Series Flow Fan Powered Terminal (Model TCS)

Model TCS fan terminals are specifically designed for quiet operation. They also offer improved space comfort and flexibility for a wide variety of Heating, Ventilating, and Air Conditioning (HVAC) systems. This is critical in today's buildings where occupants are placing more emphasis on indoor acoustics.

Due to heightened interest in indoor air quality, many HVAC system designers are focusing on the effects of particulate contamination within a building's occupied space. Often, HVAC system noise is overlooked as a source of occupied space contamination. The TCS Terminal is specifically designed to eliminate obtrusive fan noise from reaching the occupants while providing constant air motion in the space.

Occupants benefit from a TCS design that minimizes low frequency (125 - 250 Hz) sound levels that typically dominate the space sound level. The TCS also minimizes the fluctuation in sound levels that occurs during Variable Air Volume (VAV) damper modulation.

Bundled with the TCS Terminal is a digital controller from the VAV Modular Assembly (VMA) Series or the LN Series. Each model in the VMA1400 Series and the LN Series combines a controller, pressure sensor, and actuator housed in one preassembled unit.

Unique features that reduce installation and commissioning time while enhancing VAV system operation make the VMA the product of choice for VAV systems.

The VMA and LN Series controls can be used in these types of applications:

- *Series Fan On/Off or Electronically Commutated Motor (ECM)*
- *Series Fan with Reheat Coil*

Note: *For more information on the VMA1400 Series, refer to the* Variable Air Volume Modular Assembly (VMA) 1400 Series Product Bulletin (LIT-635058).

Note: *For more information on the LN Series, refer to the* Metasys System LN Series VAV and VVT Profile Application Controllers Product Bulletin (LIT-1201910).

Figure 1: Series Flow Fan Powered Terminal (Model TCS)

Figure 2: VMA1420

Figure 3: LN Series Controller

Features and Benefits	
❑ **Factory-Provided Direct Digital Controls (DDC)**	An integrated VAV box with controls eliminates the coordination and difficulties associated with factory mounting
❑ **Factory-Commissioned DDC**	Downloading of software, setting of parameters, addressing and testing at the factory reduces startup time and lowers risk
❑ **Flexible Design**	Provides application flexibility, while providing options that can meet even the most stringent job requirements
❑ **Superior Flow Measuring**	Provides for lower minimum Cubic Feet per Minute (CFM) values, which reduces energy costs and noise while maintaining comfort in the zone
❑ **Integrated Module**	Includes controller, pressure sensor, and/or actuator, preassembled to reduce installation time
❑ **Enhanced Actuator**	Provides a fast response stepper motor that drives the damper from full open to close in 30 seconds (VMA Series)
❑ **Automated Commissioning**	Uses Proportional Adaptive (P-Adaptive) and Pattern Recognition Adaptive Control (PRAC) for continuous loop tuning (VMA Series)
❑ **Advanced Diagnostics**	Offers damper stall detection, starved box detection, actuator motor duty cycle, VAV box flow test, and other diagnostics on most models (VMA Series)
❑ **Multiple Network Communications**	Enables integration into a Building Automation System (BAS)
❑ **Standard Applications**	Provides proven designs and quick selection of proper variables to ensure proper operation
❑ **Quick Installation**	Installation time can be reduced with the low profile compact design and standard metal hanging straps
❑ **Agency Certified**	Wired in compliance with all applicable National Electrical Code (NEC) requirements and tested in accordance with Air Conditioning and Refrigeration Institute (ARI) Standard 880
❑ **Easy Maintenance and Service**	Requires no periodic maintenance and provides trouble-free operation

Model TCS Terminals

Flexibility

Selection and Layout

The TCS provides flexibility in system design. Reduced noise at the fan terminal enables the system designer to place properly sized units directly above occupied spaces. It is not necessary to use the crowded space above a hall or corridor to locate the equipment. This will reduce lengthy and expensive discharge duct runs. The standard shallow casing height (14” up to 1,000 Cubic Feet per Minute [CFM]) minimizes conflict with other systems competing for ceiling space. The sensor ensures accurate control, even when space constraints do not permit long, straight inlet duct runs to the terminal.

Sizes

Model TCS Terminals are available in nine fan sizes to handle airflow capacities between 100 and 4,800 CFM. Most fan sizes are available with three primary air valve sizes to optimize the unit fan and primary air valve combinations required by current industry needs.

