

SINEAX A 210/A 220

Multifunctional Power Monitor

63 measured quantities
8 energy meters
5 average power values P, Q, S each

Application

The A 210/A 220 power measuring instrument is suitable for control panel mounting and measures all the important measurands in 3-phase and single-phase systems.

It displays the measurands with a high contrast 14 mm high LED display. The instrument is also suitable for measurements in high and middle voltage systems because of the freely programmable factors for the current and voltage transformers.

It replaces a large number of analog instruments and delivers high-accuracy values.

The basic execution is an instrument with 2 S0-outputs, which can be programmed as pulse or limit outputs. An extension module extends the functionality and flexibility and supports programming and communication via an RS 232/485 (selectable) interface. It supports data communication with a control system via MODBUS RTU and it can be added without making changes to the basic instrument. Memory and a digital input allow the monitoring and recording of average power values for a minimum of 83 days at 15 min intervals. This function enables the load profile to be determined. Alternatively, the digital input can be used to switch between the high and low tariffs.

Features

- Measurement of current, voltage, active, reactive and apparent power, active and reactive energy, neutral conductor current, power factor and frequency
- 4 meters for active power: Incoming/outgoing with high/low tariff
- 4 meters for reactive power: Inductive/capacitive with high/low tariff
- 5 values each for active, reactive and apparent power averages with programmable interval times
- Two S0-outputs for pulse or limit values
- Dimensions: SINEAX A 210: 96 x 96 x 46 mm
SINEAX A 220: 144 x 144 x 46 mm
- Programmable conversion factors
- Flexible power supply with an AC/DC wide-range power supply unit
- Electrically isolated current inputs (1 A or 5 A)
- Upgradeable extension module: RS 232/485 interface (MODBUS RTU), load profile memory, HT/LT switchover, or synchronizing input
- Accurate measured values for U, I ≤ 0.5%, F ≤ 0.02 Hz, others 1%
- Storage of minimum and maximum values
- Measurements in single-phase systems, 3-wire and 4-wire systems in 4 quadrant operation



Benefits

- High functionality (63 measurand values) in a compact form (depth 46 mm)
- Therefore low costs for purchase, engineering and installation
- Safe 3-way galvanic isolation between all circuits and between the 3 current inputs
- Large LED display that can be read from a distance, especially suitable for badly lit rooms
- Upgradeable extension module allows data storage and communication
- Robust front (IP 66) for tough industrial applications
- Storage of all counter values, the min./max. values, the display mode and the programmed data on failure of the power supply

Version	Order No.	
	A 210	A 220
500 V / 5 A, power supply 85 to 253 V AC/DC	149 783	152 546
500 V / 5 A, power supply 20 to 70 V AC/DC	150 300	152 554
500 V / 5 A, power supply 85 to 253 V AC/DC, with test certificate	150 318	152 562
500 V / 5 A, power supply 20 to 70 V AC/DC, with test certificate	150 326	152 570
500 V / 1 A, power supply 85 to 253 V AC/DC	152 447	152 588
500 V / 1 A, power supply 20 to 70 V AC/DC	152 702	152 736
500 V / 1 A, power supply 85 to 253 V AC/DC, with test certificate	152 710	152 752
500 V / 1 A, power supply 20 to 70 V AC/DC, with test certificate	152 728	152 744

