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Low Voltage Variable Speed Drives

1/8 - 1000 HP

YASKAWA™

Yaskawa Advantages

Yaskawa AC Drives

Yaskawa drives incorporate the latest technological advancements in variable speed AC motor control, made possible by experience and dedication to quality. With manufacturing facilities in the United States, United Kingdom, Japan, China, and other countries, Yaskawa is the world's largest manufacturer of variable speed drives, providing solutions through 1750HP. From simple to complex applications, Yaskawa has a variety of drive products to fit your needs.

The Microdrive collection of J1000 and V1000 provides great performance in the most compact and economical packages through 7.5HP and 25HP respectively. In addition, the V1000 is available in an integrated IP66, NEMA / UL Type 4X version for machine mounting or harsh environments.

For advanced features or larger power ratings, Yaskawa offers three different products to fit your needs. The A1000 is a multi-purpose drive delivering up to 1000HP, and provides Yaskawa's highest level of vector performance including precise control of both induction and permanent magnet motors. For optimized use on fans and pumps, the P7 is offered through 500HP. And for applications with challenging installation requirements, the G7 is the world's only low voltage "three level inverter," providing a superior solution for extra long motor cables or sensitivity to electrical noise.

FROST & SULLIVAN

2010 BEST PRACTICES AWARD

Performance and Technology

Yaskawa offers a range of performance choices and innovative technologies. Control methods include V/f, open loop current vector, closed loop vector control, open loop PM, and closed loop PM. High-slip braking is available to help reduce or eliminate the need for dynamic braking resistors. Options for high output frequency and zero-servo control are also available.

Yaskawa Advantages

Quality, Reliability, Customer Satisfaction

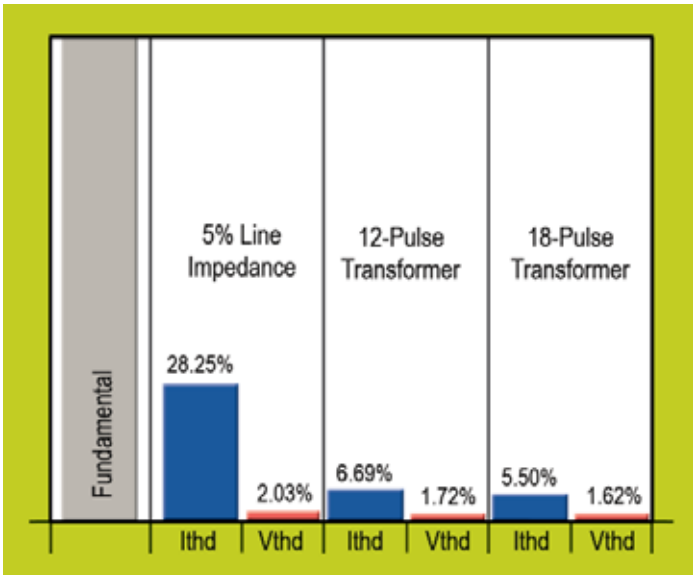
Yaskawa is the world leader in quality and reliability. Quality Magazine ranked Yaskawa among the top five companies for quality out of 800. As noted by Quality Magazine, all phases of Yaskawa's business - including research and development, supply chain management, production and quality control, sales and marketing as well as technical service and distribution - are committed to delivering high quality products and service.

With ISO 9001 certification, a Supplier Rating Program, and rigorous testing, Yaskawa ensures that quality and reliability are designed in and built in. Field data confirms that calculated MTBF (Mean Time Between Failures) targets are exceeded in actual production units. Yaskawa is the only manufacturer in the field of industrial electronic equipment to receive the Deming Prize for Quality.

Power Quality

Yaskawa drives are designed to minimize harmful demand for input harmonic distortion. Drives up to 25 HP are available with optional 3% or 5% equivalent line impedance DC Bus Reactors.

At 30 HP and above, drives include 3% impedance as standard. Some drives include a dual diode bridge rectifier which can be configured to accept 12-pulse (delta-delta and delta-wye secondary) transformer input. These transformers can be installed at our factory as an integral part of the drive package or purchased as a loose item, to eliminate power quality issues. Yaskawa Drives can also be factory configured with an integral 18-pulse transformer. These packages are typically used to meet the most strict harmonic requirements at both drive input terminals and the point of common coupling.



Current and Voltage Harmonic Distortion at Drive Input (% of Fundamental)

The data listed in the graph was collected on a 75 HP, 480V drive and shows the different effects bus reactors, 12-pulse, and 18-pulse harmonic mitigation solutions have at the input terminals to the drive.

Easy To Use

Yaskawa Drives are factory-programmed and ready to run. An LCD interface enhances ease of use with its multi-language support and parameter copy feature that allows duplication of settings between drives. In addition, a portable USB Copy Unit (1000 series only) provides a very convenient method of desktop configuration transportable to the factory floor.

Yaskawa Advantages

LCD Operator
(Local for A1000)
(Remote for V1000 / A1000)

USB Copy Unit
(For all 1000 series)

LED Operator
(Local for A1000)
(Remote for all 1000 Series)

Easy to Install and Service

All Yaskawa drives have a split cover for easy access to the power and control terminals. The power terminal compartment easily accommodates bend radius for cable connections. Control wires are connected to a detachable terminal board for ease of installation and maintenance.

