clarity 3 VAV Programmable Controller
BACnet VAV Controller-Actuators (B-AAC)

(CLAR-VAV-FP with MS/TP Shown)

DESCRIPTION

Taco Clarity3™series controller-actuators are designed to operate VAV (Variable Air Volume) terminal units. The integrated alarming, scheduling, and trending enable these BACnet Advanced Application Controllers to be powerful edge devices for the modern smart building ecosystem.

With integrated actuators, internal air pressure sensors, and other powerful features, they are ideal for new installations and upgrades of less-efficient equipment. They easily mount\ to terminal boxes by securing a "V" clamp on the shaft and securing a single-screw anti-rotation bracket.

The factory-supplied programming covers common VAV applications. The controllers feature simple, menu-driven setup choices using an NS-100/200 series digital sensor, which can be installed permanently as the room sensor or used temporarily as a technician's service tool.

Alternately, quick configuration of controller properties can be done using NFC (Near Field Communication) from a smart phone, tablet, or computer (using Taco Vison Lite™ app) while the controller is unpowered.

The Ethernet-enabled CLAR-VAV-FPC-IP can also be configured by connecting an HTML5-compatible web browser to the built-in configuration web pages.

To meet the most demanding building automation custom requirements, these controllers are also fully programmable. Custom configuration and programming, with wizards for application programming selection/configuration, are enabled by Taco Vision software.

Taco GCE software additionally provide the capability of creating custom graphical web pages (hosted on a custom user-interface for remote web server) to use as the controllers.

APPLICATIONS

Application options include:

- Pressure independent or dependent VAV
- Cooling only and with changeover
- Staged, modulated, floating, or time-proportional reheat
- Series or parallel fan control
- Dual duct (with ACC-TSACT-DP actuators)
- Supply/exhaust tracking (with ACC-TSACT-DP actuators)
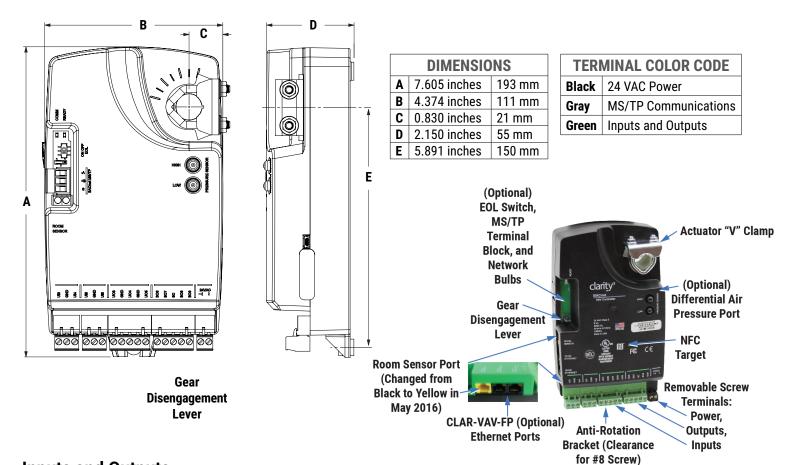- CAV (Constant Air Volume)

For installations with a BACnet building automation system, these easily integrated controllers signal demands for higher static duct pressure, cooler or warmer supply air, and other diagnostics for AHU optimization.

MODELS

APPLICATIONS	INPUTS	OUTPUTS	FEATURES				MODEL
			Air Pressure Sensor	**Real Time Clock**	**MS/TP**	**Ethernet**	
Pressure-**independent** VAV, cooling/heating with fan and reheat; CAV	8 total: • 1 internal actuator position feedback • 1 integrated air pressure sensor (except BAC-9021) • 2 analog (temperature sensor port) • 4 software-configurable universal inputs (terminals)	9 total: • 2 internal triacs (actuator motor control) • 4 external triacs (terminals) • 3 universal outputs (0−12 VDC on terminals)	✔		✔		CLAR-VAV-FP
						✔	CLAR-VAV-FPC-IP
Pressure-**dependent** VAV					✔		CLAR-VAV-FP-D

