

DSCP20

Programmable 2-Wire Temperature Transmitter, DIN Mount



Description

Each DSCP20 2-wire transmitter is designed for measuring temperature using thermocouples or RTDs. The input type, measurement range, and other features are software configurable. A PC, the DSCX-887 and DSCX-416 interface cables, and the DSCX-895 configuration software are required to configure the transmitter. Communication is serial RS-232C.

The DSCP20 can interface to 12 industry standard thermocouple types: J, K, T, E, R, S, B, N, L, U, C, and D. Cold junction compensation is selectable as either internal or external. Three RTD types, Pt 100, Ni 100, and Cu 50* can be interfaced in a two, three or four wire connection. All inputs are linearized using up to 23 points of interpolation, and total errors are less than $\pm 0.2\%$.

Other configurable features include: zero point and input range adjustment, output response for open or short-circuit sensor or cable failure, normal or inverted output, ripple suppression for 50Hz or 60Hz, and output time response. The DSCX-895 configuration software allows query, print-out and saving of configuration settings, display of input measurement value, and display of interpolation table points.

*Call factory for Cu RTD information.

► Features

- Low-Cost Non-Isolated 4-20mA Transmitter
- No Power Supply Required, Powered from Output Loop Current
- Interfaces to All Standard Thermocouples and RTDs
- Software Configurable Input Type and Range
- Open and Short-Circuit Input Detection
- Configurable with or without Output Loop Power Connected
- Mounts on Standard DIN Rail
- -25°C to $+80^{\circ}\text{C}$ Operating Temperature
- CE Compliant

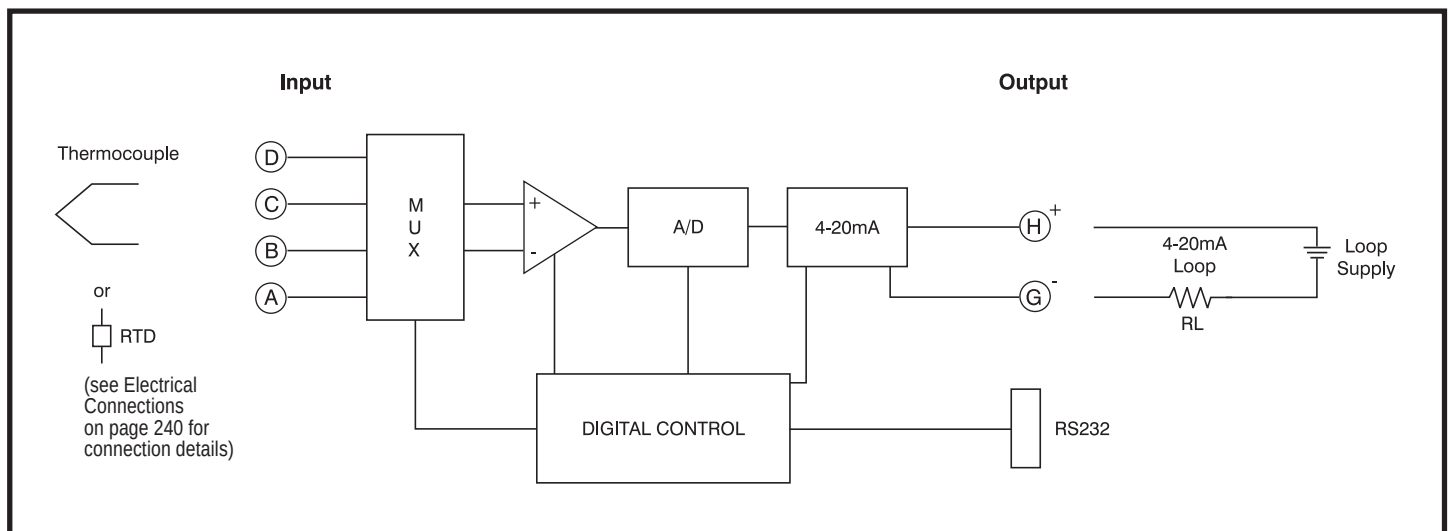


Figure 1: DSCP20 Block Diagram



The following grounding condition must be observed when programming the instrument.

