V3 ECO DRIVES
AC Variable Speed Drive

PUMP CONTROL
Energy efficient

1HP – 350HP / 0.75kW – 250kW
200–600V Single & 3 Phase Input
V3 ECO DRIVES

Energy Efficient Pumping

When a pump or pump set is selected, it must be suitable for operation during periods of maximum flow demand. In many applications, this maximum flow level may be rarely required, and as such the pump may operate for long periods at less than maximum flow capacity. By varying the speed of the pump to match the actual flow demand, significant energy savings are possible.

V3 ECO drives have been designed to maximize the energy savings potential in pumping applications, while also providing significant additional benefits in reduced installation costs, maintenance costs and downtime. Throughout all this, our “Ease of Use” philosophy ensures that advanced features are simple to commission, without requiring extensive, in depth knowledge of a huge number of parameters. V3 ECO drives have a simple menu structure, and provide just the right amount of parameters to allow flexibility without over complication.

Overall, this provides the perfect balance of Easy to Install, Easy to operate, Advanced Pump Control.

All V3 ECO drives are drive.web ready

drive.web uses distributed control over Ethernet to provide cost effective, high performance integration of drives and controls in systems of any size or complexity.
Save Energy

ECO vector operation, based on Bardac’s advanced motor control, provides the most energy efficient operation of the pump, continually optimizing the output to match the required flow with minimum energy consumption.

Advanced sleep & wake functions provide maximum energy savings by switching off the pump when not required.

Save Money

V3 ECO drive technology allows simple operation of multiple pump sets without the need for a PLC.

Pump blockage detection and cleaning dramatically reduces pump maintenance requirements.

drive.web functionality allows bespoke customized applications to be programmed directly in the drive.

Save Time

Simple parameter set allows fast commissioning of pump control systems.

Pump operating curve detection automatically detects and monitors normal pump behaviour and is able to react when pumping conditions change.

Customizable OLED display provides excellent visibility of drive status and operation in all conditions.

Key Features

- ECO Vector Motor Control
- Standard Induction Motors
- Permanent Magnet AC Motors
- Brushless DC Motors
- Synchronous Reluctance Motors
- Energy Optimized Design
- Internal EMC Filter
- Low Noise Operation

Maximum Pumping Efficiency

Unique Eco Vector Sensorless Control

V3 ECO drives use advanced motor control technology, designed to provide the most energy efficient motor control possible. Operation with standard IM Motors, Permanent Magnet or Synchronous Reluctance motors is possible, all without requiring any feedback device or optional modules – simply change parameters to suit the connected motor, autotune and operate!

V3 ECO drives continuously adjust in real time to provide the most efficient operating conditions for the load, typically reducing energy consumption by 2 – 3% compared to standard AC drives – providing similar long term costs savings to selecting a higher efficiency motor.

Energy Optimized Design

V3 ECO drives, up to frame size 5, are designed with film capacitors, replacing the traditional electrolytic capacitors used in the DC link. Film capacitors have lower losses, and also remove the need for AC, DC or swinging chokes, improving overall drive efficiency. Efficiency is improved by up to 4% compared to standard AC drives, while also reducing supply current total harmonic distortion (iTHD), improving the Real Power Factor and reducing total input current, leading to cost savings on installation through reduced cable and fuse ratings and smaller supply transformer rating.

Improved Efficiency, Reduced Lifetime Costs: e.g. for a 37kW load, operating 10 hours per day, 5 days per week, 50 weeks per year, improving the efficiency by just 1% will provide an energy saving > 900kWh per year.

Typical efficiency comparison for V3 ECO drives vs other AC variable speed drives:

- Standard AC Variable Speed Drive
- AC Variable Speed Drive + 4% Line Choke
- V3 ECO Drive
**V3 ECO DRIVES**

**V3 ECO Drive Multi-pump Control**
Embedded control technology for multi-pump systems

**Flexible pump station control**
with no PLCs or pump control units

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**Total Control**
A single ‘Master’ drive acts to control and monitor system operation. Control connections are made to this drive only, saving installation time and reducing costs.

**Simple Connection**
Additional drives connected on the system require a single RJ45 connection and basic commissioning, leading to time savings and simplified installation.

