Operating Instructions
Programmable multi-transducer SINEAX M 561 / M 562

Contents

1. Read first and then …

The proper and safe operation of the device assumes that the Operating Instructions are **read** and the safety warnings given in the sections

3. Mounting
4. Electrical connections
5. Commissioning
10. Safety notes

are **observed**.

The device should only be handled by appropriately trained personal who are familiar with it and authorized to work in electrical installations.

Unauthorized repair or alteration of the unit invalidates the warranty.

2. Brief description

SINEAX M 561 / M 562 is a programmable transducer with a **RS 232 C interface**. It supervises any 1 resp. 2 variables of an electrical power system **simultaneously** and generated 1 resp. 2 electrically insulated analog output signals.

The transducers are also equipped with an **RS 232** serial interface to which a PC with the corresponding software can be connected for programming or accessing and.

The usual methods of connection, the types of measured variables, their ratings, the transfer characteristic for each output etc. are the main parameters that can be programmed.

The ancillary functions include displaying, recording and evaluation of measurements on a PC, the simulation of the outputs for test purposes and a facility for printing nameplates.

3. Mounting

The transducer SINEAX M 561 / M 562 can be mounted on a top-hat rail.

Note “**Environmental conditions”** in Section **“5.1 Technical data”** when determining the place of installation!

Simply clip the device onto the top-hat rail (EN 50 022) (see Fig. 1).

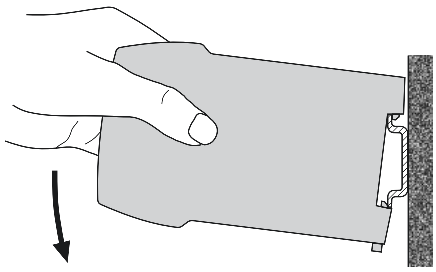


Fig. 1. Mounting on top-hat rail 35 ×15 or 35×7.5 mm.

4. Electrical connections

Connect the electric conductors acc. to the instructions on type label. Note, that the direction of energy and the phase sequence are adhered to.

Make sure that all cables are not live when making the connections!

Impending danger by high input voltage or high power supply voltage!

Note that, …

… the data required to carry out the prescribed measurement must correspond to those marked on the nameplate of the SINEAX M 561 / M 563 (⊸ measuring input, ○→ measuring output and →○ power supply, see Fig 2)!

… the resistance in the output circuit may not **overrange** the current output value

$$R_{ext} \text{ max. } [k\Omega] \leq \frac{15 \text{ V}}{I_{AN} \text{ [mA]}}$$

(I_{AN} = current output value)

and not **underrange** the voltage output value

$$R_{ext} \text{ min. } [k\Omega] \geq \frac{U_{AN} \text{ [V]}}{1 \text{ mA}}$$

(U_{AN} = voltage output value)

… the measurement output cables should be twisted pairs and run as far as possible away from heavy current cables!

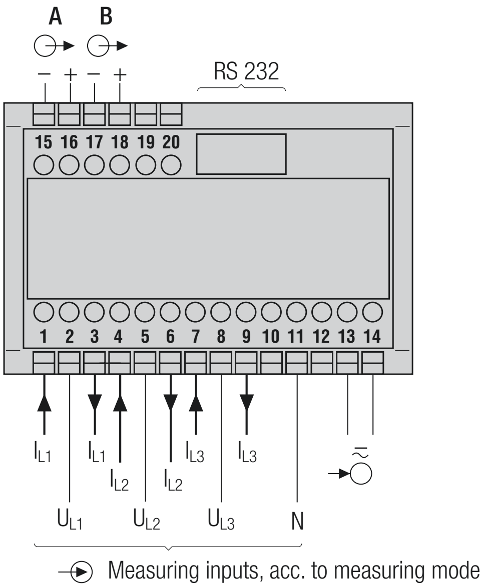
In all other respects, observe all local regulations when selecting the type of electrical cable and installing them!