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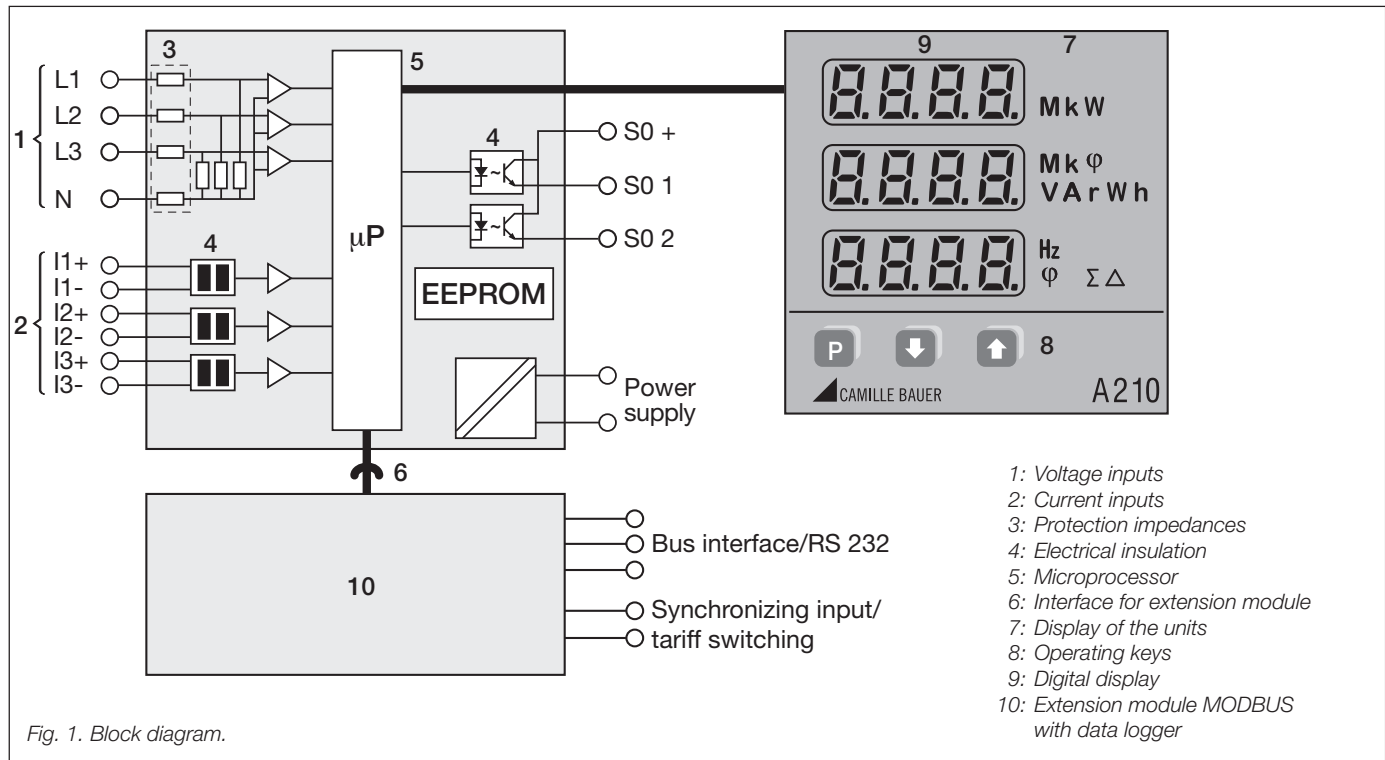
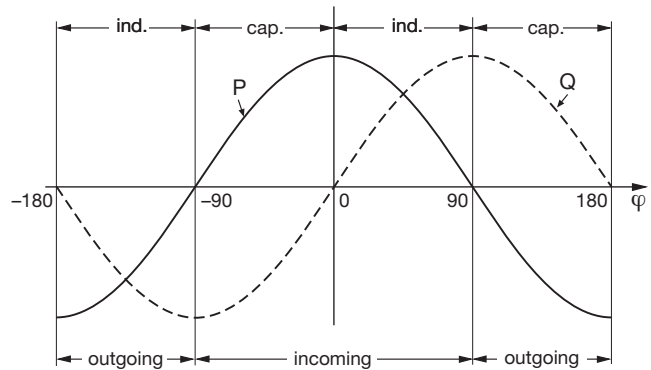
Function

The instrument measures the currents I1, I2, I3 and the voltages U1, U2, U3, the frequency, and the phase angles between the individual currents and voltages. All the other measurands are calculated from these. The measurements are made internally via integrated current transformers. Therefore it is possible to make direct connections without an external transformer.

Each input is sampled 32 times per cycle. This allows measurements to be made including up to the 15th harmonic.

The calculation of the measurands is made in accordance with DIN 40 110 part 1 and part 2, however in 4-quadrant operation.

In the figures at this data sheet only SINEAX A 210 is shown. Display and operating are identical with the A 220.



