CE

SCTP20
Configurable Two-Wire Temperature Transmitter, Head Mount

FEATURES

- NO POWER SUPPLY REQUIRED, POWERED FROM OUTPUT LOOP CURRENT
- INTERFACES TO ALL STANDARD THERMOCOUPLES AND RTDS
- SOFTWARE CONFIGURABLE INPUT TYPE AND RANGE
- ISOLATED (1500VRMS) AND NON-ISOLATED VERSIONS AVAILABLE
- OPEN AND SHORT-CIRCUIT INPUT DETECTION
- CONFIGURABLE WITH OR WITHOUT OUTPUT LOOP POWER CONNECTED
- -25°C TO +80°C OPERATING TEMPERATURE

DESCRIPTION

Each SCTP20 two-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-440 interface cables, and the DSCX-895 configuration software are required to configure the transmitter. Communication is serial RS-232C. User can choose an isolated or non-isolated model.

The SCTP20 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, Cu50, and Ni 100, 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 ±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.

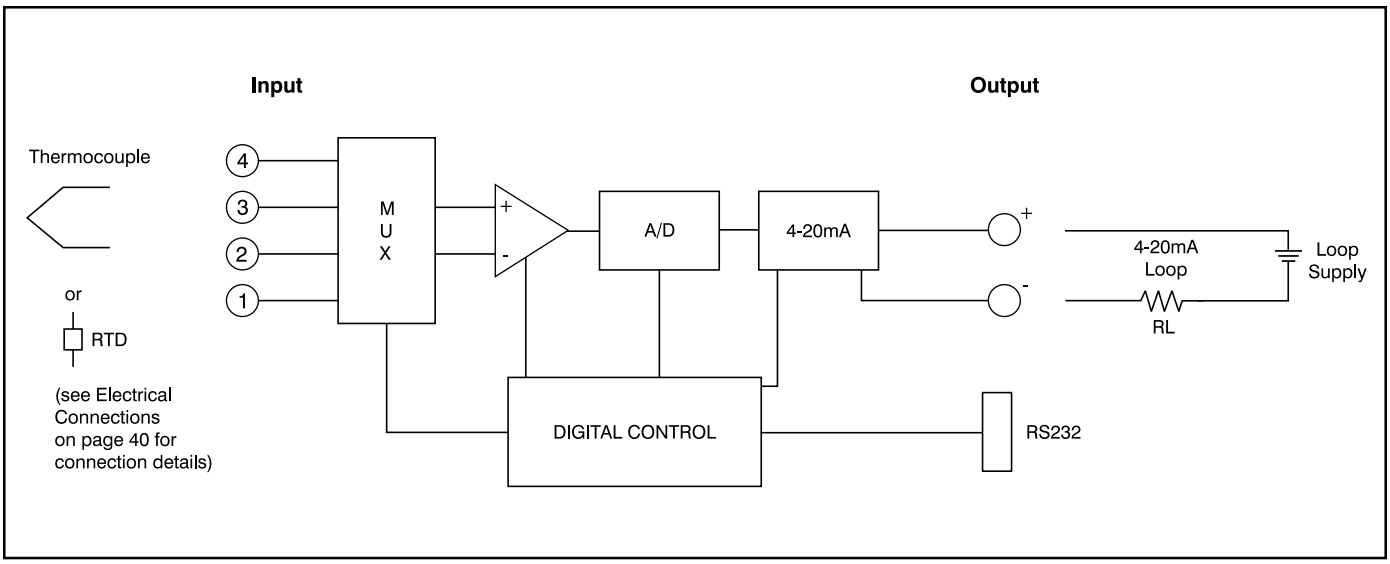


Fig 1: SCTP20 Block Diagram, Non-Isolated Model

SPECIFICATIONS

Reference Conditions: T_A = +25°C, +24V loop supply voltage, and 250Ω Load Resistance

