Technical Description

Square Panel Meters

Square panel meters per DIN 43700 with quadrant scale, dull black or dull gray (RAL 7037) bezel per DIN 43718.

Interchangeable Scales

Meter's scale plate replacement is quick and simple with no loss of accuracy and without tools.
The permanently affixed closure flag at the top, or at the left side of the housing (for 144x144 mm panel meters only) need only be opened, and the scale can then 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 crosses - head or with standard screw drivers.
Except for ammeters with direct connection:
Moving - coil ammeters ≥ 6A and 40A/60A, moving - iron ammeters include M6 bolt terminals and 100A
moving - iron ammeters have M8 bolt terminals.

Housings

The rugged polycarbonate housing is self-extinguishing and drip-proof per UL 94 V-0.
Glass faceplate material: silicate glass
Bezels and glass faceplates can be easily replaced.
All panel meters are optionally available with a sheet metal housing, **except for** power meters and meters with front panel dimensions of 48x48 mm and 144x144 mm.
Several instruments can me 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 48x48 mm).
The hosing configuration, as well as a special housing for panel meters with front panel dimensions of 48x48 mm (available as an option), allow for installation into the various grid 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 144x144 mm panel meters only) for control panel thicknesses of ≤ 40 mm.

The following are available as options:

- Sheet metal housing with screw clamp per B DIN43835 for control panel thicknesses of ≤ 40 mm (**except for** power meters and panel meters with front panel dimensions of 48x48 mm).
- Polycarbonate housing with front dimensions of 48x48mm for manual grid mount, no fasteners.
- Polycarbonate housing with 2 leaf springs for standard stress requirements, also suitable for H&B Unblocks and manual grid mount for panel meters with front panel dimensions of 72x72 mm and 96x96mm (except for power meters and meters with front panel dimensions of 144x144 mm).
- Polycarbonate housing with front panel dimensions of 48x48 mm for H&B Unblock grid with 2 leaf springs (Broncos spring).
- Polycarbonate housing with 4 leaf springs for heightened stress requirements (**except for** power meters and meters with front panel dimensions of 144x144 mm).

Advantages of leaf spring mounting:

- Time saving, front mounting into DIN control panel cutout for control panel thicknesses of ≥ 1mm
- Front mounting into grid systems (see above)

- Polycarbonate housing with Subtle fastener (screw clamp similar to type "S" with cup point) for Sulked grid(**except for** meters with front panel dimensions of 144x144 mm).

IEC,EN and DIN Standards and VDE Regulations for Electrical Measuring Instruments

Our panel meters comply with the regulations set forth in European guidelines 73/23/EWG and 89/336/EWG, which has been substantiated by adherence to the following standards:
IEC61010-1/A2/, EN61010-1/A2/ VDE0400-1/A1 (safety requirements)
IEC 60051/EN 60051/DIN EN 60051 (measuring instruments with scale display)
EN 50081 – 2 : 1993 EMC (interference emission, industrial)
EN 50082 – 2 : 1995 EMC (interference immunity, industrial)

The most important regulations for manufacture of electrical measuring instruments Included therein, as well as their characteristics, are defined below.

Accuracy

The accuracy of a measuring instrument or any of its accessories is determined by inherent deviation limits and influence error limits.
Inherent deviation is the measurement deviation of a measuring instrument and/or any of its accessories, when these are operated under reference conditions in accordance with DIN EN 60051.
Measuring instrument influence error is the difference between two indicated values for the same measured quantity, when the individual influence variable demonstrates two different, predetermined values, one after the other, within nominal range of use in accordance with DIN 60051

Our measuring instruments comply with accuracy class 1.5 unless otherwise specified for individual measuring instrument types.
The accuracy class is indicated on the scale, for example Class 1.5 which means that the limits for inherent deviation are equal to ± 1.5% of the reference value.
The reference value is generally the upper measuring range limit with the following exceptions:

- Reference value is equal to the sum of the absolute values which correspond to the upper and lower measuring range values, as long as both the electrical and the mechanical zero points
- Reference value is equal to 90 electrical degrees for power factor meters

Safety Precautions

- Instruments with damaged bezels or glass faceplates must be disconnected from the mains.
- Adequate safety clearance must be maintained to control panel fasteners and to sheet metal housings if non-isolated (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 VBG 4.
- Scales may only be replaced under voltage – free conditions.
- Bezels and glass faceplates may only be replaced under voltage – free conditions.

Standards and Regulations
IEC,EN and DIN Standards and VDE Regulations for Electrical Measuring Instruments

Vibration and Shock Resistance

Our measuring instruments comply with requirements per DIN EN 60051-1

Model	Vibration Test	Shock Test
Standard	10 Hz–55 Hz–10 Hz 0.15 mm (≙1.5 g at 50 Hz)	147 m/s² (15 g_n) 11 ms
Excessive Stress (order no: LN56)	5 Hz–55 Hz–5 Hz 0.25 mm (≙ 1.5 g at 50 Hz)	294 m/s² (30 g_n) 11 ms

Scale and Pointer Design

The scales and pointers in our instruments comply with DIN 43802, parts 2 through 4.

Protection per DIN VDE 0470 ,Part 1 (EN 60529)

Housing front: IP 52

Temperature Limit Values

Operating temperature range per DIN EN 60051-1:– 10… + 55°C
Storage temperature range:– 25… + 65°C

Applications Range (climatic category)

Our measuring instruments comply with VDI/VDE 3540

Model		Standard	Conditionally Tropic-Proof (order no: LB4)
Climatic Category		2z	3
Temperature Limits		– 10°C…+ 40°C	– 10°C…+ 55°C
Relative Humidity:	annual average max. 30 days/yr remaining days	≤ 75% (at 21°C) ≤ 95% (at 25°C) ≤ 85% (at 23°C)	≤ 75% (at 21°C) ≤ 95% (at 25°C) ≤ 85% (at 23°C)
Condensation		none	Infrequent, minimal condensation

Safety Regulations

In accordance with DIN EN 61010-1 (IEC 1010-1, our measuring instruments are designed for:

- Over voltage category III (CAT III)
- Fouling factor: 2
- Operating voltage:
  300 V or 600 V RMS for direct or alternating voltage (see table)
  (operating voltage = nominal voltage, phase-to-neutral)for the following nominal line voltages:

Instrument Type	Nominal Voltage		
	3-phase 4-wire system	3-phase 3-wire system	Phase-to-Neutral
S-PQ72,S-PQ96,S-PQ144 S-VQ72,S-VQ96,S-VQ144 S-EQ72,S-EQ96,S-EQ144 S-ZQ72,S-ZQ96,S-ZQ144	400/690 V	1000 V	600 V
S-PQ48,S-VQ48,S-EQ48 1) S-BIQ48,S-BIQ72,S-BIQ96 S-BIEQ72/2,S-BIEQ96/2 S-WQ96,S-WQ144 S-CQ96,S-CQ144	230/400 V 277/480 V	500 V	300 V

1) Operating voltage: 600 V (600 V CAT III) see Options / Order Information

The corresponding test voltages are as follows:

Instrument Type	Test Voltage Alternating Voltage, 50/60 Hz, U_{rms}, 1 min.
S-PQ72,S-PQ96,S-PQ144 S-VQ72,S-VQ96,S-VQ144 S-EQ72,S-EQ96,S-EQ144 S-ZQ72,S-ZQ96,S-ZQ144	3.25 kV
S-PQ48,S-VQ48,S-EQ48 2) S-BIQ48,S-BIQ72,S-BIQ96 S-BIEQ72/2,S-BIEQ96/2 S-WQ96,S-WQ144 S-CQ96,S-CQ144	2.2 kV

2) Test voltage: 3.25 kV with option, "Operating voltage 600 V (600 V CAT III)" see Order Information

	Moving-Coil Movement	Moving-Iron Movement	Bimetal Movement
Application	Measurement of direct current or direct voltage Precision measurement of arithmetic mean value With rectifier: Measurement of alternating current or alternating voltage Measurement of rectified value, effective value display with sine wave	Measurement of alternating current or alternating voltage True RMS measurement	Alternating current measurement 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	
Damping • Overshoot • Response Time	Eddy-current damping ≤ 5% of scale length ≤ 2% s per DIN EN 60061-1	Viscous 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: 40 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. Ammeters upon request with double overload scale	
Measuring Range	With rectifier: for connection to transformer = 120% of rated transformer value	For connection to transformer = 120% of rated transformer value, Ammeters upon request, = 100% of rated transformer value	For connection to transformer = 120% of rated transformer value,
Overload Capacity • Continuous • Short-Term: Current Measurement Voltage Measurement	120% of rated value 10 x rated value,5 s With rectifier: 2 x rated value,0.5 s 2 x rated value,0.5 s With rectifier: 2 x rated value,0.5 s	120% of rated value 10 x rated value,5 s 40 x rated value,1.5 I_{max} = 250 A 2 x rated value,0.5 s	120% of rated value 10 x rated value,1.5 (I_{max} = 10 A)
Connection		Ammeters ≥ 40 A adjusted with horizontal cables to the outside	
Intrinsic Consumption		Ammeters: 0.4… 0.6 VA Voltmeters: 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)

Square Panel Meters
Alternating Current 15 … 45 … 65 … 400 Hz or
Alternating Voltage 15 … 45 … 65 … 100 Hz

Moving-Iron Movement, 90° Scale
Narrow Bezel per DIN 43718

Front Dimensions Type	48 x 48 mm. S-EQ 48	72 x 72 mm. S-EQ 72	96 x 96 mm. S-EQ 96	144 x 144 mm. S-EQ 144
Scale Length	37 mm.	63 mm.	97 mm.	150 mm.
Scale Length mm	1.5	1.5	1.5	1.5
Weight (standard model). Max.	0.1kg.	0.22 kg.	0.29 kg.	0.48 kg.
Operating Voltage. Max	300 V	600 V	600 V	600 V
Test Voltage	2.2 kV	3.25 kV	3.25 kV	3.25 kV
Front Housing-Panel Protection	IP 52	IP52	IP52	IP 52
				In Preparation

Type S-EQ96

Description

Analog Panel Meter with Core-Magnet Moving Coil Movement and Integrated Frequency Converter or with separate frequency converter

Display

Scale Graduation	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 for front panel dimensions of 72 x 72 mm and 96 x 96 mm as option.
Mounting Fasteners	Standard: S type screw clamp, except: screw spindle for 144 x 144 mm panel meters option: see next page
Scale	Interchangeable scales ■ Scales may only be replaced under voltage-free conditions!
Replaceable	Bezels and glass faceplate ■ 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. **except for:**
Terminal Designation	" +11" and "12" , except: "+17" and " 18" for 144 x 144 mm panel meters
Contact Protection	Finger-safe full cover include

Order information

Model

S-EQ 96 Dimension 96x96mm. Scales 90 Degree.
Class1.5 and 2times over scale are standard.

Input type

S-EQ96 AC Amp Meter Direct 1,2.5,5,10,15,20,25,30,40,50,60,75,100A
CT Connection ?/ 1A, ?/5A
S-EQ96 Volt meter 0-150V,0-300V,0-500V,0-600V & customize
PT Rated? / 100, ? / 110, ? / 115, ? / 120V & customize

Example

1) S-EQ96 AC Amp Meter Input CT100/5A, Range 0-100A Class 1.5, Scale 90 Degree.
2) S-EQ96 AC Volt Meter Input PT 115kV/115V, Range 0-130kV Class 1.5, Scale 90 Degree.

