

# Low Voltage Variable Speed Drives

1/8 - 1000 HP



# YASKAWA

WWW.KORAYASAKAWAGROUP.COM

# 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 2250HP. 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 two 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 P1000 is offered through 1000HP.

A1000 and P1000 are also offered in configured and engineered drive packages that mount the drive inside a NEMA/UL Type 1, 12, or 3R enclosure with space for various commonly used options.

Yaskawa's latest addition is the U1000 Industrial Matrix Drive. With the U1000, Yaskawa incorporates innovative technology into a low-voltage matrix converter to directly convert input AC voltage to output AC voltage. It is ideally suited for industrial applications that require extremely low harmonic distortion, energy savings, safety, and serviceability in a space-saving design.



**IT'S PERSONAL  
YASKAWA**

### "It's Personal"

"It's Personal" means each Yaskawa associate is committed to providing you with a great experience every time you deal with us..

We train our people, we treat our customers, we design, engineer and manufacture our products in ways that say everything we do matters. And, when your job is to make sure that everything that matters is done well, you take that pretty personally.

We commit to that at Yaskawa. We can make it happen. Because to us, our relationship with you is personal.

# Yaskawa Advantages

## Quality, Reliability, and Customer Satisfaction

Yaskawa is the world leader in quality and reliability. With ISO 9001 certification, a Supplier Rating Program, and rigorous testing, Yaskawa ensures that quality and reliability are designed in and built in. Historically, Yaskawa drives have demonstrated extremely high reliability with an average MTBF (mean time between failure) of 28 years or more. The 1000 series products take reliability to the next level with a calculated design life that is twice as long as previous generations. Field data confirms that calculated MTBF 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.

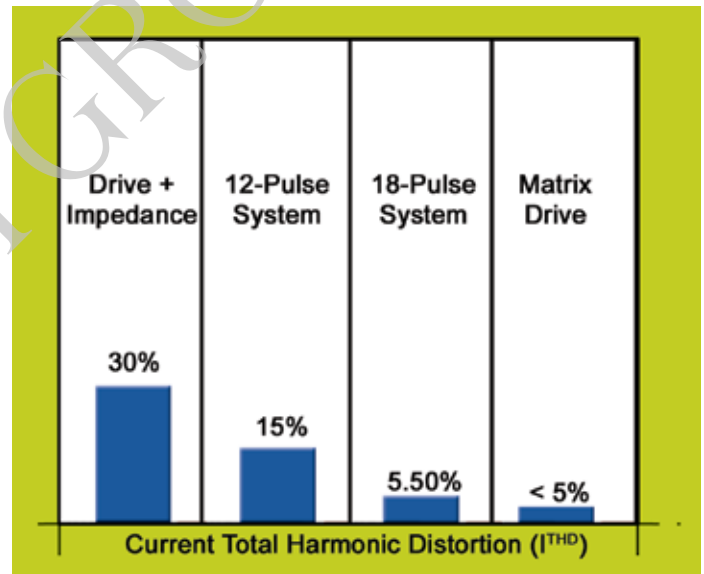


## Solutions for your Power Quality Concerns

Yaskawa variable speed drives provide many benefits ranging from optimized production, to energy savings, to improvements in workplace safety. However, these variable speed drives are power converters that can distort the power source to which they are connected.

In some cases, the total variable speed load is a significant portion of the system capacity, which can cause stress and problems with other equipment. For these cases, Yaskawa offers intelligent solutions to minimize harmonic distortion to acceptable levels. These solutions range in performance and price according to the variety of customer situations.

The simplest solution is additional system impedance (e.g. line reactor). More dramatic solutions include 12-Pulse, 18-Pulse, and Yaskawa's special low harmonic drive (Matrix Drive). Your Yaskawa representative can help determine whether or not harmonic distortion mitigation is important for your system, and which solution is the most appropriate.



Input Current Distortion: 480V, 75HP Example

## Easy To Use



LCD Operator  
(all 1000 Series Drives)

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.



USB Copy Unit  
(all 1000 Series Drives)

# Yaskawa Advantages

## 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.



Easy Power & Control Terminal Access



Easily Replaceable Fan



DriveWizard® Industrial Support Tool

## Distribution Channel

Yaskawa maintains a tiered distributor program, whereby 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 complimentary products.



# 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](http://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 drive packages with a wide 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



**P1000, Type 12 Enclosure,  
18-Pulse Input**

All configured and engineered drive packages are produced in Yaskawa's 130,000 square foot value-add manufacturing facility in Oak Creek, WI, allowing for consistent design and manufacturing of these drive packages.

















