YASKAWA

YASKAWA AC Drive A1000
High Performance Vector Control Drive
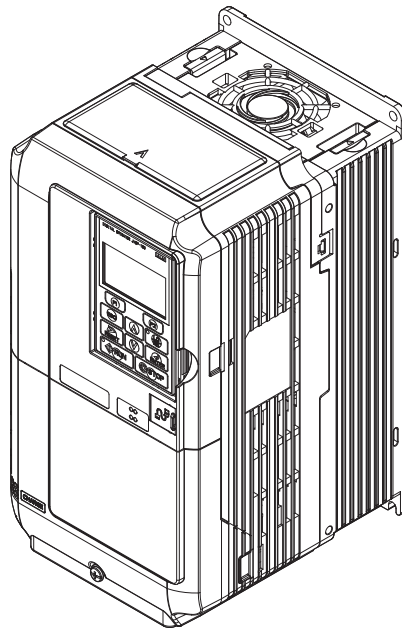# Quick Start Guide

Type: CIMR-AC☐☐☐☐☐

Models: 200 V Class: 0.55 to 110 kW
          400 V Class: 0.55 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.

Table of Contents

1   Safety Instructions and General Warnings

Yaskawa Electric supplies component parts for use in a wide variety of industrial applications. The selection and application of Yaskawa products remain the responsibility of the equipment designer 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 products designed to incorporate a component part 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 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.

◆ Applicable Documentation

The following manuals are available for A1000 series drives:

	A1000 Series AC Drive Quick Start Guide (this book)
	Read this manual first. This guide is packaged together with the product. It contains basic information on safety precautions, model list, and wiring. Use the information in this book to prepare the drive for a trial run with the application and for basic operation.
	A1000 Series AC Drive Technical Manual
	This manual contains information required to install and wire the drive, in addition to an overview of fault diagnostics, maintenance safety, and parameter settings.

◆ General Warnings

⚠ WARNING
• **Read and understand this manual before installing, operating or servicing this drive.** • **All warnings, cautions, and instructions must be followed.** • **All work must be performed by qualified personnel.** • **The drive must be installed according to this manual and local codes.**
Heed the safety messages in this manual.
The operating company is responsible for any injuries or equipment damage resulting from failure to heed the warnings in this manual.

The following conventions are used to indicate Safety messages in this manual:

⚠ 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 Warnings

⚠ WARNING

Electrical Shock Hazard

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

Yaskawa is not responsible for the damage caused by modification of the product made by the user. Failure to comply could result in death or serious injury from operation of damaged equipment.

Do not touch any terminals before the capacitors have fully discharged.

Failure to comply could result in death or serious injury.

Before wiring terminals, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait at least five minutes after all indicators are off and measure the DC bus voltage level to confirm safe level.

Do not allow unqualified personnel to use equipment.

Failure to comply could result in death or serious injury.

Maintenance, inspection, and replacement of parts must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of AC drives.

Do not change wiring, remove covers, connectors or options cards, or attempt to service the drive with power applied to the drive.

Failure to comply could result in death or serious injury. Disconnect all power to the drive and check for unsafe voltages before servicing.

Always ground the motor-side grounding terminal.

Improper equipment grounding could result in death or serious injury by contacting the motor case.

Do not perform work on the drive while wearing loose clothing, jewelry or without eye protection.

Failure to comply could result in death or serious injury.

Remove all metal objects such as watches and rings, secure loose clothing, and wear eye protection before beginning work on the drive.

Never short the output circuits of the drive.

Do not short the output circuits of the drive. Failure to comply could result in death or serious injury.

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

When an EMC filter is installed or with models CIMR-A☐4A0414 and larger, the leakage current exceeds 3.5 mA. Therefore according to IEC/EN 61800-5-1:2007 automatic power supply interruption in case of discontinuity of the protective earthing conductor must be provided or a protective earthing conductor with a cross section of at least 10 mm^2 (Cu) or 16 mm^2 (Al) must be used.

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

This drive 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.

Sudden Movement Hazard

Stay clear of the motor during rotational Auto-Tuning. The motor may start operating suddenly.

During automatic starting of equipment, the machine may start moving suddenly, which could result in death or serious injury.

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

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

⚠ WARNING
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 drive matches the voltage of the incoming power supply before applying power.

Do not use improper combustible materials in drive installation, repair or maintenance.

Failure to comply could result in death or serious injury by fire. Attach the drive or braking resistors to metal or other noncombustible material.

Do not connect the AC power line to the output terminals of the drive.

Failure to comply could result in death or serious injury by fire as a result of drive damage from line voltage application to output terminals.
- Do not connect AC line power to output terminals U, V, and W.
- Make sure that the power supply lines are connected to main circuit input terminals R/L1, S/L2, T/L3 (or R/L1 and S/L2 for single-phase power).

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.

Crush Hazard

Use a dedicated lifter when transporting the drive by a lifter.

Improper lifter may cause the drive to drop, resulting in serious injury.

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

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

⚠ CAUTION
Crush Hazard

Do not carry the drive by the front cover.

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

Burn Hazard

Do not touch the heatsink or braking resistor hardware until a powered-down cooling period has elapsed.

NOTICE
Equipment Hazard

Observe proper electrostatic discharge procedures (ESD) when handling the drive and circuit boards.

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

Never connect or disconnect the motor from the drive while the drive is outputting voltage.

Improper equipment sequencing could result in damage to the drive.

Do not perform a withstand voltage test or megger test on any part of the unit.

Failure to comply could result in damage to the sensitive devices within the drive. Use power off resistance checks to determine shortcircuits.

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.

NOTICE
If a fuse is blown or equipment for residual current monitoring/detection (RCM/RCD) is tripped, check the wiring and the selection of the peripheral devices.
Check for short circuits or ground faults on the secondary side of fuses and RCM/RCDs and check the wiring and the selection of peripheral devices. Remove the cause of the problem and then turn the power supply off and on again. If the cause cannot be identified, do not turn on the power supply or attempt to operate the equipment.
Do not restart the drive until 5 minutes passes and CHARGE lamp is OFF or immediately operate the peripheral devices if a fuse is blown or equipment for residual current monitoring/detection (RCM/RCD) is tripped.
Check the wiring and the selection of peripheral devices to identify the cause.
Contact Yaskawa or a Yaskawa representative before restarting the drive or the peripheral devices if the cause cannot be identified.
For models CIMR-A□4A0930 and 4A1200, make sure to install a fuse and equipment for residual current monitoring/detection (RCM/RCD).
Failure to comply may result in serious damage to the facilities in case the drive is defected.
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 drive.
Do not carelessly connect parts or devices to the drives braking transistor terminals.
Failure to comply could result in damage to the drive or braking circuit.
Carefully review instruction manual TOBP C720600 00 or TOBP C720600 01 when connecting a braking option to the drive.
Do not modify the drive circuitry.
Failure to comply could result in damage to the drive and will void warranty.
Yaskawa is not responsible for 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 drive and connecting other devices.
Failure to comply could result in damage to the drive.
Improper application of devices on drive output circuits can damage the drive
Do not connect unapproved LC or RC interference suppression filters, capacitors, ground fault circuits, or overvoltage protection devices to the drive.
Fire Hazard
Install adequate branch circuit short circuit protection per applicable codes.
The drive 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). Inadequate branch short circuit protection damage or serious injury by fire.

◆ Precautions for CE Low Voltage Directive Compliance

This drive has been tested according to European standard IEC/EN 61800-5-1:2007, and it fully complies with the Low Voltage Directive. The following conditions must be met to maintain compliance when combining this drive with other devices:

Do not use drives in areas with pollution higher than degree 2 and overvoltage category III in accordance with IEC/EN 60664.
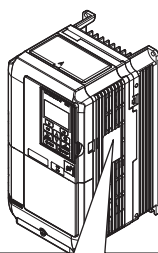
Ground the neutral point of the main power supply for 400 V Class drives.

2   Mechanical Installation

◆ Upon Receipt

Perform the following tasks after receiving the drive:

- Inspect the drive for damage. If the drive appears damaged upon receipt, contact Yaskawa or a Yaskawa representative.
- Verify receipt of the correct model by checking the information on the nameplate. If you have received the wrong model, contact Yaskawa or a Yaskawa representative.

◆ Nameplate

<1> Drive models CIMR-A□4A0930 and 4A1200 use software version 301□. The availability of certain functions on these models differs from models CIMR-A□2A0004 to 2A0415 and 4A0002 to 4A0675, which use software version 10□□.
<2> The address of the head office of Yaskawa Electric Corporation (responsible for product liability) is shown on the nameplate.

◆ Installation Environment

For optimum performance life of the drive, install the drive in an environment that meets the conditions listed below.

Environment	Conditions
Installation Area	Indoors
Ambient Temperature	IP20/UL Type 1 enclosure: -10°C to +40°C IP00 enclosure: -10°C to +50°C Finless Type: IP20/IP00 enclosure: -10°C to +45°C Drive reliability improves in environments without wide temperature fluctuations. When using the drive 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 drive.
Humidity	95% RH or less and free of condensation
Storage Temperature	-20°C to +60°C
Surrounding Area	Install the drive 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, up to 3000 m with derating (for details, refer to the Technical Manual)

Environment	Conditions
Vibration	10 to 20 Hz at 9.8 m/s^2 *<1>* 20 to 55 Hz at 5.9 m/s^2 (Models CIMR-□2A0004 to 2A0211 and 4A0002 to 4A0165) or, 2.0 m/s^2 (Models CIMR-A□2A0250 to 2A0415 and 4A0208 to 4A1200)
Orientation	Install the drive vertically to maintain maximum cooling effects.

<1> Models CIMR-A□4A0930 and 4A1200 are rated at 5.9 m/s^2.

◆ Installation Orientation and Spacing

Always install the drive in an upright position. Leave space around the unit for proper cooling as shown in the figure on the right.

> **Note:** Several units can be installed closer together than shown in the figure by using "Side-by-Side" mounting. For details refer to the Technical Manual.
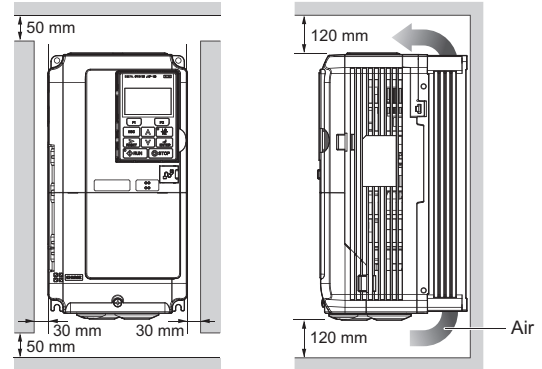
◆ Instructions on Installation

Eye bolts are used to install the drive or to temporarily lift the drive when replacing it. The drive can be installed in an enclosure panel or on a wall. Do not leave the drive suspended by the wires in a horizontal or vertical position for long periods of time. Do not transport the drive over long distances. Read the following precautions and instructions before installing the drives.

WARNING! *Be sure to observe the following instructions and precautions. Failure to comply could result in minor or moderate injury and damage to the drive from falling equipment.*

- *Before using wires to suspend the drive vertically and horizontally, make sure that the drive front cover, terminal blocks and other drive components are securely fixed with screws.*
- *Do not subject the drive to vibration or impact greater than 1.96 m/s^2 (0.2 G) while it is suspended by the wires.*
- *Do not overturn the drive while it is suspended by the wires.*
- *Do not leave the drive suspended by the wires for long periods of time.*

■ Horizontal Suspension of the Drive (CIMR-A□2A0360, 2A0415, 4A0250 to 4A0675)

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

When lifting the drive, confirm that the spring washer is fully closed. If not, the drive may become deformed or damaged when lifted.
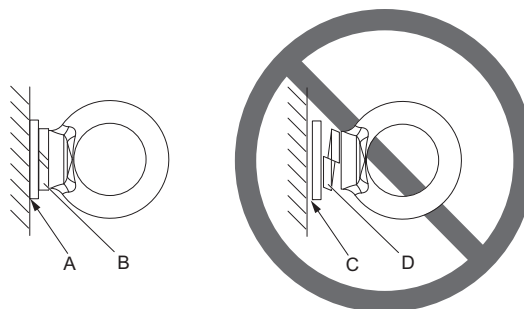
A – No space between drive and washer	C – Space between drive and washer
B – Spring washer: Fully closed	D – Spring washer: Open

Figure 1 Details of Spring Washers

■ Vertical Suspension of the Drive (CIMR-A□2A0360, 2A0415, 4A0250 to 4A1200)

CIMR-A□2A0360, 2A0415, 4A0250 to 4A0675

When vertical suspension of the drive is required in an enclosure panel, the orientation of the eye bolts for these drive models can be easily changed by turning the eye bolts counterclockwise 90 degrees.
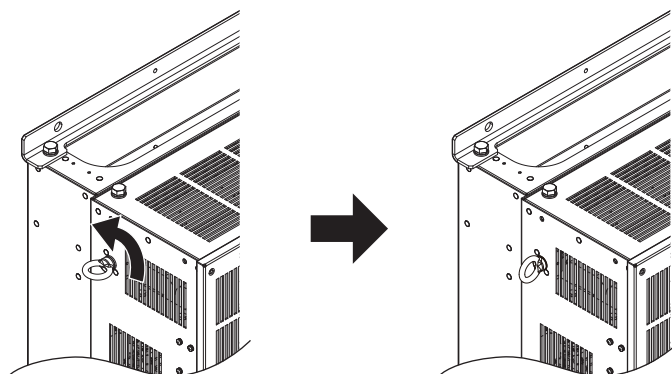
Figure 2 Adjusting Angle of Eye Bolts (CIMR-A□2A0360, 2A0415, 4A0250 to 4A0675)

CIMR-A□4A0930, 4A1200

When suspending the CIMR-A□4A0930 or 4A1200 drive with wires, make sure to follow the procedure described below.

Note: Use a wire long enough to ensure an angle of suspension that is at least 50 degrees. If not, the maximum allowable load of the eye bolts cannot be guaranteed. Refer to *Figure 4* for details.

1. Remove the four eye bolts from the drive side panels, and screw them into the holes on the top panel.
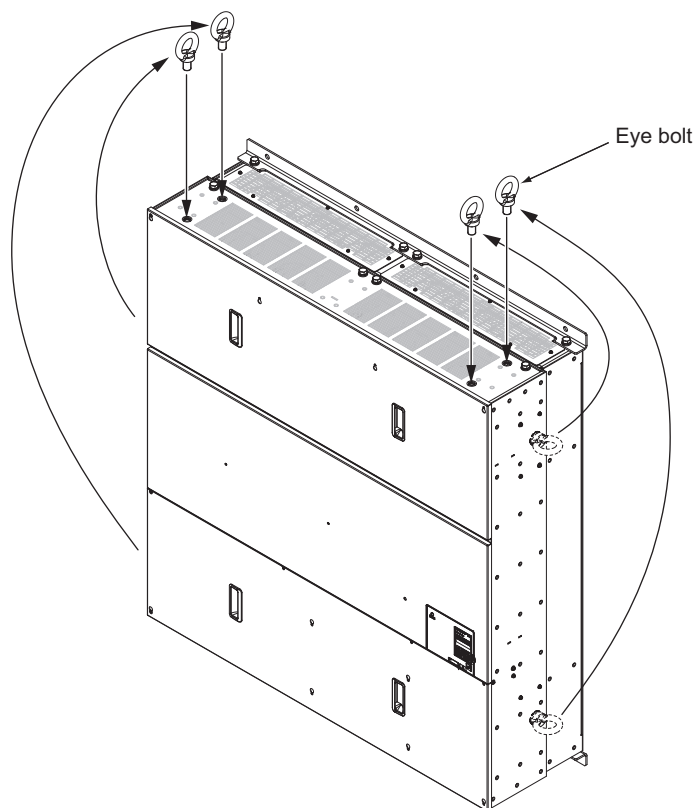
Figure 3 Location of Eye Bolts (CIMR-A□4A0930, 4A1200)

2. Pass wire through the holes of the four eye bolts.
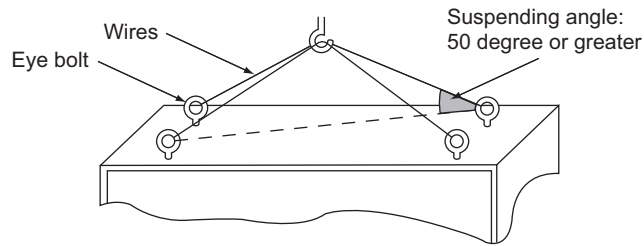
Figure 4 State of Suspension with Wires

3. Take up the slack in the wires gradually with a crane, and when the wires are confirmed to have stretched tight, hoist the drive.

4. When ready to install the drive in the enclosure panel, lower the drive. Halt lowing once when the drive has reached near the floor, and then lower the drive again very slowly.

◆ Dimensions

■ IP20/UL Type 1 Enclosure Drives

Note: IP20/UL Type 1 Enclosure drives are equipped with a top protective cover. Removing this cover voids UL Type 1 protection but still keeps IP20 conformity.
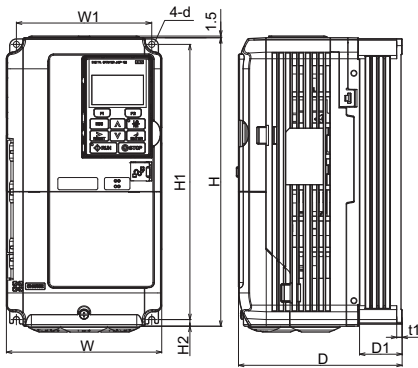
Figure 5
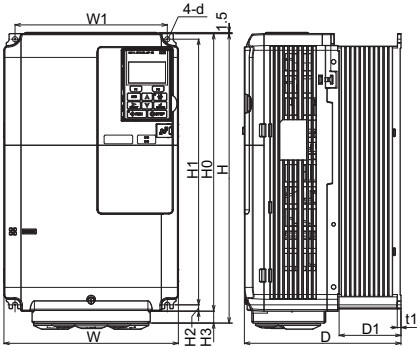
Figure 6

Model CIMR-A□	Fig.	Dimensions (mm)												Weight (kg)
		W	H	D	W1	H0	H1	H2	H3	D1	t1	t2	d	
2A0004		140	260	147	122	–	248	6	–	38	5	–	M5	3.1
2A0006		140	260	147	122	–	248	6	–	38	5	–	M5	3.1
2A0010		140	260	147	122	–	248	6	–	38	5	–	M5	3.2
2A0012		140	260	147	122	–	248	6	–	38	5	–	M5	3.2
2A0021	5	140	260	164	122	–	248	6	–	55	5	–	M5	3.5
2A0030		140	260	167	122	–	248	6	–	55	5	–	M5	4.0
2A0040		140	260	167	122	–	248	6	–	55	5	–	M5	4.0
2A0056		180	300	187	160	–	284	8	–	75	5	–	M5	5.6
2A0069		220	350	197	192	–	335	8	–	78	5	–	M6	8.7
2A0081	6	220	365	197	192	350	335	8	15	78	5	–	M6	9.7
4A0002		140	260	147	122	–	248	6	–	38	5	–	M5	3.2
4A0004		140	260	147	122	–	248	6	–	38	5	–	M5	3.2
4A0005		140	260	147	122	–	248	6	–	38	5	–	M5	3.2
4A0007		140	260	164	122	–	248	6	–	55	5	–	M5	3.4
4A0009		140	260	164	122	–	248	6	–	55	5	–	M5	3.5
4A0011	5	140	260	164	122	–	248	6	–	55	5	–	M5	3.5
4A0018		140	260	167	122	–	248	6	–	55	5	–	M5	3.9
4A0023		140	260	167	122	–	248	6	–	55	5	–	M5	3.9
4A0031		180	300	167	160	–	284	8	–	55	5	–	M5	5.4
4A0038		180	300	187	160	–	284	8	–	75	5	–	M5	5.7
4A0044		220	350	197	192	–	335	8	–	78	5	–	M6	8.3

■ IP00 Enclosure Drives
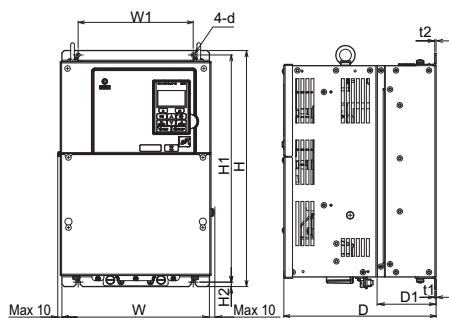
Figure 7
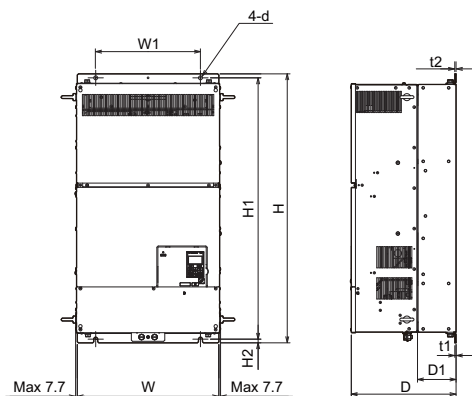
Figure 8
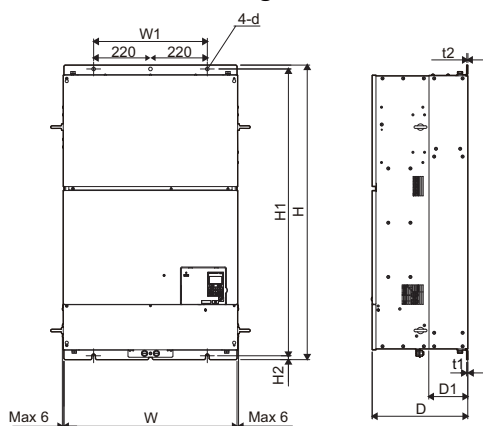
Figure 9
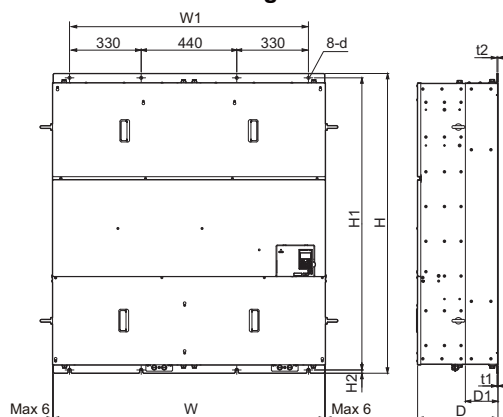
Figure 10

Model CIMR-A□	Fig.	Dimensions (mm)										Weight (kg)
		W	H	D	W1	H1	H2	D1	t1	t2	d	
2A0110	7	250	400	258	195	385	7.5	100	2.3	2.3	M6	21
2A0138		275	450	258	220	435	7.5	100	2.3	2.3	M6	25
2A0169		325	550	283	260	535	7.5	110	2.3	2.3	M6	37
2A0211		325	550	283	260	535	7.5	110	2.3	2.3	M6	38
2A0250		450	705	330	325	680	12.5	130	3.2	3.2	M10	76
2A0312		450	705	330	325	680	12.5	130	3.2	3.2	M10	80
2A0360		500	800	350	370	773	13	130	4.5	4.5	M12	98
2A0415		500	800	350	370	773	13	130	4.5	4.5	M12	99
4A0058		250	400	258	195	385	7.5	100	2.3	2.3	M6	21
4A0072		275	450	258	220	435	7.5	100	2.3	2.3	M6	25
4A0088		325	510	258	260	495	7.5	105	2.3	3.2	M6	36
4A0103		325	510	258	260	495	7.5	105	2.3	3.2	M6	36
4A0139		325	550	283	260	535	7.5	110	2.3	2.3	M6	41
4A0165		325	550	283	260	535	7.5	110	2.3	2.3	M6	42
4A0208		450	705	330	325	680	12.5	130	3.2	3.2	M10	79
4A0250		500	800	350	370	773	13	130	4.5	4.5	M12	96
4A0296		500	800	350	370	773	13	130	4.5	4.5	M12	102
4A0362		500	800	350	370	773	13	130	4.5	4.5	M12	107
4A0414	8	500	950	370	370	923	13	135	4.5	4.5	M12	125
4A0515	9	670	1140	370	440	1110	15	150	4.5	4.5	M12	216
4A0675												221
4A0930	10	1250	1380	370	1110	1345	15	150	4.5	4.5	M12	545
4A1200												555