Detachable cooling fans are easy to replace and on/off fan control can extend operating life. Accumulated operation time and cooling fan run time are recorded and can be displayed for preventive maintenance programs.

Start-up and configuration are simplified by the intuitive programming menu and start-up procedure.

DriveWizard® Industrial is a PC-based support tool for drive commissioning and maintenance. It provides a way to operate the drive, change parameters, upload and download parameters, monitor and graph parameters, provide status and troubleshooting data, and utilize a host of additional features with built-in help menus.

A1000 Top View

Distribution Channel

Yaskawa Distributors are trained by Yaskawa and continually improve their knowledge with periodic training. Most distributors have a Certified Drive Specialist on staff, assuring you the highest level of local support. Yaskawa distributors can provide the best solutions for your applications, and added value with a range of complementary products.

CDS Certified Drive Specialist

Yaskawa Advantages

Technical Training

Both standard and customized courses are available with hands-on activities and demonstrations. Instruction is offered at Yaskawa locations as well as traveling road schools, and is supplemented by live web classes and e-Learning Modules / Videos to provide the right level of training to fit your needs. Trainers are degreed engineers with extensive industry experience.

Traveling Road Show Van

Worldwide Services

Yaskawa offers worldwide support with application assistance, start-up, maintenance, troubleshooting and repair, as well as internet tools and telephone support. Sales and service offices are located around the world.

Through one website address, yaskawa.com, customers can access several Yaskawa global websites that best service their geographic area, in several languages. The websites have an extensive document and knowledge database. Customers can easily locate information, select products, as well as maintain products. Our FAQs cover many facets of ownership and are derived from our field and telephone assistance with our customers.

In the Americas, telephone assistance is available 24/7/365 at 800-YASKAWA (927-5292). Our phone support group is product certified to assist you with current and legacy drive requirements.

Yaskawa's Field Service personnel and local Authorized Service Providers can provide on-site start-up assistance, troubleshooting, and repair. Same day exchange units or fast turnaround repairs are available.

Drive Packaging Options

Yaskawa not only offers the highest quality drives in the industry, but also preconfigured or custom engineered packages with a broad array of optional items. Specify NEMA Type 1, 12, or 3R enclosures. Select circuit breakers, disconnects, bypass contactors, dynamic braking resistors, reactors, space heaters, operator devices, and more. Yaskawa can also package drives with 12-pulse and 18-pulse input for applicable drives.

NEMA 3R (Bypass)

NEMA 12 FVFF (18-Pulse Input)

AC Drive Product

Selection Matrix

Product	Dedicated Enclosure Types	Power Range	Performance (IM = Induction Motor) (PM = Permanent Magnet Motor)		
			Volts per Hertz	Open Loop Vector	Closed Loop Vector
A1000 General Purpose High Performance Vector	Chassis Type Type 1	1/2 — 175HP @ 240V 3Ø 3/4 — 1000HP @ 480V 3Ø 1 — 250HP @ 600 VAC	40:1 (IM)	200:1 (IM) 100:1 (PM)	1500:1 (IM) 1500:1 (PM)
G7 Three Level Problem Solver	Chassis Type Type 1	1/2 — 175HP @ 240V 3Ø 3/4 — 500HP @ 480V 3Ø	40:1 (IM)	200:1 (IM)	1000:1 (IM)
P7 Fans & Pumps	Chassis Type Type 1	5 — 175HP @ 230/240V 3Ø 5 — 600HP @ 480V 3Ø	40:1 (IM)		
V1000 Compact Vector	Chassis Type Type 1 Type 4X/12	1/8 — 5HP @ 240V 1Ø 1/8 — 25HP @ 240V 3Ø 1/2 — 25HP @ 480V 3Ø	40:1 (IM)	100:1 (IM)	
J1000 Ultra Compact	Chassis Type	1/8 — 3HP @ 240V 1Ø 1/8 — 5HP @ 240V 3Ø 1/2 — 7.5HP @ 480V 3Ø	40:1 (IM)		

AC Drive Product

Maximum Frequency	Inputs and Outputs						Communications								Auxiliary Control Power Input	Safe-Torque-Off
Standard (Alternate Firmware)	Analog Inputs	Analog Outputs	Digital Inputs	Digital Outputs	Pulse Train Inputs	Pulse Train Outputs	EhterNet/IP	DeviceNet	Modbus TCP/IP	Modbus RTU	Modbus Plus	MECHATROLINK-II	Profibus DP	ProfiNet		
400 Hz (1000 Hz)	3	2	8	4	1	1	■	■	■	●		■	■	■	■	Cat 3 PLd SIL CL2
400 Hz	3	2	12	6	1	1	■	■	■	●	■		■			
120 Hz	2	2	7	3			■	■	■	●	■		■			
400 Hz (1167 Hz)	2	1	7	3	1	1	■	■	■	●		■	■		■	Cat 3
400 Hz	1	1	5	1						■						

