SINEAX VK 636
Programmable Temperature Transmitter with PROFIBUS-PA protocol

for installation in the terminal head of a temperature sensor DIN 43 729, shape B

CE 0102 Ex II 2 (1) G FISCO

PROFI PROCESS FIELD BUS BUS

Application

The **SINEAX VK 636** is a temperature transducer for use in automation systems with PROFIBUS.

It converts the measured value, i.e. the signal from a thermocouple or a resistance thermometer to the PROFIBUS-PA format.

PROFIBUS-PA (**P**rocess **A**utomation) is an open field bus standard according to EN 50 170 and IEC 61 158-2 that requirements of the process industries.

Both the communication and power supply are via the bus conductors.

The measured variables, ranges and other parameters can be configured and set on a PC (Master Class 2) running the respective configuration software.

Fig. 1. Measuring transmitter SINEAX VK 636 with PROFIBUS-PA protocol.

Features / Benefits

- **Measuring transmitter with bus acc. to EN 50 170 and IEC 61 158-2**
- **Digital communication and power supply via the bus conductors / saving of installation costs**
- **Measured variables, ranges and other parameters configured and set using Master (Class 2) / 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			

- **Electrical insulation (test voltage 1500 V AC)**
- **Available in type of protection «Intrinsic safety» EEx ia IIC T6** (see "Table 4: Data on explosion protection")
- **Open and short-circuit sensor circuit supervision acc. to Profil 3.0**
- **Terminals with captive screws**

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 1:

Version	Dimensions ∅ 43 mm	Order Code	**Order No.**
Standard, electrically isolated	Height 30.8 mm	636-7C0	141 937
EEx ia IIC T6, electrically isolated		636-7D0	141 945

Please complete the Order Code 636-7.1. .... .. according to "Table 2: Specification and ordering information" for versions with user-specific input ranges.

Basic configuration:	Measuring input	Pt 100 for **three-**wire connection
	Measuring range	0 … 600 °C
	Response time	Approx. 1.5/2 s
	Mains ripple suppression	50 Hz
	Device address	126

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Configurations and settings

A Master Class 2, the basic device file (GSD), the device description (DD) and the respective configuration software are needed to configure and set the transmitter. The hardware required includes an DP cable, a bus coupler and an ancillary two-wire cable.

The connections between
"Master Class 2 ↔ bus coupler ↔ SINEAX VK 636" can be seen from Fig. 2.

The bus coupler compensates the level between RS 485 and IEC 61 158-2 and also establishes the power supply connection between the Master Class 2 and the SINEAX VK 636 transmitter.

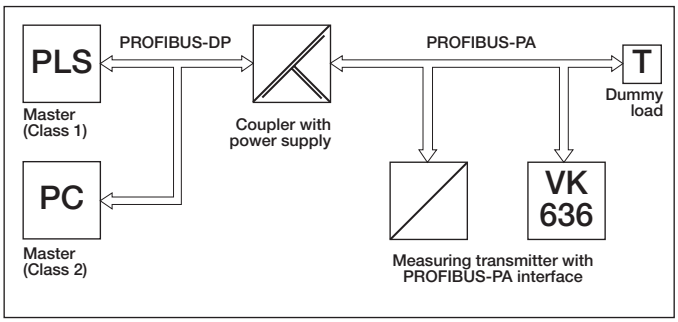

Fig. 2. Communication by PROFIBUS-PA interface.

Technical data

Measuring input

Temperature with resistance thermometers

Measuring range limits:	See table 3
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 3
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

Communication protocol:	Profibus PA (Profil for Process Control, Version 3.0)
Data transfer:	Acc. to IEC 61 158-2
Bus termination:	External
Transmission speed:	31.25 kbit/s
Power supply:	Via the usual bus couplers according to IEC 61 158-2. The VK 636 explosion protection type "intrinsically safe" (U_i = 17.5 V, I_i, P_i = any value, C_i ≤ 5 nF, L_i ≤ 10 µH) corresponds to the FISCO model. It is therefore suitable for connection to FISCO model bus couplers. For other types of connection, as for the FISCO model, the date are: U_i = 24 V, I_i = 250 mA, P_i = 1.2 W, C_i ≤ 1.15 nF, L_i ≤ 3 µH. These values may not be exceeded by the power supply connected. More information on the FISCO model may be obtained from the PTB report W53 and other sources.