Module	SCTP20-01	SCTP20-02
Input Range, Thermocouple Thermocouple Types: B,E,J,K,N,R,S,T,L,U,C,D	Reference Table 1	*
Cold Junction Compensation		
Internal	Incorporated Pt 100	*
External	0 to 60°C, configurable	*
Input Resistance	>10MΩ	*
Input Range, RTD RTD Types: Pt 100, Ni 100	Reference Table 1	*
RTD Excitation Current	≤0.20mA	*
Input Resistance	>10MΩ	*
Lead Resistance	≤30Ω per lead	*
Output Range	4 to 20mA or inverse 20 to 4mA	*
CMV, Input to Output	Not Isolated	1500Vrms, 1 min.
Output Noise	< 1% p-p	*
Loop Supply Voltage	12 to 30 VDC	*
Reverse Supply Protection	Continuous	*
Load Resistance	See Note 2	*
Output Response for Input Failure	Configurable to hold previous output value, or value between 4 and 21.6mA	*
Output Time Response	Configurable, see Table 2	*
Accuracy(1)	< ±0.2%	*
Linearity	< 0.1%	*
Stability	<±150ppm/°C	*
Environmental		
Operating Temp. Range	-25°C to +80°C	*
Storage Temp. Range	-40°C to +80°C	*
Relative Humidity	0 to 75% Noncondensing	*
Mechanical Dimensions (h)(w)	0.66" x 1.69" (16.8mm x 43mm)	*
Housing Material	Lexan 940, Flammability Class V0 according To UL 94	*
Mounting	Shape B version terminal head	*

***** Same specification as SCTP20-01
NOTE: (1) Includes hysteresis, conformity, repeatability, and CJC error (thermocouples).

TABLE 1

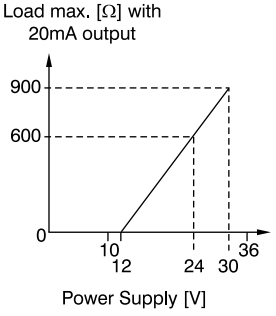
Measured Variables	Measuring Ranges Limits	Min Span	Max Span
RTD: 2, 3, or 4-wire			
Pt 100, Standard IEC 60 751	-200 to +850°C	50°C	850°C
Ni 100, Standard DIN 43 760	-60 to +250°C	50°C	250°C
Thermocouple Type B, E, J, K, N, R, S, T; Standard IEC 60 584-1	According to type	2mV	80mV
Type L and U; Standard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

ORDERING INFORMATION

MODEL	INPUT RANGE / DESCRIPTION	OUTPUT RANGE
SCTP20-01 (Basic Configuration)(3)	Factory User Configurable RTD or Thermocouple, Not Isolated	4 to 20mA, or Inverted
SCTP20-01-xxxx (Contact Factory)(4)	Factory User Configurable RTD or Thermocouple, Not Isolated	4 to 20mA, or Inverted
SCTP20-02 (Basic Configuration)(3)	Factory User Configurable RTD or Thermocouple, Isolated	4 to 20mA, or Inverted
SCTP20-02-xxxx (Contact Factory)(4)	Factory User Configurable RTD or Thermocouple, Isolated	4 to 20mA, or Inverted
ACCESSORIES		
DSCX-887	PC Interface Cable	
DSCX-440	Module Interface Cable	
DSCX-895	Configuration Software	

NOTE: (3) Shipped as PT 100 for 3-wire connection, 0 to 600°C range, 4 to 20mA output, open circuit detect = 21.6mA output.
NOTE: (4) Submit configuration form shown on pages 37 and 38, and factory will assign part number prior to order entry.

NOTE: (2) Load Resistance: $R_L(max) = \frac{\text{Loop Supply (V)} - 12V}{I_{OUTPUT}(max)}$



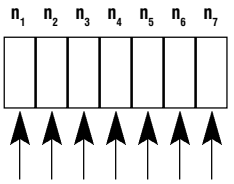
THERMOCOUPLE TYPE AND MATERIAL

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

TABLE 2: Output Response Times

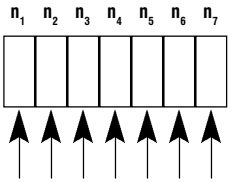
Measuring Mode	Open sensor circuit	Short-circuit	Possible response times approx. [s]						
TC int. comp.	active	–	1.5	2.5	3.5	6.5	11	20.5	40
TC int. comp.	off	–	1.5	2.5	3.5	6.5	13.5	24.5	49.5
TC ext. comp.	active	–	1.5	2.5	3.5	6.5	11	20.5	40
TC ext. comp.	off	–	1.5	2.5	4	6.5	13.5	24.5	48.5
RTD 2L	active	–	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