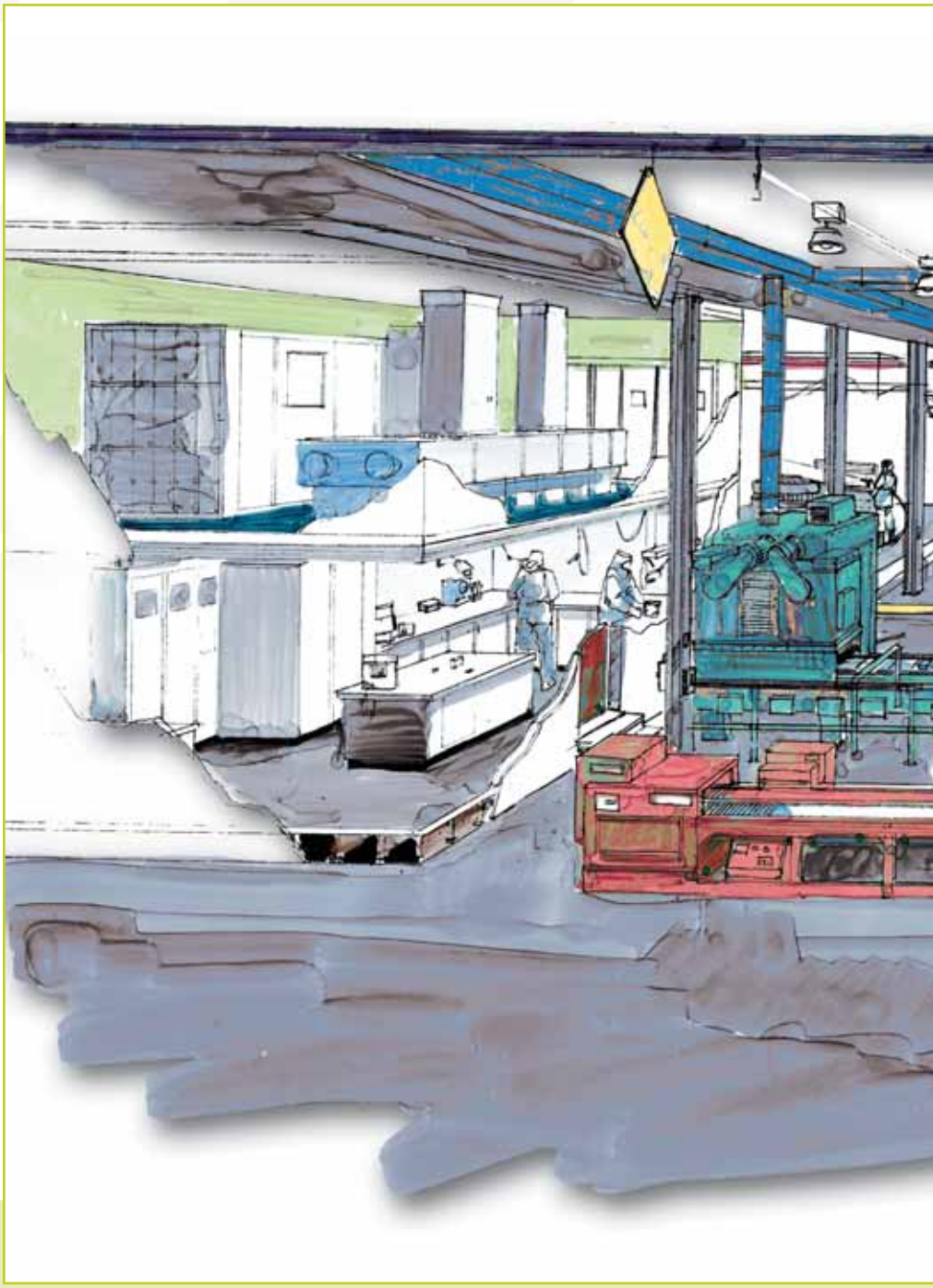
● Standard

■ Option

Industrial Applications

Drives for Every Spectrum

Every industrial manufacturing facility and processing plant is filled with opportunities for automation improvements, upgrades to modern drive technologies, cost savings, and efficiency gains. The Yaskawa family of variable speed drives provide quality, performance, ease of use, and consistency across a wide range of applications.



Textile
P-jump Winders
Extruders
Tufting Machines
Dye Pumps

Packaging
In-feed / Out-feed
Case Packing
Bottling & Canning
Carton Manufacturing

