

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 • Overshoot • Response Time	Eddy-current damping ≤ 5% of scale length ≤ 2 s per DIN EN 60061-1	Eddy-current damping ≤ 5% of scale length ≤ 2 s per DIN EN 60061-1	Thermal, time-delayed, for display of mean effective value 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 • Short-Term: Current Measurement Voltage Measurement	1.2 x rated value 10 x rated value, 1 s with rectifier: 2 x rated value, 0.5 s 5 x rated value, 5 s with rectifier: 2 x rated value, 0.5 s	1.2 x rated value 10 x I _N 5 s 40 x I _N 1 s (max = 250 A) 2 x rated value, 5 s	1.2 x rated value 10 x rated value 1 s (max = 50 A)
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.

Please request data sheets if required for products and options not included in this catalog.

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

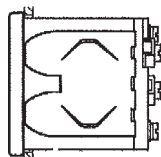
Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60 05 1



Vario-Series • Square Panel Meters

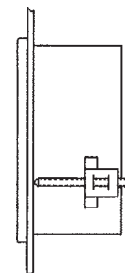
For Alternating Current or Alternating Voltage 15 ... 65 Hz

Leaf Spring



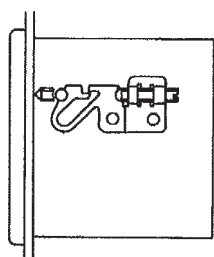
Control panel thickness 1 to 3 mm.
Size 48 x 48 mm, not appropriate for Mauell-Grid.
Also available as option for sizes 72 x 72 and 96 x 96 mm.

Screw Clip S



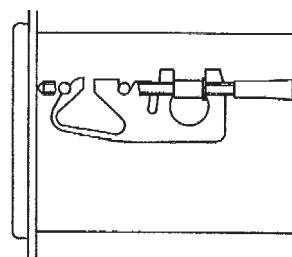
Control panel thickness 1 to 25 mm.
Special screw clamp M4 required for sizes 72 x 72 and 96 x 96 mm.
Also available as option for size 48 x 48 mm, not appropriate for Mauell-Grid.

Screw Clip G



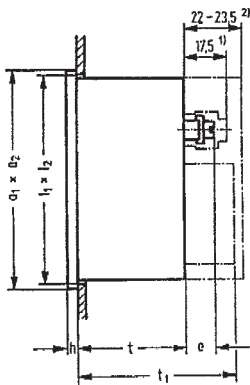
Control panel thickness 1 to 32 mm.
Special screw clamp M4 required for size 144 x 144 mm.

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
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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



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	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
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 ... > 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



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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	LN99	N	N	N	N
Suitable for marine use with the following approvals:					
BV 0591 German Navy	} Class 1.5 only Measuring input ≥ 100 mA ≥ 6 V	LN1	-	A ²⁾	A ²⁾
Germanischer Lloyd		LN2	A	A	A
Vibration resis. 2.5 g, Shock resis. 30 g		LN56	A ³⁾	A	A
Vibration resis. 5 g, Shock resis. 50 g		LN55	A ⁴⁾	A	A

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



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	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 for single division	RA1	N	N	N	N
knife-edge for double division	RA2	+	+	+	+
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



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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
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⁾
Without scale; pointer black	SG10	+	+	-
Without scale; pointer white	SG11	A	A	-
Without scale; pointer yellow	SG12	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
Tropic resistant	LB1	A	A	A
Protection Class				
Standard (see technical data)	LH99	N	N	N
Front housing-panel protection IP54, terminals IP00	LH21	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
Glass Window				
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	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	-
Screw Clip S	MN14	A	N ²⁾	-
Screw Clip G	MN13	-	-	N
Fastener B DIN 43 835	MN11	-	A ³⁾	A
Subklew fastener (screw clip S without cone point)	MN32	-	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. ML4 (sheet metal housing with cone head rivets)



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'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
Marker Pointer					
Without marker pointer	PM99	N	N	N	N
Adjustable red index pointer	PM1	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 ≤ 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	ap. 1.1 VA	ap. 1.1 VA	ap. 1.1 VA	ap. 1.1 VA
sec. 5 A	ap. 1.9 VA	ap. 1.9 VA	ap. 1.9 VA	ap. 1.9 VA

