



YASKAWA AC Drive V1000 IP66 Type

Compact Vector Control Drive

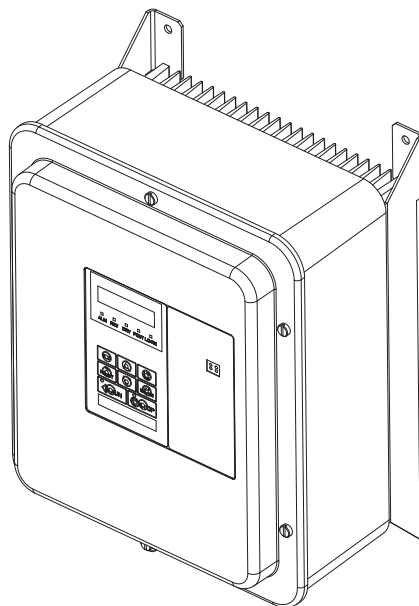
Quick Start Guide

Type: CIMR-VC□□□□□□H□□-00□□

Models: 200 V Class, Single-Phase Input: 0.1 to 3.0 kW

400 V Class, Three-Phase Input: 0.2 to 18.5 kW

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



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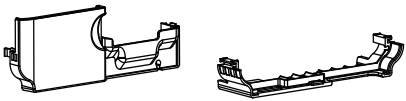

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1 General Information and Safety Instructions

YASKAWA 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.

◆ Scope of Delivery

The following items are delivered with V1000 Series IP66 Type drives:

V1000 Drive	Bottom and Terminal Cover <1>	Quick Start Guide
		

<1> Only delivered with drives CIMR-VCBA□□□□HAA-00□□ and CIMR-VC4A0001HAA-00□□ to CIMR-VC4A0011HAA-00□□

◆ Applicable Documentation

The following manuals are available for V1000 Series IP66 Type drives:

V1000 Series IP66 Type AC Drive Quick Start Guide	This guide is packaged together with the product. It contains basic information required to install and wire the drive.
V1000 Series AC Drive Technical Manual	Read this manual for detailed information about parameter usage. Contact YASKAWA to order this manual.

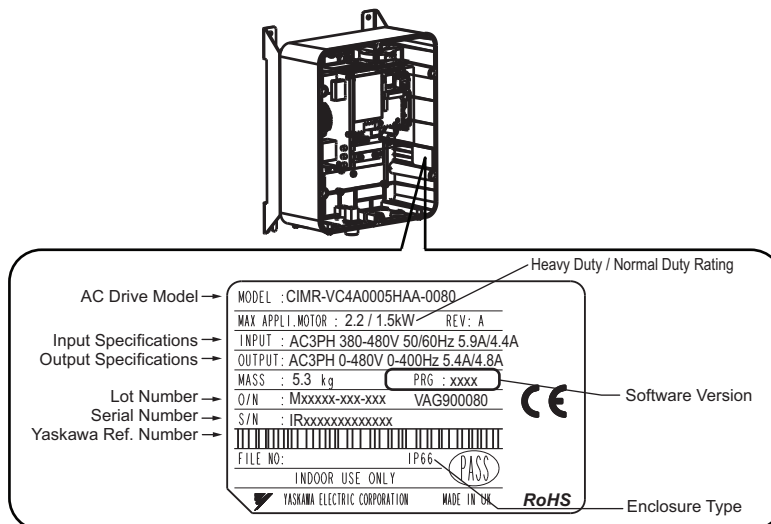
◆ Receiving

Please perform the following tasks after receiving the drive:

- Inspect the drive for damage. If the drive appears damaged upon receipt, contact your supplier.
- Verify receipt of all components.
- Verify receipt of the correct model by checking the information on the nameplate. If you have received the wrong model contact your supplier.

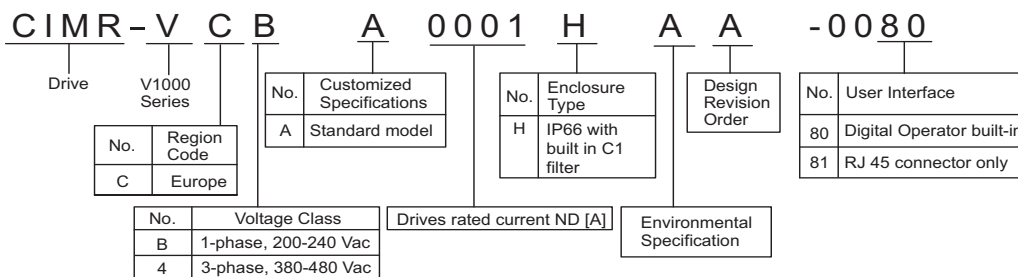
■ Nameplate

To check the nameplate, remove the front cover and look on the inside of the IP66 enclosure. Refer to [Removing the Front Cover on page 9](#) for instructions.



■ Drive Model Identification

The V1000 IP66 drive type is indicated by the letter “H” in the AC drive model designation code.



◆ 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.

⚠ WARNING

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

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

⚠ 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.

Failure to comply could result in death or serious injury.

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

Never submerge this product in water.

Using this product in water can damage the product and result in serious electric shock.

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.

WARNING

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

Failure to comply could result in death or serious injury.

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

An EMC filter is installed, the leakage current exceeds 3.5 mA. Therefore according to IEC 61800-5-1 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 mm² (Cu) or 16 mm² (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 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.

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.

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

Attach the drive to metal or other noncombustible material.

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 L1, L2, L3 (or L1 and L2 for single-phase drives).

Do not connect the AC power line to the output motor 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.

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.

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 on any part of the drive.

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

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.

Prevent moisture and other solvents from entering the drive enclosure.

Failing to do so can damage the drive or considerably shorten its expected performance life.

Install adequate branch circuit short circuit protection per applicable codes.

Failure to comply could result in damage to the drive.

The drive is suitable for circuits capable of delivering not more than 30,000 RMS symmetrical Amperes, 240 Vac maximum (200 V Class) and 480 Vac maximum (400V Class).

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 allow unqualified personnel to use the product.

Failure to comply could result in damage to the drive or braking circuit.

Carefully review the braking option instruction manual 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.

Do not connect unapproved LC or RC interference suppression filters, capacitors, or overvoltage protection devices to the output of the drive.

Using unapproved filters could result in damage to the drive or motor equipment.

Exchange the entire unit including the drive, case, and heatsink in the event that any single part becomes damaged.

The drive, enclosure, and heatsink are constructed as a single piece, and it is therefore not possible to simply return the drive separate from the protective casing.

◆ Precautions for CE Low Voltage Directive Compliance

This drive has been tested according to European standard EN61800-5-1, 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 severity 2 and over voltage category 3 in accordance with IEC664.

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

◆ Precautions for Using the Inputs H1/H2-HC

Same as standard V1000 drives, this drive provides terminals H1/H2 and HC. In the V1000 IP66 drives, described here, these terminals can be used to disable the drive output, but they can NOT be used to perform safe stop according to EN60204-1 (Function is in preparation. Contact your sales representative or YASKAWA for details).

2 Mechanical Installation

◆ Installation Environment

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

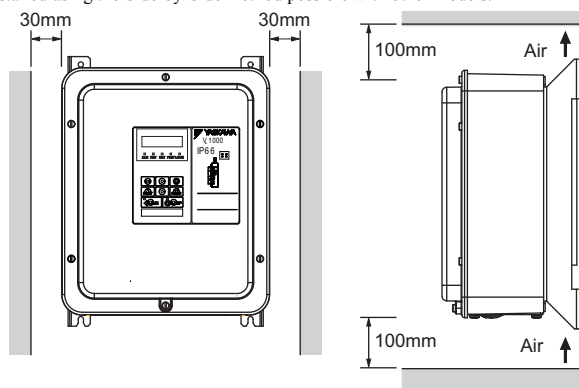
Environment	Conditions
Installation Area	Indoors
Ambient Temperature	-10°C to +40°C Drive reliability improves in environments without wide temperature fluctuations.
Storage Temperature	-20°C to +60°C Temperature conditions allowable for short-term transport.
Surrounding Area	Install the drive in an area free from: <ul style="list-style-type: none"> • oil mist • radioactive materials • combustible materials (e.g., wood) • harmful gases • excessive vibration • direct sunlight The surrounding area can contain the following chemicals and solvents. (Reagent) <ul style="list-style-type: none"> • Hydrochloric acid (10%) • Sulfuric acid (10%) • Nitric acid (10%) • Ammonia water • Sodium chloride (Solvent) <ul style="list-style-type: none"> • Methanol • Ethanol
Altitude	1000 m or less
Vibration	10 - 20 Hz at 9.8 m/s ² , 20 - 55 Hz at 5.9 m/s ²
Orientation	Install the drive vertically to maintain maximum cooling effects.

NOTICE: Never allow a constant stream of the solvent or chemicals listed above to be sprayed directly onto the drive.

◆ 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: V1000 Series IP66 Type should not be installed using the Side-by-Side method possible with other models.