SPECIFICATIONS

Gear Disengagement Lever

DIMENSIONS		
A	7.605 inches	193 mm
B	4.374 inches	111 mm
C	0.830 inches	21 mm
D	2.150 inches	55 mm
E	5.891 inches	150 mm

TERMINAL COLOR CODE	
Black	24 VAC Power
Gray	MS/TP Communications
Green	Inputs and Outputs

(Optional) EOL Switch, MS/TP Terminal Block, and Network Bulbs

Actuator "V" Clamp

Gear Disengagement Lever

(Optional) Differential Air Pressure Port

NFC Target

Room Sensor Port (Changed from Black to Yellow in May 2016)

CLAR-VAV-FP (Optional) Ethernet Ports

Anti-Rotation Bracket (Clearance for #8 Screw)

Removable Screw Terminals: Power, Outputs, Inputs

Inputs and Outputs

Inputs, Universal (4 on Terminal Blocks)

Universal inputs	Configurable as analog, binary, or accumulator objects
Termination	1K and 10K ohm sensors, 0–12 VDC, or 0–20 mA (without need for an external resistor)
Resolution	16-bit analog-to-digital conversion
Protection	Overvoltage protection (24 VAC, continuous)
Wire size	12–24 AWG, copper, in removable screw terminal blocks

Input, Dedicated Room Sensor Port

Connector	Modular connector for NS-100/200 series digital wall sensors or CLAR-ES Series analog temperature sensors
Cable	Uses standard Ethernet patch cable up to 150 feet (45 meters)

Input, Integrated Air Pressure Sensor (optional)

Δ pressure range	0 to 2" wc (0 to 500 Pa)
Sensor accuracy	±4.5% of the reading or (when near zero) 0.0008" wc (0.2 Pa), whichever is greater (@ 25° C); internally linearized and temperature compensated
Connections	Barbed for 1/4 inch FR tubing

Outputs, Universal (3 on Terminal Blocks)

Universal outputs	Configurable as an analog (0 *to* 12 VDC) or binary object (0 *or* 12 VDC, on/off)
Power/protection	Each short-circuit protected universal output capable of driving up to 100 mA (at 0–12 VDC) or 100 mA total for all outputs
Resolution	12-bit digital-to-analog conversion
Wire size	12–24 AWG, copper, in removable screw terminal blocks

Outputs, Triac (4 Binary)

Triac outputs	Optically isolated zero-crossing triac output configured as a binary object
Power	Maximum switching 24 VAC at 1.0 A for each output; maximum total for controller is 3.0 A
Wire size	12−24 AWG, copper, in removable screw terminal blocks

Output, Integrated Actuator

Torque	40 in-lb. (4.5 N•m)
Angular rotation	0 to 95°; adjustable end stops at 45 and 60° rotation
Motor timing	90 sec. for 90° at 60 Hz; 108 sec. for 90° at 50 Hz
Shaft type/size	Mounts on round or square damper shafts—see **Enclosure and Mounting on page 4**
Noise level	<35 db(A) @ 1 meter (3.3 feet)

Communication Ports

MS/TP (optional)	One EIA-485 port (removable terminal block) for BACnet MS/TP, operating at 9.6, 19.2, 38.4, 57.6, or 76.8 kilobaud; max. length of up to 4,000 feet (1,200 meters of 18 AWG shielded twisted-pair, no more than 51 pf/ft (167 pf/m); use repeaters for longer distances
Ethernet (optional)	On "IP" model only, two 10/100BaseT Ethernet connectors for BACnet IP, Foreign Device, and Ethernet 802.3 (ISO 8802-3); segmentation supported; up to 328 ft (100 m) between controllers (using T568B Category 5 or better cable)
NFC	NFC (Near Field Communication) up to 1 inch (2.54 cm) from the top of the enclosure
Room sensor	Modular STE connection jack for CLAR-NS series digital sensors and CLAR-RS analog sensors
Auxiliary	One serial port with mini Type B connector (reserved for future use)

Configurability

OBJECTS*	MAXIMUM #
Inputs and Outputs	
Analog, binary, or accumulator input	8
Analog or binary output	9
Values	
Analog value	120
Binary value	80
Multi-state value	40
Program and Control	
Program (Control Basic)	10
PID loop	10
Schedules	
Schedule	2
Calendar	1
Logs	
Trend log	20
Trend log multiple (must be created)	4 (default 0)
Alarms and Events	
Notification class	5
Event enrollment	40

*Configuration allows creation and deletion of objects (maximum number of objects shown). The number and configuration of default objects depends on the selected application.

