CAMILLE BAUER

# SINEAX V624, Programmable Temperature Transmitter for RTD and TC inputs

**for rail mounting in housing P12/17 or P12/17 St**

CE 0102

II (1) G [Ex ia Ga] IIC
II (1) D [Ex ia Da] IIIC

## Application

**SINEAX V624** (Fig. 1) is designed for **measuring temperature in combination with thermocouples or resistance thermometers**. Thermocouple non-linearities are automatically compensated.

The analog output signal is either an impressed current or superimposed voltage which is linearly proportional to temperature and can be processed by other devices for purposes of displaying, recording and/or regulating a constant.

The input variable and measuring range are programmed with the aid of a PC and the corresponding software.

The sensor circuit is monitored for open an short-circuits and the output responds in a defined manner if one is detected.

The transmitter fulfils all the important requirements and regulations concerning electromagnetic compatibility **EMC** and **Safety** (EN 61010). It was developed and is manufactured and tested in strict accordance with the **quality assurance standard** ISO 9001.

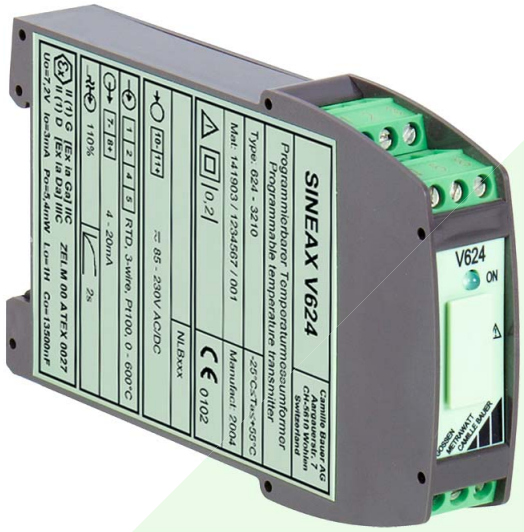



*Fig. 1. Transmitter SINEAX V624 in housing P12/17, terminals not pluggable.*

## Features / Benefits

- **Input variable and measuring range programmed using PC / Simplifies project planning and engineering, short delivery times, low stocking levels**

| Measured variables | Measuring ranges Limits | Min. span | Max. span |
|---|---|---|---|
| Temperatures with resistance thermometers for **two, three** or **four-**wire connection | | | |
| Pt100, IEC 60751 | – 200 to 850 °C | 50 K | 850 K |
| Ni100, DIN 43760 | – 60 to 250 °C | 50 K | 250 K |
| Temperatures with thermocouples Type B, E, J, K, N, R, S, T acc. to IEC 60584-1 Type L and U, DIN 43710 Type W5 Re/W26 Re Type W3 Re/W25 Re acc. to ASTM E 988-90 | acc. to type | 2 mV | 80 mV |

- **Electric isolation between input, output 2.3 kV and power supply 3.7 kV / Fulfils EN 61010**
- **Wide DC, AC power pack tolerance / Universal**
- **Available in type of protection "Intrinsic safety" [Ex ia Ga] IIC and [Ex ia Da] IIIC** (see "Table 3: Data on explosion protection")
- **Ex devices also directly programmable on site / No supplementary Ex interface needed**
- **Open and short-circuit sensor circuit supervision / Defined output response hould the supervision pick up**
- **Programmable with or without power supply connection**
- **Housing only 17.5 mm wide (**size **P12/17** housing**) / Low space requirement**
- **Other programmable parameters: specific measured variable data** (e.g. **two, three** or **four-**wire connection for resistance thermometers, "internal" or "external" cold junction compensation of thermocouples etc.), **transmission mode, operating sense** (output signal directly or inversely proportional to the measured variable) **and open-circuit sensor supervision** (output signal assumes fixed preset value between – 5 and 110%) **/ Highly flexible solutions for measurement problems**
- **Software calibration of beginning and end of output signal range**
- **Digital measured variable data available at the programming interface/ Simplifies commissioning, measured variable and signals can be viewed on PC in the field**

# SINEAX V624, Programmable Temperature Transmitter for RTD and TC inputs

## Programmation

A PC, the programming cable PK610 plus ancillary cable and the programming software V 600 *plus* are required to program the transmitter. (Details of the programming cable and the software are to be found in the separate data sheet: PK610 Le.)