◆ Dimensions

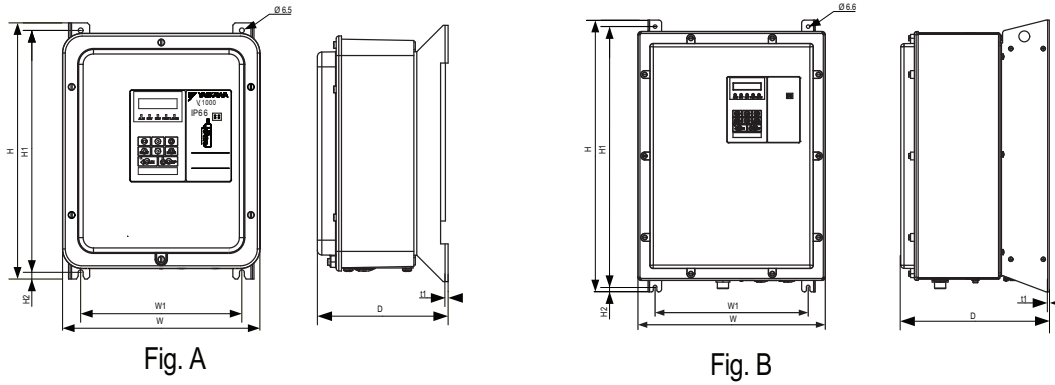


Fig. A

Fig. B

Model CIMR-VC□	Dimensions (mm)								Weight (kg)
	Fig.	W	H	D	W1	H1	H2	t1	
BA0001	A	262	340	173.5	214	321	9	2	4.9
BA0002									4.9
BA0003									5.1
BA0006									5.7
BA0010									5.8
BA0012									6.1
4A0001									5.2
4A0002									5.2
4A0004									5.3
4A0005									5.3
4A0007									5.7
4A0009									5.7
4A0011									6.0
4A0018									B
4A0023	19.9								
4A0031	21.0								
4A0038	21.3								

◆ Wiring Instructions

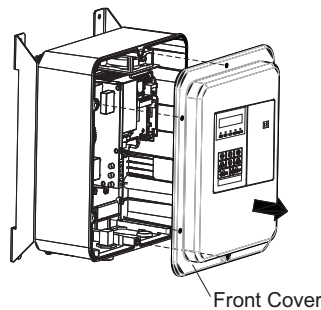
WARNING! Never remove the front cover while the power is on. Failing to do so may result in serious electric shock.

■ Removing the Front Cover

Accessing the main circuit and control circuit wiring requires the front cover of the drive to be removed. Drives with model code **CIMR...-0080** (with built-in digital operator) the connecting cable for the digital operator has to be plugged out at the operator before the front cover can be removed.

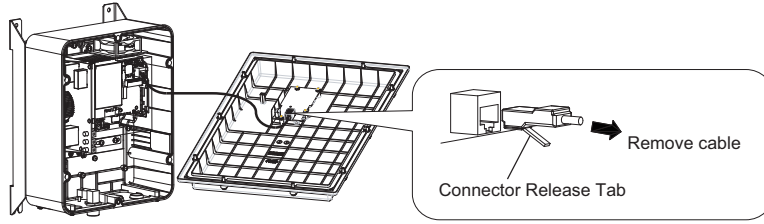
NOTICE: Never disassemble the protective case that encloses the drive. The case is constructed as a single continuous piece that includes the heatsink. Attempting to disassemble the case can therefore damage the drive.

1. Loosen the screws that hold the front cover in place, and remove the front cover.



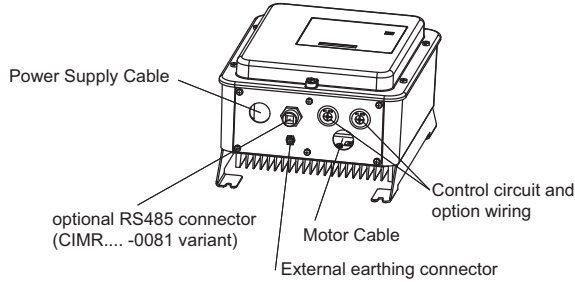
2 Mechanical Installation

- For disconnecting the operator cable, firmly press the tab that is holding the cable in place and then pull out the plug as shown in the figure below. Disconnect the cable **only** from the operator at the front cover (cable is fixed to the drive side on size B units)



■ Main Circuit and Control Circuit Wiring

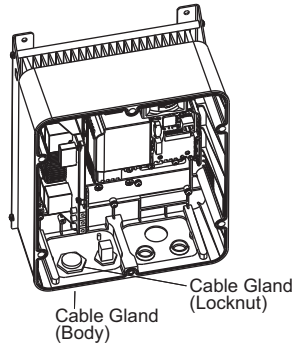
Note: Before wiring up the drive, remove the sealing grommets from the access holes in the bottom of the drive. The figure below explains the purpose of each hole. Make sure the proper holes are used. Do not remove the rubber bushings from holes that will not be used.



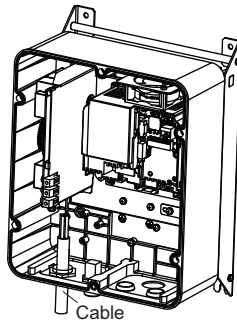
NOTICE: Be sure to use the recommended waterproof cable glands for all cables entering and exiting the drive.

NOTICE: RJ45 connector on drives with model code CIMR....-0081 is meant to connect an external digital operator JVOP-180(LCD), JVOP-182(LED) (with recommended cable, YASKAWA part No. 72606-WV003) or JVOP-181 (USB Copy Unit) for PC connection. Do NOT connect any other device to the RJ45 connector. Otherwise the drive or external device may be damaged.

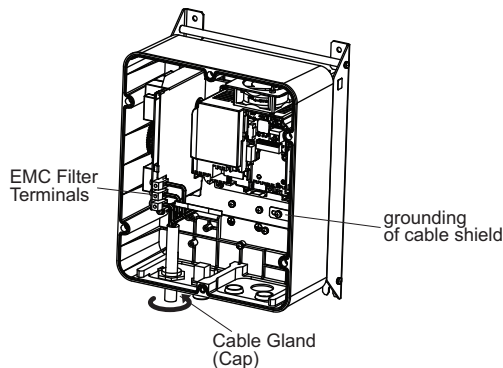
- After removing the rubber bushings, insert the cable glands into the holes and tighten them with the locknut. Refer to [Cable Glands Specifications and Model Numbers on page 11](#) for the maximum allowable tightening torque.



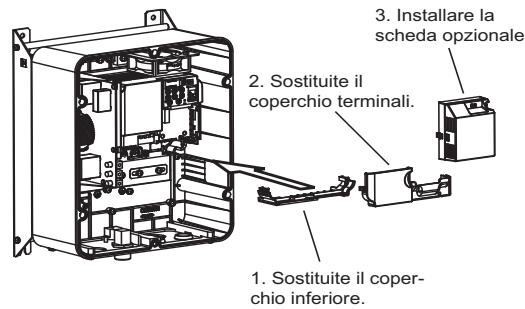
- Route the cables through the cable glands, following the instructions in [Cable Glands on page 11](#).



- Tighten the cable gland caps.



4. Connect the power supply cable to the EMC Filter. Use only the green colored screws for grounding. Connect motor cable to inverter main terminals and control circuit to the control terminals.
5. Install option cards if required. For drives CIMR-VCBA□□□□HAA-00□□ and CIMR-VC4A0001HAA-00□□ to CIMR-VC4A0011HAA-00□□ place the bottom cover and terminal cover delivered with the drive before attaching the option card.



■ Reattaching the Front Cover

NOTICE: Be careful not to pinch or damage the front cover sealing when attaching the front cover. Any damage to the sealing may allow moisture or oil to enter the drive case and damage components.

NOTICE: Equipment Hazard. Be sure to fastening all screws in accordance with specified tightening torque. If any screws are loose, water and oil may seep into the case and damage the drive.

1. For drives with digital operator in the front cover insert the LED operator cable back into the correct port on the drive.
2. Place the front cover back onto the drive, and fasten the cover screws applying the following tightening torque values:
 Drives CIMR-VCBA□□□□ and CIMR-VC4A0001 to 0011: 1.5 Nm
 Drives CIMR-VC4A0018 to 0038: 2.5 Nm

◆ Cable Glands

NOTICE: Equipment Hazard. Use only the recommended multiconductor cable and use one cable per cable gland only. Attempting to pass more than one wire through a cable gland will result in a space between those wires, thus considerably reducing the water-proofing and dust-proofing capabilities of the cable gland, and may result in damaging the drive.

NOTICE: Make sure that the rubber edging along the outside of the cable gland is properly sealed. Failing to properly seal the outside may allow water or oil into the drive and damage components.

■ Cable Glands Specifications and Model Numbers

YASKAWA recommends using SKINTOP cable glands by Lapp Kabel for use with V1000 Series IP66 Type.

Main Circuit Wiring

Drive Side Wiring Hole Diameter (mm) <1>			Recommended Cable Glands (Lapp Kabel)		
Drive Size	Input	Output	Input / Output Wiring		
			Cable Gland No./Model <2>	Cable Diameter (mm)	Tightening Torque (Nm)
A	28.8	28.8	Body: 53015150/STR 21 Locknut: 53019050/GMP-GL21	9 to 16	Body: 5.0 Locknut: 7.5
			Body: 53015050/ST 21 Locknut: 53019050/GMP-GL21	13 to 18	
B	37	37	Body: 53015160/STR 29 Locknut: 53019060/GMP-GL29	11 to 22	Body: 5.0 Locknut: 7.5
			Body: 53015060/ST 29 Locknut: 53019060/GMP-GL29	14 to 25	

<1> Separate holes have been provided for input, output, and option wiring (total of 4 holes).
 <2> Note that the cable gland body and locknut are usually sold separately.

