MV1000 Medium Voltage AC Drive

2.4 kV Class: 200 to 2750 HP
4.16 kV Class: 300 to 5000 HP

YASKAWA™

The Next Generation in Medium Voltage (MV) AC Drives

The Yaskawa MV1000!

All MV Drives offer energy savings and improved process control. The MV1000 provides these features, of course, but leapfrogs the industry with much more.

Building on past success, the MV1000 minimizes application and installation issues, by providing:

- Minimal Input Power Distortion (THD)
- Multi-phase Input Transformer with Galvanic Isolation
- Near Sinusoidal Output Waveform
- Proven Reliability with High Performance
- Compact Size
- User Friendliness
- Compatibility with Yaskawa A1000 LV Products

A History of the path we took to bring you the MV1000 Medium Voltage AC Drive:

Contents

Installation Friendly

1

Input:
Drive industry's lowest THD with Smart Harmonics™ Technology 36-pulse input transformer

Output:
Motor friendly 9/17 level output waveform

Proven Reliability

2

Highest Uptime:
Yaskawa's superior design and quality control provides reliability that is unmatched in the industry

Lowest Life Cycle Cost (LCC):
Highest MTBF creates lowest LCC

High Performance

3

Control platform based on the hugely successful A1000 low voltage (LV) product:
Open loop vector (OLV) or closed loop vector (CLV) control for the most difficult loads

Compact Design

4

Optimum packaging and a draw-out design:
Facilitates transportation, installation, and maintenance

User Friendly

5

Operation, adjustment, maintenance, and management are simple and intuitive:
MV1000 utililzes the same keypad as the Yaskawa 1000 series LV drives and a parallel parameter set

Global Standards

MV1000 provides an I/O voltage range at 2.4 kV and 4.6 kV and conforms with UL, CSA, IEEE 519, and other global standards

Features and Benefits

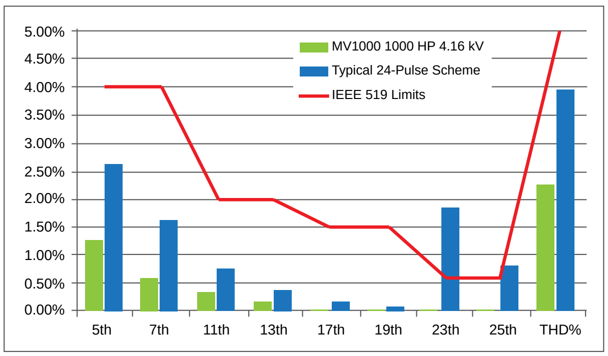
Installation Friendly

Yaskawa Smart Harmonics™ Technology and PWM Control

Input Total Harmonic Distortion (THD) < 2.5% without filters!

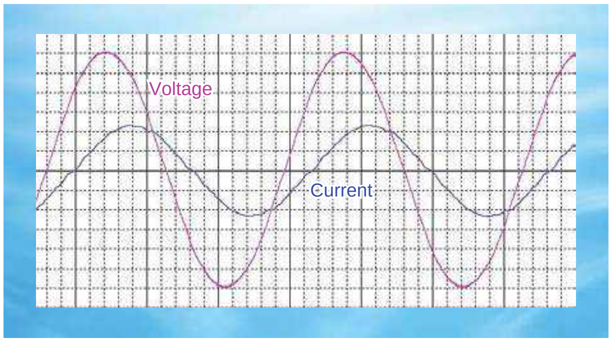
Minimized Input Harmonics Exceed Guidelines

Yaskawa's original Smart Harmonics™ Technology incorporated in the MV1000 drastically reduces input harmonics. The resulting input waveform is near sinusoidal, exceeding the requirements of IEEE519-1992. No input filter is necessary.



The diagram above represents actual test data, certified by **TUV**

Input Waveform



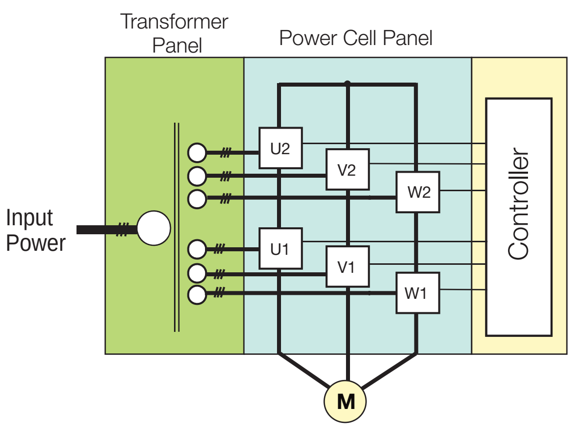
Measured Harmonics Input Current

Harmonic	5th	7th	11th	13th	17th	19th	23rd	25th	THD
IEEE519 Limits	4.00%	4.00%	2.00%	2.00%	1.50%	1.50%	0.60%	0.60%	5%
MV1000 1000 HP 4.16 kV	1.28%	0.56%	0.34%	0.16%	0.03%	0.04%	0.01%	0.01%	2.26%
Typical 24-Pulse Scheme	2.60%	1.60%	0.70%	0.40%	0.20%	0.10%	1.90%	0.80%	3.80%

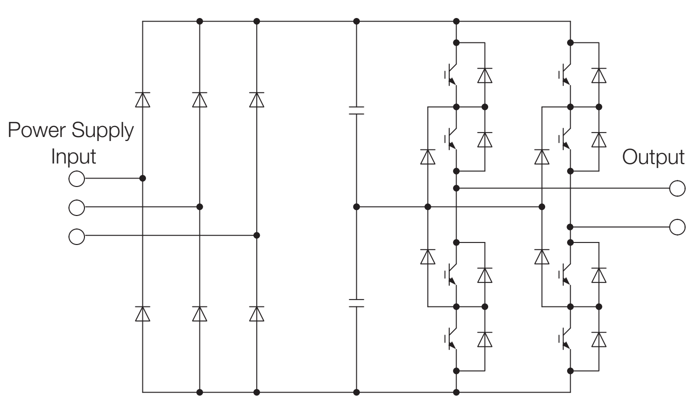
9/17 Level Output Waveform Using Enhanced Cascaded H Bridge (CHB) Configuration

Circuit Configuration

- Configuration of complete drive, 2.4 or 4.16 kV

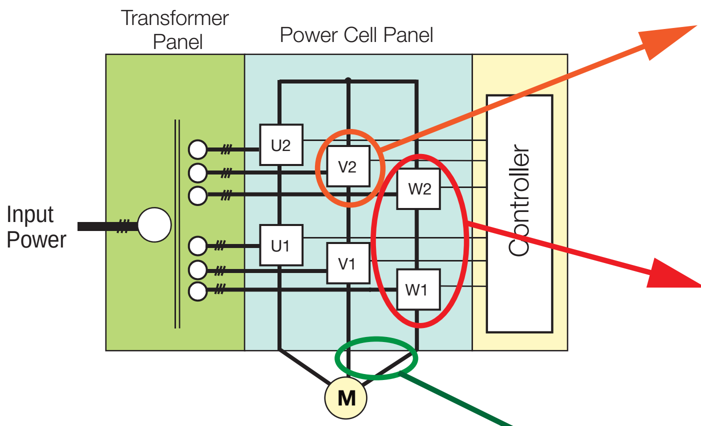


- Configuration of one power cell



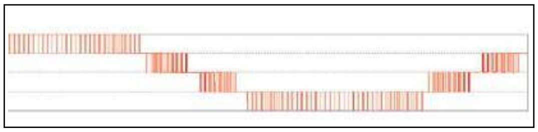
Circuit Configuration (continued)

- MV1000 uses multiple 5 voltage step bridges
- Requires only two bridges per phase at 4.16 kV



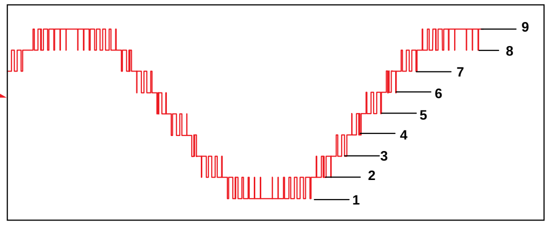
Cell Waveform

Output voltage of single power cell



Phase Waveform

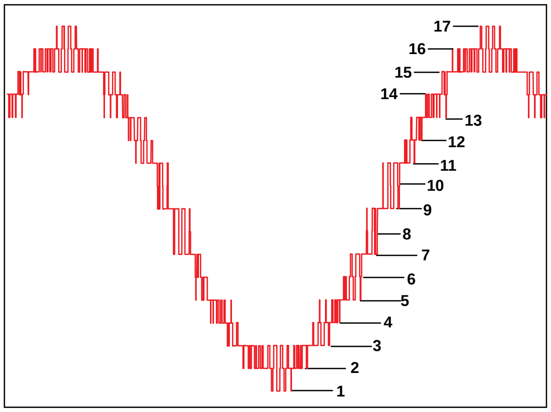
Line to neutral voltage for 4.16 kV drive



Result is “9-level” waveform

Output Waveform

Line to line voltage for 4.16 kV drive



Result is “17-level” line-to-line voltage waveform (applied to motor)

Motor Friendly Output

Use existing motors without supplemental filtering, even at long lead lengths

PWM control with Enhanced CHB outputs a near sinusoidal waveform.

- Minimal surge voltage (reflected wave phenomenon) protects motor insulation.
- Low torque ripple - smooth mechanical power transmission
- Low audible noise

Proven Reliability

Yaskawa Quality

Yaskawa’s quality has always led the drives industry, and each generation builds on the last. The last generation medium voltage product (the MV1S) has a proven field MTBF greater than 300,000 hours.

The MV1000 builds on the MV1S success using the same rigorous design rules and Quality Control/Quality Assurance (QC/QA) practices. The MV1000 has a reduced component count as well. With units and hours in the field, the MV1000 will exceed the already outstanding performance of the MV1S.

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.

