The Z1000 variable speed drive is designed for building automation applications such as fans, pumps, and cooling towers through 500 HP. The Z1000 features an easy-to-read LCD keypad that provides Hand-Off-Auto interface and a real time clock. These features make the Z1000 perfect for most building automation applications that require reliable motor control.

**Harmonic Mitigation**
Built-in 5% line impedance for input harmonic reduction.

**Noise Filter**
On board EMI/RFI filter complies with IEC 61800-3 restricted distribution for first environment.

**Serial Communications**
Embedded BACnet communications (BTL Certified), along with Modbus/ Memobus.

**Ratings**

**Internal Real-Time Clock**
Time and date stamping for events, along with timer controls for starting stopping and speed changes without the need for external controls.

**PI Feature**
Maintains a set point for closed loop control of fans and pumps for pressure, flow or temperature regulation and eliminates the need for a closed loop output signal from a BAS. Independent PI to control an external device in the system.

**LCD Operator**
5-Line 16 character alpha-numeric, easy to read and understand display, with Hand-Off-Auto functions.

**Carrier Frequency**
5 kHz carrier frequency with dynamic noise control for quiet motor operation.

**Application Macros**
Choose from pre-configured set up macros to match the application for quick and easy set up.

**Sealed Heatsink**
Allows for drive to be mounted in a NEMA 12 enclosure with heatsink external.

*Available only as options, 300-500HP ratings.*
# Z1000 HVAC Drive

**3 HP to 500 HP**

**Fan and Pump Applications**

### FREE Estimating Tools

- Energy Savings Predictor
- Harmonics Estimator
- Carbon Footprint Calculator

---

**Model Number**

**CIMR-ZU4A**

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**Model Number**

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**Z1000 HVAC Drive**

**Energy Savings**

**Predictor Software**

**Harmonics Estimating Tool**

**Energy Savings** by Yaskawa Electric America, Inc.

**iTunes App**

Energy savings app for the iPhone and the iPod touch is available at iTunes.com - search for Yaskawa.
## Model Number Designation for Z1000 Drive

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**Model Number**: CIMR-ZU2 A0021 FA A A

**Configuration**: Z1000 Drive Series

**Designation**: Z1000 Drive, Z1000 Bypass, Z1000 Configured, E7 Drive, E7S Slim Configured Package, E7C Drive Configured, E7N Narrow Bypass Package, E7B Drive Bypass, E7L Drive Bypass, E7E Drive Engineered.
Variable Frequency Drive (VFD)
Z1000  Mechanical Specification Submittal
(For NEMA 1 Rated Drives)

GENERAL

The Z1000 is a high performance PWM (pulse-width-modulated) AC drive. Three-phase input line power is converted to a sine-coded, variable frequency output, which provides optimum speed control of any conventional squirrel cage induction motor and permanent magnet motor. The use of IGBTs (Insulated Gate Bipolar Transistors), with a carrier frequency range of 1 kHz to 12.5 kHz, permits quiet motor operation.

This drive has one control logic board for all horsepower ratings. Printed circuit boards employ surface mount technology, providing both high reliability, and small physical size of the printed circuit assemblies. The dual 32 bit microprocessors deliver the computing power necessary for complete three phase motor control in building automation systems.

Operating Principle: Input three phase AC line voltage is first rectified to a fixed DC voltage. Using pulse width modulation (PWM) inverter technology, the DC voltage is processed, to produce an output waveform in a series of variable-width pulses. Unique firmware algorithms optimize motor magnetization through control of voltage, current and frequency applied to generate a nearly sinusoidal output waveform.

STANDARDS

UL 508C (Power Conversion)
CSA 22.2 No. 14-95 (Industrial Control Equipment)
UL 1995 (Plenum)
CE mark 2006/95/EC LVD
CE mark 2004/108/EC
IEC 61800-5-1 (LVD)
EN 61800-3
IEC 529
IEEE C62.41
BTL Listed
UL, cUL listed; CE marked

ENVIRONMENTAL & SERVICE CONDITIONS

Ambient service temperature:
NEMA 1 (IP20): -10°C to 40°C (14°F to 104°F)
Ambient storage temperature: -20°C to 70°C (-4°F to 158°F)
Humidity: 0 % to 95 %, non-condensing
Altitude: to 1000 meters (3300 feet), higher by derating
Service factor: 1.0
Vibration: 9.81m/s² (1 G) maximum at 10 to 20 Hz, 2.0 m/s² (0.2 G) at 20 Hz to 55 Hz.
Plenum mounting capable (IP20)
RoHS Compliant

QUALITY ASSURANCE

In circuit testing of all printed circuit boards is conducted, to ensure proper manufacturing.

Final printed circuit board assemblies are functionally tested, via computerized test equipment.

All fully assembled controls are computer tested with induction motor loads to assure unit specifications are met.

The average MTBF (Mean Time Between Failure) is 28 years

CONSTRUCTION

Input Section - VFD power input stage converts three phase AC line power into a fixed DC voltage, via a solid state full wave diode rectifier, with MOV (Metal Oxide Varistor) surge protection. An internal 5% DC bus reactor reduces harmonics for cleaner power.

Intermediate Section - DC bus maintains a fixed DC voltage, with filtering and short circuit protection, as a DC supply to the VFD output section. It is interfaced with the VFD diagnostic logic circuit, to continuously monitor and protect the power components.

Output Section - Insulated Gate Bipolar Transistors (IGBTs) convert DC bus voltage to a variable frequency and voltage, utilizing a PWM sine-coded output to the motor. IGBT output allows motor noise, at 60 Hz, to measure less than 2 dB (@ 1 meter) above that resulting from across the line operation.

