Modbus

Programmable temperature transmitter for PT1000 probes

The transmitter measures the temperature for a PT1000 platinum film element. The microprocessor samples the temperature once per second. It calculates an averaging signal over a pre-set number of seconds and generates an output signal based on lower and upper signal range values. Standard range is -40…400°C (-40…752°F) and 3 second's average. The output signal range and type may be customized by jumpers and if required by a programming tool. Standard signal ranges are 0-10VDC, 2-10VDC, 0-20mA and 4-20mA. Other ranges can be set on the optional built-in operation terminal "OPC-S" or by connecting an external operation terminal "OPA-S / OPU-S".

Features

- Precision temperature measurement for different ranges and accuracies
- Minimum and maximum temperature memory
- 0…10V, 0…20mA or 2…10V, 4…20mA measuring signal output, selectable with jumpers
- DIP switch for temperature range pre-set
- Alternative temperature signal ranges programmable (operation terminal)
- Selectable averaging filter for the measurement signal
- Optional LCD display (OPC-S) or external display (OPA-S / OPU-S)
- Status LED
- Modbus RTU/ASCII RS485 for monitoring and configuration
- Copy of settings with accessory (AEC-PM2)

Applications

- For indoor, outdoor, duct, immersion temperature measurement in the field of heating, ventilation and air conditioning applications
- Measure exactly the temperature range you need
- Recording of minimum and maximum values for critical environments
- Supervision of critical temperatures

Temperature range configuration

The measuring temperature range of the SCC-T1-Tp2 can be set with DIP switches or fine-tuned using configuration parameters.

▲ Temperature range configuration with DIP switch

The following preset temperature ranges can be selected with the DIP switches:

Number (DIP switch)	**Temperature range** [°C]	**Temperature range** [°F]
0 [1)]	-40…400 °C	-40…752 °F
1	-40…60 °C	-40…140 °F
2	0…50 °C	32…122 °F
3	0…100 °C	32…212 °F
4	0…250 °C	32…482 °F
5	-40…150 °C	-40…302 °F
6	-20…80 °C	-4…176 °F
7	-15…35 °C	5…95 °F

1) Standard position of DIP switch

For your convenience, use the DIP switches to select a pre-set temperature range. For details see section "Temperature range selection" on page 8.

▲ Temperature range fine-tuning with configuration parameters

The temperature-signal can be fine-tuned to suit your system. Define your signal by setting a minimum and maximum temperature limit. The output will only react when the temperature is above the lower limit. The output signal will be spanned to the upper limit. This allows the full resolution of the output signal to be used even if only a fraction of the temperature sensors signal range is used. Note: This does not improve the sensing resolution, only the output signal resolution.

For details see section "Temperature range selection" on page 8.

Minimum and maximum values

Using the optional built-in operation terminal "OPC-S" or the external operation unit "OPA-S / OPU-S", the user can read and reset the minimum and maximum values. The minimum and maximum values can be sent to the output using parameter OP 00. In this way the transmitter can be used to supervise the temperature in critical environments. The minimum and maximum values are stored in the EEPROM every minute. They are available even after a power failure.

Safety

DANGER! Safety advice
This device is for use as a temperature transmitter. It is not a safety device. Where a device failure could endanger human life and property, it is the responsibility of the client, installer and system designer to add additional safety devices to prevent such a device failure. Ignoring specifications and local regulations may cause equipment damage and endangers life and property. Tampering with the device and misapplication will void warranty.

