



Universal Programmable Controller TCX2-BAC

The TCX2 is a programmable universal controller with BACnet® fieldbus connection. Each control loop may use 2 PI sequences and 6 binary stages. The TCX2 comes with a built-in RS485 communication interface that allows peer-to-peer communication with an operation terminal such as OPA2-(2TH)-VC. 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. The TCX2 uses the universal X2-operating system.

Applications

- Refrigeration / air conditioning units
- Air handling units
- Chillers
- Humidifying / dehumidifying
- Pressure / pump systems
- and many more...

Functions

- BACnet® MS/TP communication via RS485
- BACnet® B-ASC device profile
- 4 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
 - Transmitter function for inputs and set points
- 8 selectable universal inputs (VDC, mA, NTC)
- 3 universal analog outputs (VDC, mA) and 6 relays with normally open contacts
- 8 freely assigned alarm conditions, selectable state of outputs on alarm condition
- Power cap protected real-time clock with 48hr power backup
- 7-day programmable schedules, with options including change of set points and direct position of manual outputs
- Password protected programmable user and control parameters

Ordering

| Model | Item | Loop | UI | DO | AO | Functions |
|-------------------|-----------|------|----|----------|----|---|
| TCX2-40863-BAC | 40-110079 | 4 | 8 | 6 Relays | 3 | Universal controller with BACnet® MS/TP communication |
| TCX2-40863-OP-BAC | 40-110080 | 4 | 8 | 6 Relays | 3 | Universal controller with display and BACnet® MS/TP communication |
| AEC-PM1 | 40-500016 | | | | | Plug-In memory module |
| AEX-MOD | 40-500013 | | | | | Modbus RTU or ASCII communication |
| AEX-BAC | 40-500044 | | | | | BACnet® MS/TP communication |
| AMM-1 | 40-510022 | | | | | Accessory for cabinet door mounting |

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

Technical specifications

Important notice and 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.

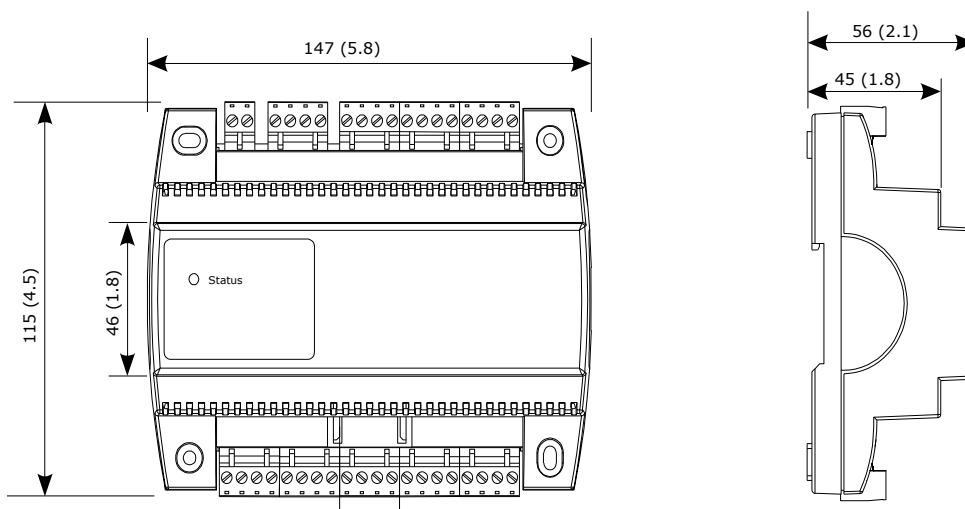
| | | |
|--------------------------------------|---|--|
| Power supply | Power requirements | 24 VAC \pm 10%, 50/60 Hz, 15..34 VDC SELV to HD 384, class II, 48VA max |
| | Power consumption | Max. 10 VA |
| | Electrical connection | Removable terminal connectors, wire 0.34...2.5 mm ² (AWG 24...12) |
| | Clock backup | Min. 48 hours |
| Signal inputs | Universal input | Input jumper set for voltage or current |
| | Input signal | 0...10 V or 0...20 mA |
| | Resolution | 9.76 mV or 0.019 mA (10 bit) |
| | Impedance | Voltage: 98k Ω Current: 250 Ω |
| | Passive input | Input jumper set to temperature (RT) or digital input (DI) |
| Signal outputs | Type: | NTC (Sxx-Tn10) 10k Ω @25 $^{\circ}$ C |
| | Range | -40...100 $^{\circ}$ C (-40...212 $^{\circ}$ F) |
| | Relay outputs: | AC Voltage 0...250 VAC, full-load current 3A, locked-rotor 18A DC Voltage 0...30 VDC, full-load current 3A, locked-rotor 18A |
| | Insulation strength between relays contacts and system electronics: | 4000V AC to EN 60 730-1 |
| | between neighbouring contacts: | 1250V AC to EN 60 730-1 |
| 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 16pF/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 furthestmost node of the network |
| | Network topology | Daisy chain according EIA/TIA 485 specifications |
| | Recommended maximum length per chain | 1200 m (4000 ft.) |
| BACnet™ | Communication standard | BACnet™ MS/TP over RS485 |
| | Communication speed | 9600, 19200, 38400, 57600, 76800, 115200 |
| Connection to remote terminal | Hardware interface | RS485 in accordance with EIA/TIA 485 |
| | Cabling | Twisted pair cable |
| Environment | Operation | To IEC 721-3-3 |
| | Climatic conditions | class 3K5 |
| | Temperature | 0...50 $^{\circ}$ C (32...122 $^{\circ}$ 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 $^{\circ}$ C (-13...158 $^{\circ}$ F) |
| Humidity | <95 % RH non-condensing | |
| Mechanical conditions | class 2M2 | |



