

Plug-in module SIRAX V 606, 1 or 2 channels

Programmable Temperature Transmitter for RTD and TC inputs

Application

The programmable **SIRAX V 606** transmitter (Fig. 1) is designed for **measuring temperature in combination with thermocouples or resistance thermometers**. Thermocouple non-linearities are automatically compensated. The output is an analog linear temperature value.

The analogue output signal is either an impressed current or superimposed voltage which is 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 respectively EN 61 010). It was developed and is manufactured and tested in strict accordance with the **quality assurance standard ISO 9001**.

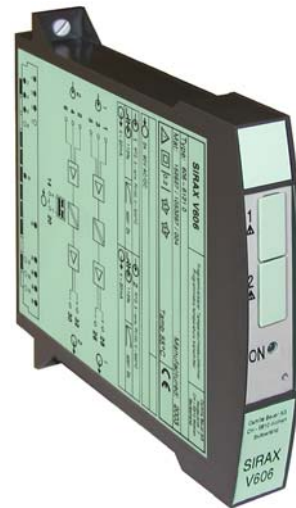


Fig. 1. Plug-in module SIRAX V 606 for plugging onto backplane BP 902.

Features / Benefits

- **Transmitter plugs onto backplane** (mechanically latched by fasteners), all electric connections made to the backplane and not to the SIRAX V 606 / Thus no wiring when replacing devices
- **Input variable and measuring range programmed using PC / Simplifies project planning and engineering, short delivery times, low stocking levels**
- **Electric isolation between input, output 2.3 kV and power supply 3.7 kV / Fulfils EN 61 010**
- **Wide DC, AC power pack tolerances / Universal**
- **Type of protection "Intrinsic safety" [Ex 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**
- **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**

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			

*) Restrictions at 2-channel version

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Programming

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 ↔ SIRAX V 606" 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 95 or higher.

The programming cable PK 610 adjusts the signal level between the PC and the transmitter SIRAX V 606.

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

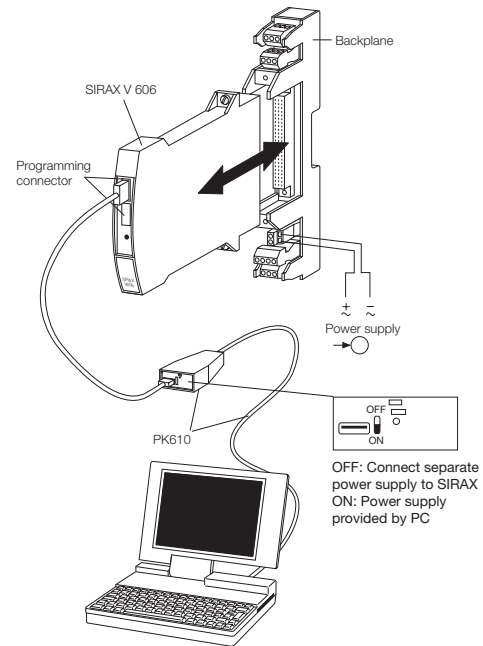


Fig. 2. Example of the set-up for programming a SIRAX V 606 in standard version without the power supply. For this case the switch on the interface must be set to "ON".

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:	$R_i > 10 \text{ M}\Omega$
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 Ni 100 or 1 thermocouple, external cold junction compensation
Input resistance:	$R_i > 10 \text{ M}\Omega$

Cold junction compensation:

Internal:	With built-in Ni 100
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:	$R_{\text{ext max.}} [\text{k}\Omega] = \frac{12 \text{ V}}{I_{\text{AN}} [\text{mA}]}$ 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:	$R_{\text{ext min.}} [\text{k}\Omega] \geq \frac{U_{\text{AN}} [\text{V}]}{5 \text{ mA}}$ 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.

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Table 1: Response time

Measuring mode	Open sensor circuit	Short circuit	Possible response times approx. [s]							
			*)		Optionally					
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 $\leq \pm 0.2\%$ at reference conditions

Reference conditions

Ambient temperature 23 °C

Power supply 24 V DC $\pm 10\%$ and 230 V AC $\pm 10\%$

Output burden
Current: 300 Ω
Voltage: 4 k Ω

Settings Pt100, 3-wire, 0 to 600 °C

Additional errors (additive)

Low measuring ranges

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:

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 $\pm 0.01\%$ pro Ω

internal cold junction compensation

± 0.5 K at 23 °C, ± 0.25 K/10 K

Linearisation

$\pm 0.3\%$

If hardware output end value/ output span > 1.25

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

Example:

Hardware output end value 20 mA
New configuration 14 to 16 mA
Additional error =

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

Influencing factors

Temperature

$\leq \pm (0.15\% + 0.15 \text{ K})$ per 10 K with temperature measurement

$\leq \pm (0.15\% + 12 \mu\text{V})$ per 10 K with voltage measurement

Long-time drift

$\leq \pm 0.1\%$

Common and transverse mode influence

$\leq \pm 0.2\%$

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 $\rightarrow \bigcirc$

DC, AC power pack (DC or 45 to 400 Hz)

Table 2: Rated voltages and permissible variations

Nominal voltages U_N	Tolerance	Instruments version
24 to 60 V DC / AC	DC -15 to $+33\%$ AC $\pm 15\%$	Standard (Non-Ex)
85 to 230 V ^{*)} DC/AC		
24 to 60 V DC / AC	DC -15 to $+33\%$ AC $\pm 15\%$	Type of protection "Intrinsic safety" [EEx ia] IIC
85 to 230 V AC		
85 to 110 V DC	-15 to $+10\%$	

Power consumption:

≤ 1.0 W resp. ≤ 2.1 VA

Installation data

Housing:

Transmitter in housing B17 for plugging onto backplane BP 902. Refer to section "Dimensional drawing" for dimensions

Material of housing:

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

Designation:

SIRAX V 606

Mounting position:

Any

^{*)} An external supply fuse must be provided for DC supply voltages > 125 V.

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Electrical connections:	96-pin connector acc. to DIN 41 612, pattern C. Layout see section "Electrical connections"	Electrical standards:	Acc. to IEC 1010 resp. EN 61 010
		Operating voltages:	< 300 V between all insulated circuits
		Pollution degree:	2
Coding:	Transmitter supplied already coded Backplane The rack is coded by the user by fitting the coding inserts supplied	Installation category acc. to IEC 664:	III for power supply II for measuring input and output
		Double insulation:	– Power supply versus all circuits – Measuring input versus measuring output
Weight:	1 channel approx. 160 g 2 channels approx. 180 g	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.
Electrical insulation:	All circuits (measuring input/measuring output/power supply) are electrically insulated		
Standards		Ambient conditions	
Electromagnetic compatibility:	The standards EN 50 081-2 and EN 50 082-2 are observed	Climatic rating:	IEC 60 068-2-1/2/3
Intrinsically safe:	Acc. to EN 50 020	Ambient temperature range:	– 25 to + 40 °C, Ex – 20 to + 40 °C
Protection (acc. to IEC 529 resp. EN 60 529):	Housing IP 40 Terminals IP 20	Storage temperature range:	– 40 to + 70 °C
		Annual mean relative humidity:	≤ 75%, no moisture condensation

Table 3: Data on explosion protection  **II (1) GD**

Order code	Type of protection "Intrinsic safety"		Certificate	Mounting location of instruments
	Instrument	Measuring input		
606-63/64	[EEx ia] IIC	EEx ia IIC	EC-type-examination Certificate ZELM 03 ATEX 0181	Within 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 circuits	Measuring output*)	Power supply	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	2	4...20 mA programmable between 0 and 20 resp. 20 and 0 mA minimum span 2 mA	24 ... 60 V DC / AC	606 - 6	152 827
			85 ... 230 V DC / AC	606 - 6	152 835

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

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Table 5: Instrument in [EEx ia] IIC version (measuring circuit intrinsically safe)

Measuring input programmable for RTD and TC inputs	Measuring circuits	Measuring output*)	Power supply	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	2	4...20 mA programmable between 0 and 20 resp. 20 and 0 mA minimum span 2 mA	24 ... 60 V DC / AC	606 - 6	154 170
			85 ... 110 V DC 85 ... 230 V AC	606 - 6	154 188

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

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

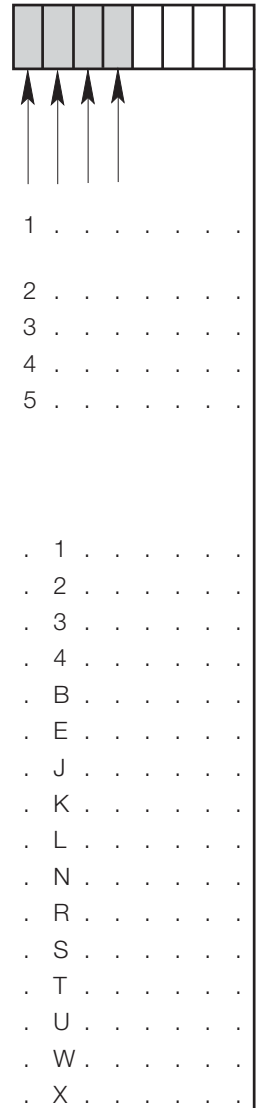
Table 6: Specification and ordering information (see also Table 4 and 5: Standard versions)