Types and Ordering

Product Name	Product No.	Description / Function
SCC-T1-Tp2-1 [1)]	40-300157	Temperature transmitter for PT1000 sensor (sensor not included) with 2 cable glands
SCC-T1-Tp2-08-1	40-300159	Temperature transmitter with PT 1000 duct sensor probe, length 8 cm
SCC-T1-Tp2-16-1	40-300111	Temperature transmitter with PT 1000 duct sensor probe, length 16 cm
SCC-T1-Tp2-24-1	40-300112	Temperature transmitter with PT 1000 duct sensor probe, length 24 cm
SCC-T1-Tp2-MOD-1 [1)]	40-300241	Temperature transmitter for PT1000 sensor (sensor not included) with 2 cable gland and Modbus RTU / ASCII communication
SCC-T1-Tp2-08-MOD-1	40-300242	Temperature transmitter, with PT 1000 duct sensor probe, length 8 cm and Modbus RTU / ASCII communication
SCC-T1-Tp2-16-MOD-1	40-300243	Temperature transmitter, with PT 1000 duct sensor probe, length 16 cm and Modbus RTU / ASCII communication
SCC-T1-Tp2-24-MOD-1	40-300244	Temperature transmitter, with PT 1000 duct sensor probe, length 24 cm and Modbus RTU / ASCII communication

1) An external PT1000 sensor according to EN 60751 has to be connected. For Vector Controls sensors check accessories below.

Accessories

Product Name	Product No.	Description
Built-in Operation Terminal		
OPC-S	40-500029	Optional built-in operation terminal for SCC devices. Replaces housing cover
Sensors & Probes		
S-Tp2-2	40-200012	Flying lead PT1000 sensor, 2 m cable
S-Tp2-2H	40-200156	Flying lead PT1000 sensor, 2 m high temperature cable
S-Tp2-5H	40-200158	Flying lead PT1000 sensor, 5 m high temperature cable
SC-Tp2-2	40-200101	Flying lead PT1000 pipe mounting contact sensor, 2 m cable
SD-Tp2-12-2	40-200024	Flying lead PT1000 duct sensor; Probe length 12 cm, 2 m cable
SD-Tp2-20-2	40-200027	Flying lead PT1000 duct sensor; Probe length = 20 cm, 2 m cable
SRA-Tp2	40-200041	Indoor PT1000 sensor
SOD-Tp2-1	40-200148	Outdoor PT1000 sensor
AMI-Sx-1	40-5100xx	Immersion pocket with ½" NTP thread for temperature sensors Pocket length: 5, 7.5, 10, 15, 20, 30, 40 cm (2, 3, 4, 6, 8, 12, 16 inch)
AMI-Sx-2	40-5100xx	Immersion pocket with ½" BSP thread for temperature sensors Pocket length: 5, 10, 20, 40 cm (2, 4, 8, 16 inch)
External Operation Terminal		
OPA-S	40-500006	External operation terminal
OPU-S	40-500030	External operation terminal (US version)
Plug-In		
AEC-PM2	40-500130	Plug-In memory module for saving and fast copying of parameter sets
Cable & Connectors		
AMC-1	20-100035	Cable gland PG9 for cables Ø 4 – 8 mm (AWG 6 – 1)
AMC-2	20-100067	Conduit connector NPT 1/2

Technical specifications

Power supply	Power requirements	24 VAC ±10% 50/60 Hz, 15…34 VDC
	Power consumption	Max. 2 VA
	Safety extra low voltage (SELV)	HD 384, Class II
	Electrical connection	Screw terminal for wire 0.32…2.0 mm^2 (AWG 22…14)
Signal inputs	Temperature sensor type	PT1000 EN 6075
	Temperature range	-40…400 °C (-40…752 °F± 25 Pa
Signal outputs	Analog outputs Output signal Resolution Maximum load	Analog output for temperature signal 0/2...10 VDC or 0/4...20 mA 4.9 mV or 0.0098 mA (11 bit) Voltage: ≥1kΩ Current: ≤500Ω
Environment	Operation Climatic conditions Temperature Temperature with built-in display Humidity	To IEC 721-3-3 class 3K5 -25…70 °C (-13…158 °F) 0…50 °C (32…122 °F) <85 % RH non-condensing
	Transport & storage Climatic conditions Temperature Temperature with built-in display Humidity Mechanical conditions	To IEC 721-3-2 and IEC 721-3-1 class 3K3 and class 1K3 -25…70 °C (-13…158 °F) 0…50 °C (32…122 °F) <95 % RH non-condensing class 2M2
Standards	Degree of protection	IP64 to EN 60 529
	Pollution class	II (EN 60 730-1)
	Safety class:	III (IEC 60536)
	Overvoltage category	II (EN 60 730-1)
General	Material	Flame retardant PC+ABS plastic (UL94 class V-0)
	Dimensions (H x W x D) Transmitter case	47 x 98 x 68 mm (1.9 x 3.9 x 2.7 in)
	Weight (including package) with standard housing cover with OPC-S operation display with duct probe (8/16/24cm)	 182g (6.4 oz) 212g (7.5 oz) 248g (8.7 oz), 266g (9.4 oz), 292g (10.3 oz)

