A ²⁾	A ²⁾
100 V AC (90...100...110 V), 45...65 Hz	IV10	—	+	—	—
110 V AC (99...110...121 V), 45...65 Hz	IV13	—	+	—	—
115 V AC (103...115...127 V), 45...65 Hz	IV16	A ²⁾	+	A ²⁾	A ²⁾
220 V AC (198...220...242 V), 45...65 Hz	IV19	—	+	—	—
230 V AC (207...230...253 V), 45...65 Hz	IV23	A ²⁾	+	A ²⁾	A ²⁾
240 V AC (216...240...264 V), 45...65 Hz	IV24	—	+	—	—
SCALE VARIANTS					
Division and Pointer					
Single division	GD1	N	N	N	N
Double division ¹⁾	GD2	A	A	A	A
Additional Imprint					
Second numbering, black ¹⁾	SK982	A	A	A	A
Second numbering, red (RAL 2002) ¹⁾	SK983	A	A	A	A
Inscription:					
Without additional inscription	SM99	N	N	N	N
Inscription ≤ 15 characters German ¹⁾	SM991	A	A	A	A
Inscription ≤ 15 characters other language ¹⁾ (Latin lettering)	SM993	A	A	A	A
Coloured mark red RAL 2002	ST981	A	A	A	A
Coloured sector red (RAL 2002) ¹⁾	SU981	A	A	A	A
Coloured sector green (RAL 6018) ¹⁾	SU982	A	A	A	A
HOUSING VARIANTS					
Application					
Standard version	LB99	N	N	N	N
Tropic resistant	LB1	A	A	—	—
Protection					
Standard (see technical data)	LH99	N	N	N	N
Housing panel IP 54, connections IP 20	LH22	A	A	—	—
Front Frame Colour					
Matt black	MA2	N	N	N	N
Matt grey RAL 7037	MA11	A	A	A	A
Glass Window					
Standard version	MG99	N	N	N	N
Anti-glare glass	MG1	A	A	A	A
Identification					
Without Identification	MZ99	N	N	N	N
Identification on the back ¹⁾	MZ998	A	A	A	A

¹⁾ Specify in clear text

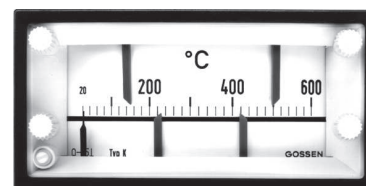
²⁾ With external power supply unit (extra charge) for the following voltages: 24 V AC, 115 V AC and 230 V AC, ±10 %; see accessories, page 130

Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 4 Limit Contacts



Moving-coil movement, edgewise scale
Narrow front frame per DIN 43 718, matt black



PFN 96 x 48

Technical Data

Front Dimensions mm Type	96 x 48 PFN 96 x 48
Scale Length mm	65
Class	1.5
Weight approx. (kg)	0.5
for auxiliary voltage 20 ... 40 V AC / DC	0.2
Sampling	electronic
Relative Switching Speed (max. error as related to scale length)	1 %
Repetition Accuracy (at nom. aux. voltage and 23 °C)	0.1 %
Number of Limits	4
Min. Contact Limit Clearance (of scale length)	3 %
Output Relay	built in
Output Contact	1 changeover per limit
Switching Capacity with Ohmic Load	
Max. Switching Voltage	300 V AC / DC
Max. Switching Current	6 A AC/DC
Nominal Switching Capacity	≤ 1500 VA
Service Life at Nominal Switching Capacity	> 10 ⁶ switching cycles
Max. Switching Time	500 ms
Auxiliary Voltage (U _H)	see order information
Power Consumption, AC Aux. Voltage	4 VA
Power Consumption, DC Aux. Voltage	4.5 W
Safety Regulations per IEC/EN 61010-1/A2 VDE 0411-1/A1	
Safety Class	II (total insulation)
Measuring Circuit:	
Over voltage Category	CAT III
Pollution Degree	2
Operating Voltage	300 V
Operating Voltage for Voltage Measuring > 250 V ... ≤ 600 V	600 V
Test Voltage (to Housing)	5.8 kV
Front Panel-Housing Protection	IP 52
Fasteners	screw spindle

Description

Analog indicator/controller with moving-coil movement for direct current or direct voltage

Display

Scale Division Coarse-fine
 Pointer Beam pointer with knife-edge for single and double division

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL 94 V-0
 Replaceable Glass windows and front frames
 ⇒ May only be replaced under
 voltage-free conditions!
 Terminals tab connectors (IP 20 protection)
 1 x 6.3 x 0.8 mm or 2 x 2.8 x 0.8 mm

Internal Resistance / Voltage Drop / Power Consumption

(Values only apply with zero point at left or at bottom)

Measuring Range	Internal Resistance / Voltage Drop / Power Consumption
≥ 100 μA / ≤ 10 mA	≤ 100 mV
> 10 mA / ≤ 6 A	≤ 100 mV
≥ 60 mV / ≤ 1 V	≥ 1 MΩ
> 1 V / ≤ 50 V	≥ 100 kΩ
> 50 V / ≤ 600 V	≥ 2 kΩ / V
0/4 ... 20 mA	6 Ω ¹⁾
Connection to shunt	6 mA ²⁾

1) Tolerance ± 30 %

2) Tolerance ± 20 %

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1 °
Other	DIN EN 60 051

Ordering Example:

Indicator/Controller 96 x 48 mm for direct voltage, landscape scale,
 Measuring range 0 ... 100 V, direct voltage,
 Closed-circuit current model, contacting Min.-Max./Min.-Max.

Techn. Data Type: PFN 96 x 48	Order No. 2596P, AM40, DC100
----------------------------------	---------------------------------

Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 2 Limit Contacts



General Issues

Indicator/controllers are meters with adjustable limits.
 The accuracy of the limits are not influenced by the contacts.
 Our meters and indicator/controllers comply with the regulations of the European Guidelines 73/23/EEG. This is proven by the compliance with the following standards:
 IEC 61010-1/A2 / EN 61010-1/A2 VDE 0411-1/A1 (Safety Regulations)
 IEC 60051/EN 60051/DIN EN 60051 (Meters with Scale Display)
 EN 50081-2: 1993 EMV (Emitted Interference, Industries)
 EN 50082-2: 1995 EMV (Emitted Interference, Industries)
 To protect the movable part of the indicator/controller against shocks, the bearings are spring mounted.

Application

Indicator/controllers display the actual value and energise with the help of one or more limits one or more relays. Their contacts can be used for monitoring, operating or controlling.
 Indicator/controllers are also available with logic output (transistor output).

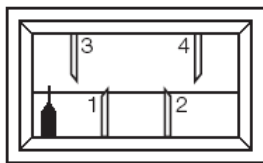
Sampling

The sampling of the indicator/controllers works contact-free.
 When the pointer reaches the limit the switching operation will be disengaged.

Contacting

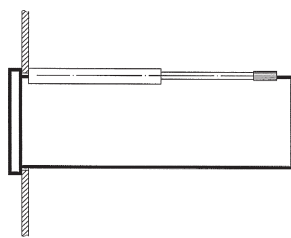
The max. contact disengages the switching operation when it overshoots the adjusted scale value. The min. contact disengages the switching operation when it undershoots the adjusted scale value.

Position of Limits

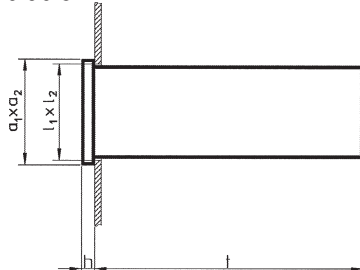


Fasteners

Screw spindle
 (control panel thickness 1 ... 40 mm)



Basic Dimensions



All indicators/controllers cause a permanent contact. This means that the output signal is held up as long as the pointer does not overrun the adjusted limit. The indicators/controllers are available as closed-circuit current model or working current model (see different Order No.).

Closed-Circuit Current Model: When the indicator/controller is not-operated a voltage is impressed on the relays (output signal H, logic output). The voltage drops as soon as one of the contact marks is undershot or overshoot. The same happens when a power breakdown or an electronic breakdown occurs and no limit is overshoot or undershot (self supervision). A short-term power failure leads to the same effect.

Working Current Model: When the indicator/controller is not-operated the relays are in zero current condition (output signal L, logic output). As soon as one of the limits is overshoot or undershot the relays pick up (output signal H).