3 Electrical Installation

The figure below shows the main and control circuit wiring.
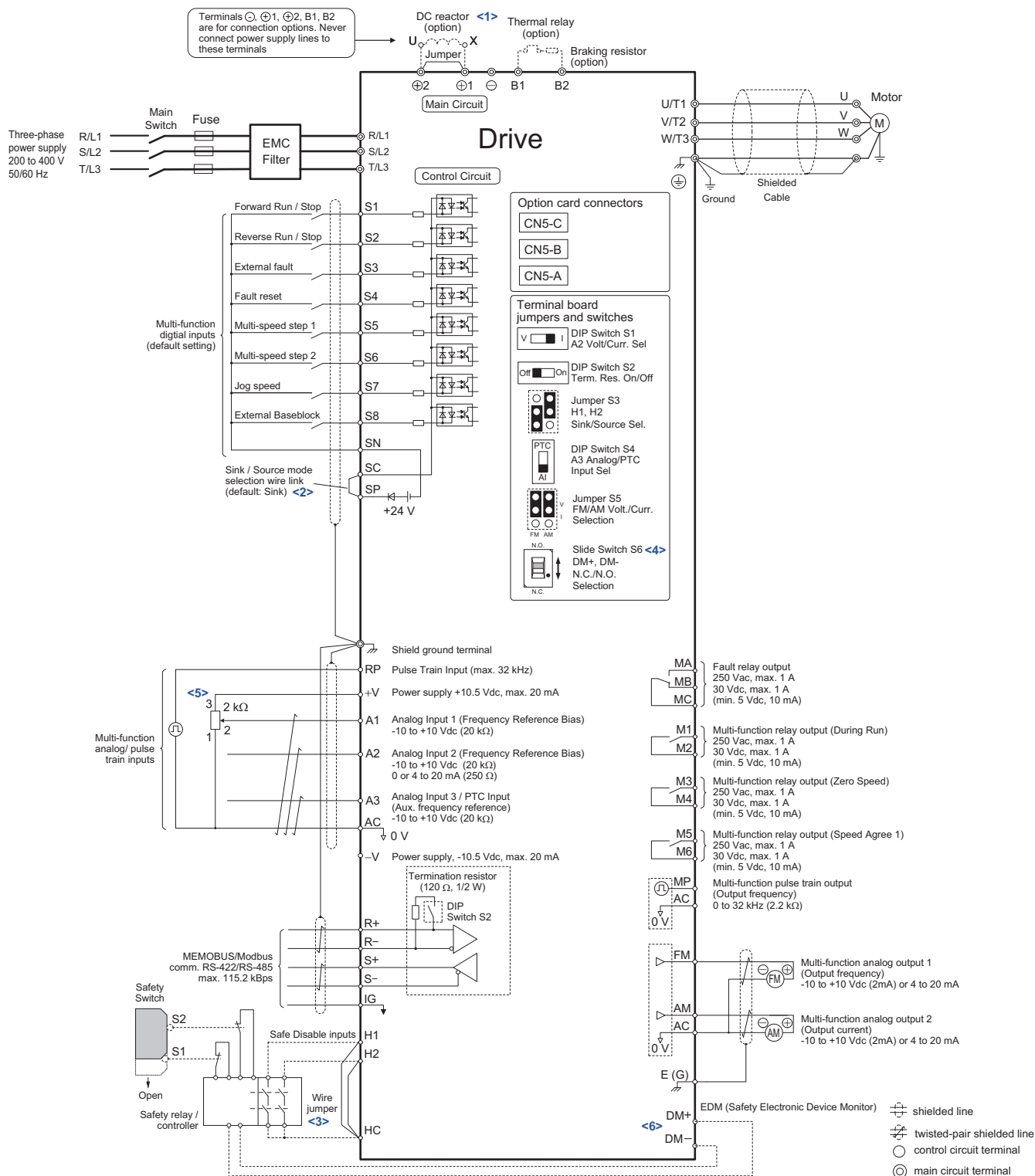
<1> Remove the jumper when installing a DC reactor. Models CIMR-A□2A110 through 0415 and 4A0058 through 1200 come with a built-in DC reactor.

<2> Never short terminals SP and SN as doing so will damage the drive.

<3> Disconnect the wire jumper between H1 - HC and H2 - HC when utilizing the Safe Disable input.

<4> Available slide switch S6 is models ETC740310 and ETC740311.
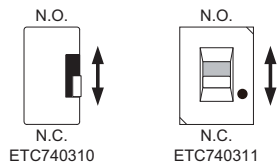
<5> Shows the connection when using the frequency setting potentiometer recommended by Yaskawa.
<6> Slide the switch S6 to select N.C. or N.O. as the state of the DM+ and DM- terminals for EDM output.

◆ Wiring Specification

■ Main Circuit

Use the fuses and line filters listed in the table below when wiring the main circuit. Make sure not to exceed the given tightening torque values.

Model CIMR-A□	EMC Filter Type — Manufacturer: Schaffner	EMC Filter Type — Manufacturer: Block	Main Fuse Manufacturer: Bussmann	DC Power Supply Input <2> — Fuse Type	Fuse Rated Short-circuit Breaking Current (kA)	Fuse Qty.	Fuse Holder Type	Fuse Holder Qty.	Recom. Motor Cable (mm²)	R/L1,S/L2,T/L3,U/T1,V/T2,W/T3,⊖,⊕1,⊕2	⊕3	B1,B2	⏚
2A0004	FS5972-10-07	FB-40008A	FWH-70B	CR2LS-30	100	2	CM-1A	1	2.5	M4	—	M4	M4
2A0006	FS5972-10-07	FB-40008A	FWH-70B	CR2LS-30	100	2	CM-1A	1	2.5	M4	—	M4	M4
2A0010	FS5972-18-07	FB-40014A	FWH-70B	CR2LS-50	100	2	CM-1A	1	2.5	M4	—	M4	M4
2A0012	FS5972-18-07	FB-40014A	FWH-70B	CR2LS-50	100	2	CM-1A	1	2.5	M4	—	M4	M4
2A0021	FS5972-35-07	FB-40025A	FWH-90B	CR2LS-100	100	2	CM-1A	1	2.5	M4	—	M4	M4
2A0030	FS5972-35-07	FB-40060A	FWH-100B	CR2L-125	100	2	CM-2A	1	6	M4	—	—	M5
2A0040	FS5972-60-07	FB-40060A	FWH-200B	CR2L-150	100	2	CM-2A	1	10	M4	—	—	M5
2A0056	FS5972-60-07	FB-40060A	FWH-200B	CR2L-175	100	2	CM-2A	1	16	M6	—	—	M5
2A0069	FS5972-100-35	FB-40072A	FWH-300A	CR2L-225	100	2	<3>		16	M8	—	M5	M6
2A0081	FS5972-100-35	FB-40105A	FWH-300A	CR2L-260	100	2	<3>		25	M8	—	M5	M6
2A0110	FS5972-170-40	FB-40170A	FWH-300A	CR2L-300	100	2	<3>		35	M8	—	M8	M8
2A0138	FS5972-170-40	FB-40170A	FWH-350A	CR2L-350	100	2	<3>		50	M8	—	M10	M8
2A0169	FS5972-250-37	FB-40250A	FWH-400A	CR2L-400	100	2	<3>		70	M10	—	M10	M10
2A0211	FS5972-250-37	FB-40250A	FWH-400A	CR2L-450	100	2	<3>		95	M10	—	M10	M10
2A0250	FS5972-410-99	FB-40414A	FWH-600A	CR2L-600	100	2	<3>		95 × 2P	M12	M10	—	M12
2A0312	FS5972-410-99	FB-40414A	FWH-700A	CR2L-600	100	2	<3>		95 × 2P	M12	M10	—	M12
2A0360	FS5972-600-99	FB-40414A	FWH-800A	CS5F-800	200	2	<3>		240	M12	—	—	M12
2A0415	FS5972-600-99	FB-40675A	FWH-1000A	CS5F-1200	200	2	<3>		300	M12	—	—	M12
4A0002	FS5972-10-07	FB-40008A	FWH-40B	CR6L-20	100	2	CMS-4	2	2.5	M4	—	M4	M4
4A0004	FS5972-10-07	FB-40008A	FWH-50B	CR6L-30	100	2	CMS-4	2	2.5	M4	—	M4	M4
4A0005	FS5972-10-07	FB-40008A	FWH-70B	CR6L-50	100	2	CMS-4	2	2.5	M4	—	M4	M4
4A0007	FS5972-10-07	FB-40008A	FWH-70B	CR6L-50	100	2	CMS-4	2	2.5	M4	—	M4	M4
4A0009	FS5972-18-07	FB-40014A	FWH-90B	CR6L-50	100	2	CMS-4	2	2.5	M4	—	M4	M4
4A0011	FS5972-18-07	FB-40014A	FWH-90B	CR6L-50	100	2	CMS-4	2	2.5	M4	—	M4	M4
4A0018	FS5972-35-07	FB-40025A	FWH-80B	CR6L-75	100	2	CMS-5	2	4	M4	—	M4	M5
4A0023	FS5972-35-07	FB-40025A	FWH-100B	CR6L-75	100	2	CMS-5	2	4	M4	—	M4	M5
4A0031	FS5972-60-07	FB-40044A	FWH-125B	CR6L-100	100	2	CMS-5	2	6	M5	—	M5	M6
4A0038	FS5972-60-07	FB-40044A	FWH-200B	CR6L-150	100	2	CMS-5	2	6	M5	—	M5	M6
4A0044	FS5972-60-07	FB-40060A	FWH-250A	CR6L-150	100	2	<3>		16	M6	—	M8	M6
4A0058	FS5972-60-07	FB-40060A	FWH-250A	CR6L-200	100	2	<3>		16	M6	—	M8	M6
4A0072	FS5972-100-35	FB-40072A	FWH-250A	CR6L-250	100	2	<3>		25	M8	—	M8	M8
4A0088	FS5972-100-35	FB-40105A	FWH-250A	CR6L-250	100	2	<3>		25	M8	—	M8	M8
4A0103	FS5972-100-35	FB-40105A	FWH-250A	CR6L-300	100	2	<3>		35	M8	—	M8	M8
4A0139	FS5972-170-35	FB-40170A	FWH-350A	CR6L-350	100	2	<3>		50	M10	—	M10	M10
4A0165	FS5972-170-35	FB-40170A	FWH-400A	CR6L-400	100	2	<3>		70	M10	—	M10	M10
4A0208	FS5972-250-37	FB-40250A	FWH-500A	CS5F-600	100	2	<3>		95	M10	—	M10	M10
4A0250	FS5972-250-37	FB-40250A	FWH-600A	CS5F-600	100	2	<3>		120	M10	—	M10	M10
4A0296	FS5972-410-99	FB-40414A	FWH-700A	CS5F-600	100	2	<3>		185	M10	—	—	M10
4A0362	FS5972-410-99	FB-40414A	FWH-800A	CS5F-600	100	2	<3>		240	M10	—	—	M10
4A0414	FS5972-600-99	FB-40414A	FWH-800A	CS5F-800	200	2	<3>		95 × 2P	M12	M10	—	M12
4A0515	FS5972-600-99	FB-40675A	FWH-1000A	CS5F-1200	200	2	<3>		150 × 2P	M12	M10	—	M12
4A0675	FS5972-800-99	FB-40675A	FWH-1200A	CS5F-1500	200	2	<3>		95 × 4P	M12	M10	—	M12
4A0930	FS5972-600-99 <1>	FB-41200A	FWH-1200A	CS5F-1200	200	4	<3>		120 × 4P	M12	—	—	M12
4A1200	FS5972-800-99 <1>	<1>	FWH-1600A	CS5F-1500	200	4	<3>		(95 × 4P) × 2	M12	—	—	M12

<1> Connect two of the same EMC filters in parallel. Refer to the Technical Manual for details.
<2> DC Power Supply Input is not available for UL standards.
<3> Manufacturer does not recommend a specific fuse holder for this fuse. Contact Yaskawa or a Yaskawa representative on fuse dimensions.

■ CE Standards Compliance for DC Power Supply Input

To meet CE standards, the following fuses should be installed. For details of connection diagram, refer to the following figure. For details of fuses and fuse holders, refer to the table on page *15*.
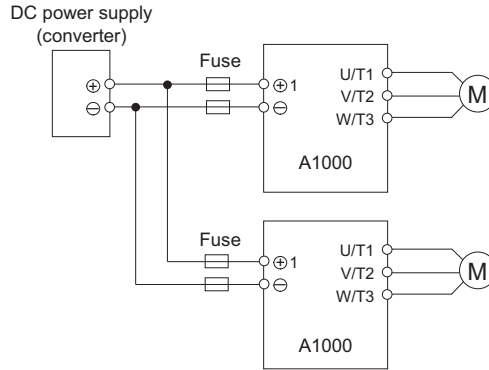
Figure 11

Note:
1. When connecting multiple drives together, make sure that each drive has its own fuse. If any one fuse blows, all fuses should be replaced.
2. For an AC power supply, refer to the connection diagram of *Electrical Installation on page 13*.
3. The recommended fuses and fuse holders are made by Fuji Electric.

Tightening Torque Values

Tighten the main circuit terminals using the torque values provided by the table below.

Terminal Size	M4 <1>	M5 <2>	M6	M8	M10	M12
Tightening Torque (N·m)	1.2 to 1.5	2.0 to 2.5	5.4 to 6.0	9.0 to 11.0	18.0 to 23.0	32.0 to 40.0

<1> The tightening torque differs for the following terminals.
  For use with CIMR-A□2A0030, 2A0040, 4A0018, 4A0023:
  R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, -, +1, +2, B1, B2: 2.1 to 2.3 N·m
<2> The tightening torque differs for the following terminals.
  For use with CIMR-A□4A0031 and 4A0038:
  R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, -, +1, +2: 3.6 to 4.0 N·m
  B1, B2: 2.7 to 3.0 N·m
  For use with CIMR-A□2A0056, 2A0069, 2A0081 and 4A0044:
  B1, B2: 2.7 to 3.0 N·m

■ 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 (mm²)
Solid	0.2 to 1.5
Flexible	0.2 to 1.0
Flexible with ferrule	0.25 to 0.5

◆ EMC Filter Installation

This drive has been tested in accordance with European standards EN 61800-3:2004/A1:2012. In order to comply to the EMC standards, wire the main circuit as described below.

1. Install an appropriate EMC noise filter to the input side. See the table in *Main Circuit on page 15* or refer to the Technical Manual for details.
2. Place the drive and EMC noise filter in the same enclosure.
3. Use braided shield cable for the drive and motor wiring.
4. Remove any paint or dirt from ground connections for minimal ground impedance.
5. Install an DC reactor at drives smaller than 1 kW for compliance with the IEC/EN 61000-3-2. Refer to the Technical Manual or contact Yaskawa or a Yaskawa representative for details.
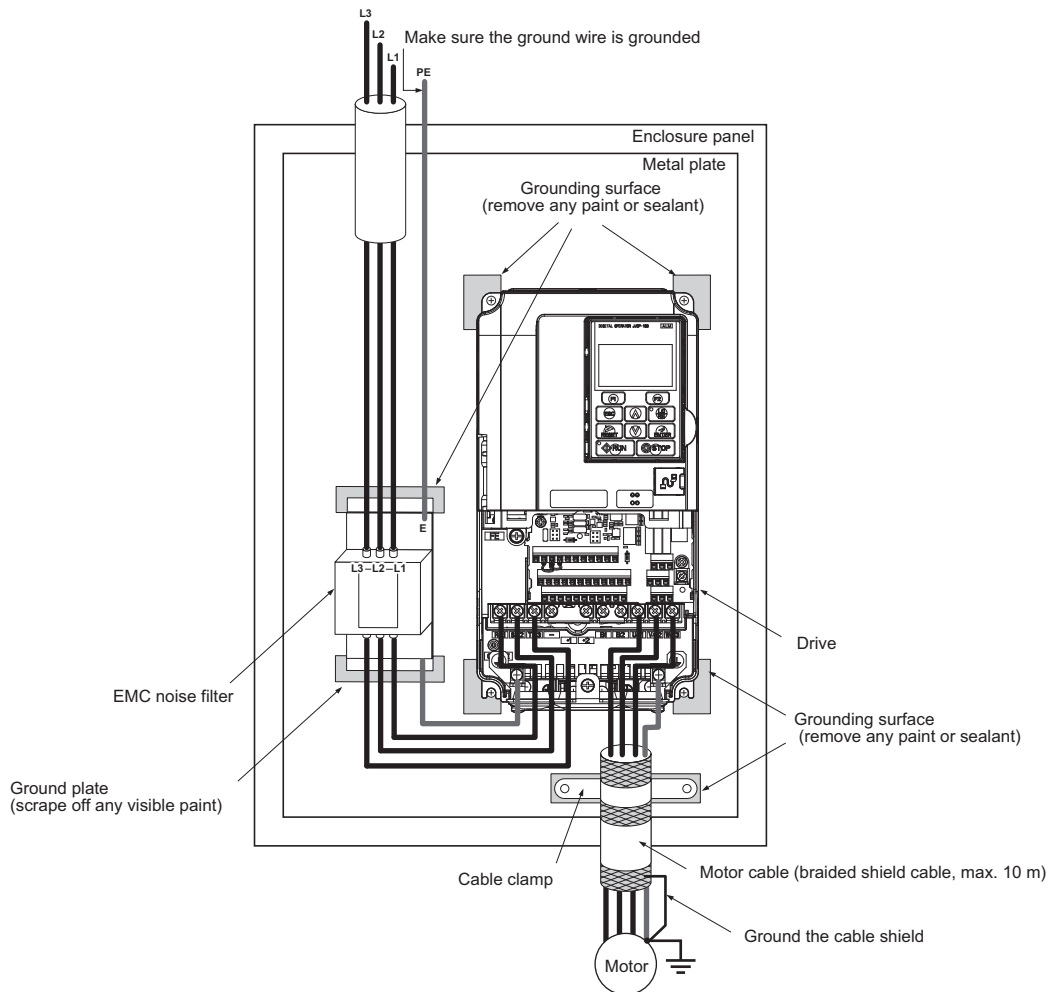
◆ Main and Control Circuit Wiring

■ Wiring the Main Circuit Input

Consider the following precautions for the main circuit input.

- Use fuses recommended in *Main Circuit on page 15* only.
- If using a ground fault circuit breaker, make sure that it can detect both DC and high frequency current.
- If using an input switch is used, make sure that the switch does not operate not more than once every 30 minutes.
- Use insulation caps when wiring the drive with crimp terminals. Take particular care to ensure that wiring does not touch neighboring terminals or the surrounding case.
- Insulation barriers are packaged with drive models CIMR-A□4A0414 through 1200 to provide added protection between terminals. Yaskawa recommends using the insulation barriers provided to ensure proper wiring.
- Use a DC reactor or AC reactor on the input side of the drive:
  - To suppress harmonic current.
  - To improve the power factor on the power supply side.
  - When using an advancing capacitor switch.
  - With a large capacity power supply transformer (over 600 kVA).

■ Wiring the Main Circuit Output

Consider the following precautions for the output circuit wiring.

- Do not connect any other load than a 3 phase motor to the drives output.
- Never connect a power source to the drives output.
- Never short or ground the output terminals.
- Do not use phase correction capacitors.
- If using a contactor between the drive and motor, it should never be operated when the drive is outputting a voltage. Operating while there is voltage output can cause large peak currents, thus tripping the over current detection or damage the drive.

■ Ground Connection

Take the following precautions when grounding the drive.

- Never share the ground wire with other devices such as welding machines, etc.
- Always use a ground wire, that complies with electrical equipment technical standards. Keep ground wires as short as possible. Leakage current is caused by the drive. Therefore, if the distance between the ground electrode and the ground terminal is too long, potential on the ground terminal of the drive will become unstable.
- When using more than one drive, do not loop the ground wire.

■ Control Circuit Wiring Precautions

Consider the following precautions for wiring the control circuits.

- Separate control circuit wiring from main circuit wiring and other high-power lines.
- Separate wiring for control circuit terminals M1-M2, M3-M4, M5-M6, MA, MB, MC (contact output) from wiring to other control circuit terminals.
- For external control power supply use a UL Listed Class 2 power supply.
- Use twisted-pair or shielded twisted-pair cables for control circuits to prevent operating faults.
- Ground the cable shields with the maximum contact area of the shield and ground.
- Cable shields should be grounded on both cable ends.
- If flexible wires with ferrules are connected they might fit tightly into the terminals. To disconnect them, grasp the wire end with a pair of pliers, release the terminal using a straight-edge screw driver, turn the wire for about 45°, and pull it gently out of the terminal. For details, refer to the Technical Manual. Use this procedure for removing the wire link between HC, H1 and H2 when the Safe Disable function is utilized.

■ Main Circuit Terminals

Note: Properly connect the inputs on terminals R1/L11, S1/L21, and T1/L31 in addition to R1/L1, S1/L2, and T1/L3 when connecting models CIMR-A□4A0930 and 4A1200.

Terminal		Type				Function
200 V Class	**Model**	**2A0004 to 2A0081**	**2A0110 to 2A0138**	**2A0169 to 2A0415**	**–**	
400 V Class	**CIMR-A□**	**4A0002 to 4A0044**	**4A0058 to 4A0072**	**4A0088 to 4A0675**	**4A0930, 4A1200**	
R/L1, S/L2, T/L3		Main circuit power supply input			Main circuit power supply input	Connects line power to the drive
R1/L11, S1/L21, T1/L31		not available				
U/T1, V/T2, W/T3		Drive output				Connects to the motor
B1, B2		Braking resistor		not available		Available for connecting a braking resistor or a braking resistor unit option
⊕2		• DC reactor connection (⊕1, ⊕2) (remove the shorting bar between ⊕1 and ⊕2) • DC power supply input (⊕1, ⊖)	not available			For connection • of the drive to a DC power supply (terminals ⊕1 and ⊖ are not UL approved) • of braking options • connection of a DC reactor
⊕1, ⊖			DC power supply input (⊕1, ⊖)	• DC power supply input (⊕1, ⊖) • Braking transistor connection (⊕3, ⊖)		
⊕3		not available				
⏚		–				Grounding terminal

■ Control Circuit Terminals

The figure below shows the control circuit terminal arrangement. The drive is equipped with screwless terminals.