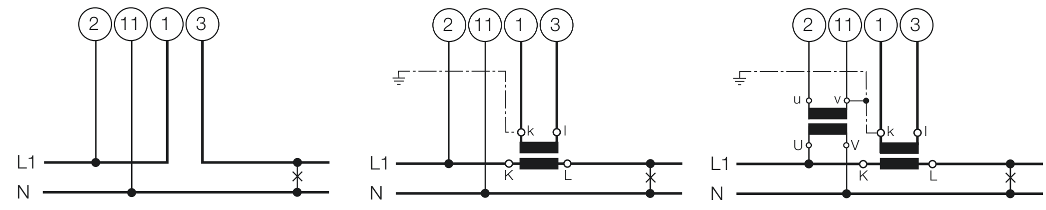
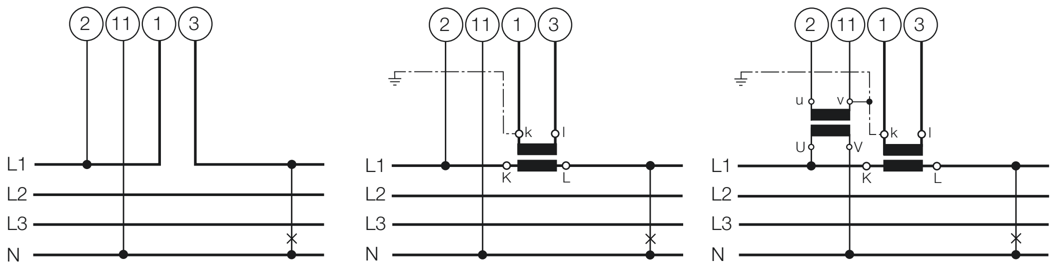
Function			Connect.
Measuring input	AC current	IL1	1 / 3
		IL2	4 / 6
		IL3	7 / 9
	AC voltage	UL1	2
		UL2	5
		UL3	8
		N	11
Outputs	Analog		
	A	–	15
		+	16
	B	–	17
		+	18
Power supply	AC	~	13
		~	14
	DC	–	13
		+	14
RS 232 C interface			

*) M 561: Output A
M 562: Outputs A and B

If power supply is taken from the measured voltage internal connections are as follow:

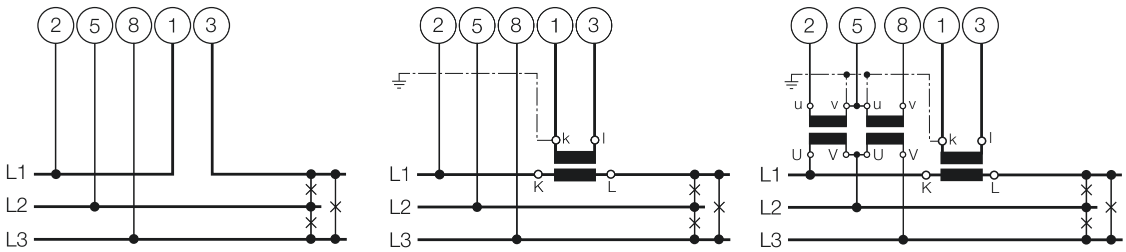
Application (system)	Internal connection Terminal / System
Single-phase AC current	2 / 11 (L1 – N)
4-wire 3-phase symmetric load	2 / 11 (L1 – N)
All other (apart from feature 9, lines E, F and J)	2 / 5 (L1 – L2)

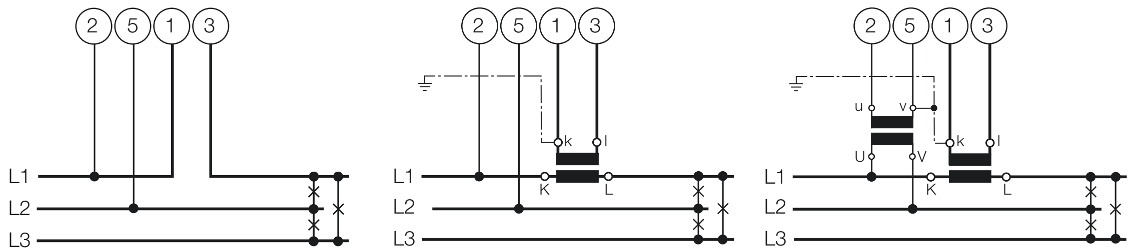


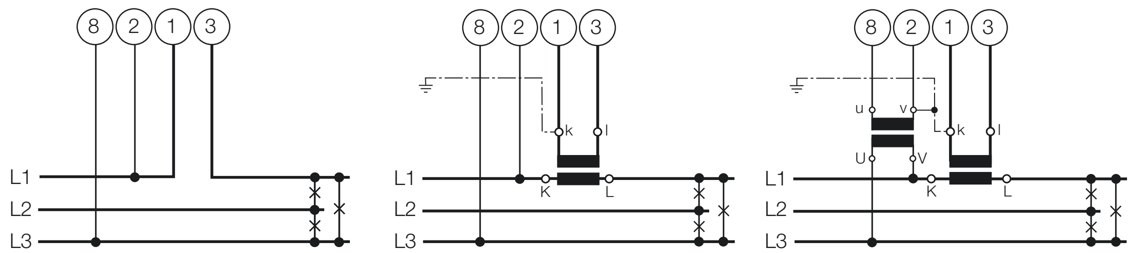
	Measuring inputs
System / Application	Terminals
Single-phase AC system	
4-wire 3-phase **symmetric load** **I: L1**	

Connect the voltage according to the following table for current measurement in L2 or L3:

Current transf.	Terminals		2	11
L2	1	3	L2	N
L3	1	3	L3	N

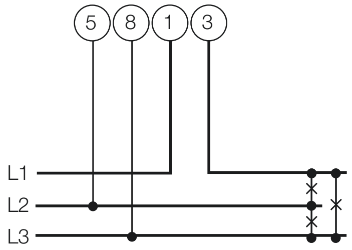
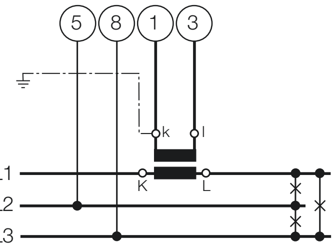
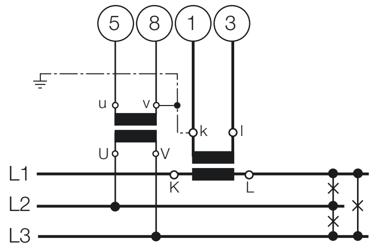
<table>
<tr><th colspan="2">Measuring inputs</th></tr>
<tr><td>System / application</td><td>Terminals</td></tr>
<tr><td>3-wire
3-phase
symmetric load
I: L1</td><td>


Connect the voltage according to the following table for current measurement in L2 or L3:
<table>
<tr><td>Current transf.</td><td colspan="2">Terminals</td><td>2</td><td>5</td><td>8</td></tr>
<tr><td>L2</td><td>1</td><td>3</td><td>L2</td><td>L3</td><td>L1</td></tr>
<tr><td>L3</td><td>1</td><td>3</td><td>L3</td><td>L1</td><td>L2</td></tr>
</table>
</td></tr>
<tr><td>3-wire
3-phase
symmetric load
Phase-shift
U: L1 – L2
I: L1</td><td>


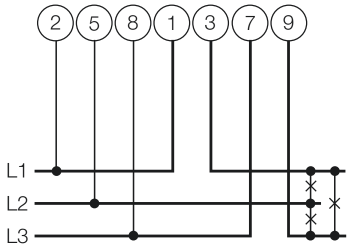
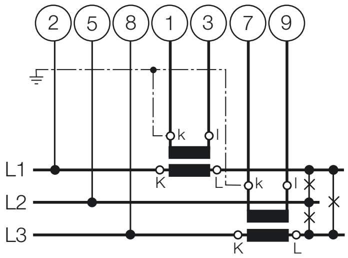
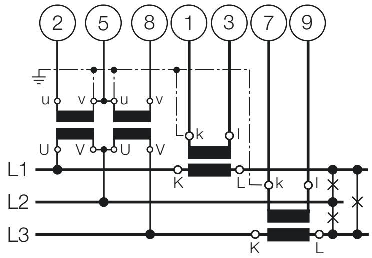
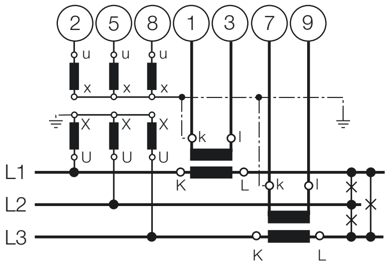
Connect the voltage according to the following table for current measurement in L2 or L3:
<table>
<tr><td>Current transf.</td><td colspan="2">Terminals</td><td>2</td><td>5</td></tr>
<tr><td>L2</td><td>1</td><td>3</td><td>L2</td><td>L3</td></tr>
<tr><td>L3</td><td>1</td><td>3</td><td>L3</td><td>L1</td></tr>
</table>
</td></tr>
<tr><td>3-wire
3-phase
symmetric load
Phase-shift
U: L3 – L1
I: L1</td><td>


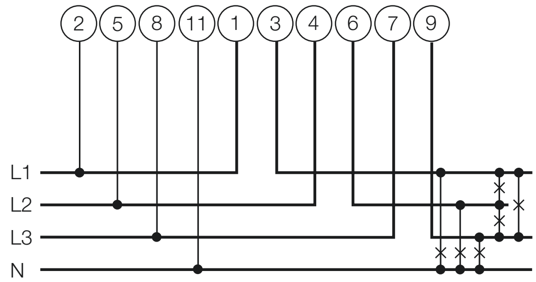
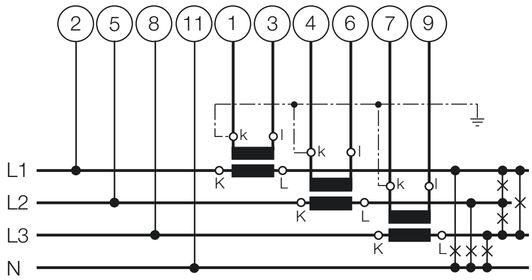
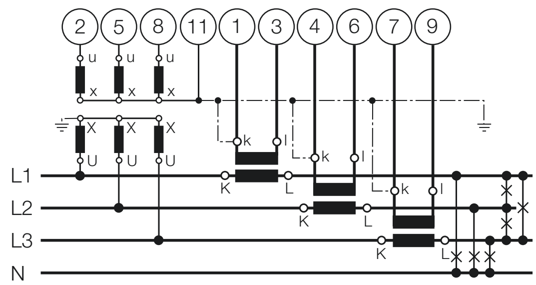
Connect the voltage according to the following table for current measurement in L2 or L3:
<table>
<tr><td>Current transf.</td><td colspan="2">Terminals</td><td>8</td><td>2</td></tr>
<tr><td>L2</td><td>1</td><td>3</td><td>L1</td><td>L2</td></tr>
<tr><td>L3</td><td>1</td><td>3</td><td>L2</td><td>L3</td></tr>
</table>
</td></tr>
</table>

