



A1000

High Performance Vector Drive



200 V CLASS, 0.4 to 110 kW
400 V CLASS, 0.4 to 630 kW



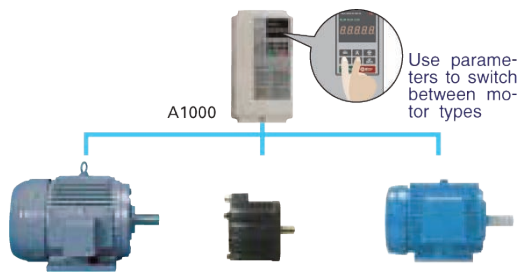
Motor Drive Performance Leading the Pack

A top quality drive; silent, beautiful, and incredibly powerful. Perfectly designed functions open a new field with A1000. A product only possible from L&T - Yaskawa, knowing everything there is to know about the world of drive technology to create the most efficient operation possible with an inverter drive. You just have to try it to know how easy it is to use. Integrating the latest vector control technology in a general-purpose drive with the performance of a higher order demanded by the drives industry. A1000 is the answer to user needs, carrying on the L&T - Yaskawa tradition of absolute quality in this next generation product line.

The Most Advanced Drive Technology

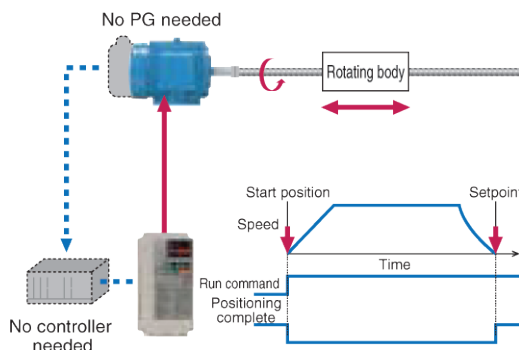
A1000 runs not only induction motors but also synchronous motors like IPM and SPM motors with high performance vector control.

- ◆ Minimize equipment needed for your business by using the same drive to run induction and synchronous motors.
- ◆ Switch easily between motor types with a single parameter setting.



Positioning Capability Without External Devices

- ◆ Use an IPM motor to perform position control without motor feedback.
- ◆ Electrical saliency in IPM motors makes it possible to detect speed, direction and rotor position without the use of external sensors.
- ◆ Precision positioning functionality without an upper controller.
- ◆ Visual programming in DriveWorksEZ lets the user easily create a customized position control sequence, without the use of sensors or motor feedback.



Cutting-Edge Torque Characteristics

- ◆ Powerful torque at 0 Hz, without the use of sensors or feedback devices

Once out of reach for AC drives, A1000 now offers sensorless control with synchronous motors. Achieve even more powerful starting torque at zero speed with an IPM motor.



Synchronous Motor

- Advanced Open Loop Vector Control for PM
200% rated torque at 0 r/min*, speed range of 1:100
- Closed Loop Vector Control for PM
200% rated torque at 0 r/min*, speed range of 1:1500

- ◆ High-performance current vector control achieves powerful starting torque with an induction motor.



Induction Motor

- Open Loop Vector Control
200% rated torque at 0.3 Hz*, speed range of 1:200
- Closed Loop Vector Control
200% rated torque at 0 r/min*, speed range of 1:1500


* Achieving this torque output requires a larger capacity drive.




Loaded with Auto-Tuning Features

A1000 provides multiple auto-tuning features for highly precise speed/torque control.

- ◆ Auto-Tuning features optimize drive parameters for operation with induction motors as well as synchronous motors to achieve the highest performance levels possible.
- ◆ On-line auto tuning to take care of temperature variations.
- ◆ Perfects not only the drive and motor performance, but also automatically adjusts settings relative to the connected machinery.

 Tuning the Motor	
Rotational Auto-Tuning	Applications requiring high starting torque, high speed, and high accuracy.
Stationary Auto-Tuning	Applications where the motor must remain connected to the load during the tuning process.
Line-to-Line Resistance Auto-Tuning	For re-tuning after the cable length between the motor and drive has changed, or when motor and drive capacity ratings differ.
Energy-Saving Auto-Tuning	For running the motor at top efficiency all the time.

