

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 $\geq 6A$ 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 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 48x48 mm).

The housing 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 ≥ 1 mm
 - 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/EEG and 89/336/EEG, 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 $\pm 1.5\%$ 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 (Δ 1.5 g at 50 Hz)	147 m/s ² (15 g _n) 11 ms
Excessive Stress (order no: LN56)	5 Hz–55 Hz–5 Hz 0.25 mm (Δ 1.5 g at 50 Hz)	294 m/s ² (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	\leq 75% (at 21 °C) \leq 95% (at 25 °C) \leq 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 \leq 5% of scale length \leq 2% s per DIN EN 60061-1	Viscous damping \leq 5% of scale length \leq 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	\leq 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	120% of rated value 10 x rated value, 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	120% of rated value 10 x rated value, 1.5 (I _{max} = 10 A)
Voltage Measurement	2 x rated value, 0.5 s With rectifier: 2 x rated value, 0.5 s	2 x rated value, 0.5 s	
Connection		Ammeters \geq 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

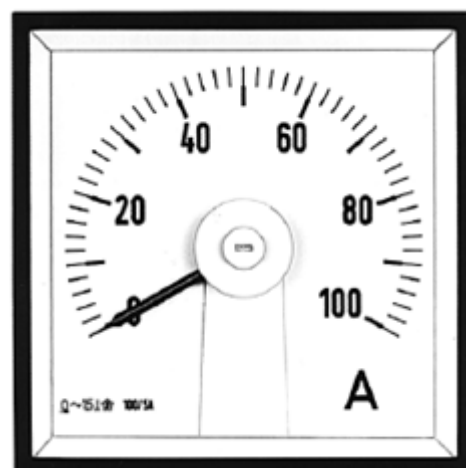
Alternating Current 40... 45 ... 65 ... 1000 Hz or

Alternating Voltage 40 ... 45 ... 65 ... 10000 Hz

Moving-Coil Movement with Rectifier, 250° Scale

Narrow Bezel per DIN 43718

Front Dimensions Type	48 x 48 mm. S-EL 48-250	72 x 72 mm. S-EL 72-250	96 x 96 mm. S-EL 96-250	144 x 144 mm. S-EL 144-250
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-EL96-250

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!
Bezels and glass faceplate

Replaceable ■ 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

Internal Resistance / power Consumption

Measuring Input	Internal Resistance	Power Consumption
Connection		
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
-----------	--

Ordering Information

Model

S-EL96 Dimension 96x96 mm. Scale 250Degree
Volt meter
Direct connection 0-150V, 0-300V, 0-500V, 0-600V
PT connection 100, 110, 115, 120VAC
Amp Meter
Direct 1.2A, 6A.
CT Connection 1A, 5A

Class

Class 1.5 standard or others by request

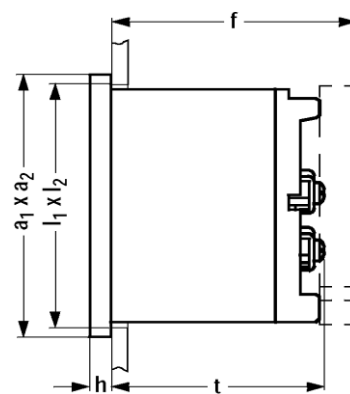
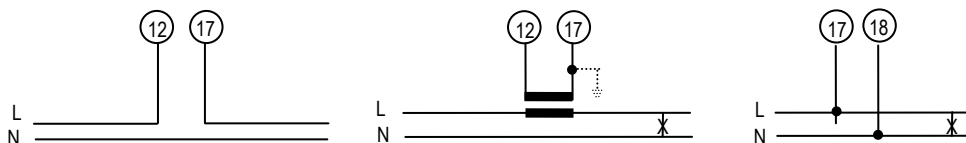
Example

- 1) S-EL96 Volt Meter Input PT 115kV/115V, Range 0-130kV Class 1.5, Scale 250 Degree
- 2) S-EL96 Amp Meter Input CT100/5A, Range 0-100A Class 1.5, Scale 250 Degree

