SINEAX V 624
Programmable Temperature Transmitter for RTD and TC inputs

CAMILLE BAUER

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

CE 0102 Ex II (1) GD



Fig. 1. Transmitter SINEAX V 624 in housing P12/17, terminals not pluggable.



Fig. 2. Transmitter SINEAX V 624 in housing P12/17 St, terminals pluggable.

Application

SINEAX V 624 (Figs. 1 and 2) is designed for **measuring temperature in combination with thermocouples or resistance thermometers**. Thermocouple non-linearities are automatically compensated.

The analogue 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 and 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** (IEC 1010 resp. EN 61 010). It was developed and is manufactured and tested in strict accordance with the **quality assurance standard** ISO 9001.

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			
Pt 100, IEC 60 751	– 200 to 850 °C	50 K	850 K
Ni 100, DIN 43 760	– 60 to 250 °C	50 K	250 K
Temperatures with thermocouples			
Type B, E, J, K, N, R, S, T acc. to IEC 60 584-1	acc. to type	2 mV	80 mV
Type L and U, DIN 43 710			
Type W5 Re/W26 Re, Type W3 Re/W25 Re acc. to ASTM E 988-90			

- **Electric isolation between input, output 2.3 kV and power supply 3.7 kV / Fulfils EN 61 010**
- **Wide DC, AC power pack tolerance / Universal**
- **Available in type of protection "Intrinsic safety" [EEx ia] IIC** (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 should 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**

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Programmation

A PC, the programming cable PK 610 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: PK 610 Le.)

The connections between
«PC ↔ PK 610 ↔ SINEAX V 624» can be seen from Fig. 3. 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, 95, 98, NT and 2000.

The programming cable PK 610 adjusts the signal level between the PC and the transmitter SINEAX V 624.

The programming cable PK 610 is used for programming both standard and Ex versions.

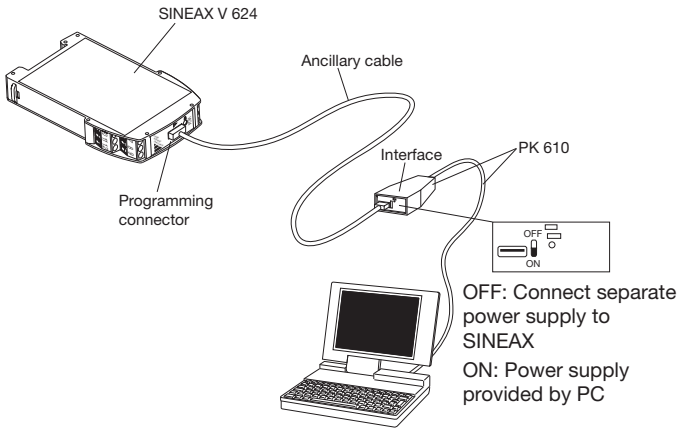


Fig. 3. Example of the set-up for programming a SINEAX V 624 in standard version without the power supply. For this case the switch on the interface must be set to "ON".

Technical data

Measuring input ⊣►

Temperature with resistance thermometers

Measuring range limits:	See table 7
Resistance types:	Type Pt 100 (IEC 60 751) Type Ni 100 (DIN 43 760) 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 (IEC 584) Type E: NiCr-CuNi (IEC 584) Type J: Fe-CuNi (IEC 584) Type K: NiCr-Ni (IEC 584) Type L: Fe-CuNi (DIN 43710) Type N: NiCrSi-NiSi (IEC 584) Type R: Pt13Rh-Pt (IEC 584) Type S: Pt10Rh-Pt (IEC 584) Type T: Cu-CuNi (IEC 584) Type U: Cu-CuNi (DIN 43710) Type W5 Re/W26 Re (ASTM Type W3 Re/W25 Re E 988-90)
Standard circuit:	1 thermocouple, **internal** cold junction compensation with built-in Pt 100 or 1 thermocouple, **external** cold junction compensation
Input resistance:	Ri > 10 MΩ

Cold junction compensation:

Internal:	With built-in Pt 100 or with Pt 100 connected to the terminals
External:	Via cold junction thermostat 0 … 60 °C, configurable

Measuring output ⊣►

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

Table 1: Response time

Measuring mode	Open sensor circuit	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/IEC 60 770-1)

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% pro 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 =