Technical data

System/application

Single-phase, 3-wire balanced or unbalanced, 4-wire balanced or unbalanced, 4-quadrant operation

Measurements available

Measured quantities	Measuring path	max	min
Voltage	1-N, 2-N, 3-N	•	•
Voltage	1-2, 2-3, 3-1	•	•
Current	1, 2, 3, N	•	
Current I _{avg} (bimetal/slave pointer)	1, 2, 3	•	
Active power P	1, 2, 3, Σ	•	
Reactive power Q	1, 2, 3, Σ	•	
Apparent power S	1, 2, 3, Σ	•	

Measured quantities	Measuring path	max	min
cosφ (4-quadrant display)	1, 2, 3, Σ		
cosφ inductive min.	1, 2, 3		•
cosφ capacitive min.	1, 2, 3		•
Frequency	U, I		
P-meter incoming/outgoing (HT/NT)	Σ		
Q-meter ind. / cap. (HT / NT)	Σ		
5 active power interval values	Σ		
5 reactive power interval values	Σ		
5 apparent power interval values	Σ		

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Programmable values (basic unit)

Trip points, pulse rate, transformer ratio, type of system, interval time for average power values.

Programming can be locked with a jumper at the back of the instrument.

However, the limit values can still be changed.

All min. and max. values and the counter values can be reset. The resetting of the counter values can also be blocked with the above mentioned jumper.

All the measurands, the selected display, the counter values and the programmed data are kept on a power failure.

Factory default

Brightness:	(mid setting)
Limit value / S01:	Off
Limit value / S02:	Off
Transformer ratio:	1 : 1
Jumper:	Not in the LOCK position
Connecting mode:	4-wire asymmetric load
Synchronizing interval:	15 min.

Applicable regulations and standards

IEC 1010 resp. EN 61 010	Safety regulations for electrical measuring, control and laboratory equipment
EN 60 529	Protection types by case
DIN 43 864	Current interface for the transmission of impulses between impulse encoder counter and tariff meter (S0 output)
DIN 40 110	AC quantities
IEC/EN 61326-1	Electrical equipment for measurement, control and laboratory use, EMC requirements
IEC/EN 61326/A1	
EN 60 688	Electrical measuring transducers for converting AC electrical variables into analogue and digital signals
IEC 68-2-1/-2/-3/-6/-27 resp. EN 60 068-2-1/-2/-3/-6/-27	Ambient tests -1 Cold, -2 Dry heat, -3 Damp heat, -6 Vibration, -27 Shock

Measuring inputs

Nominal frequency:	50, 60 Hz
Nominal input voltage:	Phase-phase: 500 V Phase-N: 290 V
Nominal input current:	5 A or 1 A
Waveform:	Sine
Own consumption:	Current circuit: $\leq I^2 \cdot 0.01 \Omega$ Voltage circuit: $\leq \frac{U_{LN}^2}{300 \text{ k}\Omega}$

Continuous thermal rating of inputs

10 A at 346 V in single-phase AC system

10 A at 600 V in three-phase system

Short-time thermal rating of inputs

Input variable	Number of inputs	Duration of overload	Interval between two overloads
557 V LN	10	1 s	10 s
100 A	10	1 s	100 s
100 A	5	3 s	5 min.

Measuring range

U, I, S: $\leq 120\%$ of nominal value

P, Q: $\leq \pm 120\%$ of nominal value

F: 45 to 65 Hz

$\cos\varphi$: ± 1

Overload indicator: oL

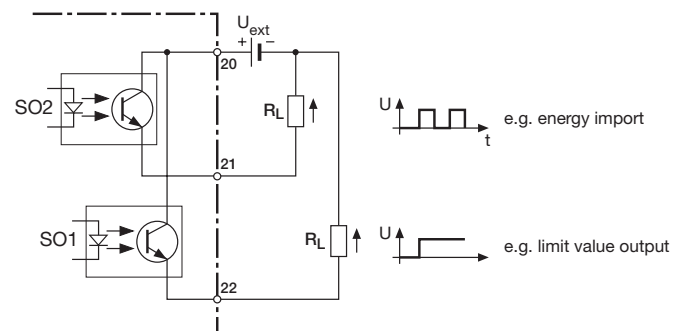
The frequency is measured from the current or voltage. The voltage has priority.