The connection between
"PC ↔ PK610 ↔ SINEAX V624" can be seen from Fig. 2. The transmitter can be programmed either with or without the power supply connected.

The software V 600 *plus* is supplied on one CD and runs under Windows 3.1x or higher.

The programming cable PK610 adjusts the signal level between the PC and the transmitter SINEAX V624.

**The programming cable PK610 is used for programming both standard and Ex versions.**

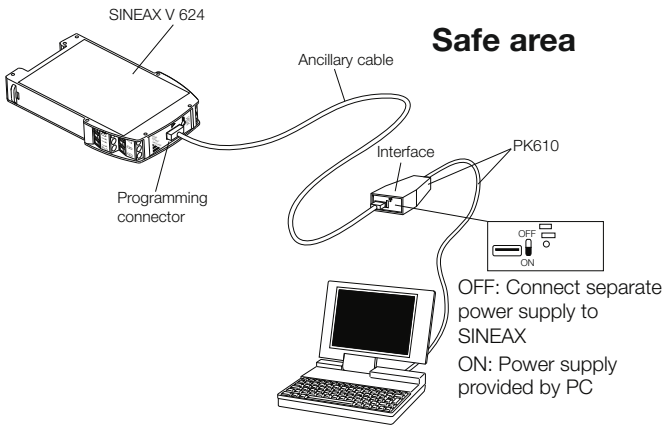



*Fig. 2. Example of the set-up for programming a SINEAX V624 in standard version without the power supply. For this case the switch on the interface must be set to "ON".*

## Technical data

### Measuring input ⊖

*Temperature with resistance thermometers*

| | |
|---|---|
| Measuring range limits: | See table 7 |
| Resistance types: | Type Pt100 (IEC 60751)<br>Type Ni100 (DIN 43760)<br>Other sensor types configurables |
| Measuring current: | ≤ 0.20 mA |
| Standard circuit: | 1 resistance thermometer for **two, three** or **four-**wire connection |
| Input resistance: | $R_i$ 10 MΩ |
| Lead resistance: | ≤ 30 Ω per lead |

*Temperature with thermocouple*

| | |
|---|---|
| Measuring range limits: | See table 7 |
| Thermocouple pairs: | Type B: Pt30Rh-Pt6Rh (IEC60584-1)<br>Type E: NiCr-CuNi (IEC60584-1)<br>Type J: Fe-CuNi (IEC60584-1)<br>Type K: NiCr-Ni (IEC60584-1)<br>Type L: Fe-CuNi (DIN43710)<br>Type N: NiCrSi-NiSi (IEC60584-1)<br>Type R: Pt13Rh-Pt (IEC60584-1)<br>Type S: Pt10Rh-Pt (IEC60584-1)<br>Type T: Cu-CuNi (IEC60584-1)<br>Type U: Cu-CuNi (DIN43710)<br>Type W5 Re/W26 Re (ASTM<br>Type W3 Re/W25 Re E 988-90) |
| Standard circuit: | 1 thermocouple, **internal** cold junction compensation with built-in Pt100<br>or<br>1 thermocouple, **external** cold junction compensation |
| Input resistance: | Ri 10 MΩ |

**Cold junction compensation:**

| | |
|---|---|
| Internal: | With built-in Pt100<br>or<br>with Pt100 connected to the terminals |
| External: | Via cold junction thermostat<br>0 … 60 °C, configurable |