AC current direct

AC current transformer

AC Voltage



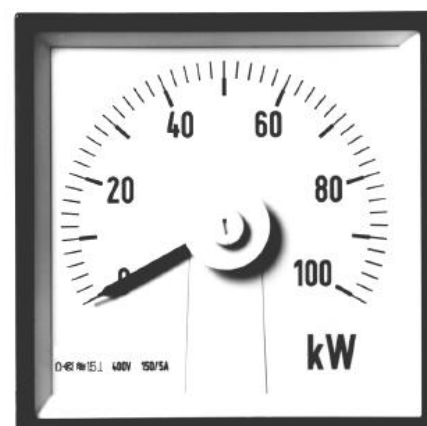
Front in mm.	Nominal Dimensions ,mm.		Cutout Dimensions, mm.	Installation Depth Including Terminals (t). mm.	Installation Depth Including Full Cover (f), mm.
	a1 x a2	h	l1 x l2	M4	
48 x 48	48 x 48	5	45 + 0.6 x 45 + 0.6	54	62.5
72 x 72	72 x 72	5	68 + 0.7 x 68 + 0.7	54	62.5
96 x 96	96 x 96	5	92 + 0.8 x 92 + 0.8	54	62.5
144 x 144	144 x 144	8	138 + 1 x 138 + 1	54	62.5

Square Panel Meters

Active Power or Reactive Power

Moving-Coil Movement, with Power Converter, 250° Scale Narrow Bezel per DIN 43718

Front Dimensions Type	96 x 96 mm. S-WL 96-250	144 x 144 mm. S-WL 144-250
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	3.0 VA	3.0 VA
order no.: AB1/AB2/AB12/AB5/AB15		
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-WL96-250

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 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) Interchangeable scales ■ Scales may only be replaced under voltage-free conditions!
Scale	Bezels and glass faceplate ■ May only be replaced under voltage-free conditions!
Replaceable	M4 screw terminals with self-lifting terminal clips. Screws can be turned with cross-head or standard screw drivers.
Terminals	per Din 43807
Terminal Designation	Hand-safe full cover included
Contact Protection	

Ordering Information

Model

S-WL96 Watt or Var Dimension 96x96mm. Scale 250 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-WL96 AC Watt Meter Input PT115kV/115V, CT200/5A range 0-40MW Class 1.5, Scale 250Degree.
S-WL96 AC Var Meter Input PT115kV/115V, CT200/5A range 0-40MVar Class 1.5, Scale 250Degree.

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:

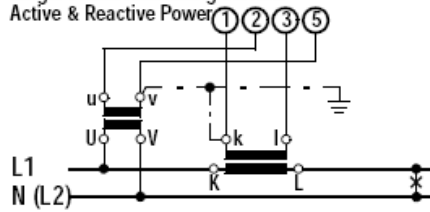
- Single-Phase AC $S = U \times I$
- Three-Phase $S = \sqrt{3} \times U \times I$
where U equals phase-to-phase voltage

Square Panel Meter

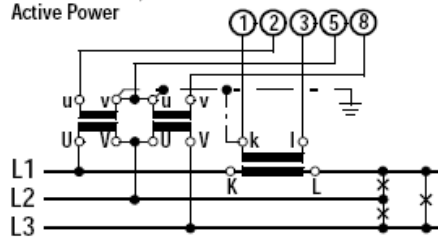
Active Power or Reactive Power

Schematic Diagrams

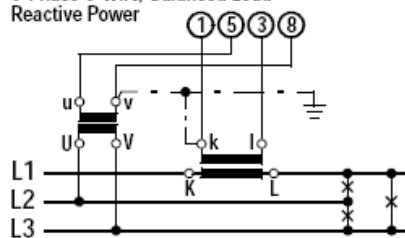
Single-Phase Alternating Current
Active & Reactive Power



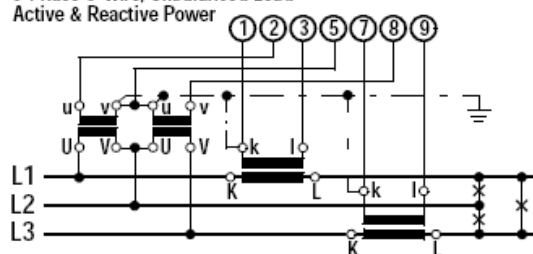
3-Phase 3-Wire, Balanced Load
Active Power



