Outdoor Controller and Sensor SOC2

The SOC2 is a programmable controller and sensor with communication capabilities. It is for outdoor sensing with rain protection (IP63). Each control loop may use 2 PI sequences and 2 binary stages. The SOC2 uses the universal X2 operating system. Serial communication options are realized with Modbus RTU/ASCII and BACnet MS/TP over RS485. There is also a Wi-Fi communication option available which supports Modbus TCP and BACnet IP. The SOC2 comes with a built in RS485 communication interface that allows peer-to-peer communication with an operation terminal such as OPT1-x or OPA2-x. An embedded webserver provides a web interface to operate the controller or change the connection settings. Complete parameter sets may be copied by use of an accessory called AEC-PM2 or exchanged with a PC using an RS485-USB converter or Wi-Fi communication and the EasySet program.

Applications

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

Functions

- 2 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
- Built in humidity and temperature sensors
- Universal analogue 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 temperature and humidity
- Peer to peer communication to optional X2 operation terminal OPxx-VC
- Communication over Modbus, BACnet or Wi-Fi (optional Wi-Fi interface required)
- Webserver that supports SOC2 operation trough browser or mobile devices (optional Wi-Fi interface required)

Types and Ordering

Product Name	Product No.	Loop	UI	DO	AO	Functions	AO1	AO2
SOC2-TH-210.102U-1	40-300181	2	1	1	2	TH = Temperature- and humidity sensor	Temp.	RH
SOC2-TH-210.102U-OP-1	40-300184	2	1	1	2	OP = With operation display	Temp.	RH
SOC2-TH-210.102U-MOD-1	40-300183	2	1	1	2	MOD = Communication with Modbus RTU or ASCII	Temp.	RH
SOC2-TH-210.102U-OP-MOD-1	40-300186	2	1	1	2		Temp.	RH
SOC2-TH-210.102U-BAC-1	40-300182	2	1	1	2	BAC = Communication with BACnet MS/TP	Temp.	RH
SOC2-TH-210.102U-OP-BAC-1	40-300185	2	1	1	2	WIM = Communication with Modbus TCP over Wi-Fi	Temp.	RH
SOC2-TH-210.102U-WIM-1	40-300200	2	1	1	2		Temp.	RH
SOC2-TH-210.102U-WIB-1	40-300202	2	1	1	2	WIB = Communication with BACnet IP over Wi-Fi	Temp.	RH

UI = Universal inputs, DO = Digital outputs, AO = Analog outputs

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
Built-in Operation Terminal		
OPC2-S	40-500109	Optional built-in operation display for SOC2 devices. Same display as order option "OP".
External Operation Terminal		
OPT1-xx	40-50xxxx	A large range of external operation terminals may be found on our website www.vectorcontrols.com. All -VC operation terminals work with this controller.
OPA2-xx	40-50xxxx	
Memory		
AEC-PM2	40-500130	Plug-In memory module for fast copying of parameter sets

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	Operating voltage	24 VAC ±10%, 50/60 Hz, 12…34 VDC
	Power consumption	Max. 10 VA
	Safety extra-low voltage (SELV)	HD 384, class II
Built in sensors (Type)	Temperature sensor Range Measuring accuracy Repeatability	Bandgap sensor -25…50 °C (-13…122 °F) See *Figure 1* ± 0.1°C (± 0.2°F)
-TH	Humidity sensor Range Measuring accuracy Hysteresis Repeatability Stability	Capacity sensor element 0…100% RH See *Figure 2* ± 1% ± 0.1% < 0.5% / year
Signal inputs	Passive input Type: Range	UI6, Passive Temperature NTC or open contact NTC (Sxx-Tn10) 10kΩ@25°C -40…100 °C (-40…212 °F)
Signal outputs	Analog outputs Output signal Resolution Maximum load	AO1 to AO2 0…10 VDC or 0…20 mA 9.76 mV or 0.019 mA (10 bit) Voltage: ≥1kΩ Current: ≤250Ω
	Relay outputs: AC Voltage DC Voltage Insulation strength between relays contacts and system electronics: between neighbouring contacts:	0…48 VAC, full-load current 2A. 0…30 VDC, full-load current 2A 1500 VAC to EN 60 730-1 800 VAC to EN 60 730-1
Electrical connections	Connector type	Screw terminal connectors for wire 0.75…1.5 mm2 (AWG 22…16)
	Remote terminal	RS485 in accordance with EIA/TIA 485, Shielded twisted pair cable
Environment	Operation Climatic conditions Temperature Humidity	To IEC 721-3-3 class 3K5 -25…50 °C (-13…122 °F) <85 % RH non-condensing
	Transport & storage Climatic conditions Temperature Humidity Mechanical conditions	To IEC 721-3-2 and IEC 721-3-1 class 3K3 and class 1K3 -25…70 °C (-13…158 °F) <95 % RH non-condensing class 2M2
Standards	Degree of protection	IP63 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: (L x W x H)	150 x 98 x 47 mm (5.9 x 3.9 x 1.9 in)
	Weight (including package)	380g (13.4 oz)

Technical specification for serial communication -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

