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VSD Series II Variable Speed Open Drives Catalog Page

Description

The Johnson Controls® VSD Series II Variable Speed Open Drives, powered by Eaton® technology, are specifically engineered for HVAC, pump, and fluid control applications. The ultra-efficient DC capacitor and power structure allow the drives to consume less energy, which lowers greenhouse gases.

The input/output (I/O) configuration is designed with wiring ergonomics in mind by including removable terminal blocks. The main, easily removable control board that is used for all drive frames has six digital IN, two analog IN, one analog OUT, three relay OUT, and two expansion slots for I/O or communication boards. In addition, the control board has built-in RS-485 and Ethernet communication.

These drives continue the tradition of robust performance and raise the bar on features and functionality, which ensures the best solution at the right price.

VSD Series II Variable Speed Open Drives are selected using VSD Series II code numbers and standard Johnson Controls order entry tools.

Features

- **Patented Active Energy Control Algorithm**—Achieves an additional 2% to 8% energy savings when compared to competitive products.
- **HAND/OFF/AUTO and DRIVE/BYPASS Selector on Keypad**—Simplifies control.
- **Copy/Paste Function**—Allows the transfer of parameter settings from one drive to the next.
- **Versatile Keypad**—Displays up to nine monitored parameters simultaneously.
- **EMI/RFI Filters Standard on All Drives (Frame 4 through Frame 9)**—Meet EMC Category 2 requirements.
- **Motor Overload, Underload, and Stall Protections**—Protect against premature motor failure.
- **BACnet® MS/TP, BACnet IP, MODBUS®, and N2 Network Protocols**—Provide a wide variety of communication protocols to meet the needs of many applications.

Additional Features

- Integrated DC link choke standard on drives from Frame 4 through Frame 9
- Anti-trip DC bus regulation
- Input surge protection against voltage spikes varistor input
- Additional I/O and communication cards provide plug-and-play functionality
- Remote-mount keypad kit available
- NEMA Type 1 and NEMA Type 12 available
- Real-time clock with programmable logic controller (PLC) functionality
- Two independent proportional-integral-derivative (PID) functions
- On-screen troubleshooting diagnostics with embedded manual assistance
- Onboard RS-485 (BACnet, N2, MODBUS)
- Onboard Ethernet-based communications (BACnet/IP, MODBUS/TCP)
- Standard NEMA Type 12 keypad on all drives
- Quickstart wizard built into programming of drive ensures a smooth startup
- I/O connections with simple quick connection terminals
- Control logic can be powered from an external 24 V power supply to simulate internal drive functions and fieldbus, if necessary, for testing purposes and software downloads
- Standard I/O,6DI, 2AI, 1AO 2 Form C RO (NO/NC), 1 Form A RO (NO)
- Hard-wired external/damper interlock

VSD Series II Variable Speed Open Drive

Repair Information

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

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Selection Chart: 230/460 V Models

	Code Number	V	S						0		—		0	0	0	0
Base Product	VS = Series II Variable Speed Open Drives prefix															
Amps/hp/kW	3D4 = 3.4 A, 1.5 hp, 1.1 kW[1] 3D7 = 3.7 A, 3/4 hp, 0.55 kW[2] 4D8 = 4.8 A, 1 hp, 1.1 kW[1] 4D8 = 4.8 A, 2 hp, 1.5 kW[2] 5D6 = 5.6 A, 3 hp, 2.2 kW[2] 6D6 = 6.6 A, 1.5 hp, 1.1 kW[1] 8D0 = 8 A, 2 hp, 1.5 kW[1] 8D0 = 8 A, 4 hp, 3 kW[2] 9D6 = 9.6A, 5HP, 4kW[2] 011 = 11 A, 3 hp, 2.2 kW[1] 012 = 12 A, 4 hp, 3 kW[1] 012 = 12 A, 7.5 hp, 5.5 kW[2] 016 = 16 A, 10 hp, 7.5 kW[2] 018 = 18 A, 5 hp, 4 kW[1] 023 = 23 A, 15 hp, 11 kW[2] 024 = 24 A, 7.5 hp, 5.5 kW[1] 031 = 31 A, 10 hp, 7.5 kW[1] 031 = 31 A, 20 hp, 15 kW[2] 038 = 38 A, 25 hp, 18.5 kW[2] 046 = 46 A, 30 hp, 22 kW[2] 048 = 48 A, 15 hp, 11 kW[1] 061 = 61 A, 40 hp, 30 kW[2] 062 = 62 A, 20 hp, 15 kW[1] 072 = 72 A, 50 hp, 37 kW[2] 075 = 75 A, 25 hp, 18.5 kW[1] 087 = 87 A, 60 hp, 45 kW[2] 088 = 88 A, 30 hp, 22 kW[1] 105 = 105 A, 40 hp, 30 kW[1] 105 = 105 A, 75 hp, 55 kW[2] 140 = 140 A, 50 hp, 37 kW[1] 140 = 140 A, 100 hp, 75 kW[2] 170 = 170 A, 60 hp, 45 kW[1] 170 = 170 A, 125 hp, 90 kW[2] 205 = 205 A, 75 hp, 55 kW[1] 205 = 205 A, 150 hp, 110 kW[2] 261 = 261 A, 100 hp, 75 kW[1] 261 = 261 A, 200 hp, 132 kW[2] 310 = 310 A, 125 hp, 90 kW[1] 310 = 310 A, 250 hp, 160 kW[2]															
Voltage	2 = 230 V 4 = 480 V															
Enclosure Rating	1 = NEMA Type 1 (IP21) 2 = NEMA Type 12 (IP54)															
Drive Style	0 = None (Open Drive)															
Revision	B = Rev. 2 (Americas) D = Rev. 2 (Canada)															
Separator (—)																
Communications	0 = STD (BACnet/Legacy N2/MODBUS) S = SA Bus, CS Card (added to JC-VSD) L = LonWorks® Network, C4 Card (added)[3]															
Options	0000 = None **Note:** No factory-assembled options are available.															