Technical Specifications continued

| | | |
|------------------|--|--|
| Standards | conformity | 2004/108/EC |
| | EMC directive | 2006/95/EC |
| | Low voltage directive | |
| | Product standards | |
| | Automatic electrical controls for household and similar use | EN 60 730 -1 |
| | Special requirement on temperature dependent controls | EN 60 730 - 2 - 9 |
| | Electromagnetic compatibility for industrial and domestic sector | Emissions: EN 60 730-1 Immunity: EN 60 730-1 |
| | Degree of protection | IP00 to EN 60 529 |
| | Pollution class | II (EN 60 730-1) |
| | Safety class: Local regulations must be observed! | III (IEC 60536) if SELV is connected to DO II (IEC 60536) if line voltage is connected to DO. |
| | Overvoltage category | III (EN 60 730-1) |
| | Product standards: | |
| | Temperature- indicating and - regulating equipment | UL 873 CSA C22.2 No. 24 Certified by Intertek: 4005917 |
| | Mark: c(ETL)us | |
| General | Material | Fire proof 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 (including package) | TCX2-40863: 430g (15.2 oz) TCX2-40863-OP: 490g (17.3 oz) |

Dimensions, mm (inch)



Selection of actuators and sensors

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

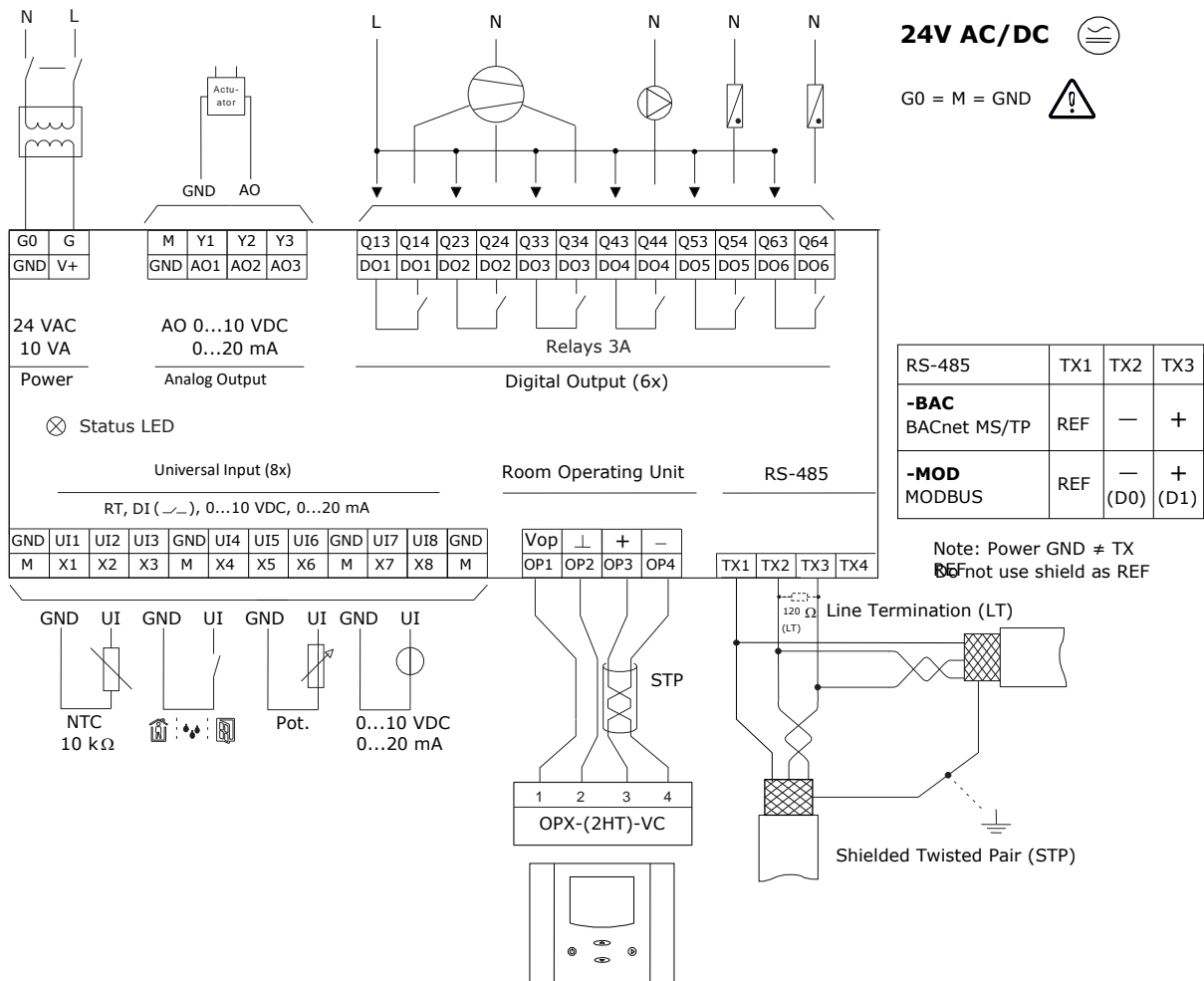
Choose modulating actuators with an input signal type of 0-10 V DC or 4-20 mA (Min. and max. signal limitations may be set with parameters).

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 startup current on inductive loads.

Connection diagram



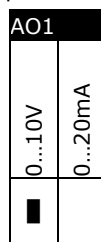
Configuration Jumpers

The inputs and outputs are configured with jumpers. Jumpers are located underneath the controller.

AO: Selection of analog output type

Left position:
voltage output (0... 10 V)
factory default

Right position:
current output (0... 20 mA)

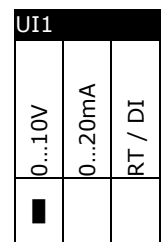


UI: Selection of universal input type

Left position:
voltage output (0... 10 V)
factory default