Convenience

Quality

All TCS Terminals are thoroughly inspected during each step of the manufacturing process, including a comprehensive pre-ship inspection, to ensure the highest quality product available. Each unit is also run tested before leaving the factory to ensure trouble-free field startup.

Quick Installation

A standard single point electrical main power connection is provided. Electronic controls and electrical components are located on the same side of the casing for quick access, adjustment, and troubleshooting.

Finite fan speed adjustment is accomplished with an electronic Speed Controller Relay (SCR). The SCR fan speed controller is compatible with the fan motor. This minimizes electronic interference and harmonic distortion that occurs from noncompatible motor and SCR components. Increased motor life and efficiency result from the compatible design.

TCS Terminals use three-tap motors that accommodate a broad range of flow and static pressure field conditions while dramatically increasing efficiency.

The sensor ensures accurate airflow measurement, regardless of field installation conditions. A calibration label and wiring diagram is located on the terminal for quick reference during startup.

The terminal is constructed to enable installation with standard metal hanging straps. Optional hanger brackets for use with all-thread support rods or wire hangers are also available.

Value and Security

Quality

All metal components are fabricated from premium-grade G90 galvanized, chromate-finished steel. Unlike most manufacturers' terminals, the steel used in the TCS is capable of withstanding a 125-hour salt spray test without showing any evidence of red rust.

Energy Efficiency

In addition to quiet and accurate temperature control, the building owner benefits from lower operating costs. The highly amplified velocity pressure signal from the inlet sensor allows precise airflow control at low air velocities.

The sensor's airfoil shape provides minimal pressure drop across the terminal. This allows the central fan to run at a lower pressure and with less brake horsepower. Energy efficient three-tap, three-winding, and permanent-split-capacitor fan motors are manufactured to ensure efficient, quiet, and reliable maintenance operation.

Three-tap motors provide superior energy efficiency over single speed motors by delivering three separate horsepower outputs. For example, a nominal 1/2 hp motor delivers 1/3 hp on medium tap and 1/4 hp on low tap. This allows the motor to operate at a higher efficiency when at a reduced fan capacity.

Fan terminals that use a single speed motor must rely solely on an SCR controller to obtain the reduction in fan capacity. At minimum turndown, they suffer from excessive power consumption and high motor-winding temperatures, significantly reducing the motor life.

Agency Certification

Model TCS Terminals, including those with electric heat, are listed with ETL as an assembly and bear the ETL label.

Note: ETL is a mark issued by Intertek Testing Services' (ITS) ETL SEMKO Division.

TCS Terminals comply with applicable NEC requirements, are tested in accordance with ARI Standard 880, and are certified by ARI.

Maintenance and Service

TCS Terminals require no periodic maintenance other than optional filter replacement. If component replacement becomes necessary, the unit is designed to minimize field labor. The bottom casing panels can be removed to provide easy access to the fan assembly, and the motor electrical leads are easily unplugged.

Standard Features

Construction

Standard construction features include:

- ARI 880 certified and labeled
- 22-gauge galvanized steel casing and valve
- 3/4" 4 lb·ft^3 skin, dual density fiberglass insulation

Fan Assembly

Standard fan assembly features include:

- forward curved, dynamically balanced, direct drive, galvanized blower wheel
- 115 to 277 volt single-phase, three-tap Permanent Split Capacitor (PSC) motor
- SCR fan speed controller
- quick-select motor speed terminal
- permanently lubricated motor bearings
- thermally protected motor
- vibration isolation motor mounts
- single point wiring

Primary Air Valve

Standard primary air valve features include:

- embossed rigidity rings
- non-thermal conducting damper shaft with position indicator
- mechanical stops for open and closed position
- center-averaging airflow sensor
- brass balancing tees
- plenum-rated sensor tubing

Hot Water Coils

Standard hot water coil features include:

- ARI 410 certified and labeled
- 1-, 2-, 3-, 4-row coils
- tested at a minimum of 350 psig under water

Electrical Components

Standard electrical components include:

- cETL listed for safety compliance
- National Electrical Manufacturers Association (NEMA) Type 1 wiring enclosure

Electric Heat

Standard electric heat features include:

- ETL listed as an assembly for safety compliance
- integral electric heat assembly
- automatic reset primary and back-up secondary thermal limits
- single-point power connection
- hinged electrical enclosure
- fusing per NEC