Contact Assignments

Measuring Input	- 12- + 11+
Auxiliary Voltage	20 ... 40 VAC/DC L1 L2 90 ... 127 VAC L 198 ... 264 VAC N
Relay Output	Logic Output
Limit Contact 1	
Limit Contact 2	
Limit Contact 3	
Limit Contact 4	
The output contacts are shown in the wiring diagram in the zero current condition	+ terminals are electrically connected within the instrument

Front Dim. mm	Nominal Dimensions		Cutout Dimensions $l_1 \times l_2$	Installation Depth (t) Relay Output	Installation Depth (t) Logic Output
	$a_1 \times a_2$	h			
96 x 48	96 x 48	5	$92^{+0.8} \times 45^{+0.6}$	146	126

Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 4 Limit Contacts



Moving-coil movement, edgewise scale

Narrow front frame per DIN 43 718, matt black

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. →	PFN 96 x 48 2596P
Contacting ¹⁾	+ ↓	N
	Landscape Portrait	HQ1 HQ2
Min. - Max. / Min. - Max. closed current	AM40	+
Min. - Max. / Max. - Max. closed current	AM41	+
Min. - Max. / Min. - Min. closed current	AM42	+
Min. - Min. / Min. - Min. closed current and Max. - Max. / Max. - Max. working current	AM43	+
Min. - Min. / Min. - Min. working current	AM44	+
Min. - Max. / Min. - Max. working current	AM45	+
Min. - Max. / Max. - Max. working current	AM46	+
Min. - Max. / Min. - Min. working current	AM47	+
Zero Pint - left / bottom		
Direct Current		
Range		
0 ... 100 μ A	CA100	A
0 ... 150 μ A	CA150	A
0 ... 250 μ A	CA250	A
0 ... 400 μ A	CA400	A
0 ... 600 μ A	CA600	A
> 100 μ A ... < 1 mA ²⁾	CA...	A
0 ... 1 mA	CB1	+
0 ... 1.5 mA	CB1.5	+
0 ... 2.5 mA	CB2.5	+
0 ... 4 mA	CB4	+
0 ... 5 mA	CB5	+
0 ... 6 mA	CB6	+
0 ... 10 mA	CB10	+
0 ... 15 mA	CB15	A
0 ... 20 mA	CB20	A
0 ... 25 mA	CB25	A
0 ... 40 mA	CB40	A
0 ... 50 mA	CB50	A
0 ... 60 mA	CB60	A
0 ... 100 mA	CB100	A
0 ... 150 mA	CB150	A
0 ... 250 mA	CB250	A
0 ... 400 mA	CB400	A
0 ... 600 mA	CB600	A
> 1 mA ... < 1A ²⁾	CB...	A
Electr. suppressed		
0/4 ... 20 mA landscape	BC25	A
0/4 ... 20 mA portrait	BC27	A
0 ... 1 A	CC1	A
0 ... 1.5 A	CC1.5	A
0 ... 2.5 A	CC2.5	A
0 ... 4 A	CC4	A
0 ... 6 A	CC6	A
> 1 A ... < 6 A ²⁾	CC...	A

1) Number of contacts - specify in clear text

2) Specify in clear text

Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 4 Limit Contacts



Moving-coil movement, edgewise scale

Narrow front frame per DIN 43 718, matt black

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

		Type Order No.	⇒	PFN 96 x 48 2596P
	Landscape	+ ↓		N
	Portrait	HQ1 HQ2		+
Limits ¹⁾				
Min. - Max. / Min. - Max. closed current		AM40		+
Min. - Max. / Max. - Max. closed current		AM41		+
Min. - Max. / Min. - Min. closed current		AM42		+
Min. - Min. / Min. - Min. closed current and Max. - Max. / Max. - Max. working current		AM43		+
Max. - Max. / Max. - Max. closed current and Min. - Min. / Min. - Min. working current		AM44		+
Min. - Max. / Min. - Max. working current		AM45		+
Min. - Max. / Max. - Max. working current		AM46		+
Min. - Max. / Min. - Min. working current		AM47		+
Zero Point - left / bottom Connection to Shunt (Direct Current)				
... A / 60 mV		BE3 ²⁾		A
... A / 150 mV		BE4 ²⁾		A
... A / ... > 60 mV ³⁾		BE981 ²⁾		A
Scale:	1 A	CG1		+
	1.5 A	CG1.5		+
	2.5 A	CG2.5		+
	4 A	CG4		+
	5 A	CG5		+
	6 A	CG6		+
	10 A	CG10		+
	15 A	CG15		+
	20 A	CG20		+
	25 A	CG25		+
	30 A	CG30		+
	40 A	CG40		+
	50 A	CG50		+
	60 A	CG60		+
	75 A	CG75		+
	100 A	CG100		+
	150 A	CG150		+
	200 A	CG200		+
	250 A	CG250		+
	300 A	CG300		+
	400 A	CG400		+
	500 A	CG350		+
	600 A	CG600		+
	0 ... > 1 A ... < 1 kA ³⁾	CG...		+
	1 kA	CH1		+
	1.5 kA	CH1.5		+
	2.5 kA	CH2.5		+
	4 kA	CH4		+
	5 kA	CH5		+
	6 kA	CH6		+
	10 kA	CH10		+
	15 kA	CH15		+
	> 1 kA ³⁾	CH...		+

1) Number of limits - specify in clear text

2) Complement with CG... or CH...

3) Specify in clear text

Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 4 Limit Contacts



Moving-coil movement, edgewise scale

Narrow front frame per DIN 43 718, matt black

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No.	⇒	PFN 96 x 48 2596P
Limits ¹⁾	Landscape	+ ↓	N
	Portrait	HQ1 HQ2	+ +
Min. - Max. / Min. - Max. closed current	AM40		+
Min. - Max. / Max. - Max. closed current	AM41		+
Min. - Max. / Min. - Min. closed current	AM42		+
Min. - Min. / Min. - Min. closed current and Max. - Max. / Max. - Max. working current	AM43		+
Min. - Min. / Min. - Min. working current	AM44		+
Min. - Max. / Min. - Max. working current	AM45		+
Min. - Max. / Max. - Max. working current	AM46		+
Min. - Max. / Min. - Min. working current	AM47		+
Zero Point - left / bottom			
Direct Voltage			
Range			
0 ... 60 mV	DB60		A
0 ... 100 mV	DB100		A
0 ... 150 mV	DB150		A
0 ... 250 mV	DB250		A
0 ... 400 mV	DB400		A
0 ... 600 mV	DB600		A
0 ... > 60 mV ... < 1 V ²⁾	DB...		A
0 ... 1 V	DC1		A
0 ... 1.5 V	DC1.5		A
0 ... 2.5 V	DC2.5		A
0 ... 4 V	DC4		A
0 ... 5 V	DC5		A
0 ... 6 V	DC6		A
0 ... 10 V	DC10		A
0 ... 15 V	DC15		A
0 ... 20 V	DC20		A
0 ... 25 V	DC25		A
0 ... 40 V	DC40		A
0 ... 50 V	DC50		A
0 ... 60 V	DC60		A
0 ... 100 V	DC100		A
0 ... 150 V	DC150		A
0 ... 250 V	DC250		A
0 ... 400 V	DC400		A
0 ... 500 V	DC500		A
0 ... 600 V	DC600		A
0 ... > 1 V ... < 600 V ²⁾	DC...		A

1) Number of limits - specify in clear text

2) Specify in clear text

Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 4 Limit Contacts



Moving-coil movement, edgewise scale

Narrow front frame per DIN 43 718, matt black

Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen. Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type Order No. ⇒	PFN 96 x 48 2596P
	+ ↓ HQ1 ↑ HQ2	N +
GENERAL VARIANTS		
Zero Point		
Zero point at left (landscape)	BC1	N
Zero point at bottom (portrait)	BC4	+
Zero point at the center	BC2	A
Zero point between bottom and center of scale ¹⁾	BC21	A
Position of Use		
Control panel vertical	LA1	N
Control panel horizontal	LA2	+
Other	LA999	A
(Please specify angle between scale and horizontal)		
OUTPUT VARIANTS		
Relay output	AU1	N
Logic output (open collector)	AU2	+
H = + 24 V (electrically isolated from U _n) L < + 1 V, I ≤ 25 mA at U _n 20 ... 40 V DC/AC I ≤ 10 mA at U _n 90 ... 127 V AC u+ and U _n 198 ... 267 V AC		
AUXILIARY VOLTAGE VARIANTS		
20...40 V DC / AC, 45...65 Hz	IV62	N
90...127 V AC, 45...65 Hz	IV60	A
198...267 V AC, 45...65 Hz	IV61	A
SCALE VARIANTS		
Division and Pointer		
Single division	GD1	N
Double division ¹⁾	GD2	A
Additional Imprint		
Second numbering, black ¹⁾	SK982	A
Second numbering, red (RAL 2002) ¹⁾	SK983	A
Inscription		
Without additional inscription	SM99	N
Inscription ≤ 15 characters German ¹⁾	SM991	A
Inscription ≤ 15 characters other language ¹⁾ (Latin lettering)	SM993	A
Coloured mark red RAL 2002 ¹⁾	ST981	A
Coloured sector red (RAL 2002) ¹⁾	SU981	A
Coloured sector green (RAL 6018) ¹⁾	SU982	A
HOUSING VARIANTS		
Application		
Standard version	LB99	N
Tropic resistant	LB1	A
Protection		
Standard (see technical data)	LH99	N
Housing panel IP 54, connections IP 20	LH22	A
Front Frame Colour		
Matt black	MA2	N
Matt grey, RAL 7037	MA11	A
Glass Window		
Standard version	MG99	N
Anti-glare glass	MG1	A
Identification		
Without identification	MZ99	N
Identification on the back ¹⁾	MZ998	A

¹⁾ Specify in clear text

Vario-Series • Special Panel Meters

Switch Position Indicator for Direct Voltage or Alternating Voltage 45...65 Hz



Front frame gloss black



ST1

Technical Data

Front Dimensions mm Type	25 x 25 STQ 1	Ø 25 ST 1	Ø 32 ¹⁾ ST 2
Weight approx. (kg)	0.07	0.07	0.07
Operating Voltage	300 V	300 V	300 V
Test Voltage	3.5 kV	3.5 kV	3.5 kV
Front Housing-Panel Protection	IP 52	IP 52	IP 52
Fasteners	round nut	round nut	round nut

1) Snap-on front frame included (36 x 36 mm)

Description

Switch position indicator for remote indication of contact positions at power plants and switching stations. Can also be used advantageously as an indicator in mimic diagrams.