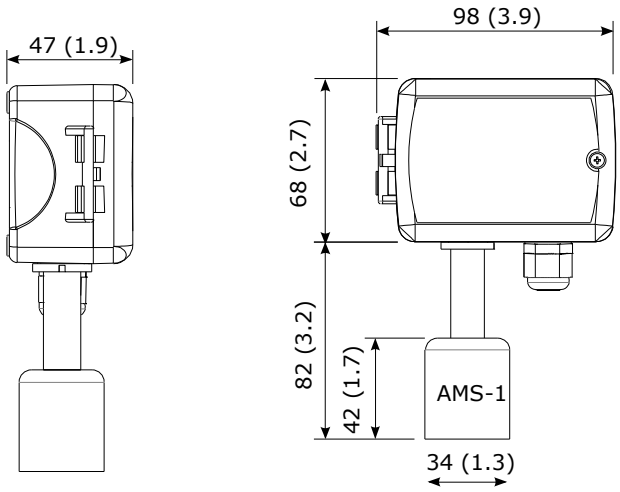
Technical specification for TCP/IP communication -WIM, -WIB types

Wi-Fi	Standards	Wi-Fi Alliance FCC/CE-RED/IC/TELEC/KCC/SRRC/NCC 802.11 b/g/n (802.11n up to 150 Mbps) A-MPDU and A-MSDU aggregation and 0.4 µs guard interval support
	Frequency range	2.4 GHz ~ 2.5 GHz
	Antenna	Internal
Modbus TCP (-WIM)	Standard	IEC 61158
	Communication protocol	Modbus TCP (www.modbus.org)
	Transport Layer	TCP/IP
	TCP/IP Port	502
BACnet/IP (-WIB)	Communication standard	BACnet/IP BTL tested and listed B-ASC
	Transport Layer	UDP
	UDP Port	47808

Product testing and certification

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)



Mounting and Installation

Mounting location

- On a flat, easily accessible wall
- The following mounting locations should be avoided:
  - Protect from direct exposure to sunlight
  - Do not install near heat sources or other heat-generating devices
  - Areas with poor air circulation and niches
  - In the direct influence area of ventilation and fans
  - Avoid locations that interfere with the radio signals of the sensor types with wireless transmission (-WIM), e.g. metal boxes or devices that generate electrical interferences.

Mounting instructions

See the SOC2-TH-210 installation sheet no. 70-00-0687 (www.vectorcontrols.com).

Selection of sensors and actuators

▲ **Temperature sensors**

Use Vector Controls NTC sensors to achieve maximum accuracy: SDB-Tn10-20 (duct), SRA-Tn10 (room), SDB-Tn10-20 + AMI-S10 as immersion sensor.

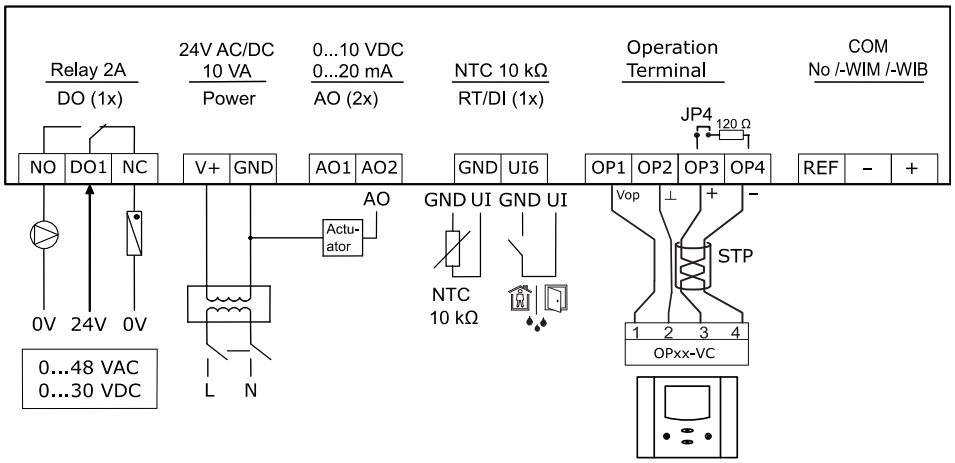
▲ **Actuators**

Choose modulating actuators with an input signal type of 0/2-10 VDC.
3-point actuators with constant running time are recommended.

