

Variable Speed Open Drives

Description

The Johnson Controls® VSD Series Variable Speed Open Drives, powered by Cutler-Hammer® technology from Eaton's electrical business, are specifically engineered for HVAC, pump and fluid control applications. The power circuit makes use of the most sophisticated semiconductor technology and a highly modular construction that is adaptable to the customer's needs.

The open drive input and output configuration (I/O) is designed with modularity in mind. The I/O is comprised of option cards, each with its own input and output configuration. The control module is designed to accept a total of five of these cards.

Features

- True full Network connectivity for both Drive and Bypass N2, XT, SA Bus, LON, and BACnet® Protocol
- Software parameters that utilize engineering units common to the HVAC industry
- Johnson Controls support that includes ordering, estimating, and project management tools: Advanced Order Management System (AOMS), Advanced Installation Management (AIM) Tools - QuickLIT, Catalog, PRESTO, and STORE

- Closed-Loop control programmed with engineering units for HVAC applications: Duct Static, Building Static, Pressure Control, and Temperature Control
- Standard TYPE 12 keypad on all drives with Copy and Paste Function; capable of monitoring three parameters simultaneously
- Drive programming capability using auxiliary 24 V power supply (VS-AUX24V)
- Run permissive damper control in drive mode
- Up to six user-defined skip frequencies
- Selectable Analog Input (AI) Min/Max/Averaging feature
- Digital inputs can be defined for normally open (N.O.) or normally closed (N.C.) operation
- Automatic fault display captures 16 drive operating parameters at time of fault
- HAND/OFF/AUTO selector on keypad simplifies control
- Plenum rated
- Standard 3% line reactors for enhanced transient and harmonic distortion protection
- EMI/RFI Filters standard on all drives
- Standard drive current rating of 100 kAIC
- I/O and communication cards provide plug-and-play functionality



VSD Series Variable Speed Open Drive

Repair Information

If the Variable Speed Open Drive fails to operate within its specifications, contact the nearest Johnson Controls representative.

Selection Chart

	Code Number	V	S						0	A	—				
Base Product	VS = Variable Speed Drive prefix														
Horsepower (VT) ¹	001 = 1.0 hp to 250 = 250 hp ²														
Voltage ³	2 = 208/230 V 4 = 480 V 5 = 575 V ⁴														
Enclosure Rating	1 = TYPE 1 2 = TYPE 12														
Enclosure Style	0 = None (Open Drive)														
Revision #	A = Rev. 1 (Americas) C = Rev. 1 (Canada)														
Separator (—)															
Communications ⁵	0 = None B = MS/TP BACnet Communication N = N2/XT/SA Bus Communication (N2 by default) L = LONWORKS® Network														
Option 1	00 = None														
Option 2	00 = None														

1. All horsepower ratings are Variable Torque (VT).
 2. 1 to 100 hp at 230 V; 1.5 to 250 hp at 480 V; 3 to 200 hp at 575 V.
 3. Voltage Ratings: 230 V = 208 - 240 V; 480 V = 380-500 V; 575 V = 525-690 V.
 4. Can only be ordered as Revision C.
 5. N2/XT/SA Bus, MS/TP BACnet, or LONWORKS Communications selectable on drive keypad.

Variable Speed Open Drives (Continued)