Technical specification communication for -MOD types

Network	Hardware interface	RS485 in accordance with EIA/TIA 485
	Max nodes per network	128
	Max nodes per segment	64 (Vector devices only)
	Conductors	Shielded Twisted Pair (STP) cable
	Impedance	100 - 130 ohm
	Nominal capacitance	100 pF/m 16 pF/ft. or lower
	Galvanic isolation	The communication circuitry is not isolated Connect earth signal of the devices with one another
	Line termination	A line termination resistance (120 ohm) shall be connected between the terminals (+) and (-) of the furthermost node of the network
	Network topology	Daisy chain according EIA/TIA 485 specifications
	Recommended maximum length per chain	1200 m (4000 ft.)
Modbus (-MOD)	Communication standard	Modbus (www.modbus.org)
	Default setting	19200 baud rate, RTU 8 data bits, 1 even parity bit, 1 stop bit
	Communication speed	4800, 9600, 19200, 38400
	Protocol: Data bits Parity – stop bit	RTU - 8 data bits, ASCII – 7 data bits, no parity – 2 stops, even or odd parity – 1 stop

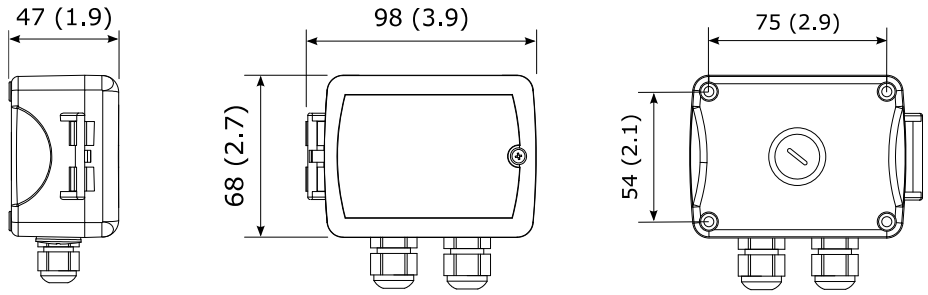