Power Consumption

Connection	Measuring Input		Power Consumption
direct	current	1A …. 10A	approx. 0.5 VA
direct	current	≥ 15A	approx. 0.8 VA
to transformer	current	sec.: 1A or 5A	approx. 0.5 VA
direct	voltage	120 V… 600 V	approx. 4.0 VA
to transformer	voltage	sec:100V or 110V	approx. 3.2 VA

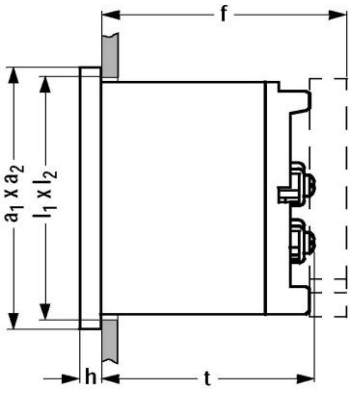
Reference Conditions

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

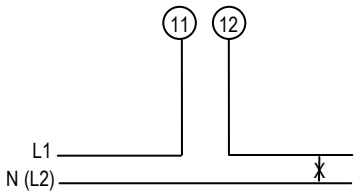
Nominal Range of Use Limits

Frequency	for alternating current, 15 … 400 Hz for alternating current, 15 … 100 Hz

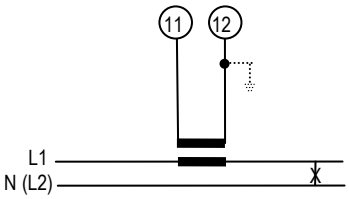
Dimensions



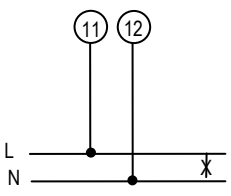
AC current direct connection



AC current transformer connection



AC Voltage

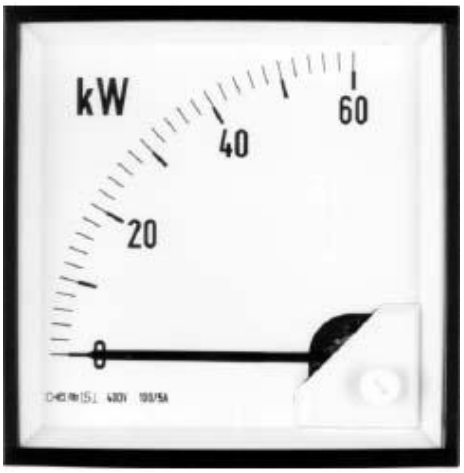


Front in mm.	Nominal Dimensions mm.		Cutout Dimensions, mm.	Installation Depth Including Terminals (t). mm.			Installation Depth Including Full Cover (f), mm.	
	a_1 x a_2	h	l_1 x l_2	≤25A (M4)	40/60A (M6)	100A (M8)	≤ 25A	40…100A
48 x 48	48 x 48	5	$45^{+0.6}$ x $45^{+0.6}$	54	-	-	62.5	-
72 x 72	72 x 72	5	$68^{+0.7}$ x $68^{+0.7}$	54	62	66	62.5	70
96 x 96	96 x 96	5	$92^{+0.8}$ x $92^{+0.8}$	54	62	66	62.5	70
144 x 144	144 x 144	8	138^{+1} x 138^{+1}	54	62	-	62.5	70(40/60A)

Square Panel Meters
Active Power or Reactive Power

Moving-Coil Movement, with Power Converter,90° Scale
Narrow Bezel per DIN 43718

Front Dimensions Type			96 x 96 mm. S-WQ 96	144 x 144 mm. S-WQ 144
Scale Length			97 mm.	150 mm.
Accuracy Class			1.5	1.5
Weight (standard model), Max.			8 kg.	1.0 kg.
Consumption, Approx.				
Current Path			0.2 VA	0.2 VA
Voltage Path	order no.:	AB1/AB2/AB12/AB5/AB15	3.0 VA	3.0 VA
		AB11	3.5 VA	3.5 VA
		AB4 / AB14	3.4 VA	3.4 VA
		AB6	3.9 VA	3.9 VA
		AB16	4.3 VA	4.3 VA
Nominal Line Voltage	phase-to-neutral (= operating voltage)		≤300 V	≤300 V
	3-phase 3-wire systems		≤500 V	≤500 V
	3-phase 4-wire systems		≤277/480 V	≤277/480 V
Test Voltage			2.2 kV	2.2 kV
Front Housing-Panel Protection			IP 52	IP 52
				In preparation



Type S-WQ96

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 Graduation	Coarse-fine
Pointer	Beam pointer with knife-edge

Mechanical Design

Housing Material	Polycarbonate, self-extinguishing and drip-proof per UL94V-0
Mounting Fasteners	Standard: S type screw clamp, except: screw spindle for 144 x 144 mm panel meters Alternative: . Screw S type screw clamp meters alternative (except for 144 x 144 mm panel meter)
Scale	Interchangeable scales ■ Scales may only be replaced under voltage-free conditions!
Replaceable	Bezels and glass faceplate ■ 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.
Terminal Designation	Per Din 43807
Contact Protection	Hand-safe full cover included

Ordering Information

Model

S-WQ96 Watt or Var Dimension 96x96mm. Scale 90 Degree

System available

1Ph2W 110, 220, 380V
3Ph3W-Balanced Load 110, 220, 380, 400, 440V
3Ph3W-Unbalanced Load 110, 220, 380, 400, 440V
3Ph4W-Unbalanced Load 58/100, 63/110, 66.4/115, 69.3/120, 127/220, 220/380V others by request

Current
CT/1A or CT/5A

Example

S-WQ96 AC Watt Meter Input PT115kV/115V,CT200/5A range 0-40MW Class 1.5, Scale 90Degree.
S-WQ96 AC Var Meter Input PT115kV/115V,CT200/5A range 0-40MVar Class 1.5, Scale 90Degree.

