Air Quality Controller and Sensor SCC2

The SCC2 is a programmable controller and sensor with communication capabilities. Each control loop may use 2 PI sequences and 2 binary stages. The SCC2 comes with a built in RS485 communication interface that allows peer-to-peer communication with an operation terminal such as OPT1-(2TH)-VC. Complete parameter sets may be copied by use of an accessory called AEC-PM2 or exchanged with a PC using an RS485-USB converter and the EasySet program. The SCC2 uses the universal X2 operating system. Communication options are realized with Modbus RTU/ASCII and BACnet® MS/TP.

Applications

- Ventilation control
- Air measurement
- Zone control
- VAV control

Functions

- Two universally configurable control loops:
  - Functions for dehumidifying, set point shift and cascade control
  - Multiple auxiliary functions: heat-cool auto changeover, automatic enable, set point compensation
  - Free heating and cooling with economizer function based on enthalpy or temperature
  - Differential, averaging, min and max functions, enthalpy and dew point calculations
  - Transmitter function for sensors and set points
- Universal analog outputs (VDC, mA) and one relay with a normally open and a normally closed contact (SPDT)
- 8 freely assigned alarm conditions, selectable state of outputs on alarm condition
- Password protected programmable user and control parameters
- Measures CO2 and VOC

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".

Types and Ordering

Product Name	Product No.	Loop	UI	DO	AO	Functions	AO1	AO2
SCC2-C-200.101U-1	40-300194	2		1	1	CO2 sensor with tube connectors	CO2	
SCC2-Q-200.101U-1	40-300195	2		1	1	VOC sensor with tube connectors	VOC	
SCC2-Q-200.101U-MOD-1	40-300204	2		1	1	Communicating with Modbus RTU or ASCII	VOC	
SCC2-CQ-210.102U-MOD-1	40-300196	2	1	1	2	Communicating with Modbus RTU or ASCII	CO2	VOC
SCC2-CQ-210.102U-BAC-1	40-300197	2	1	1	2	Communicating with BACnet® MS/TP	CO2	VOC

AO1 and AO2 are the analog outputs of the controller/sensor. The device is pre-programmed ex works as a transmitter. The sensors are assigned to the analog outputs according to the table.

Accessories

Product Name	Product No.	Description
AEC-PM2	40-500130	Plug-In memory module

A large range of remote operation terminals may be found on our website. All -VC operation terminals work with this controller.

Safety

DANGER! Safety advice
This device is for use as an operating controller or sensor. 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.