Technical Specifications

VSD Series Variable Speed Open Drives (Part 1 of 2)	
Input Voltage (V_{in})	10%/-15%
Input Frequency (f_{in})	50/60 Hz (Variation Up to 45-66 Hz)
Connection to Power	Once Per Minute or Less (Typical Operation)
Current Withstand Rating	100 kAIC
Output Voltage	0 to V_{in}
Continuous Output Current	Ambient Temperature Maximum 104°F (40°C), Overload 1.1 x I_L (1 min./10 min.)
Overload Current	110%
Output Frequency	0 to 320 Hz
Frequency Resolution	0.01 Hz
Control Method	Frequency Control (V/f) Open Loop Sensorless Vector Control
Switching Frequency	Adjustable with Parameters 2.6.9 1 to 40 hp: 1 to 16 kHz; Default 10 kHz 50 to 75 hp: 1 to 10 kHz; Default 3.6 kHz
Frequency Reference	Analog Input: Resolution 0.1% (10 bit), Accuracy +/-1% Panel Reference: Resolution 0.01 Hz
Field Weakening Point	30 to 320 Hz
Acceleration Time	0 to 3,000 s
Deceleration Time	0 to 3,000 s
Braking Torque	DC Brake: 30% x T_n (without Brake Option)
Ambient Operating Temperature	14 (No Frost) to 104°F (-10 to 40°C)
Storage Temperature	-40 to 158°F (-40 to 70°C)
Relative Humidity	0 to 95% RH, Noncondensing, Noncorrosive, No Dripping Water
Air Quality	Chemical Vapors: IEC 721-3-3, Unit In Operation, Class 3C2; Mechanical Particles: IEC 721-3-3, Unit In Operation, Class 3S2
Altitude	100% Load Capacity (No Derating) Up to 3,280 ft (1,000 m); 1% Derating for Each 328 ft (100 m) Above 3,280 ft (1,000 m); Maximum 9,842 ft (3,000 m)
Vibration	EN 50178, EN 60068-2-6; 5 to 50 Hz, Displacement Amplitude 1 mm (Peak) at 3 to 15.8 Hz, Max. Acceleration Amplitude 1 G at 15.8 to 150 Hz
Shock	EN 50178, EN 6068-2-27 United Parcel Service® (UPS) Drop Test (for Applicable UPS Weights) Storage and Shipping: max. 15 G, 11 ms (in package)
Enclosure Class	TYPE 1/IP21 or TYPE 12/IP54
Product	IEC 61800-2
Safety	UL 508C; CSA C22.2 No. 14
EMC (at default settings)	Immunity: Fulfills all Electromagnetic Compatibility (EMC) Immunity Requirements; Emissions: EN 61800-3, LEVEL H
Air Quality Chemical Vapors	IEC721-3-3; Unit In Operation; Class 3C2
Mechanical Particles	IEC721-3-3, Unit In Operation Class 3S2
Analog Input Voltage	0 to 10 V, R = 200 Ohms Differential (-10 to 10 V Joystick Control) Resolution 0.1%; Accuracy ±1%
Analog Input Current	0 (4) to 20 mA; R_i - 250 Ohms Differential
Digital Inputs (6)	Positive or Negative Logic; 18 to 24 VDC

VSD Series Variable Speed Open Drives (Part 2 of 2)	
Auxiliary Voltage	24 V ±15%, Maximum 250 mA
Output Reference Voltage	10 V 3%, Maximum Load 10 mA
Analog Output	0 (4) to 20 mA; R_L max. 500 Ohms; Resolution 10 bit; Accuracy ± 2%
Digital Outputs	Open Collector Output, 50 mA/48 V
Relay Outputs	2 Programmable Form C Relay Outputs Switching Capacity: 24 VDC/8 A, 250 VAC/8 A, 125 VDC/0.4 A
Overcurrent Protection	Trip Limit 4.0 x I_H Instantaneously
Overvoltage Protection	Yes
Undervoltage Protection	Yes
Earth Fault Protection	In case of earth fault in motor or motor cable, only the frequency converter is protected.
Input Phase Supervision	Trips if any of the input phases are missing.
Motor Phase Supervision	Trips if any of the output phases are missing.
Overtemperature Protection	Yes
Motor Overload Protection	Yes
Motor Stall Protection	Yes
Motor Underload Protection	Yes
Short Circuit Protection	Yes (of the 24 V and 10 V Reference Voltages)
Ratings	UL Listed File No. E244421; cUL Listed
Warranty	2 Years Standard Terms; 3 Years with Certified Startup
Reliability	500,000 hours Mean Time Between Failures (MTBF)
Line Voltage (VAC)	230 V (208 to 240 V) 480 V (380 to 500 V) 575 V (525 to 690 V)
Weight	FR4: 11 lb (5 kg) FR5: 17.9 lb (8 kg) FR6: 40.8 lb (19 kg) FR7: 77.2 lb (35 kg) FR8: 127.8 lb (58 kg) FR9: 321.9 lb (59 kg)
Voltage/Horsepower	FR4: 230 V/1 to 3 VT, 480 V/1-1/2 to 7-1/2 VT FR5: 230 V/5 to 10 VT, 480 V/10 to 20 VT FR6: 230 V/15 to 20 VT, 480 V/25 to 40 VT, 575 V/3 to 30 VT FR7: 230 V/25 to 40 VT, 480 V/50 to 75 VT, 575 V/40 to 50 VT FR8: 230 V/50 to 75 VT, 480 V/100 to 150 VT, 575 V/60 to 100 VT FR9: 480 V/200 to 250 VT, 575 V/125 to 200 VT