Hazardous location controls and apparatus

Getting you closer
ACE series explosionproof variable frequency drives

Now available with Eaton's PowerXL DG1 drive

EATON
Powering Business Worldwide
The ACE VFD solution

ACE explosionproof VFDs are the optimal choice for motor control in Class I, Division 1 and 2 locations.

• **Simple and cost-effective installations** – ACE explosionproof VFDs can be installed inside hazardous areas right next to the operation, eliminating expensive, complicated installations. There is no need to run long lines of conduit and motor cable, navigate around obstacles and hazards, or build off-site control rooms in non-hazardous areas to house VFD clusters.

• **Reduced energy usage** – ACE explosionproof VFDs allow you to adjust the motor’s level of power to exactly what is needed for optimal performance, significantly lowering energy consumption.

• **Reduced downtime** – Built-in diagnostics monitor equipment information and operating conditions, bringing visibility to potential issues before they become problems. Maintenance can be proactively scheduled during non-production hours.

• **Lower maintenance costs** – The ACE explosionproof VFD’s ability to lower system speeds and loads, as well as its soft start and stop capabilities, helps eliminate water hammer effects, increase life on bearings and seals and reduce stress on the overall electrical system.

### The Class I dilemma

Until now, a VFD couldn’t be used inside a classified enclosure in Class I, Division 1 or 2 locations. The heat generated by the VFD inside the classified enclosure caused it to fail. To overcome this problem, VFDs had to be stationed in control rooms outside of the hazardous area, resulting in expensive and impractical installation costs.

But what if you could station VFDs exactly where you want them, literally mounting the drives next to motors inside Class I areas? This would provide:

• A significant reduction of construction and installation costs

• The elimination of logistical and engineering problems

• An increase in uptime

Crouse-Hinds has developed such a solution – the ACE series explosionproof variable frequency drive. It is the only explosionproof enclosure to safely and reliably house a VFD. This revolutionary new product features a NEMA 7 enclosure with patented active cooling technology, allowing a traditional VFD to be housed inside the classified enclosure without the risk of overheating.

The ACE explosionproof VFD is rated Class I, Divisions 1 and 2 for use in the most extreme hazardous environments, and it is designed to match the high requirements of pumps, compressors, fans, separators and mixers in the following process industries:

• Oil and gas/refineries

• OEM skid builders

• Petrochemical

• Water/waste water

• Pharmaceutical

• Food and beverage manufacturing

An industry first...explosionproof VFDs
Deliver installation savings, conserve energy & improve performance.
Installation and energy savings

**Application**
An oil refinery utilizes thousands of pumps throughout the facility, many of them in hazardous areas. In an effort to improve their bottom line, the owners would like to control the pumps with VFDs and capture the energy savings they provide.

**Problem**
There is no space in the non-classified control room for VFDs. Also, the cost to engineer and install conduit and motor cable from the non-classified area to the pumps in the hazardous area is prohibitive.

**Solution**
Install Crouse-Hinds ACE series explosionproof VFDs right next to the motor and pump, tapping into an existing 480V supply.

**Benefit**
By using a VFD to optimize pump flow, significant energy savings are realized. Additionally, by installing the VFD next to the pump and motor, installation costs are greatly reduced.

Reduced maintenance

**Application**
A waste water treatment plant wants to reduce maintenance costs by installing VFDs on their pumps to eliminate the effects of water hammer in their pipes, which causes damage to the pipe system and its appendages.

**Problem**
The cost to run motor cable and conduit, coupled with the added cost of filters to mitigate the effects of Reflected Wave Syndrome (due to long cable lengths), makes installing the VFDs in a non-classified area impractical.

**Solution**
Install Crouse-Hinds ACE series explosionproof VFDs throughout the facility, thereby eliminating costly installations and protecting against the possibility of Reflected Wave Syndrome by keeping motor cable runs short. Additionally, the VFD’s soft start and stop capabilities eliminate water hammer.

**Benefit**
Total cost of ownership is reduced by protecting both the piping system and the motor itself with a classified solution that is easy to install.