High Performance

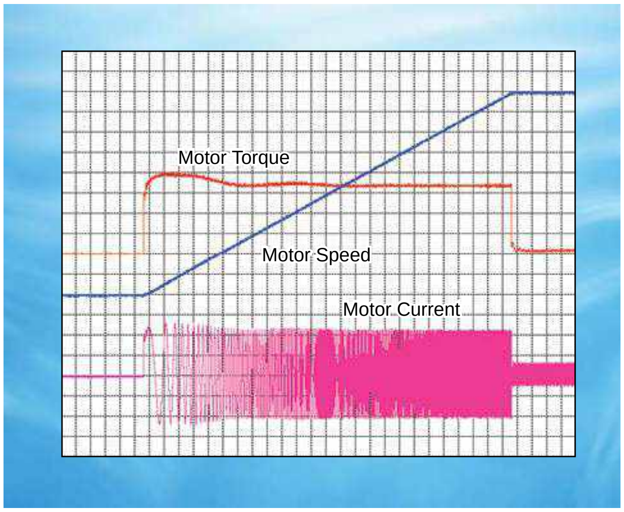
Open Loop Vector Control

Highly resistant to fluctuations in load, enabling stable, continuous operation

High-level Control

Open Loop Vector control enables smooth acceleration from low speed without using an encoder. Operation is stable, unaffected by fluctuations in load. The high performance vector control can be applied to synchronous motors as well as induction motors.

Starting Characteristics

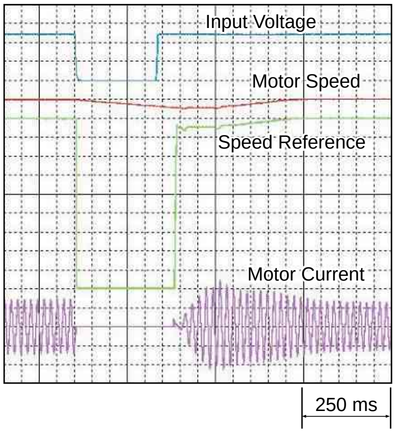


Controlled and Secure Operation at Momentary Power Loss

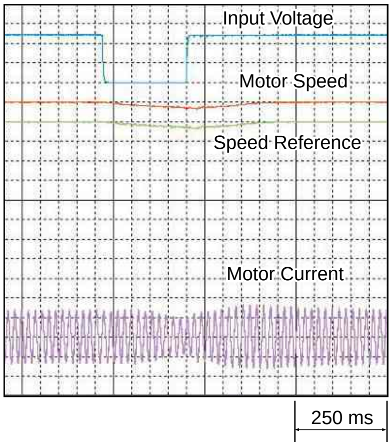
MV1000 continues to operate for a number of cycles*1 when a momentary power loss occurs, and re-accelerates to the reference speed immediately after the power is restored to ensure a smooth system start-up.

*1: The retention time varies depending on the types of load and operation status.

Speed Search Function



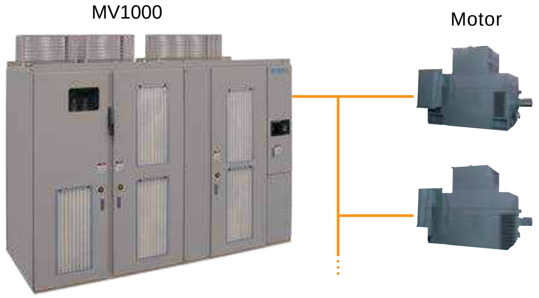
KEB Function*2



*2: KEB (Kinetic Energy Braking) Function:
KEB uses stored mechanical energy in the load to continue operation during a momentary power loss

Running Multiple Motors

The capability to run multiple induction motors in parallel with a single drive can reduce the size of the system as a whole.

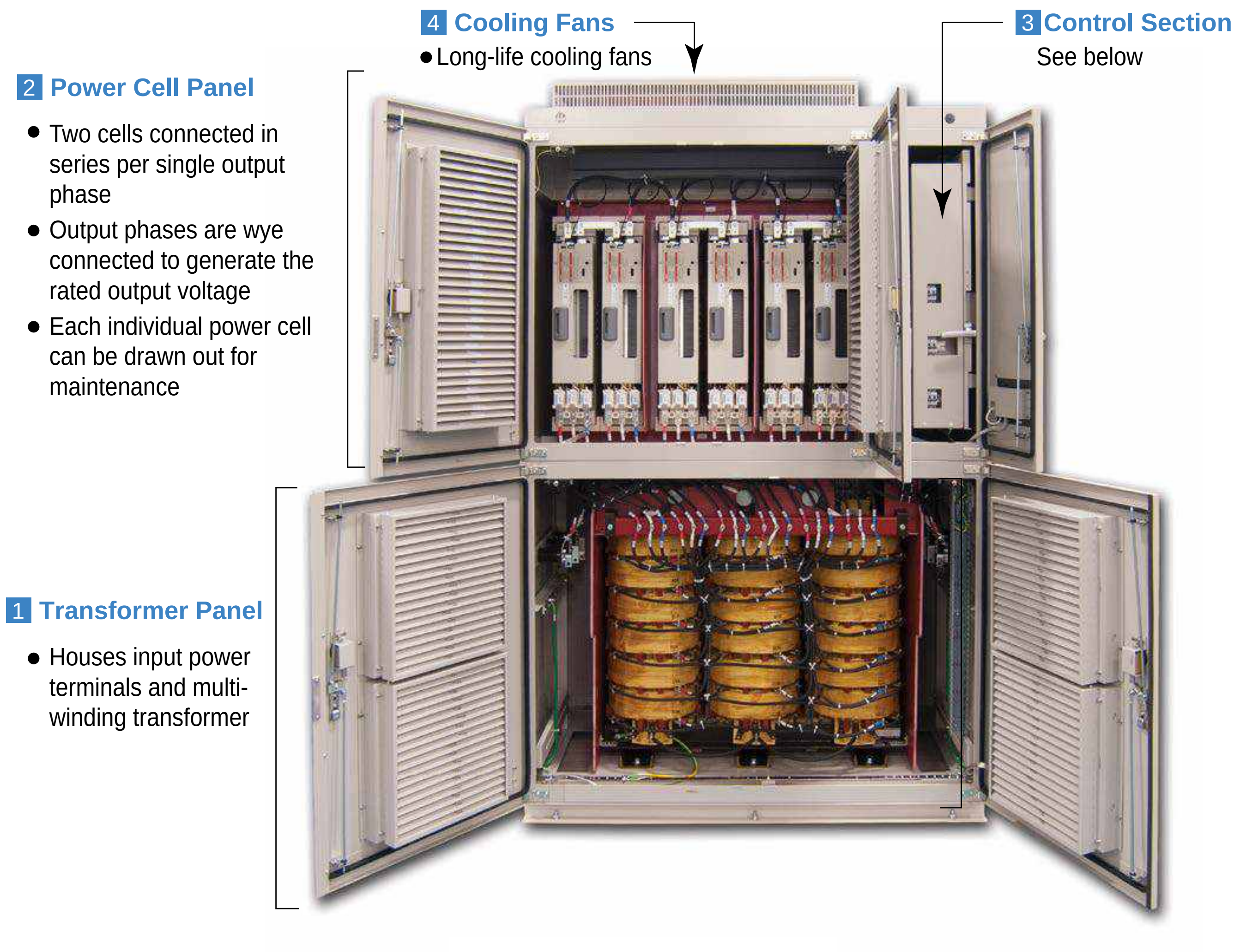


Note: When running multiple motor operations, a protective device is required on each motor

Compact Design

Optimum packaging and a draw-out design facilitates tranportation, installation, and maintenance

Typical Configuration of 1000 HP MV1000



Control Section

- Houses the control board for PWM control
- Communicates with power cells through fiber optic cables
- LV circuit breakers for auxiliary circuitry

Features and Benefits

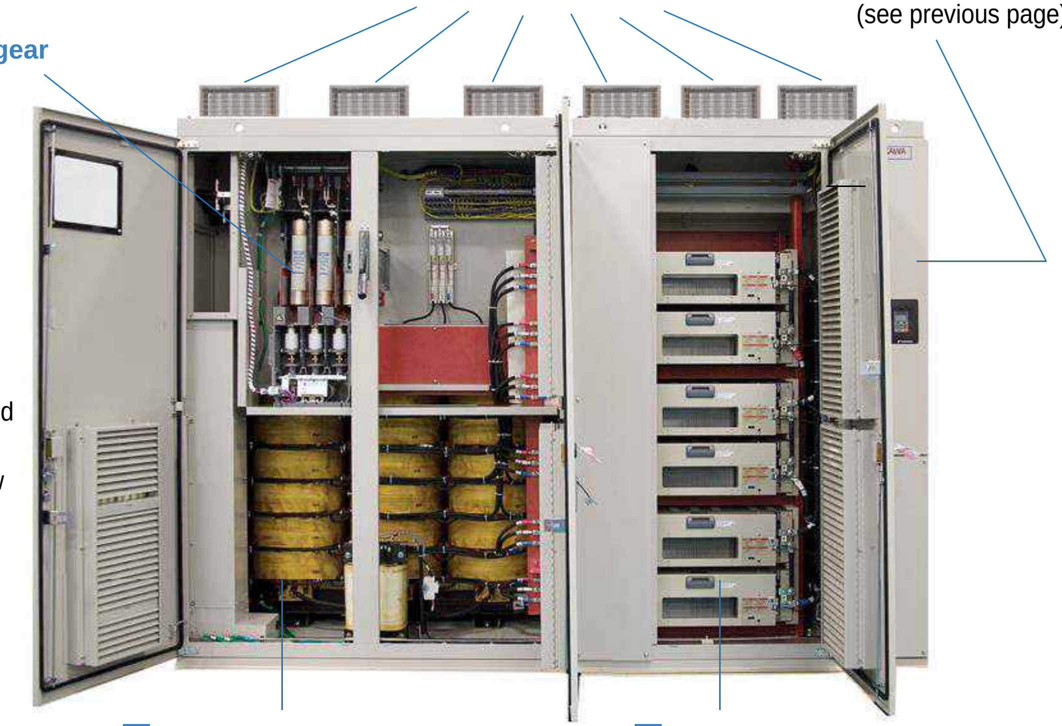
Typical Configuration of 2000 HP MV1000 with Optional Input Switchgear

4 Cooling Fans

5 Control Section
(see previous page)

2 Input Switchgear

- Non-load break switch
- R-rated, current-limiting fuses
- Vacuum contactor for interrupting current
- All UL/CSA rated components
- Viewing window



1 Multi-Pulse Transformer

3 Power Cells
Two cells per phase

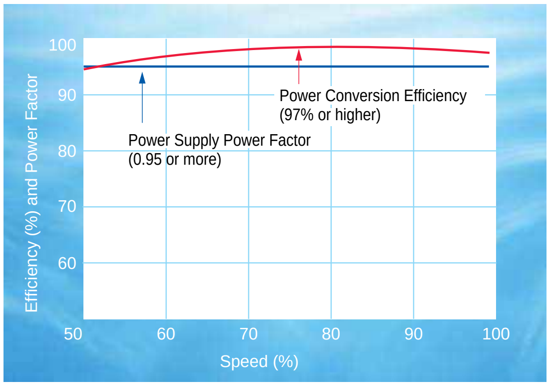
Energy Efficiency

Promotes energy savings with highly efficient operation

High Efficiency and High Power Factor

Since the MV1000 is a direct medium-voltage drive that does not need an output transformer, it can maintain a power conversion efficiency of 97% or better over a wide speed range and power factor of 0.95 (at rated load), minimizing energy losses.