Optional Features

Construction

Optional construction features include:

- 20-gauge galvanized steel construction
- 3/4” or 1” insulation
- scrim-reinforced, foil-faced insulation meeting American Society for Testing and Materials (ASTM) C1136 for mold, mildew, and humidity resistance
- double wall construction with 22-gauge liner
- mounting brackets to accept all-thread hanging rods or wire hangers
- low temperature construction for use in thermal storage applications, including a thermally isolated primary air inlet and a composite damper shaft
- low velocity, low pressure drop induced air filter rack and filters located at induction inlet and/or radiated sound damper
- hot water, steam, or electric heating coils mounted at unit discharge — access plate upstream of hydronic coil (standard)

Fan Assembly

Optional fan assembly features include:

- 208, 230, 240 and 480 volt single-phase PSC motors
- 220/240 volt 50 Hz motors

Electrical Components

Optional electrical components include:

- full unit toggle disconnect and inline motor fusing
- primary and secondary transformer fusing

Electric Heat

Optional electric heat features include:

- proportional (SSR) heater control
- mercury contactors
- door interlocking disconnect switches

Controls

Optional controls include:

- factory-provided controls
- Direct Digital Controls (DDC)
- pneumatic controls

VMA1400 Series Controllers

Actuator Enhancements

The VMA1420 uses an actuator with a fast response stepper motor, which is quiet (<35 dBA) and precise (23 K resolution). The stepper motor drives the damper from full open to full close in 30 seconds. This significantly reduces the time to commission and balance a VAV terminal box. The stepper motor quickly and accurately adjusts the damper position in response to new conditions, minimizing position hunting and motor runtime.

Applications

The VMA1400 Series controllers can be configured for most single duct VAV applications. The VMA1420 requires an additional damper actuator with Differential Pressure Transducer (DPT) sensor for supply/exhaust applications and dual duct applications.

Standard applications for the VMA1420 reside in the HVAC PRO library, which is a section of the Global Operations Support library. See Table 1 for more detailed application and control options. Also refer to the *Variable Air Volume Modular Assembly* (*VMA) 1400 Series Application Note (LIT-6375125).*

Advanced Diagnostics

The VMA1400 Series has several unique diagnostic features. Diagnostics include damper stall detection, starved box detection, actuator motor duty cycle, VAV box flow test, and others.

The VMA constantly monitors the space temperature and airflow and generates alarms to alert the operator of setpoint deviations. The operator can react quickly, taking corrective action to get the system back into desired operation. This ensures occupants better comfort control.

Factory Commissioning

Whenever the VMA Series controls are ordered on the TCS Series, the factory downloads the correct application into the controller. In addition, the factory also sets the Area and K Factor for the size of the box on which it is installed. If provided, the factory also sets the minimum/maximum Cubic Feet per Minute (CFM) and address. Each box is thoroughly tested at end-of-line prior to packaging.

Automated Commissioning

Because the VMA1420 performs loop tuning automatically, there is no need to set proportional bands and integration terms. There is no need to set any jumpers or switches. Even network addressing can be done via software, if desired.

The VMA1420 is configured to detect the damper end-stops automatically. On powerup, the actuator drives to both hard stops on the VAV box and remembers these positions. These automated features get the system operating quickly.

LN Series Controllers

LN-VAVL-0 and LN-VAVC-0 Controllers

LN-VAVL-0 and LN-VAVC-0 controllers include an enclosure with actuator, pressure sensor, eight Input/Outputs (I/Os), and LONWORKS® Network Services (LNS®) plug-in.

Applications

The LN-VAVL-0 Series controllers can be configured for most single duct VAV applications. The LN-VAVC-0 requires an additional damper actuator with Differential Pressure Transducer (DPT) sensor for supply/exhaust applications and dual duct applications.

Standard applications for the LN-VAVL-0 and the LN-VAVC-0 reside in the Global Operations Support library.