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

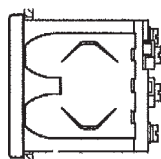
Continuous	120 % of rated value
Short-term	10 x of rated value; 1 s (I _{max} = 10 A)



Vario-Series • Square Panel Meters

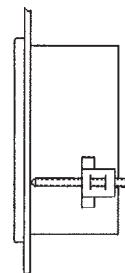
For Alternating Current

Leaf Spring



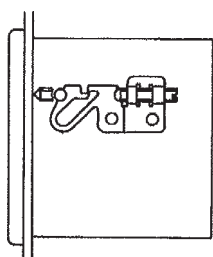
Control panel thickness 1 to 3 mm.
For size 48 x 48 mm, not appropriate for Mauell-Grid.
Also available as option for sizes 72 x 72 and 96 x 96 mm.

Screw Clip S



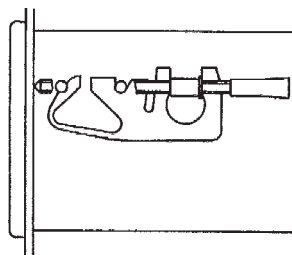
Control panel thickness 1 to 25 mm.
Special screw clamp M4 required for panel meters with front panel dimensions of 72 x 72 and 96 x 96 mm.
Also available as option for size 48 x 48 mm, not appropriate for Mauell-Grid.

Screw Clip G



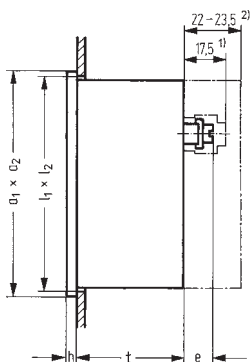
Control panel thickness 1 to 32 mm.
Special screw clamp M4 required for size 144 x 144 mm.

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 Transfotmer 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 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 und pointer black	SG99	N	N	N	N
Scale black; imprint und pointer white	SG1	A ¹⁾	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint und 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	-

1) 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
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
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

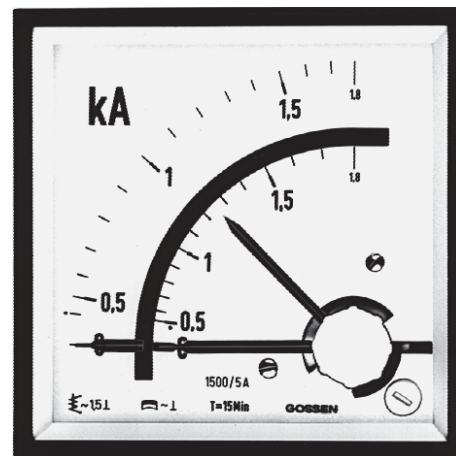
For Alternating Current



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	300 V	600 V	600 V
Test Voltage	3.5 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

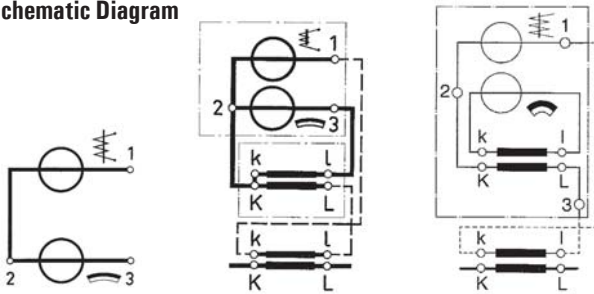
Mechanical Design

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	AMQS 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



Without current transformer

With separate current transformer

With built in current transformer

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

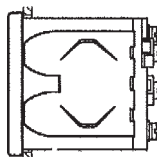
Continuous	120% of rated value
Short-term	10 x of rated value; 1 s (I _{max} = 10 A)

Vario-Series • Square Panel Meters

For Alternating Current

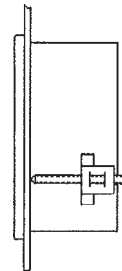


Leaf Spring



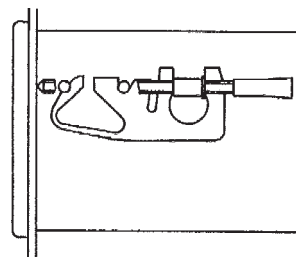
Control panel thickness 1 to 3 mm.
Also available as option for sizes of 72 x 72 and 96 x 96 mm.