 Tuning the Load	
Inertia Tuning	Optimizes the drive's ability to decelerate the load. Useful for applications using KEB and Feed Forward functions.
ASR Gain Auto-Tuning Automatic Speed Regulator	Automatically adjusts ASR gain to better match the frequency reference.

Tackling Power Loss and Recovery

A1000 is capable of handling momentary power loss with sensor-less control for induction motors as well as synchronous motors.

A1000 offers two ways to handle momentary power loss

- ◆ Ride through power loss for up to 2* seconds.
 - No need to purchase a back-up power supply
 - Detects, outputs an undervoltage signal during power loss

* The Momentary Power Loss Recovery Unit option may be required depending on the capacity of the drive.

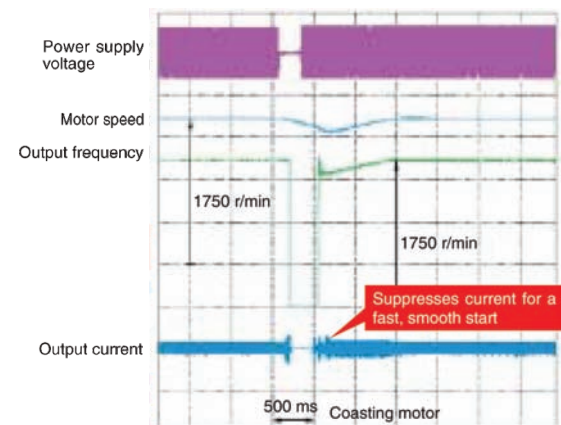
- In power loss ride through motor will be automatically started using speed search function

Speed Search

Easily find the speed of a coasting motor for a smooth restart.

Applications

Perfect for fans, blowers, and other rotating, fluid type applications.

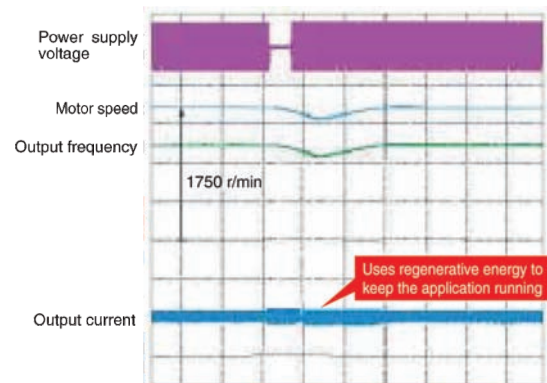


- ◆ KEB - Kinetic Energy Buffering

Motor goes into controlled deceleration without allowing it to coast.

Applications

Highly recommended for film lines and other applications requiring continuous operation.



Note: Requires a separate sensor to detect power loss. The drive may trip depending on load conditions and the motor coast to stop

Application Oriented Drive - Get > Set > Go !

Breeze-Easy Setup

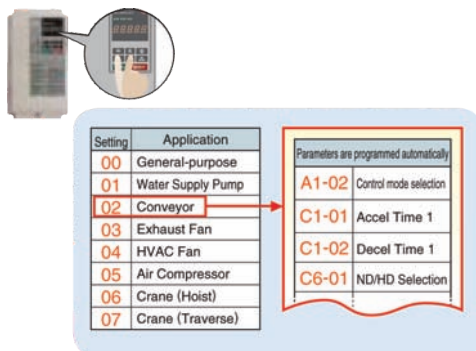
- ◆ Immediate setup with Application Presets

A1000 automatically sets parameters needed for most major applications. Simply selecting the appropriate application instantly optimizes the drive for top performance, saving enormous time setting up for a trial run.