Plastics & Rubber
Extruders
Blow Molding
Thermoforming
Injection Molding

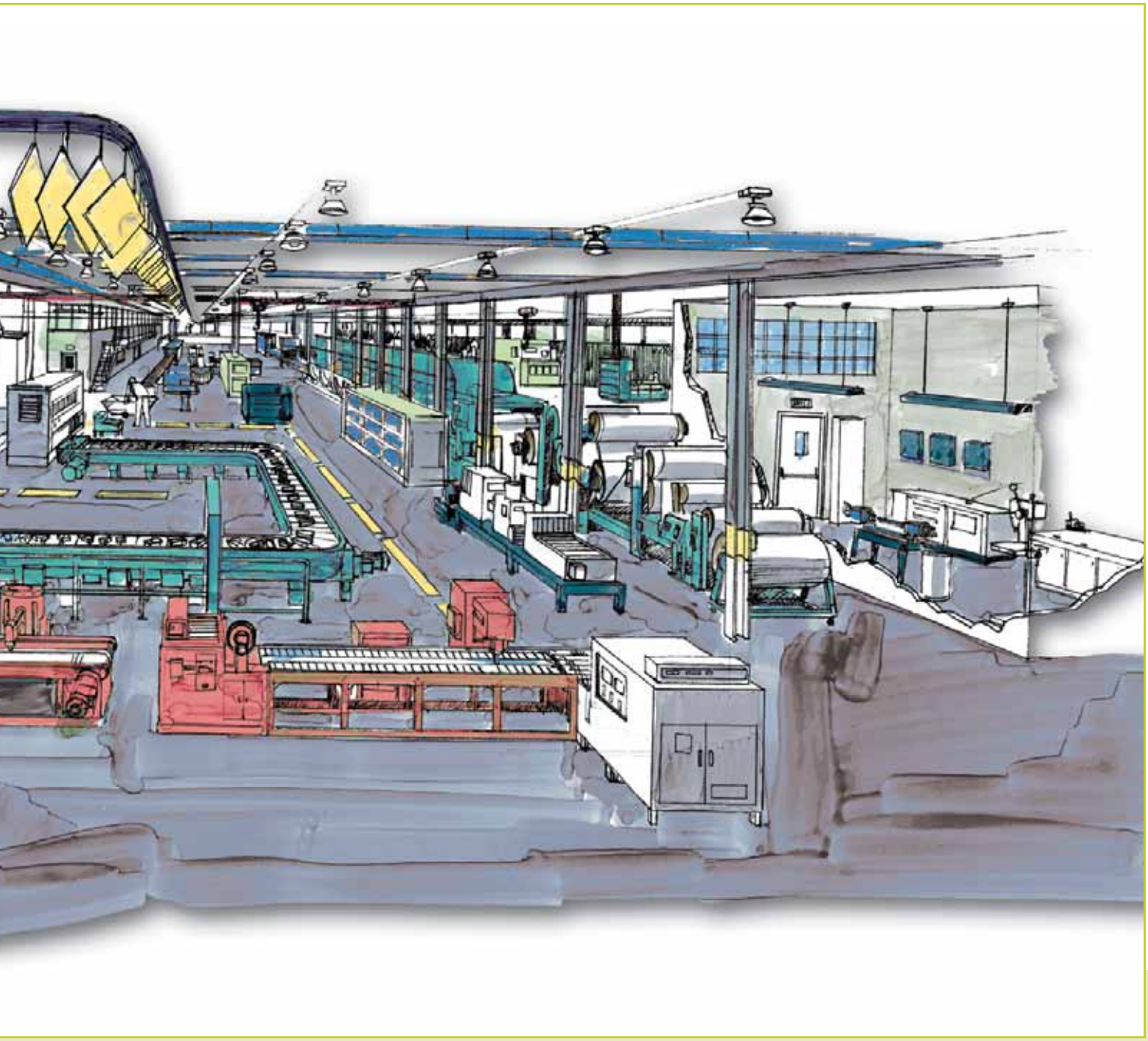
Elevator
Construction Elevators
Geared Elevators
Gearless Elevators
Escalators

Pulp & Paper
Paper Machines
Debarkers
Winders
Saw Mills

Converting
Coaters
Laminators
Slitters
Flying Cutters

Air Handling
Supply and Return Fans
Cooling Towers
Spray Booths
Dryers

Oil & Gas
Top Drives
Pumpjacks
Down-hole Pumping
Centrifuges



Pumping
Metering
Irrigation
Chillers
Positive Displacement

Laundry
Dryers
Extractors
Folders
Washers

Material Handling
Conveyors
Sortation
Palletizers
Coil Winding

Food & Beverage
Conveyors
Fillers
Mixers
Centrifuges

Metals
Stamping / Punch Press
Wind / Unwind
Cut-to-length
Wire Draw

Automotive
Stamping
Test Stands
Indexing
Metal Cutting

Construction Materials
Kilns
Planers
Flying Cutoff
Mixers

A1000

1/2 - 1000 HP

EXAMPLE APPLICATIONS

- **Conveyors**
- **Mixers**
- **Test Stands**
- **Cut-to-length**
- **Pumps**
- **Centrifuges**
- **Extruders**
- **Winders**
- **Coordinated Systems**
- **Packaging Machines**

A Single Drive for All Your Needs with Outstanding Performance

The A1000 is a full featured drive, providing outstanding quality, performance, flexibility, and environmental friendliness through 1000HP. Enjoy network communications, feedback, and expandable I/O to control anything from simple fans and pumps to complex machines. For new installations or retrofits, the A1000 provides a single robust solution, regardless of your application.

Features

- Closed or open loop vector control for outstanding regulation, torque production, and position control capability
- Continuous Auto-tuning optimizes performance by compensating for changes in motor temperature
- High Frequency Injection enables high precision open loop control of Interior Permanent Magnet Motors
- Fast acting current and voltage limiters help achieve continuous drive operation during periods of excessive demand
- High Slip Braking reduces installation cost and reduces the need for dynamic braking resistors
- Communication options for all major industrial networks reduce installation cost and provide high speed control and monitoring. In addition, Modbus RTU is embedded as standard.
- DriveWizard® computer software and Application Sets for easy configuration
- Auxiliary Control Power Unit maximizes production time and efficiency by maintaining network communication while main power is removed
- Embedded Safe Torque Off minimizes downtime for applications requiring occasional intervention (SIL CL2, PLd, Category 3)
- Embedded function blocks, programmable with DriveWorksEZ®, provide additional application flexibility and the opportunity to eliminate separate controllers
- USB Copy Unit and Keypad configuration storage provide speed and convenience for duplicate configuration of multiple drives
- Removable terminal board with configuration storage provides convenient ways of backing up drive configuration
- Made with RoHS compliant materials
- Integrated DC Reactor (standard on 30HP and larger) for input harmonic reduction

Want to take the guesswork out of choosing a drive? The A1000 can address virtually any application, providing ease of use, flexibility, and the most advanced performance.