TABLE 3: Specification and Ordering Information for Factory Configuration



Part Number: SCTP20-yy-n_1 n_2 n_3 n_4 n_5 n_6 n_7 yy=01 or 02			
Features, Selection			
1. Temperature units			
1) Temperatures in °C			1 . . . . .
2) Temperatures in °F			2 . . . . .
3) Temperatures in K			3 . . . . .
2. Measuring mode, input connection			
Thermocouple			
1) Internal cold junction compensation, with built-in or external PT100			. 1 . . . . .
2) External cold junction compensation, by fixed junction temperature (see NOTE A)	t_K		. 2 . . . . .
Resistance thermometer			
3) Two-wire connection, R_L (see NOTE B)	[Ω]		. 3 . . . . .
4) Three-wire connection, R_L ≤30Ω/wire			. 4 . . . . .
5) Four-wire connection, R_L ≤30Ω/wire			. 5 . . . . .
NOTE A: Specify external cold junction temperature t_k (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*			
1) RTD Pt 100	Provide Range		. . 1 . . . .
2) RTD Ni 100	Provide Range		. . 2 . . . .
3) RTD Pt 100...[Ω] (see NOTE)	Provide Range		. . 3 . . . .
4) RTD Ni 100...[Ω] (see NOTE)	Provide Range		. . 4 . . . .
B) TC Type B	Provide Range		. . B . . . .
E) TC Type E	Provide Range		. . E . . . .
J) TC Type J	Provide Range		. . J . . . .
K) TC Type K	Provide Range		. . K . . . .
L) TC Type L	Provide Range		. . L . . . .
N) TC Type N	Provide Range		. . N . . . .
R) TC Type R	Provide Range		. . R . . . .
S) TC Type S	Provide Range		. . S . . . .
T) TC Type T	Provide Range		. . T . . . .
U) TC Type U	Provide Range		. . U . . . .
C) TC W5-W26RE	Provide Range		. . C . . . .
D) TC W3-W25RE	Provide Range		. . D . . . .
*Specify measuring range in [°C], [°F], or [K]; refer to table 4 for the operating limits for each type of sensor.			
NOTE: Specify resistance in Ω at 0°C, any value between 50 and 1000Ω.			

TABLE 3: (continued)



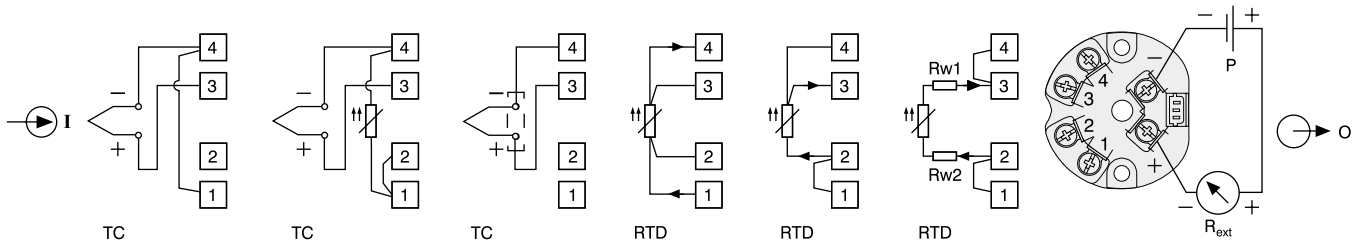
Part Number: SCTP20-yy-n_1 n_2 n_3 n_4 n_5 n_6 n_7				n_1 n_2 n_3 n_4 n_5 n_6 n_7
Features, Selection				
4. Output characteristic				
0) Standard 4...20mA				. . . 0 . . .
1) Inverted 20...4mA				. . . 1 . . .
5. Open and short-circuit sensor detection				
Output response for an open or short-circuit* sensor				
0) Output 21.6mA				. . . . 0 . .
1) Output (see NOTE)	Specify	[mA]		. . . . 1 . .
2) Hold output at last value				. . . . 2 . .
A) No signal				. . . . A . .
NOTE: Any value between 4 and <21.6mA				
*The short-circuit signal is only active for RTD measuring ≥100Ω at 0°C and three or four-wire connection				
6. Output time response				
0) Standard response time approx. 2 seconds				. . . . . 0 .
9) Response time (see NOTE)	Specify	[s]		. . . . . 9 .
NOTE: For admissible values, see Table 2				
7. Mains ripple suppression				
0) Frequency 50 Hz				 0
1) Frequency 60 Hz				 1

TABLE 4: Temperature measuring ranges

Measuring ranges available	Resistance thermometers		Thermocouples											
[°C]	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 15 ohms when the end value[3] is less than or equal to 400 ohms.
Minimum span is 150 ohms when the end value[3] is greater than 400 ohms and not exceeding 4000 ohms.
The ratio of the zero 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 zero 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



