Universal Programmable Controller TCX2-23343

The TCX2 is a programmable universal controller with communication capabilities. Each control loop may use 2 PI sequences and 6 binary stages. The TCX2 uses the universal X2 operating system. Serial communication options are realized with Modbus RTU/ASCII and BACnet MS/TP. The TCX2 comes with a built in RS485 communication interface that allows peer to peer communication with an operation terminal e.g. OPA2-(2TH)-VC or a PC.
The device can be fully configured and commissioned using the EasySet program. Complete parameter sets may be copied by use of an accessory called AEC-PM1 or exchanged with a PC using an RS485-USB converter and the EasySet program. EasySet may be downloaded free of charge from our website.

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 inputs and set points
- Communication over Modbus or BACnet over RS485
- 3 selectable analog inputs (VDC) and 3 passive inputs (NTC)
- 4 relays outputs with each a normally open contact
- 8 freely assigned alarm conditions, selectable state of outputs on alarm condition
- Password protected programmable user and control parameters
- Peer to peer communication to optional X2 operation terminal OPxx-VC

Types and Ordering

Product Name	Product No.	Loop	Inputs	DO	AO	Functions
TCX2-23343-MOD	40-11 0098	2	3 NTC, 3 VDC	4 Relays	3	= 24 VAC MOD = Communication with Modbus RTU or ASCII BAC = Communication with BACnet MS/TP
TCX2-23343-BAC	40-11 0097	2	3 NTC, 3 VDC	4 Relays	3	

DO = Digital outputs, AO = Analog outputs

Accessories

Product Name	Product No.	Description
Communication		
AEX-MOD	40-500013	Modbus RTU or ASCII communication
AEX-BAC	40-500044	BACnet MS/TP communication
AEC-USB-01	40-500046	USB to RS-485 converter cable kit used for EasySet tool. Not needed for -WIM or -WIB type
Input Extension		
AEI-4UI	40-500138	Accessory for additional 4 universal inputs on a X2 device
Mounting		
AMM-1	40-510022	Mounting kit for panel mounting of the TCX2
Memory		
AEC-PM1	40-500016	Plug-In memory module for saving and fast copying of parameter sets
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 type operation terminals work with this controller.
OPA2-xx	40-50xxxx	

Safety

DANGER! Safety advice
This device is for use as an operating controller. 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
	Safety extra-low voltage (SELV)	HD 384, Class II
	Power consumption	Max. 10 VA
Signal inputs	Passive input Type & range:	X1 to X3, passive temperature NTC or open contact NTC (Sxx-Tn10, 10kΩ@20°C), -40…140 °C (-40…284 °F)
	Analog input Input signal Resolution Impedance	X4 to X6 0...10 VDC 9.76 mV (10 bit) 98kΩ
Signal outputs	Analog outputs Output signal Resolution Maximum load	Y1 to Y3 0...10 VDC 9.76 mV (10 bit) ≥1kΩ
	Relays outputs: DO1, DO2, DO3, DO4 (SPST NO)	0…250 VAC, 0...30 VDC full-load current 3A (1.5)
	Insulation strength between relays contacts and system electronics: between neighboring contacts:	 4000 VAC to EN 60 730-1 1250 VAC to EN 60 730-1
Electrical connections	Connector type	Removable connectors, wire 0.34…2.5 mm² (AWG 24…12)
	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 0…50 °C (32…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	Electromagnetic compatibility for industrial and domestic sector	Emissions: EN 60 730-1 Immunity: EN 60 730-1
	Degree of protection	IP30 to EN 60 529
	Pollution class	II (EN 60 730-1)
	Safety class:	III (IEC 60536) only if SELV is connected to DO, else II
	Overvoltage category	III (EN 60 730-1)
General	Material	Fire proof PC+ABS plastic (UL94 class V-0)
	Dimensions (H x W x D)	56 x 147 x 115 mm (2.3 x 5.8 x 4.5 in)
	Weight (incl. package):	380g (13.4 oz.)