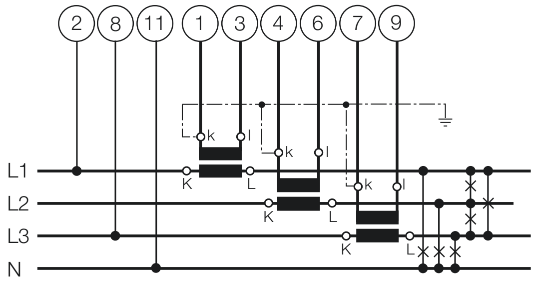
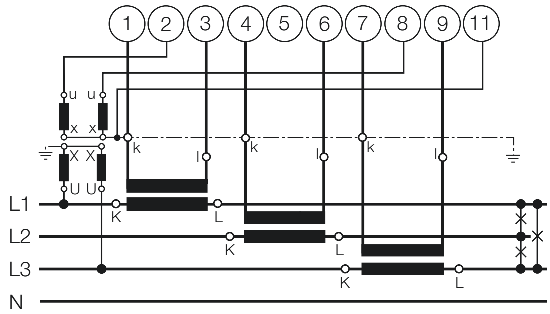
Measuring inputs

System / application	Terminals
3-wire 3-phase **symmetric load** Phase-shift U: L2 – L3 I: L1	   Connect the voltage according to the following table for current measurement in L2 or L3:

Current transf.	Terminals		5	8
L2	1	3	L3	L1
L3	1	3	L1	L2

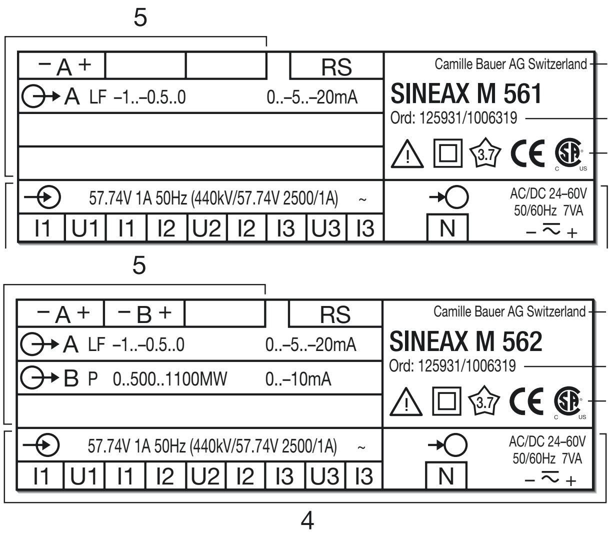
System / application	Terminals
3-wire 3-phase **asymmetric load**	   

System / application	Terminals
4-wire 3-phase **asymmetric load**	   3 single-pole insulated voltage transformers in high-voltage system

Measuring input	
System / application	Terminals
4-wire 3-phase **asymmetric load,** Open Y connection	 Low-voltage system  2 single-pole insulated voltage transformers in high-voltage system

5. Commissioning

> ⚠ Prior to starting, check that the connection data of the transducer agrees with the system data (see type label).
>
> The power supply to the transducer can then be switched on and the signals applied to the measuring inputs.



Measuring input
Rated value of the input voltage Ur
Rated value of the input current Ir
The figures in brackets are the ratios of the main v.t's and c.t's referred to Ur and Ir
Nominal frequency
System
~e.g. AC current

Measuring output
Output signal

Power supply

1 Manufacturer
2 Works No.
3 Test and conformity mark
4 Terminals
Input quantities and power supply
5 Terminals
Output quantities

Fig. 2. Declaration to type labels.