Reverence Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23°C± 2°C
Position of Use	control panel vertical ±1°
Frequency	45 Hz --- 65 Hz 50 Hz ±0.1 Hz for order no.: D1W
Current Components	20 …. 120% of rated value
Voltage Components	98 …. 102% of rates value
Warm-Up Time	≥5 min
Other	DIN EN 60051

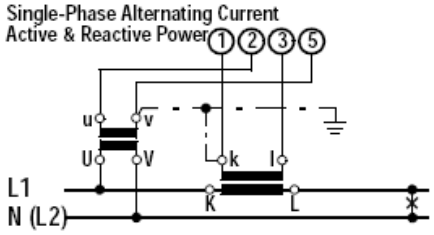
Notes Concerning the Determination of Measuring Ranges

The upper measuring range value should be a standard value per DIN43701
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 S is calculated from the primary values from the current and voltage transformer:

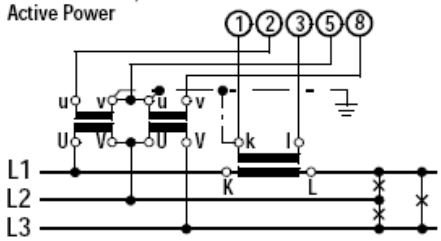
- Single-Phase AC **S=UxI**
- Three-Phase **S= √3xUxI**
  where U equals phase-to-phase voltage

Schematic Diagrams

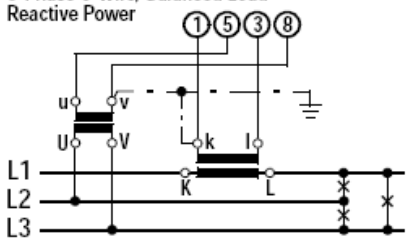
Single-Phase Alternating Current
Active & Reactive Power



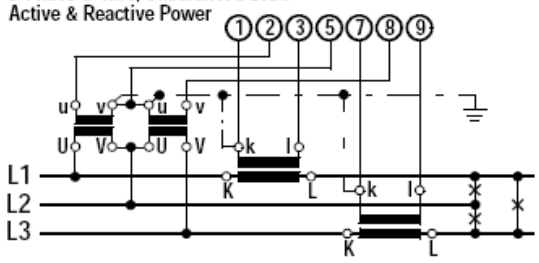
3-Phase 3-Wire, Balanced Load
Active Power



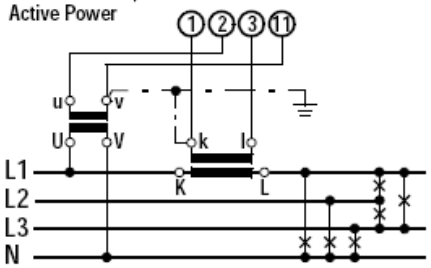
3-Phase 3-Wire, Balanced Load
Reactive Power



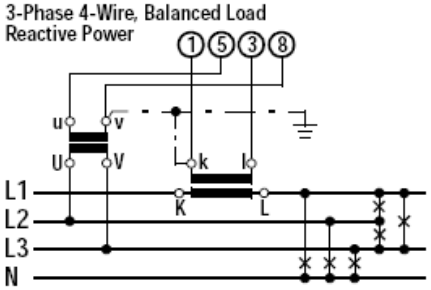
3-Phase 3-Wire, Unbalanced Load
Active & Reactive Power



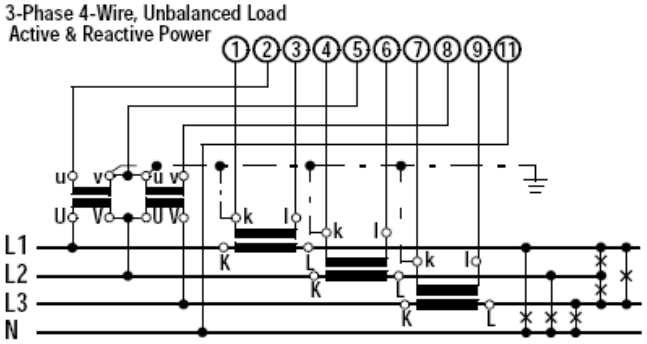
3-Phase 4-Wire, Balanced Load
Active Power



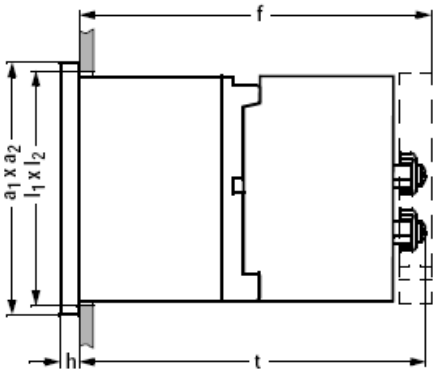
3-Phase 4-Wire, Balanced Load
Reactive Power



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



Dimensions



Front, mm.	Nominal Dimension, mm.		Cutout, mm.		Installation Depth, mm.	
	$a_1 \times a_2$	h	$l_1 \times l_2$		Including Terminals (t)	Including Full Cover (f)
96 x 96	96 x 96	5	$92^{+0.8} \times 92^{+0.8}$		105	111
144 x 144	144 x 144	8	$138^{+1} \times 138^{+1}$		131	137

Square Panel Meters
Power Factor

Moving-Coil Movement with Power Factor Converter, 90° Scale
Narrow Bezel per DIN 43718

Front Dimensions Type		96 x 96 mm. S-CQ 96	144 x 144 mm. S-CQ 144
Scale Length		97 mm.	150 mm.
Accuracy Class		1.5	1.5
Weight (standard model). Max.		0.38 kg.	0.59 kg.
Power Consumption,	current path	1.0 VA	1.0 VA
	voltage path	3.0 VA	3.0 VA
Nominal Line Voltage	phase-to-neutral (=operating voltage)	≤300 V	≤300 V
	3-phase 3-wire systems	≤500 V	≤500 V
	3-phase 3-wire systems	≤ 277/480 V	≤ 277/480 V
Test Voltage		2.2 kV	2.2 kV
Front Housing-Panel Protection		IP 52	IP 52
			In preparation

Type S-CQ 96

Description

Analog Panel Meter with core-magnet moving-coil movement and integrated Power factor converter. The power factor converter determines the phase angle Between current and voltage. Cos φ is displayed at the moving-coil movement

Display

Measuring Range	CAP 0.5 … 1 … 0.5 IND
Scale Graduation	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 for front dimensions 96 x 96 mm.
Mounting Fasteners	Standard: S type screw clamp, except for: Screw spindle for 144 x 144 mm. panel meters Options: se next page
Scale	Interchangeable scales ■ Scales may only be replaced under voltage-free conditions!
Replaceable	Bezels and glass faceplates ■ 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.
Terminal Designation	Similar to 43807
Contact Protection	Finger-safe full cover included

Reference Conditions

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

Ordering Information

Model

S-CQ96 Dimension 96x96 mm. Scale 90 Degree.
Range: 0.5 cap-1-0.5 ind,0.3 cap-1-0.1ind,0.4 cap-1-0.4 ind,0.7 cap-1-0.2ind
Class: Standard class 1.5
Input
Voltage 100V,110V,115, 220,380,400,440V
Current CT/1A, CT/5A

Example

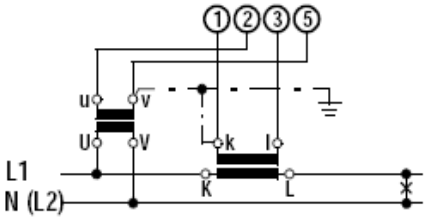
S-CQ96 AC Power Factor Input 115kV/115V CT 200/5A Range 0.5-1-0.5, class1.5,Scale 90 Degree.