Table 1: Applications

Applications	Control Options	VMA1400		LON	
		1410	1420	LN-VAVL-0	LN-VAVC-0
System Types	Fan Powered (Series)		X		X
	Pressure Independent		X		X
Heating (Terminal Box)	Floating 3-Wire Valve Actuator		X		X
	Proportional Valve Actuator		X		X
	Normally Open or Normally Closed Valve		X		X
	1- to 3-Stage Electric		X		X
	2-Stage Electric		X		X
Heating (Supplemental)	Floating 3-Wire Valve Actuator		X		X
	Proportional Valve Actuator		X		X
	Normally Open or Normally Closed Valve		X		X
	Single Stage Electric		X		X
Cooling (Terminal Box)	Stepper Motor Damper Actuator		X		X
Floating/3-Wire (Incremental) Actuator	Valve only		X		X
Proportional Actuator	External Valve		X		X
Fan-Powered Terminal Box	Series, On/Off Control		X		X
	Series, Proportional Control		X		X
Lighting	On/Off (In Relation to Occupancy Mode)		X		X
Modes	Occ/Unocc		X		X
	Occ/Temp		X		X

Standard Terminal Construction

Model TCS

The TCS Terminal incorporates many standard features that are expensive options for other manufacturers.

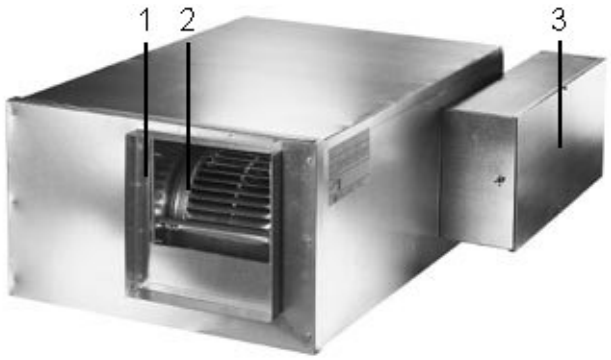

Figure 4: Model TCS – Standard Features (Front View)

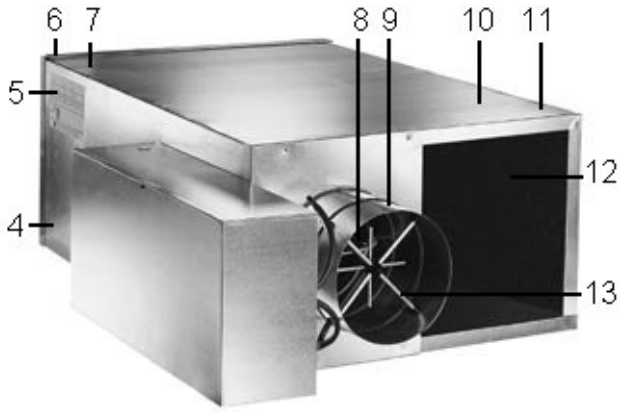

Figure 5: Model TCS – Standard Features (Rear View)

Table 2: Model TCS – Standard Features

Feature	Description
1	Integral discharge collar simplifies field installation
2	Dynamically balanced, direct drive fan assembly
3	Electrical devices installed within a NEMA Type 1 Enclosure, with single point power connection
4	Full bottom removable access panels
5	Product label includes tagging, airflow, and electrical information
6	Mechanical lock construction ensures lowest possible casing leakage
7	All unit configurations listed with ETL for safety compliance
8	Low leakage damper incorporates closed cell foam gasket
9	Roll-formed inlet collar with integral stiffening ribs adds strength and rigidity
10	Premium, chromate coated, G90 galvanized steel casing withstands 125-hour salt spray test per American Society for Testing and Materials (ASTM) B-117
11	Mechanically fastened insulation for added security
12	3/4" thick, 4 lb·ft^3 skin, dual density insulation complying with Underwriters Laboratories Inc.® (UL) 181 and National Fire Protection Association (NFPA) 90A
13	Patented airflow sensor
(not shown)	Dynamically balanced, direct drive fan assembly
(not shown)	Factory-supplied and installed controls

Application and Selection

Purpose of Series Flow Fan Terminals

Series flow fan powered terminals offer improved space comfort and flexibility in a wide variety of applications. Substantial operating savings can be realized through the recovery of waste heat, reduced central fan horsepower requirements, and night setback operation.

Heat Recovery

The TCS recovers heat from lights and core areas to offset heating loads in perimeter zones. Additional heat is available at the terminal unit using electric, steam, or hot water heating coils. Controls are available to energize remote heating devices such as wall fin, fan coils, radiant panels, and roof load plenum unit heaters.