### Measuring output ⊕

| | |
|---|---|
| **DC current*:** | Programmable between<br>0 and 20 resp. 20 and 0 mA<br>minimum span 2 mA |
| Burden voltage: | 12 V |
| Open-circuit voltage: | < 20 V |
| External resistance: | $R_{ext}$ max. [kΩ] = $\frac{12\ V}{I_{AN}\ [mA]}$<br>$I_{AN}$ = Output current end value |
| Residual ripple: | 1.0% p.p., DC … 10 kHz |
| **DC voltage*:** | Programmable between<br>0 and 10 resp. 10 and 0 V<br>minimum span 1 V |
| Short-circuit current: | ≤ 50 mA |
| External resistance: | $R_{ext}$ min. [kΩ] ≥ $\frac{U_{AN}\ [V]}{5\ mA}$<br>$U_{AN}$ = Output voltage end value |
| Residual ripple: | 1.0% p.p., DC … 10 kHz |

** The output variable (current or voltage) is not re-programmable!*

# SINEAX V624, Programmable Temperature Transmitter for RTD and TC inputs

Table 1: Response time

| Measuring mode | Open sensor | Short-circuit | Possible response times approx. [s] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | *) | Option | | | | | |
| TC int. comp. | active | — | 1.5 | 2.5 | 3.5 | 6.5 | 11 | 20.5 | 40 |
| TC int. comp. | off | — | 1.5 | 2.5 | 3.5 | 6.5 | 13.5 | 24.5 | 49.5 |
| TC ext. comp. | active | — | 1.5 | 2.5 | 3.5 | 6.5 | 11 | 20.5 | 40 |
| TC ext. comp. | off | — | 1.5 | 2.5 | 4 | 6.5 | 13.5 | 24.5 | 48.5 |
| RTD 2L | active | — | 2 | 2.5 | 3 | 5 | 9.5 | 17.5 | 33.5 |
| RTD 3L, 4L | active | active | 2 | 2.5 | 4 | 6.5 | 11.5 | 21 | 40.5 |
| RTD 2L,3L,4L | off | off | 1.5 | 2.5 | 3.5 | 7.5 | 14 | 26.5 | 50.5 |

*) Standard values, also valid for basic configuration

### Programming connector

interface: Serial interface

### Accuracy data (acc. to EN 60770-1)

Reference value: Measuring span

Basic accuracy: Error limits ≤ ± 0.2% at reference conditions

#### Reference conditions

Ambient temperature 23 °C

Power supply 24 V DC ± 10% and 230 V AC ± 10%

Output burden Current 300 Ω
Voltage 4 kΩ

Settings Pt100, 3-wire, 0…600 °C

#### Additional errors (additive)

Low measuring ranges

Voltage measurement ± 5 µV
at measuring spans < 10 mV

Resistance thermometer ± 0.3 K
at measuring spans < 400 °C

Thermocouple

Type U, T, L, J, K, E ± 0.1 K
at measuring spans < 200 °C

Type N ± 0.13 K
at measuring spans < 320 °C

Type S, R ± 0.42 K
at measuring spans <1000 °C

Type B ± 0.6 K
at measuring spans < 1400 °C

High initial value (Additional error = Factor · Initial value)

| | Factor |
|---|---|
| Voltage measurement | ± 0.1 µV / mV |
| Resistance thermometer | ± 0.00075 K / °C |
| Thermocouple | |
| Type U, T, L, J, K, E | ± 0.0006 K / °C |
| Type N | ± 0.0008 K / °C |
| Type S, R | ± 0.0025 K / °C |
| Type B | ± 0.0036 K / °C |

Influence of lead resistance at resistance thermometer ± 0.01% per Ω

Internal cold junction compensation ± 0.5 K at 23 °C, ± 0.25 K/10 K

Linearisation ± 0.3%

If hardware output end value / output span > 1.25

$$\pm \left( \frac{\text{20 mA resp. 10 V}}{\text{output span}} \cdot 0.07\ \% \right)$$