Screw Clip S



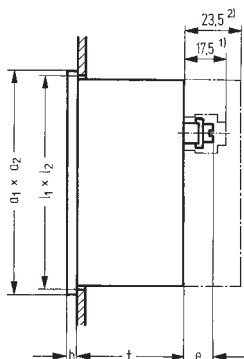
Control panel thickness 1 to 25 mm.
Special screw clamp M4 for sizes 72 x 72 and 96 x 96 mm.

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



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.

Drawings to scale (on request)

0101A259

Techn. Data		Order No. 1606C
V-MAQS 96	Movement I (Bimetal)	1BE11, 1BU5, 1CG25
	Movement II (Moving-iron)	2BE11, 2BW10, 2CG25

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	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 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. ML4 (sheet metal housing with cone head rivets)

Vario-Series • Square Panel Meters

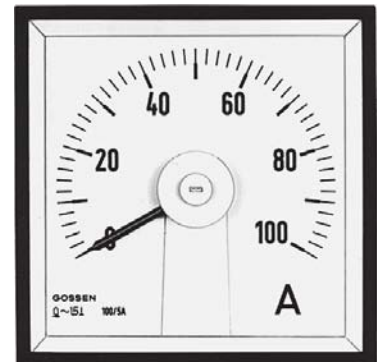
For Alternating Current or Alternating Voltage 40 ... 50 ... 10 000 Hz



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

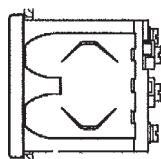
Reference Quantities	Reference Conditions
Wave Shape	sine, distortion factor ≤ 1%
Frequency	50 Hz ± 2 %
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60 051



Vario-Series • Square Panel Meters

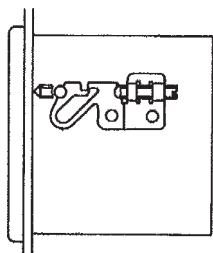
For Alternating Current or Alternating Voltage 40 ... 50 ... 10 000 Hz

Leaf Spring



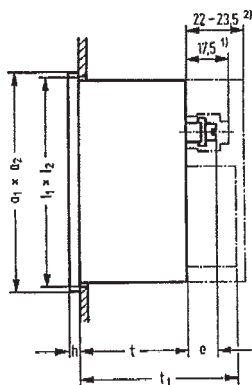
Control panel thickness 1 to 3 mm.
For size 48 x 48 mm, not available for Mauell-Grid.
Also available as option for sizes 72 x 72 and 96 x 96 mm.

Screw Clip G



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

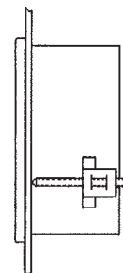
Basic Dimensions



Drawings to Scale (on request)

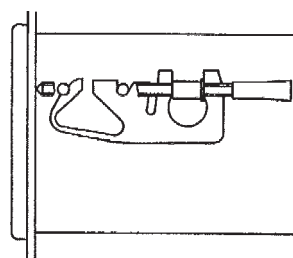
0101A258 for size 48 x 48 mm
0101A259 for sizes 72 x 72 and 96 x 96 mm
0101A261 sheet 1 for size 144 x 144 mm

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, DC40
----------------------------	---------------------------------

Front Dimensions mm	Nominal Dimensions		Cutout Dimensions	Installation Depth		Terminals	
	a ₁ x a ₂	h		t	t ₁	M4 e	≥ 100 mA M3 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 µA ²⁾	CA100	A	A	A	A
0 ... 150 µA	CA150	A	A	A	A
0 ... 250 µA	CA250	A	A	A	A
0 ... 400 µA	CA400	A	A	A	A
0 ... 600 µA	CA600	A	A	A	A
0 ... > 100 µA ... < 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. value		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 ≥ 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...	BF12	A	A	A	A
.../110 V sec.		BF15	A	A	A	A
.../100 V } Overload		BF25	A	A	A	A
.../110 V } 1.2 x of rated value		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 < 300 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⁾	+
Germanischer Lloyd	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:

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
SCALE VARIANTS					
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 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	A
Knife-edge pointer for double division	RA11	A ⁶⁾	A	A	A
Bar indicator ⁵⁾ 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
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
<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

Please note when ordering:

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'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
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 Voltage 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	A	A
Light conductor with mask, dial illumination red	PA7	-	A	A	A
<i>Note: Completion with Voltage Order No. PB... necessary. (SG 99 as light conductor with mask not available) Dial illumination available only with screw mounted scale (Order No. SA11).</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 IPO0	LH21	A	A	A	A
Earthquake-proof (possible combination: LH99 or LH21)	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



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
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 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 Strip					
Without label strip	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 V-PQS 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	
	Ri	Ri	
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		

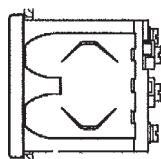
¹⁾ Indicated internal resistance is only valid for instruments with standard accuracy class.
Please inquire regarding internal resistance (Ri) for moving-coil indicators with mechanical zero point at any desired scale value.