- * Example using Application Presets

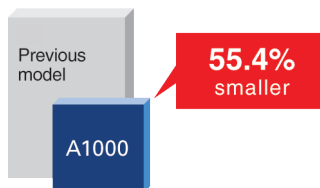
Selecting "Conveyor" optimizes five parameter settings so the drive is ready to start running your conveyor application immediately.



Even More and More Compact

- ◆ World's smallest drive in its class with the light, efficient design of a synchronous motor.

Comparing drive dimensions
Example: 400 V Class 75 kW



- * Comparing drive dimensions

- ◆ Use Side-by-Side installation* for an even more compact setup. * For models up to 18.5 kW.
- ◆ Finless models also available
- ◆ Synchronous motor further enhances the compactness of the system.

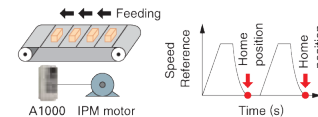
Customize Your Drive

- ◆ DriveWorksEZ visual programming tool with all models

Simply drag and drop icons to completely customize your drive. Create special sequences and detection functions, then load them onto the drive.

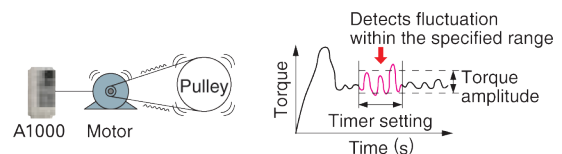
- * Program a customized sequence

Example: Positioning control without a motor encoder



- * Create customized detection features

Example: Machine weakening analysis using torque pulse detection



- ◆ USB for connecting to a PC

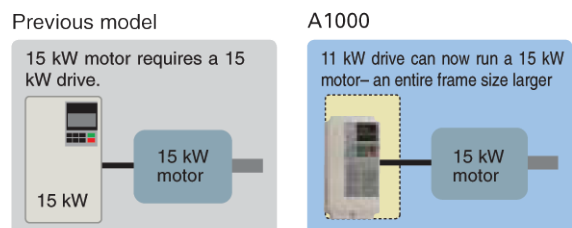
- * USB port lets the drive connect to a PC



Note: Drives are also equipped with an RJ-45 comm. port that takes the existing WV103 cable used in Yaskawa's previous models. Simply remove the operator keypad for to the RJ-45 connector.

- ◆ Dual Rating allows for an even more compact setup. Each drive lets the user choose between Normal Duty or Heavy Duty operation. Depending on the application, A1000 can run a motor an entire frame size larger than previous model.

- * Select the drive rating that best fits the application needs



Dual Ratings in A1000

A single parameter lets the user set the drive for Normal Duty or Heavy Duty

	Motor	Applications
Heavy Duty	11 kW motor	For conveyors, cranes...
Normal Duty	15 kW motor	For fans, pumps...

Note: Always select a drive with a current rating greater than the motor rated current.

Caring for Safe & Green World

Energy Saving

Next-Generation Energy Saving

- ◆ Loaded with the most advanced energy-saving control technology.

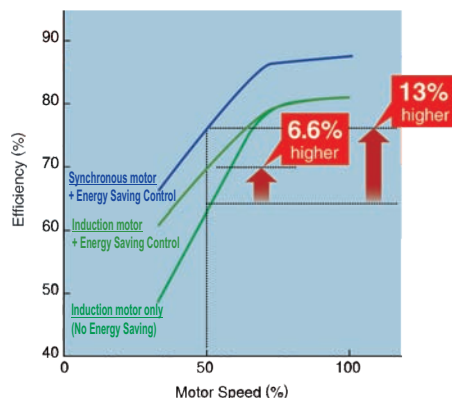
Energy Saving control makes highly efficient operation possible with an induction motor.

- ◆ Amazing energy saving with a synchronous motor.

Combining the high efficiency of a synchronous motor along with A1000's Energy Saving control capabilities allows for unparalleled energy saving.

✦ [Efficiency using a motor drive](#)

Example shows a 200 V 3.7 kW drive in a fan or pump application.