**Flexible Solution**
The system can operate with up to five pumps in any configuration, e.g. Jockey Pump / Duty / Assist / Standby. Duty pumps are automatically rotated, ensuring maximum service life and system efficiency.

**Pump Prime Mode**

**Pump Prime with Burst Pipe Detection**

Pump prime mode allows starting of the pump in a safely controlled manner, to ensure consistent filling and pressurisation of pipe work and systems. Low pressure warnings are ignored during priming to allow the system to prime correctly, while a failsafe timeout prevents the pump from continuing to run in the event of a failure to prime. This helps to prevent the effects of water hammering (such as bursting water pipes) or damage to fountain / sprinkler heads.

The time limit, set for pump prime mode to complete, means that the pressure in the system must reach the minimum level within the set time. Failure of the system to pressurise would indicate a leak or burst pipe within the pump system and result in the V3 ECO drive shutting down the pump. During normal operation the system pressure is still continuously monitored against the minimum level so that a burst pipe during normal operation will likewise result in the drive tripping ‘low pressure’ and shutting the pump down.
Energy efficient pumping with Consistent Flow

The required pressure and flow levels are maintained regardless of how many pumps are required. When demand increases, additional pumps are automatically brought on stream to assist and are switched off again when not required.

Reduced Downtime

In the event of a fault, or if a pump needs to be isolated for maintenance, the system will automatically continue to operate with the remaining available pumps. The mains power can even be completely isolated from the Master drive without affecting operation of the Slave drives.

Avoid Pump Downtime

Blockage Detect/Clear

V3 ECO drives can detect pump blockages and trigger a programmed cleaning cycle to automatically clear them, preventing downtime.

Dry Run Protection

V3 ECO drives can evaluate a pump’s speed/power and shut it off or warn when the pump starts to run dry, protecting it from heat/friction damage.

Motor Preheat Function

V3 ECO drives feature a motor preheat function to help ensure moisture is not permitted to collect on the motor in periods of inactivity and prior to motor start up. In addition, the motor preheat function can be used to keep condensation from developing on the motor as the motor cools down immediately following a stop. The feature is fully configurable, meaning the pump can be always available the instant it is required.

Pump Stir Cycle

Triggered by a settable period of inactivity, a configurable cleaning cycle can be run to clear sediment, ensuring the pump is ready to run when needed.

Summary

- All drives operate at variable speed for maximum energy efficiency.
- Operating time (Hours Run) is automatically balanced and duty pumps rotated
- Automatic system reconfiguration in the event of a pump fault (including the master pump).
- Continued system operation when drives are individually powered off (including the master drive).
- Communication and +24V control voltage shared between drives via a standard RJ45 patch lead.
- Independent maintenance indicators for each pump.
- Any pump can be switched to Hand operation at the touch of a button, and will automatically rejoin the network when switched back to Auto.
- For waste water applications each pump can be set for blockage/ragging detection and activate an automatic de-ragging/pump cleaning cycle.
- Optional mains isolator with lock-off for safe pump maintenance.
V3 ECO DRIVES

Drive Features
A compact and robust range of drives dedicated to pump control

- Long Life, Dual Ball Bearing Fans
- Integrated cable management
- Pluggable terminals
- Hand / Auto Keypad
- Multi Language OLED Display
- Maintenance interval timer and service indication

Enclosure Options
NEMA 12
NEMA 4X
IP20
NEMA 4X with optional mains disconnect

Internal EMC Filter
Compliant with global EMC Standards

OLED Display
Installed as standard on all NEMA 12 & NEMA 4X models
- Clear multi-line text display
- Operates -10 to 50°C
- Wide viewing angle, effective in dark and light conditions
- Customisable display
- Multi-language selection
Energy efficient pumping with Reduced Harmonic Current Distortion

V3 ECO drives use innovative design to improve overall efficiency while minimizing the harmonic distortion levels. All drives designed for 3 phase power supply operation up to frame size 5 utilise film capacitor in the DC link, providing exceptionally low harmonic current distortion without compromising efficiency. Frame size 6 and above include DC chokes and traditional electrolytic capacitors.