Example:
Hardware output end value 20 mA
New configuration 14 … 16 mA
Additional error =

$$\pm \left( \frac{20\ \text{mA}}{2\ \text{mA}} \cdot 0.07\ \% \right) = 0.7\%$$

#### Influencing factors

Temperature ± (0.15% + 0.15 K) per 10 K with temperature measurement

± (0.15% + 12 µV) per 10 K with voltage measurement)

Long-time drift ± 0.1%

Common and transverse mode influence ± 0.2%

### Open and short-circuit sensor circuit supervision

Signalling modes: Output signal programmable to…

… the value the output had immediately prior to the open or short-circuit (hold value)

… a value between – 5 and 110% of the output span

### Power supply →◯

DC, AC power pack (DC or 50 to 400 Hz)

Table 2: Rated voltages and permissible variations

| Nominal voltages $U_N$ | Tolerance | Instruments Version |
|---|---|---|
| 24…60 V DC/AC | DC –15…+ 33% AC ± 15% | Standard (Non-Ex) |
| 85…230 V[1] DC/AC | | |
| 24…60 V DC/AC | DC –15…+ 33% AC ± 15% | Type of protection "Intrinsic safety" [Ex ia Ga] IIC [Ex ia Da] IIIC |
| 85…230 V AC | ± 10% | |
| 85…110 V DC | – 15…+ 10% | |

Installation data: 1.0 W resp. 2.1 VA

### Installation data

Housing: Housing **P12/17** and **P12/17 St**
Dimensions see section "Dimensional drawings"

*[1]An external supply fuse must be provided for DC supply voltages > 125 V!*

# SINEAX V624, Programmable Temperature Transmitter for RTD and TC inputs

| | |
|---|---|
| Material of housing: | Lexan 940 (polycarbonate)<br>Flammability class V-0 acc. to UL 94, self-extinguishing, non-dripping, free of halogen |
| Mounting: | For snapping onto top-hat rail (35 x 15 mm or 35 x 7.5 mm) acc. to EN 50022 |
| Mounting position: | Any |
| Terminals: | PHOENIX screw terminals with wire guards for 0.14 $mm^2$ to 2.5 $mm^2$ |
| Weight: | Approx. 0.1 kg |
| **Electrical insulation:** | All circuits (measuring input/measuring output/power supply) are electrically insulated |

### Standards

| | |
|---|---|
| Electromagnetic compatibility: | The standards EN 61000-6-4 and EN 61000-6-2 are observed |
| Intrinsically safe: | Acc. to EN 60079-11, EN 60079-26 |
| Protection (acc. to IEC 529 resp. EN 60529): | Housing IP 40<br>Terminals IP 20 |
| Electrical standards: | EN 61010 |
| Operating voltages: | 300 V between all insulated circuits |
| Pollution degree: | 2 |
| Installation category: | III for power supply<br>II for measuring input and measuring output |
| Double insulation: | – Power supply versus all circuits<br>– Measuring input versus measuring output |
| Test voltage: | Power supply versus:<br>– all 3.7 kV, 50 Hz<br>Measuring input versus:<br>– measuring output 2.3 kV, 50 Hz |

### Ambient conditions

| | |
|---|---|
| Climatic rating: | IEC 60068-2-1/2/3 |
| Ambient temperature range: | – 25 to + 55 °C |
| Storage temperature range: | – 40 to + 70 °C |
| Annual mean relative humidity: | ≤ 75%, no moisture condensation |
| Altitude: | 2000 m max. |
| Indoor use statement! | |

## Table 3: Data on explosion protection ⟨Ex⟩ II (1) Ga and ⟨Ex⟩ II (1) Da

| Order Code | Type of protection "Intrinsic safety" Marking | | Certificate | Mounting location of instruments |
|---|---|---|---|---|
| | Instrument | Measuring input | | |
| 624-33/34/93/94 | [Ex ia Da] IIC<br>[Ex ia Ga] IIIC | [Ex ia Da] IIC<br>[Ex ia Ga] IIIC | EC-type-examination Certificate ZELM 00 ATEX 0027 | **Outside** the hazardous area |