Nominal Range of Use Limits

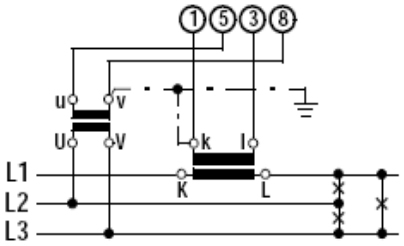
Frequency	45 Hz … 65 Hz

Schematic Diagrams

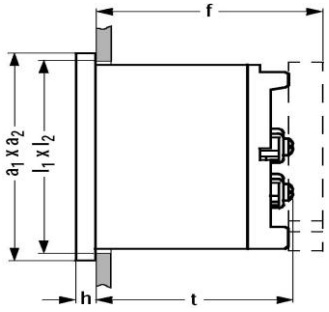
Single Phase Alternating Current



3-Phase 3-Wire, Balanced Load



Dimensions



Front in mm.	Nominal Dimensions, mm.		Cutout, mm.	Installation Depth Including Terminals (t),mm. M4	Installation Depth Including Terminals (f),mm.
	a1 x a2	h	l_1 x l_2		
96 x 96	96 x 96	5	$92^{+0.8}$ x $92^{+0.8}$	54	62.5
144 x 144	144 x 144	8	138^{+1} x 138^{+1}	54	62.5

Square Panel Meters
Frequency (pointer-type frequency meters)

Moving-Coil Movement, with Frequency Converter,90° Scale
Narrow Bezel per DIN 43718

Front Dimensions Type	48 x 48 mm. S-ZQ48	72 x 72 mm. S-ZQ72	96 x 96 mm. S-ZQ96	144 x 144 mm. S-ZQ144
Scale Length	37 mm.	63 mm.	97 mm.	150 mm.
Weight (standard model). Max.	0.27kg	0.20 kg.	0.28 kg.	0.49 kg.
Power Consumption, Approx.	5 mA	5 mA	5 mA	5 mA
Operating Voltage. Max	300 V	600 V	600 V	600 V
Test Voltage	2.2 kV	3.25 kV	3.25 kV	3.25 kV
Front Housing-Panel Protection	IP 52	IP52	IP52	IP 52
				In Preparation

Description

Analog Panel Meter with Core-Magnet Moving Coil Movement and Integrated Frequency Converter or with separate frequency converter

Display

Scale Graduation: 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 for front panel dimensions of 72 x 72 mm and 96 x 96 mm as option.

Mounting Fasteners: Standard: S type screw clamp, except: screw spindle for 144 x 144 mm panel meters
Option: see next page

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

Replaceable: Bezels and glass faceplate
■ 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.

Terminal Designation: " 11" and "12" , except: "17" and " 18" for 144 x 144 mm. panel meters

Contact Protection: Finger-safe full cover included

Order information

S-ZQ96 Dimension 96x96 Scale 90 Degree

Input Type

Direct 60,100,110,115,120 ,220,400,415,440V & customize
PT Rated 100,110,115,120,220V or request

Scale Range

45-55Hz, 45-65Hz, 55-65Hz, 450-550Hz, 450-650Hz, 550-650Hz
Factory standard range or specify when ordering or consult.

Class

Class 1.0 is standard or others by request

Example

S-ZQ96 Frequency Meter Input PT 115kV 115V, Range 45-55HZ.
Class 1.0, Scale 90 Degree.

Type S-ZQ96

Reference Conditions

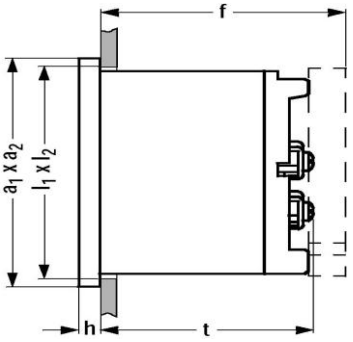
Reference Quantities	Reference Conditions
Ambient Temperature	23°C. ± 2°C.
Position of Use	control panel vertical ± 1°
Input Voltage	nominal voltage
Wave shape	sine, distortion factor 0%
Warm-Up Time	≥ 5 min
Other	DIN EN 60051

Nominal Range of Use Limits

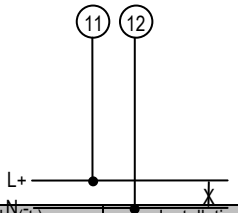
Input Voltage	nominal voltage ± 20% Exception: Frequency converter (Static transducer) 60 … 300 V
Wave shape	sine, distortion factor ≤15%

Dimensions

For separate frequency converter (screw and snap mountable, for top-hat rails Dis EN 50 022 -35 x 7.5 or Din EN 50 022-35 x 15)
L x B x H = 70 x 45 x 114.5



