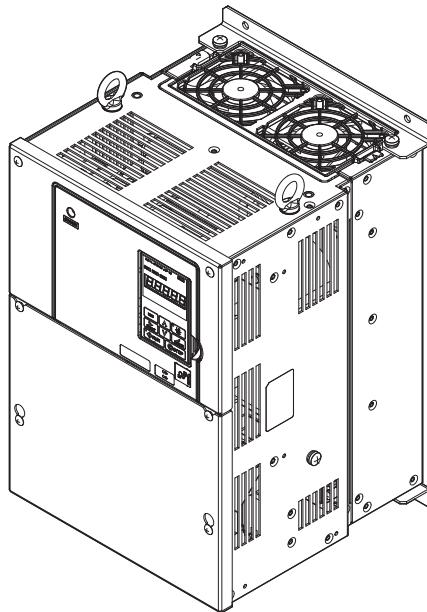![YASKAWA]

YASKAWA D1000 Series
Power Regenerative Converter
Quick Start Guide

Type: CIMR-D☐☐☐☐☐☐☐☐
Models: 200 V Class, Three-Phase Input: 5 to 130 kW
       400 V Class, Three-Phase Input: 5 to 630 kW

To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.
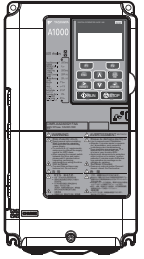
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1 Preface

Yaskawa manufactures products used as components in a wide variety of industrial systems and equipment. The selection and application of Yaskawa products remain the responsibility of the equipment manufacturer or end user. Yaskawa accepts no responsibility for the way its products are incorporated into the final system design. Under no circumstances should any Yaskawa product be incorporated into any product or design as the exclusive or sole safety control. Without exception, all controls should be designed to detect faults dynamically and fail safely under all circumstances. All systems or equipment designed to incorporate a product manufactured by Yaskawa must be supplied to the end user with appropriate warnings and instructions as to the safe use and operation of that part. Any warnings provided by Yaskawa must be promptly provided to the end user. Yaskawa offers an express warranty only as to the quality of its products in conforming to standards and specifications published in the Yaskawa manual. NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS OFFERED. Yaskawa assumes no liability for any personal injury, property damage, losses, or claims arising from misapplication of its products.

This manual is designed to ensure correct and suitable application of D1000-Series power regenerative converters. Read this manual before attempting to install, operate, maintain, or inspect a converter and keep it in a safe, convenient location for future reference. Be sure you understand all precautions and safety information before attempting application.

◆ Applicable Documentation

The following manuals are available for D1000 series:

	YASKAWA D1000 Series Power Regenerative Converter Quick Start Guide (TOEP C710656 06) (This document)
	This guide is packaged together with the product and contains basic information required to install and wire the converter, in addition to an overview of fault diagnostics, maintenance, and parameter settings. It is meant to get the converter ready for a trial run with the application and for basic operation.
	YASKAWA D1000 Series Power Regenerative Converter Technical Manual (SIEP C710656 06)
	This manual is available for download on our documentation website, www.yaskawa.eu.com. It provides detailed information on parameter settings, functions, and MEMOBUS/Modbus specifications. Use this manual to expand the functionality of the converter and to take advantage of higher performance features.

◆ General Warnings

⚠ WARNING
Read and understand this manual before installing, operating or servicing this unit. The unit must be installed according to this manual and local codes.
The following conventions are used to indicate safety messages in this manual. Failure to heed these messages could result in serious or fatal injury or damage to the products or to related equipment and systems.

⚠ DANGER
Indicates a hazardous situation, which, if not avoided, will result in death or serious injury.

⚠ WARNING
Indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

⚠ CAUTION
Indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

NOTICE
Indicates a property damage message.

◆ Safety Messages

⚠ DANGER

Heed the safety messages in this manual.

Failure to comply will result in death or serious injury.

The operating company is responsible for any injuries or equipment damage resulting from failure to heed the warnings in this manual.

Electrical Shock Hazard

Do not install, wire, maintain, or inspect the product or replace parts while the power supply is turned on.

Failure to comply will result in death or serious injury.

Disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the converter before touching any components.

Do not turn on the power supply or supply power to the input-side AC reactor or to the harmonic filter (harmonic filter module) only.

Voltage will remain in the internal capacitor and will result in death or serious injury. Always connect a converter as shown in the Standard Connection Diagram before you turn on the power supply.

⚠ WARNING

Sudden Movement Hazard

System may start unexpectedly upon application of power, resulting in death or serious injury.

Clear all personnel from the converter, drive, motor and machine area before applying power to the converter. Secure covers, couplings, shaft keys and machine loads.

Electrical Shock Hazard

Do not attempt to modify or alter the converter in any way not explained in this manual.

Failure to comply could result in death or serious injury.

Yaskawa is not responsible for any modification of the product made by the user. This product must not be modified.

Do not allow unqualified personnel to perform work on the converter.

Failure to comply could result in death or serious injury.

Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of converters.

Do not remove covers or touch circuit boards while the power is on.

Failure to comply could result in death or serious injury.

Always use a ground wire that complies with technical standards on electrical equipment and minimize the length of the ground wire.

Improper equipment grounding may cause dangerous electrical potentials on equipment chassis, which could result in death or serious injury.

<table>
<tr><td align="center">⚠ **WARNING**</td></tr>
</table>

Make sure the protective earthing conductor complies with technical standards and local safety regulations.

Because the leakage current exceeds 3.5 mA in model 4A0630, IEC/EN 61800-5-1 states that either the power supply must be automatically disconnected in case of discontinuity of the protective earthing conductor or a protective earthing conductor with a cross-section of at least 10 mm² (Cu) or 16 mm² (Al) must be used. Failure to comply may result in death or serious injury.

Use appropriate equipment for residual current monitoring/detection (RCM/RCD).

This converter can cause a residual current with a DC component in the protective earthing conductor. Where a residual current operated protective or monitoring device is used for protection in case of direct or indirect contact, always use an RCM or RCD of type B according to IEC/EN 60755.

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

Fire Hazard

Do not use an improper voltage source.

Failure to comply could result in death or serious injury by fire.

Verify that the rated voltage of the converter matches the voltage of the incoming power supply before applying power.

When installing an IP00/IP20 converter in a closed panel or cabinet, sufficiently cool the panel or cabinet with a cooling fan or air conditioner so that the air temperature entering the converter is 50°C or cooler.

Failure to comply could result in overheating and fire.

Tighten all terminal screws to the specified tightening torque.

Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

Do not use improper combustible materials.

Failure to comply could result in death or serious injury by fire.

Do not install the converter to a combustible surface. Never place combustible materials on the converter.

Crush Hazard

Only allow qualified personnel to operate a crane or hoist to transport the converter.

Failure to comply may result in serious injury or death from falling equipment.

<table>
<tr><td align="center">⚠ **CAUTION**</td></tr>
</table>

Do not carry the converter by the front cover or the terminal cover.

Failure to comply may result in minor or moderate injury from the main body of the converter falling.

Hold the specified locations when carrying a harmonic filter module by hand.

Holding any other location when carrying the harmonic filter module could cause the module could fall and cause injury.

Carry all standard configuration and peripheral devices in a method suitable for the weight of the device.

Incorrectly handling devices could cause them to fall and result in injury or damage to the device.

NOTICE

Do not disconnect the wiring to the converter and harmonic filter module while the converter is outputting a voltage.

Improper equipment sequencing could result in damage to the converter.

When connecting a converter, use a power supply with a capacity that is the same or higher than the capacity calculated by the power supply capacity selection formula below.

$$\text{Power supply capacity} \geq \sqrt{3} \times \text{Input power supply rated voltage} \times \text{Rated AC input current} / 1000$$

Failure to comply could result in damage to the converter.

Observe proper electrostatic discharge procedures (ESD) when handling the converter, circuit boards, and CMOSIC.

Failure to comply may result in ESD damage to the converter circuitry.

Do not perform a withstand voltage test on any part of the converter.

Failure to comply could result in damage to the sensitive devices within the converter.

Do not operate damaged equipment.

Failure to comply could result in further damage to the equipment.

Do not connect or operate any equipment with visible damage or missing parts.

Install adequate branch circuit short circuit protection per applicable codes.

Failure to comply could result in damage to the converter.

The converter is suitable for circuits capable of delivering not more than 100,000 RMS symmetrical Amperes, 240 Vac maximum (200 V Class) and 480 Vac maximum (400 V Class).

Prevent foreign matter such as metal shavings or wire clippings from falling into the converter during installation and project construction.

Failure to comply could result in damage to the converter. Place a temporary cover over the top during installation. Be sure to remove the temporary cover before start-up, as the cover will reduce ventilation and cause the converter to overheat.

Never lift the converter up while the cover is removed.

This can damage the terminal board and other components.

Do not perform signal checks during operation.

Failure to comply could result in damage to the converter.

Check the following items before you turn on the power supply.

Failure to comply could result in damage to the converter and filter module.
• Is the power supply voltage correct?
  200 V Class: AC200 to 240 V 50/60 Hz
  400 V Class: AC380 to 480 V 50/60 Hz
• Are the converter and the control devices connected properly (e.g., is the phase order correct)?
• Is the phase order correct between the main circuit terminals (R/L1, S/L2, and T/L3) on the converter and the power supply voltage detection terminals (r1/ℓ11, ⊿1/ℓ21, and t1/ℓ31).
• Are the control circuit terminals on the converter connected properly to the control devices?
• Are the Run Commands for the converter and the control devices turned off?

Replace the cooling fan correctly according to instructions in this manual.

Incorrect cooling fan mounting direction will prevent sufficient cooling of the converter and could damage internal circuits.

NOTICE
Do not use unshielded cable for control wiring.
Failure to comply may cause electrical interference resulting in poor system performance.
Use shielded, twisted-pair wires and ground the shield to the ground terminal of the converter.
Do not modify the circuitry of the converter and the filter module.
Failure to comply could result in damage to the converter and will void warranty.
Yaskawa is not responsible for any modification of the product made by the user. This product must not be modified.
Check all the wiring to ensure that all connections are correct after installing the converter and connecting any other devices.
Failure to comply could result in damage to the converter.
To get the full performance life out of the electrolytic capacitors and circuit relays, refrain from switching the converter power supply off and on more than once every 30 minutes.
If a fuse is open or equipment for residual current monitoring/detection (RCM/RCD) is tripped, check the wiring and the selection of the peripheral devices.
Contact your supplier if the cause cannot be identified after checking the above.
Do not restart the converter or immediately operate the peripheral devices if a fuse is open or an RCD is tripped.
Check the wiring and the selection of peripheral devices to identify the cause.
Contact your supplier before restarting the converter or the peripheral devices if the cause cannot be identified.
Connect the converters to power supply transformers on a 1:1 basis and use independent grounds.
If devices, such as office equipment, that is sensitive to noise are installed in the same location, connect them while observing the grounding standards for each device, separate the ground wires, and use independent grounds or noise filters to prevent noise from entering the devices through the ground wire.
Do not expose the converter to halogen group disinfectants.
Failure to comply may cause damage to the electrical components in the converter.
Do not pack the converter in wooden materials that have been fumigated or sterilized.
Do not sterilize the entire package after the product is packed.

◆ Precautions for CE Low Voltage Directive Compliance

This converter has been tested according to European standard IEC/EN 61800-5-1, and it fully complies with the Low Voltage Directive.

Do not use converter in areas with pollution higher than degree 2 and overvoltage category 3 in accordance with IEC/EN 664.

Ground the neutral point of the main power supply for 400 V Class converters.

2 Mechanical Installation

◆ Upon Receipt

Perform the following tasks after receiving the converter and the filter module:

• Inspect the converter and the harmonic filter module for damage. If the converter or the harmonic filter module appear damaged upon receipt, contact the shipper immediately.
• Verify receipt of the correct model by checking the information on the nameplate.
• If you have received the wrong model or the converter or the harmonic filter module does not function properly, contact your supplier.

◆ Nameplate
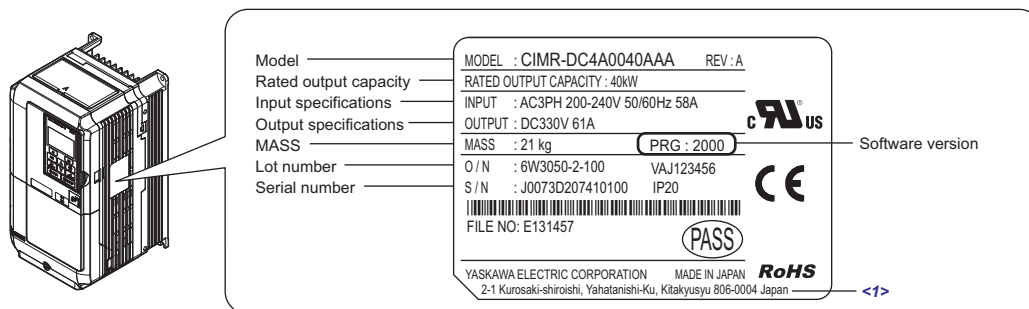
<1> The address of the head office of Yaskawa Electric Corporation (responsible for product liability) is shown on the nameplate.

Figure 1 Converter Nameplate Information Example

Figure 2 Harmonic Filter Module Nameplate Information Example

◆ Installation Environment

Install the converter in an environment matching the specifications in *Table 1* to help prolong the optimum performance life of the converter.

Table 1 Installation Environment

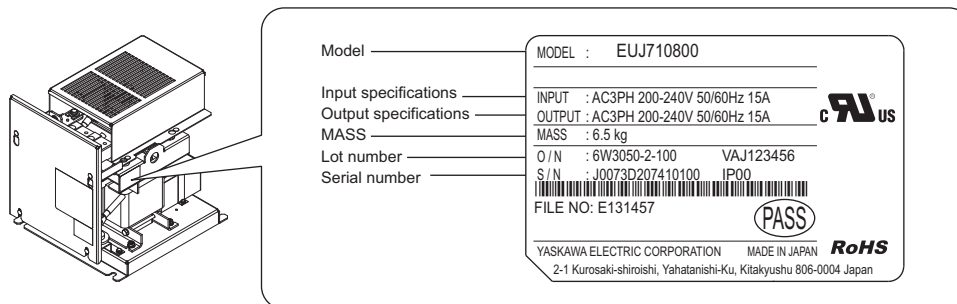| Environment	Conditions
Installation Area	Indoors
Ambient Temperature	IP00 Open Type enclosure: -10°C to +50°C IP20 Open Type enclosure: -10°C to +40°C Converter reliability improves in environments without wide temperature fluctuations. When using the converter in an enclosure panel, install a cooling fan or air conditioner in the area to ensure that the air temperature inside the enclosure does not exceed the specified levels. Do not allow ice to develop on the converter or the harmonic filter module.
Humidity	95% RH or less and free of condensation
Storage Temperature	-20°C to +60°C
Surrounding Area	Install the converter and the harmonic filter module in an area free from: • oil mist and dust • metal shavings, oil, water, or other foreign materials • radioactive materials • combustible materials (e.g., wood) • harmful gases and liquids • excessive vibration • chlorides • direct sunlight.
Altitude	1000 m or lower, up to 3000 m with derating. Refer to the Technical Manual for details.
Vibration	10 to 20 Hz at 9.8 m/s^2, 20 to 55 Hz at 5.9 m/s^2 (2A0005 to 2A0050, 4A0005 to 4A0100) 10 to 20 Hz at 9.8 m/s^2, 20 to 55 Hz at 2.0 m/s^2 (2A0065 to 2A0130, 4A0130 to 4A0370) 10 to 20 Hz at 5.9 m/s^2, 20 to 55 Hz at 2.0 m/s^2 (4A0630)
Orientation	Install the converter vertically to maintain maximum cooling effects.

NOTICE: *Avoid placing converter peripheral devices, transformers, or other electronics near the converter as the noise created can lead to erroneous operation. If such devices must be used in close proximity to the converter, take proper steps to shield the converter from noise.*

NOTICE: *Prevent foreign matter such as metal shavings and wire clippings from falling into the converter during installation. Failure to comply could result in damage to the converter. Place a temporary cover over the top of the converter during installation. Remove the temporary cover before converter start-up, as the cover will reduce ventilation and cause the converter to overheat.*

◆ Installation Orientation and Spacing

Figure 3 shows the installation distance required to maintain sufficient space for airflow and wiring. Install the heatsink against a closed surface to avoid diverting cooling air around the heatsink.
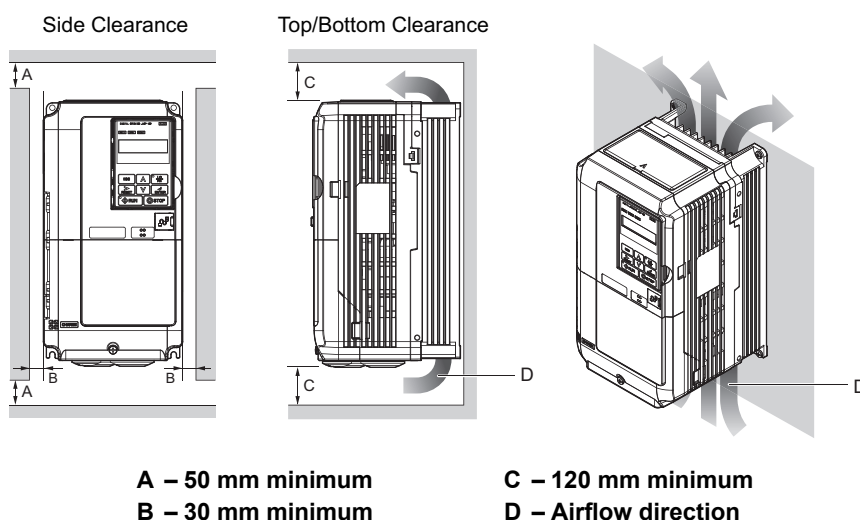

A – 50 mm minimum	**C – 120 mm minimum**
B – 30 mm minimum	**D – Airflow direction**

Figure 3 Correct Installation Spacing (Single)

■ Installation Screws

Refer to *Exterior and Mounting Dimensions on page 13* for the sizes of the installation screws.

◆ Precautions and Instructions for Installation

Read the following precautions and instructions before installing models 4A0270 to 4A0630.

WARNING! *Crush Hazard. Observe the following instructions and precautions. Failure to comply could result in serious injury or death from falling equipment.*

- *Only use vertical suspension to temporarily lift the converter during installation to an enclosure panel.*
- *Do not use vertical suspension to transport the converter.*
- *Use screws to securely affix the converter front cover, terminal blocks, and other converter components prior to vertical suspension.*
- *Do not subject the converter to vibration or impact greater than 1.96 m/s^2 (0.2 G) while it is suspended by the wires.*
- *Do not attempt to flip the converter over while it is suspended by the wires.*
- *Do not leave the converter unattended while it is suspended by the wires.*

■ Horizontal Suspension of Models 2A0065 to 2A0130 and 4A0130 to 4A0370

To make a wire hanger or frame for use when lifting the converter with a crane, lay the converter in a horizontal position and pass a wire through the holes of the four eye bolts.

NOTICE: *Damage to Equipment. When lifting the converter, confirm that the spring washer is fully closed. Failure to comply may deform or damage the converter when lifted.*
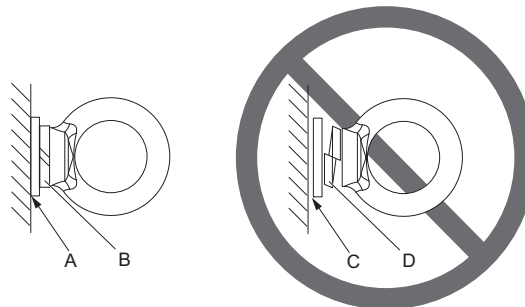
| A – No space between converter and washer | C – Space between converter and washer |
| B – Spring washer: Fully closed | D – Spring washer: Open |

Figure 4 Details of Spring Washers

■ Vertical Suspension of Models 2A0065 to 2A0130 and 4A0130 to 4A0630

Models 2A0065 to 2A0130 and 4A0130 to 4A0370

When vertical suspension of the converter is required in an enclosure panel, the orientation of the eye bolts for these converter models can be easily changed by turning the eye bolts counterclockwise 90 degrees.
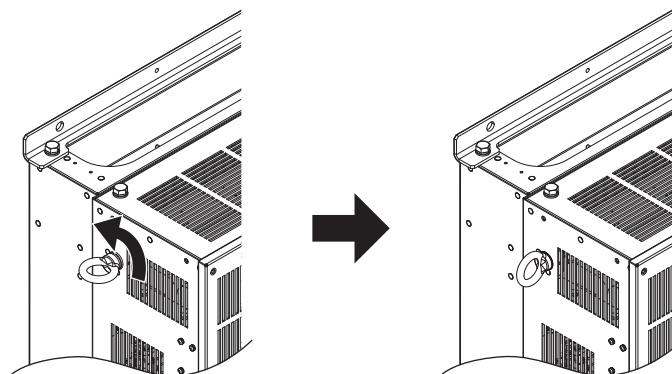
Figure 5 Adjusting Angle of Eye Bolts

Model 4A0630

When suspending model 4A0630 converter with wires, make sure to follow the procedure described below.

WARNING! *Crush Hazard. Use an adequate length of wire to ensure a 50° or wider suspension angle as illustrated in Figure 7. The maximum allowable load of the eye bolts cannot be guaranteed when the converter is suspended with the wires at angles less than 50°. Failure to comply may result in serious injury or death from falling equipment.*

1. Remove the four eye bolts from the converter side panels and fix them securely on the top panel.
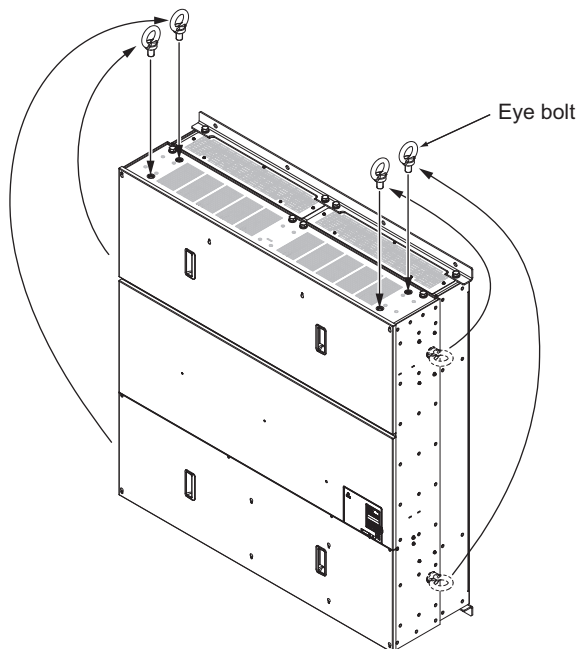
Figure 6 Eye Bolt Repositioning

2. Pass wire through the holes of all four eye bolts.
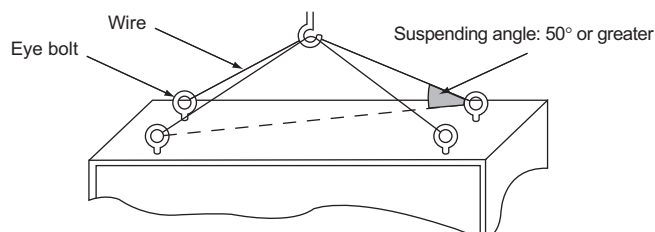
Figure 7 Suspension Wire Angle Example

3. Gradually take up the slack in the wires and hoist the converter after the wires are stretched tight.
4. Lower the converter when ready to install in the enclosure panel. Stop lowering the converter when it is near the floor then begin lowering the converter again very slowly until the converter is placed correctly.