**Custom Drive Manufacturing**



# AC Drive Product

## Selection Matrix

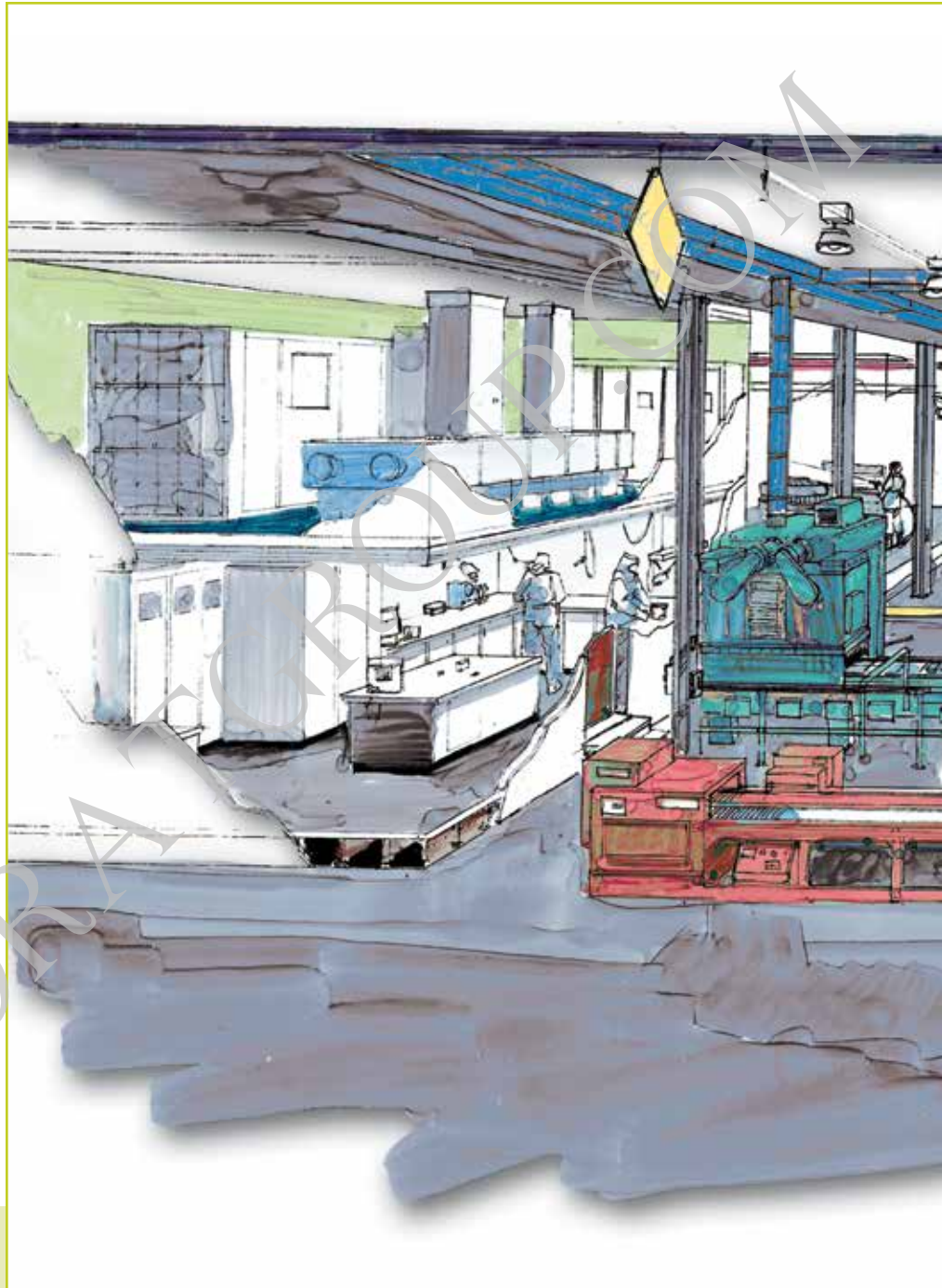
Product	Dedicated Enclosure Types	Power Range	Performance (IM = Induction Motor) (PM = Permanent Magnet Motor)		
			Volts per Hertz	Open Loop Vector	Closed Loop Vector
<b>A1000</b> General Purpose High Performance Vector	Chassis Type Type 1	1/2  175HP @ 240V 3Ø 3/4  1000HP @ 480V 3Ø 1  250HP @ 600 VAC	40:1 (IM)	200:1 (IM) 100:1 (PM)	1500:1 (IM) 1500:1 (PM)
<b>P1000</b> Fans & Pumps	Chassis Type Type 1	1/2  175HP @ 240V 3Ø 3/4  1000HP @ 480V 3Ø 1  250HP @ 600 VAC	40:1 (IM)		
<b>U1000</b> Industrial Matrix Drive	Chassis Type Type 1	7-1/2  100HP @ 240V 3Ø 5  350HP @ 480V 3Ø	40:1 (IM)	200:1 (IM) 100:1 (PM)	1500:1 (IM) 1500:1 (PM)
<b>V1000</b> Compact Vector	Chassis Type Type 1 or Type 4X/12	1/8  5HP @ 240V 1Ø 1/8  25HP @ 240V 3Ø 1/2  25HP @ 480V 3Ø	40:1 (IM)	100:1 (IM) 10:1 (PM)	
<b>J1000</b> Ultra Compact	Chassis Type	1/8  3HP @ 240V 1Ø 1/8  5HP @ 240V 3Ø 1/2  7.5HP @ 480V 3Ø	40:1 (IM)		