Environmental Features

Protective Design

- ◆ A variety of protective designs are available to reinforce the drive against moisture, dust, oil mist, vibration, corrosive sulfur gas, conductive particles, and other harsh environments.

RoHS

- ◆ All standard products are fully compliant with the EU's RoHS directive.

Noise Reduction

- ◆ A1000 uses Yaskawa's Swing PWM function to suppress electromagnetic and audible motor noise, creating a more peaceful environment.

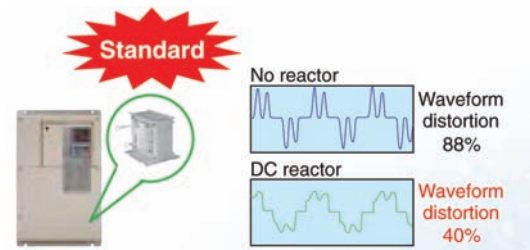
[Comparing our former product line with our new Swing PWM feature](#)



Note: Calculated by comparing peak values during noise generation

Suppressing Power Supply Harmonics

- ◆ A DC reactor minimizes harmonic distortion, standard on drives 22 kW and above.



- ◆ 12-pulse and 18-pulse rectifier options, as well as filters to minimize harmonic distortion are also available.

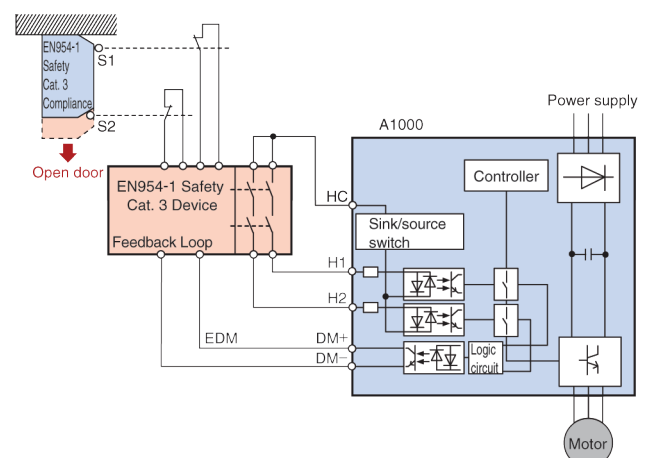
Safety

Safety Regulations

- ◆ All models have a Safe Disable function to stop the motor in accordance with EN954-1 safety category 3, IEC/EN61508 SIL2 requirements.
- ◆ An External Device Monitor (EDM) function has also been added to monitor the safety status of the drive.

✦ [Safe Disable example: Door switch circuit](#)

A1000 is equipped with 2 input terminals for connecting a safe disable device. Input: Triggered when either terminal H1 or H2 opens. Output: EDM output monitors the safety status of the drive.

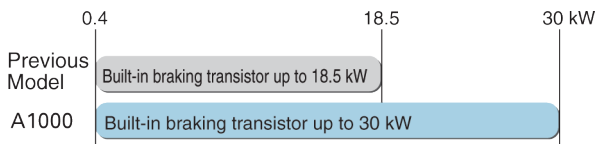


Controlled stop during Power loss

- ◆ The application can be made to stop quickly in applications involving spindles & production lines to avoid production loss. (KEB Function)

Variety of Braking Functions

- ◆ Over excitation deceleration capabilities bring the motor to an immediate stop without the use of a braking resistor.
- ◆ All models up to 30 kW are equipped with a braking transistor for even more powerful braking options by just adding a braking resistor.



All Major Serial Network Protocols

- ◆ RS-422/485 (Memobus/Modbus at 115.2 kbps) standard on all models.
- ◆ Option cards available for all major serial networks used across the globe: Profibus-DP, DeviceNet, CC-Link, CANopen, Mechatro-Link-II, among others.
- ◆ Less wiring and space-saving features make for easy installation and maintenance.