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

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 45...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" [EEx ia] IIC
85...230 V AC	± 10%	
85...110 V DC	–15...+ 10%	

Power consumption: ≤ 1.0 W resp. ≤ 2.1 VA

Installation data

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

Material of housing: Lexan 940 (polycarbonate)
Flammability class V-0 acc. to UL 94, self-extinguishing, non-dripping, free of halogen

Mounting: For snapping onto top-hat rail (35 × 15 mm or 35 × 7.5 mm) acc. to EN 50 022

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

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Mounting position:	Any
Terminals:	PHOENIX screw terminals with wire guards for 0.14 mm² to 2.5 mm²
Weight:	Approx. 0.1 kg
Electrical insulation:	All circuits (measuring input/measuring output/power supply) are electrically insulated

Standards

Electromagnetic compatibility:	The standards EN 50 081-2 and EN 50 082-2 are observed
Intrinsically safe:	Acc. to EN 50 020
Protection (acc. to IEC 529 resp. EN 60 529):	Housing IP 40 Terminals IP 20
Electrical standards:	Acc. to IEC 1010 resp. EN 61 010
Operating voltages:	< 300 V between all insulated circuits
Pollution degree:	2
Installation category acc. to IEC 664:	III for power supply II for measuring input and measuring output
Double insulation:	– Power supply versus all circuits – Measuring input versus measuring output
Test voltage:	Power supply versus: – all 3.7 kV, 50 Hz, 1 min. Measuring input versus: – measuring output 2.3 kV, 50 Hz, 1 min.

Ambient conditions

Climatic rating:	IEC 60 068-2-1/2/3
Ambient temperature range:	– 25 to + 55 °C
Storage temperature range:	– 40 to + 70 °C
Annual mean relative humidity:	≤ 75%, no moisture condensation

Table 3: Data on explosion protection ⟨Ex⟩ II (1) GD

Order Code	Type of protection "Intrinsic safety" Marking		Certificate	Mounting location of instruments
	Instrument	Measuring input		
624-33/34/93/94	**[EEx ia] IIC**	**EEx ia IIC**	**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 Nr.**
RTD: Pt 100, Ni 100 TC: Types B, E, J, K, L, N, R, S, T and U W5/W26 Re W3/W25 Re	**4…20 mA** programmable between 0 and 20 resp. 20 and 0 mA 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!*

Table 5: Instruments in [EEx ia] IIC 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: Pt 100, Ni 100 TC: Types B, E, J, K, L, N, R, S, T and U W5/W26 Re W3/W25 Re	4…20 mA programmable between 0 and 20 resp. 20 and 0 mA minimum span 2 mA	24… 60 V DC/AC	not pluggable	624-3310	141 911
		85…110 V DC/ 85…230 V AC		624-3410	141 929
		24… 60 V DC/AC	pluggable	624-9310	143 438
		85…110 V DC/ 85…230 V AC		624-9410	143 446

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

Basic configuration:	Measuring input:	Resistance thermometer Pt 100
	Connection mode:	**Three-**wire connection
	Measuring range:	0 … 600 °C
	Measuring output:	4 … 20 mA resp. 0 … 10 V (acc. to order)
	Open-circuit supervision:	Output 21.6 mA resp. 11 V (acc. to order)
	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)

Order Code **624 -**			
Features, Selection		*SCODE	no-go
1. Housing			
3) Housing P12/17 for rail mounting, connecting screw terminals not pluggable			
9) Housing P12/17 St for rail mounting, connecting screw terminals pluggable			
2. Version	**/ Power supply**		
1) Standard	/ 24 … 60 V DC/AC		
2) Standard	/ 85 … 230 V DC/AC		
3) [EEx ia] IIC	/ 24 … 60 V DC/AC		
4) [EEx ia] IIC	/ 85 … 110 V DC / 230 V AC		
3. Output variable			
1) Current	End value max. 20 mA		
2) Voltage	End value max. 10 V		
4. Configuration			
0) **Basic** configuration programmed, (Pt 100, three-wire, 0…600 °C)		G	
1) Configurated to order			
Line 0: All types with basic configuration are available as standard versions, see table 4 and 5, specification complete!			
Line 1: The following features 5 to 12 must be fully specified!			