Indoor Air Quality

The TCS enhances the indoor air quality of a building by providing constant air motion, and higher air volumes in the heating mode than typically provided by straight VAV single duct terminals or parallel flow fan terminals. The higher air capacity provides continuous air motion in the space and lowers the heating discharge air temperature. This combination improves air circulation, preventing accumulation of CO_2 concentrations in stagnant areas. Increased air motion improves occupant comfort. The higher air capacity also improves the performance of diffusers and minimizes diffuser dumping.

Selection Guidelines

The TCS Terminal has been designed to provide maximum flexibility in matching primary air valve capacities (cooling loads) with unit fan capacities. The overall unit size is dictated by the fan size. With each unit fan size, multiple primary air valve sizes are available to handle a wide range of cooling capacities.

The fan should be sized first to determine the unit size. The selection is made by cross plotting the specified fan capacity and external static pressure on the appropriate fan performance curves. Terminals using hot water heating coils require the summation of the coil air pressure drop and the design External Static Pressure (ESP) to determine the total ESP. It is common to have more than one fan size that can meet the design requirements. Typically, the selection begins with the smallest fan that can meet the capacity. Occasionally this selection may not meet the acoustical requirements, and you should select the next larger fan size. Upsizing may also occur when it is necessary to meet the design capacity on the medium or low motor tap.

System Pressure Considerations

Because the terminal unit fan is selected to move 100% of the design airflow to the zone, all downstream pressure losses are neglected when determining minimum primary air inlet pressure to the unit. The central fan is only required to overcome the minimal loss through the unit air valve, reducing the central fan total pressure and horsepower requirements. Due to extremely low pressure drop of the air valve, central fan operating inlet static pressures may be as low as 0.5” wg.

Common Misapplication

Note that a conventional Series Flow Fan Terminal cannot be applied as a booster fan. In problem areas where there is insufficient primary airflow capacity, this terminal does not aid in pulling more air from the primary duct. Instead the unit fan draws air from the plenum inlet, which has less resistance.

The induction opening should never be sealed, as this causes problems should the primary airflow increase beyond the unit fan capacity. In this condition, the fan casing becomes pressurized, which eventually stalls the fan motor and causes premature failure.

Electric Heater Features and Selection

Model TCS-E

Figure 6: Model TCS-E

Model TCS-E Standard Features

Model TCS-E standard features include:

- ETL listed as an assembly
- primary auto-reset high limit
- secondary high limit
- hinged control panel
- ni-chrome elements
- primary/secondary power terminations
- fusing per NEC
- wiring diagram and ETL label
- fan interlock device (relay or Pneumatic Electric [PE] switch)
- Single point power connection
- Available kW increments are as follows:
  0.5 to 5.0 kW - .25 kW; 5.0 to 10.0 kW - .50 kW
  Above 10 kW - 1.0 kW

Model TCS-E Optional Features

Model TCS-E optional features include:

- disconnect (toggle or door interlocking)
- PE switches
- mercury and magnetic contactors
- manual reset secondary limit
- proportional control (Solid State Relay [SSR])
- 24 volt control transformer
- airflow switch

Table 3: Maximum Allowable kW

Unit Size	Max CFM	Max kW
404	250	3
504	350	5
604	400	5
506	350	5
606	550	7
806	700	10
611	500	7
811	1000	14
1011	1200	17
818	1000	14
1018	1600	22
1218	1800	25
1021	1600	22
1221	2300	30
1421	2300	30
1224	2300	20
1424	2600	25
1230	2300	20
1430	3100	30
1630	3100	30
1440	3100	30
1640	4100	35
1644	4100	40
1844	4600	40

Model TCS-E Selection Procedure

With standard heater elements, the maximum capacity (kW) is obtained by dividing the heating (fan) Standard Cubic Feet per Minute (SCFM) by 70. In other words, the terminal must have at least 70 SCFM per kW. In addition, each size terminal has a maximum allowable kW based upon the specific heater element configuration (for example, voltage, phase, and number of steps).

Heaters require a minimum of 0.07” wg downstream static pressure to ensure proper operation.

For optimum diffuser performance in overhead heating applications, the supply air temperature should be within 20°F of the desired space temperature. This typically requires a higher air capacity, which provides higher air motion in the space increasing thermal comfort. The electric heater should be selected with this in mind, keeping the Leaving Air Temperature (LAT) as low as possible.