Display

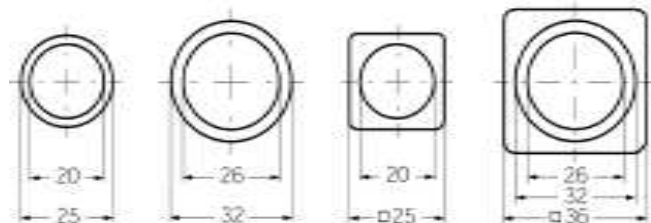
Three different displays are included: "Off", "On" and "Error" or "Disabled".

Mechanical Design

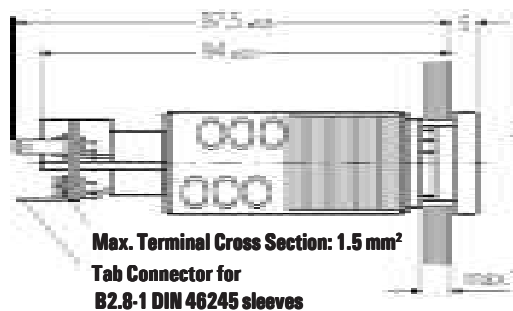
Housing Material Polycarbonate
 Terminals tab connectors, 2.8 x 0.8 mm
 Contact Protection Available as option

Front Panel Dimensions

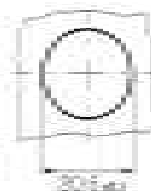
Front frame snaps on 32 mm diameter front ring



Basic Dimensions



Panel Cutout



Isolating Contact

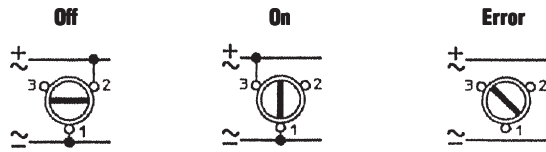


Vario-Series • Special Panel Meters

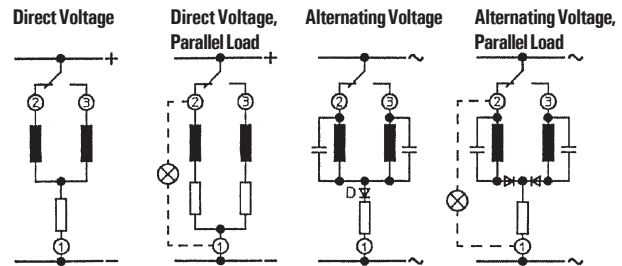
Switch Position Indicator for Direct Voltage or Alternating Voltage 45...65 Hz



Graphic Symbols



Schematic Diagrams



Please note when ordering:

Only one Identification No. with the same letter sequence may be chosen. Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '-' = Not available

	Type	STQ 1	ST 1	ST 2
	Front Dim. mm	25 x 25	∅ 25	∅ 32
	Order No. ⇒	1108B	1280B	1281B
	+ ↓			
Direct Voltage ¹⁾	B1	+	+	+
24 V (0.3 W)	IL224	+	+	+
48 V (0.3 W)	IL248	+	+	+
60 V (0.4 W)	IL260	+	+	+
110 V (0.6 W)	IL511	+	+	+
125 V (0.7 W)	IL512	+	+	+
220 V (1.0 W)	IL522	+	+	+
Alternating Voltage ¹⁾	B2	A	A	A
24 V (0.3 VA)	IL624	+	+	+
48 V (0.3 VA)	IL648	+	+	+
60 V (0.4 VA)	IL660	+	+	+
110 V (0.6 VA)	IL311	+	+	+
220/230 V (1.4 VA)	IL726	+	+	+
Movement Variants ²⁾				
with parallel load	IN1	A	A	A
Scale Variants ²⁾				
with isolation contact	GA2	+	+	+
Housing Variants ²⁾				
Tropic resistant	LB1	A	A	A
full contact protection	VB2	A	A	A

1) Nominal voltage tolerance: ± 20 %

2) Applies to all types for direct and alternating voltage

Ordering Example:

Contact position indicator, front dimension ∅25 mm
for Alternating Voltage 220 / 230 V

Techn. Data Typ: ST1	Order No. 1280B, B2, IL726
--------------------------------	--------------------------------------

Special Panel Meters

LED-Switch Position Indicator for Direct Voltage and Alternating Voltage 45...65 Hz



Front frame gloss black



ST 1-LED

Technical Data

Front Dimensions mm Type	25 x 25 STQ 1-LED	Ø 25 ST 1-LED
Weight approx. (kg)	0,07	0,07
Operating Voltage	300 V	300 V
Test Voltage	3,5 kV	3,5 kV
Front Housing - Panel Protection Fasteners	IP 52 round nut	IP 52 round nut

Description

Switch position indicator for remote indication of contact positions at power plants and switching stations. Can also be used advantageously as an indicator in mimic diagrams.

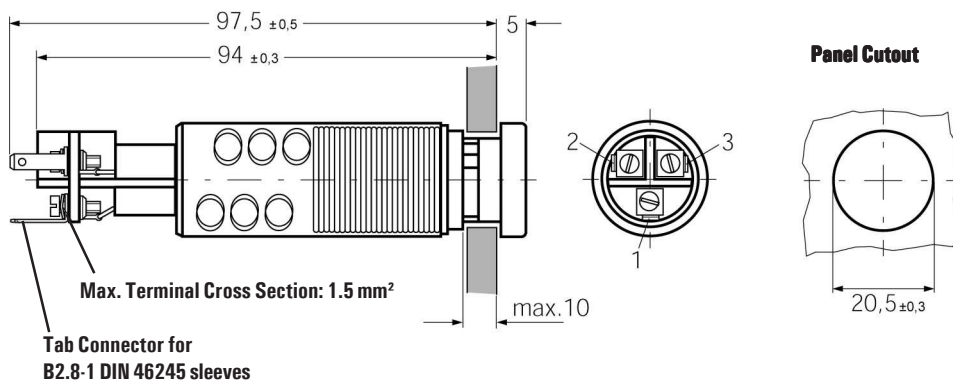
Front Panel Dimensions



Mechanical Design

Housing Material: Polycarbonate
 Terminals: tab connectors, 2.8 x 0.8
 Contact Protection: available as option

Basic Dimensions

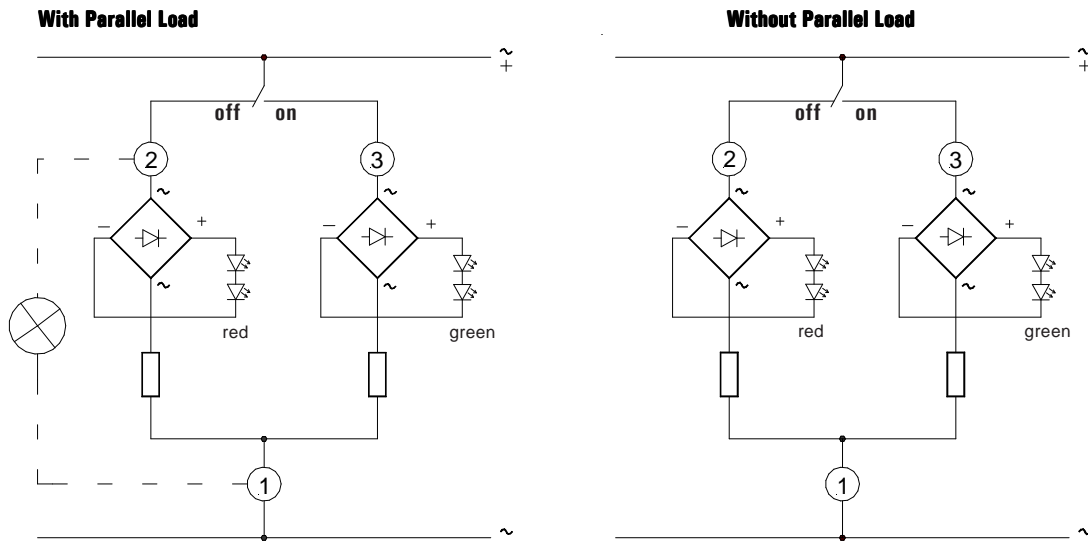


Special Panel Meters

LED-Switch Position Indicator for Direct Voltage and Alternating Voltage 45...65 Hz



Schematic Diagrams for Direct- and Alternating Voltage



Type
Front Dimension mm

STQ 1-LED
25 x 25

ST 1-LED
Ø25

1108 BC LED
Order No.

1280 BC LED
Order No.

Direct Voltage:

24 V AC/DC
48 V AC/DC
60 V AC/DC
110 V AC/DC
125 V AC/DC
220/230 V AC/DC

IL824
IL848
IL860
IL811
IL812
IL826

IL824
IL848
IL860
IL811
IL812
IL826

Movement Variants:

without parallel load (standard)
with parallel load

INH002
INH001

INH002
INH001

Front Plate:

black (standard)
white

NF099
NF001

NF099
NF001

Symbols:

cross symbol
interruption symbol
earthing symbol

RS099
RS001
RS002

RS099
RS001
RS002

LED - Colours:

LED red / green

PE099

PE099

Cross symbol only:

- LED yellow / yellow
- LED green / green
- LED red / red

PE001
PE002
PE003

PE001
PE002
PE003

other colours on request

Housing Variants:

standard
tropicalized
without contact protection (standard)
full contact protection

LB099
LB001
VB099
VB002

LB099
LB001
VB099
VB002

Vario-Series • Accessories

Low Voltage Current Transformers, Class 1 and 0.5

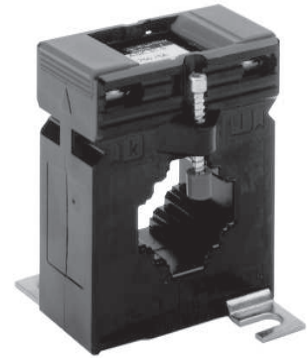
Current Transformers

Wound- Primary Current Transformers

Description

Current transformers for direct mounting to bus bars or insulated round conductor and wound-primary current transformers with fixed primary coil.