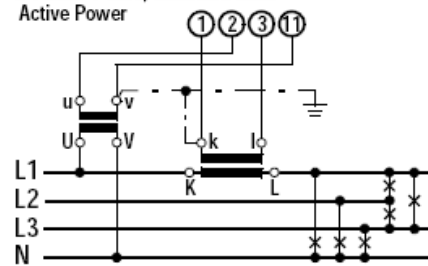
3-Phase 3-Wire, Balanced Load
Reactive Power



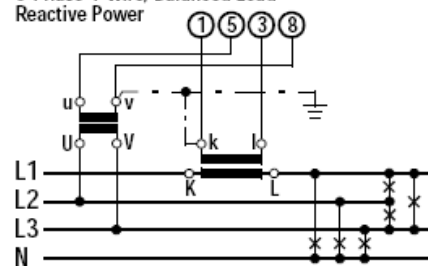
3-Phase 3-Wire, Unbalanced Load
Active & Reactive Power



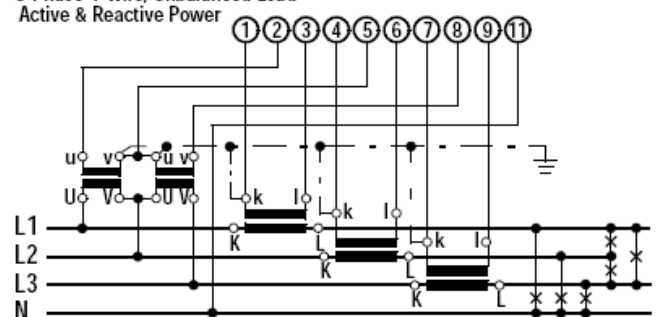
3-Phase 4-Wire, Balanced Load
Active Power



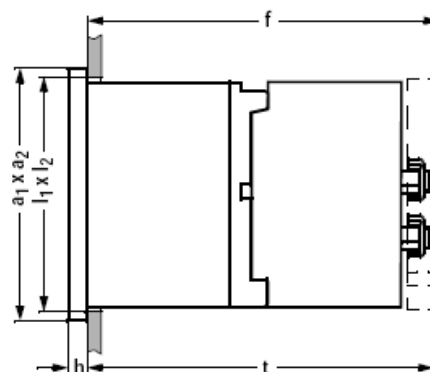
3-Phase 4-Wire, Balanced Load
Reactive Power



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



Dimensions



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

Square Panel Meters

Power Factor

Moving-Coil Movement with Power Factor Converter, 250° Scale Narrow Bezel per DIN 43718

Front Dimensions Type	96 x 96 mm. S-CL96-250	144 x 144 mm. S-CL144-250
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)	
3-phase 3-wire systems	≤300 V	≤300 V
3-phase 3-wire systems	≤500 V	≤500 V
Test Voltage	≤ 277/480 V	≤ 277/480 V
Front Housing-Panel Protection	2.2 kV	2.2 kV
	IP 52	IP 52

In preparation



Type S-CL96-250

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: see 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-CL96 Dimension 96x96 mm. Scale 250Degree.

Range

0.5 cap-1-0.5 ind, 0.3 cap-1-0.1 ind, 0.4 cap-1-0.4 ind, 0.7 cap-1-0.2 ind

Class: Standard class 1.5

Input

Voltage 100V, 110V, 115, 220, 380, 400, 440V

Current CT/1A, CT/5A

Example

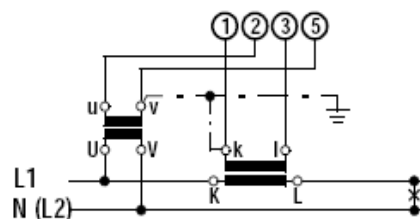
S-CL96 AC Power Factor Input 115kV/115V CT 200/5A Range 0.5-1-0.5, class 1.5, Scale 250 Degree