Note: Main circuit wires should be multiconductor 600 V vinyl insulated line with a continuous maximum allowable temperature of over 70°C (such as ÖLFLEX® CLASSIC 100/100CY by Lapp Kabel).

Note: For single phase input, use 3 wire cable, and for 3-phase input, use 4 wire cable.

Note: Always use shielded motor cables.

Control Circuit Wiring

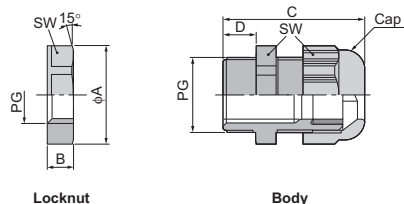
Drive Side Wiring Hole <1>		Recommended Cable Glands for I/O Wiring (Lapp Kabel)		
Diameter (mm)	Number of Holes	Cable Gland No./Model <2>	Cable Diameter (mm)	Tightening Torque (Nm)
23	2	Body: 53015140/STR 16 Locknut: 53019040/GMP-GL16	6 to 12	Body: 3.3 Locknut: 5.0
		Body: 53015040/ST 16 Locknut: 53019040/GMP-GL16	9 to 14	

<1> Sealing grommets fitted to control circuit wiring holes on reception.
 <2> Note that the cable gland body and locknut are usually sold separately.

Note: Main circuit wires should be multiconductor shielded line with a continuous maximum allowable temperature of over 70°C (such as ÖLFLEX® CLASSIC 110/115CY and UNITRONIC® LIYCY (TP) by Lapp Kabel).

2 Mechanical Installation

■ Dimensions - Lapp Kabel SKINTOP



Cable Glands for Control Wiring (glands are plastic)

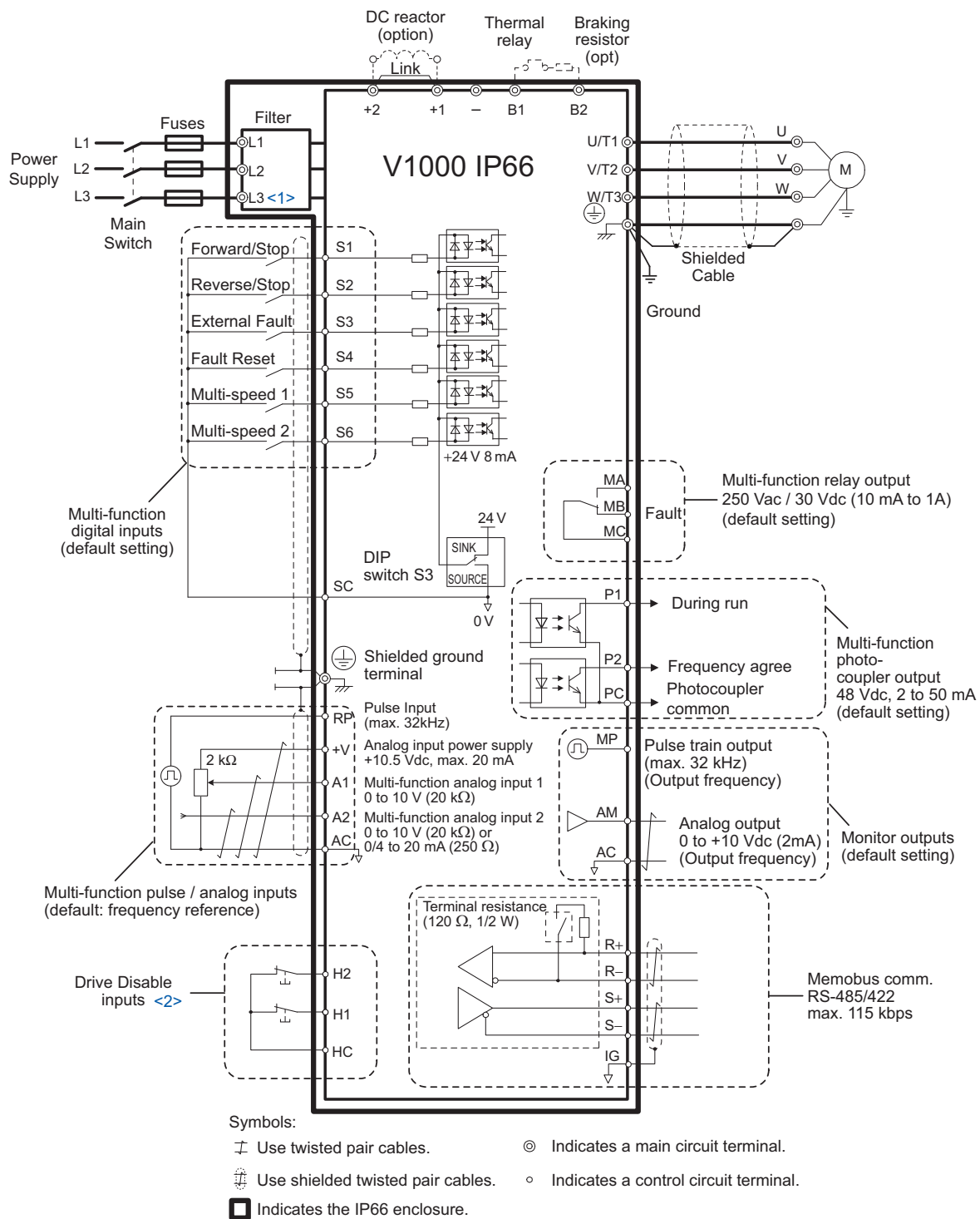
Part	No.	Model	PG Size	Wrench Size SW (mm)	A (mm)	B (mm)	C (mm)	D (mm)
Body	53015140	STR 16	16	27	-	-	44	10
	53015040	ST 16						
Locknut	53019040	GMP-GL 16	16	30	33	6	-	-

Cable Glands for Main Circuit Input and Output Wiring (glands are plastic)

Part	No.	Model	PG Size	Wrench Size SW (mm)	A (mm)	B (mm)	C (mm)	D (mm)
Body	53015150	STR 21	21	34	-	-	49	11
	53015050	ST 21						
	53015160	STR 29	29	42			56	11
	53015060	ST 29						
LockNut	53019050	GMP-GL 21	21	36	39	7	-	-
	53019060	GMP-GL 29	29	46	50	7		

3 Electrical Installation

The figure below shows the main and control circuit wiring.



<1> Single-phase units do not have a L3 terminal.
 <2> These terminals can be used to disable the drive output. Other than in V1000 standard drives they can NOT be used to perform safe stop according to EN60204-1 (Function is in preparation. Contact your sales representative or YASKAWA for details).

◆ Wiring Specification

■ Main Circuit

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

Model CIMR-VC□	Main Fuse [Ferraz]	Applicable Wire Gauge (mm ²) L1,L2,L3, U/T1,V/T2,W/T3, -,+1,+2,B1,B2	Recommended Wire Gauge (mm ²)			Terminal Size	
			L1,L2,L3, U/T1,V/T2,W/T3, -,+1,+2,B1,B2	⊕ <2>		U/T1,V/T2,W/T3, -,+1,+2,B1,B2	⊕ <2>
				Input <1>	Output		
BA0001	TRS5R	0.75 to 2.5	2.5	10	2.5	M3.5	M5
BA0002	TRS10R	0.75 to 2.5	2.5	10	2.5	M3.5	M5
BA0003	TRS20R	0.75 to 2.5	2.5	10	2.5	M3.5	M5
BA0006	TRS35R	2.5 to 6	2.5	10	2.5	M4	M5
BA0010	TRS50R	2.5 to 6	4	10	4	M4	M5
BA0012	TRS60R	2.5 to 6	6	10	6	M4	M5
4A0001	TRS2.5R	2.5 to 6	2.5	10	2.5	M4	M5
4A0002	TRS5R	2.5 to 6	2.5	10	2.5	M4	M5
4A0004	TRS10R	2.5 to 6	2.5	10	2.5	M4	M5
4A0005	TRS20R	2.5 to 6	2.5	10	2.5	M4	M5
4A0007	TRS20R	2.5 to 6	2.5	10	2.5	M4	M5
4A0009	TRS20R	2.5 to 6	2.5	10	4	M4	M5
4A0011	TRS30R	2.5 to 6	2.5	10	4	M4	M5
4A0018	A6T50	2.5 to 6	6	10	6	M4	M5
4A0023	A6T60	2.5 to 6	6	10	6	M4	M5
4A0031	A6T70	2.5 to 6	6	10	10	M5	M5
4A0038	A6T80	2.5 to 6	6	10	10	M5	M5

<1> The leakage current of this drive exceeds 3.5 mA. Therefore according to IEC61800-5-1 a protective earthing conductor with a cross section of at least 10 mm² (CU) of 16 mm² (Al) must be used. Smaller protective earthing conductors can be used if automatic power supply interruption in case of discontinuity of the protective earthing conductor is provided.
<2> Use a ring terminal end to connect the ground wire to the ground terminal.