◆ Exterior and Mounting Dimensions

■ IP20 Open Type Enclosure Models
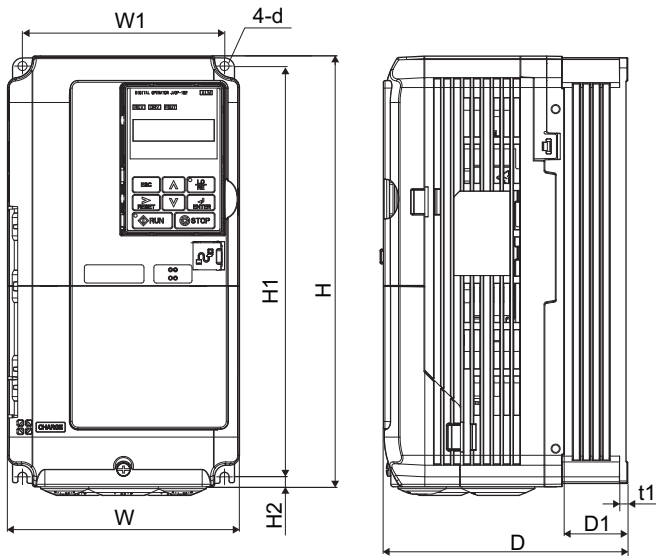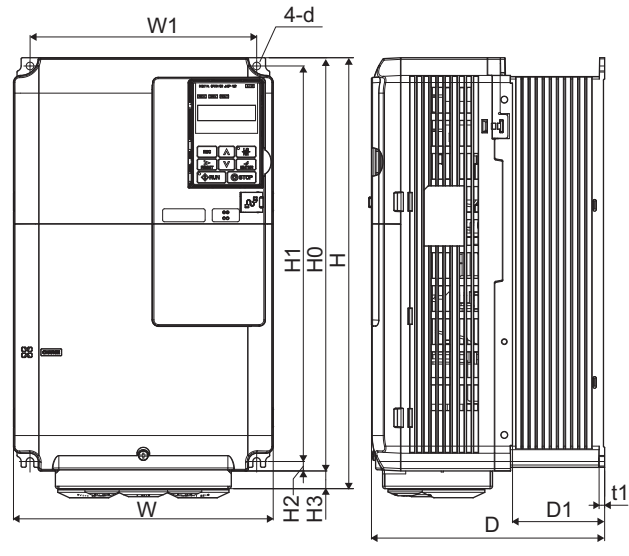
Figure 1

Figure 2

Table 2 Dimensions for IP20 Open Type Enclosure: 200 V Class

Model	Figure	Dimensions mm											Weight kg
		W	H	D	W1	H0	H1	H2	H3	D1	t1	d	
2A0005	1	180	300	187	160	–	284	8	–	75	5	M5	5
2A0010	1	180	300	187	160	–	284	8	–	75	5	M5	5
2A0020	2	220	365	197	192	350	335	8	15	78	5	M6	8

Table 3 Dimensions for IP20 Open Type Enclosure: 400 V Class

Model	Figure	Dimensions mm											Weight kg
		W	H	D	W1	H0	H1	H2	H3	D1	t1	d	
4A0005	1	180	300	187	160	–	284	8	–	75	5	M5	5
4A0010	1	180	300	187	160	–	284	8	–	75	5	M5	5
4A0020	2	220	365	197	192	350	335	8	15	78	5	M6	8

■ IP00 Open Type Enclosure Models
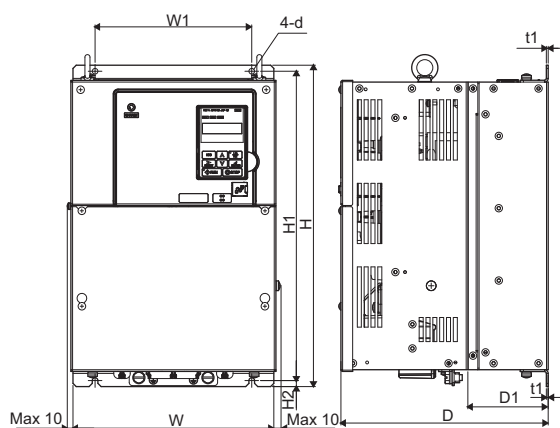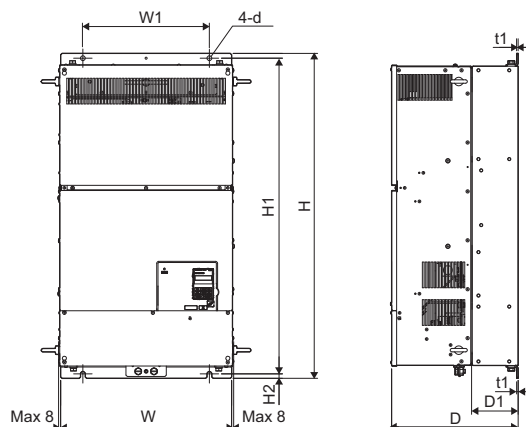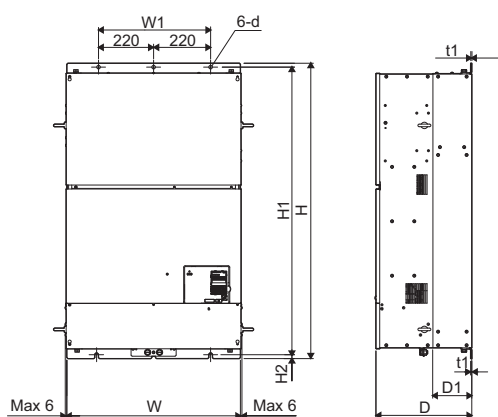
Figure 1
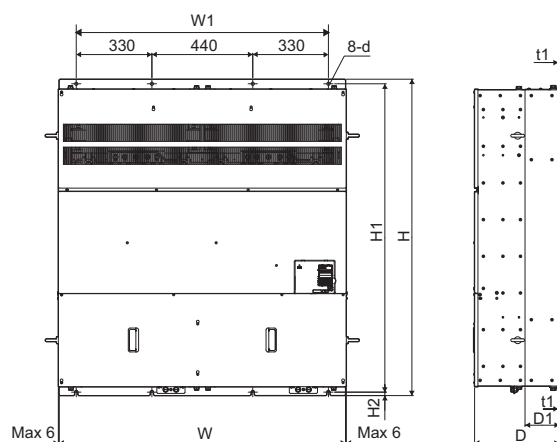
Figure 2

Figure 3

Figure 4

Table 4 Dimensions for IP00 Open Type Enclosure: 200 V Class

Model	Figure	Dimensions mm									Weight kg
		W	H	D	W1	H1	H2	D1	t1	d	
2A0030	1	275	450	258	220	435	7.5	100	2.3	M6	20
2A0050	1	325	550	283	260	535	7.5	110	2.3	M6	32
2A0065	2	450	705	330	325	680	12.5	130	3.2	M10	57
2A0090	2	450	705	330	325	680	12.5	130	3.2	M10	61
2A0130	3	500	800	350	370	773	13	130	4.5	M12	85

Table 5 Dimensions for IP00 Open Type Enclosure: 400 V Class

Model	Figure	Dimensions mm									Weight kg
		W	H	D	W1	H1	H2	D1	t1	d	
4A0030	1	275	450	258	220	435	7.5	100	2.3	M6	21
4A0040	1	275	450	258	220	435	7.5	100	2.3	M6	21
4A0060	1	325	550	283	260	535	7.5	110	2.3	M6	34
4A0100	1	325	550	283	260	535	7.5	110	2.3	M6	36
4A0130	3	500	800	350	370	773	13	130	4.5	M12	85
4A0185	3	500	800	350	370	773	13	130	4.5	M12	85
4A0270	3	670	1140	370	440	1110	15	150	4.5	M12	183
4A0370	3	670	1140	370	440	1110	15	150	4.5	M12	194
4A0630	4	1250	1380	370	1100	1345	15	150	4.5	M12	413

3 Harmonic Filter Module Installation

◆ Installation Environment

Install the harmonic filter module in an environment matching the specifications in *Table 6* to help prolong the optimum performance life of the filter module.

Table 6 Installation Environment

Environment	Conditions
Installation Area	Indoors Install the converter in an environment that does not easily accessible such as control panel.
Ambient Temperature	IP00 Open Type enclosure: -10°C to +50°C Filter module reliability improves in environments without wide temperature fluctuations. When using the filter module in an enclosure panel, install a cooling fan or air conditioner in the area to ensure that the air temperature inside the enclosure does not exceed the specified levels. Do not allow ice to develop on the filter module.
Humidity	95% RH or less and free of condensation
Storage Temperature	-20°C to +60°C
Surrounding Area	Install the filter module in an area free from: • oil mist and dust • metal shavings, oil, water, or other foreign materials • radioactive materials • combustible materials (e.g., wood) • harmful gases and liquids • excessive vibration • chlorides • direct sunlight.
Altitude	3000 m or lower
Vibration	2.0 m/s^2 (20 to 55 Hz)

NOTICE: *Prevent foreign matter such as metal shavings and wire clippings from falling into the converter and filter module during installation. Failure to comply could result in damage to the converter and the filter module. Place a temporary cover over the top of the converter and the filter module during installation. Remove the temporary cover before converter and filter module start-up, as the cover will reduce ventilation and cause the converter and the filter module to overheat.*

■ Installation Spacing

Figure 8 shows the installation distance required to maintain sufficient space for airflow and wiring.

A – 50 mm minimum
B – 30 mm minimum
C – 120 mm minimum
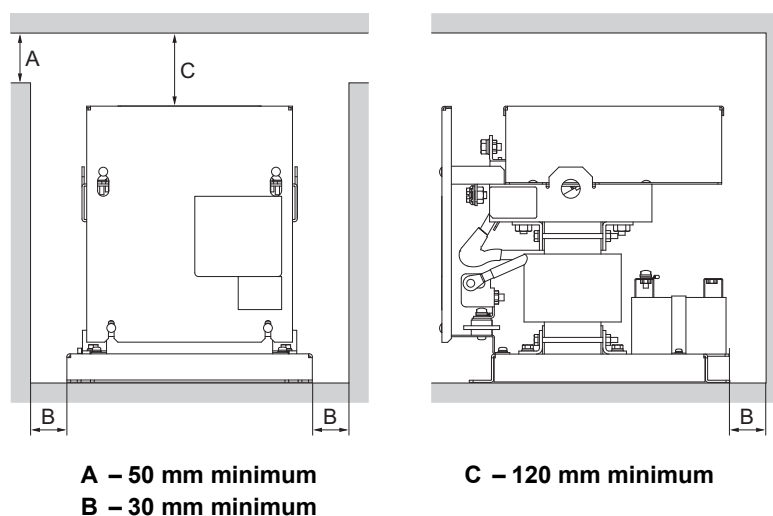
Figure 8 Installation Spacing

■ Precautions and Instructions for Installation of Harmonic Filter Module

Read the following precautions and instructions before installing a harmonic filter module.

WARNING! *Always observe the following precautions. If handled incorrectly, the harmonic filter module may fall, possibly causing injury. Also, the harmonic filter module may be damaged.*

- *Suspend the harmonic filter module with wires only temporarily and only when installing them in a control panel. Do not suspend them when transporting them.*
- *Before you suspend the harmonic filter module, confirm that faceplate, top cover, and other configuration components are securely screwed in place.*
- *Do not place the harmonic filter module on its side.*
- *Do not leave the harmonic filter module suspended with wires for a long period of time.*

Attach hooks to the specified locations when suspending the harmonic filter module with wires.

NOTICE: *Do not apply excessive force to the top cover when suspending the harmonic filter.*
The top cover may be deformed. When lifting the module by hand, always use the holding frames and use two people. Failure to comply may damage the module.

Refer to *Figure 9* and *Figure 10* for details.
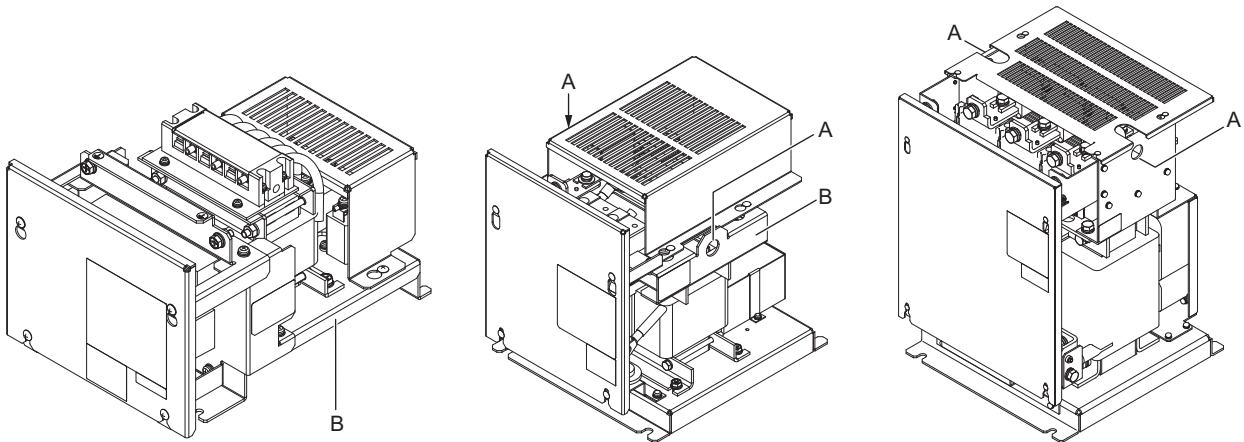
A – Suspension Holes (Two on Each Side)	B – Holding Frames (One on Each Side)

Figure 9 Suspension Locations for the Harmonic Filter Module
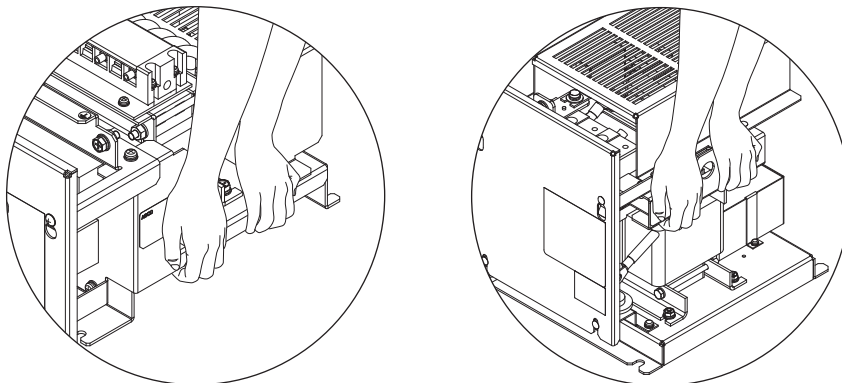
Figure 10 Holding the Harmonic Filter Module

◆ Harmonic Filter Module Dimensions

Figure 1
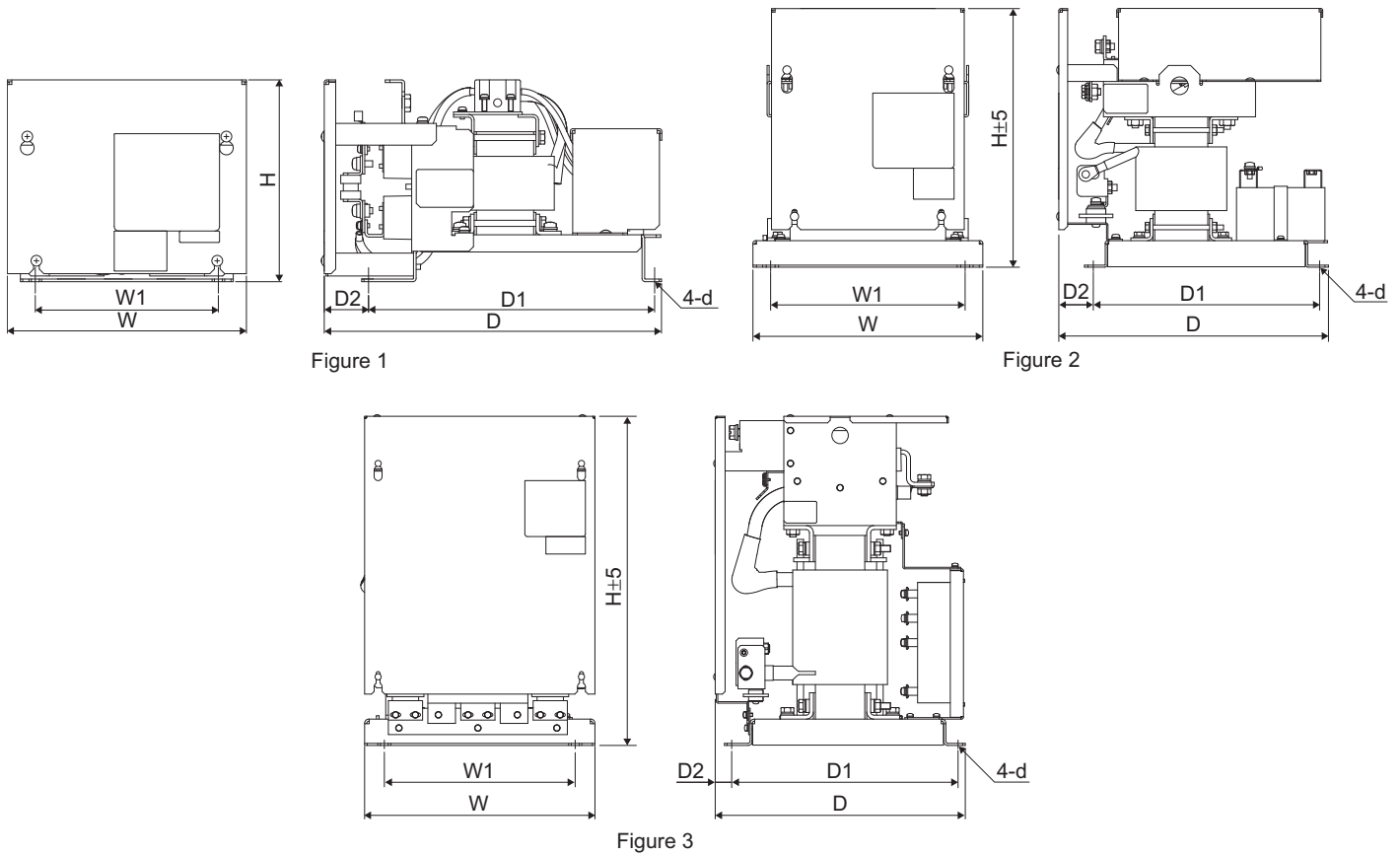
Figure 2

Figure 3

Table 7 Dimensions for IP00 Open Type Enclosure: 200 V Class

Model	Figure	Dimensions mm							Weight kg
		W	H	D	W1	D1	D2	d	
EUJ71080□	1	209	176	285	160	240	39	M6	6.5
EUJ71081□	1	209	184	295	160	250	39	M6	9
EUJ71082□	2	232	265	301	203	247	44	M8	14
EUJ71083□	2	260	281	305	220	256	39	M8	16
EUJ71084□	2	290	348	355	250	314	30	M10	27
EUJ71085□	3	290	350	352	254	314	27	M10	38
EUJ71086□	3	290	387	352	254	314	27	M10	43
EUJ71087□	3	350	500	380	290	350	19	M10	62

Table 8 Dimensions for IP00 Open Type Enclosure: 400 V Class

Model	Figure	Dimensions mm							Weight kg
		W	H	D	W1	D1	D2	d	
EUJ71088□	1	209	176	285	160	240	39	M6	7
EUJ71089□	1	209	178	295	160	250	39	M6	9
EUJ71090□	2	232	265	301	203	247	44	M8	15
EUJ71091□	2	260	293	305	220	256	39	M8	17
EUJ71092□	2	260	293	305	220	256	39	M8	19
EUJ71093□	2	290	348	355	250	314	30	M10	27
EUJ71094□	2	290	385	355	250	314	30	M10	39
EUJ71095□	3	350	500	380	290	350	19	M10	64
EUJ71096□	3	350	500	380	290	344	25	M10	73

4   Electrical Installation

The figure below shows the main and control circuit wiring.

NOTICE: *When installing a noise filter on the converter power supply, use a reactor-type noise filter (without a capacitor), such as a zero phase reactor, and install it after the MCCB on the power supply side. Do not install a filter with a built-in capacitor as the harmonic components may cause the capacitor to overheat or may damage the capacitor.*

NOTICE: *When installing a breaker or contactor on the converter side for an emergency shutoff, confirm that the CHARGE indicators on the drive and converter are not lit before closing the breaker or contactor on the converter output (DC) side. If the power supply is turned on while there is a voltage charge, an overcurrent will flow and the device may be damaged. Always confirm that the breaker or contactor on the converter output (DC) side is turned on before applying power to the converter.*

Figure 11 Standard Connection Diagram (example: model 2A0030, 2A0130, 4A0030 to 4A0185)

<1> Do not use a line longer than 10 m to connect the input AC reactor and the converter.
<2> Use the specified AC reactor and harmonic filter reactor. Non-specified devices may cause erroneous operation.
<3> Do not use a DC bus line that is longer than 5 m to connect the converter and drive.
<4> Sequence the operation so that the converter starts operation before the drive when power is applied. Sequence the stopping operation to turn off the drive first, then the motor, and finally the converter. Operating the drive without operating the converter or turning off the power supply unit during operation may trigger a converter fault.
<5> Do not connect a power supply to the drive AC power supply terminals (R/L1, S/L2, and T/L3).