The V3 ECO product range complies with the requirements of EN61000-3-12.

Bardac V3 ECO drives deliver:

- Improved Efficiency, Reduced Lifetime Costs: e.g. for a 37kW load, operating 10 hours per day, 5 days per week, 50 weeks per year, improving the efficiency by just 1% will provide an energy saving > 900kWh per year
- Improved True Power Factor – No additional charges etc.
- Lower Mains Supply Current

Noise Reduction through Speed Control

Optimizing motor speed gives significant energy savings and reduces motor noise.

Reduced Harmonic Current Distortion

It can be clearly seen that the reduced DC link capacitance significantly reduces the total harmonic distortion at full load, and has a much greater benefit at part load compared to a conventional DC choke or swinging choke. This results in reduced overall input current and reduced transformer heating effect.

Power factor comparison

Bardac V3 ECO drives offers improved power factor over conventional VFDs under all loads.
**V3 ECO DRIVES**

**drive.web** uses distributed control over Ethernet to provide cost effective, high performance integration of drives and controls in systems of any size or complexity.

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**smarty**

controllers with a wide range of I/O

Used for all programmable control, peer-to-peer Ethernet networking and system integration tasks.

- DIN mount controllers with flexible analog, logic, and encoder I/O
- 16 points of high resolution I/O
- Includes gateway to ModbusTCP/IP, ModbusRTU, EIP/PCCC, etc.
- USB port for easy system-wide programming

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**speedy**

miniature, full-featured controllers

Tiny, full-featured, programmable controllers for embedding into drives, sensors, HMIs, etc.

- The easiest, affordable way to get all your drives & devices up onto peer-to-peer Ethernet
- Includes gateway to ModbusTCP/IP, ModbusRTU, EIP/PCCC, etc.
- USB port for easy system-wide programming

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**savvy**

the smart automation tool

Smart, intuitive graphical tools for device programming, system design, and monitoring.

**savvyPanel**

smart, touch screen operator station technology

Provides unprecedented flexibility in instrumentation, control, and monitoring.

Also available on PC and iOS devices
Installation & Peripheral Options

A range of external EMC Filters, Brake Resistors, Input Chokes and Output Filters are available, to suit all installation requirements.

Fieldbus Interfaces

- BACnet/IP
  - T2-BNTP-IN
- PROFIBUS DP
  - T2-PROFB-IN
- DeviceNet
  - T2-DEVNT-IN
- EtherNet/IP
  - T2-ETHNT-IN
- Modbus TCP
  - T2-MODIP-IN
- PROFINET
  - T2-PFNET-IN
- EtherCAT
  - T2-ETCAT-IN

Plug-in Options

- Extended I/O
  - T2-EXTIO-IN
    - Additional 3 Digital Inputs
    - Additional Relay Output
- Cascade Control
  - T2-CASCD-IN
  - Additional 3 Relay Outputs
- BACnet MS/TP & Modbus RTU on board as standard

Mains Isolator

- Mains Isolator Option
  - Frame Sizes 2 & 3 can be factory ordered with a built in lockable isolator. An optional bolt on isolator is available for Frame Sizes 4 & 5.
  - Product Codes:
    - Frame Size 4 = T2-ISOL4-IN
    - Frame Size 5 = T2-ISOL5-IN

Rapid Commissioning

- Allows rapid copying of parameters between multiple drives
- Backup and restore of drive parameters
- T2-STICK-IN
# V3 ECO Drives Models & Ratings

## 200-240V ± 10%, 1-ph in, 230V, 3-ph motor

<table>
<thead>
<tr>
<th>Model</th>
<th>HP (kW)</th>
<th>Amps</th>
<th>Size</th>
<th>NEMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>V3-220043-1F12-SN</td>
<td>1.43</td>
<td>2</td>
<td>2</td>
<td>IP20</td>
</tr>
<tr>
<td>V3-220070-1F12-SN</td>
<td>2.7</td>
<td>2</td>
<td>2</td>
<td>IP20</td>
</tr>
<tr>
<td>V3-220105-1F12-SN</td>
<td>3.105</td>
<td>2</td>
<td>2</td>
<td>IP20</td>
</tr>
</tbody>
</table>

