

AquaDrive+

The *CT AquaDrive+* is a sophisticated pump control panel with the added capability to operate a complete water-recycling system. It combines an advanced variable-frequency drive (VFD), a fused disconnect, and a programmable logic controller (PLC) within a weatherproof enclosure. The drive runs a three-phase pump at constant pressure with optimal efficiency while protecting the pump from common problems such as dry-running, over current, low voltage, phase imbalance, ground faults, and overheating. The fused disconnect simplifies wiring and improves safety. An LCD indicates the supply pressure and storage tank level. Control relays can operate external valves or water treatment devices.

Standard panels are available for three-phase pumps up to 10hp operating at either 208v-240v or 460v-480v. For multi-pump systems, each pump is operated by a separate control panel for optimal reliability and efficiency, but the panels communicate to intelligently alternate pumps for optimal reliability and can operate the pumps simultaneously when higher flow is required.



FEATURES

durable weatherproof enclosure: The cast-aluminum AquaDrive+ is NEMA 4X (IP66) rated to resist water spray, so the panel can be located near the pump it controls. It can be used outdoors with a simple rain and sun shield, underground in a well-drained vault, or in damp mechanical rooms without the need for expensive enclosures.

integral fused disconnect: The built-in fused disconnect eliminates the need for pump disconnects and secondary circuit protection, allowing a less-expensive, more compact installation.

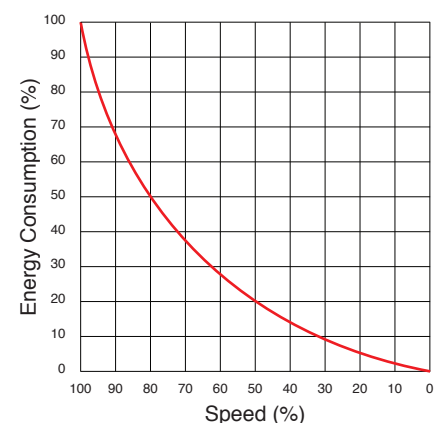
optimal energy efficiency: The variable frequency drive dramatically reduces energy consumption by reducing the motor speed to the minimum required to maintain the required pressure at the current flow rate. Reducing the speed by only 20% can reduce the energy consumption by 50%, and the internal power loss of the control electronics is less than 2%.

precise pressure regulation: Motor speed is accurately controlled by automatically tuned PID loops optimized for water pumping applications.

redundant control of multi-pump systems: In multi-pump systems, each pump has its own AquaDrive+, so the system can remain fully functional when it is necessary to repair both a pump and a panel at the same time.

automatic pump alternation: In multi-pump systems, the AquaDrive+ panels communicate to alternate pumps with internal timers assuring equal run time. This prevents shafts from locking and keeps seals lubricated.

automatic pump cascading: In multi-pump systems, the AquaDrive+ panels optionally communicate so that if a single pump is not sufficient to meet the total required flow and pressure, multiple pumps will operate simultaneously to equally share the demand. This “master-follower” functionality minimizes motor wear and sound levels compared with conventional cascading systems that only vary the speed of one pump and operate the others at full speed.



automatic sleep and restart: When the flow of water through the pump stops because there is no water being used, the AquaDrive+ automatically shuts the pump off. When the pressure drops below the set pressure, the pump automatically restarts. This minimizes pump wear and significantly reduces power consumption.

dry-run protection: When the flow of water through the pump becomes very low or stops because insufficient water reaches the pump, the AquaDrive+ automatically shuts the pump off. The shutoff is triggered by changes in the pump electrical behavior and does not require flow sensors.

voltage protection: Two standard AquaDrive+ voltages are available: 208v-240v and 460v-480v. The AquaDrive+ automatically adjusts the output voltage to match the motor specs provided the input voltage is within 10% of the required voltage, assuring full motor torque. When the voltage falls outside the allowable range, the pump shuts off.

current protection: The AquaDrive+ provides traditional short-circuit and overload protection, but also measures current flowing in each of the three motor phases and shuts off the pump if there are any irregularities.

ground fault protection: The AquaDrive+ monitors ground currents in both the power supply input and the motor power output and shuts off the pump if a fault is detected.

thermal protection: An electronic thermal relay in the AquaDrive+ detects motor overheating and shuts off the pump without need for a wired thermistor to directly measure pump motor surface temperatures.

phase protection: The AquaDrive+ monitors each of the three motor phases and shuts off the pump if there is a phase loss or imbalance.

transient protection: The AquaDrive+ dissipates voltage and current spikes from external sources such as lighting, as well as from internal sources such as inductive equipment, preventing damage to both the panel electronics and controlled pumps.

plumbing failure detection: When the pump runs at full speed without developing the set pressure, the AquaDrive+ automatically shuts off the pump and can also operate a safety throttle valve or trigger an alarm. This prevents catastrophic water loss due to broken pipes or faulty valves.

intelligent pressure regulation: The basic idea behind variable frequency drive pump control is that the VFD increases the output power frequency and consequently the motor speed as required to maintain a pre-set pressure. A fundamental problem is that normally it is only practical to measure pressure at the pump outlet. Since the pressure loss in the plumbing systems is proportional to the flow rate, as the flow increases the pressure at the end of the line will drop unless the pressure at the pump is increased and not just kept constant. The typical solution is to increase the pressure setpoint at the pump outlet to deliver the required end of line pressure at maximum flow, but designing for the worst case wastes energy at more typical flow rates. The AquaDrive+ solves this problem by allowing the user to set a zero-flow pressure and automatically adjusting the pressure setpoint as the flow increases.