<6> This figure shows an example of a sequence input to S1 through S8 using a non-powered relay or an NPN transistor. Install the wire link between terminals SC-SP for Sink mode and SC-SN for Source mode. Leave it out for external power supply. Never short terminals SP and SN as doing so will damage the converter.

<7> Multi-function analog outputs work with devices such as analog frequency meters, ammeters, voltmeters, and wattmeters. They are not intended for use as a feedback-type signal.

Figure 12 Standard Connection Diagram (example: model 4A0270, 4A0370)

<1> Do not use a line longer than 10 m to connect the input AC reactor and the converter.

<2> Use the specified AC reactor and harmonic filter reactor. Non-specified devices may cause erroneous operation.

<3> Do not use a DC bus line that is longer than 5 m to connect the converter and drive.

<4> Sequence the operation so that the converter starts operation before the drive when power is applied. Sequence the stopping operation to turn off the drive first, then the motor, and finally the converter. Operating the drive without operating the converter or turning off the power supply unit during operation may trigger a converter fault.

<5> Do not connect a power supply to the drive AC power supply terminals (R/L1, S/L2, and T/L3).

<6> This figure shows an example of a sequence input to S1 through S8 using a non-powered relay or an NPN transistor. Install the wire link between terminals SC-SP for Sink mode and SC-SN for Source mode. Leave it out for external power supply. Never short terminals SP and SN as doing so will damage the converter.

<7> Multi-function analog outputs work with devices such as analog frequency meters, ammeters, voltmeters, and wattmeters. They are not intended for use as a feedback-type signal.

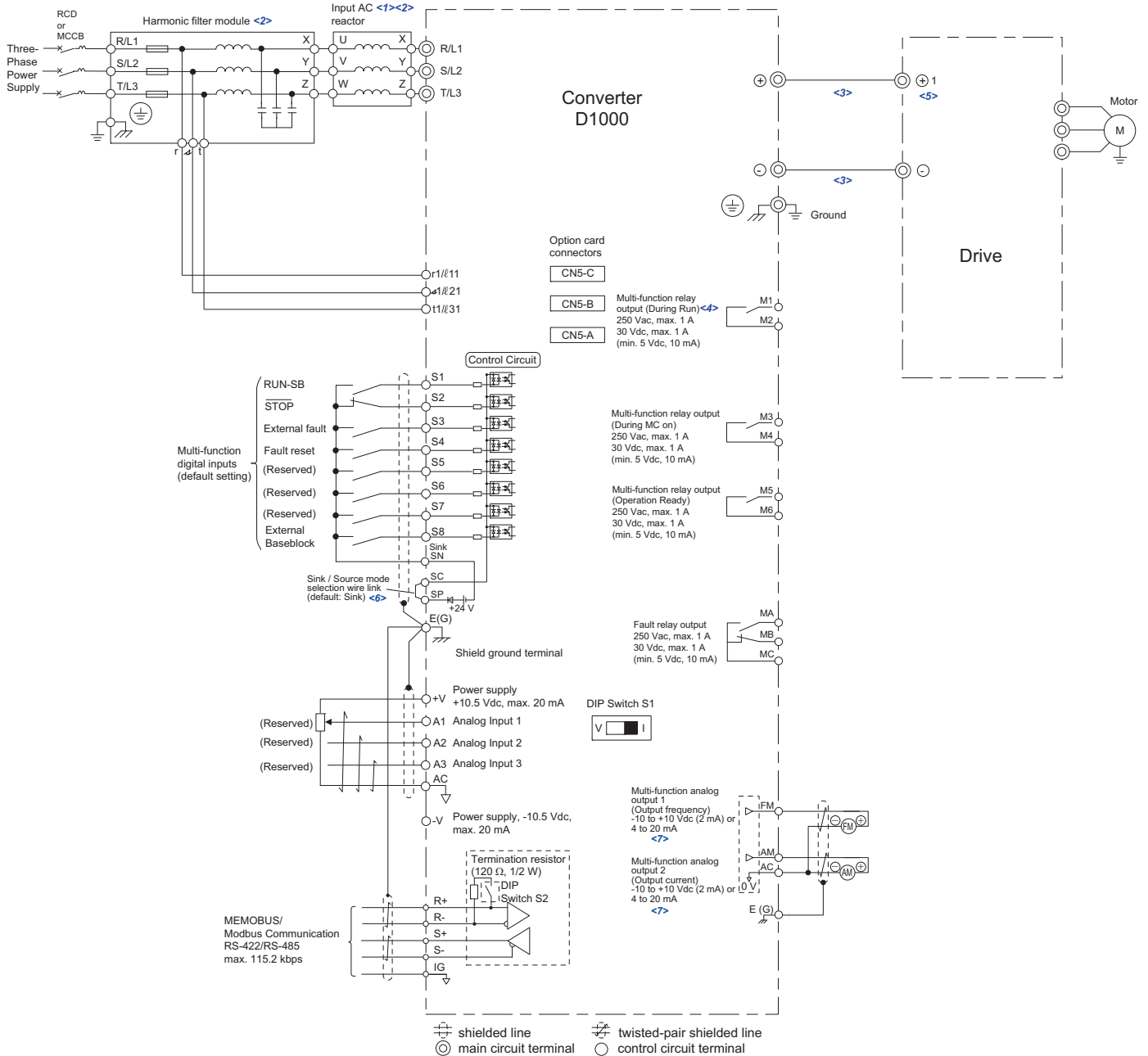**Figure 13 Standard Connection Diagram (example: model CIMR-D□4A0630)**

<1> Do not use a line longer than 10 m to connect the input AC reactor and the converter.
<2> Use the specified AC reactor and harmonic filter reactor. Non-specified devices may cause erroneous operation.
<3> Do not use a DC bus line that is longer than 5 m to connect the converter and drive.
<4> Sequence the operation so that the converter starts operation before the drive when power is applied. Sequence the stopping operation to turn off the drive first, then the motor, and finally the converter. Operating the drive without operating the converter or turning off the power supply unit during operation may trigger a converter fault.
<5> Do not connect a power supply to the drive AC power supply terminals (R/L1, S/L2, and T/L3).
<6> This figure shows an example of a sequence input to S1 through S8 using a non-powered relay or an NPN transistor. Install the wire link between terminals SC-SP for Sink mode and SC-SN for Source mode. Leave it out for external power supply. Never short terminals SP and SN as doing so will damage the converter.
<7> Multi-function analog outputs work with devices such as analog frequency meters, ammeters, voltmeters, and wattmeters. They are not intended for use as a feedback-type signal.
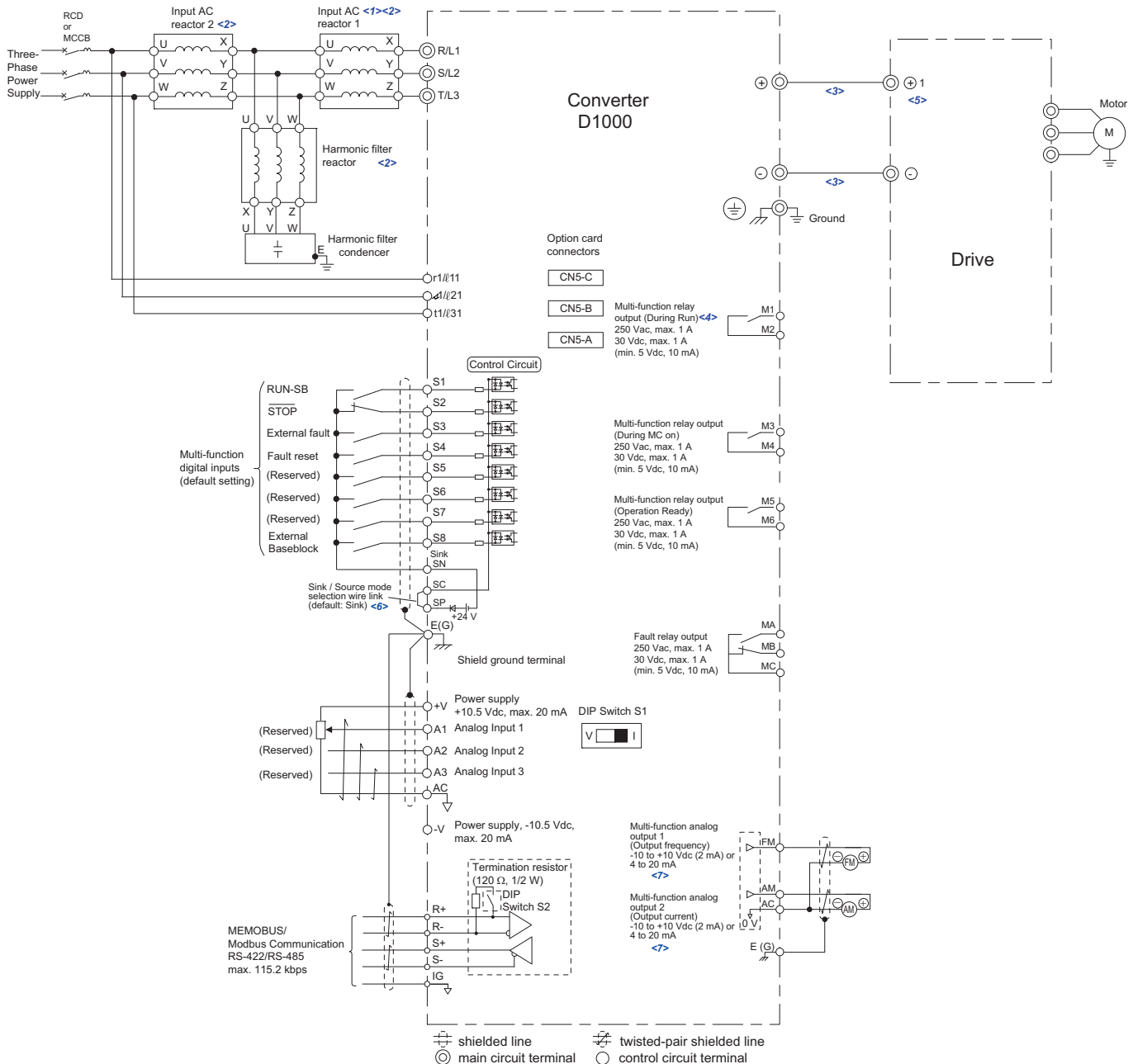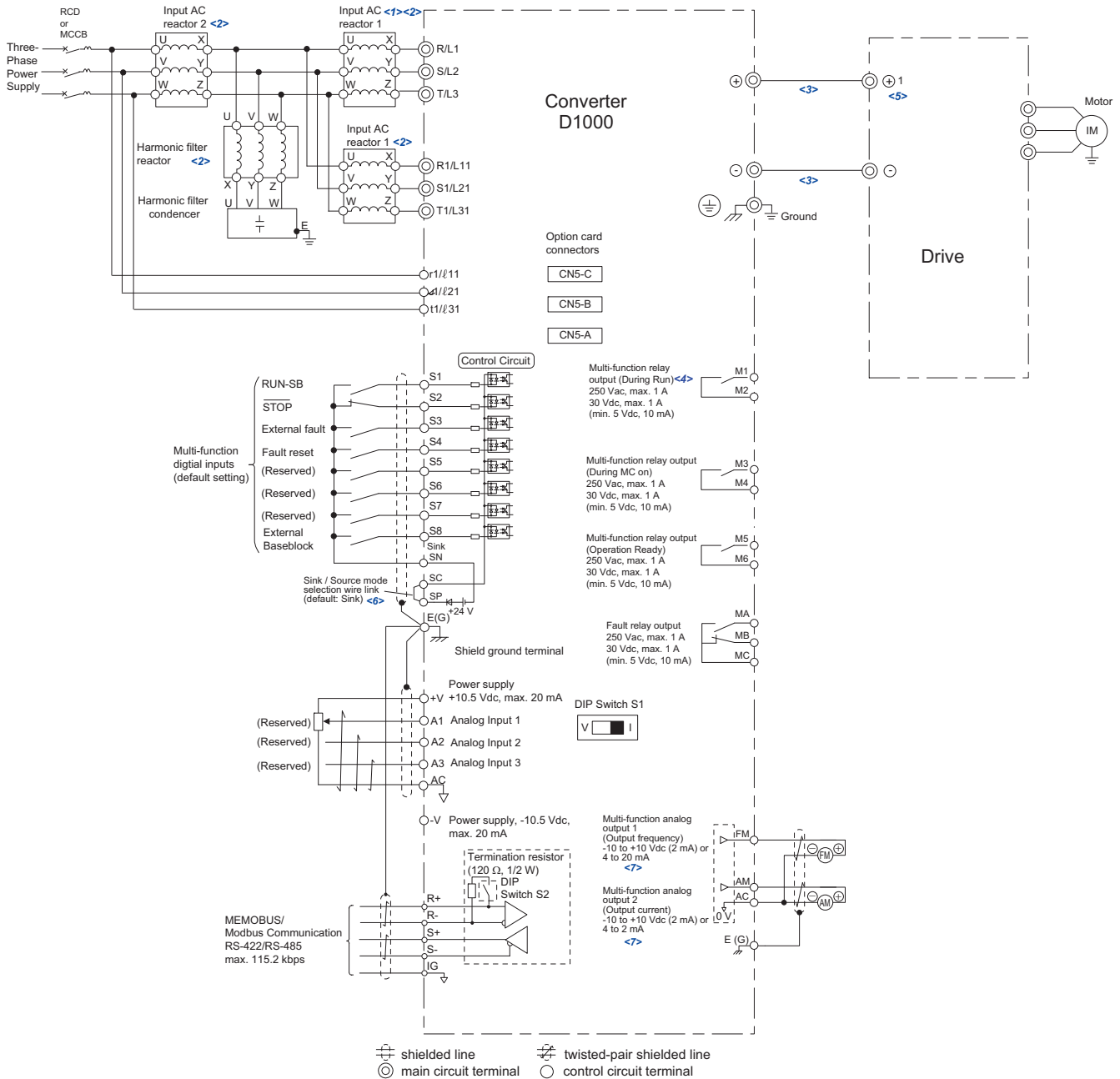
◆ Wiring Specification

■ Main Circuit

Use the EMC filters and the harmonic filter modules listed in the table below when wiring the main circuit. Make sure not to exceed the given tightening torque values.

Table 9 Wiring Specification (Main Circuit, EMC Filter, and Harmonic Filter Module)

| Model CIMR-D□ | EMC Filter Type | | Harmonic Filter Module | Fuse | | | Main Circuit | | | |
	Model	Manufacturer		Model	Manufacturer	Rating Ampere (A)	Recom. Cable (mm²)	R/L1, S/L2, T/L3, ⊖, ⊕	r1/ℓ11, ⌀1/ℓ21, t1/ℓ31	⏚
2A0005	RTEN-2030C6E3-00	TDK-Lambda	EUJ71080□	350GH-25ULTC	HINODE	25	4	M4	2.5	1.5
2A0010	RTEN-2030C6E3-00		EUJ71081□	350GH-50ULTC	HINODE	50	4	M4		4
2A0020	RTEN-2080G6E2-00		EUJ71082□	350GH-125ULTC	HINODE	125	16	M6		16
2A0030	RTEN-2100G6E3-00		EUJ71083□	170M1369	BUSSMANN	160	25	M8		16
2A0050	RTEN-2150G6E2-00		EUJ71084□	350GH-250ULTC	HINODE	250	50	M8		25
2A0065	B84143B0320T176	EPCOS	EUJ71085□	170M4012	BUSSMANN	400	95	M12		50
2A0090	B84143B0320T176		EUJ71086□	170M4013	BUSSMANN	450	95 × 2P	M12		95
2A0130	B84143B0400T176		EUJ71087□	170M4017	BUSSMANN	700	95 × 2P	M12		95
4A0005	B84143A0020R106		EUJ71088□	660GH-16ULTC	HINODE	16	4	M4		0.75
4A0010	B84143A0020R106		EUJ71089□	660GH-40ULTC	HINODE	40	4	M4		2.5
4A0020	B84143A0035R106		EUJ71090□	660GH-63ULTC	HINODE	63	2.5	M6		2.5
4A0030	B84143A0065R106		EUJ71091□	170M1368	BUSSMANN	125	10	M8		10
4A0040	B84143A0065R106		EUJ71092□	170M1369	BUSSMANN	160	16	M8		16
4A0060	B84143B0180S080		EUJ71093□	660GH-160ULTC	HINODE	160	25	M8		16
4A0100	B84143B0180S080		EUJ71094□	660GH-250ULTC	HINODE	250	50	M8		25
4A0130	B84143B0400S080		EUJ71095□	170M4012	BUSSMANN	400	95	M10		50
4A0185	B84143B0400S080		EUJ71096□	170M4015	BUSSMANN	550	95 × 2P	M12		95
4A0270	B84143B1000S080		–	170M6011	BUSSMANN	700	95 × 2P	M12		95
4A0370	B84143B1000S080		–	170M6014	BUSSMANN	1000	150 × 2P	M12		150
4A0630	B84143B1600S080		–	170M6014	BUSSMANN	1000	150 × 2P	M12		150 × 2P

■ CE Standards Compliance for DC Power Supply Input

Factory Recommended Branch Circuit Protection

Install appropriate harmonic filter module that has built-in input fuses to the input side to protect converter wiring and prevent other secondary damage. Select harmonic filter module according to *Table 9*.

Refer to the Technical Manual for details on the converter Input Current and Rated Output Current.

NOTICE: *If a fuse is open or a Residual Current Device (RCD) is tripped, check the wiring and the selection of peripheral devices to identify the cause. Contact Yaskawa before restarting the converter or the peripheral devices if the cause cannot be identified.*

■ Harmonic Filter Module

Table 10 Wire Gauge and Torque Specifications (Harmonic Filter Module)

Model	Terminal	Recommended Gauge mm^2	Applicable Gauge mm^2	Screw Size	Tightening Torque N·m
200 V Class					
EUJ71080☐	R/L1, S/L2, T/L3	4	4 to 10	M4	1.1 to 1.2
	X, Y, Z		4		
	r, ⏚, t	2.5	2.5		
	⏚	1.5	1.5 to 6	M5	2.2 to 2.4
EUJ71081☐	R/L1, S/L2, T/L3	4	4 to 10	M5	2.2 to 2.4
	X, Y, Z				
	r, ⏚, t	2.5	2.5	M4	1.1 to 1.2
	⏚	4	4 to 6	M5	2.2 to 2.4
EUJ71082☐	R/L1, S/L2, T/L3	16	16 to 70	M6	4 to 5
	X, Y, Z		16 to 25		
	r, ⏚, t	2.5	2.5	M4	1.1 to 1.2
	⏚	16	10 to 16	M6	4 to 5
EUJ71083☐	R/L1, S/L2, T/L3	25	25 to 70	M8	8.9 to 10.7
	X, Y, Z		25 to 35		
	r, ⏚, t	2.5	2.5 to 6	M4	1.1 to 1.2
	⏚	16	16 to 25	M8	8.9 to 10.7
EUJ71084☐	R/L1, S/L2, T/L3	50	50 to 70	M8	8.9 to 10.7
	X, Y, Z				
	r, ⏚, t	2.5	2.5 to 6	M4	1.1 to 1.2
	⏚	25	25	M8	8.9 to 10.7
EUJ71085☐	R/L1, S/L2, T/L3	95	95 to 150	M12	32 to 40
	X, Y, Z		95		
	r, ⏚, t	2.5	2.5 to 6	M4	1.1 to 1.2
	⏚	50	35 to 50	M12	32 to 40
EUJ71086☐	R/L1, S/L2, T/L3	95 × 2P	95 to 150	M12	32 to 40
	X, Y, Z		95		
	r, ⏚, t	2.5	2.5 to 6	M4	1.1 to 1.2
	⏚	95	70 to 95	M12	32 to 40
EUJ71087☐	R/L1, S/L2, T/L3	95 × 2P	95 to 150	M12	32 to 40
	X, Y, Z				
	r, ⏚, t	2.5	2.5 to 6	M4	1.1 to 1.2
	⏚	95	70 to 95	M12	32 to 40
400 V Class					
EUJ71088☐	R/L1, S/L2, T/L3	4	4 to 10	M4	1.1 to 1.2
	X, Y, Z		4		
	r, ⏚, t	2.5	2.5		
	⏚	0.75	0.75 to 4	M5	2.2 to 2.4
EUJ71089☐	R/L1, S/L2, T/L3	4	4 to 10	M4	1.1 to 1.2
	X, Y, Z		4		
	r, ⏚, t	2.5	2.5		
	⏚	2.5	2.5 to 6	M5	2.2 to 2.4

Model	Terminal	Recommended Gauge mm^2	Applicable Gauge mm^2	Screw Size	Tightening Torque N·m
EUJ71090☐	R/L1, S/L2, T/L3	6	6 to 70	M6	4 to 5
	X, Y, Z		6 to 25		
	r, ⏚, t	2.5	2.5	M4	1.1 to 1.2
	⏚	6	6 to 10	M6	4 to 5
EUJ71091☐	R/L1, S/L2, T/L3	10	10 to 70	M8	8.9 to 10.7
	X, Y, Z		10 to 35		
	r, ⏚, t	2.5	2.5 to 6	M4	1.1 to 1.2
	⏚	10	10 to 16	M8	8.9 to 10.7
EUJ71092☐	R/L1, S/L2, T/L3	16	16 to 70	M8	8.9 to 10.7
	X, Y, Z		16 to 35		
	r, ⏚, t	2.5	2.5 to 6	M4	1.1 to 1.2
	⏚	16	16	M8	8.9 to 10.7
EUJ71093☐	R/L1, S/L2, T/L3	25	25 to 70	M8	8.9 to 10.7
	X, Y, Z				
	r, ⏚, t	2.5	2.5 to 6	M4	1.1 to 1.2
	⏚	16	16	M8	8.9 to 10.7
EUJ71094☐	R/L1, S/L2, T/L3	50	50 to 70	M8	8.9 to 10.7
	X, Y, Z				
	r, ⏚, t	2.5	2.5 to 6	M4	1.1 to 1.2
	⏚	25	25	M8	8.9 to 10.7
EUJ71095☐	R/L1, S/L2, T/L3	95	95	M12	32 to 40
	X, Y, Z				
	r, ⏚, t	2.5	2.5 to 6	M4	1.1 to 1.2
	⏚	50	50 to 70	M12	32 to 40
EUJ71096☐	R/L1, S/L2, T/L3	95 × 2P	95	M12	32 to 40
	X, Y, Z				
	r, ⏚, t	2.5	2.5 to 6	M4	1.1 to 1.2
	⏚	95	50 to 95	M12	32 to 40

■ Control Circuit

The control terminal board is equipped with screwless terminals. Always use wires within the specification listed below. For safe wiring it is recommended to use solid wires or flexible wires with ferrules. The stripping length respectively ferrule length should be 8 mm.