Use a straight-edge screwdriver with a blade width of max 2.5 mm and a thickness of max 0.6 mm to release the terminals
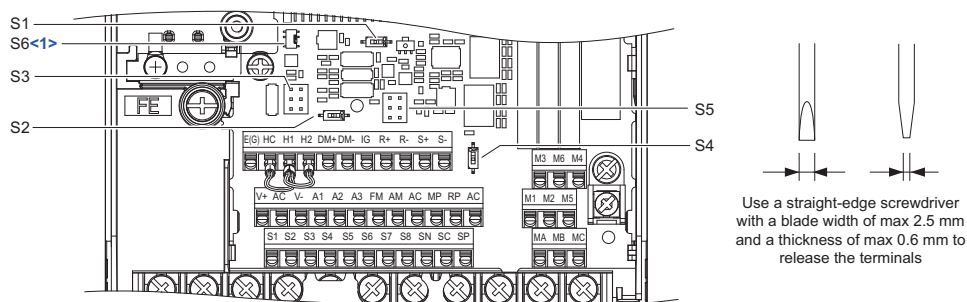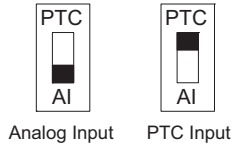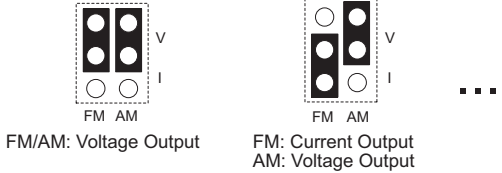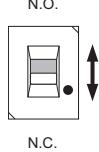
<1> Available slide switch S6 is models ETC740310 and ETC740311.
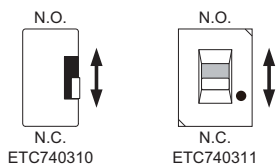
There are three DIP Switches and one Slide Switch and two jumpers, S1 to S6, located on the terminal board.

S1	Terminal A2 Signal Selection	Current / Voltage
S2	RS-422/RS-485 Termination Resistor	Off / On
S3	Safe Disable Input Sink/Source/External Supply Selection	Source / Sink / External 24 Vdc Power Supply

S4	Terminal A3 Analog/PTC Input Selection	Analog Input PTC Input
S5	Terminal FM/AM Signal Selection	FM/AM: Voltage Output FM: Current Output AM: Voltage Output
S6 <1>	Terminal DM+, DM- (N.C./N.O.) Selection	

<1> Available slide switch S6 is models ETC740310 and ETC740311.

ETC740310   ETC740311
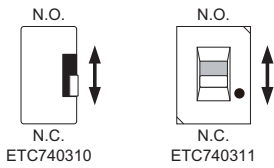
■ Control Circuit Terminal Functions

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting
Multi-Function Digital Inputs	S1	Multi-function input 1 (Closed: Forward run, Open: Stop)	Photocoupler 24 Vdc, 8 mA Use the wire link between terminals SC and SN or SC and SP to select between sinking, sourcing mode, and the power supply.
	S2	Multi-function input 2 (Closed: Reverse run, Open: Stop)	
	S3	Multi-function input 3 (External fault, N.O.)	
	S4	Multi-function input 4 (Fault reset)	
	S5	Multi-function input 5 (Multi-step speed reference 1)	
	S6	Multi-function input 6 (Multi-step speed reference 2)	
	S7	Multi-function input 7 (Jog reference)	
	S8	Multi-function input 8 (External baseblock)	
	SC	Multi-function input common	–
	SN	Multi-function input 0 V	24 Vdc power supply for digital inputs, 150 mA max (if no digital input option DI-A3 is used) Never short terminals SP and SN as doing so will damage the drive.
	SP	Multi-function input 24 Vdc	
Safe Disable Inputs	H1	Safe Disable input 1	24 Vdc, 8 mA One or both open: Drive output disabled Both closed: Normal operation Internal impedance: 3.3 kΩ Off time of at least 1 ms Disconnect the wire jumpers shorting terminals H1, H2, and HC to use the Safe Disable inputs. Set the S3 jumper to select between sinking, sourcing mode, and the power supply.
	H2	Safe Disable input 2	
	HC	Safe Disable function common	Safe disable function common

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting
Analog Inputs/ Pulse Train Input	RP	Multi-function pulse train input (Frequency reference)	Input frequency range: 0 to 32 kHz Signal Duty Cycle: 30 to 70% High level: 3.5 to 13.2 Vdc, low level: 0.0 to 0.8 Vdc Input impedance: 3 kΩ
	+V	Power supply for analog inputs	10.5 Vdc (max allowable current 20 mA)
	-V	Power supply for analog inputs	-10.5 Vdc (max allowable current 20 mA)
	A1	Multi-function analog input 1 (Frequency reference bias)	-10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ)
	A2	Multi-function analog input 2 (Frequency reference bias)	-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 (Auxiliary frequency reference)/ PTC Input	-10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ) Use switch S4 on the control terminal board to select between analog input or PTC input. If PTC is selected, set H3-06 = E.
	AC	Frequency reference common	0 V
	E (G)	Ground for shielded lines and option cards	–
Fault Relay	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	M1	Multi-function digital output (During run)	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 (Zero speed)	
	M4		
	M5	Multi-function digital output (Speed agree 1)	
	M6		
Monitor Output	MP	Pulse train output (Output frequency)	32 kHz (max)
	FM	Analog monitor output 1 (Output frequency)	-10 to +10 Vdc, 0 to +10 Vdc, or 4 to 20 mA
	AM	Analog monitor output 2 (Output current)	Use jumper S5 on the control terminal board to select between voltage or current output at terminals AM and FM. Set parameters H4-07 and H4-08 accordingly when changing the jumper setting.
	AC	Monitor common	0 V
Safety Monitor Output	DM+	Safety monitor output	Outputs status of Safe Disable function. Closed when both Safe Disable channels are closed. The switch is initially set to N.C. Up to +48 Vdc 50 mA Slide the switch S6 to select N.C. or N.O. as the state of the DM+ and DM- terminals for EDM output. *[1]*
	DM-	Safety monitor output	

[1] The slide switch S6 is available with terminal board "ETC74031□".

NOTICE: *The terminals HC, H1, H2 are used for the Safe Disable function. Do not remove the wire link between HC, H1, or H2 unless the Safe Disable function is used.* **Refer to Safe Disable Input Function on page 45** *when using this function.*

NOTICE: *The wiring length to the terminals HC, H1 and H2 should not exceed 30 m.*

4 Keypad Operation

◆ Digital Operator and Keys

The digital operator is used to program the drive, to start/stop it, and to display fault information. The LEDs indicate the drive status.

■ Keys and Functions

Key	Name	Function
F1 F2	Function Key (F1, F2)	The functions assigned to F1 and F2 vary depending on the menu that is currently displayed. The name of each function appears in the lower half of the display window.
ESC	ESC Key	• Returns to the previous display. • Moves the cursor one space to the left. • Pressing and holding this button will return to the Frequency Reference display.
> RESET	RESET Key	• Moves the cursor to the right. • Resets the drive to clear a fault situation.
◇ RUN	RUN Key	Starts the drive in the LOCAL mode. The Run LED • is on, when the drive is operating the motor. • flashes during deceleration to stop or when the frequency reference is 0. • flashes quickly the drive is disabled by a DI, the drive was stopped using a fast stop DI or a run command was active during power up.
Λ	Up Arrow Key	Scrolls up to display the next item, selects parameter numbers and increments setting values.
V	Down Arrow Key	Scrolls down to display the previous item, selects parameter numbers and decrements setting values.
⊘ STOP	STOP Key	Stops drive operation.
↵ ENTER	ENTER Key	• Enters parameter values and settings. • Selects a menu item to move between displays.
LO RE	LO/RE Selection Key	Switches drive control and frequency setting between the operator (LOCAL) and an external source (REMOTE).
ALM	ALM LED Light	On: When the drive detects a fault. Flashing: • When an alarm occurs. • When oPE is detected. • When a fault or error occurs during Auto-Tuning.

◆ Menu Structure and Modes

The following illustration explains the operator keypad menu structure.

Drive Mode <1>

- MODE - DRV Rdy
FREF (OPR)
U1-01= 0.00Hz
U1-02= 0.00Hz LSEQ
U1-03= 0.00A LREF
JOG FWD FWD/REV

ENTER → ← ESC

-MONITR- DRV Rdy
FREF (d1-01)
U1-01= 000.00Hz
(0.00～50.00)
"0.00Hz"
← FWD → <3>

- MODE - DRV Rdy
Monitor Menu
U1-01= 0.00Hz
U1-02= 0.00Hz LSEQ
U1-03= 0.00A LREF
JOG FWD FWD/REV

ENTER → ← ESC

-MONITR- DRV Rdy
Monitor
U1-01= 0.00Hz
U1-02= 0.00Hz LSEQ
U1-03= 0.00A LREF
JOG FWD FWD/REV

ENTER → ← ESC

-MONITR- DRV Rdy
Frequency Ref
U1-01 = 0.00Hz
U1-02= 0.00Hz LSEQ
U1-03= 0.00A LREF
JOG FWD FWD/REV

-MONITR- DRV Rdy
Fault Trace
U2-01= oC
U2-02= oPr LSEQ
U2-03= 0.00Hz LREF
JOG FWD FWD/REV

-MONITR- DRV Rdy
Output Freq
U1-02 = 0.00Hz
U1-03= 0.00A LSEQ
U1-04= 0 LREF
JOG FWD FWD/REV

Programming Mode <2>

- MODE - PRG
Modified Consts
Modified
X Parameters
HELP FWD DATA <4>

- MODE - PRG
Quick Setting
HELP FWD DATA

- MODE - PRG
Programming
HELP FWD DATA

- MODE - PRG Rdy
Auto-Tuning
AUTO
HELP FWD DATA

Initial Display <5>

A1000
YASKAWA

→

A1000
XXXV, X.X/X.XkW
XX.XX/XX.XXA
<XXXXXXXXX>
<6>

<1> Pressing ⟨RUN⟩ will start the motor.
<2> Drive cannot operate the motor.
<3> Flashing characters are shown as 0 .
<4> X characters are shown in this manual. The LCD Operator will display the actual setting values.
<5> The Frequency Reference appears after the initial display which shows the product name.
<6> The information that appears on the display will vary depending on the drive.

5   Start Up

◆ Drive Setup Procedure

The illustration below shows the basic setup procedure. Each step is explained more detailed on the following pages.

```
┌─────────────────────────────────────┐
│                START                 │
└─────────────────────────────────────┘
                   ⋮
┌─────────────────────────────────────┐
│  Install and wire the drive as explained.  │
└─────────────────────────────────────┘
                   ⋮
┌─────────────────────────────────────┐
│            Turn the power on.             │
└─────────────────────────────────────┘
                   ⋮
┌─────────────────────────────────────┐
│ Initialize the drive if necessary using parameter A1-03. │
└─────────────────────────────────────┘
                   ⋮
┌─────────────────────────────────────┐
│           Set the control mode.           │
└─────────────────────────────────────┘
                   ⋮
┌─────────────────────────────────────┐
│         Select Normal / Heavy Duty        │
└─────────────────────────────────────┘
                   ⋮
┌─────────────────────────────────────┐
│ Perform Auto-Tuning or set the motor data manually. │
└─────────────────────────────────────┘
                   ⋮
┌─────────────────────────────────────┐
│ Set/check the basic parameters:                        │
│ * b1-01, b1-02 for frequency reference and RUN command source │
│ * H1-□□, H2-□□, H3-□□, H4-□□, H6-□□ to configure the I/Os │
│ * Frequency reference values                           │
│ * C1-□□, C2-□□ for Acceleration/Deceleration times and S-curves │
└─────────────────────────────────────┘
                   ⋮
┌─────────────────────────────────────┐
│ Run the motor without load, check the operation and verify, if the │
│ upper controller (e.g. PLC,...) commands to the drive work as      │
│ desired.                                                           │
└─────────────────────────────────────┘
                   ⋮
┌─────────────────────────────────────┐
│ Connect the load, run the motor and check the operation │
└─────────────────────────────────────┘
                   ⋮
┌─────────────────────────────────────┐
│ Fine tune and set application parameters (e.g. PID,...) if necessary. │
└─────────────────────────────────────┘
                   ⋮
┌─────────────────────────────────────┐
│ Final  check the operation and verify the settings. │
└─────────────────────────────────────┘
                   ⋮
┌─────────────────────────────────────┐
│    Drive is ready to run the application    │
└─────────────────────────────────────┘
```

◆ Power On

Before turning on the power supply,

- Make sure all wires are connected properly.
- Make sure no screws, loose wire ends or tools are left in the drive.
- After turning the power on, the drive mode display should appear and no fault or alarm should be displayed.

◆ Control Mode Selection (A1-02)

There are more than three control modes available. Select the control mode that best suits the application the drive will control.

Control Mode	Parameter	Main Applications
V/f Control for Induction Motors	A1-02 = 0 (default)	• General variable speed applications, particularly useful for running multiple motors from a single drive. • When replacing a drive in which parameter settings are unknown.
V/f Control with PG Speed Feedback	A1-02 = 1	• For general-purpose applications that do not require high dynamic response but high speed accuracy. • This mode should be used if the motor parameters are unknown and Auto-Tuning cannot be performed.
Open Loop Vector Control	A1-02 = 2	• General variable speed applications • Applications requiring high precision, high speed control
Closed Loop Vector Control [1]	A1-02 = 3	• For general, variable-speed applications that requiring precise speed control down to zero speed, fast torque response, or precise torque control. • A speed feedback signal from the motor is required.

Control Mode	Parameter	Main Applications
Open Loop Vector Control for PM <1>	A1-02 = 5	Derated torque-load applications employing permanent magnet motors (SPM, IPM) and energy savings.
Advanced Open Loop Vector Control for PM <1>	A1-02 = 6	This control mode can be used to operate an IPM motor for constant torque applications.
Closed Loop Vector Control for PM <1>	A1-02 = 7	• This mode can be used for high precision control of a PM motor in constant torque or variable torque applications. • A speed feedback signal is required.

<1> For explanations of these control modes, refer to the Technical Manual.

◆ Drive Duty Mode Selection (C6-01)

The drive supports two ratings, Normal Duty and Heavy Duty. Both have different output current ratings (refer to the catalog or the Technical Manual). Set the Duty mode in accordance with the application.

Mode	Heavy Duty Rating (HD)	Normal Duty Rating (ND)
C6-01	0	1
Application	Applications with a constant torque like extruders, conveyors and cranes. High overload capability might be needed.	Applications where the torque increases with the speed like fans or pumps. High overload tolerance is normally not needed.
Overload capability (oL2)	150% of drive rated current for 60 s	120% of drive rated current for 60 s
L3-02 Stall Prevention during Acceleration	150%	120%
L3-06 Stall Prevention during Run	150%	120%
Default Carrier Frequency	2 kHz	2 kHz Swing PWM

◆ Auto-Tuning (T1-☐☐)

Auto-Tuning automatically sets up the motor data relevant drive parameters. Three different modes are supported.

Type	Setting	Application Conditions and Benefits	Control Mode (A1-02)			
			V/f (0)	V/f w/PG (1)	OLV (2)	CLV (3)
Rotational Auto-Tuning	T1-01 = 0	• Motor can be decoupled from the load and rotate freely while Auto-Tuning is performed. • Motor and load can not be decoupled but the motor load is below 30%. • Rotational Auto-Tuning gives the most accurate results, and is therefore highly recommended if possible.	N/A	N/A	YES	YES
Stationary Auto-Tuning 1	T1-01 = 1	• Motor and load can not be decoupled and the load is higher than 30%. • A motor test report listing motor data is not available. • Automatically calculates motor parameters that are needed for vector control.	N/A	N/A	YES	YES
Stationary Auto-Tuning 2	T1-01 = 4	• Motor and load can not be decoupled and the load is higher than 30%. • A motor test report is available. Once the no-load current and the rated slip have been entered, the drive calculates and sets all other motor-related parameters.	N/A	N/A	YES	YES
Stationary Auto-Tuning for Line-to-Line Resistance	T1-01 = 2	• The drive is used in V/f Control and other Auto-Tuning selections not possible. • Drive and motor capacities differ. • Tunes the drive after the cable between the drive and motor has been replaced with a cable over 50 m long. Assumes Auto-Tuning has already been performed. • Should not be used for any vector control modes unless the motor cable has changed.	YES	YES	YES	YES

Type	Setting	Application Conditions and Benefits	Control Mode (A1-02)			
			V/f (0)	V/f w/PG (1)	OLV (2)	CLV (3)
Rotational Auto-Tuning for V/f Control	T1-01 = 3	• Recommended for applications using Speed Estimation Speed Search or using the Energy Saving function in V/f Control. • Assumes motor can rotate while Auto-Tuning is performed. Increases accuracy for certain functions like torque compensation, slip compensation, Energy Saving, and Speed Search.	YES	YES	N/A	N/A
Stationary Auto-Tuning 3 *<1>*	T1-01 = 5	• A motor test report listing motor data is not available. • Motor can be driven with a normal duty mode after Auto-Tuning. A trial run is performed after Auto-Tuning to automatically calculate motor parameters needed for vector control.	N/A	N/A	YES	YES

<1> Not available in models CIMR-A□4A0930 and 4A1200.

⚠ CAUTION

Do not touch the motor until the Auto-Tuning is finished.

Failure to comply may result in minor or moderate injury. Voltage is still applied to the motor during the tuning process, even thought the motor may not be rotating.

For Auto-Tuning enter the Auto-Tuning menu and perform the steps shown in the figure below. The number of name plate data to be entered depends on the selected type of Auto-Tuning. This example shows Rotational Auto-Tuning.
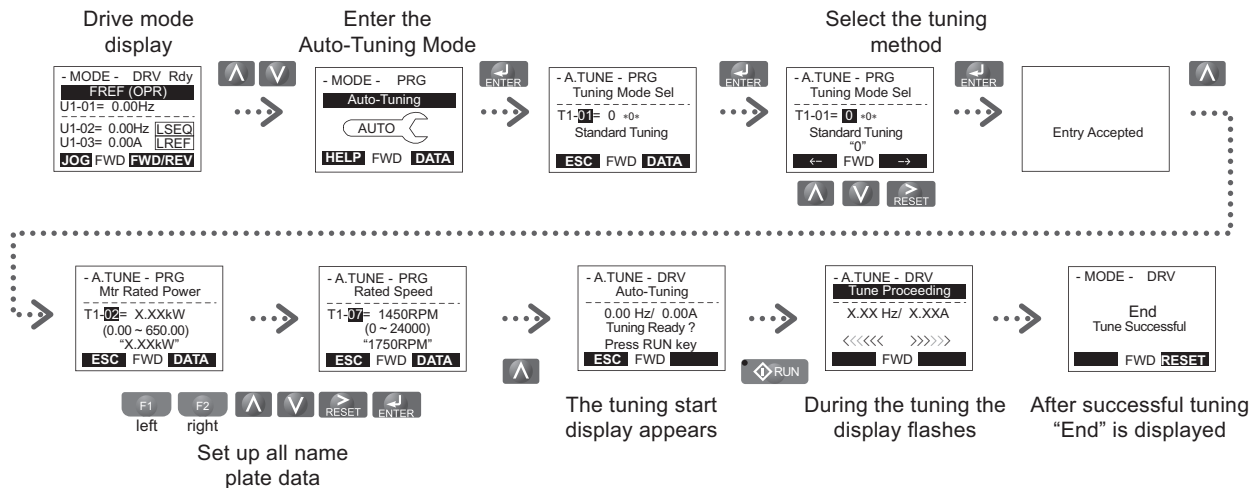
If Auto-Tuning can not be performed for some reason (no-load operation impossible etc.), then set up the maximum frequency and voltage in the E1-□□ parameters and enter the motor data manually into the E2-□□ parameters.

NOTICE: *The Safe Disable inputs must be closed during Auto-Tuning.*

◆ External Reference Selection and Acceleration/ Deceleration Times

■ Frequency Reference Selection (b1-01)

Set parameter b1-01 according to the frequency reference used.

b1-01	Reference Source	Frequency Reference Input
0	Digital Operator	Set the frequency references in the d1-☐☐ parameters and use digital inputs to switch over between different reference values.
1	Analog input terminals	Apply the frequency reference signal to terminal A1, A2, or A3.
2	MEMOBUS/Modbus communications	Serial Communications using the RS-422/RS-485 port
3	Option Card	Communications option card
4	Pulse input (terminal RP)	Set the frequency reference at terminal RP using a pulse train signal.

■ Run Command Selection (b1-02)

Set parameter b1-02 according to the run command used.

b1-02	Reference Source	Run Command Input
0	Digital Operator	RUN and STOP keys on the operator
1	Digital input terminals	Multi-Function digital input
2	MEMOBUS/Modbus Communications	Serial Communications using the RS-422/RS-485 port
3	Option Card	Communications option card

■ Acceleration/Deceleration Times and S-Curves

There are four sets of acceleration and deceleration times which can be set in the C1-☐☐ parameters. The default activated accel/decel times are C1-01/C1-02. Adjust these times to the appropriate values required by the application. If necessary S-curves can be activated in the C2-☐☐ parameters for softer accel/decel start and end.

◆ Reference and Run Source

The drive has a LOCAL and a REMOTE mode.

Status	Description
LOCAL	The Run/Stop command and the frequency reference are entered at the operator keypad.
REMOTE	The Run command source entered in parameter b1-02 or b1-16 and the frequency reference source entered in parameter b1-01 or b1-15 are used.

If the drive is operated in the REMOTE mode, make sure that the correct sources for the frequency reference and run command are set in parameters b1-01/b1-02 or b1-15/b1-16 and that the drive is in the REMOTE mode.

The LED in the LO/RE key indicates where the Run command is input from.

LO/RE LED	Description
ON	Run command is issued from operator.
OFF	Run command is issued from a different source than the operator.

◆ I/O Setup

Note: The default setting functions can be seen in the connection diagram on page *13*.

■ 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. Input A1 and A3 are set for -10 to +10 Vdc input. A2 is set for 4-20 mA input.

NOTICE: *If the input signal level of input A2 is switched between voltage and current, make sure that DIP switch S1 is in the correct position and parameter H3-09 is set up correctly.*

NOTICE: *When using analog input A3 as PTC input, set DIP switch S4 to PTC and parameter H3-06 = E.*

■ 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. When changing signal levels in parameter H4-07/08, make sure jumper S5 is set accordingly.

◆ Test Run

Perform the following steps to start up the machine after all parameter settings have been done.

1. Run the motor without load and check if all input, outputs and the sequence work as desired.
2. Connect the load to the motor.
3. Run the motor with load and make sure that there is no vibrations, hunting or motor stalling occurs.

After taking the steps listed above, the drive should be ready to run the application and perform the basic functions. For special setups like PID control etc. refer to the Technical Manual.