Nominal Range of Use Limits

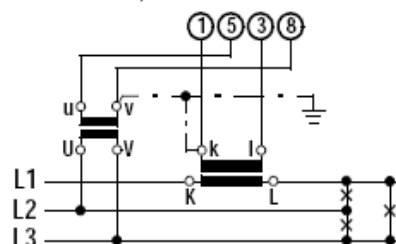
Frequency	45 Hz ... 65 Hz
-----------	-----------------

Schematic Diagrams

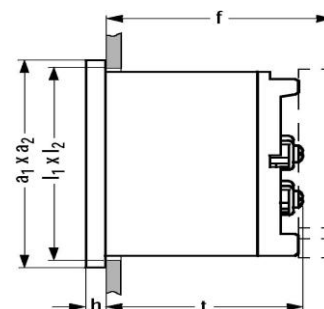
Single Phase Alternating Current



3-Phase 3-Wire, Balanced Load



Dimensions



Front in, mm.	Nominal Dimensions, mm.		Cutout, mm.	Installation Depth Including Terminals (t), mm.	Installation Depth Including Terminals (f), mm.
	a1 x a2	h	l1 x l2	M4	
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, 250° Scale Narrow Bezel per DIN 43718

Front Dimensions Type	48 x 48 mm. S-ZL48-250	72 x 72 mm. S-ZL72-250	96 x 96 mm. S-ZL96-250	144 x 144 mm. S-ZL144-250
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				



Type S-ZL96-250

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!
Bezels and glass faceplate
■ May only be replaced under voltage-free conditions!

Replaceable

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

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

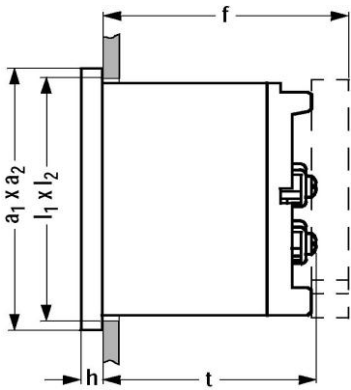
Nominal Range of Use Limits

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

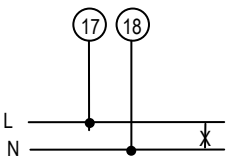
Dimensions

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

Dimensions



Frequency



Order information

S-ZL96 Dimension 96x96mm. Scale 250 Degree

Input Type

Direct 60,100,110,115,120,220,380,415,440V & customize
PT Rated 100,110,115,120, 220V or request

Scale Range

45-55Hz, 45-65Hz, 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-ZL96 Frequency Meter Input PT115kV/115V, Range 45-55Hz
Class 1.0, Scale 250 Degree.

Front in mm.	Nominal Dimensions, mm.		Cutout Dimensions, mm.	Installation Depth Including Terminals (t), mm.	Installation Including Full Cover (f), mm.
	a ₁ x a ₂	h	l ₁ x l ₂	M4	
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

Square Panel Meters

Direct current or Direct Voltage

Moving-Coil Movement, 250° Scale Narrow Bezel per DIN 43718 Dull Black

Front Dimensions Type	48 x 48 mm S-PL 48-250	72 x 72 mm S-PL 72-250	96 x 96 mm S-PL 96-250	144 x 144 mm S-PL 144-250
Scale Length	73 mm.	113 mm.	151 mm.	235 mm.
Aalen Length mm	1.5	1.5	1.5	1.5
Weight (standard model). Max.	0.16	0.2	0.25	0.65
Nominal Insulation Voltage	660V	1000V	1000V	660V
Test Voltage	2kV	3kV	3kV	2kV
Front Housing-Panel Protection	IP52	IP52	IP52	IP52
Fasteners (see nix page)	Leaf spring	Type S	Type S	Type G
Housing Material	Polycarbonate	Polycarbonate	Polycarbonate	Sheet metal
Interchangeable Scale	yes	yes	yes	no

Description

Analog Panel Meter with Moving-Coil Movement 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 (see above) Sheet metal housing for S-PL 72-250 and S-PL 96-250 Available as option
Replaceable	Glass faceplate, bezel and scale (no interchangeable scale for) front dimensions 144 x 144 mm).
Terminals	M4 (voltmeters and ammeters ≤ 4A) or M6 (ammeters > 4A) M4 screw terminals with self-lifting terminal clips. Screws can be trued with cross-head or standard screw drivers.
Contact Protection	Available as option

Reference Conditions

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

Order Information

Model

S-PL96 Dimension 96x96mm. Scale 250 Degree

Range

Amp direct 1, 3, 5, 10, 20, 30, 40A.
0-1mA, 0-10mA, 0-20mA, 4-20mA or request.
Voltage 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.