# 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 provides quality, performance, ease of use, and consistency across a wide range of applications.



### Textile

- 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
- Gearless Elevators
- Gearless Elevators
- Escalators

### Pulp & Paper

- Paper Machines
- Debarbers
- Winders
- Saw Mills

### Converting

- Coaters
- Laminators
- Slitters
- Flying Cutters

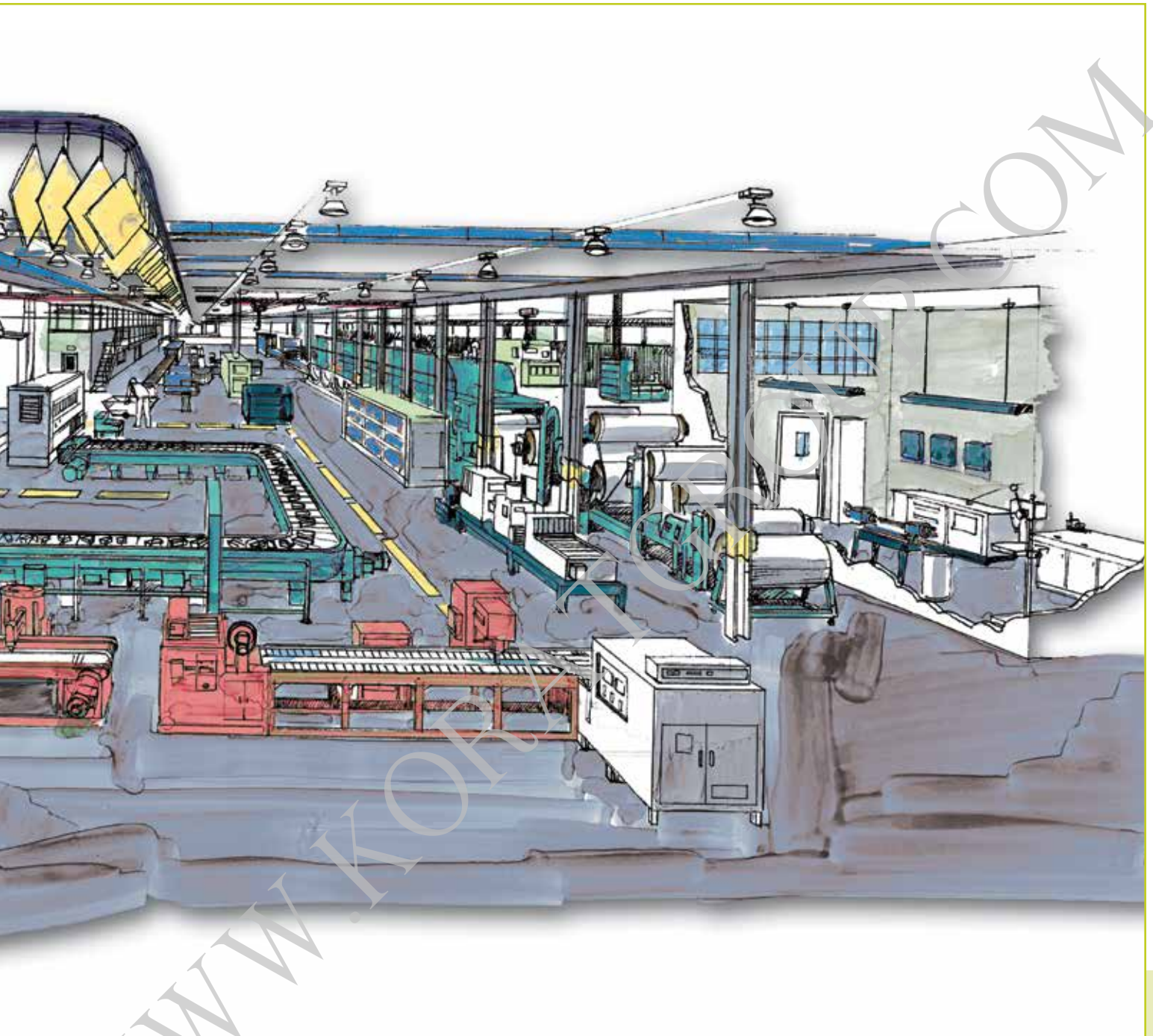
### Air Handling

- Supply and Return Fans
- Cooling Towers
- Spray Booths
- Dryers

### Oil & Gas

- Top Drives
- Pump Jacks
- 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

# J1000



1/8 - 7.5 HP

## 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.

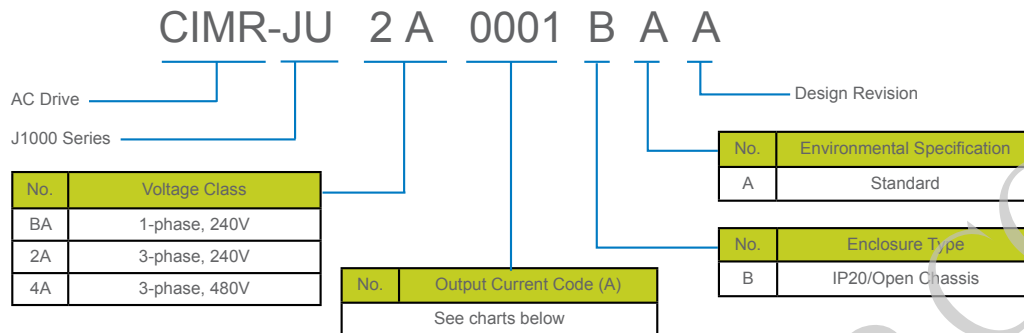
## APPLICATIONS

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

## 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.*



Note: Current codes are equivalent to the current rating.

## 240V Models Single Phase Models

Model Number: CIMR-JUBA		0001	0002	0003	0006	0010
Max Capacity (HP)	Normal Duty	1/8 & 1/4	1/4	1/2 & 3/4	1 & 1.5	2 & 3
	Heavy Duty	1/8	1/4	1/2	3/4 & 1	2