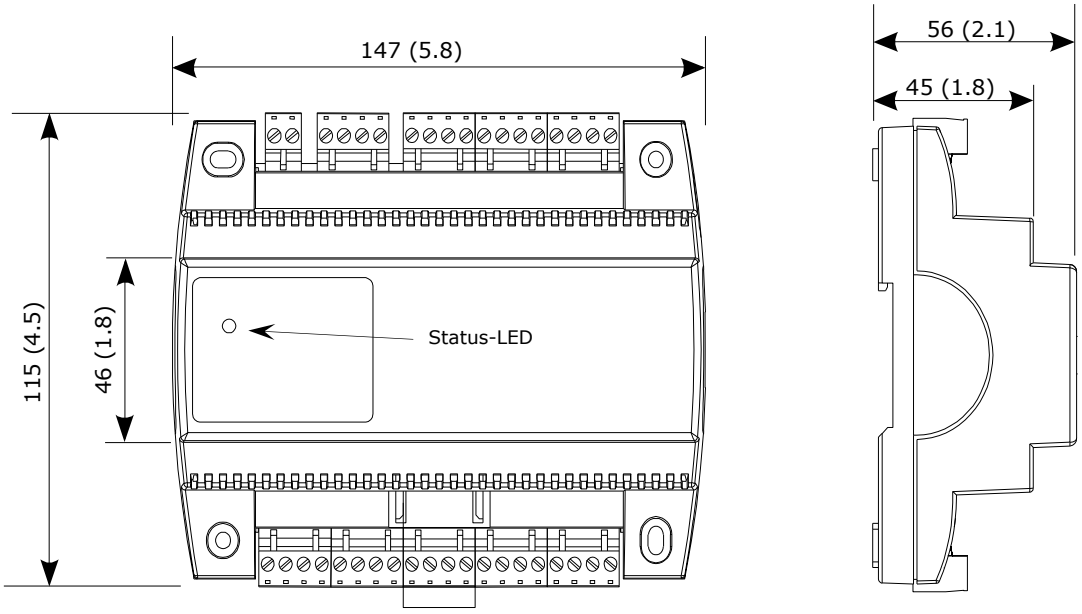
Technical specification for serial communication -MOD and -BAC types

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

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

- In a cabinet on a flat surface
- In a cabinet on a top-hat rail
- In a panel (cabinet door) with the optional panel mounting kit
- The following mounting locations should be avoided:
  - For the types with wireless transmission (-WEM or -WEB), avoid locations that interfere with the radio signals, e.g. metal boxes or devices that generate electrical interferences.

Mounting instructions

See the TXC2-23343 installation sheet, document no. 70-00-0618 (www.vectorcontrols.com).

