

# 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

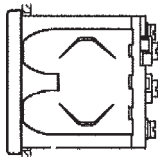
Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2 °C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60 05 1

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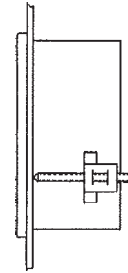


## Leaf Spring



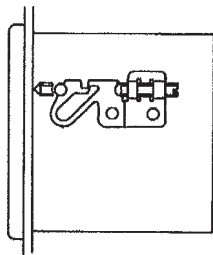
Control panel thickness 1 to 3 mm.  
Size 48 x 48 mm, not appropriate for Mauell-Grid.  
Also available as option for sizes 72 x 72 and 96 x 96 mm.

## Screw Clip S



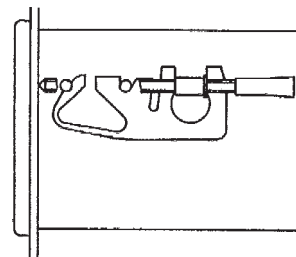
Control panel thickness 1 to 25 mm.  
Special screw clamp M4 required for sizes 72 x 72 and 96 x 96 mm.  
Also available as option for size 48 x 48 mm, not appropriate for Mauell-Grid.

## Screw Clip G



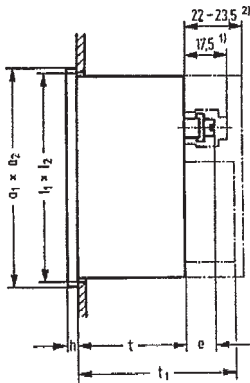
Control panel thickness 1 to 32 mm.  
Special screw clamp M4 required for size 144 x 144 mm.

## 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 <b>V-AQS 96</b>	Order No. <b>1604E, BE11, CG100, BU10</b>
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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 <sup>4)</sup> ≤ 100 A <sup>4)</sup>	
	a <sub>1</sub> x a <sub>2</sub>	h	l <sub>1</sub> x l <sub>2</sub>	t	t <sub>1</sub>	M4 e	M6 e	M8 e	
48 x 48	48 x 48	5	45 <sup>+0.6</sup> x 45 <sup>+0.6</sup>	43.5	56 <sup>3)</sup>	12.5	16	—	
72 x 72	72 x 72	5	68 <sup>+0.7</sup> x 68 <sup>+0.7</sup>	43.5	—	12.5	16	20	
96 x 96	96 x 96	5	92 <sup>+0.8</sup> x 92 <sup>+0.8</sup>	43.5	—	12.5	16	20	
144 x 144	144 x 144	8	138 <sup>+1</sup> x 138 <sup>+1</sup>	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

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

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

2) Specify in clear text

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Narrow front frame per DIN 43 718, matt black

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	Type Order No. ⇒	AQS 48 W 1670E	V-AQS 72 <sup>1)</sup> 1601E	V-AQS 96 <sup>1)</sup> 1604E	AQS 144 1620E
<b>Alternating Voltage</b> + ↓					
<b>Range:</b>					
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 <sup>2)</sup>	DC...	—	A	A	—
<b>Alternating Voltage</b>					
<b>Connection to Voltage Transformer</b>					
.../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
<b>Scale:</b>					
0 ... 500 V	DG500	+	+	+	+
0 ... 600 V	DG600	+	+	+	+
0 ... > 500 V < 1 kV <sup>2)</sup>	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 <sup>2)</sup>	DH...	+	+	+	+

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	Type Order No. ⇒	AQS 48 W 1670E	V-AQS 72 1601E	V-AQS 96 1604E	AQS 144 1620E	
<b>GENERAL VARIANTS</b>	<b>Identification</b> + ↓					
<b>Measuring Input</b>						
Alternating Current / Voltage	<b>B2</b>	N	N	N	N	
Dir. / Alt. Current and Dir. / Alt. Voltage	<b>B3</b>	A	A	A	A	
<b>Nominal Frequency</b>						
According to list	<b>IK99</b>	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)	<b>IK991</b>	A	A	A	A	
... Hz (Frequency in a range of > 65 ... 500 Hz) for Ammeters > 6 A (please specify frequency)	<b>IK992</b>	A	A	A	A	
<b>Screening</b>						
Normal mounting	<b>LF99</b>	N	N	N	N	
Increased stray field protection	<b>LF9</b>	-	A	A	A	
<b>Accuracy</b>						
Class 1.5	<b>IE15</b>	N	N	N	N	
Class 1.0 (only for alternating current / voltage 50 Hz) <sup>1)</sup>	<b>IE10</b>	-	-	A	A	
<b>Position of Use</b>						
Control panel vertical	<b>LA1</b>	N	N	N	N	
Control panel horizontal	<b>LA2</b>	+	+	+	+	
Other (Please specify angle between scale and horizontal)	<b>LA999</b>	A	A	A	A	
<b>Special Features</b>						
Normal vibration and shock resistance	<b>LN99</b>	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	<b>LN1</b>	-	A <sup>2)</sup>	A <sup>2)</sup>	A
Germanischer Lloyd		<b>LN2</b>	A	A	A	A
Vibration resis. 2.5 g, Shock resis. 30 g		<b>LN56</b>	A <sup>3)</sup>	A	A	A
Vibration resis. 5 g, Shock resis. 50 g		<b>LN55</b>	A <sup>4)</sup>	A	A	A <sup>5)</sup>