Vario-Series • Square Panel Meters

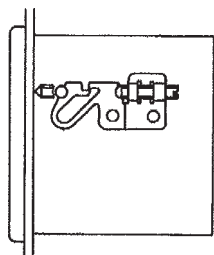
For Direct Current or Direct Voltage

Leaf Spring



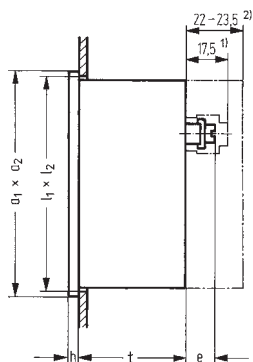
Control panel thickness 1 to 3 mm.
For size 48 x 48 mm, not available for Mauell-Grid.
Also available as option for sizes 72 x 72 and 96 x 96 mm.

Screw Clip G

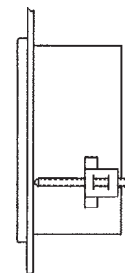


Control panel thickness 1 to 32 mm.
Special screw clamp M4 required for size 144 x 144 mm.

Basic Dimensions

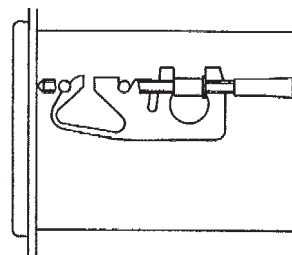


Screw Clip S



Control panel thickness 1 to 25 mm.
Special screw clamp M4 required for 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, DC40
-------------------------	---------------------------------

Front Dimensions mm	Nominal Dimensions		Cutout Dimensions $l_1 \times l_2$	Installation Depth t	Terminals	
	$a_1 \times a_2$	h			≤ 4 A M4 e	> 4 A M6 e
48 x 48	48 x 48	5	$45^{+0.6} \times 45^{+0.6}$	43.5	12.5	17
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
0 ... 500 V	DC500	—	A	A	A
0 ... 600 V	DC600	—	A	A	A
0 ... > 1 V ... < 600 V ^{1) 2)}	DC...	—	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 (Please specify angle between scale and horizontal)	LA999	A	A	A	A
Special Features					
Normal vibration and shock resistance	LN99	N	N	N	N
Suitable for marine use with the following approvals:					
Germanischer Lloyd	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⁾
					} on request

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 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	A
Knife-edge pointer 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
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
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 Order No.	PQS 48 W ⇒ 1670P	V-PQS 72 1601P	V-PQS 96 1604P	PQS 144 1620P
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⁾
Without scale; pointer black	SG10	+	+	+	-
Without scale; pointer white	SG11	A	A	A	-
Without scale; pointer yellow	SG12	A	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	N
With direct dial illumination (Plexiglass scale, scale and dial illumination white)	PA1	A	A	A	A
Note: Completion with Voltage 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	A	A
Light conductor with mask, dial illumination red	PA7	-	A	A	A
Note: Completion with Voltage Order No. PB... and SG necessary. (SG 99 as light conductor with mask not available). Dial illumination available only with screw mounted scale (Order No. SA11)					
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, terminals IP00	LH21	A	A	A	A
Earthquake-proof (possible combination: LH99 or LH21)	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



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	A
Label Strip					
Without label strip	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)

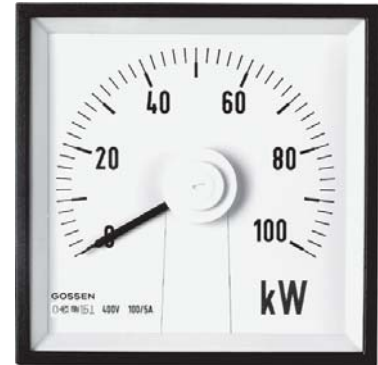
6) ML5 (housing for Mauell-Grid) standard version

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.