Power and control electronics housings:
NEMA 1 (IP20) wall-mounted enclosure:
208 V, 3 thru 100 HP; 480 V, 3 thru 250 HP
CONSTRUCTION (continued)

Microprocessor based control circuit

Non-Volatile memory (NV RAM); all programming memory is saved when the VFD is disconnected from power.

Current transformers detect the output current for motor control and protective functions

Digital operator keypad and display, with copy function, provides local control and readout capability:
  - Hand/Off/Auto commands
  - Speed Reference command
  - Reset command

Easy to remove heat sink cooling fan with programmable on/off control

USB Type B port for quick and easy PC Connection

PRODUCT FEATURES

Displacement power factor of .98 throughout the motor speed range

Input phase insensitive; sequencing of the three phase input is unnecessary

Internal EMI/RFI filter complies with IEC 61800-3 restricted distribution for first environment

Built-In real time clock for time and date stamping events along with timer functions for starting, stopping and speed changes without the need for external controls

Volt meter, ammeter, kilowatt meter elapsed run time meter and heat sink temperature monitoring functions

Two internal (PI) Controls
  1. Drive internal PI closed loop control with selectable engineering units
  2. Independent PI control for use with external device

Differential PI feedback feature

Sleep function in both closed loop and open loop control

Feedback signal low pass filter

Feedback signal loss detection and selectable response strategy

Feedback signal inverse and square root capability

24 Vdc, 150ma transmitter power supply

Input and output terminal status indication

Diagnostic fault indication

VFD efficiency: 96% at half-speed; 98% at full-speed

“S-curve” soft start / soft stop capability

Run/Fault output contacts

Serial communication loss detection and selectable response strategy

“Up/Down” floating point control capability

Controlled speed range of 40:1

Critical frequency rejection capability: 3 selectable, adjustable bandwidths

100% starting torque capability, available from 3 Hz to 60 Hz

Remote speed reference (speed command) signal:
  - 0 to 10 VDC (20 kΩ)
  - 4 to 20 mA DC (250 Ω)

Adjustable carrier frequency, from 1 kHz to 12.5 kHz

Dynamic carrier frequency

Programmable noise control for quiet motor operation

7 programmable multi-function input terminals (24Vdc) providing 60+ programmable features, including:

Customer Safeties
  - BAS / Damper Interlock
  - Emergency Override
  - Preset Speed
  - PI control enable / disable

3 programmable multi-function output relays (Form A rated 2 amps @ 250Vac & 30Vdc), providing 50+ functions, including:
  - Damper control
  - Hand / Auto Status
  - Contactor Control for External Bypass
  - Overtorque/undertorque detection
  - Serial communication status
  - No load detection (broken belt alert)

One fixed “Fault” form C output relay (Rated 2 amps @ 250Vac & 30Vdc)

7 preset speeds

Built-in BACnet protocol along with Modbus/Memobus. Protocol are accessible via RS-422/485 communication, which is standard

Stationary motor auto-tuning

“Kinetic Energy Braking” (KEB) function stops the motor in up to half the time it would take without this function.

LCD keypad: Hand/Off/Auto functions with a built-in copy feature,

Motor preheat function

Flash upgradeable firmware

Customizable monitor display

Heat sink over temperature speed fold-back feature

“No load detection (broken belt alert)” transfer between Hand and Auto modes

Emergency override can be used as “smoke purge” function

Fan failure detection and selectable drive action
OPERATION
Output frequency and speed display can be programmed for other speed-related and control indications, including: RPM, CFM, GPM, PSI, in WC, % of maximum RPM or custom
Power loss ride-thru (2 seconds capable)
Time delay on start, peak avoidance
VFD accepts either a direct acting or a reverse acting speed command signal
Bi-directional “Speed Search” capability, in order to start into a rotating load. Two types: current detection and residual voltage detection
DC injection braking, to prevent fan “wind milling”
Remote Run/Stop command input
Two programmable 0 to 10 VDC or 4-20ma analog outputs, proportional to drive monitor functions including: output frequency, output current, output power, PI feedback, output voltage and more…..
5-Line 16 Character LCD display provides readout functions that include: output frequency, output voltage, output current, output power, DC bus voltage, interface terminal status, PI feedback and fault status.
Programmable HVAC specific application macros
Over 100 programmable functions, resettable to factory HVAC presets
User parameter initialization, re-establish project specific parameters
Ramp-to-stop or coast-to-stop selection
Auto restart capability: 0 to 10 attempts with adjustable delay time between attempts
One custom selectable Volts/Hertz pattern and multiple preset Volts/Hertz patterns
Auto speed reference input signal, adjustable for bias and gain
While the VFD is running, operational changes in control and display functions are possible, including:
  - Acceleration time (0 to 6000 seconds)
  - Deceleration time (0 to 6000 seconds)
  - Frequency reference command
  - Hand/Off/Auto commands
  - Monitor display
  - Removable digital operator
Automatic energy saving, reduced voltage operation

PROTECTION
Output current overload rating of 110 % of drive’s continuous current rating for 60 seconds
Output short circuit protection
Current limited stall prevention (overload trip prevention) during acceleration, deceleration, and run conditions
Optically isolated operator controls
Fault display and last 10 faults storage
“Hunting” prevention logic
Electronic ground fault protection
Electronic thermal motor overload protection (UL approved)
DC bus charge indication
Heat sink over temperature protection
Cooling fan operating hours recorded
Input/Output phase loss protection
Reverse prohibit selectability
Short circuit withstand rating of 100K amps RMS

OPTIONS
  - LonWorks Interface
  - EtherNet/IP
  - Siemens Apogee FLN
  - Metasys N2