Application: indirect measurement of sinusoidal alternating current.



Typ ASK 31.3

Type	Current Transformers				Wound-Primary Current Transformers		
	ASK 31.3	ASK 412.4	ASK 63.4	ASK 105.6	WSK 30	WSK 40	WSK 70.6 N
For Bars up to	30 x 10 mm 25.4 x 13 mm 2 x 20 x 10 mm	40 x 12 mm 30 x 15 mm —	60 x 30 mm 50 x 40 mm —	100 x 55 mm — —	—	—	—
For Round Conductors to	∅ 26 mm	∅ 30.5 mm	∅ 44 mm	∅ 55 mm	—	—	—
Rated Primary Current	50 to 750 A (Cl. 0.5 as of 100 A)	50 to 1000 A (Cl. 0.5 as of 100 A)	750 to 2000 A	1500 to 4000 A	1 to 20 A	1 to 40 A	30 to 150 A
Class	1 or 0.5	1 or 0.5	1 or 0.5	1 or 0.5	1 or 0.5	1 or 0.5	1 or 0.5
Housing Material	polycarbonate	polycarbonate	polycarbonate	polycarbonate	polycarbonate	polycarbonate	polycarbonate
Transformer Width	60 mm	70 mm	95 mm	129 mm	60 mm	70 mm	70 mm ¹⁾
Max. Weight	0.28	0.45	0.41	1.2	0.25	0.4	0.5

Technical Data, Characteristics Values

Polycarbonate housing per	UL 94 V-0
Angle bracket and rail Screw Clip Screws with insulated protective cover as standard mount (rail Screw Clip Screws only with current transformer)	
Tightening torque for rail Screw Clip Screws	2 ... 3 Nm
Maximum device voltage U_m (RMS value) = max. allowable operating voltage	0.72 kV
Rated short-time alternating withstand voltage (RMS value) = test voltage	3 kV
Ambient temperature (operating temperature range)	-5 ... 40 °C (no condensation)
Design applies for	40 °C ambient temperature and 70 °C bus bar temperature
Rated thermal continuous current	1.0 x I_N
Rated frequency	50 – 60 Hz
Rated thermal short-time current	60 x I_N
Insulation class	E
Overcurrent limiting factor (FS)	FS 5 to 1500 A rated primary current FS 10 from 1600 A rated primary current

Regulations and Standards

IEC 185 / DIN VDE 0414 part 1

BGV A2

VDE 0106 part 100 / DIN 57106 part 100 (safe from finger-touch)

Vario-Series • Accessories

Low Voltage Current Transformers, Class 1 and 0.5

Type ASK 31.3

Current Transformer

Primary Conductor 30 x 10 mm
25.4 x 13 mm
2 x 20 x 10 mm

Round Conductor \varnothing 26 mm

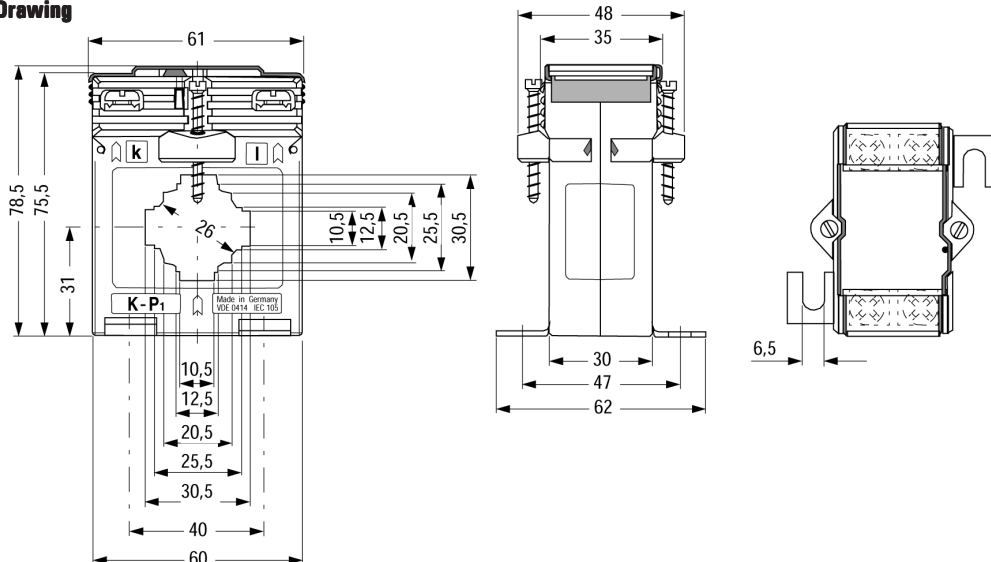
Transformer Width 60 mm

Rated Primary Current		Class 1		Class 0.5	
		Sec. 5 A	Sec. 1 A	Sec. 5 A	Sec. 1 A
		Order No.	Order No.	Order No.	Order No.
A	VA	1715V + ↓	1715V + ↓	1715V + ↓	1715V + ↓
50	1.0	0100	1100	—	—
60	1.0	0110	1110	—	—
75	1.5	0120	1120	—	—
80	2.5	0130	1130	—	—
100	2.5	0140	1140	2140	3140
150	2.5	0150	1150	2150	3150
200	5	0160	1160	2160	3160
250	5	—	—	2170	3170
250	10	0170	1170	—	—
300	5	—	—	2180	3180
300	10	0180	1180	—	—
400	5	—	—	2190	3190
400	10	0190	1190	—	—
500	10	0200	1200	2200	3200
600	10	0210	1210	2210	3210
750	10	0220	1220	2220	3220

Rated frequency 400 Hz, extra charge = specify in clear text

Accessories:	Order No.
Adaptor for 35 mm mounting rail to DIN EN 50022	1722V9010
Protective Cover	1722V9110

Dimensional Drawing



Vario-Series • Accessories

Low Voltage Current Transformers, Class 1 and 0.5

Type ASK 412.4

Current Transformer

Primary Conductor 40 x 12 mm
30 x 15 mm

Round Conductor \varnothing 30.5 mm

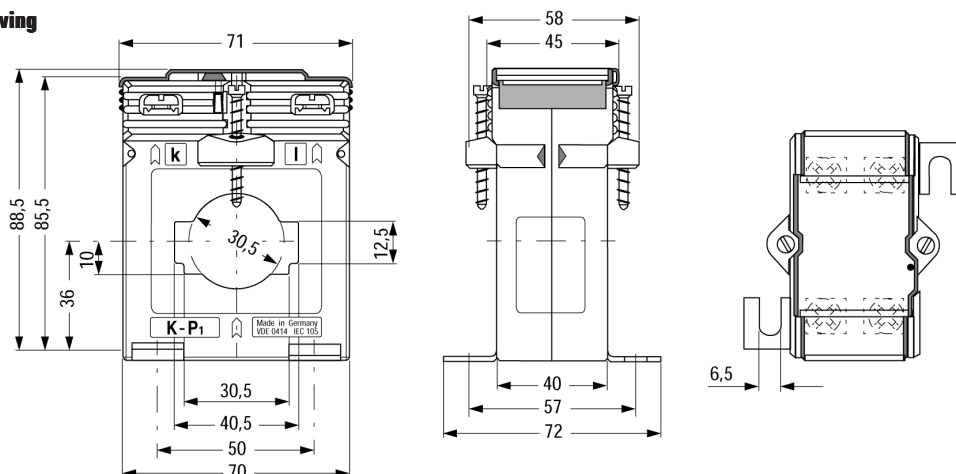
Transformer Width 70 mm

Rated Primary Current A	VA	Class 1		Class 0.5	
		Sec. 5 A	Sec. 1 A	Sec. 5 A	Sec. 1 A
		Order No. 1716V + ↓	Order No. 1716V + ↓	Order No. 1716V + ↓	Order No. 1716V + ↓
50	1.5	0100	1100	—	—
60	1.5	0110	1110	—	—
75	2.5	0120	1120	—	—
80	2.5	0130	1130	—	—
100	1.5	—	—	2140	3140
100	3.75	0140	1140	—	—
150	2.5	—	—	2150	3150
150	5	0150	1150	—	—
200	2.5	—	—	2160	3160
200	10	0160	1160	—	—
250	5	—	—	2170	3170
250	10	0170	1170	—	—
300	5	—	—	2180	3180
300	10	0180	1180	—	—
400	10	0190	1190	2190	3190
500	10	0200	1200	2200	3200
600	10	0210	1210	2210	3210
750	10	0220	1220	2220	3220
800	10	0230	1230	2230	3230
1000	10	0240	1240	2240	3240