TC Internal cold junction compensation with built-in PT100

TC Internal cold junction compensation with external Pt100

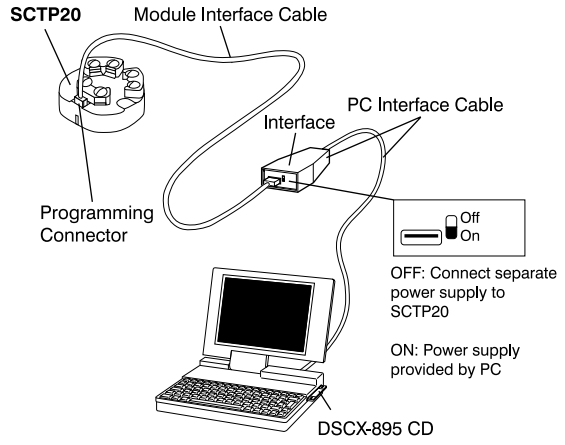
TC External cold junction compensation

RTD Four-wire connection

RTD Three-wire connection

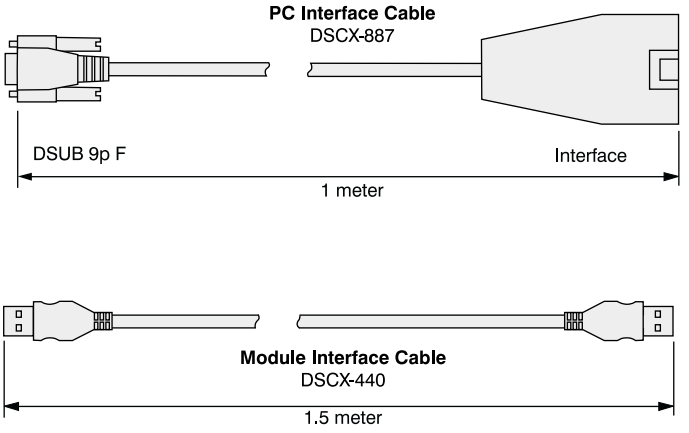
RTD Two-wire connection

I = Input
O = Two-wire output (4-20mA signal)
P = Power supply = 12...30V DC



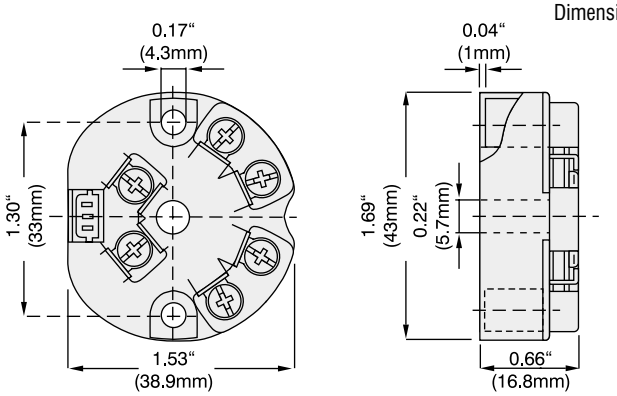
Example of the set-up for configuring an SCTP20 without the power supply. For this case the switch on the interface must be set to "ON".

TABLE 5: ACCESSORIES AND SPARE PARTS

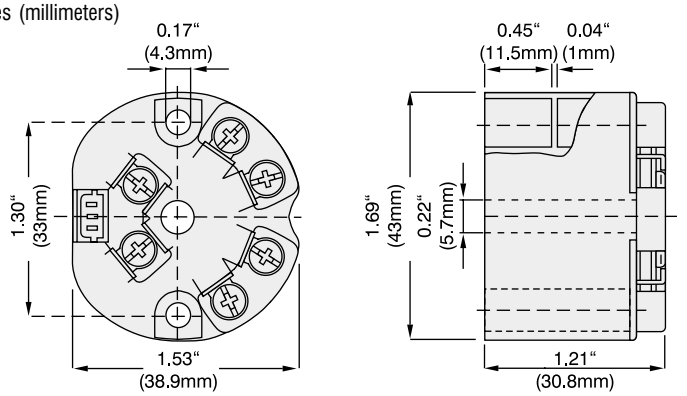


DIMENSIONS

Dimensions: inches (millimeters)



*SCTP20-01 input/output **not** electrically isolated.*



SCTP20-02 input/output electrically isolated.