6 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.
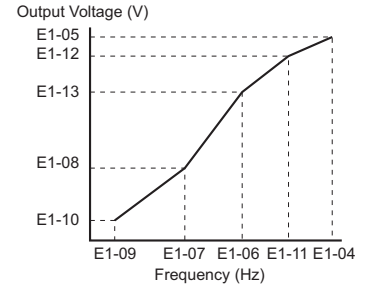
No.	Name	Description
Initialization Parameters		
A1-00	Language Selection	**0: English** 1: Japanese 2: German 3: French 4: Italian 5: Spanish 6: Portuguese 7: Chinese 8: Czech 9: Russian 10: Turkish 11: Polish 12: Greek Note: 1. Settings 8 to 12 can be selected from an LCD operator with version (REV) F or later. The version is listed on the back of the LCD operator. 2. The setting range is 0 to 7 in models CIMR-A□4A0930 and 4A1200.
A1-01	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)**
A1-02	Control Method Selection	**0: V/f Control** 1: V/f Control with PG 2: Open Loop Vector Control 3: Closed Loop Vector Control 5: Open Loop Vector Control for PM 6: Advanced Open Loop Vector Control for PM 7: Closed Loop Vector Control for PM
A1-03	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
Operation Mode Selection		
b1-01	Frequency Reference Selection 1	0: Digital operator **1: Analog input terminals** 2: MEMOBUS/Modbus communications 3: Option Card 4: Pulse input (terminal RP)
b1-02	Run Command Selection 1	0: Digital operator **1: Digital input terminals** 2: MEMOBUS/Modbus communications 3: Option Card

No.	Name	Description
b1-03	Stopping Method Selection	**0: Ramp to stop** 1: Coast to stop 2: DC Injection Braking to stop 3: Coast with timer 9: Simple Positioning Stop
b1-04	Reverse Operation Selection	**0: Reverse enabled.** 1: Reverse disabled.
b1-14	Phase Order Selection	**0: Standard** 1: Switch phase order (reverses the direction of the motor)
DC Injection Braking		
b2-01	DC Injection Braking Start Frequency	Sets the frequency at which DC Injection Braking starts when "Ramp to stop" (b1-03 = 0) is selected.
b2-02	DC Injection Braking Current	Sets the DC Injection Braking current as a percentage of the drive rated current. **Note:** This parameter is not available for AOLV/PM in models CIMR-A□4A0930 and 4A1200.
b2-03	DC Injection Braking Time at Start	Sets DC Injection Braking (Zero Speed Control when in CLV and CLV/PM) time at start. Disabled when set to 0.00 seconds. **Note:** This parameter is not available for AOLV/PM in models CIMR-A□4A0930 and 4A1200.
b2-04	DC Injection Braking Time at Stop	Sets DC Injection Braking (Zero Speed Control when in CLV and CLV/PM) time at stop. **Note:** This parameter is not available for AOLV/PM in models CIMR-A□4A0930 and 4A1200.
Acceleration/Deceleration		
C1-01	Acceleration Time 1	Sets the time to accelerate from 0 to maximum frequency.
C1-02	Deceleration Time 1	Sets the time to decelerate from maximum frequency to 0.
C1-03 to C1-08	Acceleration/ Deceleration Time 2 to 4	Set the accel/decel times 2 to 4 (set like C1-01/C1-02).
C2-01	S-Curve Characteristic at Accel Start	S-curve at acceleration start.
C2-02	S-Curve Characteristic at Accel End	S-curve at acceleration end.
C2-03	S-Curve Characteristic at Decel Start	S-curve at deceleration start.
C2-04	S-Curve Characteristic at Decel End	S-curve at deceleration end.
Slip Compensation		
C3-01	Slip Compensation Gain	Sets the gain for the motor slip compensation function used for motor 1.

No.	Name	Description
C3-02	Slip Compensation Primary Delay Time	Adjusts the slip compensation function delay time used for motor 1.
Torque Compensation		
C4-01	Torque Compensation Gain	Sets the gain for the automatic torque (voltage) boost function and helps to produce better starting torque. Used for motor 1.
C4-02	Torque Compensation Primary Delay Time 1	Sets the torque compensation filter time.
Carrier Frequency		
C6-01	Drive Duty Mode Selection	**0: Heavy Duty (HD) for constant torque applications.** 1: Normal Duty (ND) for variable torque applications.
C6-02	Carrier Frequency Selection	**1: 2.0 kHz** 2: 5.0 kHz 3: 8.0 kHz 4: 10.0 kHz 5: 12.5 kHz 6: 15.0 kHz 7: Swing PWM1 (Audible sound 1) 8: Swing PWM2 (Audible sound 2) 9: Swing PWM3 (Audible sound 3) A: Swing PWM4 (Audible sound 4) B to E: No setting possible F: User defined (determined by C6-03 through C6-05)
Frequency Reference		
d1-01 to d1-16	Frequency Reference 1 to 16	Sets the frequency reference for the drive. Setting units are determined by parameter o1-03.
d1-17	Jog Frequency Reference	Sets the Jog frequency reference. Setting units are determined by parameter o1-03.
V/f Pattern for Motor 1		
E1-01	Input Voltage Setting	This parameter must be set to the power supply voltage. WARNING! Drive input voltage (not motor voltage) must be set in E1-01 for the protective features of the drive to function properly. Failure to do so may result in equipment damage and/or death or personal injury.

No.	Name	Description
E1-04	Maximum Output Frequency	E1-04, E1-06 to E1-13 can only be changed when E1-03 is set to F. To set linear V/f characteristics, set the same values for E1-07 and E1-09. In this case, the setting for E1-08 will be disregarded. Ensure that the four frequencies are set according to these rules or an oPE10 fault will occur: $E1\text{-}09 \le E1\text{-}07 < E1\text{-}06 \le E1\text{-}11 \le E1\text{-}04$
E1-05	Maximum Voltage	
E1-06	Base Frequency	
E1-07	Middle Output Frequency	
E1-08	Middle Output Frequency Voltage	
E1-09	Minimum Output Frequency	
E1-10	Minimum Output Frequency Voltage	
E1-13	Base Voltage	Note: Some parameters may not be available depending on the control mode. • E1-07, E1-08 and E1-10 are available only in the following control modes: V/f Control, V/f with PG, Open Loop Vector. • E1-11, E1-12 and E1-13 are available only in the following control modes: V/f Control, V/f with PG, Open Loop Vector, Closed Loop Vector.
Motor 1 Parameters		
E2-01	Motor Rated Current	Sets the motor nameplate full load current in Amps. Automatically set during Auto-Tuning.
E2-02	Motor Rated Slip	Sets the motor rated slip. Automatically set during Auto-Tuning.
E2-03	Motor No-Load Current	Sets the no-load current for the motor. Automatically set during Auto-Tuning.
E2-04	Number of Motor Poles	Sets the number of motor poles. Automatically set during Auto-Tuning.
E2-05	Motor Line-to-Line Resistance	Sets the phase-to-phase motor resistance. Automatically set during Auto-Tuning.
E2-06	Motor Leakage Inductance	Sets the voltage drop due to motor leakage inductance as a percentage of motor rated voltage. Automatically set during Auto-Tuning.
Multi-Function Digital Inputs		
H1-01 to H1-08	Multi-Function Digital Input Terminal S1 to S8 Function Selection	Selects the function of terminals S1 to S8.
Note: Major functions are listed at the end of the table.		
Multi-Function Digital Outputs		
H2-01	Terminal M1-M2 function selection (Relay)	Set the function for the relay output M1-M2.

No.	Name	Description
H2-02	Terminal M3-M4 function selection (Relay)	Sets the function for the relay output M3-M4.
H2-03	Terminal M5-M6 function selection (Relay)	Sets the function for the relay output M5-M6.
H2-06	Watt Hour Output Unit Selection	Sets the output units for the watt hours when Watt Hour Pulse Output is selected as the digital output (H2-01, H2-02, or H2-03 = 39). Outputs a 200 ms pulse signal when the watt-hour counter increases by the units selected. **0: 0.1 kWh units** 1: 1 kWh units 2: 10 kWh units 3: 100 kWh units 4: 1000 kWh units

Note: Major functions are listed at the end of the table.

	Multi-Function Analog Inputs	
H3-01	Terminal A1 Signal Level Selection	**0: 0 to 10 V** 1: -10 to 10 V
H3-02	Terminal A1 Function Selection	Sets the function of terminal A1.
H3-03	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	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	Terminal A3 Signal Level Selection	**0: 0 to 10 V** 1: -10 to 10 V
H3-06	Terminal A3 Function Selection	Sets the function of terminal A3.
H3-07	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	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	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	Terminal A2 Function Selection	Sets the function of terminal A2.
H3-11	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	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	Analog Input Filter Time Constant	Sets a primary delay filter time constant for terminals A1, A2, and A3. Used for noise filtering.

No.	Name	Description
H3-14	Analog Input Terminal Enable Selection	Determines which of the analog input terminals will be enabled or disabled when a digital input programmed for "Analog input enable" (H1-□□ = C) is activated. The terminals other than the one set as the target are not influenced by input signals. 1: Terminal A1 only 2: Terminal A2 only 3: Terminals A1 and A2 only 4: Terminal A3 only 5: Terminals A1 and A3 only 6: Terminals A2 and A3 only **7: All terminals enabled**

	Multi-Function Analog Outputs	
H4-01	Multi-Function Analog Output Terminal FM Monitor Selection	Selects the data to be output through multi-function analog output terminal FM. Set the desired monitor parameter to the digits available in U□-□□. For example, enter "103" for U1-03.
H4-02	Multi-Function Analog Output Terminal FM Gain	Sets the signal level at terminal FM that is equal to 100% of the selected monitor value.
H4-03	Multi-Function Analog Output Terminal FM Bias	Sets the signal level at terminal FM that is equal to 0% of the selected monitor value.
H4-04	Multi-Function Analog Output Terminal AM Monitor Selection	Selects the data to be output through multi-function analog output terminal AM. Set the desired monitor parameter to the digits available in U□-□□. For example, enter "103" for U1-03.
H4-05	Multi-Function Analog Output Terminal AM Gain	Sets the signal level at terminal AM that is equal to 0% of the selected monitor value.
H4-06	Multi-Function Analog Output Terminal AM Bias	Sets the signal level at terminal AM that is equal to 0% of the selected monitor value.
H4-07	Multi-Function Analog Output Terminal FM Signal Level Selection	**0: 0 to 10 V** 1: -10 to 10 V 2: 4 to 20 mA
H4-08	Multi-Function Analog Output Terminal AM Signal Level Selection	**0: 0 to 10 V** 1: -10 to 10 V 2: 4 to 20 mA

	Pulse Input Setting (Freq.)	
H6-02	Pulse Train Input Scaling	Sets the terminal RP input signal frequency that is equal to 100% of the value selected in H6-01.
H6-03	Pulse Train Input Gain	Sets the level of the value selected in H6-01 when a frequency with the value set in H6-02 is input.
H6-04	Pulse Train Input Bias	Sets the level of the value selected in H6-01 when 0 Hz is input.

	Pulse Output Setting	
H6-06	Pulse Train Monitor Selection	Select the pulse train monitor output function (value of the □-□□ part of U□-□□). Example: To select U5-01, set 501.

No.	Name	Description
H6-07	Pulse Train Monitor Scaling	Sets the terminal MP output signal frequency when the monitor value is 100%. As an example, have the pulse train monitor output equal the output frequency, set H6-06 to 102 and H6-07 to 0.
	Motor Protection	
L1-01	Motor Overload Protection Selection	0: Disabled **1: General purpose motor (standard fan cooled)** 2: Drive dedicated motor with a speed range of 1:10 3: Vector motor with a speed range of 1:100 4: PM motor with variable torque 5: PM motor with constant torque control 6: General purpose motor (50 Hz) The drive may not be able to provide protection when multiple motors are used, even if overload is enabled in L1-01. Set L1-01 to 0 and install separate thermal relay to each motor.
L1-02	Motor Overload Protection Time	Sets the motor thermal overload protection (oL1) time.
	Stall Prevention	
L3-01	Stall Prevention Selection during Acceleration	0: Disabled. **1: General purpose. Acceleration is paused as long as the current is above the L3-02 setting.** 2: Intelligent. Accelerate in the shortest possible time without exceeding the L3-02 level. Note: Setting 2 is not available when using OLV/PM.
L3-02	Stall Prevention Level during Acceleration	Used when L3-01 = 1 or 2. 100% is equal to the drive rated current.
L3-04	Stall Prevention Selection during Deceleration	0: Disabled. Deceleration at the active deceleration rate. An ov fault may occur. **1: General purpose. Deceleration is paused when the DC bus voltage exceeds the Stall Prevention level.** 2: Intelligent. Decelerate as fast as possible while avoiding ov faults. 3: Stall Prevention with braking resistor. Stall Prevention during deceleration is enabled in coordination with dynamic braking. 4: Overexcitation Deceleration. Decelerates while increasing the motor flux. 5: Overexcitation Deceleration 2. Adjust the deceleration rate according to the DC voltage. **Note:** The setting of 3 is not available with models CIMR-A☐4A0930 and 4A1200.
L3-05	Stall Prevention Selection during Run	0: Disabled. Drive runs at a set frequency. A heavy load may cause stalling. **1: Decel time 1. Uses the deceleration time set to C1-02 while Stall Prevention is performed.** 2: Decel time 2. Uses the deceleration time set to C1-04 while Stall Prevention is performed.

No.	Name	Description
L3-06	Stall Prevention Level during Run	Enabled when L3-05 is set to 1 or 2. 100% is equal to the drive rated current.
	Induction Motor Auto-Tuning	
T1-01	Auto-Tuning Mode Selection	**0: Rotational Auto-Tuning** 1: Stationary Auto-Tuning 1 2: Stationary Auto-Tuning for Line-to-Line Resistance 3: Rotational Auto-Tuning for V/f Control (necessary for Energy Savings and Speed Estimation Speed Search) 4: Stationary Auto-Tuning 2 5: Stationary Auto-Tuning 3 8: Inertia Tuning (perform Rotational Auto-Tuning prior to Inertia Tuning) 9: ASR Gain Tuning (perform Rotational Auto-Tuning prior to ASR Gain Auto-Tuning) **Note 1.** Stationary Auto-Tuning 3 is not available in models CIMR-A☐4A0930 and 4A1200. **2.** Inertia Tuning and ASR Gain Auto-Tuning might not be available if gears are between the machine and the motor shaft.
T1-02	Motor Rated Power	Sets the motor rated power as specified on the motor nameplate.
T1-03	Motor Rated Voltage	Sets the motor rated voltage as specified on the motor nameplate.
T1-04	Motor Rated Current	Sets the motor rated current as specified on the motor nameplate.
T1-05	Motor Base Frequency	Sets the rated frequency of the motor as specified on the motor nameplate.
T1-06	Number of Motor Poles	Sets the number of motor poles as specified on the motor nameplate.
T1-07	Motor Base Speed	Sets the rated speed of the motor as specified on the motor nameplate.
T1-08	PG Number of Pulses Per Revolution	Set the number of pulses per revolution for the PG being used (pulse generator or encoder).
T1-09	Motor No-Load Current (Stationary Auto-Tuning)	Sets the no-load current for the motor. After setting the motor capacity to T1-02 and the motor rated current to T1-04, this parameter will automatically display the no-load current for a standard 4 pole Yaskawa motor. Enter the no-load current as indicated on the motor test report.
T1-10	Motor Rated Slip (Stationary Auto-Tuning)	Sets the motor rated slip. After setting the motor capacity to T1-02, this parameter will automatically display the motor slip for a standard 4 pole Yaskawa motor. Enter the motor slip as indicated on the motor test report.
T1-11	Motor Iron Loss	Sets the iron loss for determining the Energy Saving coefficient. The value is set to E2-10 (motor iron loss) set when the power is cycled. If T1-02 is changed, a default value appropriate for the motor capacity that was entered will appear.

Monitor	Description
U1-01	Frequency Reference (Hz)
U1-02	Output Frequency (Hz)
U1-03	Output Current (A)
U1-05	Motor Speed (Hz)
U1-06	Output Voltage Reference (Vac)
U1-07	DC Bus Voltage (Vdc)
U1-08	Output Power (kW)
U1-09	Torque Reference (% of motor rated torque)
U1-10	Input Terminal Status Displays the input terminal status. U1-10=00000000 1 Digital input 1 (terminal S1) enabled 1 Digital input 2 (terminal S2) enabled 1 Digital input 3 (terminal S3) enabled 1 Digital input 4 (terminal S4) enabled 1 Digital input 5 (terminal S5) enabled 1 Digital input 6 (terminal S6) enabled 1 Digital input 7 (terminal S7) enabled 1 Digital input 8 (terminal S8) enabled
U1-11	Output Terminal Status Displays the output terminal status. U1-11=00000000 1 Multi-Function Digital Output (terminal M1-M2) enabled 1 Multi-Function Digital Output (terminal M3-M4) enabled 1 Multi-Function Digital Output (terminal M5-M6) enabled Not Used 1 Fault Relay (terminal MA-MC closed MB-MC open) enabled
U1-12	Drive Status Displays the drive operation status. U1-12=00000000 1 During run enabled 1 During zero-speed enabled 1 During REV enabled 1 During fault reset signal input enabled 1 During speed agree enabled 1 Drive ready enabled 1 During alarm detection enabled 1 During fault detection enabled
U1-13	Terminal A1 Input Level
U1-14	Terminal A2 Input Level
U1-15	Terminal A3 Input Level
U1-16	Output Frequency after Soft Starter
U1-18	oPE Fault Parameter
U1-24	Input Pulse Monitor

Monitor	Description
Fault Trace	
U2-01	Current Fault
U2-02	Previous Fault
U2-03	Frequency Reference at Previous Fault
U2-04	Output Frequency at Previous Fault
U2-05	Output Current at Previous Fault
U2-06	Motor Speed at Previous Fault
U2-07	Output Voltage at Previous Fault
U2-08	DC Bus Voltage at Previous Fault
U2-09	Output Power at Previous Fault
U2-10	Torque Reference at Previous Fault
U2-11	Input Terminal Status at Previous Fault
U2-12	Output Terminal Status at Previous Fault
U2-13	Drive Operation Status at Previous Fault
U2-14	Cumulative Operation Time at Previous Fault
U2-15	Run Speed after Soft Starter at Previous Fault
U2-16	Motor q-Axis Current at Previous Fault
U2-17	Motor d-Axis Current at Previous Fault
U2-20	Heatsink Temperature at Previous Fault
Fault History	
U3-01 to U3-04	First to 4th Most Recent Fault
U3-05 to U3-10	5th to 10th Most Recent Fault
U3-11 to U3-14	Cumulative Operation Time at 1st to 4th Most Recent Fault
U3-15 to U3-20	Cumulative Operation Time at 5th to 10th Most Recent Fault
NOTE: The following faults are not recorded in the error log. CPF00 to 03, Uv1, and Uv2	

DI/DO Sel.	Description
Digital Input Function Selections	
3	Multi-step speed reference 1
4	Multi-step speed reference 2
5	Multi-step speed reference 3
6	Jog reference selection (higher priority than multi-step speed reference)
7	Accel/decel time selection 1
F	Through mode (Set when a terminal is not used or when using the terminal in the pass-through mode)
14	Fault reset (Reset when turned ON)
20 to 2F	External fault; Input mode: N.O. contact/N.C. contact, Detection mode: Normal/during operation
Digital Output Function Selections	
0	During Run (ON: run command is ON or voltage is being output)
1	Zero Speed
2	Speed Agree 1
6	Drive Ready
E	Fault
F	Through mode
10	Minor fault (Alarm) (ON: Alarm displayed)

7 Troubleshooting

◆ General Fault and Alarms

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

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

A fault is indicated by a code on the data display and the ALM LED is on. The drive 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 drive 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	FLT	Cause	Corrective Action
Baseblock bb	❍		The software base block function is assigned to one of the digital inputs and the input is off. The drive does not accept Run commands.	• Check the digital inputs function selection. • Check the upper controller sequence.
Control Fault CF		❍	The torque limit was reached during deceleration for longer than 3 s. when in Open Loop Vector control • The load inertia is too big. • The torque limit is too low. • The motor parameters are wrong.	• Check the load. • Set the torque limit to the most appropriate setting (L7-01 through L7-04). • Check the motor parameters.
Current Offset Fault CoF		❍	Due to residual induction current in the motor when the drive attempted to start the motor, the drive attempted to adjust the current offset value beyond the allowable range.	• Create a motor restart sequence that allows enough time for the residual induction voltage to dissipate. • Enable Speed Search at start (b3-01 = 1). Use the multi-function terminals to execute External Speed Search 1 and 2 (H1-☐☐ = 61 or 62). **Note:** When using a PM motor, both External Speed Search 1 and 2 perform the same operation. • Replace the drive if the fault occurs again.
Control Circuit Fault CPF02 to CPF24		❍	There is a problem in the drive's control circuit.	• Cycle the drive power supply. • Initialize the drive. • Replace the drive if the fault occurs again.
Terminal Board not Connected CPF25		❍	There is no terminal board connected to the control board.	• Check if the terminal board is installed properly. • Uninstall and Reapply the terminal board. • Change the drive.
Cannot Reset CrST	❍		Fault reset was input when a Run command was active.	Turn off the Run command and reset the drive.
Option Card External Fault EF0	❍	❍	An external fault was tripped by the upper controller via an option card.	• Remove the fault cause, reset the fault and restart the drive. • Check the upper controller program.
External Fault EF	❍		A forward and reverse command were input simultaneously for longer than 500 ms. This alarm stops a running motor.	Check the sequence and make sure that the forward and reverse input are not set at the same time.
External Faults EF1 to EF8	❍	❍	• An external fault was triggered by an external device via one of the digital inputs S1 to S8. • The digital inputs are set up incorrectly.	• Find out why the device tripped the EF. Remove the cause and reset the fault. • Check the functions assigned to the digital inputs.
Ground Fault GF		❍	• Ground leakage current has exceeded 50% of the drives rated output current. • Cable or motor insulation is broken. • Excessive stray capacitance at drive output.	• Check the output wiring and the motor for short circuits or broken insulation. Replace any broken parts. • Reduce the carrier frequency.
Safe Disable Signal Input Hbb	❍		Both Safe Disable inputs are open. The drive output is safely disabled and the motor can not be started.	• Check why the upper controller's safety device disabled the drive. Remove the cause and restart. • Check the wiring. • If the Safe Disable function is not utilized for the ISO/EN 13849-1, Category 3 PLd, and IEC/EN 61508, SIL2 or for disabling the drive, the terminals HC, H1, H2 must be linked.

Digital Operator	AL	FLT	Cause	Corrective Action
Safe Disable Signal Fault HbbF	❍		Drive output is disabled while only one of the Safe Disable inputs is open. (normally both input signals H1 and H2 should be open) • One channel is internally broken and does not switch off, even if the external signal is removed. • Only one channel is switched off by the upper controller.	• Check the wiring from the upper controller and make sure that both signals are set correctly by the controller. • If the signals are set correctly and the alarm does not disappear, replace the drive.
Input Phase Loss PF		❍	Input cable is disconnected or the motor winding is damaged. Loose wires at the drive input. Motor is too small (less than 5% of drive current).	• Check the motor wiring. • Make sure all terminal screws in the drive and motor are properly tightened. • Check the motor and drive capacity.
Overcurrent oC		❍	Short circuit or ground fault on the drive output side The load is too heavy. The accel./decel. times are too short. Wrong motor data or V/f pattern settings. A magnetic contactor was switched at the output.	• Check the output wiring and the motor for short circuits or broken insulation. Replace the broken parts. • Check the machine for damages (gears, etc.) and repair any broken parts. • Check the drive parameter settings. • Check the output contactor sequence.
Heatsink Overheat oH or oH1	❍	❍	Surrounding temperature is too high. The cooling fan has stopped. The heatsink is dirty. The airflow to the heatsink is restricted.	• Check the surrounding temperature and install cooling devices if necessary. • Check the drive cooling fan. • Clean the heatsink. • Check the airflow around the heatsink.
Motor Overload oL1		❍	The motor load is too heavy. The motor is operated at low speed with heavy load. Cycle times of accel./decel. are too short. Incorrect motor rated current has been set.	• Reduce the motor load. **Note:** After the value of U4-16 has decreased to one less than 100, reset oL1. The value of U4-16 must be less than 100 before oL1 can be reset. • Use a motor with external cooling and set the correct motor in parameter L1-01 • Check the sequence. • Check the rated current setting.
Drive Overload oL2		❍	The load is too heavy. The drive capacity is too small. Too much torque at low speed.	• Check the load. • Make sure that the drive is big enough to handle the load. • The overload capability is reduced at low speeds. Reduce the load or increase the drive size.
Overvoltage ov	❍	❍	DC bus voltage rose too high. The deceleration time is too short. Stall prevention is disabled. Braking chopper/resistor broken. Unstable motor control in OLV. Too high input voltage.	• Increase the deceleration time. • Enable stall prevention by parameter L3-04. • Make sure the braking resistor and braking chopper are working correctly. • Check motor parameter settings and adjust torque and slip compensation as needed. • Make sure that the power supply voltage meets the drives specifications.
Output Phase Loss LF		❍	Output voltage drop or phase imbalance. One of the output phase is lost. Loose wires at the drive input.	• Check the power supply. • Make sure that all cables are properly fixed to the correct terminals.
Braking Transistor Fault rr		❍	The internal braking transistor is broken.	• Cycle the power supply. • Replace the drive if the fault reoccurs.
Thermistor Disconnect THo	❍	❍	The motor thermistor is not connected properly.	Check the wiring for the thermistor.
DC Bus Undervoltage Uv1	❍	❍	The voltage in the DC bus fell below the undervoltage detection level (L2-05). The power supply failed or one input phase has been lost. The power supply is too weak.	• Check the power supply. • Make sure, that the power supply is strong enough.