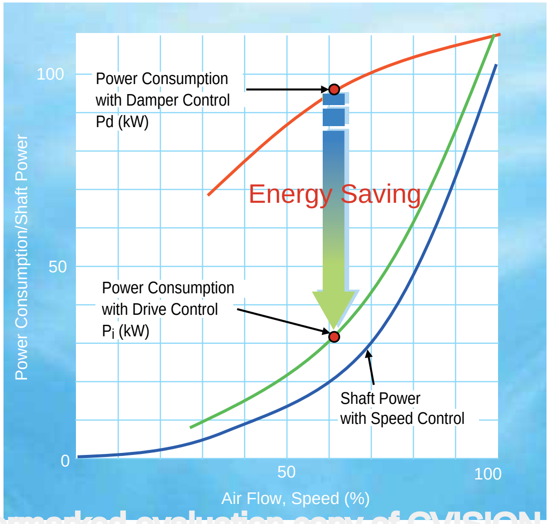
■ Power Conversion Efficiency Ratio



Energy Saving by Speed Control

The shaft power required by fan and pump applications is proportional to the cube of the rotational speed. Since drives maintain high efficiency even at low speed, significant energy savings can be obtained by using drives for fans and pumps and operating them at lower speeds.

■ Power Consumption Characteristic Curve



User Friendly

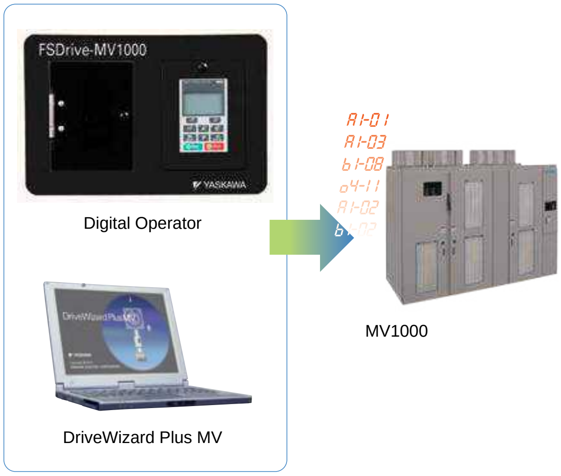
Simple Operation, Adjustment, and Maintenance

Same user interfaces as Yaskawa 1000 Series low voltage drives

Easy-to-use User Interfaces

A Digital Operator with an easy-to-view LCD display (the same as used on Yaskawa's 1000 series low-voltage drives) is provided on the front panel as standard, making it easy to operate and set the drive.

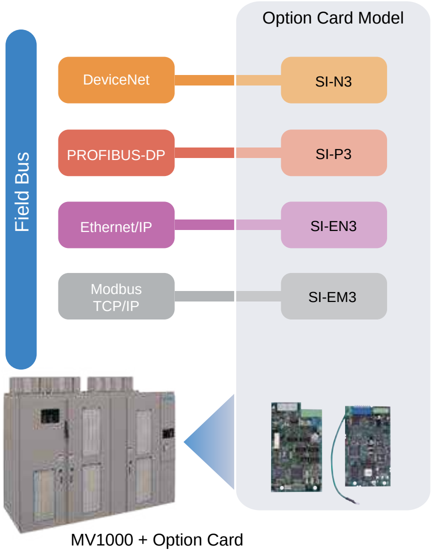
The engineering tool DriveWizard Plus MV enables consolidated management of the parameters for each drive and makes for easy adjustment and maintenance.



➡Refer to pages 10 and 11 for details

Compatible with World's Major Field Network Protocols

The RS-485 communication function (Modbus protocol) is installed as standard. By adding an optional communication card, major network protocols can be supported.



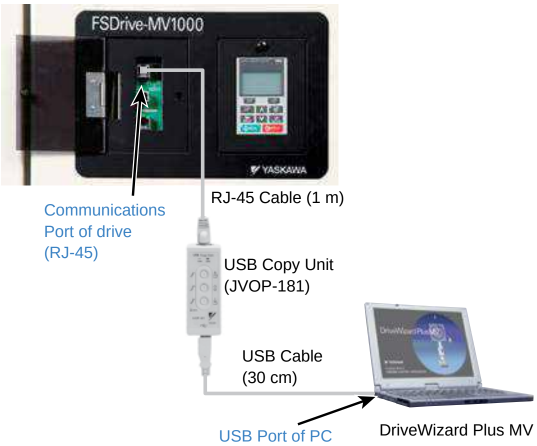
Note: Product names are trademarks or registered trademarks of the companies concerned

USB Copy Unit (Model: JVOP-181)

Enables the copying and transfer of parameters between drives using simple operations. This unit can also be used as a conversion connector between the communication port (RJ-45) of a drive and a USB port of a PC.

Note: No USB cable is needed to copy parameters to other drives

Connection

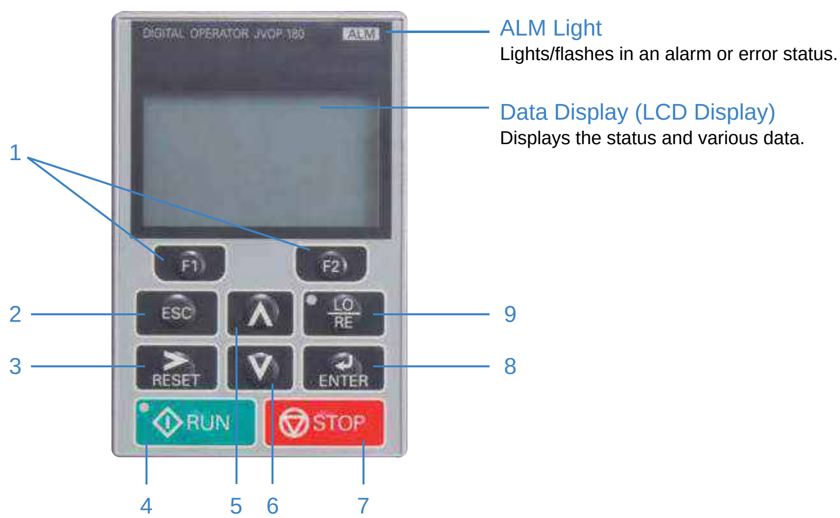


Features and Benefits

Digital Operator

User Friendly Digital Operator

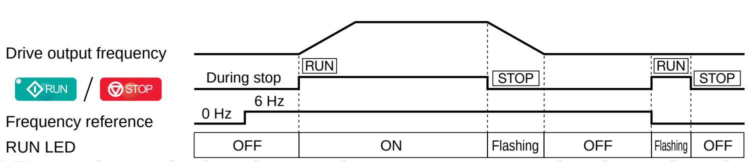
The digital operator is installed as standard to facilitate easy configuration, operation, and monitoring



Key Names and Functions

No.	Key	Name	Function
1	F1 / F2	Function Key (F1/F2)	The functions assigned to F1 and F2 vary depending on the currently displayed menu. The name of each function appears in the lower half of the LCD display window.
2	ESC	ESC Key	• Returns to the previous display. • Moves the cursor one digit to the left when setting parameter numbers. • Pressing and holding this button returns to the Frequency Reference display.
3	RESET	RESET Key	• Moves the cursor one digit to the right when setting parameter values, etc. • Resets the drive to clear a fault.
4	RUN	RUN Key	Starts drive operation.
		RUN LED	Lit or flashing while the drive is running.
5	∧	Up Arrow Key	• Scrolls up to display the next item. • Increments the parameter number or the setting value.
6	∨	Down Arrow Key	• Scrolls down to display the previous item. • Decrements the parameter number or the setting value.
7	STOP	STOP Key	Stops drive operation. Note: The drive can be stopped in an emergency stop status by pressing STOP when danger is detected even if the drive is operating in the REMOTE mode. To disable emergency stop operation using STOP, set parameter o2-02 (STOP key function selection) to 0 (disabled).
8	ENTER	ENTER Key	• Enters the selected operation mode, parameter number and setting value. • Selects a menu item to move between displays.
9	LO RE	LO/RE Selection Key	Switches the control of the drive between the digital operator (LOCAL mode) and an external source (REMOTE mode) for the Run command and frequency reference. Note: When there is a danger that the operation of the drive may be disrupted by erroneously switching the operation mode from REMOTE to LOCAL, disable LO RE by setting parameter o2-01 (LO/RE selection key function selection) to 0 (disabled).
		LO/RE LED	Lit while the operator is selected to run the drive (LOCAL mode).

Drive operation status and relevant RUN LED indications



Programming Software

DriveWizard™ Plus MV

Provides support for a variety of adjustment and maintenance tasks

DriveWizard Plus MV enables consolidated management of the parameters for each drive on a PC. A variety of functions including monitoring, parameter editing, pattern operation, and oscilloscope functions facilitates adjustment and maintenance of the drives. In addition, the extensive trace and event log functions enable implementation of preventive maintenance and a quick response in case of a malfunction.