Wire Type	Wire Size (mm^2)
Solid	0.2 to 1.5
Flexible	0.2 to 1.0
Flexible with ferrule	0.25 to 0.5

■ EMC Filter Installation

The following conditions must be met to ensure continued compliance with guidelines. Refer to the Technical Manual for EMC filter selection.

Installation Method

Verify the following installation conditions to ensure that other devices and machinery used in combination with this converter also comply with EMC guidelines.

1. Install an EMC noise filter to the input side specified by Yaskawa for compliance with European standards.
2. Place the converter and EMC noise filter in the same enclosure.
3. Use braided shield cable for the converter and motor wiring, or run the wiring through a metal conduit.
4. Keep wiring as short as possible. Ground the shield on both the converter side and the motor side.
5. Make sure the protective earthing conductor complies with technical standards and local safety regulations.
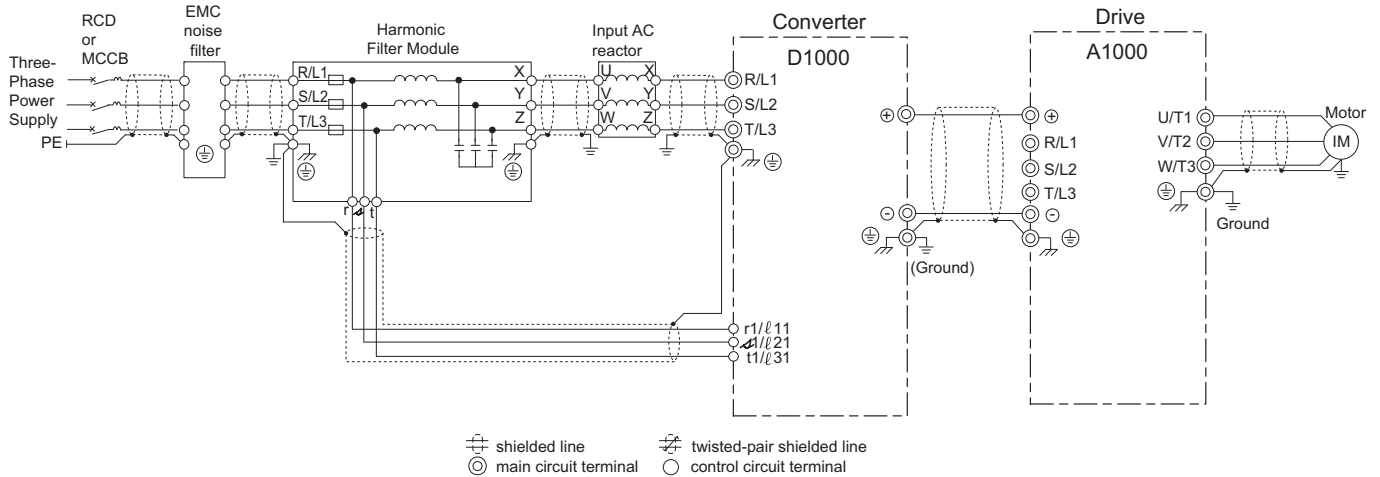
Connection Diagram

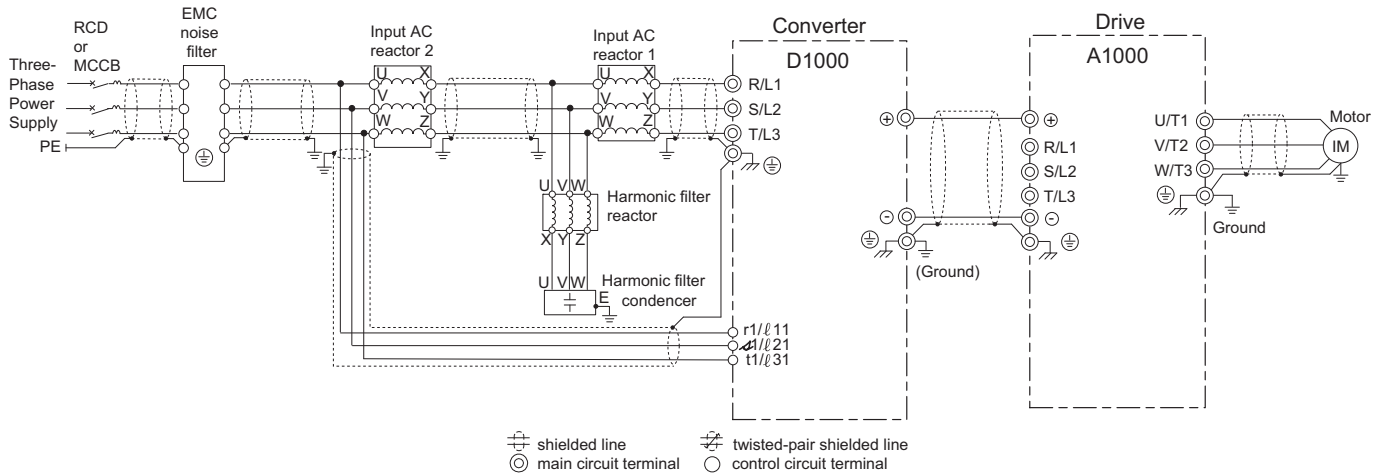**Figure 14 Wiring Diagram for EMC Filter (Models 2A0005 to 2A0130, 4A0005 to 4A0185)**

Figure 15 Wiring Diagram for EMC Filter (Models 4A0270, 4A0370)

■ **EMC Filters**

The converter should be installed with the EMC filters listed in *Table 11* in order to comply with the IEC/EN61800-3 requirements.

Table 11 IEC/EN61800-3 Filters

Model	Type	Manufacturer	Rated Current (A)	Weight kg	Dimensions [W × H × D] mm	Y × X mm
2A0005	RTEN-2030C6E3-00	TDK-Lambda	30	1.1	170 × 54 × 90	80 × 160
2A0010	RTEN-2030C6E3-00	TDK-Lambda	30	1.1	170 × 54 × 90	80 × 160
2A0020	RTEN-2080G6E2-00	TDK-Lambda	80	3.9	267 × 85 × 161	135 × 247
2A0030	RTEN-2100G6E3-00	TDK-Lambda	100	5.1	285 × 79 × 152	126 × 265
2A0050	RTEN-2150G6E2-00	TDK-Lambda	150	6.5	290 × 88 × 190	164 × 270
2A0065	B84143B0320T176	EPCOS	320	20.7	605 × 140 × 220	200 × 450
2A0090	B84143B0320T176	EPCOS	320	20.7	605 × 140 × 220	200 × 450
2A0130	B84143B0400T176	EPCOS	400	20.9	605 × 140 × 220	200 × 450
4A0005	B84143A0020R106	EPCOS	20	0.6	150 × 58 × 57.5	28 × 132.5
4A0010	B84143A0020R106	EPCOS	20	0.6	150 × 58 × 57.5	28 × 132.5
4A0020	B84143A0035R106	EPCOS	35	0.9	200 × 71 × 72.5	50 × 142.5
4A0030	B84143A0065R106	EPCOS	65	1.9	217 × 80 × 84.5	65 × 152.5
4A0040	B84143A0065R106	EPCOS	65	1.9	217 × 80 × 84.5	65 × 152.5
4A0060	B84143B0180S080	EPCOS	180	5	270 × 114 × 170	155 × 145
4A0100	B84143B0180S080	EPCOS	180	5	270 × 114 × 170	155 × 145
4A0130	B84143B0400S080	EPCOS	400	7.5	320 × 120 × 190	165 × 170
4A0185	B84143B0400S080	EPCOS	400	7.5	320 × 120 × 190	165 × 170
4A0270	B84143B1000S080	EPCOS	1000	18.5	410 × 140 × 260	235 × 240
4A0370	B84143B1000S080	EPCOS	1000	18.5	410 × 140 × 260	235 × 240
4A0630	B84143B1600S080	EPCOS	1600	24.5	490 × 140 × 260	235 × 240

■ **Main Circuit Terminal Functions**

Table 12 Main Circuit Terminal Functions

Terminal Model	Type 2A0005 to 2A0130 / 4A0005 to 4A0630	Function
R/L1		These are the power supply input terminals that connect to the input reactor.
S/L2	Main circuit power supply input	
T/L3		
r1/ℓ11		These terminals are to detect the power supply voltage order and voltage levels.
ℓ1/ℓ21	Power supply voltage detection inputs	
t1/ℓ31		
⊖		These terminals output a DC voltage.
⊕	DC voltage output	
⏚	–	Grounding terminal

◼ Control Circuit Terminals

The control circuit terminals are arranged as shown in *Figure 16*.
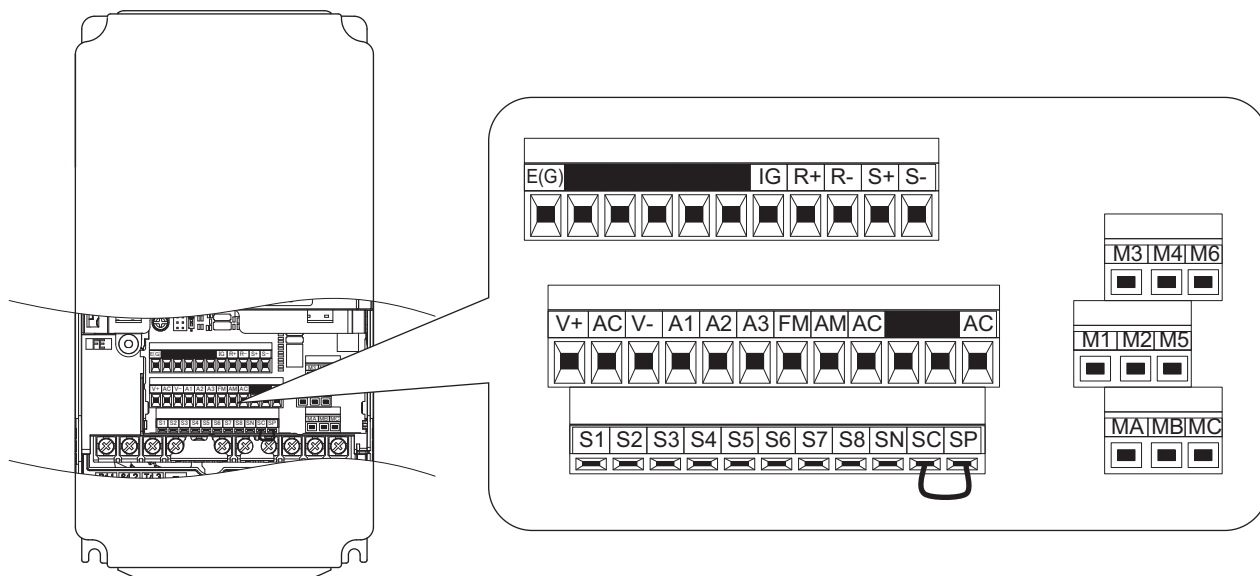

Figure 16 Control Circuit Terminal Arrangement

There are three DIP Switches and one Slide Switch and two jumpers, S1, S2, and S6, located on the terminal board.

S1	Terminal A2 Signal Selection	
S2	RS-422/RS-485 Termination Resistor	
S5	Terminal FM/AM Signal Selection	

■ Control Circuit Terminal Functions

Table 13 Control Circuit Input Terminals

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting
Multi-Function Digital Inputs	S1	Multi-function input 1 (RUN-SB)	• Photocoupler • 24 Vdc, 8 mA • Set the S3 jumper to select between sinking, sourcing mode, and the power supply.
	S2	Multi-function input 2 (STOP)	
	S3	Multi-function input 3 (External fault)	
	S4	Multi-function input 4 (Fault reset)	
	S5	Multi-function input 5 (Reserved)	
	S6	Multi-function input 6 (Reserved)	
	S7	Multi-function input 7 (Reserved)	
	S8	Multi-function input 8 (External Baseblock)	
	SC	Multi-function input common	
	SP	Digital input power supply +24 Vdc	24 Vdc power supply for digital inputs, 150 mA max (only when not using digital input option DI-A3) **NOTICE:** *Do not jumper or short terminals SP and SN. Failure to comply will damage the converter.*
	SN	Digital input power supply 0 V	
Analog Inputs	+V	Analog reference input	10.5 Vdc (max allowable current 20 mA)
	-V	Analog reference input	-10.5 Vdc (max allowable current 20 mA)
	A1	Multi-function analog input 1 (Reserved)	-10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ)
	A2	Multi-function analog input 2 (Reserved)	• -10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ) • 4 to 20 mA, 0 to 20 mA (input impedance: 250 Ω) • Voltage or current input must be selected by DIP switch S1 and H3-09.
	A3	Multi-function analog input 3 (Reserved)	• -10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ) • Use DIP switch S4 on the terminal board to select between analog and PTC input.
	AC	Frequency reference common	0 V
	E (G)	Ground for shielded lines and option cards	–

Table 14 Control Circuit Output Terminals

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting
Fault Relay Output	MA	N.O. output (Fault)	30 Vdc, 10 mA to 1 A; 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA
	MB	N.C. output (Fault)	
	MC	Fault output common	
Multi-Function Digital Output [1]	M1	Multi-function digital output (During Run 1)	30 Vdc, 10 mA to 1 A; 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA
	M2		
	M3	Multi-function digital output (During MC on)	30 Vdc, 10 mA to 1 A; 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA
	M4		
	M5	Multi-function digital output (Operation Ready)	
	M6		
Monitor Output	FM	Analog monitor output 1 (Power Supply Side Power)	-10 to +10 Vdc, or 0 to +10 Vdc
	AM	Analog monitor output 2 (Power Supply Side Current)	
	AC	Monitor common	0 V

<1> Refrain from assigning functions to digital relay outputs that involve frequent switching, as doing so may shorten relay performance life. Switching life is estimated at 200,000 times (assumes 1 A, resistive load).
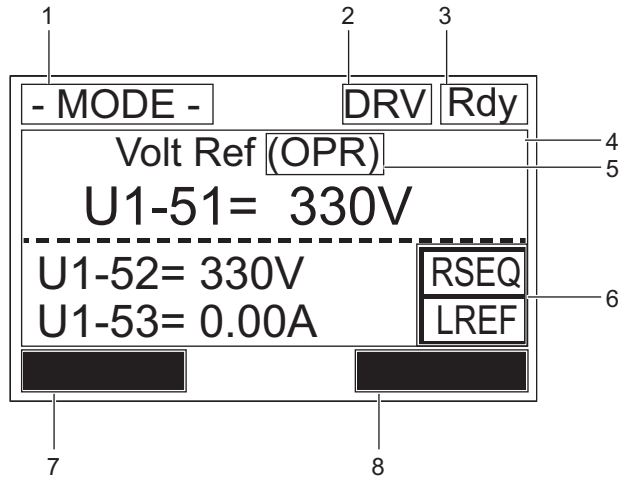
5 Using the Digital Operator

◆ LCD Display

Figure 17 LCD Display

Table 15 Display and Contents

No.	Name	Display	Content
1	Operation Mode Menus	MODE	Displayed when in Mode Selection.
		MONITR	Displayed when in Monitor Mode.
		VERIFY	Indicates the Verify Menu.
		PRMSET	Displayed when in Parameter Setting Mode.
		SETUP	Displayed when in Setup Mode.
2	Mode Display Area	DRV	Displayed when in Drive Mode.
		PRG	Displayed when in Programming Mode.
3	Ready	Rdy	Indicates the converter is ready to run.
4	Data Display	–	Displays specific data and operation data.
5	DC Bus Voltage Reference Assignment *<1>*	OPR	Displayed when the DC Bus Voltage Reference is assigned to the LCD Operator Option.
		AI	Displayed when the DC Bus Voltage Reference is assigned to the converter Analog Input.
		COM	Displayed when the DC Bus Voltage Reference is assigned to the converter MEMOBUS/Modbus Communication Inputs.
		OP	Displayed when the DC Bus Voltage Reference is assigned to a converter Option Unit.
6	LO/RE Display *<2>*	RSEQ	Displayed when the reference is supplied from a remote source.
		LSEQ	Displayed when the reference is supplied from the operator keypad.
		RREF	Displayed when the frequency reference is supplied from a remote source.
		LREF	Displayed when the frequency reference is supplied from the operator keypad.
7	Function Key 1 (F2)	HELP	Pressing [F2] displays the Help menu.
		←	Pressing [F2] scrolls the cursor to the left.
		HOME	Pressing [F2] returns to the top menu (DC Bus Voltage Reference).
		ESC	Pressing [F2] returns to the previous display.
8	Function Key 2 (F1)	DATA	Pressing [F1] scrolls to the next display.
		→	Pressing [F1] scrolls the cursor to the right.
		RESET	Pressing [F1] resets the existing converter fault or error.

<1> Displayed when in DC Bus Voltage Reference Mode.
<2> Displayed when in DC Bus Voltage Reference Mode and Monitor Mode.

◆ Menu Structure for Digital Operator
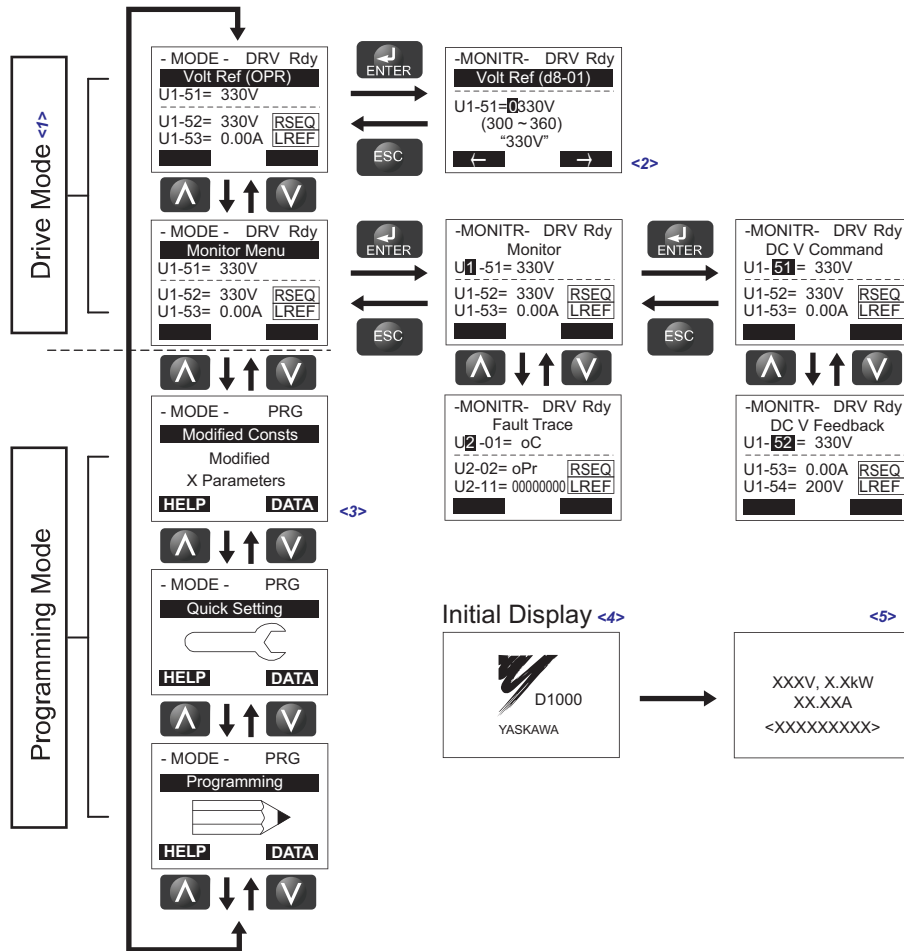
<1> Pressing ◇RUN will start the converter operation.
<2> Flashing characters are shown as **0**.
<3> "X" characters are used as examples in this manual. The LCD Operator will display the actual setting values.
<4> The DC Bus Voltage Reference appears after the initial display that shows the product name.
<5> The information that appears on the display will vary depending on the converter.

Figure 18 Digital Operator Menu and Screen Structure

6 Powering Up the Converter

◆ Powering Up the Converter

Review the following checklist before turning the power on.

Item to Check	Description
Power supply voltage	Check the power supply voltage. 200 V class: Three-phase 200 to 240 Vac 50/60 Hz 400 V class: Three-phase 380 to 480 Vac 50/60 Hz
	Properly wire the power supply input terminals (R/L1, S/L2, and T/L3).
	Properly wire the phase order of the power supply input terminals (R/L1, S/L2, and T/L3) and the power supply voltage detection terminals (r1/ℓ11, ⊿1/ℓ21, and t1/ℓ31).
	Check for proper grounding of converter.
Converter output terminals and drive terminals	Properly connect the DC voltage output terminals (⊕/⊖) on the converter to the DC power supply input terminals (⊕/⊖) on the drive. Be particularly careful to correctly connect the ⊕ and ⊖ terminals.
Control circuit terminals	Properly connect the control circuit terminals on the converter to other control devices.
Converter control terminal status	Turn off the Run Commands for the converter and the peripheral control devices.
Input AC reactor and harmonic filter (harmonic filter module) connections to converter	Properly connect the AC reactor and harmonic filter (harmonic filter module) to the converter as shown in the Standard Connection Diagram.