Pulse/limit value outputs

Depending on the function selected, the two digital outputs can be used either as pulse outputs for actual and reactive energy or as limit signals.

The outputs are passive, and are galvanically isolated from all the other circuits by opto-couplers. They are suitable to drive tariff devices (S0-standard DIN 43 864) or 24 V-relais.

U_{ext}	$\leq 40 \text{ V DC}$	(OFF: leakage current $\leq 0.1 \text{ mA}$)
I_L	$\leq 150 \text{ mA}$	(ON: terminal voltage $\leq 1.2 \text{ V}$)



Limit value outputs:

the limits can be associated with any measurand. Depending on the type of connection an OR or an AND function is possible for the following values.

3-wire unbalanced load: $U_{12}/U_{23}/U_{31}$, $I_1/I_2/I_3$, $I_{avg1}/I_{avg2}/I_{avg3}$

4-wire unbalanced load: $U_1/U_2/U_3$, $U_{12}/U_{23}/U_{31}$, $I_1/I_2/I_3$, $I_{avg1}/I_{avg2}/I_{avg3}$, $P_1/P_2/P_3$, $Q_1/Q_2/Q_3$, $S_1/S_2/S_3$, $PF_1/PF_2/PF_3$

Alarm ON: OR function of the phase measurands

Alarm OFF: AND function of the phase measurands

Delay time: Fixed at 1 s (cannot be modified)

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Pulse outputs:

The reactive and active energy can be read out at the pulse outputs in the form of standard S0 pulses for the driving of electronic and electromechanical counting mechanisms.

The pulse rate is programmable:

1 ... 5000 Imp./Wh ... GWh resp. 1 ... 5000 Imp/varh ... Gvarh

The duration of the pulses cannot be programmed and also cannot be changed by hardware means.

Pulse duration: > 100 ms

For systems with external transformers, the pulses are for the primary energy data.

Power supply

DC, AC power pack 45 to 400 Hz

85 to 253 V AC/DC or

20 to 70 V AC/DC

Power consumption: < 4 VA (with interface module)
< 3 VA (without interface module)

Display

14 mm LED digital display; adjustable brightness

3 digits with sign, frequency: 4 digits, energy: 8 digits

Colour: red

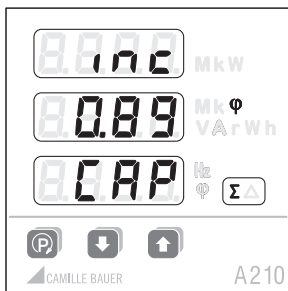
Zero value suppression

PF resp. $\cos\varphi$: Display ---, if $S_x < 1\% S_{nenn}$

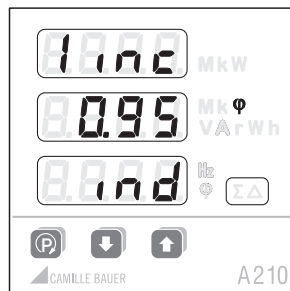
IN: Display 0, if $I_N < 3\% I_{nenn}$

Ix: Display 0, if $I_x < 1\% I_{nenn}$

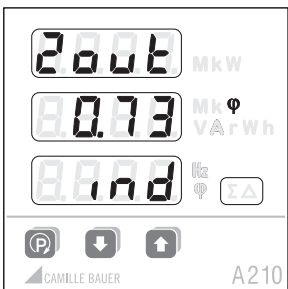
Example of the display for 4-quadrant measurements