## Standard versions

The following versions are available as standard versions already programmed for the **basic** configuration. It is only necessary to quote the **Order No.:**

**Table 4: Instruments in standard (non-Ex) version (measuring circuit not intrinsically safe)**

| Measuring input programmable for RTD and TC inputs | Measuring output* | Power supply | Connecting screw terminals | Order Code | Order No. |
|---|---|---|---|---|---|
| RTD: Pt100, Ni 100<br>TC: Types B, E, J, K, L, N, R, S, T and U<br>W5/W26 Re<br>W3/W25 Re | **4 … 20 mA**<br>programmable between 0 and 20 resp. 20 and 0 mA<br>minimum span 2 mA | 24 … 60 V DC/AC | not pluggable | 624 – 3110 | 141 896 |
| | | 85 … 230 V DC/AC | | 624 – 3210 | 141 903 |
| | | 24 … 60 V DC/AC | pluggable | 624 – 9110 | 143 412 |
| | | 85 … 230 V DC/AC | | 624 – 9210 | 143 420 |

** The output variable (current or voltage) is not re-programmable!*

# SINEAX V624, Programmable Temperature Transmitter for RTD and TC inputs

**Table 5: instruments in [Ex ia Ga] IIC and [Ex ia Da] IIIC version (measuring circuit intrinsically safe)**

| Measuring input programmable for RTD and TC inputs | Measuring output* | Power supply | Connecting screw terminals | Order Code | Order No. |
|---|---|---|---|---|---|
| RTD: Pt100, Ni 100<br>TC: Types B, E, J, K, L, N, R, S, T and U<br>W5/W26 Re<br>W3/W25 Re | 4 … 20 mA<br>programmable between 0 and 20 resp. 20 and 0 mA<br>minimum span 2 mA | 24 … 60 V DC/AC | not pluggable | 624 – 3310 | 141 911 |
| | | 85 … 110 V DC<br>85 … 230 V AC | | 624 – 3410 | 141 929 |
| | | 24 … 60 V DC/AC | pluggable | 624 – 9310 | 143 438 |
| | | 85 … 110 V DC/<br>85 … 230 V AC | | 624 – 9410 | 143 446 |

** The output variable (current or voltage) is not re-programmed!*

| | | |
|---|---|---|
| **Basic** configuration: | Measuring input: | Resistance thermometer Pt100 |
| | Connection mode: | **Three-**wire connection |
| | Measuring range: | 0 … 600 °C |
| | Measuring output: | 4 … 20 mA |
| | Open-circuit supervision: | Output 21.6 mA |
| | Response time: | Approx. 1.5/2 s (table 1) |
| | Mains ripple suppression: | For frequency 50 Hz |

## Table 6: Specification and ordering information (see also Tables 4 and 5: Standard versions)

| Description | *Blocking code | no-go with blocking code | Article No./ Feature |
|---|---|---|---|
| **SINEAX V624** **Order Code V624 - xxxx xxxx xxxx** | | | 624 – |
| **Features, Selection** | | | |
| **1. Housing** | | | |
| Housing P12/17 for rail mounting, connecting screw terminals not pluggable | | | 3 |
| Housing P12/17 St for rail mounting, connecting screw terminals pluggable | | | 9 |
| **2. Version / Power supply** | | | |
| Standard / 24 … 60 V DC/AC | | | 1 |
| Standard / 85 … 230 V DC/AC | | | 2 |
| [Ex ia Ga] IIC and [Ex ia Da] IIIC / 24 … 60 V DC/AC | | | 3 |
| [Ex ia Ga] IIC and [Ex ia Da] IIIC / 85 … 110 V DC / 230 V AC | | | 4 |
| **3. Output variable** | | | |
| Current, end value max. 20 mA | | | 1 |
| Voltage, end value max. 10 V | | | 2 |
| **4. Configuration** | | | |
| **Basic** configuration programmed (Pt100, three-wire, 0 … 600 °C)<br>All types with basic configuration are available as standard versions, see table 4 and 5, specification compete! | G | | 0 |
| Configurated to order<br>The following features 5 to 12 must be fully specified! | | | 1 |
| **5. Measuring unit** | | | |
| Temperatures in °C | | | 1 |
| Temperatures in °F | | G | 2 |
| Temperatures in K | | G | 3 |