Downtime reduction

**Application**
A petrochemical plant is experiencing an unacceptable amount of downtime in critical processes, costing the facility tens of thousands of dollars per hour. The plant manager has been tasked with determining the problem and proposing a solution.

**Problem**
The motors throughout the facility are controlled by basic “across-the-line” motor starters and unexpected motor failure is the biggest reason for unscheduled downtime.

**Solution**
Installing Crouse-Hinds ACE series explosionproof VFDs throughout the facility will provide access to real-time equipment and process data. Employees can monitor rises in average motor current, accurately predicting imminent bearing failure.

**Benefit**
Using a VFD to access and analyze real-time equipment data significantly reduces plant downtime, as the plant manager is now able to proactively schedule motor change out maintenance during non-production hours.
Heavy duty blower* creates airflow through the enclosure, allowing VFD to operate in ambient temperatures up to 50°C.

Variable Frequency Drive (VFD) in explosionproof enclosure allows installation in classified area, providing significant installation savings.

* Heavy duty blower, shroud, filters and pre-filter screens not included with units containing 1 to 5 horsepower VFDs.
Filters* in top and bottom of enclosure allow airflow into and out of the enclosure, cooling the VFD and eliminating risk of overheating.

Pre-filter screens* (not shown) eliminate clogging of the primary filters, ensuring reliable and consistent airflow. Pre-filter screens can be easily removed and cleaned without shutting down operations.

Shroud covering top filters allows water to dissipate off enclosure.

Stainless steel, captive, triple lead quick release spring loaded bolts install faster and provide clear indication that the cover bolts are fully retracted from the body.

Stainless steel hinges provide convenient and easy access to enclosure interior.

Enclosure epoxy painted for superior corrosion resistance.

Explosionproof window allows for viewing of the VFD interface module LCD screen.

Internal and external grounding lugs.

Explosionproof pilot lights provide run, stop and alarm indication.

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Fused disconnect.
ACE DG1 Series VFD available up to 100 HP!

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Stainless steel hinges provide convenient and easy access to enclosure interior.

Explosionproof window allows for viewing of the VFD interface module LCD screen.

Explosionproof pilot lights provide run, stop and alarm indication.

Enclosure epoxy painted for superior corrosion resistance.
Specifications

Applications
• For speed control of pumps, compressors, fans, conveyors, separators, mixers and other process equipment.
• Designed to meet the high reliability and safety requirements of process industries such as oil and gas, chemical and mining.

ACE series system benefits
• ACE explosionproof VFDs are installed ‘on-machine’ inside the hazardous areas, eliminating expensive, complicated installations.
• There is no need to run long lines of conduit and motor cable, dig up roadways and sidewalks, navigate around obstacles and hazards or build off-site control rooms in non-hazardous areas to house VFD clusters.
• Reflected Wave Syndrome is eliminated due to short motor cable runs.

ACE DG1 Series VFD benefits
• Drives available up to 100 HP
• Improved temperature rating: -30°C to +50°C (up to 75 HP) -30°C to +40°C (100 HP)
• Standard features include:
  - EtherNet/IP
  - Modbus TCP
  - RS-485: Modbus RTU
  - BACnet MS/TP

Standard materials & finishes
• Body and cover – copper-free aluminum, epoxy powder coated
• Operating handle – copper-free aluminum, epoxy painted
• Window – tempered soda lime glass
• Blower – aluminum, natural
• Filters – stainless steel, natural
• Pre-filters – stainless steel, natural
• Disconnect – stainless steel, natural
• Shroud – copper-free aluminum, epoxy painted
• Cover hinges, bolts, washers and springs – stainless steel, natural
• Internal brackets – stainless steel, natural
• Manifold and intake – EPDM rubber, natural

VFD system specifications
• Eaton PowerXL DG1 general purpose drives

Horsepower ratings
• Available from 1 to 100 HP

Certifications & compliances
UL Classified
• Class I, Divisions 1 and 2, Groups B, C, D

cUL Classified
• Class I, Divisions 1 and 2, Groups B*, C, D
  * 5 HP and below listed for Group B.