If one of the power supply or input wires is grounded to earth, a PC without an earth connection must be used when programming (e.g. a Laptop running on batteries).

Under no circumstances should a PC be used running from a power supply with an earth connection, as this will damage the module.

Thermocouple Type and Material

Type	Material
B	Pt30Rh-Pt6Rh
E	NiCr-CuNi
J	Fe-CuNi
K	NiCr-Ni
L	Fe-CuNi
N	NiCrSi-NiSi
R	Pt13Rh-Pt
S	Pt10Rh-Pt
T	Cu-CuNi
U	Cu-CuNi
C	W5 Re/W26 Re
D	W3 Re/W25 Re

Specifications

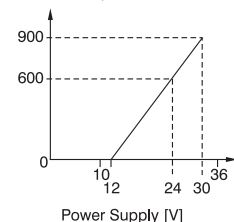
Typical at $T_A = +25^\circ\text{C}$, 24V loop supply voltage, $R_L = 250\Omega$; PT100, 3 wire, 0-600°C

Module	DSCP20
Input Range, Thermocouple Thermocouple Types: B, E, J, K, N, R, S, T, L, U, C, D Cold Junction Compensation Internal External Input Resistance	Reference Table 1 Incorporated Pt 100 0 to 60°C, Configurable >10M Ω
Input Range, RTD RTD Types: Pt 100, Ni 100 RTD Excitation Current Input Resistance Lead Resistance	Reference Table 1 $\leq 0.20\text{mA}$ >10M Ω $\leq 30\Omega$ per Lead
Output Range Output Noise Loop Supply Voltage Reverse Supply Protection Load Resistance Output Response for Input Failure Output Time Response	4 to 20mA or Inverse 20 to 4mA <1% p-p 12 to 30 VDC Continuous See Note 1 Configurable to hold value of output immediately prior to input failure, or value between 4 and 21.6mA Configurable, see Table 2
Accuracy ⁽²⁾	$\pm 0.1\%$ Span Typ., $\pm 0.2\%$ Span max. [†]
Linearity	$\pm 0.03\%$ Span Typ., $\pm 0.1\%$ Span max.
Stability	$\leq \pm(0.015\% + 0.015^\circ\text{C})/^\circ\text{C}$
Environmental Operating Temp. Range Storage Temp. Range Relative Humidity Emissions Immunity	-25°C to +80°C -40°C to +80°C 0 to 75% Noncondensing EN50081-2 (Radiated, Conducted) EN50082-2 (ESD, RF, EFT)
Mechanical Dimensions (h)(w)(d)	2.44" x 0.67" x 2.56" (62mm x 17mm x 65mm)
Housing Material	Polyamide, Flammability Class V2 According to UL 94
Mounting	DIN EN 50022-35x7.5 or EN 50035-G32

NOTES:

(1): Load Resistance: $R_L(\text{max}) = \frac{\text{Loop Supply (V)} - 12\text{V}}{I_{\text{OUTPUT}}(\text{max})}$

Load max. [Ω] with 20mA output



(2) Includes hysteresis, conformity and repeatability at reference conditions. Does not include CJC error.

(3) Shipped as PT 100 for 3-wire connection, 0 to 600°C range, 4 to 20mA output, open circuit detect = 21.6mA output.

(4) Submit configuration form shown on page 238, and factory will assign part number prior to order entry.

(5) Many different ranges may be programmed as long as the min/max limits are observed. For minimum range examples, a K type thermocouple could be programmed for +30°C to +78.5°C, or +100°C to +149°C, or +900°C to +995°C, and so on.