# SINEAX V624, Programmable Temperature Transmitter for RTD and TC inputs

| Description | *Blocking code | no-go with blocking code | Article No./ Feature |
|---|---|---|---|
| **SINEAX V624** **Order Code V624 - xxxx xxxx xxxx** | | | 624 – |
| **Features, Selection** | | | |
| **6. Measuring mode, input connection** | | | |
| **Thermocouple** | | | |
| Internal cold junction compensation, with built-in Pt100 | T | G | 1 |
| External cold junction compensation $t_K$ | T | G | 2 |
| Specify external cold junction temperature $t_K$ (in °C, °F or K, acc. to specification in Feature 5), any value between 0 and 60 °C or equivalent | | | |
| **Resistance thermometer** | | | |
| Two-wire connection, $R_L$ [Ω] | R | G | 3 |
| Specify total lead resistance $R_L$ [Ω], any value between 0 and 60 Ω | | | |
| Three-wire connection, $R_L \leq 30$ Ω/wire | R | | 4 |
| Four-wire connection, $R_L \leq 30$ Ω/wire | R | G | 5 |
| **7. Sensor type / measuring range** Sensor type / beginning … end value of measuring range | | | |
| RTD Pt100 Range | | T | 1 |
| RTD Ni 100 Range | | GT | 2 |
| RTD Pt … [Ω] Range | | GT | 3 |
| RTD Ni … [Ω] Range | | GT | 4 |
| TC Type B Range | | GR | B |
| TC Type E Range | | GR | E |
| TC Type J Range | | GR | J |
| TC Type K Range | | GR | K |
| TC Type L Range | | GR | L |
| TC Type N Range | | GR | N |
| TC Typ R Range | | GR | R |
| TC Typ S Range | | GR | S |
| TC Type T Range | | GR | T |
| TC Type U Range | | GR | U |
| TC W5-W26Re Range | | GR | W |
| TC W3-W25Re Range | | GR | X |
| Specify measuring range in [°C], [°F] or [K]; refer to table 7 for the operating limits for each type of sensors.<br>Lines 3 and 4: Specify resistance in Ω at 0 °C, any value between 50 and 1000 Ω | | | |
| **8. Output characteristic** | | | |
| 20 … 100% end value | | | 0 |
| 0 … 100% end value | | | 1 |
| Inversely 100 … 20% end value | | G | 2 |
| Inversely 100 … 0% end value | | G | 3 |

# SINEAX V624, Programmable Temperature Transmitter for RTD and TC inputs

| Description | *Blocking code | no-go with blocking code | Article No./ Feature |
|---|---|---|---|
| **SINEAX V624** **Order Code V624 - xxxx xxxx xxxx** | | | 624 – |
| **Features, Selection** | | | |
| **9. Open and short-circuit sensor signalling** Output response for an open or short-circuit* sensor | | | |
| Output → at start value + 110% of the span | | | 0 |
| Output [%] | | G | 1 |
| Any value from – 5 to < 110; specify value in % of output signal span, e.g. correspondence with output 4 … 20 or 20 … 4 mA; – 5% = 3.2 mA and 110% = 21.6 mA | | | |
| Hold output at last value | | G | 2 |
| No signal | | G | A |
| * The short-circuit signal is only active for the RTD measuring mode ≥ 100 Ω at 0 °C and three or four-wire connection | | | |
| **10. Output time response** | | | |
| Standard setting time, approx. 2 s | | | 0 |
| Setting time (admissible values see Table 1) [s] | | G | 9 |
| **11. Mains ripple suppression** | | | |
| Frequency 50 Hz | | | 0 |
| Frequency 60 Hz | | G | 1 |
| **12. Test certificate** | | | |
| Without test certificate | | | 0 |
| Test certificate in German | | G | D |
| Test certificate in English | | G | E |