Configuration and setting connector

Interface:	Output terminals

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	18 V DC
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
Linearisation	± 0.3%

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%

Failure signal

Status signal:	According to the PROFIBUS-PA® specification profile 3.0

Installation data

Dimensions:	See section “Dimensional drawing”
Housing:	Lexan 940 (polycarbonate) Flammability class V-0 acc. to UL 94, self-extinguishing, non-dripping, free of halogen
Mounting position:	Any
Electrical connections:	Screw terminals with Philips heads for max. 2 × 1.5 mm²
Weight:	Approx. 80 g
Mounting:	In terminal head, shape B, by two M4 cheese-headed screws and two springs

Standards

Electromagnetic compatibility:	The standards EN 50 081-2 and EN 50 082-2 are observed
Intrinsically safe:	Acc. to EN 50 020
FISCO:	Draft DIN IEC 31G/89/NP: June 2001
Protection (acc. to IEC 529 resp. EN 60 529):	Housing IP 40 Terminals IP 00
Electrical standards:	Acc. to IEC 1010 resp. EN 61 010
Test voltage:	1500 V AC, applied between measuring input and output

Ambient conditions

Climatic rating:	IEC 60 068-2-1/2/3
Ambient temperature range:	Standard instruments: – 25 and + 80 °C **Ex** instruments: – 25 to max. 45 °C, T6 – 25 to max. 60 °C, T5 – 25 to max. 80 °C, T4
Storage temperature range:	– 40 to + 80 °C
Annual mean relative humidity:	≤ 75%, no moisture condensation

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Table 2: Specification and ordering information

Order Code **636 -**			
Features, Selection	*SCODE	no-go	
1. Housing			
7) For installation in a terminal head DIN 43 729, shape B			7 . . . . .
2. Version			
C) Not intrinsically safe			. C . . . . .
D) EEx ia IIC T6, intrinsically safe electrical circuits			. D . . . . .
3. Configuration			
0) **Basic** configuration programmed, (Pt 100, 3-wire, 0…600 °C)	G		. . 0 . . . . .
1) Configured to order			. . 1 . . . . .
Line 0: All types with basic configuration are available as standard versions, see table 1, specification complete! Line 1: The following features 4 to 10 must be fully specified!			
4. Measuring unit			
1) Temperatures in °C		G	. . . 1 . . . .
2) Temperatures in °F		G	. . . 2 . . . .
3) Temperatures in K		G	. . . 3 . . . .
5. 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 4), 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			

Table 2: “Specification and ordering information” continued on next page!

Order Code **636 -**				
Features, Selection		*SCODE	no-go	
6. 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 . . . . .
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 3 for the operating limits for each type of sensor.				
7. Open and short-circuit sensor signalling (failure signal*) Output response for an open or short-circuit* sensor				
0) Output at 110%				. 0 . . . . .
1) Output at	[%]		G	. 1 . . . . .
2) Hold output at last value			G	. 2 . . . . .
A) No signal			G	. A . . . . .
Line 1: Any value between – 5 and < 110 ** Status signal according to the PROFIBUS-PA® specification profile 3.0*				
8. Filter time constant				
0) Standard setting time approx. 2 s				. . 0 . . . .
9) Setting time	[s]		G	. . 9 . . . .
9. Mains ripple suppression				
0) Frequency 50 Hz				. . . 0 . . .
1) Frequency 60 Hz			G	. . . 1 . . .
10. 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 3: Temperature measuring ranges

Measuring ranges [°C]	Resistance thermometers		Thermocouples											
	Pt100	Ni100	B	E	J	K	L	N	R	S	T	U	C [1]	D [2]
0… 40	X			X	X		X							
0... 50	X	X		X	X	X	X				X	X		
0... 60	X	X		X	X	X	X				X	X		
0... 80	X	X		X	X	X	X	X			X	X		
0... 100	X	X		X	X	X	X	X			X	X		
0... 120	X	X		X	X	X	X	X			X	X		
0... 150	X	X		X	X	X	X	X			X	X	X	
0... 200	X	X		X	X	X	X	X			X	X	X	X
0... 250	X	X		X	X	X	X	X			X	X	X	X
0... 300	X			X	X	X	X	X	X	X	X	X	X	X
0... 400	X			X	X	X	X	X	X	X	X	X	X	X
0... 500	X			X	X	X	X	X	X	X		X	X	X
0... 600	X			X	X	X	X	X	X	X		X	X	X
0... 800	X		X	X	X	X	X	X	X	X			X	X
0... 900			X	X	X	X	X	X	X	X			X	X
0...1000			X	X	X	X		X	X	X			X	X
0...1200			X		X	X		X	X	X			X	X
0...1500			X						X	X			X	X
0...1600			X						X	X			X	X
0...1800			X										X	X
0...2000													X	X
50... 150	X	X		X	X	X	X	X			X	X		
100... 300	X			X	X	X	X	X			X	X	X	X
200... 500	X			X	X	X	X	X	X	X		X	X	X
300... 600	X			X	X	X	X	X	X	X		X	X	X
600... 900			X	X	X	X	X	X	X	X			X	X
600...1000			X	X	X	X		X	X	X			X	X
900...1200			X		X	X		X	X	X			X	X
600...1600			X						X	X			X	X
600...1800			X										X	X
–10... 40	X	X		X	X	X	X					X		
–30... 60	X	X		X	X	X	X	X			X	X		
Measuring range limits [°C]	–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 $\frac{\text{Initial value}}{\Delta U} \leq 10$											

