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 VSD Models and Dimensions (with 3.3- to 6.6-kV input and up to 4.5-kV output)

<table>
<thead>
<tr>
<th>Output rating, A</th>
<th>62</th>
<th>124</th>
<th>186</th>
<th>248</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output power at 4.16 kV, kVA [hp]</td>
<td>447 [500]</td>
<td>893 [1,000]</td>
<td>1,340 [1,500]</td>
<td>1,786 [2,000]</td>
</tr>
<tr>
<td>Dimensions (H × W × D), in [cm]</td>
<td>107 × 168 × 63</td>
<td>107 × 168 × 63</td>
<td>107 × 168 × 63</td>
<td>107 × 222 × 72</td>
</tr>
<tr>
<td>[272 × 427 × 160]</td>
<td>[272 × 427 × 160]</td>
<td>[272 × 427 × 160]</td>
<td>[271.8 × 563.9 × 182.8]</td>
<td></td>
</tr>
<tr>
<td>Weight, lbm [kg]</td>
<td>15,000 [6,804]</td>
<td>15,000 [6,804]</td>
<td>15,000 [6,804]</td>
<td>24,500 [11,113]</td>
</tr>
</tbody>
</table>

SpeedStar MVD VSD Models and Dimensions (with 34.5-kV input and up to 4.5-kV output)

<table>
<thead>
<tr>
<th>Output rating, A</th>
<th>62</th>
<th>124</th>
<th>186</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output rating at 4,160 V, kVA [hp]</td>
<td>500 [447]</td>
<td>1,000 [893]</td>
<td>1,500 [1,340]</td>
</tr>
<tr>
<td>Dimensions (H × W × D), in [cm]</td>
<td>96 × 252 × 63</td>
<td>96 × 240 × 63</td>
<td>96 × 240 × 63</td>
</tr>
<tr>
<td>[244 × 640 × 160]</td>
<td>[244 × 609 × 160]</td>
<td>[244 × 609 × 160]</td>
<td></td>
</tr>
<tr>
<td>Weight, lbm [kg]</td>
<td>34,000 [15,422]</td>
<td>34,000 [15,422]</td>
<td>34,000 [15,422]</td>
</tr>
</tbody>
</table>

Power System Specifications

- **Control system**: Sinusoidal multilevel PWM control
- **Base control system**: V/Hz, sensorless vector control, variable torque, closed-loop vector control, constant torque
- **Efficiency**: 96.5% overall
- **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%
- **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
- **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

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

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1 For other input voltages, dimensions and weights will be advised per project.
2 In some models, the MVD must be derated beyond 4.16 kV.
3 All dimensions and weights are approximate.
4 Available with up to 6.64 kV input with dry-type transformers.
5 For MVDs with liquid-filled transformers, temperature is variable, as specified on order.