Rated frequency 400 Hz, extra charge = specify in clear text

Accessories	Order No.
Adaptor for 35 mm mounting rail to DIN EN 50022	1722V9020
Protective Cover	1722V9120

Dimensional Drawing



Vario-Series • Accessories

Low Voltage Current Transformers, Class 1 and 0.5

Type ASK 63.4

Current Transformer

Primary Conductor 60 x 30 mm
50 x 40 mm

Round Conductor \varnothing 44 mm

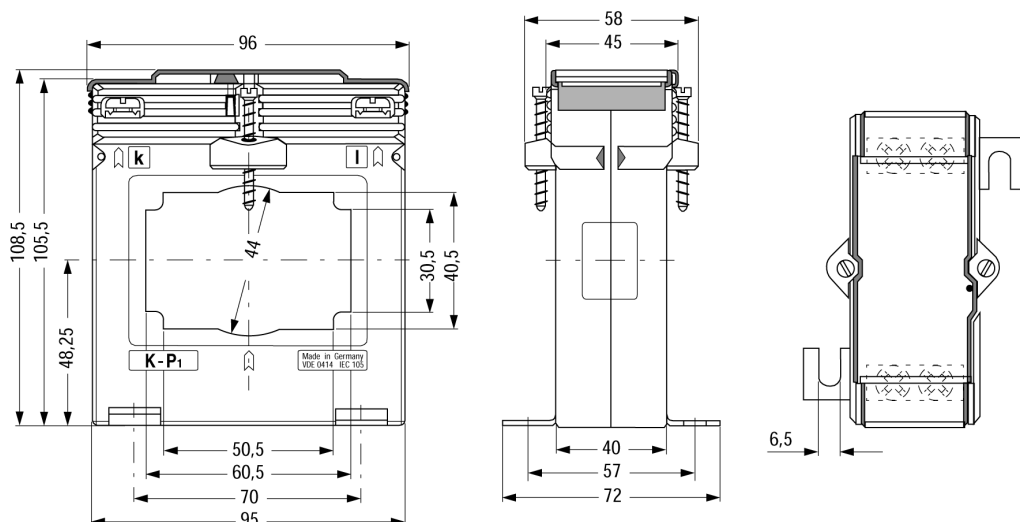
Transformer Width 95 mm

Rated Primary Current		Class 1		Class 0.5	
		Sec. 5 A	Sec. 1 A	Sec. 5 A	Sec. 1 A
		Order No. 1717V + ↓	Order No. 1717V + ↓	Order No. 1717V + ↓	Order No. 1717V + ↓
A	VA				
750	10	0220	1220	2220	3220
800	10	0230	1230	2230	3230
1000	10	0240	1240	2240	3240
1200	10	0250	1250	2250	3250
1500	10	0260	1260	2260	3260
1800	10	0270	1270	2270	3270
2000	10	0280	1280	2280	3280

Rated frequency 400 Hz, extra charge = specify in clear text

Accessories:	Order No.
Protective Cover	1722V9130

Dimensional Drawing



Vario-Series • Accessories

Low Voltage Current Transformers, Class 1 and 0.5

Type ASK 105.6

Current Transformer

Primary Conductor 100 x 55 mm

Round Conductor \varnothing 55 mm

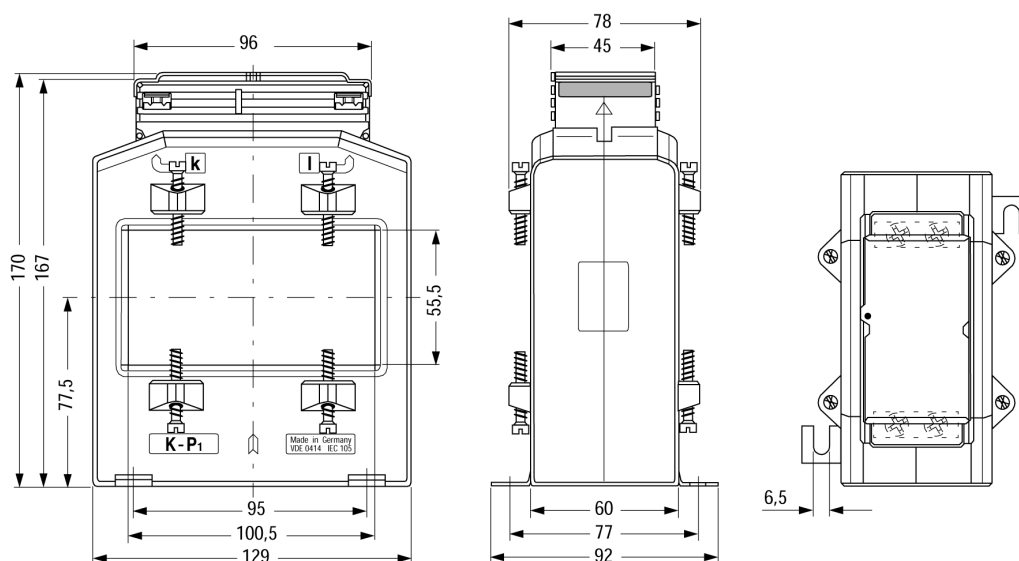
Transformer Width 129 mm

Rated Primary Current		Class 1		Class 0.5	
		Sec. 5 A	Sec. 1 A	Sec. 5 A	Sec. 1 A
		Order No.	Order No..	Order No.	Order No.
A	VA	1718V + ↓	1718V + ↓	1718V + ↓	1718V + ↓
1500	10	0260	1260	2260	3260
1800	10	0270	1270	2270	3270
2000	10	0280	1280	2280	3280
2500	10	0290	1290	2290	3290
3000	10	0300	1300	2300	3300
4000	10	0310	1310	2310	3310

Rated frequency 400 Hz, extra charge = specify in clear text

Accessories:	Order No.
Protective Cover	1722V9130

Dimensional Drawing



Vario-Series • Accessories

Low Voltage Current Transformers, Class 1 and 0.5

Type WSK 30

Wound-Primary Current Transformer

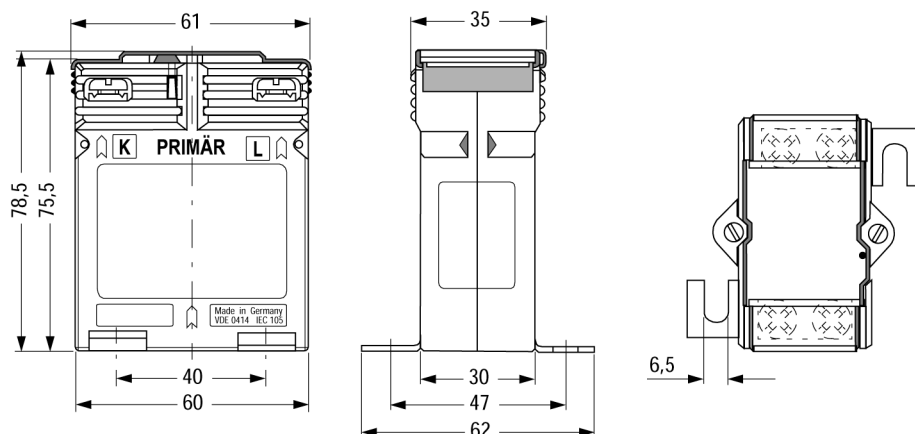
Transformer Width 60 mm

Rated Primary Current	VA	Class 1		Class 0.5	
		Sec. 5 A	Sec. 1 A	Sec. 5 A	Sec. 1 A
		Order No	Order No	Order No	Order No
A		1719V + ↓	1719V + ↓	1719V + ↓	1719V + ↓
1	2.5	—	—	2010	3010
1	5	0010	1010	—	—
2.5	2.5	—	—	2020	3020
2.5	5	0020	1020	—	—
5	2.5	—	—	2030	3030
5	5	0030	1030	—	—
10	2.5	—	—	2040	3040
10	5	0040	1040	—	—
15	2.5	—	—	2050	3050
15	5	0050	1050	—	—
20	2.5	—	—	2060	3060
20	5	0060	1060	—	—

Rated frequency 400 Hz, extra charge = specify in clear text

Accessories:	Order No.
Adaptor for 35 mm mounting rail to DIN EN 50022	1722V9010
Protective Cover	1722V9110