G7

Problem Solver 3-Level Drive

This innovative drive utilizes 3 level control to offer the best solution for challenging installations. Yaskawa is the only manufacturer to offer a low voltage drive with this architecture. 3 level technology minimizes drive induced problems associated with long motor cables and premature motor bearing failures. In addition, overall electrical noise is greatly reduced, resulting in the most problem free installations. Not only does the Yaskawa G7 deliver this exclusive advantage, but it also provides high flexibility and excellent vector performance for control of speed, torque, and position, available in ratings through 500HP. For more detail on 3-level technology, refer to page 18 “Three-Level Inverter.”

1/2 - 500 HP

Features

- 3-Level inverter architecture (480V only) for reduced motor-drive system issues
- Closed or open loop vector control for excellent regulation, torque production, and position control capability
- Communication options for all major industrial networks reduces installation cost and provides high speed control and monitoring. In addition, Modbus RTU is embedded as standard.
- DriveWizard® computer software and Application Sets for easy configuration
- Embedded function blocks, programmable with DriveWorksEZ®, provide additional application flexibility and the opportunity to eliminate separate controllers

The G7 drive offers a superior solution for applications more susceptible to the effects of power transistor switching.

EXAMPLE APPLICATIONS

- **Oil & Gas Industry**
- **Converting Industry**
- **Long length motor cables**
- **Motors with bearing life issues**

P7

5 - 500 HP

APPLICATIONS

- **Centrifugal Pumps**
- **Fans**
- **Blowers**
- **Spray Booths**
- **Dryers**
- **Centrifuges**
- **Chillers**
- **Cooling Towers**

Industrial Fan/Pump

The P7 is the Industrial Fan and Pump drive designed for variable torque applications. It is supplied with V/f control and an overload rating of 110% for one minute. Network communications, plug-in I/O cards, and power/packaging options are available. With an optional phase-shifting input transformer, the P7 dual-diode bridge can be operated in 12-pulse rectification mode, reducing input current harmonic distortion. The optional P7 Bypass package is a 3-contactor style bypass, allowing motor operation from the drive or across-the-line.

Features

- Variable torque ratings
- Speed Search (bi-directional) reduces down time due to overload trips
- Enhanced energy-saving control shortens the payback period due to reduced energy costs
- PI function for process control without the need for additional hardware
- Copy keypad function for convenient parameter uploading and downloading
- Communication options that support all major industrial and commercial networks

The P7 drive has been designed specifically for fan and pump applications.

J1000

Great Things Come in Small Packages

The J1000 drive is a general purpose AC drive; its PWM design provides low motor noise and high starting torque, with a heavy duty current overload rating of 150% for 60 seconds and a normal duty current overload rating of 120% for 60 seconds. V/f control makes this drive suitable for most general applications. The J1000 is feature-packed, low cost and compact. The digital operator includes a 5-digit LED status display. The J1000 has five multi-function digital inputs, one multi-function analog input, one multi-function digital output, and one multi-function analog output. An optional RS-422/485 Modbus RTU serial communication port is available. An ideal choice whenever low cost and small size are required.

1/8 - 7.5 HP

Features

- Copy function for convenient parameter storage and recall (requires remote LED operator or copy unit/Y-stick)
- Digital operator interface for easy and quick configuration
- Speed search function for automatic restart after power loss
- Compact space saving design with side-by-side mounting
- Dynamic braking transistor standard on all models
- RoHS compliant on all models
- Dual rating: Normal duty and heavy duty
- Swing PWM function to decrease noise at low carrier frequencies
- Ingenious pre-maintenance function

J1000 is the OEM's choice whenever low cost, simplicity, and micro-size drives are required.

APPLICATIONS

- **Conveyors**
- **Grinders**
- **Centrifuges**
- **Pumps**
- **Fans**
- **Blowers**
- **Mixers**
- **Commercial Laundry**
- **Automotive Assembly**
- **Packaging Equipment**
- **Material Handling**
- **Food Processing**

V1000

1/8 - 25 HP

APPLICATIONS

- **Conveyors**
- **Grinders**
- **Pumps**
- **Material Handling**
- **Mixers**
- **Food Processing**
- **Packaging**
- **Commercial Laundry**
- **Machine Tools**
- **Fan**

A World of Power in the Palm of Your Hand

The V1000 Series is a high performance line of AC microdrives with low motor noise and high starting torque. It provides two control methods; V/f and open loop current vector control for precise speed regulation and higher torque at lower speeds. The V1000 is intended for either heavy duty applications (overload rating of 150% for 60 seconds) or normal duty applications (overload rating of 120% for 60 seconds). The V1000 Series is the perfect choice wherever high performance in a small size is required.

Features

- Vector control without feedback can deliver excellent starting torque and performance
- PID function with loss of feedback for process control without additional hardware
- Copy keypad function for convenient parameter uploading and downloading
- Communication options that support all major industrial networks
- Compact space saving design with side-by-side mounting
- Dynamic braking transistor standard on all models
- RoHS compliant on all models
- Permanent magnet synchronous motor (PM) operation
- Application presets
- Removable terminal block with parameter backup function
- Super-fast 2ms scan rate with dual CPU
- Safe Torque Off minimizes downtime for applications requiring occasional intervention (EN954-1 Safety Category 3)
- Modbus Communication up to 115 kbps
- Swing PWM function to decrease noise at low carrier frequencies
- Preventative maintenance function

V1000 drives are the best in class choice whenever excellent performance, flexibility and compact size drives are required.