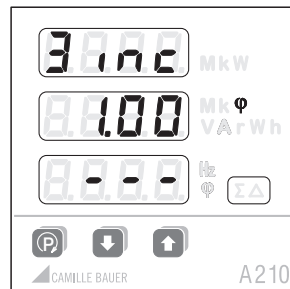
System



Phase 1



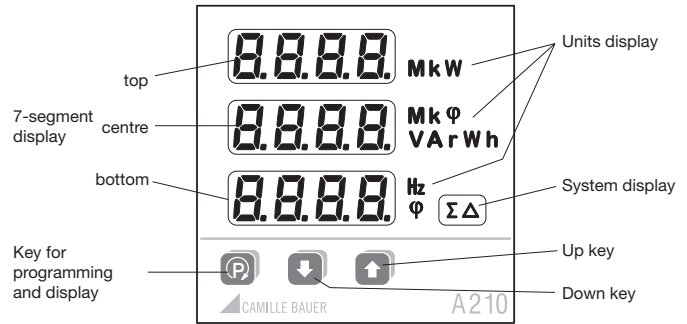
Phase 2



Phase 3

ind inductive
cap capacitive

inc incoming
out outgoing



Display levels: e.g. 4-wire unbalanced load

		a	b	c	d	e	f
 	1	U1 U2 U3	U1 _{max.} U2 _{max.} U3 _{max.}	U1 _{min.} U2 _{min.} U3 _{min.}	U12 U23 U31	U12 _{max.} U23 _{max.} U31 _{max.}	U12 _{min.} U23 _{min.} U31 _{min.}
	2	I1 I2 I3	I1 _{max.} I2 _{max.} I3 _{max.}	I1 _{avg.} I2 _{avg.} I3 _{avg.}	I1 _{avgmax.} I2 _{avgmax.} I3 _{avgmax.}	IN	IN _{max.}
	3	P1 P2 P3	P1 _{max.} P2 _{max.} P3 _{max.}	P	P _{max.}		
	4	Q1 Q2 Q3	Q1 _{max.} Q2 _{max.} Q3 _{max.}	Q	Q _{max.}		
	5	S1 S2 S3	S1 _{max.} S2 _{max.} S3 _{max.}	S	S _{max.}		
	6	PF1	PF2	PF3	PF	PF _{minind}	PF _{mincap}
	7	F					
	8	EP inc HT ¹	EP inc LT ²	EP out HT ¹	EP out LT ²		
	9	EQ ind HT ¹	EQ ind LT ²	EQ cap HT ¹	EQ cap LT ²		
	10	P Q PF	P S F				
	11	Pint0	Pint1	Pint2	Pint3	Pint4	
	12	Qint0	Qint1	Qint2	Qint3	Qint4	
	13	Sint0	Sint1	Sint2	Sint3	Sint4	

¹ HT = High tariff

² LT = Low tariff

Safety

Protection class: II
Overvoltage category: III
Pollution degree: 2
Enclosure protection: Front: IP 66
Terminals and housing: IP 20

Insulation test (versus earth): 300 V
Surge test: 4.25 kV; 1.2/30 μs

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Test voltage:

The voltage inputs are fitted with protection impedances. (Circuits for double isolation in accordance with EN 61 010 6.5.3). After this the basic isolation is sufficient (2.2 kV AC).

Power supply ↔ input I, output and housing: 3.7 kV AC

Input I ↔ other circuits and housing: 3.7 kV AC

Input I ↔ input I: 2.2 kV AC

Inputs, outputs and power supply are electrically isolated. The current inputs are electrically isolated from each other.

Accuracy data

Reference conditions acc. to IEC 688 resp. EN 60 688

Sine 50 - 60 Hz, 15 - 30°C, application group II

Measurement accuracy (related to nominal value)

Current, voltage	± 0.5%
Power	± 1.0%
Power factor	± 1.0%
Energy	± 1.0%
Frequency	± 0.02 Hz (abs.)

Mechanic

Dimensions	A 210:	96 x 96 x 46 mm; Panel cutout 92 ^{+0,8} x 92 ^{+0,8} mm
	A 220:	144 x 144 x 46 mm; Panel cutout 138 ⁺¹ x 138 ⁺¹ mm

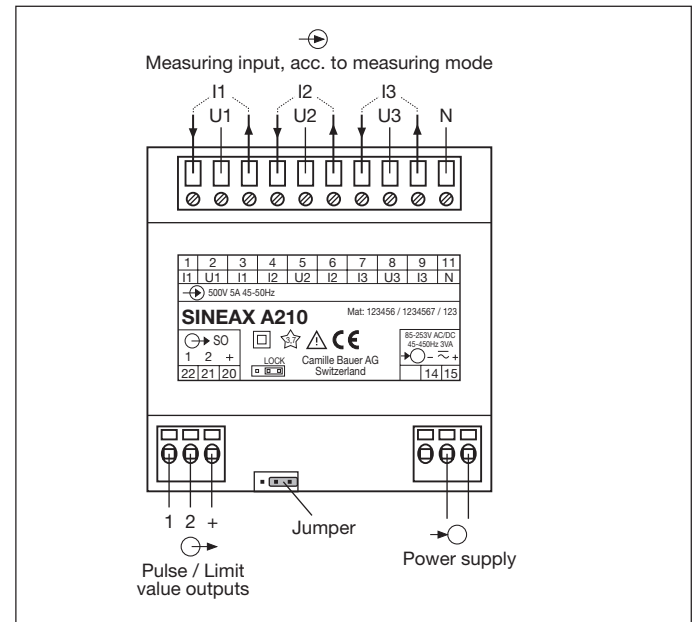
Terminals:

Inputs	Screw terminals Wire gauge single wire: 0.5 - 2.5 mm ² Wire gauge fine wire: 0.5 - 1.5 mm ²
Power supply, outputs	Clamps Wire gauge single and fine wire: 0.5 - 1.5 mm ²
Housing material:	Flammability class UL 94 HB
Weight:	250 g at A 210 resp. 300 g at A 220
Mounting:	For control panel mounting

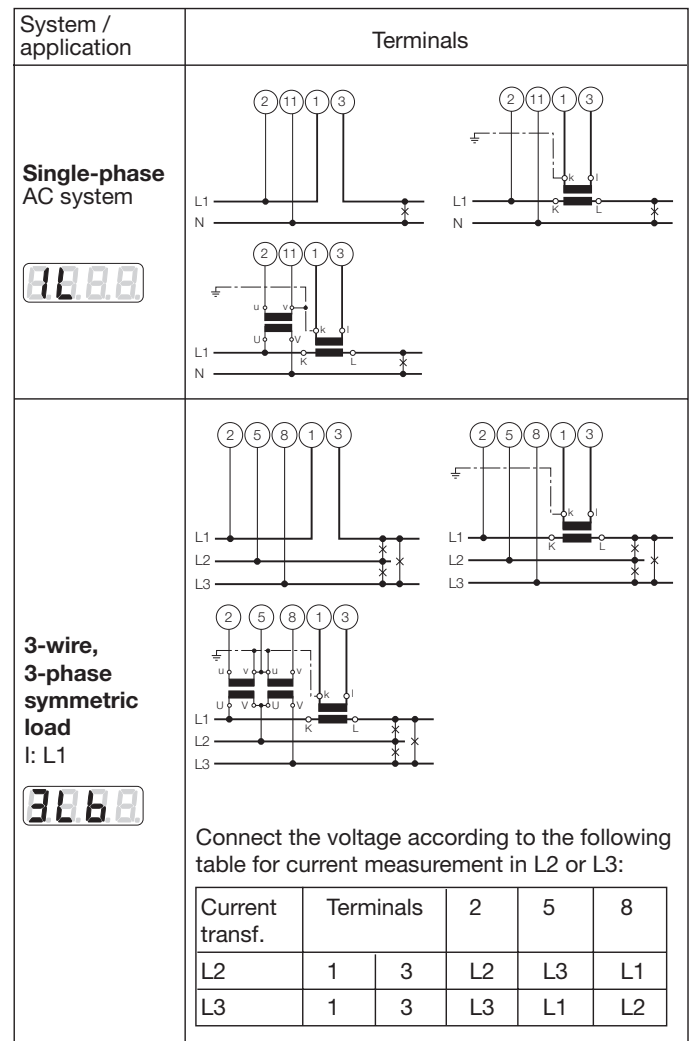
Environmental conditions

Operating temperature:	- 10 to + 55 °C
Storage temperature:	- 25 to + 70 °C
Humidity relative:	≤ 75%
Altitude:	2000 m max.
Indoor use statement	

