- 1-channel
- Input EEx ia IIC
- 24 V DC supply voltage
- Current output: 0/4 mA ... 20 mA (optional voltage output)
- Characteristic curve deviation +0.1;%
- Adjustment option via DIP switch for temperature measuring range, thermocouple type and output: 0 mA ... 20 mA or 4 mA ... 20 mA
- Lead breakage monitoring and deactivation of cold junction compensation

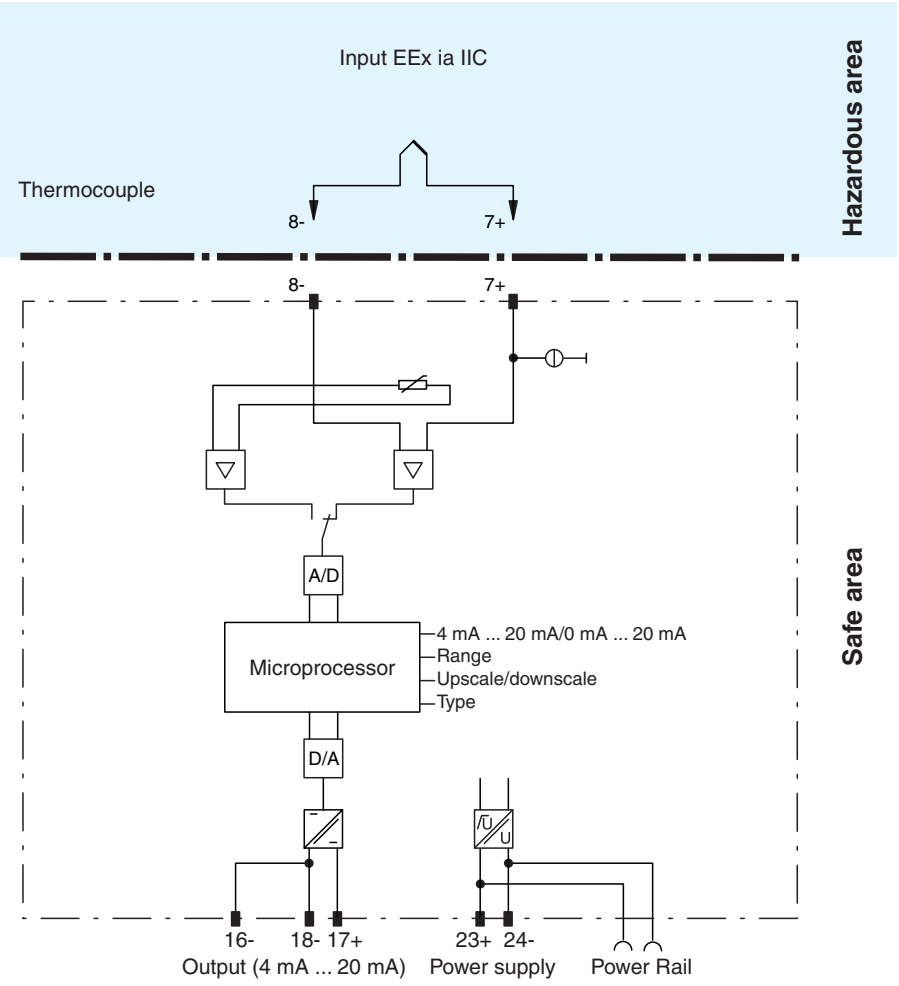
KFD2-TT-Ex1

Discontinued type

Function

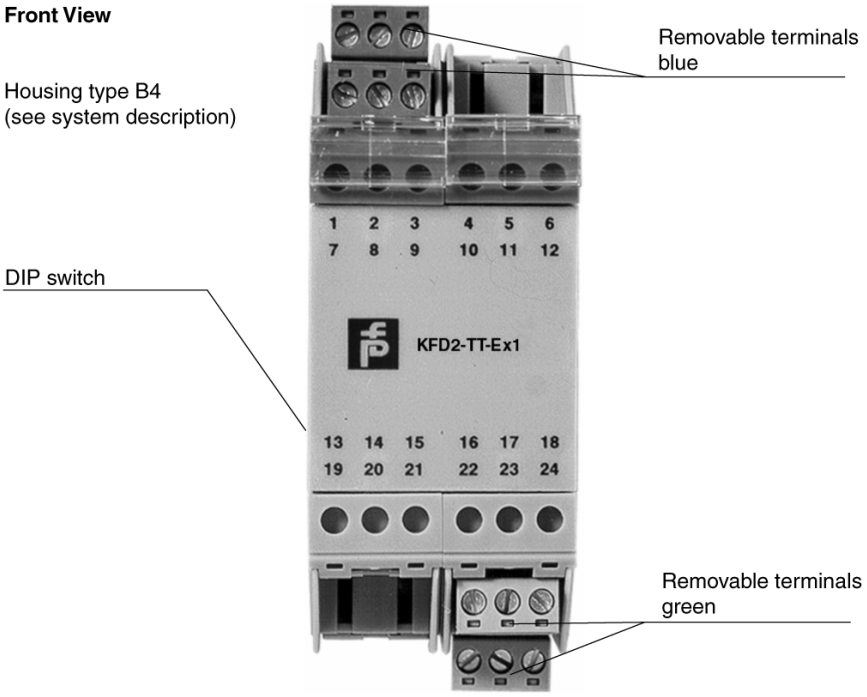
The converter is used in conjunction with thermocouples per DIN/IEC for temperature measurements. Thermocouple models R, S, B, J, T, E and K are suited for this. A current signal of 0/4 mA ... 20 mA is available at the output which is proportional to the temperature.
The temperature range is adjustable in levels of 50 °C or 100 °C. The unit may also be used as a mV converter by a simple adjustment. The measurement range lies between -25 mV ... 130 mV, the max. span is 80 mV. The measurement range is adjustable in 5 mV levels in this operating mode. An adjustment to the preset measurement range is not required when used as a thermocouple converter or a mV converter. The thermocouple can be directly connected, neither a thermostat nor an external sensor are required for the thermocouple junction.
The lead breakage monitoring for the input affects the output through downscaling (0 mA) or upscaling (20 mA) (adjustable).
Input, output and power supply are galvanically isolated from each other.

Connection



Composition

Front View



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Supply			
Connection			Power Rail or terminals 23+, 24-
Rated voltage			20 ... 35 V DC
Ripple			within the supply tolerance
Power consumption			approx. 1,2 W
Input			
Connection			terminals 7+, 8- designed for thermocouples type E, J, K, T, R, S according to IEC 584 (type B without cold junction compensation, only for ambient temperatures between 0 ... 40 °C) and type N acc. to BS 4937: part 8
Output			
Connection			terminals 16-, 17+, 18-
Current			0/4 ... 20 mA (adjustable), load ≤1 kOhm
Voltage			0 ... 20 V , load ≥;30;kOhm at 0.1;% error
Safety maximum voltage U_m			250 V
Transfer characteristics			
Deviation			