The standard V1000 can accept CASE custom software to add functionality to the drive by reconfiguring drive defaults, establishing presets for OEM equipment, and by eliminating peripheral controls and PLCs. Plug-in interface option boards enable the V1000 to communicate with all the major industrial networks.

V1000-4X

Washdown and Dust-Tight

This AC drive is a version of the standard V1000 in an integral enclosure that meets NEMA type 4X/12 *indoor use requirements*, UL type 4X/12 standards, and the IP66 rating of IEC 60529. This enclosure provides the protection required in tough washdown or dust-tight environments. The enclosure is epoxy-coated to protect against the harmful effects of sanitizing chemicals commonly used in food industries.

Features

- Meets NEMA Type 4X/12 indoor use requirements
- UL Type 4X/12 Standards
- IP66 rating of IEC60529
- Open loop current vector control can deliver excellent starting torque and performance (200% at 0.5 Hz)
- RoHS Compliance
- On-line auto-tuning
- Function Block Diagram (FBD) programming via DriveWorksEZ®
- Removable terminal block with parameter backup function
- "One-touch" copy function with verify
- Super-fast 2 ms scan cycle with dual CPU
- Safe Torque Off minimizes downtime for applications requiring occasional intervention (EN954-1 Safety Category 3)
- Communication options that support all major industrial networks

V1000-4X drives have two control methods, V/Hz and open loop vector, which allows speed/torque performance to suit the application.

1/8 - 25 HP

APPLICATIONS

- **Food and Beverage**
- **Metal Machining**
- **Packaging**
- **Pumping**
- **Woodworking**
- **Printing**
- **Refrigeration**

Yaskawa AC Drives

Common Specifications and Options

Yaskawa Drives range in horsepower from 1/8 to 1750 HP. These AC drives incorporate the latest technological advancements and award winning designs. Yaskawa Drives have capabilities for popular network communications, the ability to accept customer-specific or application-specific software, and are supported by software tools for parameter management. The following specifications are common to all Yaskawa Drives.

Performance Features

- Adjustable S-curve accel/decel
- DC injection braking: at start or stop, adjustable, current-limited
- Power loss ride-thru
- Frequency resolution: 0.01 Hz with digital reference, 0.06 / 60 Hz with analog reference
- Frequency accuracy: 0.01% with digital command, 0.5% with analog command
- Volts / frequency ratio: fully adjustable pattern
- Drive efficiency: 96 to 98%
- Displacement power factor: 0.98
- Output frequency (max): 400 Hz**
- Torque boost: full range and auto
- Speed search: selectable auto restart
- Critical frequency rejection settings

Protective Features

- Torque limit
- Heat sink over-temperature
- Current-limiting DC bus fuse
- Electronic motor overload (UL 508C)
- Phase-to-phase and ground fault short circuit protection
- Current limit
- Over / Under torque protection
- Over / Under voltage protection
- Short circuit current rating: 30kA rms symmetrical (J1000, V1000) and 100kA rms symmetrical (A1000, G7, P7)
- Input / output phase loss protection
- Optically-isolated controls
- DC bus charge indicator
- Motor thermistor input

Design Features

- Copy keypad function
- Digital keypad operator
- RJ-45 Style digital operator connector
- 24 VDC control logic for sourcing or sinking outputs (PNP or NPN)
- Multi-speed settings plus jog speed
- Carrier frequency: selectable
- Dynamic braking
- Flash RAM software memory for update
- Common DC bus capability
- DC link choke: 30 HP and above
- Split front cover for easy wiring
- Heat sink fan: Plug-in with on-off control

Service Conditions

- Ambient service temperatures: -10° to 40°C (104°F) NEMA 1, -10° to 45°C (113°F) -10° to 50°C (113°F) protected chassis (A1000, V1000, J1000)
- Ambient storage temperature: -20° to 60°C (-4° to 140°F)
- Input frequency: 50 / 60Hz 3 5%
- Input voltage: +10% / -15%, 3 phase, 200 to 240VAC, 380 to 480VAC, phase insensitive 500-600VAC
- Humidity: Non-condensing, 95% RH maximum
- Altitude: 3300 feet (1000 meters) higher by derate
- Vibration: 1G (10 to 20Hz), 0.6G or less (20 to 55Hz)

Inputs and Outputs

- Analog inputs: programmable, -10 to +10VDC or 4 to 20mA
- Analog outputs: programmable, 0 to +10VDC
- Digital inputs: programmable multi-function, sinking or sourcing
- Digital outputs: programmable
- Pulse train input: one programmable, 30 kHz max *
- Pulse train output: one programmable, 30 kHz max *
- Fault contact: 1 form C
- RS-232/422/485: Modbus RTU protocol - 19.2 to 115 kbps (not J1000)

Standards & Reliability

- UL, CSA, CE and C-tick
- MTBF: Exceeds 28 years
- Tested on fully-loaded motors
- Surface mount technology
- Protective PCB Coating

Options

- Remote digital operator kit
- Input circuit breaker / disconnect
- Input fuses
- 120VAC interface *
- NEMA 1, 12 or 3R enclosures
- Line/load reactors
- Dynamic braking resistors and modules
- EMC-compliant filters
- DC bus choke (if not standard)