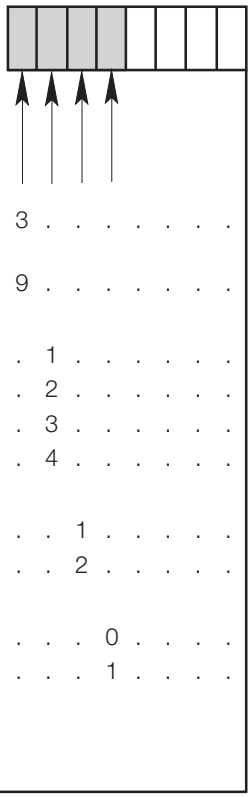


Table 6: “Specification and ordering information” continued on next page!

SINEAX V 624
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Order Code **624 -**				
Features, Selection	*SCODE	no-go		
5. Measuring unit				
1) Temperatures in °C			1	
2) Temperatures in °F		G	2	
3) Temperatures in K		G	3	
6. Measuring mode, input connection				
Thermocouple				
1) Internal cold junction compensation, with built-in Pt 100	T	G		1
2) External cold junction compensation t_K	T	G		2
Resistance thermometer				
3) Two-wire connection, R_L [Ω]	R	G		3
4) Three-wire connection, $R_L \leq 30$ Ω/wire	R			4
5) Four-wire connection, $R_L \leq 30$ Ω/wire	R	G		5
Line 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 Line 3: Specify total lead resistance R_L [Ω], any value between 0 and 60 Ω				
7. Sensor type / measuring range				
Sensor type / beginning…end value of measuring range				
1) RTD Pt 100 Range		T		1
2) RTD Ni 100 Range		GT		2
3) RTD Pt … [Ω] Range		GT		3
4) RTD Ni … [Ω] Range		GT		4
B) TC Type B Range		GR		B
E) TC Type E Range		GR		E
J) TC Type J Range		GR		J
K) TC Type K Range		GR		K
L) TC Type L Range		GR		L
N) TC Type N Range		GR		N
R) TC Type R Range		GR		R
S) TC Type S Range		GR		S
T) TC Type T Range		GR		T
U) TC Type U Range		GR		U
W) TC W5-W26Re Range		GR		W
X) 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. Lines 3 and 4: Specify resistance in Ω at 0 °C, any value between 50 and 1000 Ω				
8. Output characteristic				
0) 20 … 100% end value				0
1) 0 … 100% end value				1
2) Inversely 100 … 20% end value		G		2
3) Inversely 100 … 0% end value		G		3

Table 6: “Specification and ordering information” continued on next page!

Order Code **624 -**			
Features, Selection	*SCODE	no-go	
9. Open and short-circuit sensor signalling Output response for an open or short-circuit* sensor			
0) Output → at start value + 110% of the span			0 . . . . .
1) Output [%]		G	1 . . . . .
2) Hold output at last value		G	2 . . . . .
A) No signal		G	A . . . . .
Line 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 ** 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			
0) Standard setting time approx. 2 s			. 0 . . . . .
9) Setting time [s]		G	. 9 . . . . .
Line 9: Admissible values see Table 1			
11. Mains ripple suppression			
0) Frequency 50 Hz			. . 0 . . . .
1) Frequency 60 Hz		G	. . 1 . . . .
12. Test certificate			
0) Without test certificate			. . . 0 . . .
D) Test certificate in German		G	. . . D . . .
E) Test certificate in English		G	. . . E . . .

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

Table 7: Measuring range limits

Resistance thermometers		Thermocouples											
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 ΔR min. 150 Ω at final value > 400 Ω max. final value 4000 Ω $\frac{\text{Initial value}}{\Delta R} \leq 10$		ΔU min 2 mV, max. 80 mV $\frac{\text{Initial value}}{\Delta U} \leq 10$											

[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.