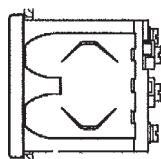
Please inquire regarding internal resistance (Ri) for moving-coil indicators with mechanical zero point at any desired scale value.



Vario-Series • Square Panel Meters

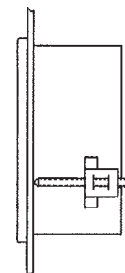
For Direct Current or Direct Voltage

Leaf Spring



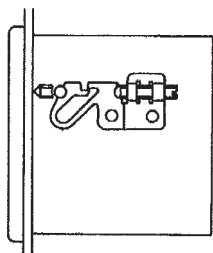
Control panel thickness 1 to 3 mm.
For size 48 x 48 mm, not available for Mauell-Grid.
Also available as option for sizes 72 x 72 and 96 x 96 mm.

Screw Clip S



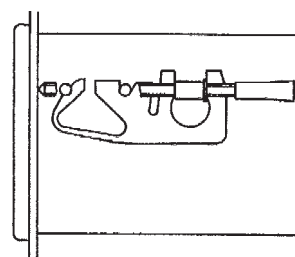
Control panel thickness 1 to 25 mm.
Special screw clamp M4 required for sizes 72 x 72 and 96 x 96 mm.
Also available as option for size 48 x 48 mm, not available for Mauell-Grid.

Screw Clip G



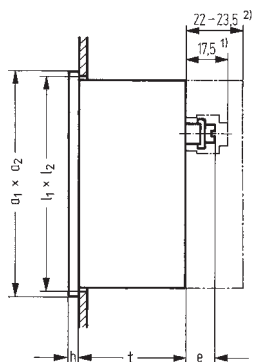
Control panel thickness 1 to 32 mm.
Special screw clamp M4 required for size 144 x 144 mm.

Fastener B DIN 43 835



Control panel thickness 1 to 40 mm.
Screw clamp M4 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



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-PQ 96-250	Order No. 1605P, DC40
----------------------------	---------------------------------

Front Dimensions mm	Nominal Dimensions		Cutout Dimensions $l_1 \times l_2$	Installation Depth t	Terminals	
	$a_1 \times a_2$	h			$\leq 4 A$	$> 4 A$
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 μA	CA100	A	A	A	A
0 ... 150 μA	CA150	A	A	A	A
0 ... 250 μA	CA250	A	A	A	A
0 ... 400 μA	CA400	A	A	A	A
0 ... 600 μA	CA600	A	A	A	A
0 ... > 100 μA ... < 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 divider⁵⁾					
... 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:				
Germanischer Lloyd	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
				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
Beam pointer with knife-edge 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
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
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)	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

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'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 Voltage 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	A
Light conductor with mask, dial illumination red	PA7	-	A	A
Note: Completion with Voltage Order No. PB... and SG necessary (SG 99 as light conductor with mask not available). Dial illumination available only with screw mounted scale (Order No. SA11)				
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 IPOO	LH21	A	A	A
Earthquake-proof (possible combination: LH99 or LH21)	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



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:

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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. ⇒	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 Strip					
Without label strip	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

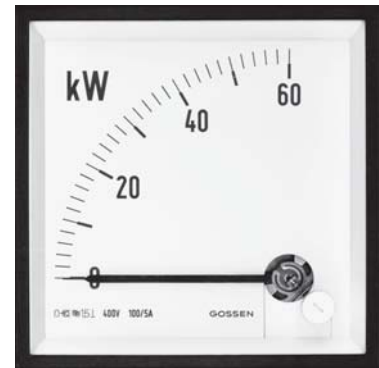
For Active Power or Reactive Power



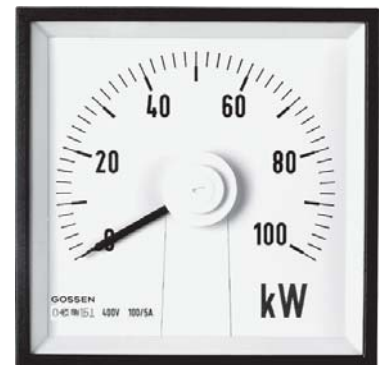
Moving-coil movement with power converter, 90° or 240° scale
Narrow front frame per DIN 43 718, matt black

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		
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: Subklew 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.