Electrical connections


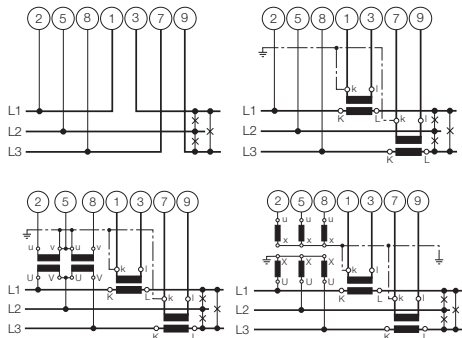

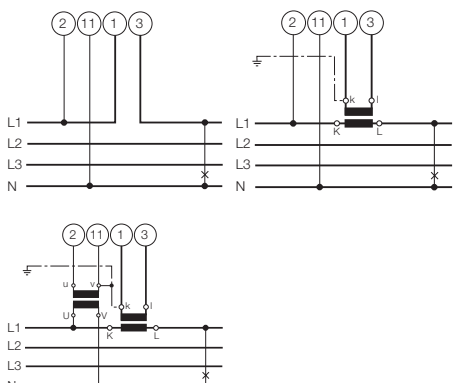

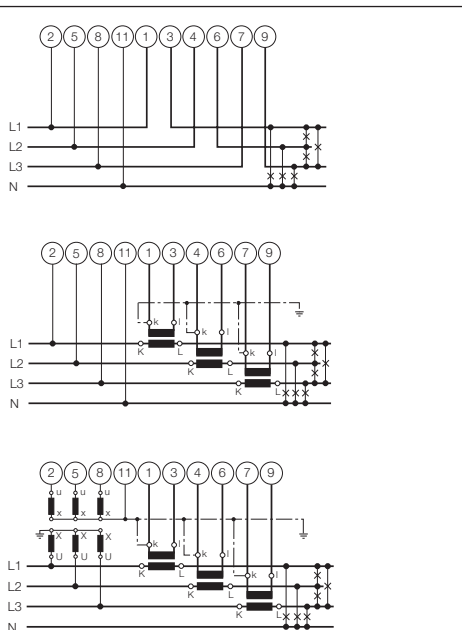


Connecting modes



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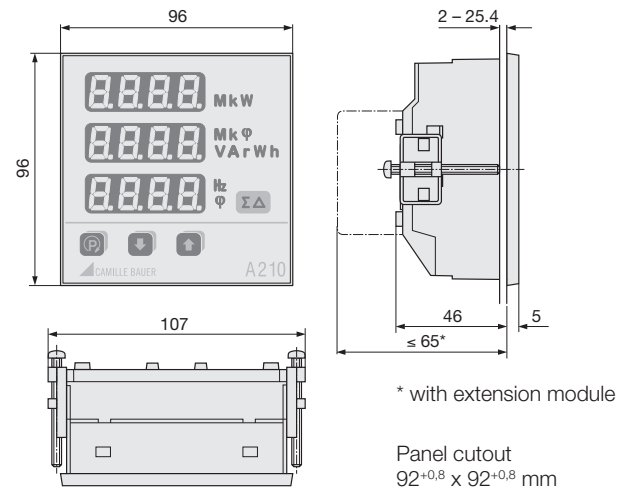
System / application	Terminals												
3-wire 3 phase asymmetric load 													
4-wire 3 phase symmetric load I: L1 	 <p>Connect the voltage according to the following table for current measurement in L2 or L3:</p> <table border="1"> <thead> <tr> <th>Current transf.</th> <th>Terminals</th> <th>2</th> <th>11</th> </tr> </thead> <tbody> <tr> <td>L2</td> <td>1</td> <td>3</td> <td>N</td> </tr> <tr> <td>L3</td> <td>1</td> <td>3</td> <td>N</td> </tr> </tbody> </table>	Current transf.	Terminals	2	11	L2	1	3	N	L3	1	3	N
Current transf.	Terminals	2	11										
L2	1	3	N										
L3	1	3	N										
4-wire 3 phase asymmetric load 	 <p>3 single-pole insulated voltage transformers in high-voltage system</p>												