Rated Output Current (A)	Normal Duty	1.2	1.9	3.3	6.0	9.6
	Heavy Duty	0.8	1.6	3.0	5.0	8.0
Dimensions (In.)	Height	2.7			4.3	
	Width	5.0			5.0	
	Depth	3.0			4.6	6.1

## Three Phase Models

Model Number: CIMR-JU2A		0001	0002	0004	0006	0010	0012	0020
Max Capacity (HP)	Normal Duty	1/8 & 1/4	1/4	1/2 & 3/4	1 & 1.5	2 & 3	3	5
	Heavy Duty	1/8	1/4	1/2	3/4 & 1	2	3	5
Rated Output Current (A)	Normal Duty	1.2	1.9	3.5	6.0	9.6	12.0	19.6
	Heavy Duty	0.8	1.6	3.0	5.0	8.0	11.0	17.5
Dimensions (In.)	Height	2.7			4.3			5.5
	Width				5.0			
	Depth	3.0		4.3	5.0	5.1	5.4	5.6

## 480V Models

Model Number: CIMR-JU4A		0001	0002	0004	0005	0007	0009	0011
Max Capacity (HP)	Normal Duty	1/2	3/4 & 1	2	3	4	5	7.5
	Heavy Duty	1/2	3/4	2	3	3	4	5
Rated Output Current (A)	Normal Duty	1.2	2.1	4.1	5.4	6.9	8.8	11.1
	Heavy Duty	1.2	1.8	3.4	4.8	5.5	7.2	9.2
Dimensions (In.)	Height	4.3						5.5
	Width	5.0						
	Depth	3.2	3.9	5.4			6.1	5.6

# Yaskawa AC Drives

## Common Specifications and Options

Yaskawa Drives range in horsepower from 1/8 to 2250HP. 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, P1000)
- 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) 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\*