NOTICE: Equipment Hazard. Be sure to connect the recommended fuses between each input terminal and the main circuit power supply (3-phase: L1, L2, L3, single-phase: L1, L2). As the V1000 Series IP66 Type enclosure is very compact, fuses are required to prevent serious damage to the drive components as well as prevent personal injury in the event that a short-circuit occurs.

Tightening Torque Values

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

Terminal Size	M3.5	M4	M5
Tightening Torque (Nm)	0.8 to 1.0	1.2 to 1.5	2 to 2.5

■ Control Circuit

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

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

◆ 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 14* 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 an 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.
- Make sure the ground conductor complies with technical standards and local safety rules. The drive has an EMC filter installed and the leakage current exceeds 3.5 mA. Therefore according to IEC61800-5-1, a protective earthing conductor with a cross section of at least 10 mm² (Cu) or 16 mm² (Al) must be used, or automatic power supply interruption in case of discontinuity of the protective earthing conductor must be provided.
- When using more than one drive, do not to loop the ground wire.

■ **Control Circuit Wiring Precautions**

Consider the following precautions for wiring the control circuits.

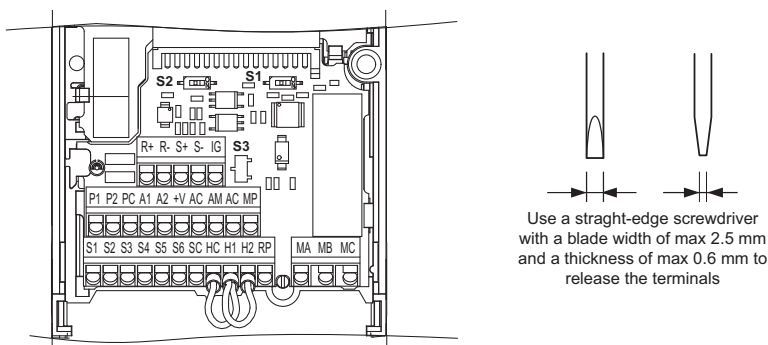
- Separate control circuit wiring from main circuit wiring and other high-power lines.
- Separate wiring for control circuit terminals MA, MB, MC (contact output) from wiring to other control circuit terminals.
- For external control power supply use a UL Listed Class 2 power supply.
- Use twisted-pair or shielded twisted-pair cables for control circuits to prevent operating faults.
- Connect only Digital Operator JVOP-180 (LCD), JVOP-182(LED) or JVOP-181 (USB Copy Unit) to external RJ45 connector on drives model code CIMR-...-0081. Do not connect any other device to the RJ45 connector. Drive or external device may be damaged.
- Drives model code CIMR-...0080 can be connected to PC by using JVOP-181(USB Copy Unit). Use the RJ45 connector where the Digital Operator is connected.
- 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 Drive Disable function is utilized.

■ **Main Circuit Terminals**

Terminal	Type	Function
L1, L2, L3 (located at the built-in EMC filter)	Main circuit power supply input	Connects line power to the drive. Drives with single-phase 200 V input power have no L3 terminal.
U/T1, V/T2, W/T3	Drive output	Connects to the motor.
B1, B2	Braking resistor	For connecting a braking resistor.
+1, +2	DC reactor connection	Linked at shipment. Remove the link to install a DC choke.
+1, -	DC power supply input	For connecting a DC power supply.
⊕ (2 terminals)	Ground Terminal, (green colored screws)	

■ **Control Circuit Terminals**

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



There are three DIP switches, S1 to S3, located on the terminal board

SW1	Switches analog input A2 between voltage and current input
SW2	Enables or disables the internal RS422/485 comm. port terminal resistance.
SW3	Used to select sourcing (PNP)/sinking (NPN, default) mode for the digital inputs (PNP requires external 24 Vdc power supply)

■ **Control Circuit Terminal Functions**

Type	No.	Terminal Name (Signal)	Function (Signal Level), Default Setting
Multi-Function Digital Inputs	S1 to S6	Multi-function digital input 1 to 6	Photocoupler inputs, 24 Vdc, 8 mA Note: Drive preset to sinking mode (NPN). When using source mode, set DIP switch S3 to "SOURCE" and use an external 24 Vdc (±10%) power supply.
	SC	Multi-function input common	Sequence common

3 Electrical Installation

Type	No.	Terminal Name (Signal)	Function (Signal Level), Default Setting
Multi-Function Analog/ Pulse Inputs	RP	Pulse train input	Response frequency: 0.5 to 32 kHz, Duty: 30 to 70%, High: 3.5 to 13.2 V, Low: 0.0 to 0.8 V, input impedance: 3 k Ω)
	+V	Analog input power supply	+10.5 V (max allowable current 20 mA)
	A1	Multi-function analog input 1	0 to +10 Vdc (20 k Ω) resolution 1/1000
	A2	Multi-function analog input 2	0/4 to 20 mA (250 Ω) resolution: 1/500 (A2 only)
	AC	Frequency reference common	0 V
Drive Disable Inputs	HC	Drive Disable Input common	+24 V (max 10 mA allowed)
	H1	Drive Disable Input 1	One or both open: Drive output disabled (time from input open to drive output switch off is less than 1 ms)
	H2	Drive Disable Input 2	Both Closed: Normal operation
Multi-Function Relay Output	MA	N.O. (fault)	Digital relay output
	MB	N.C. output (fault)	30 Vdc, 10 mA to 1 A
	MC	Digital output common	250 Vac, 10 mA to 1 A
Multi-Function PHC Output	P1	Photocoupler output 1	Digital photocoupler output 48 Vdc, 2 to 50 mA
	P2	Photocoupler output 2	
	PC	Photocoupler output common	
Monitor Output	MP	Pulse train output	32 kHz (max)
	AM	Analog monitor output	0 to 10 Vdc (2 mA or less), Resolution: 1/1000 (10 bit)
	AC	Monitor common	0 V
MEMOBUS/ Communication	R+	Communications input (+)	MEMOBUS/Modbus communication.: RS-485 or RS-422, 115.2 kbps (max)
	R-	Communications input (-)	
	S+	Communications output (+)	
	S-	Communications output (-)	
Operator/ PC Communication	RJ45	Communication port to Digital Operator or PC	RS232: PC connection via JVOP-181 (USB Copy Unit), Digital Operators JVOP-180 (LCD) or JVOP-182 (LED). Other device connection may damage the drive or the external device. Variant CIMR-...-0080 only on the drive. Variant CIMR-...-0081 with external RJ45 connector.

NOTICE: The terminals HC, H1, H2 can be used to disable the drive output. Other than in V1000 standard drives they can NOT be used to perform safe stop according to EN60204-1 (Function is in preparation. Contact your sales representative or YASKAWA for details).

