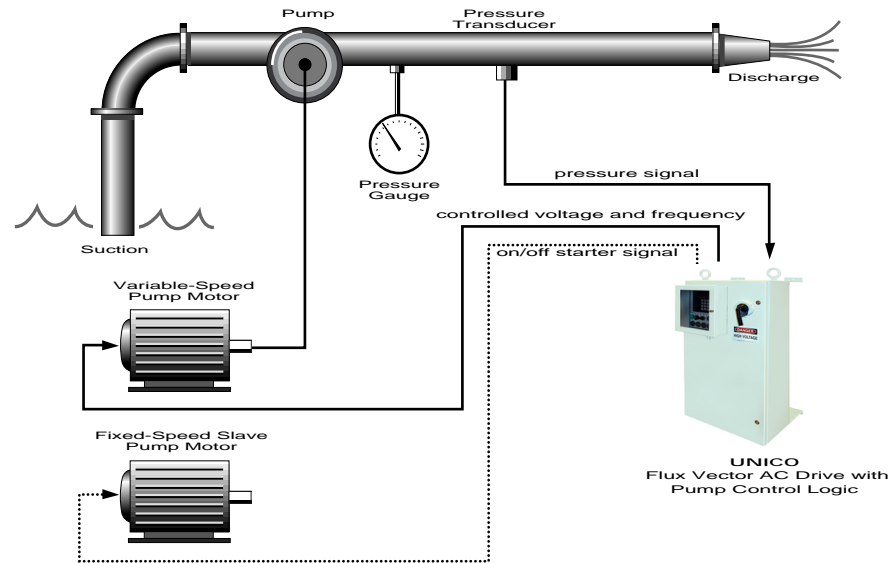


APPLICATION NOTE

Constant-Pressure Pumping Systems



Overview

The greatest challenge in most pumping applications is maintaining constant pressure in the face of varying system demand without the expense of large tanks or energy-robbing throttling valves. At the same time, it is necessary to prevent pumps from rapid cycling and causing pressure surges when they start and stop. Variable-speed drives offer one solution, but they are much more difficult to control than fixed-speed systems. Ordinary variable-frequency drives take their operational instructions from outside sources such as PLCs and PID (setpoint) controllers, which are time-consuming and difficult to integrate and set up. With its built-in setpoint and pump system logic, the 1100 Pump Control AC Drive greatly simplifies the process of applying variable-speed control to pumping systems.

Custom performance in a simple-to-use controller

The 1100 provides the performance of a custom-engineered, integrated control system without the cost and complexity. Setup and operation are greatly simplified because all functions are incorporated into one unit, rather than being distributed among multiple devices. A simple, menu-driven keypad and descriptive two-line display is all that is required. Values are set up and display in everyday engineering units such as psi, rpm, and gpm. There are no encrypted codes or symbols or complicated conversions.

Monitors pressure and flow feedback

Pressure and flow are critical components of accurate pump control. Some so-called "pump macros" base all control decisions on the drive frequency. In other words, decisions to start and stop pumps are made without knowing what the system pressure is or whether or not there is flow. This approach wastes energy and wears out critical components by starting pumps when they are not required. The 1100's Pump Control Logic constantly keeps track of pressure and flow information so that pumps start and stop only when needed, thereby saving energy and increasing pump and motor life.



Overview Controls multiple pumps*(continued)*

In systems where more than one pump is used to cover the necessary range of flow, the 1100 will control the staging of additional pumps, turning them on and off when needed while constantly adjusting the speed of the first pump to maintain constant pressure. Several innovative features are built into the logic program to prevent nuisance starts and stops, provide smooth transitions between pumps, and maintain pressure within a narrow range.

Runs all types of pumps

The 1100 works with any electric-motor-driven pump. It has a built-in minimum speed setpoint to accommodate submersible well pump motor manufacturers' minimum speed requirements. Because the drive delivers 100% rated torque from zero to full speed, it can give positive displacement pumps the low-speed torque they need without oversizing the drive and motor. Critical speed lockouts are provided for applications with line-shaft turbine pumps.

Complete pump and motor protection

The 1100 protects the motor, pump, and system from damaging conditions such as loss of prime, rapid cycling, extended dead heading, overpressure, high pump casing temperature, cavitation, motor overload, and more. The 1100 will even shut down the system in the event of a catastrophic discharge line break. All appropriate alarm functions have adjustable override timers so nuisance trips can be easily tuned out of the system. In addition, all necessary alarm functions are automatically overridden during start-up and line-filling modes.