Configuring, Programming, and Designing

SETUP PROCESS			IES CONTROLS TOOL
Config-uration	Programming (Control Basic)	Web Page Graphics*	
✔			Clarity Net Sensor
✔			Internal Configuration web pages in Clarity Ethernet "IP" Models
✔			Taco Vision (NFC) app***
✔	✔		Taco Vision software
✔	✔	✔	Taco software

*Custom graphical user-interface web pages can be hosted on a remote web server, but not in the controller.

Clarity Ethernet-enabled "E" models with the latest firmware can be configured with an HTML5 compatible web browser from pages served from within the controller. For information, see the **Clarity Ethernet Controller Con iguration Web Pages Application Guide.

***Near Field Communication via enabled smart phone or tablet running the Taco Vision Lite app.

Hardware Features

Processor, Memory, and Clock

Processor	32-bit ARM® Cortex-M4
Memory	Programs and configuration parameters are stored in nonvolatile memory; auto restart on power failure
RTC	Real time clock with (capacitor) power backup for 72 hours ("C" model only) for network time synchronization or full stand-alone operation

Indicators and Isolation

LED indicators	Power/status, MS/TP communication, and Ethernet status
MS/TP protection	One network bulb assembly indicates reversed polarity and isolates circuit
Switch	EOL (end of line) for MS/TP

Installation

Power

Supply voltage	24 VAC (−15%, +20%), 50/60 Hz, Class 2 only; non-supervised (all circuits, including supply voltage, are power limited circuits)
Required power	8 VA, plus external loads
Wire size	12−24 AWG, copper, in a removable screw terminal block

Enclosure and Mounting

Weight	1.17 lb. (0.53 kg)
Case material	Green and black flame retardant plastic
Mounting	Directly mounts on 3/8 to 5/8 inch (9.5 to 16 mm) round or 3/8 to 7/16 inch (9.5 to 11 mm) square damper shafts with 2 inch (51 mm) minimum shaft length

Environmental Limits

Operating	32 to 120° F (0 to 49° C)
Shipping	−40 to 160° F (−40 to 71° C)
Humidity	0 to 95% relative humidity (non-condensing)

Protocol and Regulatory Approvals

Warranty, Protocol, and Approvals

Warranty

Taco Limited Warranty	5 years (from mfg. date code)

BACnet Protocol

Standard	Meets or exceeds the specifications in ANSI/ASHRAE BACnet Standard 135-2010 for Advanced Application Controllers
Type	BTL-certified as a B-AAC controller type (pending)

Regulatory

UL	UL 916 Energy Management Equipment listed
CE	CE compliant
RoHS 2	RoHS 2 compliant (pending)
FCC	FCC Class A, Part 15, Subpart B and complies with Canadian ICES-003 Class A*

*This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. (NFC operation meets FCC compliance while the controller is in an unpowered state.)

ACCESSORIES

NOTE: For accessory details, see the respective product data sheets and installation guides.

Miscellaneous Hardware

ACC-RP-TERMBLOCK-CLAR	Controller replacement parts kit with terminal blocks and DIN clips

Network Communications

CLAR-BACROUTER	Single port router

Room Sensors, Analog

CLAR-RS-W CLAR-RS-W-SP	Temperature sensor, white
	Sensor with rotary setpoint dial, white
CLAR-RS-W-SP/OR	Sensor with rotary setpoint dial and override button, white

Room Sensors, Digital (LCD Display)

Taco Net Sensor	Taco NetSensor digital room temp. sensors for viewing and configuration and optional humidity, occupancy, and CO_2 sensing
	NetSensor distribution module (future release)