Digital Operator	AL	FLT	Cause	Corrective Action
Control Power Supply Voltage Fault Uv2		❍	The drives controller power supply voltage is too low.	• Cycle power to the drive. Check if the fault reoccurs. • Replace the drive if the fault continues to occur.
Undervoltage 3 Uv3		❍	The charge circuit for the DC bus is broken.	• Cycle power to the drive. Check if the fault reoccurs. • Replace the drive if the fault reoccurs.

◆ Operator Programing Errors

An Operator Programming Error (oPE) occurs when an inapplicable parameter is set or an individual parameter setting is inappropriate. When oPE02 or oPE08 appear on the operator display, press the ENTER button to view U1-18 and see which parameter is causing the oPE.

Digital Operator	Cause	Corrective Action
oPE01	Drive capacity and value set to o2-04 do not match.	Correct the value set to o2-04.
oPE02	Parameters were set outside the allowable setting range.	Set parameters to the proper values.
oPE03	A contradictory setting is assigned to multi-function contact inputs H1-01 through to H1-08. • The same function is assigned to two inputs. (this excludes "External fault" and "Not used") • Input functions which require the setting of other input functions were set alone. • Input functions that are not allowed to be used simultaneously have been set.	• Fix any incorrect settings. • Refer to the Technical Manual for more details.
oPE05	• The run command source (b1-02) or frequency reference source (b1-01) is set to 3 but no option card is installed. • The frequency reference source is set to pulse input but H6-01 is not 0.	• Install the required option card. • Correct the values set to b1-01 and b1-02.
oPE07	Settings to multi-function analog inputs H3-02 and H3-10 and PID functions conflict. • H3-02 and H3-10 are set to the same value. (this excludes settings 0 and F) • PID functions have been assigned to both analog inputs and the pulse input at the same time.	• Fix any incorrect setting. • Refer to the Technical Manual for more details.
oPE08	A function has been set that cannot be used in the control mode selected.(might appear after control mode change)	• Fix any incorrect setting. • Refer to the Technical Manual for more details.
oPE10	The V/f pattern setting is incorrect.	• Check the V/f pattern settings. • Refer to the Technical Manual for more details.
oPE18	One of the following setting errors has occurred while Online Tuning is enabled in OLV (A1-02 = 2): • E2-02 has been set below 30% of the original default value • E2-06 has been set below 50% of the original default value • E2-03 = 0	Make sure E2-02, E2-03, and E2-06 are set the correct values.
oPE20	With the entered encoder resolution (F1-01), maximum output frequency (E1-04), and motor pole number (E5-04,) the calculation encoder signal frequency exceeds 50 kHz (with PG-F3 option).	• Set F1-01 to the correct encoder resolution. • Reduce the maximum output frequency of the drive in parameter E1-04 so the encoder signal frequency at maximum speed is lower than 50 kHz.

◆ Auto-Tuning Errors

Digital Operator	Cause	Corrective Action
Er-01	Motor Data Error The input motor data are not valid. (e.g. the base frequency and base speed do not fit).	Re-enter the data and repeat Auto-Tuning.
Er-02	Minor Fault • The wiring is faulty. • The load is too heavy.	• Check the wiring. • Check the load. Always perform Auto-Tuning with the load decoupled from the motor.
Er-03	STOP Button Input The STOP button was pressed and Auto-Tuning was canceled.	Repeat the Auto-Tuning.
Er-04	Line-to-Line Resistance Error • Wrong input data. • Auto tuning exceeded the given time frame. • Calculated values out of range.	• Check the input data. • Check the wiring. • Re-enter the data and repeat the Auto-Tuning.
Er-05	No-Load Current Error • Incorrect data was entered. • Auto tuning took too long. • Calculated values out of range.	
Er-08	Rated Slip Error • Wrong data input. • Auto tuning exceeded the given time frame. • Calculated values out of range.	
Er-09	Acceleration Error The motor did not accelerate for the specified acceleration time.	• Increase the acceleration time C1-01. • Check the torque limits L7-01 and L7-02.
Er-11	Motor Speed Error The torque reference was too high.	• Increase the acceleration time (C1-01). • If possible, disconnect the load.
Er-12	Current Detection Error • One of the motor phases is missing: (U/T1, V/T2, W/T3). • Current is either too low or exceeds the drives rating. • The current sensors are faulty.	• Check the wiring. • Make sure, that the drive rating fits to the motor. • Check the load. (Auto-Tuning should have been performed without the load connected.) • Replace the drive.
Er-13	Leakage Inductance Error Drive was unable to complete tuning for leakage inductance within 300 s.	• Check all wiring and correct any mistakes. • Double check the motor rated current value that was entered to T1-04 for Auto-Tuning. • Check the motor rated current value written on the motor nameplate and enter the correct value.
End1	Excessive V/f Setting • The torque reference exceeded 20% during Auto-Tuning. • The calculated no-load current is above 80% of the motor rated current.	• Check the V/f pattern setting. • Perform Auto-Tuning without the load connected. • Check the input data and repeat Auto-Tuning.
End2	Motor Iron-Core Saturation Coefficient • Calculated core saturation values out of range. • Incorrect data was entered.	• Check the input data. • Check the motor wiring. • Perform Auto-Tuning without load connected.
End3	Rated Current Setting Alarm	Check the input data and repeat tuning.
End4	Adjusted Slip Calculation Error The slip that was calculated is outside the allowable range.	• Make sure the data entered for Auto-Tuning is correct. • Execute Rotational Auto-Tuning instead. If not possible, try Stationary Auto-Tuning 2.
End5	Resistance Tuning Error The resistance value that was calculated is outside the allowable range.	• Double check the data that was entered for the Auto-Tuning process. • Check the motor and motor cable connection for faults.
End6	Leakage Inductance Alarm The leakage inductance value that was calculated is outside the allowable range.	Double check the data that was entered for the Auto-Tuning process.
End7	No-Load Current Alarm • The entered no-load current value was outside the allowable range. • Auto-Tuning results were less than 5% of the motor rated current.	• Check and correct faulty motor wiring. • Double check the data that was entered for the Auto-Tuning process.

8　European Standards

Figure 12 CE Mark

The CE mark indicates compliance with European safety and environmental regulations. It is required for engaging in business and commerce in Europe.

European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers, and the EMC guidelines for controlling noise.

This drive displays the CE mark based on the EMC guidelines and the Low Voltage Directive.

- **Low Voltage Directive:** 2014/35/EU
- **EMC Guidelines:** 2014/30/EU

Devices used in combination with this drive must also be CE certified and display the CE mark. When using drives displaying the CE mark in combination with other devices, it is ultimately the responsibility of the user to ensure compliance with CE standards. After setting up the device, verify that conditions meet European standards.

◆ EU Declaration of Conformity

EU Declaration of Conformity
Original

YASKAWA

Ref.No. VKOHIN-S1706-17

YASKAWA ELECTRIC CORPORATION
2-13-1 Nishimiyaichi Yukuhashi City
Fukuoka Pref., 824-8511 Japan

declares under sole responsibility conformity of the following products

A1000 Series AC Drive
Model: CIMR-A ☐☐☐ ☐☐☐☐ ☐☐☐

Directive of the European Parliament and Council:

Low Voltage Directive (LVD)	: 2014/35/EU
Electromagnetic Compatibility Directive (EMC)	: 2014/30/EU
Machine Directive (MD)	: 2006/42/EC
Restriction of the use of certain hazardous substances (RoHS)	: 2011/65/EU

Applied harmonized Standards:
EN ISO 13849-1:2015(Cat.3, PL d)
EN 61800-3:2004/A1:2012
EN 61800-5-1:2007
EN 61800-5-2:2007(SIL2)
EN 61000-6-2:2005
EN 50581:2012

Place / Date
YASKAWA ELECTRIC CORPORATION
2-13-1 Nishimiyaichi Yukuhashi City
Fukuoka Pref., 824-8511 Japan

9th.June.2017

Drives Division
General Manager

Nobuaki Jinnouchi

EU Declaration of Conformity

Translation - Danish | Swedish | Finnish | Latvian | Estonian

YASKAWA

Ref.No. VKOHIN-S1706-17

EF-overensstemmelseserklæring | EG-försäkran om överensstämmelse
EY-vaatimustenmukaisuusvakuutus | EK atbilstības deklarācija
EÜ vastavusdeklaratsioon

YASKAWA ELECTRIC CORPORATION
2-13-1 Nishimiyaichi Yukuhashi City
Fukuoka Pref., 824-8511 Japan

declares under sole responsibility conformity of the following products
erklærer som eneste ansvarlig overensstemmelsen for følgende produkter
försäkrar på eget ansvar att följande produkter uppfyller kraven på överensstämmelse
vakuuttaa yksinomaisella vastuullaan seuraavien tuotteiden vaatimustenmukaisuuden
uz savu atbildību paziņo par tālāk minēto izstrādājumu atbilstību
deklareerib ainuvastutusel järgmiste toodete vastavust

A1000 Series AC Drive
Model: CIMR-A ☐ ☐ ☐ ☐☐☐☐ ☐ ☐ ☐

Directive of the European Parliament and Council
Europa-Parlamentets og Rådets direktiv / EU-direktiv / Euroopan parlamentin ja neuvoston direktiivi
Eiropas Parlamenta un Padomes Direktīva / Euroopa Parlamendi ja nõukogu direktiiv

Low Voltage Directive (LVD) : 2014/35/EU
Lavspændingsdirektivet / Lågspänningsdirektivet / Pienjännitedirektiivi
Zemsprieguma direktīva / Madalpingedirektiiv

Electromagnetic Compatibility Directive (EMC) : 2014/30/EU
EMC-direktivet / EMC-direktivet / EMC-direktiivi
EMS direktīva / Elektromagnetilise ühilduvuse direktiiv

Machine Directive (MD) : 2006/42/EC
Maskindirektivet / Maskindirektivet / Konedirektiivi
Mašīnu direktīva / Masinadirektiiv

Restriction of the use of certain hazardous substances (RoHS) : 2011/65/EJ
Om begrænsning af anvendelsen af visse farlige stoffer i elektrisk og elektronisk udstyr.
Om begränsning av användning av vissa farliga ämnen i elektrisk och elektronisk utrustning.
Tiettyjen vaarallisten aineiden käytön rajcittamisesta sähkö- ja elektroniikkalaitteissa.
Par dažu bīstamu vielu izmantošanas ierobežošanu elektriskās un elektroniskās iekārtās.
Dēl tam tikrų pavojingų medžiagų naudojimo elektros ir elektroninėje įrangoje apribojimo.

Applied harmonized Standards:
Anvendt harmoniseret standard: / Tillämpad harmoniserad standard:
Sovellettu harmonisoitu standardi: / Piemērotais saskaņotais standarts:
Rakendatud ühtlustatud standardid:

EN ISO 13849-1:2015(Cat.3, PL d)
EN 61800-3:2004/A1:2012
EN 61800-5-1:2007
EN 61800-5-2:2007(SIL2)
EN 61000-6-2:2005
EN 50581:2012

Place / Date
By, dato / Ort och datum / Paikka, pvm / Vieta, datums / Koht, kuupäev
YASKAWA ELECTRIC CORPORATION
2-13-1 Nishimiyaichi Yukuhashi City
Fukuoka Pref., 824-8511 Japan

9th.June.2017

Drives Division
General Manager

Nobuaki Jinnouchi

EU Declaration of Conformity

Translation – Polish | Lithuanian | Czech | Slovak | Hungarian

YASKAWA

Ref.No. VKOHIN- S1706-17

Deklaracja zgodności WE | EB atitikties deklaracija
ES Prohlášení o shodě | Vyhlásenie o zhode ES
EK megfelelőségi nyilatkozat

YASKAWA ELECTRIC CORPORATION
2-13-1 Nishimiyaichi Yukuhashi City
Fukuoka Pref., 824-8511 Japan

declares under sole responsibility conformity of the following products
oświadcza z wyłączną odpowiedzialnością, że niżej wymienione wyroby są zgodne z odpowiednimi przepisami unijnymi
prisiimdama atsakomybę patvirtina toliau nurodytų gaminių atitiktį
Prohlašuje na svou výhradní odpovědnost shodu níže uvedených výrobků
potvrdzuje výlučnú zodpovednosť za zhodu pre nasledujúce výrobky
saját kizárólagos felelősségére kijelenti, hogy a következő termékek megfelelnek az alábbiakban megfogalmazott követelményeknek

A1000 Series AC Drive
Model: CIMR-A ☐ ☐ ☐ ☐☐☐☐ ☐ ☐ ☐

Directive of the European Parliament and Council
Dyrektywa Parlamentu Europejskiego i Rady / Europos Parlamento ir Tarybos direktyva
Směrnice Evropského parlamentu a Rady / Smernice Európskeho parlamentu a Rady
Az Európai Parlament és az Európai Tanács irányelve

Low Voltage Directive (LVD) : 2014/35/EU
Dyrektywa dot. niskich napięć / Žemos įtampos direktyva
Směrnice o zařízeních nízkého napětí / Smernica o nízkom napätí
Kisfeszültségről szóló irányelv

Electromagnetic Compatibility Directive (EMC) : 2014/30/EU
Dyrektywa EMC / EMS direktyva / Směrnice o elektromagnetické kompatibilitě
Smernica EMC / Elektromágneses összeférhetőségről szóló irányelv

Machine Directive (MD) : 2006/42/EC
Dyrektywa w sprawie maszyn / Direktyva dėl mašinų
Směrnice o strojních zařízeních / Smernica o strojových zariadeniach / Gépekről szóló irányelv

Restriction of the use of certain hazardous substances (RoHS) : 2011/65/EU
W sprawie ograniczenia stosowania niektórych niebezpiecznych substancji w sprzęcie elektrycznym i elektronicznym.
Dėl tam tikrų pavojingų medžiagų naudojimo elektros ir elektroninėje įrangoje apribojimo.
O omezení používání některých nebezpečných látek v elektrických a elektronických zařízeních.
O obmedzení používania určitých nebezpečných látok v elektrických a elektronických zariadeniach.
Egyes veszélyes anyagok elektromos és elektronikus berendezésekben való alkalmazásának korlátozásáról.

Applied harmonized Standards: EN ISO 13849-1:2015(Cat.3, PL d)
Zastosowane zharmonizowane normy. / Taikomi darnieji standartai: EN 61800-3:2004/A1:2012
Použité harmonizované normy. / Aplikovaná harmonizovaná norma: EN 61800-5-1:2007
Alkalmazott harmonizált szabványok: EN 61800-5-2:2007(SIL2)
EN 61000-6-2:2005
EN 50581:2012

Place / Date
Miejscowość, data / Vieta, data / Místo, datum / Miesto, dátum / Hely, dátum
YASKAWA ELECTRIC CORPORATION
2-13-1 Nishimiyaichi Yukuhashi City
Fukuoka Pref., 824-8511 Japan

Drives Division

9th.June.2017 General Manager

Nobuaki Jinnouchi

EU Declaration of Conformity

Translation – Dutch | Irish | Greek | Bulgarian | Romanian

YASKAWA

Ref.No. VKOHIN-S1706-17

EG-conformiteitsverklaring | Dearbhú Comhréireachta AE
Δήλωση Συμμόρφωσης ΕΚ | ЕО-Декларация за съответствие
Declaraţie de conformitate CE

YASKAWA ELECTRIC CORPORATION
2-13-1 Nishimiyaichi Yukuhashi City
Fukuoka Pref., 824-8511 Japan

declares under sole responsibility conformity of the following products
verklaart onder eigen verantwoordelijkheid de conformiteit van de volgende producten
a dhearbhaíonn faoi fhreagracht aonair comhréireacht na dtáirgí seo a leanas
επιβεβαιώνει, με αποκλειστική του ευθύνη, τη συμμόρφωση των ακόλουθων προϊόντων
декларира на собствена отговорност съответствието на следния продукт
declară pe răspunderea sa exclusivă conformitatea următoarelor produse

A1000 Series AC Drive
Model: CIMR-A □ □ □ □□□ □ □ □

Directive of the European Parliament and Council
Richtlijn van het Europese Parlement en de Europese Raad
Treoir ó Pharlaimint na hEorpa agus ón gComhairle / Οδηγία του Ευρωπαϊκού Κοινοβουλίου και του Συμβουλίου
Директива на Европейския парламент и Съвета / Directiva Parlamentului European şi a Consiliului

Low Voltage Directive (LVD)   : 2014/35/EU
Laagspanningsrichtlijn / Treoir maidir le hísealvoltas
Οδηγία για τη χαμηλή τάση / Директивата за ниско напрежение
Directive voltaj scăzut

Electromagnetic Compatibility Directive (EMC)   : 2014/30/EU
EMC-richtlijn / Treoir maidir le Comhoiriúnacht Leictreamaighnéadach
Οδηγία ηλεκτρομαγνητικής συμβατότητας (EMC) / Директива за електромагнитна съвместимост
Directive CEM

Machine Directive (MD)   : 2006/42/EC
Machinerichtlijn / Treoir maidir le hInnill (MD)
Οδηγία για τα μηχανήματα / Директива Машини (ДМ) / Directive maşinărie

A Restriction of the use of certain hazardous substances (RoHS)   : 2011/65/EU
Betreffende beperking van het gebruik van bepaalde gevaarlijke stoffen in elektrische en elektronische apparatuur.
για τον περιορισμό της χρήσης ορισμένων επικίνδυνων ουσιών σε ηλεκτρικό και ηλεκτρονικό εξοπλισμό.
относно ограничението за употреба на определени опасни вещества в електрическото и електронното оборудване.
Privind restricţiile de utilizare a anumitor substanţe periculoase în echipamentele electrice şi electronice.

Applied harmonized Standards: EN ISO 13849-1:2015(Cat.3, PL d)
Toegepaste harmonisatienorm: / Caighdeáin chomhchuibhithe i bhfeidhm: EN 61800-3:2004/A1:2012
Εφαρμοζόμενο εναρμονισμένο πρότυπο: / Приложени хармонизирани норми: EN 61800-5-1:2007
Standard armonizat aplicat: EN 61800-5-2:2007(SIL2)
                                                                EN 61000-6-2:2005
                                                                EN 50581:2012

Place / Date
Plaats, Datum / Áit, Dáta / Τόπος, ημερομηνία / Място, Дата / Locul, data
YASKAWA ELECTRIC CORPORATION
2-13-1 Nishimiyaichi Yukuhashi City
Fukuoka Pref., 824-8511 Japan

9th.June.2017

Drives Division
General Manager

Nobuaki Jinnouchi

EU Declaration of Conformity

Translation - Croatian | Slovene | Maltese

YASKAWA

Ref.No. VKOHIN-S1706-17

EZ Izjava o sukladnosti | Deklaracija o skladnosti ES
Dikjarazzjoni tal-KE dwar il-Konformità

YASKAWA ELECTRIC CORPORATION
2-13-1 Nishimiyaichi Yukuhashi City
Fukuoka Pref., 824-8511 Japan

declares under sole responsibility conformity of the following products
pod isključivom odgovornošću izjavljuje sukladnost sljedećih proizvoda
na lastno odgovornost potrjuje skladnost naslednjih izdelkov
tiddikjara taħt ir-responsabbiltà unika tagħha l-konformità tal-prodotti li ġejjin

A1000 Series AC Drive

Model: CIMR-A ☐ ☐ ☐ ☐☐☐ ☐ ☐ ☐

Directive of the European Parliament and Council
Direktiva Europskog parlamenta i Vijeća / Direktiva Evropskega parlamenta in Sveta
Eiropas Parlamenta un Padomes Direktīva / Euroopa Parlamendi ja nõukogu direktiiv
Direttiva tal-Parlament Ewropew u tal-Kunsill

Low Voltage Directive (LVD) : 2014/35/EU
Direktiva o niskom naponu / Nizkonapetostna direktiva
Direttiva dwar il-Voltaġġ Baxx

Electromagnetic Compatibility Directive (EMC) : 2014/30/EU
Direktiva o elektromagnetskoj kompatibilnosti (EMC) / EMC direktiva
Direttiva dwar l-EMC

Machine Directive (MD) : 2006/42/EC
Direktiva o strojevima / Direktiva o strojih
Direttiva dwar il-Makkinarju (MD)

Restriction of the use of certain hazardous substances (RoHS) : 2011/65/EU
O ograničenju uporabe određenih opasnih tvari u električnoj i elektroničkoj opremi.
O omejevanju uporabe nekaterih nevarnih snovi v električni in elektronski opremi.
Dwar ir-restrizzjoni tal-użu ta' ċerti sustanzi perikolużi fit-tagħmir elettriku u elettroniku.