5.1 Technical data

Symbols

Symbols	Meaning
X	Measured variable
X0	Lower limit of the measured variable
X1	Break point of the measured variable
X2	Upper limit of the measured variable
Y	Output variable
Y0	Lower limit of the output variable
Y1	Break point of the output variable
Y2	Upper limit of the output variable (Hardware)
Y2 SW	Programmed upper limit of the output variable
U	Input voltage
Ur	Rated value of the input voltage
U 12	Phase-to-phase voltage L1 – L2
U 23	Phase-to-phase voltage L2 – L3
U 31	Phase-to-phase voltage L3 – L1
U1N	Phase-to-neutral voltage L1 – N
U2N	Phase-to-neutral voltage L2 – N
U3N	Phase-to-neutral voltage L3 – N
I	Input current
I1	AC current L1
I2	AC current L2
I3	AC current L3
Ir	Rated value of the input current
IM	Average value of the currents (I1 + I2 + I3) / 3
IMS	Average value of the currents and sign of the active power (P)
IB	RMS value of the current with wire setting range (bimetal measuring function)
IBT	Response time for IB
BS	Slave pointer function for the measurement of the RMS value IB

BST	Response time for BS
φ	Phase-shift between current and voltage
F	Frequency of the input variable
Fn	Rated frequency
P	Active power of the system P = P1 + P2 + P3
P1	Active power phase 1 (phase-to-neutral L1 – N)
P2	Active power phase 2 (phase-to-neutral L2 – N)
P3	Active power phase (phase-to-neutral L3 – N)
Q	Reactive power of the system Q = Q1 + Q2 + Q3
Q1	Reactive power phase 1 (phase-to-neutral L1 – N)
Q2	Reactive power phase 2 (phase-to-neutral L2 – N)
Q3	Reactive power phase 3 (phase-to-neutral L3 – N)
S	Apparent power of the system
S1	Apparent power phase 1 (phase-to-neutral L1 – N)
S2	Apparent power phase 2 (phase-to-neutral L2 – N)
S3	Apparent power phase 3 (phase-to-neutral L3 – N)
Sr	Rated value of the apparent power of the system
PF	Active power factor cosφ = P/S
PF1	Active power factor phase 1 P1/S1
PF2	Active power factor phase 2 P2/S2
PF3	Active power factor phase 3 P3/S3
QF	Reactive power sin φ = Q/S
QF1	Reactive power factor 1 Q1/S1
QF2	Reactive power factor 2 Q2/S2
QF3	Reactive power factor 3 Q3/S3
LF	Power factor of the system LF = sgnQ · (1 – |PF|)
LF1	Power factor phase 1 sgnQ1 · (1 – |PF1|)
LF2	Power factor phase 2 sgnQ2 · (1 – |PF2|)
LF3	Power factor phase 3 sgnQ3 · (1 – |PF3|)
c	Factor for the intrinsic error
R	Output load
Rn	Rated burden
H	Power supply
Hn	Rated value of the power supply
CT	c.t. ratio
VT	v.t. ratio

Measuring input

Waveform: Sinusoidal

Rated frequency: 50 or 60 Hz

Consumption [VA] (with external power supply): Voltage circuit: U^2 / 400 kΩ
Current circuit: ≤ I^2 · 0.01 Ω

Thermal rating of inputs

Input variable	Number of inputs	Duration of overload	Interval between two overloads
Current circuit	400 V single-phase AC system 693 V three-phase system		
12 A	——	continu.	——
120 A	10	1 s	100 s
120 A	5	3 s	5 min.
250 A	1	1 s	1 hour
Voltage circuit			
480 V/831 V[1]	——	contin.	——
600 V/1040 V[1]	10	10 s	10 s
800 V/1386 V[1]	10	1 s	10 s

[1] Maximum 264 V across the power supply when it is obtained from the measured variable with a power supply unit for 85 - 230 V DC/AC and maximum 69 V with a power supply unit for 24 - 60 V DC/AC.

Analog outputs

For the outputs A and B:

Output variable Y	Impressed DC current	Impressed DC voltage
Full scale Y2	1 ≤ Y2 ≤ 20 mA	5 ≤ Y2 ≤ 10 V
Limits of output signal for input overload and/or R = 0	1.2 · Y2	40 mA
R → ∞	30 V	1.2 Y2
Rated useful range of output lead	$0 \le \frac{7.5\ V}{Y2} \le \frac{15\ V}{Y2}$	$\frac{Y2}{2\ mA} \le \frac{Y2}{1\ mA} \le \infty$
AC component of output signal (peak-to-peak)	≤ 0.02 Y2	≤ 0.02 Y2

The outputs A and B may be either short or open-circuited. They are electrically insulated from each other and from all other circuits (floating).

All the full-scale output values can be reduced subsequently using the programming software, but a supplementary error results.