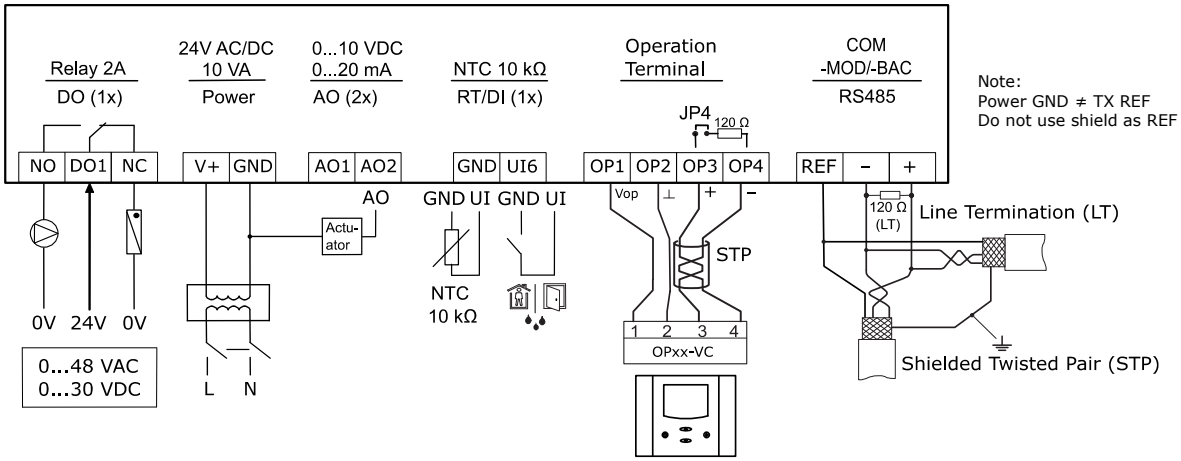
Binary auxiliary devices (e.g. pumps, fans, on/off valves, humidifiers, etc.)
Do not directly connect devices that exceed specified limits in technical specifications – observe startup current on inductive loads.

Connection diagram

No, -WIM or -WIB communication:



-MOD or -BAC communication:



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

▲ **Modbus / BACnet**

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

▲ **Peer-to-Peer or Master-Slave**

For maximum recommended wire length of a peer-to-peer / master-slave connection to a X2 operation terminal:

See SOC2-TH-210 installation sheet no. 70-00-0687 (www.vectorcontrols.com).

Status-LED

The SOC2 has a status-LED which becomes visible by removing the front part. The location of the LED is described in the installation sheet. The function of the LED is explained in the X2 operation manual.

Rest button TCP/IP (-WIM, -WIB type only)

The TCP/IP configuration setting of the SOC2 can be reset by after opening the front part and pressing the reset button on the communication module. The function of the TCP/IP reset is explained in the X2 Wi-Fi / Ethernet Configuration Manual.

See SOC2-TH-210 installation sheet no. 70-00-0687 and X2 Wi-Fi / Ethernet Communication Manual no 70-00-0900 (www.vectorcontrols.com).

Sensors

Temperature & Humidity tolerance of –TH sensor type

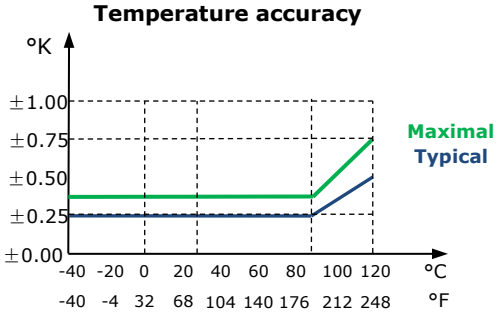


Figure 1: Max T-tolerance by sensor type

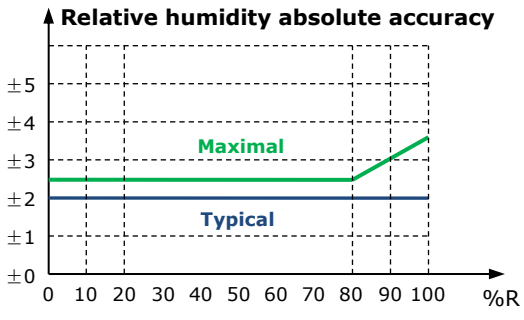


Figure 2: Max RH-tolerance at 25°C (77°F) per sensor type

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

The actual documents can be found on the website www.vectorcontrols.com in the corresponding product page.

Document Type	Document No.	Description
SOC2 Data Sheet	70-00-0727	Product data sheet (this document)
SOC2 Install Sheet	70-00-0687	Mounting and installation manual
X2 Operations Manual button display	70-00-0950	Operations instructions of X2 system with button display
X2 Web Interface operation manual	70-00-0952	Operations instructions of X2 Web interface
X2 Engineering Manual	70-00-0737	Guidelines for configuring the X2 system
X2 Modbus Communication Module (-MOD type)	70-00-0290	Setup and configuration manual Modbus (no Modbus TCP)
X2 Modbus Communication Module (-WIM type)	70-00-0925	Setup and configuration manual Modbus TCP
X2 BACnet Communication Module (-BAC type)	70-00-0218	Setup and configuration manual BACnet (no BACnet/IP)
X2 BACnet/IP Communication Module (-WIB type)	70-00-0899	Setup and configuration manual BACnet/IP
X2 Wi-Fi / Ethernet Communication Manual (-WIM, -WIB type)	70-00-0900	Setup and configuration manual TCP/IP

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

BACnet Protocol Implementation Conformance Statement (PICS)

The following is only valid for -BAC type of products.

Vendor Name: Vector Controls
Product Name: SOC2 Controls series
SOC2 product description:
The SOC2 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 supports the following X2 functions and elements:

Group	Modules	QTY	Description
UP	-	-	User and display parameters
UI	01U to 05U	5	Sensor inputs for temperature and humidity
	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.

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