1. 208 to 240 V, three-phase.
2. 380 to 480 V, three-phase.
3. Contact your local Johnson Controls representative for product availability.

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Selection Chart: 575 V Models

	Code Number	V	S				5		0	D	—	0	0	0	0	0
Base Product	VS = Series II Variable Speed Open Drives prefix															
Amps/hp	3D9 = 3.9 A, 3 hp 6D1 = 6.1 A, 5 hp 9D0 = 9 A, 7.5 hp 011 = 11 A, 10 hp 018 = 18 A, 15 hp 022 = 22 A, 20 hp 027 = 27 A, 25 hp 034 = 34 A, 30 hp 041 = 41 A, 40 hp 052 = 52 A, 50 hp 062 = 62 A, 60 hp 080 = 80 A, 75 hp 100 = 100 A, 100 hp 125 = 125 A, 125 hp 144 = 144 A, 150 hp 208 = 208 A, 200 hp															
Voltage	5 = 525 to 600 V, three-phase															
Enclosure Rating	1 = NEMA Type 1 (IP21) 2 = NEMA Type 12 (IP54)															
Drive Style	0 = None (Open Drive)															
Revision	D = Rev. 2 (Canada)															
Separator (—)																
Communications	0 = STD (BACnet/Legacy N2/MODBUS)															
Options	0000 = None **Note:** No factory-assembled options are available; see below for options that can be ordered separately.															

Options (Order Separately):

VS-XMX-K9-FS4-5 = Two auxiliary contacts (FS4-5 bypass and drive output contactors)

VS-XMX-K9-FS6-9 = Two auxiliary contacts (FS6-9 bypass and drive output contactors)

Extended I/O Options in Slot D and E (Order Separately):

VS-XMX-B1 = 6 DI or DO, 1 ext +24 VDC/ext +24 VDC programmable

VS-XMX-B2 = 1 RO (NC/NO), 1 RO (NO), 1 thermistor

VS-XMX-B4 = 1 AI (mA isolated), 2 AO (mA isolated)

VS-XMX-B5 = Card-3 relay dry contact

VS-XMX-B9 = 1 RO (NO), 5 DI 42 to 240 VAC input

VS-XMX-BF = Expander IO—1*AO, 1*DO, 1*RC

VS-XMX-CS = SA bus (JC-VSD only)