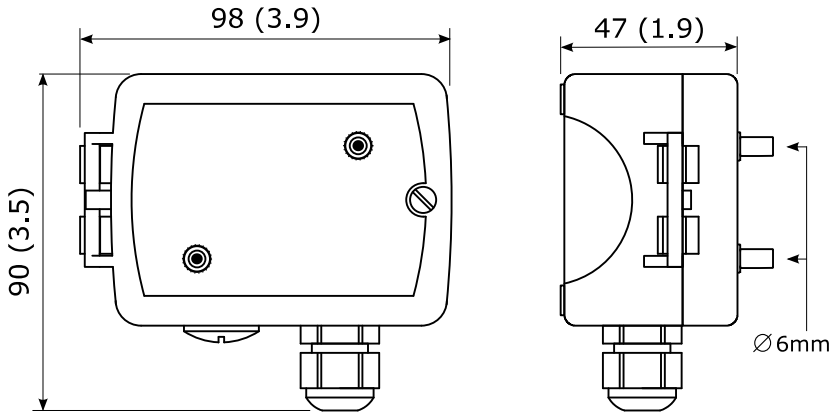
Technical specifications

Power supply	Power requirements	24 VAC ±10%, 50/60 Hz, 15..34 VDC
	Power consumption	Max. 5 VA
	Safety extra low voltage (SELV)	HD 384, Class II
	Electrical connection	Screw terminal connectors for wire 0.75…1.5 mm² (AWG 20…16)
Signal inputs	CO2 sensor	Non-dispersive infrared (NDIR) waveguide technology with ABC automatic background calibration algorithm
	Response time (90%)	2 Minutes
	Measurement range	0 - 2000 ppm
	Repeatability	± 20 ppm ± 1 % of measured value
	Accuracy	± 40 ppm ± 3 % of measured value
	Pressure dependence	+ 1.6% reading per kPa deviation from normal pressure, 100 kPa
	VOC sensor	MEMS metal oxide sensor with ABC automatic background calibration algorithm
	Sensing range: TVOC (relative)	0 – 2000 ppb
	CO2 equivalents (relative)	400 – 2000 ppm
	Passive input	UI6, Passive Temperature NTC or open contact
	Type:	NTC (Sxx-Tn10) 10kΩ@25°C
	Range	-40…100 °C (-40…212 °F)
Signal outputs	Analog outputs	AO1 to AO2
	Output signal	0...10 VDC or 0...20 mA
	Resolution	9.76 mV or 0.019 mA (10 bit)
	Maximum load	Voltage: ≥1kΩ Current: ≤250Ω
	Relay outputs: AC Voltage	0…48 VAC, full-load current 2A.
	DC Voltage	0…30 VDC, full-load current 2A
	Insulation strength between relays contacts and system electronics:	1500 VAC to EN 60 730-1
	between neighbouring contacts:	800 VAC to EN 60 730-1
Connection to remote terminal	Hardware interface	RS485 in accordance with EIA/TIA 485
	Cabling	Twisted pair (STP) cable
Environment	Operation	To IEC 721-3-3
	Climatic conditions	class 3K5
	Temperature	0…50 °C (32…122 °F)
	Humidity	<85 % RH non-condensing
	Transport & storage	To IEC 721-3-2 and IEC 721-3-1
	Climatic conditions	class 3K3 and class 1K3
	Temperature	-25…70 °C (-13…158 °F)
	Humidity	<95 % RH non-condensing
	Mechanical conditions	class 2M2
Standards	Degree of protection	IP60 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	Fire proof ABS plastic (UL94 class V-0)
	Dimensions (H x W x D)	47 x 98 x 90 mm (1.9 x 3.9 x 3.5 in)
	Weight (including package)	380g (13.4 oz)

Technical specification communication for -MOD and -BAC 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 isolated
	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
BACnet® (-BAC)	Communication standard	BACnet™ MS/TP over RS485 BTL tested and listed B-ASC
	Communication speed	9600, 19200, 38400, 57600, 76800, 115200

Dimensions, mm (inch) with tube connectors



Sensors

CO2 sensor for –C-types

The CO2 concentration is measured through non-dispersive infrared (NDIR) waveguide technology with ABC automatic background calibration algorithm. The applied measuring technology guarantees excellent reliability and long-term stability. The microprocessor samples the CO2 once per second. It calculates an averaging signal over a present number of seconds and generates the output signal.

Automatic baseline calibration ABC

The ABC background calibration constantly supervises the measured CO2 concentrations. The calibration function expects the CO2 values sink to 400 ppm when the room is not occupied. Over a period of several days the controller tries to reach this value step by step through recalibration of 30ppm per day max. In order to reach the given accuracy, it is required that the Sensor is for at least 3 weeks in operation.

Note

The ABC calibration works only in those applications where the CO2 concentration sinks regularly to fresh air levels of 400 ppm. For special applications such as green houses, animal farms, etc. the ABC calibration should be deactivated and the sensor should be manually calibrated. See chapter internal sensor inputs in this document.

VOC (Air Quality Sensor) for –Q-types

Reliable evaluation of indoor air quality:
The sensing element used is a MOS (metal oxide semiconductor) based gas sensor component. It was specifically designed for a broad detection of reducing gases such as VOCs (volatile organic compounds) and CO (carbon monoxide) associated with bad air quality. The sensor has to run at least 24h for reliable VOC values. It has the following features:

- Sensing range: 400 – 2000 ppm CO2 equivalents and 0 – 2000 ppb TVOC equivalents
- High sensitivity and fast response
- Module with automatic baseline correction

Note

The VOC sensor is recommended as an actuator for multi-stage ventilation systems. The VOC values can be classified into the following air quality classes:

TVOC concentration [ppb]	0 – 60	60 – 200	200 – 610	610 – 1900	1900 – 2000
air quality class (EPA)	1	2	3	4	5
air quality	very good	good	moderate	unhealthy for sensitive groups	unhealthy