Ordering Information

Model	Input Range/Description	Output Range
DSCP20 (Basic Configuration) ⁽³⁾	Configurable RTD or Thermocouple, User Programmed	4 to 20mA, or Inverted
DSCP20-xxxx (Contact Factory) ⁽⁴⁾	Configurable RTD or Thermocouple, Factory Programmed	4 to 20mA, or Inverted

Accessories

Model	Description
DSCX-887	PC Interface Cable
DSCX-416	Module Interface Cable
DSCX-895	Configuration Software

Table 1

Measured Variables	Measuring Ranges		
	Limits	Min. Span	Max. Span
RTD: 2, 3, or 4-wire Pt 100, Standard IEC 60 751 Ni 100, Standard DIN 43 760	-200 to +850°C -60 to +250°C	50°C 50°C	850°C 250°C
Thermocouple Type B, E, J, K, N, R, S, T; Standard IEC 60 584-1 Type L and U; Standard DIN 43 710 Type C: W5 Re/W26 Re, Type D: W3 Re/W25 Re; Standard ASTM E 988-90	According to type	2mV ⁽⁵⁾	80mV ⁽⁵⁾

Table 2: Output Response Times

Measuring Mode	Open Sensor Circuit	Short-Circuit	Possible Response Times [s]							
			1.5	2.5	3.5	6.5	11	20.5	40	
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	

†Additional Errors

Low Measuring Range Resistance Thermometer (<200°C Span) Thermocouples (<500°C Span)		$\pm 0.015\%$ Span Typ., $\pm 0.05\%$ Span max $\pm 0.015\%$ Span Typ., $\pm 0.05\%$ Span max
High Initial Value	Factor: Error:	± 0.0002 Typ., ± 0.0005 max (Factor)*(Initial Value/Span)*100 [%]
Influence of Lead Resistance		$\pm 0.01\%$ per Ω
Internal Cold Junction Compensation		$\pm(0.5^\circ\text{C}/\text{Span})*(100)$ [%]

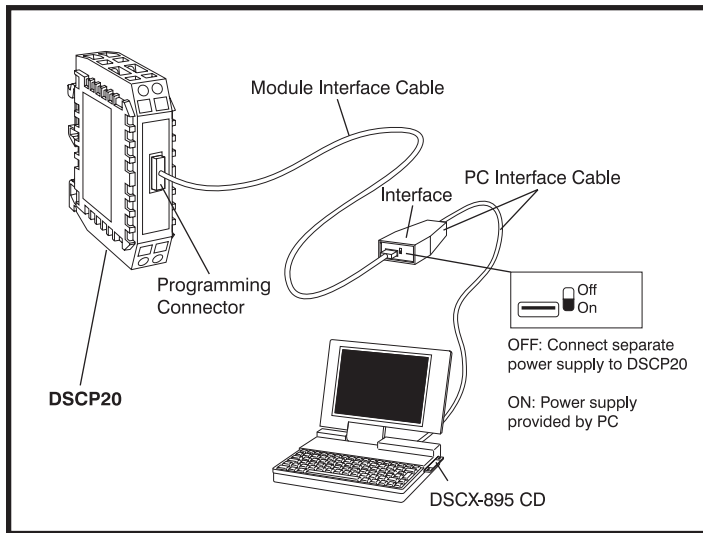
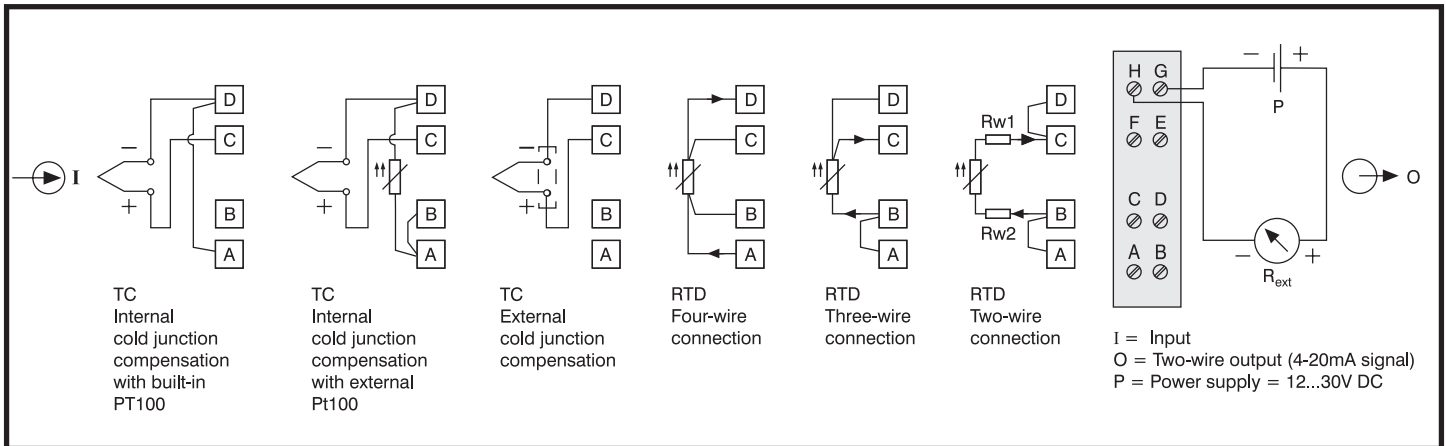
Table 3: Specification and Ordering Information for Factory Configuration