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Electrical connections

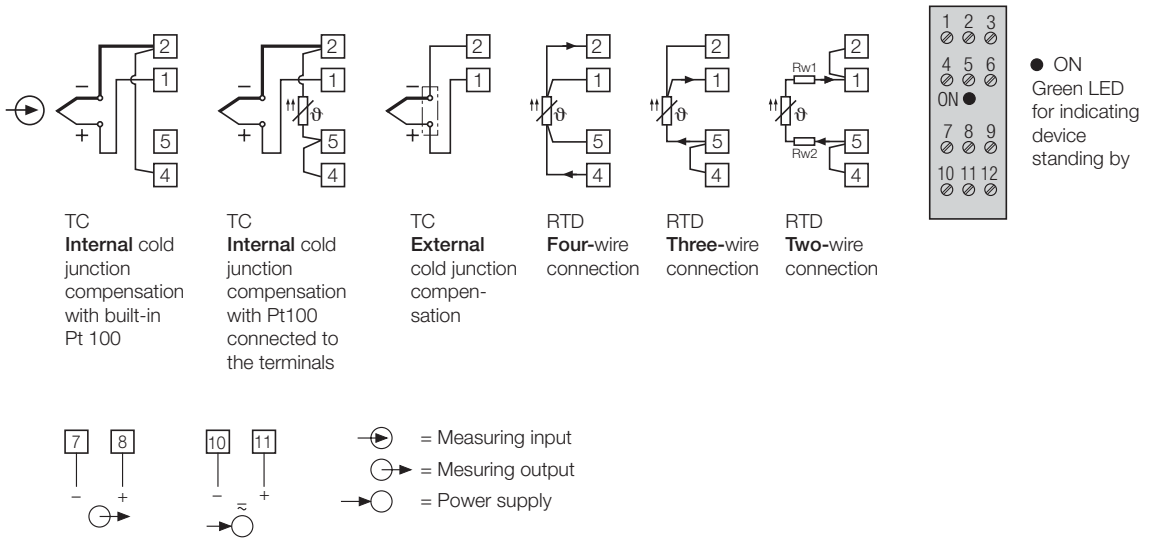


Table 8: Accessories and spare parts

Description	Order No.
Programming cable PK 610 DSUB 9p F — Interface — 1 meter	137 887
Ancillary cable SINEAX Type V 624 2,0 meter	141 416
PC software V 600 *plus* on CD **(Download free of charge under http://www.camillebauer.com)**	146 557
Operating Instructions V 624 Bd in German	141 995
Operating Instructions V 624 Bf in French	142 109
Operating Instructions V 624 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)

Dimensional drawings

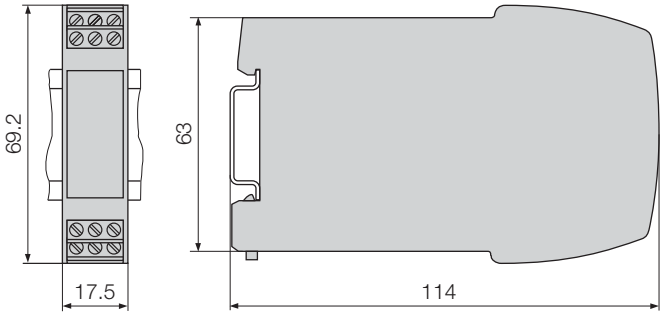


*Fig. 4. SINEAX V 624 in housing **P12/17** clipped onto a top-hat rail (35 x 15 mm or 35 x 7.5 mm, acc. to EN 50 022), connecting screw terminals not pluggable.*

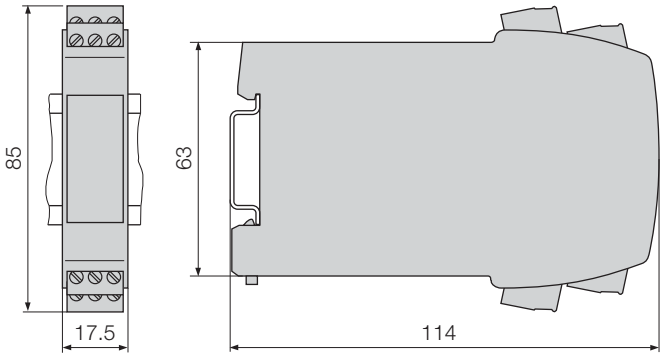


*Fig. 5. SINEAX V 624 in housing **P12/17 St** clipped onto a top-hat rail (35 x 15 mm or 35 x 7.5 mm, acc. to EN 50 022), connecting screw terminals pluggable.*

MOD-TRONIC INSTRUMENTS LIMITED
1 Delta Park Blvd, #12 Brampton, ON L6T 5G1
Tel 905-457-6322 or 1-800-794-5883
Fax 905-457-4716 or 1-800-830-7122
sales@mod-tronic.com www.mod-tronic.com