### 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

\*\* P1000 Output Freq (max): 120 Hz

# Options Matrix

Option Type	Option Description	Applicable Drive				
		A1000	P1000	U1000	V1000	J1000
Network Communications	DeviceNet Communication Kit	■	■	■	■	
	Modbus TCP/IP Communication Kit	■	■	■	■	
	EtherNet/IP Communication Kit	■	■	■	■	
	MECHATROLINK-II	■	■	■	■	
	MECHATROLINK-III	■	■	■	■	
	PROFIBUS DP Communication Kit	■	■	■	■	
	PROFINET Communication Kit	■	■	■	■	
	EtherCAT Communication Kit	■	■	■	■	
	RS-232 Modbus RTU Communication Kit					■
	RS-485 Modbus RTU Communication Kit					■
	METASYS/Apogee	■	■	■		
	BACnet	■	■	■		
	LonWorks	■	■	■		
	Analog Inputs	Analog Input Kit (1 Input @ 0-10VDC, 1 Input @ 4-20mA)	■		■	
Analog Input Trim Potentiometer Kit		■	■	■		
Analog Potentiometer Card						■
Isolated Analog Input Kit (3 Selectable, +/-10VDC or 0/4-20mA)		■		■		
Digital Inputs	120VAC Logic Interface Kit		■	■	■	
	Digital Input Kit (12/16 Data Inputs, BCD or Binary)	■		■		
Analog Outputs	Analog Output Kit (2 Outputs, +/-10VDC)	■		■		
Digital Outputs	Digital Output Kit (2 Form A, 6 PHC)	■		■		
Encoder (PG) Inputs	PG Feedback Kit (Differential Line Driver)	■		■		
	PG Feedback Kit (Differential Open Collector)	■		■		
	Absolute Encoder Feedback (Stegman, Heidenhain, EnDat)	■		■		
	Resolver Feedback	■		■		
Remote Operators	Remote Operator Kit, UL Type 4X, 12, 3R	■	■	■	■	■
	Remote Operator, LCD	■	■	■	■	
	Remote Operator, LED	■	■	■	■	■
Remote Operator Cables	Remote Operator Cable	■	■	■	■	■
PC Interface Cables	Computer Interface Cable	■	■	■	■	■
DriveWizard® *	DriveWizard® Industrial Software	■	■	■	■	■

\* Free download via [yaskawa.com](http://yaskawa.com)



# Advanced Technology

## Configured Drive Packages

Configured drive packages provide the A1000 or P1000 in a NEMA 1, NEMA 12, or NEMA 3R enclosure, with space for several commonly used options. These packages have been designed for flexibility in providing commonly requested features and options to provide a customized drive solution..

### Configured Options

- Feedback cards
- Input and output cards
- Network communication cards
- Input breaker
- Input disconnect
- Input fuses
- 120 VAC interface
- Line/load reactors
- Input filter
- Bus reactor (for small HP ratings)
- Dynamic braking
- Blower motor starter
- Door-mounted Hand/Off/Auto switch
- Door-mounted speed pot

## Engineered Drive Packages

Both end users and OEM customers have come to rely on our fully-engineered products. These products are based off of our standard configurations but evolve into a customized package just for you.

Engineered packages include:

- Redundant Drive Packages
- 12 or 18 Pulse Configurations
- Bypass Packages
- Integrated Trap Filter Packages
- Multiple Motor Configurations

Engineered packages can be provided as NEMA 1, 12 or 3R. They are supported with custom engineered drawings and documentation.