Long Life Performance

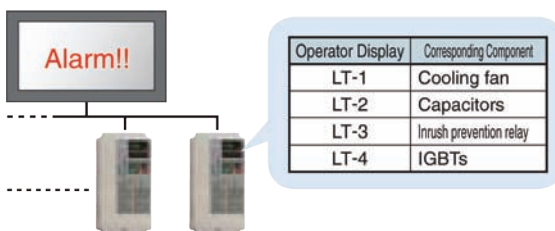
Motor Life

- ◆ Thanks to relatively low copper loss in the rotor and a cool shaft during operation, synchronous motors have a bearing life twice that of induction motors.

Performance Life Monitors

- ◆ Equipped with performance life monitors that notify the user of part wear and maintenance periods to prevent problems before they occur.

- * Drive outputs a signal to the control device indicating components may need to be replaced

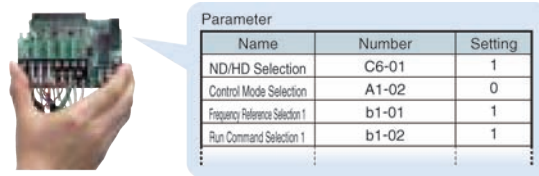


Easy Maintenance

The First Terminal Board with a Parameter Backup Function

- ◆ The terminal block's ability to save parameter setting data makes it a breeze to get the application back online in the event of a failure requiring drive replacement.

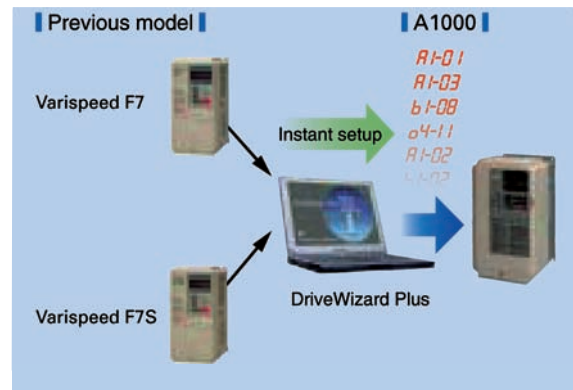
- * A1000 Terminal Block



Engineering Tool DriveWizard Plus

- ◆ Manage the unique settings for all your drives right on your PC.
- ◆ An indispensable tool for drive setup and maintenance. Edit parameters, access all monitors, create customized operation sequences, and observe drive performance with the oscilloscope function.
- ◆ The Drive Replacement feature in DriveWizard Plus saves valuable time during equipment replacement and application upgrades by converting previous product parameter values to the new A1000 parameters automatically.

- * Drive Replacement Function



Note: To obtain a copy of DriveWizard Plus, contact a L&T representative

Parameter Copy Function

- ◆ All standard models are equipped with a Parameter Copy function using the keypad that allows parameter settings to be easily copied from the drive or uploaded for quick setup.
- ◆ A USB Copy Unit is also available as an even faster, more convenient way to back up settings and instantly program the drive.

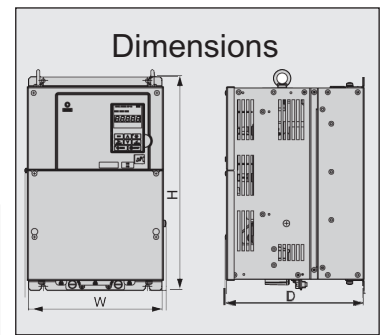
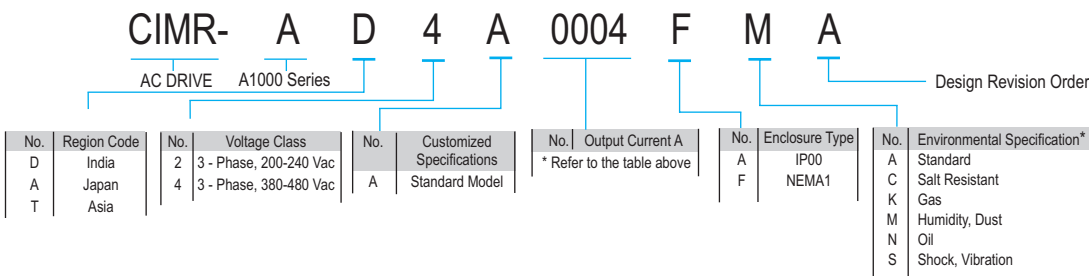
Standard Specifications (Model wise)