7   Operation with the Drive Connected

◆ A1000 Connection Example

NOTICE: *When installing a noise filter on the converter power supply, use a reactor-type noise filter (without a capacitor), such as a zero phase reactor, and install it after the MCCB on the power supply side. Do not install a filter with a built-in capacitor as the harmonic components may cause the capacitor to overheat or may damage the capacitor.*

NOTICE: *When installing a breaker or contactor on the converter side for an emergency shutoff, confirm that the CHARGE indicators on the drive and converter are not lit before closing the breaker or contactor on the converter output (DC) side. If the power supply is turned on while there is a voltage charge, an overcurrent will flow and the device may be damaged. Always confirm that the breaker or contactor on the converter output (DC) side is turned on before applying power to the converter*
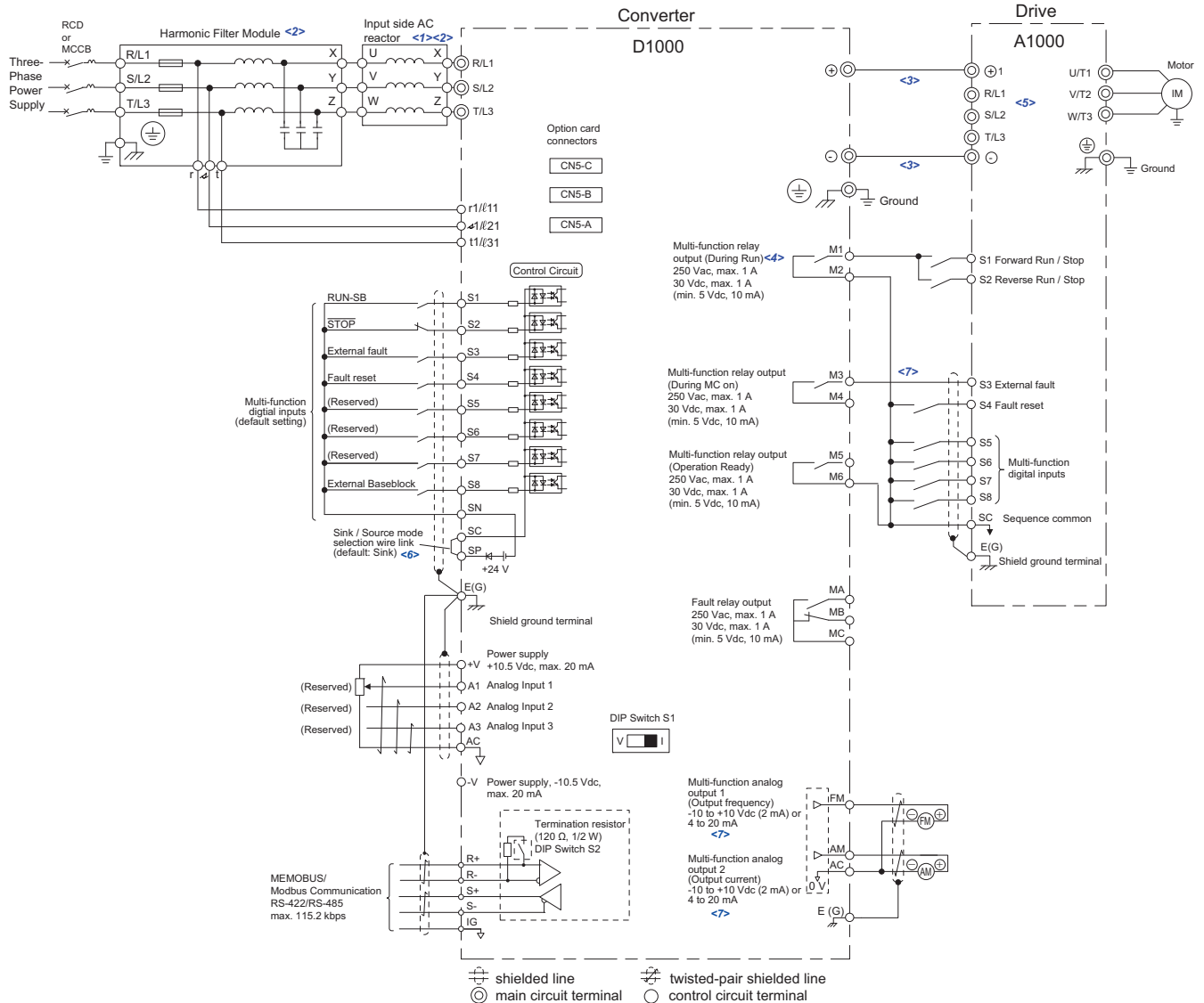

Figure 19 Standard Connection Diagram with A1000 (Example for CIMR-D□2A0030, 2A0130, and 4A0030 to 4A0185)

<1> Do not use a line longer than 10 m to connect the input AC reactor and the converter.
<2> Use the specified AC reactor and harmonic filter module. Non-specified devices may cause erroneous operation.
<3> Do not use a DC bus line that is longer than 5 m to connect the converter and drive.
<4> Sequence the operation so that the converter starts operation before the drive when power is applied. Sequence the stopping operation to turn off the drive first, then the motor, and finally the converter. Operating the drive without operating the converter or turning off the power supply unit during operation may trigger a converter fault.
<5> Do not connect a power supply to the drive AC power supply terminals (R/L1, S/L2, and T/L3).
<6> This figure shows an example of a sequence input to S1 through S8 using a non-powered relay or an NPN transistor. Install the wire link between terminals SC-SP for Sink mode and SC-SN for Source mode. Leave it out for external power supply. Never short terminals SP and SN as doing so will damage the converter.
<7> Multi-function analog outputs work with devices such as analog frequency meters, ammeters, voltmeters, and wattmeters. They are not intended for use as a feedback-type signal.

   Note: For information on connecting other control circuit I/O terminals, refer to the Quick Start Guide for the drive that is connected to the converter.

◆ Timing Chart for Turning the Power Supply On and Off

Figure 20 is a timing chart for turning the power supply on and off.
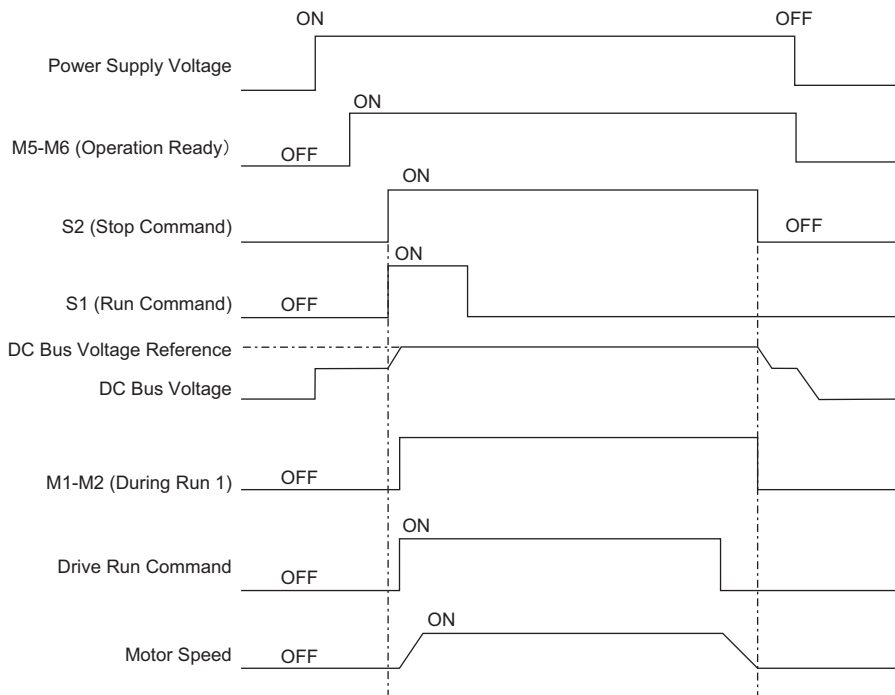
Figure 20 Timing Chart for Power ON and Run Command Sequence

Observe the following precautions when you perform operation with the converter connected to the drive.

- After turning on the power supply to the converter, wait for the operation ready signal on the multi-function contact output to turn on and then input the Run Command for the converter.
- Confirm that the converter is operating (i.e., confirm that During Run 1 is on) and then turn on the Run Command for the drive.
- To stop the converter, turn off the Run Command to the drive, confirm that the motor has stopped, and then input the Stop Command.
- Wait for the converter to stop and the During Run 1 multi-function contact output to turn off, then turn off the power supply.

◆ Interlocks

■ Interlock with the Drive

An interlock is required between the converter and the drive to stop the drive with a fault signal from the converter. It is also necessary to provide a suitable time to restart the drive if it will be restarted for momentary power losses.

Restarting can be timed with the "During MC on" signal that is output from a control terminal of the converter. Create a sequence to turn off the output from the drive with an external base block input to the drive or by a similar means when the terminal that is set for the "During MC on" signal opens.

The drive should be operated only when the converter is operating. The M1-M2 terminals (During Run 1) will confirm that the converter is operating, and the drive should be operated only when the During Run 1 signal is on. Stop the drive if the During Run 1 signal turns off.

Not Restarting Operation for Momentary Power Loss (Stopping Operation When a Momentary Power Loss Is Detected)

Connect the "During MC on" signal from the converter to a multi-function contact input terminal on the drive that is assigned to an external fault.

Use an N.C. input for the external fault input on the drive, and set the drive to detect external faults only during operation to prevent an external fault from being detected when the power supply is turned on.

Restarting the System for Momentary Power Losses

• A1000

  Connect the "During MC on" signal from the converter to a multi-function contact input terminal on the drive that is assigned to a Baseblock Command (N.C.).

• Control Devices Other Than the A1000

  Connect the "During MC on" signal from the converter to a multi-function contact input terminal on the drive that is assigned to External Search Command 2.

  (Contact your Yaskawa representative if you are using a YASKAWA drive that does not have External Search Command 2.)

■ Stopping the Converter for Faults in Peripheral Devices

If an external device fails or a fault occurs, the fault contact output on the converter is activated to stop operation. To use an external fault, set H1-□□ (terminal S1 to S8 function selection) to one of the values from *Table 16*. When an external fault is input, EF□ is displayed on the digital operator. The □ in EF□ is the number of the terminal where the external fault signal was input.

Example: If an external fault signal is input to the S3 terminal, EF3 is displayed.

Select the number to set for H1-□□ according to the combination of the following three conditions:

• Use an input contact for a signal from the peripheral device.
• Use detection of an external fault.
• Stop operation (as the operation selection when an external fault is detected).

Table 16 shows the relationship between the combination of conditions and the set value of H1-□□.

Table 16 Combination of Conditions

Setting Value	Input contact <1>		Detection <2>		Operation selection	
	N.O. contact	N.C. contact	Always detect	Detect only during operation	Stop Unit (fault)	Continue operation (minor fault)
24	O	–	O	–	O	–
25	–	O	O	–	O	–
26	O	–	–	O	O	–
27	–	O	–	O	O	–
2C	O	–	O	–	–	O
2D	–	O	O	–	–	O
2E	O	–	–	O	–	O
2F	–	O	–	O	–	O

<1> When using an input contact, set whether to detect a fault when the signal opens or closes. (N.O.: External fault when closed, N.C.: External fault when open)

<2> When using detection of a fault, set whether to always detect faults or to detect them only during operation.

◆ I/O Setup

Note: The default setting functions can be seen in the connection diagram on page *18*.

■ Multi-Function Digital Inputs (H1-□□)

The function of each digital input can be assigned in the H1-□□ parameters.

■ Multi-Function Digital Outputs (H2-□□)

The function of each digital output can be assigned in the H2-□□ parameters. The setting value of these parameters consist of 3 digits, where the middle and right digit set the function and the left digit sets the output characteristics (0: Output as selected; 1: Inverse output).

■ Multi-Function Analog Inputs (H3-□□)

The function of each analog input can be assigned in the H3-□□ parameters.

■ Multi-Function Analog Outputs (H4-□□)

Use the H4-□□ parameters to set up the output value of the analog monitor outputs and to adjust the output signal levels.

◆ Test Run Checklist

Review the checklist before performing a test run. Check each item that applies.

☑	No.	Checklist
☐	1	Thoroughly read the manual before performing a test run.
☐	2	Check the wiring.
☐	3	Set the correct power supply voltage.
☐	4	Turn on the power supply to the converter and drive.
☐	5	Correctly sequence the Run commands.
☐	6	The DRV should light after giving a Run command.
☐	7	To give Run command and DC bus voltage reference from the digital operator, press LO/RE key to set to LOCAL.
☐	8	To give Run command and DC bus voltage reference from the control circuit terminals, press the LO/RE to set REMOTE. (The LO/RE indicator is lit off while REMOTE is set.)

8   Parameter Table

This parameter table shows the most important parameters. Default settings are bold type. Refer to the Technical Manual for a complete list of parameters.

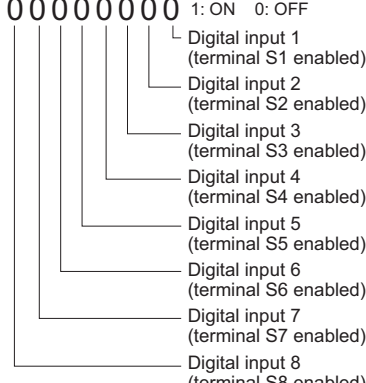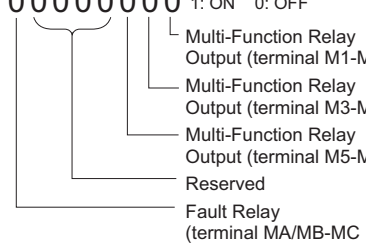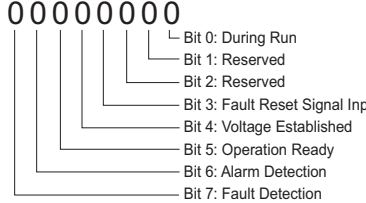| No. (Addr. Hex)	Name	Description
A1: Initialization		
A1-00 (100H)	Language Selection	**0: English** 1: Japanese 7: Chinese
A1-01 (101H)	Access Level Selection	0: View and set A1-01 and A1-04. U□-□□ parameters can also be viewed. 1: User Parameters (access to a set of parameters selected by the user, A2-01 to A2-32) **2: Advanced Access (access to view and set all parameters)**
A1-03 (103H)	Initialize Parameters	**0: No initialization** 1110: User Initialize (parameter values must be stored using parameter o2-03) 2220: 2-Wire initialization 3330: 3-Wire initialization 5550: oPE04 error reset
A1-04 (104H)	Password	When the value set into A1-04 does not match the value set into A1-05, parameters A1-01 through A1-03, A1-06, and A2-01 through A2-33 cannot be changed.
A1-05 (105H)	Password Setting	
A2: User Parameters		
A2-01 to A2-32 (106H to 125H)	User Parameters 1 to 32	Recently edited parameters are listed here. The user can also select parameters to appear here for quicker access.
A2-33 (126H)	User Parameter Automatic Selection	**0: Parameters A2-01 to A2-32 are reserved for the user to create a list of User Parameters.** 1: Save history of recently viewed parameters. Recently edited parameters will be saved to A2-17 through A2-32 for quicker access.
b1: Operation Mode Selection		
b1-02 (181H)	Run Command Selection 1	0: Digital operator **1: Digital input terminals** 2: MEMOBUS/Modbus communications 3: Option PCB
b1-06 (185H)	Digital Input Reading	0: Input status is read once and processed immediately (for quicker response) **1: Input is read twice and processed only if the status is the same in both readings (robust against noisy signals)**
b1-08 (187H)	Run Command Selection in Programming Mode	**0: Run command is not accepted while in Programming Mode.** 1: Run command is accepted while in Programming Mode. 2: Prohibit entering Programming Mode during run.
b1-17 (1C6H)	Run Command at Power Up	**0: Disregarded. A new Run Command must be issued.** 1: Allowed. Converter will start immediately if Run Command is present at power up.

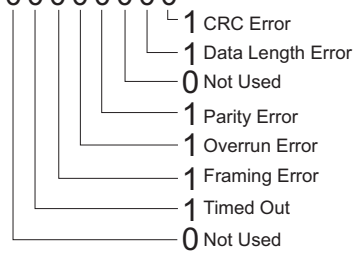| No. (Addr. Hex)	Name	Description
b1-18 (179H)	Voltage Reference Source	**0: Digital operator** 1: Control circuit terminal (analog input) 2: MEMOBUS/Modbus communications 3: Option card 7: Input voltage based control 1 8: Input voltage based control 2
b4: Timer Function		
b4-01 (1A3H)	Timer Function On-Delay Time	Sets the on-delay times for a digital timer output (H2-□□ = 12). The output is triggered by a digital input programmed to H1-□□ = 18.
b4-02 (1A4H)	Timer Function Off-Delay Time	Sets the off-delay times for a digital timer output (H2-□□ = 12). The output is triggered by a digital input programmed to H1-□□ = 18.
C1: Voltage Increase and Decrease Times		
C1-20 (265H)	Voltage Increase Time	Sets the output voltage increase time in seconds. Set the time to increase from 0% to 100%. 400 V Class: 800 V/C1-20 (V/s) 200 V Class: 400 V/C1-20 (V/s)
C1-21 (266H)	Voltage Decrease Time	Sets the output voltage decrease time in seconds. Set the time to decrease from 100% to 0%. 400 V Class: 800 V/C1-21 (V/s) 200 V Class: 400 V/C1-21 (V/s)
C6: Carrier Frequency		
C6-03 (225H)	Carrier Frequency Upper Limit	C6-03 is displayed on the operator, but cannot be set.
C7: DC Bus Voltage Control		
C7-01 (253H)	DC Bus Voltage Control (Avr) Proportional Gain	Sets the proportional gain for DC bus voltage control (Avr).
C7-02 (254H)	DC Bus Voltage Control (Avr) Integral Time	Sets the integral time for DC bus voltage control (Avr).
C7-03 (255H)	DC Bus Voltage Control (Avr) Primary Delay Time Constant	Sets the primary delay time constant for DC bus voltage control (Avr).
C7-12 (26EH)	Reactive Current Reference Bias Automatic Calculation Selection	0: Disabled **1: Enabled (Automatically calculate the reactive current reference bias.)**
d8: DC Bus Voltage Reference		
d8-01 (2B9H)	DC Bus Voltage Reference	Sets the DC bus voltage reference in volts. Yaskawa recommends setting a value that is 1.5 times the set value of the Power Supply Voltage (U1-54).
H1: Multi-Function Digital Inputs		
H1-01 to H1-08 (438H to 405H)	Multi-Function Digital Input Terminal S1 to S8 Function Selection	Assigns a function to the multi-function digital inputs S1 to S8. **Note:** Set unused terminals to F.

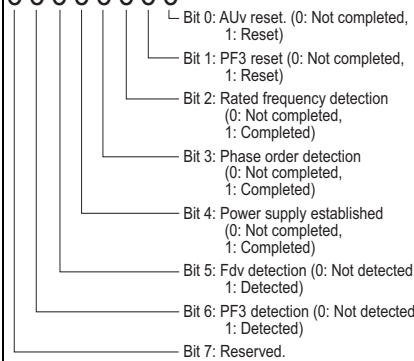| No. (Addr. Hex)	Name	Description
H2: Multi-Function Relay Outputs		
H2-01 (40BH)	Terminal M1-M2 Function Selection (Relay)	Set the functions for the relay outputs. Refer to the Technical Manual for a description of setting values. **Note:** Set unused terminals to F.
H2-02 (40CH)	Terminal M3-M4 Function Selection (Relay)	
H2-03 (40DH)	Terminal M5-M6 Function Selection (Relay)	
H2-06 (437H)	kWh Monitor Pulse Output Unit Selection	**1: 1 kWh Units** 2: 10 kWh Units 3: 100 kWh Units 4: 1000 kWh Units
H3: Multi-Function Analog Inputs		
H3-01 (410H)	Terminal A1 Signal Level Selection	**0: 0 to 10 V** 1: -10 to 10 V
H3-02 (434H)	Terminal A1 Function Selection	Sets the function of terminal A1.
H3-03 (411H)	Terminal A1 Gain Setting	Sets the level of the input value selected in H3-02 when 10 V is input at terminal A1.
H3-04 (412H)	Terminal A1 Bias Setting	Sets the level of the input value selected in H3-02 when 0 V is input at terminal A1.
H3-05 (413H)	Terminal A3 Signal Level Selection	**0: 0 to 10 V** 1: -10 to 10 V
H3-06 (414H)	Terminal A3 Function Selection	Sets the function of terminal A3.
H3-07 (415H)	Terminal A3 Gain Setting	Sets the level of the input value selected in H3-06 when 10 V is input at terminal A3.
H3-08 (416H)	Terminal A3 Bias Setting	Sets the level of the input value selected in H3-06 when 0 V is input at terminal A3.
H3-09 (417H)	Terminal A2 Signal Level Selection	0: 0 to 10 V 1: -10 to 10 V **2: 4 to 20 mA** 3: 0 to 20 mA **Note:** Use DIP switch S1 to set input terminal A2 for a current or a voltage input signal.
H3-10 (418H)	Terminal A2 Function Selection	Sets the function of terminal A2.
H3-11 (419H)	Terminal A2 Gain Setting	Sets the level of the input value selected in H3-10 when 10 V (20 mA) is input at terminal A2.
H3-12 (41AH)	Terminal A2 Bias Setting	Sets the level of the input value selected in H3-10 when 0 V (0 or 4 mA) is input at terminal A2.
H3-13 (41BH)	Analog Input Filter Time Constant	Sets a primary delay filter time constant for terminals A1, A2, and A3. Used for electrical noise filtering.

No. (Addr. Hex)	Name	Description
H3-14 (41CH)	Analog Input Terminal Enable Selection	1: Terminal A1 only 2: Terminal A2 only 3: Terminals A1 and A2 only 4: Terminal A3 only 5: Terminals A1 and A3 6: Terminals A2 and A3 **7: All terminals enabled**
H4: Analog Outputs		
H4-01 (41DH)	Terminal FM Monitor Selection	Selects the data to be output through terminal FM. Set the desired monitor parameter to the digits available in U☐-☐☐. For example, enter "153" for U1-53.
H4-02 (41EH)	Terminal FM Monitor Gain	Sets the signal level at terminal FM that is equal to 100% of the selected monitor value.
H4-03 (41FH)	Terminal FM Monitor Bias	Sets the signal level at terminal FM that is equal to 0% of the selected monitor value.
H4-04 (420H)	Terminal AM Monitor Selection	Selects the data to be output through terminal AM. Set the desired monitor parameter to the digits available in U☐-☐☐. For example, enter "153" for U1-53.
H4-05 (421H)	Terminal AM Monitor Gain	Sets the signal level at terminal AM that is equal to 100% of the selected monitor value.
H4-06 (422H)	Terminal AM Monitor Bias	Sets the signal level at terminal AM that is equal to 0% of the selected monitor value.
H4-07 (423H)	Terminal FM Signal Level Selection	**0: 0 to 10 V** 1: -10 to 10 V 2: 4 to 20 mA
H4-08 (424H)	Terminal AM Signal Level Selection	**0: 0 to 10 V** 1: -10 to 10 V 2: 4 to 20 mA
L2: Momentary Power Loss Ride-Thru		
L2-01 (485H)	Momentary Power Loss Operation Selection	**0: Disabled. Converter trips on Uv1 fault when power is lost.** 1: Recover within the time set in L2-02. Uv1 will be detected if power loss is longer than L2-02. 2: Recover as long as CPU has power. Uv1 is not detected. **Note:** Even if L2-01 is set to 1 or 2, the converter may detect a fault when momentary-power-loss occurs during regeneration or during no load.
L2-02 (486H)	Momentary Power Loss Ride-Thru Time	Sets the Power Loss Ride-Thru time. Enabled only when L2-01 = 1 or 3.
L5: Fault Restart		
L5-01 (49EH)	Number of Auto Restart Attempts	Sets the number of times the converter may attempt to restart after the following faults occur: GF, oC, oH1, oL2, ov, Uv1.
L5-02 (49FH)	Auto Restart Fault Output Operation Selection	**0: Fault output not active.** 1: Fault output active during restart attempt.
L5-04 (4A0H)	Fault Reset Interval Time	Sets the amount of time to wait between performing fault restarts.