Applied harmonized Standards:
Primijenjena harmonizirana norma: / Uporabljeni usklajeni standard:
Standards armonizzati applikati:

EN ISO 13849-1:2015(Cat.3, PL d)
EN 61800-3:2004/A1:2012
EN 61800-5-1:2007
EN 61800-5-2:2007(SIL2)
EN 61000-6-2:2005
EN 50581:2012

Place / Date
Mjesto, datum / Kraj, datum / Post, Data
YASKAWA ELECTRIC CORPORATION
2-13-1 Nishimiyaichi Yukuhashi City
Fukuoka Pref., 824-8511 Japan

Drives Division
General Manager

9th.June.2017

Nobuaki Jinnouchi

EU Declaration of Conformity

Translation – German | French | Italian | Spanish | Portugese

YASKAWA

Ref.No. VKOHIN-S1706-17

EG-Konformitätserklärung | Déclaratione de conformiteé CE
Dichiarazione di conformità CE | Declaración de Conformidad de la CE
Declaração de Conformidade CE

YASKAWA ELECTRIC CORPORATION
2-13-1 Nishimiyaichi Yukuhashi City
Fukuoka Pref., 824-8511 Japan

declares under sole responsibility conformity of the following products
erklärt in alleiniger Verantwortung die Konformität für folgende Produkte
déclare, sous sa seule responsabilité, que-les produits
dichiara sotto la propria esclusiva responsabilità la conformità dei seguenti prodotti
bajo su exclusiva responsabilidad la conformidad para los siguientes productos
declara, sob a sua exclusiva responsabilidade, a conformidade dos seguintes produtos

A1000 Series AC Drive
Model: CIMR-A ☐ ☐ ☐ ☐☐☐☐ ☐ ☐ ☐

Directive of the European Parliament and Council
Richtlinie des Europäischen Parlamentes und Rates / Directive du Parlement européen et du Conseil
Direttiva del Parlamento europeo e del Consiglio / Directiva del Parlamento Europeo y del Consejo /
Diretiva do Parlamento Europeu e do Conselho

Low Voltage Directive (LVD)   : 2014/35/EU
Niederspannungsrichtlinie / Directive Basse Tension
Direttiva sulla bassa tensione / Directiva de Baja Tensión / Diretiva "Baixa Tensão"

Electromagnetic Compatibility Directive (EMC)   : 2014/30/EU
EMV-Richtlinie / Directive CEM
Direttiva EMC / Directiva sobre Compatibilidad Electromagnética / Diretiva CEM

Machine Directive (MD)   : 2006/42/EC
Maschinenrichtlinie / Directive machines
Direttiva Macchine / Directiva de Máquinas / Directiva de máquinas

Restriction of the use of certain Hazardous Substances (RoHS)   : 2011/65/EU
Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten.
Relative à la limitation de l'utilisation de certaines substances dangereuses dans les équipements électriques et électroniques.
Sulla restrizione dell'uso di determinate sostanze pericolose nelle apparecchiature elettriche ed elettroniche.
Sobre restricciones a la utilización de determinadas sustancias peligrosas en aparatos eléctricos y electrónicos.
Relativa à restrição do uso de determinadas substâncias perigosas em equipamentos eléctricos e electrónicos.

Applied harmonized Standards: EN ISO 13849-1:2015(Cat.3, PL d)
Angewandte harmonisierte Norm: / Normes harmonisées appliquées: EN 61800-3:2004/A1:2012
Norma armonizzata applicate: / Norma armonizada aplicada: /   EN 61800-5-1:2007
Normas harmonizadas aplicadas :   EN 61800-5-2:2007(SIL2)
                                                                    EN 61000-6-2:2005
                                                                    EN 50581:2012

Place / Date
Ort, Datum / Lieu et date / Luogo, data / Lugar, Fecha / Local, data
YASKAWA ELECTRIC CORPORATION
2-13-1 Nishimiyaichi Yukuhashi City
Fukuoka Pref., 824-8511 Japan

Drives Division
General Manager

9th.June.2017

Nobuaki Jinnouchi

9   Safe Disable Input Function

◆ Specifications

Inputs/Outputs		Two Safe Disable inputs and one EDM output according to ISO/EN 13849-1 Cat. 3 PLd, IEC/EN 61508 SIL2.
Operation Time		Time from input open to drive output stop is less than 1 ms.
Failure Probability	**Demand Rate Low**	PFD = $5.15E^{-5}$
	Demand Rate High or Continuous	PFH = $1.2E^{-9}$
Performance Level		The Safe Disable feature satisfies all requirements of performance level d (PLd) as defined by ISO/EN 13849-1 (this includes DC from EDM).

◆ Precautions

DANGER! *Improper use of the Safe Disable function can result in serious injury or even death.*
Make sure the whole system or machinery that the Safe Disable function is used in complies with safety requirements. When implementing the Safe Disable function into the safety system of a machine, a thorough risk assessment for the whole system has to be carried out to assure it complies with relevant safety norms (e.g., ISO/EN 13849, IEC/EN 61508, IEC/EN 62061,...).

DANGER! *When using a PM motor, even if the drive output is shut off by the Safe Disable function, a break down of two output transistors can cause current to flow through the motor winding, resulting in a rotor movement for a maximum angle of 180 degree (electrically). Make sure such a situation would have no effect on the safety of the application when using the Safe Disable function. This is not a concern with induction motors.*

DANGER! *The Safe Disable function can switch off the drive output, but does not cut the drive power supply and cannot electrically isolate the drive output from the input. Always shut off the drive power supply when performing maintenance or installations on the drive input side as well as the drive output side.*

DANGER! *When using the Safe Disable inputs, make sure to remove the wire links between terminals H1, H2, and HC that were installed prior to shipment. Failing to do so will keep the Safe Disable circuit from operating properly and can cause injury or even death.*

DANGER! *All safety features (including Safe Disable) should be inspected daily and periodically. If the system is not operating normally, there is a risk of serious personal injury.*

DANGER! *Only a qualified technician with a thorough understanding of the drive, the instruction manual, and safety standards should be permitted to wire, inspect, and maintain the Safe Disable input.*

NOTICE: *From the moment terminal inputs H1 and H2 have opened, it takes up to 1 ms for drive output to shut off completely. The sequence set up to trigger terminals H1 and H2 should make sure that both terminals remain open for at least 1 ms in order to properly interrupt drive output.*

NOTICE: *The Safe Disable Monitor (output terminals DM+ and DM-) should not be used for any other purpose than to monitor the Safe Disable status or to discover a malfunction in the Safe Disable inputs. The monitor output is not considered a safe output.*

NOTICE: *When utilizing the Safe Disable function; an EMC filter must be used. Use only the EMC filters recommended in EMC Filter Installation on page 17.*

NOTICE: *Drives with safety-related functions need to be replaced after 10 years of use.*

◆ Using the Safe Disable Function

The Safe Disable inputs provide a stop function in compliance with "Safe Torque Off" as defined in the IEC/EN 61800-5-2. Safe Disable inputs have been designed to meet the requirements of the ISO/EN 13849-1, Category 3 PLd, and IEC/EN 61508, SIL2.

A Safe Disable Status Monitor for error detection in the safety circuit is also provided.

■ Safe Disable Circuit

The Safe Disable circuit consists of two independent input channels that can block the output transistors. In addition, it provides a monitoring channel that indicates the status of those two input channels.

The input can either use the drive internal power supply or an external power supply. Use jumper S3 on the terminal board to select between Sink or Source mode with either internal or external power supply.

A single photocoupler output is available to monitor the status of the Safe Disable terminals. *Refer to Control Circuit Terminal Functions on page 20* for signal specifications when using this output. The figure below shows an example of wiring the Safe Disable inputs.

<1> Available slide switch S6 is models ETC740310 and ETC740311.
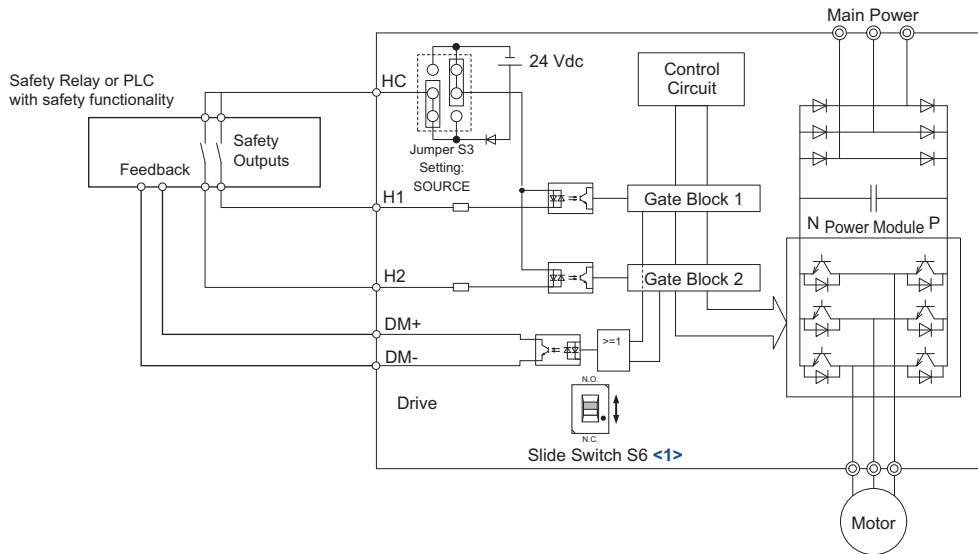
ETC740310   ETC740311
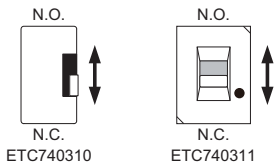
■ Disabling and Enabling the Drive Output ("Safe Torque Off")

The diagram below illustrates the Safe Disable input operation.
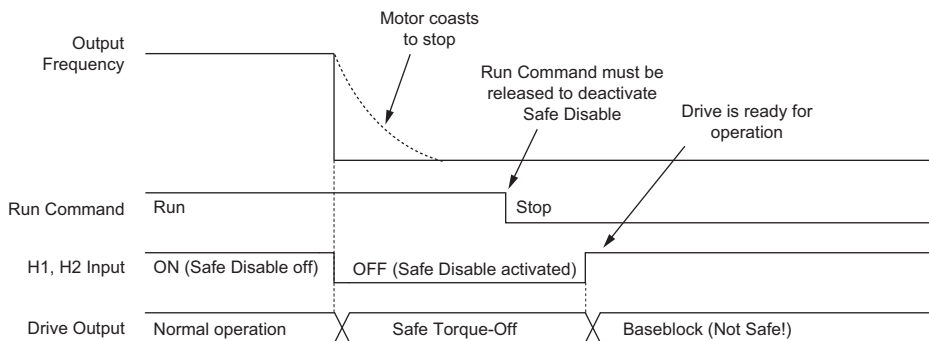
Entering the "Safe Torque Off" State

Whenever either one Safe Disable input or both inputs open, the motor torque is shut off by switching off the drive output. If the motor was running before the Safe Disable inputs opened, then the motor will coast to stop, regardless of the stopping method set in parameter b1-03.

Notice that the "Safe Torque Off" state can only be achieved using the Safe Disable function. Removing the Run command stops the drive and shuts the output off (baseblock), but does not create a "Safe Torque Off" status.

Note: To avoid an uncontrolled stop during normal operation, make sure that the Safe Disable inputs are opened first when the motor has completely stopped.

Returning to Normal Operation after Safe Disable

The Safe Disable function can only be deactivated when a Run command is not active.

When Safe Disable was activated during stop, normal operation can be resumed by simply turning on both Safe Disable inputs (i.e., by deactivating "Safe Torque Off").

When Safe Disable was activated during run, first the Run command has to be removed and then the Safe Disable inputs have to be turned on before the drive can be restarted.

◼ Safe Disable Monitor Output Function and Digital Operator Display

The table below explains the drive output and Safe Disable monitor state depending on the Safe Disable inputs.

Safe Disable Input Status		Safety Electric Device Monitor, DM+ - DM- <1>		Drive Output Status	Digital Operator Display
Input 1, H1-HC	Input 2, H2-HC	S6 Selected N.C.	S6 Selected N.O.		
OFF	OFF	OFF	ON	Safely disabled, "Safe Torque Off"	Hbb (flashes)
ON	OFF	ON	OFF	Safely disabled, "Safe Torque Off"	HbbF (flashes)
OFF	ON	ON	OFF	Safely disabled, "Safe Torque Off"	HbbF (flashes)
ON	ON	ON	OFF	Baseblock, ready for operation	Normal display

<1> Available slide switch S6 is models ETC740310 and ETC740311.
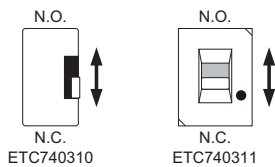
Safe Disable Status Monitor

With the Safe Disable monitor output (terminals DM+ and DM-), the drive provides a safety status feedback signal. This signal should be read by the device that controls the Safe Disable inputs (PLC or a safety relay) in order to prohibit leaving the "Safe Torque Off" status in case the safety circuit malfunctions. Refer to the instruction manual of the safety device for details on this function.

Digital Operator Display

When both Safe Disable inputs are open, Hbb will flash in the digital operator display.

Should only one of the Safe Disable channels be on while the other is off, HbbF will flash in the display to indicate that there is a problem in the safety circuit or in the drive. This display should not appear under normal conditions if the Safe Disable circuit is utilized properly. *Refer to General Fault and Alarms on page 34* to resolve possible errors.

10 UL Standards

◆ UL Standards Compliance

Figure 13 UL/cUL Mark

The UL/cUL mark applies to products in the United States and Canada. It indicates 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.

This drive is tested in accordance with UL standard UL508C and complies with UL requirements. The conditions described below must be met to maintain compliance when using this drive in combination with other equipment:

Note: Model CIMR-A□4A1200 is UL compliant when the air entering the drive-installed panel or cabinet is 45°C or less. For more information, contact Yaskawa or a Yaskawa representative.

■ Installation Area

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

■ Ambient Temperature

IP00 enclosure: -10°C to +50°C
IP20/UL Type 1 enclosure: -10°C to +40°C
IP20/IP00 finless-type enclosure: -10°C to +45°C

■ Main Circuit Terminal Wiring

Yaskawa recommends using closed-loop crimp terminals on all drive models. UL/cUL approval requires the use of UL Listed closed-loop crimp terminals when wiring the drive main circuit terminals on models CIMR-A□2A0110 to 2A0415 and 4A0058 to 4A1200. Use only the tools recommended by the terminal manufacturer for crimping.

The wire gauges listed in the tables below are Yaskawa recommendations. Refer to local codes for proper wire gauge selections.

Wire Gauges and Tightening Torques

Model CIMR-A□	Terminal	For Europe and China [1]		For U.S.A. [2]		For Asia [3]		Screw Size	Tightening Torque N·m (lb.in.)
		Recommen-ded Gauge mm²	Applicable Gauge mm²	Recommen-ded Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Recommen-ded Gauge mm²	Applicable Gauge mm²		
2A0004 2A0006 2A0010	R/L1, S/L2, T/L3	2.5	2.5 to 6	14	14 to 10	2	2 to 5.5	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	2.5	2.5 to 6	14	14 to 10	2	2 to 5.5		
	⊖, ⊕1, ⊕2	–	2.5 to 6	–	14 to 10	2	2 to 5.5		
	B1, B2	–	2.5 to 6	–	14 to 10	2	2 to 5.5		
	⏚	2.5	2.5 to 6	10	14 to 10	2	2 to 5.5		
2A0012	R/L1, S/L2, T/L3	2.5	2.5 to 6	12	14 to 10	2	2 to 5.5	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	2.5	2.5 to 6	14	14 to 10	2	2 to 5.5		
	⊖, ⊕1, ⊕2	–	2.5 to 6	–	14 to 10	2	2 to 5.5		
	B1, B2	–	2.5 to 6	–	14 to 10	2	2 to 5.5		
	⏚	2.5	2.5 to 6	10	14 to 10	3.5	2 to 5.5		

Model CIMR-A□	Terminal	For Europe and China [1]		For U.S.A. [2]		For Asia [3]		Screw Size	Tightening Torque N·m (lb.in.)
		Recommended Gauge mm²	Applicable Gauge mm²	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Recommended Gauge mm²	Applicable Gauge mm²		
2A0021	R/L1, S/L2, T/L3	4	2.5 to 6	10	12 to 10	5.5	3.5 to 5.5	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	2.5	2.5 to 6	10	12 to 10	3.5	3.5 to 5.5		
	⊖, ⊕1, ⊕2	–	4 to 6	–	12 to 10	5.5	3.5 to 5.5		
	B1, B2	–	2.5 to 6	–	14 to 10	2	2 to 5.5		
	⏚	4	4 to 6	10	12 to 10	3.5	3.5 to 5.5		
2A0030	R/L1, S/L2, T/L3	6	4 to 16	8	10 to 6	14	5.5 to 14	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	6	4 to 16	8	10 to 6	8	5.5 to 14		
	⊖, ⊕1, ⊕2	–	6 to 16	–	10 to 6	14	5.5 to 14		
	B1, B2	–	4 to 6	–	14 to 10	3.5	2 to 5.5		
	⏚	6 [4]	6 to 10	8 [4]	10 to 8	5.5 [4]	5.5 to 8	M5	2.0 to 2.5 (17.7 to 22.1)
2A0040	R/L1, S/L2, T/L3	10	6 to 16	6	8 to 6	14	14	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	10	6 to 16	8	8 to 6	14	8 to 14		
	⊖, ⊕1, ⊕2	–	16	–	6	14	14		
	B1, B2	–	4 to 6	–	12 to 10	5.5	3.5 to 5.5		
	⏚	10	6 to 10	8	10 to 8	5.5	5.5 to 8	M5	2.0 to 2.5 (17.7 to 22.1)
2A0056	R/L1, S/L2, T/L3	16	16 to 25	4	6 to 4	22	14 to 22	M6	5.4 to 6.0 (47.8 to 53.1)
	U/T1, V/T2, W/T3	16	16 to 25	4	6 to 4	14	14 to 22		
	⊖, ⊕1, ⊕2	–	16 to 25	–	6 to 4	22	14 to 22		
	B1, B2	–	6 to 10	–	10 to 6	14	5.5 to 14	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	16	10 to 16	6	8 to 6	8	8 to 14	M6	5.4 to 6.0 (47.8 to 53.1)
2A0069	R/L1, S/L2, T/L3	25	16 to 25	3	4 to 3	30	22 to 30	M8	9.9 to11 (87.6 to 97.4)
	U/T1, V/T2, W/T3	16	16 to 25	3	4 to 3	22	14 to 30		
	⊖, ⊕1, ⊕2	–	25	–	4 to 3	30	22 to 30		
	B1, B2	–	10 to 16	–	8 to 6	14	8 to 14	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	16	16 to 25	6	6 to 4	8	8 to 22	M6	5.4 to 6.0 (47.8 to 53.1)
2A0081	R/L1, S/L2, T/L3	35	25 to 35	2	3 to 2	38	30 to 38	M8	9.9 to11 (87.6 to 97.4)
	U/T1, V/T2, W/T3	25	25 to 35	2	3 to 2	30	22 to 38		
	⊖, ⊕1, ⊕2	–	25 to 35	–	3 to 2	38	30 to 38		
	B1, B2	–	16	–	6	14	14	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	16	16 to 25	6	6 to 4	14	14 to 22	M6	5.4 to 6.0 (47.8 to 53.1)
2A0110 [5]	R/L1, S/L2, T/L3	35	25 to 50	1/0	3 to 1/0	38	30 to 50	M8	9.0 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	35	25 to 50	1/0	3 to 1/0	38	30 to 50		
	⊖, ⊕1	–	35 to 50	–	2 to 1/0	60	38 to 60		
	B1, B2	–	16 to 50	–	6 to 1/0	22	14 to 50		
	⏚	16	16 to 25	6	6 to 4	14	14 to 38		

Model CIMR-A□	Terminal	For Europe and China <1>		For U.S.A. <2>		For Asia <3>		Screw Size	Tightening Torque N·m (lb.in.)
		Recommended Gauge mm^2	Applicable Gauge mm^2	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Recommended Gauge mm^2	Applicable Gauge mm^2		
2A0138 <5>	R/L1, S/L2, T/L3	50	35 to 70	2/0	1 to 2/0	60	50 to 60	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	50	35 to 70	2/0	1 to 2/0	60	50 to 60		
	⊖, ⊕1	–	50 to 70	–	1/0 to 3/0	80	60 to 80		
	B1, B2	–	25 to 70	–	4 to 2/0	30	22 to 60		
	⏚	25	25	4	4	22	22 to 38	M8	9.0 to 11 (79.7 to 97.4)
2A0169 <5>	R/L1, S/L2, T/L3	70	50 to 95	4/0	2/0 to 4/0	80	60 to 100	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	70	50 to 95	4/0	3/0 to 4/0	80	60 to 100		
	⊖, ⊕1	–	35 to 95	–	1 to 4/0	50 × 2P	50 to 100		
	⊕3	–	50 to 95	–	1/0 to 4/0	60	50 to 100		
	⏚	35	25 to 35	4	4 to 2	22	22 to 60		
2A0211 <5>	R/L1, S/L2, T/L3	95	70 to 95	1/0 × 2P	1/0 to 2/0	100	80 to 100	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	95	70 to 95	1/0 × 2P	1/0 to 2/0	50 × 2P	50 to 60		
	⊖, ⊕1	–	35 to 95	–	1 to 4/0	50 × 2P	50 to 100		
	⊕3	–	50 to 95	–	1/0 to 4/0	80	60 to 100		
	⏚	50	25 to 50	4	4 to 1/0	22	22 to 60		
2A0250 <5>	R/L1, S/L2, T/L3	95 × 2P	95 to 150	3/0 × 2P	3/0 to 300	80 × 2P	38 to 150	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	95 × 2P	95 to 150	3/0 × 2P	3/0 to 300	80 × 2P	38 to 150		
	⊖, ⊕1	–	70 to 150	–	3/0 to 300	80 × 2P	80 to 150		
	⊕3	–	35 to 150	–	2 to 300	80 × 2P	30 to 150	M10	18 to 23 (159 to 204)
	⏚	95	95 to 150	3	3 to 300	22	22 to 150	M12	32 to 40 (283 to 354)
2A0312 <5>	R/L1, S/L2, T/L3	95 × 2P	95 to 150	4/0 × 2P	3/0 to 300	80 × 2P	70 to 150	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	95 × 2P	95 to 150	3/0 × 2P	3/0 to 300	80 × 2P	70 to 200		
	⊖, ⊕1	–	70 to 150	–	3/0 to 300	150 × 2P	80 to 150		
	⊕3	–	70 to 150	–	3/0 to 300	80 × 2P	80 to 150	M10	18 to 23 (159 to 204)
	⏚	95	95 to 150	2	2 to 300	38	38 to 150	M12	32 to 40 (283 to 354)
2A0360 <5>	R/L1, S/L2, T/L3	240	95 to 300	250 × 2P	4/0 to 600	100 × 2P	80 to 325	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	240	95 to 300	4/0 × 2P	4/0 to 600	100 × 2P	80 to 325		
	⊖, ⊕1	–	125 to 300	–	250 to 600	150 × 2P	125 to 325		
	⊕3	–	70 to 300	–	3/0 to 600	80 × 2P	80 to 325	M10	18 to 23 (159 to 204)
	⏚	120	120 to 240	1	1 to 350	38	38 to 200	M12	32 to 40 (283 to 354)
2A0415 <5>	R/L1, S/L2, T/L3	120 × 2P	95 to 300	350 × 2P	250 to 600	125 × 2P	100 to 325	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	300	95 to 300	300 × 2P	300 to 600	125 × 2P	125 to 325		
	⊖, ⊕1	–	150 to 300	–	300 to 600	200 × 2P	150 to 325		
	⊕3	–	70 to 300	–	3/0 to 600	100 × 2P	80 to 325	M10	18 to 23 (159 to 204)
	⏚	120	120 to 240	1	1 to 350	60	60 to 200	M12	32 to 40 (283 to 354)

<1> Gauges listed here are for use in Europe and China.
<2> Gauges listed here are for use in the United States.
<3> Gauges listed here are for use in Asia except for China.

<4> When using the wire of this gauge in accordance with IEC/EN 61800-5-1:2007, install an RCM/RCD, or use copper wire of 10 mm² (AWG 8).

<5> Drive models CIMR-A□2A0110 to 4A0415 require the use of closed-loop crimp terminals for UL/cUL compliance. Use only the tools recommended by the terminal manufacturer for crimping.

Note: Use crimp insulated terminals or insulated tubing for wiring these connections. Wires should have a continuous maximum allowable temperature of 75°C 600 V UL approved vinyl sheathed insulation. Ambient temperature should not exceed 40°C.