Thrives in hostile environments

The 1100 was designed for harsh pumping system environments. Go ahead and hang it outside on a pole. Summer or winter, its compact, rugged NEMA 4 dust- and rain-tight enclosure is up to the task. A unique mechanical design allows the drive to be mounted inside the enclosure with its heat sink outside so that heat is dissipated externally.

Easy troubleshooting

When there's a problem, the 1100 lets you know with a blinking display. Faults are identified in plain language without cryptic codes. The drive retains the last three faults, making it easy to spot trends. It also stores the operating conditions at the time of the most recent fault to aid in troubleshooting.

Application flexibility

With more than 100 user-selectable settings, the 1100 can be customized to suit your application. You can specify coast- or ramp-to-stop, acceleration and deceleration rates, preset speeds with duration timers for filling empty lines, critical frequency lock outs, and a "sleeper" mode for pressurized mains (when the pump is off and pressure drops below a user-specified minimum, the drive will ramp the pump up until the requested pressure is achieved). The drive can work alone, or it can easily be integrated into a larger system where it can talk to programmable controllers, PCs, building automation systems, and other computers. Multiple 1100s can be networked together using the drive's master/slave capability.

Accommodates single- or three-phase power

Whether your input power is three-phase or single-phase, there's a version of the 1100 to accommodate. Standard three-phase drives are available up to 400 hp.

Specifications Electrical

Input Supply

Voltage:	200 to 240, 380 to 480, or 500 to 600 VAC, Phase sequence insensitive/supports DC solar power
Voltage tolerance:	-10% of minimum, +10% of maximum
Frequency:	47 to 63 Hz
Power factor:	Displacement: 0.99 at all loads and speeds Overall: 0.94 at rated load

Output Rating

Voltage:	Zero to input supply voltage, 3-phase
Frequency:	Zero to twice base frequency
Switching frequency:	4 to 8 kHz, programmable, without de-rating

Service Conditions

Efficiency:	96% nominal at 6 kHz switching frequency
Overload current:	Variable torque: 120% of rated for 1 min; trip at 160%

Environmental

Operating temperature:	Control section: 32° to 131° F (0° to 55° C) Heat sink: 32° to 104° F (0° to 40° C)
Storage temperature:	5° to 158° F (-15° to 70° C)
Operating humidity:	95% maximum, non-condensing
Altitude:	To 3,300 ft (1,000 m) without de-rating

Performance

Velocity Control

Range:	Zero to base speed at full torque Zero to twice base speed with automatic field weakening
Regulation:	±0.01% of base speed, down to zero, with encoder ±0.5% of base speed, 2 Hz and above, without encoder

Torque Control

Starting torque:	
Regulation:	Variable torque: zero to 120% of rated ±3.0%, with encoder

Frequency Resolution

Analog input (12-bit):	
Digital input:	0.025% 0.010%

Standard Features

- Pressure or flow control
- Independent acceleration and deceleration rates
- Automatic anticavitation/pipe-filling control
- Multipump sequencing with selectable start points
- Minimum speed adjustment
- Automatic low pressure start
- Automatic high pressure standby
- Automatic no flow standby
- Override and nuisance trip delay timers
- Adjustable bandwidth for multipump sequencing
- 24-hour clock timer control
- Status and diagnostic displays

Specifications **Options**

(continued)

- Remote control
- Windows graphical interface
- Serial communication via modem

Protection

- High/low pressure
- High/low flow
- Pump start no flow
- Transducer failure
- Loss of prime
- Voltage spike
- Low wet-well level
- Motor overload
- Low suction pressure
- Rapid cycle
- High/low voltage

Power Range

Input Voltage	Three-Phase Variable-Torque Applications (1100 drive)
230 V AC	1 1/2-75 hp (1.1-56 kW)
460 V AC	1 1/2-400 hp (1.1-298 kW)
575 V AC	1 1/2-400 hp (1.1-298 kW)

Consult factory for other powers. Other voltages require appropriate derating.

Applications **Pumps and Pumping Systems**

- Submersible pumps
- Centrifugal pumps
- Positive displacement pumps
- Turbine pumps
- Vertical hollow-shaft pumps
- Municipal water booster stations
- Municipal sewage lift stations
- Farm irrigation systems
- Turf irrigation systems
- Greenhouse irrigation systems
- Horticultural irrigation systems
- Tailwater recovery systems
- Agricultural manure pumps
- Dairy vacuum pumps

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Specifications subject to change without notice.

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Unico is a leading global innovator of motion-control solutions for industry. Founded in 1967, the company develops, manufactures, and services variable-speed drives, application-engineered drive products, integrated drive systems, and ancillary products that improve operations by increasing productivity, safety, and equipment life while lowering energy and maintenance costs.