** Lines with letter(s) under "Blocking code" cannot be combined with preceding lines having the same letter under "no-go".*

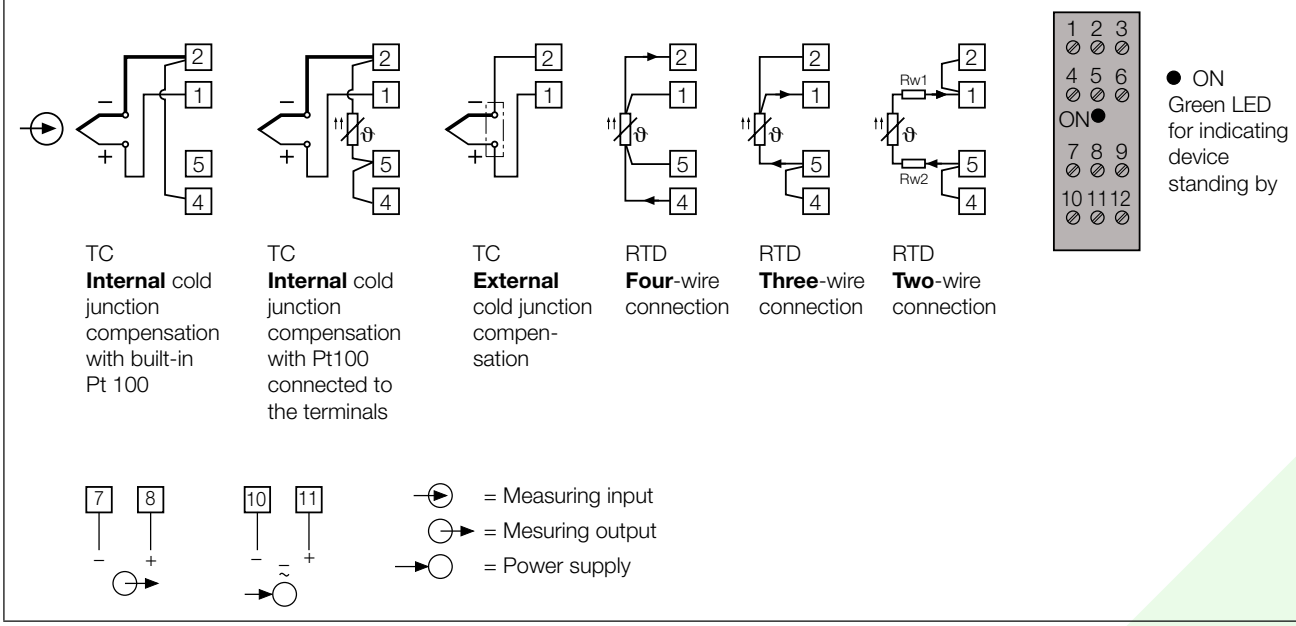
## Table 7: Measuring range limits

| Resistance thermometers | | Thermocouple | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pt100 | Ni100 | B | E | J | K | L | N | R | S | T | U | C [1] | D [2] |
| – 200 to 850 | – 60 to 250 | 0 to 1820 | – 270 to 1000 | – 210 to 1200 | – 270 to 1372 | – 200 to 900 | – 270 to 1300 | – 50 to 1769 | – 50 to 1769 | – 270 to 400 | – 200 to 600 | 0 to 2315 | 0 to 2315 |
| ΔR min. 15 Ω at final value [3] ≤ 400 Ω<br>ΔR min. 150 Ω at final value > 400 Ω<br>max. final value 4000 Ω<br>$\frac{\text{Initial value}}{\Delta R} \leq 10$ | | ΔU min. 2 mV, max. 80 mV<br>$\frac{\text{Initial value}}{\Delta U} \leq 10$ | | | | | | | | | | | |