VS-XMX-C4 = LonWorks comm card

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Technical Specifications

VSD Series II Variable Speed Open Drives (Part 1 of 2)	
Input Voltage (V_{in})	200 to 240 V, 380 to 480 V, 525 to 600 V, -10%/+10%
Input Frequency (f_{in})	50/60 Hz (variation up to 45 to 66 Hz)
Connection to Power	Once per minute or less (typical operation)
Current Withstand Rating	100k AIC
Output Voltage	0 to V_{in} line voltage in
Continuous Output Current	Ambient temperature maximum 104°F (40°C), overload 1.1 x I_L (1 min./10 min.)
Overload Current	110% (1 min./10 min.)
Initial Output Current	150% for 2 seconds
Output Frequency	0 to 320 Hz
Frequency Resolution	0.01 Hz
Control Method	Frequency control (V/f) open loop sensorless vector control
Switching Frequency	1 to 310 A, Frame 4 through 9: default 6 kHz
Frequency Reference	Analog input: resolution 0.1% (10 bit), accuracy +/-1% Panel reference: resolution 0.01 Hz
Field Weakening Point	8 to 320 Hz
Acceleration Time	0.1 to 3,000 s
Deceleration Time	0.1 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 60721-3-3, unit in operation, Class 3C2; Mechanical particles: IEC 60721-3-3, unit in operation, Class 3S2
Altitude	100% load capacity (no de-rating) up to 3,280 ft (1,000 m); 1% de-rating for each 328 ft (100 m) above 3,280 ft (1,000 m); maximum 9,842 ft (3,000 m)
Vibration	Frame 4 through 9, EN 61800-5-1, EN 60068-2-6; 5 to 150 Hz, displacement amplitude 1 mm (peak) at 5 to 15.8 Hz, maximum acceleration amplitude 1 G at 15.8 to 150 Hz
Shock	EN 61800-5-1, EN 6068-2-27 United Parcel Service® (UPS) drop test (for applicable UPS weights) storage and shipping: maximum 15 G, 11 ms (in package)
Enclosure Class	NEMA Type 1/IP21 or NEMA Type 12/IP54
EMC (At Default Settings)	Immunity: fulfills all electromagnetic compatibility (EMC) immunity requirements; Emissions: EN 61800-3, LEVEL H
Emissions	EMC level dependent: +EMC 2: EN 61800-3 (2004) Category C2, delivered with Class C2 EMC filtering as default
Analog Input Voltage	0 to 10 V, R = 200k ohms differential resolution 0.1%; Accuracy ±1%, dip switch selection (voltage/current)
Analog Input Current	0 (4) to 20 mA; R_i - 250 ohms differential
Digital Inputs (Six)	Positive or negative logic; 18 to 30 VDC
Auxiliary Voltage	24 V ±10%, maximum 250 mA
Output Reference Voltage	10 V +3%, maximum load 10 mA
Analog Output	0 to 10 V, 0 (4) to 20 mA; R_L maximum 500 ohms; resolution 10 bit; accuracy ± 2%, dip switch selection (voltage/current)
Relay Outputs	Three programmable, two Form C, one Form A relay outputs switching capacity: 24 VDC/8 A, 250 VAC/8 A, 125 VDC/0.4 A
Hard Wired Jumper	Between terminal 6 and 10 (factory default)
DIP Switch Setting Default	RS485 = off, A01 = current, A12 = current, A11 = voltage
Overcurrent Protection	Yes
Overvoltage Protection	Yes
Undervoltage Protection	Yes
DC Bus Regulation Anti-Trip	Yes (accelerates or decelerates the load)
Earth Fault Protection	Yes (in case of earth fault in motor or motor cable, only the frequency converter is protected)
Input Phase Supervision	Yes (trips if any of the input phases are missing)
Motor Phase Supervision	Yes (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)

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VSD Series II Variable Speed Open Drives (Part 2 of 2)	
Surge Protection	Yes (varistor input)
OHSPD Special Seismic Certification Pre-Approval	Yes
Compliance	UL Listed File No 508C, cUL Listed
	Safety—EN 61800-5-1
CE	CE Mark—Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and the Low Voltage Directive.
Warranty	Two years standard terms; three years with certified startup
Reliability	500,000 hours mean time between failures (MTBF)
Line Voltage	230 V (208 to 240 V), 480 V (380 to 500 V), 575 V (525 to 690 V)
Weight	FR4: 13.2 lb (6 kg)
	FR5: 22 lb (10 kg)
	FR6: 44 lb (20 kg)
	FR7: 83 lb (37.5 kg)
	FR8: 154.3 lb (70 kg)
	FR9: 238 lb (108 kg)
Voltage/hp/Amperes	
FR4	230 V: 0.75 to 4 hp, 0.55 to 3 kW, 3.7 to 12 A
	480 V: 1.5 to 7.5 hp, 1.1 to 5.5 kW, 3.4 to 12 A
FR5	230 V: 5 to 10 hp, 4 to 7.5 kW, 18 to 31 A
	480 V: 10 to 20 hp, 7.5 to 15 kW, 16 to 31 A
FR6	230 V: 15 to 20 hp, 11 to 15 kW, 48 to 62 A
	480 V: 25 to 40 hp, 18.5 to 30 kW, 38 to 61 A
FR7	230 V: 25 to 40 hp, 18.5 to 30 kW, 38 to 61 A
	480 V: 50 to 75 hp, 37 to 55 kW, 75 to 105 A
FR8	230 V: 50 to 75 hp, 37 to 55 kW, 140 to 205 A
	480 V: 100 to 150 hp, 75 to 110 kW, 140 to 205 A
FR9	230 V: 100 to 120 hp, 75 to 90 kW, 261 to 310 A
	480 V: 100 to 125 hp, 132 to 160 kW, 261 to 310 A