Dimensional Drawing



Vario-Series • Accessories

Low Voltage Current Transformers, Class 1 and 0.5

Type WSK 40

Wound-Primary Current Transformer

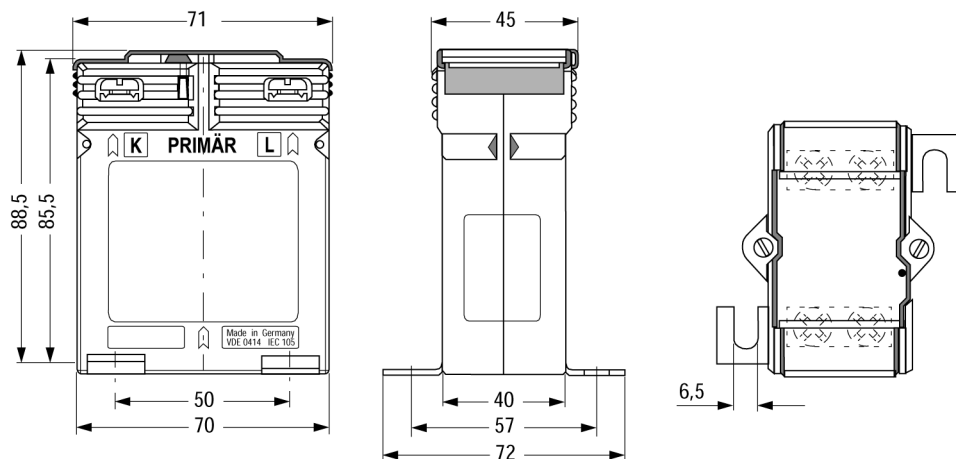
Transformer Width 70 mm

Rated Primary Current	VA	Class 1		Class 0.5	
		Sec. 5 A	Sec. 1 A	Sec. 5 A	Sec. 1 A
		Order No. 1720V + ↓	Order No. 1720V + ↓	Order No. 1720V + ↓	Order No. 1720V + ↓
A					
1	10	0010	1010	2010	3010
2.5	10	0020	1020	2020	3020
5	10	0030	1030	2030	3030
10	10	0040	1040	2040	3040
15	10	0050	1050	2050	3050
20	10	0060	1060	2060	3060
25	10	0070	1070	2070	3070
30	5	—	—	2080	3080
30	10	0080	1080	—	—
40	5	—	—	2090	3090
40	10	0090	1090	—	—

Rated frequency 400 Hz, extra charge = specify in clear text

Accessories:	Order No.
Adaptor for 35 mm mounting rail to DIN EN 50022	1722V9020
Protective Cover	1722V9120

Dimensional Drawing



Vario-Series • Accessories

Low Voltage Current Transformers, Class 1 and 0.5

Type WSK 70.6 N

Wound-Primary Current Transformer

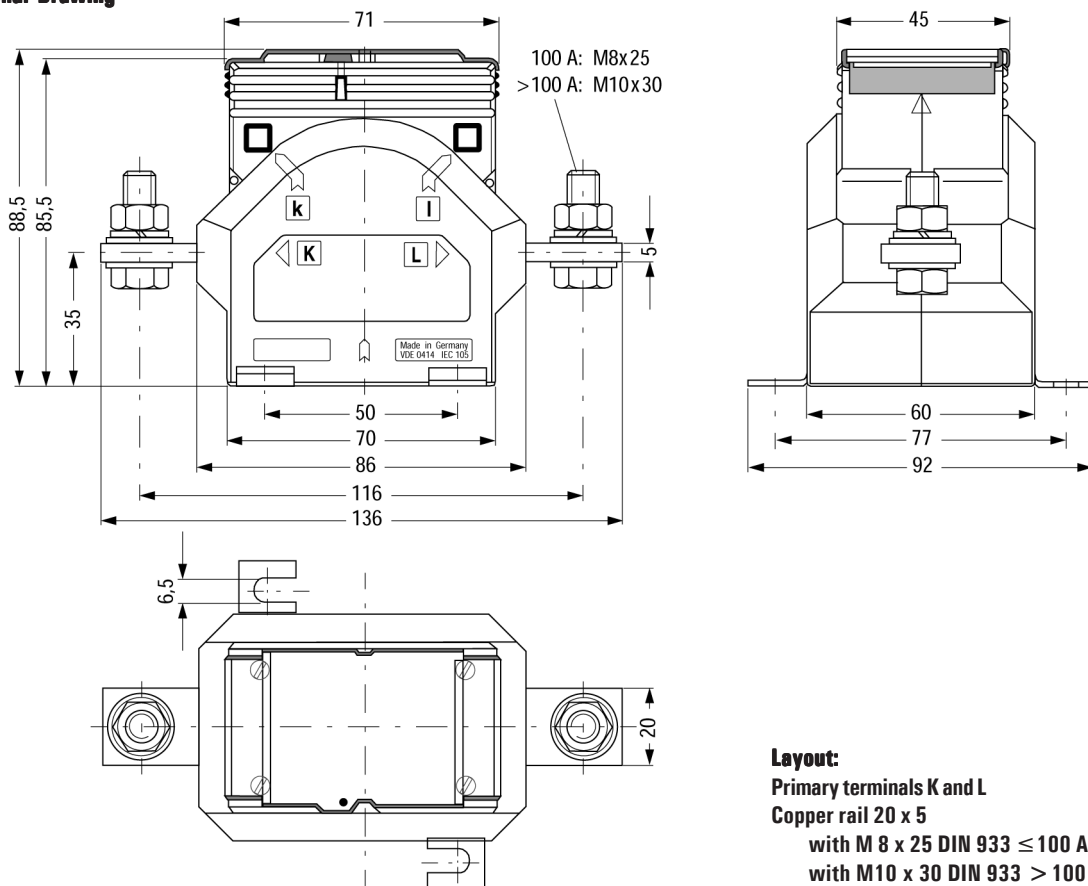
Transformer Width 70 mm

Rated Primary Current		Class 1		Class 0.5	
		Sec. 5 A	Sec. 1 A	Sec. 5 A	Sec. 1 A
		Order No.	Order No.	Order No.	Order No.
A	VA	1721V + ↓	1721V + ↓	1721V + ↓	1721V + ↓
30	10	0080	1080	2080	3080
40	10	0090	1090	2090	3090
50	10	0100	1100	2100	3100
60	10	0110	1110	2110	3110
75	10	0120	1120	2120	3120
80	10	0130	1130	2130	3130
100	10	0140	1140	2140	3140
150	10	0150	1150	2150	3150

Rated frequency 400 Hz, extra charge = specify in clear text

Accessories:	Order No.
Protective Cover	1722V9120

Dimensional Drawing



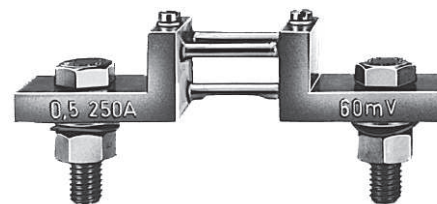
Vario-Series • Accessories

Shunt Resistors, Class 0.5

Technical Data

Type	60 mV	150 mV
Accuracy Class per DIN EN 60051	0.5	0.5
Dimensions per	DIN 43703 ¹⁾	
Balancing	An instrument power consumption value of 6 mA is taken into consideration for balancing when shunt resistors are used	

1) Model with insulation base can be screw or snap mounted (for top-hat rail per DIN EN 50022-35), overall length: 140 mm. Overall height for model with cover is increased to 40.5 mm.



Shunt Resistor, 250 A / 60 mV

Ordering Example

Techn. data	Order No.
Shunt Resistor, Nominal Current I_N 250 A. Voltage Drop 60 mV	1700V3340

Nominal Current	60 mV		Nominal Current	150 mV	
I_N	Weight approx. (kg)	Order No.	I_N	Weight approx. (kg)	Order No.
1 A	0.10	1700V3010 ◇	1 A	0.10	1700V4010 ◇
1.5 A	0.10	1700V3030 ◇	1.5 A	0.10	1700V4030 ◇
2.5 A	0.10	1700V3050 ◇	2.5 A	0.10	1700V4050 ◇
4 A	0.10	1700V3070 ◇	4 A	0.10	1700V4070 ◇
6 A	0.10	1700V3090 ◇	6 A	0.10	1700V4090 ◇
10 A	0.10	1700V3110 ◇	10 A	0.10	1700V4110 ◇
15 A	0.10	1700V3130 ◇	15 A	0.10	1700V4130 ◇
25 A	0.10	1700V3170 ◇	25 A	0.10	1700V4170 ◇
40 A	0.10	1700V3200 ◇	40 A	0.14	1700V4200 ◇
60 A	0.10	1700V3230 ◇	60 A	0.15	1700V4230 ◇
100 A	0.10	1700V3280 ◇	100 A	0.17	1700V4280 ◇
150 A	0.15	1700V3300 ◇	150 A	0.20	1700V4300 ◇
250 A	0.50	1700V3340 ◇	250 A	0.70	1700V4340 ◇
400 A	0.70	1700V3370 ◇	400 A	1.10	1700V4370 ◇
500 A	1.00	1700V3390 ◇	500 A	1.10	1700V4390 ◇
600 A	1.20	1700V3400 ◇	600 A	1.70	1700V4400 ◇
1 kA	1.45	1700V3460 ◇	1 kA	2.50	1700V4460 ◇
1.5 kA	1.95	1700V3480 ◇	1.5 kA	3.70	1700V4480 ◇
2.5 kA	2.90	1700V3520 ◇	2.5 kA	5.20	1700V4520 ◇
4 kA	4.20	1700V3550 ◇	4 kA	8.30	1700V4550 ◇
5 kA	4.30	1700V3570 ◇	5 kA	10.60	1700V4570 ◇
6 kA	10.50	1700V3580 ◇	6 kA	15.00	1700V4580 ◇
10 kA	21.00	1700V3630 ◇	10 kA	28.00	1700V4630 ◇
15 kA	32.00	1700V3650 ◇			

Nominal Current I_N	60 mV
	Order No.
40 A	1700V7200 ◇
60 A	1700V7230 ◇
100 A	1700V7280 ◇
150 A	1700V7300 ◇