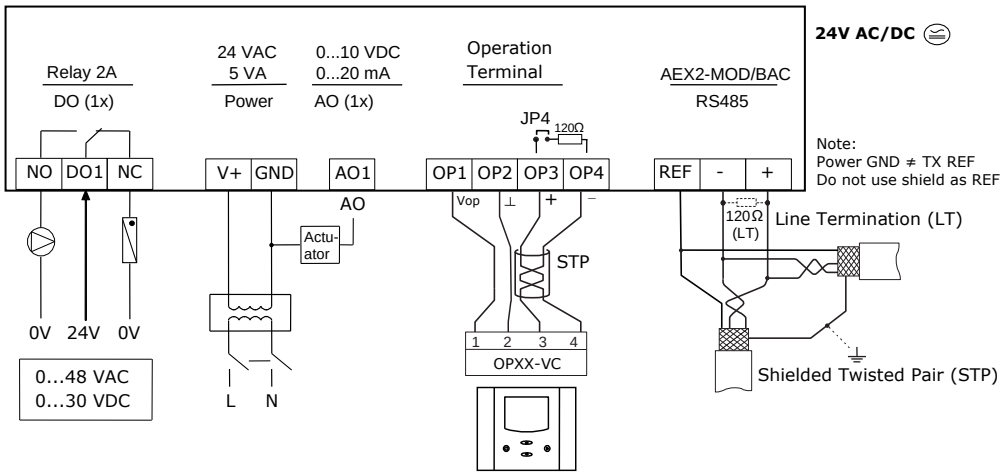
Mounting and Installation

Mounting instructions

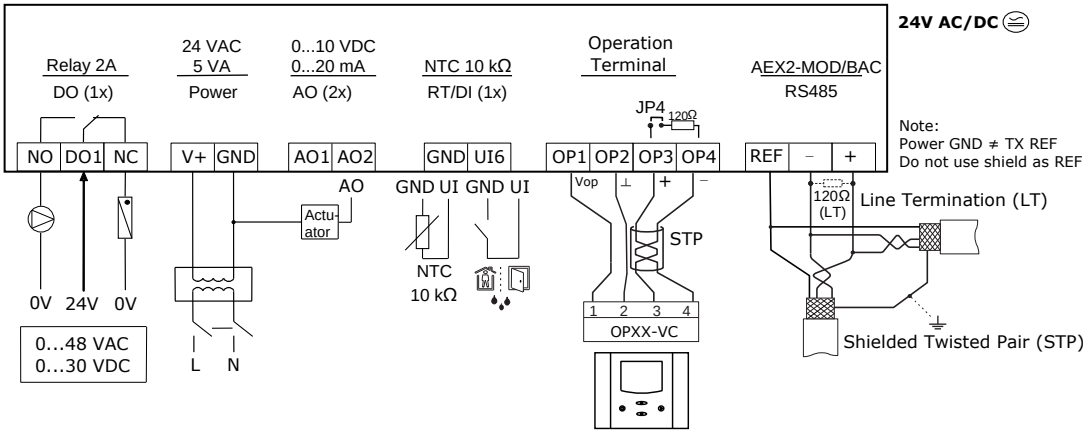
See installation sheet no:

- SCC2-200 70-000726
- SCC2-210 70-000734 (www.vectorcontrols.com)

Connection diagram SCC2-200



Connection diagram SCC2-210



LED-indicators

A status LED is located in the controller housing. During normal operation the LED blinks briefly once every 5 seconds. If there is an alarm or fault condition it will blink every second. See also installation sheet point number D. The function of the system LED is explained in the engineering manual.

The Modbus slave or BACnet® interface features a green LED and a red LED for indication of traffic on the RS-485 bus. The green LED is lit when an incoming packet is received, and the red LED is lit when an outgoing packet is transmitted to the bus. At power-up, both LED blink twice simultaneously as a sign of the boot process being completed. A constantly lit LED serves as an indication of a fault condition in the reception or sending process.

Wire type

An EIA-485 network shall use shielded, twisted-pair cable for data signalling with characteristic impedance between 100 and 130 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot). Distributed capacitance between conductors and shield shall be less than 200 pF per meter (60 pF per foot). Foil or braided shields are acceptable.

Maximum length

The maximum recommended length per segment is 1200 meters (4000 feet) with AWG 18 (0.82 mm2 conductor area) cable.

Operation and Configuration

▲ Documentation

This controller uses the latest generation X2 operating system. Detailed operation instructions for all devices equipped with this operating system can be found on our website.

Also available are programming instructions for technicians and an application database.

▲ Configuration

The device can be fully configured and commissioned using the EasySet program.
EasySet may be downloaded free of charge from our website www.vectorcontrols.com**.**

Documentation overview

Document Type	Document No.	Description
SCC2 Data Sheet	70-000744	Product data sheet (this document)
SCC2-200 Install Sheet	70-000726	Mounting and installation manual
SCC2-210 Install Sheet	70-000734	Mounting and installation manual
X2 Operations Manual	70-000741	Operations instructions of the X2 system
X2 Engineering Manual	70-000737	Guidelines for configuring the X2 system
X2 Modbus Communication Module (-MOD type)	70-000290	Setup and configuration manual Modbus
X2 BACnet Communication Module (-BAC type)	70-000218	Setup and configuration manual BACnet (no BACnet/IP)

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

BACnet Protocol Implementation Conformance Statement (PICS)

BACnet MS/TP network

The following is only valid for products with the **-BAC** type option.