Model CIMR-AD4A□□□□	0002	0004	0005	0007	0009	0011	0018	0023	0031	0038	0044	0058	0072	0088	0103	0139	0165	0208	0250	0296	0362	0414	0515	0675	0930	1200	
Max. Applicable	Normal Duty	0.75	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	185	220	250	355	500	630
Motor Capacity - kW	Heavy Duty	0.4	0.75	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	185	220	315	450	560
Rated Output	Normal Duty ²	1.6	3.1	4.1	5.3	6.7	8.5	13.3	17.5	24	29	34	44	55	67	78	106	126	159	191	226	276	316	392	514	709	915
Capacity*1 kVA	Heavy Duty	1.4 ³	2.6 ³	3.7 ³	4.2 ³	5.5 ³	7 ³	11.3 ³	13.7 ³	18.3 ³	24 ³	30 ³	34 ³	46 ³	57 ³	69 ³	85 ³	114 ⁴	137 ⁴	165 ⁴	198 ⁴	232 ⁴	282 ⁴	343 ²	461 ²	617 ²	831 ²
Rated Output	Normal Duty ²	2.1	4.1	5.4	6.9	8.8	11.1	17.5	23	31	38	44	58	72	88	103	139	165	208	250	296	362	414	515	675	930	1200
Current A	Heavy Duty	1.8 ³	3.4 ³	4.8 ³	5.5 ³	7.2 ³	9.2 ³	14.8 ³	18 ³	24 ³	31 ³	39 ³	45 ³	60 ³	75 ³	91 ³	112 ³	150 ⁴	180 ⁴	216 ⁴	260 ⁴	304 ⁴	370 ⁴	450 ²	605 ²	810 ²	1090 ²
Dimensions - mm	Width - W	140	140	140	140	140	140	140	180	180	220	250	275	325	325	325	325	450	500	500	500	500	500	670	670	1250	1250
	Height - H	260	260	260	260	260	260	260	300	300	350	400	450	510	510	550	550	705	800	800	800	800	950	1140	1140	1380	1380
	Depth - D	147	147	147	164	164	164	167	167	167	187	197	258	258	258	283	283	330	350	350	350	350	370	370	370	370	370
Enclosure Type	NEMA-1 (can be used as IP00 by removing top & bottom covers)														IP00												
Carrier Frequency	1 to 15 kHz ⁵														1 to 10 kHz ³				1 to 5 kHz ⁵				2kHz				
Overload Tolerance	Normal Duty Rating ⁵ : 120% of rated output current for 60 s														Heavy Duty Rating ⁵ : 150% of rated output current for 60s.												
Max. Output Voltage	Three-phase 380 to 480 V (relative to input voltage)																										
Max. Output Frequency	400 Hz ³																							150 Hz			
Rated Voltage / Rated Frequency	Three-phase 380 to 480 Vac, 50/60 Hz, (510 to 680 Vdc)																										
Allowable Voltage Fluctuation	- 15% to +10%																										
Allowable Frequency Fluctuation	±5%																										
Harmonic Suppression	DC Reactor	Option												Built-in													
Braking Function	Braking Chopper	Built-in												Option													

Notes

- *1: Rated output capacity is calculated with a rated output voltage of 440 V.
- *2: This value assumes a carrier frequency of 2 kHz. Increasing the carrier frequency requires a reduction in current.
- *3: This value assumes a carrier frequency of 8 kHz. Increasing the carrier frequency requires a reduction in current.
- *4: This value assumes a carrier frequency of 5 kHz. Increasing the carrier frequency requires a reduction in current.
- *5: Carrier frequency can be set by the user.