Product Testing and Certification

CE Declaration of Conformity

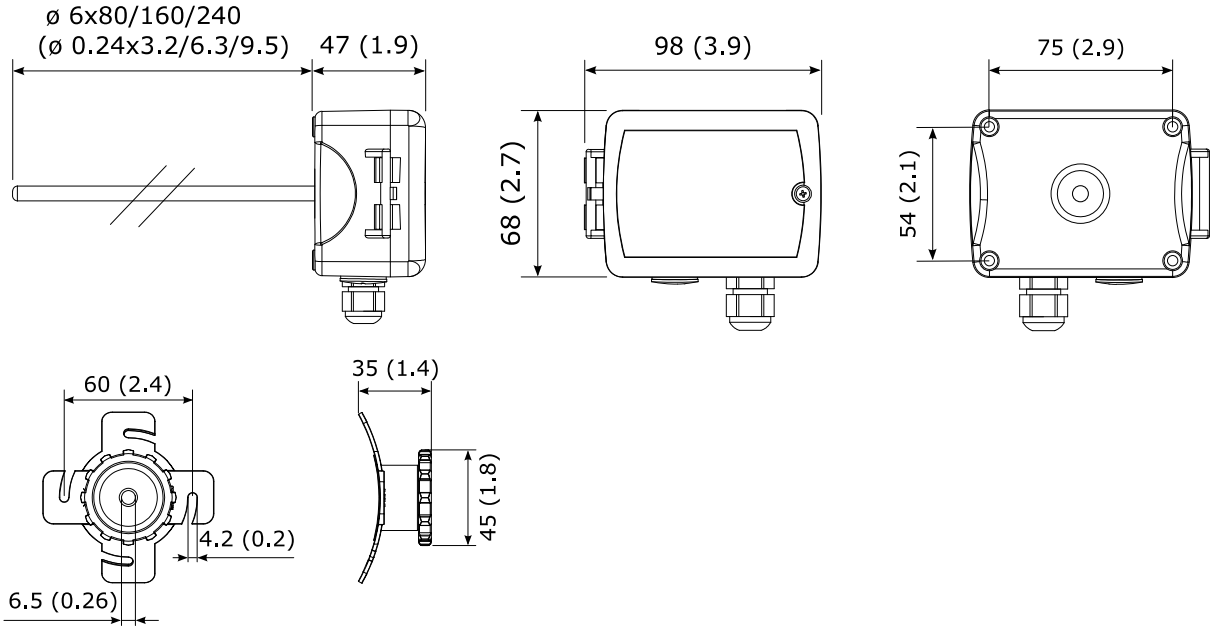
Information on the conformity of our products can be found on our website www.vectorcontrols.com on the corresponding product page under "Downloads".

Dimensions, mm (inch)

SCC-T1-Tp2



SCC-T1-Tp2 with duct probe



Documentation overview

Document Type	Document No.	Description
SCC-T1-Tp2 Data Sheet	70-00-0175	Product data sheet (this document)
SCC-T1-Tp2 Install Sheet	70-00-1005	Mounting and installation sheet
SCC-T1-Tp2 Duct Install Sheet	70-00-1006	Mounting and installation sheet for duct probe version
Modbus Communication Module (-MOD type)	70-00-1030	Setup and configuration manual Modbus TCP
OPA-S Operation Manual	70-00-0171	Operations instructions for external operation terminal OPA-S
OPU-S Short Instruction	70-00-0303	Short instructions for external operation terminal OPU-S (US version)

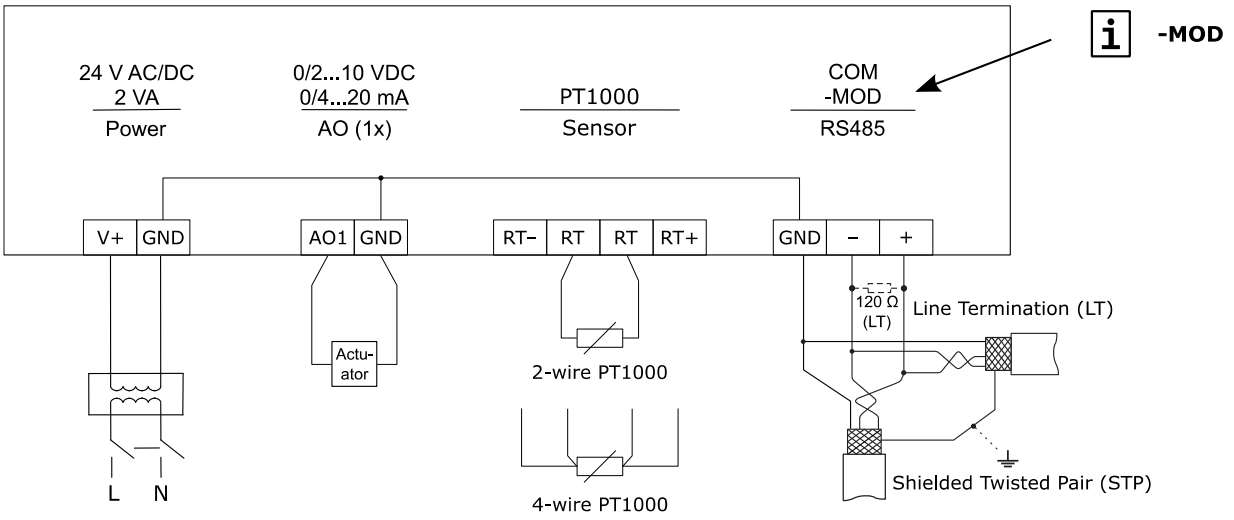
Note: The above list is not complete. The documents on the website are relevant.