Order Code 606 -	*SCODE	no-go	
Features, Selection			↑ ↑ ↑ ↑ ↑
1. Housing SIRAX, in housing B17, for plugging onto backplane			6
2. Version / Power supply			. 1
Standard / UN 24 to 60 V DC/AC			. 2
Standard / UN 85 to 230 V DC/AC			. 3
[EEx ia] IIC / UN 24 to 60 V DC/AC			. 4
[EEx ia] IIC / UN 85 to 110 V DC / 230 V AC			
3. Number of measuring circuits			
1 channel	0		. . 1
2 channels	X		. . 2
4. Output variable			
Current End value 20 mA			. . . 1
Voltage End value 10 V			. . . 2
Same for both outputs			
5. Configuration			
Basic configuration , (Pt 100, 3-wire, 0 to 600 °C, 4 to 20 mA / 0 to 10 V)	G	 0
Configured to order		 1
The following features 6 to 17 must only be specified at feature 1 "Configured to order"			

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Order Code 606 -											
Features, Selection						*SCODE	no-go				
6. Channel 1: Measuring mode, input connection											
TC, thermocouple with internal cold junction compensation, with built-in Ni100						T	GX				
TC, thermocouple with external cold junction compensation						T	G				
Temperature t_k [°C]											
RTD, resistance thermometer 2-wire						R	G				
RTD, resistance thermometer 3-wire						R	G				
RTD, resistance thermometer 4-wire						R	GX				
Line 2: External cold junction temperature t_k between 0 and 60 °C											
Line 3: Total lead resistance R_L max. 60 Ω											
7. Channel 1: Sensor type / measuring range start value; end value											
Pt 100							GT				
Range											
Ni 100							GT				
Range											
Pt ... [Ω]							GT				
Range											
Ni ... [Ω]							GT				
Range											
TC Type B							GR				
Range											
TC Type E							GR				
Range											
TC Type J							GR				
Range											
TC Type K							GR				
Range											
TC Type L							GR				
Range											
TC Type N							GR				
Range											
TC Type R							GR				
Range											
TC Type S							GR				
Range											
TC Type T							GR				
Range											
TC Type U							GR				
Range											
TC W5-W26Re							GR				
Range											
TC W3-W25Re							GR				
Range											
Specify measuring range in [°C], [°F] or [K]; refer to Table 7 for the operating limits for each types of sensors.											
Lines 3 and 4: Specify resistance in Ω at 0 °C, any values between 50 and 1000 Ω											
8. Channel 1: Output characteristics											
20 to 100% end value							G				
0 to 100% end value							G				
Inversely 100 to 20% end value							G				
Inversely 100 to 0% end value							G				
9. Channel 1: Open and short-circuit sensor signalling											
Set output at 110%							G				
Set output							G				
[%]											
Hold output at last value							G				
No signal							G				
The short-circuit signal is only active for three/four-wire connection of resistance thermometers up to 100 Ω at 0 °C											
Line 2: - 5 to < 110% of output span											

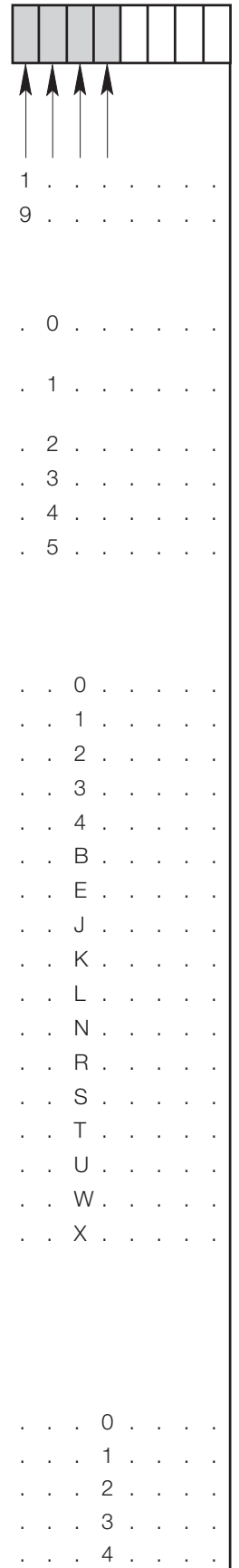


Continuation of Table 6: "Specification and ordering information" see on next page!