- 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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'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
<b>SCALE VARIANTS</b>					
<b>Identification</b> + ↓					
<b>Scale</b>					
In accordance with measuring input	<b>GF99</b>	N	N	N	N
Blank scale (lower and upper value markings. company logos, symbols)	<b>GF24</b>	+	+	+	+
<b>Division and Pointer</b>					
Single division	<b>GD1</b>	N	N	N	N
Double division	<b>GD2</b>	-	A	A	A
Coarse-fine division	<b>SE1</b>	N	N	N	N
Fine division	<b>SE3</b>	-	A	A	A
Beam pointer with for single division	<b>RA1</b>	N	N	N	N
knife-edge for double division	<b>RA2</b>	+	+	+	+
<b>Additional Imprint</b>					
Second numbering (specify in clear text)	<b>SK992</b>	A	A	A	A
Inscription:					
Without additional inscription	<b>SM99</b>	N	N	N	N
Inscription ≤ 15 characters German	<b>SM991</b>	A	A	A	A
> 15 characters German	<b>SM992</b>	A	A	A	A
≤ 15 characters other language	<b>SM993</b>	A	A	A	A
> 15 characters other language	<b>SM994</b>	-	A	A	A
(Other language in Latin lettering, specify in clear text)					
Coloured mark red RAL 2002 (Specify in clear text)	<b>ST991</b>	A	A	A	A
Coloured sectors yellow RAL 1021, green RAL 6018 or red RAL 2002 (Specify in clear text)	<b>SU991</b>	A	A	A	A
<b>Scale Characteristics</b>					
Interchangeable scale	<b>SA10</b>	N	N	N	-
Screw mounted scale	<b>SA11</b>	-	A	A	N <sup>1)</sup>
<b>Overload</b>					
No overload	<b>BU99</b>	N	N	N	N
1.2 x of rated value <sup>2)</sup>	<b>BU5</b>	+	+	+	+
2 x of rated value (Ammeter only)	<b>BU10</b>	+	+	+	+
4 x of rated value (Ammeter only)	<b>BU12</b>	-	A <sup>4)</sup>	A <sup>4)</sup>	-
6 x of rated value (Ammeter only)	<b>BU14</b>	-	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
<b>SCALE VARIANTS</b>				
<b>Identification</b> + ↓				
<b>Scale / Pointer Colours</b>				
Scale white; imprint and pointer black	<b>SG99</b>	N	N	N
Scale black; imprint and pointer white	<b>SG1</b>	A <sup>1)</sup>	A <sup>1)</sup>	A <sup>1)</sup>
Scale black; imprint and pointer yellow	<b>SG2</b>	A <sup>1)</sup>	A <sup>1)</sup>	A <sup>1)</sup>
Without scale; pointer black	<b>SG10</b>	+	+	-
Without scale; pointer white	<b>SG11</b>	A	A	-
Without scale; pointer yellow	<b>SG12</b>	A	A	-
<i>Versions without Scales available only for panel meters that are connected to current or voltage transformers</i>				
<b>HOUSING VARIANTS</b>				
<b>Application</b>				
Standard version	<b>LB99</b>	N	N	N
Tropic resistant	<b>LB1</b>	A	A	A
<b>Protection Class</b>				
Standard (see technical data)	<b>LH99</b>	N	N	N
Front housing-panel protection IP54, terminals IP00	<b>LH21</b>	A	A	A
<b>Front Frame Colour</b>				
Matt black	<b>MA2</b>	N	N	N
Matt grey RAL 7037	<b>MA11</b>	A	A	A
Matt stone grey RAL 7032	<b>MA12</b>	A	A	A
Matt light grey RAL 7035	<b>MA14</b>	A	A	-
Matt dark beige approx. RAL 1019	<b>MA21</b>	A	A	A
<b>Glass Window</b>				
Standard version	<b>MG99</b>	N	N	N
Anti-glare glass	<b>MG1</b>	A	A	A
<b>Housing</b>				
Standard housing	<b>ML99</b>	N	N	N
Sheet metal housing with cone head rivets	<b>ML4</b>	-	A	N <sup>2)</sup>
<b>Fasteners</b>				
2 leaf springs	<b>MN2</b>	N	+	-
2 leaf spr. for H&B Unibloc-Grid (bronze springs)	<b>MN4</b>	+	-	-
4 leaf springs	<b>MN1</b>	A	A	-
Screw Clip S	<b>MN14</b>	A	N <sup>2)</sup>	-
Screw Clip G	<b>MN13</b>	-	-	N
Fastener B DIN 43 835	<b>MN11</b>	-	A <sup>3)</sup>	A
Subklew fastener (screw clip S without cone point)	<b>MN32</b>	-	A	-
Without fastener	<b>MN88</b>	+	+	+

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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<b>HOUSING VARIANTS</b>	<b>Identification</b> + ↓				
<b>Identification</b>					
Without identification	<b>MZ99</b>	N	N	N	N
Identification on the back (specify in clear text)	<b>MZ998</b>	A	A	A	A
<b>Marker Pointer</b>					
Without marker pointer	<b>PM99</b>	N	N	N	N
Adjustable red index pointer	<b>PM1</b>	A	A	A	A
<b>Contact Protection</b>					
Without terminal cover	<b>VB99</b>	N	N	N	N
Overall terminal cover	<b>VB2</b>	A	A	A	A
Single terminal cover (Voltmeter and Ammeter ≤ 9 A or ≤ 25 A for size 48 x 48 mm)	<b>VB1</b>	+	+	+	+