## 200-240V ± 10%, 3-ph in, 230V, 3-ph motor

<table>
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<tr>
<th>Model</th>
<th>HP (kW)</th>
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<th>Size</th>
<th>NEMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>V3-220043-3F12-SN</td>
<td>1.43</td>
<td>2</td>
<td>2</td>
<td>IP20</td>
</tr>
<tr>
<td>V3-220070-3F12-SN</td>
<td>2.7</td>
<td>2</td>
<td>2</td>
<td>IP20</td>
</tr>
<tr>
<td>V3-220105-3F12-SN</td>
<td>3.105</td>
<td>2</td>
<td>2</td>
<td>IP20</td>
</tr>
</tbody>
</table>

## 380-480V ± 10%, 3-ph in, 460V, 3-ph motor

<table>
<thead>
<tr>
<th>Model</th>
<th>HP (kW)</th>
<th>Amps</th>
<th>Size</th>
<th>NEMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>V3-240022-3F12-SN</td>
<td>1.22</td>
<td>2</td>
<td>2</td>
<td>IP20</td>
</tr>
<tr>
<td>V3-240041-3F12-SN</td>
<td>2.41</td>
<td>2</td>
<td>2</td>
<td>IP20</td>
</tr>
<tr>
<td>V3-240058-3F12-SN</td>
<td>3.58</td>
<td>2</td>
<td>2</td>
<td>IP20</td>
</tr>
</tbody>
</table>

## 600 Volts Drives

## 500-600V ± 10%, 3-ph in

<table>
<thead>
<tr>
<th>Model</th>
<th>HP (kW)</th>
<th>Amps</th>
<th>Size</th>
<th>NEMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP20 with LED display</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V3-260021-3F12-SN</td>
<td>1.21</td>
<td>2</td>
<td>2</td>
<td>IP20</td>
</tr>
<tr>
<td>V3-260031-3F12-SN</td>
<td>2.31</td>
<td>2</td>
<td>2</td>
<td>IP20</td>
</tr>
<tr>
<td>V3-260041-3F12-SN</td>
<td>3.41</td>
<td>2</td>
<td>2</td>
<td>IP20</td>
</tr>
</tbody>
</table>

## NEMA 4X (IP65), with OLED text display

<table>
<thead>
<tr>
<th>Model</th>
<th>HP (kW)</th>
<th>Amps</th>
<th>Size</th>
<th>NEMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>V3-360220-3F12-SN</td>
<td>1.78</td>
<td>2</td>
<td>2</td>
<td>4X</td>
</tr>
<tr>
<td>V3-360170-3F12-SN</td>
<td>1.27</td>
<td>2</td>
<td>2</td>
<td>4X</td>
</tr>
</tbody>
</table>

### Optional Features

- LED, Display & EMC Filter
- Smart automation
- USB programming
- Ethernet networking

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**Speedy on board**

Ethernet networking
USB programming
Smart automation

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*Size 2 & 3 drives model number suffix X or D

X = No disconnect switch
D = With power disconnect switch*
### Drive Specification

<table>
<thead>
<tr>
<th>Input Ratings</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>200 – 240V ± 10%</td>
</tr>
<tr>
<td>Supply Frequency</td>
<td>50 – 60Hz ± 2Hz</td>
</tr>
<tr>
<td>Displacement Power Factor</td>
<td>0.99</td>
</tr>
<tr>
<td>Phase Inductance</td>
<td>3% Maximum allowed</td>
</tr>
<tr>
<td>Inrush Current</td>
<td>≤ rated current</td>
</tr>
<tr>
<td>Power Cycles</td>
<td>120 per hour max, evenly spaced</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output Ratings</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overload Capacity</td>
<td>110% for 60 seconds</td>
</tr>
<tr>
<td>Overload Capacity</td>
<td>165% for 4 seconds</td>
</tr>
<tr>
<td>Typical Efficiency</td>
<td>≥ 95%</td>
</tr>
</tbody>
</table>