Table 4: Model TCS-E Selection Equations

Equations			
KW	=	$\frac{CFM \times \Delta T \times 1.085}{3413}$*	* Air density at sea level - reduce by 0.036 for each 1,000 feet of altitude above sea level.
CFM	=	$\frac{KW \times 3413}{\Delta T \times 1.085}$ *	
ΔT	=	$\frac{KW \times 3413}{CFM \times 1.085}$*	

Table 5: Model TCS-E - Calculating Line Amperage

Equations		
Single Phase Amperes	=	$\frac{KW \times 1,000}{Volts}$
Three Phase Amperes	=	$\frac{KW \times 1,000}{Volts \times 1.73}$

Hot Water Features and Selection

Model TCS-W

Figure 7: Model TCS-W

Table 6: Model TCS-W – Definition of Terms

Term	Definition
EAT	Entering Air Temperature (°F)
EWT	Entering Water Temperature (°F)
LWT	Leaving Water Temperature (°F)
LAT	Leaving Air Temperature
CFM	Air Capacity (Cubic Feet per Minute)
GPM	Water Capacity (Gallons per Minute)
MBH	1,000 BTUH
BTUH	Coil Heating Capacity (British Thermal Units per Hour)
ΔT	EWT minus EAT

Model TCS-W Standard Features

Model TCS-W standard features include:

- aluminum fin construction with die-formed spacer collars for uniform spacing
- mechanically expanded copper tubes leak tested to 350 psig air pressure
- male sweat type water connections
- 1-, 2-, 3-, and 4-row configurations
- top and bottom access plates in coil casing for fan sizes 04 through 24 (coil access through bottom casing panel for fan sizes 30, 40, and 44)

Model TCS-W Optional Features

Model TCS-W optional features include:

- steam coils
- multi-circuit coils for reduced water pressure drop
- opposite hand water connections

Model TCS-W Selection Procedure

Table 8 gives correction factors for various entering ΔTs (difference between EWT and EAT). Multiply MBH values obtained from selection tables by the appropriate correction factor to obtain the actual MBH value. Air and water pressure drop can be read directly from the selection tables.

The leaving air and leaving water temperatures can be calculated from the following fundamental formulas.

Table 7: LAT/LWT Fundamental Formulas

Formulas				
LAT	**=**	EAT	+	$\frac{\text{BTUH}}{1.085 \times \text{CFM}}$
LWT	**=**	EWT	-	$\frac{\text{BTUH}}{500 \times \text{GPM}}$

Table 8: Correction Factors

Entering Water - Air Temperature Differential (ΔT) Correction Factors															
ΔT	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	0.15	0.19	0.23	0.27	0.31	0.35	0.39	0.43	0.47	0.51	0.55	0.59	0.63	0.67	0.71
ΔT	85	90	95	100	105	110	115	120	125	130	135	140	145	150	155
Factor	0.75	0.79	0.83	0.88	0.92	0.96	1.00	1.04	1.08	1.13	1.17	1.21	1.25	1.29	1.33

