Variable Speed Drives
Optimize production potential
Well conditions often change over time—reservoir pressures drop, GORs and watercuts vary, pressure maintenance and fluid patterns change, abrading impact flow rates, and power supplies fluctuate. Such events inevitably affect the performance of the ESP system and the well.

By varying speeds, VSDs enable pumps to operate across a wider range than possible with fixed speed drives. This feature reduces the need to change out pumps as conditions change, decreasing downtime and operating costs, contributing to a longer system life, and enhancing production.

**Application-specific solutions**

Our suite of VSDs includes models for a range of applications, from routine conditions to high-power, high-voltage, technically challenging situations, including:

- **Robust outdoor system protects the Amazon.**
- **Outdoor drives suit indoor space constraints, offshore Middle East.**
- **Adaptive VSDs respond to changing conditions.**
- **Durability and remote control meet North Sea requirements.**
- **Lightning protection delivers 362% returns.**

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System integrity

Because early system failure can be financially catastrophic, we provide solutions that maintain overall system integrity. Expert services and software packages can help predict the harmonic content and determine the mitigation requirements for your installation.

We offer a complete range of solutions for harmonic control. Conversion of the supply frequency to the desired operating frequency gives rise to harmonic reflections into the input power supply.

- For 6-pulse low-voltage drives (LVDs), the electric current is typically distorted 25%, depending on the power system impedance.
- 12-pulse LVDs halve the distortion to 11% by a process of phase multiplication, from three phases to six.
- The 18-pulse SpeedStar 519 SWD* VSD effectively reduces the current distortion by 80% compared to a 6-pulse VSD. With just 5% current distortion, subject to power system impedances, it is an economical method of conforming to IEEE 519–1992 guidelines.

Current demands

The emphasis on VSDs is on system optimization, and to some extent auto-adaptive systems using intelligent controllers and increasing efficiency gains, including adherence to clean line or supply power according to recommended guidelines on voltage and current harmonic distortion levels. We offer technologies that include high voltage direct to MVD applications using integral input isolation type transformers.

The input transformer is designed to match customer specified supply voltage and frequency, eliminating the need for additional transformers, thereby raising efficiency and lowering your operating costs.

SpeedStar 519 SWD 18-pulse, low-voltage package is designed to minimize supply power harmonic current and voltage distortion, while providing clean power to the downstream device.

With thousands sold globally, SpeedStar VSD is widely used and suitable in the majority of mature production situations, including brownfields.

MVDs are suitable for offshore installations where reliability really counts. They are also suitable for high horsepower, medium voltage applications in subsea or high intervention environments.

The outdoor MVD, the first of its type in the industry, is designed standard with a visible disconnect switch, precharge circuitry, 36-pulse input and sine wave drive output filter specifically tailored for controlling and protecting high-horsepower ESPs and surface pumps. The outdoor MVD does not require installation in a climate-controlled environment.

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Reliability and safety

Our VSDs are among the most reliable in the industry, with a mean time between failures (MTBF) design philosophy of 5 to 10 years for LVDs and MVDs respectively. Because medium voltage can be lethal, SpeedStar MVDs have a high level of built-in safety. Features include a visible disconnect switch interlocked with Kirk keys to protect personnel and assets, input fuses that provide a current limit, and vacuum contactors that will interrupt a fault and possibly prevent fire and explosion. In addition, a precharge circuit limits the inrush current to a maximum of 150% full load amperage, thereby limiting any mechanical and electrical stresses during startup and ensuring longer term reliability. The SpeedStar MVD also generates its own internal control power for microprocessors and cooling fans, ensuring a single source of power into the MVD and consequently, a single lockout and tagout safety procedure.

<table>
<thead>
<tr>
<th>VSD Type</th>
<th>3 Pulse</th>
<th>6 Pulse</th>
<th>9 Pulse</th>
<th>12 Pulse</th>
<th>15 Pulse</th>
<th>18 Pulse</th>
<th>21 Pulse</th>
<th>24 Pulse</th>
<th>27 Pulse</th>
</tr>
</thead>
<tbody>
<tr>
<td>THD (%)</td>
<td>30</td>
<td>15</td>
<td>12.5</td>
<td>6.7</td>
<td>6.7</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>1.5</td>
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</table>

VSD portfolio line harmonic solutions for a weak power system (typical outdoor remote land applications) where the percent absolute values will vary with different types of power systems, but the ratios mostly apply and are typical.
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Quality support

Whether you need a brief consultation or the most comprehensive solution, our experts are available anywhere and anytime. Since 1976, our power systems team, based at the Edmonton Technology Center in Canada, has provided innovative and advanced solutions for the control, automation, remote monitoring, and electrical protection of ESP and surface pumping installations. These experts help ensure the efficient and economical use of power through field measurements and computer modeling, by analyzing power system components including VSDs, and by delivering customized solutions.