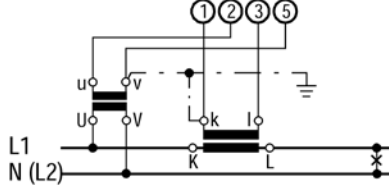
Vario-Series • Square Panel Meters

For Active Power or Reactive Power

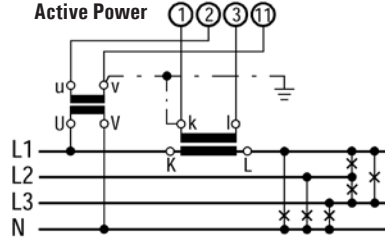


Schematic Diagrams

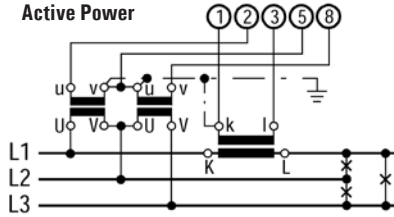
**Single-Phase Alternating Current
Active & Reactive Power**



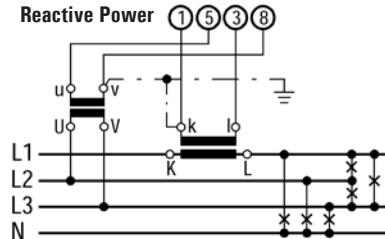
**3-Phase 4-Wire, Balanced Load
Active Power**



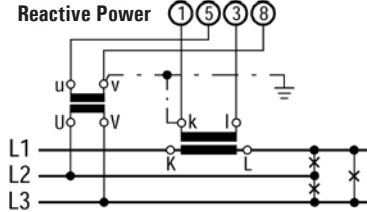
**3-Phase 3-Wire, Balanced Load
Active Power**



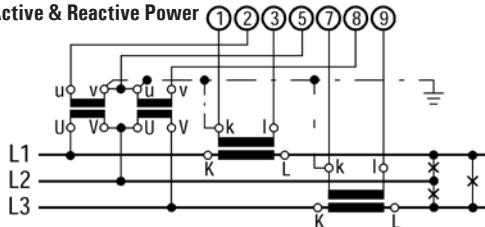
**3-Phase 4-Wire, Balanced Load
Reactive Power**



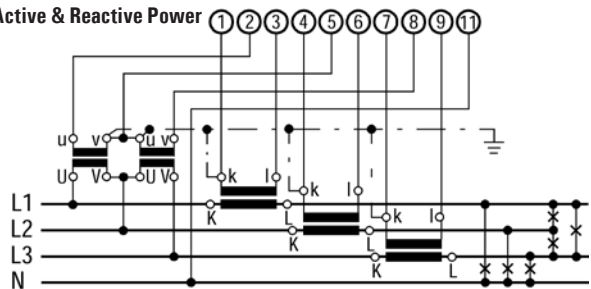
**3-Phase 3-Wire, Balanced Load
Reactive Power**



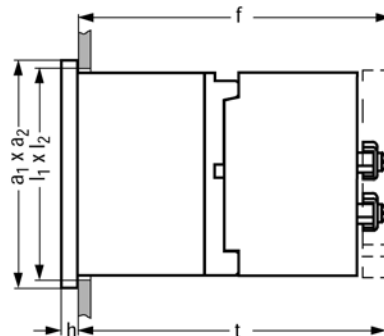
**3-Phase 3-Wire, Balanced Load
Active & Reactive Power**