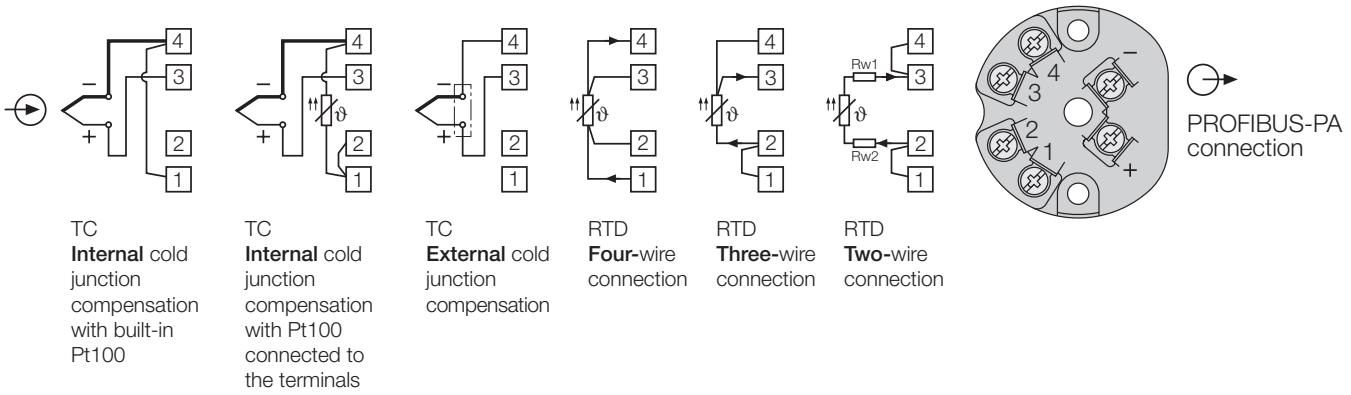
[1] W5 Re W26 Re (ASTM E 988-90)
[2] W3 Re W25 Re (ASTM E 988-90)
[3] For two-wire connection, the final value is made up of the measured final value [Ω] plus the total resistance of the leads.

Table 4: Data on explosion protection ⟨Ex⟩ II 2 (1) G

Order Code	Type of protection Marking	Electrical data acc. to Certificate Sensor input	Output	Certificate	Mounting location
636 - 7D	EEx ia IIC T6	U_o = 6.5 V I_o = 3 mA P_o = 4.8 mW C_o = 24 µF L_o = 1 H	FISCO U_i = 17.5 V I_i, P_i = any C_i ≤ 1,15 nF L_i ≤ 3 µH or U_i = 24 V I_i = 250 mA P_i = 1.2 W C_i ≤ 1.15 nF L_i ≤ 3 µH	EC-type-examination Certificate ZELM 01 ATEX 0070	**Within** the hazardous area, Zone 1 and 2*

* *It is permissible for the sensor circuit to enter Zone 0, however, EN 50 284 and any applicable national standards must be observed.*

Electrical connections



TC **Internal** cold junction compensation with built-in Pt100

TC **Internal** cold junction compensation with Pt100 connected to the terminals

TC **External** cold junction compensation

RTD **Four-**wire connection

RTD **Three-**wire connection

RTD **Two-**wire connection

⊸⊕ = Measuring input

⊕⊸ = PROFIBUS-PA connection

Table 5: Accessories and spare parts

Description	Order No.
Operating Instructions VK 636 Bd in German	141 979
Operating Instructions VK 636 Bf in French	142 092
Operating Instructions VK 636 Be in English	142 141

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Dimensional drawing

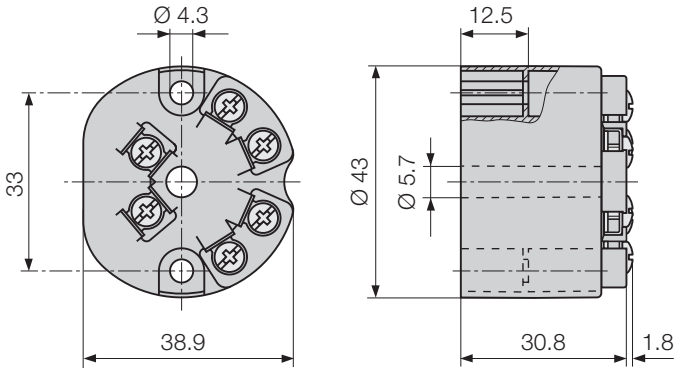

Fig. 3. SINEAX VK 636.

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