Mounting and Installation

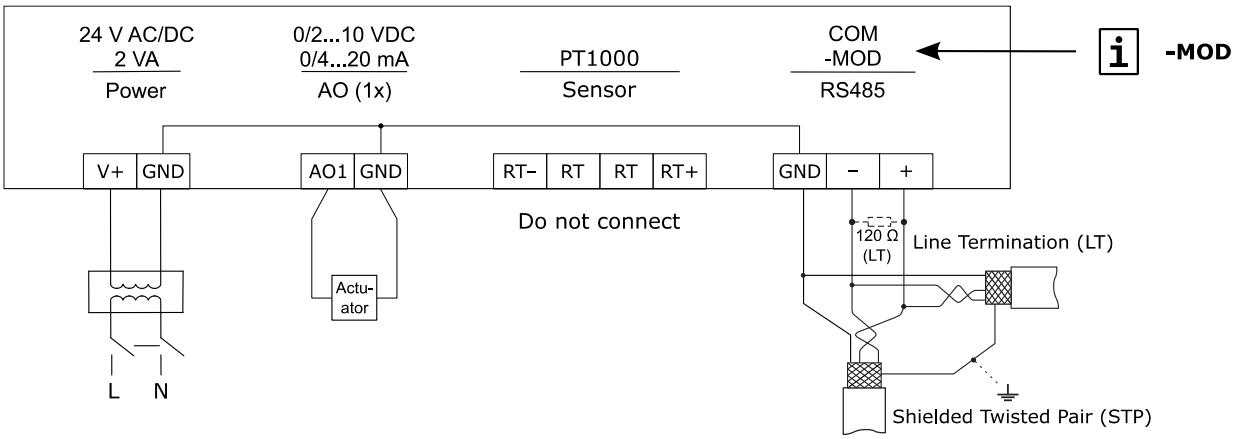
Mounting instructions

For details see "SCC-T1-Tp2" install sheet, document no. 70-00-1005 or "SCC-T1-Tp2 duct" install sheet, document no. 70-00-1006 on our webpage www.vectorcontrols.com

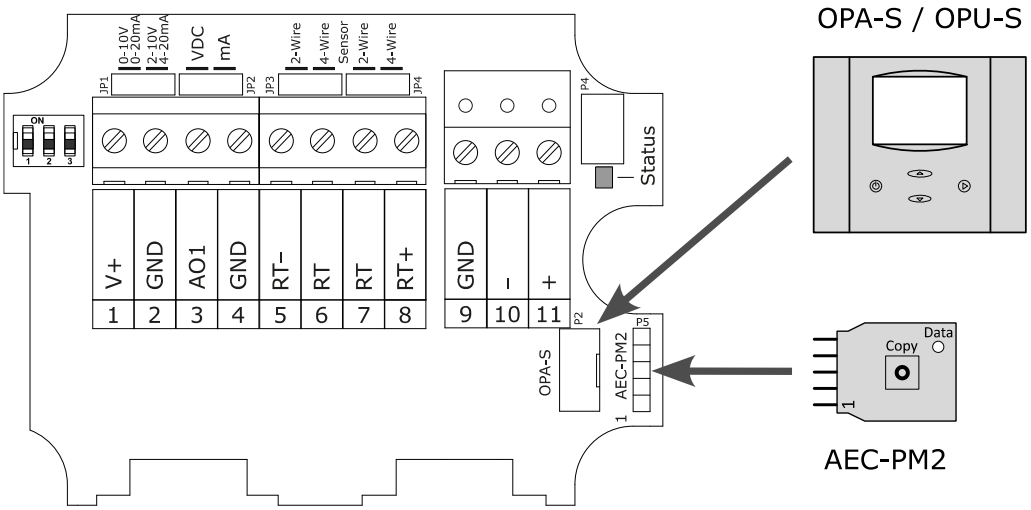
Connection diagram SCC-T1-Tp2-1



Connection diagram SCC-T1-Tp2-08/-16/-24 (SCC with duct probe)