◇ On insulating base (screws or snaps onto top-hat rail per DIN EN 50022-35)

◇ Cover for shunt resistor on insulating base: **Order No. 1700V8210**

One Pair Cables with Cable Lugs

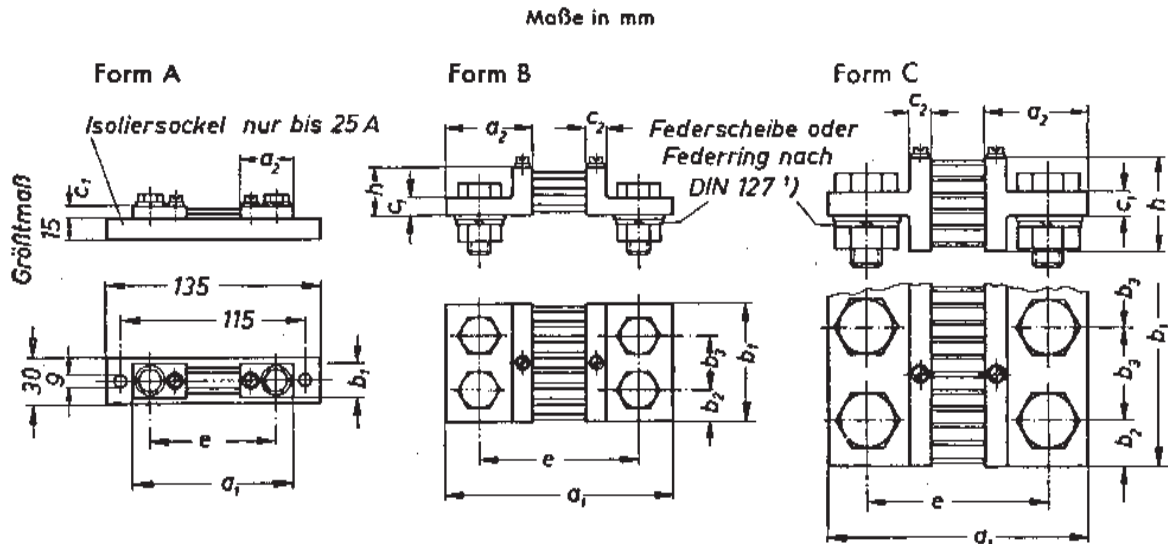
Length	Cross-Section	Cable per VDE 0281 part 401	Order No.
1.3 m	0.75 mm ²	H03V-H	1700V8010
2.6 m	1.5 mm ²	H07V-H	1700V8020
4.3 m	2.5 mm ²	H07V-H	1700V8030
7.0 m	4.0 mm ²	H07V-H	1700V8040
10.5 m	6.0 mm ²	H07V-H	1700V8050

0.06 Ω cable resistance per cable pair

Vario-Series • Accessories

Shunt Resistors, Class 0.5

Dimensional Drawings



Bezeichnung eines Nebenwiderstandes für 60 mV Spannungsabfall und 25 A Nennstrom:

Nebenwiderstand 60/25 DIN EN 60051

Spannungsabfall mV	Maß	für Nennstrom in A														
		1,5	2,5	4	40	60	250	400	600	1000	1500	2500	4000	6000	10000	15000
60		Form A				Form B				Form C						
	a ₁	90	100	145	165	165	175	185								
	a ₂	28	33	55	65	65	70	75								
	b ₁	20	25	30	40	60	90	120	120	154	206	310				
	b ₂	—	—	15	20	30	21	30	30	—	25	—				
	b ₃	—	—	—	—	—	48	60	60	—	52	—				
	c ₁	8	—	—	—	10	—	—	15	—	25	30				
	c ₂	—	—	—	—	10	—	—	10	—	15	20				
	e	78	80	105	115	115	125	135	—		—	—				
	h	—	—	—	—	30	60	130	170							
150		Form A				Form B				Form C						
	a ₁	90	225	270	290	290	300	310								
	a ₂	28	33	55	65	65	70	75								
	b ₁	20	25	30	40	70	90	120	120	154	206	310				
	b ₂	—	—	15	20	35	21	30	30	—	25	—				
	b ₃	—	—	—	—	—	48	60	60	—	52	—				
	c ₁	8	—	—	—	10	—	—	15	—	25	30				
	c ₂	—	—	—	—	10	—	—	10	—	15	20				
	e	78	205	230	240	240	240	250	260		—	—				
	h	—	—	50	60	60	60	130	170							
Stromanschlüsse: Anzahl		2x1				2x2				2x3	2x4	2x6				
Sechskantschraube: DIN 933—5		M 5x12 ⁵⁾	M 8x15 ⁵⁾	M 12x40	M 16x45	M 20x50	M 16x45 ²⁾	M 20x50 ²⁾	M 20x60 ²⁾	M 20x75	M 20x85					
Scheibe DIN 125 Flußstahl		5,3	8,4	13,5	17	21	17	—	21	—	—					
Mutter DIN 934—5		—	—	M 12	M 16	M 20	M 16	—	M 20	—	—					
Spannungs-Anschlüsse		2 Zylinderschrauben A M 5x8 DIN 84—4 und Scheiben 5,3 DIN 433 Flußstahl														

Nicht angegebene Einzelheiten sind zweckentsprechend zu wählen

Genauigkeitsklasse 0,5 nach DIN 57410, Regeln für Meßgeräte

Nebenwiderstände austauschbar, wenn Verbrauch des angeschlossenen Meßgerätes höchstens 500 µW

1) Zwischen Scheibe und Mutter zur Erhaltung gleichbleibenden Kontaktdrucks Federscheibe oder Federring legen.

2) für 150 mV: Schraube M 16x60 3) für 150 mV: Schraube M 20x75

4) für 150 mV: Schraube M 20x60 5) Bei Schrauben M 5 und M 8 ist vorzugsweise 5 nach DIN 267 zu verwenden.

Vario-Series • Accessories

Voltage Divider for Direct Voltage

Voltage divider for direct voltage,
Can be combined with any moving-coil type

Technical Data

Design	Film resistors with porcelain insulators on pressed paper sheet
Mounting	on isolater necessary
Weight approx. (kg)	0.2
Protection	IP 00
Resistor	ca. $2\text{ k}\Omega/\text{V}$ (voltage divider in comb. with moving-coil meter)
Terminals	can be connected to any moving-coil voltmeter

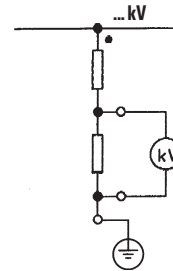
Description

Voltage divider for direct voltage meters, made of film resistors. For Usage in single-ended high voltage facilities up to 10 kV.
Design of the test circuit: At full scale deflection of the meter, $250\ \mu\text{A}$ each pass through the protective resistor an the meter. 25 V are impressed on the indicator.

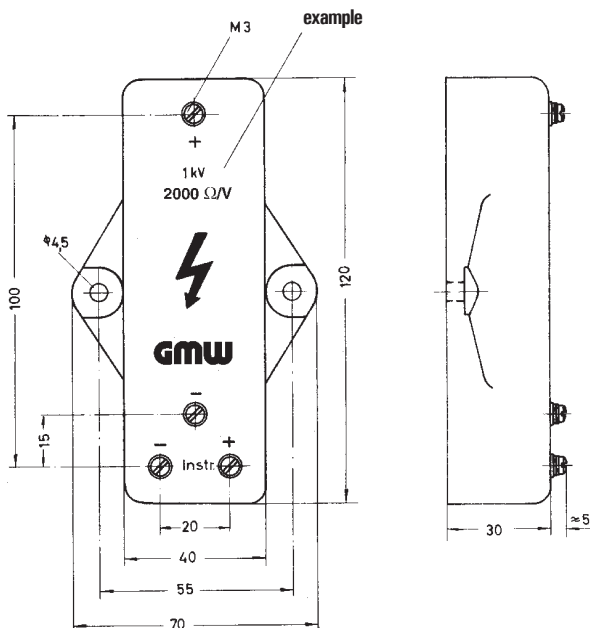


SP

Schematic Diagram



Basic Dimensions



Order Information

Voltage Divider for Direct Current 25 V / $250\ \mu\text{A}$

Type	SP Order No.	Scale-Order No.
Nominal Voltage	↓	⚡
1000 V	48900 13370	DH1
1500 V	48900 13390	DH1.5
2000 V	48900 13400	DH2
2500 V	48900 13410	DH2.5
3000 V	48900 13420	DH3
4000 V	48900 13430	DH4
5000 V	48900 13440	DH5
6000 V	48900 13450	DH6
10000 V	48900 13460	DH10

Ordering Example for Meters with Voltage Divider:

Techn. Data	Order No.
Square Panel Meter with moving-coil movement V-PQS 96 Measuring range 0-1 kV	1604P, BE76, DH1

Vario-Series • Accessories

Power Supply Unit for Indicator/Controllers

Description

Due to the compact design of indicator/controllers with smaller sizes, a built in power supply, that differs from the necessary 24 V direct voltage is not realisable. Therefore GMW developed power supplies that enable the user to accommodate an individual auxiliary voltage supply according to the available supply voltage and the necessary power consumption of the the indicator/controller.