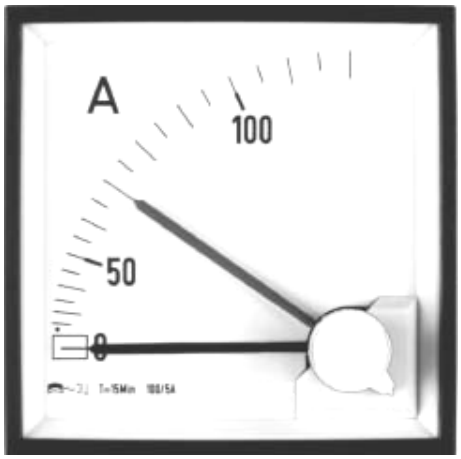
Frequency 1ph AC



Front in mm.	Nominal Dimensions, mm. a_1 x a_2	h	Cutout Dimensions, mm. l_1 x l_2	Installation Depth Including Terminals (t), mm. M4	Installation Including Full Cover (f), mm.
48 x 48	48 x 48	5	$45^{+0.6}$ x $45^{+0.6}$	54	62.5
72 x 72	72 x 72	5	$68^{+0.7}$ x $68^{+0.7}$	54	62.5
96 x 96	96 x 96	5	$92^{+0.8}$ x $92^{+0.8}$	54	62.5
144 x 144	144 x 144	8	138^{+1} x 138^{+1}	54	62.5

Bimetal Movement, 90° Scale
Narrow Bezel per DIN 43718

Front Dimensions Type		48 x 48 mm. S-BIQ 48	72 x 72 mm. S-BIQ 72	96 x 96 mm. S-BIQ 96
Scale Length		34 mm.	63 mm.	97 mm.
Weight (standard model), max		0.1 kg.	0.17 kg.	0.25 kg.
Power Consumption, Approx.	secondary transformer terminal: 1A	1.1 VA	1.6 VA	1.6 VA
	secondary transformer terminal: 5A	1.9 VA	2.5 VA	2.5 VA
Accuracy Class		3	3	3
Nominal Line Voltage	phase-to-neutral (= operating voltage)	≤ 300 V	≤300 V	≤300 V
	3-phase 3-wire systems	≤ 500 V	≤ 500 V	≤ 500 V
	3-phase 3-wire systems	≤ 277/480 V	≤ 277/480 V	≤ 277/480 V
Test Voltage		2.2 kV	2.2 kV	2.2 kV
Front Housing-Panel Protection		IP 52	IP 52	IP 52
				In preparation



Type S-BIQ96

Description

Analog Panel Meter with Bimetal Movement

Display

Scale Graduation	Medium fin
Pointer	Bar indicator with knife-edge Red slave pointer for display of maximum value Reset button for slave pointer can be locked

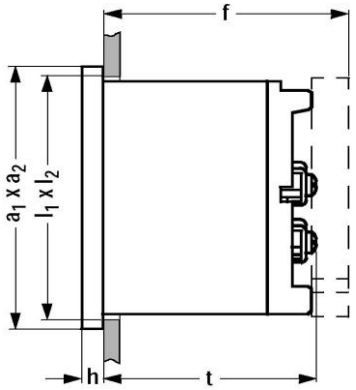
Mechanical Design

Housing Material	Polycarbonate, self-extinguishing and drip-proof per UL94V-0 or sheet metal housing for front panel dimensions of 72 x 72 mm and 96 x 96 mm as option.
Mounting Fasteners	Standard: S type screw clamp alternative: see next page
Scale	Interchangeable scales ■ Scales may only be replaced under voltage-free conditions!
Replaceable	Bezels and glass faceplate ■ 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.
Terminal Designation	" 11" and "12" , except:
Contact Protection	Includes finger-safe full cover for BM 72 and BM 96, As well as finger-safe individual cover for BM 48.

Reference Conditions

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

Dimensions



Order information

Model

S-BIQ 96 Dimension 96x96 Scale 90 Degree

Input Type

CT Connection /1A, /5A

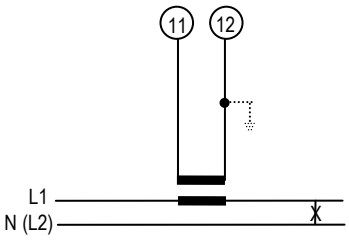
Class

Class3.0 is standard.

Example

1)S-BIQ96 AC Amp Max Demand Meter Input CT 1000/5A, class 3.0, Scale 90 Degree

AC current transformer

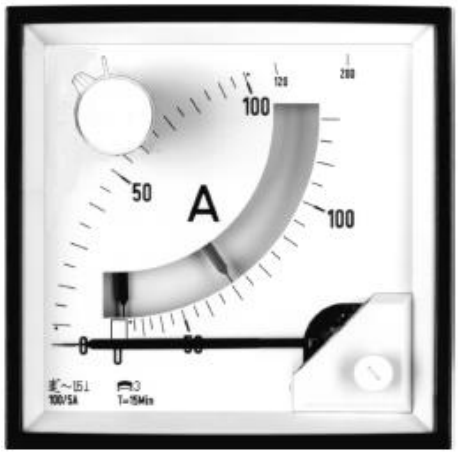


Front in mm.	Nominal Dimensions, mm.		Cutout Dimensions, mm.	Installation Including Terminals (t) mm.	Installation Depth Incl. Cover (f) mm.	
	a_1 x a_2	h	l_1 x l_2	M4	Full Cover	Individual Cover
48 x 48	48 x 48	5 mm.	$45^{+0.6}$ x $45^{+0.6}$	56	-	61
72 x 72	72 x 72	5 mm.	$68^{+0.7}$ x $68^{+0.7}$	54	62.5	-
96 x 96	96 x 96	5 mm.	$92^{+0.8}$ x $92^{+0.8}$	54	62.5	-

Square Panel Meters
Alternating Current Combined Maximum Demand

Moving-Iron Movement 90° Scale
Narrow Bezel per DIN 43718

Front Dimensions Type		72 x 72 mm. S-BIEQ 72	96 x 96 mm. S-BIEQ 96
Scale Length	moving-iron movement	**63 mm.**	**97 mm.**
	bimetal movement	**42 mm.**	**72 mm.**
Weight (standard model) Max.		0.21 kg	0.29 kg
Power Consumption, Approx.	secondary transformer terminal:1A	2.3 VA	2.3 VA
	secondary transformer terminal:5A	3.4 VA	3.4 VA
Accuracy Class	moving-iron bimetal movement	1.5/3	1.5/3
Nominal Line Voltage	phase-to-neutral(=operating voltage)	≤300 V	≤300 V
	3-phase 3-wire systems	≤500 V	≤500 V
	3-phase 4 wire systems	≤277/480 V	≤277/480 V
Test Voltage		2.2 kV	2.2 kV
Front Housing-Panel Protection		IP 52	IP 5.2