Connection overview

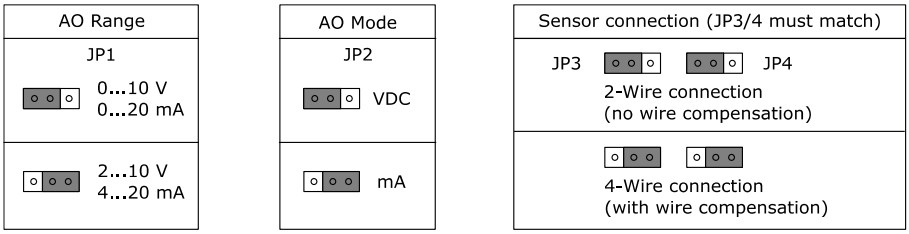


1	V+	Power supply:	24 VAC ±10% 50-60 Hz, 15-34 VDC
2	GND	Power supply:	0 VAC, 0 VDC – common ground
3	AO1	Analog output:	DC 0(2)…10 V DC 0(4)…20 mA
4	GND	Common ground:	Ground analog output – common ground
5 [1)]	RT–	Temp sensor power:	Negative power supply for external sensing element
6 [1)]	RT	Temp sensor:	Negative measuring input for external sensing element
7 [1)]	RT	Temp sensor:	Positive measuring input for external sensing element
8 [1)]	RT+	Temp sensor power:	Positive power supply for external sensing element
9	GND	COM GND (-MOD):	Modbus Ground (RS485) – common ground
10	–	COM data (-MOD):	Modbus data signal (RS485)
11	+	COM data (-MOD):	Modbus data signal (RS485)

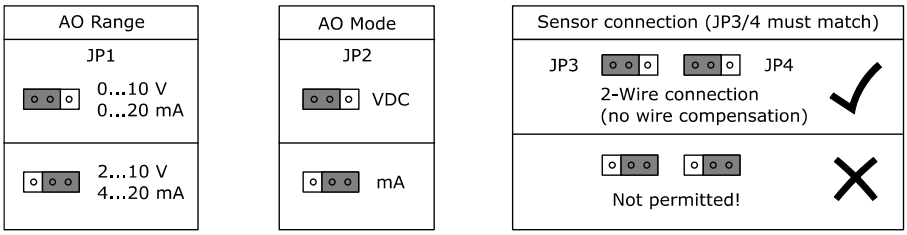
1) Note: do not connect for SCC-T1-Tp2-08/-16/-24 type!

Jumper settings

SCC-T1-Tp2-1



SCC-T1-Tp2-08/-16/-24 (SCC with duct probe)



Temperature range selection

The temperature range of the SCC-T1-Tp2 can be further adjusted according to the following table and by setting the DIP switches accordingly.

Number (DIP switch)	**Temperature range** [°C]	**Temperature range** [°F]
0 [1)]	-40…400 °C	-40…752 °F
1	-40…60 °C	-40…140 °F
2	0…50 °C	32…122 °F
3	0…100 °C	32…212 °F
4	0…250 °C	32…482 °F
5	-40…150 °C	-40…302 °F
6	-20…80 °C	-4…176 °F
7	-15…35 °C	5…95 °F