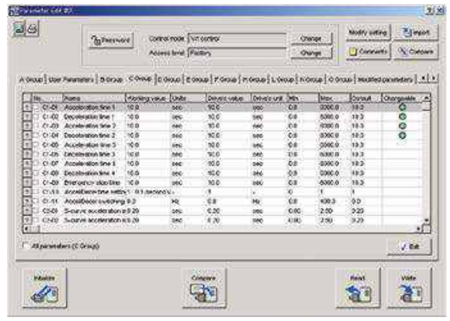
System Requirements

PC	IBM PC compatible computers Note: Operation on NEC PC9821 series computers is not guaranteed.
CPU	Pentium 1GHz or higher (1.6 GHz recommended)
Main Memory	1 GB or greater
Available Hard Disk Space	In the standard setup configuration: • 100 MB or greater (400 MB or greater recommended at time of installation)
Display Resolution	XGA monitor (1024 × 768 or higher, use “Small Fonts”.)
Number of Colors	65535 colors (16 bits) or greater
OS	English or Japanese operating system (32-bit OS only) • Windows 2000 Service Pack 1 or later • Windows XP • Windows Vista • Windows 7
Others	More than one RS-232, RS-485 or USB port CD-ROM drive (only for installation) Adobe Reader 6.0 or later Note: Adobe Reader is required to display the help information.

Note: Pentium is a registered trademark of Intel Corporation.
Windows 2000/XP/Vista/7 are registered trademarks of Microsoft Corporation.

Parameter Edit

Displays and edits drive parameters

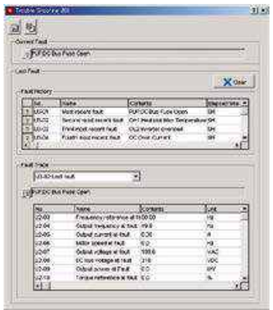


Auto-tuning

Automatically adjusts the motor-related parameters

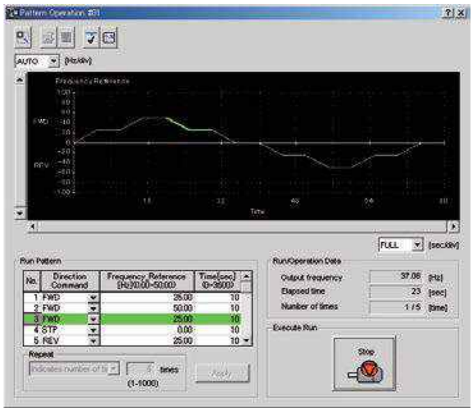
Troubleshooting

Checks the faults that have occurred on the drive. Causes are quickly investigated by tracing fault status and the corrective actions are displayed.



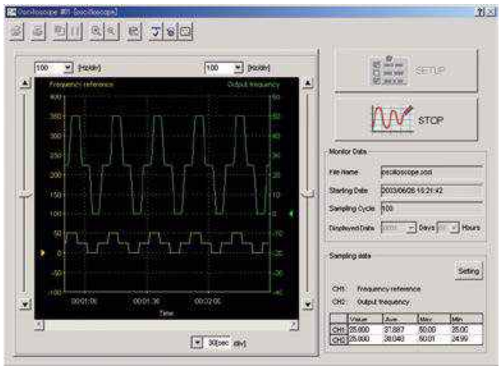
Pattern Operation

Runs the drive automatically in the preset patterns



Oscilloscope

Displays the monitor data in real time while the drive is running



Specifications

Drive Specifications

2 kV Class

Model	CIMR-MV2UA6AA		052	068	080	093	102	115	135	160	180	205	220	280	330	390	440	505	550	600
Nominal Capacity	2.4 kV Output	kVA	220	280	330	390	420	480	560	670	750	850	920	1160	1370	1620	1820	2100	2300	2500
	Motor Capacity[1]	HP	200	300	350	400	450	500	600	700	800	900	1000	1250	1500	1750	2000	2250	2500	2750
Output Rating	Rated Output Current	A	52	68	77	93	102	115	135	160	180	205	220	280	330	390	440	505	550	600
	Rated Output Voltage	V	Three-Phase, 2400V (Sine wave, proportional to input voltage)																	
Power Supply	Main Circuit		Three-Phase, 2400V, -20% to +10%, 60Hz																	
	Auxiliary Supply (Fans Etc.)		Single-Phase, 200/240V, -10% to +10%, 50/60Hz																	
	Control Logic Power		Single-Phase, 110/120V, -10% to +10%, 50/60Hz																	

4 kV Class

Model	CIMR-MV2UD6DA		039	052	058	064	077	093	102	115	125	155	190	220	250	285	315	340	375	440	505	575	625
Nominal Capacity	4.16 kV Output	kVA	280	375	420	460	550	670	735	830	900	1120	1370	1590	1800	2050	2270	2500	2700	3170	3640	4140	4500
	Motor Capacity[1]	HP	300	400	450	500	600	700	800	900	1000	1250	1500	1750	2000	2250	2500	2750	3000	3500	4000	4500	5000
Output Rating	Rated Output Current	A	39	52	58	64	77	93	102	115	125	155	190	220	250	285	315	340	375	440	505	575	625
	Rated Output Voltage	V	Three-Phase, 4160V (Sine wave, proportional to input voltage)																				
Power Supply	Main Circuit		Three-Phase, 4160V, -20% to +10%, 60Hz																				
	Auxiliary Supply (Fans Etc.)		Single-Phase, 200/240V, -10% to +10%, 50/60Hz																				
	Control Logic Power		Single-Phase, 110/120V, -10% to +10%, 50/60Hz																				

1 : Nominal ratings for 4-pole NEMA B Motor

Common Specifications

Efficiency		Approx. 97% (At rated motor speed, 100% load)
Power Factor		Min. 0.95 (At motor rated speed, from 50% to 100% load)
Cooling Method		Forced air-cooling by fan (with failure detection)
Control Specifications	Control Method	Open-loop vector control, Closed loop vector control, V/f control (for multiple motor operation), Closed loop vector control for SM (option)
	Main Circuit	Voltage-type PWM control with multiple outputs connected in series
	Freq. Control Range	0.01 to 120 Hz
	Speed Accuracy	Open Loop Vector: 0.2%; Closed Loop Vector: 0.02%
	Freq. Control Accuracy	±0.5%
	Analog Input Resolution	0.03 Hz
	Accel/Decel Time	0.1 to 6000 s
	Torque Accuracy	±5% (open-loop vector control), ±3% (closed loop vector control)
	Overload Tolerance	Continuous rated current 100%, overload tolerance 110% for 1 minute and 120% for 15 seconds
	Momentary Power Loss Compensation Time[*1]	Max. 2 seconds
	Main Control Functions	Torque control, Droop control, Speed/torque control switch, Momentary power loss compensation, 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), Dwell, Cooling fan on/off, Slip compensation, Torque compensation, Frequency jump, Upper/lower limits for frequency reference, DC injection braking at start and stop, High slip braking, PID control (with sleep function), Energy saving control, Modbus communication (RS-485, max. 115.2 kbps), Fault retry
Protective Functions		Overcurrent, Overvoltage, Undervoltage, Output ground fault, Output open-phase, Overload, Cooling-fan error, Transformer overheat, Motor overheat, etc., Panel door open interlock
Communications (Optional)[*2]		Any one of PROFIBUS-DP™, DeviceNet™, or Ethernet can be installed.
Input Transformer (with Isolated Windings)		Class H dry type (220˚C rated, 150˚C rise), -5%/N/+5% tap, secondary multi-phase winding
Temperature Protection		Power cells: protected by thermistor for temperature Transformer: protected by thermal sensor, PT100
Maintainability/ Environmental Specifications	Control Panel	Status display, Fault display, Parameter setting, Parameter reference
	Main Circuit	Replaceable modular power cell construction
	Protection Design	IP40 (simplified dustproof type): NEMA Type 1
	Ambient Temperature, Relative Humidity	−5˚C to +40˚C (23˚F to 104˚F), 95%RH max. (no condensing)
	Storage Temperature	−20˚C to +60˚C (4˚F to 140˚F), for very short term when handling
	Atmosphere	General environmental conditions, free from dust and corrosive gases Altitude: Max. 6600 ft (2000 m) without derating
Panel Specifications	Painting	Munsel 5Y7/1 semi-gloss both for inner and outer faces
	Form	Made of enclosing steel sheets, vertical standalone type, front maintenance type
Applicable Standards		UL, CSA, IEEE 519, JIS, JEM, JEC

*1: When the momentary power loss compensation function is used, an uninterruptible power supply unit for the control power supply is needed (this is an option).
*2: To use the communications function, additional wiring and the installation of an option card is required