Model Identification:



Common specifications

Control Characteristics	Control Method	V/f Control, V/f Control with PG, Open Loop Vector Control, Closed Loop Vector Control with PG, Open Loop Vector Control for PM, Advanced Open Loop Vector Control for PM, Closed Loop Vector Control for PM
	Frequency Control Range	0.01 to 400 Hz
	Frequency Accuracy	Digital reference: within ±0.01% of the max. output frequency (- 10 to+40°C)
	(Temperature Fluctuation)	Analog reference: within ±0.1% of the max. output frequency (25°C ±10°C)
	Frequency Setting Resolution	Digital reference: 0.01 Hz Analog reference: 0.03 Hz / 60 Hz (11 bit)
	Output Frequency Resolution	0.001 Hz
	Frequency Setting Signal	-10 to +10 V, 0 to +10 V, 4 to 20 mA, pulse train
	Starting Torque	150%/3 Hz (V/f Control and V/f Control with PG), 200%/0.3 Hz [†] (Open Loop Vector Control), 200%/0 RPM [†] (Closed Loop Vector Control, Closed Loop Vector Control for PM, and Advanced Open Loop Vector Control for PM), 100%/5% speed (Open Loop Vector Control for PM)
	Speed Control Range	1:1500 (Closed Loop Vector Control and Closed Loop Vector Control for PM) 1:200 (Open Loop Vector Control) 1:40 (V/f Control and V/f Control with PG) 1:20 (Open Loop Vector Control for PM) 1:100 (Advanced Open Loop Vector Control for PM)

Common specifications continued...

