YASKAWA
Variable Frequency Drive (VFD)
GA800 Mechanical Specification Submittal

GENERAL

The GA800 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, permanent magnet motor, or synchronous reluctance motor. The use of IGBTs (Insulated Gate Bipolar Transistors), with a carrier frequency range of 2 kHz to 15 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 microprocessor delivers 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)
CE mark 2006/42/EC MD
CE mark 2014/35/EU LVD
CE mark 2014/30/EU EMC
CE mark 2011/65/EU RoHS
EN 61800-3
EN 61800-5-1 (LVD)
EN 62061 (SIL CL3)
EN ISO 13849-1 (Cat 3, PLe)
EN 61800-5-2 (SIL3)
EN 61800-6-2
EN 50581
UL, cUL listed; CE, RCM, TUV marked

ENVIRONMENTAL & SERVICE CONDITIONS

Ambient service temperature:

-10°C to 40°C, 50°C maximum with derate

Ambient storage temperature IP20/Protected Chassis: -20°C to 70°C

Humidity: 0% to 95%, non-condensing

Altitude: to 1,000 meters; 4,000 meters with derate

Service factor: 1.0

Vibration: 9.81 m/s² (1 G) maximum at 10 to 20 Hz, 2.0 m/s² (0.2 G) at 20 Hz to 55 Hz.

RoHS 2 Compliant

WEEE Directive

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

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.

Intermediate Section of the VFD - 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 of the VFD - Insulated Gate Bipolar Transistors (IGBTs) convert DC bus voltage to a variable frequency and voltage, utilizing a PWM sine-coded output to the motor. Motor noise at 60 Hz is less than 2 dB above the motor noise from across-the-line operation when measured at a distance of one meter.

POWER AND CONTROL ELECTRONIC HOUSINGS

IP20/Protected Chassis enclosure: 240 V, 1 thru 150 HP; 480 V, 1 thru 600 HP; 600 V, 400 thru 500 HP

IP20/UL Type 1 wall-mounted enclosure (optional kit): 240 V, 1 thru 150 HP; 480 V, 1 thru 600 HP; 600 V, 400 thru 500 HP

IP20/Protected Chassis with UL Type 12 heatsink: 240 V, 1 thru 150 HP; 480 V, 1 thru 600 HP; 600 V, 400 thru 500 HP

IP00/UL Open Type or IP55/UL Type 12 Heatsink External Mounting 12-pulse input: 480 V, 75 thru 600 HP

Microprocessor-based control circuit
Non-volatile memory (EEPROM); all programming memory is saved when the VFD is disconnected from power.

Digital operator keypad and display provide local control and readout capability:

> Local/Remote/Start/Stop commands
> Speed Reference command
> Reset command

Easy to remove heatsink cooling fan with programmable on/off control.

USB mini-B port for quick and easy PC connection

PROTECTION

Output current overload rating of 110% for 60 seconds (normal duty) or 150% for 60 seconds (heavy duty)

Output short circuit protection

Current limited stall prevention (overload trip prevention) during acceleration, deceleration, and run conditions

Optically isolated operator controls

Fault display

"Hunting" prevention logic

Electronic ground fault protection

Electronic motor overload protection (UL approved)

DC bus charge indication

Heatsink overtemperature protection

Cooling fan operating hours recorded

Input/output phase loss protection

Reverse prohibit selectability

Suitable for use on a circuit capable of delivering not more than 100kA RMS symmetrical amperes

OPERATION

Output frequency and speed display can be programmed for other speed-related and control indications, including: Hz, RPM, % of maximum RPM, or custom.

Power loss ride-through (2 seconds capable)

VFD accepts either a direct acting or a reverse acting speed command signal.

Bi-directional "Speed Search" capability to start into a rotating load. Two types: current detection and residual voltage detection

DC injection braking

Remote Run/Stop command input

Two programmable 0 to 10 VDC, -10 to 10 VDC, or 4-20 ma analog outputs, proportional to drive monitor functions including output frequency, output current, output power, PI feedback, output voltage and others

8-Line, 32-character Local/Remote 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.

Over 100 programmable functions, resettable to factory presets

User parameter initialization to 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
> Monitor display
> Removable digital operator

Automatic energy saving, reduced voltage operation

PRODUCT FEATURES

Displacement power factor of .98 throughout the motor speed range

Data logging – record status for up to 10 monitors with adjustable sample time

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

Voltmeter, ammeter, kilowatt meter, elapsed run time meter, and heatsink temperature monitoring functions

24 VDC, 150 mA 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

Output Frequency 0 to 590 Hz

Controlled speed range of 40:1 (V/f, V/f with encoder), 200:1 (open loop vector), 1500:1 (closed loop vector), 200:1 (advanced open loop vector), 20:1 (open loop vector for PM), 100:1 (advanced open loop vector for PM, EZ vector)

Maximum output frequency; 590 Hz

Safe Torque Off: SIL3, PLe

200% starting torque capability, available from 0 Hz to 60 Hz

Remote speed reference (speed command) signal:

> 0 to 10 VDC (20 kΩ)
> 4 to 20 mA DC (250 Ω)

Critical frequency rejection capability: three selectable, adjustable bandwidths

Analog/Digital Virtual I/O – internally sends an output to an input (no wiring needed)

Adjustable carrier frequency, from 2 kHz to 15 kHz

Dynamic noise control for quiet motor operation

Programmable security code

Cloud service (Yaskawa Drive Cloud) for product registration and parameter storage

Store up to four additional parameter sets in keypad

Integrated PLC (DriveWorks EZ)

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

> Fault reset
> Motor operated pot (MOP)
> External fault
> 16 preset speeds
> PI control enable / disable

Three programmable multi-function output relays (Form A rated 1 A @ 250 VAC & 30 VDC), providing 50+ functions, including:

> Fault status
> Run status
> Overtorque / undertorque detection
> Serial communication status

One fixed "Fault" Form C output relay (Rated 1 A @ 250 VAC & 30 VDC)

Sixteen preset speeds

Built-in Modbus RTU protocols accessible via RS-422/485 communication, which is standard. EtherNet/IP, Modbus TCP/IP, PROFINET, EtherCAT, DeviceNet, and PROFIBUS are optionally available.

Rotational as well as Stationary motor auto-tuning

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

Control Methods Include:
V/f Control
V/f Control with encoder feedback
Open loop vector
Advanced open loop vector
Closed loop vector
Open loop vector for PM
Closed loop vector for PM
Advanced open loop vector for PM
SynRM Motor Control

Motor Types:
Induction
Permanent Magnet
Synchronous Reluctance

Temperature controlled fans

Side by side mounting

LCD keypad with Local/Remote, Start/Stop and Copy keypad functions.

Motor preheat function

Flash upgradeable firmware

Heatsink overtemperature speed fold-back feature

Fan failure detection and selectable drive action

Programming and firmware upgrade without three-phase main power DriveWizard Mobile

Programming Application

LED Status Ring

Conformal coating (IEC 60721-3-3, IP20/Protected Chassis: 3C3, 3S2)