1) Standard position of DIP switch

DIP switch positions

Number	**Position DIP switch 1**	**Position DIP switch 2**	**Position DIP switch 3**
0 [1)] =	OFF	OFF	OFF
1 =	ON	OFF	OFF
2 =	OFF	ON	OFF
3 =	ON	ON	OFF
4 =	OFF	OFF	ON
5 =	ON	OFF	ON
6 =	OFF	ON	ON
7 =	ON	ON	ON

1) Standard position

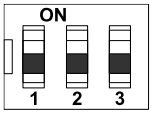


Figure 1: All DIP switches in position OFF

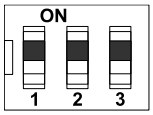


Figure 2: All DIP switches in position ON

LED-indicator

A status LED is located inside of the transmitter housing. During normal operation the LED will flash once every 5 seconds. If there is an alarm or fault condition, it will flash every second and if an operation terminal is connected an error message will be displayed.

For details see section “Error messages” on page 9.

Operation and Configuration

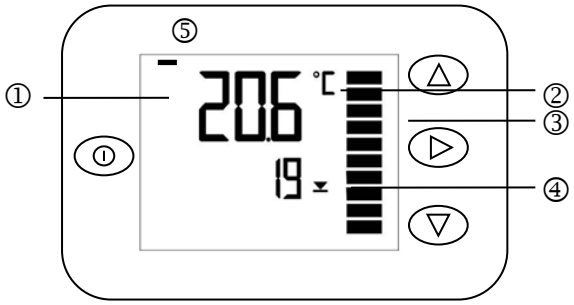
The SCC is designed to work for most applications. However, it can be fine-tuned to fit the application perfectly.

To configure the SCC transmitter or to access the minimum and maximum settings, either the optional built-in SCC operation terminal (OPC-S), a remote operation terminal (OPA-S or OPU-S) or Modbus communication (-MOD) must be used.

It is also possible to load settings to a memory plug-in accessory (AEC-PM2) and to copy them back to other SCC.

For details how to connect see "SCC-T1-Tp2" install sheet, document no. 70-00-1005 or "SCC-T1-Tp2 duct" install sheet, document no. 70-00-1006 on our webpage www.vectorcontrols.com

Operation terminal



Button Symbol	Function	Description
⏻	LEFT key	Exit from parameter menu Long press: Turns SCC OFF Short press: Turns SCC ON if SCC is OFF
△	UP key	Display Maximum values, press for more than 3 seconds resets Maximum value
▽	DOWN key	Display Minimum values, press for more than 3 seconds resets Minimum value
▷	RIGHT key	Select transmitter, For transmitters with more than one input.

LCD Display

Position	Description
1	Big 4-digit display of current value, Minimum, Maximum or control parameter
2	Unit of displayed value, °C, °F, % or none
3	Graphical display of output or input signal with a resolution of 10%
4	Small 4-digit display of current value or control parameter
5	Left bar = display of minimum value Right bar = display of maximum value

Error messages

Following error condition may be displayed:

Err1: Communication time out between terminal unit and transmitter. Terminal unit will reset after 10 seconds.

Err2: Temperature sensor faulty. The connection to the temperature sensor may be interrupted or the temperature sensor is damaged

Display and reset of minimum and maximum values

Press UP key to display maximum values, press DOWN key to display minimum values.
To reset the minimum or maximum values press either the UP or DOWN key for more than 3 seconds while the minimum or maximum value is displayed.

Setting the parameters

The parameters are password protected. The parameters can be modified as follows:

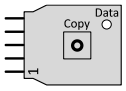
1. Press the UP and DOWN buttons simultaneously for 3 seconds. The display shows CODE.
2. Select a password with the UP or DOWN keys. Dial **09** in order to get access to the configuration parameters. After selecting the correct password, press the RIGHT button.
3. Once logged in, use the UP or DOWN keys to select IP for input configuration or OP for output configuration. Once selected, press the RIGHT key.
4. The parameters will now be displayed. The small digits indicate the parameter number and the large digits indicate the parameter value.
5. Select the parameters using the UP/DOWN keys. Modify a parameter by pressing the RIGHT button. The MIN and MAX symbols are displayed to indicate that the parameter can now be changed. Use the UP and DOWN keys to adjust the value.
6. When finished, press the RIGHT or LEFT key in order to return to the parameter selection level.
7. Press the LEFT key again to exit the menu. The unit will return to normal operation if no key is pressed for more than 5 minutes.