Type S-BIEQ 96

Description

Analog Panel Meter with Moving iron and Bimetal Movement

Display

Scale Graduation	Coarse-fine
Pointer	Beam pointer with knife-edge With bimetal movement: Red slave pointer for display of highest value Slave pointer reset button can be locked

Mechanical Design

Housing Material	Polycarbonate, self-extinguishing and drip-proof per UL94V-0 or sheet metal housing as option
Mounting Fasteners	Standard: S type screw clamp, alternative: • B DIN 43835 screw clamp • Leaf springs • Suckled fastener
Scale	Interchangeable scales ■ Scales may only be replaced under voltage-free conditions!
Replaceable	Bezels and glass faceplate ■ 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.
Terminal Designation	" 11" and "12"
Contact Protection	Finger-safe full cover included

Order Information

Model

S-BIEQ96 Dimension 96x96 mm. Scale 90 Degree

Input Type

CT Connection /1A, /5A

Class

Class 3.0 is standard

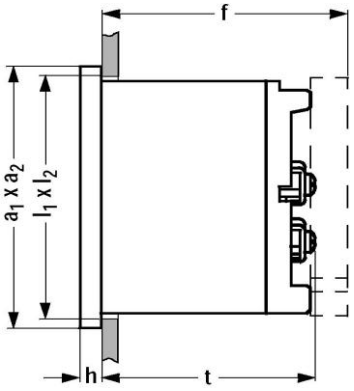
Example

S-BIEQ96 AC Amp Max Demand Meter Input CT1000/5A Class 3.0 Scale 90 Degree

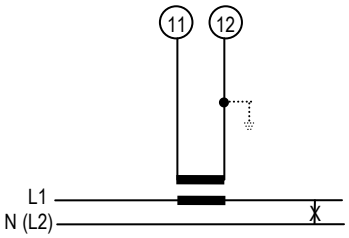
Reference Conditions

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

Dimensions



AC Current transformer



Front in mm.	Nominal Dimensions, mm.		Cutout Dimensions, mm.	Installation Depth Including Terminals (f), mm.	Installation Depth Including Full Cover (f), mm.
	a_1 x a_2	h	l_1 x l_2	M4	
72x72	72x72	5	86+0.7x68+0.7	54	62.5
96x96	96x96	5	96+0.8x92+0.8	54	62.5

Square Panel Meters
Direct Current or Direct Voltage

Moving-Coil Movement 90° Scale
Narrow Bezel per DIN 43718

Front Dimensions Type	48 x 48 mm S-PQ 48	72 x 72 mm S-PQ 72	96 x 96 mm S-PQ 96	144 x 144 mm S-PQ 144
Scale Length	37 mm	63 mm	97 mm	150 mm
Accuracy Class	1.5	1.5	1.5	1.5
Weight (standard model) Max.	0.12kg	0.32 kg	0.25 kg	0.53 kg
Operating Voltage. Max	300 V	600 V	600 V	600 V
Test Voltage	2.2kV	3.25 kV	3.25 kV	3.25 kV
Front Housing-Panel Protection	IP 52	IP	IP52	IP 52
				In Preparation

Type S-PQ96

Description

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

Display

Scale Graduation: 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 for front panel dimensions of 72 x 72 mm and 96 x 96 mm as option.

Mounting Fasteners: Standard: S type screw clamp, except: screw spindle for 144 x 144 mm panel meters
Alternatives: see next page

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

Replaceable: Bezels and glass faceplate
■ 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.
Except for:
Direct connection ammeters ≥ 6A: M 6 bolt terminals

Terminal Designation: " +11" and "12" , except:
"+17" and " 18" for 144 x 144 mm panel meters

Contact Protection: Finger-safe full cover included

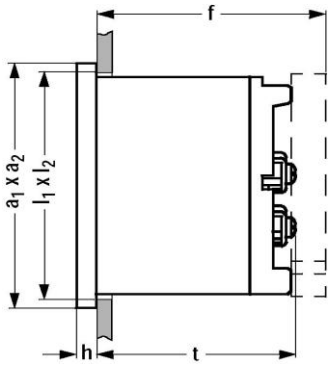
Internal Resistance / Voltage Drop / Power Consumption

Measuring Input	Ri at Zero Point			Tolerance
	Left	center	10% of Positive Upper value	
1 mA	37 Ω	92 Ω	34 Ω	± 10%
5 mA	2.5 Ω	18 Ω	-	± 10%
10 mA	18 Ω	9.5 Ω	-	± 10%
20 mA	3.0 Ω	1.5 Ω	2.8 Ω	± 10%
4 … 20 Ma	0.7 Ω			± 10%
Connection to shunt	power consumption: 6 mA lead resistance: 0.06 Ω			± 10%
1 A … 60 A	voltage drop: 0.60 mV			± 10%
≥ 1 V	100 Ω / V			± 5%

Reference Conditions

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

Dimensions



Order Information

Model

S-PQ96 Dimension 96x96mm. Scale 90 Degree
Class1.5 is standard.

Range

Amp direct 1,3,5,10, 15, 20, 30, 50, 60A.
0-1mA, 0-10mA, 0-20mA, 4-20mA or request.
Voltage range 0-3,0-5,0-10,0-15,0-20,0-30,0-50,0-75,0-100,0-120,
0-150V,0-200,0-250,0-300V,0-500V& customize
Shunt resistor connection 60mV,75mV,150mV,300mV
Factory standard range or specify when ordering or consult.

Class

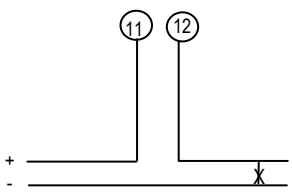
Class1.5 is Standard or others by request

Example

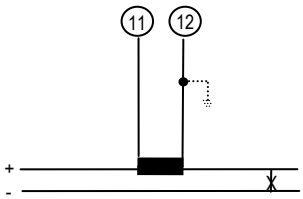
S-PQ96 Amp Meter Input shunt 100/A60mV,
Range 0-100A class 1.5,Scale 90 Degree

S-PQ96 Volt Meter Input 0-150V
Range 0-150V class 1.5 Scale 90 Degree.

