

# VSD Series II Variable Speed Micro Drives

## Description

Johnson Controls® VSD Series II Variable Speed Micro Drives (JC-VSM II) are the next generation of drives specifically engineered for today's HVAC mid-market applications. These micro-processor-based drives have standard features that can be programmed to tailor the drive's performance to suit a wide variety of application requirements. The JC-VSM II product line uses a 32-bit microprocessor and insulated gate bipolar transistors (IGBTs) that provide quiet operation, high efficiency, and smooth low-speed performance for three-phase induction motors. The size and simplicity of the JC-VSM II makes it ideal for hassle-free installation. Models rated at 575 volts, three-phase, 50/60 Hz are available in sizes ranging from 1 to 7-1/2 hp. Models rated at 480 volts, three-phase, 50/60 Hz are available in sizes ranging from 1/2 to 10 hp. Models rated at 230 volts, single or three-phase, 50/60 Hz are available in sizes ranging from 1/4 to 3 hp, 230 V three-phase output. Models rated at 115 volts, single-phase, 50/60 Hz are available in 1/4 to 1-1/2 hp, 230 V three-phase output.

The standard drive includes a digital display, and operating and programming keys on a visually appealing, efficient application programming interface. The display provides drive monitoring, as well as adjustment and diagnostic information. The keys are used for digital adjustment and programming of the drive, as well as for operator control. Separate terminal blocks for control and power wiring are provided for customer connections.

Refer to the *VSD Series II Variable Speed Micro Drives Product Bulletin (LIT-12011813)* for important product information.

## Features

- Preset Application Macros, Startup Wizard, and Diagnostic Capabilities — allows for quick and easy startup
- Rugged Construction — offers 122°F (50°C) rated, conformal coated boards
- DIN Rail and Screw Mountable Chassis — reduces installation time
- Compact, Space Saving Design — allows for side-by-side installation resulting in less mounting space
- Industry-Leading Efficiency — delivers energy savings to the customer. Provides integrated EMC filters and brake choppers as standard features in three-phase applications, which make the unit suitable for commercial and industrial applications.
- IP 20 Enclosure Class Available as Standard — offers IP21/NEMA Type 1 kits
- Temperature-Controlled Fan — ensures extended product reliability
- RS-485/Modbus® — includes a standard communication protocol
- PID Controller — provides stand-alone, closed-loop control

## Programmable Parameters

- Application macros: basic, pump, fan, and high-load
- Programmable start and stop and reverse signal logic (sinking or sourcing)
- Reference scaling



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- Programmable start and stop functions
- DC brake at start and stop
- Programmable V/Hz curve
- Adjustable switching frequency
- Auto restart function after fault
- Protections and supervisions (all fully programmable; off, warning, and fault)
- Current signal input fault
- External fault
- Fieldbus communication
- Eight preset speeds
- Analog input range selection, signal scaling, and filtering
- PID controller

## Repair Information

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

## Selection Chart (Single-phase Input, 3-Phase Output)

Code Number		V	S				0	4	B	—	M	0	0	0	0
Base Product	VS = Variable Speed Series II Micro Drive prefix														
Full Load Amperes (VT/CT)	1D7 = 1.7 A (1/4 hp, 0.25 kW) <sup>1,2</sup> 2D4 = 2.4 A (1/2 hp, 0.37 kW) <sup>1,2</sup> 2D8 = 2.8 A (3/4 hp, 0.55 kW) <sup>1,2</sup> 3D7 = 3.7 A (1 hp, 0.75 kW) <sup>1,2</sup> 4D8 = 4.8 A (1.5 hp, 1.1 kW) <sup>1,2</sup> 7D0 = 7.0 A (2 hp, 1.5 kW) <sup>2</sup> 9D6 = 9.6 A (3 hp, 2.2 kW) <sup>2</sup>														
Voltage	0 = 120 V 2 = 230 V														
Enclosure Rating	0 = IP20														
Enclosure Style	4 = Single-phase (Micro Drive)														
Revision #	B = Rev. 2 (Americas) D = Rev. 2 (Canada)														
Separator (—)															
Communications	M = Modbus														
Options	00 = None EM = EMC Filter														

1. 120 Volts  
2. 230 Volts

Note: Horsepower ratings are based on the use of a 240 V four- or six-pole squirrel-cage induction motor and are for reference only. Select a drive where the motor current is less than or equal to the rated continuous output current.