Model CIMR-A□	Terminal	For Europe and China <1>		For U.S.A. <2>		For Asia <3>		Screw Size	Tightening Torque N·m (lb.in.)
		Recommended Gauge mm²	Applicable Gauge mm²	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Recommended Gauge mm²	Applicable Gauge mm²		
4A0002 4A0004	R/L1, S/L2, T/L3	2.5	2.5 to 6	14	14 to 10	2	2 to 5.5	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	2.5	2.5 to 6	14	14 to 10	2	2 to 5.5		
	⊖, ⊕1, ⊕2	–	2.5 to 6	–	14 to 10	2	2 to 5.5		
	B1, B2	–	2.5 to 6	–	14 to 10	2	2 to 5.5		
	⏚	2.5	2.5 to 4	12	14 to 12	2	2 to 5.5		
4A0005 4A0007 4A0009	R/L1, S/L2, T/L3	2.5	2.5 to 6	14	14 to 10	2	2 to 5.5	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	2.5	2.5 to 6	14	14 to 10	2	2 to 5.5		
	⊖, ⊕1, ⊕2	–	2.5 to 6	–	14 to 10	2	2 to 5.5		
	B1, B2	–	2.5 to 6	–	14 to 10	2	2 to 5.5		
	⏚	2.5	2.5 to 6	10	14 to 10	3.5	2 to 5.5		
4A0011	R/L1, S/L2, T/L3	2.5	2.5 to 6	12	14 to 10	2	2 to 5.5	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	2.5	2.5 to 6	14	14 to 10	2	2 to 5.5		
	⊖, ⊕1, ⊕2	–	2.5 to 6	–	14 to 10	2	2 to 5.5		
	B1, B2	–	2.5 to 6	–	14 to 10	2	2 to 5.5		
	⏚	2.5	2.5 to 6	10	14 to 10	3.5	2 to 5.5		
4A0018	R/L1, S/L2, T/L3	2.5	2.5 to 16	10	12 to 6	3.5	2 to 14	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	2.5	2.5 to 16	10	12 to 6	3.5	2 to 14		
	⊖, ⊕1, ⊕2	–	4 to 16	–	12 to 6	3.5	2 to 14		
	B1, B2	–	4 to 6	–	12 to 10	2	2 to 5.5		
	⏚	2.5	2.5 to 6	10	14 to 10	3.5	2 to 5.5	M5	2.0 to 2.5 (17.7 to 22.1)
4A0023	R/L1, S/L2, T/L3	4	2.5 to 16	10	10 to 6	5.5	3.5 to 14	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	4	2.5 to 16	10	10 to 6	5.5	3.5 to 14		
	⊖, ⊕1, ⊕2	–	4 to 16	–	12 to 6	5.5	3.5 to 14		
	B1, B2	–	4 to 6	–	12 to 10	2	2 to 5.5		
	⏚	4	4 to 6	10	12 to 10	3.5	3.5 to 5.5	M5	2.0 to 2.5 (17.7 to 22.1)
4A0031	R/L1, S/L2, T/L3	6	6 to 16	8	8 to 6	14	5.5 to 14	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	6	6 to 16	8	10 to 6	8	5.5 to 8		
	⊖, ⊕1, ⊕2	–	6 to 16	–	10 to 6	14	5.5 to 14		
	B1, B2	–	6 to 10	–	10 to 8	3.5	2 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6 <4>	6 to 10	8 <4>	10 to 8	5.5 <4>	5.5 to 8	M6	5.4 to 6.0 (47.8 to 53.1)

| Model CIMR-A□ | Terminal | For Europe and China [1] | | For U.S.A. [2] | | For Asia [3] | | Screw Size | Tightening Torque N·m (lb.in.) |
		Recommended Gauge mm²	Applicable Gauge mm²	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Recommended Gauge mm²	Applicable Gauge mm²		
4A0038	R/L1, S/L2, T/L3	10	10 to 16	6	8 to 6	14	14	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	6	6 to 16	8	8 to 6	14	8 to 14		
	⊖, ⊕1, ⊕2	–	6 to 16	–	6	14	14		
	B1, B2	–	6 to 10	–	10 to 8	5.5	3.5 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	10	6 to 16	6	10 to 6	8	5.5 to 14	M6	5.4 to 6.0 (47.8 to 53.1)
4A0044	R/L1, S/L2, T/L3	16	16 to 25	6	6 to 4	14	14 to 22	M6	5.4 to 6.0 (47.8 to 53.1)
	U/T1, V/T2, W/T3	16	16 to 25	6	6 to 4	14	14 to 22		
	⊖, ⊕1, ⊕2	–	16 to 25	–	6 to 4	14	14 to 22		
	B1, B2	–	6 to 10	–	10 to 8	8	5.5 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	16	10 to 16	6	8 to 6	8	8 to 14	M6	5.4 to 6.0 (47.8 to 53.1)
4A0058 [5]	R/L1, S/L2, T/L3	16	10 to 16	4	6 to 4	14	14	M8	9.0 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	16	10 to 16	4	6 to 4	14	14		
	⊖, ⊕1	–	16 to 35	–	6 to 1	22	14 to 38		
	B1, B2	–	10 to 16	–	8 to 4	14	8 to 14		
	⏚	16	10 to 16	6	8 to 6	8	8 to 14		
4A0072 [5]	R/L1, S/L2, T/L3	16	16 to 25	3	4 to 3	22	14 to 22	M8	9.0 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	25	16 to 25	3	4 to 3	22	14 to 22		
	⊖, ⊕1	–	25 to 35	–	4 to 1	30	22 to 38		
	B1, B2	–	16 to 25	–	6 to 3	14	14 to 22		
	⏚	16	16 to 25	6	6	14	14 to 22		
4A0088 [5]	R/L1, S/L2, T/L3	25	16 to 50	2	3 to 1/0	30	22 to 60	M8	9.0 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	25	25 to 50	2	3 to 1/0	30	22 to 60		
	⊖, ⊕1	–	25 to 50	–	3 to 1/0	38	30 to 60		
	⊕3	–	16 to 50	–	6 to 1/0	22	14 to 60		
	⏚	16	16 to 25	4	6 to 4	22	14 to 22		
4A0103 [5]	R/L1, S/L2, T/L3	35	25 to 50	1/0	2 to 1/0	38	30 to 60	M8	9.0 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	35	25 to 50	1	2 to 1/0	38	30 to 60		
	⊖, ⊕1	–	25 to 50	–	3 to 1/0	60	30 to 60		
	⊕3	–	25 to 50	–	4 to 1/0	30	22 to 60		
	⏚	16	16 to 25	4	6 to 4	22	14 to 22		
4A0139 [5]	R/L1, S/L2, T/L3	50	35 to 95	3/0	1/0 to 4/0	60	38 to 100	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	50	35 to 95	2/0	1/0 to 4/0	60	50 to 100		
	⊖, ⊕1	–	50 to 95	–	1/0 to 4/0	100	60 to 100		
	⊕3	–	25 to 95	–	3 to 4/0	50	30 to 100		
	⏚	25	25	4	4	22	22		
4A0165 [5]	R/L1, S/L2, T/L3	70	50 to 95	4/0	3/0 to 4/0	80	60 to 100	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	70	70 to 95	4/0	3/0 to 4/0	80	80 to 100		
	⊖, ⊕1	–	35 to 95	–	1 to 4/0	50 × 2P	50 to 100		
	⊕3	–	50 to 95	–	1/0 to 4/0	60	50 to 100		
	⏚	35	25 to 35	4	4 to 2	22	22 to 30		

| Model CIMR-A☐ | Terminal | For Europe and China [1] | | For U.S.A. [2] | | For Asia [3] | | Screw Size | Tightening Torque N·m (lb.in.) |
		Recommended Gauge mm²	Applicable Gauge mm²	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Recommended Gauge mm²	Applicable Gauge mm²		
4A0208 [5]	R/L1, S/L2, T/L3	95	35 to 95	300	2 to 300	150	30 to 150	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	95	35 to 95	300	2 to 300	150	30 to 150		
	⊖, ⊕1	–	35 to 150	–	1 to 250	80 × 2P	38 to 150		
	⊕3	–	25 to 70	–	3 to 3/0	80	22 to 80		
	⏚	50	50 to 150	4	4 to 300	22	22 to 150		
4A0250 [5]	R/L1, S/L2, T/L3	120	95 to 300	400	1 to 600	150	38 to 325	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	120	95 to 300	400	1/0 to 600	150	38 to 325		
	⊖, ⊕1	–	70 to 300	–	3/0 to 600	200	80 to 325		
	⊕3	–	35 to 300	–	1 to 325	125	38 to 325		
	⏚	70	70 to 240	2	2 to 350	22	22 to 200		
4A0296 [5]	R/L1, S/L2, T/L3	185	95 to 300	500	2/0 to 600	200	80 to 325	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	185	95 to 300	500	2/0 to 600	200	80 to 325		
	⊖, ⊕1	–	70 to 300	–	3/0 to 600	325	80 to 325		
	⊕3	–	35 to 300	–	1 to 325	150	38 to 325	M10	18 to 23 (159 to 204)
	⏚	95	95 to 240	2	2 to 350	30	30 to 200	M12	32 to 40 (283 to 354)
4A0362 [5]	R/L1, S/L2, T/L3	240	95 to 300	4/0 × 2P	3/0 to 600	250	80 to 325	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	240	95 to 300	4/0 × 2P	3/0 to 600	250	80 to 325		
	⊖, ⊕1	–	95 to 300	–	4/0 to 600	325	100 to 325		
	⊕3	–	70 to 300	–	3/0 to 600	200	80 to 325	M10	18 to 23 (159 to 204)
	⏚	120	120 to 240	1	1 to 350	30	30 to 200	M12	32 to 40 (283 to 354)
4A0414 [5]	R/L1, S/L2, T/L3	95 × 2P	95 to 150	300 × 2P	4/0 to 300	100 × 2P	80 to 150	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	95 × 2P	95 to 150	300 × 2P	4/0 to 300	125 × 2P	80 to 150		
	⊖, ⊕1	–	70 to 150	–	3/0 to 300	150 × 2P	80 to 150		
	⊕3	–	70 to 150	–	3/0 to 300	80 × 2P	80 to 150		
	⏚	95	35 to 95	1	1 to 3/0	38	38 to 100		
4A0515 [5]	R/L1, S/L2, T/L3	120 × 2P	95 to 150	3/0 × 4P	3/0 to 300	125 × 2P	80 to 150	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	150 × 2P	95 to 150	4/0 × 4P	3/0 to 300	150 × 2P	80 to 150		
	⊖, ⊕1	–	70 to 150	–	1/0 to 300	60 × 4P	60 to 150		
	⊕3	–	70 to 150	–	1/0 to 300	100 × 2P	60 to 150		
	⏚	150	50 to 150	1/0	1/0 to 300	60	50 to 150		
4A0675 [5]	R/L1, S/L2, T/L3	95 × 4P	95 to 150	300 × 4P	4/0 to 300	80 × 4P	80 to 150	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	95 × 4P	95 to 150	300 × 4P	4/0 to 300	80 × 4P	80 to 150		
	⊖, ⊕1	–	70 to 150	–	1/0 to 300	125 × 4P	60 to 150		
	⊕3	–	70 to 150	–	1/0 to 300	60 × 4P	60 to 150		
	⏚	95 × 2P	60 to 150	2/0	2/0 to 300	60	70 to 150		

| Model CIMR-A□ | Terminal | For Europe and China [1] | | For U.S.A. [2] | | For Asia [3] | | Screw Size | Tightening Torque N·m (lb.in.) |
		Recommended Gauge mm²	Applicable Gauge mm²	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Recommended Gauge mm²	Applicable Gauge mm²		
4A0930 [5]	R/L1, S/L2, T/L3, R1/L11, S1/L21, T1/L31	120 × 4P	95 to 150	(4/0 × 4P) × 2	3/0 to 300	150 × 4P	125 to 150	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	120 × 4P	95 to 150	(4/0 × 4P) × 2	3/0 to 300	150 × 4P	125 to 150		
	⊖, ⊕1	–	95 to 150	–	4/0 to 300	(125 × 4P) × 2	100 to 150		
	⊕3	–	95 to 150	–	4/0 to 300	125 × 4P	100 to 150		
	⏚	120 × 2P	70 to 120	3/0	3/0 to 250	100	80 to 125		
4A1200 [5]	R/L1, S/L2, T/L3, R1/L11, S1/L21, T1/L31	(95 × 4P) × 2	95 to 150	(300 × 4P) × 2	4/0 to 300	(125 × 4P) × 2	100 to 150	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	(95 × 4P) × 2	95 to 150	(300 × 4P) × 2	4/0 to 300	(125 × 4P) × 2	100 to 150		
	⊖, ⊕1	–	120 to 150	–	250 to 300	(150 × 4P) × 2	125 to 150		
	⊕3	–	95 to 150	–	4/0 to 300	(100 × 4P) × 2	100 to 150		
	⏚	95 × 4P	95 to 120	4/0	4/0 to 250	125	100 to 125		

[1] Gauges listed here are for use in Europe and China.
[2] Gauges listed here are for use in the United States.
[3] Gauges listed here are for use in Asia except for China.
[4] When using the wire of this gauge in accordance with IEC/EN 61800-5-1:2007, install an RCM/RCD, or use copper wire of 10 mm² (AWG 8).
[5] Drive models CIMR-A□4A0058 to 4A1200 require the use of closed-loop crimp terminals for UL/cUL compliance. Use only the tools recommended by the terminal manufacturer for crimping.

Note: 1. Model CIMR-A□4A1200 is UL compliant when the air entering the drive-installed panel or cabinet is 45°C or less. For more information, contact Yaskawa or a Yaskawa representative.

2. Use crimp insulated terminals or insulated tubing for wiring these connections. Wires should have a continuous maximum allowable temperature of 75°C 600 V UL approved vinyl sheathed insulation. Ambient temperature should not exceed 40°C.

Closed-Loop Crimp Terminal Recommendations

Yaskawa recommends using closed-loop crimp terminals on all drive models. UL approval requires the use of UL Listed crimp terminals when wiring the drive main circuit terminals on models CIMR-A☐2A0110 to 2A0415 and 4A0058 to 4A1200. Use only crimping tools as specified by the crimp terminal manufacturer. Yaskawa recommends crimp terminals made by JST and Tokyo DIP (or equivalent) for the insulation cap.

The table below 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 drive model. Place orders with Yaskawa or a Yaskawa representative.

| Drive Model | Wire Gauge (AWG, kcmil) | | Screw Size | Crimp Terminal Model Number | Tool | | Insulation Cap Model No. | Code *<2>* |
	R/L1·S/L2·T/L3	U/T1·V/T2·W/T3			Machine No.	Die Jaw		
200 V Class Three-Phase Drives								
2A0004 2A0006 2A0008 2A0010	14 *<1>*		M4	R2-4	YA-4	AD-900	TP-003	100-054-028
	12			R5.5-4			TP-005	100-054-029
	10							
2A0012	14	14 *<1>*	M4	R2-4	YA-4	AD-900	TP-003	100-054-028
	12 *<1>*	12		R5.5-4			TP-005	100-054-029
	10							
2A0018	–	14	M4	R2-4	YA-4	AD-900	TP-003	100-054-028
	12			R5.5-4			TP-005	100-054-029
	10 *<1>*							
2A0021	12		M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	10 *<1>*							
2A0030	10		M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8 *<1>*			8-4		AD-901	TP-008	100-054-031
	6			14-NK4		AD-902	TP-014	100-054-033
2A0040	8	8 *<1>*	M4	8-4	YA-4	AD-901	TP-008	100-054-031
	6 *<1>*	6		14-NK4		AD-902	TP-014	100-054-033
2A0056	6		M6	R14-6	YA-5	AD-952	TP-014	100-051-261
	4 *<1>*			R22-6		AD-953	TP-022	100-051-262
2A0069	4		M8	R22-8	YA-5	AD-953	TP-022	100-051-263
	3 *<1>*			R38-8		AD-954	TP-038	100-051-264
2A0081	3		M8	R38-8	YA-5	AD-954	TP-038	100-051-264
	2 *<1>*							
2A0110	3		M8	R38-8	YA-5	AD-954	TP-038	100-051-264
	2							
	1			R60-8	YA-5	AD-955	TP-060	100-051-265
	1/0 *<1>*							
2A0138	1		M10	R60-10	YF-1 YET-300-1	TD-321, TD-311	TP-060	100-051-266
	1/0							
	2/0 *<1>*			R80-10		TD-323, TD-312	TP-080	100-051-267
2A0169	2/0	–	M10	R80-10	YF-1 YET-300-1	TD-323, TD-312	TP-080	100-051-267
	3/0							
	4/0 *<1>*			R100-10		TD-324, TD-312	TP-100	100-051-269
2A0211	1/0 × 2P *<1>*		M10	R60-10	YF-1 YET-300-1	TD-321, TD-311	TP-060	100-051-266
	2/0 × 2P			R80-10		TD-323, TD-312	TP-080	100-051-267

Drive Model	Wire Gauge (AWG, kcmil) R/L1·S/L2·T/L3	U/T1·V/T2·W/T3	Screw Size	Crimp Terminal Model Number	Tool Machine No.	Die Jaw	Insulation Cap Model No.	Code <2>
2A0250	3/0 × 2P <1>		M12	80-L12	YF-1 YET-300-1	TD-323, TD-312	TP-080	100-051-558
	4/0 × 2P			100-L12		TD-324, TD-312	TP-100	100-051-560
	–	250 × 2P		150-L12		TD-325, TD-313	TP-150	100-051-562
	250	–		R150-12			TP-150	100-051-273
	300							
2A0312	3/0 × 2P	3/0 × 2P <1>	M12	80-L12	YF-1 YET-300-1	TD-323, TD-312	TP-080	100-051-558
	4/0 × 2P <1>	4/0 × 2P		100-L12		TD-324, TD-312	TP-100	100-051-560
	250 × 2P			150-L12		TD-325, TD-313	TP-150	100-051-562
	300 × 2P							
2A0360	4/0 × 2P	4/0 × 2P <1>	M12	100-L12	YF-1 YET-300-1	TD-324, TD-312	TP-100	100-051-560
	250 × 2P <1>	250 × 2P		150-L12		TD-325, TD-313	TP-150	100-051-562
	300 × 2P							
	350 × 2P			200-L12		TD-327, TD-314	TP-200	100-051-564
	400 × 2P							
	500 × 2P			325-12		TD-328, TD-315	TP-325	100-051-277
	600	600 × 2P						
2A0415	250 × 2P	–	M12	150-L12	YF-1 YET-300-1	TD-325, TD-313	TP-150	100-051-562
	300 × 2P	300 × 2P <1>						
	350 × 2P <1>	350 × 2P		200-L12		TD-327, TD-314	TP-200	100-051-564
	400 × 2P							
	500 × 2P			325-12		TD-328, TD-315	TP-325	100-051-277
	600 × 2P							
400 V Class Three-Phase Drives								
4A0002 4A0004 4A0005 4A0007 4A0009	14 <1>		M4	R2-4	YA-4	AD-900	TP-003	100-054-028
	12			R5.5-4			TP-005	100-054-029
	10							
4A0011	14	14 <1>	M4	R2-4	YA-4	AD-900	TP-003	100-054-028
	12 <1>	12		R5.5-4			TP-005	100-054-029
	10							
4A0018	12		M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	10 <1>							
	8			8-4		AD-901	TP-008	100-054-031
	6			14-NK4		AD-902	TP-014	100-054-033
4A0023	10 <1>		M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8			8-4		AD-901	TP-008	100-054-031
	6			14-NK4		AD-902	TP-014	100-054-033
4A0031	–	10	M5	R5.5-5	YA-4	AD-900	TP-005	100-054-030
	8 <1>			R8-5		AD-901	TP-008	100-054-032
	6			R14-5		AD-902	TP-014	100-054-034
4A0038	8	8 <1>	M5	R8-5	YA-4	AD-901	TP-008	100-054-032
	6 <1>	6		R14-5		AD-902	TP-014	100-054-034
4A0044	6 <1>		M6	R14-6	YA-5	AD-952	TP-014	100-051-261
	4			R22-6		AD-953	TP-022	100-051-262
4A0058	6		M8	R14-8	YA-5	AD-952	TP-014	100-054-035
	4 <1>			R22-8		AD-953	TP-022	100-051-263
4A0072	4		M8	R22-8	YA-5	AD-953	TP-022	100-051-263
	3 <1>			R38-8		AD-954	TP-038	100-051-264

Drive Model	Wire Gauge (AWG, kcmil)		Screw Size	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code [2]
	R/L1·S/L2·T/L3	U/T1·V/T2·W/T3			Machine No.	Die Jaw		
4A0088	3		M8	R38-8	YA-5	AD-954	TP-038	100-051-264
	2 [1]							
	1			R60-8		AD-955	TP-060	100-051-265
	1/0							
4A0103	2		M8	R38-8	YA-5	AD-954	TP-038	100-051-264
	1	1 [1]		R60-8		AD-955	TP-060	100-051-265
	1/0 [1]	1/0						
4A0139	1/0		M10	R60-10	YF-1 YET-300-1	TD-321, TD-311	TP-060	100-051-266
	2/0	2/0 [1]		R80-10		TD-323, TD-312	TP-080	100-051-267
	3/0 [1]	3/0						
	4/0			R100-10		TD-324, TD-312	TP-100	100-051-269
4A0165	3/0		M10	R80-10	YF-1 YET-300-1	TD-323, TD-312	TP-080	100-051-267
	4/0 [1]			R100-10		TD-324, TD-312	TP-100	100-051-269
4A0208	2 × 2P		M10	38-L10	YF-1 YET-150-1	TD-224, TD-212	TP-038	100-051-556
	1 × 2P							
	3/0 × 2P			80-L10		TD-227, TD-214	TP-080	100-051-557
	4/0			R100-10		TD-228, TD-214	TP-100	100-051-269
	250			R150-10		TD-229, TD-215	TP-150	100-051-272
	300 [1]							
4A0250	1 × 2P	–	M10	38-L10	YF-1 YET-150-1	TD-224, TD-212	TP-038	100-051-556
	3/0 × 2P			80-L10		TD-227, TD-214	TP-080	100-051-557
	4/0 × 2P			100-L10		TD-228, TD-214	TP-100	100-051-559
	250 × 2P			150-L10		TD-229, TD-215	TP-150	100-051-561
	300			R150-10			TP-150	100-051-272
	350			200-10	YF-1 YET-300-1	TD-327, TD-314	TP-200	100-051-563
	400 [1]							
	500			325-10		TD-328, TD-315	TP-325	100-051-565
	600							
4A0296	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		TD-324, TD-312	TP-100	100-051-560
	250 × 2P			150-L12		TD-325, TD-313	TP-150	100-051-562
	300 × 2P							
	–	350 × 2P		200-L12		TD-327, TD-314	TP-200	100-051-564
	350	–		R200-12				100-051-275
	400							
	500 [1]			325-12		TD-328, TD-315	TP-325	100-051-277
	600							

Drive Model	Wire Gauge (AWG, kcmil)		Screw Size	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code <2>
	R/L1·S/L2·T/L3	U/T1·V/T2·W/T3			Machine No.	Die Jaw		
4A0362	3/0 × 2P		M12	80-L12	YF-1 YET-300-1	TD-323, TD-312	TP-080	100-051-558
	4/0 × 2P <1>			100-L12		TD-324, TD-312	TP-100	100-051-560
	250 × 2P			150-L12		TD-325, TD-313	TP-150	100-051-562
	300 × 2P							
	350 × 2P			200-L12		TD-327, TD-314	TP-200	100-051-564
	400 × 2P							
	500			325-12		TD-328, TD-315	TP-325	100-051-277
	600							
4A0414	4/0 × 2P		M12	100-L12	YF-1 YET-300-1	TD-324, TD-312	TP-100	100-051-560
	250 × 2P			150-L12		TD-325, TD-313	TP-150	100-051-562
	300 × 2P <1>							
4A0515	3/0 × 4P <1>	3/0 × 4P	M12	80-L12	YF-1 YET-300-1	TD-323, TD-312	TP-080	100-051-558
	4/0 × 4P	4/0× 4P <1>		100-L12		TD-324, TD-312	TP-100	100-051-560
	250 × 4P			150-L12		TD-325, TD-313	TP-150	100-051-562
	300 × 2P							
4A0675	4/0 × 4P		M12	100-L12	YF-1 YET-300-1	TD-324, TD-312	TP-100	100-051-560
	250 × 4P			150-L12		TD-325, TD-313	TP-150	100-051-562
	300 × 4P <1>							
4A0930	3/0 × 8P		M12	80-L12	YF-1 YET-300-1	TD-323, TD-312	TP-080	100-051-558
	4/0 × 8P <1>			100-L12		TD-324, TD-312	TP-100	100-051-560
	250 × 8P			150-L12		TD-325, TD-313	TP-150	100-051-562
	300 × 8P							
4A1200	4/0 × 8P		M12	100-L12	YF-1 YET-300-1	TD-324, TD-312	TP-100	100-051-560
	250 × 8P			150-L12		TD-325, TD-313	TP-150	100-051-562
	300 × 8P <1>							

<1> Recommended wire gauges.
<2> 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: Models 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: Models with 4/0 AWG × 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 [100-051-560].