Standards
• UL1203

Environmental ratings
• NEMA 3, 4X*, 7BCD
• Raintight
• Wet Locations
• Operating temperature range
  1 to 75 HP
  -30°C to +50°C (-22°F to 122°F)
  100 HP
  -30°C to +40°C (-22°F to 104°F)
  * Please consult factory.
### Part number configuration and replacement parts

#### Horsepower rating

<table>
<thead>
<tr>
<th>Base part number</th>
<th>Nominal HP (kW)</th>
<th>Max. disconnect rating (Amps)</th>
<th>Disconnect fuse rating</th>
<th>Enclosure size</th>
<th>460V input ratings (Amps)</th>
<th>Max. output rating (Amps)</th>
<th>Power loss (Watts)</th>
<th>Temperature rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE-DG1-1</td>
<td>1.0 (.75)</td>
<td>30</td>
<td>10</td>
<td>1</td>
<td>2.0</td>
<td>2.2</td>
<td>48</td>
<td>T6</td>
</tr>
<tr>
<td>ACE-DG1-2</td>
<td>2.0 (1.5)</td>
<td>30</td>
<td>10</td>
<td>1</td>
<td>3.2</td>
<td>4.3</td>
<td>71</td>
<td>T6</td>
</tr>
<tr>
<td>ACE-DG1-3</td>
<td>3.0 (2.2)</td>
<td>30</td>
<td>15</td>
<td>1</td>
<td>4.5</td>
<td>5.6</td>
<td>82</td>
<td>T6</td>
</tr>
<tr>
<td>ACE-DG1-4</td>
<td>4.0 (3.0)</td>
<td>30</td>
<td>30</td>
<td>2</td>
<td>7.1</td>
<td>7.6</td>
<td>99</td>
<td>T6</td>
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<tr>
<td>ACE-DG1-5</td>
<td>5.0 (3.0)</td>
<td>35</td>
<td>20</td>
<td>2</td>
<td>10.2</td>
<td>12.0</td>
<td>483</td>
<td>T4A</td>
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<tr>
<td>ACE-DG1-6</td>
<td>6.0 (4.5)</td>
<td>60</td>
<td>60</td>
<td>2</td>
<td>19.5</td>
<td>23.0</td>
<td>598</td>
<td>T4A</td>
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<td>ACE-DG1-7</td>
<td>7.5 (5.5)</td>
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<td>50</td>
<td>2</td>
<td>25.1</td>
<td>31.0</td>
<td>719</td>
<td>T4A</td>
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<tr>
<td>ACE-DG1-8</td>
<td>10.0 (7.5)</td>
<td>60</td>
<td>60</td>
<td>2</td>
<td>31.6</td>
<td>38.0</td>
<td>764</td>
<td>T4A</td>
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<td>ACE-DG1-9</td>
<td>15.0 (11.0)</td>
<td>100</td>
<td>100</td>
<td>3</td>
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<td>46.0</td>
<td>821</td>
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<td>ACE-DG1-10</td>
<td>20.0 (15.0)</td>
<td>100</td>
<td>100</td>
<td>3</td>
<td>48.3</td>
<td>61.0</td>
<td>909</td>
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<tr>
<td>ACE-DG1-11</td>
<td>25.0 (18.5)</td>
<td>110</td>
<td>110</td>
<td>3</td>
<td>60.4</td>
<td>72.0</td>
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<td>ACE-DG1-12</td>
<td>30.0 (22.0)</td>
<td>125</td>
<td>125</td>
<td>3</td>
<td>71.6</td>
<td>87.0</td>
<td>1222</td>
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<td>ACE-DG1-13</td>
<td>40.0 (30.0)</td>
<td>175</td>
<td>175</td>
<td>3</td>
<td>89.2</td>
<td>105.0</td>
<td>1271</td>
<td>T4A</td>
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<td>ACE-DG1-14</td>
<td>50.0 (35.0)</td>
<td>200</td>
<td>200</td>
<td>3</td>
<td>115.3</td>
<td>140.0</td>
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<td>T4A</td>
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<tr>
<td>ACE-DG1-15</td>
<td>60.0 (45.0)</td>
<td>200</td>
<td>200</td>
<td>3</td>
<td>137.0</td>
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<tr>
<td>ACE-DG1-16</td>
<td>75.0 (55.0)</td>
<td>300</td>
<td>300</td>
<td>3</td>
<td>165.0</td>
<td>185.0</td>
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<td>T4A</td>
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<tr>
<td>ACE-DG1-17</td>
<td>100.0 (75.0)</td>
<td>500</td>
<td>500</td>
<td>3</td>
<td>193.0</td>
<td>215.0</td>
<td>2422</td>
<td>T4A</td>
</tr>
</tbody>
</table>