## VSD Series II Variable Speed Micro Drives (Continued)


### Selection Chart (3-Phase Input, 3-Phase Output)

	Code Number	V	S				0	3	B	—	M	0	0	0	0
Base Product	VS = Variable Speed Series II Micro Drive prefix														
Full Load Amperes (VT/CT)	<b>230 V</b> 1D7 = 1.7 A (1/4 hp, 0.25 kW) 2D4 = 2.4 A (1/2 hp, 0.37 kW) 2D8 = 2.8 A (3/4 hp, 0.55 kW) 3D7 = 3.7 A (1 hp, 0.75 kW) 4D8 = 4.8 A (1.5 hp, 1.1 kW) 7D0 = 7.0 A (2 hp, 1.5 kW) 011 = 11.0 A (3 hp, 2.2 kW) 017 = 17.0 A (5 hp, 4 kW) 025 = 25.0 A (7.5 hp, 5.5 kW) 031 = 31.0 A (10 hp, 7.5 kW) 038 = 38.0 A (15 hp, 11 kW)  <b>480V</b> 1D3 = 1.3 A (1/2 hp, 0.37 kW) 1D9 = 1.9 A (3/4 hp, 0.55 kW) 2D4 = 2.4 A (1 hp, 0.75 kW) 3D3 = 3.3 A (1.5 hp, 1.1 kW) 4D3 = 4.3 A (2 hp, 1.5 kW) 5D6 = 5.6 A (3 hp, 2.2 kW) 7D6 = 7.6 A (4 hp, 3 kW) 9D0 = 9.0 A (5 hp, 4 kW) 012 = 12.0 A (7.5 hp, 5.5 kW) 014 = 14.0 A (10 hp, 7.5 kW) 016 = 16.0 A (10 hp, 7.5 kW) 023 = 23.0 A (15 hp, 11 kW) 031 = 31.0 A (20 hp, 15 kW) 038 = 38.0 A (25 hp, 18.5 kW)  <b>575 V</b> 1D7 = 1.7 A (1 hp, 0.75 kW) 2D7 = 2.7 A (2 hp, 1.5 kW) 3D9 = 3.9 A (3 hp, 2.2 kW) 6D1 = 6.1 A (5 hp, 4 kW) 9D0 = 9.0 A (7.5 hp, 5.5 kW)														
Voltage	2 = 230 V 4 = 480 V 5 = 575 V														
Enclosure Rating	0 = IP20														
Enclosure Style	3 = 3-phase (Micro Drive)														
Revision #	B = Rev. 2 (Americas) D = Rev. 2 (Canada)														
Separator (—)															
Communications	M = Modbus														
Options	00 = None EM = EMC Filter														

Note: Horsepower ratings are based on the use of a 240 V, 460 V, and 575 V four- or six-pole squirrel-cage induction motor and are for reference only. Select a drive when the motor current is less than or equal to the rated continuous output current.