intelligent speed ramping: When the pump starts, the AquaDrive+ provides initial rapid acceleration until the pump reaches a pre-defined speed, then automatically reduces the acceleration rate to prevent bearing damage and motor overheating. When water flow slows, the process is reversed: the controller decelerates the pump at a moderate rate, then automatically reduces the deceleration rate until the pump reaches zero flow and stops. This behavior prevents water hammer, pipe damage, rapid check valve closure, and fixture blowouts, a particular problem in closed loop water supply and irrigation systems.

harmonic suppression: DC-link reactor technology minimizes harmonic currents, eliminating the need for AC line reactors that can cause a significant voltage drop. The reduced harmonics increase the lifetime of motor capacitors and result in smooth and quiet motor operation. Motor cable sizes can be reduced while simultaneously cable lengths can be increased.

alarm history, counters, and reminders: The AquaDrive+ stores and displays the alarm history, maintenance reminders, trends in key parameters, motor running hours, kilowatt hours of energy consumed, and the number of motor starts.

water level monitoring: By connecting an optional stainless-steel submersible pressure transducer, the AquaDrive+ can display the water level in a tank, for example a cistern or break tank.

sterilizer monitoring and control: When used with a UV sterilizer with appropriate input and output capabilities, the AquaDrive+ can monitor the UV intensity and evaluate whether it is sufficient to provide sterilization. The AquaDrive+ can also turn the UV lamp on and off according to a clock schedule to save energy,

external valve control: The AquaDrive+ can control a solenoid valve or motorized valve based on a pre-programmed sequence of events. For example, in a rainwater harvesting system, a motorized three-port valve can be set to automatically switch to municipal water to assure uninterrupted water availability in the event the rainwater tank is low, the UV sterilizer is not functioning, or there is a pump failure.

SPECIFICATIONS

Electrical:

Input Voltage: 208-240v or 460-480v, 60 hz, 3 ϕ

Output Voltage: $\pm 10\%$ of input volts, 0-60 hz, 3 ϕ

Pump Horsepower: up to 10 hp

Ventilation:

Minimum Top and Bottom Clearance: 4"

Mounting: must be mounted on solid surface

Control and Communication:

Pressure Sensor Input

Level Sensor Input

Backup Valve Relay Output

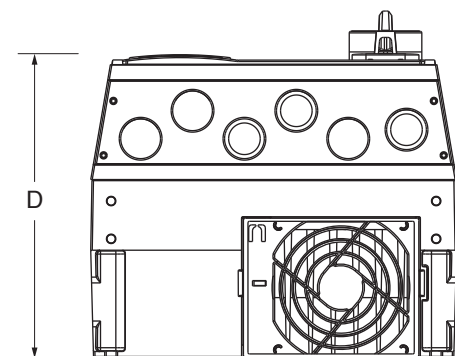
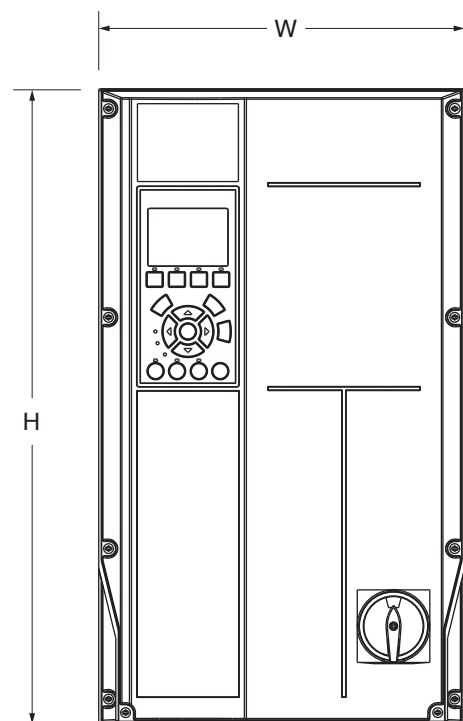
Low Water Float Switch Input

UV Sterilizer Input (optional)

UV Clock Output (optional)

Communication: Modbus RTU (optional EtherNet, BACnet, LonWorks, DeviceNet, CAN Open, and PROFIBUS)

Voltage	Amps	Height-H	Width-W	Depth-D
208-240	7.5	16-1/2"	9-1/2"	8"
208-240	10.6	16-1/2"	9-1/2"	8"
208-240	12.5	16-1/2"	9-1/2"	8"
208-240	16.7	16-1/2"	9-1/2"	8"
208-240	24.2	19"	9-1/2"	10-1/4"
208-240	30.8	19"	9-1/2"	10-1/4"
460-480	3.4	16-1/2"	9-1/2"	8"
460-480	4.8	16-1/2"	9-1/2"	8"
460-480	6.3	16-1/2"	9-1/2"	8"
460-480	8.2	16-1/2"	9-1/2"	8"
460-480	11	16-1/2"	9-1/2"	8"
460-480	14.5	16-1/2"	9-1/2"	8"



bottom with conduit knockouts