Dimensional Diagrams

MV1000 Standard Unit

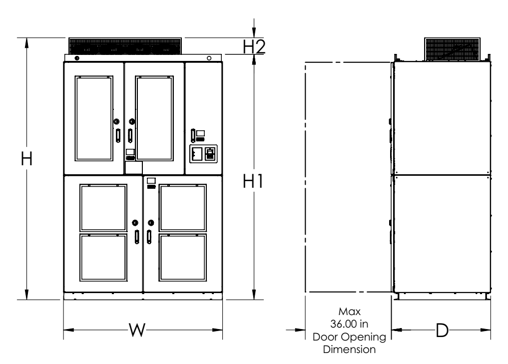


Fig. A

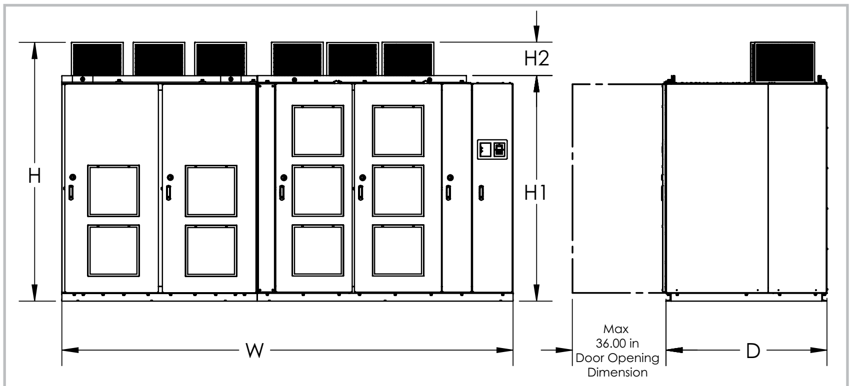


Fig. B

2.4 kV Class

Model CIMR-MV2U	Fig.	Frame Size	Dimensions Inches (mm)					Weight lbs (kg)	HP[1]
			Width W	Depth D	Height H	Height H1	Height H2		
A6AA052E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	5840 (2649)	200
A6AA068E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	5840 (2649)	300
A6AA080E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	5840 (2649)	350
A6AA093E1ABA	A	1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	5840 (2649)	400
A6AA102E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	5840 (2649)	450
A6AA115E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6800 (3084)	500
A6AA135E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6800 (3084)	600
A6AA160E1ABA		2A	118.2 (3002)	50.0 (1270)	105.7 (2686)	93.0 (2362)	12.8 (324)	11518 (5224)	700
A6AA180E1ABA		2A	118.2 (3002)	50.0 (1270)	105.7 (2686)	93.0 (2362)	12.8 (324)	11518 (5224)	800
A6AA205E1ABA		2B	128.1 (3253)	55.0 (1397)	105.7 (2686)	93.0 (2362)	12.8 (324)	13180 (5978)	900
A6AA220E1ABA		2B	128.1 (3253)	55.0 (1397)	105.7 (2686)	93.0 (2362)	12.8 (324)	13180 (5978)	1000
A6AA280E1ABA		3	173.6 (4408)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	16085 (7296)	1250
A6AA330E1ABA	B	3	173.6 (4408)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	16085 (7296)	1500
A6AA390E1ABA		3	173.6 (4408)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	18550 (8414)	1750
A6AA440E1ABA		4A	208.7 (5300)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	23810 (10800)	2000
A6AA505E1ABA		4A	208.7 (5300)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	23810 (10800)	2250
A6AA550E1ABA		4B	220.5 (5600)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	26015 (11800)	2500
A6AA600E1ABA		4B	220.5 (5600)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	26015 (11800)	2750

1 : Nominal ratings for 4-pole NEMA B Motor

4.16 kV Class

Model CIMR-MV2U	Fig.	Frame Size	Dimensions Inches (mm)					Weight lbs (kg)	HP[1]
			Width W	Depth D	Height H	Height H1	Height H2		
D6DA039E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	5840 (2649)	300
D6DA052E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	5840 (2649)	400
D6DA058E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	5840 (2649)	450
D6DA064E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	5840 (2649)	500
D6DA077E1ABA	A	1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6800 (3084)	600
D6DA093E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6800 (3084)	700
D6DA102E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6800 (3084)	800
D6DA115E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	7359 (3338)	900
D6DA125E1ABA		1	66.4 (1685)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	7359 (3338)	1000
D6DA155E1ABA		2A	118.2 (3002)	50.0 (1270)	105.7 (2686)	93.0 (2362)	12.8 (324)	11518 (5224)	1250
D6DA190E1ABA		2A	118.2 (3002)	50.0 (1270)	105.7 (2686)	93.0 (2362)	12.8 (324)	11518 (5224)	1500
D6DA220E1ABA		2B	128.1 (3253)	55.0 (1397)	105.7 (2686)	93.0 (2362)	12.8 (324)	13180 (5978)	1750
D6DA250E1ABA		2B	128.1 (3253)	55.0 (1397)	105.7 (2686)	93.0 (2362)	12.8 (324)	13180 (5978)	2000
D6DA285E1ABA		3	173.6 (4408)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	16085 (7296)	2250
D6DA315E1ABA		3	173.6 (4408)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	16085 (7296)	2500
D6DA340E1ABA	B	3	173.6 (4408)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	18550 (8414)	2750
D6DA375E1ABA		3	173.6 (4408)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	18550 (8414)	3000
D6DA440E1ABA		4A	208.7 (5300)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	23810 (10800)	3500
D6DA505E1ABA		4A	208.7 (5300)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	23810 (10800)	4000
D6DA575E1ABA		4B	220.5 (5600)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	26015 (11800)	4500
D6DA625E1ABA		4B	220.5 (5600)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	26015 (11800)	5000

MV1000 with Switchgear Option

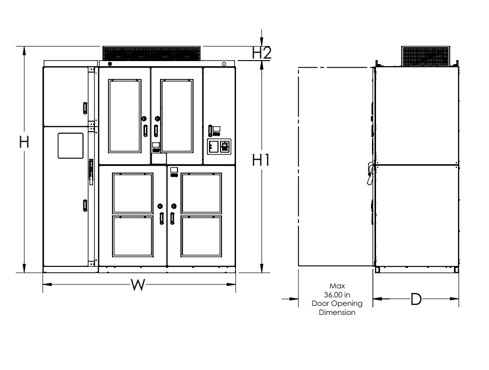


Fig. C

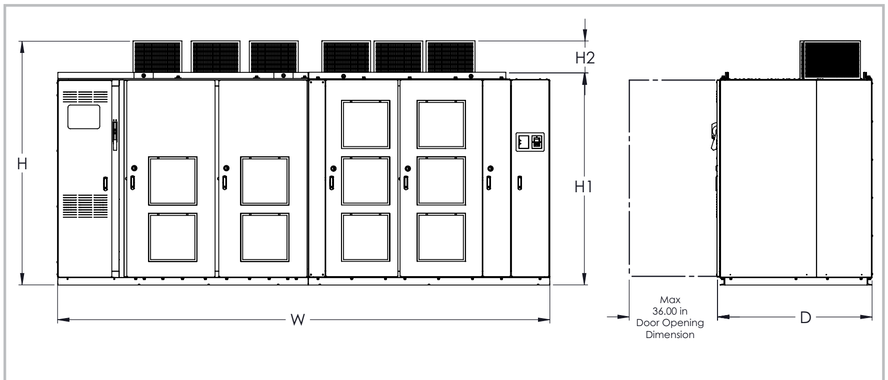


Fig. D

2.4 kV Class

Model CIMR-MV2U	Fig.	Frame Size	Dimensions Inches (mm) Width W	Depth D	Height H	Height H1	Height H2	Weight lbs (kg)	HP[1]
A6AA052E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6040 (2740)	200
A6AA068E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6040 (2740)	300
A6AA080E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6040 (2740)	350
A6AA093E1ABB	C	1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6040 (2740)	400
A6AA102E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6040 (2740)	450
A6AA115E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	7000 (3175)	500
A6AA135E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	7000 (3175)	600
A6AA160E1ABB		2A	118.2 (3002)	50.0 (1270)	105.7 (2686)	93.0 (2362)	12.8 (324)	11618 (5270)	700
A6AA180E1ABB		2A	118.2 (3002)	50.0 (1270)	105.7 (2686)	93.0 (2362)	12.8 (324)	11618 (5270)	800
A6AA205E1ABB		2B	128.1 (3253)	55.0 (1397)	105.7 (2686)	93.0 (2362)	12.8 (324)	13280 (6024)	900
A6AA220E1ABB		2B	128.1 (3253)	55.0 (1397)	105.7 (2686)	93.0 (2362)	12.8 (324)	13280 (6024)	1000
A6AA280E1ABB		3	200.6 (5096)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	16535 (7500)	1250
A6AA330E1ABB	D	3	200.6 (5096)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	16535 (7500)	1500
A6AA390E1ABB		3	200.6 (5096)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	19000 (8618)	1750
A6AA440E1ABB		4A	255.7 (6500)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	24460 (11095)	2000
A6AA505E1ABB		4A	255.7 (6500)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	24460 (11095)	2250
A6AA550E1ABB		4B	267.5 (6800)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	26665 (12095)	2500
A6AA600E1ABB		4B	267.5 (6800)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	26665 (12095)	2750

1 : Nominal ratings for 4-pole NEMA B Motor

4.16 kV Class

Model CIMR-MV2U	Fig.	Frame Size	Dimensions Inches (mm) Width W	Depth D	Height H	Height H1	Height H2	Weight lbs (kg)	HP[1]
D6DA039E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6040 (2740)	300
D6DA052E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6040 (2740)	400
D6DA058E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6040 (2740)	450
D6DA064E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	6040 (2740)	500
D6DA077E1ABB	C	1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	7000 (3175)	600
D6DA093E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	7000 (3175)	700
D6DA102E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	7000 (3175)	800
D6DA115E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	7559 (3429)	900
D6DA125E1ABB		1	93.2 (2366)	41.5 (1055)	109.3 (2776)	102.4 (2602)	6.9 (74)	7559 (3429)	1000
D6DA155E1ABB		2A	118.2 (3002)	50.0 (1270)	105.7 (2686)	93.0 (2362)	12.8 (324)	11618 (5270)	1250
D6DA190E1ABB		2A	118.2 (3002)	50.0 (1270)	105.7 (2686)	93.0 (2362)	12.8 (324)	11618 (5270)	1500
D6DA220E1ABB		2B	128.1 (3253)	55.0 (1397)	105.7 (2686)	93.0 (2362)	12.8 (324)	13280 (6024)	1750
D6DA250E1ABB		2B	128.1 (3253)	55.0 (1397)	105.7 (2686)	93.0 (2362)	12.8 (324)	13280 (6024)	2000
D6DA285E1ABB		3	200.6 (5096)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	16535 (7500)	2250
D6DA315E1ABB		3	200.6 (5096)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	16535 (7500)	2500
D6DA340E1ABB	D	3	200.6 (5096)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	19000 (8618)	2750
D6DA375E1ABB		3	200.6 (5096)	63.1 (1602)	99.6 (1531)	86.8 (2204)	12.9 (326)	19000 (8618)	3000
D6DA440E1ABB		4A	255.7 (6500)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	24460 (11095)	3500
D6DA505E1ABB		4A	255.7 (6500)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	24460 (11095)	4000
D6DA575E1ABB		4B	267.5 (6800)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	26665 (12095)	4500
D6DA625E1ABB		4B	267.5 (6800)	63.0 (1600)	110.2 (2800)	90.6 (2300)	15.75 (400)	26665 (12095)	5000

Model Number

Model Number Designation

CIMR- MV2 U A 6 A A 052 E1 A B A

- **CIMR-** — Drive
- **MV2** — MV1000 Series
- **U** — Region Code
  - A : Japan
  - U : U.S.A.
- **A** — Input Voltage Class
  - A : 2.4 kV
  - D : 4.16 kV
- **6** — Input Frequency
  - 6 : 60 Hz
  - 5 : 50 Hz
- **A** — Output Voltage Class
  - A : 2-kV class
  - D : 4-kV class
- **A** — Customized Specifications
  - A : Standard model
- **052** — Output Current (see table below)
- **E1** — Enclosure Type
  - E1 : IP40 - NEMA Type 1
- **A** — Environmental Specifications
  - A : Standard
- **B** — Design Revision Order
  - A, B, C, etc.
- **A** — Switch Gear Option
  - A : Without input switchgear
  - B : With input switchgear

Note: All input voltage classes are not necessarily compatible with all output voltage classes.