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

4 Keypad Operation

◆ LED Operator and Keys

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



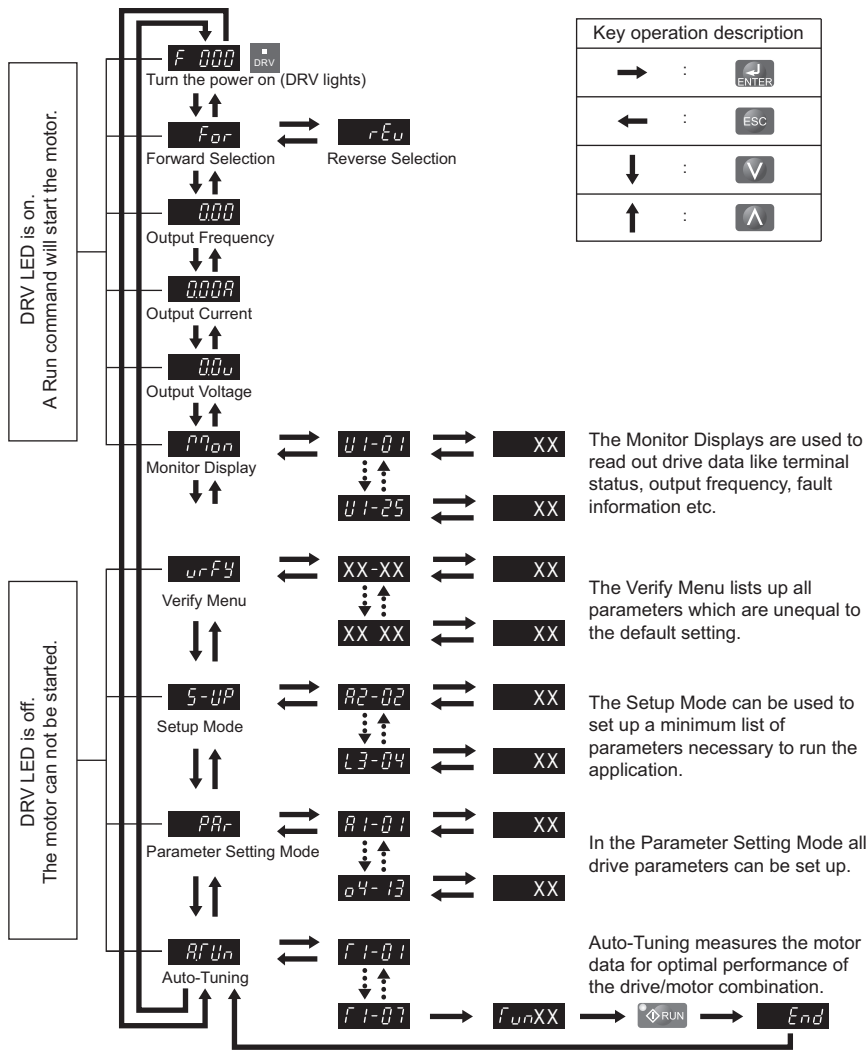
■ Keys and Functions

Display	Name	Function
	Data Display Area	Displays the frequency reference, parameter number, etc.
	ESC Key	Returns to the previous menu.
	RESET Key	Moves the cursor to the right. Resets a fault.
	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.
	Up Arrow Key	Scrolls up to select parameter numbers, setting values, etc.
	Down Arrow Key	Scrolls down to select parameter numbers, setting values, etc.
	STOP Key	Stops the drive in the LOCAL mode. The Stop LED <ul style="list-style-type: none"> is on when the drive is not operating the motor. flashes during deceleration at a fast-stop or stop by interlock operation. is off during run, deceleration to stop, or when the frequency reference is 0.
	ENTER Key	Selects modes, parameters and is used to store settings.
	LO/RE Selection Key	Switches drive control between the operator (LOCAL) and the control circuit terminals (REMOTE).
	ALM LED Light	Flashing: The drive is in an alarm state. On: The drive is in a fault state and the output is stopped.
	REV LED Light	On: The motor rotation direction is reverse. Off: The motor rotation direction is forward.
	DRV LED Light	On: The drive is ready to operate the motor. Off: The drive is in the Verify, Setup, Parameter Setting or Auto tuning mode.
	FOUT LED Light	On: The output frequency is displayed on the data screen. Off: Anything else than the output frequency is displayed on the data screen.
	LO/RE LED Light	On: The drive is in the LOCAL mode. Off: The drive is in the REMOTE mode.

4 Keypad Operation

◆ Menu Structure and Modes

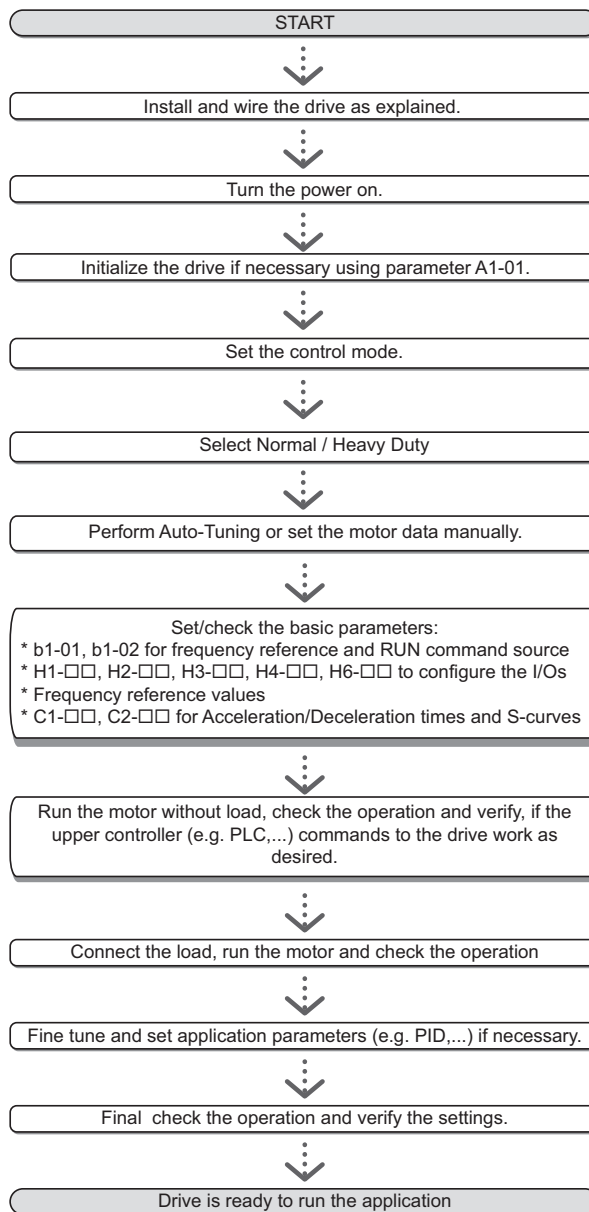
The following illustration explains the operator keypad menu structure.



5 Start Up

◆ Drive Setup Procedure

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



◆ 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 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	A1-02 = 0 (default)	<ul style="list-style-type: none"> • General variable speed applications, particularly useful for running multiple motors from a single drive • When replacing a drive in which parameter settings are unknown
Open Loop Vector Control (OLV)	A1-02 = 2	<ul style="list-style-type: none"> • General variable speed applications • Applications requiring high precision, high speed control
PM Open Loop Vector Control	A1-02 = 5	<ul style="list-style-type: none"> • Derated torque-load applications employing permanent magnet motors (SPM, IPM) and energy savings.

◆ Normal / Heavy Duty Selection (C6-01)

The drive supports two ratings, Normal Duty and Heavy Duty. Both have different output current ratings (refer to the catalog or instruction 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	8/10 kHz <->	Swing PWM

<1> 1-phase 200V drives up to CIMR-VCBA0006, default 10kHz

◆ Auto-Tuning (T1-□□)

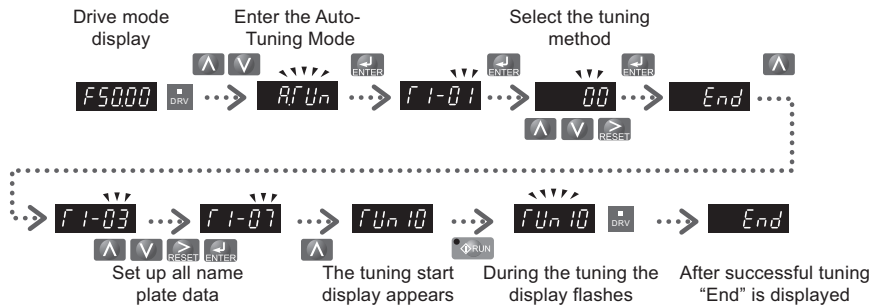
Auto-Tuning automatically sets up the motor data relevant drive parameters. Three different modes are supported

Tuning Mode	Parameter	Control Mode	Description
Rotational Auto-Tuning	T1-01 = 0	OLV	Perform when setting the drive to operate in Open Loop Vector control. The motor must be able to rotate without load during the tuning process in order to achieve a high accuracy.
Terminal resistance tuning	T1-01 = 2	OLV, V/f control	Perform in V/f control if the motor cable is long or if the cable has been changed.
Rotational Auto-Tuning for Energy Saving	T1-01 = 3	V/f control	Perform when using Energy Saving or Speed Search. The motor must be able to rotate without load in order to achieve a high tuning accuracy.

CAUTION

Never touch the motor until the Auto-Tuning is finished. Even though the motor may not be rotating when Auto-Tuning, voltage is still applied to the motor during the tuning process.

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 Drive Disable inputs must be closed during Auto-Tuning.

◆ Frequency Reference and Acceleration/ Deceleration Times

■ Frequency Reference Source (b1-01)

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

b1-01	Reference source	Frequency reference input
0	Operator keypad	Set the frequency references in the d1-□□ parameters and used digital inputs to switch over between different reference values.
1	Analog input	Apply the frequency reference signal to terminal A1 or A2.
2	Serial Comm.	Serial Communications using the RS422/485 port
3	Option Board	Communications option card
4	Pulse input	Set the frequency reference at terminal RP using a pulse train signal.

■ Run Command Source (b1-02)

Set parameter b1-02 according to the Run command source used.

b1-02	Command source	Run command Input
0	Operator keypad	RUN and STOP keys on the operator
1	Multi-Function digital input	Multi-Function digital input
2	Serial Comm.	Serial Communications using the RS422/485 port
3	Option Board	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 C1-01/02. 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 and the frequency reference source entered in parameter b1-01 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 b1-01/02 and that the drive is in the REMOTE mode.

The LO/RE LED on the drive operator 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

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

The function of each digital input can be assigned in the H1-□□ parameters. The default setting functions can be seen in the connection diagram in [Electrical Installation on page 13](#).

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

The function of each digital output can be assigned in the H2-□□ parameters. The default setting functions can be seen in the connection diagram in [Electrical Installation on page 13](#). 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. The default setting of both inputs is "Frequency bias". Input A1 is set for 0 to 10V input and A2 is set for 4-20 mA input. The addition of both input values builds the frequency reference.

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.

■ Monitor Output (H4-□□)

Use the H4-□□ parameters to set up the output value of the analog monitor output and to adjust the output voltage levels. The default monitor value setting is "Output frequency".