Control Characteristics	Speed Control Accuracy	±0.2% in Open Loop Vector Control (25°C ±10°C) ² , ±0.02% in Closed Loop Vector Control (25°C±10°C)
	Speed Response	10 Hz in Open Loop Vector Control (25°C ±10°C), 50 Hz in Closed Loop Vector Control (25°C±10°C) (excludes temperature fluctuation when performing Rotational Auto-Tuning)
	Torque Limit	All vector control modes allow separate settings in four quadrants
	Accel/Decel Time	0.00 to 6000.0 s (4 selectable combinations of independent acceleration and deceleration settings)
	Braking Torque	Drives of 200/400V 30kW (ND) or less have a built-in braking transistor. Short-time decel torque ³ : over 100% for 0.4/ 0.75 kW motors, over 50% for 1.5 kW motors, and over 20% for 2.2 kW and above motors (Overexcitation Deceleration, High Slip Braking: approx. 40%) Continuous regen. torque: approx. 20% (approx. 125% with dynamic braking resistor option ⁴ : 10% ED, 10 s, internal braking transistor)
	V/f Characteristics	User-selected programs and V/f preset patterns possible
Protection Function	Main Control Functions	Torque Control, Droop Control, Speed/Torque Control switch, Feed Forward Control, Zero Servo Control, Momentary, Power Loss Ride-Thru, Speed Search, Overtorque detection, torque limit, 17 Step Speed (max.), accel/decel, time switch, S-curve accel/decel, 3-wire sequence, Auto-Tuning (rotational, stationary), Online Tuning, Dwell, cooling, fan on/off switch, slip compensation, torque compensation, Frequency Jump, Upper/lower limits for frequency, reference, DC Injection Braking at start and stop, Over excitation Deceleration, High Slip Braking, PID control (with, Sleep function), Energy Saving Control, Fault Restart, Application Presets, DriveWorksEZ (customized functions), Removable Terminal Block with Parameter Backup.
	Motor Protection	Motor overheat protection based on output current
	Momentary Overcurrent Protection	Drive stops when output current exceeds 200% of Heavy Duty rating
	Overload Protection	Drive stops after 60 s at 150% of rated output current (Heavy Duty rating) ⁵
	Overvoltage Protection	200 V class: Stops when DC bus exceeds approx. 410 V, 400 V class: Stops when DC bus exceeds approx. 820 V
	Undervoltage Protection	200 V class: Stops when DC bus exceeds approx. 190 V, 400 V class: Stops when DC bus exceeds approx. 380 V
	Momentary Power Loss Ride-Thru	Stops immediately after 15 ms or longer power loss (default). Continuous operation during power up to 2 s (standard). ⁶
	Heatsink Overheat Protection	Thermistor
	Braking Resistance Overheat Protection	Overheat sensor for braking resistor (optional ERF-type, 3% ED)
	Stall Prevention	Stall prevention during acceleration/deceleration and constant speed operation
Interface	Ground Fault Protection	Protection by electronic circuit ⁷
	Charge LED	Charge LED remains lit until DC bus has fallen below approx. 50 V
	Digital Inputs	8 nos. programmable (24 VDC Sink/Source/External supply configurable)
	Digital Outputs	4 nos. (1 fixed / 3 programmable) 2 nos. open collector - 48 VDC & 2 nos. Relay - 230VAC / 30 VDC
	Analog Inputs	3 nos. Programmable - 2 nos. 0 to ±10 VDC & 1 no. 0/4 to 20mA
	Analog Outputs	2 nos. Programmable -10 to +10 VDC
	Pulse Train I/O	0 to 32 kHz max. - 1 no. input & 1 no. output
	Communication	Modbus RS422 / RS485 with speed upto 115.2 kbps
Option	Safety I/O	2 nos. hardware baseblock inputs & 1 no. Safety Electronic Device Monitor Output (Complying to UL508C, EN954-1 Cat.3, IEC/EN61508 SIL2)
	I/O	Analog Input (AI-A3) - 3 AI, Digital Input (DI-A3) - 16 DI, Analog Monitor (AO-A3) - 2 AO, Digital Output (DO-A3) - 8 DO
	Encoder Interface	PG-B3 for Complimentary Type PG upto 50KHz, PG-X3 for Line Driver Type PG upto 300KHz
	Communication	PROFIBUS-DP (SI-P3), DeviceNet(SI-N3), CANopen (SI-S3), MECHATROLINK-2 (SI-T3)
Environment	Others	LCD Operator, External 24V supply; Braking unit
	Area of Use	Indoors
	Ambient Temperature	-10 to +40°C (NEMA Type 1) ⁸ , -10 to +50°C (IP00)
	Humidity	95% RH or less (no condensation)
	Storage Temperature	-20 to +60°C (short-term temperature during transportation)
	Altitude	Up to 1000 meters
	Shock	10 Hz to 20 Hz, 9.8 m/s ² max. 20 Hz to 55 Hz, 5.9 m/s ² (400 V: 55 kW - HD or more) or 2.0 m/s ² max. (400 V: 75 kW- HD or less)
Standard Compliance	   RoHS compliant UL 508C, EN61800-3, EN61800-5-1, EN954-1 Cat.3, ISO 13849-1 (Cat.3, PLd), IEC/EN61508 SIL2	

*1: Requires a drive with recommended capacity.

*2: Speed control accuracy may vary slightly depending on installation conditions or motor used.

*3: Momentary average deceleration torque refers to the deceleration torque from 60 Hz down to 0 Hz. This may vary depending on the motor.

*4: If L3-04 is enabled when using a braking resistor or braking resistor unit, the motor may not stop within the specified deceleration time.

*5: Overload protection may be triggered before 60 sec. when operating with 150% of the rated output current if the output frequency is less than 6 Hz.

*6: Varies in accordance with drive capacity and load. Drives with a capacity of smaller than 11 kW in the 200 V (model: CIMR-AA4A0056) or 400 V (model: CIMR-AA4A0031) require a separate Momentary Power Loss Recovery Unit to continue operating during a momentary power loss of 2 s or longer.

*7: Protection may not be provided under the following conditions as the motor windings are grounded internally during run:
• Low resistance to ground from the motor cable or terminal block. • Drive already has a short-circuit when the power is turned on.

*8: NEMA-1 Type units can be used as open chassis type by removing top & bottom covers.



For more details, please contact:

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