Output Current:

2.4 kV Class	4.16 kV Class
052 : 52 A	039 : 39 A
068 : 68 A	052 : 52 A
080 : 80 A	058 : 58 A
093 : 93 A	064 : 64 A
102 : 102 A	077 : 77 A
115 : 115 A	093 : 93 A
135 : 135 A	102 : 102 A
160 : 160 A	115 : 115 A
180 : 180 A	125 : 125 A
205 : 205 A	155 : 155 A
220 : 220 A	190 : 190 A
280 : 280 A	220 : 220 A
330 : 330 A	250 : 250 A
390 : 390 A	285 : 285 A
440 : 440 A	315 : 315 A
505 : 505 A	340 : 340 A
550 : 550 A	375 : 375 A
600 : 600 A	440 : 440 A
	505 : 505 A
	575 : 575 A
	625 : 625 A

Drive Options

Type		Name	Function	Manual No./Notes
Plug-in	Speed (Frequency) Reference Card	Analog Input AI-A3	Enables high-precision and high-resolution analog speed reference setting. • Input signal level: −10 to +10 Vdc (20 kΩ) 4 to 20 mA (500 Ω) • Input channels: 3 channels (DIP switch for input voltage/input current selection) • Input resolution: Input voltage 13 bit signed (1/8192) Input current 1/6554	TOBPC73060038
		Digital Input DI-A3	Enables 16-bit digital speed reference setting. • Input signal: 16 bit binary, 4 digit BCD + sign signal + set signal • Input voltage: +24 V (isolated) • Input current: 8 mA User-set: 8 bit, 12 bit, 16 bit	TOBPC73060039
	Communications Card	DeviceNet Interface SI-N3	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through DeviceNet communication with the host controller.	TOBPC73060043 SIJPC73060043
		PROFIBUS-DP Interface SI-P3	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through PROFIBUS-DP communication with the host controller.	TOBPC73060042 SIJPC73060042
		Ethernet TCP/IP Interface SI-EN3	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through EtherNet TCP/IP communication with the host controller.	TOEPYEACOM04 SIEPYEACOM04
		Modbus/TCP/IP Interface SI-EM3	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through Modbus/TCP/IP communication with the host controller.	TOEPYEACOM05 SIEPYEACOM05
	Monitor Card	Analog Monitor AO-A3	Outputs analog signal for monitoring drive output state (output freq., output current etc.). • Output resolution: 11 bit signed (1/2048) • Output voltage: −10 to +10 Vdc (non-isolated) • Terminals: 2 analog outputs	TOBPC73060040
		Digital Output DO-A3	Outputs isolated type digital signal for monitoring drive run state (alarm signal, zero speed detection, etc.) • Terminals: 6 photocoupler outputs (48 V, 50 mA or less) 2 relay contact outputs (250 Vac, 1 A or less 30 Vdc, 1 A or less)	TOBPC73060041
	PG Speed Controller Card	Complementary Type PG Interface PG-B3	For control modes requiring a PG encoder for motor feedback. • Phase A, B, and Z pulse (3-phase) inputs (complementary type) • Max. input frequency: 50 kHz • Pulse monitor output: Open collector, +24 V, max. current 30 mA • Power supply output for PG: +12 V, max. current 200 mA	TOBPC73060036
		Line Driver PG Interface PG-X3	For control modes requiring a PG encoder for motor feedback. • Phase A, B, and Z pulse (differential pulse) inputs (RS-422) • Max. input frequency: 300 kHz • Pulse monitor output: RS-422 • Power supply output for PG: +5 V or +12 V, max. current 200 mA	TOBPC73060037
Panel Mount	Momentary Power Loss Compensation	Uninterruptible Power Supply (UPS)	UPS is installed inside the panel and backs up the control power supply when momentary power losses occur. This option is required to enable momentary power loss functions (speed search function or KEB function).	Engineered Option
	Backup Cooling Fan		Automatically enables continued operation of the drive in case of one of the cooling fans fails to operate. (N + 1 backup system)	Under development
External	USB Copy Unit JVOP-181		Enables the copying and transfer of parameters between drives using (one-touch) simple operations. This unit can also be used as a conversion connector between the communication port (RJ-45) of a drive and a USB port of a PC running DriveWizard Plus MV. This option comprises a copy unit with USB interface, an RJ-45 cable and a USB cable.	IG-V1000.01
	Lifter for Replacing Power Cells		Facilitates power cell replacement.	Available as option

Application Examples

Fans, Blowers, Pumps (Variable Torque Load)

Advantages

1. Energy-saving operation

- Switching operation from conventional damper (valve) control using a commercial power supply to frequency control with MV1000 saves a large amount of energy.
- Increased energy savings are possible with machines with standby operation (under normal duty conditions).

2. Stable operation

- The speed can be retrieved quickly by the speed search function in response to momentary power loss.*
- The KEB function allows operation to continue without base-blocking even when momentary power losses occur. When priority is given to continuing operation, the fault restart function enables MV1000 to continue running even if an unexpected error is detected.

*: A UPS unit is required to supply control power.

3. Optimize operation

- Because the airflow (flow rate) is controlled directly by the drive output frequency, with none of the pressure loss by dampers (valves), the ideal operation pattern is easily achieved.
- The machine can be started and stopped frequently.
- With speed search function, operation can be smoothly restarted even when fans are coasting.
- Minimum frequency setting function prevents pumps from cavitation.

4. Extended machine life

- The machine runs at low speed during no-load operation, helping to prolong its life.
- Controlled starting and stopping (soft start) minimizes mechanical shock, further extending machine life.

5. Reduced power supply capacity

- With MV1000, the accel/decel times can be optimized, reducing the starting current. The power supply capacity can be reduced compared to across-the-line starting.

Vector control makes it simple to operate constant torque loads like extruders, conveyors, rotary kilns, banbury mixers and machine tools.

Advantages

1. Improved response and operating efficiency

- High starting torque required for operation is provided.
- Vector control improves response against load fluctuations, enabling stable operation.
- Starting current can be kept lower than with direct-on-line, enabling frequent stopping and starting and efficient operation.

2. Improved speed control accuracy

- High-accuracy speed control improves machine performance.

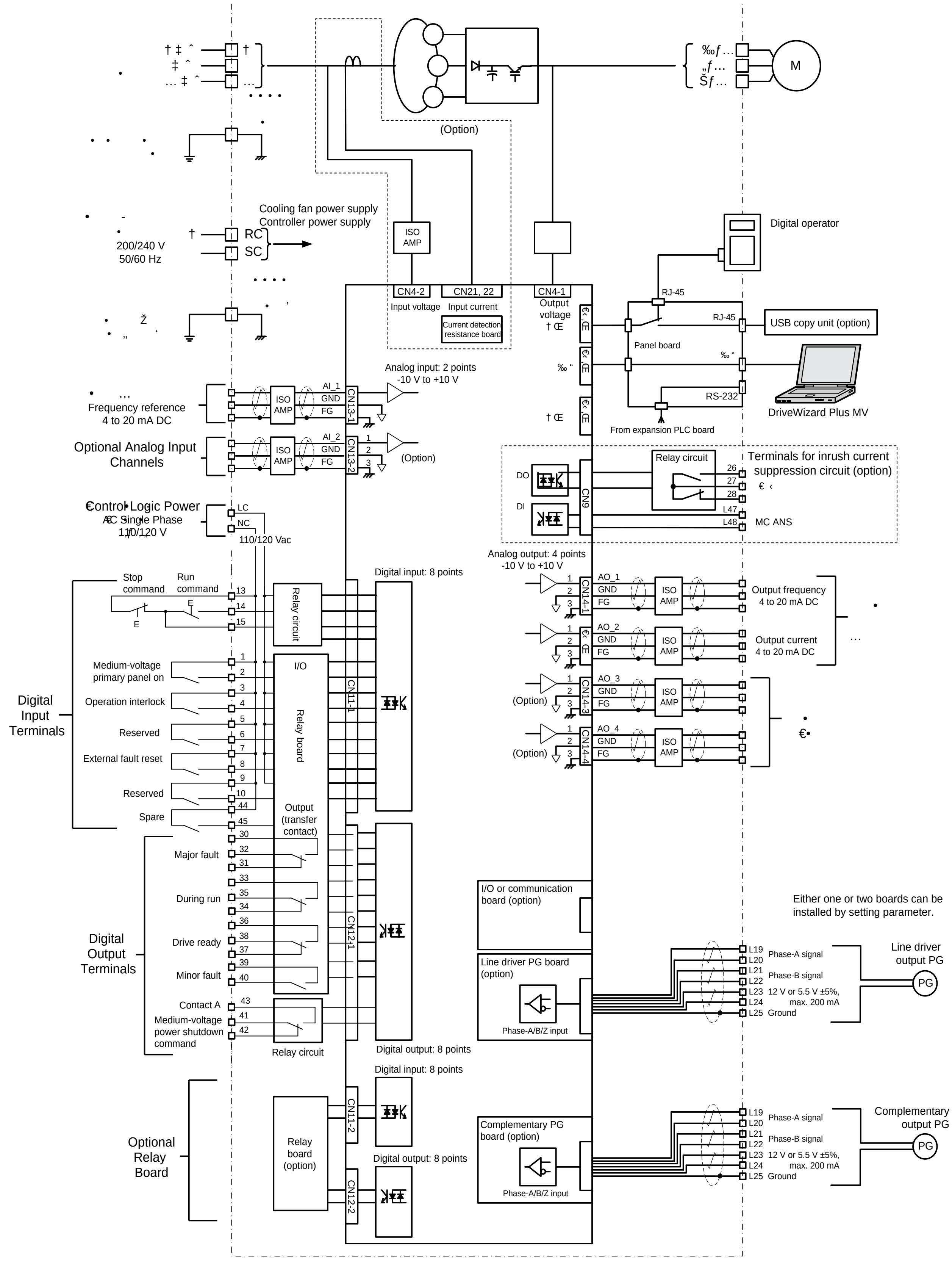
3. Energy-saving effects

- Using frequency control instead of fluid-couplings or wound rotor motors minimizes losses in low speed operations, saving energy.