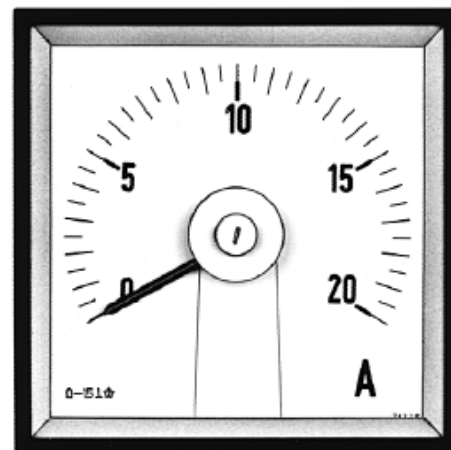
Class

Class 1.5, Standard or others by request

Example

S-PL96 Amp Meter Input shunt 100/A60mV, Range 0-100A, class 1.5 Scale 250 Degree

S-PL96 Volt Meter Input 0-150V, Range 0-150V class 1.5 Scale 250 Degree.



Type S-PL96-250

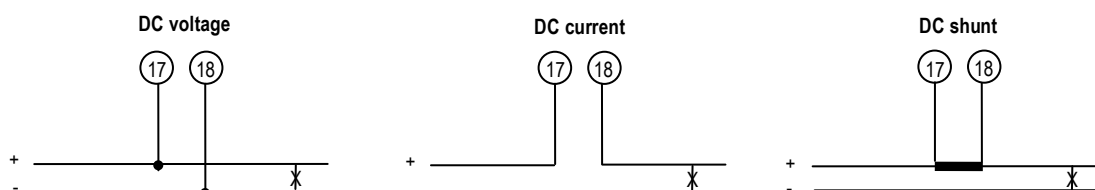
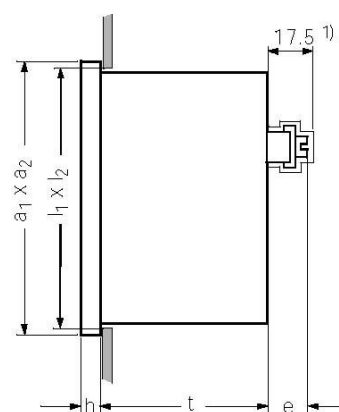
Internal Resistance / Voltage Drop / Power Consumption

Measuring Range	Ri
1 mA	337 Ω ± 20%
5 mA	16.3 Ω ± 20%
10 mA	3 Ω ± 30%
20 mA	5 Ω ± 30%
4...20 mA	6.5 Ω ± 30%
≥ 1 A	Voltage drop 150 mV ± 20%
Connection to shunt	Power consumption 10 mA ± 20%
	Lead resistance 0.06 Ω ± 20%
≥ 1V	1000 Ω/V ± 20%
Measuring Current	Measuring Voltage
1 A / 1.5 A / 2.5 A / 4 A	1 / 1.5 / 2.5 / 3 / 4 6 10V
6 A / 10 A	15 / 25 40 / 60 V
15 A / 25 A / 40 A	100 / 150 / 250 400 500 600 V

1) Indicated intermit resistance is only valid for instruments with standard accuracy classes.

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

Dimensions



Front in mm.	Nominal Dimensions ,mm.		Cutout , mm.	Installation Depth, mm.	Terminals	
	a ₁ x a ₂	h	l ₁ x l ₂	(t)	≤4A M4	>4A M6
48 x 48	48 x 48	5	45 + 0.6 x 45 + 0.6	43.5	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	43.5	12.5	-