Vendor Name: Vector Controls
Product Name: TRI2 Controls series
SCC2 product description: The SCC2 communicating BACnet controllers are designed as universal controls equipment suitable for a large number of applications. They may be used in zoning and other applications which are monitored by a BACnet MS/TP network.

▲ Supported BACnet Interoperability Blocks (BIBB)

The BACnet interface conforms to the B-ASC device profile (BACnet Application Specific Controller).
The following BACnet Interoperability Building Blocks (BIBB) is supported.

BIBB	Type	Name
DS-RP-B	Data sharing	Read property - B
DS-RPM-B	Data sharing	Read property multiple - B
DS-WP-B	Data sharing	Write property - B
DM-DCC-B	Device management	Device communication Control - B
DM-DDB-B	Device management	Dynamic device binding - B
DM-DOB-B	Device management	Dynamic object binding - B
DM-TS-B	Device management	Time synchronisation - B
DM-UTC-B	Device management	UTC Time synchronisation - B
DM-RD-B	Device management	Reinitialize device - B

▲ Supported standard BACnet application services

- ReadProperty
- ReadPropertyMultiple
- WriteProperty
- DeviceCommunication (password protected)
- I-Am
- I-Have
- TimeSynchronisation
- UTCTimeSynchronisation
- ReinitializeDevice (“cold” or “warm”) (password protected)

▲ Supported standard Object types

- Device
- Analog input
- Analog value
- Binary value
- Multi-state Value

X2 Functional Scope

The controller SCC2-200 has the following X2 functions and elements:

Group	Modules	QTY	Description
UP			User and display parameters
UI	01U to 05U	5	Sensor inputs for CO2 and VOC
	06U to 09U	4	Virtual inputs for operation terminals, bus modules or special functions
AL	1AL to 8AL	8	Alarm conditions
LP	1L to 2L	2	Control loops
AO	1A	1	Analog output for mA, VDC
FAN	1F	1	Fan or lead lag modules, 1 to 3 fan speeds, up to 3 switching lead-lag stages each
DO	1d	1	Binary output with a normally open and a normally closed (SPDT) relays contact
FU	1FU	1	Remote Enable: Activation of the controller based on signal and alarm conditions
	2FU	1	Change Operation Mode: Switching occupied and unoccupied with control signals
	3FU	1	Heat/Cool Change: Switching heating and cooling based on a control signal
	4FU	1	Setpoint Compensation: Summer/winter compensation of setpoint
	5FU	1	Economizer (free heating or cooling due to the condition of outside and room air)
CO			Communication (if a communication module is available)
COPY			Copying complete parameter sets between run, default and external memory with up to 4 memory locations (AEC-PM2)

The controller SCC2-210 has the following X2 functions and elements:

Group	Modules	QTY	Description
UP			User and display parameters
UI	01U to 05U	5	Sensor inputs for CO2 and VOC
	06U	1	Universal input for RT/DI
	07U to 10U	4	Virtual inputs for operation terminals, bus modules or special functions
AL	1AL to 8AL	8	Alarm conditions
LP	1L to 2L	2	Control loops
AO	1A to 2A	2	Analog outputs for mA, VDC
FAN	1F	1	Fan or lead lag modules, 1 to 3 fan speeds, up to 3 switching lead-lag stages each
DO	1d	1	Binary output with a normally open and a normally closed (SPDT) relays contact
FU	1FU	1	Remote Enable: Activation of the controller based on signal and alarm conditions
	2FU	1	Change Operation Mode: Switching occupied and unoccupied with control signals
	3FU	1	Heat/Cool Change: Switching heating and cooling based on a control signal
	4FU	1	Setpoint Compensation: Summer/winter compensation of setpoint
	5FU	1	Economizer (free heating or cooling due to the condition of outside and room air)
CO			Communication (if a communication module is available)
COPY			Copying complete parameter sets between run, default and external memory with up to 4 memory locations (AEC-PM2)

More detailed information on the X2 functions can be found in the "X2 Engineering Manual" on our website www.vectorcontrols.com.

For configuration see section "Operation and Configuration", page 6.

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