◆ Test Run

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

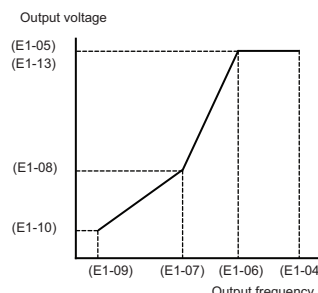
1. Run the motor without load and check if all input, outputs and the sequence work as desired.
2. Connect the load to the motor.
3. Run the motor with load and make sure that there is no vibrations, hunting or motor stalling occurs.

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.

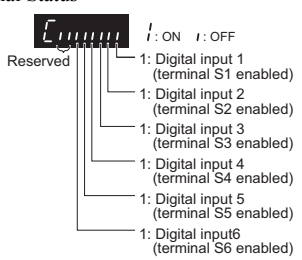
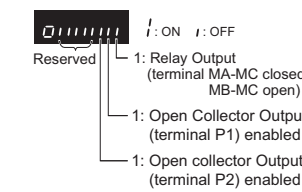
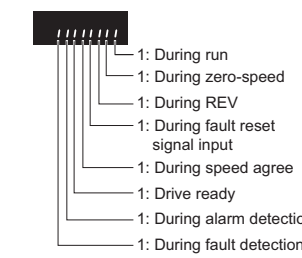
6 Parameter Table

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

Par.	Name	Description
Initialization Parameters		
A1-01	Access Level Selection	Selects which parameters are accessible via the digital operator. 0: Operation only 1: User Parameters 2: Advanced Access Level
A1-02	Control Method Selection	Selects the Control Method of the drive. 0: V/f Control 2: Open Loop Vector (OLV) 5: PM Open Loop Vector (PM) Note: Not initialized with A1-03!
A1-03	Initialize Parameters	Resets all parameters to default. (returns to 0 after initialization) 0: No Initialize 1110: User Initialize (The user must first set user parameter values and then store them using parameter o2-03) 2220: 2-Wire Initialization 3330: 3-Wire Initialization
Operation Mode Selection		
b1-01	Frequency Reference Selection	0: Operator - d1-□□ values 1: Analog input A1 or A2 2: Serial communication - RS-422/485 3: Option board 4: Pulse input (Terminal RP)
b1-02	Run Command Selection	0: Operator - RUN and STOP keys 1: Terminals - Digital inputs 2: Serial Com - RS-422/485 3: Option board connected
b1-03	Stopping Method Selection	Selects the stopping method when the run command is removed. 0: Ramp to Stop 1: Coast to Stop 2: DC Injection Braking to Stop 3: Coast with Timer (a new run command is ignored if received before the timer expires)
b1-04	Reverse Operation Selection	0: Reverse enabled 1: Reverse prohibited
b1-14	Phase Order Selection	Switches the output phase order. 0: Standard 1: Switch phase order
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. If $b2-01 < E1-09$, DC Injection Braking starts at E1-09.
b2-02	DC Injection Braking Current	Sets the DC Injection Braking current as a percentage of the drive rated current. In OLV the DC excitation current is determined by E2-03.
b2-03	DC Inj. Braking Time/ DC Excitation Time at Start	Sets the time of DC Injection Braking at start in units of 0.01 seconds. Disabled when set to 0.00 seconds.
b2-04	DC Inj. Braking Time at Stop	Sets the DC Injection Braking time at stop. Disabled when set to 0.00 seconds.
Acceleration/ Deceleration		
C1-01	Accel Time 1	Sets the acceleration time 1 from 0 to the max. output frequency.
C1-02	Decel Time 1	Sets the deceleration time 1 from the max. output frequency to 0.
C1-03 to C1-08	Accel/Decel Times 2 to 4	Set the accel/decel times 2 to 4 (set like C1-01/02).
C2-01	S-Curve 1	S-curve at acceleration start.

Par.	Name	Description
C2-02	S-Curve 2	S-curve at acceleration end.
C2-03	S-Curve 3	S-curve at deceleration start.
C2-04	S-Curve 4	S-curve at deceleration end.
Slip Compensation		
C3-01	Slip Compensation Gain	Increase if the speed is lower than the frequency reference. Decrease if the speed is higher than the frequency reference.
C3-02	Slip Compensation Delay Time	Decrease the setting when the slip compensation is too slow. Increase the setting when the speed is not stable.
Torque Compensation		
C4-01	Torque Compensation Gain	Increase this setting when the torque response is slow. Decrease this setting when speed/torque oscillations occur.
C4-02	Torque Compensation Delay Time	Increase this setting when speed /torque oscillations occur. Decrease the setting when the torque response is too slow.
Duty Mode and Carrier Frequency		
C6-01	Normal/ Heavy Duty Selection	0: Heavy Duty (HD) - Constant torque applications 1: Normal Duty (ND) - Variable torque application
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 to A: Swing PWM1 to 4 F: User defined
Frequency References		
d1-01 to d1-16	Frequency Reference 1 to 16	Set the multi-speed references 1 to 16.
d1-17	Jog Speed	Jog speed
V/f Pattern		
E1-01	Input Voltage Setting	Input Voltage
E1-04	Max. Output Freq.	For a 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 OPE10 fault will occur: $E1-04 \geq E1-06 \geq E1-07 \geq E1-09$ 
E1-05	Max. Output Voltage	
E1-06	Base Frequency	
E1-07	Middle Output Freq.	
E1-08	Mid. Output Voltage	
E1-09	Min. Output Freq.	
E1-10	Min. Output Voltage	
E1-13	Base Voltage	
Motor Data		
E2-01	Motor Rated Current	Automatically set during Auto-Tuning.
E2-02	Motor Rated Slip	Motor rated slip in hertz (Hz). Automatically set by Rotational Auto-Tuning.
E2-03	Motor No-Load Current	Magnetizing current in Ampere. Automatically set by Rotational Auto-Tuning.
E2-04	Motor Poles	Number of motor poles. Automatically set by Auto-Tuning.

Par.	Name	Description
E2-05	Motor Line-to-Line Resistance	Sets the phase-to-phase motor resistance in ohms. Automatically set by 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 by Auto-Tuning.
Digital Input Settings		
H1-01 to H1-06	Digital Input S1 to S6 Function Selection	Selects the function of terminals S1 to S6. Major functions are listed at the end of the table.
Digital Output Settings		
H2-01	Digital Output MA/MB Function	Set the function for the relay output MA-MB-MC.
H2-02	Digital Output P1 Function	Sets the function for the photocoupler output P1.
H2-03	Digital Output P2 Function	Sets the function for the photocoupler output P2. Major functions are listed at the end of the table.
Analog Input Setting		
H3-01	A1 Signal Level Sel.	0: 0 to +10 V (neg. input is zeroed) 1: 0 to +10 V (bipolar input)
H3-02	A1 Function Sel.	Assign a function to terminal A1.
H3-03	A1 Gain	Sets the input value in % at 10 V analog input.
H3-04	A1 Bias	Sets the input value in % at 0 V analog input.
H3-09	A2 Signal Level Selection	0: 0 to +10 V (neg. input is zeroed) 1: 0 to +10 V (bipolar input) 2: 4 to 20 mA (9 bit input) 3: 0 to 20 mA
H3-10	A2 Function Sel.	Assign a function to terminal A2.
H3-11	A2 Gain	Sets the input value in % at 10 V/20 mA analog input.
H3-12	A2 Bias	Sets the input value in % at 0 V/0 mA/4 mA analog input.
Analog Input Setting		
H4-01	AM Monitor Selection	Enter value equal to U1-□□ monitor values. Example: Enter "103" for U1-03.
H4-02	AM Gain	Sets terminal AM output voltage equal to 100% monitor value.
H4-02	AM Bias	Sets terminal AM output voltage equal to 0% monitor value.
Pulse Input Setting (Frequency Reference Input)		
H6-02	RP Input Scaling	Sets the number of pulses (in Hz) that is equal to 100% input value.
H6-03	Pulse Train Input Gain	Sets the input value in % at pulse input with H6-02 frequency.
H6-04	Pulse Train Input Bias	Sets the input value in % at 0 Hz pulse input frequency.
Pulse Output Setting		
H6-06	MP Monitor Sel.	Enter value equal to U□-□□ monitor values. Example: Enter "102" for U1-02.
H6-07	MP Monitor Scaling	Sets the number of output pulses when the monitor is 100% (in Hz).
Motor Overheat Protection		
L1-01	Motor Overload Prot. Sel.	Sets the motor overload protection. 0: Disabled 1: Standard fan cooled motor 2: Standard blower cooled motor 3: Vector motor
L1-02	Motor Overload Prot. Time	Sets the motor overload protection time in min. Normally no change is necessary.
Stall Prevention		
L3-01	Stall Prevention Selection during Acceleration	0: Disabled - Motor accelerates at active acceleration rate and may stall with too heavy load or too short accel time. 1: General Purpose - Hold acceleration when current is above L3-02. 2: Intelligent - Acceleration in the shortest possible time.