Copy parameters to other SCC devices

Complete parameter sets can be copied to other SCC devices using the AEC-PM2 plug-in memory accessory.

▲ **Loading parameters from SCC to AEC-PM2**

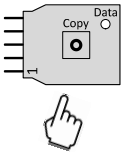
1. Connect the AEC-PM2 plug-in memory to the master SCC
2. Login to the SCC using the operation terminal or Modbus communication
3. Set parameter IP 05 to 1 to start copying parameters to the AEC-PM2
4. The "Data" LED of the AEC-PM2 will light up for 5 seconds if the parameter copy is successful and OP05 is set to 0. If the parameter copy fails, the LED will flash for 5 seconds and OP05 will be set to 7!



AEC-PM2

▲ **Copying parameters from AEC-PM2 to SCC**

1. Connect the AEC-PM2 plug-in memory to the other SCC
2. Press the "Copy" button on the AEC-PM2
3. The "Data" LED on the AEC-PM2 will light for 5 seconds if the parameters have been successfully copied.
   If the parameter copy fails, the LED will flash for 5 seconds!



Push to copy configuration

Configuration Parameters

The transmitter can be perfect adapted to the application. Its parameters are set using the built-in operation terminal OPC-S or the external operation terminals OPA-S / OPU-S. In order to use all the functions described below and get a correct display, only OPA-S or OPU-S units with firmware version V1.5 or higher should be used.

Input configuration

Parameter	Description	Range	Standard
Temperature parameter			
IP 00	TI1: Celsius or Fahrenheit, C = OFF, F = ON	ON, OFF	OFF
IP 01	TI1: Samples taken for averaging control signal	1…255	3
IP 02	TI1: Calibration	-10…10	0.0
IP 03	TI1: Minimum temperature Note: Only has an impact in DIP switch position 0	-40…400°C (752°F)	-40 °C
IP 04	TI1: Maximum temperature Note: Only has an impact in DIP switch position 0	-40…400°C (752°F)	400°C
IP 05	AEC-PM2 parameter copy 0: Parameter copy successful; No action 1: Start parameter copy to AEC-PM2 7: Copy fail (no AEC-PM2 or communication error)	0…1 7 display only	0
Modbus parameter (only visible with the type -MOD)			
IP06	Not used	-	-
IP07	Not used	-	-
IP08	Modbus communication address	1-255	1
IP09	Modbus baud rate: 0 = 19200 1 = 4800 2 = 9600 3 = 19200 4 = 38400	0-4	3
IP10	Modbus communication mode: 0 = Modbus RTU, No parity, 2 stop bits 1 = Modbus RTU, Even parity, 1 stop bit 2 = Modbus RTU, Odd parity, 1 stop bit 3 = Modbus RTU, No parity, 1 stop bit 4 = Modbus ASCII, No parity, 2 stop bits 5 = Modbus ASCII, Even parity, 1 stop bit 6 = Modbus ASCII, Odd parity, 1 stop bit	0-6	1
IP11	Allow parameter change via Modbus 0 = No change allowed 1 = Change allowed	0-1	1

Analog output configuration

Parameter	Description	Range	Standard
OP 00	Configuration output signal: 0 = Feedback temperature input 1 = Feedback temperature minimum value 2 = Feedback temperature maximum value	0…2	0
OP 01	Minimum limitation of output signal	0…Max. %	0%
OP 02	Maximum limitation of output signal	Min.…100%	100%

Modbus configuration (parameter)

The Modbus configuration and parameters are described in a separate document.

For details how to configure the Modbus see "Modbus communication with SCC-T1-Tp2", document no. 70-00-1030 on our webpage www.vectorcontrols.com

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