System response

Accuracy class: (the reference value is the full-scale value Y2)

Measured variable	Condition	Accuracy class[1]
System: Active, reactive and apparent power	0.5 ≤ X2/Sr ≤ 1.5 0.3 ≤ X2/Sr < 0.5	0.5 c 1.0 c
Phase: Active, reactive and apparent power	0.167 ≤ X2/Sr ≤ 0.5 0.1 ≤ X2/Sr < 0.167	0.5 c 1.0 c
Power factor, active power and reactive power	0.5Sr ≤ S ≤ 1.5 Sr, (X2 - X0) = 2	0.5 c
	0.5Sr ≤ S ≤ 1.5 Sr, 1 ≤ (X2 - X0) < 2	1.0 c
	0.5Sr ≤ S ≤ 1.5 Sr, 0.5 ≤ (X2 - X0) < 1	2.0 c
	0.1Sr ≤ S < 0.5Sr, (X2 - X0) = 2	1.0 c
	0.1Sr ≤ S < 0.5Sr, 1 ≤ (X2 - X0) < 2	2.0 c
	0.1Sr ≤ S < 0.5Sr, 0.5 ≤ (X2 - X0) < 1	4.0 c
AC voltage	0.1 Ur ≤ U ≤ 1.2 Ur	0.5 c
AC current/ current averages	0.1 Ir ≤ I ≤ 1.2 Ir	0.5 c
System frequency	0.1 Ur ≤ U ≤ 1.2 Ur resp. 0.1 Ir ≤ I ≤ 1.2 Ir	0.15 + 0.03 c

[1] Basic accuracy 1.0 c for applications with phase-shift

Duration of the measurement cycle: Approx. 0.6 to 1.6 s at 50 Hz, depending on measured variable and programming

Response time: 1 … 2 times the measurement cycle

Factor c (the highest value applies):

Linear characteristic:

$$c = \frac{1 - \frac{Y0}{Y2}}{1 - \frac{X0}{X2}} \quad \text{or } c = 1$$

Bent characteristic:
X0 ≤ X ≤ X1

$$c = \frac{Y1 - Y0}{X1 - X0} \cdot \frac{X2}{Y2} \quad \text{or } c = 1$$

X1 < X ≤ X2

$$c = \frac{1 - \frac{Y1}{Y2}}{1 - \frac{X1}{X2}} \quad \text{or } c = 1$$

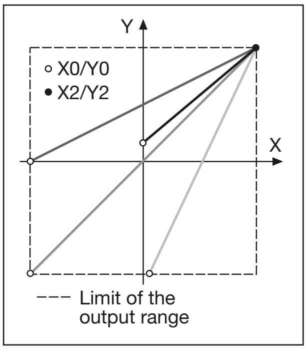


Fig. 3. Examples of settings with linear characteristic.

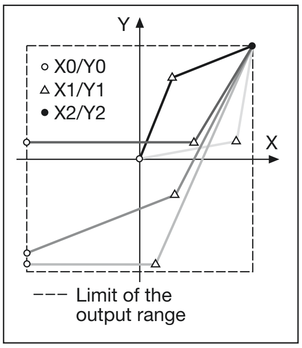


Fig. 4. Examples of settings with bent characteristic.

(System response inversely configurable)

Influencing quantities and permissible variations

Acc. to IEC 688

Safety

Protection class: II (protection isolated, IEC 1010)

Enclosure protection: IP 40, housing (test wire, IEC 529)
IP 20, terminals (test finger, IEC 529)

Pollution degree: 2

Installation category: III (with ≤ 300 V)
II (with > 300 V)

Insulation test: Inputs: 300 V [2]
600 V [3]
Power supply: 230 V
Outputs: 40 V

Power supply →○

AC/DC power pack (DC or 50/60 Hz)

Rated voltage	Tolerance
24 - 60 V DC / AC	DC – 15 to + 33% AC ± 15%
85 - 230 V DC / AC	

Power consumption: ≤ 5 W resp. ≤ 7 VA

Option

Power supply from measuring input (self powered): ≥ 24 - 60 V AC or 85 - 230 V AC

⚠ Please note the max. and min. measuring input voltage!

Type label inscription (* acc. to application N or U2)	Input voltage range = internal power supply range	Tolerance	Power supply connection
Self powered by U1/* (int. 24-60 V)	24 - 60 V AC	± 15%	Internal measuring input
Self powered by U1/* (int. 85-230 V)	85 - 230 V AC		

[2] Overvoltage category III

[3] Overvoltage category II

Programming connector on transducer

The programming connector on the transducer is connected by the programming cable PRKAB 560 to the RS-232 interface on the PC. The electrical insulation between the two is provided by the programming cable.

Ambient conditions

Nominal range of use for temperature:	0…15…30…45 °C (usage group II)
Operating temperature:	– 10 to + 55 °C
Storage temperature:	–40 to + 85 °C
Annual mean relative humidity:	≤ 75%
Altitude:	2000 m max.
Indoor use statement	

5.2 Programming the transducer ⚠

The transducers SINEAX M 561 / M 562 have an integrated RS 232 C interface (SCI).

The existing programmation can be matched conveniently to a changed situation and stored via the "Configuration software for M 560" (Order number 146 557).

For this purpose, the RS 232 output of the transducer must be connected to a PC via the RS 232 C (SCI) programming cable (Order number 147 779 and 143 587) and the transducer must be supplied with power supply.

