Wall-mounted Controller and Sensor TRI2-FC

The TRI2 is a programmable controller and sensor with communication capabilities. Each control loop may use 2 PI sequences and 2 binary stages. 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 and the configuration adapter called AEC-TRI. The TRI2 uses the universal X2 operating system. Communication options are realized with Modbus RTU/ASCII and BACnet® MS/TP.

Applications

- Ventilation control
- Temperature control
- Zone control
- Air humidifier and dehumidifier

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 inputs and set points
- 2 passive inputs (NTC, open contact), 1 analog input (VDC) and 2 analog outputs (VDC)
- 2 relays with each a normally open contact to switch line voltage
- 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
TRI2-FC-TH-221.202C	40-100220	2	3	2	2	Temperature- and humidity sensor
TRI2-FC-TH-221.202C-MOD	40-100221	2	3	2	2	Communicating with Modbus RTU or ASCII
TRI2-FC-TH-221.202C-BAC	40-100222	2	3	2	2	Communicating with BACnet® MS/TP

Model	Item	Description
AEC-PM2	40-500130	Plug-In memory module
AEC-TRI	40-500150	Configuration adapter

Technical specifications

Important notice and 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.

Power supply	Power requirements	24V AC/DC ±10%, 50/60 Hz, 15..34V DC SELV to HD 384, Class II, 48VA max
	Power consumption	Max. 5 VA
	Electrical connection	Screw terminal connectors for wire 0.34…1.3 mm^2 (AWG 22…16)
Signal inputs	Humidity sensor Range Measuring accuracy Hysteresis Repeatability Stability	Capacity sensor element 10…90% RH 3% ± 1% ± 0.1% < 0.5% / year
	Temperature sensor Measuring accuracy Repeatability	NTC 0.5°C / 1°F ± 0.1 °C, ± 0.2 °F
	Passive input Type: Range	UI4 to UI5, Passive Temperature NTC or open contact NTC (Sxx-Tn10) 10kΩ@25°C -40…100 °C (-40…212 °F)
	Analog input Type & range: Resolution	UI6, in Voltage mode 0 – 10V 9.76mV (10 Bit)
Signal outputs	Analog output Output signal Resolution Maximum load	AO1 to AO2 DC 0…10 V 9.76 mV ≥1kΩ
	Relay outputs: AC Voltage DC Voltage Insulation strength between relays contacts and system electronics: between neighbouring contacts:	0…250 VAC, full-load current (1.2) A 0…30 VDC, full-load current 2 A 1500V AC nach EN 60 730-1 1000V AC nach EN 60 730-1
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	CE conformity EMC directive Low voltage directive	 2014/30/EU 2014/35/EU
	Product standards: Automatic electrical controls for household and similar use	EN 60 730 –1
	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:	II (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)	Front part: 60 x 60 x 10 mm (2.4 x 2.4 x 0.4 in) Power Case: 50 x 50 x 31 mm (2.0 x 2.0 x 1.2 in)
	Weight (including package)	184g (6.5 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

Dimension, mm (inch)
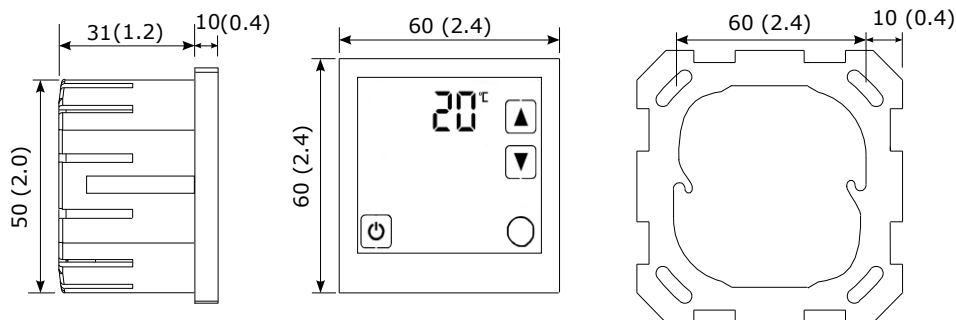
Selection of actuators and sensors

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 0/2-10 VDC.

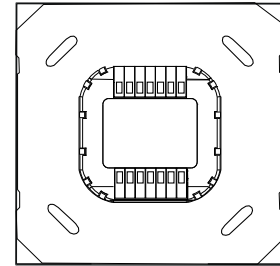3-point actuators with constant running time are recommended.

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
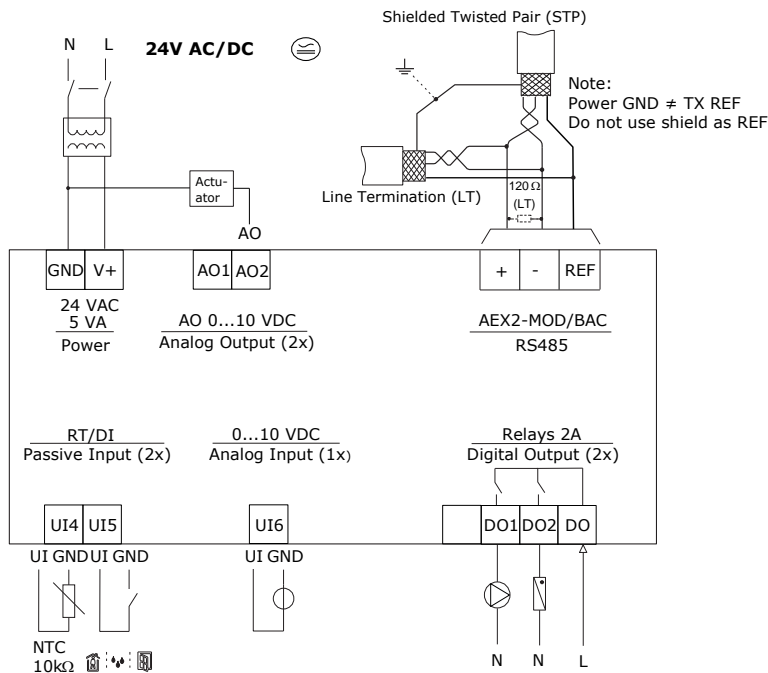
LED-indicators

The TRI2 has a system LED. This is located on the rear part of the device and becomes visible by removing the front part. The function of the system LED is explained in the engineering manual.

The Modbus or BACnet® slave 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.

Installation

See installation sheet no:

- TRI2-FC-221-202   70-000742 (www.vectorcontrols.com)

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.

TRI2-BAC Protocol Implementation Conformance Statement (PICS)

Vendor Name: Vector Controls
Product Name: TRI2 Controls series
TRI2 product description:
The TRI2 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 03U	3	Sensor inputs for temperature and humidity
	04U to 06U	3	Universal inputs for RT/DI, mA, 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 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 to 2d	2	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-PM2)
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

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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