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Programmable Temperature Transmitter for RTD and TC inputs

Order Code 606 -					
Features, Selection			*SCODE	no-go	
10. Channel 1: Output time response					
Standard setting time, approx. 2 s				G	
Setting time	[s]			G	
Line 9: Admissible values see Table 1					
11. Channel 2: Measuring mode, input connection					
omitted at 1 channel version				GX	
TC, thermocouple with internal cold junction compensation. with built-in Ni100			D	GOX	
TC, thermocouple with external cold junction compensation			Temperature t_k [°C]	D	
RTD, resistance thermometer 2-wire			R_L [Ω]	S	
RTD, resistance thermometer 3-wire				S	
RTD, resistance thermometer 4-wire				S	
Line 2: External cold junction temperature t_k between 0 and 60 °C					
Line 3: Total lead resistance R_L max. 60 Ω					
12. Channel 2: Sensor type / measuring range start value; end value					
Does not apply for 1 channel version				GX	
Pt 100	Range			GDO	
Ni 100	Range			GDO	
Pt ... [Ω]	Range			GDO	
Ni ... [Ω]	Range			GDO	
TC Type B	Range			GSO	
TC Type E	Range			GSO	
TC Type J	Range			GSO	
TC Type K	Range			GSO	
TC Type L	Range			GSO	
TC Type N	Range			GSO	
TC Type R	Range			GSO	
TC Type S	Range			GSO	
TC Type T	Range			GSO	
TC Type U	Range			GSO	
TC W5-W26Re	Range			GSO	
TC W3-W25Re	Range			GSO	
Specify measuring range in [°C], [°F] or [K]; refer to Table 7 for the operating limits for each types of sensors.					
Lines 3 and 4: Specify resistance in Ω at 0 °C, any values between 50 and 1000 Ω					
13. Channel 2: Output characteristics					
Does not apply for 1 channel version				GX	
20 to 100% end value				GO	
0 to 100% end value				GO	
Inversely 100 to 20% end value				GO	
Inversely 100 to 0% end value				GO	



Continuation of Table 6: "Specification and ordering information" see on next page!