4. Better maintainability

- Using a squirrel-cage motor and the MV1000 minimizes motor maintenance compared to wound rotor motors with rotor resistance control.
- Using the MV1000 instead of fluid couplings simplifies the drive system and reduces mechanical maintenance.

Standard Connection Diagram



Protective Functions

Drive Faults

Fault	Display	Meaning
DC Bus Undervoltage	Uv1	The average DC voltage of the main circuit for power cells fell lower than the value set in L2-05 (main circuit undervoltage (Uv) detection level).
Ground Fault	GF	The ground-fault current at the drive output side exceeded 50% of the rated output current of the drive.
Voltage Unbalance	VUB	The total value of the output voltage for the three phases exceeded the detection level for longer than the stipulated time.
Output Phase Loss	LF	An open-phase occurred at the drive output. (Detected when L8-07 is set to 1 or 2.)
Transformer Temperature Fault	TME	The temperature input from the transformer exceeded the operation level.
Internal Fan Fault	FAn	A fault on the drive cooling fan has been detected.
Motor Overload	oL1	The motor overload protection function has operated based on the internal electronic thermal value.
Drive Overload	oL2	The drive overload protection function has operated based on the internal electronic thermal value.
Overtorque Detection 1	oL3	There has been a current greater than the setting in L6-02 (overtorque/undertorque detection level 1) for longer than the time set in L6-03 (overtorque/undertorque detection time 1).
Overtorque Detection 2	oL4	There has been a current greater than the setting in L6-05 (overtorque/undertorque detection level 2) for longer than the time set in L6-06 (overtorque/undertorque detection time 2).
Undertorque Detection 1	UL3	There has been a current below the setting in L6-02 (overtorque/undertorque detection level 1) for longer than the time set in L6-03 (overtorque/undertorque detection time 1).
Undertorque Detection 2	UL4	There has been a current below the setting in L6-05 (overtorque/undertorque detection level 2) for longer than the time set in L6-06 (overtorque/undertorque detection time 2).
Overspeed	oS	The speed detection value based on pulse inputs exceeded the value set in F1-08 (overspeed detection level).
PG Disconnect	PGo	The speed detection value based on pulse inputs stayed at 0 for the time set in F1-14 (PG disconnection detection time).
PG Hardware Fault (detected when using a PG-X3 option card)	PGoH	Disconnection of the PG cable has been detected (only when equipped with PG-X3).
Speed Deviation	dEv	The deviation between the speed detection value based on pulse inputs and the speed reference exceeded the value set in F1-10 (excessive speed deviation detection level) for longer than the time set in F1-11 (excessive speed deviation detection time).
Control Fault	CF	The torque limit has been reached continuously for 3 seconds or longer during deceleration to a stop under open-loop vector control.
PID Feedback Loss	FbL	The PID feedback input went below the fault detection level for longer than the set time (detected when b5-12 is set to 2).
External Fault	EF□□	An external fault signal has been input from a multi-function contact input terminal (S□□). (□□: External input number)
Modbus/TCP/IP Communication Error	CE	Control data has not been received for longer than the time set in H5-09 (CE detection time) after being successfully received once.
Option Card Connection Error	oFA□□	A fault related to an option card has been detected. (□□: fault number, details of the fault)
Control Circuit Error	CPF□□	A fault related to the controller has been detected. (□□: fault number, details of the fault)
Digital Operator Connection Fault	oPr	The connection to the digital operator was broken during operation in response to a run command from the digital operator.
CCB-MB Communications Error (Link fault)	LIN	Response data from power cells have not been detected for longer than the set detection time.

Power Cell Faults

Fault	Display	Meaning
Overcurrent	CFA □□ : OC	An output current greater than the specified overcurrent level has been detected.
Overvoltage	CFA □□ : OV	The DC voltage at the P side or N side of the main circuit exceeded the overvoltage detection level.
Undervoltage	CFA □□ : CUV	The DC voltage at the P side or N side of the main circuit fell below the undervoltage detection level.
Excessive Temperature	CFA □□ : OH	The temperature detection value exceeded the fault detection level.
Main Circuit Capacitor Neutral Point Potential Error	CFA □□ : VCF_OV	The DC voltage at the P side or N side of the main circuit became unbalanced.
IGBT Fault	CFA □□ : IGBT_FLT	An IGBT fault (arm short-circuit, output short-circuit, or circuit fault) has been detected.
Fuse Blown	CFA □□ : FU	Operation of a main circuit fuse or open-phase in the input voltage has been detected.
Initial Error	CFA □□ : INIT_ERR	A discrepancy has been detected in the initial setting data from the main controller.
Conversion Error	CFA □□ : AIN_ERR	A fault in the analog-to-digital converter or the peripheral circuit has been detected.
Thermistor Disconnect	CFA □□ : THBOW	The temperature detection value fell to −30˚C or lower.

Terminal Functions

Main Circuit Terminals (Common to all Models)

Type	Terminal No.	Terminal Function
Main Circuit Input Terminals	R	2.4 kV or 4.16 kV, 60 Hz
	S	
	T	
Main Circuit Output Terminals	U	2.4 kV or 4.16 kV, 60 Hz
	V	
	W	
Ground Terminal	EA	Grounding of the main circuit
Control Power Supply Input Terminal	RC	200/240 VAC, Single Phase 50/60 Hz
	SC	
	LC	110/120 VAC 50/60Hz
	NC	
Ground Terminal	ED	Grounding of the control system

Control Circuit Terminals (Common to all Models)

Type	Terminal No.	Signal Name	Signal Level	Terminal Function
Analog Input Terminals	L1	Speed (Frequency) Reference	4 to 20 mA DC (0 to 10 V as option)	Speed (frequency) reference input signal
	L2			Ground
	L3			Shield ground
Analog Output Terminals	L4	Output Frequency	4 to 20 mA DC (0 to 10 V as option)	Output frequency reference output signal
	L5			Ground
	L6			Shield ground
	L7	Output Current	4 to 20 mA DC (0 to 10 V as option)	Output current reference output signal
	L8			Ground
	L9			Shield ground
Digital Input Terminals	1	Medium-Voltage Primary Panel On	Contact input 120 VAC	ON: Medium voltage power present
	2			
	3	Operation Interlock	Contact input 120 VAC	External interlock
	4			
	5	Reserved	—	—
	6			
	7	External Fault Reset	Contact input 120 VAC	ON: Reset
	8			
	9	Reserved	—	—
	10			
	13	Run Command/ Stop Command	Contact input 120 VAC	ON: Run
	14			
	15			OFF: Stop
Digital Output Terminals	30	Major Fault	Form C contact 220 VAC/15 A 110 VAC/15 A 24 VDC/15 A	Open: Major Fault
	31			
	32			
	33	During run	Form C contact 220 VAC/15 A 110 VAC/15 A 24 VDC/15 A	Closed: During run
	34			
	35			
	36	Drive Ready	Form C contact 220 VAC/15 A 110 VAC/15 A 24 VDC/15 A	Closed: Drive Ready
	37			
	38			
	39	Minor Fault	N.O. contact 220 VAC/15 A 110 VAC/15 A 24 VDC/15 A	Closed: Minor Fault
	40			
	41	Medium-Voltage Power Shutdown Command	N.C. contact 220 VAC/10 A 24 VDC/10 A	Closed (N.C.) : closed when power is off
	42			

Software Functions

The following software functions optimize the system to provide application flexibility.

Functions at Start and Stop

Optimal Deceleration

Optimal deceleration without needing to set the deceleration time.

Drive slows the application smoothly controlling DC bus voltage.

High Slip Braking

Suitable for applications with occasional stopping, such as emergency stopping of large-inertia loads

Reduces the deceleration time at emergency stops.

Speed Search

Start a coasting motor.

Automatically brings a coasting motor back to the set frequency without using an encoder

Dwell Function

Accelerate and decelerate smoothly with large inertia loads.

Drive prevents speed loss by holding the output frequency at a constant level during acceleration and deceleration.

Accel/Decel Time Switch

Switch easily between accel/decel times.

Switch acceleration and deceleration rates when running two motors from the same drive, or assign specific accel/decel rates when operating at high speed or at low speed.

Direct Current Braking at Start

Braking the motor by applying direct current when starting

Enables stopping of a coasting motor for restarting or quickly generating motor magnetic flux (initial excitation) to obtain high starting torque.

Reference Functions

Frequency Reference Upper/Lower Limits

Limit motor speed.

Set speed limits and eliminate the need for extra peripheral devices and extraneous hardware.

Frequency Jump

Skip over troublesome resonant frequencies.

Drive can be programmed to avoid machine resonance problems by avoiding operation at certain speeds.

Frequency Reference Hold

Improved operability.

Momentarily holds the operating frequency during acceleration or deceleration as the load is lowered or raised.

Droop Control

Balances the load automatically between motors.

Calculates the ratio of the load torque and adjusts motor speed accordingly.

Functions for Top Performance

IM/SM Compatible

Supporting both IMs and SMs

Controls synchronous motors (SM) as well as induction motors (IM).

Line/Drive Transfer

Seamlessly performs transfer operation from line to drive and drive to line

Energy Saving

Optimizes motor efficiency

The drive supplies voltage to the motor relative to the speed and load so that the application is operating at the most efficient level.

Current Vector Control

Achieves high levels of performance.

The drive comes with current vector control capabilities for high performance applications.

Software Functions

Multi-speed Operation

Simple multi-speed operation

Enables speed selection of up to 17 steps. Speed selection is enabled during operation by using multi-function digital inputs.

PID Control

Automatic PID control

The internal PID controller fine-tunes the output frequency for precise control of pressure, flow, or other variables.

Motor 2 Switch

One drive runs two motors.

Use a single drive to operate two different motors

V/f Control (Multi-motor Drive)

Controlling multiple motors

Runs multiple motors simultaneously in parallel.

Overtorque Detection

Improved reliability in continuous operation while protecting the system

Outputs a signal when the motor torque exceeds a preset overtorque detection level. This signal can be used as an interlock to protect the machine.

Torque Limit

Improved reliability in continuous operation while protecting the system

Helps protect the system by restricting motor torque to a preset level. The output frequency is controlled according to the overload status.