After calibration			at 293 K (20 °C) mV: ± 0,1 % of span thermocouple: (deviation of CJC included) ± 0.5 °C + 0.1 % of measurement value in °C with forced cooling and 5 mm spacing between adjacent units; 0 ... ± 1.2 °C ± 1 % of measured value in °C with 10 mm spacing between adjacent units and natural cooling
Influence of ambient temperature			for an ambient temperature range of 273 ... 333 K zero point: ± (0.02 K + 0.1 µV)/K Elevated or lowered zero point 0.008 % of the elevated or lowered value / K (current and voltage output) span, current output: ± (0.0085 % of span)/K ; voltage output: ± 0.01 % of span / K
Linearisation			≤ 0.1 % of span
Influence of supply voltage			< 0.01 % of span
Influence of input current			approx. -5.6 µV per 100 Ohm source resistance
Influence of load			current output < 0.001 % of output value per 100 Ohm
Long-term stability			≤ 0,02 % of span within 30 days, measured acc. to IEC 770: 1984
Response time			< 430 ms
Electrical isolation			
Input/Output			safe electrical isolation acc. to EN 50020, voltage peak value 375 V
Input/power supply			safe electrical isolation acc. to EN 50020, voltage peak value 375 V
Output/power supply			basic insulation acc. to EN 50178, rated insulation voltage of 50 V AC
Directive conformity			
Electromagnetic compatibility			
Directive 89/336/EC			EN 50081-2, EN 50082-2
Conformity			
Insulation coordination			EN 50178
Electrical isolation			EN 50178
Protection degree			IEC 60529
Ambient conditions			
Ambient temperature			-20 ... 60 °C (253 ... 333 K)
Mechanical specifications			
Protection degree			IP20
Mass			approx. 150 g
Dimensions			40 x 107 x 115 mm (1.6 x 4.2 x 4.5 in)
Data for application in conjunction with hazardous areas			
EC-Type Examination Certificate			BASEEFA No. Ex-89C2355 , for additional certificates see www.pepperl-fuchs.com
Group, category, type of protection			[EEx ia] IIC (T_{amb} = 60 °C)
Voltage	U_0		7,1 V
Current	I_0		7,2 mA
Power	P_0		12,7 mW
Supply			
Safety maximum voltage U_m			250 V
Type of protection [EEx ia]			
Explosion group		IIA	IIB IIC
External capacitance		80 µF	30 µF 10 µF
External inductance		4800 mH	1800 mH 600 mH
Electrical isolation			
Input/Output			safe electrical isolation acc. to EN 50020, voltage peak value 375 V
Input/power supply			safe electrical isolation acc. to EN 50020, voltage peak value 375 V
Directive conformity			