The configuration software has an easy-to-operate, clear menu structure which allows for the following functions to be performed:

- Reading and displaying the programmed configuration of the transducer
- Clear presentation of the input and output parameters
- Transmission of changed programmation data to the transducer and for archiving of a file
- Protection against unauthorized change of the programmation by entry of a password
- Configuration of all the usual methods of connection (types of power system)

Fig. 5. Presentation of all programmation parameters in the main menu.

- Easy change of input and output parameters

  WARNING: Watch for maximum input voltage on transducers with internal power supply connection from measuring input:

Power supply	Power supply connection	Maximum input voltage across the power supply
24 - 60 V AC	Internal from measuring input	69 V AC
85 - 230 V AC		264 V AC

- Selection possible for frequency measurement via voltage or current
- Possibility to reset the slave pointer of the output quantity involved
- Parameter setting of outputs A and B (input of measured quantity, upper limits, limitation of upper limits and response time per output, possible up to max. 30 s)
- Graphics display of the set system behaviour of each output

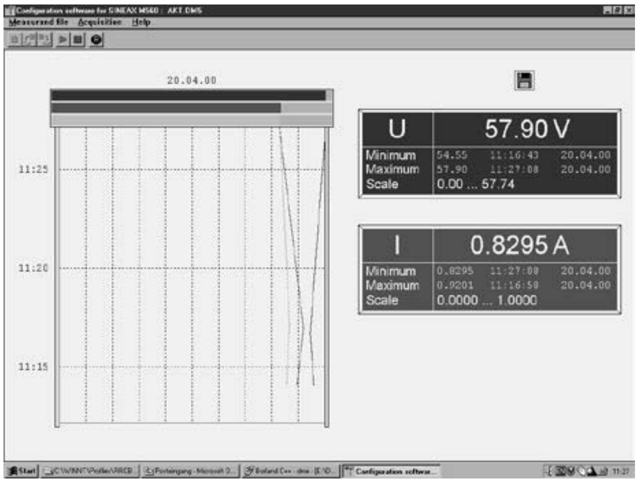


Fig. 6. Displaying, recording and evaluation of measurements.

Provision is also made for the following ancillary functions:

- Displaying, recording and evaluation of measurements on a PC
- The simulation of the outputs for test purposes
- Printing of nameplates

6. Reconfiguring the analog outputs

The alternative configurations for the analog outputs can be seen from Table 1.

Table 1:

Action	Procedure
Change the current full-scale value from, for example, 20 mA to 10 mA (a hardware setting always thas to be made when changing from a lower to a higher value)	Reconfigure the software, but do not change the hardware setting. Accuracy is reduced.

Unauthorized repair of alteration of the unit invalidates the warranty!

7. Notes of maintenance

No maintenance is required.

8. Releasing the transducer

Release the transducer from a top-hat rail as shown in Fig. 7.

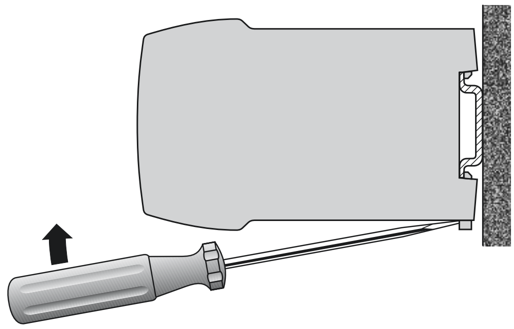


Fig. 7

9. Dimensional drawing

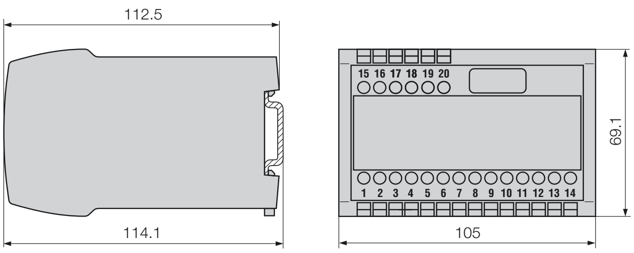


Fig. 8. Housing **P20/105** clipped onto a top-hat rail (35 ×15 mm or 35×7.5 mm, acc. to EN 50 022.

10. Safety notes

- Before you start the device check for which power supply it is built.
- Verify that the connection leads are in good condition and that they are electrically dead while wiring the device.
- When it must be assumed that safe operation is no longer possible, take the device out of service (eventually disconnect the power supply and the input voltage!).

  This can be assumed on principle when the device shows obvious signs of damage.

  The device must only be used again after troubleshooting, repair and a final test of calibration and dielectric strength in our factory or by one of our service facilities.
- **When opening the cover, live parts may be exposed.**

  Calibration, maintenance or repair with the device open and live must only be performed by a qualified person who understands the danger involved. Capacitors in the device may still be charged even though the device has been disconnected from all voltage sources.