Part Number:	DSCP20-xxxx. xxxx is factory assigned part number	xxxx =
Features, Selection		
1. Temperature units		
1) Temperatures in °C		☐
2) Temperatures in °F		☐
3) Temperatures in K		☐
2. Measuring mode, input connection		
Thermocouple		
1) Internal cold junction compensation, with built-in or external PT100		☐
2) External cold junction compensation, by fixed junction temperature (see NOTE A)	Specify: _____ °	
Resistance thermometer		
3) Two-wire connection, R_L (see NOTE B)	Specify: _____ Ω	
4) Three-wire connection, $R_L \leq 30\Omega/\text{wire}$		☐
5) Four-wire connection, $R_L \leq 30\Omega/\text{wire}$		☐
NOTE A: Specify external cold junction temperature t_c (in °C, °F or K, acc. to selection in Feature 1), any value between 0 and 60°C or equivalent		
NOTE B: Specify total lead resistance R_L [Ω], any value between 0 and 60Ω		
3. Sensor type/measuring range		
Sensor type/beginning...end value of measuring range*		Specify Range:
1) RTD Pt 100	Specify: _____ Ω (See Note)	_____ ° to _____ °
2) RTD Ni 100	Specify: _____ Ω (See Note)	_____ ° to _____ °
B) TC Type B	_____ ° to _____ °	N) TC Type N
E) TC Type E	_____ ° to _____ °	R) TC Type R
J) TC Type J	_____ ° to _____ °	S) TC Type S
K) TC Type K	_____ ° to _____ °	T) TC Type T
L) TC Type L	_____ ° to _____ °	U) TC Type U
C) TC W5-W26RE	_____ ° to _____ °	D) TC W3-W25RE
*Specify measuring range in [°C], [°F], or [K]; refer to table 4 for the max range operating limits for each type of sensor, and table 1 for min/max span limits.		
NOTE: Specify resistance in Ω at 0°C, any value between 50 and 1000Ω		
4. Output characteristic		
0) Standard 4-20mA		☐
1) Inverted 20-4mA		☐
5. Open and short-circuit sensor detection		
Output response for an open or short-circuit* sensor		
0) Output 21.6mA		☐
1) Output (see NOTE)	Specify: _____ mA	
2) Hold output at last value		☐
A) No signal		☐
NOTE: Any value between 4 and <21.6mA *The short-circuit signal is only active for RTD measuring $\geq 100\Omega$ at 0°C and three or four-wire connection		
6. Output time response		
0) Standard response time approx. 2 seconds		☐
9) Response time (see NOTE)	Specify: _____ s	
NOTE: For admissible values see Table 2		
7. Mains ripple suppression		
0) Frequency 50 Hz		☐
1) Frequency 60 Hz		☐