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Electrical connections

Version with 1 input and 1 output

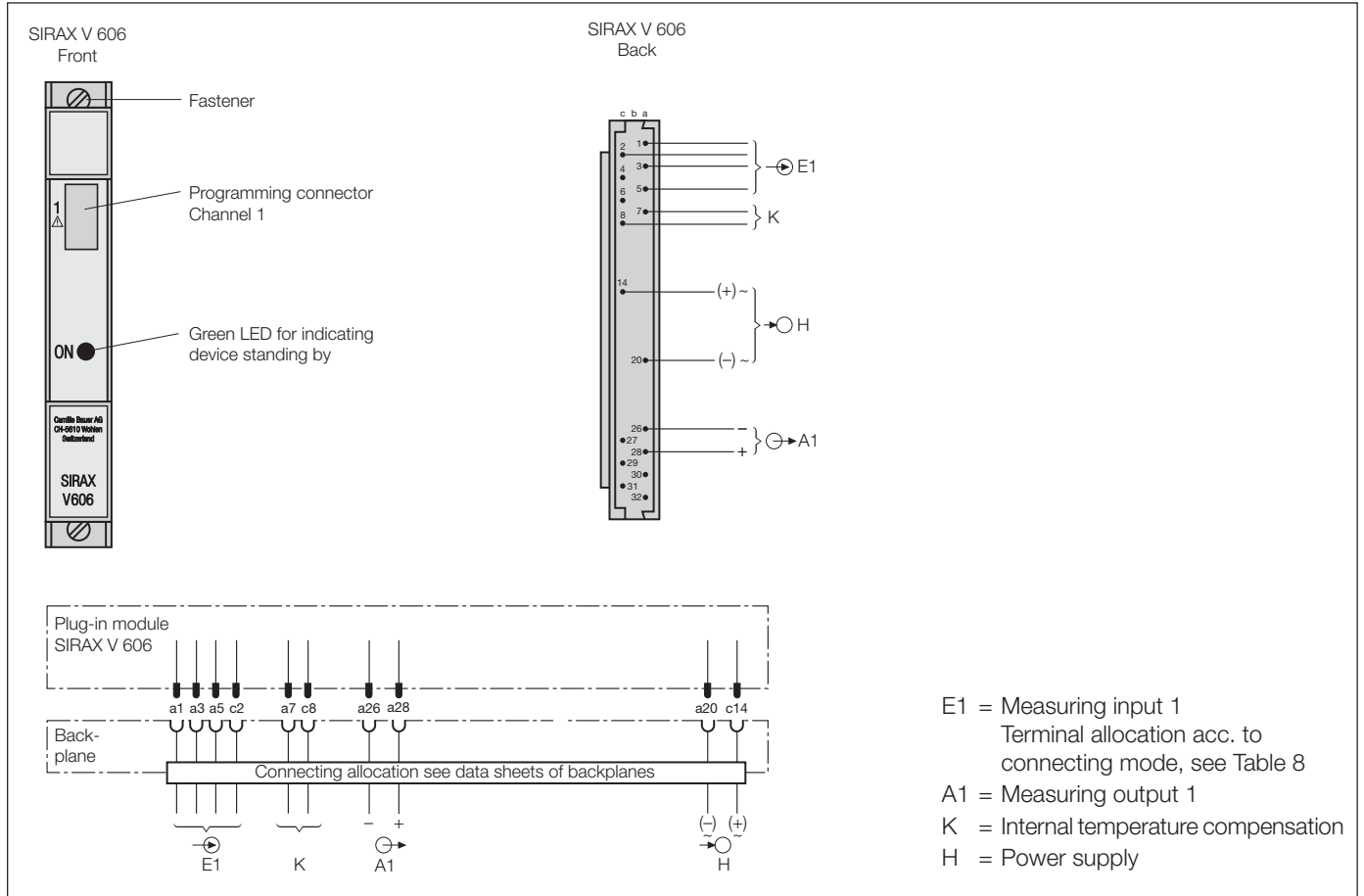


Table 8: Measuring input leads E1

Measuring input	Connection mode	Connecting diagram Plug wiring	
Version with 1 input	Measuring input \rightarrow E1	TC external compensated *)	
		RTD two-wire connection *)	
		RTD three-wire connection *)	
		RTD four-wire connection *)	
		TC internal compensated	

*) The Ni 100 must be removed from the backplane

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Programmable Temperature Transmitter for RTD and TC inputs