Par.	Name	Description
L3-02	Stall Prev. Level during Accel.	Sets the current level for stall prevention during acceleration.
L3-04	Stall Prev. Selection during Decel.	0: Disabled - Deceleration as set. OV might occur. 1: General Purpose - Deceleration is hold if DC bus voltage rises high.
L3-05	Stall Prev. Selection during Run	0: Disabled - Motor stall or overload might occur. 1: Decel Time 1 - Reduce speed using C1-02.
L3-06	Stall Prev. Level during Run	Sets the current level at which stall prevention during run starts to operate.
Auto-Tuning		
T1-01	Auto-Tuning Mode Selection	0: Rotational Auto-Tuning 2: Terminal resistance only 3: Rotational Auto-Tuning for Energy Saving
T1-02	Rated Power	Sets the motor rated power (kW).
T1-03	Rated Voltage	Sets the motor rated voltage (V).
T1-04	Rated Current	Sets the motor rated current (A).
T1-05	Base Frequency	Sets the motor base frequency (Hz).
T1-06	Motor Poles	Sets the number of motor poles.
T1-07	Base Speed	Sets the motor base speed (RPM).
T1-11	Motor Iron Loss	Iron loss for determining the Energy Saving coefficient. If unknown leave it on default.
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	 <p>Reserved</p> <ul style="list-style-type: none"> 1: ON 1: OFF 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)
U1-11	Output Terminal Status	 <p>Reserved</p> <ul style="list-style-type: none"> 1: ON 1: OFF 1: Relay Output (terminal MA-MC closed MB-MC open) 1: Open Collector Output 1 (terminal P1) enabled 1: Open collector Output 2 (terminal P2) enabled
U1-12	Drive Status	 <ul style="list-style-type: none"> 1: During run 1: During zero-speed 1: During REV 1: During fault reset signal input 1: During speed agree 1: Drive ready 1: During alarm detection 1: During fault detection
U1-13	Terminal A1 input level	
U1-14	Terminal A2 input level	
U1-16	Soft Starter Output (freq after accel/decel ramps)	
U1-18	OPE Fault Parameter	

6 Parameter Table

Monitor	Description
U1-24	Pulse Input frequency
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	Soft-Starter Speed Reference at Previous Fault
U2-16	Motor q-Axis Current at Previous Fault
U2-17	Motor d-Axis Current at Previous Fault
Fault History	
U3-01 to U3-04	Lists the most recent fault that occurred through the fourth most recent fault.
U3-05 to U3-08	Accumulated operation time at the most recent fault through the fourth most recent fault.
U3-09 to U3-14	Lists the fifth most recent fault that occurred through the tenth most recent fault.
U3-15 to U3-20	Accumulated operation time at fifth most recent fault through the tenth most recent fault.
* The following faults are not recorded in the error log: CPF00, 01, 02, 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 frequency command (higher priority than multi-step speed reference)
7	Accel/decel time selection 1
F	Not used (Set when a terminal is not used)
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
6	Drive Ready
E	Fault
F	Not used
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.

LED Display	ALM	FLT	Cause	Corrective Action
Base Block 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.	<ul style="list-style-type: none"> Check the digital inputs function selection. Check the upper controller sequence.
Control Fault EF		○	The torque limit was reached during deceleration for longer than 3 sec. when in Open Loop Vector control <ul style="list-style-type: none"> The load inertia is too big. The torque limit is too low. The motor parameters are wrong. 	<ul style="list-style-type: none"> Check the load. Set the torque limit to the most appropriate setting (L7-01 through L7-04). Check the motor parameters.
Control Circuit Fault CPF02 to CPF24		○	There is a problem in the drive's control circuit.	<ul style="list-style-type: none"> Cycle the drive power supply. Initialize the drive. Replace the drive if the fault occurs again.
Control Circuit Fault CPF25		○	There is no terminal board connected to the control board or the connection is broken.	<ul style="list-style-type: none"> Check if the terminal board is installed properly. Uninstall and Reapply the terminal board. Change the drive.
Cannot Reset CrSF	○		Fault reset was input when a Run command was active.	Turn off the Run command and reset the drive.
Option External Fault EF	○	○	An external fault was tripped by the upper controller via an option card.	<ul style="list-style-type: none"> 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 EF6	○	○	<ul style="list-style-type: none"> An external fault was triggered by an external device via one of the digital inputs S1 to S6. The digital inputs are set up incorrectly. 	<ul style="list-style-type: none"> Find out why the device tripped the EF. Remove the cause and reset the fault. Check the functions assigned to the digital inputs.
Internal Fan Alarm FRn	○	○	<ul style="list-style-type: none"> Internal stirring fan does not work 	<ul style="list-style-type: none"> Replace internal fan (see fig. Replacing the Internal Stirring Fan on page 28)
Ground Fault GF		○	Ground leakage current has exceeded 50% of the drives rated output current. <ul style="list-style-type: none"> Cable or motor insulation is broken. Excessive stray capacitance at drive output. 	<ul style="list-style-type: none"> Check the output wiring and the motor for short circuits or broken insulation. Replace any broken parts. Reduce the carrier frequency.
Drive Disable Hbb	○		Both Drive Disable inputs are open. The drive output is safely disabled and the motor can not be started.	<ul style="list-style-type: none"> Check why the upper controller's safety device disabled the drive. Remove the cause and restart. Check the wiring. If the Drive Disable function is not utilized for EN60204-1, stop cat. 0 or for disabling the drive, the terminals HC, H1, H2 must be linked.
Drive Disable Fault HbbF		○	Drive output is disabled while only one of the Drive Disable inputs is open. (normally both input signals H1 and H2 should be open) <ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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.
Output Phase Loss PF		○	<ul style="list-style-type: none"> Output cable is disconnected or the motor winding is damaged. Loose wires at the drive output. Motor is too small (less than 5% of drive current). 	<ul style="list-style-type: none"> Check the motor wiring. Make sure all terminal screws in the drive and motor are properly tightened. Check the motor and drive capacity.
Overcurrent OL		○	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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	○	○	<ul style="list-style-type: none"> Surrounding temperature is too high. The cooling fan has stopped. </> The heatsink is dirty. The airflow to the heatsink is restricted. 	<ul style="list-style-type: none"> 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		○	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Reduce the motor load. 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		○	<ul style="list-style-type: none"> The load is too heavy. The drive capacity is too small. Too much torque at low speed. 	<ul style="list-style-type: none"> 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.
DC Overvoltage OU	○	○	DC bus voltage rose too high. <ul style="list-style-type: none"> The deceleration time is too short. Stall prevention is disabled. Braking chopper / resistor broken. Unstable motor control in OLV. Too high input voltage. 	<ul style="list-style-type: none"> 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, AFR and hunting prevention as needed. Make sure that the power supply voltage meets the drives specifications.

7 Troubleshooting

LED Display	ALM FLT	Cause	Corrective Action
Input Phase Loss LF	○	<ul style="list-style-type: none"> Input voltage drop or phase imbalance. One of the input phase is lost. Loose wires at the drive input. 	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Cycle the power supply. Replace the drive if the fault reoccurs.
DC Undervoltage Uu1	○ ○	The voltage in the DC bus fell below the undervoltage detection level (L2-05). <ul style="list-style-type: none"> The power supply failed or one input phase has been lost. The power supply is too weak. 	<ul style="list-style-type: none"> Check the power supply. Make sure, that the power supply is strong enough.
Controller Undervoltage Uu2	○	The drives controller power supply voltage is too low.	<ul style="list-style-type: none"> Cycle power to the drive. Check if the fault reoccurs. Replace the drive if the fault continues to occur.
DC Charge Circuit Fault Uu3	○	The charge circuit for the DC bus is broken.	<ul style="list-style-type: none"> Cycle power to the drive. Check if the fault reoccurs. Replace the drive if the fault reoccurs.

<|> Please contact YASKAWA to replace internal or external cooling fan in case of Heatsink Overheat Alarm

◆ Operator Programming Errors

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

LED Operator Display	Cause	Corrective Action
oPE01 oPE01	Drive capacity and value set to o2-04 do not match.	Correct the value set to o2-04.
oPE02 oPE02	Parameters were set outside the allowable setting range.	Set parameters to the proper values.
oPE03 oPE03	A contradictory setting is assigned to multi-function contact inputs H1-01 through to H1-06. <ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Fix any incorrect settings. Refer to the Technical Manual for more details.
oPE05 oPE05	<ul style="list-style-type: none"> The run command source (b1-02) or frequency reference source (b1-01) is set to 3 but no option board is installed. The frequency reference source is set to pulse input but H6-01 is not 0. 	<ul style="list-style-type: none"> Install the required option board. Correct the values set to b1-01 and b1-02.
oPE07 oPE07	Settings to multi-function analog inputs H3-02 and H3-10 and PID functions conflict. <ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Fix any incorrect setting. Refer to the Technical Manual for more details.
oPE08 oPE08	A function has been set that cannot be used in the control mode selected. (might appear after control mode change)	<ul style="list-style-type: none"> Fix any incorrect setting. Refer to the Technical Manual for more details.
oPE10 oPE10	The V/f pattern setting is incorrect.	<ul style="list-style-type: none"> Check the V/f pattern settings. Refer to the Technical Manual for more details.

◆ Auto-Tuning Errors

LED Operator Display	Cause	Corrective Action
Er-01 Er-01	Motor data fault 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 Er-02	Minor Fault <ul style="list-style-type: none"> The wiring is faulty. The load is too heavy. 	<ul style="list-style-type: none"> Check the wiring. Check the load. Always perform Auto-Tuning with the load decoupled from the motor.
Er-03 Er-03	The STOP button was pressed and Auto-Tuning was canceled.	Repeat the Auto-Tuning.