Table 4: Temperature Measuring Ranges

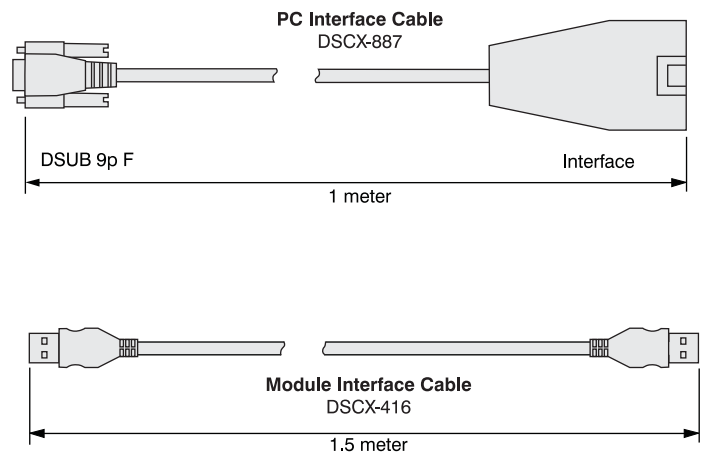
Measuring range examples [°C]	Resistance thermometers		Thermocouples											
	Pt100	Ni100	B	E	J	K	L	N	R	S	T	U	C ⁽¹⁾	D ⁽²⁾
0...40	X			X	X		X							
0...50	X	X		X	X	X	X				X	X		
0...60	X	X		X	X	X	X				X	X		
0...80	X	X		X	X	X	X	X			X	X		
0...100	X	X		X	X	X	X	X			X	X		
0...120	X	X		X	X	X	X	X			X	X		
0...150	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
	NOTE A		NOTE B											
NOTE A: Minimum span is 15Ω when the end value ⁽³⁾ is less than or equal to 400Ω. Minimum span is 150Ω when the end value ⁽³⁾ is greater than 400Ω and not exceeding 4000Ω. The ratio of the min value to the span must be less than or equal to 10. NOTE B: Range of span is 2mV minimum to 80mV maximum. The ratio of the min value to the span must be less than or equal to 10. NOTE (1): W5 Re W26 Re (ASTM E 988-90) NOTE (2): W3 Re W25 Re (ASTM E 988-90) NOTE (3): For two-wire connections, the end value is made up of the measured end value (Ω) plus the total resistance of the leads.														

Electrical Connections



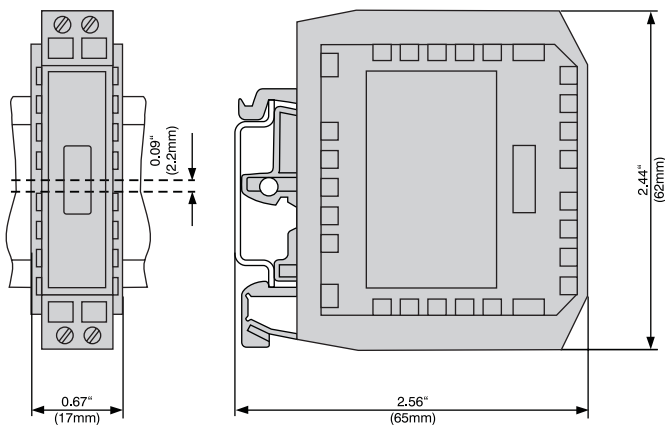
Example of the set-up for programming a DSCP20 without the power supply. For this case the switch on the interface must be set to "ON".

Table 5: Accessories and Spare Parts

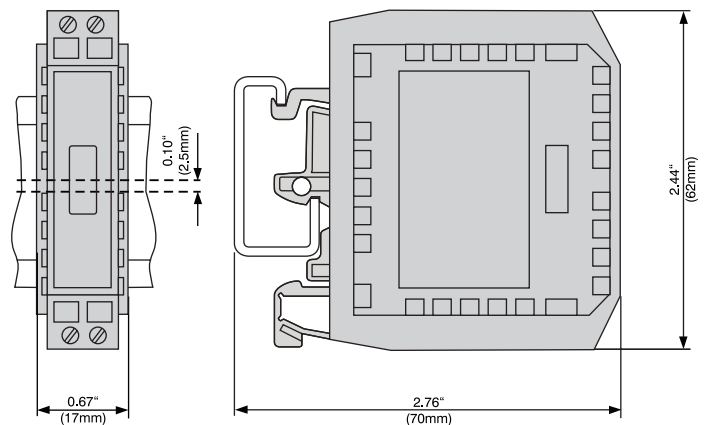


Dimensions

Dimensions: inches (millimeters)



DSCP20 Clipped onto a Top-Hat Rail EN 50-022-35 x 7.5



DSCP20 Clipped onto a Rail "G" EN 50-035-G32