11. Konformitätserklärungen / Certificats de conformité / Declarations of conformity

SINEAX M 561

EG – KONFORMITÄTSERKLÄRUNG
DECLARATION OF CONFORMITY

CAMILLE BAUER

Dokument-Nr./ Document.No.:	M561
Hersteller/ Manufacturer:	**Camille Bauer AG** Switzerland
Anschrift / Address:	**Aargauerstrasse 7** **CH-5610 Wohlen**
Produktbezeichnung/ Product name:	**Programmierbarer Multi-Messumformer** Programmable Multi-Transducers
Typ / Type:	**SINEAX M 561**

Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinien überein, nachgewiesen durch die Einhaltung folgender Normen:

The above mentioned product has been manufactured according to the regulations of the following European directives proven through compliance with the following standards:

Nr. / No.	Richtlinie / Directive
89/336/EWG 89/336/EEC	Elektromagnetische Verträglichkeit - EMV - Richtlinie Electromagnetic compatibility -EMC directive

EMV / EMC	Fachgrundnorm / Generic Standard	Messverfahren / Measurement methods
Störaussendung / Emission	EN 50 081-2 : 1993	EN 55011 : 1998 + A1 : 1999
Störfestigkeit / Immunity	EN 61000-6-2 : 2001	IEC 61000-4-2 : 1995+A1:1998+A2:2000 IEC 61000-4-3 : 1995+A1:1998+A2:2000 IEC 61000-4-4 : 1995+A1:2000 IEC 61000-4-5 : 1995+A1:2000 IEC 61000-4-6 : 1996+A1:2000 IEC 61000-4-8 : 1993+A1:2000 IEC 61000-4-11:1994+A1:2000

Nr. / No.	Richtlinie / Directive
73/23/EWG	Elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen - Niederspannungsrichtlinie - CE-Kennzeichnung : 95
73/23/EEC	Electrical equipment for use within certain voltage limits - Low Voltage Directive - Attachment of CE mark : 95

EN/Norm/Standard	IEC/Norm/Standard
EN 61 010-1 : 1993	IEC 1010-1 : 1990 + A1 : 1992

Ort, Datum /
Place, date: Wohlen, den 23.August 2005

Unterschrift / M.Ulrich

Signature: [signature] Leiter Technik

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften. Die Sicherheitshinweise der mitgelieferten Produktdokumentationen sind zu beachten.

This declaration certifies compliance with the above mentioned directives but does not include a property assurance. The safety notes given in the product documentations, which are part of the supply, must be observed.

EG – KONFORMITÄTSERKLÄRUNG
DECLARATION OF CONFORMITY

CAMILLE BAUER

Dokument-Nr./ Document.No.:	M562
Hersteller/ Manufacturer:	**Camille Bauer AG** Switzerland
Anschrift / Address:	**Aargauerstrasse 7** **CH-5610 Wohlen**
Produktbezeichnung/ Product name:	**Programmierbarer Multi-Messumformer** Programmable Multi-Transducers
Typ / Type:	**SINEAX M 562**

Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinien überein, nachgewiesen durch die Einhaltung folgender Normen:

The above mentioned product has been manufactured according to the regulations of the following European directives proven through compliance with the following standards:

Nr. / No.	Richtlinie / Directive
89/336/EWG 89/336/EEC	Elektromagnetische Verträglichkeit - EMV - Richtlinie Electromagnetic compatibility -EMC directive

EMV / EMC	Fachgrundnorm / Generic Standard	Messverfahren / Measurement methods
Störaussendung / Emission	EN 50 081-2 : 1993	EN 55011 : 1998 + A1 : 1999
Störfestigkeit / Immunity	EN 61000-6-2 : 2001	IEC 61000-4-2 : 1995+A1:1998+A2:2000 IEC 61000-4-3 : 1995+A1:1998+A2:2000 IEC 61000-4-4 : 1995+A1:2000 IEC 61000-4-5 : 1995+A1:2000 IEC 61000-4-6 : 1996+A1:2000 IEC 61000-4-8 : 1993+A1:2000 IEC 61000-4-11:1994+A1:2000

Nr. / No.	Richtlinie / Directive
73/23/EWG 73/23/EEC	Elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen - Niederspannungsrichtlinie - CE-Kennzeichnung : 95 Electrical equipment for use within certain voltage limits - Low Voltage Directive - Attachment of CE mark : 95

EN/Norm/Standard	IEC/Norm/Standard
EN 61 010-1 : 1993	IEC 1010-1 : 1990 + A1 : 1992

Ort, Datum /
Place, date: Wohlen, den 23.August 2005

Unterschrift /
Signature: M.Ulrich

Leiter Technik

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften. Die Sicherheitshinweise der mitgelieferten Produktdokumentationen sind zu beachten.

This declaration certifies compliance with the above mentioned directives but does not include a property assurance. The safety notes given in the product documentations, which are part of the supply, must be observed.