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SpeedStar MVD

Medium-voltage variable speed drive for outdoor applications

APPLICATIONS

- Outdoor high-horsepower, variable-speed ESP, and surface electrical motor applications

BENEFITS

- Reduces operating costs
- Improves ESP system run life
- Enhances operational safety

FEATURES

- Plug-and-play design with integral output sinewave filter (for ESP applications)
- Multilevel pulse-width modulated (PWM) inverter output with no neutral point shift
- Input power factor of 0.96 at all loads and speeds
- Flexible input voltage design
- Built-in, visible, fused isolation switch
- 36-pulse input transformer with precharge circuitry
- Distribution-class lightning arrestors
- Ability to perform a smooth restart on or catch a spinning motor
- Speed control to maintain constant load or pressure
- Rocking start for wells where the pumps have stalled because of scale or sand
- Available 500-hp configurations and above
- Instruct* all-in-one acquisition and control unit

SpeedStar MVD VSD NEMA 3R for outdoor installations from 500 hp to 1,500 hp.

The SpeedStar MVD* medium-voltage variable speed drive (VSD) is a NEMA 3R medium-voltage drive (MVD) suitable for outdoor installations. This drive is designed for the control of ESPs and surface pumping systems. It provides a high-reliability, high-efficiency control solution for high-horsepower, high-value applications in a single package. Energy consumption is reduced by approximately 2% over a similar low-voltage VSD because a step-up transformer is not required. It is the first MVD in the industry that does not require installation in a climate-controlled environment, making it suitable for remote applications where building infrastructure is nonexistent. An optional marine version is available for outdoor use in both nonhazardous and harsh environments typical with platforms or offshore applications.

Design and operation

The outdoor SpeedStar MVD VSD features innovative safety and enclosure designs and power section topology with no moving parts. For input voltages between 3.3 kV and 6.6 kV, the input transformer section is dry-type convection cooled, with heat dissipated through passive vents at the top of the drive. The dry-type input transformer is available in sizes up to 13.8 kV with additional high-voltage input sections. For other voltages, an optional liquid-filled transformer suitable for outdoor installations can be used for input voltages between 0.38 kV and 34.5 kV. This flexible alternative input voltage design ensures there is never a need for an additional input transformer to minimize losses, improving system efficiency.

The SpeedStar MVD VSD is the first MVD with a standard design featuring an integral main isolation switch for lockout and tagout. The switch includes KIRK® key coordination and precharge circuitry, which ensures an infinite number of MVD starts while maintaining transformer and overall equipment reliability. The inverter section power modules are mounted on heat sinks on the back of the unit to dissipate heat to the atmosphere.

SpeedStar MVD

SpeedStar MVD VSD Models and Dimensions (with 3.3- to 6.6-kV input and up to 4.5-kV‡ output)				
Output rating, A	62	124	186	248
Output power at 4.16 kV, kVa [hp]	447 [500]	893 [1,000]	1,340 [1,500]	1,786 [2,000]
Dimensions (H × W × D), in [cm]	107 × 168 × 63 [272 × 427 × 160]	107 × 168 × 63 [272 × 427 × 160]	107 × 168 × 63 [272 × 427 × 160]	107 × 222 × 72 [271.8 × 563.9 × 182.8]
Weight, lbm [kg]	15,000 [6,804]	15,000 [6,804]	15,000 [6,804]	24,500 [11,113]
SpeedStar MVD VSD Models and Dimensions (with 34.5-kV† input and up to 4.5-kV‡ output)				
Output rating, A	62	124	186	
Output rating at 4,160 V, kVa [hp]	500 [447]	1,000 [893]	1,500 [1,340]	
Dimensions (H × W × D),§ in [cm]	96 × 252 × 63 [244 × 640 × 160]	96 × 240 × 63 [244 × 609 × 160]	96 × 240 × 63 [244 × 609 × 160]	
Weight,§ lbm [kg]	34,000 [15,422]	34,000 [15,422]	34,000 [15,422]	
Power System Specifications				
Control system	Sinusoidal multilevel PWM control			
Control precision	±0.5% of maximum output frequency			
Base control system	V/Hz, sensorless vector control, variable torque, closed-loop vector control, constant torque			
Efficiency	96.5% overall			
Input power factor	0.96			
Overload capacity	115% for 60 s, 100% continuous			
Input voltage supply	3.3 kV to 13.8 kV, 50/60 Hz (dry-type transformer) or 0.38 kV to 34.5 kV, 50/60 Hz user specified (liquid-filled transformer)			
Input tolerance	Voltage: ±10%; Frequency: ±5%			
Output	Voltage: 0 to 4,160/4,500 V; Frequency: 0 to 120 Hz			
Main input power	Three-phase input isolation transformer, 36-pulse design with visible input fused isolation switch (optional for liquid-filled transformer >6.6 kV) and precharge circuitry			
Control power supply	2-kVA control power transformer providing 110 V			
Internal protective functions	Current limit, overcurrent, overcharge, overload, undervoltage, overvoltage, ground fault, CPU error, internal RTDs for temperature monitoring			
PWM carrier frequency	2.048 kHz			
Output transistor type	Medium-voltage IGBT			
Applicable standards	Electrical performance: NEC, ANSI			
Components and others	NEC, NEMA, UL,†† cUL††			
Construction Specifications				
Panel construction	Free-standing, front-maintenance type, back or bottom access for motor and input power cables			
	Two sections: input transformer section and inverter section			
Cooling	Dry-type transformer section, convection cooled; heat eliminated through passive vents at top of drive			
	Liquid-filled transformer section type, ONAN cooled			
	Inverter section: power modules mounted on heat sinks, forced air cooled and cooled using plate-type heat exchangers			
Paint color	Bright white			
Environmental Ratings				
Overall enclosure type	NEMA 3R rated, gasketed††, or filtered outdoor MVD with liquid-filled transformer‡‡			
Ambient temperature operating range, degF [degC]	–13 to 122 [–25 to 50]‡‡			
Ambient temperature storage range, degF [degC]	–22 to 140 [–30 to 60]‡‡			
Humidity	95% maximum (noncondensing)			
Max. altitude, ft [m]	3,300 [1,000] above sea level or less			
Vibration	0.5 g or less at 10–50 Hz			
Installation	Outdoor, nonhazardous, noncorrosive environment			

† For other input voltages, dimensions and weights will be advised per project.

‡ In some models, the MVD must be derated beyond 4.16 kV.

§ All dimensions and weights are approximate.

†† Available with up to 6.6-kV input with dry-type transformers.

‡‡ For MVDs with liquid-filled transformers, temperature is variable, as specified on order.

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