No. (Addr. Hex)	Name	Description
L5-05 (46CH)	Fault Reset Operation Selection	**0: Continuously attempt to restart while incrementing restart counter only at a successful restart.** 1: Attempt to restart with the interval time set in L5-04 and increment the restart counter with each attempt.
L7: Torque Limit		
L7-25 (628H)	Active Current Limit at Power Supply Side	Sets the limit for the active current at the power supply side.
L7-26 (629H)	Active Current Limit at Regeneration Side	Sets the limit for the active current at the regeneration side.
L8: Drive Protection		
L8-02 (4AEH)	Overheat Alarm Level	An overheat alarm occurs when heatsink temperature exceeds the L8-02 level.
L8-03 (4AFH)	Overheat Pre-Alarm Operation Selection	0: Ramp to stop. A fault is triggered. **3: Continue operation. An alarm is triggered.**
L8-09 (4B5H)	Output Ground Fault Detection Selection	0: Disabled 1: Enabled
L8-10 (4B6H)	Heatsink Cooling Fan Operation Selection	**0: During run only. Fan operates only during run for L8-11 seconds after stop.** 1: Fan always on. Cooling fan operates whenever the converter is powered up.
L8-11 (4B7H)	Heatsink Cooling Fan Off Delay Time	Sets a delay time to shut off the cooling fan after the Run command is removed when L8-10 = 0.
L8-12 (4B8H)	Ambient Temperature Setting	Enter the ambient temperature. This value adjusts the oL2 detection level.
L8-35 (4ECH)	Installation Method Selection	0: IP00/IP20 Open Type Enclosure 1: Side-by-Side Mounting 3: External Heatsink Installation
L8-41 (4F2H)	High Current Alarm Selection	**0: Disabled** 1: Enabled. An alarm is triggered at output currents above 150% of converter rated current.
L8-65 (66FH)	Power Supply Fault Detection Selection	**0: No detection** 1: Stop operation (fault) 2: Continue operation (minor fault)
L8-66 (670H)	Power Supply Fault Detection Voltage Level	There is normally no need to change this parameter from the default value. The main circuit DC voltage ripple is monitored in a cycle of 200 ms. If the difference between the maximum and minimum values of the ripple exceeds the value that is set in L8-66 for the number of times that is set in L8-67, a power supply fault is detected.
L8-67 (671H)	Number of Times of Power Supply Fault for Detection	
L8-69 (673H)	Input Phase Loss Protection Selection 3	Sets whether to enable or disable the protective function for the converter when there is an input phase loss. 0: Disabled 1: Enabled (Detect input phase loss and power supply imbalance.)

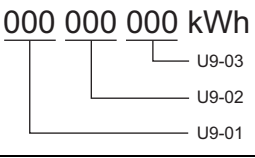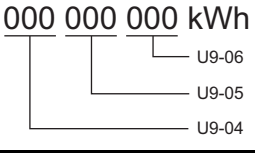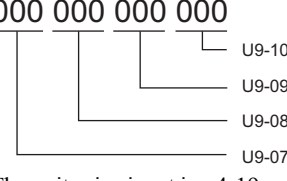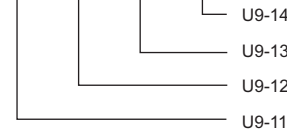| No. (Addr. Hex)	Name	Description
L8-78 (2CCH)	Module Phase Loss (LF3) Protection	0: Disable **1: Enable** **Note:** This parameter is available in model 4A0630.
L9-08	DC5 Conveter Unit Replacement Selection	**0: Disable** 1: Enable
L9-09	DC3 Conveter Unit Replacement Selection	**0: Disable** 1: Enable
U1: Operation Status Monitors		
U1-10 (49H)	Input Terminal Status	Displays the input terminal status. U1-10= 00000000 1: ON 0: OFF Digital input 1 (terminal S1 enabled) Digital input 2 (terminal S2 enabled) Digital input 3 (terminal S3 enabled) Digital input 4 (terminal S4 enabled) Digital input 5 (terminal S5 enabled) Digital input 6 (terminal S6 enabled) Digital input 7 (terminal S7 enabled) Digital input 8 (terminal S8 enabled)
U1-11 (4AH)	Output Terminal Status	Displays the output terminal status. U1-11= 00000000 1: ON 0: OFF Multi-Function Relay Output (terminal M1-M2) Multi-Function Relay Output (terminal M3-M4) Multi-Function Relay Output (terminal M5-M6) Reserved Fault Relay (terminal MA/MB-MC closed MA/MB-MC open)
U1-12 (4BH)	Drive Status	Verifies the converter operation status. U1-12= 00000000 Bit 0: During Run Bit 1: Reserved Bit 2: Reserved Bit 3: Fault Reset Signal Input Bit 4: Voltage Established Bit 5: Operation Ready Bit 6: Alarm Detection Bit 7: Fault Detection
U1-13 (4EH)	Terminal A1 Input Level	Displays the signal level to analog input terminal A1.
U1-14 (4FH)	Terminal A2 Input Level	Displays the signal level to analog input terminal A2.
U1-15 (50H)	Terminal A3 Input Level	Displays the signal level to analog input terminal A3.
U1-18 (61H)	oPE Fault Parameter	Displays the parameter number that caused the oPE02 or oPE08 operation error.

No. (Addr. Hex)	Name	Description
U1-19 (66H)	MEMOBUS/ Modbus Error Code	Displays the contents of a MEMOBUS/ Modbus error. U1-19= 00000000 1 CRC Error 1 Data Length Error 0 Not Used 1 Parity Error 1 Overrun Error 1 Framing Error 1 Timed Out 0 Not Used
U1-25 (4DH)	Software Number (Flash)	FLASH ID
U1-26 (5BH)	Software No. (ROM)	ROM ID
U1-27 (7A8H)	Message ID (OPR)	Shows the message ID number for OPE.
U1-28 (7A9H)	Message ID (INV)	Shows the message ID number for INV.
U1-29 (7AAH)	Software No. (PWM)	PWM ID **Note:** This parameter is available only in model 4A0630.
U1-51 (1080H)	DC Bus Voltage Reference (Before SFS)	Shows the DC bus voltage reference.
U1-52 (1081H)	DC Bus Voltage Feedback	Shows the DC bus voltage feedback value.
U1-53 (1082H)	DC Bus Side Current	Shows an estimated value of the bus current on the DC side.
U1-54 (1083H)	Power Supply Voltage	Shows the power supply voltage.
U1-55 (1084H)	Power Supply Current	Shows the current on the power supply side.
U1-56 (1085H)	DC Bus Side Power	Shows the power on the DC side.
U1-57 (1086H)	Power Supply Side Power	Shows the power on the power supply side.
U1-58 (1087H)	Power Supply Frequency	Shows the frequency on the power supply side.
U1-59 (1088H)	Power Supply Current Reference	Shows the current reference on the power supply side.
U1-60 (1089H)	Power Factor	Shows the power factor.
U1-61 (108AH)	Active Current	Shows the active current.
U1-62 (108BH)	Reactive Current	Shows the reactive current.
U1-63 (108CH)	DC Bus Voltage Reference (After SFS)	Shows the DC bus voltage reference after the soft starter.
U1-64 (108DH)	Avr Input (Voltage Deviation)	Shows the Avr input.
U1-65 (108EH)	Avr Output	Shows the Avr output.

No. (Addr. Hex)	Name	Description
U1-66 (108FH)	Control Voltage Reference (Vq)	Shows the control voltage reference (Vq) in the converter for the current control on the power supply side.
U1-67 (1090H)	Control Voltage Reference (Vd)	Shows the control voltage reference (Vd) in the converter for the current control on the power supply side.
U1-72 (1095H)	Input Power Supply Information	Shows information on the input power supply. U1-72= 00000000 Bit 0: AUv reset. (0: Not completed, 1: Reset) Bit 1: PF3 reset (0: Not completed, 1: Reset) Bit 2: Rated frequency detection (0: Not completed, 1: Completed) Bit 3: Phase order detection (0: Not completed, 1: Completed) Bit 4: Power supply established (0: Not completed, 1: Completed) Bit 5: Fdv detection (0: Not detected, 1: Detected) Bit 6: PF3 detection (0: Not detected, 1: Detected) Bit 7: Reserved.
U2: Fault Trace		
U2-01 (80H)	Current Fault	Displays the current fault.
U2-02 (81H)	Previous Fault	Displays the previous fault.
U2-11 (8AH)	Input Terminal Status at Previous Fault	Displays the input terminal status at the previous fault. Displayed as in U1-10.
U2-12 (8BH)	Output Terminal Status at Previous Fault	Displays the output status at the previous fault. Displays the same status displayed in U1-11.
U2-13 (8CH)	Drive Operation Status at Previous Fault	Displays the operation status of the converter at the previous fault. Displays the same status displayed in U1-12.
U2-14 (8DH)	Cumulative Operation Time at Previous Fault	Displays the cumulative operation time at the previous fault.
U2-20 (8EH)	Heatsink Temperature at Previous Fault	Displays the temperature of the heatsink when the most recent fault occurred.
U2-28 (7FCH)	Malfunctioned Module	Displays the module where the previous fault occurred as a decimal number. **Note:** This parameter is available only in model 4A0630.
U2-51 (840H)	DC Bus Voltage Reference at Previous Fault (Before SFS)	Shows the DC Bus Voltage Reference.
U2-52 (841H)	DC Bus Voltage Feedback at Previous Fault	Shows the DC bus voltage feedback value.
U2-53 (842H)	DC Side Current at Previous Fault	Shows the estimated current on the bus on the DC side.
U2-54 (843H)	Power Supply Voltage at Previous Fault	Shows the power supply voltage.

No. (Addr. Hex)	Name	Description
U2-55 (844H)	Power Supply Side Current at Previous Fault	Shows the current on the power supply side.
U2-56 (845H)	DC Side Power at Previous Fault	Shows the power on the DC side.
U2-57 (846H)	Power Supply Side Power at Previous Fault	Shows the power on the power supply side.
U2-58 (847H)	Power Supply Frequency at Previous Fault	Shows the frequency on the power supply side.
U2-59 (848H)	Power Supply Side Current Reference at Previous Fault	Shows the current reference on the power supply side when the most recent fault occurred.
U2-60 (849H)	Power Factor at Previous Fault	Shows the power factor when the most recent fault occurred.
U2-61 (84AH)	Active Current Reference at Previous Fault	Shows the active current when the most recent fault occurred.
U2-62 (84BH)	Reactive Current Reference at Previous Fault	Shows the reactive current when the most recent fault occurred.
U2-63 (84CH)	DC Bus Voltage Reference at Previous Fault (After SFS)	Shows the DC bus voltage reference after the soft starter.
U2-64 (84DH)	Avr Input (Voltage Deviation) at Previous Fault	Shows the Avr input.
U2-65 (84EH)	Control Voltage Reference (Vq) at Previous Fault	Shows the control voltage reference (Vq) when the most recent fault occurred.
U2-66 (84FH)	Control Voltage Reference (Vd) at Previous Fault	Shows the control voltage reference (Vd) when the most recent fault occurred.
U3: Fault History		
U3-01 to U3-04 (90H to 93H)	First to 4th Most Recent Fault	Displays the first to the fourth most recent faults.
U3-05 to U3-10 (804H to 809H)	5th to 10th Most Recent Fault	Displays the fifth to the tenth most recent faults. After ten faults, data for the oldest fault is deleted. The most recent fault appears in U3-01, with the next most recent fault appearing in U3-02. The data is moved to the next monitor parameter each time a fault occurs.
U3-11 to U3-14 (94H to 97H)	Cumulative Operation Time at 1st to 4th Most Recent Fault	Displays the cumulative operation time when the first to the fourth most recent faults occurred.
U3-15 to U3-20 (80EH to 813H)	Cumulative Operation Time at 5th to 10th Most Recent Fault	Displays the cumulative operation time when the fifth to the tenth most recent faults occurred.

No. (Addr. Hex)	Name	Description
U4: Maintenance Monitors		
U4-01 (4CH)	Cumulative Operation Time	Displays the cumulative operation time of the converter. The value for the cumulative operation time counter can be reset in parameter o4-01. Use parameter o4-02 to determine if the operation time should start as soon as the power is switched on or only while the Run command is present. The maximum number displayed is 99999, after which the value is reset to 0. Note: The MEMOBUS/Modbus communications data is in 10 h units. If data in 1 h units are also required, refer to register number 0099H.
U4-02 (75H)	Number of Run Commands	Displays the number of times the Run command is entered. Reset the number of Run commands using parameter o4-13. This value will reset to 0 and start counting again after reaching 65535.
U4-03 (67H)	Cooling Fan Operation Time	Displays the cumulative operation time of the cooling fan. The default value for the fan operation time is reset in parameter o4-03. This value will reset to 0 and start counting again after reaching 99999. Note: The MEMOBUS/Modbus communications data is in 10 h units. If data in 1 h units are also required, refer to register number 009BH.
U4-04 (7EH)	Cooling Fan Maintenance	Displays main cooling fan usage time as a percentage of its expected performance life. Parameter o4-03 can be used to reset this monitor. Replace the fan when this monitor reaches 90%.
U4-05 (7CH)	Capacitor Maintenance	Displays main circuit capacitor usage time as a percentage of their expected performance life. Parameter o4-05 can be used to reset this monitor. Replace the capacitor when this monitor reaches 90%.
U4-06 (7D6H)	Soft Charge Bypass Relay Maintenance	Displays the soft charge bypass relay maintenance time as a percentage of its estimated performance life. Parameter o4-07 can be used to reset this monitor. Replace the soft charge bypass relay when this monitor reaches 90%.
U4-08 (68H)	Heatsink Temperature	Displays the heatsink temperature.
U4-09 (5EH)	LED Check	Lights all segments of the LED to verify that the display is working properly.
U4-13 (7CFH)	Peak Hold Current	Displays the highest current value that occurred during run.

No. (Addr. Hex)	Name	Description	No. (Addr. Hex)	Name	Description
U4-18 (7DAH)	DC BUS Voltage Reference Source Selection	Displays the source for the DC BUS voltage reference as XY-nn. X: indicates which reference is used: 1 = Reference 1 (b1-01) Y-nn: indicates the reference source 0-01 = Digital operator 1-01 = Analog (terminal A1) 1-02 = Analog (terminal A2) 1-03 = Analog (terminal A3) 3-01 = MEMOBUS/Modbus communications 4-01 = Communication option card 8-01 = Depends on b1-18	U9-07 to U9-10 (826H to 829H)	Electric Power Rates 1 to 4	These parameters show the electric power rate in Power Unit Price (o4-19) that is calculated from the total electrical power consumptions in U9-01 to U9-03. 000 000 000 000 — U9-10 — U9-09 — U9-08 — U9-07 The unit price is set in o4-19, and U9-07 to U9-10 are U9-01 to U9-03 times o4-19.
U4-20 (7DCH)	Option DC voltage Reference	Displays the DC bus voltage reference input by an option card (decimal).	U9-11 to U9-14 (82AH to 82DH)	Regenerative Power Rates 1 to 4	These parameters show the regenerative power rate in Power Unit Price (o4-19) that is calculated from the total electrical power consumptions in U9-04 to U9-06. 000 000 000 000 — U9-14 — U9-13 — U9-12 — U9-11 The unit price is set in o4-19, and U9-11 to U9-14 are U9-04 to U9-06 times o4-19.
U4-35 (1042H)	Power Supply Module Undervoltage (Uv)	Displays the module where power supply Undervoltage (Uv) occurred in binary. **Note:** This parameter is available only in model 4A0630.			
U4-36 (1043H)	Power Supply Module Overvoltage (ov)	Displays the module where power supply Overvoltage (ov) occurred in binary. **Note:** This setting is available only in model 4A0630.			
U4-37 (1044H)	Heatsink Overheat (oH) Module	Displays the module where Heatsink Overheat (oH) occurred in binary. **Note:** This setting is available only in model 4A0630.			
U4-38 (1045H)	Cooling Fan Error (FAn) Module	Displays the module where Cooling Fan Error (FAn) occurred in binary. **Note:** This setting is available only in model 4A0630.			
U6: Operation Status Monitors					
U6-80 to U6-99 (7B0H to 7F9H)	Option Monitors 1 to 20	Shows the monitor information for Option Monitor 1 (876 Hex) to 20 (8FF Hex). This information is displayed when option cards are connected. 200 V Class: 100% = 400 Vdc 400 V Class: 100% = 800 Vdc			
U9: Operation Status Monitors					
U9-01 (820H)	Electric Power (GWh)	Shows the total amount of electric power. 000 000 000 kWh — U9-03 — U9-02 — U9-01			
U9-02 (821H)	Electric Power (MWh)				
U9-03 (822H)	Electric Power (kWh)				
U9-04 (823H)	Regenerative Power (GWh)	Shows the total amount of regenerated power. 000 000 000 kWh — U9-06 — U9-05 — U9-04			
U9-05 (824H)	Regenerative Power (MWh)				
U9-06 (825H)	Regenerative Power (kWh)				

DI/DO Sel.	Description
Digital Input Function Selections	
1	LOCAL/REMOTE selection
8	Baseblock command (N.O.)
9	Baseblock command (N.C.)
C	Analog terminal input selection
F	Through mode
14	Fault reset
18	Timer function input
1B	Program lockout
24 to 27 2C to 2F	External fault
47	Node setup
4B	Run Command (2-wire Sequence)
4C	Stop Command (2-wire Sequence)
67	Communications test mode
Digital Output Function Selections	
0	During run
6	Operation ready
7	DC bus undervoltage
8	During baseblock (N.O.)
E	Fault
F	Through mode
10	Minor fault
11	Fault reset command active
12	Timer output
1B	During baseblock (N.C.)
1D	During regeneration
1E	Restart enabled
20	Heatsink overheat (oH) pre-alarm
24	Fuse blowout detection
25	During run 1
26	During MC on
27	Overload (oL2) warning
2F	Maintenance period
30	During torque limit
39	Power Consumption
3A	kWh monitor pulse output
3B	Alarm 2
3C	LOCAL/REMOTE status
4D	oH Pre-alarm time limit
60	Internal cooling fan alarm
100 to 160	Function 0 to 60 with inverse output

9 Troubleshooting

◆ General Fault and Alarms

Faults and alarms indicate problems in the converter or in the machine.

An alarm is indicated by a code on the data display and the flashing ALM LED. The output is not necessarily switched off.

A fault is indicated by a code on the data display and the ALM LED is on. The output is always switched off immediately and the motor coast to stop.

To remove an alarm or reset a fault, trace the cause, remove it and reset the converter by pushing the Reset key on the operator or cycling the power supply.

This lists up the most important alarms and faults only. Please refer to the Technical Manual for a complete list.

Digital Operator	AL	FL	Cause	Corrective Action
Power Supply Overvoltage Aov	O	O	The input power supply voltage is too high.	Reduce the voltage to within the range in the power supply specifications.
Power Supply Undervoltage AUv	O	O	The capacity of the power supply is too small.	Increase the capacity of the power supply.
			The AC fuse burned out.	A transistor inside the converter was destroyed. The input wiring is ground-faulted or short-circuited. Or, the drive output is ground-faulted or short-circuited, which destroyed the output transistor. Consult with your Yaskawa representative or the nearest Yaskawa sales office.
			The distortion in the power supply is too large.	Lower the impedance of the input power supply wiring.
			A phase loss occurred in the input power supply.	Check the input power supply for phase loss or an imbalance in the interphase voltages. Investigate and correct the cause and reset the fault.
Baseblock bb	O	–	External baseblock signal was entered via one of the multi-function input terminals (S1 to S8).	Check external sequence and baseblock signal input timing.
			The CE detection time (H5-09) is set shorter than the time required for a communication cycle to take place.	• Check the PLC. Change the software settings in the PLC. • Set a longer CE detection time using parameter H5-09.
			Incompatible PLC software settings or there is a hardware problem.	Check the PLC. Remove the cause of the error on the controller side.
			Communications cable is disconnected or damaged.	Check the connector to make sure the cable has a signal. Replace the communications cable.
Current Offset Fault CoF	O	O	An error occurred in the power supply detection circuit.	Cycle the power supply and check operation. If the fault occurs again, replace the board or converter. For information on board replacement, consult with your Yaskawa representative or the nearest Yaskawa sales office.
Control Circuit Error [1] CPF00 to CPF35	–	O	There is a self-diagnostic error in the control circuit.	Cycle power to the converter. If the problem continues, replace the control board or the entire converter. Contact Yaskawa or a Yaskawa representative for instructions on replacing the control board.
			Connector on the operator is damaged.	Replace the operator.
A/D Conversion Error CPF02	–	O	Control circuit is damaged.	Cycle power to the converter. If the problem continues, replace the control board or the entire converter. Contact Yaskawa or a Yaskawa representative for instructions on replacing the control board.