## VSD Series II Variable Speed Micro Drives (Continued)

### Technical Specifications

VSD Series II Variable Speed Micro Drives (Part 1 of 2)	
Input Voltage ( $V_{in}$ )	+10%/-15% (575V units: +15%/-15%)
Input Frequency ( $f_{in}$ )	50/60 Hz (Variation Up to 47-66 Hz)
Connection to Power	Once Per Minute or Less (Typical Operation)
Output Voltage	0 to $V_{in} 1^1$
Continuous Output Current	Ambient Temperature Maximum 104°F (40°C), Overload 1.1 x $I_L$ (1 min./10 min.)
Initial Output Current	Current 2 x $I_N$ for 2 Seconds in Every 20-Second Period, Torque Depends on Motor
Output Frequency	0 to 320 Hz
Frequency Resolution	0.01 Hz
Control Method	Frequency Control (V/f) Open Loop Sensorless Vector Control
Switching Frequency	1.5 to 16 kHz; Default 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)
Braking Resistor <sup>2</sup>	230 V: Frame 2, 35 ohms; Frame 3, 26 ohms 480 V: Frame 2, 75 ohms; Frame 3, 54 ohms 575 V: Frame 3, 103 ohms
Ambient Operating Temperature	14°F (-10°C), No Frost to 122°F (+50°C): Rated Loadability $I_N$
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 6,560 ft (2,000 m)
Vibration	60068-2-6; 3 to 150 Hz, Displacement Amplitude 1 mm (peak) at 3 to 15.8 Hz, Maximum Acceleration Amplitude 1 G at 15.8 to 150 Hz
Shock	EN 50178, IEC 68-2-27 UPS Drop Test (for Applicable UPS Weights); Storage and Shipping: Maximum 15 G, 11 ms (In Package)
Enclosure Class	IP20
EMC (at default settings)	Category C2, C3, and C4 (Level H): With an Internal RFI Filter Option
Emissions	EMC Level Dependent: +EMC 2: EN 61800-3 (2004)
Analog Input Voltage	0 to 10 V, R = 200 kOhms Differential Resolution 0.1%; Accuracy ±1%, Dip Switch Selection (Voltage/Current)
Overcurrent Protection	Trip Limit 4.0 x $I_H$ Instantaneously
Overvoltage Protection	115/230 V Series: 437 VDC; 400 V Series: 874 VDC; 575 V Series: 1048 VDC Trip Level
Undervoltage Protection	115/230 V Series: 183 VDC; 400 V Series: 333 VDC; 575 V Series: 460 VDC Trip Level
Earth Fault Protection	Ground fault is tested before every start. In case of ground fault in motor or motor cable, only the frequency converter is protected.
Overtemperature Protection	Yes
Motor Overload Protection	Yes
Motor Stall Protection	Yes
Motor Underload Protection	Yes
Compliance	UL Listed File No 508C; cUL Listed, IEC, RoHS Compliant  CE Mark – Johnson Controls, Inc. declares that the VSD Series II Variable Speed Micro Drives are in compliance with the essential requirements and other relevant provisions of EMC Directive 2006/95/EC and Low Voltage Directive 2006/95/EC. Safety – EN 61800-5-1
Warranty	30 months (parts only) from date of shipment
Reliability	500,000 hours Mean Time Between Failures (MTBF)
Weight	FS1: 1.21 lb (0.55 kg) FS2: 1.54 lb (0.69 kg) FS3: 2.18 lb (0.99 kg)
Single-Phase Voltage/hp/Amperes	<b>FS1</b> 230 V, 1/4 to 3/4 hp, 0.25 to 0.55 kW, 1.7 to 2.8 A

## VSD Series II Variable Speed Micro Drives (Continued)

VSD Series II Variable Speed Micro Drives (Part 2 of 2)	
FS2	120 V, 1/4 to 1 hp, 0.25 to 0.75 kW, 1.7 to 3.7 A
	230 V, 1 to 2 hp, 0.75 to 1.5 kW, 1.7 to 7 A
FS3	120 V, 1.5 hp, 1.1 kW, 1.7 to 3.7 A
	230 V, 3 hp, 2.2 kW, 4.8 A
<b>Three-Phase Voltage/hp/Amperes</b>	
FS1	230 V, 1/4 to 1 hp, 0.25 to 0.75 kW, 1.7 to 3.7 A
	480 V, 1/2 to 1.5 hp, 0.37 to 1.1 kW, 1.3 to 3.3 A
FS2	230 V, 1.5 to 2 hp, 1.1 to 1.5 kW, 4.8 to 7 A
	480 V, 2 to 3 hp, 1.5 to 2.2 kW, 4.3 to 5.6 A
FS3	230 V, 3 hp, 2.2 kW, 11 A
	480 V, 3 to 10 hp, 3 to 7.5 kW, 7.6 to 16 A
	575 V, 1 to 7.5 hp, 0.75 to 5.5 kW, 1.7 to 9 A

1. The exception is 115 V single-phase in, 230 V 3-phase out.
2. Frame 2 and Frame 3, 3-phase drives are equipped with a brake chopper circuit.