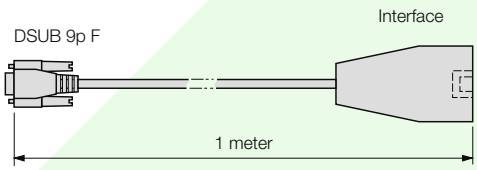
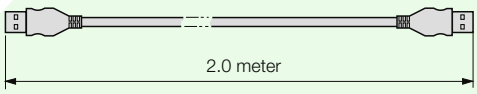
[1] W5 Re W26 Re (ASTM E 988-90)
[2] W3 Re W25 Re (ASTM E 988-90)
[3] For two-wire connection, the final value is made up of the measured final value [Ω] plus the total resistance of the leads.

# SINEAX V624, Programmable Temperature Transmitter for RTD and TC inputs

## Electrical connections




## Table 8: Accessories and spare parts

| Description | Order No. |
|---|---|
| Programming cable PK610   | 137 887 |
| Ancillary cable SINEAX Type V624   | 141 416 |
| Configuration Software V 600 *plus*<br>for SINEAX V608, VK616 and V624<br>Windows 3.1x or higher<br>on CD in German, English, French, Spanish, Italian and Dutch<br>**(download free of charge under www.camillebauer.com)**<br>In addition, the CD contains all configuration programmes presently available for Camille Bauer products | 146 557 |
| Operating Instructions V624 Bd in German | 141 995 |
| Operating Instructions V624 Bf in French | 142 109 |
| Operating Instructions V624 Be in English | 142 159 |

## Standard accessories

1 Operating Instructions in German, French and English
1 Type examination certificate (only for “Intrinsically safe” explosion-proof devices)

# SINEAX V624, Programmable Temperature Transmitter for RTD and TC inputs

## Dimensional drawings

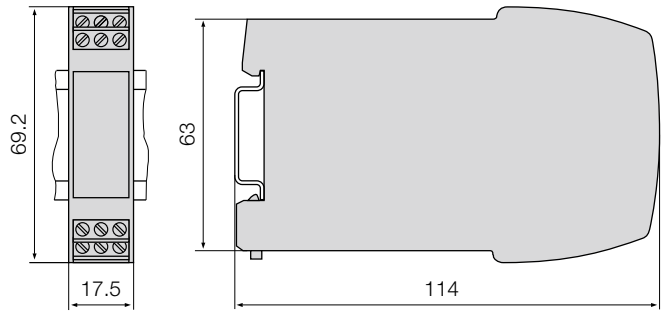



*Fig. 3. SINEAX V624 in housing **P12/17** clipped onto a top-hat rail (35 x 15 mm or 35 x 7.5 mm, acc. to EN 50022), connecting screw terminals not pluggable.*

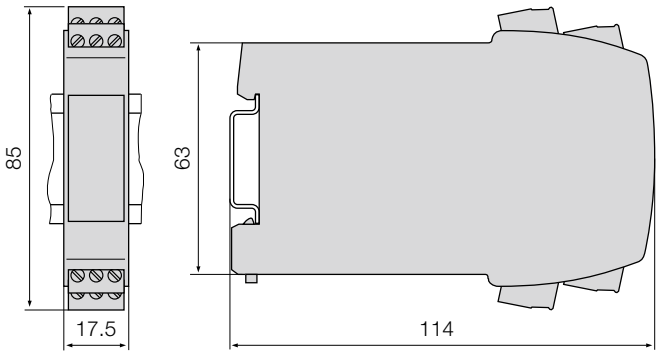



*Fig. 4. SINEAX V624 in housing **P12/17 St** clipped onto a top-hat rail (35 x 15 mm or 35 x 7.5 mm, acc. to EN 50022), connecting screw terminals pluggable.*

CAMILLE BAUER

**Rely on us.**

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