Directive 94/9 EC		EN 50014, EN 50020		
Entity parameter				
Certification number		4Z6A5.AX		
FM control drawing		No. 116-0129		
Suitable for installation in division 2		yes		
Connection		terminals 1, 3		
Input I				
Voltage	V_{OC}	6,4 V		
Current	I_t	6,5 mA		
Explosion group		A&B	C&E	D, F&G
Max. external capacitance C_a		30,59 µF	91,76 µF	244,7 µF
Max. external inductance L_a		758,1 mH	1000 mH	1000 mH
Safety parameter				
CSA control drawing		LR 65756-13		
Control drawing		No. 116-0132		
Connection		terminals 1, 3		
Input I				
Voltage	V_{OC}	6,4 V		
Current	I_{SC}	6,4 mA		
Explosion group		A&B	C&E	D, F&G
Max. external capacitance C_a		36 µF	109 µF	291 µF
Max. external inductance L_a		1000 mH	1000 mH	1000 mH

Supplementary information

EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Accessories

Power Rail PR-03
Power Rail UPR-03
Power feed module KFD2-EB2...

Power supply of the devices is only permissible via the power feed modules KFD2-EB... Via the Power Rail PR-03 or UPR-03 the devices are supplied with 24 V DC by means of the power feed modules.

Each power feed module is used for fusing and monitoring groups with up to 100 individual devices. The Power Rail PR-03 is an inset component for the DIN rail. The Power Rail UPR-03 is a complete unit consisting of the electrical inset and an aluminium profile rail 35 mm x 15 mm x 2000 mm. To make electrical contact, the devices are simply engaged.

The Power Rail must not be fed via the device terminals of the individual devices!

If no Power Rails are used, power supply of the individual devices is realised directly via their device terminals.

Notes

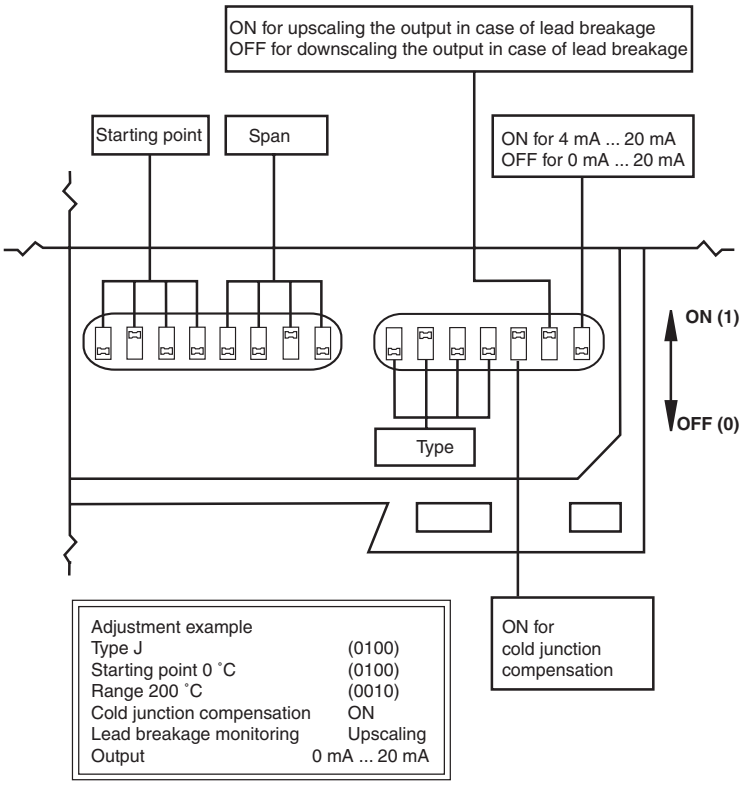
Function

The basis of the device is a microprocessor, which is responsible for the linearisation of the characteristics of the corresponding thermocouple, thermocouple junction compensation, lead breakage evaluation and measurement range adjustment.