Middle position: current input (0... 20 mA)

Right position: RT or dry contact



LED-indicators

A status LED is located on the upper left side of 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.

The 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.

TCX2-BAC Protocol Implementation Conformance Statement (PICS)

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. Needs a password which is "Vector" (case sensitive and without the quotes).
- I-Am
- I-Have
- TimeSynchronisation
- UTCTimeSynchronisation
- ReinitializeDevice ("cold" or "warm"). Needs a password which is "Vector" (case sensitive and without the quotes).

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 08U | 8 | Universal inputs, selectable with jumper: RT/DI, mA, VDC |
| | 09U to 12U | 4 | Virtual inputs for operation terminals, bus modules or special functions |
| AL | 1AL to 8AL | 8 | Alarm conditions |
| LP | 1L to 4L | 4 | 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 6d | 6 | Binary outputs Relay Normal Open switching contacts |
| 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 | | 1 | Real time clock module with 48-hour power back up (keeps clock running during power failure) |
| PRO | Pr01 to Pr12 | 12 | Time schedule programs for 7 days or annual switching events |

Installation

See installation sheet no:

- TCX2 70-000599 (www.vectorcontrols.com)

Operation manual and configuration

This controller uses the latest generation X2 operating system. Detailed operating instructions for all devices equipped with this operating system can be downloaded here:

<http://www.vectorcontrols.com/products/x2>

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

The device can be fully configured using EasySet.

EasySet may be downloaded free of charge from www.vectorcontrols.com.

**Efficient use of energy -
for a better future**

**Quality - Innovation - Partnership
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