18-Pulse P1000 Engineered Package

## 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.

# Advanced Technology

## 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, and P1000.

## 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

## 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.



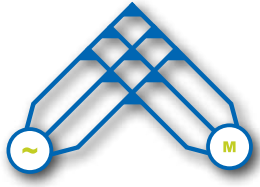
Display showing parameter navigation



Display showing trend recorder function

# Advanced Technology

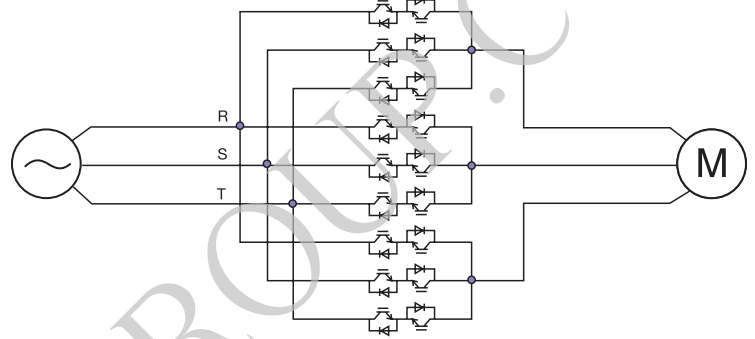
## Matrix Innovation



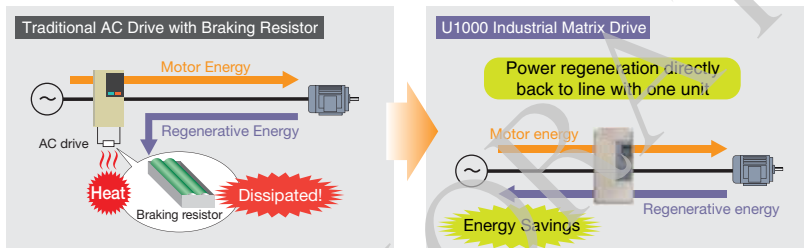
Yaskawa's development of matrix converter technology in 2006 made it possible to overcome traditional issues caused by the harmonic distortion created by variable frequency drives. Further refinement of this technology has resulted in the U1000 Industrial Matrix Drive.

### How is Matrix Technology Different?

Matrix technology employs a system of 9 bi-directional switches that are arranged in a matrix to convert a three-phase AC input voltage directly into a three phase AC output voltage. It eliminates the need for a rectifying circuit and a DC smoothing circuit that are used in traditional AC drive "inverters". This results in a compact drive with regenerative capability and reduced harmonic distortion.



### Energy Savings with Power Regeneration



Traditional drives utilize regenerative braking resistors to dissipate energy as heat. The U1000 Industrial Matrix drive allows you to return this regenerative energy directly back to the power supply, increasing energy efficiency and saving money

### Reduced Harmonic Distortion to Increase Power Quality

When a conventional AC drive converts power, the input current becomes distorted, resulting in reduced power quality. Matrix technology reduces total harmonic distortion levels to 5%, without the need for reactors and filters. The result is a smoother current waveform that reduces stress on the system power supply and infrastructure. Additionally, reduced distortion equals improved power factor and thus, reduced energy costs.

Conforms to IEEE519

Reduce Power Supply Capacity

	Power Current Waveform Samples	Input Current Spectrums	Current Distortion	Power factor
AC drive without reactor			88%	0.75
AC drive with DC reactor			33%	0.90
U1000 Industrial Matrix Drive			5%	0.98





# Global Service Network



Region	Service Area	Service Location	Service Agency	Telephone/Fax
North America	U.S.A	Chicago (HQ) Los Angeles New Jersey Boston San Francisco Ohio North Carolina	① YASKAWA AMERICA, INC.	Headquarters ☎ +1-847-887-7303 FAX +1-847-887-7070
	Mexico	Mexico City	② PILLAR MEXICANA. S.A. DE C.V.	☎ +52-5593-28-69 FAX +52-5651-55-73
South America	South America	São Paulo	③ YASKAWA ELÉCTRICO DO BRASIL LTDA.	☎ +55-11-3585-1100 FAX +55-11-3585-1187
	Colombia	Bogota	④ VARIADORES LTD.A.	☎ +57-91-635-7460 FAX +57-91-611-3872
	Argentina	Buenos Aires	⑤ ELINSUR, SRL	☎ +54-11-4918-2056 FAX +54-11-4918-1183
Europe	Europe and South Africa	Frankfurt	⑥ YASKAWA ELECTRIC EUROPE GmbH	☎ +49-6196-569-300 FAX +49-6196-569-398
			⑦ YASKAWA ENGINEERING EUROPE GmbH	☎ +49-6196-569-520 FAX +49-6196-888-598
Asia	Japan	Tokyo, offices nationwide	⑧ YASKAWA ELECTRIC CORPORATION (Manufacturing, sales)	☎ +81-3-5402-4502 FAX +81-3-5402-4580
	South Korea	Seoul	⑨ YASKAWA ELECTRIC ENGINEERING CORPORATION (After-sales service)	☎ +81-4-2931-1810 FAX +81-4-2931-1811
			⑩ YASKAWA ELECTRIC KOREA CORPORATION	☎ +82-2-784-7844 FAX +82-2-784-8495
			⑪ YASKAWA ENGINEERING KOREA Co.	☎ +82-2-3775-0337 FAX +82-2-3775-0338
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