### Ambient Conditions
- Temperature: Storage: 0 to 40°C; Operating: -10 to 50°C
- Altitude: Up to 1000m ASL without derating
- Humidity: 95% Max. non-condensing
- Vibration: Conforms to EN60721-3-3, EN60068-2-6

### Endorsements
- IP20, NEMA 12 (IP55), NEMA 4X (IP66)

### Programming
- Keypad: Built-in keypad or optional remote mountable keypad

### Control Specification
- Control Method: ECO Stop Safety Vector, Open Loop VSD Vector, Open Loop Synchronous Reactance Vector
- PWM Frequency: 3 – 32kHz Effective
- Stopping Mode: Slow to stop
- Braking: AC Plus Braking
- Skip Frequency: Single point, user adjustable

### Feedback Connectivity
- BACnet Application Specific Controller
- Modbus RTU
- BACnet/Modbus/IP
- Profinet IO

### L/O Specifications
- Power Supply: 24 VDC, 100mA, Short Circuit Protected
- 10 VDC, 10mA for Potentiometer

<table>
<thead>
<tr>
<th>Digital Outputs</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Total</td>
<td>Digital Output (0, 2, 3, 4, 5)</td>
</tr>
<tr>
<td>2</td>
<td>Analog Output (0, 1)</td>
</tr>
</tbody>
</table>

### Fieldbus Connection
- BACnet Application Specific Controller
- Modbus RTU
- BACnet/Modbus/IP

### Application Features
- MD Control: Internal MD Controller
- Multi-speed Select: Fixed / Analog / PID

### Pump Control Features
- Pump Blockage Detection: Local
- Pump Loading Monitoring: With cascade control module

### Monitoring & Diagnostics
- Fault Memory: Last 8 Trip stored with trip stamp
- Logging: Logging of data prior to trip for diagnostic purposes
- Drive Temperature: DC Bus Voltage
- Maintenance Indicator: User adjustable
- Onboard service life monitoring

### Standards

### Connection Diagram

- Option/Default Setting
  - Digital Input: 24 VDC Input
  - Digital Input: 24 VDC Input
  - Digital Input: 24 VDC Input
  - Analog Input: 24 VDC Input
  - Analog Output: 24 VDC Input
  - Safe Torque Off Input
  - Safe Torque Off Input

- Output Relays: Drive Healthy / Fault
- Output Relays: Drive Running
Since our founding in 1992, Bardac has worked hard to build our reputation around key goals:

- Innovative technologies
- Reliable products
- Focus on automation; Distributed Control, AC Drives, DC Drives, and Motors
- All catalog items normally in stock
- Competitive pricing
- Unrelenting customer support

Global Pump Solutions

Bardac drives operate at the heart of pumping systems around the world

- IRELAND: Maintaining pressure at pumping stations
- HOLLAND: Hot water pumping across district network
- ITALY: Cooling loop flow & temperature control
- AUSTRALIA: Improved reliability & running costs

V3 ECO Drives

- Saving Energy / Reducing CO₂
  With large scale increases in global energy costs and the introduction of taxes and legislation relating to the industrial production of CO₂ gases the need to reduce energy consumption and save money has never been greater. V3 ECO drives can be used with environmental sensors to reduce pump speed in pumping applications without compromising the required output of the system.

- Easy Installation
  Compact and modern design utilizing the latest available technology have accumulated in robust V3 ECO drives with small dimensions and innovative mounting and cabling features.

- Simple Set-up & Rapid Commissioning
  V3 ECO drives were developed from concept for ease of use. A handful of parameters configure the drive for basic pump applications. A short, concise product data means the drive is running in seconds. Advanced powerful functionality is equally easily accessible.

- Imaginative Enclosure Design
  With a selection of NEMA 12 and NEMA 4X enclosures, V3 ECO drives are well suited to harsh environments, or where cabinet and cabling costs need to be reduced.

- Advanced Pump Control Functions
  The key pump control functionality required for your application is built into V3 ECO drives and packaged to be both quick and simple to activate.

- Options for Flexibility
  V3 ECO drives combine both peripheral and factory built options to ensure you get the right drive, scaled to suit your application. With inbuilt BACnet and Modbus, and a host of communication options, V3 ECO drives can integrate easily into your industrial network of choice.