#### Catalog number example

**ACE-DG1-60-CC-PT**

- **Horsepower rating**: ACE-DG1-60
- **Options**: CC - PT

- **Modbus and Ethernet standard on all ACE DG1 models**

#### Options

**Communication modules**

<table>
<thead>
<tr>
<th>Part number suffix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP</td>
<td>Profibus</td>
</tr>
<tr>
<td>CD</td>
<td>Devicenet</td>
</tr>
<tr>
<td>CC</td>
<td>CAN Open</td>
</tr>
<tr>
<td>CS</td>
<td>SmartWire</td>
</tr>
<tr>
<td>CL</td>
<td>Lon Works</td>
</tr>
<tr>
<td>RO</td>
<td>Relay Output</td>
</tr>
<tr>
<td>DI*</td>
<td>6 x DI 240 VAC input option card</td>
</tr>
<tr>
<td>DIO</td>
<td>3 x DI, 3 x DO, 24 VDC</td>
</tr>
</tbody>
</table>

*DI option does not denote a 240 VAC supply voltage capability of the VFD. Please contact factory if a 240 VAC VFD is required.

**Potentiometer**

<table>
<thead>
<tr>
<th>Part number suffix</th>
<th>Description</th>
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<tbody>
<tr>
<td>PT</td>
<td>AB 800H-UP29</td>
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</table>

**Local/Remote**

<table>
<thead>
<tr>
<th>Part number suffix</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>LR</td>
<td>Two-position switch</td>
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</tbody>
</table>

**600 VAC option**

<table>
<thead>
<tr>
<th>Part number suffix</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>600</td>
<td>600 VAC</td>
</tr>
</tbody>
</table>

#### Replacement part kits – blower and filters

<table>
<thead>
<tr>
<th>Part number suffix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE KIT 1</td>
<td>Pre-filter and hardware (1 piece)</td>
</tr>
<tr>
<td>ACE KIT 2</td>
<td>Filter assembly (1 piece)</td>
</tr>
<tr>
<td>ACE KIT 3</td>
<td>Blower, manifold and hardware (1 piece)</td>
</tr>
</tbody>
</table>

#### Replacement part kits – drive fan*

<table>
<thead>
<tr>
<th>Part number suffix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE KIT 11-1</td>
<td>For use with ACE-DG1 1-5HP</td>
</tr>
<tr>
<td>ACE KIT 11-2</td>
<td>For use with ACE-DG1 7-15HP</td>
</tr>
<tr>
<td>ACE KIT 11-3</td>
<td>For use with ACE-DG1 20-30HP</td>
</tr>
<tr>
<td>ACE KIT 11-4</td>
<td>For use with ACE-DG1 40-60HP</td>
</tr>
<tr>
<td>ACE KIT 11-5</td>
<td>For use with ACE-DG1 75-100HP</td>
</tr>
</tbody>
</table>

*Note, this fan is not the main blower found inside the enclosure. ACE KIT 3 is the replacement parts kit for the main blower. The ACE-KIT 11 kits are for replacement fans specifically for the VFD drive.
Dimensions – enclosure size 1 (1 to 5 horsepower VFDs)

Dimensions – enclosure size 2 (7.5 to 30 horsepower VFDs)
Dimensions – enclosure size 3 (40 to 100 horsepower VFDs)
For more information:
If further assistance is required, please contact an authorized Eaton Distributor, Sales Office, or Customer Service Department.