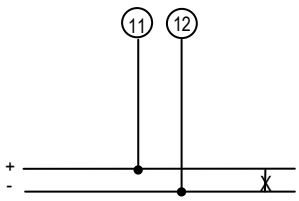
Current direct connection



Shunt connection



DC Voltage



Front in mm.	Nominal Dimensions mm.		Cutout Dimensions, mm.	Installation Depth Including Terminals (t). mm.			Installation Depth Including Full Cover (f), mm.		
	a_1 x a_2	h	l_1 x l_2	≤4A (M4)	6..25 A (M6)	40…60 A(M8)	≤ 4A	6…25A	40..60A
48 x 48	48 x 48	5	$45^{+0.6}$ x $45^{+0.6}$	54	72	-	62.5	75	-
72 x 72	72 x 72	5	$68^{+0.7}$ x $68^{+0.7}$	54	67	67	62.5	70	70
96 x 96	96 x 96	5	$92^{+0.8}$ x $92^{+0.8}$	54	67	67	62.5	70	70
144 x 144	144 x 144	8	138^{+1} x 138^{+1}	54	67	67	62.5		70

Square Panel Meters
Alternating Current 40… 45 … 65 … 1000 Hz or
Alternating Voltage 40 …45 … 65 … 10000 Hz

Moving-Coil Movement with Rectifier, 90° Scale
Narrow Bezel per DIN 43718

Front Dimensions Type	48 x 48 mm. S-VQ 48	72 x 72 mm. S-VQ 72	96 x 96 mm. S-VQ 96	144 x 144 mm. S-VQ 144
Scale Length	37 mm.	63 mm.	97 mm.	150 mm.
Accuracy Class	1.5	1.5	1.5	1.5
Weight (standard model). Max.	0.12kg	0.2 kg.	0.28 kg.	0.49 kg.
Operating Voltage. Max	300 V	600 V	600 V	600 V
Test Voltage	2.2 kV	3.25 kV	3.25 kV	3.25 kV
Front Housing-Panel Protection	IP 52	IP52	IP52	IP 52
				In Preparation

Type S-VQ96

Description

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

Display

Scale Graduation	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 for front panel dimensions of 72 x 72 mm and 96 x 96 mm as option.
Mounting Fasteners	Standard: S type screw clamp, except: screw spindle for 144 x 144 mm panel meters alternative : see next page
Scale	Interchangeable scales ■ Scales may only be replaced under voltage-free conditions!
Replaceable	Bezels and glass faceplate ■ 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.
Terminal Designation	" 11" and "12" , except: "17" and " 18" for 144 x 144 mm panel meters
Contact Protection	Finger-safe full cover included

Ordering Information

Model

S-VQ96 Dimension 96x96 mm. Scale 90 Degree
Volt meter
Direct connection 0-150V, 0-300V, 0-500V, 0-600V
PT connection 100, 110, 115, 120V AC or request
Amp Meter
Direct 1.2, 6A
CT Connection 1A,5A

Class

Class 1.5 standard or others by request

Example

1) S-VQ96 Volt Meter Input PT 115kV / 115V, Range 0-130kV Class 1.5, Scale 90 Degree.
2) S-VQ96 Amp Meter Input CT100/5A, Range 0-100A, class1.5, Scale 90 Degree

Internal Resistance / power Consumption

Measuring Input Connection		Internal Resistance	Power Consumption
to transformer	current		approx. 0.15 VA
direct or to transformer	voltage	900 Ω / V± 10%	

Reference Conditions

Reference Quantities	Reference Condition
Ambient Temperature	23°C ± 2°C
Position of Use	control panel vertical ±1°
Frequency	45 … 65 Hz
Wave shape	sine, distortion factor ≤ 1%
Other	DIN EN 60051

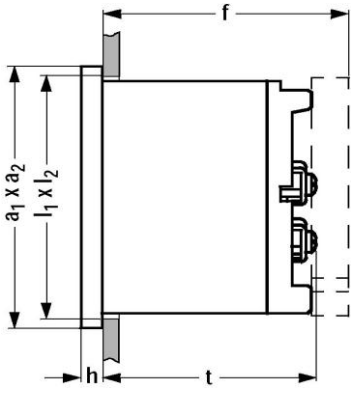
Nominal Range of Use Limits

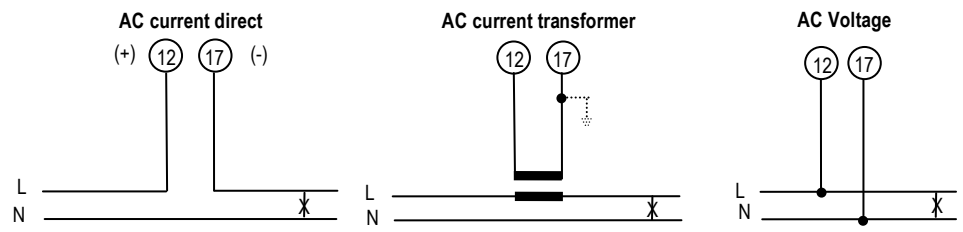
Frequency	for alternating current, 40 … 1000 Hz for automating current, 40 … 10000 Hz

Dimensions

With separate **matching transformers** for ammeters with front Panel dimensions of 48 x 48 mm: Lx W x H = 80 x 55 x 31 mm.
Dimensional Drawing (upon request) **1303A1839HO**

Dimensions





Front in mm.	Nominal Dimensions ,mm. a_1 x a_2	h	Cutout Dimensions, mm. l_1 x l_2	Installation Depth Including Terminals (t). mm. M4	Installation Depth Including Full Cover (f), mm.
48 x 48	48 x 48	5	$45^{+0.6}$ x $45^{+0.6}$	54	62.5
72 x 72	72 x 72	5	$68^{+0.7}$ x $68^{+0.7}$	54	62.5
96 x 96	96 x 96	5	$92^{+0.8}$ x $92^{+0.8}$	54	62.5
144 x 144	144 x 144	8	138^{+1} x 138^{+1}	54	62.5