Selection of sensors and actuators

▲ **Temperature sensors**

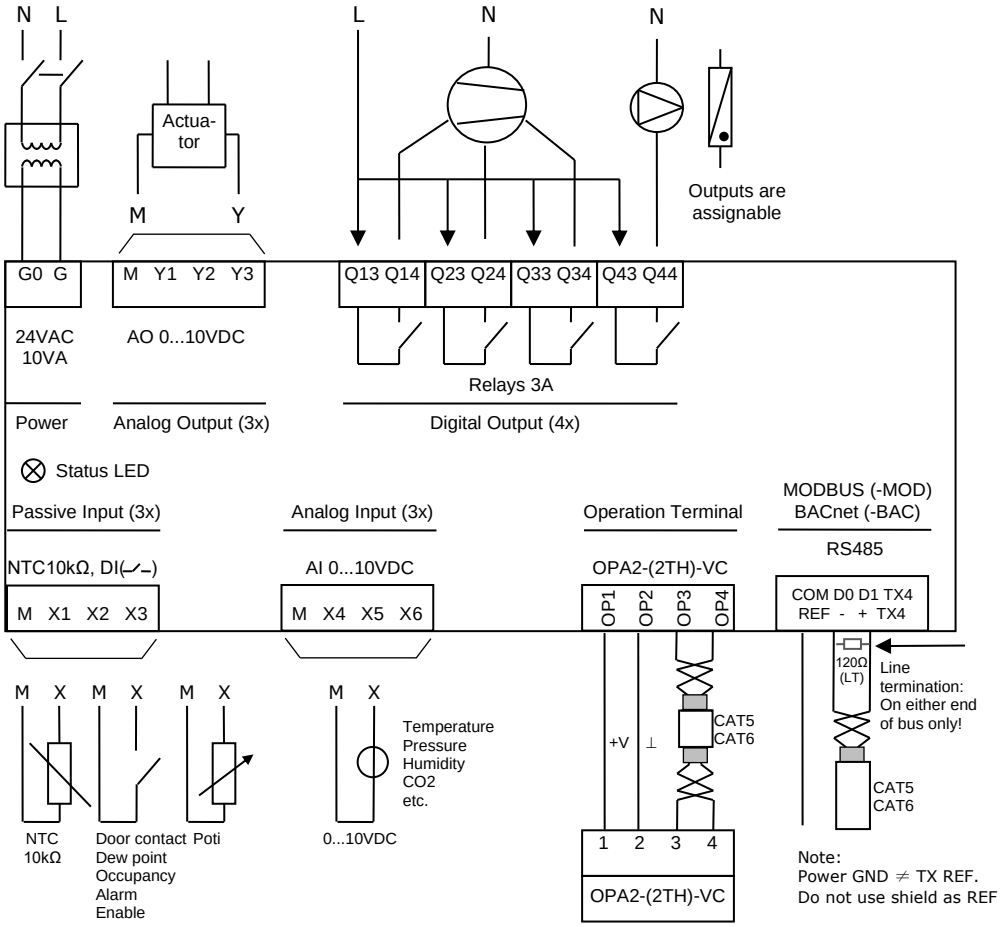
Use Vector Controls NTC sensors to achieve maximum accuracy: SDB-Tn10-20 (duct), SRA-Tn10 (room), SDB-Tn10-20 + AMI-S10 as immersion sensor.

▲ **Actuators**

Choose modulating actuators with an input signal type of 0/2-10 VDC or 4-20 mA (min. and max. signal limitations may be set with parameters).
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 start up current on inductive loads.

Connection diagram TCX2-23343



Status-LED

The TCX2 has a status-LED which is located on the upper left side of the controller housing.
The location of the LED is described in the installation sheet. The function of the LED is explained in the X2 Operations Manual.

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
TCX2-23343 Data Sheet	70-00-0992	Product data sheet (this document)
TCX2-23343 Install Sheet	70-00-0618	Mounting and installation manual -MOD, -BAC
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
X2 BACnet Communication Module (-BAC type)	70-00-0218	Setup and configuration manual BACnet

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: TCX2 Controls series
TCX2 product description: The TCX2 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 has the following X2 functions and elements:

Group	Modules	QTY	Description
UP	-	-	User and display parameters
UI	01U to 03U	3	Passive inputs for NTC 10kΩ@25°C, open contacts, potentiometers
	04U to 06U	3	Active inputs for 0…10 VDC
	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 3A	3	Analog outputs, selectable with jumper: mA, VDC
FAN	1F to 2F	2	Fan or lead lag modules, 1 to 3 fan speeds, up to 3 switching lead-lag stages each
DO	1d to 4d	4	Binary outputs with a normally open (NO) 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-PM1)
RTC*	-	0	Note: No real time clock. Clock simulated by processor clock. Accuracy 5 min/day must be synchronized over Modbus or BACnet
PRO*	Pr01 to Pr12	12	Time schedule programs for 7 days or annual switching events. Note: No real time clock included. Time needs to be synced every 24 hours.

* Requires type -MOD or -BAC for time synchronization over the network

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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