Technical Specifications

Product Name	VAV Modular Assembly (VMA) 1400 Series
Product Code Number	**Cooling w/Reheat and/or Fan:**
Single Unit:	AP-VMA1420-0
Bulk Pack:	AP-VMA1420-0D
Buy American:	AP-VMA1420-0G
Supply Voltage	20-30 VAC at 50 or 60 Hz
Optional Fuse Current	2.0 amperes for a VMA1420
Power Consumption	VMA1420: 10 VA maximum (Relay and valve requirements not included.)
Ambient Operating Conditions	0 to 50°C (32 to 122°F)
Ambient Storage Conditions	-40 to 70°C (-40 to 158°F)
Terminations	6.3 mm (1/4 in.) spade lugs (Communication has screw terminals.)
Serial Interfaces	N2 Bus and Zone Bus
N2 Controller Addressing	DIP switch set (1-253) Addresses 254 and 255 are reserved. Software addressable with HVAC PRO software, Release 7.02 or later.
Communications Bus	N2 between VMA and NCM or N30. Zone Bus between VMA and room sensor (8-pin phone jack or wire to spade lugs or optional plug-on terminals) (Not available when the TE-7720 RF Receiver is applied.)
Mounting	One screw (included) mounts the VMA1420 to the VAV box. One screw attaches the damper shaft to the actuator, 8 mm (5/16 in.) square head set screw with 44 N·m (389.4 lb·in.) of axial holding power for up to 13 mm (1/2 in.) round damper shafts. Minimum damper shaft length is 44.5 mm (1-3/4 in.).
Housing	Plastic housing for controller/actuator with UL94-5VB Plenum Flammability Rating
Dimensions (L x W x H)	VMA1420: 153 x 102 x 102 mm (6 x 4 x 4 in.)
Actuator Torque	4 N·m (35 lb·in) minimum (VMA1420 only)
Shipping Weight	VMA1420: 13.1 kg (29 lb) for a box of ten, 1.3 kg (2.8 lb) each
Electrical Inputs	Analog Inputs: Nickel, silicon, platinum (1 K ohm), or NTC (2.25 K) RTD room sensors, 1.6 K setpoint potentiometer (2-wire) Voltage input for 0-10 VDC (humidity or pressure sensor) Binary Inputs: Dry contacts Input configurations vary based on model type.
Velocity Pressure	Velocity Pressure for 374 Pascal (0-1.5 in. W.C.)
Outputs	Binary outputs, 24 VAC triac switched, 25-500 mA loads Stepper drive, 2 to 767 steps per second (23,000 step resolution) (VMA1420 only) Analog output, 0-10 VDC @ 10 mA maximum
Standards Compliance	CSA 22.2 No. 205, UL 916, UL 94-5VB, FCC Part 15, Subpart B, Class A and B, C-tick Australia/NZ, AS/NZS 4251.1, CISPR 22, Class B, CE Directive (89/336/EEC, EN50081-1, EN50082-2) Industrial, IEEE 472, IEEE518, IEEE587 Category A/B, IEC-950, IEC 801-2, -3, -4, -6, -7, -8, ANSI C62.41 A/B

Technical Specifications (Cont.)

Product Name	Metasys System LN Series Variable Air Volume Profile Application Controller (LN-VAVLx-0)
Power Requirements	Voltage: 24 VAC, ±15%, 50/60 Hz Typical Consumption: 5 VA Maximum Consumption: 10 VA Protection: 5 Ampere removable fuse
Environmental	Operating Temperature: 0°C to 70°C, 32°F to 158°F Storage Temperature: -20°C to 70°C, -4°F to 158°F Relative Humidity: 0 to 90% Noncondensing
General	Standard: LonMark® Functional Profile VAV #8010 Processor: Neuron® 3150; 8 bits, 10 MHz Memory: Nonvolatile Flash 64 K (APB application and configuration properties) Communication: LonTalk® Protocol Transceiver: TP/FT-10; 78 kbps Battery (for clock only): Real-time Clock Chip Enclosure: Material: PVC, flammable class VO Dimension: 4.88 x 8.9 x 2.48 inches (124 x 226 x 63 mm) Weight: 1.84 lbs (0.835 kg) Safety: CSA and UL Listed
Damper Motor	Motor: LM24-Mus Torque: 35 in·lb, 4 N·m Angle of Rotation: 95° adjustable Fits shaft diameter: 8.5 mm to 18.2 mm; 5/16” to 3/4” Power Supply from Controller
Inputs	Number: 4 Universal Digital: Dry Contact Voltage: 0-10 VC, Accuracy ±0.5% Current: 4-20 mA with 500 K ohms external resistor, Accuracy: ±0.5% Resistor: Thermistor Type 2 10 K ohms Accuracy: ±0.5°C; ±0.9°F Resolution: 0.1°C; 0.18°F Range: -40°C to 55°C; -40°F to 131°F Potentiometer 10 K ohms Linear 2-point setpoint adjustment Min/Max linear configuration Configurable on several points Input Resolution: 12 bits analog/digital converter 1 Differential pressure: Range 125-250-500 Pa (0.5-1-2’’ H20), Accuracy ±3% full scale

Continued on next page. . .

Technical Specifications (Cont.)

Outputs	Number: 4
	3 Digital: Triac 24 VAC ±15%, 50/60 Hz, maximum charge 1.0 Ampere, internal or external supply
	1 Tri-mode Analog:
	0-10 VDC (linear), PWM or digital 0-12 VDC
	60 mA maximum @ 12 VDC (60°C; 140°F)
	Maximum load: 200 ohms
	Auto reset fuse: 60mA @ 60°C; 140°F, 100 mA @ 20°C; 68°F
	Analog Output Resolution: 8 bits digital/analog converter

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

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