**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				N	N
	at center	BC2			A	A
	10% of positive upper value	BC6			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				N	N
	blank scale (lower/upper val. markings, logos, sym.)	GL98			+	+
Position of Use	standard				N	N
	0 ... 45 degrees from horizontal (bonded glass)	LA11			A	A
	46 ... 89 degrees from horizontal (bonded glass)	LA12			A	A
	91 ... 135 degrees from horizontal	LA13			A	A
Applications	standard				N	N
	tropic resistant, climatic category 3	LB4			A	A
Protection	standard				N	N
	front panel IP 54, terminals IP00	LH21			A	A
Resistance to Vibration/ Marine Applications	standard				N	N
	vibration resistance 2.5 g; shock resistance 30 g	LN56			A	A
	marine applications, Germanischer Lloyd	LN8			A	A
Front Frame	matt black				N	N
	matt grey, RAL 7037	MA11			A	A
Glass Window	standard				N	N
	anti-glare	MG1			A	A
	anti-glare, with red adjustable index pointer	MG98			A	A
Housing and Mounting	standard				N	N
	polycarbonate housing with Subklew fasteners	ML10			A	A
Identification	none				N	N
	on the back:	MZ998...			A	A
Scale Inscription (Latin lettering)	none				N	N
	≤ 22 characters, 1 line:	SM902...			A	A
	≤ 37 characters, 2 lines:					
	1 st line (15 characters): ...; 2 nd line (22 char.): ...	SM911...			A	A
Additional Numberings	none				N	N
	2 nd set of numbering black: ...	SK982...			A	A
	2 nd set of numbering red (RAL 2002): ...	SK983...			A	A
Red Marker (RAL 2002)	none				N	N
	red marker at: ...	ST981...			A	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	3.5 kV
Front Housing-Panel Protection	IP 52



V-LF 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. $\cos \varphi$ 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

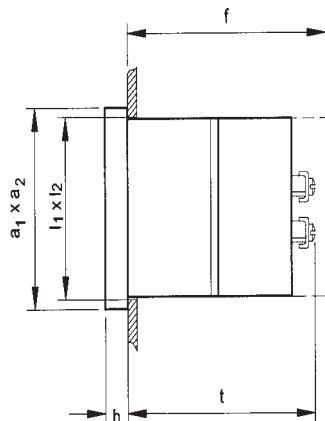
Reference Conditions

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

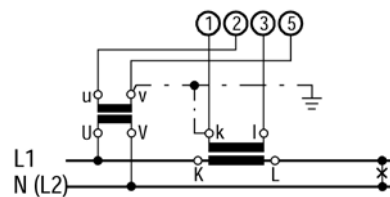
Frequency	45 Hz ... 65 Hz 49 Hz ... 51 Hz for Order No.: AB21
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Basic Dimensions

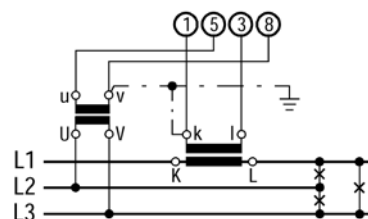


Schematic Diagrams

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 ... 110 V AC		IL710	+
	220 ... 230 V AC		IL726	+
3-Wire-System, Balanced Load		AB22		+
	100 ... 110 V AC		IL710	+
	380 V AC		IL338	+
	400 ... 500 V AC		IL341	+
Current Path Terminal	at transformer sec.: 1 A	BE10		+
	at transformer sec.: 5 A	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
	Germanischer Lloyd	LN8		A
Front Frame	matt balck			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, IL341
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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	48 x 48	72 x 72	96 x 96
Type	FZQS 48 W	V-FZQS 72	V-FZQS 96
Scale Length mm	40	66	94
Accuracy Class	0.5	0.5	0.5
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

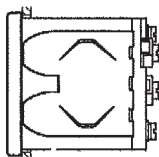
Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60 051

Vario-Series • Square Panel Meters

For Frequency (Pointer-Type)

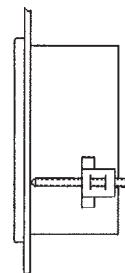


Leaf Spring



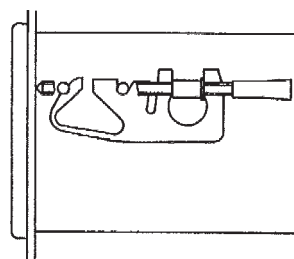
Control panel thickness 1 to 3 mm.
For size 48 x 48 mm, not available for Mauell-Grid.
Also available as option for sizes 72 x 72 and 96 x 96 mm.

Screw Clip S

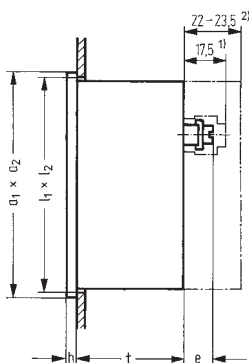


Control panel thickness 1 to 25 mm.
Special screw clamp M4 required for sizes 72 x 72 and 96 x 96 mm.
Also available as option for size 48 x 48 mm, not available for Mauell-Grid.

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
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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	IL734			
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
Wide Range					
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.

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	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:				
Germanischer Lloyd	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 (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 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)