Digital Operator	AL	FL	Cause	Corrective Action
Control Board Connection Error CPF03	–	O	There is a connection error.	Turn off the power and check the connection between the control board and the converter. If the problem continues, replace the control board or the entire converter. Contact Yaskawa or a Yaskawa representative for instructions on replacing the control board.
			Converter fails to operate properly due to noise interference.	Check the various options available to minimize the effects of noise. • Counteract noise in the control circuit, main circuit, and ground wiring. • Use only recommended cables or other shielded line. Ground the shield on the controller side or the converter input power side. • Ensure that other equipment such as switches or relays do not cause noise. Use surge suppressors if required. • Separate all communication wiring from converter power lines. Install an EMC noise filter to the converter power supply input.
EEPROM Memory Data Error CPF06	–	O	There is an error in EEPROM control circuit.	Turn off the power and check the connection between the control board and the converter. If the problem continues, replace the control board or the entire converter. Contact Yaskawa or a Yaskawa representative for instructions on replacing the control board.
			The power supply was switched off while parameters were being saved to the converter.	Reinitialize the converter (A1-03 = 2220, 3330).
Terminal Board Connection Error CPF07 CPF08	–	O	There is a faulty connection between the terminal board and the control board.	Turn off the power and reconnect the terminal board. If the problem continues, replace the control board or the entire converter. Contact Yaskawa or a Yaskawa representative for instructions on replacing the control board.
Control Board Connection Error CPF23	–	O	Hardware is damaged.	If the problem continues, replace the control board or the entire converter. Contact Yaskawa or a Yaskawa representative for instructions on replacing the control board.
Unit Capacity Detect Fault CPF24	–	O	Hardware is damaged.	If the problem continues, replace the control board or the entire converter. Contact Yaskawa or a Yaskawa representative for instructions on replacing the control board.
Cannot Reset CrST	O	–	Fault reset was being executed when a Run command was entered.	• Ensure that a Run command cannot be entered from the external terminals or option during fault reset. • Turn off the Run command.
Option Card External Fault EF0	O	O	An external fault was received from the PLC and F6-03 is set to a value other than 3.	• Remove the cause of the external fault. • Remove the external fault input from the PLC.
			Problem with the PLC program.	Check the PLC program and correct problems.
External Faults EF1 to EF8	O	O	An external device tripped an alarm function.	Remove the cause of the external fault and reset the fault.
			Wiring is incorrect.	• Properly connect the signal lines to the terminals assigned for external fault detection (H1-□□ = 20 to 2B). • Reconnect the signal line.
			Multi-function contact input setting is incorrect.	• Check for unused terminals set for H1-□□ = 20 to 2B (External Fault). • Change the terminal settings.
EEPROM Write Error Err	–	O	Electrical noise has corrupted data while writing to the EEPROM.	• Press "ENTER" on the digital operator. • Correct the parameter setting. • Cycle power to the converter.
			Hardware problem	If the problem continues, replace the control board or the entire converter. Contact Yaskawa or a Yaskawa representative for instructions on replacing the control board.

Digital Operator	AL	FL	Cause	Corrective Action
Internal Circulation Fan Fault Fan	O	O	An internal circulation fan is faulty (2A0130, 4A0130 to 4A0370).	• Cycle the power supply and see if the fault occurs again. • Check the operation of the internal circulation fans. • Check U4-03 (Cooling Fan Operation Time) and U4-04 (Cooling Fan Maintenance Display). If the life of the internal circulation fans has expired or if a fan is faulty, perform fan replacement according to instructions in this manual.
			An internal circulation fan or MC power supply is faulty (2A0130, 4A0130 to 4A0370).	Cycle the power supply and see if the fault occurs again. If the fault occurs repeatedly, replace the board or the converter. For information on board replacement, consult with your Yaskawa representative or the nearest Yaskawa sales office.
Power Supply Frequency Fault Fdv	O	O	A momentary power loss occurred.	Investigate and correct the cause and reset the fault.
			An input power supply wiring terminal is loose.	
			The fluctuation in the voltage of the input power supply is too large.	
			The AC power supply fuse burned out.	• A transistor inside the converter was destroyed. • The input wiring or drive output has ground faulted or short circuited. Contact your Yaskawa representative or the nearest Yaskawa sales office.
			The phase rotation direction has changed in the input power supply.	Correct the wiring.
			The detected power supply frequency exceeded the allowable value.	Improve the power supply.
AC Fuse Blowout FUA	–	O	The power supply fuse burned out.	• A transistor inside the converter was destroyed. • The input wiring or drive output has ground faulted or short circuited. Contact your Yaskawa representative or the nearest Yaskawa sales office.
DC Fuse Blowout FUd	–	O	The main transistor failed.	Replace the converter.
			The DC circuit fuse burned out.	
			The drive failed.	Replace the drive. For information on drive replacement, consult with your Yaskawa representative or the nearest Yaskawa sales office.
Current Alarm HCA	O	–	Load is too heavy.	Reduce the load for applications with repetitive operations (i.e., stops and starts), or replace the converter.
Ground Fault GF	–	O	A damaged cable is creating a short circuit.	Check the cable. • Remove the short circuit and reapply power to the converter. • Check the resistance between the cable and the ground terminal ⏚. • Replace the cable.
			Excessive leakage current at the drive output.	Reduce the amount of stray capacitance.
			Hardware problem	If the problem continues, replace the control board or the entire converter. Contact Yaskawa or a Yaskawa representative for instructions on replacing the control board.
			The wiring of the power supply voltage detection circuits (r1/ℓ11, ⌁1/ℓ21, and t1/ℓ31) and the wiring of the main circuit terminals (R/L1, S/L2, and T/L3) is not correct.	Correct the wiring.

Digital Operator	AL	FL	Cause	Corrective Action
Overcurrent oC	–	O	A momentary power loss occurred.	Investigate and correct the cause and reset the fault.
			One of the cables has shorted out or there is a grounding problem.	Check the motor cables. • Remove the short circuit and reapply power to the converter. Check the resistance between the motor cables and the ground terminal ⏚. • Replace damaged cables. • Reapply power to the converter.
			The load is too heavy.	• Measure the current flowing into the converter. • Replace the converter with a larger capacity converter if the current value exceeds the rated current. • Determine if there is sudden fluctuation in the current level. • Reduce the load to avoid sudden changes in the current level or switch to a larger converter.
			Converter fails to operate properly due to noise interference.	• Review the possible solutions provided for handling noise interference. • Check the control circuit lines, main circuit lines, and ground wiring.
			The wiring of the power supply voltage detection circuits (r1/ℓ11, ⌁1/ℓ21, and t1/ℓ31) and the wiring of the main circuit terminals (R/L1, S/L2, and T/L3) is not correct.	Correct the wiring.
			The voltage on the power supply side is very low.	Check the wiring. • Correct the wiring. Check the load on the power supply of peripheral devices that are connected to the same power supply line. • Reduce the load.
Option card error occurred at Option Port CN5-B oFb03 to oFb17	–	O	Option card or hardware is damaged.	Cycle power to the converter. If the problem continues, replace the control board or the entire converter. Contact Yaskawa or a Yaskawa representative for instructions on replacing the control board.
Heatsink Overheat oH	O	O	Surrounding temperature is too high.	Check the surrounding temperature. • Improve the air circulation within the enclosure panel. • Install a fan or air conditioner to cool surrounding area. • Remove anything near converter that may cause extra heat.
			Airflow around the converter is restricted.	• Provide proper installation space around the converter as indicated in the manual. Refer to *Installation Orientation and Spacing on page 10* for details. • Allow for the proper space and ensure that there is sufficient circulation around the control panel.
				• Check for dust or other foreign materials clogging the cooling fan. • Clear debris caught in the fan that restricts air circulation.
			The ambient temperature is too high.	Check the ambient temperature. • Improve ventilation in the control panel. • Install a cooling device (e.g., a cooling fan or air conditioner) and lower the ambient temperature. • If there are heat-generating objects nearby, remove them.
			The load is too large.	Measure the output current. Lower the load.
			Internal cooling fan has stopped.	Replace the cooling fan. After replacing the converter, set parameter o4-03 to 0 to reset the cooling fan operation time.
Overheat 1 oH1	–	O	Surrounding temperature is too high.	Check the temperature surrounding the converter. • Improve the air circulation within the enclosure panel. • Install a fan or air conditioner to cool the surrounding area. • Remove anything near the converter that might be producing excessive heat.
			Load is too heavy.	Measure the output current. Reduce the load.
			Internal cooling fan is stopped.	Replace the cooling fan. After replacing the cooling fan, set parameter o4-03 to 0 to reset the cooling fan maintenance.

Digital Operator	AL	FL	Cause	Corrective Action
Overload oL2	O	O	Load is too heavy.	Reduce the load.
			Converter capacity is too small.	Replace the converter with a larger model.
			The converter does not operate.	Start converter operation first, and then start converter operation.
Operator Connection Fault oPr	–	O	External operator is not properly connected to the converter.	Check the connection between the operator and the converter. • Replace the cable if damaged. • Turn off the input power and disconnect the operator. Reconnect the operator and reapply converter input power.
Overvoltage ov	O	O	A momentary power loss occurred.	Investigate and correct the cause and reset the fault.
			The regenerative load is too large.	Reduce the regenerative load.
			Input power voltage is too high.	Check the voltage. Lower input power voltage within the limits listed in the specifications.
			Converter fails to operate properly due to noise interference.	• Review the list of possible solutions provided for controlling noise. • Review the section on handling noise interference and check the control circuit lines, main circuit lines, and ground wiring.
			The wiring of the power supply voltage detection circuits ($r1/\ell11$, $s1/\ell21$, and $t1/\ell31$) and the wiring of the main circuit terminals (R/L1, S/L2, and T/L3) is not correct.	Correct the wiring.
			Electrical noise interference causes the converter to operate incorrectly.	• Review possible solutions for handling noise interference. • Review section on handling noise interference and check control circuit lines, main circuit lines and ground wiring. • If the magnetic contactor is identified as a source of noise, install a surge protector to the MC coil.
				Set number of fault restarts (L5-01) to a value other than 0.
			There is a regenerative load while the converter is stopped.	Operate the converter.
Power Supply Undervoltage Pre-Alarm PAUv	O	–	The power supply voltage is low.	Increase the power supply voltage.
			A phase loss occurred in the input power supply.	Check the input power supply for phase loss or an imbalance in the interphase voltages. Investigate and correct the cause and reset the fault.
			Voltage detection failed.	Check $r1/\ell11$, $s1/\ell21$, and $t1/\ell31$ to see if they are wired correctly.
Input Power Supply Fault PF2	–	O	The fluctuation in the voltage of the input power supply is too large.	Investigate and correct the cause and reset the fault.
			A phase loss occurred in the input power supply.	
			The capacity of the power supply is too small.	
			The wiring is too long.	
			The phase imbalance is too large.	
Input Phase Loss Detection PF3	O	O	The fluctuation in the voltage of the input power supply is too large.	Investigate and correct the cause and reset the fault.
			A phase loss occurred in the input power supply.	
			The capacity of the power supply is too small.	
			The wiring is too long.	
			The phase imbalance is too large.	
IGBT Short Circuit or Ground Fault SC	–	O	IGBT fault	• Check the wiring to the drive. • Turn the power supply off and then on again to check operation. If the problem continues, contact your Yaskawa representative or nearest Yaskawa sales office.
			IGBT short circuit detection circuit fault.	
Phase Order Fault SRC	O	O	The power supply phase order changed during operation.	Investigate and correct the cause and reset the fault.
			A momentary power loss occurred.	
			An input power supply wiring terminal is loose.	
			The fluctuation in the voltage of the input power supply is too large.	

Digital Operator	AL	FL	Cause	Corrective Action
Undervoltage Uv	O	–	Phase loss in the converter input power.	Check for wiring errors in the main circuit input power. Correct the wiring.
			Loose wiring in the converter input power terminals.	• Ensure the terminals have been properly tightened. • Apply the tightening torque to the terminals as specified.
			There is a problem with the converter input power voltage.	• Check the voltage. • Lower the voltage of the converter input power so that it is within the limits listed in the specifications.
			A power loss occurred.	Improve the power supply.
			Internal circuitry is worn.	Check the maintenance time for the capacitors (U4-05). Replace either the control board or the entire converter if U4-05 exceeds 90%. For instructions on replacing the control board, contact Yaskawa or your nearest sales representative.
			The converter input power transformer is too small and voltage drops when the power is switched on.	• Check for an alarm when the magnetic contactor, line breaker, and leakage breaker are closed. • Check the capacity of the converter input power transformer.
			Air inside the converter is too hot.	Check the temperature inside the converter.
			The CHARGE light is broken or disconnected.	Replace either the control board or the entire converter. For instructions on replacing the control board, contact Yaskawa or your nearest sales representative.
Main Circuit Undervoltage Uv1	–	O	A phase loss occurred in the input power supply.	Check the wiring of the main circuit power supply for broken wires and wiring mistakes. Correct the wiring.
			An input power supply wiring terminal is loose.	Check the terminals for looseness. Tighten the terminals to the tightening torque that is given in this manual.
			Fluctuation occurred in the power supply voltage.	Check the voltage. • Correct the voltage so that it is within the range given in the power supply specifications of the converter. • If there is no problem with the main circuit power supply, check the magnetic contactor in the main circuit for faults.
			A power loss occurred.	Improve the power supply.
			The main circuit capacitor circuit in the converter has deteriorated.	Check the maintenance period for the capacitor in U4-05 (Capacitor Maintenance). If the value of U4-05 has exceeded 90%, replace the board or the converter. For information on board replacement, consult with your Yaskawa representative or the nearest Yaskawa sales office.
			The operation of the relay or contactor in the inrush current protection circuit in the converter failed.	Cycle the power supply and see if the fault occurs again. • If the fault occurs repeatedly, replace the board or the converter. For information on board replacement, consult with your Yaskawa representative or the nearest Yaskawa sales office. Check the maintenance period for the inrush prevention relay in U4-06 (Soft Charge Bypass Relay Maintenance). • If the value of U4-06 has exceeded 90%, replace the board or the converter. For information on board replacement, consult with your Yaskawa representative or the nearest Yaskawa sales office.
			A fault occurred in the power supply device.	Check the wiring of the power supply device. Correct the wiring.
			A fault occurred in the power supply.	A fault occurred in the power supply.
			A fault occurred in power supply voltage detection.	Check the wiring. Correct the wiring.
Control Power Supply Undervoltage Uv2	–	O	Internal circuitry is damaged.	• Cycle power to the converter. Check if the fault reoccurs. • If the problem continues, replace either the control board or the entire converter. For instructions on replacing the control board, contact Yaskawa or a Yaskawa representative.
Soft Charge Circuit Fault Uv3	–	O	The relay or contactor on the soft-charge bypass circuit is damaged.	• Cycle power to the converter and see if the fault reoccurs. If the problem continues, replace either the control board or the entire converter. For instructions on replacing the control board, contact Yaskawa or a Yaskawa representative. • Check monitor U4-06 for the performance life of the soft-charge bypass. Replace either the control board or the entire converter if U4-06 exceeds 90%. For instructions on replacing the control board, contact Yaskawa or a Yaskawa representative.

Digital Operator	AL	FL	Cause	Corrective Action
Gate Drive Board Undervoltage Uv4	–	O	Not enough power is being supplied to the gate drive board.	Cycle power to the converter and see if the fault reoccurs. If the problem continues, replace either the gate drive board or the entire converter. For instructions on replacing the gate drive board, contact Yaskawa or a Yaskawa representative. Note: This fault is detected in model 4A0630
Resonance Detection VrE	O	O	The power supply was turned off during operation.	Stop the operation of the converter and turn off the power supply.
			There is noise on the power supply line.	Investigate the source of the noise and implement countermeasures.
			A phase was lost for an input terminal during operation.	Check the wiring of the power supply system and remove the cause of the phase loss.

<1> If the fault occurs when starting the converter, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.

◆ Operator Programing Errors

An Operator Programming Error (oPE) occurs when an inapplicable parameter is set or an individual parameter setting is inappropriate. When an oPE error is displayed, press the ENTER button to display U1-18 (oPE fault constant). This monitor will display the parameter that is causing the oPE error.

Digital Operator	Cause	Corrective Action
EEPROM Write Error Err	The data was corrupted by noise when writing data to the EEPROM.	• Press [ENTER]. • Set the parameters again. • Cycle the power supply.
	EEPROM Hardware Failure	Replace the board or converter. For information on board replacement, consult with your Yaskawa representative or the nearest Yaskawa sales office.
Unit Capacity Setting Error oPE01	The Unit Model Selection (o2-04) and the actual capacity of the converter are not the same.	Correct the value set to o2-04.
Parameter Setting Range Error oPE02	Parameters were set outside the possible setting range.	Set parameters to the proper values. **Note:** When multiple errors occur simultaneously, other errors are given precedence over oPE02.
Multi-Function Input Setting Error oPE03	The same function is assigned to two multi-function inputs. Excludes "Not used" and "External Fault."	• Ensure all multi-function inputs are assigned to different functions. • Re-enter the multi-function settings to ensure this does not occur.
Terminal Board Mismatch Error oPE04	The converter was replaced (but the removable terminal block with parameter backup was not replaced).	Set A1-03 to 5550 to load the parameter settings stored in the terminal board to the converter. Initialize parameters after converter replacement by setting A1-03 to 2220.
	The removable terminal block with parameter backup was replaced.	
Run Command Selection Error oPE05	The Run command is assigned to an option card (b1-18 = 3) and an input option card is not connected to the converter.	Reconnect the input option card to the converter.
	The Run command is assigned to an option card (b1-02 = 3) and an input option card is not connected to the converter.	
Multi-Function Analog Input Selection Error oPE07	At least two of these parameters have the same setting: H3-02, H3-10, or H3-06.	Change the settings to H3-02, H3-10, and H3-06 so that functions no longer conflict. **Note:** Both 1F (Through mode) and F (Through mode) can be set to H3-02, H3-10, or H3-06 simultaneously.
Incorrect Input Voltage Adjustment oPE30	• The setting of o2-04 (Unit Model Selection) changed. • EEPROM failed for the input voltage offset.	For information on clearing the fault, consult with your Yaskawa representative or the nearest Yaskawa sales office.

10   UL Standards

◆ UL Standards

The RU mark applies to products in the United States and Canada and it means that UL has performed product testing and evaluation and determined that their stringent standards for product safety have been met. For a product to receive UL certification, all components inside that product must also receive UL certification.

Figure 21 RU Mark

◆ UL Standards Compliance

This converter is tested in accordance with UL standard UL508C and complies with UL requirements. To ensure continued compliance when using this converter in combination with other equipment, meet the following conditions:

■ Conditions of Acceptability

1. The "3PH Input Harmonics Filter Module (3PH Input Reactor)", "3PH Input Reactor 1", "3PH Input Reactor For Harmonics Filter" and "3PH Input Capacitor For Harmonics Filter" shall be installed on the input of D1000 Series device.
2. The D1000 device and its peripherals shall be installed in a suitable enclosure in the end use.
3. The D1000 Series of Power Regenerative devices shall be connected to a VFD which incorporates Solid State Short Circuit Protection Circuitry and was found to comply with the High Fault Current Short Circuit Test without additional testing when:
   a) The converter unit series uses solid state short circuit protection circuitry for compliance with the Short Circuit Test, Section 45 of UL508C, 3rd edition
   b) The solid state short circuit protection circuitry is used in accordance with 45.1.3 of UL508C, 3rd edition.

■ Installation Area

Do not install the converter to an area greater than pollution degree 2 (UL standard).

■ Ambient Temperature

IP00 Open Type Enclosure: -10°C to +50°C

IP20 Open Type Enclosure: -10°C to +40°C

■ Main Circuit Terminal Wiring

Yaskawa recommends using closed-loop crimp terminals on all converter models. To maintain UL/cUL approval, UL Listed closed-loop crimp terminals are specifically required when wiring the converter main circuit terminals on models 2A0030 to 2A0130, 4A0030 to 4A0630. Use only the tools recommended by the terminal manufacturer for crimping. Refer to *Closed-Loop Crimp Terminal Recommendations on page 52* for closed-loop crimp terminal recommendations. The wire gauges listed in the following tables are Yaskawa recommendations. Refer to local codes for proper wire gauge selections.

Note: The mark ⏚ indicates the terminals for protective ground connection as defined in IEC/EN 60417-5019.
Grounding impedance:
200 V: 100 Ω or less
400 V: 10 Ω or less

Wire Gauges and Tightening Torques

Table 17 Wire Gauge and Torque Specifications (Three-Phase 200 V Class)

Model	Terminal	Recommended Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb·in.)
2A0005	R/L1, S/L2, T/L3 ⊖, ⊕	12	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ⌁1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	10	16 to 10	M6	5.4 to 6.0 (47.8 to 53.1)
2A0010	R/L1, S/L2, T/L3 ⊖, ⊕	8	8 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ⌁1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	10	12 to 10	M6	5.4 to 6.0 (47.8 to 53.1)
2A0020	R/L1, S/L2, T/L3 ⊖, ⊕	4	4 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, ⌁1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	6	8 to 6	M6	5.4 to 6.0 (47.8 to 53.1)
2A0030	R/L1, S/L2, T/L3 ⊖, ⊕	2	2 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	r1/ℓ11, ⌁1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	4	6 to 4	M8	9.0 to 11 (79.7 to 97.4)
2A0050	R/L1, S/L2, T/L3	3 × 2P	3 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕	1/0 × 2P	1/0 to 2/0		
	r1/ℓ11, ⌁1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	4	4	M10	18 to 23 (159 to 204)
2A0065	R/L1, S/L2, T/L3 ⊖, ⊕	3/0 × 2P	3/0 to 300	M12	32 to 40 (283 to 354)
	r1/ℓ11, ⌁1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	1	1 to 1/0	M12	32 to 40 (283 to 354)
2A0090	R/L1, S/L2, T/L3 ⊖, ⊕	3/0 × 2P	3/0 to 300	M12	32 to 40 (283 to 354)
	r1/ℓ11, ⌁1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	1/0	1/0 to 4/0	M12	32 to 40 (283 to 354)
2A0130	R/L1, S/L2, T/L3 ⊖, ⊕	300 × 2P	300 to 600	M12	32 to 40 (283 to 354)
	r1/ℓ11, ⌁1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	2/0	2/0 to 4/0	M12	32 to 40 (283 to 354)

Table 18 Wire Gauge and Torque Specifications (Three-Phase 400 V Class)

Model	Terminal	Recommended Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb·in.)
4A0005	R/L1, S/L2, T/L3 ⊖, ⊕	12	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ⌁1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	12	14 to 12	M6	5.4 to 6.0 (47.8 to 53.1)
4A0010	R/L1, S/L2, T/L3 ⊖, ⊕	12	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ⌁1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	10	12 to 10	M6	5.4 to 6.0 (47.8 to 53.1)
4A0020	R/L1, S/L2, T/L3 ⊖, ⊕	8	8 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, ⌁1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	8	10 to 8	M6	5.4 to 6.0 (47.8 to 53.1)

Model	Terminal	Recommended Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb·in.)
4A0030	R/L1, S/L2, T/L3	6	6 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕				
	r1/ℓ11, ⊿1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	6	8 to 6	M8	9.0 to 11 (79.7 to 97.4)
4A0040	R/L1, S/L2, T/L3	4	4 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕				
	r1/ℓ11, ⊿1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	6	6	M8	9.0 to 11 (79.7 to 97.4)
4A0060	R/L1, S/L2, T/L3	2	2 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕				
	r1/ℓ11, ⊿1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	6	6	M10	18 to 23 (159 to 204)
4A0100	R/L1, S/L2, T/L3	3 × 2P	3 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕	1/0 × 2P	1/0 to 2/0		
	r1/ℓ11, ⊿1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	3	3	M10	18 to 23 (159 to 204)
4A0130	R/L1, S/L2, T/L3	3/0 × 2P	3/0 to 600	M10	18 to 23 (159 to 204)
	⊖, ⊕				
	r1/ℓ11, ⊿1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	1/0	1/0 to 2/0	M10	18 to 23 (159 to 204)
4A0185	R/L1, S/L2, T/L3	3/0 × 2P	3/0 to 600	M12	32 to 40 (283 to 354)
	⊖, ⊕				
	r1/ℓ11, ⊿1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	1/0	1/0 to 4/0	M12	32 to 40 (283 to 354)
4A0270	R/L1, S/L2, T/L3	300 × 2P	300	M12	32 to 40 (283 to 354)
	⊖, ⊕				
	r1/ℓ11, ⊿1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	2/0	2/0 to 4/0	M12	32 to 40 (283 to 354)
4A0370	R/L1, S/L2, T/L3	4/0 × 4P	4/0 to 300	M12	32 to 40 (283 to 354)
	⊖, ⊕				
	r1/ℓ11, ⊿1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	4/0	2/0 to 300	M12	32 to 40 (283 to 354)
4A0630	R/L1, S/L2, T/L3	4/0 × 8P	4/0 to 300	M12	32 to 40 (283 to 354)
	⊖, ⊕				
	r1/ℓ11, ⊿1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	250	2/0 to 300	M12	32 to 40 (283 to 354)

Closed-Loop Crimp Terminal Recommendations

Yaskawa recommends UL Listed crimp terminals made by JST and Tokyo DIP (or equivalent) for the insulation cap. *Table 19* matches the wire gauges and terminal screw sizes with Yaskawa-recommended crimp terminals, tools, and insulation caps. Refer to the appropriate Wire Gauge and Torque Specifications table for the wire gauge and screw size for your converter model. Place orders with a Yaskawa representative or the Yaskawa sales department. The closed-loop crimp terminal sizes and values listed in *Table 19* are Yaskawa recommendations. Wire gauge values shown in *Table 19* are the recommended values. Refer to local codes for proper selections.