* Does not apply to J1000
** P7 Output Frequency (max): 120 Hz

Option Type	Option Description	Applicable Drive					
		A1000	G7	P7	V1000	V1000-4X	J1000
Network Communications	DeviceNet Communication Kit	●	●	●	●	●	
	Modbus TCP/IP Communication Kit	●	●	●	●		
	EtherNet/IP Communication Kit	●	●	●	●		
	MECHATROLINK-II	●			●		
	Modbus Plus Communication Kit		●	●			
	Profibus DP Communication Kit	●	●	●	●	●	
	ProfiNet Communication Kit	●			●		
	RS-232 Modbus RTU Communication Kit						●
	RS-485 Modbus RTU Communication Kit						●
Analog Inputs	Analog Input 3-15 PSI Transducer Kit		●	●			
	Analog Input Kit (1 Input @ 0-10VDC, 1 Input @ 4-20mA)		●				
	Analog Input Kit (3 Selectable, +/-10VDC or 4-20mA)		●				
	Analog Input Trim Potentiometer Kit	●	●	●			
	Auxiliary Analog Input Cable					●	
	Analog Potentiometer Card						●
	Isolated Analog Input Kit (3 Selectable, +/-10VDC or 0/4-20mA)	●	●				
Digital Inputs	120VAC Logic Interface Kit (8 Inputs)		●				
	120VAC Logic Interface Kit (7 Inputs)			●			
	120VAC Logic Interface Kit (4 Inputs)		●				
	120VAC Logic Interface Kit (7 Inputs), Frames 1 & 3					●	
	120VAC Logic Interface Kit (7 Inputs), Frame 2					●	
	Digital Input Kit (12/16 Data Inputs, BCD or Binary)	●	●				
	Digital Input Kit (8 Data Inputs, BCD or Binary)		●				
Analog Outputs	Analog Output Kit (2 Outputs, +/-10VDC)	●	●				
	Analog Output Kit (2 Outputs, 0-10VDC)		●				
	Isolated Analog Output Kit (2 Selectable, +/-10VDC or 0/4-20mA)		●				
	Terminal Board (2 Channels, 4-20mA)			●			
Digital Outputs	Digital Output Kit (2 Form A, 6 PHC)	●	●				
	Digital Output Kit (2 Form C)		●				
Encoder (PG) Inputs	Dual PG Feedback Kit (Differential Line Driver)		●				
	PG Feedback Kit (Differential Line Driver)	●	●				
	PG Feedback Kit (Differential Open Collector)	●	●				
	Absolute Encoder Feedback (Stegman, Heidenhain, EnDat)	●					
	Resolver Feedback	●					
	PG Feedback Kit (Single Ended Line Driver)		●				
	PG Feedback Kit (Single Ended Open Collector)		●				
Remote Operators	Remote Operator Kit, UL Type 4X, 12, 3R	●	●	●	●		●
	Remote Operator, LCD	●			●		
	Remote Operator, LED	●			●		●
Remote Operator Cables	Remote Operator Cable (3 feet)	●	●	●	●		●
	Remote Operator Cable (10 feet)	●	●	●	●		●
PC Interface Cables	Computer Interface Cable (6 feet)	●	●	●	●	●	●
	Computer Interface Cable (10 feet)	●					
DriveWizard®	DriveWizard® Kit including Interface Cable	●	●	●		●	
	DriveWizard Plus Software				●		●

* Free download via yaskawa.com

Advanced Technology

Three-Level Inverter

The 480V rated G7 drive, with its 3-level power section, can solve major installation and reliability problems found in today's industrial plants including:

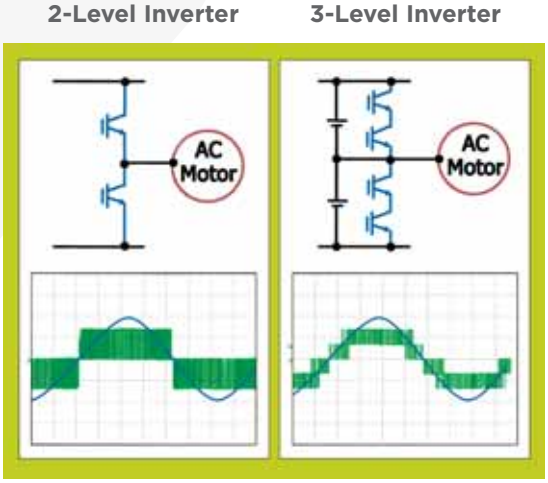
- Motor winding failures caused by high surge voltages in long cable lengths between the motor and drive.
- Motor bearing failures caused by bearing currents (shaft voltage).
- Instrument and measurement malfunction caused by common mode current (noise).

The 3-level inverter has a circuit configuration consisting of 12 IGBTs (instead of 6) that facilitates access to the DC bus mid-point. This topology is referred to as a neutral point clamped architecture. This configuration has three DC bus levels compared to two in a conventional PWM drive.