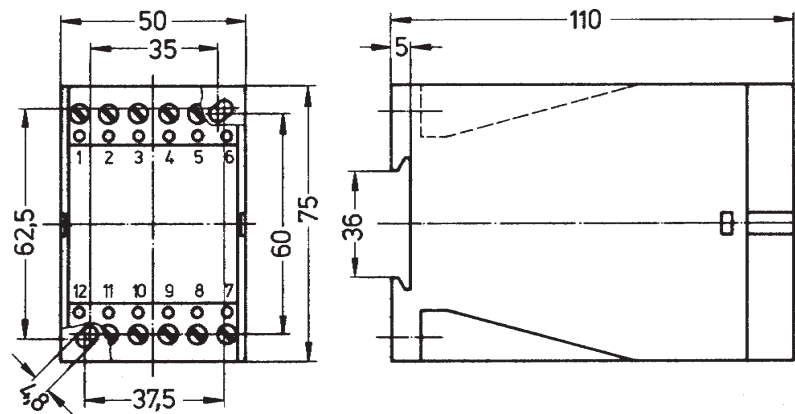


NG 24/200-1

Technical Data

Type Order No.	NG 24/200-1 49900 09610	NG 24/200-1 49900 09630	NG 24/200-2 49900 09640
Weight approx. (kg)		0.5	
Max. Operating Voltage		300 V	
Test Voltage		3.5 kV	
Protection (Terminals)		IP 10	
Input	230 V AC (198 ... 242 V) 45 ... 65 Hz	115 V AC (99 ... 121 V) 45 ... 65 Hz	24 V AC (21.6 ... 26.4 V) 45 ... 400 Hz
Output		24 V DC $\pm 20\%$ Max. output current 200 mA Ripple ≤ 3 Vss; Without electrical isolation; Protection from short circuit	

Basic Dimensions



Vario-Series • Accessories and Spare Parts

Blanking Plates, Protective Caps, Rubber Seals

**Blanking Plates, protective covers, rubber seals,
Clear cover with rubber seal for IP 65**







	Type ↓	Order No. ↓
BLANKING PLATES		
Narrow-frame types		
clear, plain glass	Q 48 S	27863 15945
	Q 72 S	27863 15900
	Q 96 S	27863 15905
	Q 144 S	27863 15915
	PF 72 x 36	27863 15920
	PFN 96 x 48	27863 15925
	PF 144 x 72	27863 15930
opaque, white plastic	Q 48 S	27863 15946
	Q 72 S	27863 15901
	Q 96 S	27863 15906
	Q 144 S	27863 15916
	PF 72 x 36	27863 15921
	PFN 96 x 48	27863 15926
	PF 144 x 72	27863 15931
opaque, black plastic	Q 48 S	27863 15948
	Q 72 S	27863 15903
	Q 96 S	27863 15908
PROTECTIVE COVER		
Plexiglass protective cover for front housing-panel protection IP 54	PR 144 x 36	32512 86760
RUBBER SEAL		
(Mounting with screw clamp necessary)		
for versions with narrow front frames – for tropic resistant versions –	Q 48	1799V2290
	Q 72	1799V2230
	Q 96 S	1799V2240
	Q 96	1799V2260
	Q 144	1799V2250
	PF 72 x 36	35235 86120
	PFN 96 x 48	35235 86125
	PF 144 x 72	35235 86130
CLEAR PROTECTIVE COVER		
with rubber seal for front housing-panel protection IP 65	Q 48	27863 15955
	Q 72	27863 15950
	Q 96	27863 15960

Vario-Series • Accessories and Spare Parts

Terminal Covers, Spare Parts for Indicator/Controllers

Finger-proof full cover

Per BGV A3 / DIN 57 106, part 100

CONTACT PROTECTION for	Type ↓	Order No. ↓	
Types QS 48 und Q 48-250	R1 ¹⁾	1799V-9050	
Types with screw terminals M4 (packed in pairs)	E ²⁾	1799V-9110	
Types (V-)QS 72, (V-)QS 72-250, QS 144 and Q144-250 with screw terminals M6 (M8)	R2 ¹⁾	1799V-9150	
Types (V-)QS 96 and (V-)Q 96-250 with screw terminals M6 (M8)	R3 ¹⁾	1799V-9160	
Types PF 48 x 24 and PFF 72 x 24	R6 ¹⁾	1799V-9090	
RUBBER CAPS			
All remaining square and rectangular types per DIN 43 700 (except sizes 96 x 24 mm and 96 x 48 mm)			
Screw terminals M4 or M5 (packed in pairs)	R8 ²⁾	1799V-9080	
Screw Terminals M6 (packed in pairs)	R9 ²⁾	1799V-9120	

1) Overall terminal cover

2) Single terminal cover

Spare Parts for Indicator/Controllers

KODPR 144 F and KODPR 144 SE

Relay for indicator/controllers	69100 00000
Compensating resistor fpr PT 100	
2-Wire	27863 88500
3-Wire	27863 88501
Cold junction for thermocouple	27863 88502
Plastic knob	22022 86010

Vario-Series • Accessories and Spare Parts

Front Windows

Front windows for all square types

	Type ↓	Order No. ↓
GLASS WINDOW COMPLETE (plain glass)		
	Q 48 S	27863 22517
	Q 72 S	27863 22519
	Q 96 S	27863 22514
	Q 144 S	27863 22521
	Q 48-250	27863 22523
	Q 72-250	27863 22525
	Q 96-250	27863 22516
	Q 144-250	27863 22528
GLASS WINDOW COMPLETE (anti-glare glass)		
	Q 48 S	27863 22518
	Q 72 S	27863 22520
	Q 96 S	27863 22530
	Q 144 S	27863 22522
	Q 48-250	27863 22524
	Q 72-250	27863 22526
	Q 96-250	27863 22527
	Q 144-250	27863 22529

Product Range

General Overview

Analogue Panel Meters

- Alternating Current / Voltages
- Direct Current / Voltages
- For Thermocouples
- For Resistance Thermometers
- Power and Power Factor Meters
- Frequency Meters (Pointer and Reed Type)
- Comb. Maximum Demand Ammeter

Contact Meters and Indicator/Controllers

- Current
- Voltage
- Power
- Frequency
- Temperature

Digital Panel Meters

- 3½-digit
- 4½-digit
- With Data Outputs
- Comparator
- Multifunctional Power Meters

Bar-Graph Panel Meters

- Direct Current / Voltage
- Resistance
- Frequency
- Temperature

Programmable Logic Controllers (PLC) Peripheral Devices

- Text Displays
- Data & Graphics Printers

Measuring Transducers

- Alternating Current / Voltage
- Thermocouples
- Resistance Thermometer
- Power
- Power Factor
- Frequency

Safety Appliance Tester

- DIN VDE 0701 / 0702
- DIN EN 62638
- DIN EN 62353

Energy Meters

- direct measuring up to 75 A
- current transformer for x/1A and x/5A
- MDI certification

Current- and Voltage Transformer

- Low Voltage
- Medium Voltage

Probes for Oscilloscopes and Multimeters

- Differential Probes
- High Voltage Probes
- HF-Probes
- HF-Demodulator-Probes
- SMT-Probes
- Kelvin-Clamps
- Measuring Tweezers and Measuring Lines

Accessories

- Shunt Resistors
- Current Transformers
- Switches
- Switch Position Indicators
- Blanking Frames
- Semaphore indicator in LED

Switchboard - Components

- Heaters
- Fans
- Controls
- Bus Bar Isolators and Supports

In Addition to our offer "Analogue Panel Meters". the following products are available (on request):

Analog panel meters from price list J
(former Müller & Weigert, Neuberger)

Analog panel meters from price list Bertram
(former Bertram)

Analog panel meters from price list GMC Universal
(former Gossen)

Example:

- Meters for ship operation (BV3340)
railway operation
vehicle operation
crane operation
aggregate operation
- Dual Voltmeters
- Dual frequency Meters
- Triple Meters
- Operating Hour Meters
- Moving-iron Edgewise Meters
- Synchronoscopes
- Combined Moving-iron / Bimetal Ammeters with Center on one Axis
- Synchro Indicators wall mounting WQ 96 or WQ 144
- Moving-iron / Moving-Coil Meters for **DIN Top Hat Rail Mounting**
- Moving-Coil Temperature Indicator, can be connected to Pt 100 or to Thermocouples
- Meters for Plant Construction / Training Sector. available as surface-type, built-in, or base frame meters
- Indicators, Mini-Meters with rectangular or round Housings

Subject to change without notice

Terms and Conditions of Sale and Delivery.

Subject to "General Terms and Conditions for Products of, and Services Rendered by the Electrical Industry" including supplementary terms regarding extended title to goods in their most current revisions.

Attention.

No guarantee claims are allowed for devices which have been opened.

Subject to change without notice.

Graphic representations and photographs are non-binding.

Order Information.

Please provide complete and unambiguous order information including complete order number in order to avoid additional follow-up and misunderstandings in the processing of orders.

Export and Customs Documents.

A processing fee will be charged per document for shipping instructions which deviate from standard shipping procedures within the Federal Republic of Germany, for example preparation of certificates of origin, preparation of shipping documents in foreign languages, preparation of export declarations etc.

Orders / Inquiries.

A large number of qualified employees are available at the following

telephone number:

+49 9103 7129-0

during the following times:

Monday through Thursday from 08:00 a.m. to 04:30 p.m. and

Friday from 08:00 a.m. to 3 p.m.

Address.

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