In the input circuit there is always one amplifier for the thermoelectric voltage terminals 7, 8 and for the sensor for thermocouple junction compensation. A current source is used for the lead breakage monitoring. The current source sends a current of approx. 50 nA through the instrument lead. The output values of both amplifiers are transferred to the microprocessor by means of a multiplexer and a digitiser. The microprocessor processes both measurement values according to the functions adjusted by means of the DIP switch and offers a current signal proportional to the output via the digital-to-analogue converter. The output can be chosen by the user between 0 mA ... 20 mA or 4 mA ... 20 mA (voltage output on demand).

Thermocouples		
Type	in accordance with DIN IEC 584, section 1	
R	Pt13Rh-Pt	platinum - 13 %, rhodium/platinum
S	Pt10Rh-Pt	platinum - 10 %, rhodium/platinum
B	Pt30Rh-Pt6Rh	platinum - 30 % rhodium/platinum - 6 % rhodium
J	Fe-CuNi	iron/copper-nickel
T	Cu-CuNi	copper/copper-nickel
E	NiCr-CuNi	nickel-chrome/copper-nickel
K	NiCr-Ni	nickel-chrome/nickel
N	in accordance with BS 4937: Part. 8	NiCrSi/NiMgSi

Adjustment example: part of a housing side piece



Adjustment of measurement range and thermocouple type
Note:

The specified accuracy of the characteristic curves is not valid for settings in the marked field.

*Accuracy of linearity + 0.2 %

ON = 1 OFF = 0		Thermocouple										
		B	E	J	J	K	K	N	R	S	T	mV
Switch position		1011	0010	0100	0101	0000	0001	1000	1001	1010	0011	1111
	0000	-	-100	-200	-200	-100	-100	-100	0	0	-270	-25
	0001	100	-50	-150	-150	-50	-50	0	100	100	-250	-20
I	0010	200	0	-100	-100	0	0	100	200	200	-200	-15
N	0011	300	50	-50	-50	50	50	200	300	300	-150	-10
I	0100	400	100	0	0	100	100	300	400	400	-100	-5
T	0101	500	150	50	50	150	150	400	500	500	-50	0
I	0110	600	200	100	100	200	200	500	600	600	0	5
A	0111	700	250	150	150	250	250	600	700	700	50	10
L	1000	800	300	200	200	300	300	700	800	800	100	15
	1001	900	350	250	250	350	350	800	900	900	150	20
P	1010	1000	400	300	300	400	400	900	1000	1000	200	25
O	1011	1100	450	350	350	450	450	1000	1100	1100	250	30
I	1100	1200	500	400	400	500	500	1100	1200	1200	300	35
N	1101	1300	550	450	450	550	550	1200	1300	1300	-	40
T	1110	1400	600	500	500	600	600	-	1400	1400	-	45
	1111	1500	650	550	550	650	650	-	1500	1500	-	50
	0000	300	100	100	800	100	800	100	100*	100*	100	5
	0001	400	150	150	850	150	850	200	200	200	150	10
	0010	500	200	200	900	200	900	300	300	300	200	15
	0011	600	250	250	950	250	950	400	400	400	250	20
	0100	700	300	300	1000	300	1000	500	500	500	300	25
	0101	800	350	350	1050	350	1050	600	600	600	350	30
S	0110	900	400	400	1100	400	1100	700	700	700	400	35
P	0111	1000	450	450	1150	450	1150	800	800	800	-	40
A	1000	1100	500	500	1200	500	1200	900	900	900	-	45
N	1001	1200	550	550	-	550	1250	1000	1000	1000	-	50
	1010	1300	600	600	-	600	1300	1100	1100	1100	-	55
	1011	1400	650	650	-	650	-	1200	1200	1200	-	60
	1100	1500	700	700	-	700	-	1300	1300	1300	-	65
	1101	1600	750	750	-	750	-	-	1400	1400	-	70
	1110	1700	800	800	-	800	-	-	1500	1500	-	75
	1111	-	850	850	-	850	-	-	1600	1600	-	80
max. measurement value		1800	1000	1200	1200	1300	1300	1300	1600	1600	400	80
units		°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	mV

1. If "downscale of the output" in case of lead breakage is selected, the output current falls off to zero, regardless whether the output configuration is 0 mA ... 20 mA or 4 mA ... 20 mA.
2. If the switches are in a position, in which the starting point plus the span exceed the admissible maximum value, the output indicates the maximum value (20 mA output current for the version with current output).

Notes

As in the case of all thermocouple converters the accuracy of the cold junction compensation cannot be kept, if the selection switch temperature is very low. This is due to the reduced sensitivity of the thermocouple at low temperatures; i. e. a fault of 10 mV for a thermocouple type K leads to the following faults:
0.25 °C at +20 °C
0.32 °C at -100 °C
0.62 °C at -200 °C