Table 19 Closed-Loop Crimp Terminal Size

Model	Wire Gauge (AWG, kcmil)		Screw Size	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code [1]
	R/L1·S/L2·T/L3	$\ominus$, $\oplus$			Machine No.	Die Jaw		
200 V Class								
2A0005	12		M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	10			R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8			8-4	YA-4	AD-901	TP-008	100-054-031
	6			14-NK4	YA-4	AD-902	TP-014	100-054-033
2A0010	8		M4	8-4	YA-4	AD-901	TP-008	100-054-031
	6			14-NK4	YA-4	AD-902	TP-014	100-054-033
2A0020	4		M6	R22-6	YA-5	AD-953	TP-022	100-051-262
	3			38-6	YA-5	AD-954	TP-038	100-092-577
	2			38-6	YA-5	AD-954	TP-038	100-092-577
	1			60-6	YA-5	AD-955	TP-060	100-092-578
2A0030	2		M8	R38-8	YA-5	AD-954	TP-038	100-051-264
	1			R60-8	YA-5	AD-955	TP-060	100-051-265
	1/0			R60-8	YA-5	AD-955	TP-060	100-051-265
	2/0			80-8	YF-1, YET-300-1	TD-323 TD-312	TP-080	100-092-579
2A0050	3 × 2P	–	M8	R38-8	YA-5	AD-954	TP-038	100-051-264
	2 × 2P	–		R38-8	YA-5	AD-954	TP-038	100-051-264
	1 × 2P	–		R60-8	YA-5	AD-955	TP-060	100-051-265
	1/0 × 2P	1/0 × 2P		R60-8	YA-5	AD-955	TP-060	100-051-265
	2/0 × 2P	2/0 × 2P		80-8	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-092-579
2A0065	3/0 × 2P		M12	80-L12	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-051-558
	4/0 × 2P			100-L12	YF-1, YET-300-1	TD-324, TD-312	TP-100	100-051-560
	250			150-L12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-562
	300			150-L12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-562
2A0090	3/0 × 2P		M12	80-L12	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-051-558
	4/0 × 2P			100-L12	YF-1, YET-300-1	TD-324, TD-312	TP-100	100-051-560
	250 × 2P			150-L12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-562
	300 × 2P			150-L12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-562

Model	Wire Gauge (AWG, kcmil)		Screw Size	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code [1]
	R/L1·S/L2·T/L3	$\ominus$, $\oplus$			Machine No.	Die Jaw		
400 V Class								
4A0005	12		M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	10			R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8			8-4	YA-4	AD-901	TP-008	100-054-031
	6			14-NK4	YA-4	AD-902	TP-014	100-054-033
4A0010	12		M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	10			R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8			8-4	YA-4	AD-901	TP-008	100-054-031
	6			14-NK4	YA-4	AD-902	TP-014	100-054-033
4A0020	8		M6	R8-6	YA-4	AD-901	TP-008	100-092-620
	6			R14-6	YA-4	AD-902	TP-014	100-051-261
	4			R22-6	YA-5	AD-953	TP-022	100-051-262
	3			38-6	YA-5	AD-954	TP-038	100-092-577
	2			38-6	YA-5	AD-954	TP-038	100-092-577
	1			60-6	YA-5	AD-955	TP-060	100-092-578
4A0030	6		M8	R14-8	YA-4	AD-902	TP-014	100-051-035
	4			R22-8	YA-5	AD-953	TP-022	100-051-263
	3			R38-8	YA-5	AD-954	TP-038	100-051-264
	2			R38-8	YA-5	AD-954	TP-038	100-051-264
	1			R60-8	YA-5	AD-955	TP-060	100-051-265
	1/0			R60-8	YA-5	AD-955	TP-060	100-051-265
	2/0			80-8	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-092-579
4A0040	4		M8	R22-8	YA-5	AD-953	TP-022	100-051-263
	3			R38-8	YA-5	AD-954	TP-038	100-051-264
	2			R38-8	YA-5	AD-954	TP-038	100-051-264
	1			R60-8	YA-5	AD-955	TP-060	100-051-265
	1/0			R60-8	YA-5	AD-955	TP-060	100-051-265
	2/0			80-8	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-092-579
4A0060	2		M8	R38-8	YA-5	AD-954	TP-038	100-051-264
	1			R60-8	YA-5	AD-955	TP-060	100-051-265
	1/0			R60-8	YA-5	AD-955	TP-060	100-051-265
	2/0			80-8	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-092-579
4A0100	3 × 2P	–	M8	R38-8	YA-5	AD-954	TP-038	100-051-264
	2 × 2P	–		R38-8	YA-5	AD-954	TP-038	100-051-264
	1 × 2P	–		R60-8	YA-5	AD-955	TP-060	100-051-265
	1/0 × 2P			R60-8	YA-5	AD-955	TP-060	100-051-265
	2/0 × 2P			80-8	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-092-579
4A0130	3/0 × 2P		M10	80-L10	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-051-557
	4/0 × 2P			100-L10	YF-1, YET-300-1	TD-324, TD-312	TP-100	100-051-559
	250 × 2P	250		150-L10	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-561
	300			R150-10	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-272
	350			200-10	YF-1, YET-300-1	TD-327, TD-314	TP-200	100-051-563
	400			200-10	YF-1, YET-300-1	TD-327, TD-314	TP-200	100-051-563
	500			325-10	YF-1, YET-300-1	TD-328, TD-315	TP-325	100-051-565
	600			325-10	YF-1, YET-300-1	TD-328, TD-315	TP-325	100-051-565

Model	Wire Gauge (AWG, kcmil)		Screw Size	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code [1]
	R/L1·S/L2·T/L3	$\ominus$, $\oplus$			Machine No.	Die Jaw		
4A0185	3/0 × 2P		M12	80-L12	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-051-557
	4/0 × 2P			100-L12	YF-1, YET-300-1	TD-324, TD-312	TP-100	100-051-559
	250 × 2P			150-L12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-562
	300 × 2P			150-L12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-562
	350 × 2P			200-L12	YF-1, YET-300-1	TD-327, TD-314	TP-200	100-051-564
	400 × 2P			200-L12	YF-1, YET-300-1	TD-327, TD-314	TP-200	100-051-564
	500			325-12	YF-1, YET-300-1	TD-328, TD-315	TP-325	100-051-277
	600			325-12	YF-1, YET-300-1	TD-328, TD-315	TP-325	100-051-277
4A0270	300 × 2P		M12	150-L12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-562
4A0370	4/0 × 4P		M12	100-L12	YF-1, YET-300-1	TD-324, TD-312	TP-100	100-051-559
	250 × 4P			150-L12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-562
	300 × 4P			150-L12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-562
4A0630	4/0 × 8P		M12	100-L12	YF-1, YET-300-1	TD-324, TD-312	TP-100	100-051-559
	250 × 8P			150-L12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-562
	300 × 8P			150-L12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-562

<1> Codes refer to a set of three crimp terminals and three insulation caps. Prepare input and output wiring using two sets for each connection.
Example 1: Model 4A0130 with 300 kcmil for both input and output require one set for input terminals and one set for output terminals, so the user should order two sets of [100-051-272].
Example 2: Model 4A0185 with 300 kcmil × 2P for both input and output require two sets for input terminals and two sets for output terminals, so the user should order four sets of [100-051-562].

Note: Use crimp insulated terminals or insulated shrink tubing for wiring connections. Wires should have a continuous maximum allowable temperature of 75°C 600 Vac UL-approved vinyl-sheathed insulation.

Model	Wire Gauge (AWG, kcmil)	Screw Size	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code
	r1/ℓ11, ℓ1/ℓ21, t1/ℓ31			Machine No.	Die Jaw		
2A0005 to 2A0020, 4A0005 to 4A0020	14	M3.5	R2-3.5	YA-4	AD-900	TP-003	100-106-516
2A0030 to 2A0130, 4A0030 to 4A0630	14	M4	R2-4	YA-4	AD-900	TP-003	100-106-517

◆ Standard Configuration Devices

Yaskawa recommends installing an appropriate harmonic filter that has built-in input fuses to maintain compliance with UL508C. The standard configuration devises are listed in *Table 20* to *Table 22*.

Table 20 Recommended Standard Configuration Devices

Model	Harmonic Filter Module	Input Fuse			Three Phase Input AC Reactor		Three Phase Input Film Capacitor	
		Model	Manufacturer	Fuse Rating Ampere (A)	SAO ELECTRIC CORP.		Nichicon Corp.	
					Model	Ratings	Model	Ratings
200 V Class								
2A0005	EUJ71080□	350GH-25ULTC	HINODE	25	300-052-260	15 A, 0.81 mH, 264 V	EM161050S0UA1HN	160 VAC, 5 uF
2A0010	EUJ71081□	350GH-50ULTC	HINODE	50	300-052-261	29 A, 0.42 mH, 264 V	EM161090S0UA1HN	160 VAC, 9 uF
2A0020	EUJ71082□	350GH-125ULTC	HINODE	125	300-052-262	57 A, 0.21 mH, 264 V	EM161180S0UA1HS	160 VAC, 18 uF
2A0030	EUJ71083□	170M1369	BUSSMANN	160	300-052-263	83 A, 0.15 mH, 264 V	EM161370S1UA1HZ	160 VAC, 12.5 uF
2A0050	EUJ71084□	350GH-250ULTC	HINODE	250	300-052-264	140 A, 0.09 mH, 264 V	EM161281S1UA1HZ	160 VAC, 96 uF
2A0065	EUJ71085□	170M4012	BUSSMANN	400	300-052-265	200 A, 0.06 mH, 264 V	EM161421S1UA1HZ	160 VAC, 140 uF
2A0090	EUJ71086□	170M4013	BUSSMANN	450	300-052-266	270 A, 0.04 mH, 264 V	EM161551S1UA1HZ	160 VAC, 185 uF
2A0130	EUJ71087□	170M4017	BUSSMANN	700	300-052-267	400 A, 0.03 mH, 264 V	EM161421S1UA1HZ	160 VAC, 140 uF
400 V Class								
4A0005	EUJ71088□	660GH-16ULTC	HINODE	16	300-052-268	8 A, 3.31 mH, 528 V	EM3211R2S0UA1HP	320 VAC, 1.2 uF
4A0010	EUJ71089□	660GH-40ULTC	HINODE	40	300-052-269	16 A, 1.65 mH, 528 V	EM3217R5S1UA1HZ	320 VAC, 2.5 uF
4A0020	EUJ71090□	660GH-63ULTC	HINODE	63	300-052-270	30 A, 0.88 mH, 528 V	EM3217R5S1UA1HZ	320 VAC, 2.5 uF
4A0030	EUJ71091□	170M1368	BUSSMANN	125	300-052-271	43 A, 0.62 mH, 528 V	EM321090S1UA1HZ	320 VAC, 3 uF
4A0040	EUJ71092□	170M1369	BUSSMANN	160	300-052-272	58 A, 0.46 mH, 528 V	EM321270S1UA1HZ	320 VAC, 9 uF
4A0060	EUJ71093□	660GH-160ULTC	HINODE	160	300-052-273	86 A, 0.31 mH, 528 V	EM321390S1UA1HZ	320 VAC, 13 uF
4A0100	EUJ71094□	660GH-250ULTC	HINODE	250	300-052-274	145 A, 0.18 mH, 528 V	EM321151S1UA2HZ	320 VAC, 50 uF
4A0130	EUJ71095□	170M4012	BUSSMANN	400	300-052-275	210 A, 0.13 mH, 528 V	EM321101S1UA1HZ	320 VAC, 35 uF
4A0185	EUJ71096□	170M4015	BUSSMANN	550	300-052-276	300 A, 0.09 mH, 528 V	EM321151S1UA2HZ	320 VAC, 50 uF
4A0270	–	170M6011	BUSSMANN	700	300-052-252	410 A, 0.06 mH, 528 V	EF521291TYQ0976	528 VAC, 290 uF
4A0370	–	170M6014	BUSSMANN	1000	300-052-253	560 A, 0.05 mH, 528 V	EF521401TYQ0969	528 VAC, 402 uF
4A0630	–	170M6014	BUSSMANN	1000	300-052-254	1140 A, 0.02 mH, 528 V	EF521801TYQ0984	528 VAC, 800 uF

Table 21 Three Phase Input AC Reactor 1

Model	SAO ELECTRIC CORP.	
	Model	Ratings
200 V Class		
2A0005	300-052-233	15 A, 2.45 mH, 264 V
2A0010	300-052-234	29 A, 1.27 mH, 264 V
2A0020	300-052-235	57 A, 0.64 mH, 264 V
2A0030	300-052-236	83 A, 0.44 mH, 264 V
2A0050	300-052-237	140 A, 0.26 mH, 264 V
2A0065	300-052-238	200 A, 0.18 mH, 264 V
2A0090	300-052-239	270 A, 0.14 mH, 264 V
2A0130	300-052-240	400 A, 0.09 mH, 264 V
400 V Class		
4A0005	300-052-241	8 A, 9.19 mH, 528 V
4A0010	300-052-242	16 A, 4.59 mH, 528 V
4A0020	300-052-243	30 A, 2.45 mH, 528 V
4A0030	300-052-244	43 A, 1.71 mH, 528 V
4A0040	300-052-245	58 A, 1.27 mH, 528 V
4A0060	300-052-246	86 A, 0.85 mH, 528 V
4A0100	300-052-247	145 A, 0.51 mH, 528 V
4A0130	300-052-248	210 A, 0.35 mH, 528 V
4A0185	300-052-249	300 A, 0.25 mH, 528 V
4A0270	300-052-250	410 A, 0.18 mH, 528 V
4A0370	300-052-251	560 A, 0.13 mH, 528 V
4A0630	300-052-251 (×2)	560 A, 0.13 mH, 528 V

Table 22 Three Phase Input Reactor for Harmonics Filter

Model	SAO ELECTRIC CORP.	
	Model	Ratings
400 V Class		
4A0270	300-052-255	64 A, 0.0218 mH, 528 V
4A0370	300-052-256	87 A, 0.0158 mH, 528 V
4A0630	300-052-257	177 A, 0.0079 mH, 528 V

◆ Installing Standard Configuration Devices

NOTICE: *If a fuse is open or a Residual Current Device (RCD) is tripped, check the wiring and the selection of the peripheral devices. Check the wiring and the selection of peripheral devices to identify the cause. Contact Yaskawa before restarting the converter or the peripheral devices if the cause cannot be identified.*

■ Recommended Branch Circuit Protection

Yaskawa recommends installing harmonic filter that has built-in input fuses to the input side of the current suppression reactor to maintain compliance with UL508C.
The fuses are listed in *Table 9*.

■ Low Voltage Wiring for Control Circuit Terminals

Wire low voltage wires with NEC Class 1 circuit conductors. Refer to national state or local codes for wiring. The external power supply shall be a UL Listed Class 2 power supply source or equivalent only.

Table 23 Control Circuit Terminal Power Supply

Input/Output	Terminal Signal	Power Supply Specifications
Multi-function digital inputs	S1, S2, S3, S4, S5, S6, S7, S8, SC, SN, SP	Use the internal LVLC power supply of the converter. Use class 2 for external power supply.
Multi function analog inputs	+V, -V, A1, A2, A3, AC	

■ Converter Short-Circuit Rating

This converter is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes, 240 Vac for 200 V class converters and 480 Vac for 400 V class converters, when protected by fuses as specified on the *Table 9*.

◆ Precautionary Notes on External Heatsink (IP00/Open Type Enclosure)

When using an external heatsink, UL compliance requires that exposed capacitors in the main circuit are covered to prevent injury to surrounding personnel.

The portion of the external heatsink that projects out can either be protected with the enclosure, or with the appropriate capacitor cover after converter installation is complete. Use the table below to match converter models and capacitor cover. Capacitor covers can be ordered from a Yaskawa representative or directly from the Yaskawa sales department. The table below lists available capacitor covers.

Table 24 Capacitor Cover

Model	Code Number	Figure
2A0030	100-061-274	*Figure 22*
2A0050	100-061-275	
2A0065	100-061-277	
2A0090	100-061-277	
2A0130	100-061-278	
4A0030	100-061-274	
4A0040	100-061-274	
4A0060	100-061-275	
4A0100	100-061-275	
4A0130	100-061-278	
4A0185	100-061-278	
4A0270	100-061-280	
4A0370	100-061-280	
4A0630	100-061-281 [1]	*Figure 23*

[1] Requires two sets.

Converter (outside panel)

Opening to capacitors

Converter (inside panel)

Installation screw
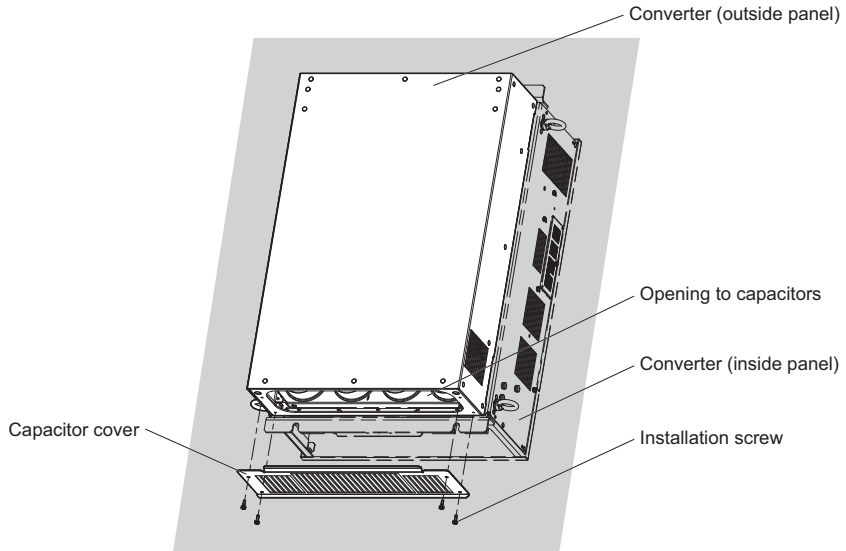
Capacitor cover

Figure 22 Capacitor Cover (2A0030 to 2A0130, 4A0030 to 4A0370)

Converter (outside panel)

Opening to capacitors

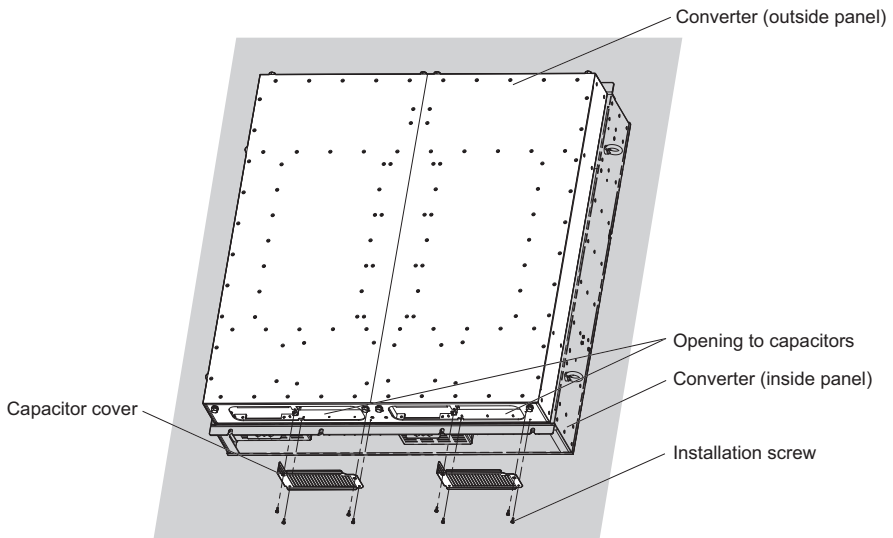Converter (inside panel)

Installation screw

Capacitor cover

Figure 23 Capacitor Cover (4A0630)

Revision History

The revision dates and the numbers of the revised manuals appear on the bottom of the back cover.

Date of Publication	Revision Number	Section	Revised Content
January 2015	⟨2⟩	All	Revision: Reviewed and corrected the entire documentation.

		8	Deletion: C6-02 (Carrier Frequency Selection)
			Addition: • H2-06 (kWh Monitor Pulse Output Unit Selection)
			    • H2-□□ = 39 (Power Consumption), 3A (Regenerated Power)
			    • L9-08 (DC5 Conveter Unit Replacement Selection)
			    • L9-09 (DC3 Conveter Unit Replacement Selection)

		9	Revision: Cause and possible solutions for oC and ov
		10	Revision: Standard Configuration Devices Addition: Conditions of Acceptability Revision: Installing Standard Configuration Devices
		Back cover	Revision: Address
February 2014	⟨1⟩	All	Revision: Reviewed and corrected entire documentation.
September 2013	–	–	First edition

YASKAWA D1000 Series
Power Regenerative Converter
Quick Start Guide

YASKAWA ELECTRIC CORPORATION

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