LED Operator Display	Cause	Corrective Action
Er-04 <i>Er-04</i>	Resistance fault <ul style="list-style-type: none"> Wrong input data. Auto tuning exceeded the given time frame. Calculated values out of range. 	<ul style="list-style-type: none"> Check the input data. Check the wiring. Re-enter the data and repeat the Auto-Tuning.
Er-05 <i>Er-05</i>	No-Load Current Error <ul style="list-style-type: none"> Incorrect data was entered. Auto tuning took too long. Calculated values out of range. 	
Er-08 <i>Er-08</i>	Rated Slip Error <ul style="list-style-type: none"> Wrong data input. Auto tuning exceeded the given time frame. Calculated values out of range. 	
Er-09 <i>Er-09</i>	Acceleration error The motor did not accelerate for the specified acceleration time.	<ul style="list-style-type: none"> Increase the acceleration time C1-01. Check the torque limits L7-01 and L7-02.
Er-11 <i>Er-11</i>	Motor speed fault. The torque reference was too high.	<ul style="list-style-type: none"> Increase the acceleration time (C1-01). If possible, disconnect the load.
Er-12 <i>Er-12</i>	Current detection error <ul style="list-style-type: none"> One or all output phases are lost. Current is either too low or exceeds the drives rating. The current sensors are faulty. 	<ul style="list-style-type: none"> 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.
End1 <i>End1</i>	Rated current alarm <ul style="list-style-type: none"> The torque reference exceeded 20% during Auto-Tuning. The calculated no-load current is above 80% of the motor rated current. 	<ul style="list-style-type: none"> Check the V/f pattern setting. Perform Auto-Tuning without the load connected. Check the input data and repeat Auto-Tuning.
End2 <i>End2</i>	Motor iron-core saturation alarm <ul style="list-style-type: none"> Calculated core saturation values out of range. Incorrect data was entered. 	<ul style="list-style-type: none"> Check the input data. Check the motor wiring. Perform Auto-Tuning without load connected.
End3 <i>End3</i>	Rated current alarm	Check the input data and repeat tuning.

8 Maintenance

Some models are equipped with internal stirring fans and external cooling fans. This section describes how to replace those fans if required.

◆ Cooling Fan Spare Part Numbers

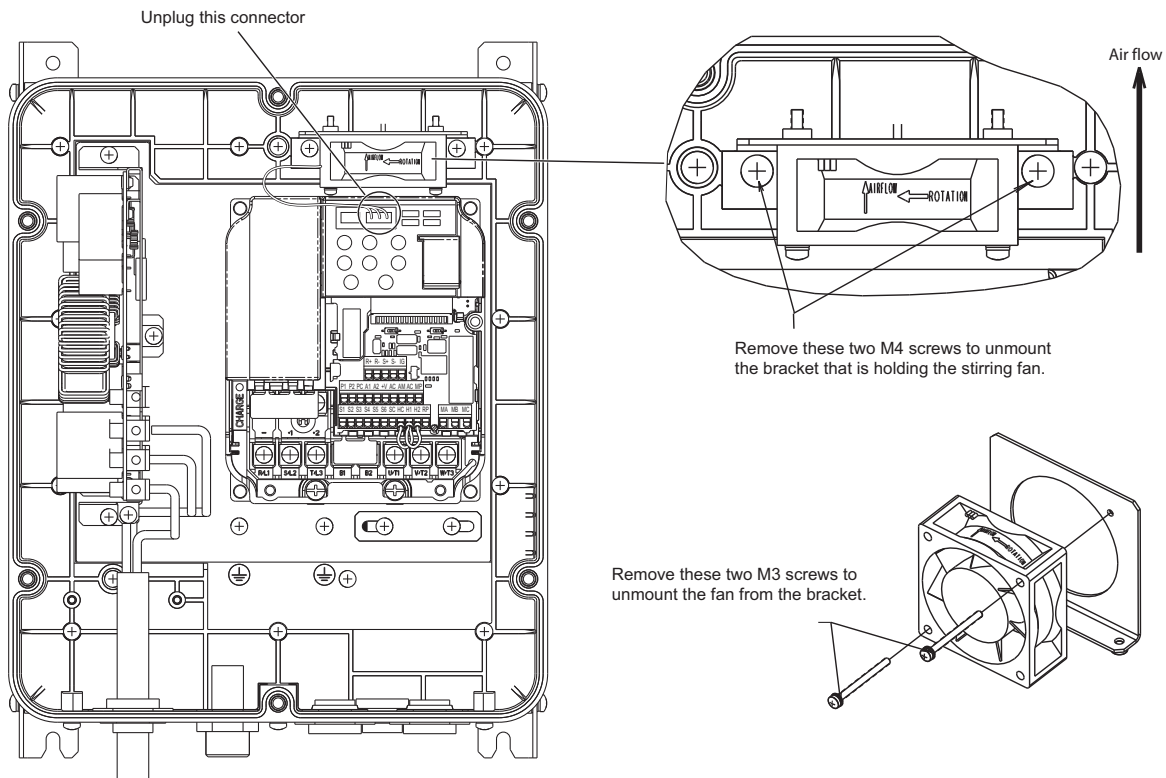
When replacing fans use YASKAWA spare parts listed in the table below only.

Model CIMR-VC□	Cooling fans fitted	
	Internal Stirring Fan	External Cooling Fan
BA0001	-	-
BA0002	-	-
BA0003	-	-
BA0006	-	-
BA0010	EUOP-V91003	-
BA0012	EUOP-V91003	-
4A0001	-	-
4A0002	-	-
4A0004	-	-
4A0005	-	-
4A0007	-	-
4A0009	-	-
4A0011	EUOP-V91003	-
4A0018	EUOP-V91003	EUOP-V91004
4A0023	EUOP-V91003	EUOP-V91004
4A0031	EUOP-V91003	EUOP-V91004
4A0038	EUOP-V91003	EUOP-V91004

◆ Replacing the Internal Stirring Fan

Should the internal stirring fan be broken a “FAn” error will be triggered in the drive. In this case replace the fan as described below.

1. Shut down the power supply to the drive wait 5 min. for DC bus capacitors to discharge.
2. Remove the IP66 front cover as described in [Removing the Front Cover on page 9](#).
3. Make sure the charge LED on the drive has gone off.
4. Unplug the internal fan cable connector (3 wires, right side connector) from the drive.
5. Unmount the stirring fan holding bracket (2x M4 screws) with the fan.
6. Unmount the fan from the holding bracket (2x M3 screws).

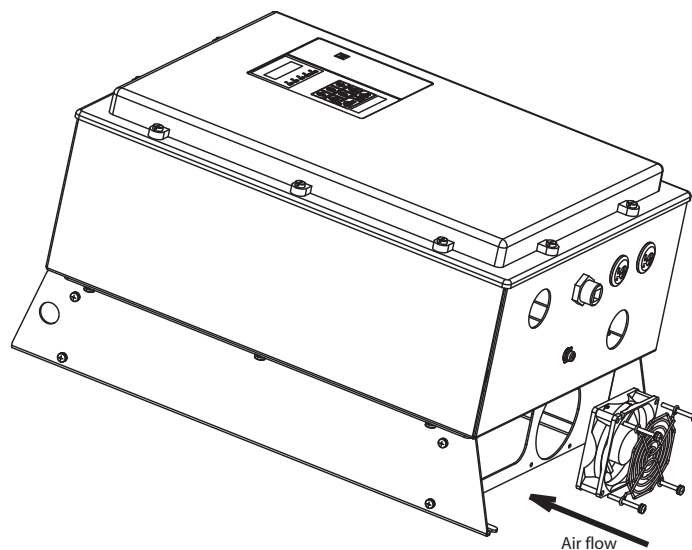


7. Attach the new fan to the bracket. Make sure the airflow direction is upwards with mounted fan. Then fix the bracket to the IP66 enclosure and connect the fan cable to the connector on the drive.
8. Reattach the IP66 front cover as described in [Reattaching the Front Cover on page 11](#).
9. Switch on the power supply. The drive should start up normally without showing an error.

◆ Replacement of the external cooling fan

Should the external cooling fan be broken (fan stopped or drive tripped with “oHP” fault) replace it following the instructions below.

1. Shut down the power supply to the drive wait 5 min. for DC bus capacitors to discharge.
2. Remove the IP66 front cover as described in [Removing the Front Cover on page 9](#).
3. Make sure the charge LED on the drive has gone off.
4. Unplug the external fan cable connector (2 wires, left side connector) from the drive. Cut cable ties that fix the fan cable.
5. Remove the fixing screws of the external fan, then remove the fan and pull the fan cable including the grommet out of the box.




6. Route the cable of the new fan through the fan cable hole and press in the grommet that is fixed to the fan cable into the fan cable hole.
7. Fix the fan. Make sure the airflow direction is upwards with mounted fan.
8. Fix the fan cable inside the box using cable ties and plug the fan cable into the connector on the drive.
9. Reattach the IP66 front cover as described in [Reattaching the Front Cover on page 11](#).
10. Switch on the power supply and confirm correct operation of the fan.

Revision History

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

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YASKAWA AC Drive V1000

IP66 Type

Compact Vector Control Drive

Quick Start Guide

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