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.

◆ Installing Input Fuses

NOTICE: *If a fuse is blown or equipment for residual current monitoring/detection (RCM/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 or a Yaskawa representative before restarting the drive or the peripheral devices if the cause cannot be identified.*

■ Factory Recommended Branch Circuit Protection

Yaskawa recommends installing one of the following types of branch circuit protection to maintain compliance with UL508C. Semiconductor protective type fuses are preferred. Alternate branch circuit protection devices are also listed in the following tables.

Drive Model	A1000 in Normal Duty Mode (C6-01 = 1)				
	AC Drive Input Amps	MCCB Rating Amps [1]	Time Delay Fuse Rating Amps [2]	Non-time Delay Fuse Rating Amps [3]	Bussman Semiconductor Fuse Rating (Fuse Ampere) [4]
Three-Phase 200 V Class					
2A0004	3.9	15	6.25	10	FWH-70B (70)
2A0006	7.3	15	12	20	FWH-70B (70)
2A0010	10.8	20	17.5	30	FWH-70B (70)
2A0012	13.9	25	20	40	FWH-70B (70)
2A0021	24	45	40	70	FWH-90B (90)
2A0030	37	60	60	110	FWH-100B (100)
2A0040	52	100	90	150	FWH-200B (200)
2A0056	68	125	110	200	FWH-200B (200)
2A0069	80	150	125	225	FWH-200B (200)
2A0081	96	175	150	275	FWH-300A (300)
2A0110	111	200	175	300	FWH-300A (300)
2A0138	136	250	225	400	FWH-350A (350)
2A0169	164	300	250	450	FWH-400A (400)
2A0211	200	400	350	600	FWH-400A (400)
2A0250	271	500	450	800	FWH-600A (600)
2A0312	324	600	500	800	FWH-700A (700)
2A0360	394	700	600	1000 [5]	FWH-800A (800)
2A0415	471	900	800	1400 [5]	FWH-1000A (1000)
Three-Phase 400 V Class					
4A0002	2.1	15	3.5	6	FWH-40B (40)
4A0004	4.3	15	7.5	12	FWH-50B (50)
4A0005	5.9	15	10	17.5	FWH-70B (70)
4A0007	8.1	15	12	20	FWH-70B (70)
4A0009	9.4	15	15	25	FWH-90B (90)
4A0011	14	25	20	40	FWH-90B (90)
4A0018	20	40	35	60	FWH-80B (80)
4A0023	24	45	40	70	FWH-100B (100)
4A0031	38	75	60	110	FWH-125B (125)
4A0038	44	75	75	125	FWH-200B (200)
4A0044	52	100	90	150	FWH-250A (250)
4A0058	58	100	100	150	FWH-250A (250)
4A0072	71	125	110	200	FWH-250A (250)
4A0088	86	150	150	250	FWH-250A (250)
4A0103	105	200	175	300	FWH-250A (250)
4A0139	142	250	225	400	FWH-350A (350)
4A0165	170	300	250	500	FWH-400A (400)
4A0208	207	400	350	600	FWH-500A (500)
4A0250	248	450	400	700	FWH-600A (600)
4A0296	300	600	500	800	FWH-700A (700)
4A0362	346	600	600	1000 [5]	FWH-800A (800)
4A0414	410	800	700	1200 [5]	FWH-800A (800)

Drive Model	A1000 in Normal Duty Mode (C6-01 = 1)				
	AC Drive Input Amps	MCCB Rating Amps [1]	Time Delay Fuse Rating Amps [2]	Non-time Delay Fuse Rating Amps [3]	Bussman Semiconductor Fuse Rating (Fuse Ampere) [4]
4A0515	465	900	800	1350 [5]	FWH-1000A (1000)
4A0675	657	1200	1100 [5]	1800 [5]	FWH-1200A (1200)
4A0930	922	Not Applicable			FWH-1200A (1200)
4A1200	1158				FWH-1600A (1600)

<1> Maximum MCCB Rating is 15 A, or 200% of drive input current rating, whichever is larger. MCCB voltage rating must be 600 VAC or greater.
<2> Maximum Time Delay fuse is 175% of drive input current rating. This covers any Class CC, J or T class fuse.
<3> Maximum Non-time Delay fuse is 300% of drive input current rating. This covers any CC, J or T class fuse.
<4> When using semiconductor fuses, Bussman FWH is required for UL compliance.
<5> This covers Class L fuse.

Drive Model	A1000 in Heavy Duty Mode (C6-01 = 0)				
	AC Drive Input Amps	MCCB Rating Amps [1]	Time Delay Fuse Rating Amps [2]	Non-time Delay Fuse Rating Amps [3]	Bussman Semiconductor Fuse Rating (Fuse Ampere) [4]
Three-Phase 200 V Class					
2A0004	2.9	15	5	8	FWH-70B (70)
2A0006	5.8	15	10	15	FWH-70B (70)
2A0010	7.5	15	12	20	FWH-70B (70)
2A0012	11	20	17.5	30	FWH-70B (70)
2A0021	18.9	35	30	50	FWH-90B (90)
2A0030	28	50	40	75	FWH-100B (100)
2A0040	37	60	60	100	FWH-200B (200)
2A0056	52	100	90	150	FWH-200B (200)
2A0069	68	125	110	200	FWH-200B (200)
2A0081	80	150	125	225	FWH-300A (300)
2A0110	82	150	125	225	FWH-300A (300)
2A0138	111	200	175	250	FWH-350A (350)
2A0169	136	250	225	350	FWH-400A (400)
2A0211	164	300	250	450	FWH-400A (400)
2A0250	200	400	350	600	FWH-600A (600)
2A0312	271	500	450	800	FWH-700A (700)
2A0360	324	600	500	900 [5]	FWH-800A (800)
2A0415	394	700	600	1100 [5]	FWH-1000A (1000)
Three-Phase 400 V Class					
4A0002	1.8	15	3	5	FWH-40B (40)
4A0004	3.2	15	5	9	FWH-50B (50)
4A0005	4.4	15	7	12	FWH-70B (70)
4A0007	6	15	10	17.5	FWH-70B (70)
4A0009	8.2	15	12	20	FWH-90B (90)
4A0011	10.4	20	17.5	30	FWH-90B (90)
4A0018	15	30	25	40	FWH-80B (80)
4A0023	20	40	35	60	FWH-100B (100)
4A0031	29	50	50	80	FWH-125B (125)
4A0038	39	75	60	110	FWH-200B (200)
4A0044	47	75	75	125	FWH-250A (250)
4A0058	43	75	75	125	FWH-250A (250)
4A0072	58	100	100	150	FWH-250A (250)
4A0088	71	125	110	200	FWH-250A (250)
4A0103	86	150	150	250	FWH-250A (250)
4A0139	105	175	175	300	FWH-350A (350)
4A0165	142	225	225	400	FWH-400A (400)
4A0208	170	250	250	500	FWH-500A (500)
4A0250	207	350	350	600	FWH-600A (600)

Drive Model	A1000 in Heavy Duty Mode (C6-01 = 0)				Bussman Semiconductor Fuse Rating (Fuse Ampere) <4>
	AC Drive Input Amps	MCCB Rating Amps <1>	Time Delay Fuse Rating Amps <2>	Non-time Delay Fuse Rating Amps <3>	
4A0296	248	400	400	700	FWH-700A (700)
4A0362	300	500	500	800	FWH-800A (800)
4A0414	346	600	600	1000 <5>	FWH-800A (800)
4A0515	410	700	700	1200 <5>	FWH-1000A (1000)
4A0675	584	1000	1000 <5>	1600 <5>	FWH-1200A (1200)
4A0930	830	–			FWH-1200A (1200)
4A1200	1031				FWH-1600A (1600)

<1> Maximum MCCB Rating is 15 A, or 200% of drive input current rating, whichever is larger. MCCB voltage rating must be 600 VAC or greater.
<2> Maximum Time Delay fuse is 175% of drive input current rating. This covers any Class CC, J or T class fuse.
<3> Maximum Non-time Delay fuse is 300% of drive input current rating. This covers any CC, J or T class fuse.
<4> When using semiconductor fuses, Bussman FWH and FWP are required for UL compliance. Select FWH for 200 V Class and 400 V Class models and FWP fuses for 600 V models.
<5> This covers Class L fuse.

■ 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. If external power supply used, it shall be UL Listed Class 2 power source only or equivalent. Refer to NEC Article 725 Class 1, Class 2, and Class 3 Remote-Control, Signaling, and Power Limited Circuits for requirements concerning class 1 circuit conductors and class 2 power supplies.

Input/Output	Terminal Signal	Power Supply Specifications
Open Collector Outputs	DM+, DM-	Requires class 2 power supply.
Digital inputs	S1-S8, SN, SC, SP, HC, H1, H2	Use the internal LVLC power supply of the drive. Use class 2 for external power supply.
Analog inputs/outputs	+V, -V, A1, A2, A3, AC, AM, FM	Use the internal LVLC power supply of the drive. Use class 2 for external power supply.

■ Drive Short-Circuit Rating

This drive is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes, 600 Vac maximum (Up to 240 V in 200 V class drives , up to 480 V for 400 V class drives) when protected by Bussmann Type FWH fuses as specified in *Installing Input Fuses on page 59*.

◆ Drive Motor Overload Protection

Set parameter E2-01 (motor rated current) to the appropriate value to enable motor overload protection. The internal motor overload protection is UL Listed and in accordance with the NEC and CEC.

■ E2-01 Motor Rated Current

Setting Range: Model Dependent

Default Setting: Model Dependent

Parameter E2-01 (motor rated current) protects the motor if parameter L1-01 is not set to 0 (default is 1, enabling protection for standard induction motors).

If Auto-Tuning has been performed successfully, the motor data entered to T1-04 is automatically written into parameter E2-01. If Auto-Tuning has not been performed, manually enter the correct motor rated current to parameter E2-01.

■ L1-01 Motor Overload Protection Selection

The drive has an electronic overload protection function (oL1) based on time, output current, and output frequency, which protects the motor from overheating. The electronic thermal overload function is UL-recognized, so it does not require an external thermal relay for single motor operation.

This parameter selects the motor overload curve used according to the type of motor applied.

Setting		Description
0	Disabled	Disabled the drive's internal motor overload protection.
1	Standard fan cooled motor (default)	Selects protection characteristics for a standard self cooled motor with limited cooling capabilities when running below the rated speed. The motor overload detection level (oL1) is automatically reduces when running below the motor rated speed.
2	Drive duty motor with a speed range of 1:10	Selects protection characteristics for a motor with self-cooling capability within a speed range of 10:1. The motor overload detection level (oL1) is automatically reduced when running below 1/10 of the motor rated speed.
3	Vector motor with a speed range of 1:100	Selects protection characteristics for a motor capable of cooling itself at any speed — including zero speed (externally cooled motor). The motor overload detection level (oL1) is constant over the entire speed range.
4	Permanent Magnet motor with variable torque	Selects protection characteristics for a variable torque PM motor. The motor overload detection level (oL1) is automatically reduces when running below the motor rated speed.
5	Permanent Magnet motor with constant torque	Selects protection characteristics for a constant torque PM motor. The motor overload detection level (oL1) is constant over the whole speed range.
6	Standard fan cooled motor (50 Hz)	Selects protection characteristics for a standard self cooled motor with limited cooling capabilities when running below the rated speed. The motor overload detection level (oL1) is automatically reduces when running below the motor rated speed.

When connecting the drive to more than one motor for simultaneous operation, disable the electronic overload protection (L1-01 = 0) and wire each motor with its own motor thermal overload relay.

Enable the motor overload protection (L1-01 = 1 to 6) when connecting the drive to a single motor, unless another motor overload preventing device is installed. The drive electronic thermal overload function causes an oL1 fault, which shuts off the output of the drive and prevents additional overheating of the motor. The motor temperature is continually calculated as long as the drive is powered up.

■ L1-02 Motor Overload Protection Time

Setting Range: 0.1 to 5.0 min

Factory Default: 1.0 min

Parameter L1-02 determines how long the motor is allowed to operate before the oL1 fault occurs when the drive is running at 50 Hz and at 150% of the full load amp rating (E2-01) of the motor. Adjusting the value of L1-02 can shift the set of oL1 curves up the y axis of the diagram below, but will not change the shape of the curves.
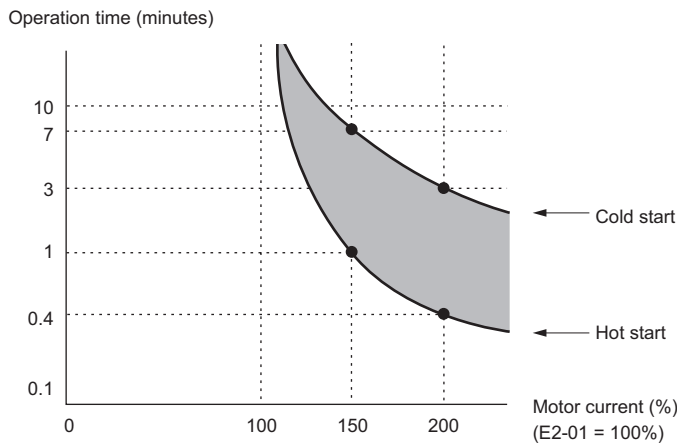
◆ Precautionary Notes on External Heatsink (IP00 Enclosure)

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 drive installation is complete. Use the table below to match drive models and capacitor cover. Capacitor covers can be ordered from Yaskawa or a Yaskawa representative. The table below lists available capacitor covers.

Drive Model CIMR-A□	Code Number	Figure
2A0110	100-061-273	14
2A0138	100-061-274	
2A0169	100-061-275	
2A0211		
2A0250	100-061-277	
2A0312		
2A0360	100-061-278	
2A0415		
4A0058	100-061-273	
4A0072	100-061-274	
4A0088	100-061-276	
4A0103		
4A0139	100-061-275	
4A0165		
4A0208	100-061-277	
4A0250	100-061-278	
4A0296		
4A0362		
4A0414	100-061-279	
4A0515	100-061-280	
4A0675		
4A0930	100-061-281	15
4A1200		

Note: Model CIMR-A□4A1200 is UL compliant when the air entering the drive-installed panel or cabinet is 45°C or less. For more information, contact Yaskawa or a Yaskawa representative.
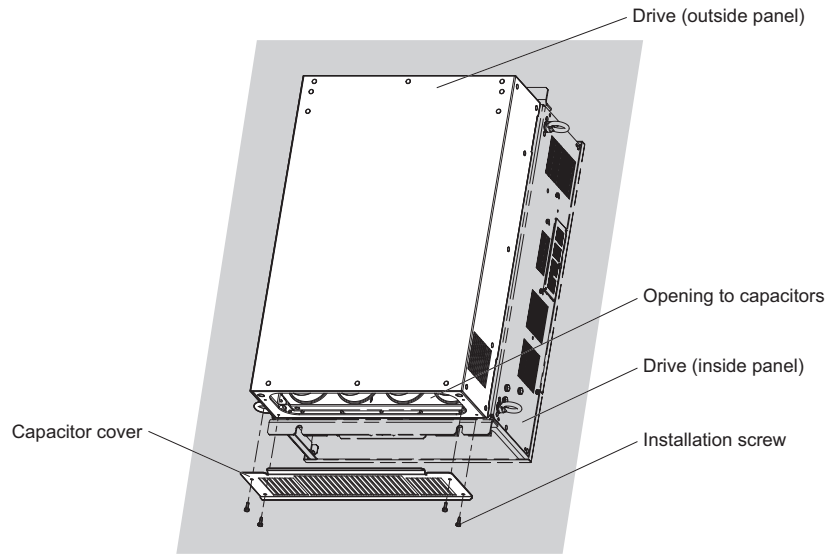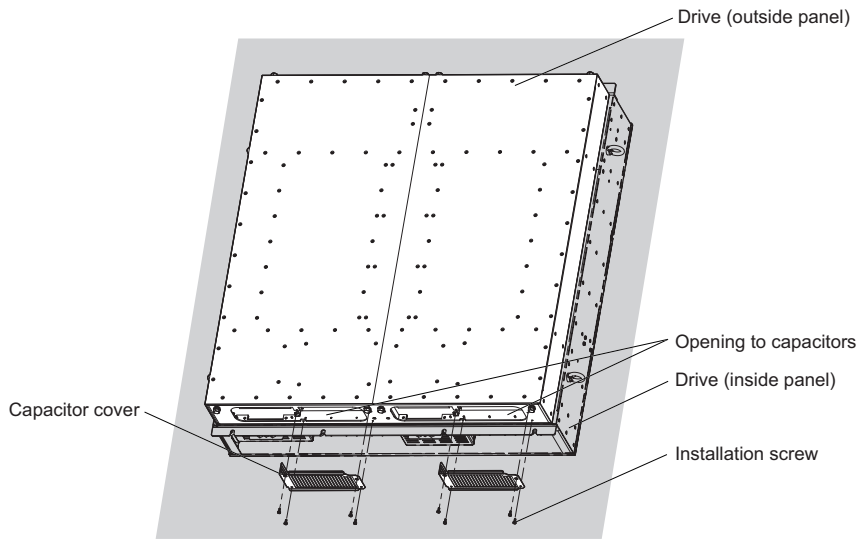
Drive (outside panel)

Opening to capacitors

Drive (inside panel)

Capacitor cover

Installation screw

Figure 14

Drive (outside panel)

Opening to capacitors

Drive (inside panel)

Capacitor cover

Installation screw

Figure 15

11 Disposal

◆ Section Safety

<table>
<tr><td align="center">⚠ DANGER</td></tr>
</table>

Electrical Shock Hazard

De-energize the drive and wait 5 minutes minimum until the Charge LED turns off. Remove the front cover and terminal cover to do work on wiring, circuit boards, and other parts. Use terminals for their correct function only.

Incorrect wiring, incorrect ground connections, and incorrect repair of protective covers can cause death or serious injury.

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

Electrical Shock Hazard

Only let approved personnel install, wire, maintain, examine, replace parts, and repair the drive.

If personnel are not approved, it can cause serious injury or death.

Do not wear loose clothing or jewelry when you do work on the drive. Tighten loose clothing and remove all metal objects, for example watches or rings.

Loose clothing can catch on the drive and jewelry can conduct electricity and cause serious injury or death.

Crush Hazard

Wear eye protection when you do work on the drive.

If you do not use correct safety equipment, it can cause serious injury or death.

Only approved personnel can operate a crane or hoist to move the drive.

If unapproved personnel operate a crane or hoist, it can cause serious injury or death from falling equipment.

Use a crane or hoist to move large drives when necessary.

If you try to move a large drive without a crane or hoist, it can cause serious injury or death.

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

Crush Hazard

Tighten terminal cover screws and hold the case safely when you move the drive.

If the drive or covers fall, it can cause moderate injury.

◆ Disposal Instructions

Correctly discard the drive and packing material as specified by regional, local, and municipal laws and regulations for this product.
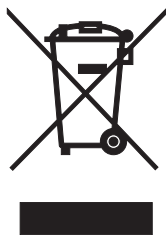
◆ WEEE Directive

Figure 16 WEEE Directive

The wheelie bin symbol on this product, its manual, or its packaging identifies that you must recycle it at the end of its product life.

You must discard the product at an applicable collection point for electrical and electronic equipment (EEE).

Do not discard the product with usual waste.

Revision History

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

MANUAL NO. TOEP C710616 27B <u><1></u>

                         —— Revision number

Published in Japan <u>February 2009</u>

              —— Date of publication

Date of Publication	Rev. No.	Section	Revised Content
February 2019	<10>	All	Revision: • Reviewed and corrected entire documentation. • Upgraded the software version to PRG:1026.
		Chapter 8	Addition: European Standards
		Chapter 11	Addition: Disposal
September 2017	<9>	All	Revision: • Reviewed and corrected entire documentation. • Upgraded the software version to PRG:1025.
April 2016	<8>	All	Revision: • Reviewed and corrected entire documentation. • Upgraded the software version to PRG:1021 to 1024.
		Back cover	Revision: Address
September 2015	<7>	Front cover	Revision: Format
		Back cover	Revision: Address, format
August 2013	<6>	All	Revision: Reviewed and corrected entire documentation.
April 2013	<5>	All	Revision: Review and corrected entire documentation
		Chapter 2	Revision: Instructions on Installation
		Chapter 3	Addition: Description related to the slide switch S6 Fuses/fuse holders and CE standards compliance for DC power supply input Revision: Model of EMC filter
		Chapter 6	Addition: A1-00
		Chapter 7	Addition: CoF, oPE20
		Chapter 8	Revision: Safe disable status monitor, DM+ - DM-
		Chapter 9	Addition: Ambient temperature Revision: Closed-loop crimp terminal and tightening torque Revision: Installing Input Fuses
		Back cover	Revision: Address
July 2011	<4>	Front cover, back cover	Revision: Format
August 2010	<3>	All	Revision: Review and corrected entire documentation
		Chapter 1	Deletion: Descriptions on UL/cUL standards compliance
		Chapter 2 Chapter 3	Addition: Larger drive capacities added along with corresponding data Three-phase 400V: CIMR-A□4A0930 and 4A1200
		Chapter 8	Revision: Safe Disable Input Function
		Chapter 9	Addition: UL Standards
June 2009	<2>	All	Revision: Review and corrected entire documentation
		Chapter 2 Chapter 3	Addition: Larger drive capacities added along with corresponding data Three-phase 400V: CIMR-A□4A0414 to 4A0675
February 2009	<1>	All	Revision: Review and corrected entire documentation
		Chapter 2 Chapter 3	Addition: Larger drive capacities added along with corresponding data Three-phase 200V: CIMR-A□2A0250 to 2A0415 Three-phase 400V: CIMR-A□4A0208 to 4A0362
October 2008	–	–	First edition

YASKAWA AC Drive A1000
High Performance Vector Control Drive
Quick Start Guide

YASKAWA

YASKAWA ELECTRIC CORPORATION

In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.

Specifications are subject to change without notice for ongoing product modifications and improvements.