Maintenance

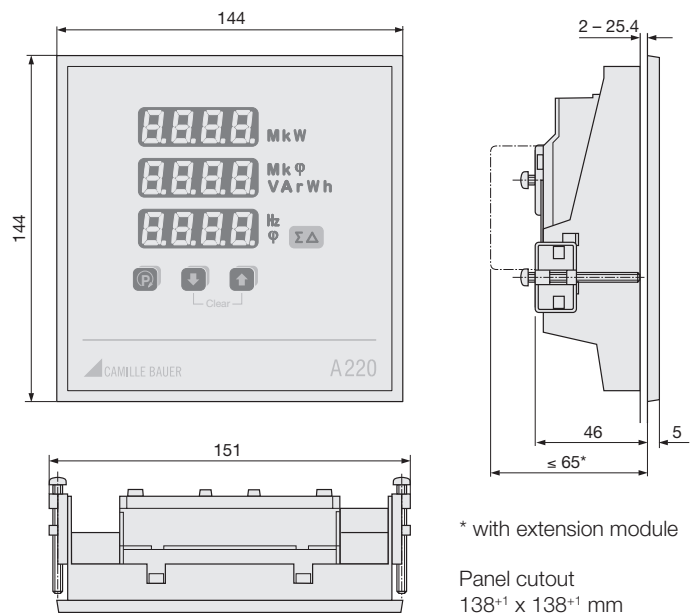
No maintenance is required.

Dimensional drawings

SINEAX A 210



SINEAX A 220



All dimensions in mm.

SINEAX A 210/A 220 Multifunctional Power Monitor

Scope of supply

Basic unit without extension module

Operating Instructions in German, French and English
Fixing clamp

Measuring protocol at instruments with order No.:

A 210: 150 318, 150 326, 152 710 and 152 728

A 220: 152 562, 152 570, 152 752 and 152 744

Accessories SINEAX A 210/A 220

Description	Article No.
Extension module EMMOD 201 Interface/MODBUS RTU/data logger	150 285
Top-hat rail adapter (A 210 only)	154 055
Operating Instructions in German, French and English	151 118

The EMMOD 201 extension module can be plugged in later. It is not necessary to make changes to the basic instrument.

Extension module EMMOD 201

The EMMOD 201 extension module extends both the functionality and flexibility of the basic A 2.. instruments and supports programming and communication via the RS 232/485 interface (selectable). It supports data communication with a control system with the MODBUS RTU. It can be added without modifying the basic instrument. Memory and a digital input support the supervision and recording of average power values at an interval of 15 minutes for at least 83 days. This function determines the values for the load profile. Alternatively, the digital input can be used for switching between high and low tariff.

The A 200 plus software is required to program the basic A 2.. instrument with a PC and the EMMOD 201, and to read and select the values in memory.

Power supply

The EMMOD 201 is supplied from the A 2.. basic instrument.

Communication

Interface: RS 232/RS 485 switchable
Protocol: MODBUS RTU for SCADA
Digital input: Synchronizing input for average power values or switching between high/low tariff for the energy counters

Bus interface address: 1 to 247
Baudrate: 1200, 2400, 4800, 9600, 19.2 k
Parity check: no, even, odd, space

Recording average power values

Values that can be recorded:

Pint: active power average value with sign (incoming + / outgoing -)

Qint: reactive power average value (inductive + / capacitive -)

Amount of data at 15 min intervals:

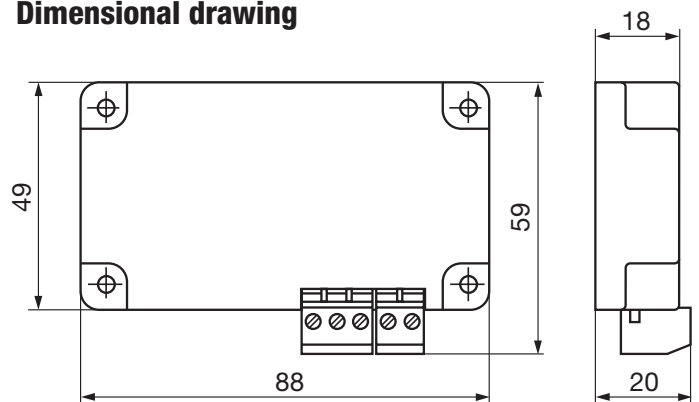
1 value (Pint or Qint) = 166 days
2 values (Pint and Qint) = 83 days

Accessories EMMOD 201 (not included in scope of supply)

Description	Article No.
Software A200 plus *)	146 557
Interface adapter cable	152 603
Extension cable sub-D 9pol. 2 m	980 179

*) Download free of charge under <http://www.camillebauer.ch>

Dimensional drawing



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