Timer Function

No need for extra hardware

Control timing by opening and closing the output signal relative to the input signal.

Continuous Run during Reference Loss

Keeps the application running

Maintains continuous operation even if the controller fails and the frequency reference is lost.

Fault Retry

Improved reliability in continuous operation

Resets the system automatically after performing self-diagnostics when the drive detects an error. A number of retries up to 10 can be selected.

Protective Functions

Momentary Power Loss Compensation

Keep running during a momentary power loss*

Automatically restarts the motor and keeps the application running during a momentary power loss.

*: UPS is required to supply control power.

Excessive Deceleration Prevention

Prevent overvoltage trips on deceleration

Controls the deceleration rate automatically by monitoring the DC-bus voltage to prevent overvoltage during deceleration.

Load Speed Display

Monitor actual speed of the motor and load.

Scalable speed display function allows monitoring in machine units

Copy Function

Save parameter settings to the digital operator.

Copy all parameter settings to the operator keypad, and then transfer those settings to another drive. Saves setup and maintenance time.

KEB Function

Continuous operation during a momentary power loss*

Uses regenerated energy from the motor to bring the application to a stop rather than simply letting it coast.

*: UPS is required to supply control power.

Notes on Using Drives

Selection

■ Power Supply Capacity

The power supply to be connected to the drive should have a capacity larger than the power required by the drive with the power factor and efficiency taken into account. When connecting multiple drives to a single power supply, select a power supply with a capacity larger than the sum of the power required by all the drives to be connected. Even when the power supply has sufficient capacity, the power supply voltage may drop when the power is turned on, causing malfunction of connected devices if the power supply has a large impedance.

■ Drive Capacity

When running multiple induction motors in parallel using a single drive, the capacity of the drive should be larger than 1.1 times the total motor rated current.

■ Starting Torque

The overload current rating of the drive determines the starting and acceleration characteristics of the motor. For applications that require high starting torque, select a drive with a larger capacity.

■ Emergency Stop

When the drive trips on a fault, the drive output is shut off. The motor coasts to rest. A mechanical brake may by needed to stop the motor depending on the installation. The MV1000 Fast Stop function may be sufficient in some installations.

Installation

■ Ambient Environment

Keep the drive in a clean environment that is free from airborne oil mist, corrosive gas, flammable gas, lint and dust. Install the fan cover at the top of the panel before starting operation. Any modification to the outside of the panel cooling fan, such as connecting a duct, may reduce air flow for cooling and cause overheating and faults.

■ Drive Storage

When storing the drive, observe the following points to maintain its reliability.

- Short term storage of the drive
  Short term storage refers to cases where the drive is stored for up to one month after unpacking or up to three months after shipping. Secure a storage environment that satisfies the conditions cited for the drive's environmental specification. Note that an ambient temperature from −20˚C to +60˚C (4˚F to 140˚F) is acceptable.
- Long term storage of the drive
  Long term storage refers to cases where the drive is stored for more than one month after unpacking or more than three months after shipping. Contact Yaskawa if long term storage is required. Note that an ambient temperature from -5˚C to 50˚C (23˚F to 122˚F) is acceptable.
- Store the spare parts without unpacking them. For details, refer to the storage method described in the Instruction Manual.

■ Grounding Specification

Provide a dedicated ground(EA) of less than 10 Ω for the main circuit of the drive and a dedicated ground(ED) of less than 100 Ω for the control circuit.

■ Compliance with local laws

Comply with the laws of the country and locality where the product is installed

Settings

■ Use V/f control when running multiple induction motors using a single drive.

■ Upper Limits

The drive is capable of running the motor at up to 120 Hz. Incorrect settings might result in dangerous operating conditions. Set the upper limit for the frequency to control the maximum speed. (The maximum output frequency for operation by external input signals is set to 60 Hz by default.)

■ Accel/Decel Times

Minimum accel and decel times are determined by the torque that the motor can generate, the load torque, and the moment of inertia (Wk^2). Set a longer accel/decel time when the stall prevention function is activated during accel/decel. When the stall prevention function is activated, the accel/decel time is extended to cover the time that the function operates. To achieve even faster acceleration and deceleration, select a motor and drive with greater capacity.

General Handling

■ Wiring Check

Never short circuit the output terminals of the drive or apply voltage from the power supply to the output terminals (U, V, W). This will damage the drive. Carry out wiring that conforms to the wire sizes and tightening torques described in the Instruction Manual. Conduct a thorough check for wiring errors before turning the power on.

■ Breaker/Magnetic Contactor Selection and Installation

Select a breaker with sufficient capacity for the power supply side of the drive, taking the inrush current from the transformer into account.
Avoid using the breaker or magnetic contactor for frequent starting/stopping. This may damage the drive. Do not switch the breaker/magnetic contactor ON/OFF more than twice a day. If it is operated more frequently, consult Yaskawa.

■ Inspection and Maintenance

Please consult MV1000 Installation and Startup Manual prior to performing any maintenance.

■ Transportation/Installation

Never steam clean the drive.
During transportation and installation, the drive must never be exposed to an atmosphere containing a halogen gas such as fluorine, chlorine, bromine, or iodine.

■ Hoisting

With some large capacity drives, the transformer, rather than the transformer panel itself, must be hoisted directly.
The drive may deform or fall if the drive panel frame is hoisted.
For details, refer to the installation method described in the Instruction Manual.

■ Radio Frequency Interference

Inputs and outputs of the drive (main circuit) contain harmonic components that may adversely affect communication devices, such as AM radios, used in the vicinity. Use high-voltage cables and ground any shielded cables. Separate cables for control from high-current circuits (main circuit and relay sequence circuits) to avoid induction from peripheral devices. (It is advisable to separate them by a distance of 12 inches or more)

■ Leakage Current

Harmonic leakage current passes through stray capacitance between the drive power lines, ground and the motor lines. Consider taking measures against this leakage current.

Notes on Motor Operation

Application to Existing Standard Motors

■ Insulation Tolerance

Consider voltage tolerance levels and insulation in applications with high input voltage or particularly long wiring distances. Contact Yaskawa for consultation.

■ High Speed Operation

Running a motor beyond its rated speed may lead to problems imposed by vibration or the durability of motor bearings. Contact the manufacturer of the motor for details.

■ Torque Characteristics

When powered by a VFD, the torque characteristics of the motor differ from when it is powered by a commercial power supply. Therefore, the load torque characteristics that the motor will see need to be confirmed.

■ Vibration and Shock

The PWM control with multiple outputs connected in series of MV1000 reduces motor oscillation to the same level as in operation by commercial power supply. However, the motor oscillation is slightly larger due to the following factors.

(1) Resonance with the natural frequency of the mechanical system

Take particular caution when using a VFD for an application that is conventionally run by commercial power at a constant speed. Installing shock absorbing rubber under the base of the motor and using Frequency Jump function can be effective measures.

(2) Residual unbalance of the rotating motor

Particular care is required when running the motor beyond its rated speed.

(3) Subsynchronous Resonance

Subsynchronous resonance may occur in fans, blowers, turbines, and other applications with high load inertia, as well as in motors with a relatively long shaft.
Yaskawa recommends using the closed loop vector control for such applications.

Global Service Network

Region	Service Area	Service Location	Service Agency	Telephone/Fax
North America	U.S.A	Chicago (HQ), Boston, North Carolina,New Jersey, San Francisco, Los Angeles	1 YASKAWA AMERICA, INC.	Headquarters ☎ +1-847-887-7000 FAX +1-847-887-7310
	Canada	Montréal	2 YASKAWA CANADA, INC.	☎ +1-514-693-6770 FAX +1-514-693-9212
	Mexico, Belize, Guatemala, Honduras, El Salvador	Mexico City	3 PILLAR MEXICANA. S.A. DE C.V.	☎ +52-555-660-5553 FAX +52-555-651-5573
South America	Brazil	São Paulo	4 YASKAWA ELÉTRICO DO BRASIL LTD.A.	☎ +55-11-3585-1100 FAX +55-11-5581-8795
	Nicaragua, Panama, Costa Rica, Colombia, Venezuela, Peru, Ecuador	Bogotá	5 VARIADORES S.A.	☎ +57-1-428-4225 FAX +57-1-428-2173
	Argentina, Chile, Bolivia, Paraguay, Uruguay	Buenos Aires	6 ELINSUR, SRL	☎ +54-11-4918-2056 FAX +54-11-4918-1183
Europe	Europe and South Africa	Frankfurt	7 YASKAWA ELECTRIC EUROPE GmbH	☎ +49-6196-569-300 FAX +49-6196-569-398
Asia	Japan	Tokyo, offices nationwide	8 YASKAWA ELECTRIC ENGINEERING CORPORATION (After-sales service)	☎ +81-4-2931-1810 FAX +81-4-2931-1811
	South Korea	Seoul	9 YASKAWA ELECTRIC KOREA CORPORATION	☎ +82-2-784-7844 FAX +82-2-784-8495
	China	Beijing, Guangzhou, Shanghai	10 YASKAWA ELECTRIC (SHANGHAI) Co., Ltd.	☎ +86-21-5385-2200 FAX +86-21-5385-3299
	Taiwan	Taipei	11 YASKAWA ELECTRIC TAIWAN Co.	☎ +886-2-2502-5003 FAX +886-2-2505-1280
	East Asia, Oceania, Australia	Singapore	12 YASKAWA ELECTRIC (SINGAPORE) Pte. Ltd.	☎ +65-6282-3003 FAX +65-6289-3003
	Thailand	Bangkok	13 YASKAWA ELECTRIC (THAILAND) Co., Ltd.	☎ +66-2-693-2200 FAX +66-2-693-2204
	India	Mumbai	14 LARSON & TOUBRO LIMITED	Headquarters ☎ +91-22-67226200 +91-22-27782230 FAX +91-22-27783032
	Indonesia	Jakarta	15 PT. YASKAWA ELECTRIC INDONESIA	☎ +62-21-57941845 FAX +62-21-57941843

MV1000 Drive: 3000 HP, 4.16 kV, with Input Switchgear Option

Yaskawa America, Inc.
Drives & Motion Division

2121 Norman Drive South
Waukegan, IL 60085
Tel: 1-800-YASKAWA (927-5292) • Fax: 1-847-887-7310

www.yaskawa.com