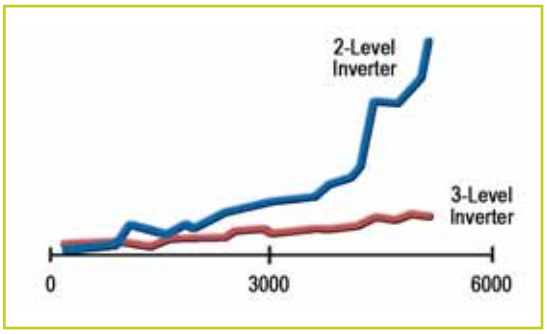
The result is an output waveform that is more sinusoidal and that switches in steps of 325VDC instead of 650VDC. The reduced output voltage step significantly reduces the surge (peak) voltage seen at the motor and the common mode voltage produced by the inverter. Common mode voltage is the cause of bearing currents and common mode noise.

Measurements made comparing the G7 to a conventional inverter confirm that the peak voltage seen in long motor cables is reduced by up to 33%. Bearing currents and common mode currents are reduced by over 50%, which leads to a four times increase in motor bearing life.

Thirteen patents were awarded to Yaskawa relative to this technology. Although the topology has been seen in large medium voltage drives, Yaskawa is the only manufacturer to offer this benefit in low voltage variable speed drives.



Comparison of Inverter Output Circuits (1 Phase of 3 Shown) and Line-to-Line Output Voltage Waveforms



Motor Bearing Vibration and Wear vs. Hours of Operation

After 5000 hours of motor operation, bearing vibration and wear are still normal with 3-level inverter output, extending bearing life to 4 times that of 2-level inverter operation.

Auto-tuning

By which the drive analyzes the motor and calculates several key parameter settings needed for maximum performance. This allows the drive to be used with virtually any motor without complicated setup. The 3 Auto-tuning methods are explained to the right.

Resistance Auto-tune

The motor's primary (or stator) resistance is important for several functions including vector control, DC injection braking, high-slip braking, speed search and torque compensation. The resistance Auto-tuning method is primarily used in V/f control where a more rigorous tune is not needed. The motor does not rotate.

Stationary Auto-tune

This method is designed primarily for use when the motor cannot be uncoupled from the load or machine. This method should give satisfactory results for most applications in all control methods. The motor does not rotate.

High Slip Braking (HSB)

The High Slip Braking function dissipates regenerative deceleration energy in the motor by creating a large slip condition. This function is ideal for high inertia rotating loads such as centrifuges, presses, and blowers; and requires no braking resistor. Braking times can be achieved that are approximately 50% less than the time required to decelerate a load normally. The exact stopping time, however, is machine and load inertia dependent. HSB has the following application considerations:

- HSB functions during motor stopping, not during normal deceleration by reduced frequency reference.
- HSB is not available for continuous regenerative loads such as elevators, winders, or test stands. HSB is not suitable for positioning applications such as transfer machines.
- HSB can only be used in V/f control or V/f control w/ PG.

Rotational Auto-tune

This is the preferred method for vector control performance and will yield the best data for all control modes. It is necessary whenever precise speed, torque or position control is required.

Custom Software

CASE (Custom Application Software Environment) allows for easy customization by Yaskawa engineers to solve difficult applications and eliminate peripheral equipment by replacing the drive's standard software and adding new functionality or enhancing existing standard functions.

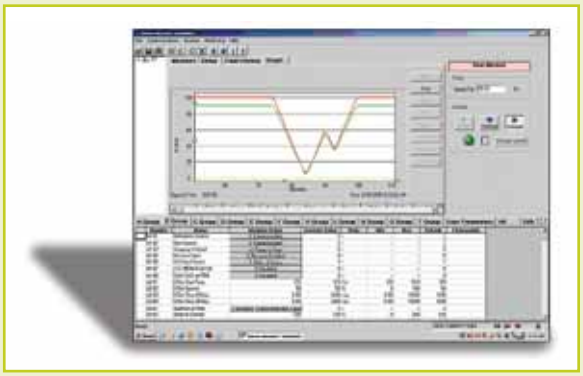
Existing versions include 1000Hz High Frequency, 1500Hz High Frequency, Electronic Lineshaft, Spindle Orientation, Enhanced PID, Motion Control, and many others. CASE software is available for the A1000, V1000, P7, and G7.

DriveWizard® Industrial

This support tool is a Windows-based PC program designed to make commissioning and troubleshooting of Yaskawa drives as simple as possible. This user-friendly program exchanges data with any Yaskawa drive. Data can be retrieved, reviewed, changed, stored, and graphed.

Parameter Management

- Easy-to-use spreadsheet format
- Parameters arranged in groups
- All parameter attributes displayed
- Parameter list is dynamic to respond to changes in operation modes, options, etc.
- Changes and errors shown in colors
- Mouse click help for each parameter
- Parameter files can be edited offline and used in other applications such as Microsoft Excel



Typical display showing drive monitor graphing function

Graphing Function

- Graph any of the drive monitors, up to 8 simultaneously
- Change colors, lines and graph display
- Expand or condense, vertically or horizontally
- Position marker can be added

With these software tools, maintenance personnel can easily maintain a large quantity and any combination of drives.

KG power systems

631-342-1171
631-342-1172 Fax
800-223-4898
Sales@kgpowersystems.com

Air Compressors
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Hauppauge, NY 11788
kgpowersystems.com

YASKAWA™

Yaskawa America, Inc.
Drives & Motion Division

2121 Norman Drive South
Waukegan, IL 60085
Tel: 1-800-YASKAWA (927-5292) • Fax: 1-847-887-7310
DrivesHelpDesk@yaskawa.com • www.yaskawa.com

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