Version with 2 inputs and 2 outputs

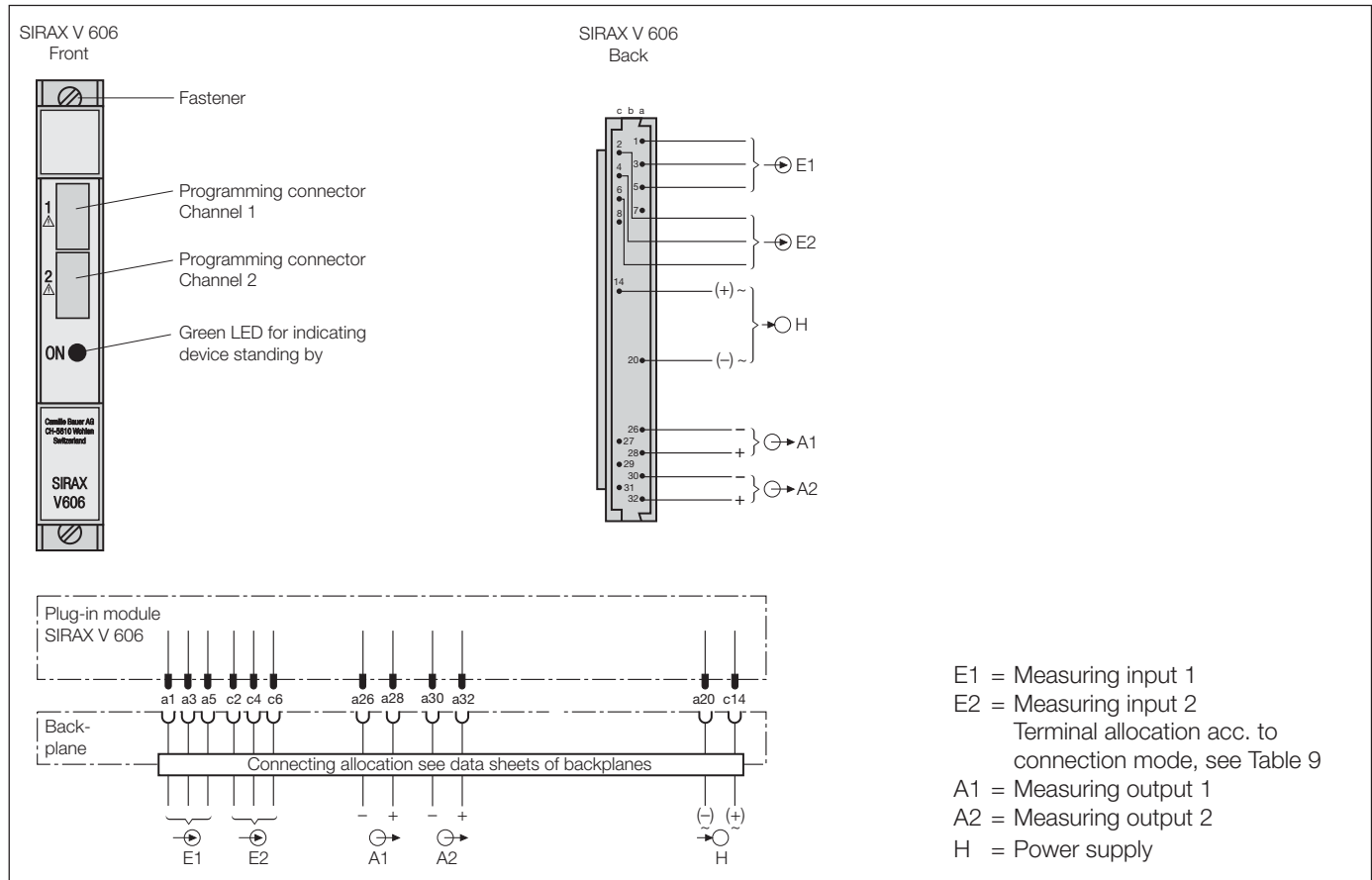


Table 9: Measuring input leads E1 and E2

Measuring inputs		Connection mode *)	Connecting diagram Plug wiring
Version with 2 inputs	Measuring input \rightarrow E1	TC external compensated **)	
		RTD two-wire connection **)	
		RTD three-wire connection **)	
	Measuring input \rightarrow E2	TC external compensated **)	
		RTD two-wire connection **)	
		RTD three-wire connection **)	

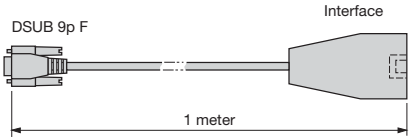
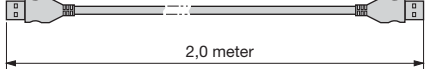
* Since the SIRAX BP 902 backplane only has six input terminals, the two-channel version of the SIRAX V 606 can only be used in **two** or **three-wire** measuring schemes.

** The Ni 100 must be removed from the backplane.

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Table 10: Accessories and spare parts

Description	Order No.
Programming cable PK 610 	137 887
Ancillary cable 	141 416
PC software V 600 plus on CD (Download free of charge under http://www.camillebauer.com)	146 557
Operating Instructions V 606-6 Bd-f-e in German, French and English	151 697
Coding comb with 12 sets of codes (for coding the backplane BP 902)	107 971

Standard accessories

- 1 Operating Instructions in German, French and English
- 1 Coding comb with 12 sets of codes
- 1 Type test certificate (only for instruments in type of protection "Intrinsically safe")

Dimensional drawing

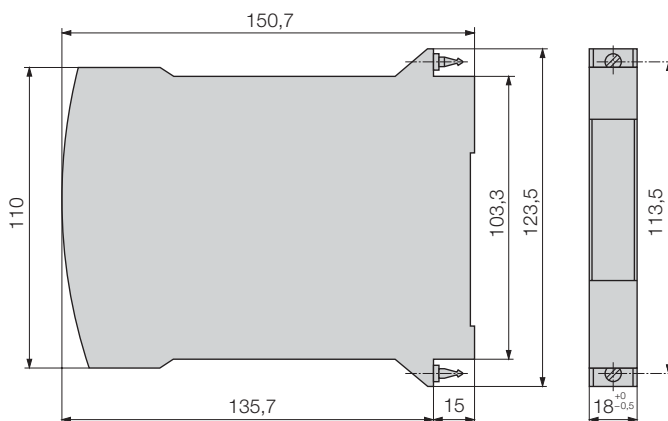


Fig. 3. SIRAX V 606 in housing B17.

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